Vegetation Classification and Mapping in the ConserveAZ Portal

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This paper outlines the process used to classify and map vegetation in the ConserveAZ Portal. The first part is a short description of the process that can be cut and pasted into a plan where it is appropriate. The second part adds some additional information to help understand the process.

Development of Statewide Vegetation Classes for Historic and Existing Vegetation

On rangelands and forestlands the main resource that can be managed is the vegetation. Changes in vegetation can lead to resource concerns such as reduced forage, increased erosion, degraded wildlife habitat, increased flooding, reduced water yield, etc. Therefore, it is important to identify the current vegetation types and their extent, and also to identify where vegetation may have changed and caused resource concerns. For this reason, a map of both existing vegetation and historical vegetation is needed.

Historical vegetation was determined by using the "historic climax" vegetation description for each ecological site. Each ecological site (about 400 ecological sites in Arizona) was assigned a formation and a biome based on the vegetation classification system of Brown, Lowe and Pase (Brown and Lowe 1974, Brown and Lowe 1977, Brown, Lowe and Pase, 1979). This system uses 7 main formations and 22 biomes for Arizona. This system was chosen because it is widely used by both federal and state agencies and others in Arizona, and the terminology is familiar to most resource managers. The vegetation was then mapped using the soil surveys available which can generate a map of either formations or biomes based on the ecological sites.

There were no maps available based on actual field surveys to document existing vegetation, so satellite mapping by Landfire was used to generate these maps (https://landfire.gov/vegetation.php). Landfire uses a different system of vegetation classification, and the number of vegetation types it delineates is too detailed for purposes of this plan (about 150 different types in Arizona). Therefore, it was necessary to group some of the Landfire types into larger categories and to assign these categories to the same formation and biome names used for the historical vegetation map. In addition, Landfire identifies the existing vegetation type in pixels of about 30X30 meters on the ground (1/4 acre) rather than in soil mapping unit polygons.

In some areas, ecological site maps were not available, e.g., on national forest lands and a few desert areas where NRCS soil surveys were not available in digital form. On the forest lands, the descriptions of Terrestrial Ecosystem Units, which are somewhat similar to ecological sites, were used to assign these mapping units to the proper formation and biome (about 350 TEU polygons were used). (https://www.fs.fed.us/soils/teui.shtml) Where no soils information was available, the Biophysical Settings product used by Landfire was used to predict pre-settlement (historic vegetation).

With maps of both historic and existing vegetation using the same formation and biome names, it was possible to make comparisons using Landfire and identify areas where the vegetation had changed from one type to another and calculate the acreage of each transition.

How accurate are these maps and acreages? It must be recognized that classifying vegetation into types is so some extent arbitrary and dependent on the objectives of the classification (see AACD TR#D-2 Vegetation classification and mapping). The potential or historic vegetation assigned to ecological sites is based on the best available information, but there is variation within an ecological site due to differences in aspect, precipitation, or soil characteristics. In addition, the ecological site map used as the basis for historic vegetation assigns the entire soil mapping unit to the dominant ecological site. Thus, there may be considerable area of a different historic vegetation type than the one mapped. Landfire is also subject to errors, especially in some types of vegetation such as desertscrub. Landfire uses a pattern recognition program to classify vegetation. Where different types give a similar pattern, it may mis classify them. This accounts for mapping some vegetation types where they clearly do not occur. The result is that these maps are probably not more than about 75% accurate. That is sufficient for broad planning purposes but would not necessarily be reliable for more specific, project-level purposes. It must be remembered that even on-the-ground mapping by experienced observers is also subject to error because vegetation may represent a transition from one type to another, and therefore, the decision of which type to call it is somewhat arbitrary.

ADDITIONAL COMMENTS

The vegetation formations used in the Portal follow those used by Brown, Lowe and Pase for Arizona. The biomes approximately follow that system, but some minor modifications were made. For example, salt desertscrub was added as a biome, although Brown put salt desert types as series with several of the other desertscrub biomes.

Tables 1 through 6 show the correlations developed among the Landfire vegetation types and the modified Brown and Lowe classification. The tables also show the dominant life form, main species and estimates of existing and pre settlement acreages of each in Arizona.

Table 1 shows the Forest formation which is divided into 3 biomes. By far the largest biome is the Southern Rocky Mt. Ponderosa Pine Woodland and this type has increased compared to pre settlement conditions, apparently partly due to decline in ponderosa pine savannah, i.e., pine has increased in density.

Table 2 shows the Shrubland, Woodland, and Chaparral formations which include 5 biomes. There are striking changes in acreage of these types from pre settlement times, with pinyon-juniper woodland showing great increases, while chaparral types have declined.

Table 3 shows the Grassland formation which is divided into 3 biomes. The acreage figures are hard to interpret, apparently due to some changes in how these are classified by Landfire. Some shown in the table have no description in the published legend.

Table 4 shows the Desertscrub formation which is divided into 6 biomes. This table also shows some major changes in these biomes from pre settlement times. Some of this may be real, e.g., conversion of desertscrub to urban development and farmland, and some may be due to lack of accuracy of the Landfire estimates in desertscrub types.

Table 5 shows the Riparian formation which is divided into 5 biomes. This one was hard to correlate because of differences in the way Brown and Landfire defined these types. Should be considered tentative.

Table 6 shows Other categories, which are really not formations in Brown's system because they all refer to vegetation that has been altered. Some of it is naturally barren of vegetation. Some has been converted to developed land, some to denuded land, some to planted vegetation, some to farmland, and some has been replaced by invasive species. None of these, except naturally barren areas, were present in pre-settlement times.

Literature Cited

Brown, D.E., Charles H. Lowe, and C.P. Pase. 1979. A digitized classification system for biotic communities of North America, with community (series) and association examples for the southwest. Arizona-Nevada Academy of Science V. 14, Pages 1-16.

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