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REMOTE SENSING AND GIS TECHNOLOGY FOR WILDLIFE HABITAT ASSESSMENT

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INTRODUCTION

A geographic information system (GIS) data base was prepared for 217 square kilometers of the Savannah River Plant (SRP). The SRP is a defense nuclear materials production facility located near Aiken, South Carolina. The SRP site includes five nuclear production reactors and a coal-fired power plant. Since 1952, these facilities have released once-through cooling water into several streams and lakes which eventually discharge into the Savannah River. The thermal effluents have altered wetland vegetation along the stream channel floodplains and in the SRP portion of the Savannah River swamp.[1,2] Two large cooling reservoirs were constructed to reduce these effects. Par Pond was constructed in 1963 to receive P- and R-Reactor cooling water discharges and L Lake was constructed in 1985 to accept L-Reactor discharges.

Alternative cooling water systems are presently being considered for C and K Reactors. Thermal effluents from these facilities flow directly into Four Mile Creek and Pen Branch, respectively. Terrestrial and aquatic wildlife habitat studies were conducted as part of the Final Environmental Impact Statement prepared for several cooling system alternatives.[3] This paper addresses the use of a GIS data base and other remote sensing data in support of habitat assessments for these alternatives using the U.S. Fish and Wildlife Service (USFWS) Habitat Evaluation Procedures (HEP).[4]

DESCRIPTION OF ACTUAL WORK

Land cover data for the GIS were interpreted from three dates of aerial photography using stereoscopic photo interpretation techniques.[5] Multiple date photography was required to achieve the high accuracy goals specified for the map and to provide for seasonal variability of the land cover types. Aircraft-acquired multispectral scanner data and field observations also aided the interpretation and accuracy assessment process. The classification scheme was primarily based on the U.S. Geological Survey (USGS) land use/land cover scheme with major extensions based on the USFWS wetland classification scheme and the USFWS HEP classification scheme required for the HEP analysis.[4,6,7]

Thus, for C and K Reactors the potential wildlife impacts and/or benefits of once-through and recirculating cooling towers were evaluated for both near-term (30 year) and long-term (100 year) time periods. These options were evaluated against the

projected effects of the current operations, i.e., release of once-through cooling water directly to Four Mile Creek and Pen Branch from C and K Reactors. Those species that were selected as representative of potential project effects in terrestrial environments included the pine warbler, downy woodpecker, eastern cottontail rabbit, gray squirrel, white-tailed deer, and eastern wild turkey. Those species selected to represent aquatic and/or semi-aquatic environments included the creek chub, redbreast sunfish, spotted sunfish, black bullhead catfish, blueback herring, great egret, wood duck, mallard, and yellow-bellied slider.[8]

Data to predict future cover changes in Four Mile Creek, Pen Branch, and the SRP Savannah River swamp were developed from previous remote sensing studies of the SRP. These included change detection studies using historical aerial photography from 1952 to 1985 and aircraft multispectral scanner data from 1981 to 1985.[1,9] The proposed cooling tower alternatives were entered into the data base and area statistics for affected land cover were tabulated. Area statistics were also extracted from the data base for specified regions around the proposed cooling-water alternative construction sites and buffer zones along the affected stream corridors. These statistics were used as input to habitat suitability index models for the evaluation species of wildlife.[4]

RESULTS

For the cooling water alternatives, the relative rankings of future wildlife effects were estimated.[8] Effects to terrestrial wildlife from construction of the once-through and recirculation

cooling towers were essentially equal. Aquatic species, such as the creek chub, benefit more from the recirculation alternative in the upper reaches of the creeks; whereas, in the middle and lower reaches, species such as the black bullhead catfish and sunfish benefit more from the once-through alternatives. In the deep swamp environments, those fish which are more likely to use the swamp during the spawning period benefit more from the recirculation alternatives. Likewise, wading birds such as the great egret benefit more from the recirculation alternative. Overwintering waterfowl such as the mallard benefit more either from the present SRP operations or from the once-through cooling towers. Similar trends were noted for both C and K Reactors for both the short term, (30 year) and long-term (100 year) analysis periods.

Remote sensing and GIS technologies provide both spatial and trend (historical) analyses in order to allow comparison of project alternatives for wildlife assessment.

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