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The design of a DataBase for Natural Resources in Danube Delta Biosphere Reserve (DDBR)

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Abstract: Efficient use of natural resources especially in Natura 2000 sites is an essential component of Europe 2020 strategy. The use of web database is absolutely necessary for a good resource management and it will provide a good communication channel for the main stakeholders: protected area manager, scientists, resources evaluators and local community. Access to information from database is allowed according with the user competence. General information on natural resources uses in Danube Delta Biosphere Reserve (D.D.B.R.) will be freely available. Different degree of information, especially regarding editing data will be applied for the main actors involved in use of natural resources. Evaluators that are mainly scientists with good biodiversity background, protected area staff that applies the regulation regarding natural resources in relation with ecological conditions, private companies or persons interested in harvesting natural resources. The user interface is realized by using OpenSource products. The web interface for tabular data was build using ExtJs Javascrip library. The web map user interface was build using Openlayers, GeoExt, and Ext. For database SQL server we chose PostgresSQL and GeoServer for maps server.

Key words: natural resources management, Web database, GeoServer, PostgresSQ, JavaScript

INTRODUCTION

Over 7,000 species of plants and animals and 30 types of ecosystems live in the one of most valuable Eco-regions of the Europe, the Danube Delta. Experts argue that climate change will have a considerable impact on this region already vulnerable: more frequent floods, longer droughts, decreased fish stocks and reduced biodiversity. In addition, climate change affects water quality and disturbs the balance of life in the wetland, which could significantly influence the welfare of the local population [1].
Currently available data to make analysis on natural resources are not used to the full potential because are not stored in a unified data base dealing with natural resources management. The database should contain general information (information of the study area, information on environmental conditions in the study area, etc.) and specific information. This information can be tabular or compatible with Geographic Information System (G.I.S.) [2]. The second format must include geographic position (either point, line, polygon or raster form). To access such G.I.S. database, web applications should be used.

MATERIALS AND METHODS

Evaluation and managing of vegetal natural resources in the Danube Delta Biosphere Reserve can be more efficient if databases will be used. This database should contain information on the main categories vegetal natural resources (reed, pastures, herbs, mushrooms), their location on the territory R.B.D.D., quantities that can be sustainably harvested quantities and resources users. The structure of table with resource users was determined using information from the study realized by Danube Delta National Institute (D.D.N.I.& R.D.) in 2008 [3].
1. User table contains information about the type of editors and has the following structure:
- RID - is the record number. Autocompletes
- Username - the name that will connect to the database
- Password – "parola" that will connect to the database
- Name - name
- Name – "prenumele" person
- Position - the position, he holds
- Institution - the institution to which he belongs
- "Initiale", institution type, phone, fax, email, location, and address - contacts on the institution
- "Stare_cont" - account status

- "Tip_utilizator" - contains one of three types of users with editing rights to the database resources: appraiser, manager and user resource
- "Tip_resursa" - contains one of the types of natural resources
- "Tip_instituţie" - contains the type of organization which the user belongs.
- "Tip_utilizator" - column will contain three types of users with editing rights to the database resources: evaluator, manager and user of resource.
- "Tip_resursa" - column will contain the types of plant resources (mushrooms, meadows, and reed).

2. For the potential of meadows a spatial database will be created that will be linked to a specific alphanumeric table for pastures that will have the following structure:
- SIG - field related database resource alphanumeric plant
- Pastoral value - nutritional value
- Humidity - Humidity Index
- Current production [t / ha] -Production estimated average
- Characterization meadow - Class meadow
- Load - maximum number of cattle per hectare (U.V.M. / Ha)
- Period - Period of optimal harvest
- CodUser - user code table as editing users.
- NumeUser - record author.
- DataEdit - Data evaluation (auto completes).

3. For the potential of edible fungi a spatial database will be created that will be linked to a specific alphanumeric table for fungi that will have the following structure:
- SIG - field related database resource alphanumeric plant
- Popular name - Name edible mushroom species
- Scientific name - scientific name of the species of edible mushrooms
- Amount estimated average - Production
- Period - Period optimal harvest
- CodUser - user code table as editing users.
- NumeUser - record author.
- DataEdit - Data evaluation (auto completes)

4. For the potential of reed a spatial database will be created that will be linked to a specific alphanumeric table regarding reed resources that will have the following structure:
- SIG - field related database resource alphanumeric plant
- Type Reed - Reed type.
- Height - height strains
- Diameter strains - strains diameter in mm
- Density - Density Reed (plants / m²)
- Biomass - Biomass strains (kg. S.u. /m²)
- Period - Period of optimal harvest
- CodUser - user code table as editing users.
- NumeUser- record author.
- DataEdit - Data evaluation (auto completes)

5. For users of plant resources, a table will be created and linked to the evaluation table and plant resources and will have the following structure:
- RID - is the record number (auto completes).
- SIG - field related to plant resource assessment table
- Author - author of registration.
- Applicant - company / person requesting the right to use resource.
- Use Period - requested period of time to use resource.
- Use Regulations - links to laws governing the resource use.
- Data input - date of recording (auto completes)

6. For vegetable resources manager a table will be created and linked to the resource manager table and will have the following structure:
- RID - is the record number (auto completes).
- SIG- field related to spatial database of plant resources.
- Author - author of registration.
- Institution - Institutions that manage resource (field about nomenclature).
- Applicant - company / person requesting the right to use the resource
- Use Period - how long was granted the right to use plant resources.
- Author resolution - Who granted the right to use.
- Motivation resolution - Reason approval / rejection of the use of resources
- Year resolution - date when it was time resolution.

- Data input - date the recording (auto completes).

Vegetable natural resource is an important source of revenue for the companies and the local population. The database will provide to the resource's user, all needed information regarding the resource: the quantity available, the recommended period of harvest, rules to be respected.

Resource Manager is also interested in monitoring quantities and areas where natural resources were exploited and the correlation between permits issued and the reality on the ground. For reed resources this correlation is feasible by processing satellite images and comparing them with data coming from resource users. Making a database of plant resources and a dedicated web interface will allow easier access to information on the economic potential of plant resources and much easier procedure to obtain the authorization to use natural resources. Using this database and the web application can ensure much better transparency in the process of licensing natural resources, starting from requests to use the resource using web interface and ending by verify the degree resources were used. Briefly, the user completes the form that containing columns of resource users table, resource manager analyzes the request and fill the resolution in users table and finally, the evaluators fill how the resource was exploited. Natural resource should be evaluated annually by a qualified person who will fill tables and draw maps described above. The evaluators must be approved by the natural resource manager.

The validation of these people as evaluators entitles them to edit the database of plant resources. To avoid pressure on evaluators, name will not be public, because the pressures can distort the outcome of the assessments. Selecting specialists who have the capabilities to assess plant resources will be undertaken by resource manager based on criteria established by scientific advisers (ex. Scientific Council of D.D.B.R.). This system ensure transparency / streamlining of documentation requested from resources, taking in account that filling forms will be done online and all evaluation and contracts regarding resources being public available.

RESULTS AND DISCUSSIONS

Alphanumerical database for plant resources was performed using open source software like PostgreSQL database server. In figure 1 grassland table structure is presented. Web interface for programming language was OpenSource ExtJS a JavaScript library that with PHP modules facilitate view/edit the database.
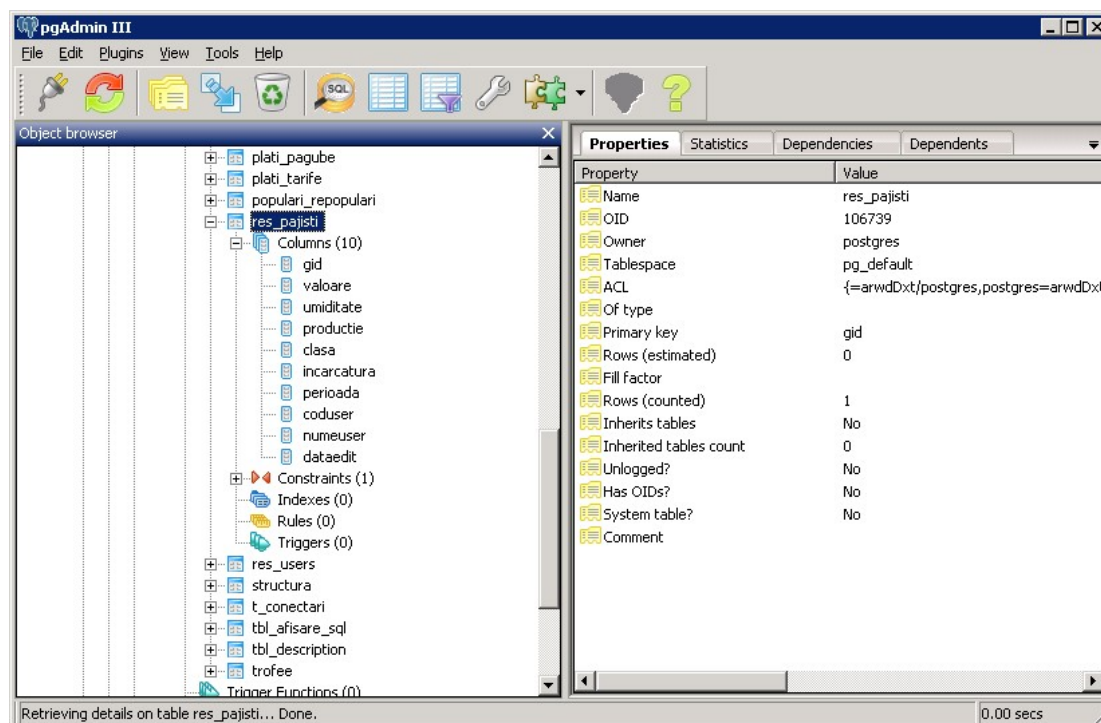

Fig. 1 The plant resources database realized on PostgreSQL server-grassland table

To create a new account, a new user button is pressed. This will open a window for entering the data needed to create a new account. All fields are required. Values in the field "tip_resursă" and "tip_user" will determine on which alphanumeric and spatial data tables the user has view / editing rights.

If the user is evaluator, the spatial information view / edit interface for plant resources is shown in figure 2. The interface was realized using OpenSource products: Javascript libraries Openlayers, GeoExt, Ext and GeoServer for map server. To provide flexibility in use of interface, view / edit of spatial information was differentiated, polygons that can be edited (belonging to the user) are displayed different from the other polygons in the resource layer. This was achieved by introducing a layer filters that displays only the user's   records.

Layer "Edit_layer" is introduced only for editing functions and contains only a single polygon that has been selected by the user for editing. This layer does not exist in GeoServer, it is temporary and is created using OpenLayers library. Edited data are taken from this layer and saved to layer "User_stuf". This mode provides less traffic compared to the standard procedure when the editing layer was generated using GeoServer (figure 3).
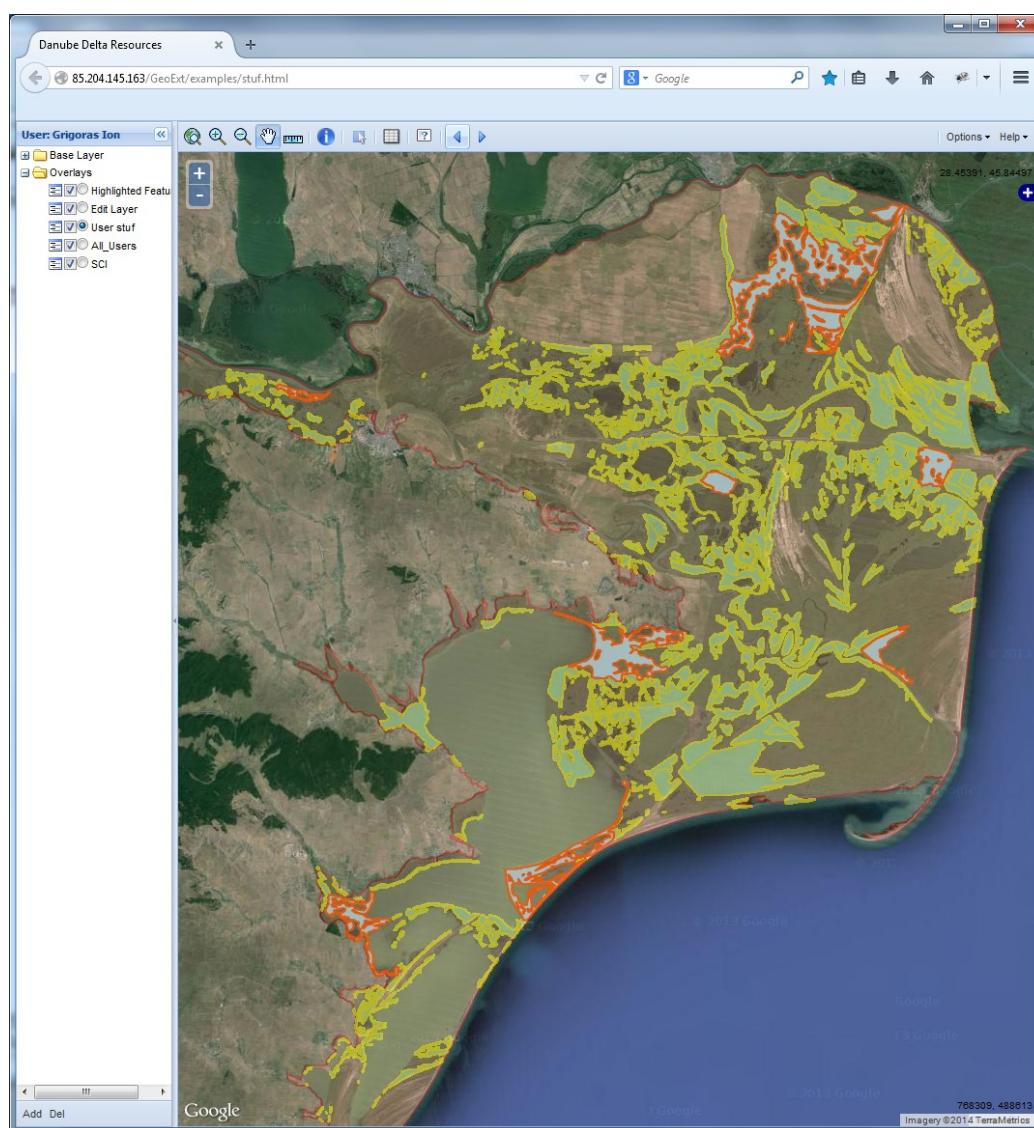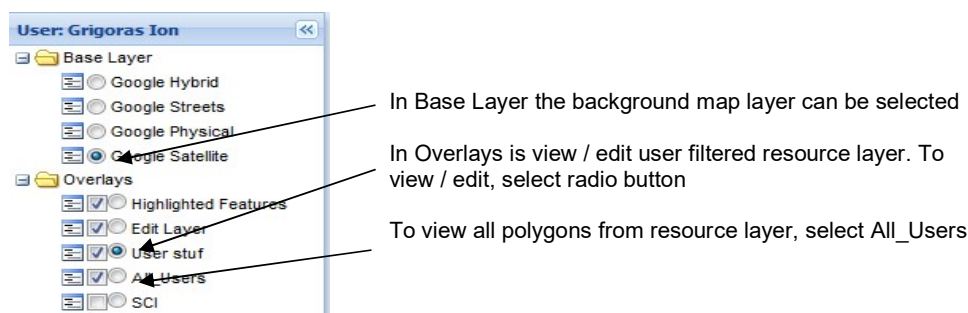

Fig. 2 Spatial data editing interface for plant resources

In Base Layer the background map layer can be selected

In Overlays is view / edit user filtered resource layer. To view / edit, select radio button

To view all polygons from resource layer, select All_Users

Fig. 3 Layers used to view / edit resource layer

The layers available spatial data editing interface are shown in figure 3. Editing (only evaluator's users) functions are: adding a new polygon, editing attributes corresponding to the selected polygons, polygon shape modification and deletion of an existing polygon.

The layers available spatial data editing interface are shown in figure 4. Editing (only evaluator's users) functions are: adding a new polygon, editing attributes corresponding to the selected polygons, polygon shape modification and deletion of an existing polygon.
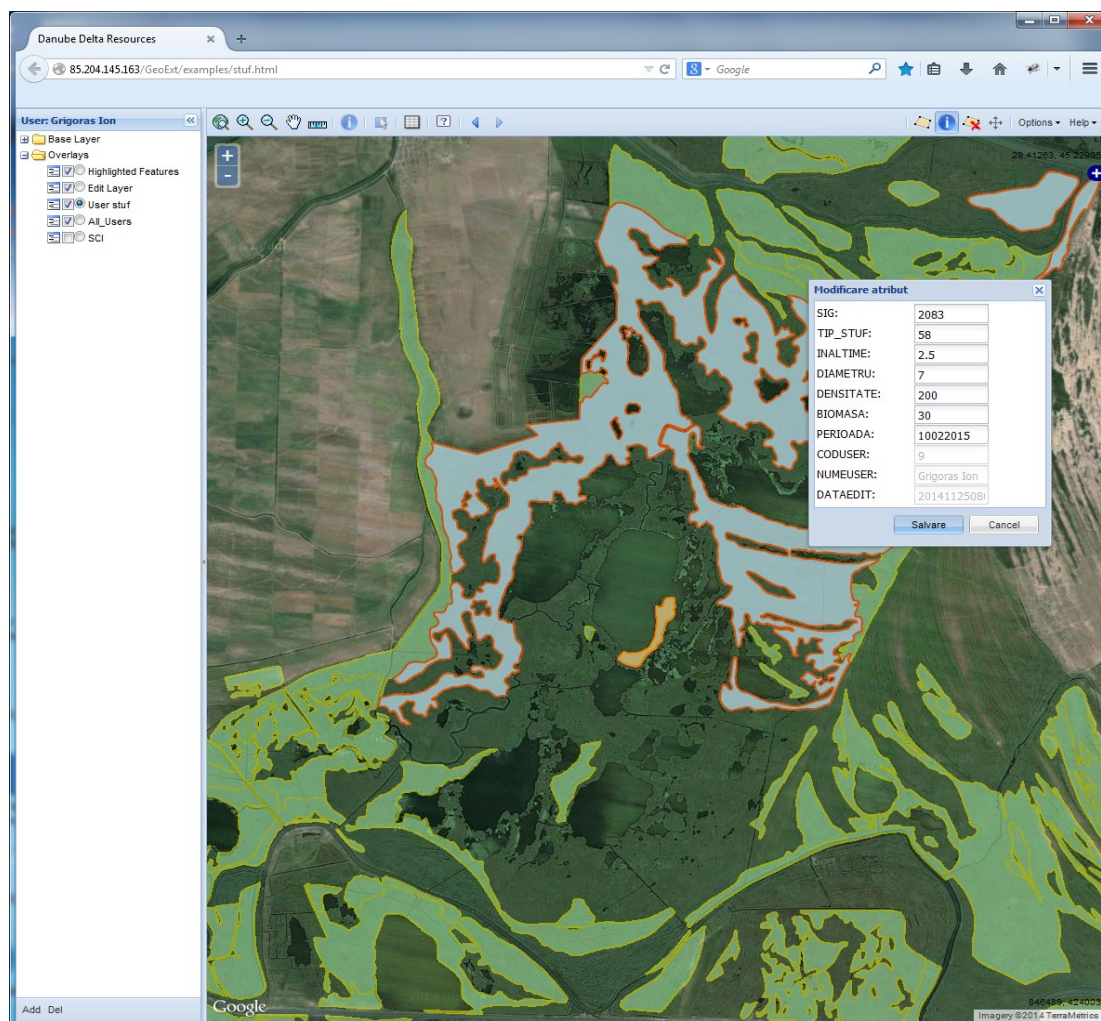
Fig. 4 shows the attributes of a polygon editing. Polygon editing attributes for which (selected) is marked with yellow

Alphanumeric data visualization is achieved using a client interface in JavaScript language using ExtJS library. For server side PHP was used. This interface contains functions for filtering data that for large tables reduces the number of records displayed and increases efficiency of using data server. Editing is done by double-clicking on row and selecting the entry. This opens a window where you can edit the data. When modifying data (Figure 5) unique registration number is displayed that can not be changed.
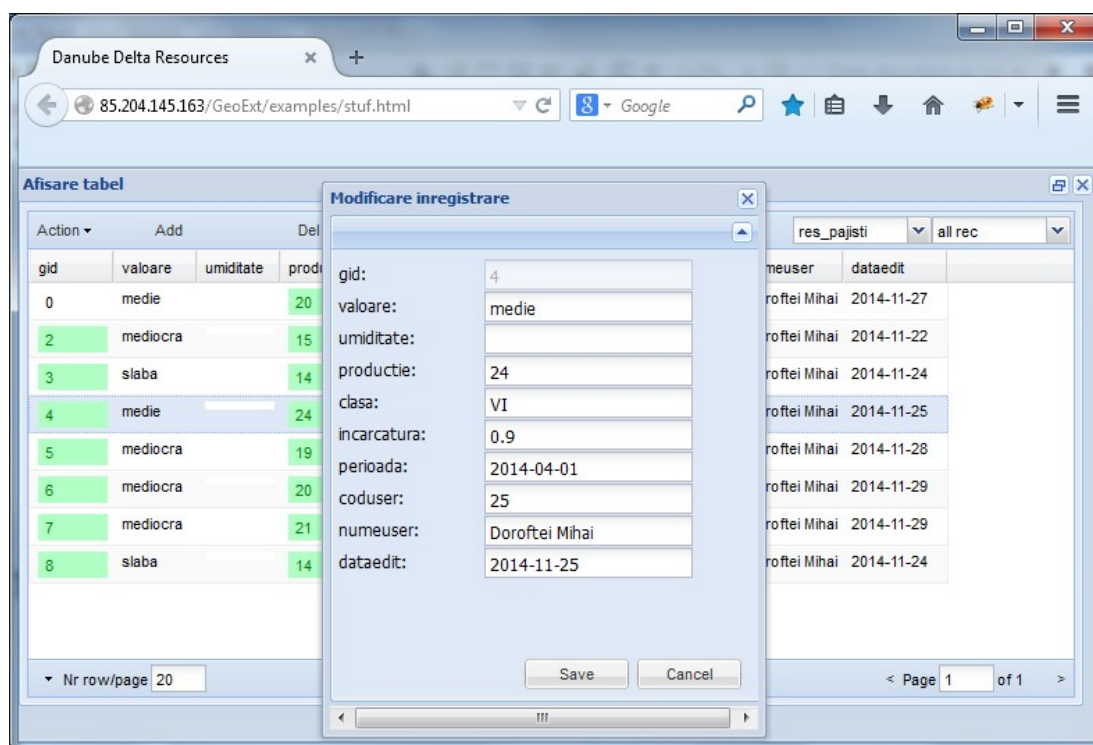

Fig. 5 Edit alphanumeric data in tables

CONCLUSIONS

A pilot database and web interface for users and vegetable resource was realized. It ensures viewing / editing information using web technology. The edit interface for evaluators and plant resource managers are accessed based on user name, password and take in account the user expertise. Table that stores user data is unique for all resources. To access a particular resource, users are selected after "tip_resursă" and "tip_utilizator" fields. Spatial database interface was designed to provide good graphical interface versatility for editing functions. For logged evaluator, only their own records are available for editing, other records can only be viewed.

ACKNOWLEDGEMENTS

REFERENCES

1. European Commission. (2014). „*A resource-efficient Europe – Flagship initiative of the Europe 2020 Strategy*", EUROPE 2020, < http://ec.europa.eu/resource-efficient-europe >
2. FAO. (2001). „*GIS in biosphere reserves*", Preliminary Feasibility Study on the Possibility of Implementing GIS within BRIM, < http://www.fao.org/gtos/doc/BRIM-gis.pdf>
3. DDNI&RD (2008) Project report 349 / 2007 "*Assessment of sustainable use potential for vegetal resources in Danube Delta Biosphere Reserve designed for 2007-2008 harvesting campaign*" (in romanian).