Water vole (*Microtus richardsoni*) MODEL APPLICATION AND ASSESSMENT OF RESULTS

Introduction

The water vole lives near water, generally along stream and creek banks or around flooded marshes. This species occurs across the planning area in appropriate habitat. By analyzing this species as a focal species, riparian habitats in these higher elevation forests will be analyzed that are also used by Moose which also another member of this group. Much of the information for this species was taken from Klaus and Beauvais (2004).

Model Description

Source Habitat

Water voles occupy short, fragmented reaches of alpine and subalpine streams with narrow channels, about 5o slopes, and stream banks with deep and well-developed soils (Pattie 1967, Ludwig 1981, Reichel 1986, Klaus and Beauvais 2004).

Water voles have rather narrow habitat requirements. Preferred sites occur in a disjunct pattern of short, fragmented patches along reaches of alpine and subalpine streams (Pattie 1967, Ludwig 1981, Reichel 1986, Klaus 2003). In general, they are found in linear colonies along spring-fed or glacial streams with gravel bottoms and about 5o slope (Ludwig 1981, Klaus 2003). The stream channels are usually narrow and bordered by deep soil layers used for burrowing (Ludwig 1984). Of ten habitat variables analyzed by Ludwig (1981), three were important for separating occupied from unoccupied sites: percent stream gradient, the number of openings in the stream bank not produced by rodents, and soil depth. Occupied sites had stream gradients that averaged 6.54 ± 1.14%, number of openings averaging 5.30 ± 0.92, and soil depths averaging 38.01 ± 6.62 cm. Unoccupied sites were steeper (8.84 ± 0.90%), had fewer openings (4.58 ± 0.46), and shallower soils (30.34 ± 3.08 cm). Stream characteristics did not vary significantly between occupied and unoccupied sites. Occupied sites had stream widths averaging 154.5 ± 26.9 cm, stream depths averaging 7.91 ± 1.4 cm, and stream velocities averaging 0.39 ± 0.07 cm/sec. Unoccupied sites were similar in all of these aspects (width 152.8 ± 15.51 cm; depth 7.91 ± 0.8 cm; velocity 0.39 ± 0.40 cm/sec).Water vole burrows have large entrances with lateral surface openings 12.7 to 15.2 cm in diameter (Hollister 1912). Burrow entrances are in the stream bank, at water level (Figure 6), or occasionally submerged. Minor temperature variations were found within burrows (Pattie 1967). Water vole tunnels 6 cm wide can be found below plant roots and mosses (Ludwig 1999).

About 75 percent cover by mid-to-late seral vegetation, dominated by willow, sedges, grasses and forbs immediately adjacent to the stream, appears to be important for water voles (Pattie 1967, Anderson et al. 1976, Brown 1977, Ludwig 1981, Getz 1985, Reichel 1986, Anthony et al. 1987, Blankenship 1995, Klaus 2003). Water voles prefer locations inhabited by previous generations of water voles (Ludwig 1981).

Water voles generally remain within 17 m of open water (range 11.6 - 16.7 m), even though a few animals may move further away into adjacent wet areas (Ludwig 1984). It is clear that this association with permanently wet habitat is real and not an artifact of spatially-biased sampling. There is a rather long tradition of small mammal trapping in the uplands of national forests in the Rocky Mountains (Region2) (e.g., Beauvais 1997). Water vole inventories have focused mostly on streamside meadows. Other wet habitats such as peatlands and marshes have received less survey effort, and water vole use of these habitats is less well known.

In Washington, Reichel (1986) captured water voles only in wet meadow and willow habitats with greater than 75 percent vegetation cover. In old growth and mature forests in the western Cascade Range of Oregon, Doyle (1987) captured water voles on stream segments where cover by Douglas-fir (*Pseudotsuga menziesii*) was sparse and where a number of recently fallen logs were present. Captures on stream segments in old growth stands were significantly more frequent than on those in mature forest stands, but the most positively correlated variable was the percent of exposed soil (Doyle 1987). However, in the Bighorn National Forest, bare ground had low correlation (r2 = 0.25) with water vole captures, no captures occurred on stream segments under tree canopies, and fallen logs were rarely encountered next to streams (Klaus 2003).

In the Shoshone National Forest, water voles were trapped exclusively along streams (Pattie 1967, Klaus et al. 1999). They occupied hummocks bordering streams and were most frequently captured near hummocks covered by dense stands of willow or along streams with undercut banks (Pattie 1967, Klaus 2003). In the Bighorn National Forest, the best locations for capturing water voles were on streams above 2,440 m with Rosgen B or E classifications. Type B channels are riffle dominated and moderately entrenched with moderate width-depth ratio and sinuosity; type E have gentle gradient, riffle/pool type channels that are slightly entrenched with a very low width-depth ratio and a very high sinuosity (Rosgen 1994, 1996). Both of these channel types have a water surface slope ranging from 2 to 4 percent. Most water voles were captured in the willow/wet *Carex* riparian type (Girard et al. 1997, Klaus 2003). The willow/wet *Carex* type is found on relatively undisturbed sites with stable well-developed soils and bank structures (Girard et al. 1997).

- Elevation - >=5,000’
- Potential Vegetation – cd sw, grassland, shrubland, riparian
- Class 1-3 streams – 100 m buffer (50m side)

We assumed NO departure from the RV for current time period.

Livestock grazing

In a qualitative assessment, Friedlander (1995) concluded that the primary threat to water voles is stream bank degradation due to livestock trampling. Luce (1995) similarly concluded that water voles were precluded from areas by heavy livestock grazing when the vegetative cover of the bank was removed and burrows were trampled.

Klaus et al. (1999) and Klaus (2003) found that capture rates were significantly lower along streams grazed by livestock compared to streams not grazed by livestock in both the Shoshone and Bighorn National Forests.

In the Shoshone National Forest, heavy grazing that noticeably affected soils and vegetation precluded water voles from occupying a site, while light to moderate grazing was suspected to reduce water vole population density and viability (Luce 1995). In some areas dense stands of willows appeared to minimize livestock use of streamside sites, and water voles were captured in these more protected areas (Klaus 2003).

Heavy grazing by large mammals, whether native ungulates or livestock or a combination of both, can degrade the quality of water vole habitat through direct disturbance of soil and vegetation in riparian areas. Livestock grazing has been cited as likely the greatest anthropogenic threat to water voles in Region 2 (USFS) (Clark and Stromberg 1987, Friedlander 1995, Luce 1995).

In general, livestock, some large native mammals such as elk, and water voles have similar preferences for low-gradient riparian zones dominated by moist herbaceous vegetation. In non-wilderness portions of the Shoshone and Bighorn National Forests, livestock grazing appears to be widespread and chronic, and may lower water vole abundance, survival, and reproduction within most patches of suitable habitat (Klaus and Beauvais 2004). Combined with drought, such pervasive impacts could contribute to local extinctions. In contrast, livestock grazing is generally less intense in designated Wilderness Areas. In this context, wilderness areas may function as refugia within which water vole population segments have a higher probability of persistence through drought, and they may also function as population sources from which adjacent non-wilderness areas may be recolonized.

The impact of grazing on source habitat within a watershed was based on percentage of source habitat in that watershed within an active grazing allotment. The amount of source habitat in an active grazing allotment was categorized using 10% increments from 0-100%, with increasing poorer habitat outcomes as the proportion of source habitat in an active allotment increased

Additional information**:** (not modeled)
Any action that degrades the quality of streams and streamside vegetation has at least some potential to degrade water vole habitat, but there is little research to support specific conclusions. Sediment load is likely to increase in watersheds experiencing construction of roads and trails, increased use of roads and trails, large fires, or timber harvest, but the effect of increased sedimentation on water voles has never been investigated. Similarly, Demboski (2001) felt that heavy recreational use may impact water voles at Crumarine Creek, Latah County, Idaho, but the impact of recreation on water vole site occupancy or abundance has also never been investigated. Fires may occasionally burn through riparian meadows, but the potential negative effects on water voles are not well understood and are likely to be short in duration. It is reasonable to

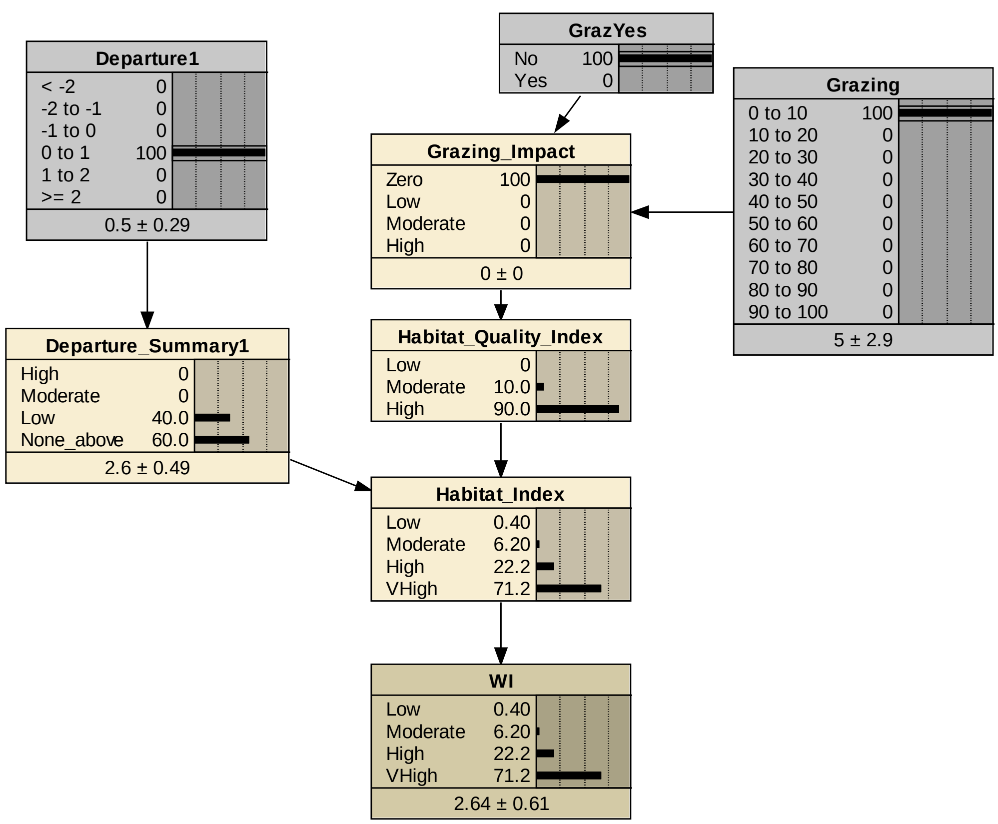
assume that drastic changes to water quantity (e.g., major water withdrawals) or quality (e.g., heavy metal contamination from mine leachate) will have negative effects on water voles. Water voles appear to flourish in discrete pockets of riparian habitat that meet their particular needs, despite the presence of potential competitors. The impact of exotic species on water vole populations is not known. Introduced small mammals, such as house mice (*Mus musculus*, have not been reported from sites occupied by water voles, and are unlikely to reach high numbers in the harsh and remote habitats favored by water voles. Because water voles use a wide variety of plants for food and cover across their range, it seems unlikely that the presence of exotic plant species would have a direct negative impact on them. The possibility that long-term beaver (*Castor canadensis*) activity maintains a higher coverage of water vole habitat than would be realized in the absence of beaver is a topic of potentially fruitful research.

Calculation of Historical Conditions

Values of the model variables were set with the following values to estimate historical habitat conditions:

- Departure of source habitat from RV – Class 1
- Grazing – none

Watershed Index Model



Figure–Focal species assessment model for the water vole

Relative Sensitivity of Model to Variables

Table -- Relative sensitivity of Watershed Index values to variables in the model for water vole

Variable	Sensitivity rank
Habitat departure	**1**
Grazing impact	**2**

Assessment Results

Habitat Influences

We assessed 82 watersheds with >10 ha of habitat across the 3 planning areas. We assumed no loss in the identified riparian habitat from the historical time period. The amount of habitat per watershed varied from 20 ha to over 4,000 ha. Twenty (24%) had over 1000 ha. The watersheds that had the most habitat generally occurred in areas with abundant Wilderness areas (MA-1).

	Y0_Acres
UMA	30,882
WAW	90,379
MAL	27,950
Blue Mnts	130,731

Table: Approximate area (acres) by National Forest modeled in the Viability Assessment. (Some watersheds contribute to more than one NF)

The primary factor that influenced the WI score was the level of livestock grazing. Generally areas in Wilderness designation are not grazed by domestic livestock.

	# Watersheds	>50% Habitat grazed
UMA	18	39% (n=7)
WAW	37	38% (n=14)
MAL	32	78% (n=25)
Blue Mtns	82	46% (n=56)

Viability Outcome Scores

Viability Outcome	Umatilla NF		Wallowa-Whitman NF		Malheur NF	
	Historical	Current	Historical	Current	Historical	Current
Shabitat(Ac)	30,882			90,379		27,950
HisWWI/CurWWI	100	78	100	86	100	63
%Hucs >=40%	72	72	70	70	50	50
Clusters	3/3	3/3	3/3 (high)	3/3 (high)	3/3	3/3
A	80	32	80	76	70	28
B	14	56	14	16	21	54
C	5	8	5	7	7.5	12
D	1	4	1	1	1.5	6
E	0	1	0	0	0	0

The VO model incorporated the weighted WI (WWI) scores (described earlier), and a habitat distribution index. The WWI scores indicated that the current habitat capability for water vole cross the 3 planning areas ranged from 63-86% of the historical capability. Dispersal across the planning area was not considered an issue for this species. Nine of nine clusters contained at least 1 watershed with >40% of the median amount of historical source habitat (median was calculated across all watersheds with source habitat). Percent of watersheds that have >40% of the median amount of historical source habitat has not changed from historical and ranges from 50-72% across the 3 planning areas. Under those circumstances the viability outcome on the Umatilla NF and the Malheur NF is primarily a B outcome currently, and on the Wallowa-Whitman it is primarily an A outcome.

Historically, we only projected a change in the quality of habitat due to livestock grazing so the amount of habitat did not change. Under the projected historical conditions, we calculated the water vole to have primarily an ‘A’ outcome in all 3 planning areas.

Overall habitat conditions declined some due to livestock grazing however, watersheds with the most habitat are generally largely in Wilderness areas, and likely provide important refugia from potential negative effects due to livestock grazing.

Alternative B Analysis

Assessment inputs:

Source Habitat - >5,000 ft elevation, grassland and shrubland habitat within 100m of class 1-3 stream

Grazing - % source habitat within an open allotment

Water voles are a riparian species. The risk factor of grazing is likely the only factor for this species that may change as a result of the implementation of any of the alternatives developed for the plan revision. The Desired Conditions for Aquatic Habitat and Watershed Direction (1.1 Watershed Function) describe areas of continued improvement in abundance and quality of riparian areas as compared to current conditions.

Source Habitat Abundance –because source habitat as described as within 100m of riparian areas, the majority of source habitat in Alternative B will be in RMA's and/or other protected status (Ma 4B).   Alternative B describes little management or alteration of stand structure and composition in riparian areas except as necessary to maintain, restore or enhance conditions that are needed to support aquatic and riparian dependent resources.

Alternative B, modified proposed action	
WLD-HAB-27 G-12	**Guideline** Where management activities occur within riparian habitat, the quantity, stature, and health of shrubs should not be reduced or degraded.
WLD-HAB-28 G-14	**Guideline** Roads and trails should not be constructed within high elevation riparian areas.
WLD-HAB-29 G-15	**Guideline** Residual herbaceous vegetation within high elevation riparian areas should be maintained at a level adequate to prevent stream bank degradation.
MA 4B RMA-FOR-1 G-112	**Guideline** Timber harvest and thinning should occur in RMAs only as necessary to maintain, restore or enhance conditions that are needed to support aquatic and riparian dependent resources.
MA 4B RMA-MIN-1 G-128	**Guideline** Adverse effects to aquatic and other riparian-dependent resources from mineral operations should be minimized or avoided. For operations in RMAs, ensure operators take all practicable measures to maintain, protect, and rehabilitate water quality and habitat for fish and wildlife and other riparian dependent resources that may be affected by the operations.

Grazing - Although this alternative is not changing the distribution or management of livestock grazing allotments, there are several plan components that speak to improving riparian and wetland function partially through improvement in livestock management in riparian areas. To reach the desired conditions and goals outlined in this alternative, it is likely that the risk of grazing on water vole habitat will be less than under the current plan which should lead to increasing the viability of this species through time. Plan components in Alternative B, especially in key watersheds describe, less trampling, trailing, bedding, watering etc. The reduction of the affects of livestock grazing especially in key watersheds will likely improve habitat for water voles

PL-TES-3 *New*	**Guideline** Domestic livestock grazing should not be authorized or allowed in the fens/bogs sensitive plant habitat groups.
MA 4B RMA-RNG-1 S-48	**Guideline** New livestock handling and/or management facilities should be located outside RMAs, except for those that inherently must be located in an RMA and those needed for resource protection.
MA 4B RMA-RNG-3 G-116	**Guideline** During allotment management planning, consider the removal of existing livestock handling or management facilities from RMAs.
MA 4B RMA-RNG-4 G-117	**Guideline** Minimize livestock trailing, bedding, watering, loading, and other handling in RMAs.
MA 4B RMA-RNG-2 G-115	**Guideline** Within green-line vegetation areas adjacent to all watercourses, the following applies:

Table x. Maximum Utilization and Residual Stubble Height within Riparian Sites

Measure	**Alternative B**
Maximum percent utilization of woody vegetation	40%
Maximum percent utilization of herbaceous vegetation	40%
Minimum residual stubble height	4 to 6 inches
Maximum bank alteration	20%

Summary: Likely due to implementation of Alternative B, viability for water voles will remain the same as current or increase due to the plan components that may lead to a decreased effect of livestock grazing in some areas and other management objectives emphasizing improving riparian area and function where much of this species habitat is located.

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ROCKY MOUNTAIN TAILED FROG (*Ascaphus Montanus*) MODEL APPLICATION AND ASSESSMENT RESULTS

Introduction

The tailed frog was selected as a focal species to represent the Conifer Riparian Group, specifically habitats associated with moderate elevation streams. Rocky Mountain tailed frogs occur in mountainous streams of the northern Rocky Mountains. Tailed frog distribution within the assessment area is limited to about the east ½ of the Blue Mountains on the parts of the Umatilla and Wallowa-Whitman NFs. Tailed frogs are not present on the Malheur NF.

Model Variables

Source Habitat

Tailed frogs reside in and next to perennial mountain streams. Mating, egg-laying, and larval development occur in streams. Adult female frogs deposit egg masses beneath large relatively stable cobbles or boulders in the summer and hatchlings emerge the following spring. At northern latitudes it takes up to four additional summers for tadpoles to metamorphose and begin a life of both lotic and terrestrial activity (Daugherty and Sheldon 1982, Brown 1990). Thus the larval life stages are particularly vulnerable to land uses that alter channel conditions (Bury 1983, Corn and Bury 1989, Bull and Carter 1996, Welsh and Ollivier 1998, Dupuis and Steventon 1999, Aubry 2000).

Ascaphus populations are sensitive to the increased siltation and water temperatures that may accompany timber harvest; thus, they are found most often in old growth reaches (Bury 1983; Corn and Bury 1989; Welsh 1990; Walls et al. 1992). This has generated concern over the loss and fragmentation of old growth habitat in the Pacific Northwest and the effect this may have on populations of tailed frogs (Bury 1983; Corn and Bury 1989; Welsh 1990; Walls et al. 1992; Blaustein et al. 1994). Considerable efforts have been made to understand these effects on the west-side forests of Oregon, Washington, and British Columbia (Aubry 2000, Biek et al. 2002, Dupuis and Steventon 1999, Stoddard and Hayes 2005, Vesely and McComb 2002).

These studies have reported differences in amphibian community composition depending on stand age (Aubry 2000) and width of riparian buffers (Veseley and McComb 2002), positive associations with the presence of amphibians and old forests adjacent to streams (Stoddard and Hayes 2005), and amphibian population declines following clear cut harvest (Dupuis and Steventon 1999). In the drier interior forests east of the Cascade crest in Washington, Piper (1996) and Gaines et al. (In prep) conducted monitoring of tailed frogs on the Wenatchee National Forest in areas with and without regeneration timber harvest adjacent to the streams. They found that the number of tailed frog captures were considerably less where harvest had occurred.

Due to our limited ability to map riparian habitats we assumed that the amount of habitat that was currently available was approximately the same as the amount of habitat that was historically available (see part 1, page 10).

We modeled source habitat for tailed frogs using a combination of stream order, cover type, and tree structure. Our model included the following GIS layers.

- Potential Vegetaion: cm, cd
- Tree Structure and Size: Multi story, >15 inches DBH (YMF, Uld, Md)
- Canopy Closure: >60%
- Stream Class 1-3 with 100 meter buffer on each side

Grazing

While no studies were found on the effects of grazing on tailed frogs, several studies have shown that livestock grazing can change the composition and quality of riparian habitats, cause soil compaction, and stream bank trampling (see Krausman 1996 and Wales 2001 for reviews). Of particular importance is the potential for grazing to contribute sedimentation to stream providing tailed frog habitat (Waters 1995, Welsh and Ollivier 1998). Thus, we accounted for the potential effects of grazing on tailed frogs by mapping cattle grazing allotments (with attributes to identify active allotments) and over-laying these onto maps of tailed frog source habitat. We used the following categories to assess these potential impacts within each watershed:

- Zero = no source habitat within an active cattle grazing allotment
- Low = <25% of the source habitat within an active cattle grazing allotment
- High = >25% of the source habitat within an active cattle grazing allotment

Habitat Effectiveness

Roads can influence riparian habitats for amphibians by removing habitat, limiting the ability of amphibians to disperse across roads, creating a source of mortality, and as a source of fine sediment deposited in amphibian habitats (Demaynadier and Hunter 2000, Dupuis and Steventon 1999, Fahrig et al. 1995, Welsh and Ollivier 1998, Yanes et al. 1995). Roads can contribute sediment to streams and reduce the densities of tailed frogs (Welsh and Ollivier 1998). Bate et al. (2007), found that snag numbers were lower adjacent to roads due to removal for safety considerations, removal as firewood, and other management activities. Other research has also indicated the potential for reduced snag abundance along roads (Wisdom and Bate 2009), it is likely that reduced snag densities will lead to reduced down-log densities. We assessed the potential impacts of roads on tailed frogs using road density within source habitat as an indicator of the effects of roads on habitat effectiveness. To estimate road density was used a moving windows routine with a 0.9 km radius circular window. We assessed the amount of source habitat that was within different road density classes and assigned each watershed to a level of habitat effectiveness:

- Low habitat effectiveness = >25% of the source habitat with road densities >2 mi./mi^2
- Moderate habitat effectiveness = >25% of the source habitat with road densities >1 mi./mi^2
- High habitat effectiveness = <25% of the source habitat with road densities >1mi./mi^2

Invasive Species

Studies have shown the negative effects of non-native trout on amphibian communities (Hecnar and M'Closkey 1997, Dunham et al. 2004) and specifically on tailed frog occurrence (Feminella and Hawkins 1994). The model included a fish distribution variable, however, in the Blue Mountains analysis area, we did not have adequate data to on fish distribution so we therefore assumed equal probabilities for both current and historical model runs.

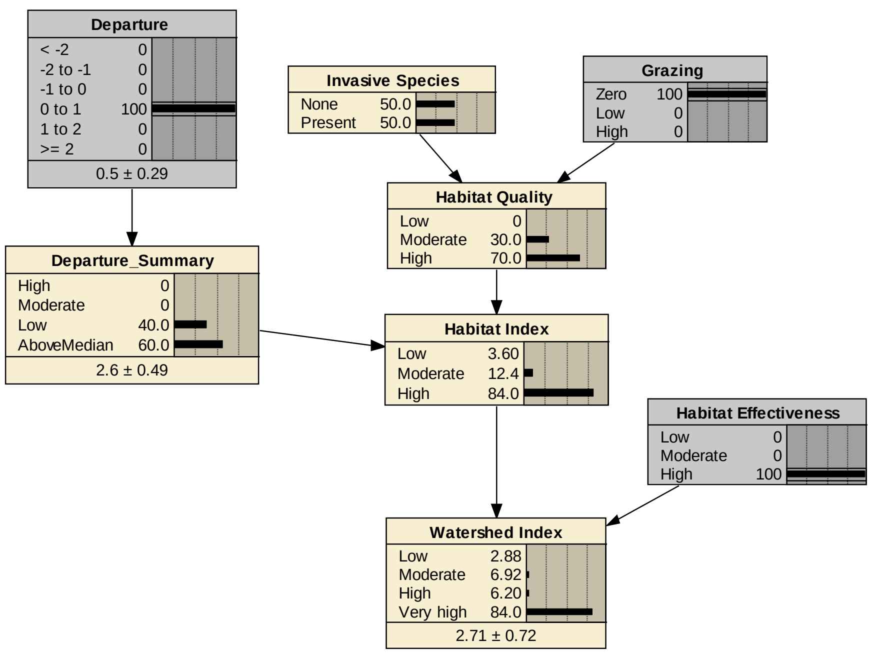
Historical Inputs for Focal Species Assessment Model

Source Habitat – Class 1
Grazing - Zero
Habitat Effectiveness - High
Invasive Species – Equal probabilities of present and non-present

Relative Sensitivity of Model to Variables

Table -- Relative sensitivity of Watershed Index values to variables in the model for tailed frog

Model Variables	Order of Variable Weighting
Source Habitat	**1**
Grazing	**2**
Habitat effectiveness	**4**
Invasive species	**3**



Figure–Focal species assessment model for the tailed frog

Assessment Results

Watershed Index Scores

Thirty-nine watersheds on the Umatilla and Wallowa-Whitman national forests were evaluated for tailed frogs where it is believed they occur (E. Bull personal communication). Fourteen watersheds were evaluated on the Umatilla NF, and 26 watersheds on the Wallowa-Whitman NF.

Due to our limited ability to map riparian habitats we assumed that the amount of habitat that was currently available was approximately the same as the amount of habitat that was historically available (see Methods, p.XX). Therefore, our assessment for the tailed frog focused on factors that influenced habitat quality and not factors that may have caused habitat loss.

	Y0_Acres
UMA	23,780
WAW	33,445
Blue Mtns	56,465

Table: Approximate area (acres) by National Forest modeled in the Viability Assessment. (Some watersheds contribute to more than one NF)

	# Watersheds	Grazing		Habitat Effectiveness			Watershed Index		
		Low (0%)	High (>25%)	Low	Moderate	High	Low (<1)	Moderate (1-2)	High (>=2)
UMA	14	14% (n=2)	64% (n=9)	0%	36% (n=5)	64% (n=9)	0%	64% (n=9)	36% (n=5)
WAW	26	23% (n=6)	65% (n=17)	27% (n=7)	46% (n=12)	27% (n=7)	23% (n=6)	54% (n=14)	23% (n=6)
Blue Mtns	39	21% (n=8)	64% (n=25)	18% (n=7)	41% (n=16)	41% (n=16)	15% (n=6)	56% (n=22)	28% (n=11)

Road densities in tailed frog source habitat were variable.

The assessment of the amount of source habitat in active grazing allotments showed that the majority of watersheds on both NF’s with ‘High’ levels.

Though we did not have the data available on distribution non-native trout present, the true impact of this on tailed frog populations is not known and it is a risk factor that is in need of further investigation and monitoring. We calibrated the overall negative effect of this risk factor to be relatively small due to uncertainty in the effects of this risk factor.

Viability Outcome Scores

Viability Outcome	Umatilla NF		Wallowa-Whitman NF	
	Historical	Current	Historical	Current
Shabitat (Ac)		23,780		33,445
HisWWI/CurWWI	100	64	100	53

%Hucs >=40%	86	86	73	73
Clusters	1/1 High	1/1 High	4/4	4/4
A	85	34	80	0
B	11	57	14	23
C	4	6	5	73
D	1	3	1	4
E	0	0	0	0

Because we assumed the amount of source habitat for tailed frogs has not declined since historical, the results indicate that habitat restoration could enhance the viability of the tailed frog. Both grazing and roads adjacent to source habitat are contributing to the lower viability outcomes currently.

Currently and historically, 86% (12/14) of the watersheds on the Umatilla NF contain source habitats that were estimated to be above 40% of the historical median. On the Wallowa-Whitman NF this percentage is 73% (19/26). The watersheds with >40% were distributed across 5 of the five clusters that the tailed frog is distributed in and this was the same historically.

Alternative B Analysis

Assessment inputs:

Source Habitat (trees >15" dbh, closed canopy, within 100m class 1-2 stream, pvg-cm,cd)
Grazing - % source habitat within an open allotment
Habitat Effectiveness – road density within source habitat
Invasive Species (non-native trout)

Tailed frogs are a riparian species. All of these input attributes could change as a result of the implementation of any of the alternatives developed for the plan revision. However, because the alternatives are not as site specific as to identify any specific trend in the abundance of larger trees or any future road or trail changes (spatially), we are unable to analyze the focal species assessment model on any particular outcome at any future time period.

The Desired Conditions for Aquatic Habitat and Watershed Direction (1.1 Watershed Function) describe areas of continued improvement in abundance and quality of riparian areas. .

Source Habitat Abundance –because source habitat as described as within 100m of riparian areas, the majority of source habitat in RMA's and/or other protected status (Ma 2A,4B).

Alternative B describes little management or alteration of stand structure and composition in riparian areas except as necessary to maintain, restore or enhance conditions that are needed to support aquatic and riparian dependent resources.

Additionally, the preference by tailed frogs for areas with large trees should be benefitted by emphasis to protect large trees, snags and old forest.

WLD-HAB-2 G-2	**Guideline** Areal extent of existing late old structure stands within the moist and cold old forest types that are 300 acres or larger should not be reduced or fragmented.
WLD-HAB-3 G-3	**Guideline** Riparian corridors connecting moist and cold old forest types should not be reduced.
WLD-HAB-13 S-7	**Standard** Where management activities occur within dry or cool moist forest habitat, all snags 21 inches DBH and greater and 50 percent of the snags from 12 to 21 inches DBH shall be retained, except for the removal of danger/hazard trees. Snags shall be retained in patches.
OF-1 G-59	**Guideline** Management activities in old forest stands should retain live old forest trees (≥ 21 inches DBH). Exceptions include: • old forest tree(s) need to be removed to favor hardwood species, such as aspen or cottonwood, or other special habitats • old forest late seral species, such as grand fir, are competing with large diameter early seral species, such as ponderosa pine • old forest tree(s) need to be removed to reduce danger/hazard trees along roads and in developed sites • a limited amount of old forest trees need to be removed where strategically critical to reinforce and improve effectiveness of fuel reduction in WUIs
OF-2 G-60	**Guideline** Management activities in non-old forest stands should retain live legacy old forest trees (≥ 21 inches DBH). Exceptions to retaining live legacy old forest trees are the same as those noted in the previous guideline (OF-1).
MA 4B RMA-FOR-1 G-112	**Guideline** Timber harvest and thinning should occur in RMAs only as necessary to maintain, restore or enhance conditions that are needed to support aquatic and riparian dependent resources.

Grazing - Although this alternative is not changing the distribution or management of livestock grazing allotments, there are several plan components that speak to improving riparian and wetland function. Plan components in Alternative B, describe less trampling, trailing, bedding, watering etc (see below).

MA 4B RMA-RNG-1 S-48	**Guideline** New livestock handling and/or management facilities should be located outside RMAs, except for those that inherently must be located in an RMA and those needed for resource protection.
MA 4B	**Guideline**

RMA-RNG-3 G-116	During allotment management planning, consider the removal of existing livestock handling or management facilities from RMAs.
MA 4B RMA-RNG-4 G-117	**Guideline** Minimize livestock trailing, bedding, watering, loading, and other handling in RMAs.

.

Habitat Effectiveness: (abundance of roads and motorized trails in close proximity to source habitat)

It is possible that if any new roads or trails are developed within source habitat, habitat effectiveness might decline, and if roads or trails are closed, habitat effectiveness might increase. Higher habitat effectiveness may lead to better/higher viability outcomes, and lower habitat effectiveness may lead to lower viability outcomes.

Alternative B – It is possible that if any new roads or motorized trails are developed within 1 km of source habitat, the risk factor of road density might decline, and if roads or trails are closed, the risk could decrease. Lower road densities may lead to better/higher viability outcomes, and lower habitat effectiveness may lead to lower viability outcomes. With implementation of this alternative (B) it is likely that in riparian and wetland areas near source habitat for this species, there will be no increased risk from increased road densities. Plan components that directly address road construction in RMA's are listed below, but there are several other components that encourage minimizing negative effects of roads/trails and mining activities in riparian areas

OF-3 *New*	**Guideline** New motor vehicle routes should not be constructed within old forest stands.
WLD-HAB-6 S-1	**Standard** Activities that have potential to cause abandonment or destruction of known denning, nesting, or roosting sites of threatened, endangered, or sensitive species shall not be authorized or allowed within 1,200 feet of those sites.
KW-1 S-15	**Standard** There shall be no net increase in the mileage of Forest Roads in any key watershed unless the increase results in a reduction in road-related risk to watershed condition. Priority should be given to roads that pose the greatest relative ecological risks to riparian and aquatic ecosystems.
WLD-HAB-28 G-14	**Guideline** Roads and trails should not be constructed within high elevation riparian areas.

Invasive trout have been introduced by ODFW in many watersheds. There are no known plans to reduce the abundance of non-native trout in areas they exist. Future plans to introduce trout in areas currently without, should consider the potential effects on tailed frog populations.

Summary: Likely due to implementation of Alternative B, viability for tailed frogs will remain the same as current or increase due to the plan components that may lead to increased abundance and quality of source habitat, and increased habitat effectiveness.

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BALD EAGLE (*Haliaeetus leucocephalus*) MODEL APPLICATION AND ASSESSMENT OF RESULTS

Introduction

The bald eagle was chosen as a focal species for the Riparian family and the Large tree or Snag/Open Water group. The bald eagle was chosen as a focal species primarily to represent species in the group associated with larger trees along larger streams. Bald eagles were recently removed from USFWS federal list of threatened and endangered species (Stinson et al. 2007). The primary risk factor identified for the bald eagle is human disturbance. Bald eagle nests in the Blue Mountains are currently rare. Within the last decade there have been about 3-4 confirmed nests in all of the Blue Mountains.

Model Variables

Source Habitat

Breeding territories for bald eagles are established in upland woodlands and lowland riparian stands with mature conifer or hardwood component (Anthony and Isaacs 1989, Garrett et al. 1993, Watson and Pierce 1998). Territory size and configuration are influenced by factors such density of breeding bald eagles (Gerrard and Bortolotti 1988), quality of foraging habitat, and the availability of prey (Watson and Pierce 1998). The three main factors that influence the location of nests and territories include proximity of water and availability of food; availability of nesting, perching, and roosting trees; and the density of breeding-age bald eagles in the area (Stalmaster 1987). Anthony and Isaacs (1989) reported that nest sites in older contiguous forest habitats with low levels of human disturbance resulted in higher levels of bald eagle productivity.

We modeled source habitat for bald eagles using a combination of tree structure and size class, elevation, and proximity to waterbodies described in the literature listed above. Our model of source habitat included the following:

- Elevation: <6000 feet
- Waterbody: waterbodies >5 acres in size (including large stream reaches)
- Distance from suitable sized waterbody: 300 meter buffer
- Tree structure and size classes: single and multi-story, >15 inches in diameter at breast height (DBH)
- Potential Vegetation : xp, dp, dd, dg, cm

The current habitat departure class for the bald eagle was set at Class 1 (no change from historical) for all watersheds. (see Part1, p.10 Calculation of reference condition).

Late-Successional Forest

Several studies have reported the importance of late-successional forests in defining quality of nesting habitat and influencing productivity of bald eagles (Anthony and Isaacs 1989, Garrett et al. 1993). We included the amount of potential source habitat that was in a late-successional forest condition as a factor that affected habitat quality. We used the following GIS data layers to map late-successional forest as a subset of the total potential source habitat:

- Single and multi-story forests, >20 inches DBH
- Canopy closure >40% (dry), >60% (cm)
- We then used the following categories in our model to categorize the proportion of source habitat within a watershed composed of late-successional habitat:
  - Zero = no source habitat is late-successional
  - Low = >0-20% of the source habitat is composed of late-successional forest
  - Moderate = >20-50% of the source habitat is composed of late-successional forest
  - High = >50% of the source habitat is composed of late-successional forest

Habitat Effectiveness

Reported responses of bald eagles to human disturbances have ranged from spatial avoidance of the activity to reproductive failure (Anthony et al. 1995, Buehler et al. 1991, McGarigal et al. 1991, Watson 1993), although in some cases, bald eagles tolerate human disturbances (Harmata and Oakleaf 1992). Bald eagles seem to be more sensitive to humans afoot than to vehicular traffic (Grubb and King 1991, Skagen et al. 1991, Stalmaster and Newman 1978). Fletcher et al. (1999) reported that the abundance of bald eagles was lower in riparian habitats with nonmotorized trails compared to riparian habitats without trails. Recommended buffer distances to reduce the potential for disturbance to bald eagles during the nesting period have ranged from 300 to 800 meters (Anthony and Isaacs 1989, Fraser et al. 1985, McGarigal 1988, Stalmaster 1987). Grubb and King (1991) evaluated the influence of pedestrian traffic and vehicle traffic on bald eagle nesting activities and recommended buffers of 550 meters for pedestrians and 450 meters for vehicles.

We included a habitat effectiveness variable in the bald eagle model in order to assess the potential influence of human activities on source habitats. We used the bald eagle nesting habitat disturbance index described in Gaines et al. (2003). To do this we buffered roads and motorized trails by 450 meters on each side and nonmotorized trails by 550 meters on each side to establish zones of influence. We then intersected this with our maps of source habitat to determine the proportion of source habitat within each watershed that was inside a zone of influence. We then developed the following categories to assess the potential influences of increasing proportions of source habitat within a zone of influence:

- Low habitat effectiveness = <30% of the source habitat outside of a zone of influence
- Moderate habitat effectiveness = 30-50% of the source habitat outside of a zone of influence
- High habitat effectiveness = >50% of the source habitat outside of a zone of influence

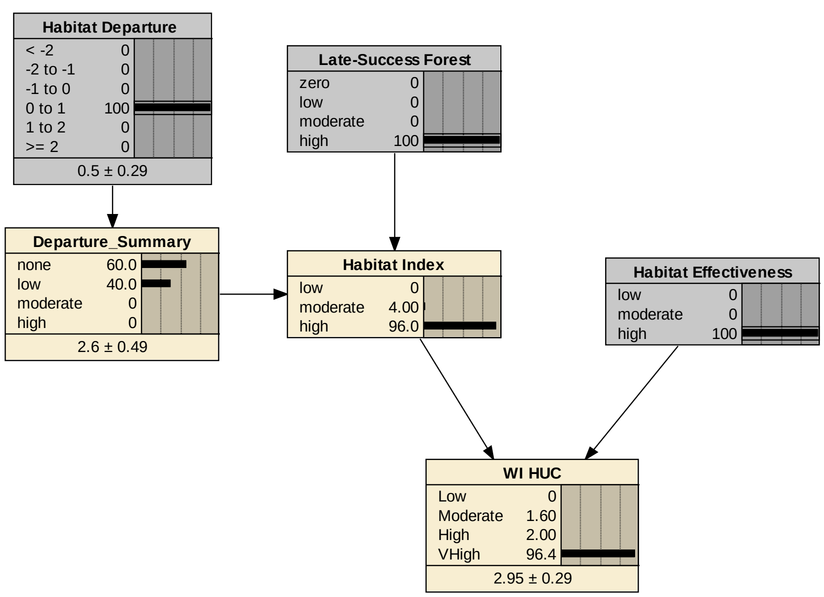
Historical Inputs for Focal Species Assessment Model

- Historical habitat departure – Class 1
- Late successional forest - Moderate
- Habitat effectiveness - High

Relative Sensitivity of Model to Variables

Relative sensitivity of Watershed Index values to variables in the model for the bald eagle

Model Variables	Order of Variable Weighting
Source Habitat	**1**
Late-Successional Forest	**2**
Habitat Effectiveness	**3**



Figure–Focal species assessment model for the bald eagle

Assessment Results

Watershed Index Scores

Habitat for the Bald eagle is limited in the Blue Mountains on USFS lands. We included 8 watersheds on the Umatilla NF, 10 on the Wallowa-Whitman NF. We identified habitat on USFS lands in 6 watersheds on the Malheur NF.

The watersheds with a 'High' watershed index score was Silvies Canyon (Malheur NF), and Grande Ronde River Grossman Ck (Umatilla NF).

Watersheds with the most source habitat (>500 ha) included Minam River (1334 ha), Grande Ronde River-Grossman Creek (907 ha), Wenahah River (783 ha) and the North Fork John Day River- Big Creek (556 ha). Because this species is a riparian species, habitat departure for all watersheds was classified as class 1 departure (no change since historical) for the Current analysis (Year 0) (see Methods, p. XX).

The percent of late-successional forest within source habitat was low and reduced the habitat quality in most watersheds.

Model results indicate that human activities are having an impact on the effectiveness of source habitat for bald eagles across the planning area. Activities associated with roads and trails have reduced habitat effectiveness to low levels in most of the watersheds analyzed.

	# Watersheds	Acres	Late successional habitat		Habitat Effectiveness		
			Zero/Low	Moderate/High	Low	Moderate	High
UMA	8	6,834	75% (n=6)	25% (n=2)	88% (n=7)	0	12% (n=1)
WAW	10	4,764	70% (n=7)	30% (n=3)	100% (n=10)	0	0%
MAL	6	2,049	33% (n=2)	67% (n=4)	83% (n=5)	16% (n=1)	0%

Viability Outcome Scores

Viability Outcome	Umatilla NF		Wallowa-Whitman NF		Malheur NF	
	Historical	Current	Historical	Current	Historical	Current
Shabitat (Ac)		6834		4764		2049
HisWWI/CurWWI	100	71	100	52	100	71
%Hucs >=40%	63	63	70	70	67	67
Clusters	2/3	2/3	2/3	2/3	3/3	3/3

A	0	0	0	0	75	30
B	55	28	60	12	18	55
C	36	40	32	60	6	10
D	10	26	8	28	1	5
E	0	0	0	0	0	0

Figure – Viability Outcome for the Bald eagle historical and current

Because we assumed the amount of source habitat did not change from historical, the only change in the viability outcome model is the weighted WI (WWI) scores which includes the effects of the amount of late successional habitat and the effects of human disturbance. We did not assume any change in the distribution of habitats from historical.

Historically the viability of the bald eagle is estimated to primarily and A on the Malheur NF and a B/C on the Umatilla and Wallowa-Whitman NF primarily due to distribution across the planning areas.

Though not apparent in the Viability Outcome scores is that likely the availability of suitable environments for the bald eagle has declined in the assessment area compared to the historical distribution. Likely additional source habitat such as large cottonwoods occurred in more abundance historically in some areas within the planning area. We were unable to map source habitat historically so it was assumed not to have changed in abundance. Although habitat for bald eagles is limited in the blues, it is also likely we underestimated the abundance of this habitat especially historically.

Results of the Bald eagle viability analysis are likely similar results for other species in the Riparian family and the Large tree or Snag/Open Water group. Human activities have altered the quality of habitat in many riparian habitats.

Alternative Analysis

Assessment inputs:

Source Habitat – forests >=15" dbh
Late Successional Habitat – forests >=20" dbh
Habitat Effectiveness - abundance of roads and motorized trails in within 450m-550m of source habitat

All of these input attributes could change as a result of the implementation of any of the alternatives developed for the plan revision. Because the alternatives are not as site specific as to identify any specific trend in the abundance of larger trees or any future road or trail changes (spatially), we are unable to run the focal species assessment model on any future time period for Alternative B.

Source Habitat; Late Successional Habitat: Bald eagles are a riparian species. Any change in the abundance of trees greater than 15" dbh within riparian areas may affect bald eagles. The majority of source habitat in Alternative B will be in RMA's and/or other protected status (Ma 2A, 4B).

The Desired Conditions for Aquatic Habitat and Watershed Direction (1.1 Watershed Function) describe areas of continued improvement in abundance and quality of riparian areas. There are other Objectives, Standards and Guidelines likely to benefit bald eagles.

Alternative B describes little management or alteration of stand structure and composition in riparian areas except as necessary to maintain, restore or enhance conditions that are needed to support aquatic and riparian dependent resources. Additionally, the preference by bald eagles for nesting in large trees should be benefitted by emphasis to protect large trees, snags and old forest.

WLD-HAB-2 G-2	**Guideline** Areal extent of existing late old structure stands within the moist and cold old forest types that are 300 acres or larger should not be reduced or fragmented.
WLD-HAB-3 G-3	**Guideline** Riparian corridors connecting moist and cold old forest types should not be reduced.
WLD-HAB-13 S-7	**Standard** Where management activities occur within dry or cool moist forest habitat, all snags 21 inches DBH and greater and 50 percent of the snags from 12 to 21 inches DBH shall be retained, except for the removal of danger/hazard trees. Snags shall be retained in patches.
OF-1 G-59	**Guideline** Management activities in old forest stands should retain live old forest trees (≥ 21 inches DBH). Exceptions include: • old forest tree(s) need to be removed to favor hardwood species, such as aspen or cottonwood, or other special habitats • old forest late seral species, such as grand fir, are competing with large diameter early seral species, such as ponderosa pine • old forest tree(s) need to be removed to reduce danger/hazard trees along roads and in developed sites • a limited amount of old forest trees need to be removed where strategically critical to reinforce and improve effectiveness of fuel reduction in WUIs
OF-2 G-60	**Guideline** Management activities in non-old forest stands should retain live legacy old forest trees (≥ 21 inches DBH). Exceptions to retaining live legacy old forest trees are the same as those noted in the previous guideline (OF-1).
MA 4B RMA-FOR-1 G-112	**Guideline** Timber harvest and thinning should occur in RMAs only as necessary to maintain, restore or enhance conditions that are needed to support aquatic and riparian dependent resources.

Habitat Effectiveness: It is possible that if any new roads or trails are developed within source habitat, habitat effectiveness might decline, and if roads or trails are closed, habitat effectiveness might increase. Higher habitat effectiveness may lead to better/higher viability outcomes, and lower habitat effectiveness may lead to lower viability outcomes.

There is little indication from this alternative that extensive road building will occur. Several plan components stress the need to reduce road densities or have no net increase in road densities especially in key watersheds (Standard KW-1 (15)). Much of the source habitat is located within or in close proximity to both key watersheds and RMA's, based on the desired conditions, objectives and standards and guidelines the risk of decreased habitat effectiveness for bald eagles is low.

OF-3 *New*	**Guideline** New motor vehicle routes should not be constructed within old forest stands.
WLD-HAB-6 S-1	**Standard** Activities that have potential to cause abandonment or destruction of known denning, nesting, or roosting sites of threatened, endangered, or sensitive species shall not be authorized or allowed within 1,200 feet of those sites.
KW-1 S-15	**Standard** There shall be no net increase in the mileage of Forest Roads in any key watershed unless the increase results in a reduction in road-related risk to watershed condition. Priority should be given to roads that pose the greatest relative ecological risks to riparian and aquatic ecosystems.

Summary: Likely due to implementation of Alternative B, viability for bald eagles will remain the same as current or increase due to plan components that may lead to increased abundance of source habitat (through protection of large trees and snags), and increased habitat effectiveness.

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MACGILLIVRAY'S WARBLER (*Oporornis tolmiei*) MODEL APPLICATION AND ASSESSMENT RESULTS

Introduction

MacGillivray's warbler was selected as focal to represent the shrubby deciduous characteristics of the Deciduous Riparian Group. This warbler's distribution is large and widespread across the planning during the breeding season. The primary risk factor of grazing for this species covers several of the other species in the group/family.

Model Description

Source Habitat

This species prefers canyons and draws, and dense willows along streams, second-growth woodland habitat that can be created by fire or logging, including dead or fallen trees, brushy areas near low moist ground, and brushy dry hillsides not far from water (Terres 1980). It requires dense undergrowth and moderate cover for breeding (Morrison and Meslow 1983). Morrison (1981) described breeding habitat in deciduous forests as having 60.1% total cover, composed of 44.8 % shrubs, 7.7% coniferous species, and 7.6% deciduous species. He also describes breeding habitat in coniferous forests as having 74.2% total cover, composed of 63.8% shrubs, 3.7% coniferous species, and 6.7% deciduous species. In eastern Oregon, MacGillivray's warblers breed in dense willow thickets around springs and stream bottoam (Gabrielson and Jewett 1940). This warbler does not nest in sagebrush habitats (Gilligan et al. 1994). Stuart-Smith et al. (2006) found this species had a negative association with increasing densities of residual trees. In the cascades of Washington, Lehmkuhl et al. (2007) recently reported this species having a strong association with riparian habitats in dry forest types.

As described in section 'calculation of habitat departure for riparian (**p. 10, part1**), numerous reports describe the severe impacts (e.g., those from dams, diversions, agriculture conversion, stream channelization, road construction) have permanently altered millions of acres of wetland habitat. Based on these findings, we made a conservative estimate that source habitat for MacGillivray's warbler in the planning area on USFS lands was approximately 80% of the historical amount. Applying these assumptions to the concept of departure of amount of habitat from the historical amounts, we considered the current departure of wetland habitat (-20%) to be at the -1 class (i.e., if 0 – 60% loss is divided into 3 classes [0, -1, -2, -3], there would be a loss of 20% per class).

Source habitat is defined on this analysis as areas with a 100 meter buffer on perennial streams (i.e. stream order 3-8) that have >= 70% shrub cover using GNN vegetation data set. In addition we included meadow habitat from the cover type map and palustrine, scrub-shrub (PSS) and palustrine forested wetlands (PFO) from the National Wetland Inventory, Ecological Systems data, and also USFS vegetation data (riparian forest, riparian shrub).

Departure set at class -1 for the current analysis. We assumed a loss of 20% of source habitat from historical for this species, as we did with other riparian associated species (see section Departure calculation for riparian species part1, p.10).

Grazing

MacGillivray's warbler is a neotropical migrant known to be negatively impacted by livestock grazing. In three separate studies, this species was absent from heavily grazed or browsed areas but was found on nearby comparison plots: Mosconi and Hutto (1982; heavily versus lightly grazed cottonwood/pine riparian habitat in Montana), Medin and Clary (1991; fall-grazed aspen/willow riparian habitat in Nevada), and Berger et al. (2001; moose-browsed riparian willow in Wyoming). The negative impact was considered to be a result of alteration of important vegetation structure and composition, as well as negative impacts on water quality or water regimes that affect vegetation (Zwartjes et al. 2005).

Grazing is used to index shrub quantity and quality. We categorized the amount of source habitat in an active grazing allotment using 10% increments from 0-100%, with increasing poorer shrub habitat as the proportion of source habitat in an active allotment increased.

Invasive Species

It has been reported that MacGillivray's warblers are reported to be occasionally parasitized by brown-headed cowbird (*Molothrus ater*) but extent and vulnerability are unknown (Pitocchelli 1995). Other research found that these warblers may be heavily parasitized by cowbirds in areas near agriculture, but have also been found breeding in smaller riparian areas far from agriculture (Tewksbury et al 1999). Though breeding success in these areas has not been sufficiently studied, smaller deciduous riparian areas far from agriculture likely provide nesting sites free from cowbird parasitism (Tewksbury et al. 1999).

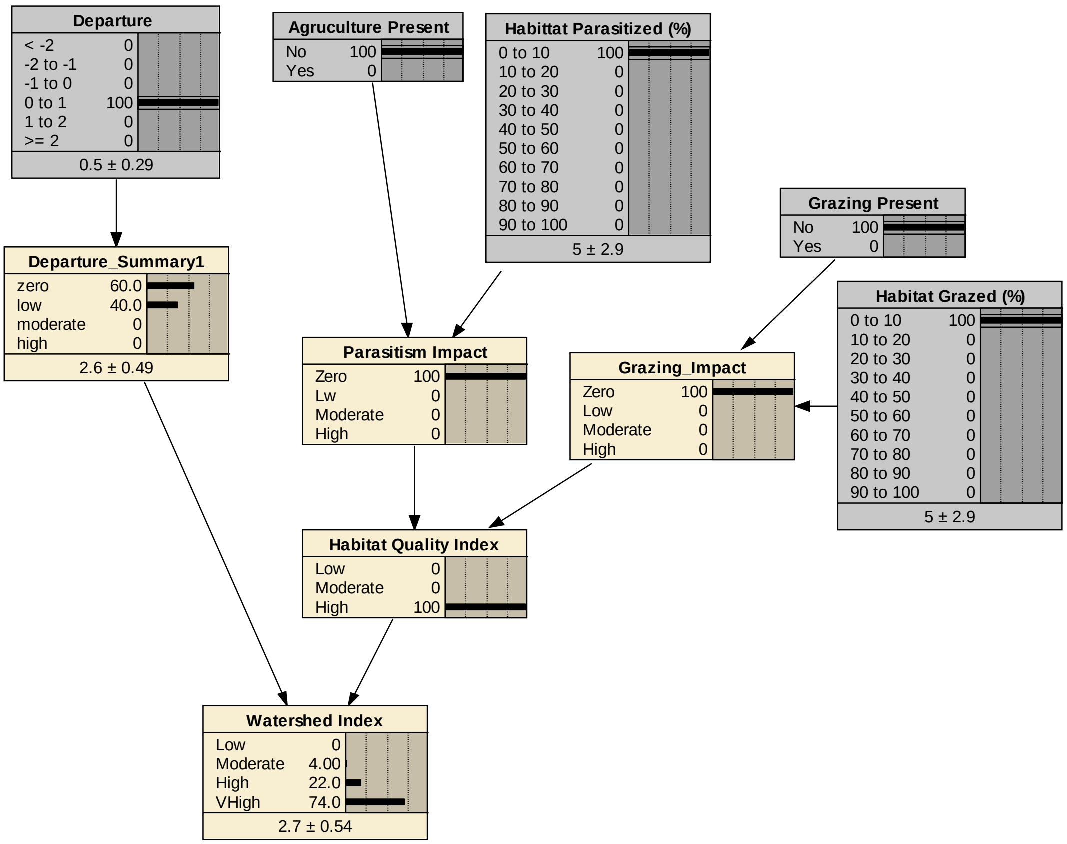
To assess the effects of nest parasitism by cowbirds we categorized the percent (per watershed) of source habitat within 1 km buffer of agricultural lands using 10% increments from 0-100%, with increasing poorer habitat outcomes as the proportion of source habitat in the buffer increased.

Historical Inputs for Focal Species Assessment Model

- Departure of source habitat – Class 1
- Livestock Grazing – 0%

- Nest Parasitism – 0%

MacGillivray's Warbler Focal Species Assessment Model



Figure—Focal species assessment model for MacGillivray's warbler

Table -- Relative sensitivity of Watershed Index values to variables in the model for MacGillivray's warbler

Variable	Sensitivity rank
Habitat departure	1
Livestock Grazing	2
Nest Parasitism	3

Assessment Results

Watershed Index Scores

Due to presumed habitat loss and reduced habitat quality in nearly all watersheds, the watershed index values in all watersheds have declined from historical conditions.

	Y0_Acres
UMA	21,624
WAW	71,559
MAL	29,690
Blue Mtns	119,431

Table: Approximate area (acres) by National Forest modeled in the Viability Assessment. (Some watersheds contribute to more than one NF)

All but 8 watersheds had active grazing allotments overlapping source habitats for MacGillivray's warblers. The majority of the watersheds on all 3 NFs had >= 50% of the source habitat in an active grazing allotment.

The negative effect of nest parasitism was less as 37 watersheds (35%) had no habitat within 1 km of agriculture, while only 6 (6%) had >=50% of their source habitat within the specified distance from agriculture that increases the potential for negative impacts of nest parasitism.

		Grazing	Invasives
	# Watersheds	watersheds >=50% of Habitat in active allotment	watersheds >=50% Habitat w/in 1km of Agriculture
UMA	31	68% (n=21)	10% (n=3)
WAW	47	57% (n=27)	6% (n=3)
MAL	34	88% (n=30)	0
Blues	107	71% (n=76)	6% (n=6)

Viability Outcome

The viability outcome model incorporated the weighted WI (WWI) scores (described earlier), and a habitat distribution index. The WWI scores indicated that the current habitat capability for MacGillvray's warbler across the 3 planning areas is between 45 and 52% across all 3 Forests. The percent of watersheds that had >40% of the median amount of historical source habitat across all clusters has declined from historical slightly. Historically the range of this across Forests was 74-81%, and currently is 68-79%. The watersheds with >40% were distributed across all clusters. Dispersal across the planning area was not considered an issue for this species.

The resulting viability outcome for MacGillivray's warbler was primarily a "C".

Historically we estimated that the viability outcome to be primarily an 'A' for MacGillivray's warbler. Habitat amount, distribution and quality has declined due to loss and modification of source habitats.

Viability Outcome	Umatilla NF		Wallowa-Whitman NF		Malheur NF	
	Historical	Current	Historical	Current	Historical	Current
HisWWI/CurWWI	100	49	100	52		45
%Hucs >=40%	74	68	81	79	79	71
Clusters	3/3	3/3	4/4	4/4	3/3	3/3
A	80	0	85	0	80	0
B	14	23	11	23	14	23
C	5	73	4	73	5	73
D	1	5	1	4	1	4
E	0	0	0	0	0	0

Figure – Historical and Current conditions Viability outcome MacGillivray's Warbler

Alternative Analysis
Assessment inputs:
Source habitat – shrubby deciduous riparian
Grazing – amount of source habitat in an open allotment
Invasives - nest parasitism by cowbirds

Because the alternatives are not as site specific as to identify any specific areas that may change grazing timing, abundance, etc., we will qualitatively describe how the proposed action or any of the other alternatives may affect viability for this species.

Plan components in each alternative give us some indication of potential changes that may have an effect on viability for this species. The Desired Conditions for Aquatic Habitat and Watershed Direction (1.1 Watershed Function) describe areas of continued improvement in abundance and quality of riparian areas as compared to current conditions. Several plan components likely will benefit MacGillivray's warbler and other species associated with shrubby deciduous riparian vegetation.

Source habitat: The objectives and desired condition statements in Alternative B emphasize the desire to increase the amount and quality of riparian deciduous shrub communities that are source habitat for MacGillivray's warbler.

Alternative B, modified proposed action	
WLD-HAB-27 G-12	**Guideline** Where management activities occur within riparian habitat, the quantity, stature, and health of shrubs should not be reduced or degraded.
WLD-HAB-28 G-14	**Guideline** Roads and trails should not be constructed within high elevation riparian areas.

Grazing: Although this alternative is not changing the distribution or management of livestock grazing allotments, there are several plan components that speak to improving riparian and wetland function partially through improvement in livestock management in riparian areas.

MA 4B RMA-RNG-1 S-48	**Guideline** New livestock handling and/or management facilities should be located outside RMAs, except for those that inherently must be located in an RMA and those needed for resource protection.
MA 4B RMA-RNG-3 G-116	**Guideline** During allotment management planning, consider the removal of existing livestock handling or management facilities from RMAs.
MA 4B RMA-RNG-4 G-117	**Guideline** Minimize livestock trailing, bedding, watering, loading, and other handling in RMAs.
MA 4B RMA-RNG-2 G-115	**Guideline** Within green-line vegetation areas adjacent to all watercourses, the following applies:

Table x. Maximum Utilization and Residual Stubble Height within Riparian Sites

Measure	Alternative B
Maximum percent utilization of woody vegetation	40%
Maximum percent utilization of herbaceous vegetation	40%
Minimum residual stubble height	4 to 6 inches
Maximum bank alteration	20%

Invasives: To assess the effects of nest parasitism by cowbirds we categorized the percent (per watershed) of source habitat within 1 km buffer of agricultural lands. The amount of privately owned agricultural lands will not change under this planning proposal. This alternative will not change the abundance of this risk factor.

In Summary: Much of the source habitat is located within or in close proximity to both key watersheds and RMA's, based on the desired conditions, objectives and standards and guidelines the risk to MacGillivray's warbler viability is not increasing. Likely due to implementation of Alternative B, viability will remain the same as current or increase due to the plan components that may lead to an increase in shrub growth.

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COLUMBIA SPOTTED FROG (*Rana luteiventris*) MODEL APPLICATION AND ASSESSMENT OF RESULTS

Introduction

Columbia spotted frog populations have declined precipitously across their range (e.g., they have been found at only 13 of 59 locations where they were present historically in Washington State [McAllister and Leonard 1997]). Small population size and reproductive characteristics likely make Columbia spotted frog populations vulnerable to anthropogenic disturbance. As a result, Columbia spotted frogs have been designated as a sensitive species by the USDA Forest Service, Pacific Northwest Region. As a focal species, they represent species associated with the Ponds/Small Lake/Backwater Group within the Riparian Family. Their source habitat and risk factors cover the other species within this group well where populations overlap. Two additional species, Woodhouse's toad and Painted turtle were identified in this group as an 'f', indicating that these species may need to be analyzed at a finer scale, due to limited distribution of the species. After review, we found no known occurrences of these species in the planning areas.

A variety of threats to the persistence of populations of Columbia spotted frogs have been identified, including wetland loss, introduced predators, mining, grazing, development, and diseases (USDI Fish and Wildlife Service 1997, Monello and Wright 1999, Reaser and Pilliod 2005, Pearl et al. 2007). Columbia spotted frogs are year-round residents of the planning area (Reaser and Pilliod 2005, Bull 2005); this assessment was for breeding and rearing habitat.

Model Description

Source Habitat

Columbia spotted frogs were highly dependent on aquatic habitats and require permanent and semipermanent wetlands that have aquatic vegetation and some deeper or flowing water for overwintering (Bull and Marx 2002, Pilliod et al., 2002). Breeding habitat for Columbia spotted frogs has been characterized, in general, as small silt or muck bottom ponds with emergent vegetation (Morris and Turner 1969, Pilliod et al. 2002, Welch. and MacMahon 2005, Pearl et al. 2007) . Wintering habitat was described as large (~2 ha), deep (>3 m) ponds and lakes (Bull and Hayes 2002, Pilliod et al. 2002). Munger et al. (1998) more specifically characterized the habitat associations of adult spotted frogs as still waters with associated shrublands and riverine conditions. They identified these areas as having National Wetland Inventory (NWI) classifications (Cowardin et al. 1979) associated with shrubscrub and seasonally flooded wetlands. Presence of spotted frogs was negatively associated with areas classified with emergent vegetation and temporarily flooded. Specifically, adult spotted frogs were found more often than expected in PSSC (palustrine, scrubshrub, seasonally flooded) wetlands and R4SBC (intermittent riverine, streambed, seasonally flooded) wetlands and less often than expected in PEMC (palustrine, emergent, seasonally flooded) wetlands and R4SBA (intermittent riverine, streambed, temporarily flooded) areas. Bull and Hayes (2001) also found adult Columbia spotted frogs associated with riverine habitats in the summer (<100 cm deep, cobble substrate, without aquatic vegetation).

For this analysis, source habitat was considered to be palustrine, scrubshrub, seasonally flooded wetlands (PSSC) and intermittent riverine streambed that were seasonally flooded (R4SBC), as described in the NWI (Cowardin et al. 1979). Also Ecological Systems data, and USFS vegetation data that indicated wetland habitats.

- NWI: Freshwater Pond, Freshwater Forested/Shrub Wetland, Freshwater Emergent Wetland
- USFS Pnvg: Rip_Herb, Rip_Shrub
- Ecological Systems – Riparian shrublands
- Ponds and lakes

Departure set at class -1 for the current analysis. We assumed a loss of 20% of source habitat from historical for this species, as we did with other riparian associated species (see Part1, P.10)

Invasive Animals

Introduced fish have been linked to the decline of ranid frog species in general across western North America (Hayes and Jennings 1986) and specifically to declines of Columbia spotted frogs (Monello and Wright 1999, Reaser 2000). The negative effects of fish introduced into previously fishless ponds and lakes were considerable for amphibians that required permanent water bodies for reproduction and overwintering (Knapp et al. 2001, Knapp et al. 2005). These negative effects also extended to stream habitats with introduced salmonids (Bosch et al. 2006). Previously fishless lakes with introduced trout (*Oncorhynchus* spp.) populations had lower abundance and recruitment of spotted frogs than fishless lakes (Pilliod and Peterson 2001, McGarvie Hirner and Cox 2007). However, Bull and Marx (2002) did not find a strong relationship between the presence of introduced trout and the abundance of eggs and larvae of Columbia spotted frogs.

The following classes were used to evaluate the effect of introduced trout on Columbia spotted frogs:

- high – introduced trout present in ≥50% of source habitat within a watershed
- low – introduced trout present in <50% of source habitat within a watershed
- zero – introduced trout not present in source habitat within a watershed

Information on fish stocking locations was not available for all potential habitats across the Blue Mountains so we assumed equal probabilities of the 3 different classes across all watersheds.

Grazing

The results reported in the literature on the effects of grazing on Columbia spotted frogs were equivocal. Reaser (2000) found that cattle grazing was related to low recruitment and high mortality. These findings were supported by Worthing (1993), Cuellar (1994), and Ross et al. (1999). However, Bull and Hayes (2000) and Adams et al. (2009) reported that they did not find any differences in productivity of spotted frogs at grazed vs. ungrazed sites in northeast Oregon. However, there was an indication that grazed sites in this area had reduced food abundance (Whitaker et al. 1983, Bull 2003). Also, overgrazing could negatively affect reproduction if egg masses or recently metamorphosed frogs were directly trampled or if banks were collapsed along ponds or rivers that serve as overwintering sites (Bull 2005).

The impact of grazing on source habitat within a watershed was based on percentage of source habitat in that watershed with an active cattle grazing allotment (i.e., sheep grazing allotments were not considered). The amount of source habitat in an active grazing allotment was categorized using 10% increments from 0-100%, with the assumption that habitat outcomes became increasingly poorer as the proportion of source habitat in an active allotment increased.

Pond Size

Ponds reported used for breeding and during the summer ranged in mean size from 0.025 to 0.40 ha (Bull and Hayes 2001, Pilliod et al. 2002). Ponds used over winter ranged in mean size from 0.08 to 2.0 ha (Bull and Hayes 2002, Pilliod et al. 2002). Bull and Marx (2002) found that lake size was a significant factor in the prediction of the abundance of egg masses. Lakes evaluated in that study ranged in size from 0.4 to 34.8 ha. A negative relationship was found between productivity and lake size.

The following classes were used to evaluate the effect of pond and lake size on Columbia spotted frogs:

- less than optimum – <0.4 or >2.0 ha mean size within a watershed
- optimum – 0.4 - 2.0 ha mean size within a watershed

Road Density

Increasing densities of roads was expected to result in reductions of habitat quality for Columbia spotted frogs as a result of direct mortality, habitat fragmentation, and reduced water quality (Findlay and Houlahan 1997, Vos and Chardon 1998, Findlay and Bourdages 2000, Trombulak and Frissell 2000, Houlahan and Findlay 2003, Funk et al. 2005). Habitat fragmentation and associated reduction in connectivity of habitat has been associated with the disappearance of frog populations from occupied habitat (Knapp et al. 2003, Cushman 2006). Columbia spotted frogs have been reported to move from 500 m (Turner 1960, Hollenbeck 1974, Bull and Hayes 2001) to 1 km (Pilliod et al. 2002) between ponds. Therefore, the effects of roads were assumed to occur within 1 km of source habitat.

The following density classes were based partially on the findings of Findlay and Houlahan (1997) and were applied to an area within 1 km of source habitat within a watershed. The percent of source habitat in each class per watershed was used. The road density classes were:

- zero – <0.06 km/km^2 open roads (<0.1 mi/mi^2)
- low – 0.06-0.62 km/km^2 open roads (0.1-1.0 mi/mi^2)
- moderate – 0.63-1.24 km/km^2 open roads (1.1-2.0 mi/mi^2)
- high – >1.24 km/km^2 open roads (>2.0 mi/mi^2)

Variables Considered But Not Included

American bullfrogs (*Rana catesbeiana*) have been reported to be a factor in the decline of populations of ranid frogs (e.g., Doubledee et al. 2000) and may be associated with declines in spotted frog populations (Bull 2005, Monello et al. 2006). However, there was limited empirical evidence to implicate American bullfrogs as a cause of spotted frog population reduction or loss. There was also limited spatial data on the distribution of American bullfrogs across the planning area. As a result of these factors, we did not include potential effects of American bullfrogs on spotted frogs in this model.

Mining activities may impact wetlands and their biota directly through habitat destruction or run-off of sediments and contaminants generated during mining operations (Linder et al. 1991). Antidotal evidence has indicated that mining operations may negatively affect habitat for spotted frogs. However, these effects have not been documented. Also, digital spatial information concerning location of mining operations throughout the planning area was generally unavailable. As a result, we did not include this variable in our assessment.

Chytridiomycosis is a recently described disease caused by the fungal pathogen *Batrachochytrium dendrobatidis*, and has been linked with amphibian mortality or population declines in at least four continents (Berger et al., 1998; Bosch et al., 2001; Green et al., 2002; Lips et al., 2006). The origins of the pathogen are not well known (see Rachowicz et al., 2005), but some evidence suggests it is novel to many amphibians and has spread rapidly after recent introductions (Daszak et al., 1999; Morehouse et al., 2003; Weldon et al., 2004). This disease has the potential to impact amphibian communities directly through local extirpations (Berger et al., 1998; Bosch et al., 2001; Pounds et al., 2006) and indirectly through altering interactions among extant species (Parris and Beaudoin, 2004; Parris and Cornelius, 2004).

Chytridiomycosis may be linked to local declines of Boreal Toad (*Bufo boreas*) in Colorado (Muths et al., 2003; Scherer et al., 2005), and Yosemite Toad (*Bufo canorus*) and Mountain Yellow-Legged Frog (*Rana muscosa*) in California (Fellers et al., 2001;

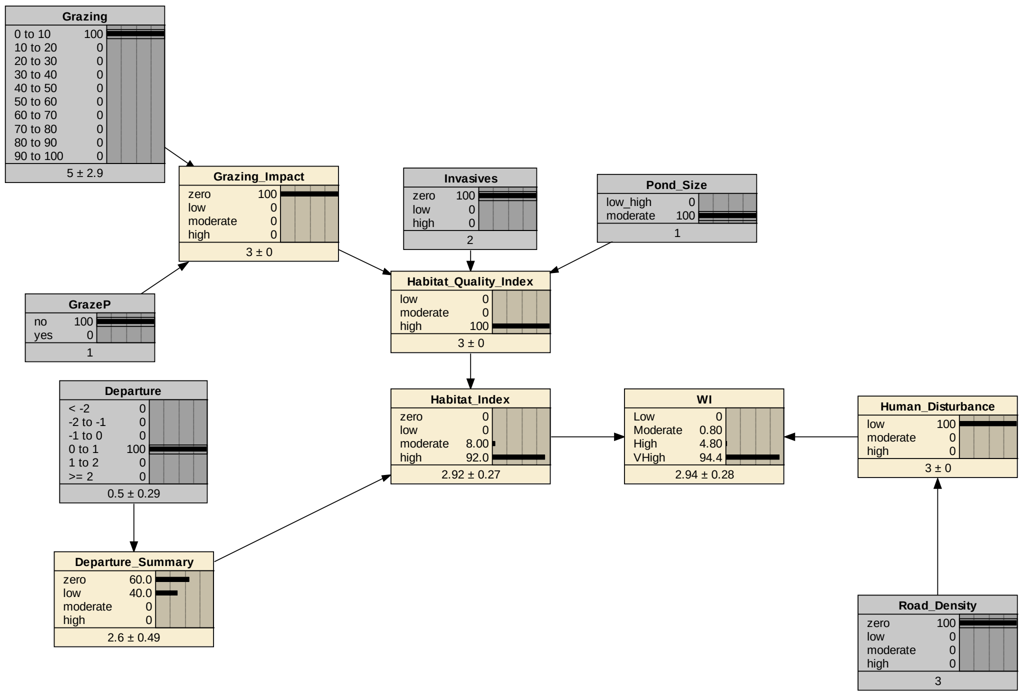
Green and Kagarise Sherman, 2001; Green et al., 2002; Briggs et al., 2005), as well as the near extinction of the Wyoming Toad (*Bufo baxteri*) in Wyoming (Taylor et al., 1999).

The Pacific Northwest (PNW) is a region of known and suspected amphibian declines, which are most commonly noted among anurans (Blaustein and Wake, 1990; McAllister et al., 1993; Wente et al., 2005). Causes of amphibian declines in the PNW are likely to be complex (Adams, 1999) and declines around the western USA have been attributed to habitat modification and the introduction of a variety of introduced predators (Fisher and Shaffer, 1996; Adams, 1999; Knapp and Matthews, 2000). The role of *B. dendrobatidis* in PNW declines is currently unknown, but concern is increasing as a result of studies in other parts of the western United States (e.g., Fellers et al., 2001; Green and Kagarise Sherman, 2001; Muths et al., 2003). Information on the distribution of *B. dendrobatidis*–infected amphibian populations in the region includes several Rana and Bufo species including the spotted frog though effects of the fungus seem to vary in intensity and distribution (Pearl et al. 2007). Recent research on amphibian declines has documented the role of emerging pathogens and in some cases epidemic outbreaks of particular infections and diseases (Daszak et al. 2003). Changes in climatic regimes are likely to increase pathogen virulence and amphibian and reptile susceptibility to pathogens (Daszak et al 2003).

Calculation of Historical Conditions

- Values of the model variables were set with the following values to estimate historical habitat conditions:
- Habitat amount: Current amount of habitat in each watershed was increased by 30%
- Departure of source habitat from RV – Class 1
- Invasive animals – class zero
- Grazing – none
- Pond size – same as current condition
- Road density – class zero

Watershed Index Model



Figure—Focal species assessment model for Columbia spotted frog.

Relative Sensitivity of Model to Variables

Table—Relative sensitivity of watershed index values to variables in the model for Columbia spotted frog.

Variable	Sensitivity rank
Habitat departure	1
Pond size	2
Grazing impact	3
Invasive animals	4
Road density	5

Assessment Results

Habitat Influences

Historically, 94 of 115 watersheds within the planning area provided greater than 10 ha of habitat for Columbia spotted frogs and were used in this analysis.

We assumed that all watersheds had approximately 80% of the historical amount of habitat remaining based on the findings of Dahl (1990) and Peters (1990).

	Y0_Acres
UMA	15,182
WAW	27,836
MAL	27,221
Blue Mtns	65,491

Table: Approximate area (acres) by National Forest modeled in the Viability Assessment. (Some watersheds contribute to more than one NF)

The size of wetlands affected suitability of habitat for Columbia spotted frogs. The mean sizes of habitats within 16% of the watersheds (n = 15) were within the optimum range. This attribute was not changed when we evaluated the historical condition.

The probability of invasive trout was given equal probabilities in all watersheds. Non-native trout have been released by the Oregon Department of Fish and Wildlife throughout many lakes in the Blue Mountains.

Grazing affected suitability of habitat for Columbia spotted frogs in nearly all of the watersheds. The majority of watersheds analyzed had >=50% of their source habitat in an active grazing allotment.

Road density also affected suitability of watersheds as habitat for Columbia spotted frogs (Trombulak and Frissell 2000). The majority of watersheds had >=50% of their source habitat in high or moderate (>1 mi/square mile) road density.

	# Watersheds	Pond Size		Grazing			Road density	
		small/large	moderate	0-10%	10-50%	>50%	Zero/Low	Mod/High
UMA	25	88% (n=22)	12% (n=3)	8% (n=2)	24% (n=6)	68% (n=17)	72% (n=18)	28% (n=7)
WAW	41	66% (n=27)	34% (n=14)	22% (n=9)	24% (n=10)	54% (n=22)	59% (n=24)	41% (n=17)
MAL	32	94% (n=30)	6% (n=2)	0%	3% (n=1)	97% (n=31)	16% (n=5)	84% (n=27)
Blue Mtns	94	81% (n=76)	19% (n=18)	11% (n=10)	17% (n=16)	72% (n=68)	47% (n=44)	53% (n=50)

Viability Outcome Scores

Viability Outcome	Umatilla NF		Wallowa-Whitman NF		Malheur NF	
	Historical	Current	Historical	Current	Historical	Current
HisWWI/CurWWI	100	56	100	61	100	50
%Hucs >=40%	60	60	80	71	75	72
Clusters	3/3	3/3	4/4	4/4	3/3	3/3
A	75	0	85	32	80	0
B	18	23	11	56	14	23
C	6	73	4	8	5	73
D	1	5	1	4	1	4
E	0	0	0	0	0	0

The VO model incorporated the weighted WI (WWI) scores (described earlier), and a habitat distribution index. The WWI scores indicated that the current habitat capability for Columbia spotted frogs within the planning areas range from 50-61% of the historical capability. Dispersal across the planning area was not considered an issue for Columbia spotted frogs. All clusters currently contain ≥1 watershed with >40% of the median amount of historical source habitat (the median was calculated across all watersheds with source habitat). The percentage of watersheds with greater than 40% of the historical median amount of source habitat ranges from 60-72% currentl. Under those circumstances we estimated the current viability outcome for Columbia spotted frogs is primarily a 'C' on the Malheur and Umatilla NFs and primarily a 'B' outcome on the Wallowa-Whitman NF. It is likely that all other species included in the Ponds/Small Lake/Backwater Group within the Riparian Family have similar outcomes. The amount of source habitat, grazing, and road densities near source habitat contributed to the decline in viability from historical conditions.

Historically dispersal across the planning area was not considered an issue for Columbia spotted frogs. Ten of 10 clusters contained at least 1 watershed with >40% of the median amount of historical source habitat (the median was calculated across all watersheds with source habitat). The percentage of watersheds with greater than 40% of the historical median amount of source habitat ranged from 60-80% across the planning areas historically Under those circumstances we estimated the viability outcome to be primarily an 'A'.

Historically Columbia spotted frogs and other species in the Ponds/Small Lake/Backwater Group within the Riparian Family were likely well distributed with sustained populations across the planning area. Changes in habitat conditions have resulted in the current situation where these species are likely well-distributed within only a portion of the plan area.

Importantly to note for this species and one other species in the group, western toad, we did not evaluate the effect the pathogen *Batrachochytrium dendrobatidis* is currently having on this species. Local research in the Blue Mountains has shown that this fungus in widespread (Bull 2005, Bull 2006, Pearl et al. 2007), some deaths have been linked to the fungus, but it is unknown the degree that this fungus may be affecting this species viability in the planning area.

Alternative B analysis

Assessment inputs:
Source habitat
Pond size
Grazing impact
Invasive species
Road density

It is possible that all of the variables in the Focal species assessment model may change in any of the alternative B except for the risk factor invasive trout. Because the alternatives are not as site specific as to identify any specific future map the amount, patch size and distribution of source habitat, changes in location or intensity of livestock grazing, or changes in quantity of or distribution of open roads we are unable to run the focal species assessment model on any particular outcome at any future time period.

Source Habitat: Under Alternative B The desired conditions for 1.1 Watershed Function are described by Key Watersheds and All Watersheds and in *1.1.1 Hydrologic Function, 1.1.2 Riparian Function, 1.1.3 Wetland Function, 1.1.4 Stream Channel Function, and 1.1.5 Aquatic Habitat Function all address restoring and improving* hydrologic and riparian function which should improve conditions for spotted frogs and other species associated with these riparian habitats. Additional standards and guidelines encourage protection of riparian areas. Encouraging the increase in abundance of beavers may likely increase habitat for spotted frogs as well.

MA 4B	**Guideline**
RMA-1	When RMAs are functioning properly, project activities should be designed to maintain those conditions.
G-101	When RMAs are not properly functioning, project activities should be designed to improve those conditions. Project activities in RMAs should not result in long-term degradation to aquatic and riparian conditions at the watershed scale. Limited short term or site-scale effects from activities in RMAs may be acceptable when they support, or do not diminish, long-term benefits to aquatic and riparian resources.

Pond Size: We did not model pond size as having changed from historical. It is unknown how and if pond size may change as an outcome of implementation of this alternative. It is important that especially in known locations of spotted frogs, pond size is not changed through management.

Grazing: Although this alternative is not changing the distribution or management of livestock grazing allotments, there are several plan components that speak to improving riparian and wetland function partially through improvement in livestock management in riparian areas Alternative B, especially in key watersheds describes, less trampling, trailing, bedding, watering etc (see MA4B direction).   The reduction of the affects of livestock grazing especially in key watersheds will likely improve habitat for spotted frogs.

MA 4B RMA-RNG-1 S-48	**Guideline** New livestock handling and/or management facilities should be located outside RMAs, except for those that inherently must be located in an RMA and those needed for resource protection.
MA 4B RMA-RNG-3 G-116	**Guideline** During allotment management planning, consider the removal of existing livestock handling or management facilities from RMAs.
MA 4B RMA-RNG-4 G-117	**Guideline** Minimize livestock trailing, bedding, watering, loading, and other handling in RMAs.
MA 4B RMA-RNG-2 G-115	**Guideline** Within green-line vegetation areas adjacent to all watercourses, the following applies:

Table x. Maximum Utilization and Residual Stubble Height within Riparian Sites

Measure	Alternative B
Maximum percent utilization of woody vegetation	40%
Maximum percent utilization of herbaceous vegetation	40%
Minimum residual stubble height	4 to 6 inches
Maximum bank alteration	20%

Road Density: It is possible that if any new roads or motorized trails are developed within 1 km of source habitat, the risk factor of road density might decline, and if roads or trails are closed, the risk could decrease. Lower road densities may lead to better/higher viability outcomes, and lower habitat effectiveness may lead to lower viability outcomes. With implementation of this alternative (B) it is likely that in riparian and wetland areas near source habitat for this species, there will be no increased risk from increased road densities. Plan components that directly address road construction in RMA's are listed below, but there are several other components that encourage minimizing negative effects of roads/trails and mining activities in riparian areas.

Roads	
KW-1 S-15	**Standard** There shall be no net increase in the mileage of Forest Roads in any key watershed unless the increase results in a reduction in road-related risk to watershed condition. Priority should be given to roads that pose the greatest relative ecological risks to riparian and aquatic ecosystems.
WLD-HAB-28 G-14	**Guideline** Roads and trails should not be constructed within high elevation riparian areas.
MA 4B RMA-RD-4 G-120	**Guideline** Wetlands and unstable areas should be avoided when reconstructing existing roads or constructing new roads and landings. Minimize impacts where avoidance is not practical.
MA 4B RMA-MIN-2 G-129	**Guideline** Structures, support facilities, and roads should be located outside RMAs. Where no alternative to siting facilities in RMAs exists, locate them in a way to minimize adverse effects to aquatic and other riparian dependant resources. Existing roads should be maintained to minimize damage to aquatic and riparian dependent resources.

Invasive trout have been introduced by ODFW in many watersheds. There are no known plans to reduce the abundance of non-native trout in areas they exist. Future plans to introduce trout in areas currently without, should consider the potential effects on tailed frog populations.

In summary, based on the objectives and goals of this alternative, it is unlikely there will be a reduction in the amount of source habitat or increased risk to the quality of this habitat due to the implementation of any management activities addressed in this Forest Plan. It is likely that the viability of this species may improve due to the attention placed on improving riparian area and function where much of this species habitat is located. However, the current analysis does not analyze the current threat of the fungus chytridiomycosis (see above). It is unknown how the affect of many management activities may or may not be affecting this fungus, or how climate change may be impacting this species.

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MARSH WREN (*Cistothorus palustris*) MODEL APPLICATION AND ASSESSMENT RESULTS

Introduction

Marsh wrens were chosen as a focal species to represent species associated with the Marsh Group of the Wetland Family. They have been shown to be sensitive to hydrologic change in wetland habitats (Steen et al. 2006, Timmermans et al. 2008). Water level changes and associated reductions in the amount or extent of standing water in emergent vegetation affected habitat quality for marsh wrens (Tozer 2002, Meyer 2003, Timmermans et al. 2008). Shallow-water species such as marsh wrens may be more sensitive to habitat suitability changes caused by hydrological dynamics than other wetland species (Steen et al. 2006, Timmermans et al. 2008). The main risk factors for all species associated with marsh habitat were draining, filling, and degradation of marshes; environmental contaminants; and predators at nest sites. Marsh wrens were chosen as the focal species for this group because they have widespread distribution in eastern Oregon and eastern Washington State and their risk factors include those of the other species in this group. Marsh wrens were year-round residents of the planning area (Kroodsma and Verner 1997); this assessment was for nesting habitat.

Model Description

Source Habitat

Presence and depth of standing water within emergent vegetation was an important habitat feature for many marsh birds, including marsh wrens, because it facilitated foraging activities, ground predator avoidance, and often dictated food or nest site availability (Pickman et al. 1993, Kroodsma and Verner 1997). Cattail marshes with interspersed open water >1 m deep were preferred nesting sites for marsh wrens (Verner and Engelsen 1970, Manci and Rusch 1988, Pickman et al. 1993, Linz et al. 1996, Ozesmi and Ozesmi 1999). Leonard and Picman (1987) reported that nests of marsh wrens in dense vegetation with deep water were more successful than those in shallower water (i.e., means of 92 cm vs. 132 cm). Banner and Schaller (2001) suggested that palustrine, emergent wetlands (PEM) (Cowardin et al. 1979) were preferred habitat for nesting marsh wrens. For this analysis, palustrine, emergent wetlands (PEM), as described and mapped through the National Wetlands Inventory (Cowardin et al. 1979), were considered source habitat for marsh wrens. In addition we used data from the USFS, and Ecological Systems data (from the GNN data) to identify additional Marsh habitat. We only considered watersheds with > 1 ha of marsh habitat.

Current departure was calculated by assuming a 20% loss in each watershed (see calculation of RV for riparian habitats' Part 1, page 10).

Invasive Species

Marshes invaded with purple loosestrife (*Lythrum salicaria*) have been reported to be less suitable as habitat for marsh wrens than cattails or other natural vegetation (Rawinski and Malecki 1984, Whitt et al. 1999). Although it has been suggested that the conclusions reached by these studies were equivocal (Anderson 1995, Hagar and McCoy 1998), a more recent review (Blossey et al. 2001) confirmed the threat of habitat degradation in marshes and other wetlands as a result of invasion by purple loosestrife. Additionally following a peer review of this species' model, reviewers indicated that reed canary grass would also decrease the quality of habitat for marsh wren.

We used county occurrence data from the Invaders database (Rice 2011), and other data from County weed boards. We had to modify how we classified the data in the original species model due to lack of information on the spatial distribution of invasive species in our planning area.

Because the data available was at the County level, we assumed that if either purple loosestrife or reed canary grass occurrence at the county level that overlapped watersheds in our analysis area, the invasive plants occurred at a 'low' level. We assumed a low level because our assessment is on USFS lands that likely many of these wetlands, on NFS, have been less impacted by invasive plants due to location generally being a greater distance from larger human populations.

Marsh Size

Birds nesting in the interior of marshes have been reported to be more secure from predation (Richter 1984, Pickman et al. 1993), indicating that marshes in large patches provide more productive habitat than small patches. This was also supported by the finding that marsh wrens suffered more predation when nesting at dry sites at the edge of marshes than at sites in the center of marshes (Leonard and Picman 1986). Gibbs and Melvin (1990) and Brown and Dinsmore (1986) found that marsh wrens preferred larger marshes to small marshes. Although their statistical power was low (i.e., 0.73), Benoit and Askins (2002) showed a tendency for marsh wrens to prefer large patches (i.e., >100 ha) for nesting. Banner and Schaller (2001) suggested that marshes >16 ha were more valuable as habitat for marsh wrens than smaller marshes. Sites >140 m from the edge in cattail marshes were preferred for nesting (Ozesmi and Ozesmi 1999). This finding suggests that marshes >6 ha provide progressively more nesting habitat.

The following classes of size of source habitat for marsh wrens were used to evaluate the effect of marsh size within the planning area:

- small – <16 ha mean size of marsh wetlands within a watershed
- large – ≥16 ha mean size of marsh wetlands within a watershed

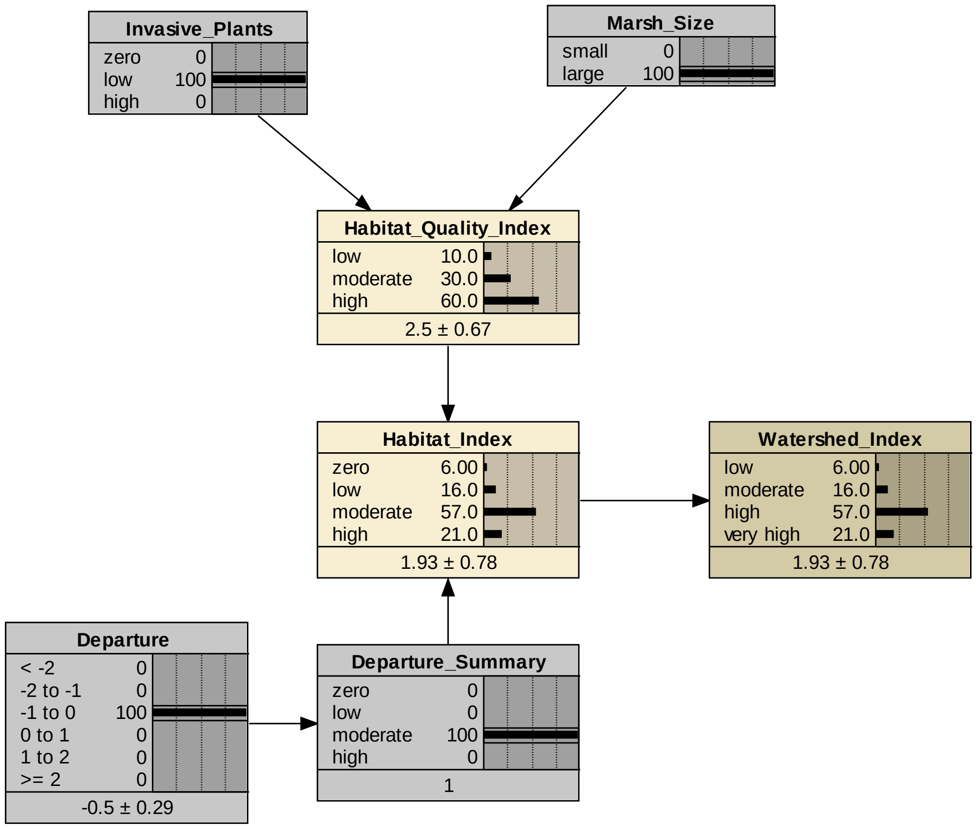
Calculation of Historical Conditions

Values of the model variables were set with the following values to estimate historical habitat conditions:

- Departure of source habitat from RV – Class 1
- Invasive species – class zero
- Marsh size – same as current condition

Historical amount of habitat in each watershed was increased by 20% from current.

Watershed Index Model



Figure—Focal species assessment model for marsh wren.

Relative Sensitivity of Model to Variables

Table—Relative sensitivity of Watershed Index values to variables in the model for marsh wren.

Variable	Sensitivity rank
Habitat departure	**1**
Marsh size	**2**
Invasive plants	**3**

Assessment Results

Habitat Influences

We included 95 watersheds that currently had >=1 ha marsh habitat in our analysis of the Blue mountains. Watersheds with the largest amounts of habitat were located in the central, eastern, and southern portions of the planning area. All watersheds we analyzed had Watershed Index (WI) scores that were high (>= 2.0).

	Y0_Acres
UMA	15,980
WAW	28,773
MAL	62,802
Blue Mtns	102,925

Table: Approximate area (acres) by National Forest modeled in the Viability Assessment. (Some watersheds contribute to more than one NF)

Marsh wrens have been reported to be sensitive to invasion of source habitats by purple loosestrife (Rawinski and Malecki 1984, Whitt et al. 1999). The PLANTS database and other local weed location data indicated that all counties within the planning area, except Columbia, Garfield, Wheeler and Adams, Id, have recorded occurrences of purple loosestrife or reed canary grass. Only 5 watersheds were determined to have no invasive weeds present. The remaining 96% (n = 91) of the watersheds with habitat were considered to be in the low invasion category.

The size of marshes was thought to be directly related to habitat quality for marsh wrens (Banner and Schaller 2001). The majority of watersheds (88%, n=84) with habitat had the average patch sizes of marshes in the small size category.

		Patch Size		Invasives		
	#Watersheds	Small	Large	Zero	Low	High
UMA	20	75% (n=40)	25% (n=5)	10% (n=2)	90% (n=18)	0%
WAW	43	93% (n=40)	7% (n=3)	2% (n=1)	98% (n=42)	0%
MAL	36	89% (n=32)	11% (n=4)	0%	1005 (n=36)	0%
Blue Mtns	95	88% (n=84)	12% (n=11)	3% (n=3)	97% (n=92)	0%

Viability Outcome Results

The VO model incorporated the weighted WI (WWI) scores (described earlier), and a habitat distribution index. The WWI scores indicated that the current habitat capability for marsh wren across the 3 planning areas is about 71-72% of the historical capability on all 3 NFs. Dispersal across the area was not considered an issue for this species. All clusters currently contained at least 1 watershed with >40% of the median amount of historical source habitat (median was calculated across all watersheds with source habitat). Across the 3 planning areas 60-70% of the watersheds had >40% of the median amount of historical source habitat. Under those circumstances viability outcome was estimated to be about a B/A currently. It is likely that other species associated with the Marsh Group of the Wetland Family had similar outcomes.

Historically, dispersal across the planning area was not considered an issue for this species. All clusters contained at least 1 watershed with >40% of the median amount of historical source habitat (median was calculated across all watersheds with source habitat). The percentage of watersheds that had >40% of the median amount of historical source habitat ranged from 65-72% across the 3 planning areas. Under those circumstances the primary viability outcome was an A, indicating that suitable environments were broadly distributed with an abundance of high quality habitat.

	Historical	Current	Historical	Current	Historical	Current
HisWWI/CurWWI	100	72	100	71	100	71
%Hucs >=40%	65	65	65	60	72	67
Clusters	3/3	3/3	4/4	4/4	3/3	3/3
A	75	30	75	30	80	30
B	18	55	18	55	14	55
C	6	10	6	10	5	10
D	1	5	1	5	1	5
E	0	0	0	0	0	0

Figure – Historical and current viability outcome marsh wren

In summary, under historical conditions, marsh wrens and other species associated with the Marsh Group of the Wetland Family were likely well-distributed throughout the planning area; currently there were likely fewer populations occupying lower quality habitat throughout the planning area though this has not changed much from historical on USFS lands.

Alternative B Analysis
Assessment inputs:
Source Habitat – Marsh
Invasive species – purple loosestrife, reed canary grass
Marsh Size

All of these input attributes could change as a result of the implementation of any of the alternatives developed for the plan revision. Because the alternatives are not as site specific as to identify any specific trend in the abundance of marsh habitat or any future density of invasive species (spatially), we are unable to run the focal species assessment model on any particular outcome at any future time period.

Plan components in each alternative give us some indication of potential changes that may have an effect on viability for this species. The Desired Conditions for Aquatic Habitat and Watershed Direction (1.1 Watershed Function) describe areas of continued improvement in abundance and quality of riparian areas as compared to current conditions.

Source Habitat: Marsh wrens are a marsh dependant species. Abundance of source habitat would likely improve especially in key watersheds and Management area 4B due to overall goal of restoring and improving hydrologic and riparian function. Several plan components address the desire to maintain or increase wetland and riparian habitats. Encouraging an increase in abundance of beavers will likely increase habitat for these wrens as well.

1.1.3 Wetland Function

Desired Condition: The extent and diversity of wetland types in the Blue Mountains is maintained or increased.

Scale: Subbasin.
The surface and subsurface flow paths that support wetland habitats are undisturbed. The timing and duration of inundation of wetlands are within natural ranges. Plant species composition in wetlands is characteristic of the biophysical setting in which they occur.

MA 4B	**Guideline**
RMA-1	When RMAs are functioning properly, project activities should be designed to maintain those conditions.
G-101	When RMAs are not properly functioning, project activities should be designed to improve those conditions.
	Project activities in RMAs should not result in long-term degradation to aquatic and riparian conditions at the watershed scale. Limited short term or site-scale effects from activities in RMAs may be acceptable when they support, or do not diminish, long-term benefits to aquatic and riparian resources.

Invasive Species: several plan components address the importance and strategies to reduce the abundance and probability of invasive species and to maintain the composition and diversity of native species. Several but not all plan components addressing invasive plants:

1.5 Invasive Species

Desired Condition: Healthy, native, and desired non-native plant and animal communities and high quality habitat dominate the landscape and are resilient given current and projected climate conditions. Invasive species are absent or occur in small areas. Invasive species do not jeopardize the ability of the national forests to provide the goods and services communities expect or the habitat that plant and animal community diversity depends upon. New invasive species resulting from changes in plant and animal habitats due to changes in climate occur only at low levels.

NOX-1	**Standard**

S-9	Herbicides other than the 10 listed in the Region 6 2005 Invasive Plant Program FEIS (USDA 2005) may be used if project scale analysis shows that the potential for adverse effects to people and the environment is less than or equal to that of the aforementioned 10 herbicides. Adjuvants (e.g., surfactants and dyes) and inert ingredients shall be limited to those reviewed in Forest Service hazard and risk assessment documents, such as Bakke 2003 and SERA 1997a, 1997b.
NOX-2 G-29 *Changed to standard*	**Standard** Materials used for construction or restoration projects on National Forest System lands shall be free of invasive species.
NOX-3 S-10	**Standard** State certified weed-free straw and mulch shall be used for projects conducted or authorized on National Forest System lands.
NOX-4 G-30 *Changed to standard*	**Standard** Pelletized or certified weed-free feed shall be used on National Forest System lands.
NOX-5 G-31 *Changed to standard*	**Standard** Gravel, fill, sand stockpiles, and borrow materials shall be free of invasive species before use or transport.
NOX-6 G-32 *Changed to standard*	**Standard** Native plant materials shall be used for restoration activities where timely natural regeneration of the native plant community is not likely to occur. Non-native non-persistent plant species may be used in the following situations: emergency situations to protect basic resource values, as an interim non-persistent measure to aid re-establishment of native plant communities if native plant material is not available, or in permanently altered plant communities.
NOX-7 G-33 *Changed to standard*	**Standard** Aerial application of herbicides shall not be authorized or allowed within 300 feet of developed campgrounds, recreation residences, or private land unless otherwise authorized by adjacent landowners.
NOX-8 G-34 *Changed to standard*	**Standard** The application of pesticides shall be conducted to minimize or eliminate direct or indirect negative effects to non-target species and water quality.
NOX-9 G-35 *Modified*	**Standard** When equipment, such as helicopter dip buckets, bulldozers, skidders, graders, backhoes, and dump trucks, (conducted by or authorized by written permit from the Forest Service) is used outside the Forest Service road prism, the equipment shall be cleaned of invasive species prior to entering NFS lands. This standard does not apply to initial attack of wildfire (unplanned fire) or other emergency situations where inspection and cleaning would delay response time.

and changed to standard	
NOX-10 G-36 *Changed to standard*	**Standard** All ground disturbing activities shall be conducted to minimize or prevent the potential spread or establishment of invasive species.

Marsh Size: It is likely that wetland size may increase with implementation of Alternative B. It is important that especially in known locations of Marsh wren, increasing marsh size is encouraged.

Summary: Likely due to implementation of Alternative B, viability for Marsh wren will remain the same as current or increase due to the plan components that may lead to increased abundance of source habitat, increased marsh size, and potential for reduction and or limiting potential growth of exotic vegetation.

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WILSON'S SNIPE (*Gallinago delicata*) MODEL APPLICATION AND ASSESSMENT RESULTS

Introduction

Wilson's snipes were chosen as a focal species to represent species associated with habitats in the Marsh/Wet Meadow Group of the Wetland Family. Wilson's snipes have one of the widest distributions for species in these habitats. However, habitats for species in this group are not abundant in eastern Oregon, and they were patchily distributed especially on USFS lands. Wilson's snipes generally forage in shallow water and mudflats; major risks to the species were draining, filling, and degradation of marshes; and environmental contaminants. Although Wilson's snipes may be present in the planning area year round, this assessment is for nesting habitat.

Model Description

Source Habitat

Breeding habitat of Wilson's snipes has been characterized as sedge bogs, fens, and alder or willow wetlands (Tuck 1972, McKibben and Hofmann 1985). Banner and Schaller (2001) interpreted these associations to equate to palustrine emergent (PEM) and palustrine scrub shrub (PSS) wetlands as described by Cowardin et al. (1979).

We used three data sources to define source habitat for the Wilson's snipe:
National Wetlands Inventory: PSS and PEM
Forest Service PVG: Upland Wetland, Riparian Herbland, Riparian Shrubland
Ecological Systems:

North Pacific Bog and Fen
North Pacific Shrub Swamp
North American Arid West Emergent Marsh
Rocky Mountain Subalpine-Montane Mesic Meadow
Ruderal Wetland
Rocky Mountain Alpine-Montane Wet Meadow
Columbia Plateau Vernal Pool
Rocky Mountain Subalpine-Montane Fen
Temperate Pacific Subalpine-Montane Wet Meadow

We assumed a departure of one class (Class -1). See part 1 methods, '*calculation of hrv for riparian species*'.

Wetland Size

Gibbs et al. (1991) reported a positive relationship between the presence of snipe during the breeding season and size of wetland (i.e., <1 ha – >20 ha). Banner and Schaller (2001) suggested that wetlands <3 ha had limited value as habitat for snipe. Based on those findings we characterized wetland size with the following classes:

- small – <10 ha mean size of palustrine, emergent (PEM) or palustrine scrub shrub (PSS) wetlands within a watershed.
- large – ≥10 ha mean size of palustrine, emergent (PEM) or palustrine scrub shrub (PSS) wetlands within a watershed.

Calculation of Historical Conditions

Values of the model variables were set with the following values to estimate historical habitat conditions:

- Departure of source habitat from HRV – Class 1
- Wetland size – class large

Current amount of habitat in each watershed was increased by 20%.

Watershed Index Model

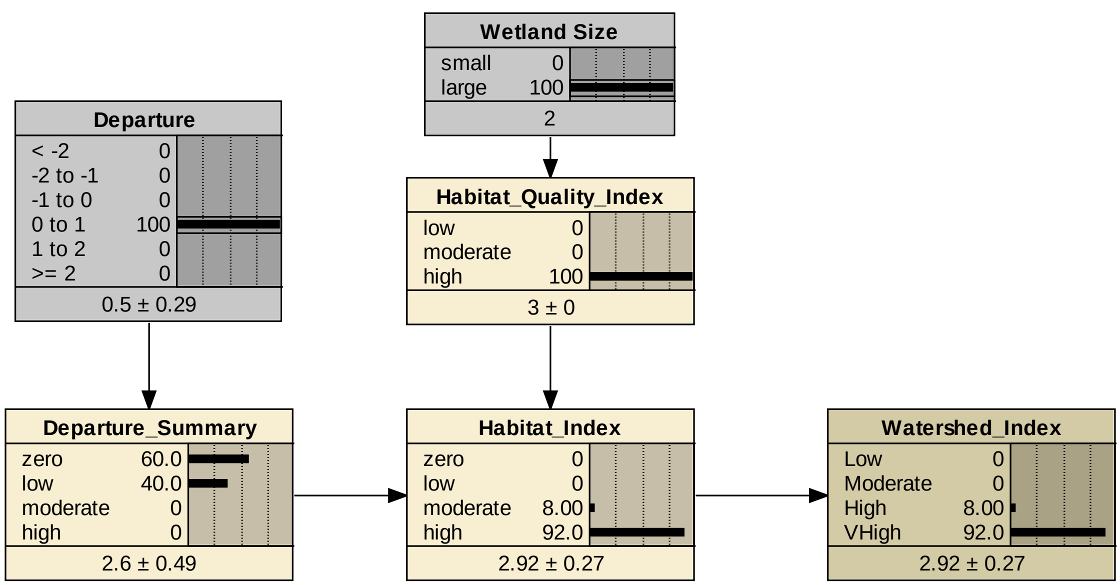

Figure —Focal species assessment model for Wilson's snipes.

Relative Sensitivity of Model to Variables

Table—Relative sensitivity of Watershed Index values to variables in the model for Wilson's snipe

Variable	Sensitivity rank
Habitat departure	1
Wetland size	2

Watershed Index Model Application

Habitat Influences

Ninety one watersheds within the 3 planning areas provided >3 ha of habitat for Wilson's snipe and were included in our analysis. We assumed that all watersheds with habitat have experienced habitat loss from historical conditions of 20% (see part1, page 10). Factors that influenced the WI scores included the amount of source habitat and size of wetland source habitat. Gibbs et al. (1991) and Banner and Schaller (2001) reported positive relationships between the presence of snipe and size of wetland. Sixty percent (n = 55) of the watersheds had small mean wetland size (<10 ha); 40% (n = 36) had large mean wetland size (≥10 ha).

	Y0_Acres
UMA	8,180
WAW	29,595
MAL	18,791
Blue Mtns	52,992

Table: Approximate area (acres) by National Forest modeled in the Viability Assessment. (Some watersheds contribute to more than one NF)

Assessment Results

The Viability Outcome model incorporated the weighted WI (WWI) scores (described earlier), and a habitat distribution index. The WWI scores indicated that the current habitat capability for Wilson's snipe within the planning area was 68% of the historical capability. Dispersal across the planning area was not considered an issue for this species. All clusters contained at least 1 watershed with >40% of the median amount of historical source habitat (median was calculated across all watersheds with source habitat). Sixty four percent (n = 58) of the watersheds currently had >40% of the median amount of historical source habitat. Under those circumstances there was a 67% probability that the current sustainability outcome for Wilson's snipes was class B, indicating habitat was broadly distributed and abundant, but there were gaps where suitable environments were absent or only present in low abundance. It is likely that other species associated with habitats in the Marsh/Wet Meadow Group of the Wetland Family had similar outcomes.

Historically, dispersal across the planning area was not considered an issue for this species. All clusters contained at least 1 watershed with >40% of the median amount of historical source habitat (median was calculated across all watersheds with source habitat). Sixty-six percent (n= 60) of watersheds had >40% of the median amount of historical source habitat. Under those circumstances there was a 60% probability that the historical viability outcome for Wilson's snipes was class A and a 28% probability that the historical viability outcome was class B indicating habitat was broadly distributed and abundant.

In summary, under historical conditions, Wilson's snipes and other species associated with habitats in the Marsh/Wet Meadow Group of the Wetland Family were likely well-distributed throughout the planning area; currently they continue to be well-distributed, but there were gaps where suitable environments were absent or only present in low abundance (e.g., high quality habitats were clustered in the eastern and central portions of the planning area). However, these habitats were estimated to be large enough and close enough together to permit dispersal among subpopulations and to allow the species to potentially interact as a metapopulation in those areas. However, some subpopulations were so disjunct or of such low density that they were essentially isolated from other populations (e.g., southwestern portion of the planning area).

Alternative B Analysis
Assessment inputs:
Source Habitat – wetlands/wet meadows
Wetland Size

Both of these input attributes could change as a result of the implementation of any of the alternatives developed for the plan revision. Because the alternatives are not as site specific as to identify any specific trend in the abundance of larger trees or any future road or trail changes (spatially), we are unable to run the focal species assessment model on any particular outcome at any future time period.

Wilson's snipe are a riparian species. Under Alternative B The desired conditions for 1.1 Watershed Function are described by Key Watersheds and All Watersheds in ***1.1.1 Hydrologic Function, 1.1.2 Riparian Function, 1.1.3 Wetland Function, 1.1.4 Stream Channel Function, and 1.1.5 Aquatic Habitat Function all address restoring and improving*** hydrologic and riparian function which should improve conditions for snipe and other species associated with these wetland/ riparian habitats. Additional standards and guidelines encourage protection of riparian/wetland areas.

Source Habitat:. Abundance of source habitat would likely improve especially in key watersheds and Management area 4B due to overall goal of restoring and improving hydrologic and riparian function. Several plan components address the desire to maintain or increase wetland and riparian/marsh/wet meadow habitat including:

1.1.3 Wetland Function
Desired Condition: The extent and diversity of wetland types in the Blue Mountains is maintained or increased. **Scale:** Subbasin. The surface and subsurface flow paths that support wetland habitats are undisturbed. The timing and duration of inundation of wetlands are within natural ranges. Plant species composition in wetlands is characteristic of the biophysical setting in which they occur.

MA 4B	**Guideline**
RMA-1	When RMAs are functioning properly, project activities should be designed to maintain those conditions.
G-101	When RMAs are not properly functioning, project activities should be designed to improve those conditions.
	Project activities in RMAs should not result in long-term degradation to aquatic and riparian conditions at the watershed scale. Limited short term or site-scale effects from activities in RMAs may be acceptable when they support, or do not diminish, long-term benefits to aquatic and riparian resources.

Wetland Size: It is likely that wetland size may increase with implementation of Alternative B. It is important that especially in known locations of Wilson's snipe, increasing wetland size is encouraged.

Summary: Likely due to implementation of Alternative B, viability for Wilson's snipe will remain the same as current or increase due to the plan components that may lead to increased abundance and quality of source habitat, and increased wetland size.

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