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MAPPING DEER YARD HABITATS USING LANDSAT: A PRACTICAL APPLICATION

KEVIN D. DORAN

University of New Hampshire Cooperative Extension Service
Woodsville, New Hampshire

I. Abstract

Mapping habitats suitable for deer yards using Landsat Multispectral Scanner (MSS) digital data has proven to be a valuable tool in New Hampshire. By knowing the requirements for deer yards in conjunction with the forest types of an area, considerable time and money can be saved by the game biologist locating deer yards. The procedure used is a relatively simple one. Landsat classification maps are generated for various towns using softwood, hardwood, mixed wood, open, and water categories. The maps are then used by the biologists to field check every softwood area on the classification map, softwood areas being important to the deer for protection from heavy snow. Having located the deer yards, efforts can commence to protect them through various methods insuring a healthy deer population. With budget cuts effecting all sectors of the economy, time saving procedures will have to be implimented. A healthy deer herd has implications that benefit the State financially as well as aesthetically. The technique of mapping forest types is not a new one, however, using this information and applying it to related areas can save considerable time and money.

II. Introduction

Many have tried to use Landsat to map wildlife habitat areas with varing degrees of success. Most of the research has been centered around mapping forest resources (Beaubien, 1979; Dodge and Bryant, 1976; Harding and Scott, 1978; Johnson et al., 1979; Kalensky et al., 1979; Kirby et al., 1975; Kourtz, 1977; Mead and Meyer, 1977; Sayn-Witlgenstein, 1977; Titus et al, 1975; Williams and Haver, 1976). The goal of this paper is not to provide any startling new technique for mapping wildlife habitat areas, but to provide some new insight into the usefulness of such a technique.

Figure 1. A dense softwood overstory provides shelter from heavy snow.

The goal of the Dartmouth forestry section of the Goddard Institute for Space Studies is to use computer classification of Landsat data to make forestry applications useful to the resource manager, preferably the "field" forester. This project although not a direct forestry application has implications to the resource manager in his decision making process. By knowing the location of the deer yards the resource manager can plan their forestry activities accordingly.

III. The Deer Yard Project

The idea for such a project developed from a contact with the New Hampshire Fish and Game Department. As the department was involved in the process of mapping deer yards and deer yard habitats the opportunity existed for a joint project utilizing Landsat. A major goal was to work the Landsat classification into a network already established, so that it could become an intregral part of the mapping technique used by the field personnel.

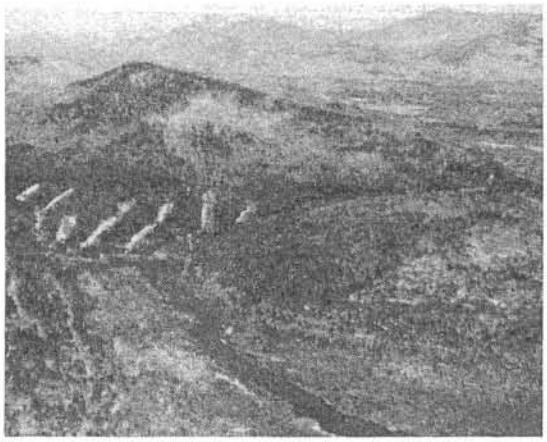

Figure 2. View of strip cutting to improve deer habitat.

IV. The Importance of Mapping Deer Yards

Deer herd management means many things to various groups. It has been estimated that through hunting and fishing activities, approximately two-hundred million dollars is generated throughout the State. Approximately forty percent of this revenue is gleaned from hunting, a very substantial amount. Traditionally, in years that the deer herd is high, the sale of hunting licenses is correspondingly high. Not to be overlooked is the aesthetics of a healthy deer population.

There are many pressures on the deer population in the State. The State continues to grow at a rate as high as any in the country and valuable undeveloped land is going under the bullet of the bulldozer. Timber harvesting for fuelwood is a growing concern now and will pose a greater threat in the near future. Unfortunately, many deer yard areas are composed of low value forest tree species suitable for whole tree harvesting, as a possible result, many deer yards could be ruined in the future.

By knowing where the deer yard areas are some form of protection can begin. In many instances the resource manager does not know of the deer yard, and if he did, steps could be taken to work with the game biologist to insure that the habitat is not destroyed, possibly improving the habitat.

V. The Test Area

The Towns of Washington, Stoddard, and Henniker, New Hampshire were selected as the areas to map using Landsat. The Fish and Game Department had already mapped these towns before the project began, so that, the location and the number of deer using the yard were known. These deer yards were located by the department using conventional techniques. The project was ready to begin.

VI. The Procedure Used

The general procedure was to use the United States Geological Survey Quadrangle maps with the location of the deer yards outlined by the Fish and Game personnel as the training areas. These deer yards were located through conventional methods; aerial photographs, quadrangle maps, and extensive fieldwork by the wildlife biologists and technicians, very labor intensive. By knowing the requirements for a deer yard, correlations can be drawn between forest cover types and topography, and the suitability for deer yards. In the project area deer prefer Eastern hemlock (Tsuga canadensis), for their yards. A goal was to use Landsat digital data to map the various forest cover types, then apply this information to that already known and come up with some possible yarding areas.

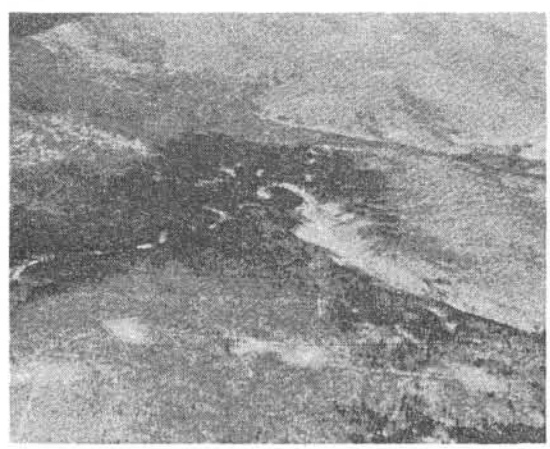

Figure 3. Aerial view of softwood area suitable for a deer yard.

The project employed computer programs to make maps from Landsat Multispectral Scanner (MSS) digital data. A supervised classification approach was used. It was developed at the Goddard Institute for Space Studies (GISS) by Steven G. Unger and is described in Merry et al. (1977). With the GISS classification algorithm, the program user defines a volume in four dimensional color space around an average signature for each land cover category. The signature is usually the average reflectance of a land cover type as taken from a representative sample of the MSS data (a "training site"). Signature training sites were chosen (usually 10-30 pixils, approximately 11-33 acres) for softwood, mixed wood, hardwood, open, and water categories using aerial photographs.

Printout maps were generated for the three towns in the project area. With the printouts in hand, the Landsat classifications were compared with the U.S.G.S. maps, the location of the deer yards previously outlined.

VII. Results

As mentioned at the onset of this paper, the purpose of this project was not to find some new technique to map deer yards and their habitats using Landsat but to find useful applications at the present time. In most instances the deer yards correspond to portions within the softwood classification.

VIII. Implications

With budget cuts effecting all sectors of the economy, the New Hampshire Fish and Game Department is no exception. A staff that has dwindled down to only a handful cannot spend many wasted hours trying to locate deer yards. The response from Fish and Game personnel has been more than favorable, they see a real use for Landsat in the future. Using Landsat as one tool many valuable hours can be saved locating deer yards.

The Fish and Game Department in the future plan to map most of the deer yards in the State. The results from the three towns comprising the test area has proven to be useful. The Department has asked for additional computer classified Landsat maps for various towns in the region. They will use these maps as a first step to locate softwood areas, possible deer yards, with the belief that the maps will save considerable fieldwork. In the future they would like to incorporate Landsat into their data base to monitor these areas for any considerable change.

IX. Summary

Mapping habitats suitable for deer yards using Landsat has been accomplished for three towns in New Hampshire. Although the technique for mapping the areas is not a new one, the application shows promise for the future. With such a valuable revenue commodity every effort should be made to protect and increase the deer population. Once a deer yard is located, the resource manager can make decisions with the knowledge of the area in mind.

Figure 4. Strip cutting to improve habitat.

With budget cuts effecting all, time, labor, and money must be saved in the near future. The use of Landsat to map deer yards can provide valuable information. Landsat alone will not locate these areas, however, used in conjunction with conventional tools it can become a very useful tool.

X. Acknowledgements

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XI. References

Beaubien, Jean, 1979. Forest Type Mapping From Landsat Digital Data, Photogrammetric Engineering and Remote Sensing, 45(8): 1135-1144.

Dodge, Arthur G., Jr., and Emily S. Bryant, 1976. Forest Type Mapping with Satellite Data, Journal of Forestry, 74(8): 526-531.

Harding, Roger A., and Robert B. Scott, 1978. Forest Inventory with Landsat, Phase II, Washington Forest Productivity Study, State of Washington Department of Natural Resources, Olympia, WA 98504. 221 p.

Johnson, Gregg R., Eric W. Barthmaier, Tim W.D. Gregg, and Robert E. Aulds, 1979. Forest Stand Classification in Western Washington Using Landsat and Computer-Based Resource Data. Proceedings of the Thirteenth International Symposium on Remote Sensing of Environment 2:1159-1167.

Kalensky, Z.D., W.C. Moore, G.A.Campbell, D.A. Wilson, and A.J. Scott, 1979. Forest Statistics by ARIES Classification on Landsat Multispectral Images in Northern Canada, Proceedings of the Thirteenth International Symposium on Remote Sensing of Environment, 2:789-811.

Keer, Richard M., 1978. Current Wildlife Habitat Inventory Techniques and their Use in Habitat Management. Proceedings of a Workshop. Tucson, Arizonia.

Kirby, C.L., D. Goodenough, D. Day, and P. Van Eck, 1975. Landsat Imagery for Banff and Jasper National Parks Inventory and Management, Proceedings of the Third Canadian Symposium on Remote Sensing, Edmonton, Alberta, pp. 207-225.

Kourtz, P.H., 1977. An Application of Landsat Digital Technology to Forest Fire Fuel Type Mapping, Proceedings of the Eleventh International Symposium on Remote Sensing of Environment, 2:1111-1115.

Mead, R., and M. Meyer, 1977. Landsat Digital Data Application to Forest Vegetation and Land-Use Classification in Minnesota, IAFHE RSL Research Report 77-6, University of Minnesota, St. Paul, Minnesota, 57 p.

Sayn-Wittgenstein, L., 1977. Remote Sensing and Today's Forestry Issues, Proceedings of the Eleventh International Symposium on Remote Sensing of Environment, 1:267-276

Strong, Karl F. 1977, Evaluative Review of Deer Yard Management Work in New Hampshire and Maine. New Hampshire Fish and Game Department, Concord, New Hampshire.

Titus, S., M. Gialdini, and J. Nichols, 1975. A total Timber Resource Inventory Based Upon Manual and Automated Analysis of Landsat-I and Supporting Aircraft Data Using Stratified Multistage Sampling Techniques, Proceedings of the Tenth International Symposium on Remote Sensing of Environment, 2:1093-1099.

Williams, Darrel L., and Gerald F. Haver, 1976. Forest Land Management by Satellite: Landsat-Derived Information as Input to a Forest Inventory System, Intralab Project #75-1, NASA/Goddard Space Flight Center, Greenbelt, MD. 36 p.

Author Biographical Data

Kevin D. Doran is an Assistant County Forester with the University of New Hampshire Cooperative Extension Service working in Grafton County. Approximately one third of his time is devoted to working with Dartmouth College as a forestry technical advisor on practical Landsat research. His remaining time is spent working with private landowners in the county on forest management activities.