
Appendix D

Elk Mitigation Meadows
Maintenance and Monitoring Plan

Elk Mitigation Meadows Maintenance and Monitoring Plan Henry Hagg Lake, Tualatin Project, Oregon

1.0 Introduction

After Scoggins Dam was constructed, the flooding of the valley (in 1978¹) that created Henry Hagg Lake, inundated habitat used by elk (*Cervus elaphus roosevelti*) for foraging primarily in the winter. Managed elk pastures are a required component of the Tualatin Project to mitigate for the loss of valley floor meadow habitat. The Bureau of Reclamation (Reclamation) has been working cooperatively with both Oregon Department of Fish and Wildlife (ODFW) and the U.S. Fish and Wildlife Service (USFWS) on the most reasonable and appropriate measures to be implemented at Hagg Lake to ensure the continuation of healthy elk herds in the Scoggins Creek subbasin. The goals of this management plan are to 1) provide approximately 140 acres of high quality forage for wintering elk around Henry Hagg Lake, 2) provide a method of accurately and effectively monitoring elk use of these pastures, and 3) to provide a framework for reporting results of the monitoring effort and coordinating with ODFW and USFWS.

Reclamation researched the history of elk winter range mitigation at Hagg Lake through archived documents. The oldest record that discusses mitigation for the loss of elk winter habitat is the “Supplement to the Final Environmental Statement on Tualatin Project, Oregon” (Supplement) dated December 6, 1973. In this document, Reclamation recognizes that elk winter range would be eliminated in areas inundated by Scoggins Dam. The affected elk population was estimated to be approximately 100 individuals. The Supplement also calls attention to a compensation plan being developed by the Oregon Game Commission (renamed ODFW) in consultation with USFWS and Reclamation. Subsequently a letter was sent from the Director of the Oregon Game Commission to Reclamation’s Regional Director transmitting the “Wildlife Compensation Plan for the Scoggins Reservoir Project” on April 24, 1974. This Plan included nine units around the reservoir that were potential sites to improve elk habitat including a map of their locations and site descriptions. This Plan noted that flexibility in site locations was prudent for both biological and recreational concerns. Reclamation located five other documents in its records search from 1977 through 1992 in which discussion of elk habitat mitigation would be relevant but the subject was given little attention. The issue was brought back to the forefront in 1994 in the “Scoggins Valley/Henry Hagg Lake Recreation Development Finding of No Significant Impact (FONSI) and Environmental Assessment (EA).” The 1994 EA referenced the 1974 Wildlife Compensation Plan and included a map of elk meadow locations based on the 1974 Plan.

Historically elk were abundant throughout Oregon before non-native settlers arrived, according to early accounts by pioneers. Elk were nearly extirpated from Oregon by the late 1890’s due to unfettered hunting by settlers who hunted elk as a primary source of meat. Remnant elk populations became clustered into the Coast Range, the Cascades, and the Willowa Mountains. Elk hunting was abolished in Oregon from 1900 – 1904 and from 1909 – 1932. Throughout the 20th century numerous different strategies for

¹ Errata: Flooding of the valley actually occurred in approximately 1975, rather than 1978.

regulating the increasing elk population were initiated by ODFW including manipulations to the length and timing of hunting seasons, restricting the bag limit, age, and/or sex of animals harvested (ODFW 2002).

ODFW manages elk herds in Oregon to maximize public recreational opportunities within the constraints of habitat capacity and primary land uses. It is also ODFW’s responsibility to respond to damage complaints and to minimize elk damage through its policies and regulations.

Elk migrate annually from summer habitat at higher elevations in October through November to lower elevations in the winter. Elk migrate back to higher elevations in March through April. Seasonal movements are in response to vegetation availability and snow cover. In the mild climate of the Coast Range, elk migrate shorter distances between summer and winter ranges (Verts and Caraway 1998). On the west slope of the Cascade Range, for example, migration is less than 64 km and winter ranges are less than 1,100 hectares (Verts and Caraway 1998). Elk in the Coast Range would likely have smaller winter ranges and migrate shorter distances.

To achieve and maintain peak health conditions elk need access to food resources in sufficient abundance to support their needs for winter survival, reproduction, calf survival, and male antler growth (ODFW 2002). Before the construction of Scoggins Dam, landscape level disturbances such as fires and floods set back the process of natural succession in meadow habitat. Human intervention has nearly eliminated these processes and the encroachment of surrounding vegetation, especially unpalatable species, has reduced the value of winter pasture habitat for elk over time (Scotter 1980). All of the elk winter pasture areas at Henry Hagg Lake will require preparation and maintenance to provide high quality winter forage.

2.0 Elk Meadow Rehabilitation and Maintenance Plan

The following narrative provides a description of the components of elk meadow maintenance including meadow rehabilitation, a rehabilitation and maintenance schedule, and buffer establishment. Currently there are approximately 110 acres designated as elk meadow at Henry Hagg Lake. Under this plan elk meadows 6a and 6b would be new meadows that have had no previous meadow rehabilitation. These sites currently are thickly vegetated with non-native, unpalatable species. Meadows 3 and 4 have had ongoing meadow management, however they were not previously defined as elk mitigation meadows in the 1974 Wildlife Compensation Plan or the 1994 EA. Table 2-1 below lists the size of each meadow in acres. Figure 2-1 shows the location of existing and planned elk meadows at Henry Hagg Reservoir.

Table 2-1. Acres of elk pasture at Hagg Lake

Elk Meadow	1	2a	2b	2c	3	4	5a	5b	6a	6b	Total
Acres	19.8	6.0	3.5	6.4	15.2	23.4	6.4	29.5	27.5	1.7	139.4

2.1 Meadow Rehabilitation

For meadows 6a and 6b the first step in rehabilitation would be the removal of Scot's broom (*Cytisus scoparius*), Himalayan blackberry (*Rubrus discolor*), and other woody species that occupy the site. Following this initial step of removing woody vegetation, treatment would be the same among the meadows. The standard practice for pasture development is to spray the existing vegetation with some type of herbicide, plow the field, disc the field, pack ground with rollers, drill seed, and pack ground with rollers again.

The choice of a seed mix should maximize good forage plant species for elk in a grass/clover ratio that has proved attractive to elk at other locations. ODFW's Jewell Meadows Wildlife Area has extensive experience with elk pasture preparation and maintenance and is similar enough to Scoggins Valley in climate conditions that the same seed mix would likely be the best choice at Hagg Lake. ODFW uses a custom seed mix that is 65% grass and 35% clover, meets or exceeds the standards for Oregon certified seed, contains no noxious weeds, is legume inoculated, and is at least 98% pure seed. An example of a seed mix that works well for ODFW is 26% annual rye grass (tetraploid variety), 25% orchard grass, 17% New Zealand white clover, 15% perennial rye grass, 7% birdsfoot trefoil, 6% red clover, and 4% alsike clover (Bryan Swearingen, ODFW Jewell Refuge, January 9, 2003 pers. comm.). An alternative to the above seed mixture would be a beef cattle pasture seed mix that is 65% grass and 35% clover with the same or better seed standards. These are not native grasses and legumes, but they are used ubiquitously in Oregon for livestock pasture and are not invasive or noxious. In addition to the seeding of grasses and legumes for forage, buffer vegetation will be planted during meadow preparation.

ODFW recommends seeding at a rate of 10 lbs/acre with three passes over the pasture with seeding equipment in different directions (30 lbs/acre total). This produces a well seeded meadow and does not result in all the plants growing in clearly defined, side-by-side rows (Bryan Swearingen, ODFW, 2003, pers. comm.)

Each elk meadow would be mowed or hayed every year in the late spring or summer. Vegetation should be removed if it is not being collected for hay or mowed with a rotary brush mower. A rotary mower should be used only two years in succession, then materials should be removed at least every year. Repeat operations. The build-up of vegetation can cause a significant decline in new plant growth if it is left to create a mat over grass. WACO Parks Department or a contractor hired by WACO would conduct this maintenance work. In the past local farmers have been contracted to hay some of the meadow areas. Contracts with local farmers are encouraged because of the benefits to the local community. Contracts should make sure that contractor would remove the cut vegetation completely and commit to do the work even if plants are wet and not good for hay baling. All work conducted within the Reclamation Zone must be coordinated with Tualatin Valley Irrigation District (TVID).

Elk meadows need to be assessed for weed treatment annually and treatment may be required every year. Typical weed species may include: tansy ragwort (*Senecio jacobea*), thistle (*Cirsium* spp.), Himalaya blackberry (*Rubrus discolor*), knapweeds (*Centaurea* spp.), and Scot's broom. Noxious weeds should be spot sprayed as needed in the late

spring/early summer. Weed control during the first year after seeding is critical. By treating weeds early before they become established maintenance in later years will be reduced.

Each meadow would require fertilization at least every 2 years and annual fertilization would be preferable for getting the most successful and healthy plant growth in the meadows. Meadows would get the most elk use as winter pasture, therefore any fertilizer should be applied in early fall, just prior to or shortly after fall rains have occurred. (Fertilization rates should be at 200 lbs per acre.) Elk meadows would have a buffer of vegetation to protect water quality from fertilizer runoff (see discussion of vegetative buffers below). Local farm supply stores can make fertilizer recommendations (type and application rates) based on the soil composition, PH, and the plant species being seeded. In general, a 16-16-16 fertilizer is a good overall product that develops both root systems and vegetation.

Following the schedule provided in Table 2-2, one meadow (or meadow complex) would be prepared and seeded (spraying, plowed/disc'd, seeded, and fertilized) each year. Meadows should be reestablished (spraying, plowed/disc'd, seeded and fertilized) at least once every 10 years. Elk meadows may need reestablishment more frequently depending on regrowth of non-palatable species. The ground should be packed down (during the seeding operation to seal the ground and retain moisture for seed germination) afterwards so elk will not sink down into the soft ground or be able to pull up young plants completely.

Table 2-2. Elk Meadow Rehabilitation and Maintenance Schedule

Meadow	Summer2004	Fall 2004	Summer 2005	Fall 2005	Summer 2006	Fall 2006	Summer 2007
1	D F	F W	M W		M W	F	M W
2	M		D F	F W	M W		M W
3	M		M		D F	F W	M W
4	M		M		M		D F
5	M		M		M		M
6							

Meadow	Fall 2007	Summer 2008	Fall 2008	Summer 2009	Fall 2009	Summer 2010	Fall 2010
1		M W	F	M W		MW	F
2	F	M W		M W	F	M W	
3		M W	F	M W		M W	F
4	F W	M W		M W	F	MW	
5		D F	F W	M W		M W	F
6				D F	F W	M W	

Meadow	Summer 2011	Fall 2011	Summer 2012	Fall 2012	Summer 2013	Fall 2013	Summer 2014
1	M W		M W	F	MW		D F
2	M W	F	M W		M W	F	M W
3	M W		M W	F	M W		M W
4	M W	F	M W		M W	F	MW
5	M W		M W	F	M W		MW
6	M W	F	M W		M W	F	M W

D = disc/plow, seed. F = fertilize. W = weed treatment. M = mow/hay.

The work shown on Table 2-2 may not be accomplished during the year shown due to funding limitations, but the schedule will be followed for the subsequent 10-year period once the initial work for each meadow had commenced. It is anticipated the work in all meadows will have been started by 2006.

2.2 Buffer Plantings

Two types of buffers zones are included in elk meadow rehabilitation: 1) herbaceous buffers along the reservoir edge, and 2) a woody vegetation buffer along portions of the elk meadows below the dam.

Vegetative buffers planted for water quality purposes will be located on the reservoir (downslope) edge of each meadow. These buffers would be mowed as part of meadow maintenance but would not be disced or fertilized to reduce the amount of contaminated runoff that could reach the reservoir. These buffers will be 100 feet wide and composed of native species of herbaceous vegetation. Spot spraying of weeds in the buffer zone would be conducted as part of general meadow maintenance.

ODFW requested that a woody vegetation buffer be established along the eastern and northern edge of meadow 4 near the boundary with Stimson Lumber Company and along the lake access road. The intent would be to provide a visual and sound screen between elk using the meadow and the vehicle traffic in and out of the lumber mill entrance road and the lake. This buffer would be 25-feet-wide and composed of native trees and shrubs. The overstory tree species should be conifers that are best suited to the site conditions. A conceptual planting plan will be prepared at a later date for ODFW review.

2.3 Estimated Rehabilitation and Maintenance Costs

The following are cost estimates provided to Reclamation by ODFW based on costs for similar wildlife habitat management programs. This list may not be comprehensive of all costs associated with maintaining elk pastures.

Table 2-3. Meadow Rehabilitation and Maintenance Costs

	Estimated cost per acre (w/labor, equip., and fuel)	Total estimated cost for 140 acres
Fertilizer	\$40.00	\$5,600
Seeds	\$25.00	\$3,500
Mowing	\$14.00	\$1,960
Discing/plowing	\$45.00 (fuel and labor only)	\$6,300
Weed control	\$25.00 (excluding labor)	\$3,500

The mitigation efforts are Reclamation’s legal responsibility. Reclamation will enter into an agreement with WACO to address specific actions and funding. Funds will come from 1) Reclamation’s appropriated budgets, 2) WACO’s operating budget when the work coincides with park operational requirements, and 3) from revenues generated at the park which may be used as a cost share for work in those meadows tied to recreation facilities. Volunteer labor will also be used whenever possible.

3.0 MONITORING PLAN

Because the intent of this management plan is to provide quality elk forage, it is necessary to evaluate the success of the program by monitoring elk use. Monitoring the use of elk meadows is an important part of an adaptive management approach. The 10-year RMP cycle will provide an opportunity to review the effectiveness of the elk meadow maintenance and management actions implemented in this RMP and provide a process to make maintenance changes for the next 10-year cycle. In the interim between RMPs, data of sufficient quality and quantity must be collected to make informed decisions in the future. Anecdotal reports of elk in the park by park staff, park visitors, TVID employees, and others, while important, are not rigorous enough to constitute monitoring. A consistent and repeatable protocol for monitoring must be established for the data to be useful in the future. The results of the monitoring need to be detectable, quantifiable, and show trends in elk use in the meadows. Carefully examining elk meadow use patterns at Hagg Lake can guide future changes in meadow maintenance as required.

Monitoring the use of the elk meadows and determining if management is having the desired effect is possible even with spotty baseline information. The rotating schedule of maintenance provides the opportunity to compare elk meadows that have been plowed/disc'd and reseeded with other meadows yet to undergo this level of restoration to determine if goals are being met. Reclamation, WACO, and ODFW have agreed to meet every two years to discuss the progress of the elk meadow maintenance and monitoring and discuss the plan for the next two year period between meetings. Adjustments to the maintenance and/or monitoring plan can be made if all agencies are in agreement. Additional information may be available from the ODFW from their aerial surveys, hunting records, and other activities. However, the elk population does not reside within the park all year. The resident populations of elk will/could be affected by other factors not under the jurisdiction of Reclamation or WACO.

Because it is difficult and time consuming to make systematic direct observations of elk use patterns, fecal pellet counts will be used as an index of elk use. Monitoring and data collection on ungulates through the use of fecal pellet counts began as early as 1940 (Bennet et al. 1940). This method has many advantages and will meet the goal of this plan by providing a quantifiable approach to documenting elk presence and use trends in the elk meadows. The monitoring plan would follow methods described in "Ground-based inventory methods for selected ungulates: moose, elk and deer" (Resources Inventory Committee 1998).

Transect lines will be placed 75 feet apart across the short axis of each elk meadow. On each transect circular plots (100 sq. ft., radius of 5.6 ft.) will be spaced at 50 ft intervals. The center point of each circular plot will be marked with PVC pipe sunk into the ground, and referenced with coordinates from a GPS unit. The GPS data will be entered into the existing GIS data layer of the elk meadows. Approximately 4-10 transects with 4-8 circular plots per transect would be placed in each meadow, depending on its size and shape. The ends of the transects and the center of the plots should be permanently marked with PVC pipe set low enough that mowing equipment can safely mow over them. Reclamation, with input from ODFW, would assist WACO in the establishment

of the transects and plots. The circular plots would be counted once every 2 weeks from October through February. After each visit the plots would be cleared of pellets.

Photos will be taken every year to monitor the condition of the meadows for successful vegetative growth of meadow and buffer vegetation. A protocol will be established prior to implementation to establish and identify photo points for consistent approach to photo documentation. Sample data sheets are included in Appendix A. The data sheet includes lines for recording the necessary data and a map that could be used to note other field observations such as elk trails, indications of bedding, or other use indicators. Collected field data will be supplemented by elk use patterns observed by WACO and ODFW staff.

A field crew of at least 2 people is needed to place transects, count and clear plots, and record data. Once the transects and plots have been established it should require one staff person one day to visit all plots and record the required data. A detailed description of the monitoring procedure will be provided to WACO and Reclamation will work with park staff to train WACO personnel on the monitoring procedure.

The following equipment will be required to establish and monitor pellet group counts:

- GPS unit
- Survey stakes (PVC to mark plot centers)
- Waterproof field notebooks
- Datasheets printed on waterproof paper
- Field measuring tape
- Metal cattle ear tags or rebar to mark ends of transects
- Flagging and permanent markers
- Camera and film (or digital camera)

4.0 Data Analysis and Reporting

The data forms used in the field and any additional field notes from monitoring crews will be submitted to Reclamation for analysis after each monitoring effort. Field data will be converted to an electronic format by Reclamation's Lower Columbia Area Office staff in Portland and can be provided in either MS Excel or as hard copies of the field data sheets and printouts of the Excel database.

The collected elk usage data will be analyzed statistically using Analysis of Variance (ANOVA) or a similar appropriate test. Biennial reports showing analyses and data trends will be prepared by Reclamation to be presented at biennial meetings with ODFW and WACO. A report will be prepared that summarizes the findings of the monitoring effort to date in narrative, graphic, and tabular formats as appropriate. Biennial meetings will give WACO, ODFW, and Reclamation a forum to discuss the progress of the elk meadow mitigation program and what, if any, changes might be needed. The cumulative results of the monitoring efforts will reported in the next Hagg Lake RMP.

Literature Cited

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Edge, W.D. 2001. Wildlife of Agriculture, Pasture, and Mixed Environs, in David A. Johnson and Thomas A. O'Neil (eds.) *Wildlife-Habitat Relationships in Oregon and Washington*. Oregon State University Press, Corvallis, OR.

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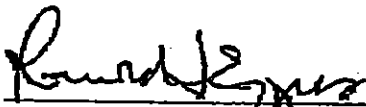
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Verts, B.J. and Leslie N. Carraway. 1998. *Land Mammals of Oregon*. University of California Press, Berkeley, CA. 668pps.

Signatures



Ronald J. Eggers, Bureau of Reclamation, Area Manager
Lower Columbia Area Office

May 1, 2003
Date



Larry Eisenberg, Washington County Parks, Facilities
Manager

May 5, 2003
Date



Jeff Boechler, ODFW, Manager North Willamette Watershed District

5-2-03

Date

Example of Data Form

Henry Hagg Lake Elk Meadow Monitoring

Investigator's Names: _____

Elk Meadow Number: _____ Date: _____ Time: _____

Weather conditions (air temp., precip., cloud cover, etc.): _____

Transect 1

Lat/long or UTM coordinates. Start point: _____ End point: _____

Transect Length: _____ Number of plots on transect: _____ Plot area: _____

Record pellet groups counted below for each plot in transect 1.

P1: _____ P2: _____ P4: _____ P5: _____

Notes _____

Transect 2

Lat/long or UTM coordinates. Start point: _____ End point: _____

Transect Length: _____ Number of plots on transect: _____ Plot area: _____

Record pellet groups counted in each plot in transect 2 below .

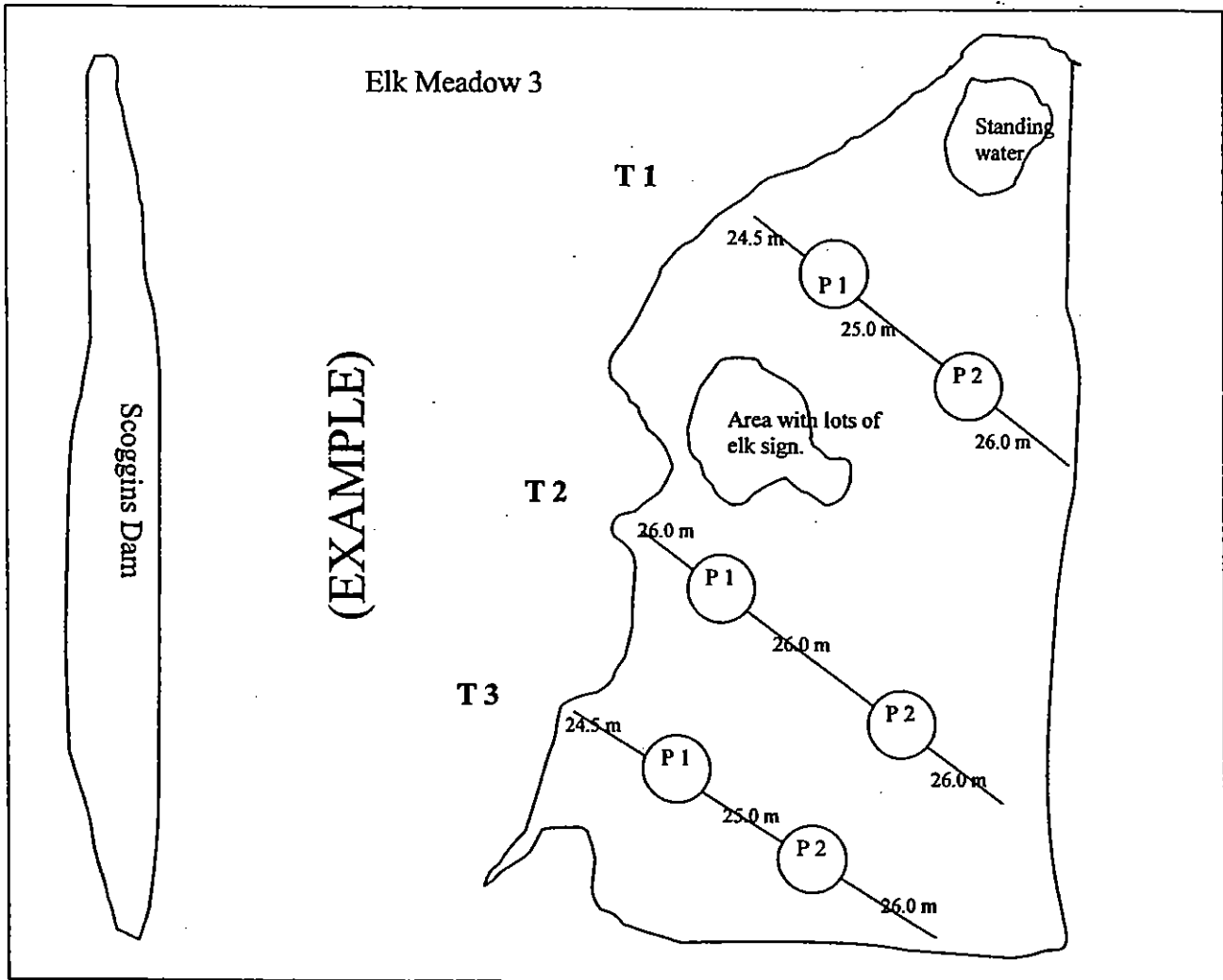
P1: _____ P2: _____ P4: _____ P5: _____

Notes _____

Describe photographs taken in this meadow _____

Back of data form

Sketch or photocopy the elk meadow in the space below from an aerial photograph and draw the approximate locations of transects, plots, and other geographical reference points.



Additional notes. Best access points, for example.