DRAFT
SEW ECOREGION/SUBBASIN MANAGEMENT PLAN
TERRESTRIAL RESEARCH, MONITORING AND EVALUATION
Developed by: Washington Department of Fish and Wildlife
April 2004

Note: This document has not been reviewed by the Subbasin Planning Team, subbasin lead(s), nor local technical staff outside of WDFW.

INTRODUCTION

As described in the previous sections of the Subbasin Management Plan, the process used to develop wildlife assessments and management plan objectives and strategies was based on the need for a landscape level holistic approach to protecting the full range of biological diversity at the Ecoregion scale. Attention was focused on the size and condition of core areas (subbasin scale), maintaining physical connections between core areas, and providing buffer zones surrounding core areas to ameliorate impacts from incompatible land uses. As most wildlife populations extend beyond subbasin or other political boundaries, this "conservation network" must contain habitat of sufficient extent, quality, and connectivity to ensure long-term viability of obligate/focal wildlife species. Subbasin planners recognized the need for large-scale planning that would lead to effective and efficient conservation of wildlife resources.

In response to this need, Ecoregion planners approached subbasin planning at two scales. The landscape scale emphasized focal habitats and associated species assemblages that are important to Ecoregion wildlife managers while specific focal habitat and/or species needs were identified at the subbasin level. For example, Asotin Subbasin planners focused only on riparian/riverine wetlands, ponderosa pine, and interior grasslands while recognizing that other habitat types, such as mixed conifer forest, cover a fair portion of the forest habitat zone, are also important and should be included in future iterations of this plan.

In developing Subbasin plans, managers made the following assumptions which served to focus planning efforts:

1. Ecoregion/subbasin planners assumed that by focusing resources primarily on selected focal habitats (riparian/riverine wetland, ponderosa pine, shrubsteppe, and interior grassland habitats), the needs of most listed and managed terrestrial and aquatic species would be addressed during this planning period. Additional habitats and species assemblages will be addressed as needed in plan updates.
2. It was assumed that species requirements (umbrella species concept) can be used to guide ecosystem management. The main premise is that the requirements of a demanding species assemblage encapsulate those of many co-occurring less demanding species. This assumption guided selection of the subbasin focal wildlife species. Focal wildlife species were selected to represent a range of desired management conditions for each focal habitat within the subbasins. Focal species population trends will be monitored and evaluated over time. The results of these species monitoring and evaluation efforts are expected to function as potential performance measures to monitor and evaluate the results of implementing future management strategies and actions on focal habitats.
3. Focal habitats are functional if a focal species assemblage's recommended management conditions are achieved.

4. Focal species assemblages adequately represent focal habitats.

Working hypotheses for focal habitat types were developed based on factors that affect focal habitats (the term, “factors that affect habitat” is synonymous with “limiting factors” for wildlife species). Ecoregion/subbasin level working hypotheses are statements that assist subbasin planners and their communities to clearly articulate a program aimed at addressing the most pressing needs in a given area. The basis for the hypothesis is the proximate or major factors affecting focal habitats as described within individual subbasin assessments and summarized in Section 4.3 (Ashley and Stovall 2004). The relationship subbasin planners attempted to address is that between management objectives, strategies or actions, and recommended (desired future) focal habitat conditions necessary to meet habitat and/or wildlife objectives and goals. These relationships are tested through implementation, followed by monitoring and evaluation. Ultimately, adaptive management is used to respond to the outcomes of these “tests” of “working hypotheses.”

The Ecoregion assessment and inventory synthesis cycle is illustrated in Figure 1. Movement through the cycle is summarized below:

1. Document and compare historic and current conditions of focal habitats to determine the extent of change.
2. Review habitat needs of focal wildlife species assemblages to assist in characterizing the “range” of recommended future conditions for focal habitats. Combine species assemblages’ habitat needs with desired ecological/habitat objectives to determine recommended future habitat conditions.
3. Determine the factors that affect habitat conditions and species assemblages (limiting factors) and compare to current and recommended future habitat conditions to establish needed future action/direction.
4. Develop strategies to address habitat “needs” and “road blocks” to obtaining biological goals.
5. Review strategies and compare to existing projects, programs, and regulatory statutes (Inventory) to determine the level at which existing inventory activities address, or contribute towards amelioration of factors that affect habitat conditions and species assemblages.
6. Develop goals and objectives to address strategies that define the key components of the management plan.

Post subbasin planning algorithms (Research, Monitoring and Evaluation) are described in 7 through 9 below.

7. Projects are approved, based on management plan strategies, goals, and objectives, and implemented.
8. Habitat and species response to habitat changes are monitored at the project level and compared to anticipated results.
9. Adaptive management principles are applied as needed, which leads back to the “new” current conditions restarting the cycle.

The Research Monitoring and Evaluation (RME) Plan lays out the framework that will allow for evaluation of the efficacy of employed strategies in achieving corresponding focal habitat objectives for the subbasin, as per post subbasin planning algorithms 8 and 9. The RME plan emphasizes cooperative efforts among managers and stakeholders, and is designed to:

- evaluate success of focal habitat management strategies, via monitoring of focal wildlife species (The results of focal species monitoring and evaluation efforts are expected to function as potential performance measures to monitor and evaluate the results of implementing management strategies and actions on focal habitats).

- determine if management strategies undertaken are achieving recommended range of habitat management conditions, via monitoring and assessment of habitat conditions over time

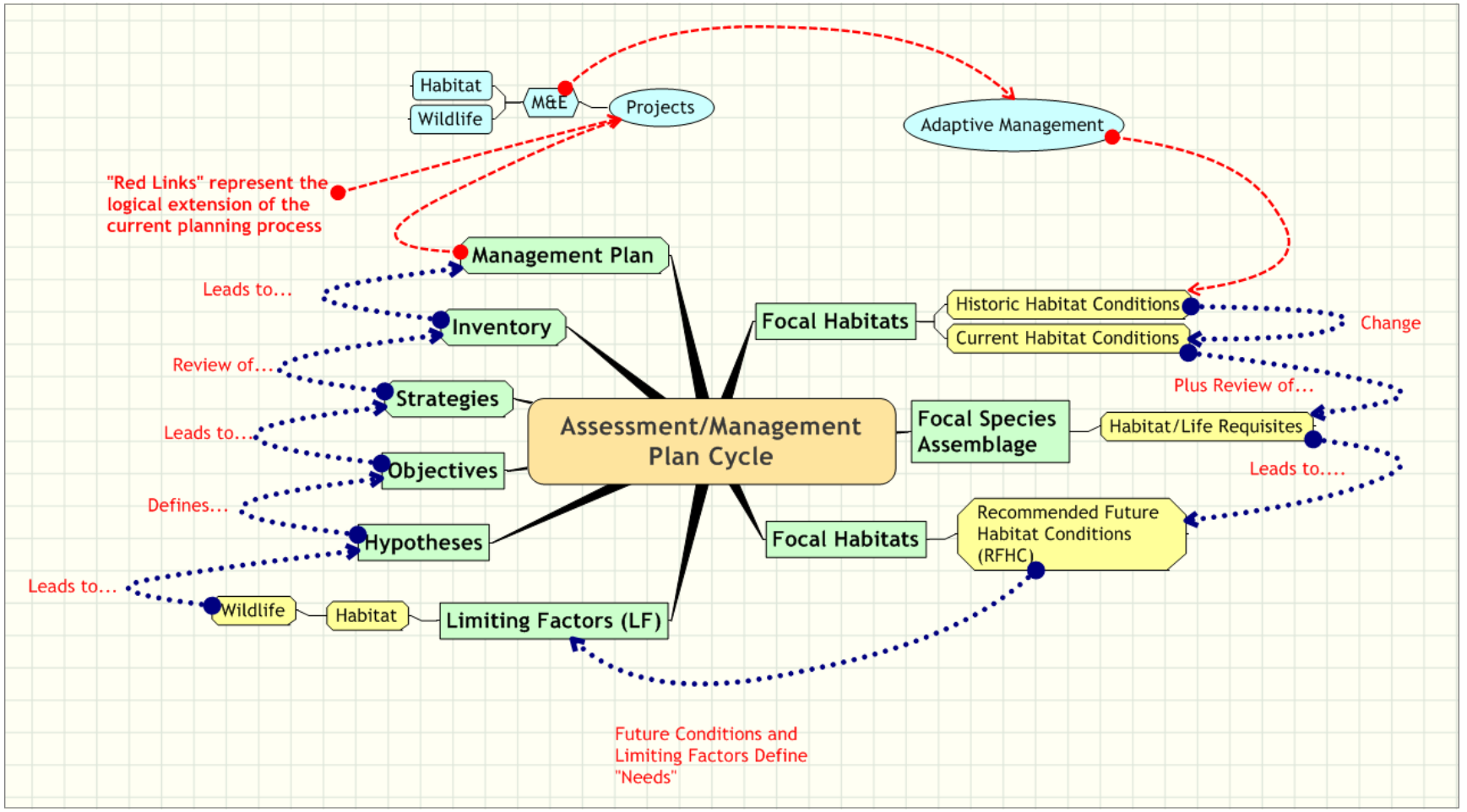

Figure 1. Ecoregional planning (Inventory and Assessment), implementation (REM), and Adaptive Management strategy.

- allow for evaluation of the assumptions and working hypotheses upon which the management plan is based, by determining if a correlation does indeed exist between focal habitat management conditions and focal species population trends

Finally, the Adaptive Management portion of this REM plan outlines a strategy that will allow managers to adjust and/or focus management activities within the subbasin, based upon monitoring and evaluation data. The feedback loop thus formed will facilitate development of future iterations of the subbasin management plan.

RESEARCH, MONITORING AND EVALUATION PLAN

The Research, Monitoring, and Evaluation (RME) plan for the subbasin is intended as a tool that will allow managers to evaluate the efficacy of employed strategies in achieving corresponding focal habitat and species objectives for the subbasin. A monitoring component should be inherent in every project proposal and management activity, to enable this evaluation. If implemented, elements of the plan will also facilitate coordination and tracking of management activities within the subbasin, allow for periodic review of progress, and provide a basis for recommended adjustments to management direction over time (adaptive management).

The RME plan, as presented, consists of a variety of quantitative elements, ranging from scientific wildlife and vegetation surveys, spacial analyses of project location and acreage, to simple enumeration of landuse projects/regulations commented upon by cooperating agencies.

Implementation of the Subbasin Plans is ultimately the responsibility of all managers and stakeholders who participated in its development, and will require the long-term commitment of all subbasin managers, as well as adequate funding. It is recommended that this group form an “Implementation Oversight Committee”, to track and guide research, monitoring and reporting activities included in the plan.

Organization of the RME plan is in two main sections: Existing Data Gaps and Research Needs, and Monitoring and Evaluation.

EXISTING DATA GAPS AND RESEARCH NEEDS

In the course of subbasin plan development, a number of data gaps were identified. Some of these gaps will be filled as data is collected via the monitoring and evaluation process as the plan is implemented. Others will require formal research efforts to address. Data gaps and research needs identified during development of the subbasin plan are listed in Table 1.

As part of the adaptive management philosophy of subbasin planning, managers believe that additional research needs not yet identified will become apparent over time. These needs will be addressed in future subbasin plan iterations.

Table 1. Data Gaps and Research Needs, Blue Mountains Ecoregion, as identified during subbasin planning.

RESEARCH NEEDS AND DATA GAPS	STRATEGY TO ADDRESS	AGENCY/ PERSONNEL
GENERAL (ASOTIN, TUCANNON, L. SNAKE, WALLA WALLA SUBBASINS)		
Testing of assumption that focal habitats are functional if a focal species assemblage's recommended management conditions are achieved		Coordinated government & NGO effort
Testing of assumption that selected species assemblages adequately represent focal habitats		Coordinated government & NGO effort
Current, broad-scale habitat data (Sec. 4.1.3)	Spatial data collection and GIS analysis	Coordinated government & NGO effort
RIVERINE RIPARIAN WETLANDS (ASOTIN, TUCANNON, L. SNAKE, WALLA WALLA SUBBASINS)		
Research Needs		
Refinement of recommended management conditions for Riparian Wetlands (Sec 5.2.3.4)	Research need; use for update to future subbasin plan iterations	Coordinated government & NGO effort.
Data are needed on all aspects of yellow warbler nesting ecology, especially the impact of cowbird parasitism in different landscapes.		Coordinated government & NGO effort
Data Gaps		
Accurate habitat type maps are needed to improve assessment quality and support management strategies and actions, including, updated and fine resolution historic/current riparian wetland data and GIS products e.g., structural conditions and KEC ground-truthed maps	Coordinated, standardized monitoring efforts; Spatial data collection and GIS analysis	Subbasin managers
Riparian habitat quality data. Assessment data bases do not address habitat quality.	Monitoring activities	Subbasin managers
Refined habitat type maps including current CREP, WHIP program/field delineations	Spatial data collection and GIS analysis	Subbasin managers

RESEARCH NEEDS AND DATA GAPS	STRATEGY TO ADDRESS	AGENCY/ PERSONNEL
GIS soils products including wetland delineations	Spatial data collection and GIS analysis	Subbasin managers
Local population/distribution data for yellow warbler	Species Monitoring, Spatial data collection, and GIS analysis	WDFW, Subbasin managers
Local population/distribution data for beaver	Species Monitoring, Spatial data collection and GIS analysis	WDFW, Subbasin managers
PONDEROSA PINE (ASOTIN, TUCANNON, L. SNAKE, WALLA WALLA SUBBASINS)		
Research Needs		
Data are needed on all aspects of white-headed woodpecker nesting ecology and habitat use within the Blue Mountains Ecoregion		Coordinated government & NGO effort
Data are needed on all aspects of flammulated owl nesting ecology and habitat use, specifically related to the size, configuration, and abundance of grassy openings for foraging and clumped thickets of sapling/pole trees for roosting		Coordinated government & NGO effort
Research to determine if restored sites attract white-headed woodpeckers and provide viable habitat, to include recommendations on effective treatment conditions		Coordinated government & NGO effort
Research to determine whether an intensively harvested landscape that meets snag and large tree objectives support viable white-headed woodpecker populations		Coordinated government & NGO effort
Research to determine whether a managed site attracts flammulated owls and provides viable habitat. Identification of the most effective treatment processes and conditions most effective.		Coordinated government & NGO effort
Research to improve agricultural damage assessment procedures, develop improved damage control and prevention		Coordinated government & NGO effort

RESEARCH NEEDS AND DATA GAPS	STRATEGY TO ADDRESS	AGENCY/ PERSONNEL
Data Gaps		
Refinement of recommended management conditions for Ponderosa pine (SeC. 5.2.1.4): collect current ponderosa pine structural condition/habitat variable data	Management Objective 2 for Ponderosa pine	Subbasin managers
Accurate habitat type maps are needed to improve assessment quality and support management strategies and actions, including, updated and fine resolution historic/current ponderosa pine data and GIS products e.g., structural conditions and KEC ground-truthed maps	Coordinated, standardized monitoring efforts; Spatial data collection and GIS analysis	Subbasin managers
Habitat quality data e.g., ground truth IBIS data. Assessment data bases do not address habitat quality.	Coordinated, standardized monitoring efforts); Spatial data collection and GIS analysis	Subbasin managers
Finer resolution GIS habitat type maps that include structural component and KEC data.	Coordinated, standardized monitoring efforts); Spatial data collection and GIS analysis	Subbasin managers
GIS soils products	Spatial data collection and GIS analysis	Subbasin managers
Identify current distribution and population levels of flammulated owls	Species Monitoring, Spatial data collection, and GIS analysis	WDFW, Subbasin managers
Identify current and potential areas of high quality flammulated owl habitat (short-term strategy i.e., <2 years).	Habitat Monitoring, Spatial data collection, and GIS analysis	WDFW, Subbasin managers
Conduct thorough inventory of white-headed woodpecker distribution within the Blue Mountains Ecoregion, to determine the species' current distribution, population levels and population trends	Species Monitoring, Spatial data collection, and GIS analysis	WDFW, Subbasin managers

RESEARCH NEEDS AND DATA GAPS	STRATEGY TO ADDRESS	AGENCY/ PERSONNEL
INTERIOR GRASSLANDS (ASOTIN, TUCANNON, L. SNAKE, WALLA WALLA SUBBASINS)		
Research Needs		
Research to determine the ability of grassland habitat areas to support populations of sharp-tailed grouse and other interior grassland focal species. Determine the number of grassland habitat areas needed to establish and maintain 3 meta-populations within 3 subbasins within the Blue Mountains Ecoregion		Coordinated government & NGO effort
Investigate the feasibility of re-establishing Columbian Sharp-tailed Grouse at historic leks which are no longer occupied. Identify reintroduction sites where there is adequate habitat to meet year-round needs; release marked birds and track success		Coordinated government & NGO effort
Data are needed on all aspects Grasshopper sparrow nesting ecology, particularly the relationship between grazing and productivity		Coordinated government & NGO effort
Determine habitat patch size required by grasshopper sparrows in the Northwest		Coordinated government & NGO effort
Investigate the effects of different grazing strategies and prescribed burning on hardwood draw vegetation and response by breeding birds, with emphasis on sharp-tailed grouse		Coordinated government & NGO effort
Research to establish mule deer herd movements and habitat use between lowland agricultural areas and the Snake River breaks, including use of CRP lands	Research/Monitoring	Coordinated government & NGO effort
Data are needed on whether cowbirds are impacting Grasshopper sparrow productivity and, if so, in what landscape and land use context		Coordinated government & NGO effort
Data Gaps		
Accurate habitat type maps are needed to improve assessment quality and support management strategies and actions, including, updated and fine resolution historic interior grassland data and GIS products e.g., structural	Coordinated, standardized monitoring efforts; Spatial data collection and	Subbasin managers

RESEARCH NEEDS AND DATA GAPS	STRATEGY TO ADDRESS	AGENCY/ PERSONNEL
conditions and KEC ground-truthed maps	GIS analysis	
Habitat quality data. Assessment data bases do not address habitat quality	Coordinated, standardized monitoring efforts); Spatial data collection and GIS analysis	Subbasin managers
Refined habitat type maps including current CRP program/field delineations	Coordinated, standardized monitoring efforts); Spatial data collection and GIS analysis	Subbasin managers
GIS soils products, including wetland delineations	Spatial data collection and GIS analysis	Subbasin managers
Local population/distribution distribution for grasshopper sparrows	Species Monitoring, Spatial data collection, and GIS analysis	WDFW, Subbasin managers
Improve data collection for mule deer and development of a mule deer population model	Species Monitoring	WDFW, Subbasin managers
SHRUBSTEPPE (L. SNAKE, WALLA WALLA SUBBASINS)		
Research Needs		
Restoration techniques for degraded shrubsteppe habitat (e.g., cheatgrass infested areas		WDFW, Subbasin managers
Data are needed on all aspects sage sparrow nesting ecology, especially area requirements to maintain populations		WDFW, Subbasin managers
Data are needed on all aspects of Brewer's sparrow nesting ecology, particularly relationship to livestock grazing and pesticide use		WDFW, Subbasin managers
An assessment of the viability of small populations of Brewer’s sparrow and sage thrasher in fragments of habitat versus those in large contiguous blocks		WDFW, Subbasin managers
Data are needed on all aspects of sage thrasher nesting ecology, particularly their response to livestock grazing		WDFW, Subbasin managers

RESEARCH NEEDS AND DATA GAPS	STRATEGY TO ADDRESS	AGENCY/ PERSONNEL
Data Gaps		
Accurate habitat type maps are needed to improve assessment quality and support management strategies and actions, including, updated and fine resolution historic/current shrubsteppe data and GIS products e.g., structural conditions and KEC ground-truthed maps	Coordinated, standardized monitoring efforts; Spatial data collection and GIS analysis	Subbasin managers
Habitat quality data. Assessment data bases do not address habitat quality	Coordinated, standardized monitoring efforts; Spatial data collection and GIS analysis	Subbasin managers
Refined habitat type maps including current CRP program/field delineations	Coordinated, standardized monitoring efforts; Spatial data collection and GIS analysis	Subbasin managers
GIS soils products, including wetland delineations	Spatial data collection and GIS analysis	Subbasin managers
Local population/distribution distribution for sage sparrow	Species Monitoring, Spatial data collection, and GIS analysis	WDFW, Subbasin managers
Local population/distribution distribution for sage thrasher	Species Monitoring, Spatial data collection, and GIS analysis	WDFW, Subbasin managers
Evaluate the role of fire, mowing, and other management treatments to maintain/improve shrupsteppe habitat quality	Coordinated, standardized monitoring efforts	Subbasin managers

MONITORING AND EVALUATION: FOCAL HABITAT AND SPECIES MONITORING METHODOLOGIES

Recommended monitoring and evaluation strategies contained below, including sampling and data analysis and storage, are derived from national standards established by Partners in Flight for avian species (Ralph et al, 1993, 1995) and habitat monitoring (Nott et al, 2003). Deer and elk sampling methodology follow standard protocols established by the Washington Department of Fish and Wildlife (pers. comm., Fowler). In addition, protocols for specific vegetation monitoring/sampling methodologies are drawn from USDA Habitat Evaluation Procedure standards (USFWS 1980a and 1980b). A common thread in the avian monitoring strategies that follow is the establishment of permanent roadside and off-road census stations to monitor bird population and habitat changes.

While monitoring protocols are specifically described for each focal avian species, it is important to note that the methodologies allow for, and will be utilized to track avian community composition over time. Depending upon the site, habitat management activities may not achieve "desired habitat conditions" for many years, and thus may not be capable of supporting populations of focal species until that time. The species monitoring methodologies described will allow subbasin managers to track and quantify changes in avian communities composition as plant community succession occurs, allowing evaluation of the efficacy of specific management actions.

Focal habitat and species monitoring strategies outlined in the following sections have been developed to allow subbasin managers to:

- Utilize statically rigorous sampling methods to establish links between habitat enhancement prescriptions, changes in habitat conditions and target wildlife population responses;
- Allow description of vegetative trends through time, via systematic collection and analysis of plant species frequency, abundance, density, height, and percent cover data;
- Evaluate the effectiveness of exotic weed control methods, allowing for adjustment of weed control plans.

In addition to defining habitat and species population trends, monitoring will also be used to determine if management actions have been carried out as planned (implementation monitoring). In addition to monitoring plan implementation, monitoring results will be evaluated to determine if management actions are achieving desired goals and objectives (effectiveness monitoring) and to provide evidence supporting the continuation of proposed management actions. Areas planted to native shrubs/trees and/or seeded to herbaceous cover will be monitored twice a year to determine shrub/seeding survival, and causes of shrub mortality and seeding failure i.e. depredation, climatic impacts, poor site conditions, poor seed/shrub sources.

Monitoring of habitat attributes and wildlife (focal) species in this manner will provide a standardized means of tracking progress towards conservation, not only within the Subbasins of the Blue Mountain Ecoregion, but within a national context as well. Monitoring will provide essential feedback for demonstrating adequacy of conservation efforts on the ground, and guide the adaptive management component that is inherent in the subbasin planning process.

Specific methodology for selection of Monitoring and Evaluation sites within all focal habitat types follows a probabilistic (statistical) sampling procedure, allowing for statistical inferences to be made within the area of interest. The following protocols describe how M&E sites will be

selected (from WDFW response to ISRP http://www.cbfwa.org/files/province/cascade/projects/199609400resp.pdf):

- Vegetation/HEP monitoring and evaluation sites are selected by combining stratified random sampling elements with systematic sampling. Project sites are stratified by cover types (strata) to provide homogeneity within strata, which tends to reduce the standard error, allows for use of different sampling techniques between strata, improves precision, and allows for optimal allocation of sampling effort resulting in possible cost savings (Block et al. 2001). Macro cover types such as shrub-steppe and forest are further sub-cover typed based on dominant vegetation features i.e., percent shrub cover, percent tree cover, and/or deciduous versus evergreen shrubs and conifer versus deciduous forest. Cover type designations and maps are validated prior to conducting surveys in order to reduce sampling inaccuracies.
- Pilot studies are conducted to estimate the sample size needed for a 95% confidence level with a 10% tolerable error level (Avery 1975) and to determine the most appropriate sampling unit for the habitat variable of interest (BLM 1998). In addition, a power analysis is conducted on pilot study data (and periodically throughout data collection) to ensure that sample sizes are sufficient to identify a minimal detectable change of 20% in the variable of interest with a Type I error rate # 0.10 and P = 0.9 (BLM 1998, Hintze 1999, Block et al. 2001). M&E includes habitat trend condition monitoring on the landscape scale (Tier 1-HEP) and plant community monitoring (Tier 2) i.e., measuring changes in vegetative communities on specific sites.
- For HEP surveys, specific transect locations within strata are determined by placing a Universal Transverse Mercator (UTM) grid over the study area (strata) and randomly selecting “X” and “Y” coordinates to designate transect start points. Random transect azimuths are chosen from a computer generated random number program, or from a standard random number table. Data points and micro plots are systematically placed along the line intercept transect at assigned intervals as described in Part 2 – monitoring section of the proposal. Sample sizes for statistical inferences are determined by replication and systematic placement of lines of intercept within the strata with sufficient distance between the lines to assume independence and to provide uniform coverage over the study site.

- Permanent vegetation monitoring transect locations are determined by placing a UTM grid over the strata and randomly selecting “X” and “Y” coordinates to designate plot locations as described for HEP surveys. One hundred meter baseline transect azimuths are randomly selected from a random numbers table. Ten perpendicular 30 meter transects are established at 10 meter intervals along the baseline transect to form a 100m x 30m rectangle (sample unit). Micro plot and shrub intercept data are collected at systematic intervals on the perpendicular transects.

Literature:

Avery, T.E. 1975. Natural resource measurements (second edition). McGraw Hill Book Company. New York, NY.

[BLM] Bureau of Land Management. 1998. Measuring and monitoring plant populations, BLM Technical Reference 1730 – 1. BLM, Denver, CO. 447p.

Block, W.M., W.L. Kendall, M.L. Morrison, and M.D. Strickland. 2001. Wildlife study design. Springer – Verlag New York, Inc., New York, NY. 210 p.

Hintze, J.L. 1999. NCSS/PASS 2000. Number cruncher statistical systems. Dr. Jerry L. Hintze. Kaysville, Utah.

Nott, R., D.F. DeSante, and N. Michel. 2003. Monitoring Avian Productivity and Survivorship (MAPS) Habitat Structure Assessment (HAS) Protocol 2003. The Institure for Bird Populations, Pt. Reyes Station, CA.

Ralph, C.J., G.R. Geupel, P. Pyle, T.E. Martin, and D.F. DeSante. 1993. Field methods for monitoring landbirds. USDA Forest Service Publication, PSW-GTR 144. Albany, CA.

Ralph, C.J., S. Droege, and J.R. Sauer. 1995. Managing and monitoring birds using point counts: standards and applications. In C. J. Ralph, J. R. Sauer and S. Droege (Eds.), Monitoring Bird Populations by Point Counts. USDA Forest Service Publication, Gen. Tech. Rep. PSW-GTR-149, Albany, CA.

USFWS. 1980a. Habitat as a Basis for Environmental Assessment, Ecological Services Manual (ESM) 101. Division of Ecological Services, U.S. Fish and Wildlife Service, Department of the Interior, Washington, D.C. Unnumbered.

USFWS. 1980b. Habitat Evaluation Procedures (HEP), Ecological Services Manual (ESM) 102. Division of Ecological Services, U.S. Fish and Wildlife Service, Department of the Interior, Washington, D.C. Unnumbered.

Eastside (Interior) Riparian/Riverine Wetlands (Asotin, Tucannon, L. Snake, Walla Walla Subbasins)

Focal Species: Yellow Warbler (*Dendroica petechia*), Great Blue Heron (*Ardea herodias*), and American Beaver (*Castor canadensis*)

Overall Habitat and Species Monitoring Strategy: Establish monitoring program for protected and managed Eastside (Interior) Riperian/Riverine Wetland sites to monitor focal species population and habitat changes and evaluate success of efforts.

Overall Habitat and Species Monitoring Strategy: Establish permanent roadside and off-road censusing stations to monitor bird population and habitat changes.

Focal Habitat Monitoring:

Factors affecting habitat: 1.) Direct loss of riparian deciduous and shrub understory, 2.) Fragmentation of wetland habitat, 3.) agricultural and sub-urban development and disturbance, 4.) reduction in water quality, 5.) organochlorines such as dieldrin or DDE may cause thinning in egg shells which results in reproductive failure (Graber *et al*. 1978; Ohlendorf *et. al.* 1980; Konermann *et. al*. 1978) (Sec. 5.2.3.3.6).

Riparian Wetlands Working Hypothesis Statement: The proximate or major factors affecting this focal habitat type are direct loss of habitat due primarily to urban/agricultural development, reduction of habitat diversity and function resulting from exotic vegetation, livestock overgrazing, fragmentation and recreational activities. The principal habitat diversity stressor is the spread and proliferation of invasive exotics. This coupled with poor habitat quality of existing vegetation

have resulted in extirpation and or significant reductions in riparian habitat obligate wildlife species.

Recommended Range of Management Conditions:*

1. Forty (40) to sixty (60) percent tree canopy closure (cottonwood and other hardwood species)
2. Multi-structure/age tree canopy (includes trees less than 6 inches in diameter and mature/decadent trees)
3. Woody vegetation within 328 feet of shoreline
4. Tree groves greater than 1 acre within 800 feet of water (where applicable)
5. Forty to 80 percent native shrub cover (greater than 50 percent comprised of hydrophytic shrubs)
6. Multi-structured shrub canopy greater than 3 feet in height

*See aquatic definition of "riparian function" for additional desired attributes.

Focal Habitat Monitoring Strategies: Establish an inventory and long-term monitoring program for protected and restored Eastside (Interior) Riparian/Riverine wetlands to determine success of efforts.

1. Identify riparian wetland sites within the subbasin that support populations of focal species for this habitat.
2. Evaluate habitat site potential on existing public lands and adjacent private lands for protection of great blue heron habitat. (short-term strategy i.e., < 2 years).
3. Enhance habitat on public lands and adjacent private lands, employing strategies outlined in the subbasin management plans (intermediate strategy; 2 to 10 years) and
4. Identify high quality/functional privately owned riparian wetlands sites that are not adjacent to public lands (long-term strategy 2 to 15 years).
5. Establish permanent roadside and off-road censusing stations to monitor bird population and habitat changes.
6. Presence of all exotic weeds i.e., knapweed, yellow starthistle (Centaurea solistitialis), cheatgrass etc. will be mapped in GIS using Global Positioning System (GPS) equipment. This information will be used to develop an annual exotic vegetation control plan.

Sampling Design: HEP is a standardized habitat-analysis strategy developed by the U.S. Fish and Wildlife Service. It uses a variety of Habitat Suitability Indices (HSI) for select wildlife species to evaluate the plant community as a whole (Anderson and Gutzwiller 1996). Sites are stratified by cover type, and starting points are established using a random number grid. Minimum length of a HEP transect is 600 ft, and patches of cover must be large enough to contain a minimum transect without extending past a 100 foot buffer inside the edge of the cover type. (Riparian zone width within the subbasins may require modification of this 100 foot buffer requirement.)

In addition, at any permanently established avian species monitoring site established within the Riverine Wetland habitat, structural habitat conditions will be monitored every 5 years as per Habitat Structure Assessment protocol (Nott et al 2003).

Sampling Methods (USFWS 1980a and 1980b):

1. Herbaceous measurements are taken every 20 ft. on the right side of the tape (the right is always determined by standing at 0 ft and facing the line of travel). The sampling quadrat

is a rectangular 0.5m^2 microplot, placed with the long axis perpendicular to the tape, and the lower right corner on the sampling interval.

2. Shrub canopy cover is measured using a point intercept method and is visually estimated before starting each transect. If the total shrub cover is anticipated to be >20%, shrub data are collected every 5 ft (20 possible "hits" per 100 ft segment). If shrub canopy cover is anticipated to be <20%, data are collected every 2 ft (50 possible "hits" per 100 ft segment).

   Shrub height measurements are collected on the tallest part of a shrub that crosses directly above each sampling intercept mark. For shorter shrub classifications (i.e. all shrubs less than 3 feet), the tallest shrub is measured that falls within that category.

3. Tree canopy cover measurements are taken every ten feet along a transect. Basal and snag measurements are taken within a tenth-acre circular plot at the end of each 100 ft segment. The center point of the circular plot is the 100 ft mark of the transect tape, and the radius of the circle is 37.2 ft.

In addition, at any permanently established avian species monitoring site established within the Riverine Wetland habitat, structural habitat conditions will be monitored every 5 years as per Habitat Structure Assessment protocol (Nott et al 2003) (http://www.birdpop.org/DownloadDocuments/manual/HSAManual03.PDF).

Analysis: Transects are divided into 100 ft. segments, and total transect length is determined using a "running mean" to estimate variance (95% probability of being within 10% of the true mean).

$$\text{Sample size equation: } n = \frac{t^2 \times s^2}{E^2}$$

Where: t = value at 95 percent confidence interval with suitable degrees of freedom
s = standard deviation
E = desired level of precision, or bounds

Literature Cited:

Anderson, S. and K. Gutzwiller. 1996. Habitat Evaluation Methods. Pages 592-606 in: T. A. Bookhout, ed. Research and Management Techniques for Wildlife and Habitats. Fifth ed., rev. The Wildlife Society, Bethesda, MD. xiii + 740pp.

Nott, R., D.F. DeSante, and N. Michel. 2003. Monitoring Avian Productivity and Survivorship (MAPS) Habitat Structure Assessment (HAS) Protocol 2003. The Institure for Bird Populations, Pt. Reyes Station, CA.

USFWS. 1980a. Habitat as a Basis for Environmental Assessment, Ecological Services Manual (ESM) 101. Division of Ecological Services, U.S. Fish and Wildlife Service, Department of the Interior, Washington, D.C. Unnumbered.

USFWS. 1980b. Habitat Evaluation Procedures (HEP), Ecological Services

Manual (ESM) 102. Division of Ecological Services, U.S. Fish and Wildlife Service, Department of the Interior, Washington, D.C. Unnumbered.

FOCAL SPECIES MONITORING:

Yellow Warbler

Rationale: Maintaining and enhancing yellow warbler populations within the Eco-region will assure the maintenance and rehabilitation of riparian wetlands.

Limiting Factors: 1) Loss of deciduous tree cover and sub-canopy/shrub habitat in riparian zones. 2.) Conversion of riparian habitat due to channelization, agriculture, and development, 3) flooding of habitat resulting from hydropower facilities, 4) habitat fragmentation, 5) degradation of existing habitats from overgrazing and introduced weedy vegetation, and 6) tree/shrub removal in riparian areas (Sec 5.2.3.1).
Proximity to agriculture, suburban development creates a hostile landscape where a high density of nest parasites, such as, brown cow bird and predation by domestic cats may occur. Disturbance from agriculture and recreational activities can also cause nest abandonment (Sec. 5.2.3.1.2).

Assumptions: 1) Addressing factors that affect eastside (interior) riparian wetlands, will also address yellow warbler and other wetland obligate species limiting factors. 2) If riparian wetland habitat is of sufficient quality, extent, and distribution to support viable yellow warbler and beaver populations, the needs of most other riparian wetland obligate species will also be addressed and habitat functionality could be inferred.

Sampling Strategy: Survey points will be placed among habitat types of interest using a stratified random design. Number of survey points in each habitat type will be determined using power analysis with the goal of being able to detect a 25% increase in abundance of yellow warbler with a power of 0.8 or greater (pers. comm. Ferguson). This protocol is based on the point count survey (Ralph et al. 1993, Ralph et al. 1995), with each survey station referred to as a “point count station.” In addition to these bird survey data, information about the distance at which individual birds are detected will also be collected, allowing absolute density estimated to be made using distance-sampling methodology (e.g., the program DISTANCE).

Methods: We will survey birds on randomly selected (stratified) points along the riparian corridor. Each site will have 4 100-m fixed-radius point counts (Ralph et al. 1993) established along a transect and spaced 200m apart (Fig 4). Each point will be marked with a permanent fiberglass stake (1m electric fence post) and colored flagging will be placed on shrubs at 50 and 100m from the point in each of the 4 cardinal directions to aid in determining distance. Counts at each point will be 5 minutes in duration during which all birds seen or heard will be noted, along with their sex (if known), distance from the point (within 50m, >50 but <100m, or beyond 100m), and behavior (singing, calling, silent, or flying over the site). Surveys will be conducted once each in May and June and within prescribed weather parameters (e.g., no rain and low wind).

Analysis: Analysis is described by Nur et al. (1999). Absolute density estimation (see Buckland et al. 1993) can be estimated using the program DISTANCE, a free program

available on the World-Wide Web (http://www.ruwpa.st-and.ac.uk/distance); an example is given in Nur et al. (1997). In brief: for species richness and species diversity, these can be analyzed as total species richness or as species richness for a subset of species; the same is true for species diversity. Species diversity can be measured using the Shannon index (Nur et al. 1999), also called the Shannon-Weiner or Shannon-Weaver index. Statistical analysis can be carried out using linear models (regression, ANOVA, etc.), after appropriate transformations (examples in Nur et al. 1999).

References:

Buckland, S.T., D.R. Anderson, K.P. Burnham, and J.L. Laake. 1993. Distance sampling: Estimating abundance of biological populations. Chapman & Hall, London, U.K.

Nur, N., S. Zack, J. Evens, and T. Gardali. 1997. Tidal marsh birds of the San Francisco Bay region: Status, distribution, and conservation of five Category 2 taxa. Final draft report to National Biological Survey (now US Geological Survey). Available from Point Reyes Bird Observatory, Stinson Beach, CA. Wetlands Regional Monitoring Program Plan 2002 Part 2: Data Collection Protocols Tidal Marsh Passerines.

Nur, N., S.L. Jones, and G.R. Geupel. 1999. A Statistical Guide to Data Analysis of Avian Monitoring Programs. Biological Technical Publication, US Fish & Wildlife Service, BTP-R6001-1999.

Ralph, C.J., G.R. Geupel, P. Pyle, T.E. Martin, and D.F. DeSante. 1993. Field methods for monitoring landbirds. USDA Forest Service Publication, PSW-GTR 144. Albany, CA.

Ralph, C.J., S. Droege, and J.R. Sauer. 1995. Managing and monitoring birds using point counts: standards and applications. In C. J. Ralph, J. R. Sauer and S. Droege (Eds.), Monitoring Bird Populations by Point Counts. USDA Forest Service Publication, Gen. Tech. Rep. PSW-GTR-149, Albany, CA.

Great Blue Heron

Rationale: The great blue heron is the only focal species that has a direct relationship with salmonids (Ashley and Stovel 2004, Table 55). The great blue heron requires multiple cover types to meet its life requisites. Suitable great blue heron habitats include herbaceous wetlands, scrub-shrub wetlands, forested wetlands, riverine, lacustrine or estuarine habitats within 0.5 mil of heronries (Sec. 5.2.3.3). Maintaining great blue heron populations will require a wide diversity of riparian wetlands be maintained or enhanced within the Ecoregion.

Limiting Factors: 1.) loss of nesting habitat near riparian zones, 2.) loss of foraging areas due to stream alteration or flows, 3.) reproductive failure due to pesticides.

Assumptions: Addressing factors that affect eastside interior riparian wetlands, will also address great blue heron and other riparian wetland obligate species limiting factors. 2.) If interior riparian wetland is of sufficient quality, extent, and distribution to support viable great blue heron populations, the needs of most riparian wetland obligate species will also be addressed and wetland functionality could be inferred.

Sampling Strategy: The sampling strategy was developed by the Bird Focus Group of the Wetland Regional Monitoring Program Plan 2002 - Part 2: Data Collection Protocols Herons and Egrets: Heron and Egret Breeding Distribution, Abundance, and Success
By John P. Kelly

Methods: At each known colony site, establishing a monitoring effort involves five steps:
1. Determine number of "active nests" early in the season. Before 1 April, nests are considered active if two adults are present or if one adult is seen carrying nest material or incubating. After 1 April, any occupied nest is considered active.

2. Create a nesting panorama. The nesting panorama is a landscape sketch or photograph that indicates the location of numbered nests to be followed through the season. Each panorama includes an exact description of the viewing position, which should be located far enough from the colony to avoid disturbance to the nesting birds. More than one panorama may be necessary to monitor all focal nests in the colony (see below).

3. Identify focal nests. Focal nests are numbered nests and monitored through the season to measure nest survivorship. Focal nests must be observed as "active" either before incubation or at Stage 1 (incubation, see below), and should be observed as active in March, although new focal nests can be added until 15 April. In colonies with 15 or fewer active nests, or with volunteer observers that can commit to monitor every nest in the colony, all nests that meet the above criteria are considered focal nests. *Random samples:* In colonies with more than 15 active nests, which cannot be monitored on every visit, a random subset of at least 15 focal nests is selected for each species. Observers are encouraged to monitor as many nests as they can.

4. Obtain necessary access permits or authorization to enter the area. Most colony sites are on privately owned lands, or on public wildlife refuges with restricted access.

5. Visit each site at least four times during the nesting season. Observers are encouraged to conduct more frequent visits if possible (weekly or biweekly). Regional observation periods are scheduled each year, during five 3-day windows at approximately monthly intervals: early March, early April, early May, early June, and late June. During each of these periods, all colony sites are visited. Diurnal timing of observations is generally not important, but site-specific effects on viewing conditions should be considered. For example, position of the sun might affect visibility of nests; low temperatures can cause brooding adults to hide nest contents; and afternoon wind can enhance the visibility of hidden nests. Because average timing of nesting varies among years, colony sites, and species, closely synchronizing colony site visits with nesting phenology is problematical.

Ancillary Information
The following information is recorded for each colony site:
1. geographic location in UTMs
2. description of nesting habitat, including vegetation, topography, and available nesting space
3. nest locations numbered on a standardized panoramic sketch or photo, updated each visit
4. property ownership
5. number of active nests on each visit, and peak number during the season, using the following criteria: *Before 1 April, "active" nests must have either two adults present or one adult carrying nest*
6. focal nest status: active or inactive

7. nesting stage of each focal nest. Seasonal timing is indexed by the distribution of focal nests across 5 nesting stages:

Stage 1: Egg-laying or incubation; adult lying down in nest for long periods, standing to turn eggs, defecate, or for nest relief

Stage 2: Hatching; small (downy) nestlings, or feeding observed low in the nest

Stage 3: Nestlings usually standing; most or all of down replaced by juvenal plumage; parent(s) continuously at the nest

Stage 4: Adults not continuously at the nest, but may be present for some time after feeding; nestlings usually on the nest platform

Stage 5: Young often off the nest, on nearby branches

8. number of adults and chicks on each focal nest
9. prefledging brood size in completely visible broods 4-8 weeks old, for Great Blue Heron
10. type and level of disturbance, observed or inferred: A=avian; H=human; O=observer; M=mammal; W=weather; P=other predator; U=unknown
Levels: 0=none 1=behavioral response only; 2=nest or nestling mortality 3=colony abandonment
11. human land use: a description of human activity and development in the immediate vicinity (within 300 m) of the colonies

Analysis: Reproductive success (rs) is calculated as the product of focal nest survivorship (s) and prefledging brood size (b): rs = *s x b.* Regional estimates should use weighted averages of *s* and *b* among colonies, based on colony size. Variance of reproductive success is estimated following Goodman (1960, *J. Am. Stat. Assoc.* 55:708- 713): var(rs) = [*s*2 (var(*b*)] + [*b*2 (var(*s*)] - [var(*b*) · var(*s*)].

Nest survivorship (*s*) is "apparent" survivorship based on focal nests monitored through the nesting season. Great Blue Heron and Great Egret nests are considered successful if they survive to 8 weeks post-hatch. Snowy Egret and Black-crowned Night-Heron nests are considered successful at 15 days post-hatch, but this level of resolution is not achieved unless monitored frequently.

Prefledging brood size (*b*) is based on the latest counts of completely visible broods observed during Stage 4 (nestlings 4-8 weeks old). During this period, most nestlings are old enough to be standing and visible, but too young to hop away from the nest platform. Most brood reduction in occurs during the first four weeks after hatching (Pratt 1970, *Condor* 72:407-416).

Sample size: Previous (unpublished) data suggest that observations from 65 nests (within or among colony sites) may be adequate to detect a 20% difference in prefledging brood size between consecutive years 80% of the time, with a significance level (a) of 0.10. At some colony sites, the number of brood size observations possible may be substantially limited by incomplete visibility of broods.

Literature Cited:

Kelly, John P. 2002. Bird Focus Group of the Wetland Regional Monitoring Program Plan 2002 - Part 2: Data Collection Protocols Herons and Egrets: Heron and Egret Breeding Distribution, Abundance, and Success

American Beaver

No monitoring protocol established under Terrestrial program. The monitoring plan for beaver developed under riparian section for aquatic species is incorporated herein by reference.

Ponderosa Pine (Asotin, Tucannon, L. Snake, Walla Walla Subbasins)

Focal Species: Rocky Mountain elk *(Cervus canadensis),* flammulated owl *(Otus flammeolus)*, white-headed woodpecker (*Picoides albolarvatus)*

Overall Habitat and Species Monitoring Strategy: Establish monitoring program for protected and managed Ponderosa pine sites to monitor focal species population and habitat changes and evaluate success of efforts.

FOCAL HABITAT MONITORING:

Factors affecting habitat:

1. Direct loss old growth forest and associated large diameter trees and snags;
2. Fragmentation of remaining Ponderosa pine habitat;
3. Agricultural and sub-urban development and disturbance;
4. Hostile landscapes which may have high densities of nest parasites, exotic nest competitors, and domestic predators;
5. Fire suppression/wildfire;
6. Overgrazing;
7. Noxious weeds;
8. Timing of silvicultural practices;
9. Insecticide use.

Ponerosa Pine Working Hypothesis Statement: The near term or major factors affecting this focal habitat type are direct loss of habitat due primarily to timber harvesting, fire reduction/wildfires, mixed forest encroachment, development, recreational activities, reduction of habitat diversity and function resulting from invasion by exotic species and vegetation and overgrazing. The principal habitat diversity stressor is the spread and proliferation of mixed forest conifer species within ponderosa pine communities due primarily to fire reduction and intense wildfires. Habitat loss and fragmentation (including fragmentation resulting from extensive areas of undesirable vegetation) coupled with poor habitat quality of existing vegetation (i.e., old growth forest and associated large diameter trees and snags) have resulted in extirpation and or significant reductions in ponderosa pine habitat obligate wildlife species.

Recommended Range of Management Conditions: Recognizing that extant ponderosa pine habitat within the Ecoregion currently covers a wide range of seral conditions, Ecoregion wildlife habitat managers have identified three general ecological / management conditions that, if met, will provide suitable habitat for multiple wildlife species at the Ecoregion scale within the ponderosa pine habitat type. These ecological conditions correspond to life requisites represented by a species' assemblage that includes white-headed woodpecker (Picoides albolarvatus), flammulated owl (Otus flammeolus), and Rocky Mountain elk (Cervus canadensis)

1. Mature ponderosa pine forest: The white-headed woodpecker represents species that require/prefer large patches (greater than 350 acres) of open mature/old growth ponderosa pine stands with canopy closures between 10 - 50 percent and snags (a partially collapsed, dead tree) and stumps for nesting (nesting stumps and snags greater than 31 inches DBH).

2. Multiple canopy ponderosa pine mosaic: Flammulated owls represent wildlife species that occupy ponderosa pine sites that are comprised of multiple canopy, mature ponderosa

pine stands or mixed ponderosa pine/Douglas-fir forest interspersed with grassy openings and dense thickets. Flammulated owls nest in habitat types with low to intermediate canopy closure (Zeiner et al. 1990), two layered canopies, tree density of 508 trees/acre (9 foot spacing), basal area of 250 feet^2/acre (McCallum 1994b), and snags greater than 20 inches DBH 3-39 feet tall (Zeiner et al. 1990). Food requirements are met by the presence of at least one snag greater than 12 inches DBH/10 acres and 8 trees/acre greater than 21 inches DBH.

3. Dense canopy closure: Rocky Mountain Elk were selected to characterize ponderosa pine habitat that is greater than 70 percent canopy closure and 40 feet in height.

Focal Habitat Monitoring Strategies: Establish an inventory and long-term monitoring program for protected and managed Ponderosa pine habitats to determine success of efforts. Subbasin managers recognize that restoration of late-successional forest is a long-term process, but these short-term (i.e., up to 15 years) strategies reflect the commitment and initiation of the process of management.

1. Identify Ponderosa pine habitat sites within the subbasin that support populations of focal species for this habitat.
2. Evaluate habitat site potential on existing public lands and adjacent private lands for protection of focal species habitat (short-term strategy i.e., < 2 years).
3. Enhance habitat on public lands and adjacent private lands (intermediate strategy; 2 to 10 years)
4. Identify high quality/functional privately owned Ponderosa pine sites that are not adjacent to public lands (long-term strategy 2 to 15 years).
5. Establish permanent roadside and off-road censusing stations to monitor bird population and habitat changes.
6. Presence of all exotic weeds i.e., knapweed, yellow starthistle (Centaurea solistitialis), cheatgrass etc. will be mapped in GIS using Global Positioning System (GPS) equipment. This information will be used to develop an annual exotic vegetation control plan.

Sampling Design: Permanent survey transects will be located within Ponderosa pine habitats using HEP protocols. HEP is a standardized habitat-analysis strategy developed by the U.S. Fish and Wildlife Service. It uses a variety of Habitat Suitability Indices (HSI) for select wildlife species to evaluate the plant community as a whole (Anderson and Gutzwiller 1996). Sites are stratified by cover type, and starting points are established using a random number grid. Minimum length of a HEP transect is 600 ft, and patches of cover must be large enough to contain a minimum transect without extending past a 100 foot buffer inside the edge of the cover type.

In addition, at any permanently established avian species monitoring site established within the Riverine Wetland habitat, structural habitat conditions will be monitored every 5 years as per Habitat Structure Assessment protocol (Nott et al 2003).

Sampling Methods (USFWS 1980a and 1980b):

1. Herbaceous measurements are taken every 20 ft. on the right side of the tape (the right is always determined by standing at 0 ft and facing the line of travel). The sampling quadrat is a rectangular 0.5m^2 microplot, placed with the long axis perpendicular to the tape, and the lower right corner on the sampling interval.

2. Shrub canopy cover is measured using a point intercept method and is visually estimated before starting each transect. If the total shrub cover is anticipated to be >20%, shrub data are collected every 5 ft (20 possible "hits" per 100 ft segment). If shrub canopy cover is anticipated to be <20%, data are collected every 2 ft (50 possible "hits" per 100 ft segment).

   Shrub height measurements are collected on the tallest part of a shrub that crosses directly above each sampling intercept mark. For shorter shrub classifications (i.e. all shrubs less than 3 feet), the tallest shrub is measured that falls within that category.

3. Tree canopy cover measurements are taken every ten feet along a transect. Basal and snag measurements are taken within a tenth-acre circular plot at the end of each 100 ft segment. The center point of the circular plot is the 100 ft mark of the transect tape, and the radius of the circle is 37.2 ft.

Measurement of Attributes (Habitat Conditions):

>10 snags/40 ha (>30cm DBH and 1.8m tall)

Method: A direct count in the 1/10 acre circle plot at the end of each 100 ft segment of the transect. DBH (measured with a loggers tape) and condition is noted for each snag. Snag condition scale follows Parks et al. (1997).

>20 trees /ha (>21" DBH)

Method: A direct count in the 1/10 acre circle plot. DBH measured with a logger's tape.

Ponderosa Pine – old growth: >10 trees/ac (>21" DBH w/ >2 trees >31" DBH)

Method: A direct count in the 1/10 acre circle plot. DBH measured with a logger's tape.

10-50% canopy closure

Method: A line intercept 'hit' or 'miss' measurement. Ten direct measurements along each 100 foot section of the transect (one every 10 feet) taken with a moosehorn densitometer.

> 1.4 snags/ac (>8" DBH w/ >50% >25")

Method: A direct count in the 1/10 acre circle plot at the end of each 100 ft segment of the transect. DBH (measured with a loggers tape) and condition is noted for each snag. Snag condition scale follows Parks et al. (1997).

In addition, at any permanently established avian species monitoring site established within the Riverine Wetland habitat, structural habitat conditions will be monitored every 5 years as per Habitat Structure Assessment protocol (Nott et al 2003).

Analysis: Transects are divided into 100 ft. segments, and total transect length is determined using a "running mean" to estimate variance (95% probability of being within 10% of the true mean).

Sample size equation: $n = \frac{t^2 \times s^2}{E^2}$

Where: t = value at 95 percent confidence interval with suitable degrees of freedom

s = standard deviation
E = desired level of precision, or bounds

Literature Cited:

Anderson, S. and K. Gutzwiller. 1996. Habitat Evaluation Methods. Pages 592-606 in: T. A. Bookhout, ed. Research and Management Techniques for Wildlife and Habitats. Fifth ed., rev. The Wildlife Society, Bethesda, MD. xiii + 740pp.

Nott, R., D.F. DeSante, and N. Michel. 2003. Monitoring Avian Productivity and Survivorship (MAPS) Habitat Structure Assessment (HAS) Protocol 2003. The Institure for Bird Populations, Pt. Reyes Station, CA.

Parks, C. G., E. L. Bull and T. R. Torgersen. 1997. Field Guide for the Identification of Snags and Logs in the Interior Columbia River Basin. USDA Forest Service, Pacific Northwest Research Station, PNW-GTR-390. 40 p.

USFWS. 1980a. Habitat as a Basis for Environmental Assessment, Ecological Services Manual (ESM) 101. Division of Ecological Services, U.S. Fish and Wildlife Service, Department of the Interior, Washington, D.C. Unnumbered.

USFWS. 1980b. Habitat Evaluation Procedures (HEP), Ecological Services Manual (ESM) 102. Division of Ecological Services, U.S. Fish and Wildlife Service, Department of the Interior, Washington, D.C. Unnumbered.

FOCAL SPECIES MONITORING:

Rocky Mountain Elk

Rationale: Elk are listed as a focal species due to the significant economic, recreational, and cultural values this species provides throughout the Blue Mountains. Elk are a habitat generalist with habitat requirements varying by habitat type. Elk were selected as a focal species for ponderosa pine habitat due to the importance of this habitat type as both summer and winter range. Much of the ponderosa pine habitat occupied by elk in the Blue Mountains of Washington consists of winter range. Although elk are listed for Condition 3 in ponderosa pine habitat, ponderosa pine stands that achieve a canopy closure of 70% are rare. In order to provide marginal thermal cover, ponderosa pine stands on winter range should maintain a canopy closure 40-70% (Thomas, el al 1979).

Limiting Factors: 1) Silvicultural practices that reduce habitat quality; 2) high road densities (Myers et al. 1999) 3) overgrazing by domestic livestock (private lands). 3.) fire suppression 4.) rural development 5.) noxious weeds 6.) agricultural damage

Assumptions: Addressing factors that affect ponderosa pine, will also address elk and other ponderosa pine obligate species limiting factors.

Management Objective: The Blue Mountains Elk Herd Plan (WDFW 2001) provides the historical background, current condition and trend of this important wildlife resource. It is essentially an assessment document that identifies management problems, develops solutions to overcome these problems, and sets management direction. The plan outlines goals, objectives, problems, strategies, and establishes priorities for managing the elk herd. It provides

a readily accessible resource for biological information collected from the herd and identifies inadequacies in scientific information.

The elk population management objective in southeast Washington is to maintain or increase the elk population in GMU's (sub-herds) within the Asotin, Tucannon, and Walla Walla subbasins to meet state herd plan management objectives (Table 2).

Table 2. Elk Population Management Objectives

Subbasin	GMU's	Pop'n Mgmt Objective
Asotin	175, 181	1,000
Tucannon	166	700
Walla Walla	154, 157, 162	1,600
L. Snake River	NA	NA

Monitoring Methods: Annual aerial elk surveys are conducted each March using sightability protocol (Unswort *et al*. 1994). This survey provides data on population status, age/sex ratios, and herd distribution. It is important to maintain the accuracy of sightability surveys by surveying 70% of the survey zones. The survey usually entails 25-30 hours of helicopter time (Hiller); costs listed (550/hr. = $16,500 + $500 fuel trk. = $17,000).

The harvest of bulls and antlerless elk will be monitored and evaluated using data from mandatory hunter reports.

Evaluation Strategies:

1) Use data from sightability survey and model to determine if the elk population within the subbasin (GMU) is meeting population management objectives (Table 1.)
2) Use survey data to determine if bull escapement goals meet management objectives; $\geq$ 15 bulls/100 cows.
3) Monitor harvest levels for bulls and antlerless elk using the mandatory hunter reporting system (WDFW, 2003).
4) Evaluate harvest reports and pre/post hunting season sex ratios to determine if the bull harvest is meeting management plan objectives; $\leq$ 50% annual mortality.
5) Develop population model using data from harvest, surveys, and current research project (Elk Vulnerability Study) to compare with sightability model data.

References:

Myers et al., editor. 1999. An Assessment of Elk Population Trends and Habitat Use with Special Reference to Agricultural Damage Zones in the Northern Blue Mountains of Washington. Final Report. Washington Dept. Fish and Wildlife, Olympia. WA. 172 pp.

Thomas, J.W. editor. 1979. Wildlife Habitats in Managed Forests of the Blue Mountains of Oregon and Washington. Agricultural Handbook No. 553. USDA Forest Service, Washington D.C. 512 pp.

Unsworth, J.W., F.A. Leban, D.J. Leptich, E.O. Garten, and P. Zager. 1994. Aerial Survey: User's Manual, Second Edition. Idaho Department of Fish and Game, Boise, ID. 84 pp.

WDFW. 2001. Washington State Elk Herd Plan – Blue Mtns. Elk Herd. 2001. Washington Dept. Fish and Wildlife, Olympia, WA. 47 pp.

Flammulated Owl

Rationale: The Flammulated owl is listed as candidates for inclusion on the WDFW endangered species list and is considered a species-at-risk by the Washington GAP Analysis and Audubon-Washington (Sec. 5.2.1.2.4). Of the three ponderosa pine focal species, flammulated owls are the most structurally dependent on the Ponderosa Pine habitat (Sec. 5.2.1.2.5). Therefore, it is important to maintain and enhance the structure and function of ponderosa pine habitats for flammulated owls.

Limiting Factors: 1) Silvicultural practices that reduce habitat quality; 2) pesticide use; 3) predation/competitors; 4) exotics. (Sec. 5.2.1.2.2)

Assumptions: 1) Addressing factors that affect ponderosa pine, will also address flammulated owl and other ponderosa pine obligate species limiting factors. 2) If ponderosa pine habitat is of sufficient quality, extent, and distribution to support viable flammulated owl and white-headed woodpecker populations, the needs of most other ponderosa pine obligate species will also be addressed and ponderosa pine functionality could be inferred.

Sampling Strategy: The following methods are designed to, 1.) facilitate delineation of current distribution and population levels of flammulated owls, and; 2) identify current and potential areas of high quality flammulated owl habitat (short-term strategy i.e., <2 years).

Methods: Nighttime surveys will be conducted throughout potentially suitable Flammulated Owl breeding habitat, which will be determined according to habitat use reported in the literature, other reports, GIS habitat mapping, and other reported sightings the species.

Routes will be randomly selected from within the potential habitat area using a stratified sampling scheme. Each route should have between 10-12 stations, distributed along the route at equal intervals of .5 km, a standard methodology based on the distance owls can be heard on a calm night (at least 1.0 km) and the average size of territories (<500 m across) (Reynolds and Linkhart 1984, Howle and Ritchie 1987, Van Woudenberg and Christie 1997). The location of the starting point of the route, and of each station along the route, should be recorded as precisely as possible using a GPS (Global Positioning System). Each route should be surveyed three times per year during May-July – the time of year when vocal activity of the majority of species is greatest. Conduct surveys between 2200 and 0100 hours (Howle and Ritcey 1987, Groves *et al.* 1997). An attempt should be made to conduct the survey at the same time of night each year. At the beginning of the breeding season the greatest calling intensity for the Flammulated Owl is during much of the evening, and then after nestling hatching singing is "later at night" (Reynolds and Linkhart 1987).

Surveys should only be conducted under favorable conditions: wind speeds <20 km per hour, a wind speed of Beaufort 3 or less and no precipitation (including rain and/or snow). Temperatures should be close to the average for the season and efforts should be made to avoid extremely cold temperatures because of evidence that owls may be less vocal in very cold weather (Takats 1998a).

Surveys will consist of visiting a point for two minutes to listen for Flammulated Owls calling, and if no owls are heard then a male territorial call will be imitated or played from tape for one minute. After listening for an additional two minutes, the observer will then walk to the next point while still listening for calling owls. (Two minutes appears to be adequate for most spontaneously calling owls to be detected, at least during the period of peak calling activity. In Alberta, relatively few additional owls were detected during a third minute of listening (Takats, pers. comm.). In Ontario, more than 70% of 5 species of owls that were detected over a 5 minute period (included playback) were detected in the first two minutes (Takats 1997, 1998b)

Playback recordings should be as clear and loud as possible without distortion. Digital technology is recommended (CD-ROM, solid state, or digital tape) as the sound quality can be better controlled and is less likely to deteriorate over time. The audio equipment should be of sufficient quality that it will not distort the sound at loud volumes. We suggest the volume be such that the recording can be heard at 400m, but not at 800m (to minimize bias at the next survey station due to owls hearing the recording from the previous station). If possible, the volume should be measured at a standard distance (e.g., 1m from the speakers) using a decibel meter.

The recording should include both the silent listening periods as well as the playback sequence time period. A soft 'beep' or other sound can be used to indicate the start of the first silent listening period, and another beep to indicate the end of the final listening period. This will ensure that the time is fully standardized at each station, and reduce the need for participants to keep checking their watches.

Surveyors should be asked to estimate the approximate direction and distance to the first position where they detect each owl and plot location on a map. This data can help to determine whether the same owls are being detected at different stations along the route, to adjust for some of the variation in detection rates, and to aid in daytime nest searches.

Male presence is not adequate to determine habitat suitability as many males may remain unmated (Reynolds and Linkart 1987a, McCallum 1994a). The nests should be monitored so that success can be determined. Parallel transects 50 m apart through areas where owls were detected were surveyed in June and early July to try and find nest site locations. Since most of the calls heard in the field are from territorial reproductive males, nests can be located by systematic nest searches during the day (Bull et al. 1990). Once territory boundaries are delineated, all suitable nesting cavities (tree cavities with entrance diameters >4 cm) within territories will be checked for nesting owls (Linkart and Reynolds 1997).

Nest sites will be searched for using a pinhole camera system attached to a telescoping pole that reaches approximately 11 m high (Proudfoot 1996). This is an effective nest finding technique, but is limited to cavities within reach. Tree scratching (with a stick) can also used, which imitates a predator climbing the nest tree and often stimulates incubating or brooding females to look out of the nest cavity entrance (Bull et al. 1990). Observation of a female Flammulated Owl at a cavity entrance will document a nest site.

Analysis: Data from the surveys described here are similar to those of the Breeding Bird Survey, though some modifications may be required in the future. A wide variety of methods have been developed for analysis of BBS data (James *et al*. 1996, Link and Sauer 1994, 1998), but there is still some disagreement as to which methods are best (James *et al*. 1996, Link and Sauer 1994a, Link and Sauer 1994b, Thomas 1996). There are two main methods currently being used by the coordinators of the BBS. One involves route regression using estimating equations

(Link and Sauer 1994), which assumes that trends may differ among routes, and calculates a weighted mean of the trends within routes. The selection of weighting factors is strongly dependent upon the sampling scheme used to select routes. An alternate approach involves a generalized linear model assuming over-dispersed Poisson residuals and a log-link function (Link and Sauer 1998). This approach assumes that trends are similar within a broader region, and allows more robust modeling of nonlinear population changes (e.g., year to year fluctuations). A simplified version of this latter approach has been used for analysis of population trends in Ontario (Lepage et al 1999, Francis and Whittam 2000), but it is not yet known whether this is the most appropriate analysis method.

The power of the survey technique will be investigated after its first three years in its present design to determine the actual variance. This will allow us to determine the number of routes required to detect our objective of a 35% change by 2020.

Finally, we recommend that relevant data be made publicly available, preferably over the Internet. This will encourage further research into analysis methods, thus ensuring that maximum use is made of the data for conservation purposes. However, care should be taken to protect sensitive information, such as precise nesting locations of rare species.

References:

Francis, C.M., and B. Whittam. 2000. Ontario nocturnal owl survey 1999 pilot study final report. unpublished report by Bird Studies Canada for the Wildlife Assessment Program, Ontario Ministry of Natural Resources. 34 pp.

Groves, C., T. Frederick, G. Frederick, E. Atkinson, M. Atkinson, J. Shepherd and G. Servheen. 1997. Density, distribution and habitat of Flammulated Owls in Idaho. Great Basin Naturalist 57:116-123.

Howie, R.R., and R. Ritcey. 1987. Distribution, habitat selection and densities of the Flammulated Owl in British Columbia. Pages 249-254 *in* R.W. Nero, R.J. Clark, R.J. Knapton and R.H. Hamre, eds. Biology and conservation of northern forest owls. USDA For. Serv. Gen. Tech. Rep. RM-142.

James, F. C., C. E. McCulloch, and D. A. Wiedenfeld. 1996. New approaches to the analysis of population trends in land birds. Ecology 77:13-27.

Lepage, D., C.M. Francis, and V. Deschamps. 1999. Ontario nocturnal owl survey 1998 pilot study final report. Report by Bird Studies Canada for Ontario Ministry of Natural Resources Wildlife Assessment Program. WAP-99-01. 21 pp.

Link, W.A., and J.R. Sauer. 1994a. Estimating equations estimates of trends. Bird Populations 2:23-32.

Link, W.A., and J.R. Sauer. 1994b. «New approaches to the analysis of population trends in land birds»: a comment on statistical methods. Ecology 78:2632-2634.

Link, W.A., and J.R. Sauer. 1998. Estimating population change from count data: application to the North American Breeding Bird Survey. Ecological Applications 8:258–268.

McCallum, D. A., and F. R. Gehlbach. 1988. Nest-Site Preference of Flammulated Owls. Condor 90:653-661.

Proudfoot, G. A. 1996. Miniature video-board camera used to inspect natural and artificial nest cavities. Wildlife Society Bulletin 24:528-530.

Reynolds, R.T. and B.D. Linkhart. 1984. Methods and materials for capturing and monitoring Flammulated Owls. Great Basin Naturalist 44:49-51.

Takats, D.L. 1998b. Volunteer nocturnal owl surveys in Alberta, annual report. Beaverhill

Takats, D.L. and G.L. Holroyd. 1997. Owl broadcast surveys in the Foothills Model Forest. In: Biology and Conservations of Owls of the Northern Hemisphere by J.R. Duncan, D.H.Johnson, and T.H. Nicholls (eds.). USDA Forest Service.

Takats, D. L., C. M. Francis, G. L. Holroyd, J. R. Duncan, K. M. Mazur, R. J. Cannings, W. Harris, D. Holt. 2001. Guidelines for Nocturnal Owl Monitoring in North America. Beaverhill Bird Observatory and Bird Studies Canada, Edmonton, Alberta. 32 pp. http://www.bsc-eoc.org

Thomas, L. 1996. Monitoring long-term population change: why are there so many analysis methods? Ecology 77: 49-58.

Van Woudenberg, A.M., and D.A. Christie. 1997. Flammulated Owl (*Otus flammeolus*) populations and habitat inventory at its northern range limit in the southern interior of British Columbia. Pages 466-476 *in* J.R. Duncan, D.H. Johnson and T.H. Nicholls, eds. Biology and conservation of owls of the northern hemisphere. Second international symposium: USDA For. Serv., Gen. Tech. Rep., NC-190. Feb, 5-9, 1997. Winnipeg, MB. 638 pp.

White-headed woodpecker

Rationale: Suitable white-headed woodpecker habitat includes large patches (greater than 350 acres) of open mature/old growth ponderosa pine stands with canopy closures between 10 - 50 percent and snags (a partially collapsed, dead tree) and stumps for nesting (nesting stumps and snags greater than 31 inches DBH). Maintaining white-headed woodpecker populations will require that this mature/old growth component of ponderosa pine habitat is maintained or enhanced within the Ecoregion.

Limiting Factors: 1) Silvicultural practices that reduce habitat quality; 2) pesticide use; 3) predation/competitors; 4) exotics. (Sec. 5.2.1.2.2)

Assumptions: If ponderosa pine habitat is of sufficient quality, extent, and distribution to support viable white-headed woodpecker populations, the needs of most other ponderosa pine obligate species will also be addressed and ponderosa pine functionality could be inferred.

Sampling Strategy: Survey points will be placed among habitat types of interest using a stratified random design. Number of survey points in each habitat type will be determined using power analysis with the goal of being able to detect a 25% increase in abundance of white-headed woodpecker with a power of 0.8 or greater (pers. comm. Ferguson).

Methods: The method used, point counts, is derived from Dixon (1998)
POINT COUNTS
Each observer will conduct one transect per day individually. Survey low-elevation transects first to assure accessibility. The protocol for point counts will follow standardized methods for variable circular plots (Reynolds et al. 1980, Ralph et al.1995, Hutto and Hoffland 1996), but modified to better census White-headed Woodpeckers.

WHEN TO SURVEY: Point counts should be conducted between April 1 and May 15 when the detectability of White-headed Woodpeckers is highest and most stable. After this period the woodpeckers typically excavate from within the nest cavity and become less visible and less vocal. Counts should begin at official sunrise and end no later than 1030 and 1100. Each transect will be visited once.

POINT COUNTS: Counts will begin as soon as the observer arrives at the station and will be comprised of a 5-minute listening period without the use of tape playbacks followed by a 6-minute sequence of tape playbacks of White-headed Woodpecker calls and drums for a total count of 11 minutes. Data from the two types of counts will be recorded separately-with a code-on a the bird data sheet.

TAPE PLAYBACK PROCEDURE: Tape playback procedures will essentially follow the Payette National Forest Protocol for Broadcast Vocalizations (Payette National Forest 1993). The tape playback sequence should begin immediately after the 5-min unsolicited point count-be ready to start the tape at exactly 5 min. A total of four 30-second tape-playbacks of White-headed Woodpecker drums and calls will be projected at 1-min intervals (e.g. using a Johnny Stewart™ game caller); that is, begin the first sequence of vocalizations to the north. During the one minute pause after the first sequence, rotate 90° for the second sequence, pause, then rotate another 90° for the third sequence of vocalizations after the second one minute break. When the third sequence is complete, rotate 90° for the fourth and final sequence for a total of 6 minutes of tape-playbacks.

WHEN NOT TO SURVEY: Surveys will not be conducted during heavy rain, fog, or when wind interferes with an observer's ability to detect calls (greater than 20 mph). If the weather appears prohibitive, wait 1 to 1.5 hours, or until you cannot reasonably complete the transect by 1100 hours. If the weather puts you in danger, STOP-your safety comes first.

WHAT TO RECORD: Record all species detected, visual or auditory. At the bottom of the data sheet, record any birds you might have detected either before or after a point count, or between stations.

References:
Dixon, R. D. 1998. An assessment of white-headed woodpeckers in a regional landscape field methodology. Wildlife Resources, College of Forestry, University of Idaho, Moscow, ID.

Hutto, R. L. and J. Hoffland. 1996. USDA Forest Service Northern Region Landbird Monitoring Project: Field Methods. Unpubl.

Johnson, Jr., C., and F. C. Hall. 1990. Plant Associations of the Blue Mountains. USDA For. Serv., Pacific Northwest Region. R6-Ecol Area 3-1990.

Johnson, Jr., C., and S. A. Simon. 1987. Plant Associations of the Wallowa-Snake Province: Wallowa-Whitman National Forest. USDA For. Serv., Pacific Northwest Region R6- ECOL-TP-255B-86-1987.

Patterson, P. A., K. E. Neiman, and J. R. Tonn. 1985. Field guide to forest plants of northern Idaho. Gen. Tech. Rep. INT-180. Ogden, UT: Intel-mountain Research Station, Forest Service, U.S. Dept. of Agriculture; 246 pp.

Payette National Forest. 1993. Region 4 sensitive species broadcast vocalization compact disc. CD use information, (S. Jeffries and L. Ostermiler, tech. coords.). Payette National Forest, McCall, Idaho.

Ralph, C. J., S. Droege, and J. R. Sauer. 1995. Managing and monitoring birds using point counts: standards and applications. Pp. 161-175 in Monitoring Bird Populations by Point Counts (C. J. Ralph, J. R. Sauer, and S. Droege, tech. eds.). Gen. Tech. Rep. PSW-GTR-149. Albany, CA: Pacific Southwest Research Station, Forest Service,
U.S. Dept. of Agriculture; 187 pp.

Reynolds, R. T., J. M. Scott, and R. A. Nussbaum. 1980. A variable circular-plot method for estimating bird numbers. Condor 82:309-313. Stnckler, G. S. 1959. Use of the densiometer to estimate density of forest canopy on permanent sampleplots. U.S. Dept. Agn'c., For. Serv., Res. Note PNW-180. Volland.L.A. 1988. Plant associations of the central Oregon pumice zone. USDA For. Serv., Pacific Northwest Region. R6-Ecol-104-1985.

Eastside Interior Grassland (Asotin, Tucannon, L. Snake, Walla Walla Subbasins)

Focal Species: Sharp-tailed grouse (*Tympanuchus phasianellus*), grasshopper sparrow (*Ammodramus savannarum*), Mule Deer *(Odocoileus hemionus hemionus)*

Overall Habitat and Species Monitoring Strategy: Establish monitoring program for protected and managed Interior Grassland sites to monitor focal species population and habitat changes and evaluate success of efforts.

FOCAL HABITAT MONITORING:

Factors affecting habitat:

1. Direct loss grasslands due to conversion to agriculture
2. Fragmentation of remaining grassland habitat, with resultant increase in nest parasites
3. Fire Management, either suppression or over-use, and wildfires
4. Invasion of exotic vegetation
5. Habitat degradation due to overgrazing, and invasion of exotic plant species
6. Loss and reduction of cryptogamic crusts, which help maintain the ecological integrity of shrubsteppe/grassland communities.
7. Conversion of CRP lands back to cropland.

Eastside Interior Grassland Working Hypothesis Statement: The near term or major factors affecting this focal habitat type are direct loss of habitat due primarily to conversion to agriculture, reduction of habitat diversity and function resulting from invasion of exotic vegetation and wildfires, and overgrazing. The principal habitat diversity stressor is the spread and proliferation of annual grasses and noxious weeds such as cheatgrass and yellow-star thistle that either supplant and/or radically alter entire native bunchgrass communities significantly reducing wildlife habitat quality. Habitat loss and fragmentation (including fragmentation resulting from extensive areas of undesirable vegetation) coupled with poor habitat quality of existing vegetation have resulted in extirpation and or significant reductions in grassland obligate wildlife species.

Recommended Range of Management Conditions: Ecoregion/subbasin planners selected the grasshopper sparrow and sharp-tailed grouse to represent the range of habitat conditions required by grassland obligate wildlife species and to serve as potential performance measures to monitor and evaluate the results of implementing future management strategies and actions on interior grassland habitats (specific species accounts are located in the Blue Mountains Ecoregional Assessment Appendix F). In addition, sharp-tailed grouse winter food/roosting needs account for macrophyllus shrub draws and riparian shrublands that historically punctuated interior grassland habitats.

1. Native bunchgrasses greater than 40 percent cover
2. Native forbs 10 to 30 percent cover
3. Herbaceous vegetation height greater than10 inches
4. Visual obstruction readings (VOR) at least 6 inches
5. Native non-deciduous shrubs less than 10 percent cover
6. Exotic vegetation/noxious weeds less than 10 percent cover

7. Multi-structured fruit/bud/catkin producing deciduous trees and shrubs (macrophyllus draws and riparian sites) dispersed throughout the landscape (10 to 40 percent of the total area), or within 1 mile of sharp-tailed grouse nesting/broodrearing habitats.
8. For mule deer: : it is noted that mule deer populations have responded positively to the conversion of agricultural cropland to CRP, especially CP2-4.

Focal Habitat Monitoring Strategies:

1. Identify subbasins in which to re-establish meta populations of sharp-tailed grouse (immediate strategy)
2. Evaluate habitat/release site potential on existing public lands and adjacent private lands (short-term strategy i.e., < 2 years)
3. Enhance habitat on public lands and adjacent private lands (intermediate strategy; 2 to 10 years)
4. Identify high quality/functional privately owned grassland sites that are not adjacent to public lands (long-term strategy 2 to 15 years).
5. Establish permanent roadside and off-road censusing stations to monitor bird population and habitat changes
6. Presence of all exotic weeds i.e., knapweed, yellow starthistle (Centaurea solistitialis), cheatgrass etc. will be mapped in GIS using Global Positioning System (GPS) equipment. This information will be used to develop an annual exotic vegetation control plan.

Sampling Design: Permanent survey transects will be located within Eastside Interior Grassland habitats using HEP protocols. HEP is a standardized habitat-analysis strategy developed by the U.S. Fish and Wildlife Service. It uses a variety of Habitat Suitability Indices (HSI) for select wildlife species to evaluate the plant community as a whole (Anderson and Gutzwiller 1996). Sites are stratified by cover type, and starting points are established using a random number grid. Minimum length of a HEP transect is 600 ft, and patches of cover must be large enough to contain a minimum transect without extending past a 100 foot buffer inside the edge of the cover type.

In addition, at any permanently established avian species monitoring site established within the Eastside Interior Grassland habitat, structural habitat conditions will be monitored every 5 years as per Habitat Structure Assessment protocol (Nott et al 2003).

Sampling Methods (USFWS 1980a and 1980b):

1. Herbaceous measurements are taken every 20 ft. on the right side of the tape (the right is always determined by standing at 0 ft and facing the line of travel). The sampling quadrat is a rectangular $0.5m^2$ microplot, placed with the long axis perpendicular to the tape, and the lower right corner on the sampling interval.

2. Shrub canopy cover is measured using a point intercept method and is visually estimated before starting each transect. If the total shrub cover is anticipated to be >20%, shrub data are collected every 5 ft (20 possible “hits” per 100 ft segment). If shrub canopy cover is anticipated to be <20%, data are collected every 2 ft (50 possible “hits” per 100 ft segment).

   Shrub height measurements are collected on the tallest part of a shrub that crosses directly above each sampling intercept mark. For shorter shrub classifications (i.e. all shrubs less than 3 feet), the tallest shrub is measured that falls within that category.

3. Tree canopy cover measurements are taken every ten feet along a transect. Basal and snag measurements are taken within a tenth-acre circular plot at the end of each 100 ft segment. The center point of the circular plot is the 100 ft mark of the transect tape, and the radius of the circle is 37.2 ft.

Analysis: Transects are divided into 100 ft. segments, and total transect length is determined using a "running mean" to estimate variance (95% probability of being within 10% of the true mean).

$$\text{Sample size equation: } n = \frac{t^2 \times s^2}{E^2}$$

Where: t = value at 95 percent confidence interval with suitable degrees of freedom
s = standard deviation
E = desired level of precision, or bounds

Literature Cited:

Anderson, S. and K. Gutzwiller. 1996. Habitat Evaluation Methods. Pages 592-606 in: T. A. Bookhout, ed. Research and Management Techniques for Wildlife and Habitats. Fifth ed., rev. The Wildlife Society, Bethesda, MD. xiii + 740pp.

Nott, R., D.F. DeSante, and N. Michel. 2003. Monitoring Avian Productivity and Survivorship (MAPS) Habitat Structure Assessment (HAS) Protocol 2003. The Institure for Bird Populations, Pt. Reyes Station, CA.

USFWS. 1980a. Habitat as a Basis for Environmental Assessment, Ecological Services Manual (ESM) 101. Division of Ecological Services, U.S. Fish and Wildlife Service, Department of the Interior, Washington, D.C. Unnumbered.

USFWS. 1980b. Habitat Evaluation Procedures (HEP), Ecological Services Manual (ESM) 102. Division of Ecological Services, U.S. Fish and Wildlife Service, Department of the Interior, Washington, D.C. Unnumbered.

FOCAL SPECIES MONITORING:

Sharp-Tailed Grouse

Rationale: Re-establishing a viable sharp-tailed grouse population in the Southeast Washington Ecoregion is a biological objective for WDFW in Region 1 (Fowler, pers. comm., WDFW 2004). Historically, the Palouse and adjacent grasslands supported high populations of sharp-tailed grouse that were extirpated as grassland habitat was converted to agriculture, fragmented, overgrazed, and/or entire native plant communities were displaced or severely altered by introduced vegetation (Sec. 5.2.4.2). Individual birds and/or isolated, small populations may still occur within the Ecoregion. Schroeder (WDFW, pers comm. 2003) reported that two sharp-tailed grouse were observed displaying at a site in Asotin County in Spring 2000 (these grouse may be from Idaho Fish and Game re-introduction efforts).

As per Grassland Objective G2, Strategy 4, Restore viable populations of Interior Grassland obligate wildlife species where possible, subbasin managers have adopted a strategy to establish a viable sharp-tailed grouse population, comprised of three meta-populations, within three of the five Ecoregion subbasins by the year 2020. Monitoring of sharp-tailed grouse is crucial to this effort.

Limiting Factors:
1) Conversion of native steppe habitat for agricultural purposes, 2) flooding of habitat resulting from hydropower facilities, 3) habitat fragmentation, 4) degradation of existing habitats from overgrazing and introduced weedy vegetation, and 5) tree/shrub removal in riparian areas (Sec. 5.2.4.2.2). Sharp-tailed grouse limiting factors are nearly identical to the factors that affect focal grassland habitats (Section 4.3).

Although mortality factors such as unrestricted hunting may have affected local sharp-tailed grouse populations (this is not the case for grasshopper sparrows and other obligate species), the assessment clearly indicates that grassland habitats were altered significantly and/or lost. Habitat loss and degradation are the primary factors relating to extirpation of sharp-tailed grouse and other grassland obligate species in the Ecoregion.

Assumptions: 1) Addressing factors that affect eastside (interior) grasslands, will also address sharp-tailed grouse and other grassland obligate species limiting factors. 2) If grassland habitat is of sufficient quality, extent, and distribution to support viable sharp-tailed grouse and grasshopper sparrow populations, the needs of most other grassland obligate species will also be addressed and grassland functionality could be inferred. Restoration of sufficient quantity and quality native habitat will be necessary to reestablish viable populations of CSTG within the Ecoregion. Reestablishment may require restoring agricultural land to permanent cover for nesting and brood rearing near sites with sufficient winter range (shrubs desireable as food plants). Managing habitat conditions for a species assemblage comprised of sharp-tailed grouse and grasshopper sparrow should provide life requisite needs for most other grassland obligate species.

Methods: **(This is the standardized WDFW protocol.)**
Male greater sage grouse and sharp-tailed grouse congregate during the spring on relatively traditional breeding sites, usually referred to as ‘leks’ or ‘lek complexes’. Females visit these sites during the peak of the breeding season to ‘select’ and copulate with males. These lek surveys are designed to be consistent with similar surveys being conducted on an annual basis in all western states with populations of either greater sage grouse or sharp-tailed grouse. Leks usually are difficult to observe. Lek counts should consist of a complete count of birds (differentiate by sex when possible). There should be at least 2 counts of each active lek, although one is better than none. Potential locations may need to be surveyed 2-4 times to be certain that birds are absent. This is particularly true for the small and isolated populations in Washington. Small leks tend to be relatively quiet, thus adding to the difficulty. Counts should be spaced at least 10 days apart between 10 March and 25 May. The peak of activity (female attendance and breeding) is early April in most years.

Searches can be conducted by ‘listening’ for displaying males at points along roads, trails, ridges, or fence lines. The sound that can be heard best is the low ‘coo’ note produced. Under perfect conditions, this noise can be heard up to 2 km. Other sounds made by swishing tail feathers, a fast tapping sound called tail rattling can be heard when closer. Both of these sounds are sounds that only the males make. Gobbles and ‘chilk’ notes can also be heard at

times. Gobbles are made by both sexes, and the 'chilk' notes are produced by males. The listening points should be a maximum of 0.5 miles apart. Listening surveys can be initiated about 0.75 hours before sunrise and continued for 2 hours. Listen for at least 5 minutes per station. If observers are too close to leks, sharp-tailed grouse will stop lekking and become quiet. Changing survey stations in repeat surveys may help address this issue.

If the lek complex cannot be clearly observed without disturbance, then birds may have to be counted when flushed. Flushing is best accomplished with at least 2 observers or one person with a trained dog, as peripheral birds often will not flush if the observer is too far away. Males are often best counted returning to the leks. In many situations, a viewpoint is available that permits careful observation of birds with the aid of a spotting scope. Multiple counts of a large lek in a single morning may be needed to insure an accurate and consistent count. This can be done by scanning from left to right and then from right to left and then repeating the procedure 10-15 minutes later. Observers should be aware that young males and/or males on the edge of lek may be difficult to see. Likewise young males may be difficult to differentiate from females, even for greater sage grouse.

Lek counts should be conducted when the weather is good (wind < 10 MPH, no precipitation, temperatures > 20^{o}F, >50% bare ground). Weather matters less during the peak of the breeding season (late-March for greater sage-grouse and early April for sharp-tailed grouse). If the weather is not acceptable, it is likely the count will be abnormally low and have to be repeated.

Counts may be low if the birds are disturbed by predators (golden eagles, red-tailed hawks, coyotes, etc.), by people (photographers, bird watchers, farmers, etc.), or by unknown factors. Counts that appear to be abnormally low that have dropped dramatically from the previous year) should be repeated. Sharp-tailed grouse are very likely to return to the lek 10-20 minutes following disturbance whereas greater sage grouse will often remain off the lek until the next morning.

Literature Cited:

Lambeck, R. J. 1997. Focal species: a multi-species umbrella for nature conservation. Conservation Biology 11:849-856.

Grasshopper Sparrow

Rationale: Suitable grasshopper sparrow habitat consists of undisturbed grasslands of intermediate height, often associated with clumped vegetation interspersed with patches of bare ground (Bent 1968; Blankespoor 1980; Vickery 1996). Other habitat requirements include moderately deep litter and sparse coverage of woody vegetation (Smith 1963; Bent 1968; Wiens 1969, 1970; Kahl et al. 1985; Arnold and Higgins 1986). In addition, the grasshopper sparrow like other grassland species shows a sensitivity to the grassland patch size (Herkert 1994; Samson 1980; Vickery 1994; Bock *et al.* 1999). Within the entire Interior Columbia Basin, overall decline in source habitats for grasshopper sparrow (71 percent) was third greatest among 91 species of vertebrates analyzed (Wisdom et al. in press). Maintaining grasshopper sparrow populations will require that native grassland habitat is maintained or enhanced within the Ecoregion.

Limiting Factors: 1) Conversion of native steppe habitat for agricultural purposes, 2) flooding of habitat resulting from hydropower facilities, 3) habitat fragmentation, 4) degradation of existing

habitats from overgrazing and introduced weedy vegetation, 5) alteration of historic fire regimes (Sec. 5.2.4.1.2).

Assumptions: 1) Addressing factors that affect eastside (interior) grasslands, will also address sharp-tailed grouse and other grassland obligate species limiting factors. 2) If grassland habitat is of sufficient quality, extent, and distribution (Hyperlink to SHGR requirements and/or recommended conditions) to support viable sharp-tailed grouse and grasshopper sparrow populations, the needs of most other grassland obligate species will also be addressed and grassland functionality could be inferred.

Sampling Strategy: Survey points will be placed among habitat types of interest using a stratified random design. Number of survey points in each habitat type will be determined using power analysis with the goal of being able to detect a 25% increase in abundance of key species with a power of 0.8 or greater.

Methods: We will survey birds on 64 sites in different vegetation types and levels of fragmentation. Each site will have 4 100-m fixed-radius point counts (Ralph et al. 1993) established along a transect and spaced 200m apart (Fig 4). The outer points of the point-count circles will describe a rectangular plot of 16ha that will be the focus of all survey work in Objectives 2-4. Each point will be marked with a permanent fiberglass stake (1m electric fence post) and colored flagging will be placed on shrubs at 50 and 100m from the point in each of the 4 cardinal directions to aid in determining distance. Counts at each point will be 5 minutes in duration during which all birds seen or heard will be noted, along with their sex (if known), distance from the point (within 50m, >50 but <100m, or beyond 100m), and behavior (singing, calling, silent, or flying over the site). Surveys will be conducted once each in May and June and within prescribed weather parameters (e.g., no rain and low wind).

References:

Ralph, C. J., G. R. Geupel, P. Pyle, T. E. Martin and D. F. DeSante. 1993. Handbook of field methods for monitoring birds, Pacific Southwest Research Station, Forest Service, U. S. Department of Agriculture, Albany, CA, pp. 41.

Mule Deer

Rationale: Mule deer inhabit all subbasins within the Ecoregion. The largest populations of mule deer occur in the lowlands and breaks of the Snake River in the Asotin, Lower Snake River, Walla Walla and Tucannon subbasins. Mule deer have been selected as a focal species in two focal habitats; Eastside Interior Grasslands (Tucannon, Lower Snake, Asotin), and Shrubsteppe (Walla Walla), due to the significant economic, recreational, and cultural values this species provides. Mule deer were selected for the Interior Grasslands because this is the only focal species that has shown a positive response from habitat improvements such as CRP plantings in recent years. Mule deer populations have responded to CRP by increasing in both population and distribution in southeast Washington (Sec. 5.2.2.4.1).

Limiting Factors: 1) flooding of habitat resulting from hydropower facilities, 2) loss of habitat due to urban and suburban development, 3) road and highway construction, 4) degradation of existing habitats from overgrazing and introduced weedy vegetation, 5) alteration of historic fire regimes, 6) past silvicultural practices, 7) competition from other ungulates, 8) natural predation

and over-harvest by hunters, 9) disease and parasites, 10) deer control efforts necessitated by agricultural damage (Sec. 5.2.2.4.2).

Assumptions: Addressing factors that affect shrubsteppe and interior grassland habitats, will also address mule deer and other shrubsteppe and interior grassland obligate species limiting factors.

Management Objective: The population management objective for mule deer will be to increase or maintain populations within the limitations of available mule deer habitat and landowner tolerance (agricultural damage). Population monitoring variables and objectives are established in the Washington Department of Fish and Wildlife Game Management Plan (WDFW 2003). In areas with high mule deer populations and significant agricultural damage complaints (eg. GMUs 145, and 149), WDFW will increase antlerless permits, and authorize "hotspot" hunts as appropriate.

Monitoring Methods: Mule deer populations will be monitored using a combination of pre and post hunting surveys and harvest data. At present, manpower and financial restrictions do not allow the collection of both the quantity and quality of data necessary to provide high confidence in populations modeling. Current surveys allow the monitoring of age/sex ratios to determine if management objectives established in the Game Management Plan (WDFW 2003) are being met for post-season buck survival (> 15 bucks/100 does) and fawn production and recruitment. Harvest data is used to monitor buck harvest trends, which is also an indicator of population trend.

Evaluation Strategies:

1.) Use late summer-early fall (pre-season) ground surveys to determine pre-hunt buck/fawn to doe ratios. Attempt to obtain a sample of 250+ classified mule deer from each of the major mule deer units; e.g. 1200-1500 mule deer.
2.) Use winter aerial and ground surveys to classify 2,000 mule deer from five major mule deer units to determine post-hunt buck/fawn to doe ratios.
3.) Monitor harvest level of bucks and anlterless deer using mandatory hunter report system.
4.) Develop population model for mule deer under a three point management strategy.

References:

Ashley, P.A., Stovall. 2004. Southeast Washington Subbasin Planning Ecoregion Wildlife Assessment.

Washington Dept. Fish and Wildlife. 2003. Game Management Plan. 136 pp.Wildlife Management Program. Washington Dept. Fish and Wildlife, Olympia, WA.

Shrubsteppe (L. Snake, Walla Walla Subbasins)

Focal Species: Sage thrasher *(Oreoscoptes montanus)*, sage sparrow ( ), Brewer's sparrow *(Spizella breweri),* and mule deer *(Odocoileus hemionus hemionus)*

Overall Habitat and Species Monitoring Strategy: Establish monitoring program for protected and managed Shrubsteppe sites to monitor focal species population and habitat changes and evaluate success of efforts.

FOCAL HABITAT MONITORING:

Factors affecting habitat:

1. Direct loss shrubsteppe due to conversion to agriculture
2. Fragmentation of remaining shrubsteppe habitat, with resultant increase in nest parasites
3. Fire Management, either suppression or over-use, and wildfires
4. Invasion of exotic vegetation
5. Habitat degradation due to overgrazing, and invasion of exotic plant species
6. Loss and reduction of cryptogamic crusts, which help maintain the ecological integrity of shrubsteppe/grassland communities.
7. Conversion of CRP lands back to cropland.

Shrubsteppe Working Hypothesis Statement: The near term or major factors affecting this focal habitat type are direct loss of habitat due primarily to conversion to agriculture, reduction of habitat diversity and function resulting from invasion of exotic vegetation and wildfires, and livestock grazing. The principal habitat diversity stressor is the spread and proliferation of annual grasses and noxious weeds such as cheatgrass and yellow-star thistle that either supplant and/or radically alter entire native bunchgrass communities significantly reducing wildlife habitat quality. Habitat loss and fragmentation (including fragmentation resulting from extensive areas of undesirable vegetation) coupled with poor habitat quality of extant vegetation have resulted in extirpation and or significant reductions in grassland obligate wildlife species.

Recommended Range of Management Conditions:

1. Condition 1: Sagebrush dominated shrubsteppe: The sage thrasher was selected to represent shrubsteppe obligate wildlife species that require sagebrush dominated shrubsteppe habitats and that are dependent upon areas of tall sagebrush within large tracts of shrubsteppe habitat. Suitable habitat includes 5 to 20 percent sagebrush cover greater than 2.5 feet in height, 5 to 20 percent native herbaceous cover, and less than 10 percent non-native herbaceous cover (Vander Haegen et al. 2000).

   The Brewer's sparrow was selected to represent wildlife species that require sagebrush dominated sites, but prefer a patchy distribution of sagebrush clumps 10-30 percent cover, lower sagebrush height (between 20 and 28 inches), native grass cover 10 to 20 percent (Dobler 1994), non-native herbaceous cover less than 10 percent, and bare ground greater than 20 percent (Altman and Holmes 2000).

   Sage sparrows are still common throughout sagebrush habitats and have a high probability of being sustained wherever large areas of sagebrush and other preferred native shrubs exist for breeding. Similar to other shrubsteppe obligate species, sage sparrows are associated with habitats dominated by big sagebrush cover and perennial bunchgrasses (Paige and Ritter 1999; Vander Haegen *et al.* 2000). Habitat attribute conditions recommended for sage sparrows include; dominant sagebrush canopy with

10 to 25 percent sagebrush cover, mean sagebrush height greater than 20 inches, high foliage density, mean native grass cover greater than 10 percent, mean exotic annual grass cover less than 10 percent, mean open ground cover greater than 10 percent, and, where appropriate, suitable habitat conditions in patches greater than 400 acres (Altman and Holmes 2000).

2. Recommended Condition 2 - *Diverse shrubsteppe habitat:* Mule deer were selected to represent species that require/prefer diverse, dense (30 to 60 percent shrub cover less than 5 feet tall) shrubsteppe habitats comprised of bitterbrush, big sagebrush, rabbitbrush, and other shrub species (Leckenby 1969; Kufeld *et al.* 1973; Sheehy 1975; Jackson 1990; Ashley *et al.* 1999) with a palatable herbaceous understory exceeding 30 percent cover (Ashley *et al.* 1999).

Focal Habitat Monitoring Strategies: Establish an inventory and long-term monitoring program for protected and managed shrubsteppe habitats to determine success of management strategies. Subbasin managers recognize that restoration of shrubsteppe is still very much a fledgling field, and complete restoration of degraded or converted shrubsteppe may not be feasible. These Monitoring strategies reflect the commitment to and initiation of the process of longterm management.

1. Identify shrubsteppe habitat sites within the subbasin that support populations of focal species
2. Evaluate habitat site potential on existing public lands and adjacent private lands for protection of focal species habitat (short-term strategy i.e., < 2 years).
3. Enhance habitat on public lands and adjacent private lands (intermediate strategy; 2 to 10 years)
4. Identify high quality/functional privately owned shrubsteppesites that are not adjacent to public lands (long-term strategy 2 to 15 years).
5. Establish permanent roadside and off-road censusing stations to monitor bird population and habitat changes.
6. Presence of all exotic weeds i.e., knapweed, yellow starthistle (Centaurea solistitialis), cheatgrass etc. will be mapped in GIS using Global Positioning System (GPS) equipment. This information will be used to develop an annual exotic vegetation control plan.

Sampling Design: Permanent survey transects will be located within shrubsteppe habitats using HEP protocols. HEP is a standardized habitat-analysis strategy developed by the U.S. Fish and Wildlife Service. It uses a variety of Habitat Suitability Indices (HSI) for select wildlife species to evaluate the plant community as a whole (Anderson and Gutzwiller 1996). Sites are stratified by cover type, and starting points are established using a random number grid. Minimum length of a HEP transect is 600 ft, and patches of cover must be large enough to contain a minimum transect without extending past a 100 foot buffer inside the edge of the cover type.

In addition, at any permanently established avian species monitoring site established within the Shrubsteppe habitat, structural habitat conditions will be monitored every 5 years as per Habitat Structure Assessment protocol (Nott et al 2003).

Sampling Methods (USFWS 1980a and 1980b):

1. Bare ground or cryptogram crust measurements are taken every 20 ft. on the right side of the tape (the right is always determined by standing at 0 ft and facing the line of travel). The sampling quadrat is a rectangular $0.5m^2$ microplot, placed with the long axis perpendicular to the tape, and the lower right corner on the sampling interval.

   The percentage of the microplot consisting of either bare ground or cryptogram crust is estimated via ocular estimate.

2. Herbaceous measurements are taken every 20 ft. on the right side of the tape (the right is always determined by standing at 0 ft and facing the line of travel). The sampling quadrat is a rectangular $0.5m^2$ microplot, placed with the long axis perpendicular to the tape, and the lower right corner on the sampling interval.

   Herbaceous cover % is measured via an ocular estimate of the percentage of the microplot shaded by any grass or forb species.

3. Shrub canopy cover is measured using a point intercept method and is visually estimated before starting each transect. If the total shrub cover is anticipated to be >20%, shrub data are collected every 5 ft (20 possible "hits" per 100 ft segment). If shrub canopy cover is anticipated to be <20%, data are collected every 2 ft (50 possible "hits" per 100 ft segment).

   Shrub canopy cover is measured on a line intercept 'hit' or 'miss'. Measurements are taken every 2 or 5 feet, depending upon shrub density.

   Shrub height measurements are collected on the tallest part of a shrub that crosses directly above each sampling intercept mark. For shorter shrub classifications (i.e. all shrubs less than 3 feet), the tallest shrub is measured that falls within that category.

4. Tree canopy cover measurements are taken every ten feet along a transect. Basal and snag measurements are taken within a tenth-acre circular plot at the end of each 100 ft segment. The center point of the circular plot is the 100 ft mark of the transect tape, and the radius of the circle is 37.2 ft.

Analysis: Transects are divided into 100 ft. segments, and total transect length is determined using a "running mean" to estimate variance (95% probability of being within 10% of the true mean).

$$\text{Sample size equation: } n = \frac{t^2 \times s^2}{E^2}$$

Where: t = value at 95 percent confidence interval with suitable degrees of freedom
s = standard deviation
E = desired level of precision, or bounds

Literature Cited:

Anderson, S. and K. Gutzwiller. 1996. Habitat Evaluation Methods. Pages 592-606 in: T. A. Bookhout, ed. Research and Management Techniques for Wildlife and Habitats. Fifth ed., rev. The Wildlife Society, Bethesda, MD. xiii + 740pp.

Nott, R., D.F. DeSante, and N. Michel. 2003. Monitoring Avian Productivity and Survivorship (MAPS) Habitat Structure Assessment (HAS) Protocol 2003. The Institure for Bird Populations, Pt. Reyes Station, CA.

USFWS. 1980a. Habitat as a Basis for Environmental Assessment, Ecological Services Manual (ESM) 101. Division of Ecological Services, U.S. Fish and Wildlife Service, Department of the Interior, Washington, D.C. Unnumbered.

USFWS. 1980b. Habitat Evaluation Procedures (HEP), Ecological Services Manual (ESM) 102. Division of Ecological Services, U.S. Fish and Wildlife Service, Department of the Interior, Washington, D.C. Unnumbered.

.

FOCAL SPECIES MONITORING:

Sage Sparrow, Brewer's Sparrow, Sage Thrasher

Rationale: The main premise for focal species selection is that the requirements of a demanding species assemblage such as sage thrasher, sage sparrow and Brewer's sparrow encapsulate those of many co-occurring less demanding species. By directing management efforts toward the requirements of the most exigent species, the requirements of many cohabitants that use the same habitat type are met. Therefore, managing habitat conditions for a species assemblage comprised of these three species should provide life requisite needs for most other shrubsteppe obligate species.

Limiting Factors: 1) Conversion of native shrub-steppe habitat for agricultural purposes, 2) habitat fragmentation; 3) degradation of existing habitats from overgrazing and introduced weedy vegetation, and 5) brush removal, 6.) wildfire (Sec. 5.2.2)

Assumptions: 1) Addressing factors that affect shrub steppe habitat will address our three-species assemblage; 2) If shrub steppe habitat is of sufficient quality, extent, and distribution to support viable sage thrasher, sage sparrow and Brewer's sparrow populations, the needs of most other shrub steppe obligate species will also be addressed and shrub steppe functionality could be inferred.

Sampling Strategy: Survey points will be placed among habitat types of interest using a stratified random design. Number of survey points in each habitat type will be determined using power analysis with the goal of being able to detect a 35% increase in abundance of key species with a power of 0.8 or greater.

Methods: We will survey birds on 64 sites in different vegetation types and levels of fragmentation. Each site will have 4 100-m fixed-radius point counts (Ralph et al. 1993) established along a transect and spaced 200m apart (Fig 4). The outer points of the point-count circles will describe a rectangular plot of 16ha that will be the focus of all survey work in Objectives 2-4. Each point will be marked with a permanent fiberglass stake (1m electric fence post) and colored flagging will be placed on shrubs at 50 and 100m from the point in each of the 4 cardinal directions to aid in determining distance. Counts at each point will be 5 minutes in duration during which all birds seen or heard will be noted, along with their sex (if known), distance from the point (within 50m, >50 but <100m, or beyond 100m), and behavior (singing,

calling, silent, or flying over the site). Surveys will be conducted once each in May and June and within prescribed weather parameters (e.g., no rain and low wind).

References:

Dobler, F. C., J. Eby, C. Perry, S. Richardson, and M. Vander Haegen. 1996. Status of Washington's shrub-steppe ecosystem: extent, ownership, and wildlife/vegetation relationships. Phase One Completion Report. Washington Department of Fish and Wildlife. Olympia. 39p.

Ralph, C. J., G. R. Geupel, P. Pyle, T. E. Martin and D. F. DeSante. 1993. Handbook of field methods for monitoring birds, Pacific Southwest Research Station, Forest Service, U. S. Department of Agriculture, Albany, CA, pp. 41.

Rotenberry, J. T., and J. A. Wiens. 1980. Habitat structure, patchiness, and avian communities in North American steppe vegetation: A multivariate analysis. Ecology 61.
Vander Haegen, W. M., and B. Walker. 1999. Parasitism by brown-headed cowbirds in the shrubsteppe of eastern Washington. Studies in Avian Biology 18:34-40.

Vander Haegen, W. M., F. C. Dobler, and D. J. Pierce. 2000. Shrubsteppe bird response to habitat and landscape variables in eastern Washington, USA. Conservation Biology 14:1145-1160.

Mule Deer

Rationale: Mule deer inhabit all subbasins within the Ecoregion. The largest populations of mule deer occur in the lowlands and breaks of the Snake River in the Asotin, Lower Snake River, Walla Walla and Tucannon subbasins. Mule deer have been selected as a focal species in two focal habitats; Eastside Interior Grasslands (Tucannon, Lower Snake, Asotin), and Shrubsteppe (Walla Walla), due to the significant economic, recreational, and cultural values this species provides. Mule deer were selected for the Interior Grasslands because this is the only focal species that has shown a positive response from habitat improvements such as CRP plantings in recent years. Mule deer populations have responded to CRP by increasing in both population and distribution in southeast Washington (Sec. 5.2.2.4.1).

Limiting Factors: 1) flooding of habitat resulting from hydropower facilities, 2) loss of habitat due to urban and suburban development, 3) road and highway construction, 4) degradation of existing habitats from overgrazing and introduced weedy vegetation, 5) alteration of historic fire regimes, 6) past silvicultural practices, 7) competition from other ungulates, 8) natural predation and over-harvest by hunters, 9) disease and parasites, 10) deer control efforts necessitated by agricultural damage (Sec. 5.2.2.4.2).

Assumptions: Addressing factors that affect shrubsteppe and interior grassland habitats, will also address mule deer and other shrubsteppe and interior grassland obligate species limiting factors.

Management Objective: The population management objective for mule deer will be to increase or maintain populations within the limitations of available mule deer habitat and landowner tolerance (agricultural damage). Population monitoring variables and objectives are established in the Washington Department of Fish and Wildlife Game Management Plan (WDFW 2003). In areas with high mule deer populations and significant agricultural damage complaints (eg.

GMUs 145, and 149), WDFW will increase antlerless permits, and authorize “hotspot” hunts as appropriate.

Monitoring Methods: Mule deer populations will be monitored using a combination of pre and post hunting surveys and harvest data. At present, manpower and financial restrictions do not allow the collection of both the quantity and quality of data necessary to provide high confidence in populations modeling. Current surveys allow the monitoring of age/sex ratios to determine if management objectives established in the Game Management Plan (WDFW 2003) are being met for post-season buck survival (> 15 bucks/100 does) and fawn production and recruitment. Harvest data is used to monitor buck harvest trends, which is also an indicator of population trend.

Evaluation Strategies:

5.) Use late summer-early fall (pre-season) ground surveys to determine pre-hunt buck/fawn to doe ratios. Attempt to obtain a sample of 250+ classified mule deer from each of the major mule deer units; e.g. 1200-1500 mule deer.
6.) Use winter aerial and ground surveys to classify 2,000 mule deer from five major mule deer units to determine post-hunt buck/fawn to doe ratios.
7.) Monitor harvest level of bucks and anlterless deer using mandatory hunter report system.
8.) Develop population model for mule deer under a three point management strategy.

References:

Ashley, P.A., Stovall. 2004. Southeast Washington Subbasin Planning Ecoregion Wildlife Assessment.

Washington Dept. Fish and Wildlife. 2003. Game Management Plan. 136 pp.Wildlife Management Program. Washington Dept. Fish and Wildlife, Olympia, WA.

MONITORING PLAN FOR FOCAL HABITAT STRATEGIES

Habitat and species monitoring will allow for evaluation of habitat use by focal species, and evaluation of habitat areas meeting management conditions. All data collection and data management methodologies will be standardized to national standards cited in the focal habitat and focal species sections of the monitoring plan. Each entity collecting or managing data will have the responsibility to comply with established protocols.

Implementation of the Subbasin Plans is ultimately the responsibility of all managers and stakeholders who participated in its development. It is recommended that this group form an "Implementation Oversight Committee", the function of which will be to track and guide research, monitoring and reporting activities included in the plans.

Table 3. Monitoring Plan For Focal Habitat Strategies.

Habitat Type	Obj.	Strategies (Note-Strategies are not prioritized and will be implemented based upon available opportunities)	Element of RME plan that will address the strategy
Riparian-Riverine Wetland (Asotin, Tucannon, L. Snake, and Walla Walla subbasins)	R1	Strategies listed under riparian function for aquatic species are incorporated herein by reference (see Chapter 7 of the Subbasin Plan for the respective subbasin: Asotin, Lower Snake, Tucannon, or Walla Walla).	Habitat and species monitoring will allow for evaluation of habitat use by focal species; evaluation of habitat area meeting management conditions Data collection will be standardized to national standards cited in monitoring plan Data management methodologies will be standardized to national standards cited in monitoring plan Each entity collecting/managing data will have responsibility to comply with established protocols RM&E efforts developed for riparian areas through the aquatic component of the subbasin plan will overlap with these RM&E elements as well.

Habitat Type	Obj.	Strategies (Note-Strategies are not prioritized and will be implemented based upon available opportunities)	Element of RME plan that will address the strategy
Ponderosa Pine (Asotin, Tucannon, L. Snake, and Walla Walla subbasins)	P1	1. Identify functioning ponderosa pine habitats, corridors, and linkages classified as ECA Class 1&2 for protection. 2. Provide information, education, and outreach to protect habitats. 3. Use easements, leases, cooperative agreements, and acquisitions to protect habitat (long-term protection strategies are preferred over short-term). 4. Uphold existing land use and environmental regulations (e.g. critical area ordinances, etc.). 5. Identify inadequate land use regulations. Work to strengthen existing regulations or pass new regulations to improve protection of habitats. 6. Complete a more detailed assessment of focal species, focal species assemblages, and obligate species needs to determine their habitat requirements (quantity and quality). Assessment/research would ultimately determine what acreage and distribution of functional habitat is necessary to achieve habitat recovery in the context of focal species needs.	1. Identification of functional ponderosa pine habitats is listed as a data gap. Will be addressed through Research and Monitoring conducted by cooperators 2. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually. 3. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually. 4. Responsibility of all participants in subbasin planning area 5. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually. 6. Identified as Research Need/Data Gap. Will be address through Research and Monitoring efforts conducted by cooperators, including State, Federal and Tribal resource management agencies.

Habitat Type	Obj.	Strategies (Note-Strategies are not prioritized and will be implemented based upon available opportunities)	Element of RME plan that will address the strategy
	P2	1. Identify non-functioning ponderosa pine habitats, corridors, and linkages within ECA Class 1 & 2 areas. 2. Identify sites that are currently not in ponderosa pine habitat that have the potential to be of high ecological value, if restored. 3. Provide information, outreach, and coordination with public and private land managers on the use of prescribed fire and silviculture practices to restore and conserve habitat functionality. 4. Enter into cooperative projects and management agreements with Federal, State, Tribal, and private landowners to restore and conserve habitat function. 5. Assist in long-term development and implementation of a Southeast Washington Comprehensive Weed Control Management Plan in cooperation with local weed boards. 6. Fund noxious weed control projects to improve habitat function. 7. Work with county, state, and federal agencies and private landowners to develop livestock grazing programs on federal and private lands that do not contribute to the invasion of noxious weeds or negatively alter understory vegetation.	1. Research and Monitoring conducted by cooperators, primarily State, Federal and Tribal resource managers 2. Research and Monitoring conducted by cooperators, primarily State, Federal and Tribal resource managers 3. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually. 4. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually. 5. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually. 6. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will seek to maximize funding and track and report accomplishments annually. 7. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually.
	P3	1. Identify functioning ponderosa pine habitats, corridors and linkages within protected areas (GAP) and areas of private land that meet one or more of the following conditions: directly contribute to the restoration of aquatic focal species, have high ecological function, are adjacent to public land, contain rare or unique plant communities, have threatened, endangered, or sensitive species habitat or populations, or provide connectivity between high quality habitat areas See P1 Strategies 2-6.	1. Identification of functional ponderosa pine habitats is listed as a data gap. Will be addressed through Research and Monitoring conducted by cooperators See P1 Elements 2-6

Habitat Type	Obj.	Strategies (Note-Strategies are not prioritized and will be implemented based upon available opportunities)	Element of RME plan that will address the strategy
Ponderosa Pine (Asotin, Tucannon, L. Snake, and Walla Walla subbasins)	P4	1. Identify non functioning ponderosa pine habitats, corridors and linkages within protected areas (GAP) and areas of private land that meet one or more of the following conditions: directly contribute to the restoration of aquatic focal species, have high ecological function, are adjacent to public land, contain rare or unique plant communities, have threatened, endangered, or sensitive species habitat or populations, or provide connectivity between high quality habitat areas. See P2 Strategies 2-7.	1. Research and Monitoring conducted by cooperators, primarily State, Federal and Tribal resource management agencies See P2 Elements 2-7
Grassland (Asotin, Tucannon, L. Snake, and Walla Walla subbasins)	G1	1. Identify functioning interior grassland habitats, corridors, and linkages classified as ECA Class 1&2 for protection. 2. Provide information, education, and outreach to protect habitats. 3. Use easements, leases, cooperative agreements, and acquisitions to protect habitats (long-term protection strategies are preferred over short-term). 4. Uphold existing land use and environmental regulations (e.g. critical area ordinances, etc.). 5. Identify inadequate land use regulations. Work to strengthen existing regulations or pass new regulations to improve protection of habitats. 6. Complete a more detailed assessment of focal species, focal species assemblages, and obligate species needs to determine their habitat requirements (quantity and quality). Assessment/research would ultimately determine what acreage and distribution of functional habitat is necessary to achieve habitat recovery in the context of focal species needs.	1. Identification of functional interior grassland habitats is listed as a data gap. Will be addressed through Research and Monitoring conducted by cooperators 2. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually. 3. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually. 4. Responsibility of all participants in subbasin planning area 5. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually. 6. Identified as Research Need/Data Gap. Will be address through Research and Monitoring efforts conducted by cooperators, including State, Federal and Tribal resource management agencies

Habitat Type	Obj.	Strategies (Note-Strategies are not prioritized and will be implemented based upon available opportunities)	Element of RME plan that will address the strategy
	G2	1. Identify non-functioning interior grassland habitats, corridors, and linkages within ECA Class 1 & 2 areas. 2. Identify sites that are currently not in grassland habitat that have the potential to be of high ecological value, if restored. 3. Provide information, outreach and-coordination with public and private land managers on management practices and the use of prescribed fire to restore and conserve habitat function. 4. Enter into cooperative projects and management agreements with Federal, State, Tribal, and private landowners to restore and conserve habitat function. 5. Assist in long-term development and implementation of a Southeast Washington Comprehensive Weed Control Management Plan in cooperation with local weed boards. 6. Fund noxious weed control projects to improve habitat function. 7. Work with county, state, and federal agencies and private landowners to develop livestock grazing programs on public and private lands that do not contribute to the invasion of noxious weeds or negatively alter habitats. 8. Restore viable populations of obligate wildlife species where possible. 9. Work with USDA programs (e.g. CRP) to maintain and enhance habitat quality.	1. Research and Monitoring conducted by cooperators, primarily State, Federal and Tribal resource managers 2. Research and Monitoring conducted by cooperators, primarily State, Federal and Tribal resource managers 3. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually. 4. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually. 5. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually. 6. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will seek to maximize funding and track and report accomplishments annually. 7. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually. 8. Identified as Research and Management need, primarily the responsibility of WDFW 9. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually

Habitat Type	Obj.	Strategies (Note-Strategies are not prioritized and will be implemented based upon available opportunities)	Element of RME plan that will address the strategy
Grassland (Asotin, Tucannon, L. Snake, and Walla Walla subbasins)	G3	1. Identify functioning interior grassland habitats, corridors, and linkages within protected areas (GAP) and areas of private land that meet one or more of the following conditions: directly contribute to the restoration of aquatic focal species, have high ecological function, are adjacent to public land, contain rare or unique plant communities, have threatened, endangered, or sensitive species habitat or populations, or provide connectivity between high quality habitat areas. See G1 Strategies 2-6.	1. Identification of functional interior grassland habitats is listed as a data gap. Will be addressed through Research and Monitoring conducted by cooperators See G1 Elements 2-6
	G4	1. Identify non functioning interior grassland habitats, corridors, and linkages within protected areas (GAP) and areas of private land that meet one or more of the following conditions: directly contribute to the restoration of aquatic focal species, have high ecological function, are adjacent to public land, contain rare or unique plant communities, have threatened, endangered, or sensitive species habitat or populations, or provide connectivity between high quality habitat areas. See G2 Strategies 2-9.	1. Research and Monitoring conducted by cooperators, primarily State, Federal and Tribal resource management agencies See G2 Elements 2-8

Habitat Type	Obj.	Strategies (Note-Strategies are not prioritized and will be implemented based upon available opportunities)	Element of RME plan that will address the strategy
	G5	1. Increase landowner participation in federal, state, tribal, and local programs that enhance watershed health (e.g. CRP, CREP, Wetlands Reserve Program, EQIP, Partners for Fish & Wildlife, WDFW Parterships for Pheasants Program, WDFW Landowner Incentive Program, Conservation Security Program, etc.)	1. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually.
		2. Seek additional funding sources consistent with current CRP and CREP guidelines to increase individual landowner enrollment in programs that achieve similar goals, including prioritization of landowners who have already reached their payment limitations.	2. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually.
		3. Seek funding sources to develop programs consistent with the goals of CRP, EQIP, and CREP in those areas where such programs are not available.	3. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually.
		4. During re-enrollment, convert CRP land to more functional plant communities.	4. Cooperative effort between County, State and Tribal resource management agencies. Each entity will track and report accomplishments annually.
		5. Enroll areas with documented wildlife damage and areas directly adjacent to high-quality wildlife habitat into CRP using cover practices 2, 3, and/or 4.	5. Cooperative effort between County and State resource management agencies, with WDFW having the lead to identify high wildlife damage areas.

Shrubsteppe **(L. Snake, and Walla Walla subbasins)**	S1	1. Identify functioning shrubsteppe habitats, corridors, and linkages classified as ECA Class 1&2 for protection. 2. Provide information, education, and outreach to protect habitats. 3. Use easements, leases, cooperative agreements, and acquisitions to protect habitats (long-term protection strategies are preferred over short-term). 4. Uphold existing land use and environmental regulations (e.g. critical area ordinances, etc.). 5. Identify inadequate land use regulations. Work to strengthen existing regulations or pass new regulations to improve protection of habitats. 6. Complete a more detailed assessment of focal species, focal species assemblages, and obligate species needs to determine their habitat requirements (quantity and quality). Assessment/research would ultimately determine what acreage and distribution of functional habitat is necessary to achieve habitat recovery in the context of focal species needs.	1. Identification of functional shrubsteppe habitats is listed as a data gap. Will be addressed through Research and Monitoring conducted by cooperators 2. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually. 3. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually. 4. Responsibility of all participants in subbasin planning area 5. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually. 6. Identified as Research Need/Data Gap. Will be address through Research and Monitoring efforts conducted by cooperators, including State, Federal and Tribal resource management agencies.

	S2	1. Identify non-functioning shrubsteppe habitats, corridors, and linkages within ECA Class 1 & 2 areas. 2. Identify sites that are currently not in shrubsteppe habitat that have the potential to be of high ecological value, if restored. 3. Provide information, outreach and-coordination with public and private land managers on management practices and the use of prescribed fire to restore and conserve habitat function. 4. Enter into cooperative projects and management agreements with Federal, State, Tribal, and private landowners to restore and conserve habitat function. 5. Assist in long-term development and implementation of a Southeast Washington Comprehensive Weed Control Management Plan in cooperation with local weed boards. 6. Fund noxious weed control projects to improve habitat function. 7. Work with county, state, federal agencies, and private landowners to develop livestock grazing programs on public and private lands that do not contribute to the invasion of noxious weeds or negatively alter the habitat. 8. Restore viable populations of obligate wildlife species where possible. 9. Work with USDA programs (e.g. CRP) to maintain and enhance habitat quality.	1. Research and Monitoring conducted by cooperators, primarily State, Federal and Tribal resource managers 2. Research and Monitoring conducted by cooperators, primarily State, Federal and Tribal resource managers 3. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually. 4. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually. 5. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually. 6. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will seek to maximize funding and track and report accomplishments annually. 7. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually. 8. Identified as Research and Management need, primarily the responsibility of WDFW 9. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually
Shrubsteppe **(L. Snake, and Walla Walla subbasins)**	S3	1. Identify functioning shrubsteppe habitats, corridors, and linkages within protected areas (GAP) and areas of private land that meet one or more of the following conditions: directly contribute to the restoration of aquatic focal species, have high ecological function, are adjacent to public land, contain rare or unique plant communities, have threatened, endangered, or sensitive species habitat or populations, or provide connectivity between high quality habitat areas. See S1 Strategies 2-6.	1. Identification of functional interior grassland habitats is listed as a data gap. Will be addressed through Research and Monitoring conducted by cooperators See S1 Elements 2-6

	S4	1. Identify non functioning shrubsteppe habitats, corridors, and linkages within protected areas (GAP) and areas of private land that meet one or more of the following conditions: directly contribute to the restoration of aquatic focal species, have high ecological function, are adjacent to public land, contain rare or unique plant communities, have threatened, endangered, or sensitive species habitat or populations, or provide connectivity between high quality habitat areas. See S2 Strategies 2-9.	1. Research and Monitoring conducted by cooperators, primarily State, Federal and Tribal resource management agencies See S2 Elements 2-9
	S5	1. Increase landowner participation in federal, state, tribal, and local programs that enhance watershed health (e.g. CRP, CREP, Wetlands Reserve Program, EQIP, Partners for Fish & Wildlife, WDFW Landowner Incentive Program, Conservation Security Program, etc.) 2. Seek additional funding sources consistent with current CRP and CREP guidelines to increase individual landowner enrollment in programs that achieve similar goals, including prioritization of landowners who have already reached their payment limitations. 3. Seek funding sources to develop programs consistent with the goals of CRP, EQIP, and CREP in those areas where such programs are not available. 4. During re-enrollment, convert CRP land to more functional plant communities. 5. Enroll areas with documented wildlife damage and areas directly adjacent to high-quality wildlife habitat into CRP using cover practices 2, 3, and/or 4.	1. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually. 2. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually. 3. Cooperative effort between County, State, Federal and Tribal resource management agencies. Each entity will track and report accomplishments annually. 4. Cooperative effort between County, State and Tribal resource management agencies. Each entity will track and report accomplishments annually. 5. Cooperative effort between County and State resource management agencies, with WDFW having the lead to identify high wildlife damage areas.