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Appendix A. Forms for Use in the Habitat Evaluation Procedures

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TY-1, TY-1 and TY-20, and TY-20 and TY-100. If additional space is required because of a larger number of target years, perform the calculations on an additional page and enter the total of all additional calculations on Line 6E.

- (8) Column 7. Enter the results of the calculations from Block 6.
- (9) Block 8. Sum the numbers in Column 7.
- (10) Block 9. Enter the number of years of the life of the project (see Chapters 4 and 5). This number does not always equal the number of target years. This number must be entered even when evaluating the proposed action "no project".
- (11) Block 10. Divide the number in Block 8 by the number of years in Block 9 and enter the quotient.

1. Study name	2. Study area	3. Proposed action												
4. Evaluation species	5. HSI and area by target year (TY)													
	Baseline(TY0)		TY1		TY		TY		TY		TY		TY	
	HSI	Area	HSI	Area	HSI	Area	HSI	Area	HSI	Area	HSI	Area	HSI	Area
<p style="text-align: right;">where: T<sub>1</sub> = First year of time interval  T<sub>2</sub> = Last year of time interval  A<sub>1</sub> = Habitat area at first target year  A<sub>2</sub> = Habitat area at second target year  H<sub>1</sub> = HSI at the first target year  H<sub>2</sub> = HSI at the second target year</p>														
<p>6. Total number of HU years = <math>(T_2 - T_1) \left[ \left( \frac{A_1 H_1 + A_2 H_2}{3} \right) + \left( \frac{A_2 H_1 + A_1 H_2}{6} \right) \right]</math></p>														
Calculations													7. Habitat Units between target years	
6A.														
6B.														
6C.														
6D.														
6E. Total from additional target years														
Sum of Habitat Units													8.	
9. Life of project					10. Average Annual HU's Block 8 + Block 9									

Form C. Calculation of Average Annual Habitat Units available for an Evaluation Species under a proposed action.

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Appendix A. Forms for Use in the Habitat Evaluation Procedures

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A.6 Form D. Determination of net change in Average Annual Habitat Units of future condition with an action vs. future without the action.

- A. Purpose. This form is used to determine the change in AAHU's attributable to a proposed action. The same length of time must be used for both the with and without proposed action calculations.
- B. Instructions. Complete a Form D for each proposed action being considered.
- (1) Block 1. Enter the study name and the name of the specific study area being evaluated.
  - (2) Block 2. Enter the name of the proposed action being evaluated.
  - (3) Column 3. List vertically the evaluation species being considered. (Collectively these will be the same evaluation species entered in each Form C, Block 4 for the proposed action).
  - (4) Column 4A. For each evaluation species, list AAHU's available with this proposed action. These figures are from the Form C's (Block 10) completed for each evaluation species and the proposed action listed in Block 2.
  - (5) Column 4B. For each evaluation species, list AAHU's available without the proposed action listed in Block 2. For each evaluation species, the number is entered from the Form C (Block 10) with "none" entered in Block 3.
  - (6) Column 5. For each evaluation species, subtract the number in Column 4B from the number in Column 4A and enter the result. This number represents the change in AAHU's, for an evaluation species, attributable to the proposed action.
  - (7) Block 6. Sum the values in Column 5 for each evaluation species. This represents the total change in AAHU's, for all evaluation species, attributable to the proposed action.



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Appendix A. Forms for Use in the Habitat Evaluation Procedures

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A.7 General instructions for Forms E, F, G-1, G-2. Calculation of Relative Value Indices (RVI) and their application to the Habitat Unit changes attributable to a proposed action.

- A. Purpose. The purpose of these forms is to facilitate the consideration of factors not considered in determining HU's for the evaluation species in a HEP analysis. These factors can include various environmental, social, and economic criteria believed to be important to a future land or water use decision. Identified criteria are weighted according to their importance when compared to the other criteria. Each evaluation species is then ranked according to each criterion. The result of this process is a Relative Value Index (RVI) which is simply an index for quantifying importance of each evaluation species relative to the other evaluation species. This index is applied as a weighting factor to the Habitat Units of the evaluation species to yield a "relative Habitat Unit" figure. The relative HU figures are used to compare alternative study areas and proposed actions.
- B. Instructions. Specific instructions are available with each of the forms in this package. One Form E and one Form F generally will be required for each HEP application when RVI computations are desired, a Form G-1 will be required for each proposed action, and a Form G-2 will be required for each study area. Forms E, F, G-1, and G-2 should not be completed if the evaluation team decides that all evaluation species should be considered equally important in the HEP analysis. In that case, the numbers from Form D, Column 5, are used without modification.

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Appendix A. Forms for Use in the Habitat Evaluation Procedures

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A.8 Form E. Pairwise comparison matrix for determining relative weights for each ranking criterion.

- A. Purpose. The form is used to determine the relative weights of the criteria that will be used to modify HU's for different evaluation species. Weights are established through a pairwise comparison which compares each criterion to every other criterion. In each comparison, a decision is made about which criterion of any pair is the more important. The more important of the pair is assigned a value between 0.5 and 1.0. The values for both criteria in a comparison must total 1.0 (Chapter 6). A dummy criterion is included in the pairwise comparison analysis to ensure that all real criteria will have some weighting value. The dummy criterion is always assigned a zero relative weight in Column 6.
- B. Instructions. Only one Form E is required for a study. Each ranking criterion must be compared to every other criterion. If more than six criteria are used, an expanded form must be prepared with additional rows and columns for the additional criteria.

- (1) Block 1. Enter the study name.
- (2) Column 2. List the ranking criteria to be used. These criteria are selected according to the guidelines presented in Chapter 6. A dummy criterion has already been included in the form to assure that each real criterion will receive some value.
- (3) Block 3. The matrix formed by Column 2 and Block 3 has rows and columns corresponding to each criterion. There is one row and one column for each criterion. Each matrix cell can be identified by a row and column descriptor. For example, matrix cell (2,3) is in Row 2 and Column 3, and corresponds to ranking criteria (2) and (3). There are two cells common to each pair of criteria. For example, the cell formed by (3) and (2) also corresponds to the cell formed by criteria (2) and (3); the sum of the entries in these common cells must total 1.0.

Compare the criterion in each row to all columns to the right of the cells with the X's.

Assign the criterion in the row a value of 0.5 if it is equally important to the criterion in the column, a 0.0 to 0.5 if it is less important, and a 0.5 to 1.0 if it is more important. For example, if criterion (1) is of equal importance to criterion (2), then enter 0.5 in matrix cell (1,2).

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Appendix A. Forms for Use in the Habitat Evaluation Procedures

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Then locate the other common cell (this cell will always be to the left of the cells with X's) and enter the difference between the first value and 1.0. For the example,  $1.0 - 0.5$  or  $0.5$  would be entered in cell (2,1).

- (4) Column 4. Horizontally sum the row values of Block 3, including the dummy value, and enter in the appropriate space.
- (5) Block 5. Total all Column 4 entries and enter the result in Block 5.
- (6) Column 6. Divide each number in Column 4 by the total in Block 5 and enter the result in Column 6. This number represents the relative weight of a specific criterion to the other criteria.
- (7) Block 7. Total the relative weights vertically and enter in Block 7. The total should equal 1, but may be slightly less than or greater than 1 due to rounding error. This step is provided as a check to ensure that the relative weights are calculated correctly (See Chapter 6 for discussion).

1. Study									
2. Ranking criteria	3. Ranking criteria							4. Sum	6. Relative weight
	(1)	(2)	(3)	(4)	(5)	(6)	Dummy		
(1)	XXXXX						1.0		
(2)		XXXXX					1.0		
(3)			XXXXX				1.0		
(4)				XXXXX			1.0		
(5)					XXXXX		1.0		
(6)						XXXXX	1.0		
Dummy criterion	0	0	0	0	0	0	XXXXX	0.0	0.00
								5. Total	7. Total weight

Form E. Pairwise comparison matrix for determining relative weights for each ranking criterion.

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Appendix A. Forms for Use in the Habitat Evaluation Procedures

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A.9 Form F. Determination of Relative Value Indices for each evaluation species.

- A. Purpose. The purpose of this form is to develop a Relative Value Index (RVI) for each evaluation species. The RVI values are determined by combining the relative weights for ranking criteria (Form E, Column 6) with relative importance of each ranking criterion to each evaluation species.
- B. Instructions. Enough Form F's must be completed so that an RVI is calculated for each evaluation species. If there are more than six ranking criteria (Form E), a new Form F must be developed with enough additional columns for each ranking criteria.
- (1) Block 1. Enter the study name.
  - (2) Column 2. List vertically the evaluation species being ranked above each dashed line.
  - (3) Block 3. List horizontally, under the appropriate number, the relative weight (Form E, Column 6) of the ranking criteria listed on Form E, Column 2.
  - (4) Column 4. On a scale of 0.1 to 1, rank each evaluation species on how well it meets each ranking criterion and enter that rank in the appropriate column above the dashed line. For information on what to consider in this ranking, and how a number is applied, see Chapter 6. For each evaluation species and each ranking criterion, multiply the relative weight of the ranking criterion (Block 3) by the number above the dashed line in Column 4 and enter the product below the dashed line.
  - (5) Column 5. Sum horizontally the products for each evaluation species and enter the total in the appropriate space in Column 5.
  - (6) Column 6. For each evaluation species, divide the number in Column 5 by the highest number that appears in Column 5 for any evaluation species and enter the quotient in the space provided.

Appendix A. Forms for Use in the Habitat Evaluation Procedures

1. Study

2. Evaluation species	3. Relative weight of ranking criteria						5. Relative value	6. Relative Value Index
	1	2	3	4	5	6		
	4. Relative importance of each ranking criterion to each evaluation species.							
Product								
Product								
Product								
Product								
Product								
Product								
Product								
Product								
Product								
Product								
Product								

Form F. Determination of Relative Value Indices for each Evaluation Species.

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Appendix A. Forms for Use in the Habitat Evaluation Procedures

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A.10 Form G-1. Calculation of total change in relative Average Annual Habitat Units due to a proposed action.

A. Purpose. This form provides a format for using the change in AAHU's (Form D, Column 5) and RVI's (Form F, Column 6) to calculate a single measure of impact for a proposed action (change in relative AAHU's).

B. Instructions.

- (1) Block 1. Enter the study name and the study area being evaluated.
- (2) Block 2. Enter the name of the proposed action being evaluated, corresponding to that entered in Block 2, Form D.
- (3) Column 3. List vertically the evaluation species utilized in the analysis. Use additional forms if necessary.
- (4) Column 4. Enter the change in AAHU's from Form D, Column 5, in the appropriate space for each evaluation species.
- (5) Column 5. List the RVI from Form F, Column 6, for each evaluation species.
- (6) Column 6. Multiply the change in AAHU's (Column 4) by the RVI (Column 5) for each evaluation species and enter the product in the appropriate space in Column 6.
- (7) Block 7. Sum the change in relative AAHU's (Column 6) and enter the total in Block 7. If more than one Form G-1 was used, complete Block 7 for the last Form G-1 only, summing Column 6 data from all Form G-1's. This single figure is a measure of how the total impacts of the proposed action listed in Block 2 are believed to be perceived by the public or decisionmakers.



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Appendix A. Forms for Use in the Habitat Evaluation Procedures

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A.11 Form G-2. Calculation of total relative Habitat Units.

- A. Purpose. This form combines estimates of HU's in a study area (Form B, Column 7), for different evaluation species at baseline conditions, with a subjective estimate of the importance of individual evaluation species to the decisionmaking process. The result is a single number (total relative Habitat Units) which describes how "valuable" the study area is perceived to be. If all evaluation species are believed to be equally important in the decisionmaking process, Form G-2 is not used. A different Form G-2 must be completed for each study area.
- B. Instructions.
- (1) Block 1. Enter the name of the study and study area being evaluated.
  - (2) Column 2. List the evaluation species for which Form B's were completed for each study area. Use additional forms if necessary.
  - (3) Column 3. Enter the number of HU's in the study area (Form B, Column 7) for each evaluation species. The only target year used is baseline.
  - (4) Column 4. Enter the RVI calculated for each evaluation species (from Form F, Column 6).
  - (5) Column 5. For each evaluation species, multiply the number in Column 3 by the number in Column 4 and enter the product.
  - (6) Block 6. Total all Column 5 entries from all Form G-2's used for this proposed action and enter the result in Block 6 of the last form used.



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Appendix A. Forms for Use in the Habitat Evaluation Procedures

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A.12 Form H. Calculation of compensation area requirements for a proposed action with a proposed management plan.

- A. Purpose. This form is used to calculate the compensation requirements for a proposed action using a selected management plan. An analysis of future without management conditions on the study area is required. The result of treating the management plan as a proposed action is that one can determine, for each evaluation species, the change in AAHU's (Form D, Column 5) or the change in relative AAHU's (Form G-1, Block 6), attributable to the management of the area. The size of a management area needed to compensate for impacts due to a proposed action is then calculated by use of the formula appropriate to the selected compensation goal (Chapter 7).
- B. Instructions. Complete a Form H for each combination of proposed actions and management plans that need to be evaluated.
- (1) Block 1. Enter the study name and the name of the study area being evaluated.
  - (2) Block 2. Enter the name of the proposed action for which compensation is desired.
  - (3) Block 3. Enter the name of the proposed management plan.
  - (4) Block 4. Enter the size of the area covered by the proposed management plan listed in Block 3.
  - (5) Column 5. List the evaluation species which will be used to determine compensation requirement. Use additional forms as needed. If Goal 1 (Chapter 7) is the compensation goal, only list those evaluation species with a loss in total or relative AAHU's due to the proposed action.
  - (6) Column 6. Enter the appropriate change in relative AAHU's for each evaluation species (from Form G-1, Block 6) if Form G-1 was used to evaluate the proposed action; or  
  
Enter the appropriate change in AAHU's for each evaluation species (from Form D, Column 5) if Form G-1 was not used to evaluate the proposed action.
  - (7) Column 7. Enter the corresponding information for the management scheme that was entered in Column 6 for the proposed action.
  - (8) Column 8. Enter the square of the number entered in Column 7.

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 Appendix A. Forms for Use in the Habitat Evaluation Procedures
 

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- (9) Column 9. For each evaluation species, divide the number in Column 6 (which may be a negative number) by the number in Column 7 and enter the absolute value (i.e., ignore the minus sign) of the result.
- (10) Column 10. For each evaluation species, multiply the number in Column 6 by the number in Column 7 and enter the result.
- (11) Column 11. For each evaluation species with a negative number in Column 6, multiply the number in Column 9 by the number in Block 4 and enter the result. This number (compensation need) is the size of an area, with the same habitat characteristics as the management area evaluated, that would have to be managed to compensate for losses of the evaluation species' habitat due to the proposed action. For each evaluation species with a positive number in Column 6, enter a 0.

Blocks 12 through 17 are completed using data for all evaluation species. If more than one form is needed to list all evaluation species, Blocks 12 through 17 are only completed on the last form, using data from all appropriate forms.

- (12) Block 12. Enter the sum of all Column 6 entries.
- (13) Block 13. Enter the sum of all Column 7 entries.
- (14) Block 14. Divide the number in Block 12 by the number in Block 13 and enter the result.
- (15) Block 15. Enter the sum of all Column 8 entries.
- (16) Block 16. Enter the sum of all Column 10 entries.
- (17) Block 17. The method used to complete this block depends on the compensation goal. These goals are explained in detail in Chapter 7:

Goal 1. In-kind (no trade-off). The number in Block 17 is determined by the following formula: Compensation requirement equals

$$(\text{Number in Block 4}) \times \frac{-\text{Number in Block 16}}{\text{Number in Block 15}}$$

Goals 2 & 3. Equal replacement (equal trade-off) and relative replacement (relative trade-off). The number in Block 17 is determined by the following formula: Compensation requirement equals (Number in Block 4) x (-Number in Block 14).

Appendix A. Forms for Use in the Habitat Evaluation Procedures

1. Study		2. Proposed action to be compensated				
3. Proposed management plan			4. Size of management area			
5. Evaluation species	6. Change in (total or relative) Average Annual Habitat Units due to proposed action	7. Change in (total or relative) Average Annual Habitat Units due to management plan	8. Column 7 squared	9. Ratio of Column 6 to Column 7	10. Column 6 times Column 7	11. Evaluation species compensation need (Block 4 x Column 9)
12. Total		13. Total	15. Total	16. Total		17. Compensation requirement
14. Ratio of 12 to 13						

Form H. Calculation of compensation area requirements for a proposed action with a proposed management plan.