Airphoto Analysis in Outdoor Recreation: Site Inventory and Planning

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Introduction

INCREASING public awareness of the growing needs for outdoor recreation has focused attention on the present supply of recreation areas and the prospects for the future. In a recently issued report, the Outdoor Recreation Resources Review Commission summarized the findings of a three-year study to inventory and to evaluate the outdoor recreation resources and opportunities of the Nation, to determine the types and location of such resource opportunities, which will be required by present and future generations.[1]

The report emphasized the need for considering the land requirements for outdoor recreation along with other uses of land including urban, industrial, agricultural, and other uses. Needs for land for outdoor recreation are particularly critical in the Northeast and Great Lakes areas, where the population is concentrated. In these areas, any use of land for recreation must be considered in relation to the more intensive uses mentioned above.

In studying an area to select land for outdoor recreation use, application of airphoto analysis to the problem is a logical continuation of its previous application in studying use of land in agriculture,[2] urban development and land use changes,[3] and in occupancy of river floodplains.[4]

In addition, in planning for outdoor recreation, up-to-date information on the present pattern and type of land use is important. Recent airphotos are often the only source of such information, where changes are taking place rapidly, because of urban and industrial development, highway and airport construction, and other kinds of development.

Outdoor Recreation Site Characteristics

Before discussing the possible application of airphoto analysis to aid in outdoor recreation site selection, it is necessary to define an "outdoor recreation site," before it can be identified by using airphotos or any other means.

The importance of water (other than for drinking) as a key item at a recreation site has been pointed out in many studies. In regions where natural bodies of water are limited or are not adequate, development of recreation sites may require construction of dams to form ponds or lakes for swimming, boating, and fishing. In addition, the desirability of natural shade, suitable terrain, and good highway access are essential items for consideration in site selection. Optimum size for a site can vary considerably depending on the availability of sites and the needs for recreation in the area. In a study to determine the number of potential new sites in the Northeastern United States, a minimum area of 30 acres was used to identify a potential site.

The importance of a water source indicated that five basic types of site would need to be identified using any method of analysis.

Headwater or ridgetop sites include places where access is usually along the ridgetop or along the slope below, and would include the upper portion of streams.

Gorge and ravine sites include stream drainage below the headwaters site described above and may or may not include the mouth of the stream. Access usually would be either along the stream or at the rim of the gorge providing the slope is not too steep for paths. Figure 1 shows a gorge type site already in use for recreation. Figure 2 illustrates the appearance of this type of site on an airphoto.

Stream, river, lake, pond, and ocean frontage sites would be existing water bodies sufficiently large to allow swimming, fishing, and boating.

Small stream and brook sites are those where the flow is too small, too shallow or too obstructed by boulders, to allow swimming or boating.

* This paper was prepared while the author was employed by the Economic Research Service, U. S. Department of Agriculture, and is in part based on his participation in a research study carried out for the Outdoor Recreation Resources Review Commission. He is now with the Bureau of Outdoor Recreation, U. S. Department of the Interior.

Potential pond sites include areas where dams could be constructed to form ponds. Figure 3 illustrates the minimum size constructed pond for recreational use.

Airphoto Analysis Applications

Having established the minimum criteria for a site, use of airphoto analysis appears to be appropriate for assisting in three main phases of the problem of site identification and location:

The inventory of large areas to determine the potential for new sites, by studying samples. The result will be data compiled and expressed by frequency of occurrence.

The identification and location of "possible" sites, by studying small-scale photo-index sheets or mosaics. The result will be "possible" sites located on airphotos.

The detailed stereoscopic analysis of individual sites, using large-scale airphotos. The results of study will include the airphoto used as a map with data annotated, plus information from measurements made on the photographs.

The use of airphoto analysis in these three phases of outdoor recreation site studies will be discussed below.

Fig. 1. This view in Chesterfield Gorge State Park, New Hampshire, illustrates the gorge-type recreation site. Picnic tables and fireplaces are located on the contour along winding trails, up the slopes above the stream to the parking area adjacent to the highway. (Courtesy of New Hampshire Forestry and Recreation Commission).

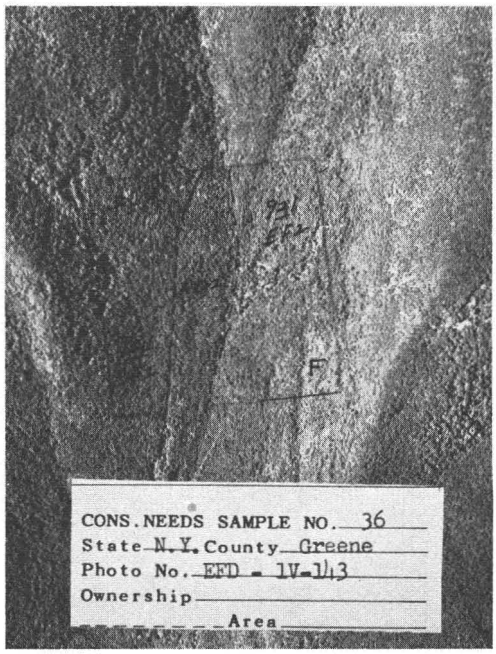

Fig. 2. A typical sample plot used in the National Inventory of Conservation Needs, containing a potential gorge type recreation site in forest, as it appears on an airphoto. The type of soil, percentage of slope and the degree of erosion are shown by symbols. Plot area outlined includes 100 acres.

Inventory of Large Areas

The use of airphoto analysis to determine the recreation site potential can be illustrated by a study carried out for the Outdoor Recreation Resources Review Commission.[5] Data were needed on the outdoor recreation site potential for the Northeastern United States. In order to obtain the required information in the time available, a method was developed using airphoto analysis of sample plots. These were available from the National Inventory of Soil and Water Conservation Needs carried out by the U. S. Department of Agriculture. The Department had made cooperative agreements with the Statistical Laboratory at Iowa State University, and the Biometrics Unit at Cornell University, for the purpose of selecting a national sample of land use and soil conditions. A basic area sampling rate of

FIG. 3. This photograph shows part of a constructed pond of about the minimum size for recreational use. The boy in the picture is walking along the low earth dam, typical of those used to impound water for fishing, swimming, and boating, where natural water resources are not sufficient. (Courtesy of U. S. Soil Conservation Service).

two per cent was determined to be statistically reliable at the county level. For most of the country, the sample plot size was 160 acres, except for the 13 Northeastern States. For this area a unit of 100 acres was used.

The sample plots were identified on individual county maps; the plot boundaries were transferred to an airphoto base for field mapping and the measurement of data. In the field, Soil Conservation Service technicians mapped cropland, pasture, and range, forest and woodland, other land (farmsteads, idle agricultural land, wildlife areas and other nonagricultural use), and urban use. In addition, the soil type, percentage of slope, and degree of erosion were carefully mapped and annotated on the airphoto by appropriate symbols. Figure 2 shows a typical plot with data annotated. The field data were measured and tabulated to show the acreage of each combination of land use with soil type, slope and erosion, and the use capability class in which this combination would be included. A separate plot summary was prepared for each sample and the data expanded to prepare county estimates which were then combined into estimates for each state. For the most part, the computation, was carried out by using punch cards prepared from the summary sheets, and rapid data machine processing. These data are unique because for the first time land use information in combination with soil and other information are available on a uniform basis for the whole country. The data can be assembled for the purpose of making estimates for any area, by selecting and summarizing the sample plots included. In addition to making compilations of the data, the sample plots themselves provide a statistical sample already drawn for making many types of studies by means of airphoto analysis.

In the time available for the Northeast recreation site study it was impossible to study the entire sample (about 18,000) plots. So a random sub-sample of 4,500 was drawn for airphoto analysis. The plots were examined to identify five basic types of recreation sites. Data on the number of potential sites, as determined by airphoto analysis, were applied to the total acreage of forest, idle, or pasture land in the sample universe, in order to compute the rate at which the potential sites occurred. For example, it was found that at least one in five of the basic types of site occurred for each 129 acres of forest.

Using airphoto analysis with this sample made possible making this estimate for ten States in the year available for the study. Even with using a sample, it was found that handling and accounting for a large number of plots presented a problem. The original plan was to borrow photostat copies of the sample plots on airphotos from county field offices and to return them after the study had been completed. It was soon realized that copies of the plots would be useful for addi-

tional studies and that microfilming was the most economic method for copying and retaining the material. The county location maps were copied on 35 mm. microfilm; for the sample field plots and summary sheets, 16 mm. was used.

IDENTIFICATION AND LOCATION OF "POSSIBLE" SITES

While the methodology described above was very useful for obtaining information on the potential number of sites for a large area, the sampling approach could not provide information on the distribution and location of sites. To obtain this type of information for an area, the most appropriate method would be to study the area using airphoto mosaics or photo-index sheets to identify "possible" selections of the five basic types of sites. For example, the area in which the sample plot in Figure 3 is located could be studied on the photo-index sheet for Greene County in order to outline the total length of the gorge and the extent of the wooded area, and show its relation to other kinds of land use, access to roads and so on. Following this procedure for any area would provide a location and distribution map on the photo-index sheet for all "possible" sites. This map could then be used to locate the sites for study in the field or to select larger scale airphotos for more detailed stereoscopic analysis of each "possible" site.

DETAILED STEREOSCOPIC ANALYSIS OF RECREATION SITES

Detailed stereoscopic study of airphotos showing a recreation site can provide many types of data depending on the needs. Information can be obtained on the type of cover at the site, land use in adjacent areas, and the ease of access by roads. Comparison of recent airphotos with earlier coverage will often show trends in use of land in the area, which may be a factor to be considered in planning. Many kinds of measurement can be made such as size of site, acreage in various types, size and type of cover on drainage area of potential constructed ponds, and so on. Finally, the airphotos with information annotated, can usually serve as the most up-to-date map for technical planning and presentation for final recommendation.

CONCLUSION

Airphoto analysis as an aid in the inventory and planning of outdoor recreation sites can provide up-to-date information, and also show the relationship of a site to other adjacent types of land use.

Depending on the problem situation, airphoto analysis can be used in three different approaches: to make estimates of the overall site potential for a large area, to identify and locate "possible" sites, and to make detailed studies of individual sites to assist in final site selection, technical planning and final presentation.

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