Habitat Evaluation Procedures (HEP) Report

Weig Property Pend Oreille National Wildlife Refuge

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Weir Property Habitat Evaluation

Project Report

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Habitat Evaluation of Weir Property

A habitat evaluation of the Weir property, an approximately 200-acre inholding of private property within the Little Pend Oreille National Wildlife Refuge (Refuge), was conducted using the Habitat Evaluation Procedures (HEP) methodology. The Weir property consists of two separate parcels, an upper unit of 40 acres and a 160-acre lower unit. Evaluation species were ruffed grouse and white-tailed deer. Life requisites evaluated were available browse for white-tailed deer and winter food and fall-to-spring cover for ruffed grouse. Field data were collected on October 16, 17, and 21, 1997.

Approximately 37 acres of the lower 160-acre unit are currently grasslands with no shrub or tree cover, and therefore do not provide suitable ruffed grouse or white-tailed deer cover. We excluded this acreage from the HEP calculations for current conditions. This acreage was included in the HEP calculations for ruffed grouse after future management strategies were factored in. It was not included in projections for white-tailed deer.

The entire property was stratified into 6 stands (2 in the upper unit and 4 in the lower unit) for data collection. Data were collected at 10 points, spaced 20 paces (approximately 16 m) apart along one randomly selected transect in each stand, for a total of six transects. A circular quadrat (.004 ha) was used at each sampling point. Within this quadrat we counted all deciduous, coniferous, and shrub stems ≥ 0.9 m in height and made an ocular estimate of shrub (< 1.5 m in height) canopy cover. We measured the height of the closest (to the center of the quadrat) three deciduous trees, conifer trees, deciduous shrubs, and lowest conifer branch. We estimated the distance to 20 aspen trees at three points along each transect.

For ruffed grouse, a Habitat Suitability Index (HSI) was calculated for each stand for each variable. Therefore, two HSIs were calculated for each stand, one for winter food and one for fall-to-spring cover. Weighted HSI scores were calculated by taking the lower of the two HSIs for each stand and multiplying by the stand acreage. The overall HSI is equal to the sum of the weighted HSI scores divided by the total area of all cover types. For white-tailed deer the mean canopy cover was calculated for the entire property and used to determine the overall HSI.

Results

Ruffed Grouse Fall-To-Spring Cover

Field summary data and HEP calculations for ruffed grouse fall-to-spring cover are shown in Table 1. Table elements are described as follows:

Stand - Stratified sampling unit as explained above. Stands 1-4 are in the lower 160-acre unit. Stands 5 and 6 are in the 40-acre upper unit.

Density of deciduous trees - Number of deciduous woody stems/ha ≥ 0.9 m in height, growing with a single, erect stem from the ground. Densities of 4,900 to 14,800 deciduous trees/ha are considered to provide optimum vertical cover. This is the standard by which conifers and deciduous shrubs are measured for suitability as vertical cover as explained below under equivalent stem densities for conifers and deciduous shrubs.

Density of conifer trees - Number of coniferous woody stems/ha ≥ 0.9 m in height, growing with a single, erect stem from the ground.

Density of deciduous shrub stems - Number of deciduous shrub stems/ha ≥ 0.9 m in height, growing with multiple, clumped erect stems emanating from a common base at the ground.

Equivalent stem density of conifer trees - The growth form of conifers is that of a woody plant with a dense, wide crown. In the model it is assumed that one typical conifer with a low crown height (height to lowest live branch) between 0.0 and 0.9 m above ground provides the same amount of vertical cover (i.e. physical obstruction) as four deciduous trees. As the low crown height of conifers increases from 0.9 to 4.6 m, the equivalent cover decreases from four times the cover provided by one deciduous tree to a value equal to the cover provided by one deciduous tree. Above 4.6 m lowest branch height, vertical cover will be provided only by the trunk of the conifer and not the branches. For example, in Stand 1, the mean lowest branch height is 5.2 m, therefore the density of 400 conifers/ha (listed in column 3) remains the same for equivalent stem density, i.e. 400 conifers/ha. Whereas, in Stand 5, the mean lowest branch height is 1.9 m, making the equivalent density of conifers approximately 3.4 times that of deciduous trees or 6,205 conifers/ha.

Equivalent stem density of shrubs - The typical growth form of deciduous shrubs is that of a woody plant with multiple, clumped, narrow stems. The model assumes that on average, four typical deciduous shrubs ≥ 0.9 m in height will occupy the same space and provide equal density of vertical cover as one deciduous trees. Therefore, equivalent stem density of shrubs is equal to the density listed in column 4 multiplied by 0.25.

Mean height lowest conifer branch - Height in meters from ground to the lowest conifer branch. This data is used to determine equivalent stem density of conifers as explained above under equivalent stem density of conifer trees.

Mean height deciduous trees - Height in meters of deciduous trees as defined under density of deciduous trees above.

Mean height of conifer trees - Height in meters of conifer trees as defined under density of conifer trees above.

Mean height of deciduous shrubs - Height in meters of deciduous shrubs as defined under density of deciduous shrubs above.

Total Equivalent Stem density - Sum of stem density for deciduous trees (column 2) and equivalent stem densities for conifer trees (column 5) and deciduous shrubs (column 6).

SIV3 - Suitability index of total equivalent stem density - Total equivalent stem densities of 4,900 to 14,800/ha are considered to be optimum, while densities of less than or equal to 4,400 stems/ha are considered to be too sparse to provide vertical cover. Total equivalent stem density (listed in column 11) in both Stands 3 and 5 is within the 4,900 to 14,800 range, resulting in optimum vertical cover (SIV3=1.0). However, in Stands 1, 2, 4, and 6, total stem densities are less than 4,400, therefore, the suitability of total equivalent stem density (SIV3) for these stands is 0.0.

Weighted SIV4 - Suitability index of weighted height of tallest 4,900 equivalent stems - Suitability of vertical cover is assumed to be optimum if there are a minimum of 4,900 equivalent stems/ha at optimal heights (i.e., ≥ 4.6 m). Suitability decreases when woody stems are < 4.6 m in height, and woody stems ≤ 1.5 m do not provide suitable overhead cover. This variable takes into account this relationship between stem density and tree height. Scoring high in this category are Stand 3, (Weighted SIV4=0.7) and Stand 5 (Weighted SIV4=1.0). Each of these stands had relatively high total stem densities with a relatively large proportion of those stems having heights of ≥ 4.6 m. Stands 1 and 4 had low SIV4 values of 0.09 and 0.19, respectively, based on lower stem densities and the fact that the majority of the stems were < 1.5 m.

SIV5 - Suitability index for conifer penalty - According to the model, maximum densities and survival of ruffed grouse are lower in forests where conifers are the predominant trees. Tall conifers provide concealment for raptors which prey upon ruffed grouse, and conifers with low branches provide concealment for mammalian predators. Therefore, this suitability index generally decreases as the percentage of conifers increases. On the Weir property, conifers are the predominant tree, causing this index to be low for all stands.

HSI - Habitat Suitability Index (HSI) for fall-to-spring cover (FSCOV) calculated as follows -

$$\text{FSCOV} = \text{SIV3} \times \text{Weighted SIV4} \times \text{SIV5}$$

HSIs for all stands ranged from 0.0 to 0.25.

Acres - Approximate number of acres in each stand.

HUs - Number of Habitat Units (HU) calculated by multiplying the number of acres in each stand by its HSI. HUs for all stands ranged from 0.0 to 6.3.

Ruffed Grouse Winter Food

Data from the winter food portion of the evaluation are presented in Table 2. One assumption of the model is that winter food for ruffed grouse is provided almost exclusively by aspen trees. The model measures proximity of aspen clumps (at least 20 trees) to fall-to-spring cover. Those clumps within 91 m are considered optimal (HSI=1.0). Suitability of winter food is assumed to decrease as this distance increases from 91 to 183 m. If the distance to 20 aspens is beyond 183 m, it is assumed that other trees and shrubs will provide winter food but at a lower level of suitability (HSI=0.2). Stands 1-3 exhibited optimum or near optimum conditions for winter food, having aspen trees in close proximity, while stands 4-6 did not have aspens in close proximity, as indicated by their low suitability indices of 0.2.

Overall Evaluation for Ruffed Grouse

The model takes into account the relationship between fall-to-spring cover and proximity to winter food to calculate overall HSIs. The HSI for each stand is the lowest of the two variables as shown in Table 3. Therefore, final stand HSIs are low, ranging from 0 to 0.2, in spite of the fact that several stands scored high for winter food. Total HUs for the Weir property are 11.4.

Ruffed grouse fall-to-spring habitat components appear to be limiting on the Weir property. According to the model, relatively high densities of deciduous trees and shrubs are important components of vertical cover for ruffed grouse. The Weir property exhibits low density of deciduous trees and shrubs. Conifers are the predominant tree, which do provide some cover, but are less important than the deciduous component. Even with the relatively high density of conifers, however, total equivalent stem density for the entire property is 3,792 stems/ha, which is well below the optimum of 4,900-14,800 stems/ha. Only two stands had sufficient total stem densities. The overall HSI for the Weir property would be 0.0 if the average stem density of 3,792 stems/ha was used in the calculations rather than the weighted HSIs. In addition deciduous shrub heights on the property average less than 1.5 m and, therefore, do not provide suitable overhead cover. Though the property appears to have low value for ruffed grouse in its current condition, management to encourage more deciduous trees and shrubs could be undertaken to increase the number of HUs.

White-tailed Deer

Field data collection and HEP calculations for the white-tailed deer habitat evaluation are based on the suitability of available browse for winter habitat. The model looks at percent canopy of deciduous shrubs < 1.5 m in height. Suitability increases as shrub canopy increases with

optimum conditions occurring at approximately 40% and above. For the Weir property, percent canopy coverage of shrubs < 1.5 m is 22.75%, resulting in an HSI of 0.58 and 94.5 HUs (Table 4). As in the case of ruffed grouse, shrub cover could likely be enhanced through management.

Habitat Management Strategies and Habitat Unit Projections

Management strategies include planting aspen in the 37-acre grassland area and harvesting 75 percent of the conifers in the remaining 163 acres to open the canopy and stimulate natural growth of shrubs and deciduous trees. Changes in habitat and habitat units were projected 15 years into the future to coincide with the time frame of the Refuge Comprehensive Conservation Plan currently being drafted.

In order to project habitat changes during the next 15 years, a number of assumptions had to be made. We assumed an increase in shrub density of 1600 stems/ha based on past growth rates. Shrub canopy cover is assumed to increase to 75%. A 125% increase in deciduous tree density was assumed based on aspen planting and natural regeneration. Deciduous tree heights increased to ≥ 4.6 m. Shrub height increased by 125 %. Conifer stem density was reduced by 75% through harvest. The other conifer variables did not change.

Ruffed Grouse

By planting aspen and stimulating shrub growth, HSI values for fall-to-spring cover and winter food would increase. Habitat units on the Weir property for ruffed grouse are projected to increase fourfold during the next 15 years from 11.4 to 44 as indicated in Table 5. This increase comes from only stands 1 and 3. If we were to project beyond 15 years HSI values would continue to increase and stands 2, 4, 5 and 6 would begin to produce habitat units. However, stands 5 and 6 will never have HSI values greater than 0.2 based on the distance to aspen which would continue to be beyond the threshold of 183 m.

White-tailed deer

Opening up the tree canopy by harvesting 75% of the conifers would stimulate shrub growth. We estimated that shrub canopy cover < 1.5 m increases to 75 % by year 15, excluding the 37 acre area planted to aspen. It is likely that deer use will be excluded or discouraged in the aspen planted area. The HSI value based on this projection becomes 1.0. Resulting HUs become 163 representing an increase of greater than 50% over the existing 94.5 units.

Table 1. Ruffed Grouse Fall-to-Spring Cover - Weir Property

Stand	Density of decid. trees (#/ha)	Density of conifer trees (#/ha)	Density of decid. shrub stems (#/ha)	Equiv. stem density conifer trees (#/ha)	Equiv. stem density decid. shrubs (#/ha)	Mean height lowest conifer branch (m)	Mean height decid. trees (m)	Mean height conifer trees (m)	Mean height decid. shrubs (m)	Total equiv stem density (#/ha)	SIV3	Weighted SIV4	SIV5	HSI	Acres	HU
1	325	400	5,125	400	1,281	5.2	1.7	9.1	1.4	2,006	0.0	0.09	0.38	0.0	22	0.0
2	25	2,600	1,475	2,600	369	5.0	2.3	10.7	1.0	2,994	0.0	0.53	0.25	0.0	10	0.0
3	25	1,325	8,475	3,445	2,119	2.8	2.3	15.0	1.3	5,589	1.0	0.7	0.25	0.17	42	7.1
4	0	575	4,825	920	1,206	3.9	N/A	10.7	1.2	2,126	0.0	0.19	0.25	0.0	50	0.0
5	50	1,825	3,400	6,205	850	1.9	3.7	6.2	1.8	7,105	1.0	1.0	0.25	0.25	23	5.8
6	0	575	4,825	1,725	1,206	2.3	N/A	11.1	1.5	2,931	0.0	0.35	0.25	0.0	16	0.0

Table 2. Ruffed Grouse Winter Food - Weir Property

Stand	1	2	3	4	5	6
Average radius to 20 aspen trees (m)	59.4	110.1	85.8	>183	>183	>183
SIV2	1.0	0.9	1.0	0.2	0.2	0.2
Acres	22	10	42	50	23	16
HU	22	9	42	10	4.6	3.2

Table 3. Overall HSIs and HUs for ruffed grouse under current conditions on the Weir Property.

Stand	HSI	Acres	HU
1	0.0	22	0.0
2	0.0	10	0.0
3	0.17	42	7.1
4	0.0	50	0.0
5	0.2	23	4.6
6	0.0	16	0.0
Total	0.07	163	11.4

Table 4. Current conditions for white-tailed deer
available browse - Weir Property

Stand	Percent shrub canopy cover <1.5 m in height	HSI ¹	Acres	HU ¹
1	25	0.61	22	13.4
2	8.5	0.23	10	2.3
3	30.5	0.73	42	30.7
4	27	0.63	50	31.5
5	8.5	0.23	23	5.3
6	19.5	0.5	16	8.0
Overall	22.75	0.58	163	94.5

¹ Listing of HSIs and HUs for individual stands is done for informational purposes only. Calculation of overall HSI and HUs is based on mean shrub canopy coverage for the entire Weir property.

Table 5. Overall HSIs and HUs based on 15 year management projections for ruffed grouse on the Weir Property.

Stand	HSI	Acres	HU
1	0.79	33	26.1
2	0.0	19	0.0
3	0.37	47	17.4
4	0.0	62	0.0
5	0.0	23	0.0
6	0.0	16	0.0
Total	0.22	200	44.0

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