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Application of GIS in Forest Resource Inventory and Management

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Geographic Information System (GIS) is an important tool in modern forestry for collecting, integrating, analysing and displaying spatial information. Its integration with remote sensing, GPS and field inventory data supports forest-cover mapping, resource assessment, monitoring and management planning. GIS can help map forest compartments, analyse forest structure, identify degraded areas and plan forestry operations. Thus, GIS-based forest inventory improves the efficiency and spatial accuracy of forest resource management.

Keywords: GIS, forest inventory, forest management, remote sensing, GPS, forest resources, spatial analysis.

Introduction

Forests provide timber, non-timber forest products, biodiversity, carbon storage and several ecosystem services. Effective management requires reliable information on forest distribution, composition, structure and condition. Conventional field inventories provide detailed observations but can be time-consuming over large areas. GIS provides a platform for integrating field observations with spatial and remotely sensed information for better forest planning and decision-making. The integration of GIS and remote sensing allows forest managers to assess forest cover, vegetation condition and changes over time. Satellite imagery can provide repeated observations, while GIS combines these data with information on forest boundaries, topography, roads and inventory plots.

GIS Applications in Forest Resource Inventory

GIS can be used to prepare maps of forest boundaries, compartments, management units and inventory plots. Field information such as tree species, diameter, height, basal area, stocking and volume can be linked with geographic locations to create a spatial forest inventory database. This makes forest information easier to store, analyse and update. Remote sensing integrated with GIS is useful for forest-cover mapping and monitoring. Multispectral satellite images can be classified into forest and non-forest classes, while vegetation indices such as NDVI can provide information on vegetation condition. Repeated satellite observations can help identify changes in forest cover and areas requiring field verification. GIS also supports the spatial analysis of forest structure and composition. Inventory plots can be mapped according to species composition, density and basal area, allowing managers to identify variations in forest condition and prioritize areas for appropriate management interventions.

GIS for Forest Management Planning

GIS supports spatially based forest management planning by integrating information on forest type, terrain, roads, drainage and management compartments. Such analysis can assist

in planning regeneration, plantation, restoration and other silvicultural activities. Road and accessibility analysis is another useful application. Forest roads and tracks can be mapped to support inventory, patrolling, transportation and other field operations. GIS can also help identify degraded or fragmented forest areas by combining land-cover maps and historical satellite observations.

Integration with Remote Sensing and GPS

GPS provides accurate locations of inventory plots and important forest features, which can be incorporated into GIS databases. When combined with satellite imagery, field observations can be compared with landscape-level information and used to validate remote-sensing outputs. Modern workflows can additionally use high-resolution imagery, drones and digital elevation models for detailed forest monitoring. The reliability of GIS-based forest assessment depends on the quality of field measurements, spatial data and classification methods. Therefore, field verification remains important for ensuring accurate forest inventory information.

Conclusion

GIS is a valuable decision-support tool for forest resource inventory and management. By integrating field inventory, GPS, remote sensing and other spatial datasets, GIS helps in forest-cover mapping, resource assessment, monitoring and management planning. Its wider integration with high-resolution imagery, drones and advanced spatial analysis can further improve sustainable and efficient forest management.

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