Secretary of State

NOTICE OF PROPOSED RULEMAKING HEARING*

A Statement of Need and Fiscal Impact accompanies this form.

Oregon Department of Fish and Wildlife (ODFW)			635
Agency and Division			Administrative Rules Chapter Number
Teri Kucera	3406 Cherry Ave NE	Salem, OR 97303	(503) 947-6033
Rules Coordinator	Address		Telephone

RULE CAPTION

Update the Oregon Wolf Conservation and Management Plan

Not more than 15 words that reasonably identifies the subject matter of the agency's intended action.

*September 30, 2010	10:00 AM	1300 NW Wall Street, Ste 200 Bend OR 97701	Oregon Fish and Wildlife Commission
Hearing Date	Time	Location	Hearings Officer

*The Commission will proceed through its agenda in order, but reserves the right to continue or postpone item until Friday October 1, 2010

Auxiliary aids for persons with disabilities are available upon advance request.

RULEMAKING ACTION

Secure approval of new rule numbers (Adopted or Renumbered rules) with the Administrative Rules Unit prior to filing.

ADOPT:

AMEND: 635-110

REPEAL:

RENUMBER:

AMEND & RENUMBER:

Stat. Auth.: ORS 496.012, 496.138, 496.146, 496.162, ORS Chapters 183 & 496

Other Auth.:

Stats. Implemented: ORS 496.171-.192, 497.298, 497.308, 498.002, 498.006, 498.012, 498.026, ORS Chapters 183 and 496

RULE SUMMARY

Rules will be amended in regards to the Oregon Wolf Conservation and Management Plan. Revisions will be made both the Plan and associated administrative rules. Rules require the department to review the management plan every 5 years.

The Agency requests public comment on whether other options should be considered for achieving the rule's substantive goals while reducing the negative economic impact of the rule on business.

September 30, 2010

Last Day for Public Comment (Last day to submit written comments to the Rules Coordinator)

*The Commission will proceed through its agenda in order, but reserves the right to continue or postpone item until Friday October 1, 2010

Heather Thomas	Heather Thomas	August 13, 2010
Signature	Printed name	Date

*Hearing Notices published in the Oregon Bulletin must be submitted by 5:00 pm on the 15th day of the preceding month unless this deadline falls on a weekend or legal holiday, upon which the deadline is 5:00 pm the preceding workday. ARC 920-2005

Secretary of State

STATEMENT OF NEED AND FISCAL IMPACT

A Notice of Proposed Rulemaking Hearing or a Notice of Proposed Rulemaking accompanies this form.

Oregon Department of Fish and Wildlife (ODFW) | 635

Agency and Division | Administrative Rules Chapter Number

Update the Oregon Wolf Conservation and Management Plan

Rule Caption (Not more than 15 words that reasonably identifies the subject matter of the agency's intended action.)

In the Matter of Amendment of Rules	)	Statutory Authority,
Relating to the Oregon Wolf Conservation	)	Statutes Implemented,
and Management Plan and associated rules	)	Statement of Need,
and amendment of Division 043	)	Principal Documents Relied Upon,
	)	Statement of Fiscal Impact

Statutory Authority: ORS 496.012, 496.138, 496.146, 496.162, ORS Chapters 183 & 496

Other Authority:

Stats. Implemented: ORS 496.171-.192, 497.298, 497.308, 498.002, 498.006, 498.012, 498.026, ORS Chapters 183 and 496

Need for the Rule(s):
Rules will be amended in regards to the Oregon Wolf Conservation and Management Plan. Revisions will be made both the Plan and associated administrative rules. Rules require the department to review the management plan every 5 years.

Documents Relied Upon, and where they are available:
Oregon Administrative Rules, Oregon Revised Statutes, 2005 Oregon Wolf Conservation and Management Plan, USFWS Final EIS

Fiscal and Economic Impact: see attached

Statement of Cost of Compliance: see attached

1. Impact on state agencies, units of local government and the public (ORS 183.335(2)(b)(E)):

2. Cost of compliance effect on small business (ORS 183.336):
a. Estimate the number of small businesses and types of business and industries with small businesses subject to the rule:

b. Projected reporting, recordkeeping and other administrative activities required for compliance, including costs of professional services:

c. Equipment, supplies, labor and increased administration required for compliance:

How were small businesses involved in the development of this rule?

Administrative Rule Advisory Committee consulted?: No

If not, why?: Staff held 14 stakeholder groups to solicit comments on proposed revisions to the plan. These stakeholder groups included representatives from conservation groups, landowners, and state and federal agencies. The meetings took place statewide from June 1 to July 15, 2010. Correspondence from interested and affected persons and testimony received are accepted into the record and considered as part of the rulemaking process.

Heather Thomas | Heather Thomas | August 13, 2010

Signature | Printed name | Date

Fiscal and Economic Impact Statement for the September 30, 2010 Hearing in the Matter of Rules Relating to the Update of the Oregon Wolf Conservation and Management Plan

Fiscal and economic impact: Rule changes are being proposed to amend the Wolf Conservation and Management Plan and to begin to develop a protocol for wildlife disease testing for wolves. The proposed rules will affect state agencies, units of local government, and the public, respectively, as discussed below:

A. The state agencies that would be affected by the adoption of these rules are the Oregon Department of Fish and Wildlife (ODFW), Oregon State Police (OSP) for enforcement costs. Part of the plan revision requires that ODFW develop a protocol for disease testing in the wolf population. Staff time would be required to develop this protocol, but costs are expected to be absorbed into existing resources. Most of the other changes in the plan entail no changes to ODFW or OSP expenditures.

B. No units of local government are expected to be affected by these rules. No significant changes from the current levels of any local agencies' operations or expenditures are anticipated as a result of the adoption of these rules.

C. The public could be affected by the adoption of these rules. The provisions of the wolf plan and the growth of the wolf population in Oregon has widespread impacts on the public and the state's economy. Some impacts are positive, such as those associated with wolves' contribution to wildlife watching and existence values held by the public. Other impacts are negative, including the impacts that wolves have on livestock and game animals such as deer and elk. Economic approaches to analyzing the problem of wildlife management allow decision-makers to shape policies and can predict outcomes of management decisions.

Provisions under the wolf plan have been liberalized with regard to the authority of individuals to do non-injurious harassment and "caught in the act" take of wolves. Ranchers who lease land were included in the rule by changing the wording from "landowner" to "livestock producer" when defining who may harass wolves. Further changes represented clarifications of the intent of the existing wolf plan rules and had no substantive changes in defining ODFW operations.

This analysis uses two main approaches to assess the economic impacts of wolves. The first is the economic benefit approach. This approach is appropriate for benefit-cost analysis in which the net benefits of management actions to businesses and the public are tallied and compared to the costs of these actions to all parties. A practical example is the benefit that a wildlife watcher would experience upon gaining the opportunity to view a wolf in the wild. The person has costs associated with this opportunity, such as transportation, relevant clothing and equipment, lodging, restaurants, etc. The trip to view the wolves would not be taken if the benefits the person gains from the experience did not outweigh the costs associated with the trip. The "net benefits" are therefore the benefits over and above the costs that are incurred to experience wildlife watching. These benefits could, in theory, be compared to the costs associated with wolf

populations. This analysis provides a projection of the numbers of sheep and cattle lost due to depredation under various wolf population scenarios. Somewhat harder to quantify are the costs associated with wolf deterrent activities undertaken by businesses to prevent loss of animals from wolves. Also included are the estimated costs of lost hunting trips due to deer and elk that fall prey to wolves. Like the wildlife watcher mentioned above, hunters experience net benefits of a hunting trip that are greater than the costs they take on to participate. A calculation is included that quantifies the lost net benefits to hunters from wolf depredation on big game such as deer and elk.

Another approach to economic analysis is to analyze the "impacts" of various management alternatives. The measurement of impacts is associated with the economic activity generated by various alternatives. For example, it might include the goods and services people purchase during recreational trips or the sales of commodities such as cattle. Purchases initiate cash flows with direct and indirect effects on businesses. Through the multiplier process, this economic activity results in personal income impacts to individuals participating in the economy.

The USFWS Wolf Environmental Impact Statement (USFWS 1994) provides a theoretical model to predict potential depredation, but its efficacy is hampered by its lack of other relevant variables such as wild prey availability, detailed spatial overlap of wolves and livestock, and methods used by ranchers to avoid wolf interactions. The following information is used to predict depredation levels:

- The ratio of the potential Oregon wolf population to the population size in other regions;
- Depredation rate associated with the wolf population size; and
- The number of livestock in the region in question.

Estimates of Oregon losses are obtained by multiplying the number of livestock in a given region, the likely wolf population scaled by the wolf population size in the region of known depredation and the depredation rate per thousand livestock. The depredation rate per thousand from other regions is used to calculate depredation in Oregon by scaling it to the number of livestock in the region of concern. The relative number of wolves in the two regions modifies this result up or down. Depredation rates used from different regions are based on confirmed losses. The formula is:

# of livestock lost = (thousands livestock) X (depredation rate expressed as livestock lost per thousand) X (ratio of wolf populations)

Cattle depredation rates ranging from 0.12 per thousand in Idaho to 0.91 in Alberta, Canada, were used to provide a range of likely losses. Depredation rates for sheep generally were higher with a range from 0.54 per thousand in British Columbia to 3.41 per thousand in Idaho. The most recent data from northwest Montana, Idaho, and Wyoming are composed of wolf numbers and depredation levels averaged over the last three years (USFWS et al. 2010). An additional estimate for the entire state of Montana is included, which assumes similar landscape and ranching practices to those found in

Oregon (Riggs 2004). Seven different regions are applied to three potential wolf population levels and three corresponding ranges in Oregon. Corresponding livestock numbers were used for each region including northeast Oregon, eastern Oregon and the entire state.

The Montana estimate was one of several predictive models that were developed to forecast depredation levels in Oregon from experiences in other western states (Riggs 2004). Although only one explanatory variable, the number of wolves, is available to explain changes in the number of livestock lost, a significant relationship between the number of wolves and depredation level was found for most regions. The analysis also provided guidance with respect to the bounds on likely outcomes for the region being considered. However, direct application to Oregon requires the same assumption used above, that biological elements of the system, ranching practices, and the spatial configuration of wolf populations and cattle are similar in the areas being compared.

Although highly variable, it was assumed that the wolf population in Oregon will consist of 14.8 animals for each breeding pair. This assumption is based on minimum fall wolf population by recovery region and the number of breeding pairs in the Northern Rocky Mountain states (USFWS et al. 2010). In the Northern Rocky Mountain States, the population size per breeding pair has increased over time as the wolf population level increased. For the periods documented for each region, the number of wolves per breeding pair ranged from approximately 10 to 17 per breeding pair. In 2009, this population segment was estimated to have 14.8 wolves per breeding pair.

Table 1. Wolf depredation rates from different regions. Montana, Idaho, and Wyoming levels are the average of the last three years through 2009. Livestock numbers are the approximate levels in regions where wolves are present and are derived from the USDA 2007 Census of Agriculture. (USFWS, Nez Perce Tribe, USDA 2009, USFWS 1994)

Region	Cattle	Sheep	# of Wolves	Cattle Losses #/000	Sheep losses #/000
Alberta	257,941	10,000	1,500	0.91	3.3
British Col.	587,750	48,000	1,500 to 6,300	0.37	0.54
Minnesota	229,065	23,719	1,625	0.12	2.11
Montana	669,665	53,365	481 *	0.12 *	2.11 *
Idaho	610,988	69,463	807 *	0.12 *	3.41 *
Wyoming	155,655	29,847	327 *	0.25 *	2.64 *

* three-year average

Table 2. Estimated annual losses of numbers and value of cattle in Oregon based on different regional depredation levels, wolf populations and numbers of livestock. Northeast Oregon includes Baker, Umatilla, Union and Wallowa counties. The eastern region includes the northeast, and counties in the Blue Mountains and adjacent areas. Livestock numbers are derived from the USDA 2007 Census of Agriculture. The Riggs 2004 Montana estimate is based on the predicted 95 percent upper bound values for livestock losses across a range of minimum wolf populations.

Region compared	NE Oregon 228,271 cattle 4 pairs 59 wolves		Eastern Oregon 589,573 cattle 7 pairs 104 wolves		OR Statewide 1,389,189 cattle 14 pairs 207 wolves	
Alberta	(8)	$ 6,800	(37)	$ 31,450	(174)	$147,900
British Columbia	(3)	$ 2,550	(15)	$ 12,750	(71)	$ 60,350
Minnesota	(1)	$ 850	(5)	$ 4,250	(21)	$ 17,850
Montana	(3)	$ 2,550	(15)	$ 12,750	(72)	$ 61,200
Idaho	(2)	$ 1,700	(9)	$ 7,650	(43)	$ 36,550
Wyoming	(10)	$ 8,500	(47)	$ 39,950	(220)	$187,000
MT (Riggs 2004)	(9)	$ 7,650	(15)	$ 12,750	(31)	$ 26,350

Table 3. Estimated annual losses of numbers and value of sheep in Oregon based on different regional depredation levels, wolf populations and numbers of livestock. Livestock numbers are derived from the USDA 2007 Census of Agriculture. The (Riggs 2004) Montana estimate is based on the predicted 95 percent upper bound values for livestock losses across a range of minimum wolf populations.

Region Compared	NE Oregon 15,720 sheep 4 pairs 59 wolves		Eastern OR 26,761 Sheep 7 pairs 104 wolves		OR Statewide 217,401 sheep 14 pairs 207 wolves	
Alberta	(2)	$ 244	(6)	$ 732	(99)	$12,078
British Columbia	(0)	$ 0	(1)	$ 122	(16)	$ 1,952
Minnesota	(1)	$ 122	(4)	$ 488	(58)	$ 7,076
Montana	(4)	$ 488	(12)	$ 1,464	(197)	$24,034
Idaho	(4)	$ 488	(12)	$ 1,464	(190)	$23,180
Wyoming	(7)	$ 854	(22)	$ 2,684	(363)	$44,286
MT (Riggs 2004)	(20)	$ 2,440	(44)	$ 5,368	(105)	$12,810

Lost value can be calculated by multiplying the number of losses by the market value of the animals lost (Duffield and Nehr 1996). The average sale prices are provided in the publication "Oregon Agripedia, 2009" with an average price of $850 per head for cattle and $122 per head for sheep. In some cases wolves prey on calves and lambs more frequently than adult livestock, with approximate ratios of one adult to two young (USFWS 1994). However, since the likely Oregon ratio is unknown, the adult price has been used for all potential lost animals.

Tables 2 and 3 provide a range of possible depredation levels based on other regions in North America. For the case of three breeding pairs in northeastern Oregon, losses are predicted to be relatively low ranging from one to 10 cattle and zero to 20 sheep. The cattle prediction is similar to the levels reported in neighboring states. The sheep prediction is scaled to the relatively low number of animals in northeastern Oregon. The highest predicted level of 20 sheep is associated with an estimate that is not scaled by the number of livestock. As expected, the number of losses increases with increases in the number of wolves and the number of livestock in a given region. Statewide predictions increase markedly for cattle, 21 to 220, and sheep, 16 to 363, in part because it is assumed that all state livestock become vulnerable to wolf depredation. Additional losses of household pets, guard dogs and other livestock also are likely, but calculations were not attempted due to uncertainties related to the relatively small numbers of losses in other states.

General examination of depredation over time in different regions provides several insights. First, there is significant variability among regions, and annually within the same region. For example, in Alberta from 1974 to 1990 annual cattle and sheep losses ranged from 22 to 217 and from 1 to 127 respectively, and more recently in the Wolf Recovery Area of the Northern Rocky Mountain states from 1997 to 2009 annual cattle and sheep losses ranged from 21 to 214 and 12 to 721 respectively. The highest cattle losses per thousand of any region were for the Simonette River, Alberta, where an average of 5.88 cattle per thousand were lost during between 1976 and 1981. The pastures were characterized as small remote wooded grazing leases with no wolf control during the first four years (USFWS 1994).

Actual depredation occurrences in Oregon also give insight into what the future might hold. In 2009 and 2010, there have been 7 confirmed calf deaths from wolves, 1 goat, and 27 sheep. Oregon has one documented breeding pair of wolves. Prior to this time period, there were no known or confirmed depredations from wolves in Oregon.

For those areas that incur wolf depredation, farm level costs will increase because of the use of avoidance, harassment and other methods will be used to decrease depredation levels. Farm-level costs also may increase because remote areas become too risky for use. Increases in staffing on farms and ranches may be one cost that these businesses incur to prevent livestock depredation. Costs of fladry or other preventative measures could also apply if these measures are taken. Wolves also may test, chase or wound cattle. Additional costs may be incurred because of effects on animal health and losses in weight gain because of stress. It is also possible that harassment by wolves could interfere with the health of livestock, including low pregnancy rates among cows and sheep. The costs to livestock production from wolf harassment are another economic factor that must be taken into account. These areas also are likely to lose value for livestock leasing although changes in practices and values in other regions have been difficult to quantify (ibid.). According to a 2002 Oregon Cattlemen's Association survey, 58 percent of respondents answered that their cattle are pastured on range not closely attended during part or all of the year.

Control methods are potentially costly depending on the need and specific situation. Non-lethal methods used to prevent loss include guard dogs, exclusion fencing, herding and night penning. Lethal methods and services are provided by government agencies such as Wildlife Services. Many of these methods currently are employed for carnivores such as coyotes, mountain lions and bears. It is not possible to provide the additional costs of control that will be solely attributable to wolves. Initially one of the largest additional agency costs in northwest Montana was for investigations of potential wolf-related losses (ibid.). Expenditures related to both private and governmental efforts should be included in the cost estimates if not included under management costs.

Wolves will be part of a much larger system that includes interactions among a number of carnivore and prey species. Coyotes currently are the cause of the majority of damage by carnivores to livestock operations. Of the approximately 1,700 average annual sheep losses in Oregon, 1,400 were lost due to coyote depredation (Wildlife Services, 2003). Of nearly 4,500 cattle and calves lost annually in Oregon, 2,300 were lost to coyotes (NASS, USDA, 2006). Wolf populations may interact with, and compete with coyote populations. Wolf-coyote interactions appear to depend on three factors.

1) Coyotes benefit from scavenging on the carcasses resulting from wolf kills.
2) Wolves tend to kill coyotes, but do not consume them.
3) Coyotes may space themselves away from wolves (Ballard, Carbyn and Smith 2003, p. 267).

Short-term changes in the Yellowstone region indicate that coyote populations may decrease in the presence of wolves (ibid.). If so, coyote depredation could decrease because wolves would take their place in the ecosystem. It is likely that the greatest impact would be on sheep operations.

Wolf predation on elk and deer may have negative impacts on related hunting activities. Hunting benefits are measured in terms of hunting days. The demand and associated value for hunting days is dependent on a number of factors such as expected success rate, congestion in the hunting area, quality and type of animal, location of the hunting area, and other characteristics of the experience. Therefore, the value of a hunting day will change as characteristics of the experience change.

Even more basic is the availability or supply of hunting opportunities if the allowable harvest of animals decreases. Although there is a decreasing trend in the number of hunting licenses sold as a proportion of total population, the demand for big game hunts in eastern Oregon generally is greater than the opportunities supplied by ODFW. As elk and deer populations change, tag numbers and other management measures or regulations adjust to control harvests. More stringent game management will translate into fewer hunter days in the field and a loss in net economic benefits directly related to the loss of hunter days. These changes can be examined with a bioeconomic analysis that considers both the biology and economics with the following relationships:

Wolf population growth → Impacts on prey populations → Decrease in allowable hunter harvest → Change in the number and or quality of hunter days → Change in the net benefits of hunting

If one can make a biological forecast of changes in prey populations, it becomes possible to estimate the change in the number of hunter days according to past experiences with resource fluctuations. As a starting point, the analysis assumes that the kill rate will be 17.3 kills per wolf per year, the average of early and late winter kills per wolf of which 90 percent were elk (Phillips and Smith 1997, Smith 1998). The ratio of major prey items included in this total depends on the relative vulnerability and availability of prey. The following analysis assumes that the wolf diet in Oregon will consist of approximately equal proportions of elk and deer. The deer portion will include nearly three times the number of elk due to their relative biomass value (Fuller 1989), resulting in the consumption of 7.8 elk and 23.4 deer per wolf per year.

The number of days in the field in the Blue Mountains region was plotted as a function of the number of annual kills in deer and elk hunts. A significant linear relationship was defined for the range of available data from 1992 to 2002. Deer hunting days increased by a factor of 3.2 for each additional deer taken in the preceding year, and elk hunting days increased by a factor of 7.5 days for each additional elk taken in the preceding year. Wolf kills are assumed to result in a direct loss in hunter success. The loss in number of rifle and bow hunting days in the field for each species then can be calculated and related to the net benefits associated with elk and deer hunting in Oregon.

In 2001 the average net economic value of elk hunting in Oregon was $92 dollars per day, expressed in 2009 dollars (USFWS 2003a). For example, a loss of 1,000 hunter days would result in a net economic loss to society of $92,000. This is likely to be an overestimate if hunters can substitute a hunt in another location, albeit one they do not value as highly. For general hunts it also may be an overestimate of losses because some hunters will continue to hunt at lower success rates. As noted earlier, changes in the characteristics of the hunting experience will change the demand and associated value of a hunting day. Although uncertainty exists with regard to the level of reduction in the number of hunting days and hunting day values, the most difficult challenge is defining and quantifying the sources of prey population fluctuations.

Table 4. Potential hunting losses in the Blue Mountains region associated with wolves without consideration of likely compensatory mechanisms. As stated in the previous section, the number of wolves in the population per pair may vary ranging up to 50 percent higher than the following estimates.

Number of wolves	Deer and elk taken by wolves	Loss in hunting days	Net benefits per hunting day	Total loss in hunting net benefits
4 pairs 59 individuals	1,381 deer 460 elk	4,418 deer 3,452 elk	$68/day deer $92/day elk	$ 300,400 $ 317,500
7 pairs 104 individuals	2,434 deer 811 elk	7,788 deer 6,083 elk	$68/day deer $92/day elk	$ 529,600 $ 559,600
14 pairs 207 individuals	4,844 deer 1,615 elk	15,501 deer 12,113 elk	$68/day deer $92/day elk	$1,054,100 $1,114,400

Table 5. Averages for total hunting activity in the Blue Mountains region for 1992 to 2002. CI represents the 95 percent confidence interval for average days in the field given the level of variation during the time period.

Hunt	Number of hunters/yr	Animals taken/yr	Average days in the field/yr	Total net benefits/yr
Deer archery/ rifle	52,357	20,408	282,688 CI = +/- 11,053	$19.2 million
Rocky Mt Elk archery/rifle	68,583	14,345	398,528 CI=+/- 21,300	$36.7 million

Total big game net benefit losses of $617,900 for four wolf pairs is approximately one percent of $55.9 million, the average net economic benefits of big game hunting for deer and elk in the Blue Mountains region during the ten year period. The higher loss estimate for fourteen pairs is $2,168,500, approximately 3.8 percent of the total net value of deer and elk hunting in the region. When compared to the variation in days hunted during the 12 year period as shown in table 5, potential losses related to wolves appear to be relatively small. No consideration of the potential value of wolf hunting is considered if wolves are classified as game animals and hunted sometime in the future.

The preceding model assumes that wolf-related mortality is additive and that the number of wolf kills can be directly subtracted from the number of animals taken by hunting. This is likely to be an overestimate because of relationships among sources of mortality. Wolves are part of a much larger system in which interactions will occur among a number of species. Mountain lions and other carnivores are believed to impact elk populations in specific regions. Researchers question whether wolf predation on these prey species will be additive, or whether there will be compensation associated with competition among carnivores.

Wildlife watching is a recreational activity that could increase net social benefits as wolves become re-established in Oregon. In 2006, the net economic value of wildlife

viewing in Oregon was $48 per participant per day and $334 per participant per year (USFWS 2009). The value reported by the U.S. Fish and Wildlife Service is highly aggregated and includes a variety of wildlife, but does not include trips to zoos, circuses, aquariums, museums and scouting game. The trips identified by survey respondents were characterized by respondents as taken solely for the purpose of viewing wildlife.

In 2006 there were nearly 1.5 million wildlife viewers in Oregon, spending approximately $776 million to participate (USFWS 2008). The addition of wolves could increase wildlife viewing days or the quality of a viewing day. For example, in Yellowstone National Park from 1995 to 2000, 70,000 visitors observed wolves in a nonforested part of the park (Fritts, Stephenson and Boitani 2003). According to Mech (1995), opportunities to see wolves without professional assistance are rare and limited to areas of open terrain.

Quantifying the level of potential benefits from wolf viewing is similar to that of hunting. The average net value per day is multiplied by the number of wolf viewing days to provide the total value of wolf viewing. The net value of a viewing day is likely to depend on a variety of factors such as the probability of actually viewing a wolf, the duration of viewing, proximity of wolves, substitute activities and other characteristics of the experience. Even with detailed data from other areas, the direct applicability in Oregon is limited by site-specific characteristics. If areas exist where there are high probabilities of wolf viewing, the potential exists for significant benefits. For example, a relatively small increase in wildlife viewing days in Oregon such as 20,000 days at a value of $48 per day would be nearly equal to potential losses to deer and elk hunting.

It has been shown that the greatest benefits associated with wolves at the national and regional levels are nonuse or existence values (USFWS 1994, Duffield and Nehr 1996, Chambers and Whitehead 2003). These are the values people place on knowing that wolves exist in the wild. Individuals may never see or hear a wolf and may not even consider this to be desirable, but still value wolves' existence. Minnesota and Yellowstone National Park studies provide evidence of both use (viewing) and nonuse (existence) values. In the Yellowstone case, Duffield and Nehr (1996) estimated a one-time willingness to pay, nearly $23 for wolf recovery. The total value then was aggregated over the number of households in the study area. Even when corrections are made for the ease with which hypothetical payments may be made, the total values were calculated in the millions. In Minnesota, Chambers and Whitehead (2003) found a willingness to pay for a wolf management plan of $4 to $21 depending on the region. This translated into a lump sum of $665,131 at the county level and approximately $27.5 million at the state level.

It also should be noted that there is a willingness to pay for wolf exclusion. This value will be partially captured in the hunting and depredation losses cited in previous sections. Without doubt there also are individuals who do not directly incur damage, who would be willing to pay to keep wolves out of Oregon. These feelings or beliefs are likely to be related to fear of a wolf encounter, perceived and actual impacts on local economies and resistance to external control and regulation. Generally, rural inhabitants place a high

value on their way of life and attributes related to independence and self-sufficiency. Many of these elements are not directly related to wolf establishment, but involve a larger set of social concerns and perceptions.

In order to calculate these values, a study specific to Oregon would have to be undertaken. Survey design and a sufficient sample size are two of the most important elements of such a study. Other regional studies indicate two important factors. There is public support and potentially large net benefits associated with wolf conservation in the United States.

Wolf Economic Impacts

The purpose of this section is to provide examples of economic impacts on livestock ranching and wildlife-related recreation, with a geographical focus on Wallowa County in eastern Oregon. Analysis of the impacts on Wallowa County personal income can be accomplished using the IMPLAN (input-output) model along with data specific to livestock ranching, big game hunting and wildlife viewing. This section also provides perspective regarding some of the important economic aspects of the potentially affected sectors.

Some 29,000 head of beef cows were in inventory in Wallowa County as of January 1, 2002 (Oregon Agricultural Statistics Service 2001-2002). Including the bulls and cull cows associated with cow/calf operations, each cow/calf unit consumes an average of about 15 Animal Unit Months, (AUMs) annually, or about 435,000 AUMs in total. This enables ranchers to produce calves at an average of 530 pounds that sell for approximately $0.90 per pound. Total sales per cow amounted to about $496 annually, including some of the bull and cull cow sales.

The economic contribution in personal income terms is estimated at $20.15 per AUM used in beef production. About $8.45 of that is generated directly by the livestock industry, $6.55 is generated in the supply industry (indirect impact), and $4.63 is generated (induced impact) in the general regional economy. The beef cow industry in Wallowa County thus generates about $8.8 million in total personal income. Since there are 15 AUMs per animal, the loss of 10 head will result in a loss in 150 AUMs. Given the loss estimates (based on maximum estimated depredation levels as shown in Table 2) of 10 cattle for northeast Oregon and 47 cattle for eastern Oregon, the loss in personal income would total approximately $3,000 and $14,200 per year, respectively. In addition, costs related to the need for additional depredation control, loss of other animals such as pet or guard dogs and modification of operations are likely to be much greater, perhaps increasing economic impacts by an order of magnitude. IMPLAN economic impact estimates for sheep ranching were not available.

Deer and elk hunting also produce personal income in Wallowa County. Hunters spend money in the county during their hunting trips. Table 6 provides estimates of the expenditures of hunters during hunts on the Starkey Experimental Forest in 1989-1991. A portion of those hunters came from western Oregon. Therefore, hunter expenditures and associated impacts on total personal income were partitioned into statewide and eastern

Oregon impacts. Using the eastern Oregon income impact estimates, updated to 2009 dollars, it is possible to approximate the personal income impact of deer and elk hunting in eastern Oregon wildlife management units.

Table 6. Starkey Experimental Forest Elk and Deer Hunter Average Hunter Day Expenditures and Associated Impacts on Total Personal Income.

Hunt period	Usable responses	Average total trip expenditures (per hunter day)	State level income impacts	Average eastern Oregon expenditures (per hunter day)	Eastern Oregon income impact
ELK HUNTS					
1989	37	$ 48.95	$ 36.55	$ 18.49	$ 8.58
August 1990	129	$ 46.40	$ 35.23	$ 26.32	$ 12.95
December 1990	37	$ 71.13	$ 54.31	$ 42.81	$ 21.56
August 1991	138	$ 51.18	$ 38.44	$ 27.17	$ 12.38
December 1991	95	$ 60.46	$ 45.68	$ 31.22	$ 14.25
WEIGHTED AVERAGE	436 total	$ 53.29	$ 40.25	$ 28.39	$ 13.41
WEIGHTED AVERAGE (2009 $)		**$ 77.80**	**$ 58.76**	**$ 41.45**	**$ 19.58**
DEER HUNTS					
1989	68	$ 46.29	$ 35.05	$ 21.25	$ 9.03
October 1990	20	$ 48.09	$ 34.12	$ 20.95	$ 8.25
October 1991	19	$ 57.18	$ 42.98	$ 36.82	$ 17.48
WEIGHTED AVERAGE	107 total	$ 48.56	$ 36.28	$ 23.96	$ 10.38
WEIGHTED AVERAGE (2009 $)		**$70.90**	**$52.97**	**$34.97**	**$15.15**

Source: ODFW unpublished data from Chris Carter, former staff economist.

Applying the eastern Oregon impact per hunter day estimates from Table 6, the total and potential changes in income impacts of deer and elk hunting for the Blue Mountains region are provided in the following tables.

Table 7. Total impact of elk and deer hunting expanded from Wallowa County data for the Blue Mountains region and the state of Oregon. Assumes that local impacts are likely to be the same as those for the original study area. ($ in millions)

Hunt	Total days	Regional expenditure	Regional personal income	State expenditure	State personal income
Deer archery and rifle	282,688	$9.9	$4.3	$20.0	$15.0
Elk archery and rifle	398,528	$16.5	$7.8	$31.0	$23.4

Table 8 . Changes in impacts including expenditures and personal income for the Blue Mountains region and the state of Oregon. Assumes that local impacts are likely to be the same as those for the original study area.

Hunt	Losses in days	Regional loss expenditure	Regional loss personal income	State loss expenditure	State loss personal income
Deer archery and rifle 4 pairs	4,418	$ 154,497	$ 66,932	$ 313,236	$ 234,021
Elk archery and rifle 4 pairs	3,452	$ 120,716	$ 67,590	$ 268,565	$ 202,839
Deer archery and rifle 7 pairs	7,788	$ 272,300	$ 118,000	$ 552,170	$ 412,500
Elk archery and rifle 7 pairs	6,083	$ 252,100	$ 119,100	$ 473,257	$ 357,400
Deer archery and rifle 14 pairs	15,501	$ 542,069	$ 234,800	$1,099,000	$ 821,100
Elk archery and rifle 14 pairs	12,113	$ 502,100	$ 237,200	$ 942,391	$ 711,800

With respect to wildlife viewing, there are no available data on numbers of wildlife viewing trips or related estimates of trip expenditures and personal income impacts per wildlife viewing day in eastern Oregon. Statewide information based on Oregon wildlife viewing from the 2006 National Survey of Fishing, Hunting and Wildlife-Associated Recreation (USFWS 2008) estimate average expenditures per individual at $35 per day.

Most businesses affected by these rules are believed to be "small business."

The rules are believed to be fully compatible with legislative direction on the goals of wildlife management in Oregon.

We do not believe that a less intrusive or less costly alternative adaptation to only small business is consistent with the purpose of this rule.

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