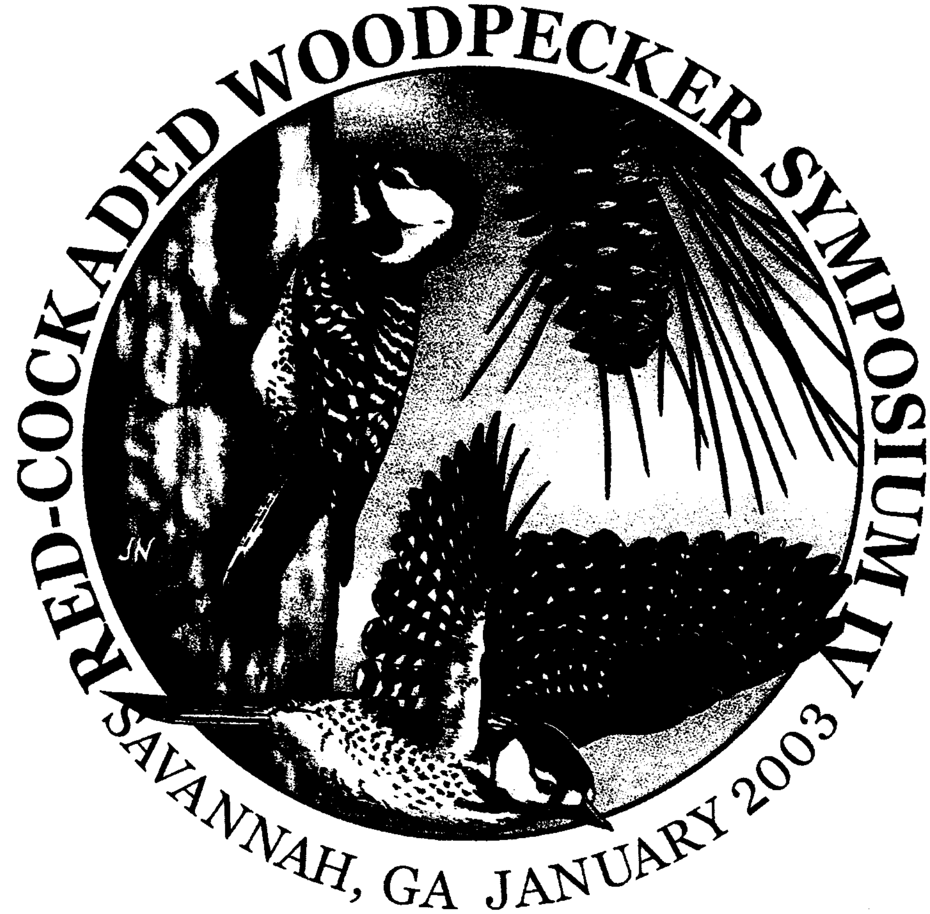
# *RED-COCKADEDWOODPECKER: ROAD TO RECOVERY*

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# USING DATA FROM REMOTE SENSING TO CONDUCT RED-COCKADED WOODPECKER FORAGING HABITAT ASSESSMENTS

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We describe the process and techniques being used to develop an automated Geographic Information System (GIS) tool to conduct red-cockaded woodpecker foraging habitat assessments on Eglin Air Force Base (Eglin). A problem facing Eglin managers has been a lack of confidence in the usefulness of existing forest inventory data in accurately estimating the resources available to each red-cockaded woodpecker group in a timely fashion. Forest inventory data had been collected using stand sampling techniques designed for sampling homogenous stands of trees; however, stands were configured using political boundaries resulting in highly variable habitat characteristics within stands and poor estimates of stand structure. We at Eglin needed a method capable of consistently and accurately estimating the available foraging resources without sampling the entire reservation. On Eglin most projects requiring red-cockaded woodpecker habitat assessments stem from Air Force mission needs and are infrequent and unpredictable. To be responsive to mission requirements we cannot depend on a sampling technique using traditional labor-intensive, time-consuming timber cruising methods.

Because of continuing advances in remote sensing technology, increasing availability of imagery, and reductions in cost, we were able to develop a method based on correlating remotely sensed data with field data from our ecological monitoring program. Our monitoring program characterizes longleaf pine dominated systems. The plot dimensions used for monitoring were designed to correspond to the minimal mapping units from readily available Thematic Mapper (TM) satellite imagery, making the plots ideal for ground-truthing. Preliminary results indicated accurate estimates were achievable for parameters such as large diameter longleaf pine stem density (stems > 25 cm dbh), basal area, groundcover quality, and oak density.

## GRID DEVELOPMENT

Using remotely sensed data each hectare is assigned to 1 of 4 categories (habitat codes). Category definitions are: unsuitable—cleared; unsuitable—forested (very few longleaf, sand pine, hardwoods, young plantation, etc.); suitable—marginal (average 29 large diameter longleaf stems/ha); suitable—optimal (average 64 large diameter longleaf stems/ha). Statistical analysis of longleaf pine foraging resources estimated using remote sensing TM classifications modeled with stand age supports the use of these 4 categories (Table 1). Three categories of longleaf pine density were tested in the statistical analysis. The fourth category (Habitat Code 0) is cleared of vegetation, has no foraging resources, and is excluded from the foraging analysis. Habitat Code 1 is closed canopy forest unsuitable for foraging; Habitat Code 2 is marginal foraging of low-density longleaf; Habitat Code 3 is optimal foraging for Eglin. The analysis of variance of remotely sensed categories as ground-truthed by Eglin monitoring plots shows a highly significant ability ($P < 0.00001$) to determine each category. Means and range of variation with Habitat Code 3 correspond closely to those determined by Hardesty et al. (1997*b*) for successfully breeding groups. This information is used to generate a pine resource availability grid, which is stored as a GIS feature available for analysis. A similar coverage is being developed for herbaceous groundcover resources.

## AUTOMATED SPATIAL ANALYSIS TOOL

An independent Oracle-based GIS tool first establishes cluster boundaries for each group by joining all active complete cavities within a polygon. From the cluster edge, the tool analyzes all hectare habitat grid cells within an 804-m radius and generates a foraging area polygon for each cluster. Attributes for each foraging area polygon are automatically calculated and include totals and percentages for each habitat code and a breakdown of shared versus exclusive habitat. Rules have been established and programmed to capture the highest quality foraging habitat adjacent to each cluster first and then allow expansion of the foraging area into suitable habitat until it encounters an adjacent cluster's foraging area or until sufficient area has been identified (Table 2). If insufficient exclusive forage exists, shared habitat with adjacent clusters is included and percent overlap calculated. Results of this model will be used in conjunction with annual mid-story condition assessments, an ecological condition model (for groundcover quality), and fire frequency data layers to conduct rapid, comprehensive foraging habitat assessments. Purchasing imagery annually will allow for inexpensive, timely, and consistent habitat assessments for use in recruitment cluster placement and consultations with the U.S. Fish and Wildlife Service.