METHODFINDER

Practitioner's Guide:

Land Cover Classification Using Remote Sensing

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Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung

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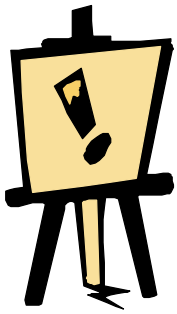
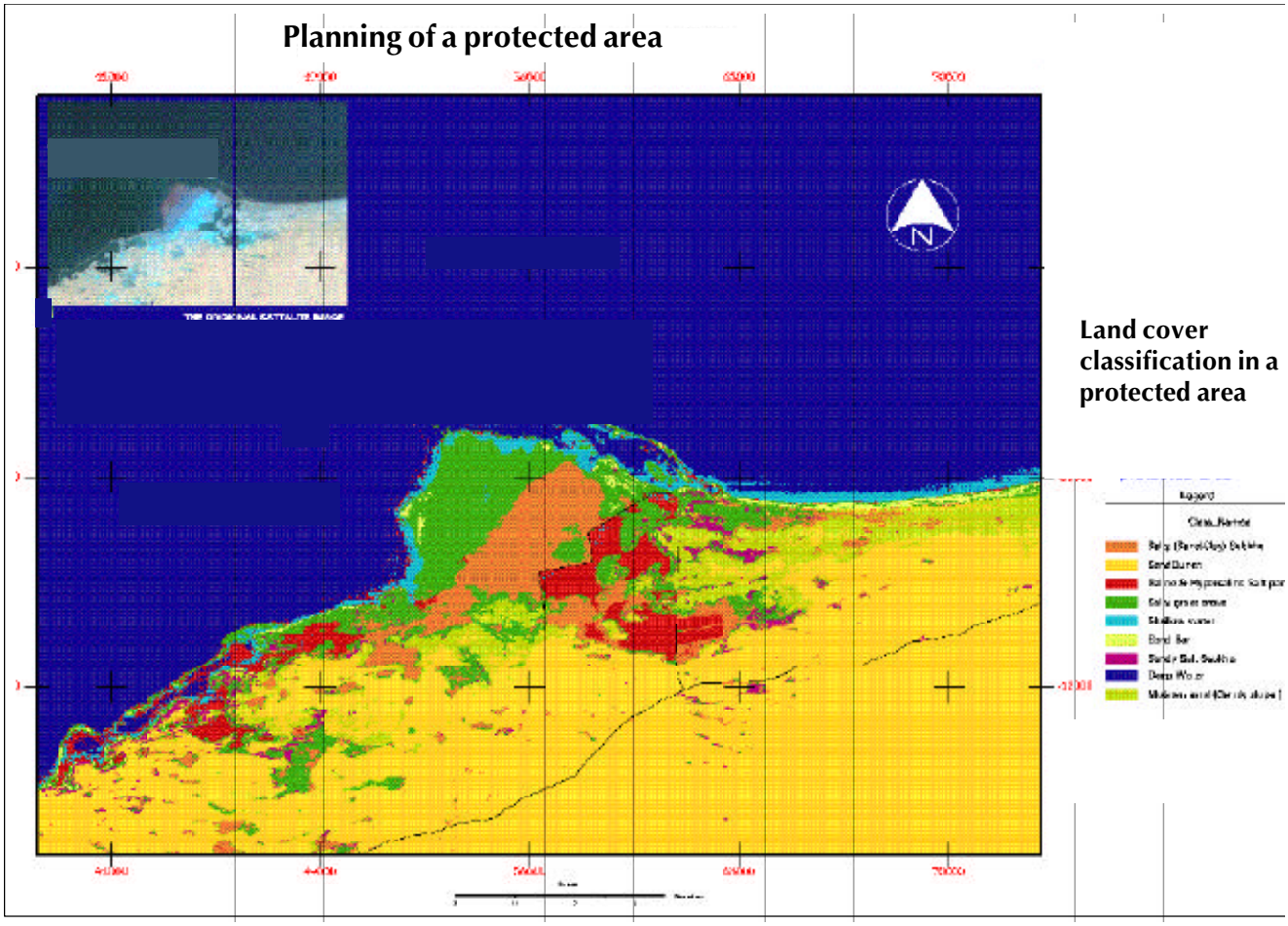
Land Cover Classification Using Remote Sensing

Brief Description



Land use maps can be quickly and accurately updated through various different methods, one being the use of multi-spectral satellite images classification. Basically, the method or tool involves analysing the different ways in which light waves (generated through the sun light) are reflected. Specific features (i.e. grass lands or trees) will reflect the same wavelengths. For example, if the wavelength that olive trees emit can be determined then the operator can quickly ascertain all of the locations where olive trees are currently growing.

Map 1: Land cover classification in a protected area



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Proposed Main Users

Planners, agriculturists and decision makers, especially those who have some background about using GIS or aerial photography. Decision makers can use the method to illustrate and present land use changes that have resulted either from controlled or uncontrolled development.

Purpose of the Method

Use of remote sensing data has proved to be a very useful way of either producing or updating maps that depict different features. For example, an accurate picture of current land uses or soil classification can be generated through the use of remote sensing data. The maps that are generated can in turn be used for other planning activities including land use planning or planning agricultural development actions (i.e. where large scale farms should use pesticides or where water is required or in order to determine the optimal harvest time of crops being grown on a large scale). Remote sensing is also a very useful monitoring tool. For example, monitoring of measures designed to combat desertification can be regularly monitored in order to determine whether the measures are having any large-scale impact on the problem of desertification.

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Advantages

- Ability to quickly produce high quality and up-to-date maps on land use, land cover and soil classification.
- Ability to produce the above mentioned maps for areas where accessibility is either impossible or only possible with considerable effort.
- Useful tool not only for agriculturalists wishing to monitor different crops being produced in a specified area but also useful for monitoring large-scale changes in the land, including destruction of forests, desertification and changes in land use over time (i.e. time series).

Limitations

- The method requires specialized know-how and therefore requires well-trained personnel to classify the features correctly and to determine the land use and other changes that have occurred. Personnel have to be familiar with cartographic principals, projection methodologies, basics in planning and monitoring as well as being knowledgeable in the use of GIS in order to be able to produce accurate maps.
- Considerable investment in hardware and software is required. Computers need to be capable of handling the large amounts of data delivered from the remote sensing satellites. Specialised software is required to handle satellite images, such software is usually quite expensive
- A further limitation is the fact that personnel usually have to be trained in order to be able to handle satellite images and remote sensing data. Such specialized training is usually expensive and time consuming. A further limitation is that suitable personnel who can be trained are often not available in the area where the technology is to be used.
- Once the personnel have been trained their "market value" rises dramatically and there is a tendency for them to leave the public service seeking more lucrative jobs in the private sector. Retention of personnel qualified in remote sensing and GIS is difficult for the public sector.
- Recent satellite images often have to be used in order to undertake change-detection of land uses or other features that are to be monitored. Acquiring the satellite images is often difficult not only because the images are relatively expensive but they can also not be freely purchased in many countries due to military or other restrictions.

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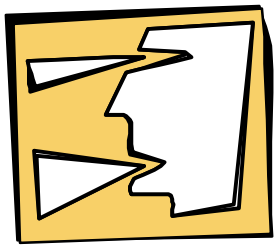
Principles and General Procedures



A seven step procedure needs to be applied:

A detailed step-by-step description of how to use remote sensing data for land use planning would require numerous pages and would go well beyond the description that can be provided in this paper. Therefore, only the most important "major" steps have been highlighted below. If the method is to be applied then the user will have to refer to references and additional literature that provide sufficiently detailed descriptions on exactly how remote sensing data is to be used for generating specific maps and planning information.

Step 1: Acquiring the satellite images: Suitable satellite images have to be purchased. It is important that the resolution that is required for the planning purposes is defined so that the correct satellite images are purchased. Balancing the cost of the images with the use to be made of them also has to be thought through. Detailed and high precision images are generally more costly and the planner has to consider whether the additional detail these images provide warrants the added cost or whether less detailed "cheaper" images would not suffice.

Step 2: Rectifying the image. The images that have been acquired need to be rectified. This means that all the maps that will be used have to be put into the same coordinate system.

Step 3: Classifying the images: Considerable amount of work is required by the operator in order classify the images. Classifying involves the operator determining different features on the computer screen. In order to be able to do this, the operator needs to have a sound knowledge of the features that he/she has to look for as well as good ground knowledge of the area that is being classified.

Step 4: Field verification: Once the initial classification has been completed on the computer, the operator needs to go to the field to verify whether the classes that have been identified are correct. For example, if the operator identifies a plantation as being an olive grove then the field verification will determine whether this was a correct classification or not.

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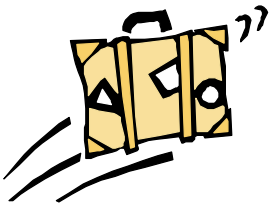
Step 5: Reclassification of the area: In the event that the classification (i.e. wavelengths used to classify, for example olive groves compared to other forest features) proved incorrect, the classification will have to be repeated based upon the information derived from the field verification

Step 6: Simplifying the classification: In view of the fact that too many classification of features may emerge it may be appropriate to merge some of the categories and land covers. The merging process should be done according to the exact purpose of the map. For example, if the map is designed to present certain specific land use features (i.e. primary forestry areas) then a detailed classification of this feature is recommended, while other features that are not essential for the map could be merged in order to reduce the overall detail being presented.

References and Sources Used



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