

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
GRAZING GUIDANCE AND GRAZING MANAGEMENT TOOLS
DRAFT 6/09/2020

TABLE OF CONTENTS

1.0 Grazing Guidance

- 1.1 Introduction and Purpose**
- 1.2 Vision for Grazing on WDFW Lands**
- 1.3 Statutory Authority for Land Management**
- 1.4 Role of Grazing to Meet WDFW Mission**
- 1.5 Managing Risk of Grazing-Related Resource Damage with Protective Measures**
- 1.6 Wolf-Livestock Conflict Management on WDFW Lands**

2.0 Grazing Management Tools

- 2.1 Grazing Management Plans**
- 2.2 Monitoring and Adaptive Management**
- 2.3 Ecological Integrity**
- 2.4 Grazing Evaluation Framework**
- 2.5 Wolf-Livestock Conflict Permit Language**

3.0 Appendices

- 3.1 A. Outreach and Review: Grazing Guidance and Grazing Management Tools**
- 3.2 B. Grazing Evaluation Framework Worksheet**

1.0 GRAZING GUIDANCE

The Washington Department of Fish and Wildlife (WDFW) manages a variety of lands and habitats across the state. WDFW's Grazing Guidance explains the authority and rationale for permitted grazing on WDFW-managed lands, and it explains WDFW's plan for avoiding and managing grazing-related risks, including risks of wolf-livestock conflict. Outreach and review processes associated with the development of the Grazing Guidance are detailed at the end of this document as section 3.1, "Appendix A."

1.1 Introduction and Purpose

The purpose of this document is to 1) facilitate review of the role of grazing on WDFW lands to meet WDFW's mission, and 2) facilitate internal and external review of existing grazing rules, policies and practices, to ensure that the Department's grazing program

- a) is consistent with WDFW's mission;
- b) complies with state law, agency policy and legal agreements; and
- c) is implemented consistently across the state.

1.2 Vision for Grazing on WDFW Lands

Livestock grazing is a land management tool utilized by WDFW in a manner that 1) is compatible with WDFW's fish, wildlife, and ecosystem conservation mission; 2) is compatible with WDFW's goal to provide sustainable fish- and wildlife-related recreation; 3) is consistent with Fish and Wildlife Commission policy to maintain ecological integrity; and 4) engages communities and key stakeholders in a manner that protects community character and the role of working lands across Washington.

1.3 Statutory Authority for Land Management

The statutory authority for WDFW to acquire and manage land for fish and wildlife is found in the Revised Code of Washington (RCW) sections 77.04.012, 77.04.020, 77.12.037, 77.12.204, 77.12.210, 77.12.220, and 77.12.880. These statutes, collectively, require or allow WDFW to 1) protect, preserve, perpetuate, and manage the state's fish and wildlife resources and habitats; 2) maximize public recreational game fishing and hunting opportunities without impairing the supply of wildlife; 3) enhance and improve recreational and commercial fishing; 4) implement practices on grazing and agricultural lands consistent with healthy ecosystems; 5) acquire by gift, purchase, or lease lands, buildings, waters, or other necessary facilities consistent with fish and wildlife conservation and management and recreation opportunity; 6) sell timber, gravel, and other materials or products from real property and to sell or lease property or grant concessions or rights-of-way for roads or utilities in the property; and 7) provide for public opportunities to view wildlife and support nature-based and wildlife viewing tourism without impairing the state's wildlife resources. Grazing on WDFW lands is managed consistent with these statutes.

In consultation with the Fish and Wildlife Commission's Wildlife Committee, WDFW is recommending changes to WDFW Commission Policy C-6003, *Domestic Livestock Grazing on Department Lands*, and to Washington Administrative Code 220-500-200 (WAC), *Livestock grazing on department of fish and wildlife lands*. WDFW has determined that these two sources of guidance are in several instances either redundant or inconsistent. Therefore, WDFW recommends that unique values in Policy C-6003 be updated and retained, and that language redundant or inconsistent with the WAC be eliminated. WDFW further recommends that the WAC be clarified and updated. Updated agency contact information and other changes in wording are also proposed. Specific explanations of these updates, per section of the current language, are described below, and are respectively followed by the proposed new text of Policy C-6003 and WAC 220-500-200.

Fish and Wildlife Commission Policy C-6003 – Explanation of proposed changes and resulting full text

(Introductory material) Some of the cited rules and legislation have since been re-codified, so updating these references is recommended. Also, instead of recapitulating existing WAC language, the general policy statement would refer to WDFW's conservation mission and to WAC 220-500-200.

(1) WDFW proposes that this section be split into two sections. The first new section, containing the purposes for grazing on WDFW-managed lands, would be clarified to reflect the roles identified in WDFW's Grazing Guidance in section 1.4. Per recommendation from the Commission's wildlife committee, protecting community character would be added to this list. The second new section would contain the requirement to maintain ecological integrity. Additionally, a statement requiring grazing to be consistent with fund sources would be added.

(2) This section, which addresses cross-program review with developmental language, would be updated to simply require such review.

(3) This section, which addresses grazing management plans, is proposed for elimination in favor of more conservative (i.e. stringent) WAC language requiring plans in a broader set of cases.

(4) Coordinated resource management would now be addressed as a purpose for grazing in section (1), so WDFW recommends deleting this existing statement.

(5) No changes are proposed to this statement, except that it would now be the fourth and final policy statement rather than the fifth.

With the changes described above, the recommended revised text for Commission Policy C-6003 is:

GENERAL POLICIES: Domestic livestock grazing on Department owned or controlled lands may be permitted if consistent with WDFW's conservation mission and WAC 220-500-200.

- 1. Permitted livestock grazing on Department lands has several roles, including managing vegetation for wildlife, enhancing recreational opportunity, encouraging conservation across multiple ownerships on landscape scales through coordinated resource management, and protecting community character.*
- 2. Permitted livestock grazing must be integrated with other uses, ensure that ecological integrity is maintained, and be consistent with any constraints tied to fund sources used to acquire or manage lands.*
- 3. Except for temporary permits, grazing permits will be made available for internal department cross-program review to ensure that all grazing permits are subject to best available science.*
- 4. The Department will promote adaptive management and continued improvement of programs and practices as new knowledge and understanding of habitat ecology becomes available.*

WAC 220-500-200 – Explanation of proposed changes and resulting full text

(1) WDFW proposes that this subsection be split into three subsections. The new first subsection would consist of the first sentence only, and the reference to ecological conditions would be replaced by the text “mission and management objectives.” The second resulting subsection would clarify the previous WAC language requiring Commission approval of all grazing permits with certain exceptions. These exceptions would include 1) temporary permits; 2) non-temporary permits active within the past ten years, which is analogous to State Environmental Policy Act (SEPA) language exempting permits from SEPA review where grazing has been permitted within the past ten years; and 3) permits on lands acquired within the previous 12 months. The new third section would clarify that permits issued on lands acquired within the previous 12 months would be limited to a maximum duration of 3 years, and would require Commission review if subsequently reissued.

(2) WDFW recommends deleting the second sentence of the existing subsection because it is redundant with language already present in the current third subsection, and recommends retaining the first sentence and combining it with the current third subsection.

(3) WDFW proposes to add a specific provision clearly allowing the director the option of declining to renew an expiring permit, in which case notice and rationale for nonrenewal must be provided by the end of the year of the most recent permitted grazing period.

(4) No changes are recommended to this section, except to place it as the second subsection in the updated WAC so as to improve clarity of other sections that refer to temporary permits.

(5) Existing WAC and Policy language are redundant regarding the content of grazing management plans, but the language is inconsistent on when grazing management plans are required. Therefore, the proposal is to retain existing WAC language requiring grazing management plans for all permits exceeding two weeks (14 days), and to clarify that the 14 day period means the total amount of time livestock are using WDFW lands, and not the term of the permit.

(6) No changes are recommended to this subsection except to clarify that permit cancellation is an action that, if taken, would only apply prior to permit expiration.

(7) Adds clarification that access will be consistent with applicable seasons and rules.

With the changes described above, the recommended revised text for WAC 220-500-200 is:

All persons wishing to apply for a grazing permit for acreage managed by the Washington Department of Fish and Wildlife should contact the Department at PO Box 43200, Olympia, Washington 98504-3200.

(1) The director is authorized to issue grazing permits when the director determines that the grazing permits will be consistent with the department's mission, management objectives, and strategic plan.

(2) A temporary permit may be granted by the director to satisfy short-term needs where benefits to wildlife management programs and the public interest can be demonstrated. The term of a temporary permit shall not exceed one year, and no fee need necessarily be charged.

(3) With the following three exceptions, the Commission must approve grazing permits prior to issuance to ensure that they conform to Commission policy: 1) temporary permits, 2) permits that are being renewed or renegotiated for acreage where the Department has permitted non-temporary grazing during the previous ten years, and 3) permits that are being issued for acreage acquired by the Department within the previous 12 months.

- (4) *A permit issued without Commission review on acreage acquired by the Department within the previous 12 months must not exceed an initial duration of 3 years, and may not be subsequently reissued before being submitted to the Commission for review and approval.*
- (5) *The director shall negotiate grazing permits with potential grazing operators to ensure the highest benefits to fish and wildlife. When an existing permit expires or is about to expire, the director may renew the permit for up to another five years, renegotiate the grazing permit with the existing permittee or with a new grazing operator, decline to re-issue the permit and provide notice of and rationale for non-renewal by the end of the calendar year of the most recent permitted grazing season, or advertise and sell the permit at public auction to the highest bidder. The director is authorized to reject any and all bids if it is determined to be in the best interest of the fish and wildlife to do so. No grazing permit shall have a term exceeding five years unless the Commission grants prior approval for a longer term.*
- (6) *Except for those temporary permits where grazing on WDFW lands is allowed for the equivalent of fewer than 14 total days, each grazing permit proposal shall be accompanied by a domestic livestock grazing management plan that includes a description of ecological impacts, desired ecological condition, fish and wildlife benefits, a monitoring plan, and an evaluation schedule for lands that will be grazed by livestock. Grazing management plans will address ecosystem standards referenced in RCW 77.12.204. The department shall inspect the site of a grazing permit no less than two times each year. The director shall retain the right to alter any provision of the plan as required to benefit fish or wildlife management, public hunting and fishing, or other recreational uses.*
- (7) *The director may cancel a permit prior to expiration (a) for noncompliance with the terms and conditions of the permit, or (b) if the area described in the permit is included in a land use plan determined by the agency to be a higher and better use, or (c) if the property is sold or conveyed, or (d) if damage to wildlife or wildlife habitat occurs. Notice of and rationale for cancellation will be provided to the permittee as far in advance as possible.*
- (8) *All lands covered by any grazing permit agreement shall at all times be open to public hunting, fishing and other wildlife recreational uses, consistent with applicable seasons and rules, unless such lands have been closed by action of the commission or director.*

[Statutory Authority: RCW [77.12.047](#), 77.12.020, 77.12.570, 77.12.210. WSR 07-11-017 (Order 07-62), § 232-12-181, filed 5/3/07, effective 6/3/07. Statutory Authority: RCW

77.12.047. WSR 03-03-016 (Order 03-03), § 232-12-181, filed 1/7/03, effective 2/7/03. Statutory Authority: RCW 77.12.210. WSR 88-23-109 (Order 323), § 232-12-181, filed 11/22/88. Statutory Authority: RCW 77.12.040. WSR 82-04-034 (Order 177), § 232-12-181, filed 1/28/82; WSR 81-12-029 (Order 165), § 232-12-181, filed 6/1/81. Formerly WAC 232-12-405.]

1.4 Purpose of Grazing to Meet WDFW Mission

WDFW's mission is to preserve, protect, and perpetuate fish, wildlife and ecosystems while providing sustainable fish and wildlife recreational and commercial opportunities. The primary purpose of department lands is the preservation, protection, perpetuation, and management of fish and wildlife and their habitats. WDFW lands also may include fishing, hunting, fish and wildlife appreciation, and other outdoor recreational opportunities when compatible with healthy and diverse fish and wildlife populations (WAC 220-500-010). To this end, the WDFW Lands Division currently manages approximately 1 million acres of land across the state as "Wildlife Areas" to provide fish and wildlife habitat and recreational opportunities.

WDFW does not permit grazing unless it is consistent with WDFW's mission and risks to wildlife and habitat can be safely managed. Where these conditions are met, grazing may be permitted as a tool to achieve one or more of the following four purposes: to manage vegetation and habitat to provide food and cover for wildlife, to enhance recreational opportunity, to improve habitat conservation across multiple ownerships on landscape scales through coordinated resource management, and to protect community character. These four broad purposes for WDFW's grazing permits are discussed in more detail below.

1) WDFW uses grazing to manage vegetation and habitat to provide food and cover for wildlife.

Livestock grazing may be used as a tool to manage vegetation in a way that can maintain or improve food, cover, and habitat structure for wildlife (Vavra 2005). Holocek (1982) notes that livestock grazing can lead to improved wild ungulate habitat, but cautions that managing to optimize wildlife benefits may differ from managing for maximum livestock production. Similarly, Anderson and McCuisition (2008) caution that benefits to wildlife and birds require careful stocking rates and timing of grazing. Below are several examples of how grazing may contribute to habitat management for big game, birds and other species, and where grazing can be used to manage weeds and wildfire risk.

Numerous studies have found that controlled livestock grazing can result in habitat that is attractive to big game. While elk often avoid cattle if they are present (Coe et al. 2005), both deer (Yeo et al. 1993) and elk (Crane et al. 2001) often prefer areas that have been lightly to moderately grazed by cattle earlier in the year. In Montana and Wyoming, incidence of previous cattle grazing (Crane et al. 2016) or a combination of previous cattle

grazing and bunchgrass density (Grover and Thompson 1986) were the best predictors of elk foraging patterns in spring. Montana Fish, Wildlife, and Parks had 60,000 hectares under rest-rotation livestock grazing in 2003, reporting improved range plant palatability for elk and reduced elk damage on private lands (McCarthy 2003). In addition, Fenster et al. (2006) noted that prescribed livestock grazing increased elk use of state wildlife management areas in Oregon and western Montana.

This preference by elk and deer to areas grazed by cattle may result from several effects that livestock have on vegetation, including forb growth, forage conditioning, vegetation structure, and woody species growth. Forb availability and time until maturation can increase as a result of grazing (Anderson and McCuiston 2008), and early season forbs are important to wildlife, particularly deer. Forage conditioning by livestock grazing in the spring can provide more nutritious forage for wildlife later in the year (Anderson and Scherzinger 1975, Clark et al. 2000, Ganskopp et al. 2004b, Ganskopp et al. 2007). Appropriate grazing can increase productivity, nutrition, and structural heterogeneity of range vegetation (Vavra 2005), and when done in spring, is associated with increased bitterbrush growth (Ganskopp et al. 1999, Ganskopp et al. 2004a) which is a significant consideration especially for deer in WDFW's wildlife areas in Okanogan County. Cattle tend to reduce the herbaceous standing crop and increase the shrub component of a system (Vallentine 1971, Knick et al. 2011). Although the effect may not be universal—Wagoner et al. (2013) failed to identify a correlation between spring grazing and mule deer nutrition in the Blue Mountains—elsewhere, spring grazing has been shown to increase browse production (UAES 1978), range capacity (Malachek 1978), and range quality (Holechek et al. 1982) for deer. Wild herbivores at least to an extent appear to prefer post-grazing regrowth (Anderson et al. 1990).

Grazing can also improve or maintain habitat for other species. For example, tall emergent vegetation, such as reed canary grass in both eastern and western Washington, can discourage waterfowl use of wet pastures and other wetlands. These habitats provide important foraging areas for geese (Ball et al. 1989) and many ducks and shorebirds. Grazing keeps vegetation low allowing the birds to forage. Crawford et al. (2004) found that light to moderate early season grazing is associated with increased forb abundance and availability which are critical to Greater Sage-grouse reproduction and brood-rearing. Low to moderate intensity grazing had no significant effect on nest survival of five species of ground-nesting birds in southwestern Saskatchewan (Lusk and Koper 2013). Patchy utilization of forage leads to vegetative heterogeneity, which is associated with improved avian (Ryder 1980) and invertebrate (DeKeyser et al. 2013) habitat quality.

In specific circumstances grazing may reduce weeds (McAdoo et al. 2007). In “early seral” rangelands, areas that are cheatgrass-infested, or where rangelands have passed a

threshold to a stable undesirable condition, livestock can be used to reduce weed biomass and/or help control certain types of noxious weeds (Davison et al. 2007). Grazing on WDFW lands primarily to control weeds is uncommon and is unlikely to be used in the future except in areas where vegetation communities are already dominated by weeds and where reduced biomass is desired. Research suggests that passive restoration such as livestock removal in such poor-condition areas will not necessarily restore cheatgrass-infested or other “early seral” rangelands (Milchunas and Lauenroth 1993, Davies et al. 2014), so grazing to reduce weedy biomass would be unlikely to interfere with establishment of desirable vegetation.

Within limits, livestock can also serve as a tool to manage fuels and wildfire risk. Grazing reduces fine fuel loads (Weber et al. 2001, Boyd et al. 2014), and can be used to alter height, amount, and distributions of fuels in a way that affects fire behavior (Hudson undated) and improves habitat (McAdoo et al. 2007). Specifically, it may reduce the likelihood of fire ignition and spread (Davies et al. 2017), particularly in those locations where grasslands predominate (Strand et al. 2014), or in wet, productive years. Although the impact to fire behavior of light to moderate grazing on a landscape scale is questionable, especially in areas with increasing shrub or tree dominance (Strand and Launchbaugh 2013), effective small scale examples exist (O'Laughlin et al. 2014). Grazing that reduces the amount of standing dead vegetation should influence fire behavior under less-than-extreme conditions (Launchbaugh et al. 2008). When fires do occur, moderate livestock grazing may help reduce the severity, size, and time for recovery in arid and semi-arid rangelands (Davies et al. 2010). Potential reduction of fire risk has been used as one of several rationales to permit grazing on the 4-O Ranch Unit of the Chief Joseph Wildlife Area.

2) WDFW utilizes grazing to enhance recreational opportunity.

WDFW's mission and goals include providing sustainable recreational experiences. WDFW encourages such recreational experiences on agency lands. Because grazing acts on the vegetation structure within habitats, grazing management can have positive, neutral, or negative effects on wildlife use. Additional wildlife use results in greater opportunity for wildlife-related recreation. The influence of livestock on vegetation, and therefore food and cover for wildlife, is described above specifically for elk, deer, and waterfowl, all of which are important recreationally in Washington, both for hunting and wildlife viewing.

On the Columbia Basin Wildlife Area, WDFW has used prescribed grazing to minimize the height of emergent vegetation around certain wetlands. Mandema et al. (2014) observed that goose use of wetlands increased following increasing cattle (and horse) stocking rates within the same year. This conclusion is consistent with anecdotal observations of waterfowl on grazed areas on the Columbia Basin Wildlife Area, although it is also possible

that these anecdotal increases are related to detectability rather than, or in addition to, grazing effects. Other birds, especially some shorebirds and neotropical migrant songbirds, may also prefer areas with increased visibility associated with short vegetation (Kantrud and Higgins 1992). Closely cropped green pasture, which increases waterfowl forage availability (Ball et al. 1989), has been maintained by livestock grazing in western Washington. This type of grazing modifies habitat structure in a way that increases waterfowl abundance on WDFW lands, thus increasing hunting and viewing opportunity. The Columbia Basin Wildlife Area is managed in part to attract migrating waterfowl, providing hunting opportunity for thousands of hunters every year (WDFW 2006). Grazing is one of many tools the agency uses to attract these birds to these lands to support this recreation opportunity.

3) WDFW uses grazing to improve habitat conservation across multiple ownerships on landscape scales through coordinated resource management.

WDFW's participation in coordinated resource management (CRM), and issuance of grazing permits through CRM, can result in positive conservation outcomes on scales that exceed individual wildlife areas. CRM is characterized by a voluntary, collaborative, consensus-based decision-making process (Washington_CRM_Task_Group 2008) to address natural resource issues. Fish and Wildlife Commission Policy C-6003 has long recognized the role of grazing in facilitating CRM.

WDFW engages in CRM where livestock grazing, managed in a coordinated, agreed-upon manner, can be implemented across multiple land ownerships. Collaborative decision making tends to be more effective than "command and control" decision making when managing public lands (Andrus and Freemuth 2001). Reasons for this might include greater buy-in and shared vision from private landowners and ranchers; increased trust resulting from the process of working through agreements and disagreements during the CRM process; establishment of a formal body to regularly conduct, report, and evaluate monitoring; and the ability of stakeholders to influence management beyond the borders of their own lands (Sulak and Huntsinger 2007, Allen et al. 2017b). Collaborative efforts resembling CRM in Utah (Longmore and Forrest 2016), Colorado (CSU 2011), and Montana (Hegstad 1996) have resulted in multi-ownership and permittee cooperation managing grazing, range improvements and land treatments, and monitoring. In Wyoming (Hicks et al. 1996), coordinated management led to much reduced duration of grazing (and increased concomitant recovery periods) in riparian areas, and greatly increased plant streambank cover.

Through the CRM process, WDFW contributes to the protection of habitat on landscape scales. For example, issuance of temporary grazing permits on WDFW lands after the suspension of federal USFS allotments following wildfire has protected privately owned

habitat that could have otherwise been at risk of excessive grazing when ranchers did not have other unburned pasture available. This type of approach, promoted by Brunson (2014), assists other state or federal agencies in promoting and achieving habitat recovery after disturbance on lands that they manage. The larger the landscape, the greater the opportunity to ensure that grazing occurs at the optimal times and locations, and CRM offers perhaps the greatest likelihood of achieving this in a multiple-ownership environment. This is valuable because continued positive conservation outcomes on privately owned lands are important to the successful management of some species. Currently, WDFW grazing permits in several counties, including Okanogan, Kittitas, and Klickitat, are managed through CRM. CRM meetings for these permits generally occur annually, often facilitated by local staff from the Natural Resources Conservation Service or the State Conservation Commission.

Similarly, WDFW can encourage habitat management on other ownerships by working with ranchers who graze on WDFW lands, and all of whom also graze on other ownerships. For example, WDFW's issuance of a grazing permit in Douglas County was conditional on the permittee using rest rotation grazing management consistent with Sage-Grouse Initiative (SGI) recommendations. SGI is a federal program promoting effective rangeland management (SGI 2015). Through this agreement, the permittee adopted grazing management practices that may improve or maintain shrub-steppe habitat both on and off WDFW lands while allowing for livestock grazing.

4) WDFW utilizes grazing to preserve habitat by protecting community character and open space.

Building cooperative, supportive relationships with local communities contributes to WDFW's mission when those relationships help preserve, protect and perpetuate fish, wildlife and ecosystems. WDFW acknowledges that Washington communities are varied in character, and that managing toward robust fish and wildlife populations benefits those communities. These benefits take the form of ecosystem services, fish- and wildlife-related recreation, working landscapes consistent with wildlife and habitat, and other values. Livestock grazing may be implemented in part to protect community character provided that it preserves ecological integrity and adheres to WDFW's conservation mission.

The continuation of agricultural activities is important to the rural character of some communities in close proximity to agriculture (Resnik et al. 2006). In the face of quickly changing land use, ownership, and development pressure, livestock grazing on WDFW lands can constitute an investment in these agricultural livelihoods. This type of land use helps maintain open spaces on public land and private land to the benefit of fish and wildlife (Maestas 2003) and the citizens of Washington State. For example, the loss of some

federal grazing privileges, if realized, could result in the associated loss of over 100,000 ha of privately owned sage-grouse habitat by 2050, with Washington habitat at elevated risk of cropland conversion (Runge et al. 2018). Open space in this document denotes lands with habitat value that are not under pressure from development, subdivision, or other types of management driven by revenue generation. Maintaining grazing opportunities on WDFW lands provides Washington ranchers some assurance that they will be able to maintain viable ranching operations.

1.5 Managing Risk of Grazing-Related Resource Damage with Protective Measures

WDFW acknowledges that there is a level of risk in many grazing regimes for negative impacts to habitat, wildlife, and fish. Where the risk of habitat damage from grazing cannot be safely managed, or where grazing is inconsistent with WDFW's mission, grazing is not permitted.

The risk of negative outcomes increases substantially when grazing occurs at levels that are too intense, too lengthy, and/or too frequent for the habitat in which it occurs. Season-long grazing in particular can lead to excessive riparian impacts (Belsky et al. 1999) and long-term perennial grass decline (Reisner et al. 2013). Connelly et al. (2004) indicate that grazing can affect soils, wildlife, and vegetation. In addition to these types of impacts, the Columbian sharp-tailed grouse recovery plan (Stinson and Schroeder 2012) has a list of studies showing grazing-related impacts such as reduction of plant cover (Schroeder and Baydack 2001), reduction of food plants and/or insect populations (Hoffman and Thomas 2007), increased invasive weed cover (Anderson and Inouye 2001), and others. WDFW's own State Wildlife Action Plan (2015) also identifies a suite of negative outcomes resulting from inappropriate grazing, including destruction of native vegetation, soil erosion and compaction, and reduced abundance and diversity of wildlife. Many more examples of livestock -associated habitat damage can be found in the literature.

Western riparian areas provide vital fish and wildlife habitat, and while such areas may have a disproportionate risk of impact from livestock grazing appropriate management may be consistent with habitat conservation. Although Tubbs (1980) found that no one grazing system has been shown to be effective in protecting riparian vegetation, several more recent studies demonstrated that grazing may be managed in a manner that is consistent with healthy, functional riparian areas (Roche et al. 2012, Roche et al. 2013, Oles et al. 2017) . Clary (1999) cautions, however, that managers must be committed to whatever is necessary to control use and distribution to prevent a range of effects that could potentially include higher stream temperatures, excessive sediment, high coliform bacteria, channel widening, vegetation changes, channel degradation, and lowered water tables.

Collectively, these studies show the importance of conservative grazing plans where habitat requirements of sensitive, threatened, and endangered fish and wildlife intersect with permitted livestock grazing. Where grazing is permitted on WDFW lands, cross-program review

from biologists and managers helps ensure that the necessary protective measures are written directly into WDFW grazing management plans (GMPs). These plans are conservative, meaning that they designed to prevent overutilization and are written with margins of error that favor fish, wildlife, and habitat. In addition to conservative grazing prescriptions, GMPs also detail any additional measures that are deemed necessary. Protective measures include restrictions associated with stocking rate, spatial and temporal extent of grazing, and intensity of grazing; requirements for rest and/or other types of grazing rotations; riparian area and streambank protections; and various categories of monitoring, including utilization monitoring and long-term monitoring to assess ecological integrity (EI). Monitoring and EI are covered in more detail in sections 2.2 and 2.3, respectively. Protective elements in grazing prescriptions and additional measures are briefly explained below.

1) **Prescriptions.** Many variables affect the outcome of a rangeland grazing operation, but the most significant ones include stocking rate and the timing/duration/frequency of grazing (Anderson and McCuiston 2008, Barnes and Hild 2013, Clark et al. 2013). These factors are the essence of a grazing prescription, and manipulating them can have important effects on rangeland ecosystems.

a) **Stocking Rate.** Stocking rate does not refer to an instantaneous number of animals on a given range at a given time; it is instead defined as the amount of land required to support a given number of animal unit months (AUMs) (Galt et al. 2000), and expressed as AUMs/acre (Holechek et al. 1998). For the purposes of calculations, an AUM is defined as the amount of air-dry forage required to feed one animal unit for one month, and varies, depending on the author, from under 700 pounds to over 900 pounds (Pratt and Rasmussen 2001). WDFW grazing permits assume 900 pounds of air-dry forage per AUM (Bailey 2004), which is on the upper, more conservative end of the range and provides a buffer for livestock that may be somewhat larger than 1000 pounds/animal. WDFW produces allowable forage estimates that account for forage production, ecological sites (Caudle et al. 2013) and ecological systems (Comer et al. 2003), plant physiological needs, and the effect of terrain (Bailey et al. 1996) and water availability on accessibility to livestock. Other considerations include prior livestock use, recent disturbances such as fire, and the condition and distribution of range infrastructure such as fencing. Conservatively estimating the amount of forage sustainably available for livestock harvest ensures that sufficient forage (Holechek et al. 1999) is available for wildlife and for plant needs, generally without the need for major de-stocking during drought years. Stocking rate allowances in permits may be adjusted upward or downward if appropriate.

b) **Timing.** Ecological effects of grazing can vary dramatically at different times of year (Clary and Webster 1989, Anderson and Frank 2003, McInnis and McIver 2009) on the wildlife areas, which are characterized by strong seasonal variation in precipitation and plant activity. Livestock tend to favor different types of forage at different times of year, so caution is needed to ensure that certain forages are not overused (Burkhardt and Sanders 2012). Furthermore, too-frequent or long-duration grazing during periods of active plant growth can lead to long-term decline of desirable species (Anderson 1991). GMPs account for these considerations through the use of deferment, rest, and rotations. Wildlife-related concerns such as grouse nesting periods and hunting seasons may also affect timing of grazing.

2) **Additional Measures.** GMPs also specify responsive actions to a variety of possible scenarios in order to prevent overuse or even damage. For example, except for rare instances where a minimum level of utilization is prescribed, plans contain measures requiring livestock removal above a certain maximum level of utilization. For those permits where livestock management presents risks to habitat affected by wildfire, plans provide for one or two seasons of rest following fire on the grazing unit in order to encourage vegetation recovery and soil stabilization. The presence of federally listed fish, wildlife or plants could result in other required precautions. GMPs also call for WDFW-permittee collaboration in detecting and treating noxious weeds. Livestock removal from an individual pasture or from an entire permit area is a tool that WDFW may consider in multiple scenarios, including situations where grazing units have surpassed utilization triggers, and potential situations where repeated depredations of livestock have occurred within specified time frames. Measures specifically responsive to wolf-livestock conflict are addressed in sections 1.6 and 2.5.

1.6 Wolf-Livestock Conflict Management on WDFW Lands

Minimizing wolf-livestock conflict is an overriding priority of WDFW grazing permits. WDFW seeks to maintain maximum flexibility to meet wolf recovery goals and to continue to permit viable grazing in areas potentially used by wolves. In mid-2019, over 40% of WDFW's grazing permits, permitted acreage, and permitted AUMs were overlapped by known wolf pack territories. Although livestock grazing may continue to be permitted in these and other areas potentially used by wolves, WDFW prioritizes wolf conservation on its lands due to its mission and the funding sources used to purchase lands. This may impact where grazing occurs on WDFW lands and/or the number of proactive nonlethal deterrent measures required by permit.

Accordingly, WDFW has worked with a cross-section of internal expertise and external stakeholders from the livestock and conservation communities to collaboratively develop the

following requirements: 1) for all grazing permits, nonlethal deterrence and sanitation measures exceed the expectations outlined in WDFW's wolf-livestock interaction protocol; and 2) for those grazing permits where wolf habitat may be present, a procedure for developing an Annual Operational Plan if and when wolves occur in the applicable area, which could include additional customized measures as negotiated with the permittee and (if necessary) temporary livestock removal or deferral. In cases of temporary livestock removal or deferral, WDFW will attempt to locate—but cannot guarantee—alternate pasture. These measures are described below in section 2.5, "Wolf-Livestock Conflict Permit Language." Additionally, WDFW will work to adaptively determine where and/or when grazing permits are likely to conflict with wolf conservation on a long-term basis and are therefore inconsistent with WDFW's mission. This is expected to only develop in response to long-term, site specific patterns of conflict and may require additional consultation with internal expertise and external stakeholders.

WDFW considers lethal removal of wolves a management option that is an essential tool in its work of recovering wolves across all landscapes. Any decision to lethally remove wolves as a result of depredation events will be based on WDFW's evaluation of case-specific facts and guidance in the wolf conservation and management plan and the wolf-livestock interaction protocol.

WDFW may cost-share required proactive nonlethal deterrent measures when possible and when funds exist. WDFW will compensate for wolf depredations on WDFW lands in the same manner as on any other land ownership.

2.0 GRAZING MANAGEMENT TOOLS

WDFW's Grazing Management Tools include a set of processes and products that directly inform the content of grazing permits. These tools include GMPs, Monitoring and Adaptive Management, EI, Wolf-Livestock Conflict Permit Language, and the Grazing Evaluation Framework (GEF). Commission Policy C-6003 and WAC 220-500-200 refer explicitly to GMPs, Monitoring and Adaptive Management, and EI, so these tools are described in order to provide context for the manner in which WDFW currently implements the Grazing Guidance. The GEF does not specifically appear in the Grazing Guidance, but it provides a foundation for WDFW to proactively address section 3 in the modified WAC 220-500-200. Finally, the Wolf-Livestock Conflict Permit Language is included to promote transparency in how this particular issue will be addressed on WDFW grazing permits. Over time, WDFW may modify or replace these tools in order to better address new scientific understanding, updates to Grazing Guidance, changes to a species' listing status, or other identified needs consistent with WDFW's mission. The review process for the Grazing Management Tools is described in Appendix A.

2.1 Grazing Management Plans

WAC 220-500-200 establishes that all WDFW grazing permits, except for temporary permits where livestock are present on WDFW lands for the equivalent of fewer than 14 days, require a GMP that includes a grazing prescription, description of current range conditions, ecological impacts, desired ecological conditions, anticipated fish and wildlife benefits, a monitoring plan, and an evaluation schedule for lands that will be grazed by livestock. WDFW will also consider applicable resource concerns, plans, policies, laws, and agreements when crafting each grazing prescription. WDFW has developed a standard GMP outline to ensure that the plans meet these requirements while also facilitating development, implementation, and review of livestock grazing actions on wildlife areas. The expected content of each GMP is summarized below:

- 1) **Background.** This section includes a brief pertinent history of the wildlife area on which the permitted grazing will occur, wildlife management objectives for the property, and a brief summary of previous grazing on the wildlife area. It also describes generally how the grazing permit will help achieve the wildlife area objectives.
- 2) **Resource Description.** This section provides a general overview of the location and landscape context of the permit area; range infrastructure such as fencing and water developments; a physical description of the permit area's soils, slope, and aspect; current condition of existing vegetation; and species and habitats present that are of special interest to WDFW.

- 3) **Goals and Objectives.** GMP goals are consistent with the wildlife area management plan, WDFW's mission, and Commission policy. Objectives are specific and measurable, and whenever possible should preferentially address outcomes rather than strategies.
- 4) **Grazing Prescription.** Specific grazing units, important infrastructure, any scheduled range improvements, dates of use and rotation schedule if applicable, AUM and utilization limits, and WDFW/permittee responsibilities are included. This section also includes specific permittee requirements including livestock use reports, fence maintenance, contact information, etc.
- 5) **Anticipated Effects.** This section describes the effects WDFW expects of the prescribed grazing on the vegetation community and on the wildlife community.
- 6) **Additional Measures.** This section contains protective measures that are required under certain circumstances, such as rest following wildfire, or actions to protect or benefit certain species or habitats. Appropriate wolf-livestock conflict prevention measures also appear here.
- 7) **Monitoring.** This is where requirements for compliance monitoring and effectiveness monitoring are specified. Grazing monitoring is explained in more detail in section 2.2.
- 8) **Results of Previous Management.** For permits being renewed, this section presents, interprets, and discusses relevant monitoring data and photographs from the previous permit term. For new permits this section may be omitted. Other events or decisions significantly affecting or changing grazing management and/or EI relative to the previous permit term may also be discussed.
- 9) **Literature Cited.** All references cited in the GMP are listed.

2.2 Monitoring and Adaptive Management

The subject of monitoring was introduced in the previous section on GMPs and is expanded here because of its important role in grazing management. Monitoring is an essential element of WDFW grazing permits and is required by WAC 220-500-200. Monitoring is not synonymous with research, and without experimental controls, it will not necessarily result in information from which causal conclusions can be drawn about grazing. It can, however, reflect current conditions and trends. A carefully implemented monitoring program will help show that WDFW's grazing permits are, or are not, consistent with their stated objectives. Monitoring is the ongoing, orderly process of repeatable data collection and analysis that informs management decisions (Bedel 1998). WDFW's purposes in monitoring grazing are to 1)

document compliance with relevant standards, laws, and stipulations specified in the associated GMP; 2) measure progress toward achievement of grazing permit objectives; and 3) provide information necessary for adaptive management.

WDFW conducts two types of monitoring—compliance and effectiveness—that address these three purposes and inform cross-program review. Effectiveness monitoring in particular relies on a suite of protocols that are similar to those used by federal land management agencies conducting long-term monitoring, and it is this type of monitoring that directly informs WDFW's evaluation of EI.

- 1) **Compliance Monitoring.** Compliance here means the degree to which grazing is occurring as planned and specified in the GMP. This comprises forage utilization observations, permittee use reports, and twice-annual completion of WDFW's grazing evaluation form. Forage utilization is the amount of forage consumed and destroyed by livestock and is typically measured in terms of biomass or stubble height. GMPs identify which of several standard methods (BLM 1999) are used to monitor utilization of important forage classes on permit areas. Permittees are responsible for keeping wildlife area managers apprised in advance of livestock numbers and movements on wildlife areas. Formal documentation of animal numbers, dates, and locations of use are submitted prior to the end of the calendar year in which grazing occurs. These permittee-submitted use reports document compliance with GMP requirements and may be used in lieu of staff-conducted livestock on-off counts, which are often impractical because pastures may include or abut multiple, sometimes unfenced, ownerships. Livestock might freely and legally pass these boundaries at any time during the grazing period, which would necessitate using best estimates. Wildlife area staff are responsible for completing grazing evaluation forms. In addition to utilization levels and other matters of compliance, these forms pose questions about achievement of objectives, weed presence, and key species of interest.
- 2) **Effectiveness Monitoring.** Effectiveness here means maintaining EI. This may be alternatively termed long-term monitoring or trend monitoring in GMPs. Long-term effectiveness monitoring is repeated at least once every 5 years, which in most cases is once for each permit iteration. Effectiveness monitoring is not necessarily required on temporary permits unless specifically provided for in the GMP. Also, any GMP may identify monitoring procedures which are additional to the general ones mentioned here. Effectiveness monitoring provides detailed data about the dynamics of attributes associated with EI. On wildlife areas, these include the following:
 - a) **Upland Plants and Soils (Herrick et al. 2009a, b).** These indicators reflect the relative abundance of different species and life forms, and the amount of biological soil crust and bare ground present. These data are currently

obtained by measuring basal gaps, density by life form, and line-point intercept cover, although these could change in the future, and some data may eventually be obtainable via remote sensing. Vegetation structure is occasionally measured, especially in areas where ground-nesting bird habitat is a management focus. Most upland data can be evaluated using the process developed for assessing EI on WDFW wildlife areas (Schroeder et al. 2011, Schroeder et al. 2015). Another section of this document covers EI more thoroughly.

- b) Riparian and in-stream characteristics (Burton et al. 2011).** This type of riparian monitoring is known as multiple indicator monitoring, and WDFW will attempt to conduct it on suitable accessible perennial streams on grazing permit areas. (Occasionally, a suitable reach—meaning a reach that is sensitive to management, representative of the permit area, and not confounded by other types of management or conditions—might not be available on a stream that otherwise would be of interest.) WDFW has not developed specific agency benchmark values for riparian and in-stream indicators, but site-specific objectives can be chosen where appropriate and agreed to by the district team or, on easements, by an interagency technical group.
- c) Repeat photo points.** Photo points accompany all upland and riparian monitoring. Photos are not currently evaluated with any particular image processing algorithm or software, but this may be an option in the future.

Compliance and effectiveness monitoring both inform adaptive management. Adaptive management is defined as a form of structured decision-making that uses monitoring and evaluation, often in an iterative process (Leffler and Sheley 2012, Allen et al. 2017a). Twice-annual monitoring, as described above, provides information on which to base within-term modifications if necessary. Whatever additional flexibility might exist within a GMP, WDFW always retains the ability to reduce acreage or AUM allotment if necessary to benefit fish and wildlife management, public hunting, or other recreational uses. Other tools that GMPs identify as responses to monitoring results include adjustment of timing or duration of grazing, and adjustment of grazing rotation. For grazing permits that are undergoing review for a potential renewal, monitoring results are summarized and discussed in the GMP.

2.3 Ecological Integrity

Commission Policy C-6003 directs that EI be maintained where grazing is permitted. EI is typically understood as a holistic concept where it is commonly assumed that stable composition, structure, and function of ecosystems can be inferred largely from the similarity of

soil and especially vegetation indicators to indicators at “natural” or reference sites (Parrish et al. 2003, Carter et al. 2016, Wurtzebach and Schultz 2016). The United States (U.S.) Forest Service, the U.S. Bureau of Land Management (BLM), the U.S. Fish and Wildlife Service, and the U.S. National Park Service all incorporate the concept of EI into some facet of monitoring or conservation planning (Carter et al. 2016, Wurtzebach and Schultz 2016).

The BLM, for example, has developed and implemented a monitoring system for rangelands (that are grazed in many areas) that produces data that can be used to assess EI (Carter et al. 2016). WDNR and WDFW have collaborated on a partially analogous preliminary draft protocol of assessing EI (Schroeder et al. 2011), which like the BLM includes remotely sensed and locally collected intensive field data. WDFW staff have tested the process of collecting and scoring several types of ecological data that ultimately yield a numerical index (Schroeder et al. 2015). Currently, intensively collected field data on areas permitted for livestock grazing specifically include cover of biological soil crust, native species, native perennial grasses, native increaser species, fire-sensitive shrubs, and invasive species. Although this process is currently best suited to steppe and shrubsteppe systems, it can also be used in grazed forests and woodlands. The data required for this analysis are currently obtained from the upland plants and soils monitoring described in section 2.2. Riparian monitoring and photo points, while not contributing directly to this index, do provide quantitative and/or site-specific information about other conceptual elements of EI.

Optimizing the process of evaluating EI is a work in progress, and WDFW expects that there may be additional adjustments to it. There are limitations associated with reducing ecological data into a single index (Brown and Williams 2016, McGarigal et al. 2018), and owing to capacity constraints preventing implementation of before/after-controlled impact research, WDFW will be unable to draw causal conclusions from effectiveness monitoring alone. For these reasons, WDFW will continue to summarize and report component data in addition to overall EI scores as long as the current index is in use. WDFW will also use cross-disciplinary district teams to discuss changing EI values as well as EI concerns that may exist even in the absence of significantly changing EI values. District teams are expected to recommend appropriate responses in the event of significant EI reductions on a grazing permit.

2.4 Grazing Evaluation Framework

WDFW may receive grazing proposals for WDFW-managed lands from a variety of sources, including WDFW staff, grazing operators, state government personnel, and other members of the general public. These proposals are sometimes associated with acreage being considered for, or undergoing, acquisition by WDFW. The Grazing Evaluation Framework was drafted with cross-program review to provide staff a consistent method of responding to grazing proposals. It directs staff to identify objectives, risks, costs, and income of a grazing proposal. When WDFW applies the Grazing Evaluation Framework to a given grazing proposal, staff will develop a recommendation to management regarding the proposal, and management then will

ultimately direct staff to prepare (or not) a full permit for district team review. The Framework template is presented at the end of this document as Appendix B.

2.5 Wolf-Livestock Conflict Permit Language

All grazing permits will include sanitation measures, and all permits will also include a provision for the development of an Annual Operation Plan (AOP) if and when wolves occur during the permit term. The AOP will consist of a minimum set of nonlethal deterrence measures and (if needed) directions on temporary livestock deferral or removal. The AOP will be agreed upon, customized for each applicable permit, and included within the “Additional Measures” section of the GMP. The process for completing AOPs and their associated Risk Assessments is described below and is followed by a template for these measures and instructions. Template language is in italicized text below, following the AOP instructions; bracketed text denotes instructions to WDFW staff, and should be deleted upon completion. AOPs are subject to annual adjustment prior to turnout when WDFW staff and Permittees take into account the High Risk Criteria and AOP Considerations as described below.

Overall Process for developing an AOP:

1 – For each District with grazing permits where wolves occur, the Wildlife Area Manager(s), District Wildlife Biologist, and Wildlife Conflict Specialist will meet to review any new wolf-livestock conflict information pertinent to permits that are existing, new, or proposed for renewal. These meetings will occur no later than 6-8 weeks prior to permitted livestock turnout, and for permits associated with CRM arrangements, the meetings should occur prior to annual CRM meetings. As part of this discussion, a Risk Assessment will be completed as presented in Figure 1, using the High Risk Criteria identified in Table 1 and the Considerations identified in Table 2. The considerations in Table 2 are not associated with specific triggers or thresholds, but they can help District staff specify appropriate recommendations based on site-specific conditions. The Wildlife Area Manager(s) District Wildlife Biologist, and Wildlife Conflict Specialist will recommend a draft AOP based on the options described below in Figure 1.

2 – As soon as possible following Step 1, annual meetings will occur on either a Regional or statewide basis where the draft AOPs are presented by the Wildlife Area Manager and discussed with the Wildlife Conflict Specialist, Range Ecologist, Wolf Policy Lead, Statewide Wolf Specialist, Lands Division Manager, Lands Operations Manager (if one exists in the Region), Wildlife Regional Program Manager, and Regional Director. These meetings will provide direction for the negotiation space for subsequent meetings with Permittees.

3 – As soon as possible following Step 2, for each grazing permit with a draft AOP, the Wildlife Area Manager will discuss the draft AOP with the Wildlife Conflict Specialist and potential or current Permittee and modify as necessary to achieve consensus. Each AOP will be signed by the Wildlife Area Manager and Permittee.

4 – Any elements of the modified draft AOP that are outside of the negotiation space developed in Step 2 will be discussed with staff listed in Step 2 before the plan is finalized. This

may require iterative work between the Wildlife Area Manager, Permittee, and staff listed in Step 2. The AOP will be finalized no later than four weeks prior to livestock turnout each year.

5 – During the grazing season, occurrence of a wolf activity center generally on or within 1 mile of a permitted grazing area OR a confirmed depredation within the local pack will trigger an updated Risk Assessment, associated recommendations, and AOP development process per Steps 1-4 and Figure 1.

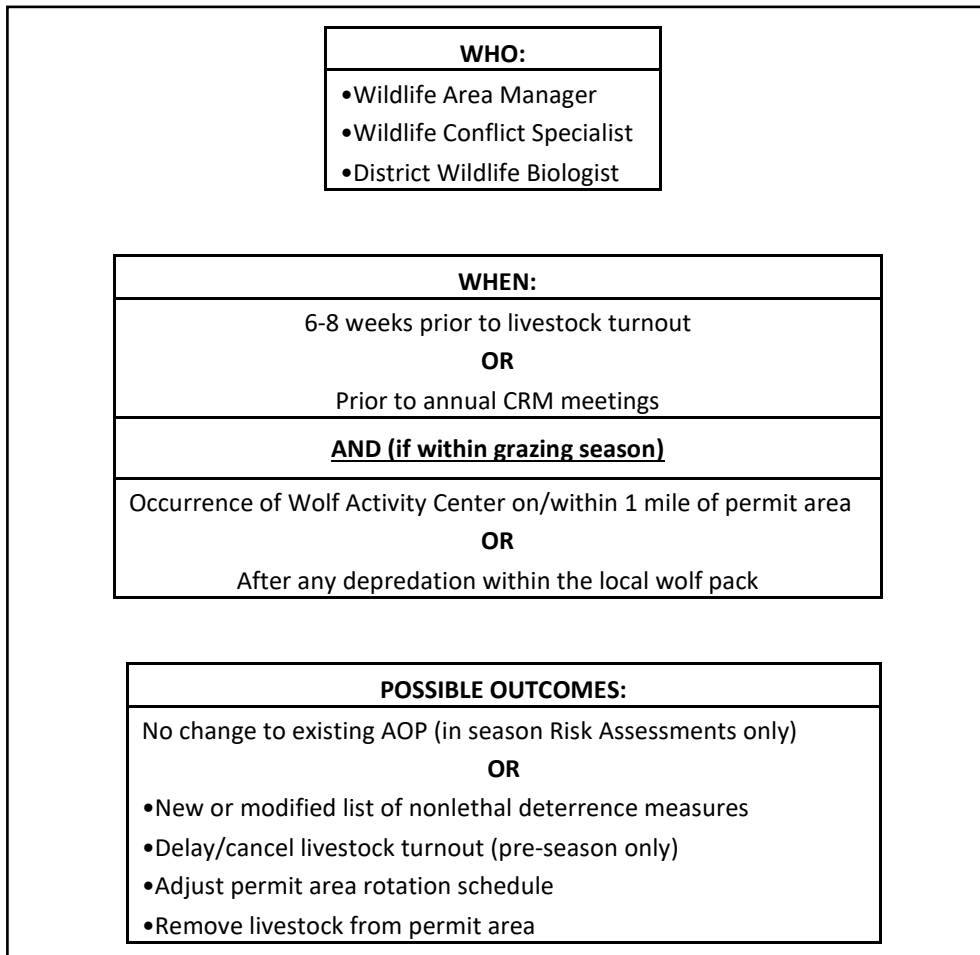


Figure 1. Risk Assessment process

Table 1. High Risk Criteria for considering deferral or removal of livestock from a WDFW permit area

High Risk Criteria		Metric	Trigger
A	Known Wolf Activity Center ¹ is near permit area	Distance between activity Center and permit area's nearest boundary. ²	Generally < 1 Mile
B	Number of Confirmed Depredations ³ for the local pack	# of depredations within a time frame	2 in 30 days OR 3 in 10 months ⁴
C	Depredations on WDFW permitted pasture	# within current grazing season. ⁵	1 ⁶

¹ Wolf Activity Center is defined by a cluster of WDFW-verified wolf locations (*e.g., collar locations, trail camera photos, observations, sign, or other evidence*) around which wolf activity is centered within a discrete area (1 mile²) that are observed for a duration of > 1 week. Wolf Activity Centers include sites used for dens, rendezvous areas, travel corridors, hunting, scavenging, etc.

² A grazing permit may include >1 grazing unit, livestock may utilize other permitted pastures where risk criteria are not met.

³ The animal killed or harmed needs to meet the legal definition of livestock within the wolf management plan.

⁴ Intentionally 1 less than criteria for consideration of wolf removal in the Wolf - Livestock interaction protocol.

⁵ As defined in the grazing plan. Decision to turnout within the current or following grazing season is a separate decision.

⁶ Applies to depredations on either permitted or trespass livestock during the permitted grazing season. If a depredation occurs on trespass livestock outside of the grazing season, it is factored into criteria B instead of Criteria C.

Table 2. Considerations to inform recommended actions in the Annual Operational Plan or updated Operational Plan.

AOP Considerations	Alternate Pasture Considerations ¹
<ul style="list-style-type: none"> • Potential of action to solve the threat of conflict • Impact on landscape level risk of additional conflict • Impact on ability to meet purpose of the grazing plan management objectives • Distance to next livestock herd • Reproductive status of pack (no pups/less risk) • Pack size • Stock density • Single event vs. chronic behavior of the pack • Availability of alternate pasture • Part of Coordinated Resource Management Plan • History of permittee's compliance • Permittee's input 	<ul style="list-style-type: none"> • Effect on reducing the risk of wolf-livestock conflict • Land ownership • Economics (transportation, access, time) • Necessary infrastructure • Conflicts with other management priorities • Availability

<ul style="list-style-type: none"> • Time depredation occurs within the grazing period (early – try to stay on with other actions to reduce risk; mid-season – move to alternate pasture; late – take the livestock home) • Calf size • Permittee’s operational rotation • Size of operation (few cattle easier to move) • Listing status (Fed/State) • Funding source for Wildlife Area purchase/ management • Risk of escalation of conflict for the producer or WDFW • Feasibility of additional nonlethal deterrence • Quality of infrastructure in existing pasture 	
<p>¹If alternate pasture is unavailable, either on WDFW lands or other land ownerships, the decision of whether to accept the risk of wolf-livestock conflict and continue permitted grazing on WDFW lands will ultimately rest with WDFW.</p>	

Template Language Included in GMPs in Wolf Habitat (under “Additional Measures”)

Wolves. WDFW manages lands to preserve, protect, and perpetuate the conservation of wildlife while recognizing the value and role livestock grazing has on habitat management and community character. To reduce the likelihood of losing both wolves and livestock, an overriding goal of this permit is to minimize the potential for wolf-livestock interactions, and the nonlethal deterrence measures listed below will be implemented on the permitted areas within this Grazing Management Plan. WDFW may consider temporarily removing livestock from a permitted area. The permittee(s) will work with local WDFW staff to deploy the nonlethal measures described below. [THROUGH NEGOTIATIONS BETWEEN THE CONFLICT SPECIALIST, WILDLIFE AREA MANAGER AND PERMITTEE, CUSTOMIZE THE “REQUIRED WHEN APPLICABLE,” “RECOMMENDED WHEN FEASIBLE,” AND “OPTIONAL WHEN APPLICABLE” SECTIONS BELOW AND SIMPLY ADD THEM TO THE LIST SO THERE IS ONLY A SINGLE LIST OF MEASURES]. DFW will work to provide cost-share for these measures where funds allow.

Required [THESE ARE REQUIRED IN ALL PERMITS WHERE WOLVES MAY OCCUR]:

- **Carcass sanitation** – Permittee will promptly notify Wildlife Conflict Specialist of livestock carcasses found on active pastures. Carcasses posing an immediate risk of wolf-livestock interactions will be, at WDFW’s option, either removed from WDFW lands or buried (after consultation between permittee and Wildlife Area Manager).

- **Removal of sick or injured livestock** – Sick or injured livestock will be removed from WDFW property as soon as possible. Permittee will promptly notify Wildlife Conflict Specialist that livestock have been removed. Sick or injured livestock may not be left on the permit area after the grazing season has concluded for the year.
- **Avoidance of known, active den and rendezvous sites** –
 - No salt blocks or other attractants such as mineral stations, molasses blocks, etc. – Salt blocks or other attractants will not knowingly be placed near an active den or rendezvous site. If an active den or rendezvous site is discovered, any previously established nearby salt block or attractant will be relocated. Appropriate minimum distances will be determined on a site-specific basis in consultation with Wildlife Area Manager and will depend primarily on topography around the den sites.
 - Minimal allotment maintenance activities – Prolonged maintenance activities (fencing, water source construction, etc.) will not be allowed near active den and rendezvous sites. The minimum appropriate distances will be determined on a site-specific basis and will depend primarily on topography around the site. Maintenance activities that mitigate wolf-livestock interactions may be allowed after consultation with Wildlife Area Manager.
- **Human presence** –
 - Locating livestock – Missing, sick, or injured livestock will be sought as soon as possible.
 - Moving livestock – Increased vigilance will be required immediately following any moving of livestock to a new grazing unit until the livestock are calm and (in the case of cow-calf pair operation) cow-calf pairs are together.
- **Documentation** – The Permittee will report the timing and implementation of all nonlethal deterrence actions to the Wildlife Area Manager at least every two weeks while WDFW land is being grazed, and documented following each grazing season.
- **Reporting suspected depredations** – A permittee who suspects that a wolf has injured or killed permitted livestock will report this by calling WILDCOMM at 360-902-2600 to notify WDFW Enforcement. If there is no answer, permittee will leave a voicemail and then attempt to contact Wildlife Conflict Specialist on the day of discovery. Actions taken after locating an injured or dead livestock may assist with determining the cause of death. To protect evidence:
 - Place a tarp over the carcass; then
 - Keep all people and domestic animals from the area
 - Do not touch anything;

- Avoid walking in and around the area; and
- Take photographs of the scene or place a trail camera at the site if one is available.
- **Actions in the event of recent depredations by the local wolf pack –**
 - Human presence – Livestock will be accompanied by sufficient human presence on a daily or near daily basis to maintain direct awareness regarding any potential wolf interactions. The permittee will be prepared to manage the livestock to minimize the chance of depredations should wolves be present.
 - Additional measures – may be recommended by WDFW as a result of internal discussion and WAG consideration.

[REQUIRED WHEN APPLICABLE - CUSTOMIZE THROUGH DISCUSSIONS WITH THE PRODUCER AND ONLY INCLUDE WHAT APPLIES AS ADD-ONS TO THE LIST ABOVE]:

Temporary removal of livestock:

- [INSERT ANY REQUIREMENTS FOR DEFERRAL/CANCELLATION OF LIVESTOCK TURNOUT (OR, IN THE CASE OF AN UPDATED RISK ASSESSMENT, REQUIREMENTS FOR TEMPORARY REMOVAL OF LIVESTOCK) THAT WERE DEVELOPED AS A RESULT OF STEPS 1 – 5 OF THE AOP GUIDANCE. CITE APPLICABLE HIGH RISK CRITERIA AS WELL AS APPLICABLE CONSIDERATIONS.]

Deferred or removed livestock may be authorized to return to the pasture within the calendar year to utilize permitted AUMs if this is consistent with the AOP and with other timing constraints in the permit.

[RECOMMENDED WHEN FEASIBLE - CUSTOMIZE THROUGH DISCUSSIONS WITH THE PRODUCER AND ONLY INCLUDE WHAT APPLIES AS ADD-ONS TO THE LIST ABOVE]:

- **Portable fencing**
- **Scare devices**
- **Delay turnout** (winter/spring calving operations)
- **Calf Panels** (fall calving operations)

[OPTIONAL SECTION FOR CROSSING PERMITS WHEN APPLICABLE:

FOR CROSSING PERMITS OCCURRING IN THE MIDST OF RECENT WOLF DEPREDACTION – INCLUDE THE FOLLOWING LANGUAGE AT THE BEGINNING OF THE GRAZING MANAGEMENT PLAN ITSELF:]

WDFW is aware that the permittee’s grazing permit [IF APPLICABLE: AND HOME RANCH] is within the active home range of the X wolf pack, [IF APPLICABLE: FOR WHICH WDFW CURRENTLY HAS AN ACTIVE LETHAL REMOVAL OPERATION]. This wolf pack has caused recent livestock depredations affecting other local producer(s).

The livestock will be accompanied at all times by sufficient human presence to maintain direct awareness regarding any potential wolf threat and will be prepared to manage the livestock to minimize the chance of depredation should such wolf presence occur.

In our discussion of this temporary crossing permit, WDFW asserts [DESCRIBE THE SPECIFIC CIRCUMSTANCES OF THE CROSSING PERMIT AND WHY WE THINK IT MAKES SENSE TO PERMIT IT IN THIS CASE] and have determined to allow the permit to occur with the listed required measures.

3.0 APPENDICES

Internal and external review of the Grazing Guidance and Grazing Management Tools is summarized in 3.1, “Appendix A,” and the steps for completing the GEF are described in section 3.2, “Grazing Evaluation Framework.”

3.1 Appendix A. Outreach and Review: Grazing Guidance and Grazing Management Tools

WDFW’s Grazing Guidance and Grazing Management Tools received multiple rounds of internal review, including cross-program review and management review. Two dedicated internal teams were created to develop and review content intended for inclusion: one team oversaw general development of the Guidance and Tools over a multi-year period, and the other team focused specifically on wolf-livestock management on WDFW lands, including external stakeholder feedback. Various elements of the Guidance and Tools were also shared with the Fish and Wildlife Commission and/or its Wildlife Committee over a period of several years (2017-2020) before Policy revision occurred and the rule-making process was initiated for WAC 220-500-200.

Final internal team review of the Guidance and Tools occurred in late 2019. Following this, additional internal groups received the opportunity to review and provide comments: wildlife area managers; and Fish Program management, Habitat Program management, and the Executive Management Team (EMT). Following EMT comments, the Wildlife Committee was updated and provided direction on which elements of the Grazing Guidance and Grazing Management Tools should be presented to the full Commission, and full Commission review occurred in 2020.

External stakeholder review also occurred in late 2019 and in spring 2020. The following groups were invited to comment on the Grazing Guidance and/or on certain elements of wolf-livestock conflict management: Audubon Society, Conservation Northwest, Current permittees, Farm Bureau, Lands Council, Land trusts, Mule Deer Foundation, Pheasants Forever, Rocky Mountain Elk Foundation, Tribes, Western Watersheds Project, and Washington Cattlemen’s Association. In addition to internal review, Commission review, and external stakeholder review, the general public had an opportunity to comment via the State Environmental Policy Act (SEPA) process in 2020.

3.2 Appendix B: Grazing Evaluation Framework

WDFW Grazing Evaluation Framework Purpose and Use

The WDFW Grazing Evaluation Framework (GEF) is designed to inform the evaluation of potential **new** grazing on Department lands. New grazing means either 1) grazing that would occur on existing WDFW-managed acreage where grazing has not been permitted within the previous 10 years, or 2) grazing that could be either new or ongoing on acreage that WDFW is considering for acquisition. The GEF consists of decision criteria to be used by staff and will result in a recommendation from staff to program management, either for or against development of a formal grazing management plan and permit. This recommendation will be based on WDFW staff evaluation of the proposed grazing in terms of 1) consistency with mission and Grazing Guidance as described below, 2) potential risks, and 3) projected implementation requirements, including initial and ongoing management costs.

The GEF should be used under the following circumstances:

- 1) During staff evaluation of potential new grazing on lands that WDFW already owns or manages.
- 2) As part of the Lands 20/20 acquisition process to evaluate proposed or existing grazing on potential acquisitions.

The GEF **should not be used** to evaluate 1) grazing covered under a temporary permit, or 2) existing grazing activities allowed by an existing or recently expired WDFW grazing permit on WDFW-managed lands. Evaluation of such grazing, and the associated ongoing costs and workload considerations, occurs in conjunction with the existing permit preparation and internal review process described in previous sections.

Authority and Rationale for Grazing on Department Lands

Grazing is permitted on WDFW Wildlife Areas under WAC 220-500-200 *Livestock Grazing on Department of Fish and Wildlife lands*. Consistent with the proposed updates to WAC 220-500-200 and WDFW Commission Policy C-6003, *Domestic Livestock Grazing on Department Lands*, domestic livestock grazing on WDFW-managed lands is allowed if it is determined to be consistent with the WDFW's mission and management objectives. If permitted, livestock grazing must be integrated with other uses and ensure that ecological integrity is maintained.

Accordingly, WDFW may permit grazing for one or more of the following broad purposes:

1. Manage vegetation and habitat to provide food and cover for wildlife.
2. Enhance recreational opportunity.
3. Improve habitat conservation beyond WDFW lands by participating in coordinated resource management.
4. Preserve and protect fish and wildlife habitat by protecting community character and maintaining open space.

Application of the Grazing Evaluation Framework

Follow these steps to apply the GEF.

- 1) (Pre-step.) Upon receiving a request for grazing by a grazing proponent, Wildlife Area Manager (Manager) confirms with Real Estate if necessary that no conflicts with fund source constraints or acquisitions purposes exist. If such a conflict exists, Manager notifies proponent of grazing that a permit is not possible. If no such conflicts exist, Manager then completes GEF Worksheet elements I, II, and III with support from statewide range ecologist. Manager submits resulting draft worksheet to Lands Division Manager (LDM) and Regional Wildlife Program Manager (RWPM), who together determine whether to proceed with the full GEF, and if so, notify the Manager.
- 2) Manager receives confirmation (or not) that the full GEF should be followed from the RWPM and the LDM.
- 3) Manager presents Framework elements I, II, and III to district team. Manager presents Framework to any other staff recommended by the district team, such as statewide game and diversity specialists, etc.
- 4) Manager, range ecologist, and staff from Step 3 above modify elements I, II, and III and supporting information in the Framework according to best available information.
- 5) Manager, range ecologist, and any applicable staff from Step 3 above complete Framework elements IV and V.
- 6) Manager forwards the resulting complete Framework, with specific recommendation and rationale, to RWPM and LDM for approval to proceed or notification of intent to proceed no further. Manager includes all documentation associated with the Framework, including the original draft and staff comments.
- 7) RWPM consults with Regional Director and LDM to review and evaluate the GEF documents. Based on this review and evaluation, RWPM notifies manager of approval to proceed, or not, and Manager notifies proponent of grazing of the decision. Approval triggers the internal permit preparation process and development of a formal grazing management plan.

Grazing Evaluation Framework Worksheet

Wildlife Area/Unit: _____

T, R, S (Attach map of proposed permit area): _____

Date: _____

I. Identify Objectives for Potential Grazing

(Check all objectives that apply.)

Is the proposed grazing action designed to meet specified vegetation/habitat/recreation objectives where those objectives may maintain or improve ecological integrity in general or benefit individual target species? If so, select one or more of the following:

1. ___ Stimulate growth, palatability, or accessibility of forage for wildlife (e.g., wild ungulates)
2. ___ Control/remove vegetation to benefit shorebirds/waterfowl (e.g. reed canary grass)
3. ___ Remove agricultural residue to benefit waterfowl, sandhill cranes, etc.
4. ___ Control/remove vegetation for other reasons (i.e. to reduce competition with priority species, to reduce fuels and the severity of fires that might occur, etc.; provide specific rationale)
5. ___ Suppress invasive weeds
6. ___ State Other Objective(s) _____

Is the proposed grazing action designed to help achieve conservation on a landscape scale? If so, select one or more of the following:

1. ___ Provide relief for individuals who have lost opportunity from wildfire, wolf activity, etc.
2. ___ Participate in coordinated resource management (CRM)
3. ___ Reduce need for fencing within a given landscape among CRM participants
4. ___ State Other Objective(s) _____

Is the proposed grazing action designed to protect community character and values? If so, select one or more of the following:

1. ___ Reduce the potential risk of wildfire
2. ___ Facilitate movement of livestock from one grazed area to another when WDFW land is in between
3. ___ Achieve acquisition goal/honor agreements made during property purchases
4. ___ Retain ranching and associated "open" (undeveloped) space
5. ___ Build relationships to foster cooperative efforts

6. ____ State Other Objective(s)_____

II. Identify Potential Risks

Does the proposed grazing pose potential risks to fish and wildlife or fish and wildlife habitat or to ongoing recreation? Is the proposed grazing inconsistent with fund source allowances, purposes of acquisition, wildlife area management plans, or other existing agreements? If so, select one or more of the following:

1. ____ Conflicts with fund source allowances or purposes of acquisitions (Check with Real Estate)
2. ____ Fencing risks to wildlife (grouse, bighorn lambs, pronghorn, migration routes, perching raptors, etc.)
3. ____ Proximity of domestic sheep to bighorn sheep
4. ____ Effects on the recovery of threatened or endangered species (area part of a recovery plan, etc.) or associated designated critical habitat
5. ____ Conflicts with habitat or species management actions outlined in the wildlife area plan
6. ____ Risks to species of greatest conservation need or other species that are of special interest to WDFW
7. ____ Risks to riparian, wetland, or other habitats of special interest to WDFW
8. ____ Risks to soil resources, including biological soil crusts in upland systems and streambank stability in riparian systems
9. ____ Risks to riparian areas where recent or ongoing habitat restoration work for anadromous fish has been performed
10. ____ Conflicts with fish- and wildlife-related recreation or other recreation activity prioritized by the Wildlife Area Management Plan
11. ____ Conflicts with ability to comply with existing contract or binding agreement
12. ____ Risk of invasive weed establishment and spread
13. ____ History of wolf-livestock conflict, including wolf depredations and lethally removed wolves
14. ____ State Other Risk(s)_____

III. Based on the objectives and potential risks identified above, provide clear rationale as to why the proposed grazing should, or should not, be further considered and subjected to the implementation costs and potential revenue assessment below. Describe all risks and how they will be managed if proposal is to proceed. Provide as much context as necessary regarding specific species, habitats, recreational values, economic values, community values, and other values.

If further consideration is not proposed, stop here. Submit framework to RWPM and LDM. If RWPM and LDM provide direction to proceed with full GEF, Manager presents existing framework to district team and any other staff recommended by district team, and together with the range ecologist they modify elements I, II, and III, and complete elements IV and V below, all according to best available information.

IV. Identify Implementation Costs

Space is provided below for the Wildlife Area Manager and others with applicable knowledge to jointly complete this section by identifying and estimating costs associated with initiating and managing the proposed grazing. These costs include planning, administration, infrastructure, and monitoring. Space is also provided to estimate costs associated with additional requirements that may be permit-specific.

Costs should be separated into 1) startup or periodic renewal costs (some costs may recur with each permit renewal and 2) annual costs incurred each year. Costs for certain administration and monitoring activities have been estimated and entered below for an average grazing permit. Use this as a general reference and edit text in italics where needed to address specific circumstances. Please consult the range ecologist when estimating costs for grazing plan and monitoring.

1. Administration: develop grazing management plan, permit area map, HB1309 Ecosystem Standards, CRM participation if applicable
Detail: Estimate of average time including wildlife area manager and range ecologist includes 1) startup efforts of 6 days to develop plan and 1309 checklist, 2) annual efforts of 6 days to accomplish reporting, compliance, coordination, CRM if needed. Salary & Benefit Cost = \$300/day; also estimate applicable vehicle and travel expenses.

Estimated Startup Cost: \$1,800, Annual Cost: \$1,800

2. Monitoring utilization and ecological integrity:

Detail: Estimate of average time includes 1) startup efforts of 5 days to measure vegetative characteristics to establish baseline conditions that will be monitored every five years, 2) annual effort of 2 days to monitor utilization. \$300/day

Estimated Startup Cost: \$1,500, Annual Cost: \$600

3. Fencing: building and maintaining fence

Detail: Take into account specific requirements such as wildlife-friendly specifications, fire-resistant fence designs, possible lay-down or 3-d fence requirements, realistic ongoing maintenance needs, etc.

Estimated Startup Cost: _____, Annual Cost: _____

4. Other Structures: miscellaneous infrastructure

Detail: building and maintaining water gaps, designated fords, bank armoring, troughs, spring developments, hardened sites for mineral blocks, wells or pumps, corral facilities, etc.

Estimated Startup Cost: _____, Annual Cost: _____

5. Cultural resources, SEPA: cultural resources and/or SEPA work(if necessary)

Detail: Surveys required for fencing, armoring; planning for SEPA review if proposed grazing is not a renewal, or is on acreage that has not been permitted within the last ten years and that exceeds one section of land

Estimated Startup Cost: _____, Annual Cost: _____

6. Species Surveys (if needed) and risk mitigation: sensitive species

Detail: surveys for species of greatest conservation need and/or threatened and endangered species, and include actions to mitigate or manage identified potential risks to species and/or habitats

Estimated Startup Cost: _____, Annual Cost: _____

7. Range rider:

Detail: _____

Estimated Startup Cost: _____, Annual Cost: _____

8. Other:

Detail: _____

Estimated Startup Cost: _____, Annual Cost: _____

9. Other:

Detail: _____

Estimated Startup Cost: _____, Annual Cost: _____

Total Estimated Startup Cost: _____ Total Estimated Annual Cost: _____.

V. Identify Potential Revenue

Estimated AUMs _____ x AUM rate _____ (2018 rate = \$11.90) = _____

If RWPM, Regional Director, and Lands Division Manager jointly agree that a grazing management plan should be developed and submitted to the district team for review, RWPM notifies manager accordingly. Otherwise, RWPM notifies manager that the proposed grazing will not go forward and that a new permit will not be developed.

Literature Cited

- Allen, C. R., D. G. Angeler, J. J. Fontaine, A. S. Garmestani, N. M. Hart, K. L. Pope, and D. Twidwell. 2017a. Adaptive management of rangeland systems. Pages 373-394 Rangeland Systems. Springer series on environmental management. Springer, Cham.
- Allen, J. H., T. Odell, J. Babcock, and C. Henrie. 2017b. Advancing collaborative solutions: lessons from the Oregon sage-grouse conservation partnership (SageCon). National Policy Consensus Center Publications and Reports. 9.
http://pdxscholar.library.pdx.edu/ncpp_pub/9.
- Anderson, A., and K. C. McCuistion. 2008. Evaluating strategies for ranching in the 21st century: successfully managing rangeland for wildlife and livestock. *Rangelands* **30**:8-14.
- Anderson, E. W., D. L. Franzen, and J. E. Melland. 1990. Rx Grazing to benefit watershed-wildlife-livestock. *Rangelands* **12**:105-111.
- Anderson, E. W., and R. J. Scherzinger. 1975. Improving quality of winter forage by elk by cattle grazing. *Journal of Range Management* **28**:120-125.
- Anderson, J. E., and R. S. Inouye. 2001. Landscape-scale changes in plant species abundance and biodiversity of a sagebrush steppe over 45 years. *Ecological Monographs* **71**:531-556.
- Anderson, L. D. 1991. Bluebunch wheatgrass defoliation effects and recover: a review. Bureau of Land Management Idaho State Office Technical Bulletin 91-2.
- Anderson, M. T., and D. A. Frank. 2003. Defoliation effects on reproductive biomass: importance of scale and timing. *Journal of Range Management* **56**:501-516.
- Andrus, C. D., and J. C. Freemuth. 2001. Policy after politics: how should the new administration approach public land management in the western states? *Journal of Land Resources and Environmental Law* **21**:1-11.
- Bailey, D. 2004. How many animals can I graze on my pasture? Page 6. University of Arizona Cooperative Extension.
- Bailey, D. W., J. E. Gross, E. A. Laca, L. R. Rittenhouse, M. B. Coughenour, D. M. Swift, and P. L. Sims. 1996. Mechanisms that result in large herbivore grazing distribution patterns. *Journal of Range Management* **49**:386-400.
- Ball, J. I., R. D. Bauer, V. Kees, and M. J. Rabenberg. 1989. Northwest riverine and Pacific coast. *in* L. M. Smith, R. L. Pederson, and R. M. Kaminski, editors. Habitat management for migrating and wintering waterfowl in North America. Texas Tech University Press, Lubbock, TX, USA.
- Barnes, M., and A. Hild. 2013. Foreword: strategic grazing management for complex creative systems. *Rangelands* **35**:3-5.
- Bedel, T. E. 1998. Glossary of terms used in range management. 4th Edition. Society for Range Management. Direct Press, Denver, CO.
- Belsky, A. J., A. Matzke, and S. Uselman. 1999. Survey of livestock influences on stream and riparian ecosystems in the western United States. *Journal of Soil and Water Conservation* **54**:419-431.
- BLM. 1999. Interagency technical reference: utilization studies and residual measurements. Page 174. USDA-Cooperative Extension Service, USDA-Forest Service, Natural Resources Conservation Service, USDI Bureau of Land Management.

- Boyd, C. S., J. L. Beck, and J. A. Tanaka. 2014. Livestock grazing and sage-grouse habitat: impacts and opportunities. *Journal of Rangeland Applications* **1**:58-77.
- Brown, E. D., and B. K. Williams. 2016. Ecological integrity assessment as a metric of biodiversity: are we measuring what we say we are? *Biodiversity and Conservation* **25**:1011-1035.
- Brunson, M. 2014. Unwanted no more: land use, ecosystem services, and opportunities for resilience in human-influenced shrublands. *Rangelands* **36**:5-11.
- Burkhardt, J. W., and K. Sanders. 2012. Management of growing-season grazing in the sagebrush steppe: a science review of management tools appropriate for managing early-growing-season grazing. *Rangelands* **34**:30-35.
- Burton, T. A., S. J. Smith, and E. R. Cowley. 2011. Riparian area management: multiple indicator monitoring (MIM) of stream channels and streamside vegetation. Technical reference 1737-23. BLM/OC/ST-10/003+1737+REV. USDI, Bureau of Land Management, National Operations Center, Denver, CO.
- Carter, S. K., n. B. Carr, C. H. Flather, E. Fleishman, M. Leu, B. R. Noon, and D. J. A. Wood. 2016. Assessing ecological integrity using multiscale information from Bureau of Land Management assessment and monitoring programs. Pages 39-53 *in* S. K. Carter, N. B. Carr, K. H. Miller, and D. J. A. Wood, editors. Multiscale guidance and tools for implementing a landscape approach to resource management in the Bureau of Land Management. Open-file report 2016-2017. U.S. Geological Survey, Reston, VA.
- Caudle, D., J. DiBenedetto, M. Karl, H. Sanchez, and C. Talbot. 2013. Interagency ecological site handbook for rangelands.
- Clark, A., T. DelCurto, M. Vavra, and B. L. Dick. 2013. Stocking rate and fuels reduction effects on beef cattle diet composition and quality. *Rangeland Ecology and Management* **66**:714-720.
- Clark, P. E., W. C. Krueger, L. D. Bryant, and D. R. Thomas. 2000. Livestock grazing effects on forage quality of elk winter range. *Journal of Range Management* **53**:97-105.
- Clary, W. P., and B. F. Webster. 1989. Managing grazing of riparian areas in the Intermountain region. Page 15. USDA Forest Service Intermountain Research Station General Technical Report INT-263.
- Coe, P. K., B. K. Johnson, L. M. Stewart, and J. G. Kie. 2005. Spatial and temporal interactions of elk, mule deer, and cattle. *The Starkey Project: a synthesis of long-term studies of elk and mule deer*. Reprinted from the 2004 Transactions of the North American Wildlife and Natural Resource Conference. Alliance Communications Group, Lawrence, Kansas, USA.
- Comer, P. J., D. Faber-Langendoen, R. Evans, M. Pyne, M. Reid, K. Schulz, K. Snow, and J. Teague. 2003. Ecological systems of the United States: a working classification of U.S. terrestrial systems. NatureServe, Arlington, Virginia.
- Crane, K. K., J. C. Mosley, T. K. Brewer, W. L. F. Torstenson, and M. W. Tess. 2001. Influence of cattle grazing on elk habitat selection. Bozeman, MT.
- Crane, K. K., J. C. Mosley, T. K. Mosley, R. A. Frost, M. A. Smith, W. L. Fuller, and M. W. Tess. 2016. Elk foraging site selection on foothill and mountain rangeland in spring. *Rangeland Ecology and Management* **69**:319-325.

- Crawford, J. A., R. A. Olson, N. E. West, J. C. Mosley, M. A. Schoreder, T. D. Whitson, R. F. Miller, M. A. Gregg, and C. S. Boyd. 2004. Ecology and management of sage-grouse and sage-grouse habitat. *Journal of Range Management* **57**:2-19.
- CSU. 2011. CSU Extension impact report. A new era of collaborative land stewardship. Colorado State University Extension.
- Davies, K. W., J. D. Bates, T. J. Svejcar, and C. S. Boyd. 2010. Effects of long-term livestock grazing on fuel characteristics in rangelands: an example from the sagebrush steppe. *Rangeland Ecology and Management* **63**:662-669.
- Davies, K. W., A. Gearhart, C. S. Boyd, and J. D. Bates. 2017. Fall and spring grazing influence fire ignitability and initial spread in shrub steppe communities. *International Journal of Wildland Fire* **26**:485-490.
- Davies, K. W., M. Vavra, B. Schultz, and N. Rimbey. 2014. Implications of longer term rest from grazing in the sagebrush steppe. *Journal of Rangeland Applications* **1**:14-34.
- Davison, J. C., E. Smith, and W. L. M. 2007. Livestock grazing guidelines for controlling noxious weeds in the western United States. Western regional sustainable agriculture, research, and education project.
- DeKeyser, E. S., M. Meehan, G. Clambey, and K. Krabbenhoft. 2013. Cool season invasive grasses in northern Great Plains natural areas. *Natural Areas Journal* **33**:81-90.
- Fenster, R. L., J. E. Knight, and C. M. Nistler. 2006. Livestock grazing to enhance big game habitat; case studies. Pages 102-106 *in* Symposium: prescribed livestock grazing to enhance wildlife habitat. Presented at the Society for Range Management's 59th annual meeting and trade show, Vancouver, British Columbia.
- Galt, D., F. Molinar, J. Navarro, J. Joseph, and J. Holechek. 2000. Grazing capacity and stocking rate. *Rangelands* **22**:7-11.
- Ganskopp, D., L. Aguilera, and M. Vavra. 2007. Livestock forage conditioning among six northern Great Basin grasses. *Rangeland Ecology and Management* **60**:71-78.
- Ganskopp, D., T. Svejcar, F. Taylor, J. Farstvedt, and K. Paintner. 1999. Seasonal cattle management in 3 to 5 year old bitterbrush stands. *Journal of Range Management* **52**:166-173.
- Ganskopp, D., T. Svejcar, F. Taylor, and J. Farstvedt. 2004a. Can spring cattle grazing among young bitterbrush stimulate shrub growth? *Journal of Range Management* **57**:161-168.
- Ganskopp, D., T. Svejcar, and M. Vavra. 2004b. Livestock forage conditioning: bluebunch wheatgrass, Idaho fescue, and bottlebrush squirreltail. *Journal of Range Management* **57**:384-392.
- Grover, K. E., and M. J. Thompson. 1986. Factors influencing spring feeding site selection by elk in the Elkhorn Mountains, Montana. *Journal of Wildlife Management* **50**:466-470.
- Grumbine, R. E. 1994. What is ecosystem management? *Conservation Biology* **8**:27-38.
- Harris, T. R., and J. Wright. 2004. Estimated economic impacts of the cattle ranching and farming sector in the White Pine County economy. University of Nevada, Reno, Nevada Cooperative Extension, Department of Resource Economics.
- Hegstad, S. S. 1996. Beaverhead County's memorandum of understanding: collaborative approach to planning. *in* K. Evans, editor. Sharing common ground on western rangelands: proceedings of a livestock/big game symposium. United States Department of Agriculture Forest Service, Rocky Mountain Research Station.

- Herrick, J. E., J. W. Van Zee, K. M. Havstad, L. M. Burkett, and W. G. Whitford. 2009a. Monitoring manual for grassland, shrubland, and savanna ecosystems. Volume 1: Quick start. USDA-ARS Jornada Experimental Range, Las Cruces, New Mexico.
- Herrick, J. E., J. W. Van Zee, K. M. Havstad, L. M. Burkett, and W. G. Whitford. 2009b. Monitoring manual for grassland, shrubland, and savanna ecosystems. Volume 2: Design, supplementary methods and interpretation. USDA-ARS Jornada Experimental Range, Las Cruces, New Mexico.
- Hicks, L., A. Warren, and C. Hicks. 1996. Upper Muddy Creek coordinated management. *in* K. Evans, editor. Sharing common ground on western rangelands: proceedings of a livestock/big game symposium. United States Department of Agriculture Forest Service, Rocky Mountain Research Station.
- Hoffman, R. W., and A. E. Thomas. 2007. Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5181954.pdf [accessed 2/4/2020].
- Holechek, J. L., H. Gomez, F. Molinar, and D. Galt. 1999. Grazing studies: what we've learned. *Rangelands* **21**:12-16.
- Holechek, J. L., R. D. Piper, and C. H. Herbel. 1998. Range management: principles and practices. Third edition. Prentice-Hall, Upper Saddle River, NJ.
- Holechek, J. L., R. Valdez, S. D. Schemnitz, R. D. Pieper, and C. A. Davis. 1982. Manipulations of grazing to improve or maintain wildlife habitat. *Wildlife Society Bulletin* **10**:204-210.
- Hudson, T. D. undated. Rangeland Management Series: grazing to limit wildfire. Washington State University Extension. 2 pp.
- Kantrud, H. A., and K. F. Higgins. 1992. Nest and nest site characteristics of some ground-nesting, non-passerine birds of northern grasslands. *Prairie Naturalist* **24**:67-84.
- Knick, S. T., S. E. Hanser, R. F. Miller, D. A. Pyke, M. J. Wisdom, S. P. Finn, E. T. Rinke, and C. J. Henny. 2011. Ecological influence and pathways of land use in sagebrush. Pages 203-251 *in* S. T. Knick and J. W. Connelly, editors. Greater Sage-Grouse: ecology and conservation of a landscape species and its habitats. University of California Press, Berkeley, CA.
- Launchbaugh, K. L., B. Brammer, M. L. Brooks, S. Bunting, J. Davison, M. Fleming, R. Kay, M. Pellant, D. A. Pyke, and B. Wylie. 2008. Interactions among livestock grazing, vegetation type, and fire behavior in the Murphy wildland fire complex in Idaho and Nevada, July 2007. Page 49. USDI United States Geological Survey Open-File Report 2008-1214.
- Leffler, A. J., and R. L. Sheley. 2012. Adaptive management in EBIPM. *Rangelands* **34**:44-48.
- Longmore, A. T., and T. Forrest. 2016. The history and overview of Utah's Grazing Improvement Program. *Rangelands* **38**:250-255.
- Lusk, J. S., and N. Koper. 2013. Grazing and songbird nest survival in southwestern Saskatchewan. *Rangeland Ecology and Management* **66**:401-409.
- Maestas, J. D., R. L. Knight, and W. C. Gilgert. 2003. Biodiversity across a rural land use gradient. *Conservation Biology* **17**:1425-1434.
- Malachek, J. C. 1978. Animal production on rangelands. Page 18 *in* Symposium: agriculture, everybody's business. Brigham Young University, Provo, UT.

- Mandema, F. S., J. M. Tinbergen, J. Stahl, P. Esselink, and J. P. Bakker. 2014. Habitat preference of geese is affected by livestock grazing - seasonal variation in an experimental field evaluation. *Wildlife Biology* **20**:67-72.
- McAdoo, K., B. Schultz, S. Swanson, and R. Orr. 2007. Northeastern Nevada wildfires 2006 part 2 - can livestock grazing be used to reduce wildfires? Fact Sheet 07-21. Pages 1-2. University of Nevada Cooperative Extension.
- Mccarthy, J. J. 2003. Results from the use of a system of "rest rotational grazing" for livestock to improve wildlife habitat in Montana. *Journal of Mountain Ecology* **7**:13-16.
- McGarigal, K., B. Compton, E. Plunkett, B. DeLuca, J. Grand, E. Ene, and S. D. Jackson. 2018. A landscape index of ecological integrity to inform landscape conservation. *Landscape Ecology* **33**:1029-1048.
- Mclnnis, M. L., and J. D. Mclver. 2009. Timing of cattle grazing alters impacts on stream banks in an Oregon mountain watershed. *Journal of Soil and Water Conservation* **64**:394-399.
- McSweeney, A. M., and C. Raish. 2012. Social, cultural, and economic aspects of livestock ranching on the Santa Fe and Carson National Forests. United States Department of Agriculture Forest Service, Rocky Mountain Research Station.
- Milchunas, D. G., and W. K. Lauenroth. 1993. Quantitative effects of grazing on vegetation and soils over a global range of environments. *Ecological Monographs* **63**:327-366.
- O'Laughlin, J., P. Cook, S., Z. Johnson, and E. Strand. 2014. Sage-grouse habitat conservation policy and the wildfire threat in Idaho. Report No. 34. Policy Analysis Group - College of Natural Resources, College of Natural Resources Experiment Station, University of Idaho.
- Parrish, J. D., D. P. Braun, and R. S. Unnasch. 2003. Are we conserving what we say we are? Measuring ecological integrity within protected areas. *BioScience* **53**:851-860.
- Pratt, M., and G. A. Rasmussen. 2001. Determining your stocking rate. Range Management Fact Sheet. Utah State University Cooperative Extension.
- Reisner, M. D., J. B. Grace, D. A. Pyke, and P. S. Doescher. 2013. Conditions favouring *Bromus tectorum* dominance of endangered sagebrush steppe ecosystems. *Journal of Applied Ecology* **50**:1039-1049.
- Resnik, J., G. Wallace, M. Brunson, and J. Mitchell. 2006. Open spaces, working places. *Rangelands* **28**:4-9.
- Runge, C. A., A. J. Plantinga, A. E. Larsen, D. E. Naugle, K. J. Helmstedt, S. Polasky, J. P. Donnelly, J. T. Smith, T. Lark, J. J. Lawler, S. Martinuzzi, and J. Fargione. 2018. Unintended habitat loss on private land from grazing restrictions on public rangelands. *Journal of Applied Ecology* **2018**, <https://doi.org/10.1111/1365-2664.13271>:1-11.
- Ryder, R. A. 1980. Effects of grazing on bird habitats. Pages 51-56 Management of western forests and grasslands for nongame birds. USDA Forest Service general technical report INT-86.
- Schroeder, M. A., and R. K. Baydack. 2001. Predation and the management of prairie grouse. *Wildlife Society Bulletin* **29**:24-32.
- Schroeder, M. A., J. Burnham, and M. Vander Haegan. 2015. Unpublished. Validation of ecological integrity assessments at Swanson lakes Wildlife Area

- Schroeder, M. A., R. C. Crawford, J. Rocchio, D. J. Pierce, and M. VanderHaegen. 2011. Ecological integrity assessments: monitoring and evaluation of wildlife areas in Washington. Page 236. Washington Department of Fish and Wildlife, Olympia, WA.
- SGI. 2015. What's good for rangelands is good for grouse. Sage Grouse Initiative. <https://ir.library.oregonstate.edu/concern/defaults/736669828>
- Stinson, D. W., and M. A. Schroeder. 2012. Washington State Recovery Plan for the Columbian Sharp-tailed Grouse. Page 159. Washington Department of Fish and Wildlife, Olympia, WA.
- Strand, E. K., K. Launchbaugh, L. R. Limb, and L. A. Torell. 2014. Livestock grazing effects on fuel loads for wildland fire in sagebrush dominated ecosystems. *Journal of Rangeland Applications* **1**:35-57.
- Strand, E. K., and K. L. Launchbaugh. 2013. Livestock grazing effects on fuel loads for wildland fire in sagebrush dominated ecosystems. Pages 1-21. University of Idaho Rangeland Center, Moscow, ID.
- Sulak, A., and L. Huntsinger. 2007. Public land grazing in California: untapped conservation potential for private lands? *Rangelands* **29**:9-12.
- UAES. 1978. Grazing to make forage. *Utah Science* **39**:150-151.
- Vallentine, J. F. 1971. Range development and improvements. Brigham Young University Press, Provo, UT.
- Vavra, M. 2005. Livestock grazing and wildlife: developing compatibilities. *Rangeland Ecology and Management* **58**:128-134.
- Wagoner, S. J., L. A. Shipley, R. C. Cook, and L. Hardesty. 2013. Spring cattle grazing and mule deer nutrition in a bluebunch wheatgrass community. *Journal of Wildlife Management* **77**:897-907.
- Washington_CRM_Task_Group. 2008. Washington State Coordinated Resource Management Handbook. Pages 1-35.
- WDFW. 2006. Columbia Basin Wildlife Area Management Plan. Page 133. Washington Department of Fish and Wildlife, Olympia, WA.
- WDFW. 2015. Washington's State Wildlife Action Plan: 2015 Update. Washington Department of Fish and Wildlife, Olympia, Washington, USA.
- Weber, K. T., B. McMahan, and G. Russell. 2001. Effect of livestock grazing and fire history on fuel load in sagebrush-steppe rangelands. Pages 62-69 *in* K. T. Weber, editor. NASA final report: wildfire effects on rangeland ecosystems and livestock grazing in Idaho. Idaho State University - GIS Training and Research Center.
- Wurtzebach, Z., and C. Schultz. 2016. Measuring ecological integrity: history, practical applications, and research opportunities. *BioScience* **66**:446-457.
- Yeo, J. J., J. M. Peek, W. T. Wittinger, and C. T. Kvale. 1993. Influence of rest-rotation cattle grazing on mule deer and elk habitat use in east-central Idaho. *Journal of Range Management* **46**:245-250.