



FDM 24-1-1 General

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1.1 Originator

The Bureau of Technical Services - Environmental Services Section is the originator of this chapter. Questions and comments on the contents of this chapter should be directed to Jennifer Gibson, Ecologist and Wetland Biologist (920) 492-4160, Jennifer.Gibson@dot.wi.gov or Bob Pearson, Hydrogeologist and Wetland Bank Administrator (608-266-7980), Robert.Pearson@dot.wi.gov.

1.2 Purpose of Chapter

The purpose of this chapter is to assist project teams in developing their projects in compliance with federal and state natural resources laws including water resources, threatened and endangered species, wildlife, and terrestrial systems.

FDM 24-1-5 Ecological Overview

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5.1 Definition and Concepts

Ecology is the study of the relationships of organisms or groups of organisms to their environment. The interaction of organisms with each other and the physical environment form an ecological system or ecosystem. An ecosystem has function and structure.

One of the structural components of an ecosystem is the biotic community. It is an assemblage of living organisms having mutual relationships among themselves and their environment. The species that exert control over and characterize the community are referred to as the dominant species. If they are removed for any reason, dominance is usually assumed by other species and the character of the community is changed. Communities may be named and classified according to major structural features, such as dominant species, or the physical habitat of the community (e.g., mud-flat, stream-rapids). Density refers to the total number of a species that occupies an area. Diversity refers to the total number of species that occupy an area, species richness, and the total number of individuals within a species, species evenness. Of the total number of species in a community, a relatively small percentage are usually represented and abundant. It is the number of infrequent species that determines the species diversity of the community. A community that has many species that are not abundant is more diverse than a community with few species occurring in large numbers.

One structural component of the biotic community is a population. A population which is a group of interbreeding organisms of the same species occupying a defined space. Populations are characterized by density age structure (ratio of one age class to another), birth and death rates, immigration (addition of new individuals from other areas), emigration (loss of individuals to other areas), and migration (temporary gain or loss of individuals).

5.2 Assessment

5.2.1 Analysis of Natural Systems

Natural systems can be analyzed for the purpose of predicting impacts. Analysis involves a thorough description of existing conditions (qualitative and/or quantitative) and identification of community types (based on vegetation and associated wildlife). Quantitative data can be used to help estimate the magnitude of impacts on the ecosystem.

5.2.2 Impact Assessment

Impact assessment involves estimating changes that are expected to occur to an existing situation. The existing conditions are described and compared to expected conditions after a disturbance has occurred. Changes must be looked at in terms of both short-term and long-term effects.

5.2.3 Determination of Significance

Impact assessment also involves estimating the significance of changes to existing conditions. Significance, as

used in the National Environmental Policy Act (NEPA), requires consideration of both context and intensity.¹

Context means the significance of an action must be analyzed from several points of view such as society (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. Impacts may be categorized as to their significance to the immediate locale, the watershed, the state, the region or the nation, but all categories must be addressed. Actions that have nationwide impact will lead to determination of greater significance than those of regional or local impact. Both short and long-term effects are relevant.

Intensity refers to the severity of impact. The following should be considered in evaluating intensity:

1. Impacts that may be both beneficial and adverse. A significant effect may exist even if on balance the effect will be beneficial.
2. The degree to which the proposed action affects public health or safety.
3. Unique characteristics of the geographic area such as proximity to parklands, wetlands, wild and scenic rivers, or ecologically critical or unique areas (e.g. fens, bluff prairies).
4. The degree to which the effects on the quality of the human environment are likely to be highly controversial. (e.g. project affects recreational area, a favored wildlife or fishery area, a favored aesthetic landscape, etc.).
5. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.
6. The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration. (i.e. potential for secondary development).
7. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.
8. The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.
9. The degree to which the action may adversely affect an endangered or threatened species or its habitat.
10. Whether the action threatens a violation of federal, state, or local law or requirements imposed for the protection of the environment.

5.3 Factor Sheet Reference List

Users can find the Factor Sheets under "Forms and tools" on the environmental services webpages site at:

<https://wisconsin.gov/Pages/doing-bus/eng-consultants/cnslt-rsrcs/environment/formsandtools.aspx>

5.4 References

Odum, E.P. 1971. Fundamentals of Ecology. W.G. Sanders Co., Philadelphia, PA.

Smith, R.L. 1980. Ecology and Field Biology. Harper and Row, New York, NY.

¹ "Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act" Council on Environmental Quality, Executive Office of the President, November 29, 1978.