

SECOND DRAFT

CRITERIA FOR IDENTIFICATION OF AREAS OF PARTICULAR PUBLIC CONCERN

Proposed for adoption by the
North Carolina Land Policy Council

by

The Interagency Task Force on
Environmental and Land Use Planning

Second Draft

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1974

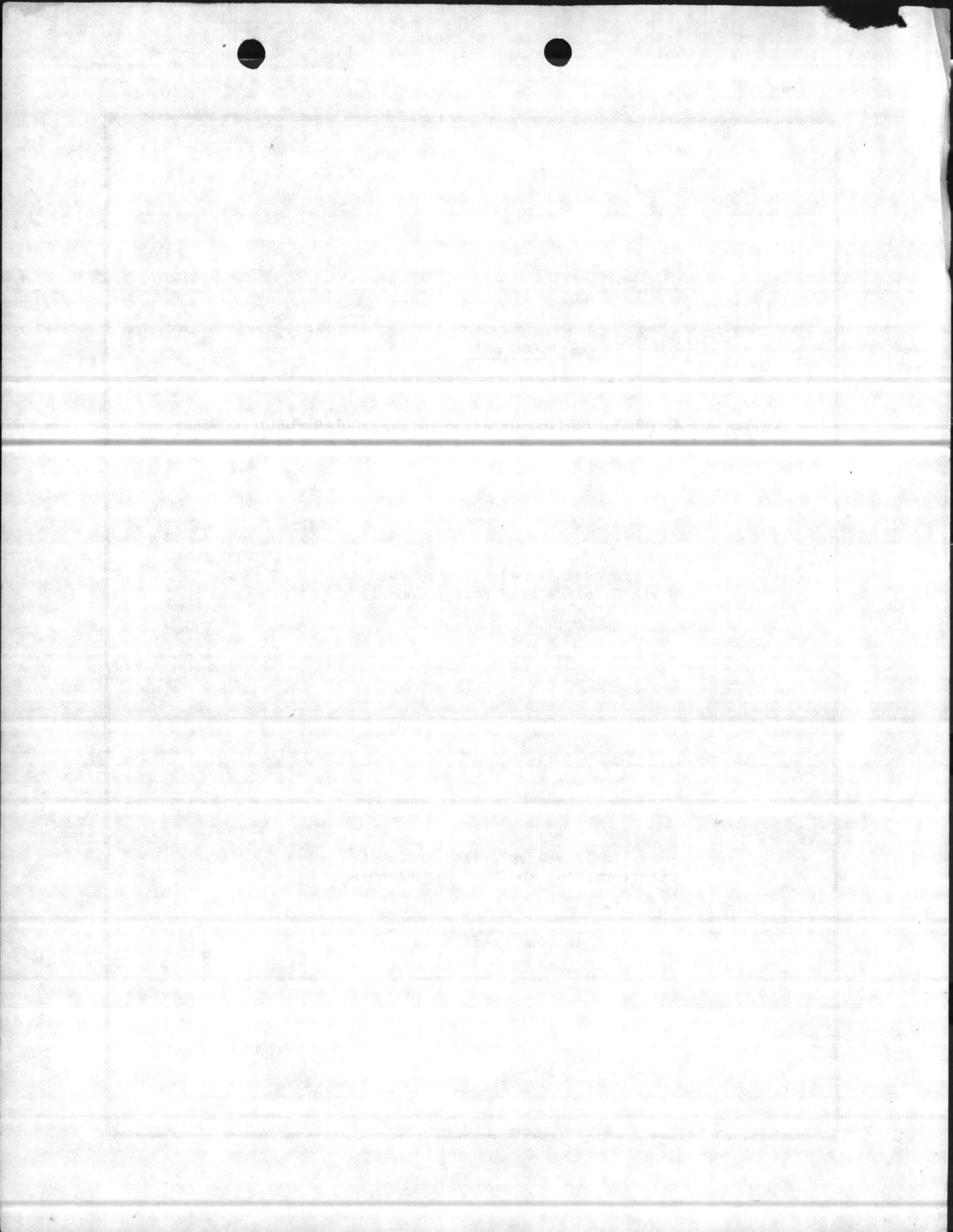
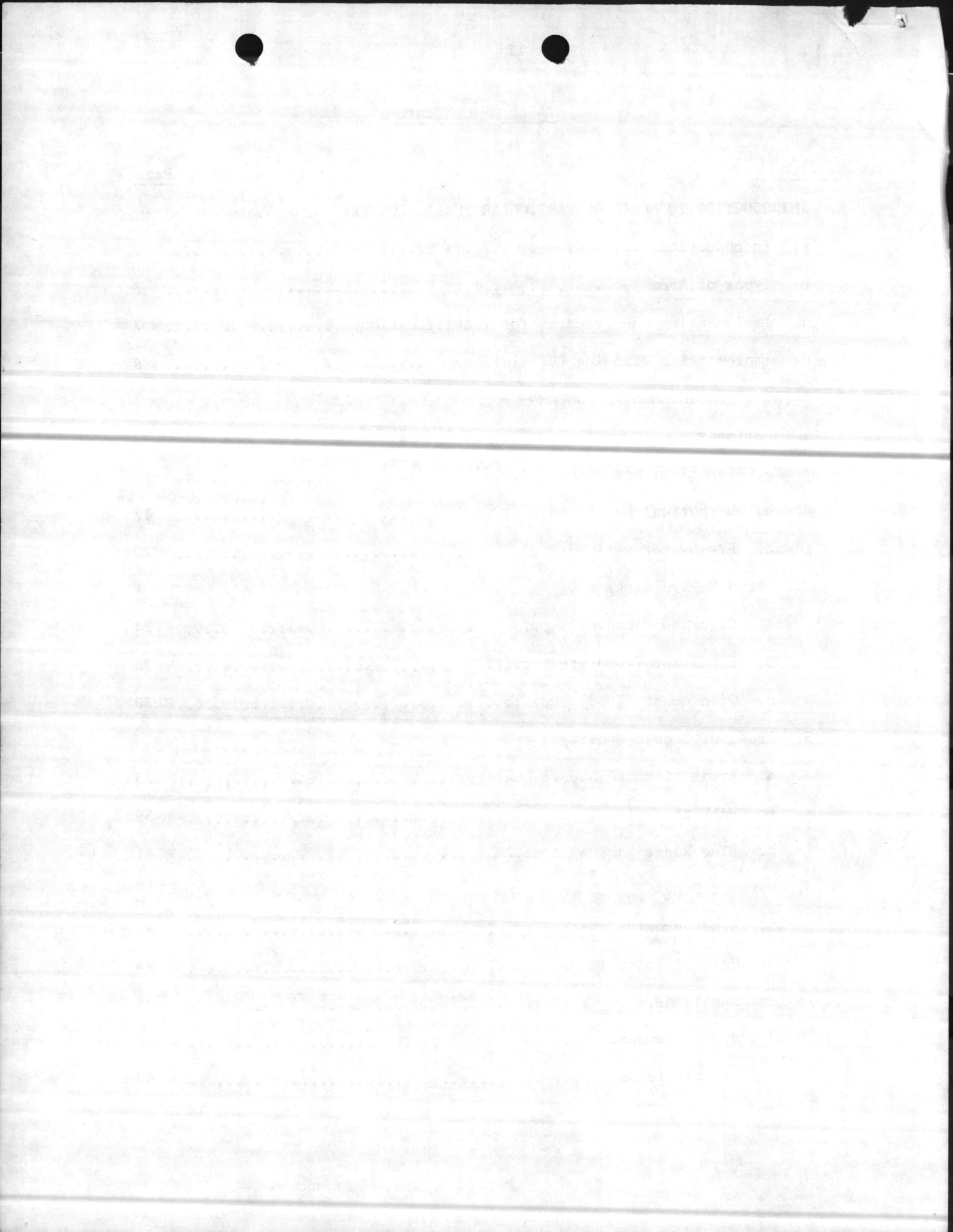
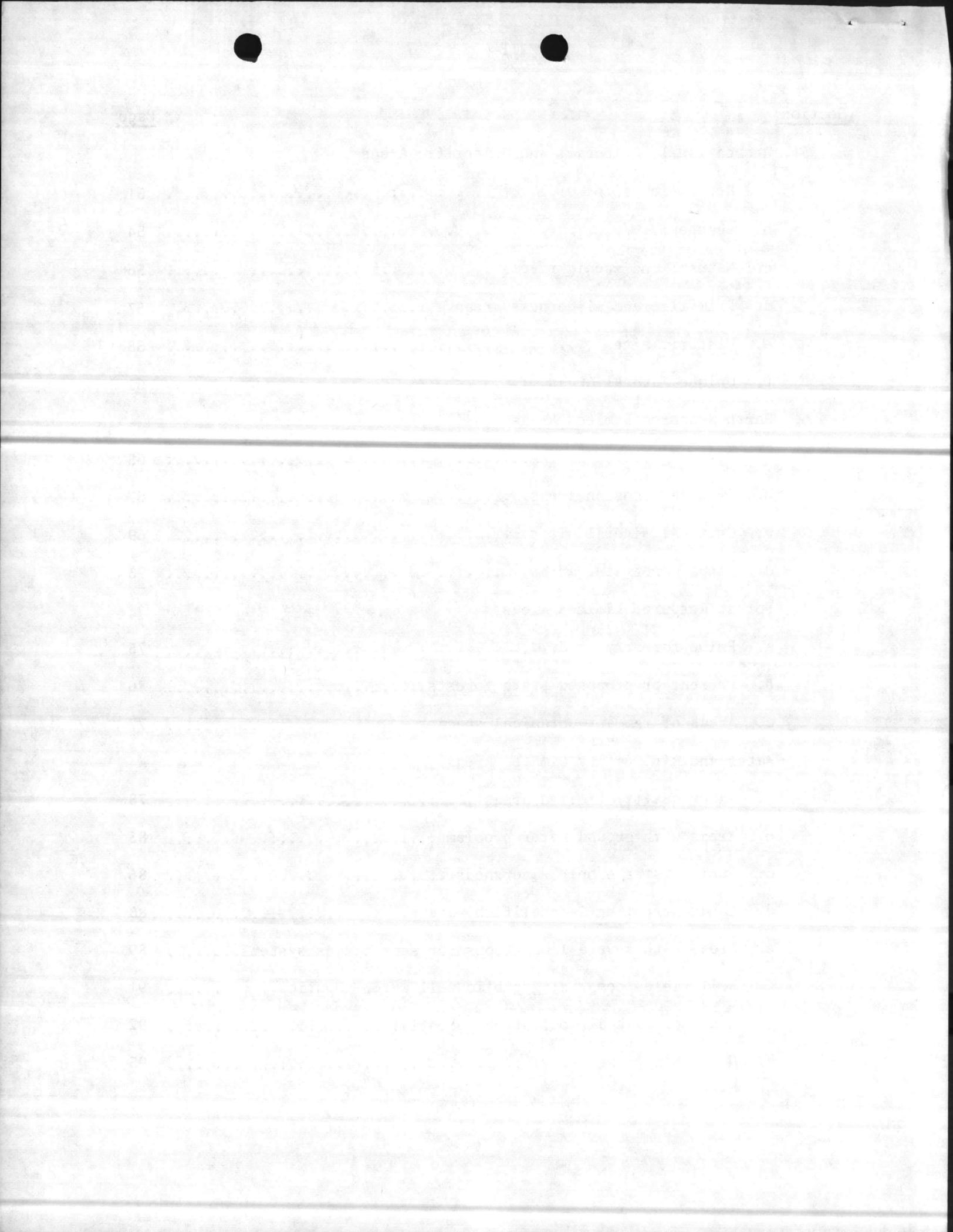


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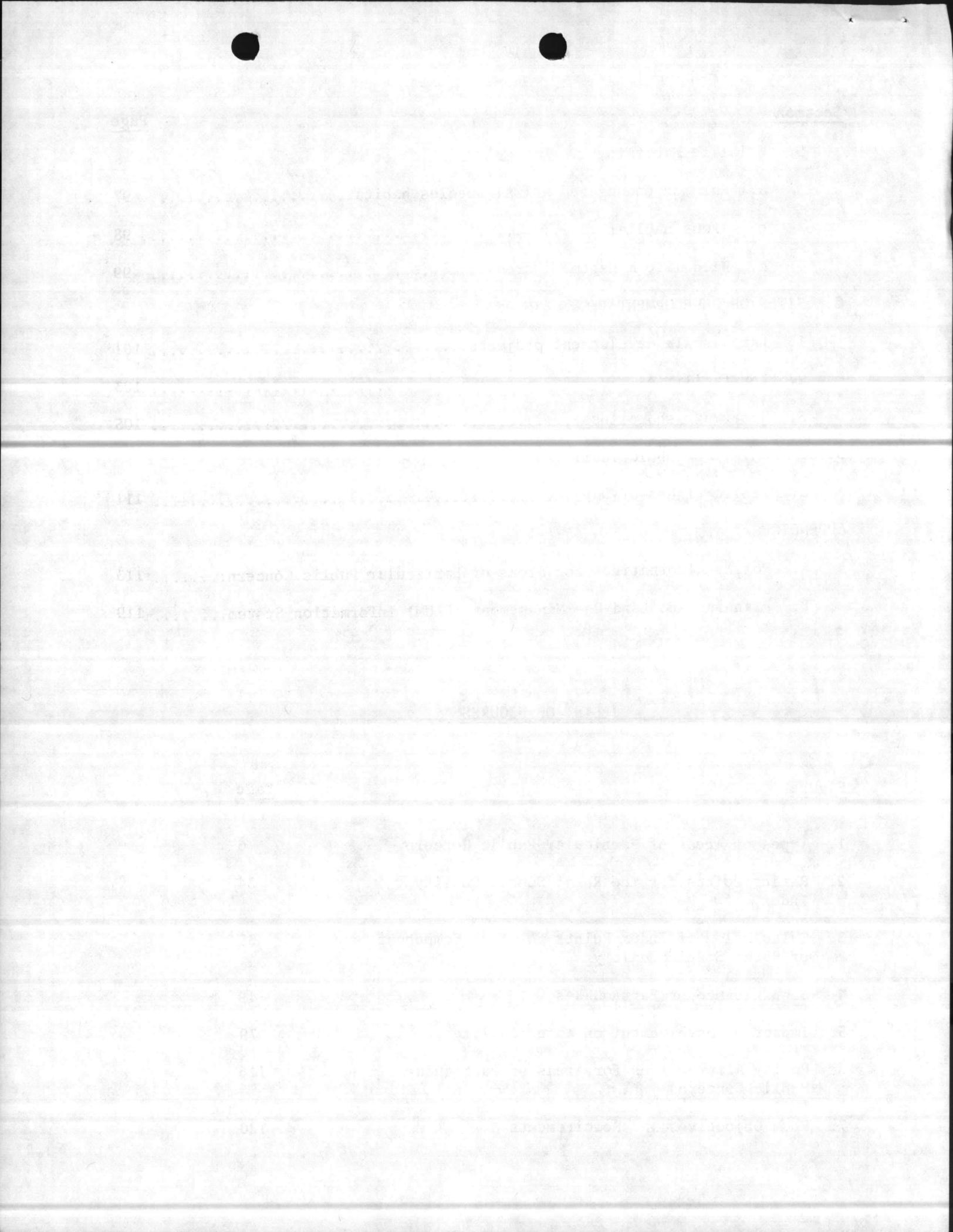
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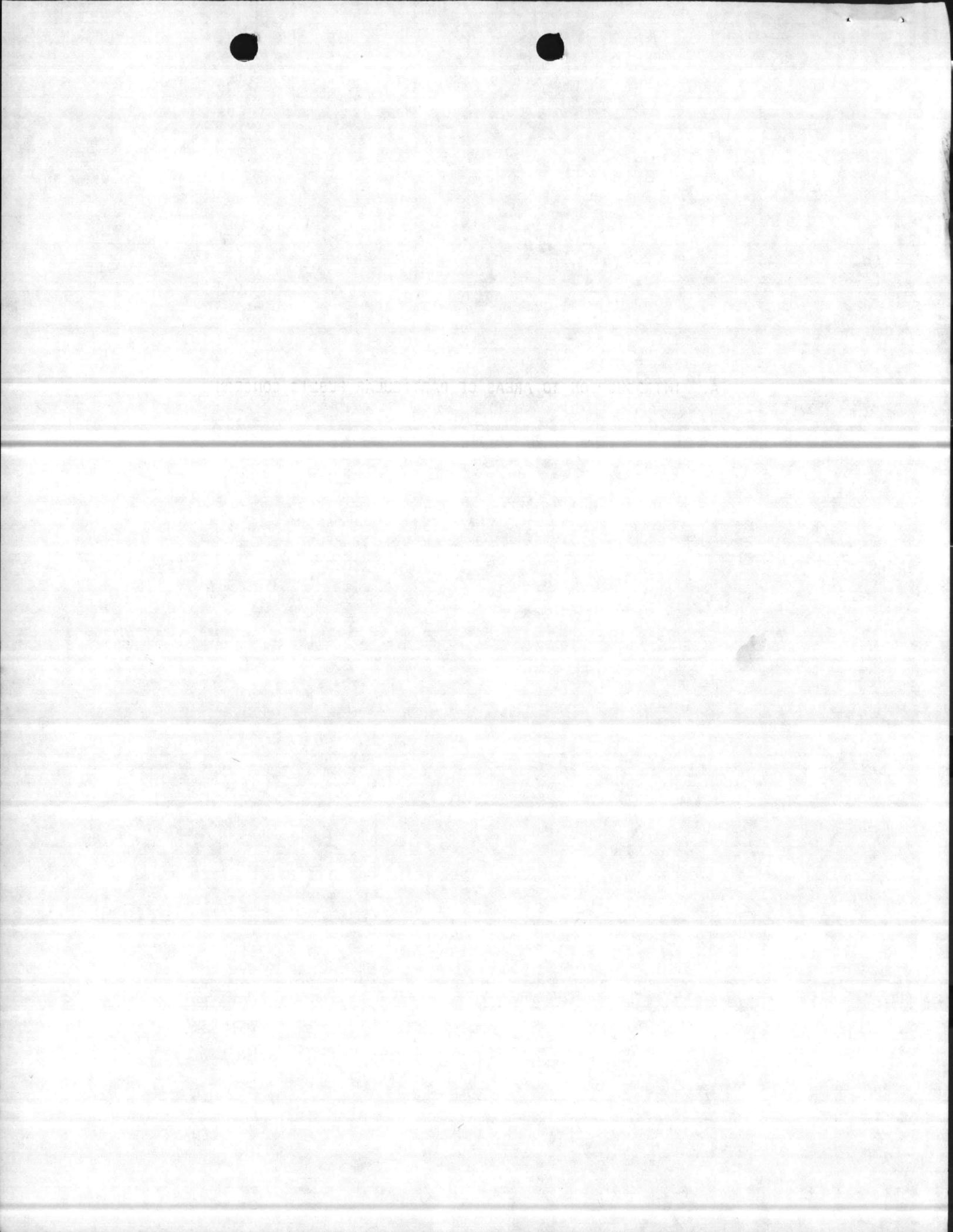
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A. INTRODUCTION TO AREAS OF PARTICULAR PUBLIC CONCERN



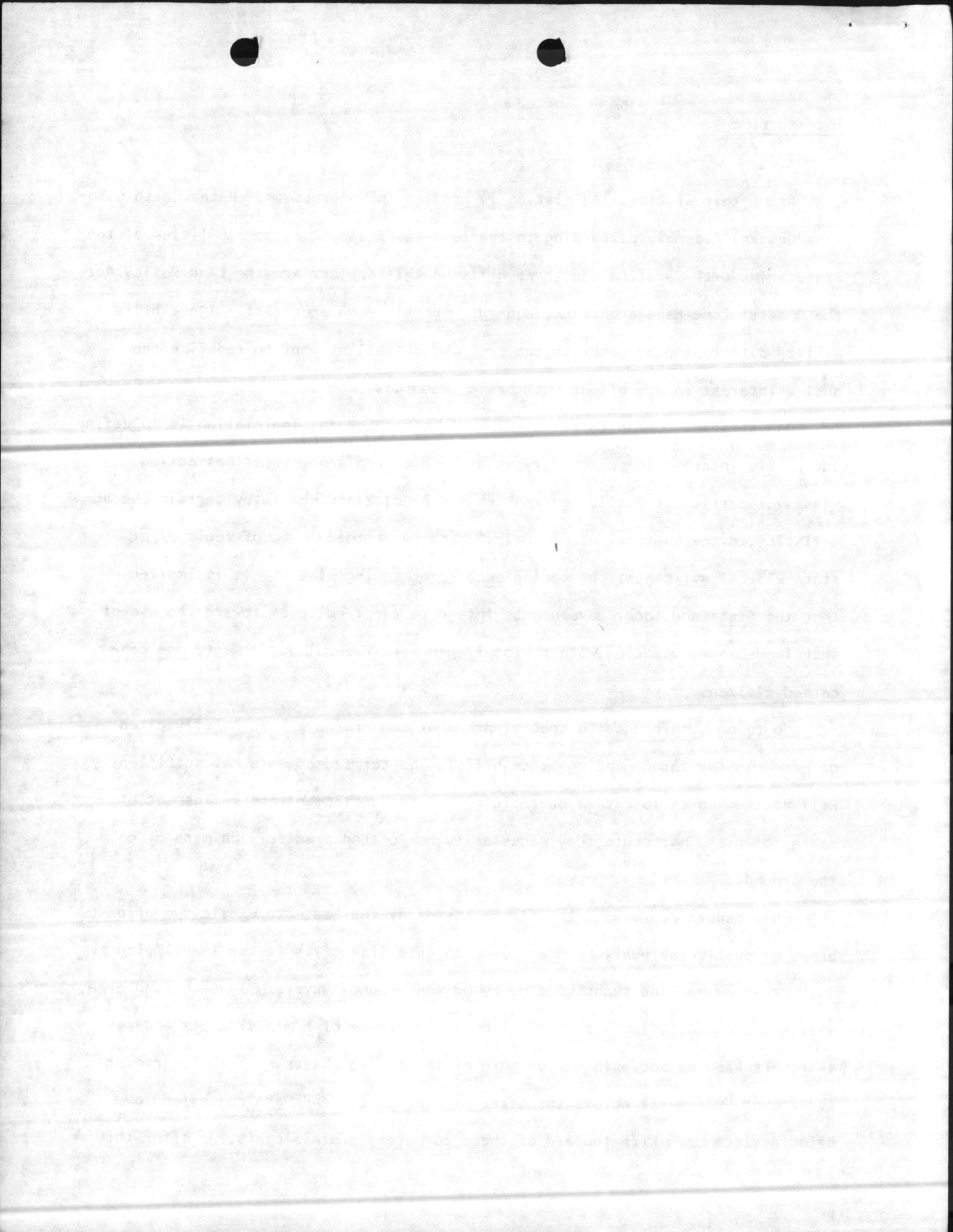
Introduction

As of this writing, legislation is pending in Congress and in the North Carolina General Assembly pertaining to the land use planning responsibilities of the State. In North Carolina the three bills on this subject are the Land Policy Act, the Coastal Zone Management Act, and the Mountain Management Act. These bills utilize different approaches to the problem, but all attempt to redefine the public interest in one of our most basic resources, the land.

One strategy common to all pending State and Federal legislation is to define the public interest in selected types of land. Such land, sometimes called "Areas of Particular Public Concern" should be distinguishable by certain characteristics, either natural or man-made, which cause them to be of regional or state-wide significance. By naming such areas in legislation, it is implied that the State and local governments intend to adopt policies toward the use of such lands in cooperation with regional agencies, Federal government, and concerned citizens.

Up to now, reference to special areas of concern have been briefly cited or named in the three pending State bills. The terms used were not sufficiently well-defined so as to become operational in the development and refinement of state policies, nor could they necessarily be located precisely on maps or on the ground.

This report represents the first attempt by the State to explicitly define areas of particular public concern, and to establish criteria for identifying such areas by mapping techniques or by on-the-ground surveys. In each land area, advice and consultation was sought from a wide range of administrators and researchers knowledgeable in one or more of the special cases. In the course of study over 50 experts across the State were contacted and were requested to offer assistance. With the aid of these competent professionals, we offer this



contribution to the establishment of land use policies for North Carolina.

Types of APPC's

The term "areas of particular public concern" (APPC's) as used in this report, refers to all types of land areas that have been selected for special attention under State land policies. Most areas are cited in legislation, such as the Land Policy Act of 1973, but they may also be referenced in other statutes, such as those dealing with water resources, recreation, or agriculture. Some may not yet be specified in legislation, but their inclusion in this document means that scientists or administrators find certain new terms relevant to the task of land use management.

"Areas of Environmental Concern" (AEC's) are those APPC's which have certain physiographic characteristics which make them important to people concerned about environmental quality. Environmental values held by such people may include concern for public health, for conservation of natural resources, for recreation, for science, or for aesthetics. Any one or all of these values may be involved in the justification for considering a land areas as having environmental concern.

"Sites of developmental concern" (SDC's) refer to sites for new development activities, such as highways, industries, housing projects, reservoirs, or other land development activities. Developmental sites are different from environmental areas in two ways. First, their location on a map is not known until a development project is proposed. This may be contrasted with environmental areas where the significance of the areas is inherent in the land. Second, the concern over developmental decisions covers more than environmental concern. One basis for concern over a development site is the possible conflict with environmental values, but concern may also be generated over inequities in the acquisition of land,

rivalry of jurisdictions, lack of adequate pay scales, inefficiency in landscape designs, or many other issues which are non-environmental in nature.

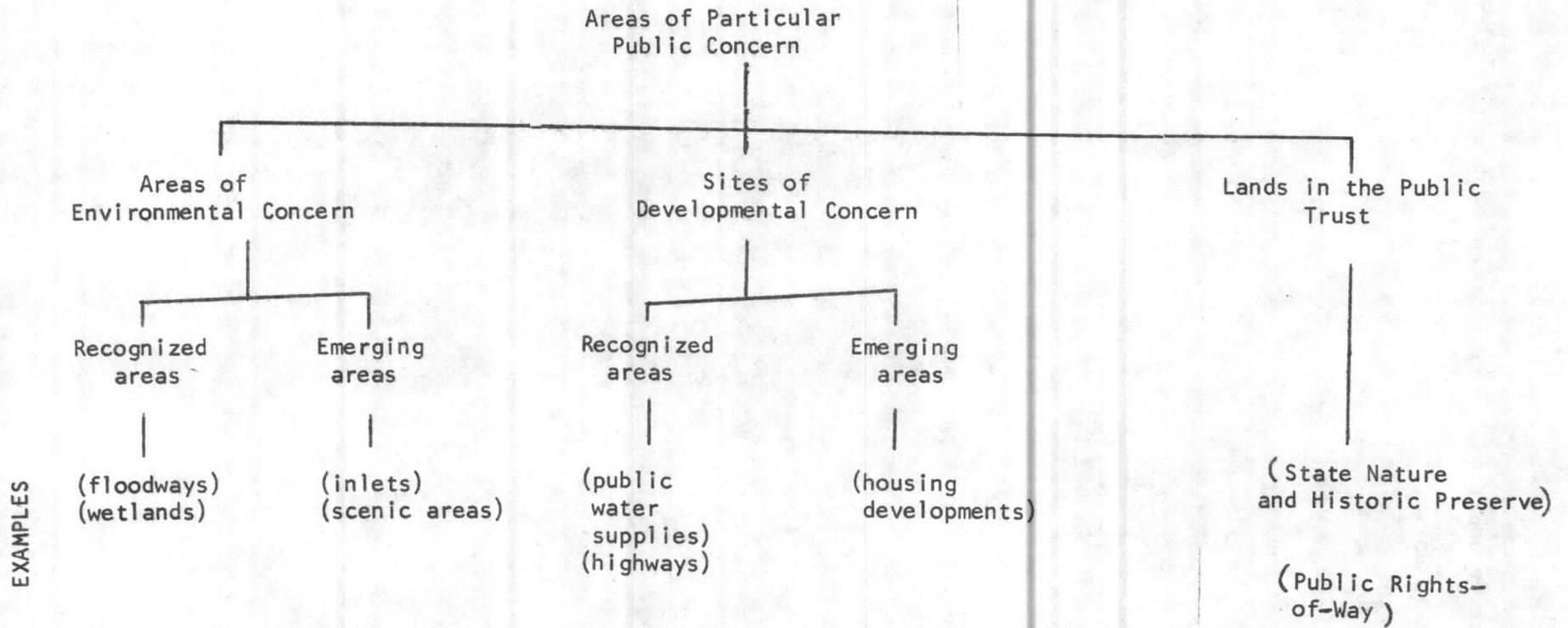
"Lands in the Public Trust" represent a third category of APPC's. These are areas where the State has established a basic public right in the land through purchase and has established a long term commitment to protecting them for public use and purpose. While environmental areas may be either in the private or public domain, lands in the public trust are always owned by government. The problem that may arise in these areas is that over a long period of time the basic public interest may be forgotten and encroachment may begin. For example, land dedicated for a public park may become a convenient location for an expressway because no effort is required to acquire it. Likewise, water might be diverted from one waterway to another river basin unless it was recognized that there was a long-term commitment for the water channel to deliver water to a downstream town.

APPC's may also be classified into those areas that are addressed by special legislation (recognized areas) and those that not addressed by special legislation (emerging areas). Recognized areas have State-level programs separate from Land Policy Councils or Commissions that deal directly with the area. For example, a flood plains management program is established to deal with flood hazard areas. Emerging areas are the subject of special concern and may sometimes be considered "critical", because no legislative or administrative policy has been established to deal with them and resolve present or potential conflicts over their usage.

Recognized areas may be addressed in State policy by a different administrative procedure than the emerging areas. Upon recommendation of the Land Policy Council, the Governor may issue directives aimed at established programs so that program plans, program budgets and legislative changes respond to the goals and policies of his administration. Where such programs have not been established by the legislature, the issue can best be handled by land use bodies that can study emerging areas of concern and establish policies within the jurisdiction of their authority.

Such bodies might also receive additional policy recommendations from the Governor, should he desire to do so.

Figure 1. Types of APPC's



Implementing the Criteria for Identification

This criteria document may be implemented by three parallel procedures under three different legislative acts pertaining to land use planning and management. The following State level bodies, when established, should consider the adoption of the criteria:

1. The North Carolina Land Policy Council. Under the North Carolina Land Policy Act, the Council is required to establish principles and guidelines for areas of particular public concern, new communities and large scale development, areas impacted by key facilities, and projects of regional impact. This document may serve these purposes.

2. The Coastal Resources Commission. The North Carolina Coastal Area Management Act requires that the Commission assist in the determination of areas of environmental concern in the coastal zone. This document may be adopted by the Commission to serve this purpose.

3. The Mountain Resources Commission. The North Carolina Mountain Area Management Act requires this Commission to approve the designation of areas of environmental concern in the mountains. Adoption of this set of criteria may serve to establish policy for identification procedures.

Under both the Coastal and the Mountain Management Acts the Secretary of the Department of Administration is responsible for proposing, developing, and coordinating the basic plans for management of the land resources. The policies and procedures to be used for planning by the Secretary are spelled out in the Land Policy Act. This means that basic procedures and guidelines will be set by the Land Policy Council, but the actual implementation of local planning procedures is the responsibility of local government.

Since local government is the key to success, local government officials should act to fulfill their responsibilities in a new partnership for planning with State

government. County commissions, city councils, and planning boards assisted by regional agencies should take steps to identify areas of particular public concern. The following immediate steps are recommended:

1. Prepare a resolution to adopt and implement this criteria document.
2. Order their staff to survey the availability of information required to properly identify the areas.
3. Begin a mapping process to place the boundaries of identified areas on maps.
 - a. 7 1/2 minute quadrangle U.S.G.S. land resource maps
 - b. Tax maps showing property boundaries

It will be noted that the process of "identifying" areas of particular public concern is not the same as actually establishing allowable land uses within those areas. The next step in the State-local partnership of land use management will be the establishment of policies within such areas, and will be the subject for a successor document. (See Appendix for a discussion of the alternatives being considered.)

Implementation of Planning Legislation

It is currently envisioned that the implementation of the three land use acts, State Land Policy Act, Coastal Area Management Act, and Mountain Area Management Act, will proceed under an integrated planning process. The staff work and coordination will be performed by personnel in the Department of Administration, principally in the Office of State Planning and the Marine Affairs Council.

Policy coordination between departments will be accomplished through the Land Policy Council, which is already a functioning body. Technical coordination with the Department of Natural and Economic Resources and other agencies will be performed through the Interagency Task Force on Environmental and Land Use Planning. Coordination with local officials and bodies will be conducted through the Advisory Councils established for this purpose.

Local agencies as well as the State will play an important role in implementing all three land use bills. Administrative guidelines are officially established by the Commissions, but the Task Force recommends the following steps for both local and State planners:

1. Identify environmental areas of more than local significance by geographical units, (See PLUM in Appendix B) rising criterial of this document.
2. Analyze the demand for land for development.
 - a. Synthesis of State Economic Development Policy, State Airport System Plan, Regional Water, Transportation and Development Plans, etc. to establish the definition and needs of Key Facilities (KF) and Developments of Regional Significance (DRS).
 - b. Identification of KF and DRS, both existing and potential, in each region by geographical units (PLUM).

c. Analysis of the following by geographical units (using grid systems of PLUM)

| <u>Land Use</u> | <u>1/</u> | <u>Demand</u> | | <u>Support Capability</u> | | | | |
|---------------------------------|-----------|-----------------|-------------------|---------------------------|--------------|--------------|-------------|----------------|
| | | <u>Trend 2/</u> | <u>Planned 3/</u> | <u>Soils</u> | <u>Topo.</u> | <u>Water</u> | <u>Geo.</u> | <u>Mineral</u> |
| Industry | | | | | | | | |
| Commerce | | | | | | | | |
| Residential | | | | | | | | |
| Recreation | | | | | | | | |
| Transportation | | | | | | | | |
| Extraction | | | | | | | | |
| Production of Renewable Res. | | | | | | | | |
| Power and Energy | | | | | | | | |

Notes:

1. Categories extracted from Sec. 302(c) of the Coastal Management Act of 1972. Refinement in accordance with USGS Circular 671 (Anderson) is needed.
2. Generated and interpreted from socio-economic projections.
3. Input from "key facilities" and "major development of regional significance" analysis.

3. Analysis and simulation of impacts (ecological, economic, public health and safety, esthetic, environmental) stemming from the use of the various critical environmental areas. The analysis will be by geographical units (PLUM) and land use categories.

4. Statements of ISSUES and POLICES regarding the management of the various areas of environmental concern

State Level

Regional/Local

- | | |
|--|--|
| <ol style="list-style-type: none"> a. Reiterate and define legislative intent and mandate. b. Articulate intergovernmental responsibilities in management. | <ol style="list-style-type: none"> a. Refine and amplify legislative intent and mandate in accordance with local goals. |
|--|--|

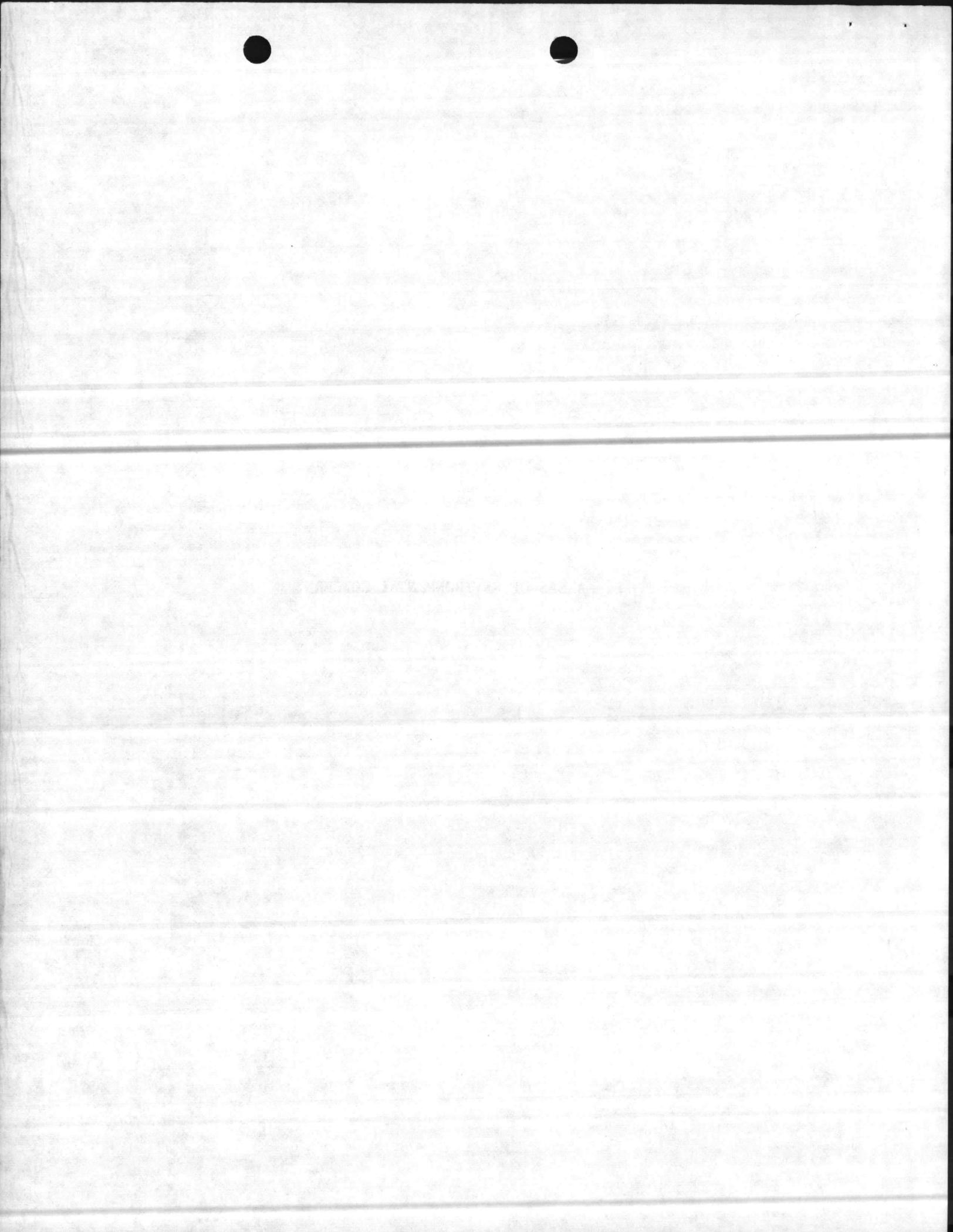
5. Development of LAND USE PLANS for the following purposes:

- a. To establish the rationale and standards for rating the priority of use in identified critical environmental areas.
- b. To set forth methods for controlling the development of permissible uses in identified critical environmental areas.

(Notes: The above will be done by geographical units -- PLUM)

6. Development of management programs and tools, including:
 - a. Land classification system
 - b. RULES, SCHEDULES AND procedures for implementing management programs at the State, Regional and Local levels.

B. AREAS OF ENVIRONMENTAL CONCERN



Low Tidal Marshland

A. Definition: Marshland existing below the mean high water line, subject to inundation by the normal rise and fall of lunar tides, and where saltmarsh cordgrass, Spartina alterniflora, normally grows as the dominant vegetative species.

B. Significance: Marshlands, especially low tidal marsh, represent the primary source of particulate detrital matter and nutrients essential to a wide variety of marine animal species of importance to sports and commercial fishermen. Recent research documents the importance of marshes in the productivity of coastal waters. As the plants die and fall to the surface of the estuarine substrate, they decompose to particulate organic detritus and nutrients to be transported to neighboring estuarine and marine waters. In North Carolina, over 90% of the total commercial catch, by weight, is comprised of species that must spend all or part of their life cycles in estuaries. Generally, the estuaries support these species at an early stage of their life cycles at a time of rapid growth. During this time of rapid growth, the larval and juvenile forms feed on bacteria, fungi, and protozoa that are attached to and associated with the detrital particles. There is also evidence that the regularly flooded salt marshes themselves serve as spawning and nursery grounds for a number of marine species important in the essential estuarine food chain.

The Spartina alterniflora marshland is the most productive of the salt water marshland, in terms of biomass of vegetation produced in a given period of time, which is readily available to the estuarine system. Marine ecologists have described low tidal marshland as more productive than the richest farmland. Although it is much less extensive in area than irregularly flooded marshes, it is con-

considered more critical to the continuance of marine life because its detrital contribution is more readily available to the estuary through a twice-a-day flush by lunar tides (Brown, 1973).

Spartina marsh is already differentiated from other marshland in the dredge and fill permit program of the Division of Commercial and Sports Fisheries. As a matter of policy, no filling, and rarely any dredging is allowed within this area (DNER, 1972). Other marshland may be altered to a somewhat greater degree, depending on the circumstances of individual cases.

The upper edge of the S. alterniflora marshland correlates closely with the mean high tide. This is convenient because the State claims all land below the elevation of mean high tide in public ownership.

Low tidal marshlands in North Carolina are found primarily between the barrier islands and the mainland from Pamlico Sound to the South Carolina border. Estuarine creek systems are normally bordered with S. alterniflora marsh of varying widths in this area. Little is found in Albemarle or Pamlico Sounds where lunar tidal fluctuations are also largely absent (Cooper, 1969).

C. Techniques for identification: "Marshland", as defined in the statutes by reference to particular plant species, covers three types of marsh that have different implications: low tidal marshland, high tidal marshland, and freshwater wetlands (See page __).

Early definitions of salt water marshlands attempted to delineate such areas by whether or not it was flooded by salt water. However, little consistency could be achieved because the plants of concern could sometimes be found above or below the lines where irregular flooding could not be consistently located. These difficulties are partially overcome by using the relevant biological communities themselves as the identifying criteria. (Fornes, 1973).

In the case of low tidal marshland, the lower and upper boundaries are clearly differentiated by the presence of S. alterniflora. No other species is capable of establishing such profound dominance in the zone where daily tides ensure a high salt content in the soil.

The technique of choice for precisely determining the edge of *Spartina* is color infrared aerial photography. Mapping of *Spartina* for purposes of inventory and management usually occurs at a scale of 1" = 600', but scales down to 1" = 200' may be required (Priddy, 1973). County tax maps may serve this purpose. Alternative techniques to mapping mean high tide provide less accurate approximations, particularly along shores with essentially flat planes. (Fornes, 1973).

D. References:

Adams, Dave, Coastal Zone Resources Corporation. Personal communication, October 9, 1973.

Brown, James, Division of Commercial and Sports Fisheries. Personal communication, October 8, 1973.

Coastal Plains Center for Marine Development Activities, "Guidelines for the Coastal Zone", Publication 73-5, July, 1973.

Cooper, A. Q., "Salt Marshes and Estuaries: Cradle of North Carolina Fisheries", from Estuarine Resources, August 1, 1969, edited by Tom Jackson, North Carolina Wildlife Resources Commission.

Copeland, B. J., Center for Marine Coastal Studies, NCSU. Personal Communication, October 15, 1973.

Fornes, Ann O. and Robert J. Reimold, "The Estuarine Environment: Location of Mean High Water--its Engineering, economic and ecological potential", from

Proceeding of the American Society of Photogrammetry Fall Convention (Part II). October, 1973. pp. 938-978.

Guss, Philip, Tidelands Management Mapping for the Coastal Plains Region from Proceedings of a Symposium on Coastal Mapping., June 5-8, 1972. pp. 243-262.

Jackson, Tom, Ed., Estuarine Resources, August, 1963, North Carolina Wildlife Resources Commission.

Marcellus, Kenneth L., et. al., Local Management of Wetlands, Environmental Considerations, June, 1973 Report No. 35, Virginia Institute of Marine Science. North Carolina Department of Natural and Economic Resources, "Applying for Permit to Alter Marshlands, Estuarine Bottom, Tidelands and State-owned Lakes," April, 1972, Division of Commercial and Sports Fisheries, Estuarine Studies Section.

Paul, Roy A. and Interagency Task Force on Environmental and Land Use Planning, Planning for Environmental Quality, Phase II, December, 1973.

Shalowitz, Aaron L., Shore and Sea Boundaries, Publication 10-1, United States Department of Commerce, Coast and Geodetic Survey, 1964. Volume I. Boun-dary Problems Associated with the Submerged Land Cases and the Submerged Land Acts. Shalowitz, Volume II, Interpretation and Use of Coast and Geodetic Survey Data. U.S.G.P.O.

High Tidal Marshland

A. Definition: Any salt marsh or other marsh subject to occasional flooding by tide, including wind tides (whether or not the tide waters reach the marshland area through natural or artificial watercourses), provided this shall not include hurricane or tropical storm generated tides.

B. Significance: High tidal flooded marshland contributes significantly to the productivity of estuarine waters. For example, shrimp is produced in large numbers in the Pamlico estuary though there is little or no S. alterniflora growing in the marshes (Adams, 1973).

Irregularly flooded marshes require protection, but are somewhat less critical than Spartina. A policy is required to better differentiate areas where development may alter these lands under special circumstances and areas where alterations will not be permitted (Paul, 1973).

C. Techniques for identification: The lower edge of irregularly flooded marshland may be either the upper edge of the Spartina marshland (see low tidal marsh), or the upper edge of submerged lands if there exists no Spartina.

High tidal marshlands, as defined by reference to particular plant species in the statutes, are composed of marsh areas that are irregularly flooded by salt water, such as a spring high tide or normal wind tides, but not including hurricane driven tides. Such species have been designated in law as follows:

Black needlerush, Juncus roemerianus

Glasswort, Salicornia spp.

Salt Grass, Distichilus spicata

Sea lavender, Limonium spp.

Bulrush, Scirpus spp.

Saw grass, Cladium jamicense

Cat-tail, Typha spp.

Salt-meadow grass, Spartina patens

Salt Reed-Grass, Spartina cynosuroides

Early definitions of these marshlands attempted to delineate that these marsh species were irregularly flooded by salt water. However, little consistency could be achieved because the plants of concern could sometimes be found above or below the lines where irregular flooding was thought to occur. Furthermore, the line of irregular flooding could not be consistently located. These difficulties are partially overcome by using the relevant biological communities themselves as the identifying criteria.

In order to locate a demarcation line on a particular property with the highest degree of certainty, a field survey must be conducted by a qualified biologist. He must use approximate identification keys such as those assembled by Virginia. Judgement will still have to be exercised because some species may have isolated representatives in areas that are quite definitely high ground. In addition to the criteria in the statute, he may use the guideline that mature high ground communities are to be excluded. Areas containing Sabala-Pinus or Quercus, or other ground species may be excluded from the marshland area. The intent is to establish a line of a consistent elevation to differentiate areas containing marsh species and the high ground species. Where indicated, it may be necessary to establish that elevation line across the property by standard surveying techniques.

In mapping the marshlands aerial photography is required to establish the boundaries of marsh. For most purposes, this can be done by black and white

photographs. Where precision is required at a map scale of 1" = 400' or larger, it may be necessary to use multi-spectral photogrammetry to establish signatures for the relevant species and demarcation lines drawn accordingly. Such procedures will require extensive ground truth surveys supplementary to over-flights at appropriate altitudes.

C. References:

(Same as low tidal marsh)

Freshwater Wetlands

A. Definition: Any lowland covered by non-salt water either frequently or intermittantly, including freshwater marshes, swamps, bogs, potholes, shallow lakes and ponds and river-overflow lands. The water may come from precipitation or overflow from rivers, streams, and creeks.

B. Significance: Fresh water wetlands and freshwater sounds represent important wildlife habitats for a wide variety of animals, some of which cannot exist without wetlands. Ducks are considered one group of birds that depend upon wetlands for feeding and resting, especially during long migrations. Anadromous fish species utilize the edges of swamps as spawning habitat. An abbreviated list of other animals that use wetlands in North Carolina follows:

Small Game: Rails, Rabbit, Snipe, Squirrels, Wild Turkey, Woodcock

Big Game: Black Bear, White-tailed deer

Fur animals: Beaver, Bobcat, Fox, Mink, Muskrat, Otter, Raccoon

Alligator

Fish: Striped bass, herring (alewife and blueback), and shad (American and hickory).

In North Carolina there are more than 4 million acres of wetlands (including saltwater wetlands). Many of these lands have been drained or displaced in recent years with little though given to their recreational, conservation and scientific value to the people of the State.

A land policy will have to consider the protection or acquisition of the remaining wetlands for maintenance of wildlife habitat, as well as for other purposes.

C. Techniques for Identification: Freshwater wetlands in North Carolina are of seven types which may be identified roughly, but not accurately, in the field and on maps. The characteristics of the freshwater wetlands are as follows (See Wetlands, 1971):

A. Inland Fresh Areas

Type 1 - Seasonally flooded basins or flats: The soil is covered with water or is waterlogged during variable seasonable periods, but usually is well drained during much of the growing season. They are found in upland depressions where they may be filled with water after heavy rain, or along river courses which are flooded in later fall, winter or spring (flood plains).

Vegetation varies greatly according to the season and the duration of flooding. It includes bottomland hardwoods as well as some herbaceous growth. Where the water has receded early in the growing season, smartweeds, wild millet, fall panicum, tealgrass, chufa, redroot cuperus, and weeds (such as marsh elder, ragweed and cocklebur) are likely to occur. Shallow basins that are submerged only very temporarily usually develop little or no wetland vegetation.

Type 5 - Inland open fresh water. Shallow ponds and reservoirs are included in this type. Water is usually less than 10 feet deep and is fringed by a border of emergent vegetation. Vegetation (mainly at water depths of less than 6 feet) include pondweeds, naiads, wildcelery, coontail, watermilfoils, muchgrasses, waterlilies, spatterdocks, and (in the South) water-hyacinth.

Type 7 - Wooded swamps. The soil is waterlogged at least to within a few inches of its surface during the growing season, and is often covered with as much as 1 foot of water. Wooded swamps occur mostly along sluggish streams, on flooded plains, on flat uplands, and in very shallow lake basins. Trees include

water oak, overcup oak, tupelo gum, swamp black gum, and cypress. Deciduous swamps frequently support beds of duckweeds, smartweeds, and other herbs.

Wooded swamps often occur in association with shrub swamps, and waterfowl often use the two types interchangeably. In the Southeast, Type 7 swamps become particularly important in years when lack of sufficient fall and early winter rains leave overflow areas dry. At such times, wooded swamps represent the only shallow water available over wide areas. This type is particularly useful to the wood duck throughout the range of this species.

Type 8 - Bogs. These are often called pocosins, bays, and savannahs. The soil is usually water logged and supports a spongy covering of mosses. Bogs occur mostly in shallow lake basins, on flat uplands, and along sluggish streams. Vegetation is woody or herbaceous, or both. Typical plants are heath shrubs, sphagnum moss, and sedges. In North Carolina, cyrilla, persea, gordonia, sweet-bay, pond pine, Virginia chainfern, and pitcher-plants are common.

B. Inland Saline Areas (None occur in North Carolina)

C. Coastal Fresh Areas

Type 12 - Coastal shallow fresh marshes. The soil is always water logged during the growing season. It may be covered at high tide with as much as 6 inches of water. These marshes are on the landward side of deep marshes along tidal rivers, sounds, and deltas. Vegetation consists of grasses (reed, big cordgrass, maidencane), sedges (carex, spikerushes, threesquares, saw grass), and various other marsh plants such as cattails, arrowheads, smartweeds, and arrow-arum.

Nationwide, these shallow fresh marshes rate the highest of the nine coastal types in their importance to waterfowl.

Type 13 - Coastal deep fresh marshes. The soil is covered at average high tide with 6 inches to 3 feet of water during the growing season. These marshes occur along tidal rivers and bays. Vegetation is mainly cattails, wildrice, pickerelweed, giant cutgrass, and spatterdocks, often with pondweeds and other submerged growths in marsh openings.

Type 14 - Coastal open fresh water. Included in this type are shallow portions of open water along fresh tidal rivers and sounds that are considered vulnerable to reclamation for agricultural or industrial uses. Vegetation is scarce or absent, in stained or turbid waters. At depths less than 6 feet, pondweeds, naiads, wildcelery, coontail, waterweeds, watermilfoilds, and musk-grasses are common.

D. Coastal Saline Areas

(These are described elsewhere in this document as low tidal marsh and high tidal marsh.)

The above descriptions of wetland types is abbreviated and insufficient in detail for accurate differentiation. More research is required to develop a more accurate definition of types and to collect information in the field, such as soils data, in order to map the wetlands.

D. References:

U. S. Department of the Interior, Fish and Wildlife Service, Wetlands of the United States, Circular 39, U.S.G.P.O., 1971.

Riverine Floodways

A. Definition: "Floodway" means that portion of the channel and flood plain of a stream designated to provide passage for the 100-year flood, without increasing the elevation of that flood at any point by more than one foot.

B. Significance: When developed, floodways are dangerous to health and well-being. Structures such as commercial buildings and residences located in these areas are subject to damage or destruction during floods.

The public interest in floodways is the prevention of economic damage, avoidance of disorder, and protection of the public health. The public interest is violated when such areas are developed into residential areas or commercial centers, but is protected if such areas are used for parks and playgrounds, agriculture or other non-structural uses.

The natural flat plain formed by recurring floods over a long period of time (the flood plains) is subject to change by the actions of man. The building of structures or highways and earth fill within the natural flood plain constricts the flow of water during a flood, and causes water to back up. This increases the height of the flood upstream and increases the area of inundation.

Upstream, developments of all kinds increase flood runoff. Displacement of permeable natural soils by houses, streets and parking lots produces more areas with impermeable surfaces. Impermeable surfaces cannot absorb any rain water and all of it runs rapidly into the nearest stream, thus increasing the height of the flood downstream and the area inundated. Any man-made changes in the watershed which disturb natural soils increases the flood runoff by an amount directly related to the land area made impervious. Urbanization thus increases

storm water runoff and the height of flooding. A land policy should consider the effects of new developments upon the floodway height and width.

Techniques for Identification: The riverine floodways are determined from studies of the variability of stream flow (hydrology), from the study of historical records of flood heights, and from studies of the runoff characteristics of the land as determined by urbanization and soil types. The agencies presently performing this work in North Carolina are the U. S. Geological Survey, the U. S. Army Corps of Engineers, and the Tennessee Valley Authority.

The first part of determining the flood hazard area is the examination of hydrological data for the stream under study. The U. S. Geological Survey operates a network of streamflow gaging stations across North Carolina in cooperation with the N. C. Office of Water and Air Resources. Some stations provide continuous monitoring of the daily flows of streams. Such "daily discharge" stations may be used for a variety of purposes, including determining the frequency of flood occurrences. "High-flow partial record" stations are established at special sites of interest to provide supplementary information on the occurrence of flooding. These stations provide the basic data for calculating the volume of water discharged during the so-called 100-year flood (Goddard, 1970).

The second part of a flood plain study is to use available data to calculate flood frequencies. This is a statistical technique that has been used for many years called the Log-Pearson Type III frequency analysis. The U. S. Water Resources Council (consisting of various federal agencies) has standardized the basic procedures to be followed by the various agencies (See WRC, 1967). The different departments may vary somewhat in the methods of applying this technique. For example, the Corps of Engineers uses a guideline prepared by

of their regional offices (See Beard, 1962). Federal agencies have also developed computerized programs for determining the frequencies of flooding. (For example, see Thomas, 1968). Regardless of these differences, calculation of flood discharge volumes by these procedures uses a presumption of linear projection. Records of stream flow collected in the past are used to project the same frequencies of flood occurrence into the future. This will yield a statistically correct result only if the characteristics of the land and its runoff do not change as a result of new developments upstream.

One of the problems in using stream flow data alone is that the geographic coverage is never quite complete. Monitoring stations cannot be operated on every mile of stream and estimates have to be made for stream segments that are monitored incompletely or not at all. Techniques for transferring information to ungaged sites are known as "regional analysis of streamflow characteristics" (Riggs, 1973). Such techniques are statistical in nature using models of the behavior of streams and regression analysis. Delineation of floodways upon maps requires transferring the estimated flood level heights to the topographic contour of the land.

In view of the limited technical resources of the State, the principle method of determining flood hazard areas will be through a reference to a document by one of the three principle federal agencies.

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Estuarine Flood Hazard Areas

A. Definition: Land areas adjacent to coastal sounds and their upstream estuaries which are prone to flooding from hurricane storm surges with an annual probability of 1% or greater. These areas are analagous to the 100 year flood plain on a river.

B. Significance: Same as open coast flood prone areas.

C. Techniques for Identification: The techniques for identifying estuarine flood hazard areas differ markedly from those used to identify flood prone areas on the Outer Banks. While mathematical models are available for estimating the height of storm surge on the open coast, such models have not been developed for the sounds and adjacent estuaries.

Certain complications bar an easy or speedy resolution of the estuarine problem.

First, the force of storms or hurricanes tides is partially broken upon the Outer Banks, although overwash of the islands will allow an undetermined amount of tidal surge from the sea to continue across the sound.

Second, the sounds behave like large inland lakes by generating their own tidal surge under the force of hurricane winds. This surge is particularly important because the height of surge is potentially greater in shallow water bodies, such as estuaries, than in deeper waters such as the ocean.

Third, the complex shoreline and variations in physiography further complicate a problem that has not yet been solved.

In the meantime, the tidal surge height having a 100 year reoccurrence can be roughly estimated from historic records. The heights reached by various storms is sometimes recorded in coastal towns. Such records have been collected

by the National Weather Services, Wilmington Office. Using a Log-Pearons frequency analysis, these data can yield a usable figure, but such estimates must be tempered by experienced professional judgement due to the lack of adequate data in some localities. In lieu of a better technique, this method provides an interim figure for use in delineating the areal extent of flood hazard areas on topographic maps.

D. References:

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Open Coast Flood Hazard Areas

A. Definition: Land areas on the outer banks or barrier islands which are prone to flooding from hurricanes with an annual probability of 1% or greater (analogous to the 100 year flood plain on a river).

B. Significance: Open coast flood hazard areas represent lands dangerous to live in and dangerous for structures, roads and public facilities. Where buildings and structures are allowed, they exist in contravention to rules of safety, principles of prevention, and especially to consumer protection.

Structures are most frequently damaged in hurricanes, but lives have also been lost. The State is often requested to build groins and levies and replace public facilities where they are damaged by hurricanes. In addition, public assistance is often requested to replace private financial loss. This policy is at present undergoing some change with a trend toward beach nourishment and protection utilizing private rather than public funds. It is generally felt that public monies should be spent on projects which the general public can enjoy rather than protect or replace private real estate or businesses constructed in hurricane flood prone areas. Some citizens believe that prevention of these losses represents a more humane alternate policy.

The principle protective measure is the ensurance that structures are elevated so that the first floor is at or above the flood height of the 100-year flood (hurricane surge). Additionally, new developments and structures within the flood area should be discouraged and structures damaged or destroyed should not be replaced.

C. Techniques for identification: Flood prone areas on the open coast are defined by estimating techniques using mathematical models of the behavior of

hurricanes. Estimates are based on known parameters which determine the storm surge, or height of the waves that wash over the islands during a hurricane. The height of storm surge as estimated is compared with records of storm surge heights that are known from historical records. Such data is used to accurately calibrate the mathematical model. The flood prone area is all land that lies below the storm surge height that is calculated to have a recurrence frequency of once in one hundred years.

Two estimating procedures are available that provide roughly equivalent results on most of the coast of North Carolina. One is a method documented by Bodine (Bondine, 1971). This method presupposes certain assumptions which may or may not always be correct for a given section of coast. The second method is utilized by the National Oceanic and Atmospheric Administration, and is based on procedures developed by Jelesnianski and others (NOAA, 1973). The Corps of Engineers and NOAA are the recognized authorities and prime sources of information on storm surge heights on the coast. Using this data the flood prone areas may be delineated on topographic contour maps.

(D. References:

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U.S.G.P.O.

"Analysis of the tide Frequency for the Open Coasts of Bogue Banks, North Carolina." July 19, 1973, Report from the National Weather Service (NOAA) to the District Engineer, U. S. Army Corps of Engineers, Wilmington.

Areas of Rural Scenic Quality

A. Definition: Areas which presently have a rating of 75 or greater on the Index of Rural Scenic Quality.

B. Significance: Traditionally, one of the least definitive and consequently most ignored aspects of environmental planning for non-urban areas involves the aesthetic or scenic quality of the landscape. While numerous studies have utilized the term "scenic quality", very few have attempted to define it in any meaningful manner.

Federal and state land policy or environmental legislation contains phrases such as "preserve natural beauty" and "maintain and enhance scenic quality". However, these terms are not defined nor a criteria delineated. This gulf between terminology and actual practice must be closed as comprehensive land use legislation becomes more prominent in the area of environmental management. Rural landscapes are undergoing the most rapid changes and land conversions so that decision makers need to be aware of the visual impacts of their decisions.

The Index of Rural Scenic Quality combines measures of the three principle components of scenic quality as perceived by the majority of people: water, vegetation, and topography. Unique natural areas is a bonus factor. It also includes the principle negative factor, poorly planned rural "sprawl".

C. Techniques for Identification: The Index of Rural Scenic Quality is based on work performed by the Office of State Planning for the Appalachian Regional Commission in analyzing environmental problems in the mountain region. It was found that a rating system can be employed to analyze the different factors and summarize the result as an Index of Rural Scenic Quality. This index can be used to map the scenic quality of a region or state and to monitor trends in rural scenic quality over time.

FIGURE ² /

Rating Points for the Rural Scenic Quality Index

| | <u>Index Points</u> |
|--|--------------------------------|
| 1. Forest cover | 25 |
| 2. Land-water contact size of water (5) x proximity (5) | 25 |
| 3. Topographic contrast slope (5) x Elevation (5) | 25 |
| 4. Natural areas | 15 |
| 5. Density of Structures Buildings (5) x Roads (5) | 25 |
| | <u>Theoretical maximum 115</u> |
| | Practical maximum 90 |

Subjective ratings:

| | |
|-------------------|-----------|
| 75 - 90 | Beautiful |
| 50 - 75 | Pretty |
| 25 - 50 | Fair |
| Less than - 25 | Poor |

FIGURE ³/₂

Calculation of Index Points for
Each Component of Rural Scenic Quality

1. Index points for forest cover

| <u>Percent of land forested</u> | <u>Points</u> |
|---------------------------------|---------------|
| 80 - 100 | 25 |
| 60 - 79 | 20 |
| 40 - 59 | 15 |
| 30 - 39 | 10 |
| 20 - 29 | 5 |
| - 20 | 0 |

2. Index points for Unique natural areas

| <u>Percent of land in natural areas</u> | <u>Points</u> |
|---|---------------|
| 0 | 0 |
| 1 - 19 | 5 |
| 20 - 49 | 10 |
| 50+ | 15 |

3. Multipliers for calculating index points for land-water contrast.

a. Multipliers for largest water body

| <u>Lake or pond (ac)</u> | <u>Stream size (cfs) low-flow</u> | <u>Estuary width (mi)</u> | <u>Multi.</u> |
|--------------------------|---------------------------------------|-------------------------------|---------------|
| -100 | | | 0 |
| 100-500 | | | 1 |
| 500-2000 | 150+ | | 2 |
| 2000-10,000 | | 0.1-0.5 | 3 |
| 10,000+ | | 0.5-5 | 4 |
| | | 5+ | 5 |

b. Multipliers for proximity to major water bodies

| Percent of Area within 1 mile of major water | Mult. |
|---|-------|
| 1 -20 | 1 |
| 20-39 | 2 |
| 40-59 | 3 |
| 60-79 | 4 |
| 80-100 | 5 |

4. Multipliers for calculating index points for topographic contrast

| Average slope in % | Mult. | Average elevation in 100's feet | Mult. |
|-----------------------|-------|------------------------------------|-------|
| 0-4.9 | 0 | 0-4.9 | 0 |
| 5-9.9 | 1 | 5-9.9 | 1 |
| 10-14.9 | 2 | 10-14.9 | 2 |
| 15-19.9 | 3 | 15-19.9 | 3 |
| 20-24.9 | 4 | 20-29.9 | 4 |
| 25+ | 5 | 30+ | 5 |

5. Multipliers for calculating index points for structural density

| Buildings (no./sq. mi.) | Mult. | Roads (miles/sq/mi) | Mult. |
|----------------------------|-------|------------------------|-------|
| 0-4.9 | 5 | 0-.9 | 5 |
| 5-9.9 | 4 | 1.0-1.4 | 4 |
| 10-14.9 | 3 | 1.5-1.9 | 3 |
| 15-19.9 | 2 | 2.0-2.4 | 2 |
| 20-24.9 | 1 | 2.5-2.9 | 1 |
| 25+ | 0 | 3.0+ | 0 |

A recent analysis of scenic quality encompassed the following steps:

1. Maps of the region were acquired which adequately delineate factors of interest. (scale 1" = 2 miles)
 - a. Forest cover - estimated from a USGS map showing land cover.
 - b. Natural areas - a regional map was available at scale from another OSP project.
 - c. Significance and proximity of water - a "water pollution potential" map was used which showed 7-day and 10-year low flows and the presence of large water bodies.
 - d. Slope - a special slope map was provided by USGS under another project.
 - e. Elevation - plastic contour overlays were derived from USGS topographic maps at a different scale.
 - f. Buildings and highways - the cultural maps of the N. C. Highway Division served admirably.
2. A four square mile (1" x 1") grid on a plastic overlay was placed over each map. Each grid square was identified by column and row numbers. Index ratings were measured for each of 900 grid squares for each of the 8 factors.
3. Records of each grid factor was kept on a grid record chart. A total index rating was then calculated for each grid square.
4. The scenic quality rating by square was then written and categorized on the plastic overlay, resulting in a scenic quality rating map.

D. References

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- _____ (1973)b "Scenery as a Natural Resources", Landscape Architecture (January), pp. 126-132.

Park Zones

A. Definition: Land areas within one mile of a State or National Park boundary.

B. Significance: Our National parks are great sources of pride in our natural environmental heritage. The Great Smokey Mountain National Park receives six million motorists annually, making it the most frequented park in the United States. People from the world over come to enjoy its campgrounds, trails, trout streams and verdant forests containing almost as many species of hardwoods as all of Europe (D.N.E.R., 1969).

The 17 State parks are great attractions for picnicking, hiking, nature study, and sight seeing. While they are less well known to out of State visitors, they are scattered across the State so as to be accessible for North Carolina residents. As our economy improves, more and more people are visiting our State parks for week-ends and longer vacations.

Areas of great tourist attraction are also attractive for commercial development. But such development can sometimes defeat its own purpose. "We came because of the good land, and the more that came the less good it became." Accommodations and facilities serve a real need, and they can be very compatible with scenic quality if proper policies are established by the State. Strip development in and near National and State parks must be discouraged, but encouraged in nearby compact communities. By encouraging new development in smaller areas and by preventing commercialization of the approaches to Parks, both the environment and the economy will receive high returns.

Techniques for Identification: The park zones can be identified on maps of any scale where the Park boundaries are known with accuracy. Special surveys by a qualified surveyor may be required where the exact location on the ground is disputed. Such surveys are at the expense of the challenger.

D. References: Travel and Promotion Division, Department of Natural and Economic Resources, "Camping in North Carolina", brochure, undated.

Travel and Promotion Division, Department of Natural and Economic Resources, "Great Smokey Mountains National Park in North Carolina", map and folder, 1969.

Blue Ridge Parkway Zone

A. Definition: Land areas within 660 feet of the public right-of-way of the Blue Ridge Parkway.

B. Significance: The five hundred mile Blue Ridge Parkway is described as the "backbone" of a great scenic mountain region of 20,000 square miles. Beginning in Shenandoah National Park in Virginia, it winds through the high ridges of the beautiful Appalachians, terminating in the Great Smokey National Park of North Carolina and Tennessee. (Parkway Association, 1973)

The Parkway is the most popular park area, according to the National Park Service. Hundreds of thousands of people drive through North Carolina each year to observe some of North Carolina's most beautiful lands. The Parkway is a major means for North Carolinians to show our best face to American as well as representing an economic boom to our burgeoning tourist industry.

If North Carolina is to continue to show its best face to the world along the Parkway corridor, then the scenic quality will have to be protected in State land policy. The public interest will be served if commercialization is discouraged or prevented at the edge of the Parkway and encouraged in compact towns and mountain communities. By this means travelers can continue to observe our green blanketed mountains in the Spring and brilliant colors in the fall, rather than our "other face".

C. Techniques for Identifications: The zone boundary can be traced on maps at any scale where the Parkway boundary is known accurately. Special surveys by a qualified surveyor may be required where the exact location of the boundary is in dispute, and should be at the expense of the challenger of the map boundaries.

D. References: Blue Ridge Parkway Association, "The Blue Ridge Parkway Accomodations and Services", pamphlet, 1973.

Beach Erosive Areas

A. Definition: That area from the toe of the frontal dune landward to a line determined as the probable limit of beach erosion due to natural shoreline processes inclusive of probability of recurrence once in one hundred years (recession line), or a characteristic annual erosion rate of one foot per year predicted for a period of 100 years.

B. Significance: The beach erosion hazard area is a zone in which it is dangerous to build structures. Any residential or commercial structure built within this area is subject to destruction by washout of sand under the foundation, resulting in sever economic loss and possibly personal injury or loss of life.

C. Techniques for Identification: The techniques for identifying the beach erosion hazard area is adapted from the work of Knowles, et. al, at N. C. State University in Raleigh. It involved a mathematical model of the behavior of storms in eroding the frontal dunes and depositing sand offshore.

Calculations of the depth of erosion have been carried out at 29 sites along the outer banks of North Carolina. These calculations were based on information on the calculated storm surge heights for storms having varying frequencies of reoccurrence (See coastal flood hazard areas). The beach profile in height or depth from mean sea level at these points was known with considerable accuracy. The calculations also considered the type of dune structure and whether the dunes would be overwashed during the storm surge, eroded rapidly and then overwashed, or not overwashed at all. The results of these calculations could then be extrapolated to 5 different segments of coastal beaches.

The study provided a range of values for each beach segment, but for the purpose of this document, a standard value is used which is the mean of the recession depths calculated for the storm surge of 100 year frequency. The values of these recession lines are as follows:

| <u>Beach Segment</u> | <u>Mean recession line (ft) from toe of dune, for 100 year storm</u> |
|--------------------------------------|--|
| Virginia to Cape Hatteras | 100 |
| Cape Hatteras to Cape Lookout | 95 |
| East-West Portion to Carteret County | 135 |
| Onslow County | 180 |
| Pender County | 205 |
| New Hanover County | 225 |
| Brunswick County | 225 |

D. References: Knowles, C. E., Jay Langfelder, and Richard McDonald, "A Preliminary Study of Storm - Induced Beach Erosion for North Carolina", Center for Marine Coastal Studies, Report No. 73-5, October, 1973.

Coastal Inlet Lands

A. Definition: Lands adjacent to presently open coastal inlets which have a probability of 1% annually of becoming part of the inlet channel under water. Coastal inlets are those water channels across the outer banks which connect the ocean with the estuary.

B. Significance: Geological processes are constantly changing the face of the land along the outer banks, but the inlets represent features that change more rapidly than any other area. They are the focus of energy at work in the form of wind, waves, tides, and in addition, stream outflow into the ocean.

(Tilley, 1973)

The particular location of the inlet channel is a temporary one, as they are subject to migration. If the wind, tides, or stream flows affect one side of the channel more than the other, the first side will be carved away and the second will be built up by the deposition of sand. Over the last 100 years a number of inlets have migrated over a space of miles. Others have been closed completely as sand deposition has filled them, and opened once again under the force of a severe storm.

Lands adjacent to inlets are very hazardous for the construction of any building, especially homes. When such homes are lost to the channel due to a shift in its course, the owners have sometimes applied for public assistance. Thus the public interest in such lands is the prevention of loss of life and property and averting unwarranted drains on the public coffers.

A state land policy will have to consider preventing unwise construction of building upon the lands adjacent to inlets, and discouraging replacement or subsidy of any lost structures. Allowing such building is tantamount to encouraging the taking of risk and an implied subsidy for that risk by the public.

C. Techniques for Identification: At the present time, techniques for identifying precisely the extent of inlet lands is not will established. The basic principles of inlet migration are understood, but the application of these principles to the inlets has not been carried out. Studies are needed to approximate the boundaries for each inlet so that a reasonable policy can be applied. Longer range research can locate the boundaries more accurately.

D. References: Tilley, William S., "Planning for North Carolina's Coastal Inlets - An Analysis of the Present Process and Recommendations for the Future", Report No. 73-4, The Center for Marine Coastal Studies, N.C.S.U.

Dunelands

A. Definition: Dunelands are sand deposits of windblown (eolian) origin. They occur to a great extent as a part of the outer banks between the ocean and the sound. Dunes are ridges or mounds oriented generally parallel to the shoreline of the ocean. They begin at the landward margin of the beach at mean high tide and extend inland as one or more series of sand mounds. Most dunes are barren, partly vegetated or in shrubby vegetation, sedges, vines, or panic grasses. Climax vegetation has not been established. Many of these dunes are active (or live) and sand blowing may occur almost daily. Planned use of these areas should be restricted and approved by local county or regional planning boards.

B. Significance: Dunelands make up a considerable portion of the barrier reef or outer banks and is the protective barrier against the ocean for sounds, estuaries, and the mainland. Without dunes, tidal action would be constantly eroding or building at the edge of the mainland. Estuaries and sound areas would be greatly reduced and the main nursery for marine life would be destroyed. Beaches would be non-existent or constantly shifting and recreation reduced. Waterfowl habitat would be destroyed. The entire use pattern for fishing, hunting, recreation, industry and beach home development would be altered, or in many cases, destroyed.

Identification: Dunelands can be identified from topographic maps, soils maps or aerial photographs. They can be identified as the sand mounds and ridges adjacent to the ocean or in the outer banks or barrier reef which have not been stabilized with permanent vegetation.

Frontal Dunes

A. Definition: A coastal dune or dune ridge oriented parallel to the shoreline of an ocean, occurring at the landward margin of the beach. Foredunes shall include the entire area from mean high tide (MHT) across the highest mound exceeding 5 feet above MHT in height and to the lowest elevation in the depression behind it, and not including slopes of the next dune. (Syn. foredune).

B. Significance: The building of dunes by wind blown sand is a natural force creating the barrier islands and banks along the North Carolina coast. Without dunes, the banks and islands cannot long exist, and become washed out by erosion, tidal currents, storms, and hurricanes.

The foredune is the first line of defense against storms, tidal action, and erosion caused by the action of the ocean. The foredune may be stable, unstable, or partially stabilized by sea oats or other dune vegetation. Special restrictions are required to protect the foredune and the vegetation upon it, otherwise the entire island may become exposed and tidal forces of the ocean. (Priddy, 1973).

C. Techniques for Identification: An acceptable technique for mapping dunes is to identify raised areas on stereo-pairs of black and white photographs taken from overflights. (Adams, 1973).

Where indicated, standard surveying techniques for establishing elevation may be employed to establish the location, elevation, and structure of dunes on particular properties, at the expense of the property owner.

D. References:

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Seismic Zones

A. Definition: Land areas having a 1% annual probability of lying within the epicenter of an earthquake of 4.5-6.0 intensity rating on the Rickter scale or within the damage zone of an earthquake of greater than 6.0 intensity rating.

B. Significance: In the continental United States, earthquakes occur most frequently along the Pacific rim; but the most severe earthquakes have occurred east of the Mississippi. In the nineteenth century, the Asheville area was hit by a series of seven damaging earthquakes in one year; and "Rumbing Mountain" gained its namesake. In 1955 a damaging earthquake hit Charleston and effects were received in North Carolina. (Stewart, 1973).

The public interest in seismic zones is directly related to the health and welfare of the people of the State. The most dangerous structure that can be built in a seismic zone are dams and nuclear power plants. Yet these structures have been constructed here, and nuclear power plants are planned in increasing numbers. Other structures that require special consideration are tall buildings and bridges.

A land policy for the State will have to consider seismic zones, or areas of earthquake damage potential. If the probability of earthquakes occurring is known in advance, then major structures can be built to withstand the type and severity of earthquake that can reasonably be expected.

Figure ⁴/₇. Significance of Earthquakes

Severity of Quake
on the Rickter Scale

Significance

less than 2.5
2.5-4.4
4.5-5.9

6.0-6.9

7.0-7.7
over 7.7

Not felt
Minor, no damage
Locally damage at the
epicenter
Causes destruction in
populated areas
Major earthquake
Great earthquake

C. Techniques for Identification: Seismic zones can be defined by geologic studies that build probability or other models that can reasonably predict earthquake occurrence. These predictions are based on extensive monitoring of seismic activity, including quakes too small to be noticed. Unfortunately, such extensive monitoring has not been conducted in North Carolina and it is not possible to predict earthquakes of the future with any reliability. According to one expert, 10 to 15 years of seismographic records may be required. (Stewart, 1973).

As an interim measure it will be desirable to study the past history of earthquakes in North Carolina to determine patterns of occurrence that can be used as rough predictors. Yet it has not been well established that past history is a reliable guide to future events. Major earthquakes have occurred in areas of little previous activity followed by long periods of quiet. If past history is any guide, then the mountain region and the areas on the north and south borders have been the most active seismic areas, while the Piedmont and coast have been the most quiet in the State.

Further research of an extended duration will be required to establish with more accuracy the degree of danger we face in the future.

D. References: McCarthy, Gerald, R., "The South Appalachian Earthquake of 1955", Earthquake Notes, Vol. 27, No. 1, March, 1956.

McCarthy, Gerald R., and Evelyn Z. Sinka, "North Carolina Earthquakes, North Carolina Earthquakes", Elisha Mitchell Scientific Society Journal, Vol. 74, No. 2, pp. 117-21, November, 1958.

Stewart, David M., U.N.C. Department of Geology, Chapel Hill, Personal Communication, December 17, 1973.

Wilson, William, Office of Earth Resources, Department of Natural and Economic Resources, Personal Communication, December 17, 1973.

Recreation Sites

A. Definition: A recreation site shall be any land area intended for recreational use that is officially recognized by the Office of Recreation Resources, Department of Natural and Economic Resources, in the Statewide Comprehensive Outdoor Recreation Plan (S.C.O.R.P.) and included in the recreation site inventory of that agency. Recreation sites will be included in one or more of the following categories, consistent with the SCORP classification system:

1. High density recreation areas
 - a. Neighborhood emphasis areas, including mini-parks, playgrounds, neighborhood parks, and combined neighborhood parks and playgrounds.
 - b. Community emphasis area, including playgrounds and community parks.
 - c. City-wide, district emphasis areas, including city-wide parks.
2. General Outdoor Recreation Areas
 - a. District park
 - b. County park
 - c. Specialized Outdoor Recreation Areas (SORA) Low Intensity (zoo, golf courses, etc.)
 - d. SORA - Medium Intensity (flower garden, ski resorts, amusement resorts).
 - e. SORA - High Intensity (stadiums, agricultural fairs, sports centers, outdoor theaters).
3. Natural Environmental Areas
 - a. SORA - Low Intensity (general forest and agricultural land for hunting).
 - b. State Parks
 - c. Destination parks
4. Trails

For the purpose of this section, recreation sites shall exclude historic sites, unique (outstanding) natural areas, or primitive areas, which are defined in another section.

The term "potential recreation site" shall mean a site in private ownership identified and recommended for public acquisition is a published report by the North Carolina Office of Recreation Resources or by an official report of a Federal agency or a unit of local government, for the purpose of a recreation site. In addition, all lands within 100 feet of a lake, reservoir, estuary or ocean shall be considered a potential recreation site until specific excluded by expressed policy of the State.

B. Significance: The term "enviornmental quality", by definition encompasses an aspiration of the people of North Carolina for outdoor recreation. The urban and rural environment must be especially designed to accomodate lands for this purpose. (See Planning for Environmental Quality, Phase 1, 1972).

In the context of land policy, the powers of State government are to be coordinated to the achievement of environmental quality, including accomodation for outdoor recreation. These powers include land acquisition, public investments in infrastructure, regulation, and taxation.

Present recreation sites must be protected from displacement by incompatible land uses, such as highways or commercial development, and from incompatible land uses in the vicinity. Where early land use activities allow for the full use and enjoyment of recreation sites for its intended purpose, then the site is protected. Where adjacent land uses interfere with intrusions of noise, air pollution or congestion of people or traffic, then the site is not adequately protected.

Potential recreation sites must also be considered for protection. There must be sufficient areas acquired and developed to meet the recreation needs of

the citizens of North Carolina. However, all potential recreation sites do not require areas that are identified as "Critical Environmental Areas". For this reason, the potential recreation sites that must be protected are limited to:

Item 3

- b. State parks
- c. Destination parks

4. Trails

Sites proposed for the above uses must be protected from displacement or interference by incompatible land uses until such time as they are acquired by the State or local government, or are specifically excluded from further consideration as a recreation site.

C. Techniques for Identification: The identification of recreation sites is accomplished by reference to the statewide recreation inventory. A mapping system is currently being developed to show: the type of operator (Federal, State, Local, private or commercial), the general location, the type of site (in terms of SCORP subclasses); and a four digit identifier code referencing the full site data contained in the computerized North Carolina Outdoor Recreation Area Inventory. The base maps for the system will be the 1" = 2 miles regional maps developed by the Office of State Planning.

Beaches

A. Definition: The tideland adjacent to the marginal sea lying between mean high tide (MHT) and mean low tide (MLT). Syn. strand, ocean shore.

B. Significance: Beaches are valuable for public recreation, swimming and fishing. Beaches, as defined, are owned by the State. Therefore, a policy quaranteeing easy public access points to all beaches should be initiated.

The nature of tidal action and the force of storms is such that the beach areas encompassed by beaches are constantly shifting. Winter storms scour beaches remove the sand and deposit it off-shore. Spring and summer finds sand being added to the beach. Thus the line of high tide and low tide fluctuates accordingly.

Littoral drift is another phenomena of nature whereby sand is removed from beaches by wave action and littoral currents and is deposited upon a different stretch of the beach. This action also shifts the line of high tide and low tide. Such a dynamic zone is strictly unfeasible for development, but highly valuable to the public.

C. Techniques for Identification: The identification of beach areas on maps is primarily a job of delineating the mean high tide (MHT). The MLT is the lower limit of the beach, but both the beach and the land under the marginal sea are under State ownership, therefore it is not necessary to establish a line between them. The dunes above MHT, however, are mostly in private ownership and a demarcation is needed.

The mapping of MHT is being undertaken by the National Oceanographic and Atmospheric Administration (NOAA) and the State will utilize the results of these studies as they become available, based on mapping in reference to tidal bench marks.

However, since the beach is a dynamic zone and shifts over the years by amounts that cause rapid obsolescence of maps, it is acceptable to approximate the delineation for most purposes. Aerial photography may be used when flown over the beach area at estimated MHT by NOAA tables. The day of overflight must be breezeless and calm so that wave action does not cause too large an error. Such approximations are sufficient in the interim down to maps at 1" = 600'.

D. References: Langfelder, Jay, NCSU School of Engineering, Personal Communication, October 29, 1973.

Shalowitz, Aaron L., Shore and Sea Boundaries, Publication 10-1, United States Department of Commerce, Coast and Geodetic Survey, 1964, Volume 1.

Natural and Scenic Rivers

A. Definition: Natural Rivers - Free flowing rivers or segments of rivers and adjacent lands existing in a natural condition. Those rivers or segments of rivers that are free of man-made impoundments and generally inaccessible except by trail, with lands within the boundaries essentially primitive and the water essentially unpolluted.

Scenic Rivers - Those rivers or segments of rivers that are largely free of impoundments, with the lands within the boundaries largely primitive and largely undeveloped, but accessible in places by roads.

B. Significance: These rivers represent vestiges of primitive America and possess outstanding natural, scenic, educational, geological, recreational, historic, fish and wildlife, scientific and cultural values of great present and future benefit to the people. There is a necessity for a rational balance between the conduct of man and the preservation of the natural beauty along the many rivers of the State.

C. Techniques for Identification: The identification of natural or scenic rivers is carried out by the Department of Natural and Economic Resources. Investigations are made to determine those streams that meet the criteria for inclusion in the State Natural Rivers System. The criteria considers length, water quality, water flow, public access and land adjacent to the stream. The Department recommends rivers or segments of rivers to be placed in the State Natural River System. Inclusion requires an Act of the General Assembly.

Primitive and Wilderness Areas

A. Definition: Extensive natural, wild and undeveloped area and setting essentially removed from the effects of civilization.

B. Significance: Primitive and wilderness areas represent the natural environment that has not been significantly modified by man; it is not disturbed by commercial or residential utilization and is without mechanized transportation. They are important for recreation and aesthetic value, and provide the only remaining opportunity for an outdoor experience where the effects of man and civilization does not intrude upon the natural scene.

C. Techniques for Identification: Wilderness areas are identified by being designated under the provisions of P.L. 88-577, the Wilderness Act. Primitive areas are areas having similar characteristics to wilderness areas but allow for minor modification by man.

HISTORIC SITES

A. Definition: All properties, including buildings, structures, sites, objects, and districts of national, state and local significance, which are recognized as having historic significance or potential significance. For the purpose of this document, such properties shall include properties owned by the state or federal government which are listed on the National Register of Historic Places, or privately owned properties listed on the North Carolina State Inventory of Historic Resources, as potential National Register nominations.

B. Significance: Historic sites constitute an integral part of the human environment. Since they are fragile, subtle, and "non-renewable" and because they are surrounded by a body of special legislation and presidential requirements for their protection, they must be considered on a par with natural resources in any environmental and land use effort.

In accordance with the Constitution of North Carolina, Article 14, Section 5, "Conservation of Natural Resources", historic sites are among those natural resources which need to be conserved and protected.

The North Carolina Environmental Policy Act of 1971, Section 3, further declares the continuing policy of the state "to preserve the important historic and cultural elements of our common inheritance."

C. Techniques for Identification: The principal mechanism for identifying properties is the National Register of Historic Places. It is maintained by the National Park Service under provisions of the National Historic Preservation Act of 1966. It has been characterized as a roll call of properties "significant in American history, architecture, archaeology, and culture—a comprehensive index of the significant physical evidence of our national patrimony."

Nominations of properties meeting strict criteria are submitted by the director of the Division of Archives and History who serves as the state's historic preservation officer. Properties require extensive research and documentation for the preparation of a nomination form.

The second mechanism for recognition of properties is the North Carolina State Inventory of Historic Resources, which is maintained by the Division of Archives and History, as a requirement of the National Preservation Act of 1966. By definition "inventory properties" are not included in the National Register.

The inventory includes many potential National Register nominations which will be eventually included in the National Register after further study. It is necessary, therefore, that planners contact the Division of Archives and History in addition to consulting the National Register of Historic Places.

D. References

Dr. Thornton W. Mitchell, Acting State Historic Preservation Officer, Division of Archives and History, Department of Cultural Resources, Raleigh, North Carolina.

Volume I and Volume II of the North Carolina Historic Preservation Plan 1974, State of North Carolina, Department of Cultural Resources, Raleigh, North Carolina 27611.

The National Register of Historic Places, Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

Criteria for Evaluating Historic Sites and Buildings, National Trust for Historic Preservation, Washington, D. C. (Preservation leaflet series).

With Heritage So Rich, by Albert Rains and Laurance G. Henderson, published by Random House, Inc., N. Y., 1966.

North Carolina Department of Archives and History, "A Lonesome Place Against the Sky," (booklet), 1971.

Historic Preservation Through Land Use Legislation, State of Vermont, Division of Historic Sites, Pavilion Building, Montpelier, Vermont 05602, 1973.

Conservation of Historic and Cultural Resources, by Ralph W. Miner, 1969, American Society of Planning Officials, 1313 East Sixtieth Street, Chicago, Illinois 60637.

National Trust for Historic Preservation and Colonial Williamsburg, Historic Preservation Today, Charlottesville, Virginia: University Press of Virginia, 1966, 265 p. index.

National Trust for Historic Preservation and Colonial Williamsburg, Historic Preservation Tomorrow--Principles and Guidelines for Historic Preservation in the U. S., 57 p.

U. S. Department of the Interior, "Historic Preservation Grants--in Aid Policies and Procedures", National Park Service, National Register of Historic Places, June, 1973 (advance issue).

Preparation of Environmental Statements: Guidelines for Discussion of Cultural (Historic, Archaeological, Architectural) Resources, August 1973.

U. S. Department of the Interior, National Park Service, Southeast Regional Office, 3401 Whipple Avenue, Atlanta, Georgia 30344.

Unique Natural Areas

A. Definition: Any area containing an usual or exemplary biological habitat, geologic feature or hydrologic location.

B. Significance: Unique natural areas represent the last representations of natural phenomena left in the State. They are important for recreational and aesthetic value, but even more important as opportunities for man to study the biology and geology of the planet Earth today and in future generations.

Unique natural areas are sensitive because they cannot withstand development without loss of their essential characteristics. Because they are unique, they cannot be replaced once lost. A Statewide land policy will need to utilize its financial resources to preserve such areas as a part of our natural environment heritage.

C. Techniques for Identification: Unique natural areas can be identified in official reports by trained scientists. The principal agency to define and locate such sites is the Department of Natural and Economic Resources.

The criteria used by scientists include the following types of natural features:

1. Physiographic and geologic natural areas

- A. Gorges -- Steep sloped creek or river valleys developed by processes of erosion, uplift, faulting, or combination of these. For natural area classification, the slope and ridge-top visible from the vicinity of the stream should not be developed for residential, commercial or continuous human use.
- B. Coves -- upper headwater valleys of streams. The vegetation covering these should be continuous, either in climax or exemplary successional status and should represent the water gathering area for the stream system below.

- C. Cliffs and outcroppings -- naturally exposed rock surfaces at least one acre in size (not of horizontal or map area for cliffs). Any area of smaller size should be considered on basis of other criteria, as containing rare plant species.
- D. Special mineral soils -- as olivine, serpentine, limestone, etc. where specially adapted plants (and perhaps animals) occur or might be expected.
- E. Faults and dikes which are exposed and provide important examples of geological processes.
- F. Ridgetops -- undisturbed ridgetops of prominent mountains (i.e. those of highest altitude in the region, mountain range, or state), or those standing above the general plain of the region, as monadnocks or monoliths.
- G. Unusual weathered rock formations -- may be fanciful, as Caesars Head, or unusual as rock bridges, or Hangover Mt.
- H. Marshes -- waterlogged soils with water level near the surface -- because of rarity now, all marshes of at least 1/2 acre or more in the West should be considered as natural areas unless badly spoiled.
- I. Swamps -- areas with the water level above the surface year-round; these are developing in many of the older lakes, which should be checked for their presence -- importance is food and nesting grounds for animals, habitats for plants, and should be counted if at least 1/2 acre in size.
- J. Bogs -- acidic, peaty soilied areas characterized by sphagnum moss and various plant species, as sedges, grasses, pitcher plants -- any such location of 1/2 acre or more (less if containing habitat of a rare species).

- K. Ponds and lagoons -- when these are naturally formed, they are usually advanced in succession and represent important biological areas. All such areas with permanent standing water should be considered here unless severely damaged (drained, filled, polluted, etc.)
 - L. Thermal waters -- rare here, but one exists at Hot Springs, North Carolina.
 - M. Scenic or Wild Rivers -- those so designated or considered for such status.
 - N. Water falls -- minimum criteria should be: falls of at least 20 feet from top to bottom where water ends quick decent and at least 3 feet with unusual formations (as spouts, splitting rocks, etc.) which would be included. Falls with roads, lakes, etc. disrupting their scenic aspects should be omitted.
 - O. Shoals -- these are characterized by "white water". They are important to stream species, for they represent important aeration zones. Minimum criteria is at least 1/4 mile length on small streams or brooks or 500 feet length and 20 ft. width on larger streams.
 - P. Dunes -- Sand formations of unusual height, above 150 feet.
- II. Biological natural areas -- many of these are a part of the above listed habitats and inseparable from them.
- A. Wildlife management areas -- usually game management areas, but also contain supporting wild species (food chain species) and should be considered natural areas.
 - B. Trout streams -- either those stocked or those of native trout waters should be considered here.
 - C. Range limits or endemic populations -- habitats containing either the

most northern or southern limit of a species population or an endemic population should be considered a natural area.

- D. Record plants -- locations of record tree size; locations of unusual plant forms (as red form of cinnamon fern at Cole Mt.)
- E. Virgin or primitive tracts -- since these are so rare here, all known sites should be designated natural areas.
- F. Tracts selected for illustration of climax or successional vegetation - e.g. the Kelsey Tract, Highlands, contain 15 acres of climax Carolina hemlocks; or the Graveyards, where first succession is slowly leading toward the spruce-fir forest that was cut and burned in the 1920's.

III. Hydrologic natural areas sites of usually high precipitation, as the Highlands and Standing Indian Mountain areas.

Justification of the natural area status are such things as:

(1) important water resource areas, (2) development and maintenance of certain vegetation types, and (3) interaction with soils, as the slide zones of Chunky Gal Mt. Coweeta Hydrologic Station is also located within this area.

D. References: Petillo, J. Dan, "Natural Area Criteria" memorandum dated August 17, 1972.

PRIME AGRICULTURAL LAND

A. Definition

Practical use units of land which have characteristics that meet the criteria for land capability Classes I, II, or III, and are needed for present agricultural use, or certain types of land or other capability classes now in cultivation and producing high yields without permanent soil deterioration.

B. Significance

Prime agricultural land represents land that can be cultivated indefinitely with few hazards and limitations or requiring only moderate conservation practices. Potentially, land now in other uses that meet the criteria for land capability Class I, II, or III, may at some future date become prime agricultural land.

Prime agricultural land may be used for multiple purposes, such as wildlife, recreation, or watershed management. The highest priority should be given to keeping prime agricultural land in crop production; other alternative use of these lands must be evaluated and justified in terms of total environmental value.

The State needs as much prime agricultural land as is now cultivated. With any appreciable population growth it will need more such land. On the other hand, there is available sufficient quantities of land in land capability Classes I, II, or III to more than double the present prime agricultural land in the state. It should be pointed out that most of the potential for increasing this prime agricultural land is now in some type of forest. If these additional lands are to be cultivated, more

efficient use and management of the remaining forest resource will be required. Prime agricultural land cannot be replaced if destroyed, except at prohibitive cost. One part of a State land policy must be to conserve and protect the lands in this category for present and future productive use.

Techniques for Identification

Soils are classified by a uniform international system that describes the different kinds of soils. In addition, the different kinds of soil can be grouped according to their limitations for a given use of the land. For cropland, eight capability classes are used to interpret the degree of limitation and hazards for agricultural use of the land.

In general, the capability classes for cropland are arranged in order of the severity of the limitations and hazards inherent in them which might influence their use and management.

Prime agricultural land can be identified by use of detailed soils maps to identify land capability and from aerial photographs to determine present land use.

CRITICAL EROSION AREAS

Definition

Critical erosion areas are those where, because of natural or existing conditions, problems are created which affect public welfare by causing offsite environmental problems or result in permanent deterioration of the area itself. Severely eroded areas, gullies, dams, borrow areas, road cuts, fills, road shoulders, spillways, spoil areas, areas over-used or mis-used, trails, developed areas, excavated areas, highly erodable soils, eroding unprotected utility rights-of-way and shallow soils are examples of critical areas.

Significance

These areas are the greatest source of sediment production in the State; thus, they are responsible for the greatest amount of pollution caused by solids, stream clogging, and damage to bottom lands. These critical areas contribute greatly to health problems and damage to fish and wildlife habitat. The damage to offsite resources is great and the annual cost to correct the damage is tremendous. Most such areas mar the landscape and destroy natural beauty as well as result in the permanent deterioration of the site itself.

More time and money is spent in correcting the problems caused by critical erosion areas than by all other taxpayer supported projects. Watershed protection, much of the road maintenance, dredging channels, purifying of waters for use, loss of water storage capacity, drainage maintenance and removal of sediment from unwanted places are some of the major examples involved.

Identification

Critical areas can be identified from soils maps, aerial photographs and field surveys. It is important to define each condition in order that it can be located and shown on a map. Usually any land that is (1) eroding at a rate of 10 tons or more per acre per year, (2) causing damaging concentrations of runoff water on adjacent lands, (3) contributing damaging sediment to adjacent lands, (4) eroding at a rate which will cause permanent deterioration of the site, (5) producing health problems, (6) polluting waters, (7) or which contains soils too shallow or steep to support ground cover.

MINERAL SITES

A. Definition: Any rock or mineral deposit that because of its location, size, content and market demand, is presently being mined or has potential for future mining, and is essential to the general welfare, future security and economic stability of this State and Nation. These include metallic and nonmetallic minerals and construction materials.

B. Significance - Introduction: All critical rock and mineral resource sites are finite and are in most instances irreplaceable by other minerals or synthetics. They are limited in their distribution and their exploration and development involves a high economic risk. Only through intensified efforts of their wise use and management and our ability to locate, protect and develop new critical resource sites, will our mineral resource economy and welfare be ensured.

- a. An economic mineral deposit is valuable because it either contains an unusually high concentration of a particular mineral (or minerals) or it possesses a unique characteristic that enables it to be used for a particular product.
- b. Critical mineral sites should include those sites that, even though they are in large supply now and are easily obtained, may in the future be at a premium, either because of improper planning or a gradual depletion of the deposits over the years.
- c. Any mineral resource that allows the Nation or State to maintain or improve its standard of living is important,

and those deposits that are recovered at the lowest cost monetarily and environmentally should receive precedence.

- d. Certain minerals may be more critical than others but as world political conditions change, techniques advance and pollution restrictions increase, the importance of particular mineral resources may also change.
- e. It may be wise for us to ask the following question -- Can we do without the product or service that a particular mineral enables us to have? In many instances the answer is yes, perhaps we can and should be without. This decision, however, is one that proper resource planning can help answer. It is true that substitutes can often be found but often at the risk of increased cost and increased drain on the supply of another critical mineral.

C. Techniques for identification: The identification of critical or economic mineral sites has a two-fold connotation. One is the active mines, quarries and pits now producing the vital mineral resources which help sustain our present economic and industrial structure and growth. The other includes unknown rock and mineral sites yet to be discovered. Locating these existing sites can be done by the following procedures:

- a. By use of existing geologic maps which contain the critical mineral site or sites.
- b. Use of topographic maps.
- c. Aerial photographs using black and white or color stereo pairs.

- d. Planetable mapping.
- e. The intersect of latitude and longitude.

Unknown mineral sites are determined by systematic scientific exploration programs. These programs consist of mineral commodity studies to determine present and future demand for the mineral; literature research to help determine target areas; detailed geophysical surveys to delineate possible mineral anomalies, and drilling programs to provide information on the cause of the anomalies and to delineate the "ore" body. Once a mineral of economic importance is determined to be present, chemical analyses and beneficiation tests must be conducted to determine if the mineral is in sufficient concentration to be recovered economically.

The exploration program varies depending upon the mineral for which the search is made. These exploration techniques include the following:

- a. Airborne electromagnetic and radiometric surveys.
- b. Induced potential (I.P.), gravity and related geophysical surveys.
- c. Earth Resources Technology Statellite.
- d. Ground geologic mapping from areas of known critical mineral sites in to areas which show promise.
- e. Ground geochemical work.
 - 1. Complete whole-rock chemical analysis.
 - 2. Spectrochemical analysis.
 - 3. X-ray diffraction.
- f. Core drilling - examine core samples.
- g. Water chemical analysis - analyses of water from creeks

and streams around possible critical mineral sites.

- h. Biogeochemistry - examine plants for trace elements (which are anomolous) around the suspected critical mineral site.

Many factors are involved in locating a mineral site.

Each mineral deposit has its own unique characteristics which determine whether it is usable. The geographic location is of prime importance, because as distances to markets are increased, the final cost of the product to the public also increases. Transportation costs often become prohibitive to the mining of a deposit and often transportation costs become greater than the actual cost of the mineral.

It should also be recognized that not all mineral sites in North Carolina have been located. A very small percentage of the State is covered by detailed geophysical and geologic maps. Only 53 percent is covered by detailed topographic maps. Without proper study, many potential sites will be destroyed and loose their usefulness to society. It is imperative that the geologic potential of an area be recognized before it is designated for any other use.

D. References: Publications of the Office of Earth Resources, Division of Mineral Resources.

SLOPE CONSTRAINT AREAS

Definition

Terrain with slopes greater than 40 percent which are suited mainly to recreation, forestry and wildlife uses. Because of the natural constraint of slope no use should be made without a plan. Planned use for other purposes should be restricted and subject to approval of county or regional planning boards or commissions.

Significance

Lands with slopes greater than 40 percent are not suited for cultivation. They are subject to severe erosion under most uses and stringent erosion control and sediment prevention measures are needed when used for any purpose. Unplanned use of these slopes will damage adjacent land and water resource. If used for forestry, grazing or recreation, the location of access roads, control of grazing, amount of clearing, amount of excavation and intensity of use must be carefully planned and the plan implemented. All such slopes are usually associated with shallow soils, rock outcrops and highly dissected terrain. Many such areas are (on positions) above other lands and any use may contribute to the use and management problems of land below. Even without the activities of man involved many such areas are subject to landslides. Thus, unplanned and unrestrained use of these areas will result in their deterioration or destruction plus damage to adjacent facilities.

Within these areas certain small areas may lend themselves to other uses, provided adequate precautions are taken to control

erosion, control runoff, prevent damage to adjacent lands and to prevent deterioration of the site.

Technique for Identification

The identification of critical terrain features are readily identifiable. All such areas can be identified from topography maps, aerial photographs or field surveys.

PRIME FORESTRY LAND

A. Definition

Any forested land in the state capable of growing 85 cubic ft/acre/year of timber when placed under management.

B. Significance

Prime forest land, as defined above, encompasses approximately 20 million acres in North Carolina. For the present and foreseeable future, this acreage of forest land is sufficient to supply timber products for the state and nation, as needed, if the level of management of the land remaining in production is raised to acceptable standards.

Because of the amount of land involved (approximately two-thirds of the state's area), these lands are considered areas of particular public concern. This large land base provides us the opportunity to make choices concerning the use of this land. These management decisions should consider the landowners' goals, society's needs for goods and services, and the environmental impact of the desired use of the land.

In addition to the timber harvested from these lands, important benefits are returned in the form of water, recreation, wildlife, and esthetic values that benefit society. Management and development opportunities must be maintained as alternatives in this large geographic area to insure a strong economic base for the state.

C. Techniques for Identification

Because of their extent, these areas would be hard to define, their boundaries would not be easily established, and they would be difficult to map.

PRESENT OR PROPOSED STATE FORESTS

A. Definition

Areas of land, owned and controlled by the State of North Carolina, administered for the primary function of multiple-use forestry, operated to demonstrate both new and accepted forest management techniques, and authorized under state enabling legislation, that are designated as State Forests.

B. Significance

The intent of the legislation enabling the creation of State Forests was to allow the establishment of areas where the techniques of forest management could be practiced and displayed to the interested people of the state. The very nature of this charge spells out the management guidelines that are to apply to these lands.

Development activities, other than for forestry purposes, would negate the basic reason for the administration of state-owned forests.

C. Techniques for Identification

State Forests can be delineated on maps of most scales. For established State Forests legal land descriptions would be available that outline the exact location on the ground.

AREAS OF REMNANT BOTONICAL SPECIES

A. Definition

An area of land sustaining a rare or endangered plant species or type.

B. Significance

Relatively small geographic areas of lands supporting the growth of a rare or endangered botanical species or vegetative type that are or should be under protection. These areas represent the last remaining samples of the species or type. Because of this rarity, they should be protected and preserved for the future where possible.

C. Techniques for Identification

These areas, once identified on the ground, can be easily located, surveyed, and mapped because of their small size.

WATER QUALITY LIMITED AREAS

A. Definition

Land areas where growth and development is presently straining society's capability to adequately collect and treat liquid waste in a way that protects water quality.

B. Significance

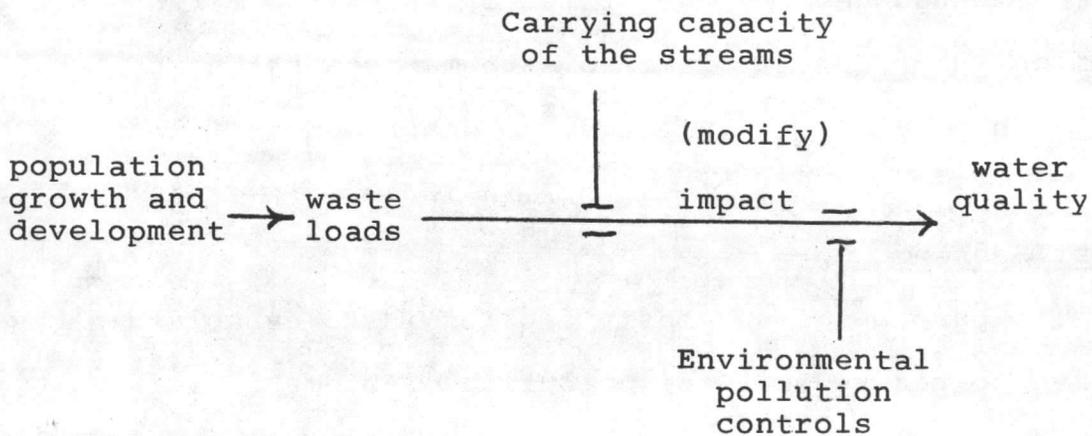
The delineation of water quality limited areas was required by the Environmental Protection Agency in order to establish the order of priority for investing in improved waste treatment systems. The concept was developed and implemented by the Office of Water and Air Resources to establish an objective method for determining the areas where investments of limited funds for sewage treatment would provide greatest return on the investments.

Water quality limited areas are also significant to land use, because they represent lands where population growth and urban development is proceeding faster than development of adequate plans for waste treatment, or where waste resulting from development is exceeding the limits of carrying capacity for our streams, rivers or estuaries. Either the waters of these areas are sensitive and easily polluted, or growth and development has proceeded at a more rapid pace than local waste treatment management programs, or both.

Growth and development impacts upon the quality of water in streams and lakes. The amount of impact is governed by the waste carrying capacity (sensitivity) of the particular streams and by the efficacy of environmental pollution controls. (See Figure 1). Up to now we have relied entirely upon waste treat-

ment to protect water quality. However, when the waste carrying capacity of the receiving waters is exceeded, then extreme measures and a great deal of expense is required to protect water quality. It may be necessary to build advanced waste treatment plants at greatly increased cost in these area. To control pollutants in rain water runoff it will be necessary to consider the design to the city, including roads, streets, and parking lots as they affect runoff water quality, and the use of vegetation buffer strips to absorb runoff water. Such measures can be carried out, but at increased costs.

Figure ⁵ 1: Impact of Development of Water Quality



Streams that are easily polluted are streams that are small in volume and have little capacity for diluting wastes, even treated wastes, from large towns or cities. Lakes, reservoirs, and estuaries are also easily polluted, particularly from nitrates and phosphates. Where the flow of water slows down and stagnates, algae may grow in great quantity and render the water unacceptable for desired uses.

A more rational growth and development policy will require a new commitment on the part of the State to live within the means of its resources. It will require more study and understanding of the practical or reasonable limits of growth, including an enlarged knowledge of the carrying capacity of our lakes and streams. It will require hard decisions to limit growth in some areas or divert it to better suited lands.

Enlightened land use policies offer an additional alternative. By limiting the amount of growth and development to the limits imposed by nature, the environment can be protected and excessive costs to society can be avoided. The water quality limited areas are among the first areas where such policies could be studied.

C. Techniques for Identification

The method used by the Office of Water and Air Resources to determine water quality limited streams is a rating system. (See "Plan", 1973). This method is described as follows:

Segment Ranking

The purpose of sub-basin ranking is to establish a base relative to the severity of pollution problems in the State, to the population affected and indirectly, to the need for preservation of pure waters. Consideration of each of these factors is required by the U. S. Environmental Protection Agency in the State's segment ranking. The segment rating is used in formulation of other water quality program priorities so as to reflect the segment ranking considerations. The State's 14 major river basins have been sub-divided into 128 sub-basins. These sub-basins

(segments) have been ranked according to the following criteria:

Sub-basin rating = A + B + C + D where

A = A direct ranking of the sub-basins by population from (1) for the sub-basin with the least population to (128) for the sub-basin with the largest population.

B = A direct ranking of the sub-basins by the ratio of the total volume of treated wastewater discharged within the sub-basin to the volume of natural stream runoff contributed by the sub-basin under 7 day/10 year minimum flow conditions, from (1) for the sub-basin having the maximum dilution ratio to (128) for the sub-basin having the lowest dilution ratio.

C = A value reflecting water quality as determined from data retrieved from the STORET computer system (operated by EPA) for the period of record for the approximately 1,900 stations included in the State monitoring network. The value is established as follows:

(1) For severe degradation (D.O. less than 1.0 mg/l, pH less than 3.0 or greater than 11.5 or B.O.D.₅ greater than 50 mg/l) a value of (256) is used.

(2) For marginally severe degradation (D.O. between 1.0 and 2.0 mg/l, pH between 3.0 and 4.0 or between 10.5 and 11.5, or B.O.D.₅ between 25.0 mg/l and 50 mg/l) a value of (215) is used.

(3) For serious degradation (D.O. between 2.0 mg/l and 3.0 mg/l, pH between 4.0 and 5.0 or between 9.5 and 10.5, or B.O.D.₅ between 15.0 mg/l and 2.50 mg/l) a value of (180) is used.

(4) For marginal degradation (D.O. between 3.0 mg/l and 4.0 mg/l, pH between 5.0 and 6.0 or between 3.0 mg/l and 4.0 mg/l,

pH between 5.0 and 6.0 or between 8.5 and 9.5, or B.O.D.₅ between 10.0 mg/l and 15.0 mg/l) a value of (128) is used.

(5) For slight to no degradation (D.O. greater than 4.0 mg/l. pH between 6.0 and 8.5, and B.O.D.₅ less than 10.0 mg/l) a value of (0) is used.

D = A field factor necessitated by the fact that the base values have been assigned in the realization that the data base is deficient in many ways, that the determination should not be limited to the three parameters shown, and that data from the period of record may well not represent current conditions.

As data becomes available from the monitoring and surveillance program, these ratings will become increasingly valid. During the interim period, the validity of these values of these values will be improved by including a field factor which will permit incorporation of information pertaining to improvements in water quality because of treatment works improvements made during the period of the data base, degradation not measured by the parameters listed and relative frequency and distribution of degradation of water quality within a sub-basin. This factor will be used to adjust the original value to any of the other four values, but in no case will a value other than 256, 215, 170, 128 or 0 be used.

D. References

North Carolina Department of Natural and Economic Resources, Office of Water and Air Resources, "North Carolina Water Pollution Control Program Plan for Fiscal Year 1973-74".

AREAS WITH GROUND WATER PROBLEMS

A. Definition

Areas in which the groundwater system is susceptible to significant impairment by man's activities or as a result of natural phenomena, including areas scheduled to receive pollutants by burial or application to the land surface, recharge areas, artesian aquifers near the land surface, unconfined fresh-water bearing aquifers in the coastal zone, areas in which sources of water supply are unusually limited, and areas where the groundwater resources are endangered due to heavy withdrawals.

B. Significance

Problems in the defined areas may include:

(1) A real or potential problem of infiltration of pollutants into the water table resulting in local impairment of that aquifer and, under certain hydraulic conditions, the contamination of the underlying artesian aquifers.

(2) Drainage of recharge areas thereby reducing the hydraulic head within the aquifer depriving it of water needed to replace that being withdrawn or lost to leakage.

(3) Confined artesian aquifers breached by deep excavations such as navigation channels in estuaries or quarrying operations. Depending upon the hydraulic relationship of the hydrologic units involved, breaching may result in drainage of water from the aquifer or the inflow of lower quality water.

(4) Freshwater aquifers in the coastal zone represent aquifers in delicate balance with saline water; therefore

overpumping could result in saltwater encroachment laterally or vertically. Dredging, construction of boat basins, and building canals increase the potential for quality impairment and reduce the storage capacity of the aquifer. Coastal dunes are extremely important to the hydrology of the area as they increase the storage capacity of the unconfined aquifer and protect the upper surface of the aquifer from inundation by storm waves and tides.

(5) Where water supplies are limited, the main concern lies in adopting aquifer protection and management plans which will insure the adequacy of the supply against current and future demands. This implies planning and areal development with water resource limitations in mind.

(6) Areas in which the demand for groundwater threatens to exceed the ability of the system to safely provide it should be subjected to a comprehensive study to determine the hydrologic characteristics of the reservoir and techniques for its orderly development and beneficial use. These areas, when evaluated by the Ground Water Division may be declared Capacity Use Areas. One Capacity Use Area now exists as a result of heavy industrial withdrawals in an area in which such withdrawals threaten the quality of the water in the principle aquifer over a large area. In other areas of the state potential problems of this type have been identified and comprehensive investigations have been begun.

C. Techniques for Identification

(1) Areas with potential pollution problems may be identified by permeable surficial materials, a water table near the land surface, or a water table higher than piezometric surface of the

artesian system.

(2) Recharge areas are areas in which the artesian or confined aquifers are replenished by the water table. Areas may become recharge areas if they lie within deep cones of depression caused by extensive pumping from wells. In these areas the piezometric surface has been depressed below the elevation of the water table resulting in downward leakage of water. Recharge areas are also sites where the artesian aquifers are more susceptible to contamination from surface sources.

(3) Identification of water quantity problem areas is made by hydrologic investigations. Critical status is based upon the lack of other sources of supply and also the hydraulic relationship between the unconfined aquifer and the lower artesian aquifers.

(4) Aquifers near the surface may be determined by depth to the top of the aquifer, the nature of overlying material, and proximity to areas of development.

(5) Heavy withdrawal problem areas are indicated by evidences of serious threats to water quality or supply depletion such as increases in undesirable chemical constituents or declining water levels over a broad area.

(6) Water supply limited areas are determined by the absence of non-groundwater sources.

(7) Recharge areas can be identified by the interpretation of hydrologic maps showing the configuration of the piezometric surface of the aquifer(s) and its relationship to the water table.

PUBLIC WATER SUPPLY WATERSHEDS

A. Definition: Those lands forming public water supply watersheds classified A-I by the Board of Water and Air Resources, Department of Natural & Economic Resources, and lands forming those portions of Class A-II watersheds on which are located Class I or Class II reservoirs as defined in the "Rules and Regulations Providing for the Protection of Public Water Supplies" of the Commission for Health Services, Department of Human Resources.

B. Significance: Public water supplies need to be protected from pollutants that enter streams and reservoirs from rainwater runoff. A wide variety of pollutants, including bacteria, oil, grease, phosphates, nitrates, other organics, and silt are washed into streams and reservoirs from streets, houses, flooded sewers and other sources. Pollutants entering into raw water supply streams and reservoirs may be carried into public water supply systems.

In order to afford proper protection for water supplies from A-I watersheds, which require disinfection only, it is necessary that the watersheds be uninhabited and entry be restricted to law enforcement officers, health officials, and representatives of the water supply owner. Therefore the regulations require that the water supply owner shall have either direct ownership or positive control over the entire watershed.

In order to afford protection for Class I or Class II reservoirs on A-II watersheds, sewerage systems must be properly designed and properly operated, the density and type of development should be limited, and buffer strips or greenways should be provided between the water's edge and any developed land.

C. Techniques for Identification: The classification of all streams is determined by and recorded in the records of the Office of Water and Air Resources. The classification of reservoirs, as Class I or II, is determined by the Sanitary Engineering Section, Division of Health Services. It is important that

demarcation lines of A-I watersheds for local zoning purposes, follow the line of highest elevation separating the A-I watershed from adjoining watersheds.

It is recommended that demarcation lines of other watersheds, for local zoning purposes, follow convenient features on the landscape which approximate the watershed boundary within 50 feet, so long as drainage patterns are properly controlled. Such features might include roads, known property lines, or lines between two established points. If a more accurate line is desired, then an accurate land survey must be made.

LAND AFFECTING SA SHELLFISH WATERS

- A. Definition: Lands within the Coastal Zone which contain present or planned discharge points for treated municipal or industrial wastewaters.
- B. Significance: The waters classified SA by the North Carolina Board of Water and Air Resources are shellfish growing beds that must maintain a very high bacterial standard, in accordance with criteria of the National Shellfish Sanitation Program. Sewage treatment facilities that discharge directly or indirectly into such waters must meet special standards as set by the Board. Decisions to proceed with development plans must weigh the economic cost of these special protective requirements against the benefits to be gained.
- C. Techniques for Identification: Discharge points may be located on water and sewer plans showing present and proposed facilities.
- D. References: Andrews, John, Department of Human Resources, Sanitary Engineering Section, Personal Communication, March 28, 1974.
North Carolina Board of Water and Air Resources, "Regulation Number LXXIX for the Treatment and Disposal of Sewage in the Coastal Areas of North Carolina." undated.

AREAS WITH SEVERE LIMITATIONS FOR SEPTIC TANK SYSTEMS

A. Definition: Land areas with soil conditions classified as "severely limited for septic tank systems" by the U. S. Soil Conservation Service and land areas of present or planned high density (more than 1200 gallons of wastewater per acre per day or more than three residences per acre).

B. Significance: Failing septic tank systems yield essentially untreated sewage coming to the surface of the ground. Such conditions may be a hazard to health and a pollution problem for streams.

If septic systems are installed in certain areas where the natural soil conditions are poor, such systems are very likely to fail. Soil limitations may be due to impermeable soil, shallow soils, steep slopes, or a high ground water table. In such areas, key facilities and large scale developments should not be allowed to be constructed unless a conventional sewage collection and treatment system approved by the Board of Water and Air Resources is installed.

Areas of high density are areas where septic tank systems frequently fail and where the degree of hazard in exposed sewage is greater. This arises because there is little space for soil nitrification lines and because the natural permeability of the soil is destroyed during construction, by soil moving or compaction. Such areas should also be served by conventional sewage collection systems.

C. Techniques for Identification: The Soil Conservation Service has provided soil association maps for all counties and a table for classifying each association according to its ability to accommodate septic tank systems (SCS-19). Where complete soil surveys have been completed, the limited areas may be delineated more accurately.

The definition of high density areas was established by the Board of Water and Air Resources for the Coastal Zone, but the concept is applicable Statewide.

High density areas may be identified by reference to land use plans which show present or proposed densities.

D. References: Andrews, John, Department of Human Resources, Sanitary Engineering Section, Personal Communication, March 28, 1974.

N. C. Board of Water and Air Resources, "Regulation Number LXXIX for the Treatment and Disposal of Sewage in the Coastal Areas of North Carolina," Section IV (6) undated.

WELL FIELDS COMPRISING PUBLIC WELL WATER SUPPLIES

A. Definition: Areas within 100 feet of any wellhead used to withdraw water for a public water supply and any additional special areas where the cone of influence may potentially become contaminated.

B. Significance: Areas surrounding the wellhead of public well water supplies must be kept clear from houses, structures, sewer lines and other sources of contamination. Such areas are regulated by the N. C. Department of Human Resources, Sanitary Engineering Section.

C. Techniques for Identification: Public wells may be located through access to the computerized records of the Department. New or proposed wells must be reviewed and meet standards of health protection within the well field.

AREAS OF HIGH AIR POLLUTION POTENTIAL

A. Definition: Areas for which the upper decile autumn morning $\overline{X/Q}$ values are estimated as greater than 75 for cities of 10 kilometers and which occur in physiographically identifiable valleys.

B. Significance: Areas of air pollution potential are constrained by natural conditions imposed by nature. The meteorology and topography causes frequent air stagnation (air inversions). Under such natural conditions air pollutants cannot rise and disperse in the upper atmosphere, but lie close to the ground. They accumulate, intensify, and may reach dangerous levels if the air stagnation is prolonged. Areas of high AP potential lie primarily in the western third of the State.

Areas of high air pollution potential can have very good air quality, depending on the number of sources of pollution. If an Appalachian Valley contains only a few small towns with few industries, then air pollution may never become a problem. On the other hand, if a large city is developed in the same valley with numerous polluting industries and a multitude of automobiles, then air pollution problems may become as severe as Los Angeles.

Air pollution controls on automobiles and on industries will limit air pollution across North Carolina. In areas of high air pollution potential, however, this may not be enough. It could become necessary in the future to limit growth of urban areas so as to limit the amount of pollutants to a level that does not exceed the carrying capacity of the air shed. Thus, the natural constraints imposed by topography and meteorology impose a limit on the amount of urban growth that is prudent in areas of high air pollution potential.

C. Techniques for Identification: The meteorological factors comprising air pollution potential have been studied and delineated by the Environmental Protection Agency. (See Holzworth, 1973). Isopleths have been presented on maps

of the United States for various mixing heights (height below which pollutants can mix with diluting air) and wind speeds. Such maps are based on data from the 62 upper altitude monitoring stations in the United States, a rather small number of sites. The generalization derived from the data are valid for an overview of a large continental land mass, but are not adequate in numbers to differentiate air pollution potential over smaller areas, such as states or multi-county planning regions.

A review of the relevant maps show that approximately the western 1/3 of North Carolina lies within a belt of relatively high air pollution potential. (See Figure 1 for Holzworth.)

From the national mapping, it is known that air pollution potential, as expressed by the upper decile annual morning values of \bar{X}/\bar{Q} , ranges from 80 to 100 in most of Appalachia if city sizes of 10 kilometers are considered. Older forecasting models, while different, also rate the Appalachia area high in potential. The problem is to differentiate at the regional scale those valleys within the region that have higher values from those of relatively less air pollution potential.

The guiding principle is to map the floors of valleys where air pollution potential is highest.

Narrow valleys, such as the Pigeon River concavity, can be identified by tracing a contour line at an elevation of 2700 feet.

Large, broad valleys, such as the French Broad River Basin can be encompassed by tracing a contour at 2200 feet. In general, these elevations were chosen to be 200-300 feet above the valley floor (Holzworth).

In the Appalachian mountain system, river basins open out into strikingly wider basins. The French Broad empties into the Tennessee Valley. Since it is the shape of a valley of a given shape that we are describing, the significance of the delineated areas change at these points. The area being circumscribed is terminated at that point of changing valley widths. (Paul, 1973).

Further details on mapping of air pollution potential may be obtained from the Office of State Planning.

D. References:

George C. Holzworth, Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution Throughout the Contiguous United States, EPA, January, 1973.

U. S. Department of Commerce (NOAA), The National Climatic Center, Asheville, North Carolina, October, 1970.

U. S. Department of Commerce, Weather Bureau Decadal Census of Weather Stations, North Carolina, 1963.

U. S. Department of Commerce, "Cooperative Observers Climatological Observations." Sample form of Records available at National Climatic Center, March, 1972

U. S. Department of Commerce, Weather Bureau, Substation History, North Carolina, 1956.

U. S. Department of Commerce, Weather Bureau, History of Climatological Record Forms 1009 and 612-14, 1963.

U. S. Department of Commerce, Environmental Services Administration, Selective Guide to Climatic Data Sources, 1969.

Paul, Roy A., Rex Minneman, and Louise MacComb, "Guidelines for Preparing Regional Environmental Profiles," unpublished report, Office of State Planning, 1973.

NOISE HAZARD AREAS

A. Definition: Land areas where noise levels from either mobile or steady state sources occur at 60 decibels (A-scale) for a significant portion of a day on a regular basis.

Airports - The noise hazard area may be considered as the area within a Noise Exposure Forecast (N.E.F.) contour of 30 units.

Major highways - The noise hazard area may be considered as the area adjacent to the road for which the median noise level is equal to or greater than 60 decibels (A) for the design traffic load.

B. Significance: Environmental noise can create problems of a wide range of severity. The EPA has noted that there is clear evidence that noise of sufficient intensity and duration can:

- Permanently damage the hearing system
- Produce a temporary hearing loss
- Interfere with speech communication
- Disturb sleep
- Be a source of annoyance
- Affect performance of a complicated task
- Affect opportunity for privacy
- Affect mood and disturb relaxation

Noise is an increasing aspect of modern life, with vast numbers of automobiles on our highways, jet planes in our skies, and heavy industries in our cities. Noise is of increasing importance in government and in the public domain, because most of the damaging or disturbing noise we receive is beyond the control of individuals. It occurs from the lack of protection provided in consumer products, lack of acoustical design in our transportation systems, and from inadequate land policies and plans.

Land policy will have to consider noise hazard areas if it is to properly protect the health and welfare of the people in our State. This means that sources of noise, such as airports and major highways will have to be sufficiently separated by distance from the citizens who wish to enjoy their property, hold conversations in their back yard and have a good night's sleep. Guidelines will have to be applied by local governments and policy established by the State to ensure adequate protection.

C. Techniques for Identification

(To be developed)

D. References:

Royster, Larry, Center for Acoustical Studies, N.C.S.U. Personal Communication, December 13, 1973.

The Committee on Boundary Noise, The Regulation of Steady-State Noise Sources at Boundaries in Municipalities in North Carolina, September, 1973, N. C. Department of Administration.

RARE OR ENDANGERED ANIMAL SPECIES HABITAT

- A. Definition: Land areas occupied by rare or endangered animal species.
- B. Significance: An endangered species is one whose prospects for survival are in jeopardy because of extreme sensitivity to its environment. Its peril may result from any of several causes. Habitat alteration is the most powerful adverse force of all, however, for its inevitable consequence will be extermination of the endangered species.

A rare species is one that, although not necessarily threatened with extinction, nevertheless is present in such small numbers throughout its range that it would quickly attain the status of an endangered species should its environment worsen.

There are some 30 animal species currently classified as endangered in North Carolina. In addition, there are 32 other animal species included on the list of rare species.

The gamut of rare and endangered species of North Carolina ranges from the cougar to the short-tailed shrew.

Patently, it would be impossible to summarize the specific habitat characteristics upon which each of the 62 species is dependent for its very existence. The potential effects upon rare or endangered species should be thoroughly explored, however, before committing any area to a significant alteration in character.

- C. Techniques for Identification: Field studies and surveys

- D. References:

Fish, Frederick, Wildlife Resources Commission, Personal Communication, March 29, 1974.

TROUT HABITAT

A. Definition: All watersheds of North Carolina which, by reason of altitude, are of sufficiently low temperature to support one or more species of trout throughout the year.

B. Significance: Trout fishing is a unique experience for southern anglers but annually some 70,000 of them have a go at it in western North Carolina. At the present time, there are about 4,000 miles of streams in the State meeting the minimum requirements of trout habitat. In North Carolina, trout habitat is marginal and an extremely fragile system at best. Every year reaches of trout streams are lost chiefly to logging the vegetative cover, sedimentation from uncontrolled soil erosion, or impoundment for "recreational lakes."

C. Techniques for Identification: Generally speaking, most waters at elevation exceeding 1,500 feet above mean sea level with a normal vegetative canopy will remain below 80°F the year round. Barring the presence of other limiting factors such as pollution or excessive siltation, these waters may be considered as trout habitat.

D. References:

Fish, Frederick, Wildlife Resources Commission, Personal Communication
March 29, 1974.

WILDLIFE MANAGEMENT AREAS

- A. Definition: Lands in public or private ownership which are designated wildlife management areas by the North Carolina Wildlife Resources Commission.
- B. Significance: These lands, which in the aggregate represent a significant acreage, are managed for the protection of wildlife and their habitat. The dominant use is compatible with other uses when such multiple-use management is carefully regulated. Intensive land use planning on these areas would allow greatly increased use of the available resources.
- C. Techniques for Identification: Refer to maps and records of the North Carolina Wildlife Resources Commission which establish fixed boundaries for these areas.
- D. References: Winkworth, Ralph, Office of Forest Resources, Memorandum to Dr. Arthur Cooper, February 19, 1974.

C. SITES OF DEVELOPMENTAL CONCERN



THE STATE OF TEXAS
COUNTY OF [illegible]

Large-Scale Development Projects

Definition: Large-scale developments are private developments which, because of their magnitude or the magnitude of their effect on the surrounding environment, are likely to present issues of more than local significance. These developments must be considered in terms of their impacts on the physical environment, the number of persons served, and on the broader regional context.

Significance:

Large-scale development projects significantly affect and respond to the process of land development. The planning of large industrial and residential complexes must consider the full of human, economic, and environmental needs. They must also be evaluated in terms of their impacts on regional and statewide resources. Thus, a series of state guidelines could serve as a means to assure that these broader-scale impacts are considered.

Identification:

Large-scale developments will include, but are not limited to, the following:

1) Any proposed industrial, manufacturing, or processing plant under common ownership which provides sites for industrial, manufacturing, or processing activity, which:

1) provides parking for more than one thousand five hundred (1,500) motor vehicles; or

2) occupies a site greater than one (1) square mile.

2) Office Parks - Any proposed office park operated under one common property ownership or management, that:

1) occupies more than thirty (30) acres of land; or

2) encompasses more than three hundred thousand (300,000) square feet of gross floor area.

3) Shopping Centers - Any proposed retail or wholesale business establishment or group of establishments operated under one common property ownership or

management, such as a shopping center or trade center, that:

- 1) occupies more than forty (40) acres of land; or
- 2) encompasses more than four hundred thousand (400,000) square feet of gross floor area; or
- 3) provides parking spaces for more than two thousand five hundred (2,500) cars.

4) Residential developments: Any proposed residential development that is planned to create or accommodate more than the following number of dwelling units:

- a) In counties with a population of less than 25,000 - 250 dwelling units.
 - b) In counties with a population between 25,000 and 50,000 - 500 dwelling units.
 - c) In counties with a population between 50,001 and 100,000 - 750 dwelling units.
 - d) In counties over 100,000 population - 1,000 dwelling units.
- 5) Any private recreational development which covers more than 25 acres of land or which is designed to employ more than 250 persons.

Key Facilities

Definition: A major public or quasi-public facility which tends to induce development and urbanization of more than local impact. The impact may be measured both in terms of the facility itself (its size, number of employees, magnitude of output) and in the amount and style of development which is likely to surround the area. For example, an interchange of a major state or federal highway can be expected to induce, first of all, increased traffic on the auxiliary roads. Secondly, it will encourage the development of motels, gas stations, food and other services in the adjacent area.

In addition to highway interchanges, the following developments would also be designated as "key facilities:" commercial airports, major developments for the development, generation or transmission of energy, major recreational lands and facilities.

Significance:

The development of major public facilities will predictably create land use impacts often far beyond the scope of the project itself. For example, the buildings of a major airport will encourage the development of transportation-related industries and other developments nearby. It also creates the negative effects of noise pollution, making large areas unsuitable for residential and other types of development. The planning of such key facilities must consider its compatibility with the natural environment and with the mix of developmental uses in the region.

Identification:

The identification of key facilities will require the designation of arbitrary minimum standards which will indicate an impact of greater than local concern. The following is an exemplary list:

- 1) Airports - The proposed construction of any airport development project

as defined in the Federal Airport and Airway Development Act of 1970, involving the location of a new airport, a new runway or a runway extension.

2) Interchanges of the interstate highway system and interchanges on four-lane limited access primary roads.

3) Any public development, including recreation, which covers more than 10 acres of land or which is designed to employ more than 100 persons.

4) Electrical Generating Facilities and Transmission Lines

a) Any proposed steam electrical generating facility with a total generating capacity greater than 100 megawatts, or a proposed steam addition to an existing electrical generating facility, which addition has a generating capacity of greater than 100 megawatts.

b) Any proposed electrical transmission line which has a capacity of two hundred thirty (230) kilovolts or more and crosses a county line.

5) Hospitals - Any proposed hospital which has a design capacity of more than six hundred (600) beds, or a hospital designed to serve the needs of more than one county.

6) Port Facilities - The proposed construction of any water port, except those designed primarily for the moving or storage of watercraft used exclusively for sport or pleasure of less than one hundred (100) slips for moorings.

RESERVOIR SHORELINES

A. Definition:

Lands adjacent to impounded waters which are subject to intensive utilization for residential and commercial development.

B. Significance:

Lakes and reservoirs are a major attraction for vacation homes, recreational activities, and commercial development. Such development results in the lining of reservoir shorelines with frequently haphazardous and mixed growth activities. Large reservoirs located in close proximity to major urban areas can attract extensive and rapid development. One example of this occurred at Lake Norman where within two years impoundment some 5,500 lots were subdivided adjacent to the shoreline. Primary ownership of the major lakes and reservoirs in North Carolina include Corps of Engineers, Tennessee Valley Authority, Soil Conservation Service, Carolina Power and Light Company and Duke Power Company.

Specific types of problems associated with development around reservoirs include:

- 1) Rapid expansion of vacation home use of reservoir shorelines which create very serious service problems for local jurisdictions to provide costly roads, water and sewage, police and fire protection, and solid waste removal services.
- 2) Intensive development and strip shoreline subdivisions result in serious environmental degradation.
- 3) The building of docks, boathouses, floats, and a mix of bus bodies, trailers, small cottages, cabins, and other structures detract from the scenic attractiveness of reservoirs.
- 4) Heavy reliance on septic tanks and privies and sediment from development pose water quality problems.

- 5) Less than 10 percent of the reservoirs in the southeast have land-use plans, zoning, and subdivision regulations governing shoreline areas.
- 6) Spread pattern development may result in destruction of open space and greenbelt areas as well as increasing the costs of services for these areas.

A land policy for the State would need to consider the problems associated with the tendency toward urbanization around reservoirs and give guidance to development. The state can give guidance in establishing minimum standards for local land-use control designed to protect the amenities of shorelands and to control water pollution.

C. Techniques for Identification:

Lakes and reservoirs can be geographically located by the use of the system adopted by the Office of Water and Air Resources. The key unit is the U. S. Geological Survey 7.5 minute quadrangle of which there are 956 covering the land area of North Carolina.

Aerial photographs are used to determine the general development around reservoirs. For more detailed data standard land use surveys will be needed.

All dam sites have been identified and are recorded in the Register of Dams and Dam Site section of the Hydrologic Information Storage and Retrieval System. Some 3,000 sites have been identified with information on geographic location block, agency with control, purpose, reservoir acreage at maximum pool, state planning region, status, and drainage area. Projected sites are also included in the data system.

There are 51 large lakes and reservoirs with surface areas of 500 acres or larger and 123 intermediate lakes and reservoirs of 100 to 500 acres.

A computer simulation model has been developed to forecast land development

patterns around existing and new reservoirs in North Carolina (Burby, et al, WRRRI Report No. 52).

D. References:

- Burby, Raymond J., III, The Role of Reservoir Owner Policies in Guiding Reservoir Land Development. Report No. 29. Raleigh: Water Resources Research Institute of the University of North Carolina, November 1969.
- Burby, Raymond J., III, and Weiss, Shirley F. Public Policy and Shorelines Landowner Behavior, Report No. 38. Raleigh: Water Resources Research Institute of the University of North Carolina, July 1970.
- Burby, Raymond J., III, Donnelly, Thomas G., and Weiss, Shirley F. Factors Influencing the Residential Utilization of Reservoir Shorelands in the Southeast. Report No. 44. Raleigh: Water Resources Research Institute of the University of North Carolina, March 1971.
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- Jensen, Clayne R. Outdoor Recreation In America. Minneapolis: Burgess Publishing Company, 1970.
- Prebble, Billy R. Patterns of Land Use Change Around a Large Reservoir. Report No. 22. Lexington, Ky.: University of Kentucky Water Resources Institute, 1969.

Sargent, Frederick O., and Bingham, William H. Lakeshore Land Use Controls. Burlington, Vt.: Vermont Agricultural Experiment Station and University of Vermont, March 1969.

Tocks Island Regional Advisory Council. What Will Happen to the Rest of the Area? Report No. 2 Stroudsburg, Pa.: The Council, May 1968.

Air Quality Development Control Areas

(Note: This area is due to be defined in the future by the Board of Water and Air Resources under guidelines of the Environmental Protection Agency. This page is held open to be completed upon promulgation of official regulations.)

References:

Hubbard, E. C., Personal Communication, Office of Water and Air Resources,
March 27, 1974.

D. LANDS IN THE PUBLIC TRUST

THE NEW YORK PUBLIC LIBRARY
ASTOR LENOX TILDEN FOUNDATION
500 5TH AVENUE
NEW YORK 17, N.Y.

PUBLIC RIGHTS-OF-WAY

A. Definition

Street and highway rights-of-way as well as the typical easements for a variety of utility systems are the physical manifestation of the fundamental right of public passage along arterial links spanning the countryside, the navigable waters, and air space as well as the use of related facilities in easements for the benefit of the public at large. This reservation in the name of the public is generally a superior right to all other rights in property.

B. Significance.

Under our social organization, we have chosen to divide the face of the earth into a large number of individual parcels which are, in turn, assigned to individuals or other entities, "to have and to hold" for their use and the exercise of their own initiative. An essential requirement that accompanies this arrangement is the necessity for four lines or avenues of communication linking all individual plots of ground with the rest of the world. These links operate as both natural and man-made "systems" for communication and service. As a minimum they may include the system for storm water drainage and a road, however primitive, in the public domain; the convenience and permanence of a public right-of-way make such an arrangement highly desirable. In the more complex situation, these systems may consist of waterways, railroads, aerial transportation, drainage ditches and sewer systems, electric lines, pipelines, and electronic communication links.

An unending array of judicial proceedings going back as far as any records exist attest to the importance of public rights-of-way. The courts have seldom, if ever, failed to hold inviolate public claim to the right of free passage where dedication and/or use has established its function. The public rights-of-way are of prime significance as areas of particular public concern in any

consideration of land use planning.

C. Identification.

Public rights-of-way and easements of all sorts for utilities, transportation, pipelines, water courses, and the like usually exist on the ground, but in some cases, they maybe found in official records and documents. Procedures for the establishment and/or management of these interests in property are well-established in law and precedent. They must be fully understood and carefully observed.

APPENDIX A

POLICY ALTERNATIVES FOR AREAS OF
PARTICULAR PUBLIC CONCERN

The subject of this document is the identification of areas of particular public concern, not the establishment of actual land use policy. However, it is helpful for planners and administrators to have a clear understanding of the significance of each area that is being identified, including the policy implications. The statements of "significance" associated with each area in the preceding pages was intended to be very suggestive of the types of policy that are appropriate for each type of area. The very act of identification represents policy of a sort, so that no clear distinction between identification and policy is possible.

The State level bodies that will be responsible for land policy development, including the legislature, have alternative choices before them in selecting policy for each type of area. Their decisions must be based on a wide range of considerations, environmental, economic and social in nature. They will have to find ways of preserving the best aspects of our environmental heritage while ensuring that the growing population is accommodated by development that is sound and energy efficient for future generations and conservative in its demand for resources.

The areas of particular public concern in these documents were selected from the language of proposed Federal and State land use legislation. Where choices were available, the different areas were broken into categories that appeared likely to require different policies. For example, "marshlands" were divided into two categories, low tidal marsh and high tidal marsh principally because the two areas are presently under two different policies under the dredge and fill permit administrative guidelines. In other cases, different

categories were used principally because the techniques for identification were decidedly different, such as in the different types of flood hazard areas. In all cases the types of categories were adopted aid in the discussion of policy alternatives.

The various kinds of alternative policies that should be considered may be conveniently categorized into three alternative strategies:

1. Preservation: The land and the facilities (if any) are to be preserved intact, unchanged and undeveloped. These areas have a very particular, singular purpose, and essentially any other imposition by man is destructive to the value of the area.

2. Conservation: The area is developed for productive uses or for facilities as a part of development, but certain measures are imposed on the development so that the value of the land resource is not destroyed and public values are protected.

3. Compromise: The area is valuable, but not so much that a limited amount of loss to development could not be tolerated. Within this type of policy it is necessary to draw additional boundaries showing which part of the resource will be compromised to development and which part will be preserved for future generations.

Theoretically, a fourth category would be all-out development where the resource is not conserved or preserved at all. This cannot be considered among the responsible alternatives, because the APPC's were chosen with knowledge of a public value in the land resource that requires protection.

The various types of alternative policies for APPC's are outlined in Figure _____. Where policies can already be identified in laws or administrative guidelines, only one alternative is mentioned. The statements in Figure _____ are only suggestive of the types of policy that may be considered and details of these policies would have to be spelled out before a decision could reasonably be made. It should also be noted that several strategies may be used in combination,

such as compromise and conservation. These alternatives are only intended to further explain the meaning of the areas being identified.

Figure 6. Policy Alternatives for APPC's

| Environmental Area | Present policy where established, examples of alternatives where policy not established | | |
|----------------------------------|---|--|---|
| | Preservation | Conservation | Compromise |
| Beaches | Use only for recreation | | |
| Register historic sites | Preserve | | |
| Inventory sites | | | Select some for preservation |
| Unique natural areas | Preserve all areas against development | Not applicable | Select some for preservation |
| Prime agricultural land | Not applicable | Keep all prime land in agricultural use; conservation practices | Lose selected parts of prime land to development |
| Water Quality Limited Areas | Not feasible, because cities already present | Increase severity of controls as population increases regardless of cost | Set population limits based on carrying capacity of streams |
| Areas of Air Pollution Potential | Not feasible, because cities already present | Increase severity of controls as population increase regardless of cost | Set population limits based on carrying capacity of airshed |
| Water Supply Watersheds | No buildings, structures, roads | Development controls on density, & buffer strip | Certain percent of watershed may be developed |
| Noise Hazard Areas | No buildings, structures, roads | Development limited to business, industry (not residential) | Some areas developed others not developed |

| Environmental Area | Present policy where established, examples of alternatives where policy not established | | |
|----------------------------|---|---|--|
| | Preservation | Conservation | Compromise |
| Beach erosive area | Do not place any buildings or structures here | Not applicable | Roads allowed but no structures |
| Coastal inlet lands | Do not place any buildings or structures here | Not applicable | Roads allowed but no structures |
| Frontal dunes | No trespassing on dunes whatever | Use fencing to protect grass and raised walkways to beach | Establish protected areas and ground paths to beach |
| Seismic zones | No buildings or structures | Buildings or structures built to withstand quakes | Maximum population and development limit established |
| Areas of erosive soils | No buildings or soil disturbance | Pace of development slow, extreme measures required | Build on some, not others |
| Present recreation sites | Use only for recreation | Multi-purpose land use | Not applicable |
| Potential recreation sites | Use only for recreation | Multi-purpose land use | Acquire some, lose most |

Environmental
Area

Present policy where established, examples of alternatives where
policy not established

| | Preservation | Conservation | Compromise |
|----------------------------------|---|---|---|
| Low tidal marsh | No structure, dredging or filling | | |
| High tidal marsh | No structures, dredging or filling | Only structures or facilities on raised piers | Some areas developed Some preserved |
| Freshwater wetlands | No structures, dredging or filling | Not applicable or feasible | Some wetlands drained and developed, others preserved |
| Open coastal flood areas | Not feasible, too much development already | All structures raised to level of storm surge | No further development, except in present incorporated areas |
| Estuarine flood hazard areas | Not feasible, too much development already | All structures raised to level of storm surge | No further development except in present incorporated areas |
| Riverine floodways | | | Development on floodfringe, not on floodway |
| Areas of rural scenic quality | No further roads, buildings or structures of any kind | Density limit on driveways, build- ings permits. Forestation pro- tection | Development in dense communities. In other areas no further buildings or roads |

APPENDIX B

Planning and Land Use Management (PLUM) Information System

As a part of its duties as described in Section 3 of the Governor's Executive Order Number 3, the North Carolina Land Policy Council has investigated the development of a statewide planning and land use management system. This system is presently being defined from the information needs presented in existing and proposed state and federal land use legislation. It will be designed to serve the Land Policy information and management needs of federal, state, regional and local agencies in North Carolina, including the need for information to identify areas of particular public concern.

The conceptual design of PLUM is presently undergoing study and formulation but certain principles of the emerging system will be useful to planners who wish to adopt or implement this criteria document.

First, PLUM will consist of the following basic components:

1. An information index which includes description, location and sources of Land Policy related information.
2. A library of written, graphic, and/or tabular information relating to Land Policy.
3. A series of maps and map overlays relating to the development of Land Policy.
4. A computerized system for storing, retrieving, processing and displaying information required for land policy decisions.

Second, the information system will be a composite of data and mapping information already in use or under development by federal, state, and local agencies. Thus, the system users will also contribute part of the data base. It

will incorporate detailed tax maps of local governments, plans of regional agencies, and data on natural resources from federal and state agencies.

Figure ¹
PLUM Objectives and Requirements

OBJECTIVE:

The development of an information system in support of the development of Land Policy and the management of Land Use in North Carolina.

REQUIREMENTS:

1. The satisfaction of the information needs developed in the proposed Federal Land Policy Legislation.
2. The satisfaction of the information needs developed in the proposed State Land Policy Legislation.
 - a. The information needs supporting Land Classification.
 - b. The information needs for the identification of Critical Areas of Public Concern.
3. The satisfaction of the information needs developed in Executive Order No. 3.
4. The satisfaction of the information needs for the development of Environmental Indicators.
5. Coastal Management Bill
6. Mountain Management Bill
7. State Law 143-341 Powers and Duties of State Planning

Third, the system will be user oriented, with a high degree of flexibility to accomodate the information and analytic requirements of a wide variety of agencies. However, the first priority user will be the North Carolina Land Policy Council. In support of the council's programs the following data are currently being emphasized:

1. The computerization of soils information.
2. The computerization of information obtained from the Earth Resources Technology Satellite (ERTS-1) and Skylab.
3. The definition and/or location of critical areas data within the coastal counties.
4. Establish a computerized data base for population data .

PLUM has been designed to include a grid structure which will accept and maintain information related to discrete points on the earth or averaged over square grid cells at any level of detail. The grid cell structure has the flexibility to be used at any level of detail and is therefore recommended for all computer-based land information efforts in North Carolina. A more detailed description of this system is provided in the publication, The North Carolina Planning and Land Use Management Information System (PLUM), Definition of Grid Cells within the North Carolina Coordinate System.

As of this writing, little information is available through PLUM. However, local and state agency planners may find it very helpful to contact the Office of State Planning prior to conducting any data collection or analysis in order to efficiently utilize the system as it becomes available and to expedite their work.

Implementing the Criteria for Identification

This criteria document may be implemented by three parallel procedures under three different legislative acts pertaining to land use planning and management. The following state level bodies, when established, should consider the adoption of the criteria:

1. The North Carolina Land Policy Council: Under the North Carolina Land Policy Act, the council is required to establish principles and guidelines for areas of particular public concern, new communities and large scale development, areas impacted by key facilities and projects of regional impact. This document may serve these purposes.
2. The Coastal Resources Commission: The North Carolina Coastal Area Management Act requires that the Commission assist in the determination of areas of environmental concern in the coastal zone. This document may be adopted by the Commission to serve this purpose.
3. The Mountain Resources Commission: The North Carolina Mountain Area Management Act requires this Commission to approve the designation of areas of environmental concern in the mountains. Adoption of this set of criteria may serve to establish policy for identification procedures.

Under both the Coastal and the Mountain Management Act the Secretary of the Department of Administration is responsible for proposing, developing, and coordinating the basic plans for management of the land resources. The policies

and procedures to be used for planning by the Secretary are spelled out in the Land Policy Act. This means that basic procedures and guidelines will be set by the Land Policy Council, but the actual implementation of local planning procedures is the responsibility of local government.

Since local government is the key to success, local government officials should act to fulfill their responsibilities in a new partnership for planning with State government. County commissions, city councils, and planning boards assisted by regional agencies should take steps to identify areas of particular public concern. The following immediate steps are recommended:

1. Prepare a resolution to adopt and implement this criteria document.
2. Order their staff to survey the availability of data and information required to properly identify the areas.
3. Begin a mapping process to place the boundaries of identified areas on maps.
 - a. 7 1/2 minute quadrangle U.S.G.S land resource maps
 - b. Tax maps showing property boundaries

It will be noted that the process of "identifying" areas of particular public concern is not the same as actually establishing allowable land uses within those areas. The next step in the State-local partnership of land use management will be the establishment of policies within such areas, and will be the subject for a successor document. (See Appendix for a discussion of the alternatives being considered.)

