ASSESSMENT OF FOREST ECOSYSTEMS AND ADJACENT AREAS STATUS FOR ECOLOGICAL AGRICULTURE

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Abstract:

The impact of forest change is a dynamic process in time and space. Research of the ecosystem's strength and balance is associated with identification of the destructive factors and the growth direction of the influence. The main objective of the proposed study includes assessment of the destructive factors affecting areas with different land cover in regions with similar climatic conditions. The results of the study include application of the NDVI for vitality evaluation of forest and quantity of green biomass and supervised classification for areas with minimum forest biomass on the base of the obtained NDVI values. For more detailed definition of forest status it is necessary to synthesize a model for correlation between different vegetation indexes and destructive factors influence as parameters in such a model.

1. Introduction

Environment has very delicate equilibrium, which is directly dependent on climate changes, natural disasters, and human influence. Research of the ecosystem's strength and balance is associated with identification of the destructive factors and the growth direction of the influence. Modern problem development covers eco-monitoring, specification of trends, and determination of rehabilitation criteria on the basis of satellite technologies. The main objective of remote sensing is to obtain information from received images for the quality of earth objects and the atmosphere with their spatial interaction. It is well known that aerospace methods for remote sensing of the Earth in various spectral ranges are the most efficient ones for expeditious monitoring of geo-ecological conditions. The present level of remote sensing facilities enables acquisition of high-precision data about land parameters with sufficiently high spatial resolution and periodical updating of information. [1]

Corresponding to the project preparation for ecological agriculture and the needs for forest change assessment in the adjacent areas the following tasks were fixed:

❏ Assessment of the state of natural forest ecosystems and identification of the destructive factors influencing the forest fund;

❏ Revealing the developmental trends and direction of identified influences;

The objective of the study includes assessment of the destructive factors affecting areas with different land cover in the region with similar climatic conditions.

2. Selection of test polygons

In accomplishing the task for eco-agriculture development in the region southward of Plovdiv it is very important to evaluate the state of the environment in the boundary area surrounding the selected test sites. It features natural forest ecosystems with prevailing coniferous trees, moderate continental climate, and uniform rain distribution.

The test polygons and field measurement sites were identified using a Landsat 5 TM satellite image from August 1992. Visual interpretation and comparative evaluation vs. a topographic map was used to fix a couple of test polygons near the arable areas of the Plovdiv field. [2] The regions were digitized and put in geographical tables using GIS software - ArcView. The database will be expanded with additional information from field measurements about forest cover, soil, and pollution types.
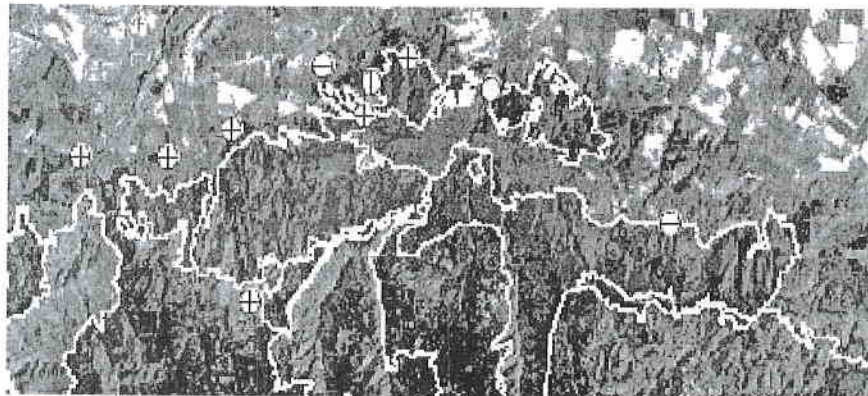

Fig.1 Test polygons

Legend

⊖ Control points for forest
ecosystem assessment

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Tab.1 Area of the fixed polygons

Shape	ID	Land cover	Area / dca
Polygon	1	Forest	30092.148
Polygon	2	Forest	5163.340
Polygon	3	Forest	28832.468
Polygon	4	Forest	4319.924
Polygon	5	Forest	7526.470
Polygon	6	Forest	43161.169
Polygon	7	Forest	29620.794
Polygon	8	Forest	2948.970

3. Results

Analysis of vegetation and detection of changes in vegetation patterns are keys to natural resource assessment and monitoring. The detection and quantitative assessment of green vegetation is one of the major applications of remote sensing for decision-making. For these purposes are used vegetation indexes based on the reflection of vegetation in the visible and infrared range of the electromagnetic spectrum, temperature changes, and ratio in water content.

For evaluation of forest vitality and green biomass quantity, the NDVI is used. Based on the obtained values, a supervised classification is made for areas with minimum forest biomass. These classes outline the ground measurement sites where the destructive factor will be evaluated, providing for the deviation from normal biomass distribution.

4. Conclusion

The large area of the studied territory and the approximate homogeneity of the forest cover suggest the use of remote sensing methods for environmental monitoring. The recorded normalized difference vegetation index values and the classification made, reveal forest biomass distribution. For more detailed definition of forest status it is necessary to synthesize a model for correlation between different vegetation indexes and destructive factors' influence as parameters in such a model. The model construction requires complex application of vegetation indexes and high resolution data. [3]

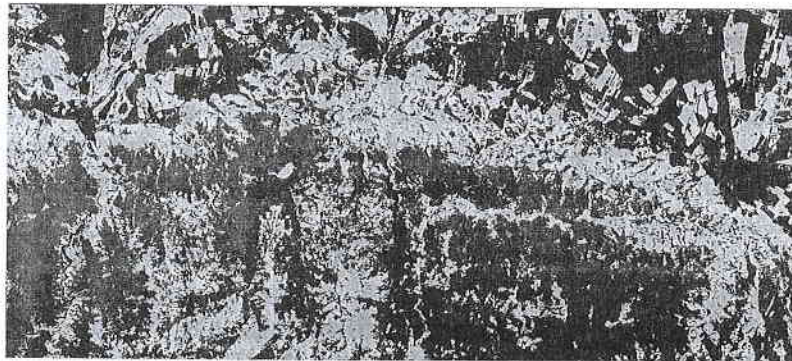**Fig.2** NDVI for vitality assessment of the selected regions

Fig.3 Classification on the NDVI values

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References

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2. C. Travaglia, L. Milenova, et al, Preparation of Land Cover Database of Bulgaria trough Remote Sensing and GIS, FAO, UN, Rome 2001
3. A. Pavlova, R. Nedkov, Satellite and aero image integration for influence assessment of different destructive factors on forest stands, SPIE 9th Annual International Symposium Remote Sensing (in press)

ОЦЕНКА НА СЪСТОЯНИЕТО НА ГОРСКИ ЕКОСИСТЕМИ И ПРИЛЕЖАЩИТЕ ТЕРИТОРИИ ЗА РАЗВИТИЕ НА ЕКОЗЕМЕДЕЛИЕ

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Резюме

Влиянието на горските промени е динамичен процес във времето и пространството. Изследването на издръжливостта и баланса в екосистемите е свързано с определяне на деструктивните фактори и посоката на развитие на оказаното въздействие. Основната цел на предлаганата разработка е свързана с оценка на деструктивните фактори, оказващи влияние върху области с различно земно покритие в райони с подобни климатични условия. Резултатите от изследването включват прилагане на NDVI за оценка на жизнеността на горите и количеството на зелената биомаса и наблюдаваната класификация за области с минимална горска биомаса на базата на получените стойности за NDVI. За по-подробно определяне на горския статус е необходимо да се синтезира модел за корелацията между различните вегетационни индекси и влиянието на деструктивните фактори като параметри в този модел.

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