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GENERALIZED CRITERIA AND ENVIRONMENTAL IMPACT ANALYSIS

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ABSTRACT

The systematic use of generalized information in impact analysis is discussed. A semi-quantitative method is developed through examples drawn from vegetation studies. The method involves 1) determination of criteria, 2) criteria rationale and impact designation and 3) impact assessment. Limitations and advantages are discussed, and indicate that the method does provide an explicit impact analysis.

Introduction

In the field of environmental analysis, impact determination has always been a source of uncertainty. With little or no site specific data in many instances, except for the engineering sciences, clear-cut impact designations are at best difficult. Hence, very few environmental reports attempt to systematically quantify impacts to the various components of the environment. Rather, they use ambiguous verbal descriptions for impact delineation. It has only been recently that research efforts were aimed at quantifying impacts and developing a systematic approach to impact study [1-6]. With a lack of reliable specific information for many areas of the United States, generalized information related to broader areas which include the site under consideration, must be relied upon for impact analysis.

This paper will present a description of the use of generalized information in a systematic, semi-quantitative impact analysis and

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an examination of its limitations and advantages. The following discussion will use examples from vegetation studies but corollaries can be drawn to other types of impact analyses.

Impact Analysis

The entire impact analysis rests upon proper identification of criteria from the general information available. This step is critical since it defines subsequent relationships of all the variables under study [7].

IDENTIFICATION OF CONSTITUENTS

First, the constituents of each area of concern must be identified. For instance, in the vegetation component, information about several factors such as production, areal distribution of different vegetation types, animal utilization of different vegetation types and species diversity among the types would seem basic requirements for impact analysis. Obviously much site specific information can be added to this list including the occurrence of rare and endangered species and species composition data. Where available such data are eminently preferable to similar general data.

RATIONALE

Second, each criterion must rely on a logical and substantiable rationale. This step, in practice, is the most time consuming and requires the synthesis of considerable information to provide an acceptable list of criteria. From the rationale, impact designations can be made. For the vegetation criteria mentioned, the following rationale [8-11], and impact designations are possible.

Production—An ecosystem with a low primary productivity cannot re-establish its biomass as quickly as one whose rate of primary production is higher. Therefore, greater impact is expected from vegetation (i.e., biomass) removal in areas of low productivity than in more highly productive areas.

Areal distribution—Vegetation types covering large areas are more capable of recruiting constituent plant and animal species for reinvading and re-establishing disturbed areas than those vegetation types of limited distribution. Disturbance of habitats that cover large amounts of the project area is considered a less significant impact than perturbations of habitats with limited distribution.

Habitat utilization—Each vegetation type is important to the animal species that utilize it. Disturbance of any vegetation type will alter this relationship and constitute an impact to the system. Some vegetation provides critical habitats which animals are highly dependent upon including winter ranges, breeding and nesting grounds. Disturbance of these areas is considered an important impact.

Diversity—Areas with high species diversity are considered less sensitive to perturbation than areas with low diversity.

Each criterion and its impact designation can be further refined with site specific data. For instance, if it is known that certain rare and endangered species occur in a vegetation type with a relatively high production and a large areal distribution (which would ordinarily indicate a relatively insignificant impact), compensation can be made so that the occurrence of these species is taken into account.

ASSESSMENT

The third and final step involves the impact assessment. In this process each area of consideration is rated according to the criteria selected and their impact designations. Number values are easily applied and overall relative impact rating can be obtained, as shown in Table 1. This example (Table 1) uses a simple case of four impact levels, but more levels can also be used given a more rigorous delineation of criteria. The separation of impact levels relies totally upon the precision of criteria and their rationale. In this example beneficial impacts were not evaluated but a similar

Table 1. Impact Designation

Vegetation type	*Production*	*Extent*	*Diversity*	*Habitat utilization*	*Summary*
Ponderosa Pine	2,1	1,1	1,1	3,2	7,5
Shrub-Steppe	3,0	1,0	2,0	3,1	9,1
Steppe	3,0	1,0	2,0	3,1	9,1
Juniper	2,0	1,0	2,0	3,1	8,1
Pinyon-Juniper	2,0	1,0	2,0	3,1	8,1
Desert-Shrub	3,0	1,0	3,0	3,1	10,1
Lake-Marsh	2,0	3,2	2,1	3,2	10,5

Note: Impact designations for a transmission line across various vegetation types. The numbers indicate respectively, short-term and long-term impacts. Maximum summary value equals 12, minimum value 0.

table could be developed for such impacts. An impact analysis, such as Table 1, would readily describe anticipated impacts and indicate the areas where major and minor impacts would occur. This type of analysis with some modifications, has been used recently [12, 13] and does provide an explicit impact analysis.

Limitations and Advantages

The most important limitation of this method is that it is best used for studies of a regional nature. Since generalized criteria are, by definition most applicable in a broad sense, their use on a restricted area may be misleading. Further, an impact analysis of this type provides only a relative scale, and so does not allow direct comparison with other studies. However, in spite of these limitations this method is perhaps the best alternative until more baseline data collection and project monitoring studies can be made on various projects. Such a specific data base would then eliminate the necessity for using generalized information. The advantage of such a method is three-fold:

1. it can be used in a semi-quantitative manner which is obviously superior to verbal impact descriptions;
2. findings from different components of the environment (geology, biology, meteorology, sociology, etc.) can be easily summarized and compared, which allows for ready use in an environmental management program [14]; and
3. it does not require (but can be amplified for use of) sophisticated computer analysis techniques, which many other methods must rely upon [6].

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