5. A Habitat-Based Impact Assessment Technique

The USFWS (1980) has developed a procedure for documenting predicted impacts to fish and wildlife from proposed land and water resource development projects. The procedure is based on the concepts of habitat potential discussed in 101 ESM 4. The purpose of this concluding chapter is to briefly discuss the procedure and identify its strengths and limitations when used in the impact assessment process.

5.1 The Habitat Evaluation Procedures. The Habitat Evaluation Procedures (HEP) have been developed (USFWS 1980) in response to the need to document the nonmonetary value of fish and wildlife resources. HEP evolved from an assessment method developed in Missouri (Daniels and Lamaire 1974) and is based on the fundamental assumption that habitat quality and quantity can be numerically described. Numerical description permits options and alternatives to be compared when numerical changes are the essence of impact assessment.

HEP is a species-habitat approach to impact assessment, and habitat quality for selected evaluation species is documented with an index, the Habitat Suitability Index (HSI). This value is derived from an evaluation of the ability of key habitat components to supply the life requisites of selected species of fish and wildlife. Evaluation involves using the same key habitat components to compare existing habitat conditions and optimum habitat conditions for the species of interest. Optimum conditions are those associated with the highest potential densities of the species within a defined area. The HSI value obtained from this comparison thus becomes an index to carrying capacity for that species.

The index ranges from 0.0 to 1.0, and for operational purposes in HEP, each increment of change must be identical to any other. For example, a change in HSI from 0.1 to 0.2 must represent the same magnitude of change as a change from 0.2 to 0.3, and so forth. Therefore, HSI must be linearly related to carrying capacity. This is an operational restriction imposed by the use of HSI in HEP. However, it is a restriction easily complied with; if the relationship between HSI and carrying capacity is unknown, it is assumed to be linear. If the relationship is nonlinear, it is converted to a linear function.

HEP attempts to incorporate concepts from both the population and habitat theories by evaluating habitat quality for specific species. Prior to the 1980 edition of HEP, this was done subjectively based on the professional judgement of a team of biologists. The habitat quality values were multiplied by area and aggregated to obtain a "habitat" score. In the 1980 edition of HEP, HSI values are obtained for

individual species through use of documented habitat suitability models employing measurable key habitat variables (e.g., percent canopy closure). The HSI values are multiplied by area of available habitat to obtain Habitat Units (HU's) for individual species. These values are used in the HEP system for comparative purposes. No aggregation of species' HSI (or HU's) occurs.

Many potential users tend to consider the HSI value as synonymous with the entire HEP system. This is not the case. HEP can be compared to a bookkeeping ledger; both passively display, and thereby document, values obtained from other sources. HEP is a data management system; it is the data it manages, i.e., the index of quality and the quantity of available habitat, which are of interest in impact assessment.

5.2 Attributes and limitations of the Habitat Evaluation Procedures. As with other approaches, HEP differs in its ability to meet the previously identified evaluation criteria (101 ESM 3.2) for an impact assessment methodology:

(1) Various forms are used in HEP to display and document HSI, area, and HU's for each evaluation species. Comparisons can be made either between two areas at one point in time, or for one area for several points in time, for any proposed action. However, the ability to document data and ultimately compare alternatives is not unique to the HEP system.

(2) The differences in quality (HSI) and quantity (area) between existing habitat conditions (baseline) and various projected future sets of conditions document project-related impacts to selected evaluation species. HEP currently does not provide guidance for performing future projections. Therefore, projected impacts are no better than the user's ability to predict future conditions.

(3) HEP can be applied at any level of assessment. However, data requirements and costs increase as more species are considered and their respective habitat models become more complex. HSI models not only provide an index value of quality, but also document which habitat variables were considered and their respective values. The level of detail for such "models" must fit the user's objectives for impact assessment.

(4) The identification of differing types and magnitudes of impacts is dependent on the validity and sensitivity of the HSI models used to generate data for HEP. As with other approaches, the results of an impact assessment employing HEP are no better than the reliability of resource data used.

(5) HU's serve not only as the principal units of comparison in HEP, but also as a standard vehicle of communication, integrating both quality and quantity of habitat. Changes in HU's represent potential impacts from proposed actions. Such changes are annualized in order to be comparable with the action agencies' benefit/cost analyses. Applications of annualized HU's include impact assessments, compensation studies, and human use analyses. In such analyses, one HU lost for a species must be directly comparable to one HU gained for that species. The latter association explains the requirement for a linear relationship between HSI and carrying capacity.

(6) HEP is a species-habitat-based assessment methodology. It is applicable only for the species evaluated and does not directly relate that species with other ecosystem components. HEP conceptually addresses only the issues of species populations and habitat, among the four indicators of public interest identified in 101 ESM 2.3. However, the degree to which these indicators are addressed by HEP is dictated by the HSI models. Through improved HSI models, it may be possible to more completely treat the remaining issues of biological integrity and environmental values.

In summary, the HU data developed are the essence of the HEP methodology. The identified changes in habitat quality and quantity provide the basis for biologists to compare alternatives for the evaluation species selected. HEP is a convenient means of documenting and displaying, in standard units, the predicted effects of proposed actions. It is a tool available to resource managers who must make knowledgeable decisions. For further information, the reader should consult the "Habitat Evaluation Procedures" (102 ESM) and "Standards for the Development of Habitat Suitability Index Models for Use with the Habitat Evaluation Procedures" (103 ESM).