

Appendix F-2

Bald Eagle Habitat Assessment Method Summary

This document summarizes the steps taken by the Northwest Habitat Institute (NHI) to produce Bald Eagle Habitat Condition Indexes (HCIs) for each 6th Order HUC in the Columbia River Basin. These procedures were applied for the current, normative, and three alternative conditions. Streamnet's 6th Order HUC ArcInfo polygon coverage was updated with several items to produce the initial COVER, FOOD, and HCI variables for the Bald Eagle Habitat Assessment Method. The first section describes the analysis methods including equations and weights used to derive the variables. The Arc Macro Language (AML) program written to calculate the variables can easily be modified and re-executed if the equations or weights need to be adjusted. The second section details the individual items found in the resulting coverages. Appendix A lists the 32 habitat codes and class names, and Appendix B contains NHI's Interactive Biodiversity Information System (IBIS) habitat association data for the Bald Eagle.

Analysis

Preparation

A major portion of the Habitat Assessment Method depends on knowing the habitat composition of each 6th Order HUC. These measurements were calculated using the NHI Current and Normative Wildlife-Habitat Types grids and Streamnet's 6th Order HUC coverage. Due to its large area extent and high 25m resolution, the Current habitat grid could not be converted to vector coverages without significant generalization of the data. Therefore, the HUC coverage was converted to a grid and an AML was written to perform a Grid analysis of the HUC and habitat data sets. This AML calculated the percentage of each habitat type in each HUC and wrote these results into the original HUC coverage as items H1PCNT - H32PCNT where 1 - 32 equals the 32 habitat type codes(see Appendix A). The remainder of the analysis was completed in ArcInfo using the updated HUC coverages. The three alternative scenarios were run using habitat data modeled by Battelle, and Salmon carcass data was provided by Mobrand Biometrics.

Habitat Assessment Method

The Habitat Assessment Method consists of two major sections. The first is a preliminary screening of all HUCS. During this screening, HUCS are either included in or excluded from further analysis based on specific criteria. The second section calculates the Habitat Condition Index (HCI) for those HUCS that pass the preliminary screening

Preliminary Screening

The preliminary screening determines, for each 6th order HUC, if 40% or greater of the HUC is in the Bald Eagle's range. The Bald Eagle's range is established as any habitat type listed as 'Generally Associated' or 'Closely Associated' with the Bald Eagle in the NHI Interactive Biodiversity Information System (IBIS) database (see Appendix B). Item RANGE_PCNT sums the percentages of all these-associated habitats per HUC. If RANGE_PCNT >= 40% for a HUC, item RANGE_KEEP is assigned a value of 1 for that HUC, otherwise its assigned 0.

Item PRELM_KEEP is added to summarize the results of the preliminary screening. If RANGE_KEEP, equals 1, then PRELM_KEEP is assigned a value of 1, otherwise its assigned a 0. The remainder of the analysis is only performed on HUICS where PRELM_KEEP equals 1.

Habitat Condition Index

The Habitat Condition Index consists of three main calculations: Cover, Food, and the HCI itself. This section describes each of these calculations.

Cover (C) is calculated by first calculating N, weighted percent NHI IBIS occurrence index. N is calculated by adding together items FCASS_WT, BGASS_WT, FGASS_WT and RGASS_WT. FCASS_WT equals the sum of the percentage of all 'Feeds' and 'Closely Associated' habitats (based on IBIS) multiplied by the weight of 1.0. BGASS_WT equals the sum of the percentage of all 'Reproduces and Feeds' and 'Generally Associated' habitats (based on IBIS) multiplied by the weight of 0.75. FGASS_WT equals the sum of the percentage of all 'Feeds' and 'Generally Associated' habitats (based on IBIS) multiplied by the weight of 0.5. RGASS_WT equals the sum of the percentage of all 'Reproduces' and 'Generally Associated' habitats (based on IBIS) multiplied by the weight of 0.25.

Next, WR, the water-riparian factor is calculated. The water-riparian factor is a weight assigned depending on the presence/absence of open water(W) and riparian(R) habitat types. For each HUC, if any amount of Open Water, Bays and Estuaries, Inland Marine Deeper Waters, or Marine Nearshore habitats are present, item W is calculated as 1, otherwise a 0. If Westside or Interior Riparian - Wetlands are present, item R is tagged with a 1, otherwise a 0. WR is then calculated for each HUC as a 1 if both W and R equalled 1, as a 0.5 if W or R is present but not both, and as 0 if both W and R equal 0.

Cover (C) is then calculated as $(N * WR)^{1/2}$.

Food (F) equals $(FEED + S) / 2$. FEED is the weighted percent of feeding habitat based on IBIS data. All of the 'Feeds' and 'Reproduces and Feeds' habitats associated with Bald Eagle in IBIS are given a weight of 1.0. So the percentages of each of these habitat types are summed and multiplied by 1.0 to produce FEED. . Item S represents the presence of carcasses in a HUC based on the anadromous fish data (CARCASS) provided by Mobrاند Biometrics. Any HUC with a CARCASS value of 0 is assigned an S value of 0, a CARCASS value of 15 is assigned an S value of 0.1, and a CARCASS value of 900 is assigned an S value of 1.0.

The Habitat Condition Index (HCI) is calculated using the previously derived variables and the following equation:

$$HCI = (C + F) / 2.$$

Data Description

This section contains projection information and item definitions for the final SAM Bald Eagle ArcInfo coverages.

Projection info of ArcInfo coverage:

Description of DOUBLE precision coverage eaglcrr

FEATURE CLASSES

Feature Class	Subclass	Number of Features	Attribute data (bytes)	Index?	Spatial Topology?
ARCS		21779	32		
POLYGONS		7063	616		Yes
NODES		14720			

SECONDARY FEATURES

Tics	1194
Arc Segments	494875
Polygon Labels	7062

TOLERANCES

Fuzzy = 1.000 V Dangle = 1.000 V

COVERAGE BOUNDARY

Xmin =	1232814.903	Xmax =	4918643.000
Ymin =	47913.910	Ymax =	2937186.250

STATUS

The coverage has not been Edited since the last BUILD or CLEAN.

COORDINATE SYSTEM DESCRIPTION

Projection	LAMBERT	Spheroid	CLARKE1866
Units	FEET		
Parameters:			
1st standard parallel		42 20	0.000
2nd standard parallel		48 40	0.000
central meridian		-117 0	0.00
latitude of projection's origin		41 0	0.000
false easting (meters)		914401.82880	
false northing (meters)		0.00000	

ArcInfo coverage pat items:

ITEM NAME	DESCRIPTION
AREA	Area of polygon in square feet.
PERIMETER	Perimeter of polygon in feet.
EAGL????#	Internal ID number.
EAGL????-ID	User ID number.
SIXHUC	Sixth Order HUC ID number.
ECOPROV	Ecoprovince Name.
CARCASS	Carcass counts modeled by Greg Blair, Mobrاند Biometrics.
H1PCNT	Percentage of Habitat-1 in Sixth Order HUC.
H2PCNT	Percentage of Habitat-2 in Sixth Order HUC.
H3PCNT	Percentage of Habitat-3 in Sixth Order HUC.
H4PCNT	Percentage of Habitat-4 in Sixth Order HUC.
H5PCNT	Percentage of Habitat-5 in Sixth Order HUC.
H6PCNT	Percentage of Habitat-6 in Sixth Order HUC.
H7PCNT	Percentage of Habitat-7 in Sixth Order HUC.
H8PCNT	Percentage of Habitat-8 in Sixth Order HUC.
H9PCNT	Percentage of Habitat-9 in Sixth Order HUC.
H10PCNT	Percentage of Habitat-10 in Sixth Order HUC.
H11PCNT	Percentage of Habitat-11 in Sixth Order HUC.
H12PCNT	Percentage of Habitat-12 in Sixth Order HUC.
H13PCNT	Percentage of Habitat-13 in Sixth Order HUC.
H14PCNT	Percentage of Habitat-14 in Sixth Order HUC.
H15PCNT	Percentage of Habitat-15 in Sixth Order HUC.
H16PCNT	Percentage of Habitat-16 in Sixth Order HUC.
H17PCNT	Percentage of Habitat-17 in Sixth Order HUC.
H18PCNT	Percentage of Habitat-18 in Sixth Order HUC.
H19PCNT	Percentage of Habitat-19 in Sixth Order HUC.
H20PCNT	Percentage of Habitat-20 in Sixth Order HUC.
H21PCNT	Percentage of Habitat-21 in Sixth Order HUC.
H22PCNT	Percentage of Habitat-22 in Sixth Order HUC.
H23PCNT	Percentage of Habitat-23 in Sixth Order HUC.
H24PCNT	Percentage of Habitat-24 in Sixth Order HUC.
H25PCNT	Percentage of Habitat-25 in Sixth Order HUC.
H26PCNT	Percentage of Habitat-26 in Sixth Order HUC.
H27PCNT	Percentage of Habitat-27 in Sixth Order HUC.
H28PCNT	Percentage of Habitat-28 in Sixth Order HUC.
H29PCNT	Percentage of Habitat-29 in Sixth Order HUC.
H30PCNT	Percentage of Habitat-30 in Sixth Order HUC.
H31PCNT	Percentage of Habitat-31 in Sixth Order HUC.
H32PCNT	Percentage of Habitat-32 in Sixth Order HUC.
RANGE_PCNT	Percent of Bald Eagle associated habitat in HUC.
RANGE_KEEP	Binary tag to keep HUC based on associated habitats.
PRELM_KEEP	Binary tag to keep HUC based on preliminary analysis.
FCASS_WT	Weighted Feeds / Closely Associated habitats
BGASS_WT	Weighted Reproduces and Feeds / Generally Associated habitats
FGASS_WT	Weighted Feeds / Generally Associated habitats
RGASS_WT	Weighted Reproduces / Generally Associated habitats
N	Weighted percent NHI IBIS Occurrence index.
W	Binary tag for HUCs with open water habitats.
R	Binary tag for HUCs with riparian habitats
WR	Water-Riparian factor for HUC.
C	Cover variable in Habitat Assessment Method.
FEED	SAM Fe variable; weighted percent of IBIS feeding habitat.

S	SAM S variable; Weighted presence of salmon carcasses.
F	SAM F variable; food.
HCI	SAM HCI variable; Habitat Condition Index.
HCI_SHADE	HCI % used for display in ArcPlot.
C_SHADE	C % used for display in ArcPlot.
F_SHADE	F % used for display in ArcPlot.

Appendix A

Wildlife-Habitat Type Codes and Names

- 1 Mesic Lowlands Conifer-Hardwood
- 2 Westside Oak and Dry Douglas-fir
- 3 Southwest Oregon Mixed Conifer-Hardwood
- 4 Montane Mixed Conifer
- 5 Interior Mixed Conifer
- 6 Lodgepole Pine Dominant
- 7 Ponderosa Pine Dominant
- 8 Upland Aspen
- 9 Subalpine Parkland
- 10 Alpine Grasslands and Shrublands
- 11 Westside Grasslands
- 12 Ceanothus-Manzanita Shrublands
- 13 Western Juniper
- 14 Canyon Shrublands
- 15 Interior Grasslands
- 16 Shrub-steppe
- 17 Dwarf shrub-steppe
- 18 Desert Playa and Salt Scrub
- 19 Agriculture, Pastures, and Mixed Environs
- 20 Urban and Mixed Environs
- 21 Open Water
- 22 Herbaceous Wetlands
- 23 Westside Riparian - Wetlands
- 24 Montane Coniferous Wetlands
- 25 Interior Riparian - Wetlands
- 26 Coastal Dunes and Beaches
- 27 Coastal Headlands and Islets
- 28 Bays and Estuaries
- 29 Inland Marine Deeper Waters
- 30 Marine Nearshore
- 31 Marine Shelf
- 32 Oceanic

Appendix B

IBIS Habitat Association data for Bald Eagle

Species	Habitat	Habitat Activity	Habitat Association	Confidence
Bald Eagle	1	Reproduces	Generally Associated	3
Bald Eagle	2	Reproduces	Generally Associated	3
Bald Eagle	3	Reproduces	Generally Associated	3
Bald Eagle	4	Reproduces	Generally Associated	3
Bald Eagle	5	Reproduces	Generally Associated	3
Bald Eagle	6	Reproduces	Generally Associated	3
Bald Eagle	7	Reproduces	Generally Associated	3
Bald Eagle	11	Feeds	Present	1
Bald Eagle	16	Reproduces	Present	3
Bald Eagle	17	Reproduces	Present	3
Bald Eagle	18	Feeds	Present	3
Bald Eagle	19	Feeds	Generally Associated	3
Bald Eagle	20	Reproduces and Feeds	Generally Associated	3
Bald Eagle	21	Feeds	Closely Associated	3
Bald Eagle	22	Feeds	Generally Associated	3
Bald Eagle	23	Reproduces and Feeds	Generally Associated	3
Bald Eagle	25	Reproduces and Feeds	Generally Associated	2
Bald Eagle	26	Feeds	Present	3
Bald Eagle	27	Reproduces and Feeds	Generally Associated	3
Bald Eagle	28	Reproduces and Feeds	Generally Associated	3
Bald Eagle	29	Feeds	Generally Associated	3
Bald Eagle	30	Feeds	Generally Associated	3
Bald Eagle	31	Feeds	Present	2