Standards for Land Health Evaluation
and
Guidelines for Livestock Grazing Management
for
Public Lands in Oregon and Washington

UPDATE for

O'Keeffe (#00216)

August 2017

Background

The O'Keeffe Individual Allotment (#00216) is located approximately 15 miles northeast of Adel, Oregon (see map 1) north of Hwy 140. The allotment, totaling 54,037 acres[1] with one permittee, contains 16 pastures: (1) Mud Lake (2,175 acres), (2) Horsehead Lake (1,222 acres), (3) Fish Lake(952 acres), (4) West Mud Lake (2,546 acres), (5) Calderwood (3,422 acres), (6) Fisher Canyon (1,705 acres), (7) May Lake (8,154 acres), (8) Monument (3,258 acres), (9) Long Lake (1,612 acres), (10) Juniper (13,494 acres), (11) Fairy Flat (4,007 acres), (12) Verlay Seeding (2,774 acres), (13) Upper Calderwood (2,183 acres), (14) Famine Lake (2,952 acres), (15) Robinson Lake (1,622 acres), and (16) Wool Lake (1,959 acres). The Bureau of Land Management (BLM) manages 51,442 acres and the remaining 2,595 acres within the allotment is under private ownership.

There are 4,808 Animal Unit Month's (AUM) authorized for cattle forage from March 15th through September 15th. The current management is a variation of a deferred rest rotation system using 16 pastures (See Map 2) and the Allotment Management Plan has been in place since 1989 and revised in 1994. The current system uses two herds (4808 AUMS) with about 600 head remaining throughout the summer and another 400 head leaving the allotment for the forest in late May.

There are three crested wheatgrass seeding pastures (5, 12, 13) grazed every year in the spring (3/5-5/1) either concurrently or in order depending on grass growth and vigor. The early season of use should allow for adequate regrowth each growing season. If adequate regrowth does not occur during the growing season, then one or more of the seeding pastures would be rested the following spring.

The two herds go into two of the middle elevation pastures (1, 2, 3, 4, 6, 11 and 14) for about 1-3 weeks. One herd moves into another middle pasture for 2-3 weeks before moving off the allotment. Herd two uses a middle pasture one year and the alternate year uses pastures 15 and 16. The result is that one-year three middle elevation pastures are grazed and four pastures are rested and the alternate year four pastures are grazed and three pastures are rested.

The herd that remains on the allotment moves to a high elevation pasture (7) in late May (1 month) and rotates into pasture 8 (1-2 weeks) and then pasture 10 for about a month. The following year the order reverses and pasture 9 is used in the middle for 1-2 weeks while pasture 8 is rested.

There are 21 long term trend plots on the allotment (Table 11) with 3 plots in Mud Lake pasture (1), 5 plots in the Verlay Seeding (12) and 2 plots in Robinson Lake pasture (15), with 1 plot in each of following pastures: Horsehead pasture (2), Fish Lake pasture (3), West Mud Lake pasture (4), Calderwood pasture(5), Fisher Canyon pasture (6), May Lake pasture (7), Long Lake pasture (9), Juniper pasture (10), Fairy Flat pasture (11), Upper Calderwood pasture (13), and Wool Lake pasture (16). Sixteen of the 21 trend plots have additional monitoring, which may include a combination of Shrub Canopy Cover, Nested Frequency, and/or Step-toe transects. Five of the 21 trend plots are photo plots only. An analysis of each trend plot by pasture is in Tables 12-19. Additionally, 18 Assessment, Inventory, and Monitoring (AIM) plots with photos, soil, and vegetation data were randomly collected throughout the allotment (Table 20).

A State and Transition Model (STM) map was developed for the O'Keeffe allotment (Map 5) and three models, Invasive Annual Grass, Dual Threat and Conifer Threat, were identified Figures (1-3). The map and threat determinations identified ecological states and areas under threat of transitioning from one state to another. An O'Keeffe Allotment Rangeland Health Assessment (RHA) was originally completed in 1999. Standards 1, 2, 3, and 5 were met, while standard 4 was not applicable. This assessment is an update to the original RHA. Presented in Table 1 is a summary of both the original 1999 and updated assessments.

Table 1. Summary of Rangeland Health Assessments for the O'Keeffe Ind. Allotment #00216

Standard	2017 Assessment	Comments 2017	1999 Assessment	Comments 1999
1. Watershed Function – Uplands Upland soils exhibit infiltration and permeability rates, moisture storage, and stability that are appropriate to soil, climate, and landform	Met	This standard continues to be met on the allotment. Assessing the trend of 21 long-term trend plots and comparing the 16 AIM plots with potential for those sites, the determination was that the vegetation and litter cover is sufficient to protect the soils and allow for infiltration and permeability rates, moisture storage, and stability appropriate to the soil, climate and landform. The assessment of the long-term plots and AIM plots included 10 different vegetation communities across all 16 pastures and encompassed 89% of the allotment. The 3% of the allotment identified in 1999 as downward trend continues to be dominated by annual grasses (cheatgrass). However, the long-term trend plots and the AIM plots in this site indicates the site is stable with adequate vegetation cover to protect the soils from erosion. The STM map correlates very well with the ESI, long term trend plots and AIM data. The STM map illustrates that the allotment is mostly in State A, indicating an intact native shrubland appropriate to support watershed function. The State C areas are stable and being managed to mitigate the threat of invasive annual grasses. The areas under threat of juniper	Met	This standard is being met on the allotment. The indicators used to evaluate this standard are Soil Surface Factor (SSF), which documents accelerated erosion; and plant community composition, which indicates root occupancy of the soil profile. In O'Keeffe Individual Allotment, 4% have an SSF rating of stable 64% are rated as Slight, and 31 % are unknown. These ratings indicate that 69% of the allotment have the two lowest levels of erosion in this methodology. A copy Another indicator of Upland Watershed condition is plant composition and community structure. Most of the allotment is in the Mid seral (75%). The Observed Apparent Trend showed an upward trend on 11 % of the allotment and static on 55% of the allotment. There is 3% that is downward trend and 31 % is unknown. The 3% of the allotment that was rated in downward trend in 1988 is mostly cheatgrass communities that left over from wild fires that were not reseeded. There are thirteen transects for monitoring trend on the allotment and they are scattered in 11 of the 14 pastures. The transects have photo trend plots which illustrate no significant change over the last 30 years except in some of the middle elevation pastures. In the crested wheatgrass and intermediate wheatgrass seedings in these

		expansion are identified and the recommendation is to control the threat thru juniper cutting. State D areas are identified along ridges and steep slopes which are the expected ecological state for these sites or stable annual grasses sites resulting from previous wildfires. The STM map and models collaborate with the other data to conclude standard 1 is being met.		middle pastures there has been an increase in the density of sagebrush since the seeding were planted in the 1960's. This is expected as with most 30 year seedings the sagebrush begins to reinvade the site. This is a desirable result as both plant species and structural diversity are increased.
2. Watershed Function Riparian/ Wetland Areas Wetland areas are in properly functioning physical condition appropriate to soil, climate, and landform.	Met	In 2017, an interdisciplinary team (ID) identified and surveyed a total of 1,566 acres of intermittent wetlands in the allotment. All 1,566 acres were determined to be in Proper Functioning Condition (PFC).	Met	There are no perennial or major intermittent streams in this allotment. No PFC assessments have been completed but this evaluation will be revised to incorporate the results of these assessments as they are completed.
3. Ecological Processes Healthy, productive, and diverse plant and animal populations and communities appropriate to soil, climate, and landform are supported by ecological processes of nutrient cycling, energy flow, and hydrologic cycle.	Met The majority of the allotment (95%) is meeting this standard. The 5% of the allotment dominated by cheatgrass (Table 8) (Map 3) is not meeting the standard. The casual factor is previous wildfires and not grazing management.	In 2017 the standard for ecological processes continues to be met except for 5% of the allotment dominanted by cheatgrass. These areas are within portions of the three seeding pastures (Verlay, Calderwood and Upper Calderwood). These areas are stable but lack the plant diversity to met this standard. This cheatgrass is the result of wildfires and unsuccessful reseeding efforts. The current grazing management is designed to reduce the cheatgrass and allow the native vegetation to return. The other vegetation communities in the allotment are stable as demonstrated by the 21 long-term vegetation plots	Met	This standard was being met in 1999. Monitoring data indicated an upward or stable trend in vegetative communities across the allotment. The majority of the allotment was in a Mid-late Seral stage.

		and the 16 AIM plots across the allotment. The STM map correlates very well with the ESI, long term trend plots and AIM data. The STM map illustrates that the allotment is mostly in State A, which is ecologically stable and ecological processes are functioning properly. The State C areas have stable vegetation communities and are being managed to mitigate the threat of invasive annual grasses. The areas under threat of juniper expansion are identified and the recommendation is to control the threat thru juniper cutting State D areas are identified along ridges and steep slopes which are the expected ecological state for these sites or stable annual grasses sites discussed above. The STM map and models collaborate with the other data to conclude standard 3 is being met.		
4. Water Quality Surface water and groundwater quality, influenced by agency actions, complies with State water quality standards.	Not Applicable	This standard is not applicable. There are no perennial or major intermittent streams in this allotment. No water quality problems have been identified.	Met	This standard is being met. There are no perennial or major intermittent streams in this allotment so no water quality problems have been identified.
5. Native, T/E, and Locally Important Species Habitats support healthy, productive and diverse populations and communities of native plants and animals (including special status species and species of local importance) appropriate to soil, climate and landform.	Met	The Warner sucker is listed as Threatened under the Endangered Species Act (ESA). There is no occupied habitat in the allotment. A Biological Evaluation was completed in 1995 which concluded that grazing in this allotment would have no effect on suckers. This update includes Multi-Scale suitability ratings for Greater Sage Grouse. The Lakeview IDT determined 88% (±13.5%) of breeding and 100% of winter seasonal habitat within the allotment was suitable; similar proportions were found within the Fine-scale area. Thus, availability of suitable seasonal habitat is	Met	The Warner sucker is listed as Threatened under the Endangered Species Act (ESA). There is no occupied habitat in the allotment. A Biological Evaluation was completed in 1995 which concluded that grazing in this allotment would have no effect on suckers.

		appropriate for the Greater Sage-Grouse—see Standard 5 discussion.		

STANDARD 1 – Watershed Function Uplands - Upland soils exhibit infiltration and permeability rates, moisture storage, and stability that are appropriate to soil, climate, and landform.

Met:

In the 1999 RHA Standard 1 was met based on the Soil Surface Factor (SSF), Observed Apparent Trend (OAT) and Ecological Condition Rating across the allotment as determined by the Ecological Site Inventory (ESI) from 1988. The 1999 RHA identified that 4% of the allotment had an SSF rating of stable erosion potential while 64% had an SSF rating of slight and 31% was unknown. The OAT and Ecological Condition Ratings are summarized in Tables 9 and 10.

In 2017, the O'Keeffe Allotment has stable to upward trends, and is meeting this standard. This is evident by a combination of step-toe transects, photo trend monitoring, nested frequency, AIM plots and State and Transition Models (STM). The step-toe transects, nested frequency transects and AIM plots are quantitative monitoring methods. These studies measure attributes relating to permeability, soil stability and erosion potential. These attributes include perennial plant cover, amount of bare ground, biological crust cover, seedling establishment, litter, and plant community composition. Based on the quantitative and qualitative data (photo monitoring and STM) described above, the majority of the long-term monitoring sites were found to have stable to upward trends (refer to monitoring summary in Appendix A for a discussion at each trend site).

As described above, the O'Keeffe Allotment has been grazed under a rest rotational/deferred grazing system for over 30 years. Information within Tables 4-7 includes the years of grazing, actual use AUMs by pasture and utilization levels for the allotment. For the majority of the allotment, rest has provided grass species an opportunity to complete life cycles. As a result, roots of perennial plants are occupying the soil profile and stabilizing the soil, preventing erosion. Plant cover is adequate to capture, store, and safely release moisture associated with normal precipitation events. Percent bare ground has remained stable or decreased in the trend plots read within the allotment. Litter has adequately intercepted raindrop impaction, and retained moisture. The majority of the long-term monitoring sites within the allotment are stable to upward. Therefore, the O'Keeffe allotment is meeting this standard. The monitoring summary in Appendix A provides a more detailed discussion at each trend site.

There is a need to treat areas under juniper expansion. These areas are currently meeting this standard, and expansion is not attributed to current livestock grazing. However, if expansion continues over time, a loss of understory would occur and would increase the potential for soil erosion. The areas with juniper expansion would not continue to meet this standard in the long-term if these areas are not treated.

The vegetation found in the O'Keeffe allotment is mapped (Map 3) and summarized in Table 8. There are 10 different vegetation types that contain either long term trend plots (Table 11) or AIM plots (Table 20) and these represent 38,449 acres or 89% of the vegetation mapped in the allotment. All sixteen pastures contain at least one long-term trend or AIM plot. Each of these vegetation types and their associated long-term trend plots, AIM plots, and the State and Transition Model (STM) will be discussed separately below.

Low sagebrush/Sandberg bluegrass (POSE/ARAR) communities

The low sagebrush/Sandberg bluegrass communities occupy 52% of the allotment and 64% of the mapped vegetation. These communities are in 12 of the 16 pastures, which means every pasture except Horsehead Lake, Verlay, Calderwood and Upper Calderwood. The low sagebrush/Sandberg bluegrass is the dominant vegetation community in May Lake, Juniper, Monument, and Fisher Canyon pastures. There are 6 long-term trend plots (Table 11) in the low sagebrush/ Sandberg bluegrass communities (OK-07, OK-10, OK-11, OK-18, OK-20, and OK-21) and 14 AIM plots (Table 20).

The 14 AIM plots (Table 20) include single plots in Famine Lake pasture (SFA-799), Wool Lake pasture (LA-019), Monument pasture (SFA-093), 4 plots in May Lake pasture (LA-007, LA-011, SFA-664, LA-646,) and 7 plots in Juniper pasture (LA-015, LA-206, LA-03, LA-018, LA-095, LA-657, LA-758).

The long-term trend plot, AIM plot data and the State and Transition Model (STM) will be discussed for each individual pasture.

Fairy Flat Pasture

In the photos for OK-7 (Table 14) in the Fairy Flat pasture the low sagebrush cover and density appeared stable over the last 30 years The step toe transects (Table 27) have low sagebrush and Sandberg bluegrass as the dominant species as expected at this site with some bluebunch wheatgrass present. This site was mapped in 1988 as a low sagebrush/Sandberg bluegrass site. The site appears stable for over 30 years as both the photos and the transect data show the perennial plant cover, amount of bare ground, biological crust cover, seedling establishment, litter, and plant community composition are at expected levels for this vegetation type. These attributes indicate that the soil infiltration and permeability rates, soil stability, moisture storage and erosion potential are appropriate to this site.

The STM map 5 illustrates that State A occupies most of the Fairy Flat pasture and is defined as sagebrush having greater than 10% cover and an understory comprised of perennial grasses and forbs. This indicates that the vegetation community across the pasture is similar to the one described above in OK-07. Therefore the balance of the evidence from both the trend plot (OK-07) and STM map indicates the upland watershed in the pasture is functioning and meeting Standard 1.

Juniper Pasture

The photos for OK-10 in the juniper pasture shows the presence of low sagebrush and Sandberg bluegrass in similar proportions thru the years, with vigor and production oscillating in response to precipitation. The cover and relative frequency data shows Sandberg bluegrass and low sagebrush are the dominant plants and remained relatively stable 1987 to the present (Table 16).

There are seven AIM plots in the low sagebrush/Sandberg bluegrass community within the Juniper pasture and all were dominated by low sagebrush and Sandberg bluegrass with some variation in total

vegetation foliar cover between 69% at LA-206 and 37% at SFA-657 (Tables 46-52). This variation and the range in low sagebrush cover is the result of varying soil conditions. The soils at the AIM plots in low sagebrush/Sandberg bluegrass communities in the Juniper pasture are characterized by a stony surface and very shallow soils to clay pan or rock. Four of the seven sites have soils less than 12" to rock. The dominance of low sagebrush, Sandberg bluegrass and surface rock makes these sites very stable. The number and percent foliar cover (16%-35%) of perennial and annual forbs in four of the plots (Tables 46, 49, 50, 51) indicate that the soil is stable and fertile enough to support native vegetation. In addition to foliar and groundcover measurements the AIM plots measure soil stability. The soil stability ratings averaged 2.2 across all plots and 2.4 in the protected areas and 2.2 in the unprotected sites (Table 53). These ratings are expected in these shallow clay soils with low organic matter and large quantities of rock.

There was a Rangeland Health Quality (RHQA) assessment using Rangeland Health Indicators (RHI) done at SFA-657 (Table 57). The soil stability and hydrologic function rated as Slight to Moderate deviation from reference condition. The biotic integrity rated as "None to Slight" deviation from the reference conditions. The biotic rating indicates the vegetation present and the condition of that vegetation closely resembles the conditions expected for this site.

The long-term trend plot and the AIM plots all indicate that the vegetation is adequate to allow for infiltration and permeability rates, moisture storage, and stability appropriate to low sagebrush/Sandberg bluegrass sites.

The STM map 5 illustrates that State A occupies most of the Juniper pasture and is defined as sagebrush greater than 10% cover and an understory comprised of perennial grasses and forbs. This indicates that the vegetation community across the pasture is similar to the one described above in OK-10 and the seven AIM plots. Therefore the balance of the evidence from the trend plot (OK-10), the AIM plots and the STM map indicates the upland watershed across the pasture is functioning and meeting Standard 1.

May Lake Pasture

In the photos for OK-11 in May Lake pasture, the grass and low sagebrush cover and density appeared stable over the last 30 years (Table 16). There was a step-toe cover transect established in 2012 and Sandberg bluegrass and low sagebrush is the dominant vegetation at this site (Table 30). The cover and relative composition percentages are in line with the expected plant composition for a low sagebrush/Sandberg bluegrass site.

There were four AIM plots (LA-007, LA-011, SFA-664, LA-646) (Table 20) in the low sagebrush/Sandberg bluegrass community within the May Lake pasture and all were dominated by low sagebrush and Sandberg bluegrass. The total vegetation foliar cover varied between 82% at SFA-664 and 49% at LA-011 (Tables 42-45). The low sagebrush and Sandberg bluegrass foliar cover were all within the expected levels for a low sagebrush/Sandberg bluegrass site. The soil pit at each site revealed that the soil found

on these sites contained more clay and a clay pan, which is closely associated with Sandberg bluegrass. The large number and high foliar cover (23%-51%) of perennial and annual forbs (Tables 42-45) across the four AIM plots is indicative of a clay pan soil in a stable low sagebrush/Sandberg bluegrass vegetation community. In addition to foliar and groundcover measurements the AIM plots measure soil stability. The soil stability ratings averaged 2.4 across all plots and 2.9 in the protected areas and 1.6 in the unprotected sites (Table 53). These ratings are expected in these shallow clay soils with low organic matter and large quantities of rock.

There was a RHQ assessment done at SFA-664 (Table 58). The soil stability, hydrologic function and biotic indicators rated as Slight to Moderate deviation from reference condition. The soil stability rating in Table 54 does indicate some extreme erosion in the form of rills and water flow patterns. This rating does not match with the other erosion indicators or the amount and vigor of vegetation recorded at the site. The foliar cover was 82% and the litter cover was 45%, both the highest of any AIM plots in this vegetation type. The photos illustrated high grass and forb production this year. Therefore, in spite of the rills and some water flow patterns, all the other indicators and vegetation cover data indicate this site is stable and functioning properly.
The long term trend plot and the AIM plots all indicate that the vegetation is adequate for the soils present, allowing for infiltration and permeability rates, moisture storage, and stability appropriate to low sagebrush/Sandberg bluegrass sites that dominate the May Lake pasture.

The STM map 5 illustrates that State A occupies most of the May Lake pasture and is defined as sagebrush than greater 10% cover and an understory comprised of perennial grasses and forbs. This indicates that the vegetation community across the pasture is similar to the one described above in OK-11 and the four AIM plots. Therefore the balance of the evidence from the trend plot (OK-11), the AIM plots and the STM map indicates the upland watershed across the pasture is functioning and meeting Standard 1.

Wool Lake Pasture

The photos for OK-18 in Wool Lake pasture illustrate increasing vegetation cover and vigor since 1972 (Table 18). In 1975 a step-toe cover transect was established and 5 years of cover and frequency data have been collected (Table 31). The cover data shows an increase in vegetation cover from 10% in 1975 to 34% in 2016 (Table 31). The site appears to be trending toward more upland vegetation. The cover and relative frequency data shows Sandberg bluegrass and low sagebrush are the dominant plants and remained relatively stable from 2002 to the present. The AIM plot in the low sagebrush/Sandberg bluegrass community in Wool Lake pasture (LA -019) has a foliar cover value of 49%, with the foliar cover value of low sage at 32% and Sandberg bluegrass is 14% (Table 40). This site has similar vegetation composition to the long-term trend plot OK-18 and is representative of a low sagebrush/ Sandberg bluegrass community. In addition to foliar and groundcover measurements the AIM plots measure soil stability. The soil stability ratings averaged 1.9 across all plots and 2.2 in the protected

areas and 1.6 in the unprotected sites (Table 53). These ratings are expected in these clay soils with low organic matter and large quantities of rock.

The long term trend plot and the AIM plot indicate that the vegetation is adequate for the soils present, allowing for infiltration and permeability rates, moisture storage, and stability appropriate to low sagebrush/Sandberg bluegrass sites in the Wool Lake pasture

The STM map 5 illustrates that the half of the Wool Lake pasture in the low sagebrush/Sandberg bluegrass vegetation community is in State A and is defined as sagebrush greater than 10% cover and an understory comprised of perennial grasses and forbs. This indicates that the vegetation community across half of the pasture is similar to the one described above in OK-18 and the AIM plot. Therefore the balance of the evidence from the trend plot (OK-18), the AIM plot and the STM map indicates the upland watershed across the pasture is functioning and meeting Standard 1.

Famine Lake

The AIM plot in the low sagebrush/Sandberg bluegrass community in Famine Lake pasture (SFA -799) has a high foliar cover value of 79%, and is dominated by low sage (21%), Sandberg bluegrass (18%) and cheatgraass (43%) (Table 39). There is substantial litter cover (39%) and 9% bare ground. The location of this plot is 0.1 mile from Famine Lake, a major water source in the southeast corner of the pasture and is not representative of the vegetation or the condition of the pasture. The low sagebrush/Sandberg bluegrass community occupies about 80 acres (3%) of the pasture. Therefore no further discussion of the data for this AIM plot (SFA-799) is necessary.

The STM map 5 illustrates that State C with an invasive annual grass threat occupies most of Famine Lake pasture and is defined as sagebrush with greater than 10% cover and an understory comprised of perennial and annual grasses. The annual grass threat is controlled thru rest rotation grazing, providing rest every other year and limiting utilization to under 50% in the years when the pasture is grazed (Table 5). The every other year rest from grazing allows perennial grass to maximize root growth and increase surface litter, which protects soil from erosion and improves infiltration and permeability rates while increasing soil moisture. Therefore the low sagebrush/Sandberg bluegrass community in Famine Lake pasture is meeting Standard 1.

Robinson Lake Pasture

The photos for OK-20 taken between 1995 and 2012 show following the prescribed burn in 1996 there was a reduction in shrubs and an increase in grass and forb cover, especially annual grasses (Table 19). By 2012 the shrubs are still largely absent but there is more perennial grass. The nested frequency transects demonstrated an increase in the frequency of perennial grasses but no measureable increase in sagebrush cover or frequency from 1996-2012 (Table 33). The site is stable following the prescribed

fire, but low sagebrush is slow to recover following the fire. The ground cover provided by perennial grasses and litter is adequate for the soils present, allowing for infiltration and permeability rates, moisture storage, and stability appropriate to low sagebrush/Sandberg bluegrass sites that dominate the Robinson Lake pasture.

The STM map 5 illustrates that the low sagebrush/Sandberg bluegrass community in the Robinson Lake pasture is in State C with an invasive annual grass threat and is defined as sagebrush with greater than 10% cover and an understory comprised of perennial and annual grasses. The annual grass threat is controlled thru rest rotation grazing, providing rest every other year and limiting utilization to under 50% in the years when the pasture is grazed. The every other year rest from grazing allows perennial grass to maximize root growth and increase surface litter, which protects soil from erosion and improves infiltration and permeability rates while increasing soil moisture. Therefore the balance of the evidence from the trend plot (OK-20), the grazing system and the STM map indicates the low sagebrush/Sandberg bluegrass community in Robinson Lake pasture is functioning and meeting Standard 1.

Fisher Canyon Pasture

The OK-21 plot was established to monitor any changes following the prescribed fire in Fisher Canyon in 1995 and 3 years of photos were taken between 1995 and 2016. It was noted in 1998 that about 10% of the site around OK-21 was actually burned during the prescribed fire. The nested frequency transect was established before the fire and read after the fire (Table 34). The results from the transect and photos illustrated that the grass and low sagebrush cover and frequency appeared stable during this time (Table 18). The cover and relative composition percentages are in line with the expected plant composition for a low sagebrush/Sandberg bluegrass site. The trend plot data and the photos indicate the vegetation is adequate for the soils present, allowing for infiltration and permeability rates, moisture storage, and stability appropriate to low sagebrush/Sandberg bluegrass sites that dominate the Fisher Canyon pasture.

The photos and the nested frequency transect did indicate an increase in the cover and density of juniper.

The STM map 5 illustrates that the low sagebrush/Sandberg bluegrass community in the Fisher Canyon pasture is in State C with a dual threat. The State C (Appenix B) is defined as having conifer, perennial grass and sagebrush as co-dominants. The landscape contains native perennial grasses and sagebrush with the threat of increasing juniper. The result of increasing juniper dominance is a decrease in herbaceous cover and species diversity with an increase in bareground (Miller et al. 2000). The increase in bareground and the loss of herbaceous cover would reduce soil stability and increase the threat of soil erosion. The recommendation to reverse the trend is to control juniper through cutting which allows the native perennial grasses and sagebrush to dominant the site.

The annual grass threat in Fisher Canyon pasture is currently controlled thru rest rotation grazing, providing rest every other year and limiting utilization to under 50% in the years when the pasture is grazed (Table 5). The every other year rest from grazing allows perennial grass to maximize root growth and increase surface litter, which protects soil from erosion and improves infiltration and permeability rates while increasing soil moisture. Therefore the balance of the evidence from the trend plot (OK-21), the grazing system and the STM map indicates the low sagebrush/Sandberg bluegrass community in Fisher Canyon pasture is functioning and meeting Standard 1.

Monument Pasture

The AIM plot in the low sagebrush/Sandberg bluegrass community in the Monument pasture (SFA-093) has a high foliar cover value (66%) and is dominated by low sagebrush (14% foliar cover) and Sandberg bluegrass (25% foliar cover). There is also nineleaf biscuitroot with 19% foliar cover despite the dominance of surface rock that prevented digging a soil pit at this site (Table 37). The vegetation cover and the presence of rock indicates this site is stable. In addition to foliar and groundcover measurements the AIM plots measure soil stability. The soil stability ratings averaged 2.2 across all plots and 1.9 in the protected areas and 2.7 in the unprotected sites (Table 53). These ratings are expected in these shallow clay soils with low organic matter and very large quantities of rock. There was so much rock here that it was not feasible to dig a soil pit.

There was a RHQ assessment done at this site (Table 56).The soil stability, hydrologic function and biotic Integrity attributes rated as “None to Slight” (N-S) deviation from reference condition. This assessment and the vegetation cover confirms that site is stable and there is sufficient vegetation cover and litter to prevent soil erosion.

The STM map 5 illustrates most of the Monument pasture is in State A and is defined as sagebrush greater than 10% cover and an understory comprised of perennial grasses and forbs.
This indicates that the vegetation community across the pasture is similar to the one described above in the AIM plot (SFA-093). Therefore the balance of the evidence from the AIM plot and the STM map indicates the upland watershed across the pasture is functioning and meeting Standard 1.

Big sagebrush/Sandberg bluegrass communities

The big sagebrush/Sandberg bluegrass communities occupy 6% of the allotment and 7% of the mapped vegetation (Map 3). There was a long-term trend plot (OK-08) and an AIM plot (SFA_UPS_SS_647) in the West Mud Flat pasture. The OK-8 plot photos and step-toe cover transect data were collected between 1987 and 2016 (Table 16). The herbaceous cover of grasses and forbs were stable during this period with Sandberg bluegrass and Thurber’s needlegrass being the dominant grasses (Table 28). However the

cover and relative frequency of big sagebrush appears to have declined while the density and size of juniper trees has increased. This is apparent in the photos and with line intercept transect data taken in 2000 and 2012 (Table 28).

The AIM plot site (SFA-647) is located in a transition area between big sagebrush/Sandberg bluegrass and low sagebrush/Sandberg bluegrass. At the plot site both low sagebrush and big sagebrush are found along the transects with foliar cover at 15% for low sagebrush and 5% for big sagebrush. The site had foliar cover of 29% for Sandberg bluegrass, 5% for bottlebrush squirreltail and 24% for cheatgrass (Table 38). The site contains an inclusion of thin clay pan soil that supports low sagebrush. The amount of sagebrush cover and Sandberg bluegrass cover is consistent with either a big sagebrush or low sagebrush Sandberg bluegrass site. In addition to foliar and groundcover measurements the AIM plots measure soil stability. The soil stability measurements average 2.8 at the surface and 2.4 protected and 3.8 unprotected (Table 53). This is expected in the clay loam soil with a low organic matter content that is found at this site.

There was a Rangeland Health Quality (RHQ) assessment done at this site (Table 55). The soil stability was rated Slight to Moderate deviation from reference condition or better in 8 of the 10 attributes. The hydrologic function averaged Slight to Moderate deviation from reference condition rating and biotic integrity were rated as None to Slight deviation from reference condition in 4 of 8 attributes. The conclusion is that the site is close to reference condition and the vegetation present is stable and productive enough to prevent accelerated soil erosion.

This big sagebrush/Sandberg bluegrass community is currently meeting Standard 1 as soils are stable and vegetation is providing sufficient cover and litter to protect the soil surface from erosion while allowing for permeability and infiltration.

However the increasing density and size of juniper will reduce the sagebrush cover and eventually the site will not met Standard 1.

The State and Transition Model (STM) mapping (Map 5) identified all of the big sagebrush/Sandberg bluegrass community as State C with most in the dual threat model and some in the invasive annual grass model. The State C (Appendix B) in the dual threat model is defined as having conifer, perennial grass and sagebrush as co-dominants. The landscape contains native perennial grasses and sagebrush with the threat of replacement by juniper. The result of increasing juniper dominance is a decrease in herbaceous cover and species diversity with an increase in bareground (Miller et al. 2000). The increase in bareground and the loss of herbaceous cover would reduce soil stability and increase the threat of soil erosion. The recommendation to reverse the trend is to control juniper through cutting which allows the native perennial grasses and sagebrush to dominant the site.

The annual grass threat in big sagebrush/Sandberg bluegrass community is currently controlled thru rest rotation grazing, providing rest every other year and limiting utilization to under 50% in the years when

the pasture is grazed (Table 5). The every other year rest from grazing allows perennial grass to maximize root growth and increase surface litter, which protects soil from erosion and improves infiltration and permeability rates while increasing soil moisture. Therefore the balance of the evidence from the trend plot (OK-08), the AIM plot, the grazing system and the STM map indicates the upland watershed in the big sagebrush/Sandberg bluegrass community is functioning and meeting Standard 1.

Crested Wheatgrass Seeding Vegetation communities

The crested wheatgrass seedings represent 4% of the mapped vegetation in the allotment and contain three long-term trend plots (OK-03, OK-12 and OK-13) in the three seeding pastures (Upper Calderwood, Verlay, and Calderwood respectively). The photographs illustrated stable crested wheatgrass seedings at all three plots with some invasion of sagebrush in the Calderwood pasture (OK-13). Only OK-12 had any long term transect data (Table 22) and the crested wheatgrass ground cover averaged 19% since 2000. There was two years of transect data at OK-03 and OK-13 (Tables 21 & 23) and the ground cover for crested wheatgrass was consistent with OK-12. The relative frequency data for all transects indicated crested wheatgrass was the dominant species with only OK-13 having any sagebrush appearing in the transect. This vegetation data indicates that the crested wheatgrass community has adequate perennial plants occupying the soil profile, and stabilizing the soil preventing erosion. Plant cover is adequate to capture, store, and safely release moisture associated with normal precipitation events.

The STM map 5 illustrates that State B with an invasive annual grass threat occupies the crested wheatgrass communities and is defined as sagebrush with less than 10% cover and an understory comprised of perennial and annual grasses. The ratio of perennial grass cover to annual grass is greater than 1:1. The annual grass threat is managed in these pastures thru early season grazing, which promotes use on the annual grasses while allowing growing season rest for the perennial grass to maximize root growth and increase surface litter, which protects soil from erosion and improves infiltration and permeability rates while increasing soil moisture. Therefore the balance of the evidence from the trend plots (OK-03, OK-12 and OK-13), the grazing system and the STM map indicates the upland watershed in the crested wheatgrass community is functioning and meeting Standard 1.

Cheatgrass Vegetation communities

The cheatgrass communities represent 5% of the allotment (Map 3) and contain three long-term trend plots (OK-15, OK-16, and OK-17) (Table 17) and one AIM plot (LA_INT-05) (Table 36). The long-term trend plots are all in the Verlay pasture and the AIM plot is in the Calderwood pasture. The long-term trend plots in the Verlay pasture are all within areas that suffered wildfires and the subsequent seeding was unsuccessful, because the rocky nature of these sites prevented the use of a seed drill and required broadcast seeding. The photos for these sites illustrate that the broadcast seeding was not very successful as all the sites are dominated by cheatgrass and annual forbs. There is scattered crested wheatgrass and bottlebrush squirreltail present. There were step-toe transects ran at OK-15 and the results indicated cheatgrass dominates the site (Table 24). The AIM plot (LA_INT-05) is in the Calderwood pasture along the edge of the crested wheatgrass and contains cheatgrass (30% foliar cover) and Sandberg bluegrass with 13 % foliar cover (Table 36). This indicates that cheatgrass dominates the site but there is native perennial grass present. In addition to foliar and groundcover

measurements the AIM plots measure soil stability. The soil stability ratings averaged 4.4 in the protected areas and 2.0 in the unprotected sites (Table 53). The percent of plant cover at all five sites and 19% bare ground (Table 36) indicates that the soil is stable and protected from precipitation events and erosion is not occurring even though annuals dominate the site.

The STM map 5 illustrates that cheatgrass communities are in State D with an invasive annual grass threat and is defined as sagebrush with less than 10% cover and an understory comprised of perennial and annual grasses. The ratio of annual grass cover to perennial grass is greater than 3:1. However the balance of the evidence from the trend plots (OK-15, OK-16 and OK-17), the AIM plot and the grazing system indicates the upland watershed in the cheatgrass community is functioning and meeting Standard 1.

Big sagebrush/Thurber's needlegrass

The big sagebrush/Thurber's needlegrass type occupies about 4% of the allotment and 5% of the mapped vegetation (Map 3). There was one AIM plot (LA-014) in the big sagebrush/Thurber's needlegrass (ARTR-STTH) community located in the Fairy Flat pasture and it included a transition area between ARTR-STTH and low sagebrush/Sandberg bluegrass (ARAR/POSE). The foliar cover (52%) and litter cover (29%) is within the expected cover and percent composition for these vegetation types. There was a mixture of perennial grasses, with Thurber's needlegrass, Sandberg bluegrass, and basin wild rye having foliar cover at 5%, 4% and 3% respectively (Table 41). In addition to foliar and groundcover measurements the AIM plots measure soil stability. The soil stability ratings averaged 2.1 in the protected areas and 2.3 in the unprotected sites (Table 53). These ratings are expected in these shallow clay soils with low organic matter and very large quantities of rock. The foliar cover (52%) and diverse species composition indicates that the big sagebrush/Thurber's needlegrass community has adequate perennial plants occupying the soil profile to stabilize the soil and prevent erosion. Plant cover is adequate to capture, store, and safely release moisture associated with normal precipitation events.

The STM map 5 llustrates most of the big sagebrush/Thurber's needlegrass community is in State A and is defined as sagebrush greater than 10% cover and an understory comprised of perennial grasses and forbs. This indicates that the vegetation community across the pasture is similar to the one described above in the AIM plot (LA-014). Therefore the balance of the evidence from the AIM plot and the STM map indicates the upland watershed in the big sagebrush/ Thurber's needlegrass community is functioning and meeting Standard 1.

Silver Sagebrush Vegetation communities

The Silver Sagebrush communities represent 2% of the allotment and are in the Mud Lake, Monument and Juniper pastures (Map 2). There are three long-term trend plots in the Mud Lake Pasture

representing 510 acres. The photographs at OK-1 and OK-06 (Table 12) illustrated the crested wheatgrass plants had disappeared by 1996, as the Mud Lake reservoir was drained and the Mud Flat was flooded for about 2 months. This action killed all the perennial grass on the southern 3/4 of the lakebed and this included OK-01 and OK-06. Currently these sites are dominated by silver sagebrush and annual forbs. The photos indicate significant annual forb production and sagebrush ground cover and no apparent soil erosion in this lakebed. The condition has remained stable from 1996 until 2016. The lack of bare ground indicates that the soil is stable and protected from precipitation events and erosion is not occurring even though silver sagebrush and annuals dominate the site.

The OK-05 site had Sagebrush invading by 1985, but crested wheatgrass persists in 2016. A step-toe cover transect was established at OK-05 in 2012 and the crested wheatgrass ground cover was 15% in 2012 and 25% in 2016 (Table 26). These levels are consistent with a stable crested wheatgrass site and transect (OK-05) represents an inclusion within the mapped silver sagebrush community.
The photos and vegetation data indicates that the silver sagebrush communities have adequate perennial plants occupying the soil profile stabilizing the soil and preventing erosion. Plant cover is adequate to capture, store, and safely release moisture associated with normal precipitation events. Therefore the balance of the evidence from the trend plots (OK-01, OK-05, OK-06) indicates the upland watershed in the silver sagebrush community is functioning and meeting Standard 1.

Big sagebrush/cheatgrass communities

The big sagebrush/cheatgrass occupies about 789 acres (1.5% of the allotment) and 2% of the mapped vegetation (Map 3). There was one AIM plot (LA-001) in the big sagebrush/cheatgrass (ARTR-BRTE) community located in the Lower Calderwood pasture. The sagebrush foliar cover is 21% while the understory is dominated by cheatgrass with 38% foliar cover (Table 35). In addition to foliar and ground cover the AIM plots measure soil stability. The soil stability ratings averaged 1.9 in the protected areas and 1.0 in the unprotected sites (Table 53). These values are expected for an AIM plot within a 0.25 mile of Calderwood reservoir, which is within the expected disturbed area for a long-term permanent water site. Because of the close proximity to Calderwood Reservoir this area is not representative of the big sagebrush/cheatgrass vegetation polygon.

Utilization data 0.5 mile from the reservoir in the same vegetation type and collected every year for ten years recorded Sandberg bluegrass, bottlebrush squirreltail and Thurber's needlegrass as being present and lightly used. It appears this AIM plot represents about 80 acres or 10% of this vegetation type. Based on the annual utilization measurements the majority (90%) of big sagebrush/cheatgrass type appears stable with enough vegetation cover to protect the soil and prevent accelerated soil erosion.

The STM map 5 illustrates that the big sagebrush/cheatgrass community is about equally divided between State A and State C with an invasive annual threat. State A is defined as sagebrush greater than 10% cover and an understory comprised of perennial grasses and forbs. The State C (Appendix B) is

defined as having sagebrush greater than 10% cover and an understory comprised of perennial and annual grasses with a ratio of annual grasses to perennial grasses as greater than 3 to 1. The annual grass threat in the big sagebrush/cheatgrass community is controlled thru early season grazing in the Calderwood pasture and rest rotation grazing in the Famine Lake pasture (Table 5). The early season grazing provides rest every year during the growing season and the rest rotation provides rest every other year. Both of these systems allow perennial grass to maximize root growth and increase surface litter, which protects soil from erosion and improves infiltration and permeability rates while increasing soil moisture. Therefore the balance of the evidence from the AIM plot, the grazing system and the STM map indicates the upland watershed in the big sagebrush/cheatgrass community is functioning and meeting Standard 1.

Big Sagebrush/bottlebrush squirreltail Vegetation communities

The big sagebrush/bottlebrush squirreltail community comprises about 1.4% of the allotment (745 acres) and is in Robinson Lake, Famine Lake, Fisher Canyon and Juniper Pastures. There is one long term trend plot (OK-19) in the Robinson Lake pasture. This site is at the southern edge of the big sagebrush/ bottlebrush squirreltail community and is actually in an inclusion area of low sagebrush/Sandberg bluegrass community that makes 40% of the mapped big sagebrush/bottlebrush squirreltail polygon (Map 2). The data (Table 32) illustrate that low sagebrush and Sandberg bluegrass dominate the site. A prescribed fire in 1996 partially burned the site. A summary of the photos and step-toe cover transect data (Table 19) found that prior to the prescribed fire in 1996, the site was stable with sagebrush and Sandberg bluegrass being dominant. After the fire there was a reduction of sagebrush on part of the site and an increase in grass cover. The cover and relative frequency data shows Sandberg bluegrass and low sagebrush are the dominant plants with sagebrush being reduced by the fire but recovered by 2010 (Table 32). The prescribed burn reduced the juniper density, while the composition and cover of grass and shrubs were in line with the expected composition for a low sagebrush/Sandberg bluegrass site.

The big sagebrush/bottlebrush squirreltail community is currently meeting Standard 1 as soils are stable and vegetation is providing sufficient cover and litter to protect the soil surface from erosion while allowing for permeability and infiltration.

The STM map 5 llustrates that the big sagebrush/bottlebrush squirreltail community is about 2/3 in State C and 1/3 in State E. State C includes an invasive annual threat, while State E is a dual threat of invasive annuals and juniper expansion. State C is defined as sagebrush greater than 10% cover and an understory comprised of perennial and annual grasses with a ratio of annual grasses to perennial grasses as greater than 3 to 1. State E is defined as having a greater than 1:1 ratio of annual to perennial grass and less than 10% juniper cover. The annual grass threat in the big sagebrush/bottlebrush squirreltail community is currently controlled thru rest rotation grazing providing rest every other year and limiting utilization to under 50% in the years when the pasture is grazed (Table 5). The every other year rest from grazing allows perennial grass to maximize root growth and increase surface litter, which protects soil from erosion and improves infiltration and permeability rates while increasing soil moisture. Therefore the balance of the evidence from the trend plot (OK-19), the grazing system and

the STM map indicates the big sagebrush/ bottlebrush squirreltail community is functioning and meeting Standard 1.

The State E site includes the threat of juniper expansion. The result of increasing juniper dominance is a decrease in herbaceous cover and species diversity with an increase in bareground (Miller et al. 2000). The increase in bareground and the loss of herbaceous cover would reduce soil stability and increase the threat of soil erosion. The recommendation to reverse the trend is to control juniper through cutting which allows the native perennial grasses and sagebrush to dominant the site.

Intermediate Wheatgrass Vegetation communities

The intermediate wheatgrass community occupy 61 acres (0.1 % of the allotment) in the Fish Lake Pasture and contain one long-term trend plot (OK-09) (Table 15). The lakebed was seeded to intermediate wheatgrass in 1964. The photographs at this trend plot show the intermediate wheatgrass was present and vigorous in 1985 but by 1996, the wheatgrass was scattered and only vigorous along the drainage. It appears the drought in the early 1990's may have resulted in the loss of most of the intermediate wheatgrass plants with the exception of the plants lining the drainage. The photos indicate significant annual forb production and ground cover and no apparent soil erosion in this lakebed. This condition has remained stable from 1996 until 2016. The lack of bare ground indicates that the soil is stable and protected from precipitation events and erosion is not occurring even though annuals dominate the site. Therefore the balance of the evidence from the trend plot (OK-09) indicates the intermediate wheatgrass community is meeting Standard 1.

Recommendations

The allotment is meeting Standard 1, but to continue to meet Standard 1, treatment of areas with juniper expansion is recommended within the O'Keeffe Allotment.

STANDARD 2 – Watershed Function Riparian/Wetland Areas – Riparian-wetland areas are in properly functioning physical condition appropriate to soil, climate, and landform.

In 1999, this standard was generally considered met, although PFC surveys had largely not been completed at the time of the RHA. The surveys were eventually completed and the lentic riparian systems were determined to be at PFC, although the RHA was not updated with that information. There are no perennial or major intermittent streams in this allotment.

In 2017, an interdisciplinary team (ID) identified and surveyed a total of 1,566 acres of intermittent lentic habitats (wetlands, lakes, playas, springs, etc.) in the allotment (see Table 2). All 1,566 acres were determined to be at PFC. Another 687 acres of intermittent lakes, playas, springs, and waterholes were inventoried in 2017, where it was determined that PFC surveys were an inappropriate inventory method

because either 1) the areas are not capable of supporting riparian vegetation, and/or 2) the area did support riparian vegetation, but only because a manmade livestock waterhole was created at the site and it is not being managed for riparian values. The 687 acres of lentic habitats where PFC surveys were determined inappropriate, were generally in good condition in relation to their potential; they were generally stable and did not exhibit signs of excessive erosion or deposition, and were relatively well vegetated.

Table 2. Summary of Proper Functioning Condition Surveys

Waterbody	Survey Determination*	Acres
Calderwood Reservoir	PFC	176
Famine Lake	PFC	49
Gibson Lake	PFC	56
Heads Waterhole/Playa	PFC	47
Hole in the Ground Waterhole/Playa	PFC	53
Little Gibson Waterhole/Playa	PFC	17
Long Lake	PFC	424
Mud Lake Reservoir	PFC	179
No Name Lake (T.39S, R.26E, Sec. 28, 29, 32, and 33)	PFC	17
Robinson Lake	PFC	67
Tomcat Waterhole/Playa	PFC	19
Wool Lake	PFC	462
TOTAL		**1,566**

*PFC = Proper Functioning Condition

STANDARD 3 -Ecological Processes-Healthy, productive, and diverse plant and animal populations and communities appropriate to soil, climate, and landform are supported by ecological processes of nutrient cycling, energy flow, and hydrologic cycle.

Met:

As stated under Standard 1 above, the O'Keeffe Allotment has been grazed under a rest rotational/deferred grazing system for over 30 years. The deviation from the rest rotation/deferred system was mostly because of livestock water availability. Livestock water is limited to waterholes, springs, and reservoirs in many pastures of the allotment, and is often lacking in dry years. For the majority of the allotment, periodic rest has provided grass species an opportunity to complete life cycles.

The majority of the long-term monitoring sites within the allotment indicate a stable to upward trend. The long-term trend data shows adequate diversity of community structure including grasses, forbs, and shrubs appropriate for the sites. This diversity ensures that the capture and storage of energy occurs throughout most of the season. Nutrient cycling is evident by litter accumulation and overall plant productivity.

Vegetation

In the 1999 RHA Standard 3 was met for vegetation based on the long term trend plots and Observed Apparent Trend (OAT). The OAT rating indicated 6% of the allotment had an upward trend and 71% was static with 3% in downward trend and 20% unknown (Table 9). The 20% of the allotment that is unknown includes rockland, inclusions, playas and water bodies.

The Ecological Site Inventory (1987) (Table 10), indicated Potential Natural Community (PNC) accounted for 0.1% of the allotment, late-seral stage was 22%, mid-seral stage was 45%, early-seral stage was 12%, and 20% was unknown(Map 4). The dominant vegetation community (52%) across the entire allotment is low sagebrush-Sandberg bluegrass. About 33% of the low sagebrush-Sandberg bluegrass community is in the late seral stage and 67% is in the mid seral stage (Table 10). These condition ratings are an indication that there are healthy, productive and diverse vegetation communities appropriate to soil, climate and landform that support the ecological processes of nutrient cycling, energy flow and the hydrologic cycle.

There appears to be a correlation between the ecological condition ratings (Tables 10 and 10a) and the STM (Map 5). The ecological condition rating from ESI (1989) identified 84% of the allotment in either late seral (28%) or mid seral (56%) condition (Table 10), while STM mapped 79% of the allotment in either State A or State C(D) Table 10a). These areas largely overlap as can be seen from the maps (map 4 and 5). The majority (62%) of the vegetation acreage in the Late seral stage is in State A (STM), which are both indicative of plant communities that are diverse, healthy and stable.

The 29% of the vegetation acreage in the Late seral stage that is in State C(D) (Figure 3) is defined as perennial herbaceous, sagebrush with encroaching juniper. These areas in State C(D) are in Late seral ecological condition because of their vegetation composition, but are separated from State A because of the threat of juniper invasion. These areas in State C(D) are represented by big sagebrush/grass communities (map 3) (Table 10) and have the plant diversity and production to be in Late seral, but are threatened by juniper invasion.

In contrast the vegetation in the Early seral stage (Table 10) are in State D(I) (42%), which are sites dominated by annual grass and State B (22%), perennial grass dominated sites. Therefore the STM map and the ecological condition map agree in describing the areas dominated by either cheatgrass or crested wheatgrass.

Table 10a illustrates that the State A and State C(D) sites as expected are in late ecological seral or mid ecological seral condition and the State B and E sites are in early ecological condition. The STM map correlates well with the ecological condition map and in addition distinguishes the areas threatened by juniper or annual grass invasion, thereby assisting in identifying areas that need attention or closer management scrutiny.

In 1999 the allotment was managed under a rest-rotation grazing system maintaining plant health and vegetative communities appropriate to those soils and climate. In 2017 rest-rotation/deferred grazing

management continues to maintain sufficient vegetation cover and litter to promote plant health and vegetative communities appropriate to those soils and climate. The utilization levels since 1999 averaged at or below the target rate of 50% on native pastures. The average utilization levels was 51% on seeded pastures, below the target rate of 60% for seeded pastures (Tables 5-7). Horsehead Lake pasture was the exception and this will discussed further in the Actual Use and Utilization section.

The vegetation found in the O'Keeffe is mapped (Map 3) and summarized in Table 8. There are 10 different vegetation types that contain either long term trend plots or AIM plots and these represent 38,449 acres or 89% of the vegetation mapped in the allotment. All sixteen pastures contain at least one long-term trend or AIM plot.

Each of these vegetation types and their associated long-term trend plots, AIM plots, and the State and Transition Model (STM) is discussed separately below.

Low Sagebrush/Sandberg bluegrass Vegetation Communities

The low sagebrush/Sandberg bluegrass community comprises about 53% of the allotment (28,108 acres) and is in every pasture except the three seeded pastures (Lower Calderwood, Upper Calderwood and Verlay) and Horsehead Lake pasture (Map 2). The low sagebrush/Sandberg bluegrass community is dominant in the late season pastures (May Lake, Juniper, Long Lake and Monument). There are six long - term trend plots (Table 11) in the low sagebrush/Sandberg bluegrass community in 6 pastures (Fairy Flat, Juniper, May Lake, Wool Lake, Robinson Lake, and Fisher Canyon). All six plots are photo points and vegetation data with three of them having more than 2 years of vegetation data. Four of the plots have were established in 1970's and the other two 1990's following a prescribed burn. Low sagebrush and Sandberg bluegrass is the dominant vegetation in all six plots is and all six sites have been stable since they were established. The detailed analysis of the long-term trend plots is in Table 13 for Fairy Flat (OK-07), Table 16 for Juniper (OK-10) and May Lake (OK-11), Table 18 for Wool Lake (OK-18) and Fisher Canyon (OK-21), and Table 19 for Robinson Lake (OK-20).

The trend plot (OK-21) in Fisher Canyon pasture detected an increase in the density of juniper in the pasture. Without juniper control the cover of grass and shrubs may decline resulting in this site not meeting the standard 3 in the future.

There are 14 AIM plots (Table 3) in the low sagebrush/Sandberg bluegrass community across five pastures (Famine Lake, Wool Lake, Monument, May Lake, and Juniper).

Table 3. AIM Plots in the low sagebrush/Sandberg bluegrass community

Pasture	Plot#	Average Percent Foliar Cover		
		POSE	ARAR	TOTAL
Famine Lake	SFA-799	18%	21%	79%
Wool Lake	LA-019	14%	32%	49%
Monument	SFA-093	25%	14%	67%
May Lake	LA-007	13%	28%	59%
May Lake	LA-011	7%	14%	49%
May Lake	SFA-664	35%	34%	82%

May Lake	LA-646	17%	33%	60%
Juniper	LA-03	9%	23%	41%
Juniper	LA-015	15%	16%	47%
Juniper*	LA-018	18%	17%	44%
Juniper*	SFA-657	13%	14%	37%
Juniper	LA-206	21%	35%	69%
Juniper*	LA-758	17%	35%	56%
Juniper	LA-095	4%	35%	55%

- These plots were in areas mapped in the late seral condition by ESI (1987)

The percent foliar cover illustrates that low sagebrush and Sandberg bluegrass dominate all 14 sites. The foliar cover of all species at each plot can be seen in Tables 37, 39-40, 42-52. The shaded plots are in the very stoney loam soil type with a thin surface and therefore potential production is limited. The unshaded plots are in the loam soil with a claypan and the higher foliar cover values reflect the greater potential for plant production in this soil type. The one outlier is LA-011 found in the May Lake pasture and mapped as loam with claypan, but the photo of the site indicates the soil is actually shallow and the surface is very stoney. The low foliar cover at this plot corresponds well with the soil seen in the photo at this site. The foliar cover recorded at the 14 AIM plots also demonstrates that the vegetation present at these sites in 2016, is representative of the expected vegetation cover and composition for the soils, climate and landform found in this allotment.

Four AIM plots (SFA-799, SFA-093, SFA-664 and SFA-657) had a Rangeland Health Quality (RHQA) assessment using Rangeland Health Indicators (RHI) done at these sites (Tables 54, 56-58).

The RHQA at SFA-799 (Table 54) in Famine Lake found the soil stability, hydrologic function and biotic integrity attributes averaged ratings were Slight to Moderate (S-M) deviation from reference condition. The soil compaction and invasive plant indicators described moderate to extreme departure from reference areas, but considering the close proximity (0.1 mile) to a large waterhole the conditions described are expected. The location of this plot in the southeast corner of the pasture and 0.1 mile from Famine Lake, a major water source, is not representative of the vegetation in the pasture or the condition of the pasture. The low sagebrush/Sandberg bluegrass community occupies about 80 acres (3%) of the pasture. Therefore no further discussion of the data for this AIM plot (SFA-799) is necessary.

There was a RHQA done at SFA-093 (Table 56) in Monument pasture. The soil stability, hydrologic function and biotic Integrity attributes rated as “None to Slight” (N-S) deviation from reference condition. This assessment and the vegetation cover confirms the site is stable and the vegetation cover and productivity closely resembles the conditions expected for this site.
There was a RHQA done at SFA-664 (Table 58) in May lake pasture. The soil stability and hydrologic function rated as Slight to Moderate deviation from reference condition. The biotic integrity rated as “None to Slight” deviation from the reference conditions. The foliar cover was 82% and the litter cover was 45%, both the highest of any AIM plots in this vegetation type. This assessment and the vegetation cover confirms the site is stable and the vegetation cover and productivity closely resembles the conditions expected for this site.

There was a RHQA done at SFA-657 (Table 57) in the juniper pasture. The soil stability and hydrologic function rated as Slight to Moderate deviation from reference condition. The biotic integrity rated as "None to Slight" deviation from the reference condition. The biotic rating indicates the vegetation present and the condition of that vegetation closely resembles the conditions expected for this site.

The ESI data referenced in the 1999 RHA found about 66% of low sagebrush/Sandberg bluegrass communities in mid seral ecological condition and about 33% in late seral condition (Table 10). There were three AIM plots in the low sagebrush/Sandberg bluegrass communities mapped in late seral condition (ESI, 1987) and all were in the juniper pasture. The foliar cover data in the table for these three sites have a species composition in 2016 that would rate in the late seral stage when compared to the Potential Natural Community (PNC). This confirms that these sites are in similar or better condition than in 1987. The remaining 11 sites were in areas mapped as mid seral condition in 1987 and the foliar cover indicates these sites would score in the mid seral stage or better in 2016. The AIM plots in the low sagebrush/Sandberg bluegrass community indicate the ecological condition in 2016 is the same or better than it was in 1999.

The STM map 5 illustrates most of low sagebrush/Sandberg bluegrass communities are in State A including most of the May Lake, Juniper, Fairy Flat, , Wool Lake, Long Lake and Monument pastures. State A is defined as sagebrush cover greater than 10% cover and an understory comprised of perennial grasses and forbs. This indicates that the vegetation community across these pastures is similar to the six long term trend plots and fourteen AIM plots described above. Therefore the balance of the evidence from the trend plots, the AIM plots and the STM map indicates the ecological processes in the low sagebrush/Sandberg bluegrass communities in State A are functioning and meeting Standard 3.

There are low sagebrush/Sandberg bluegrass communities in the Famine Lake, Robinson Lake, and Fish Lake pastures in State C with a threat of invasive annual grass. While portions of West Mud Lake, Mud Lake and Fisher Canyon pastures have low sagebrush/Sandberg bluegrass communities in State C with a dual threat. The dual threat includes invasive annual grasses and juniper expansion. State C in the Invasive Annual Grass Model is defined as sagebrush less than 10% cover and an understory of perennial and annual grasses with a ratio of annual grasses to perennial grasses as greater than 3 to 1. State C in the Dual Threat Model is defined as juniper, perennial grass and shrubs being co-dominant. In all the pastures with low sagebrush/Sandberg bluegrass communities in Sate C the annual grass threat is being managed thru rest rotation grazing providing rest every other year and limiting utilization to under 50% in the years when the pasture is grazed (Table 5). The every other year rest from grazing allows perennial grass to maximize leaf growth, root growth, litter and seed production. This produces a healthy, diverse plant community that stimulates energy flow, nutrient cycling and water cycling that are appropriate to the soil, climate and landform.

The threat of juniper expansion identified in State C in the dual the model is a long-term problem. The result of increasing juniper dominance is a decrease in herbaceous cover and species diversity with an increase in bareground (Miller et al. 2000). The loss of shrubs and herbaceous plants would reduce plant

diversity, plant cover, litter and root occupancy resulting in a negative impact to energy flow, nutrient cycling and water cycling. The recommendation to reverse the trend is to control juniper through cutting which allows the native perennial grasses and sagebrush to dominant the site.

In spite of the threat of juniper expansion in the future, the low sagebrush/Sandberg bluegrass communities across all the pastures are currently meeting Standard 3. The long-term trend plots, AIM plots and STM map all indicate that the vegetation is healthy and productive with the proper vegetation cover and composition to support ecological processes of nutrient cycling, energy flow and hydrologic cycles.

Big Sagebrush/Sandberg bluegrass Vegetation Communities

The big sagebrush/Sandberg bluegrass community comprises about 6% of the allotment (3,194 acres) and is in Mud Lake, West Mud Lake, Famine Lake, Horsehead Lake and Fish Lake pastures (Map 3). There is one long-term trend plot (OK-08) and the data (Table 28) illustrates that big sagebrush and Sandberg bluegrass dominate the site. A summary of the 7 years of photos and step-toe cover transect data (Table 14) collected between 1987 and 2016 found grasses and forbs were stable during this period. However the big sagebrush cover and relative frequency appears to have declined while the density and size of juniper trees has increased. This is apparent in the photos and confirmed with line intercept transect data taken in 2000 and 2012 (Table 28).

The ESI data referenced in the 1999 RHA found that about 84% of the big sagebrush/Sandberg bluegrass community within the allotment were in mid seral ecological condition (Table 10). The summary of the long-term trend plot (OK-08) confirms that in 2016 the ecological condition of this site is the same or better than it was in 1999. In 1999 the portion of the community (16%) in early seral condition was located along the western edge of the West Mud Lake Pasture (Map 4). This area is along the edge of a rocky rim with juniper already present in the 1987 ESI inventory. This area in early seral condition confirms the concern that as juniper invasion reduces the sagebrush cover in the community, the ecological condition of the community will deteriorate.

There was an AIM plot (SFA_UPS_SS_647) in the West Mud Flat pasture that is a transition area between big sagebrush/Sandberg bluegrass and low sagebrush/Sandberg bluegrass. At the plot site both low sagebrush and big sagebrush are found along the transects with foliar cover at 15% for low sagebrush and 5% for big sagebrush. The site also had foliar cover of 29% for Sandberg bluegrass, 5% for bottlebrush squirreltail and 24% for cheatgrass (Table 38). The actual site where the transect is located, lies partially on an inclusion of thin clay pan soil that supports low sagebrush. The amount of sagebrush cover and Sandberg bluegrass cover is consistent with both big sagebrush and low sagebrush Sandberg bluegrass sites.

There was a RHQA done at this site (Table 55). The soil stability was rated Slight to Moderate deviation from reference condition or better in 8 of the 10 attributes. The hydrologic function averaged Slight to Moderate deviation from reference condition rating and biotic integrity were rated as None to Slight

deviation from reference condition in 4 of 8 attributes. The conclusion is that the site is close to reference condition. The vegetation present is healthy, productive, diverse and appropriate to the soil, climate and landform.

The State and Transition Model (STM) mapping (Map 5) identified all of the big sagebrush/Sandberg bluegrass community as State C with most in the dual threat model and some in the invasive annual grass model. The State C (Appendix B) in the dual threat model is defined as having conifer, perennial grass and sagebrush as co-dominants. The landscape contains native perennial grasses, annual grass and sagebrush with the threat of replacement by juniper. The result of increasing juniper dominance is a decrease in herbaceous cover and species diversity with an increase in bareground (Miller et al. 2000). The loss of shrub and herbaceous cover would reduce plant diversity, plant cover, litter and root occupancy resulting in a negative impact to energy flow, nutrient cycling and water cycling. The recommendation to reverse the trend is to control juniper through cutting which allows the native perennial grasses and sagebrush to dominant the site.

The annual grass threat in big sagebrush/Sandberg bluegrass community is currently controlled thru rest rotation grazing, providing rest every other year and limiting utilization to under 50% in the years when the pasture is grazed (Table 5).). The every other year rest from grazing allows perennial grass to maximize leaf growth, root growth, litter and seed production. This produces a healthy, diverse plant community that stimulates energy flow, nutrient cycling and water cycling that are appropriate to the soil, climate and landform.

The long-term trend plots, AIM plots and STM map all indicate that the vegetation is healthy and productive with the proper vegetation cover and composition to support ecological processes of nutrient cycling, energy flow and hydrologic cycles. Therefore, this community is currently meeting Standard 3 for vegetation, but without juniper control the increasing juniper will reduce the sagebrush cover and eventually the site may not met Standard 3.

Crested Wheatgrass Seeding Vegetation Communities

The crested wheatgrass seedings represent 4% of the allotment and contains three long-term trend plots (OK-03, OK-12 and OK-13) in the three seeding pastures (Upper Calderwood, Verlay, and Calderwood respectively). The photographs illustrated stable crested wheatgrass seedings at all three plots with some invasion of sagebrush in the Calderwood pasture (OK-13). Only OK-12 had any long term transect data (Table 22) and since 2000 the crested wheatgrass ground cover averaged 19%, with no apparent trend. There was two years of transect data at OK-03 (Table 21) and OK-13 (Table 23) but the ground cover for crested wheatgrass was consistent with OK-12. The relative frequency data for all transects indicated crested wheatgrass was the dominant species with only OK-13 having any sagebrush appearing in the transect.

The ecological condition rating for the crested wheatgrass communities was in the early seral stage (Table 10). This is expected since the crested wheatgrass seedings are not diverse natural communities and therefore do score high when compared to a natural diverse community. However, these seeding have excellent ground cover and production, providing both perennial forage and cover for a variety of species. The high plant cover and production is superior to the annual grass community found in unseeded areas following a burn. The OAT rating (Table 9) for the crested wheatgrass communities was static except for 3 acres in upward trend. The photos and transects at the trend plots combined with ecological condition rating and the observed apparent trend all indicate the crested wheatgrass communities are healthy and productive plant communities and are supported by ecological processes of nutrient cycling , energy flow and hydrologic flow.

The STM map 5 illustrates that State B with an invasive annual grass threat occupies the crested wheatgrass communities and is defined as sagebrush with less than 10% cover and an understory comprised of perennial and annual grasses. The ratio of perennial grass cover to annual grass is greater than 1:1. The annual grass threat is managed in these pastures thru early season grazing, which promotes use on the annual grasses while allowing growing season rest for the perennial grass to maximize leaf growth, root growth, litter and seed production. This produces a healthy, productive plant community that stimulates energy flow, nutrient cycling and water cycling that are appropriate to the soil, climate and landform. Therefore the balance of the evidence from the trend plots and the STM map indicates the ecological processes in the crested wheatgrass community are functioning and meeting Standard 3.

Cheatgrass Vegetation communities

The cheatgrass communities comprise about 5% of the allotment (Map 3) and are the result of wildfires in the 1980's and 1990's. These sites were not successfully reseeded, primarily because the rocky nature of these sites prevented the use of a rangeland drill. The resulting cheatgrass communities are found in the three seeding pastures, Upper Calderwood, Lower Calderwood and Verlay. There are three long term trend plots (OK-15-17) (Table 11) and one AIM plot (LA_INTS-05) (Table 20) within the cheatgrass communities. The OK-15, OK-16 and OK-17 were established in the Verlay pasture in 2000 to monitor the broadcast seeding that was done in 1999 following a wildfire in this area. The photos for these sites illustrate that the broadcast seeding was not very successful as cheatgrass and annual forbs dominate all the sites (Table 17). There is scattered crested wheatgrass and bottlebrush squirreltail present. The nested frequency transect at trend plot OK-15 (Table 24) was read 4 times since 2000 and the cover and frequency data illustrates cheatgrass and annual forbs dominate the site with some bottlebrush squirreltail present

The AIM plot (LA_INTS-05) is on a slope along the edge of the historical burn and outside the seeded area in the Lower Calderwood pasture. This location has resulted in some natural recovery of the site with Sandberg bluegrass having 13% foliar cover (Table 36), but cheatgrass still dominates with 30% foliar cover. The vegetation transect with the presence of Sandberg bluegrass, sagebrush and rabbitbrush indicates some native recovery along the edge of these cheatgrass dominated areas.

The ESI data referenced in the 1999 RHA found 79% of the cheatgrass communities were in early seral ecological condition (Table 10) and 21 % in the mid seral condition. The cheatgrass areas in the early seral condition were found in the Upper Calderwood and Verlay pastures and the long term trend plots (OK14-17) document that the condition remains early seral. The area with mid seral condition in 1999 was in the Lower Calderwood pasture (Map 4) and the AIM plot (LA-05) (Table 36) documents there is enough perennial grass so the site remains in the mid seral stage. The long-term plots and the AIM plot in the cheatgrass areas within the seeding pastures indicate the ecological conditions in 2016 are the same or better than they were in 1999.

The STM map 5 illustrates that cheatgrass communities are in State D with an invasive annual grass threat and is defined as sagebrush with less than 10% cover and an understory comprised of perennial and annual grasses. The ratio of annual grass cover to perennial grass is greater than 3:1.

The cheatgrass dominated sites in the Verlay and Upper Calderwood seeding pastures except for the edges of the burn areas, are not meeting standard 3 because the plant communities while healthy, are not diverse. This is the result of wildfire and annual grass invasion, not current management. Efforts to restore these sites to perennial vegetation by reseeding have failed. The current management of early season grazing promotes use on the annual grasses while allowing growing season rest for the perennial grass to maximize leaf growth, root growth, litter and seed production.

Big sagebrush/Thurber's needlegrass

The big sagebrush/Thurber's needlegrass type occupies about 4% of the allotment and 5% of the mapped vegetation (Map 3). There was one AIM plot (LA-014) in the big sagebrush/Thurber's needlegrass (ARTR-STTH) community located in the Fairy Flat pasture and it included a transition area between big sagebrush/Thurber's needlegrass and low sagebrush/Sandberg bluegrass. The foliar cover (52%) and litter cover (29%) is within the expected cover and percent composition for these vegetation types. There was a mixture of perennial grasses, with Thurber's needlegrass, Sandberg bluegrass, and basin wild rye having foliar cover at 5%, 4% and 3% respectively (Table 41).

The ESI data referenced in the 1999 RHA found that about 49% of the big sagebrush/Thurber's needlegrass community within the allotment were in late seral ecological condition and 31% were in the mid seral ecological condition (Table 10). The species composition of the AIM site (LA-014) rates in late seral ecological condition when compared to the reference area. This community is stable and the foliar cover (52%) and diverse species composition indicates that the big sagebrush/Thurber's needlegrass community has a healthy, diverse plant community that stimulates energy flow, nutrient cycling and water cycling that are appropriate to the soil, climate and landform.

The STM map 5 illustrates most of the big sagebrush/Thurber's needlegrass community is in State A and is defined as sagebrush greater than 10% cover and an understory comprised of perennial grasses and

forbs. This indicates that the vegetation community across the pasture is similar to the one described above in the AIM plot (LA-014). . Therefore the balance of the evidence from the AIM plot and the STM map indicates the ecological processes in the big sagebrush/Thurber's needlegrass community are functioning and meeting Standard 3.

Silver Sagebrush Vegetation communities

There are three silver sagebrush communities (Table 8) occupying 2% of the allotment. The silver sagebrush with no dominant understory is the largest with 741 acres and is in Mud Lake flat and on four other lakebeds in the juniper pasture (Map 3). There are 3 long-term trend plots (OK-01, OK-05, OK-06) (Table 11) in the Mud Lake flat that were established in the 1960's as photo trend plots. A summary of the trend photos (Table 12) found the sites have been stable for 20 years with silver sagebrush and annual forbs dominating the site. A step-toe cover transect was established at OK-05 in 2012 and the crested wheatgrass ground cover was 15% in 2012 and 25% in 2016 (Table 26). These levels are consistent with a stable crested wheatgrass site. Transect (OK-05) represents an inclusion as this transect is on the northern edge of the lakebed and above the high water line.

Most of the silver sagebrush site is in early seral state (Table 10). The silver sagebrush is dominant as the construction of Mud Lake Reservoir altered the site significantly. The Mud Lake reservoir ponds large volumes of water reducing annual flooding in the lakebed and combined with the extreme shrink-swell nature of the silty clay soil reduces the amount of perennial grass (Nevada bluegrass) that can survive at this site. The deep-rooted silver sagebrush and annual forbs have dominated the site for over 20 years. The altered vegetation in this lakebed, either the crested wheatgrass or the silver sagebrush/annual forb communities are stable and are meeting standard 3.

The silver sagebrush/wheatgrass site found in Horsehead Lake pasture (75 acres) contains a long-term trend plot (OK-02). This is a photo trend plot with photos dating back 50 years. The photos illustrate there was a wheatgrass seeding (1964) still present in 1979, but by 1990 the site was dominated by silver sagebrush. The site has been stable with silver sagebrush and a variety of annual forbs for the last 20 years. The lakebed with the silty clay loam soil and an extreme shrink swell potential is functioning in an early seral stage. However it would require reseeding to restore perennial grasses that can grow in this habitat.

The silver sagebrush/Nevada bluegrass site found in Long Lake (163 acres) has a long-term trend plot (OK-04). Table 14 describes the photo history of the trend plot and concludes that Nevada bluegrass persists. There is a step-toe transect associated with the plot (Table 25) that was established in 1987. The cover and frequency both illustrate silver sagebrush and Nevada bluegrass remain the dominant vegetation with silver sage being more prevalent in the dry years and Nevada bluegrass being more common in wetter years.

The ESI data referenced in the 1999 RHA found the silver sagebrush/Nevada bluegrass community in the late seral, mid seral and early seral in three different pastures. The silver sagebrush/Nevada bluegrass

site found in Long Lake was in the late seral ecological condition (Table 10) and the long-term trend plot (OK-04) confirms the ecological condition in 2016 is the same or better than it was in 1999. The other three lake playas in the Monument and May Lake pastures are in mid and early seral ecological condition (Table 10).

These silver sagebrush communities occupy lakebeds and are subject to extreme conditions ranging from flooding to months of being completely dry. However they remain in a natural condition with production and species diversity appropriate for these sites and therefore are meeting Standard 3 for vegetation.

Big Sagebrush/Cheatgrass Vegetation communities

The big sagebrush/cheatgrass community comprises about 1.5% of the allotment (789 acres) and is in Famine Lake and Upper Calderwood pastures along the east edge of the area treated and seeded in 1964. These sites have had this plant composition since at least 1964. There is one AIM plot (LA_INTS-01) in this community with sagebrush and cheatgrass dominating the site with foliar cover for sagebrush 21% and cheatgrass 38% (Table 35). There was one perennial grass, Sandberg bluegrass with 2% foliar recorded along the transect.

However, this AIM plot is a 0.25 mile from Calderwood reservoir, which is within the expected disturbed area for a long-term permanent water site like Calderwood reservoir. This area is not representative of the big sagebrush/cheatgrass vegetation polygon. Utilization data 0.5 mile from the reservoir in the same vegetation type and collected every year for ten years recorded Sandberg bluegrass, bottlebrush squirreltail and Thurber's needlegrass as being present and lightly used. It appears this AIM plot represents about 80 acres or 10% of this vegetation type.

The ESI data referenced in the 1999 RHA found the big sagebrush/cheatgrass community within the Lower Calderwood pasture in mid seral ecological condition (Table 10) and as discussed above the utilization data for the pasture documents the ecological condition in 2016 is either the same or better than it was in 1999.

With the exception of the 80 acres contiguous to the Calderwood reservoir, the remainder of the big sagebrush/cheatgrass type (700 acres) appears stable with enough vegetation cover and diversity to meet standard 3.

The STM map 5 illustrates that the big sagebrush/cheatgrass community is about equally divided between State A and State C with an invasive annual grass threat. State A is defined as sagebrush greater than 10% cover and an understory comprised of perennial grasses and forbs. The State C (Appendix B) is defined as having sagebrush greater than 10% cover and an understory comprised of perennial and annual grasses with a ratio of annual grasses to perennial grasses as greater than 3 to 1. The annual grass threat in the big sagebrush/cheatgrass community is managed thru early season grazing in the Calderwood pasture and rest rotation grazing in the Famine Lake pasture (Table 5). The

early season grazing provides rest every year during the growing season and the rest rotation provides rest every other year. Both of these systems allow perennial grass to maximize leaf growth, root growth, litter and seed production. This produces a healthy, productive plant community that stimulates energy flow, nutrient cycling and water cycling that are appropriate to the soil, climate and landform. Therefore the big sagebrush/cheatgrass community is meeting Standard 3.

Big Sagebrush/bottlebrush squirreltail Vegetation communities

The big sagebrush/bottlebrush squirreltail community comprises about 1.4% of the allotment (745 acres) and is in Robinson Lake, Famine Lake, Fisher Canyon and Juniper Pastures (Map 3). There is one long-term trend plot (OK-19) in the Robinson Lake pasture. This site is at the southern edge of the big sagebrush/ bottlebrush squirreltail community and is actually in an inclusion area of low sagebrush/Sandberg bluegrass community that makes 40% of the mapped big sagebrush/bottlebrush squirreltail polygon (Map 3). The data (Table 32) illustrate that low sagebrush and Sandberg bluegrass dominate the site.
A prescribed fire in 1996 partially burned the site. A summary of the photos and step-toe cover transect data (Table 19) found that prior to the prescribed fire in 1996, the site was stable with sagebrush and Sandberg bluegrass being dominant. After the fire there was a reduction of sagebrush on part of the site and an increase in grass cover. The cover and relative frequency data shows Sandberg bluegrass and low sagebrush are the dominant plants with sagebrush being reduced by the fire, but recovered by 2010 (Table 32). The prescribed burn reduced the juniper density, while the composition and cover of grass and shrubs were in line with the expected composition for a low sagebrush/Sandberg bluegrass site.

The STM map 5 illustrates that the big sagebrush/bottlebrush squirreltail community is about 2/3 in State C and 1/3 in State E. State C includes an invasive annual threat, while State E is a dual threat of invasive annuals and juniper expansion. State C is defined as sagebrush greater than 10% cover and an understory comprised of perennial and annual grasses with a ratio of annual grasses to perennial grasses as greater than 3 to 1. State E is defined as having a greater than 1:1 ratio of annual to perennial grass and greater than 10% juniper cover. The annual grass threat in the big sagebrush/bottlebrush squirreltail community is currently controlled thru rest rotation grazing providing rest every other year and limiting utilization to under 50% in the years when the pasture is grazed (Table 5). The every other year rest from grazing allows perennial grass to maximize leaf growth, root growth, litter and seed production. This produces a healthy, productive plant community that stimulates energy flow, nutrient cycling and water cycling that are appropriate to the soil, climate and landform. Therefore the big sagebrush/bottlebrush squirreltail community is meeting Standard 3.

The State E site includes the threat of juniper expansion . The result of increasing juniper dominance is a decrease in herbaceous cover and species diversity with an increase in bareground (Miller et al. 2000). The loss of shrub and herbaceous cover would reduce plant diversity, plant cover, litter and root

occupancy resulting in a negative impact to energy flow, nutrient cycling and water cycling. The recommendation to reverse the trend is to control juniper through cutting which allows the native perennial grasses and sagebrush to dominant the site.

Intermediate Wheatgrass community

The Intermediate wheatgrass community is 61 acres or 0.1 % of the allotment located in Fish Lake pasture but does contain a long-term trend plot (OK-09). The trend plot is a photo plot with a description of the photos in Table 15. In summary the wheatgrass community is on a lakebed currently dominated by annual forbs with some silver sagebrush and a remnant of wheatgrass growing along the drainage. The photos illustrate that the wheatgrass was dominant across the lakebed from the 1960's through the 1980's. By 1996 the wheatgrass only occurred in scattered clumps and along the drainage. It appeared the drought in the early 1990's might have reduced the wheatgrass to the wetter areas. Since 1996 the area has been stable with wheatgrass lining the drainage and silver sagebrush slowly occupying the lakebed with a vigorous population of annual forbs.

The ESI data referenced in the 1999 RHA found the intermediate wheatgrass community within the Fish Lake pasture to be in early seral ecological condition (Table 10) and the long-term trend plot (OK-09) confirms the ecological condition in 2016 is either the same or better than it was in 1999.

This site is meeting standard 3 as the silver sagebrush occupying the site is healthy and the appropriate vegetation for a lakebed site with clay loam soils.

Actual Use and Utilization

The permit dates for the O'Keeffe Allotment are March 15th to Sept. 15th, and grazing is authorized under a rest rotation grazing management system as defined in the Lakeview Resource Management Plan (RMP)/Record of Decision (ROD), (BLM 2003, as maintained). Tables 4-7 in the monitoring summary (Appendix A) show the Actual Use and Utilization data collected for each pasture for 19 years. The total permitted AUMs for the allotment is 4,808 (permit #3601207). The total average actual use for the allotment over the last 19 years has been 3,312 AUMs. Use within the allotment has occurred within the permit dates, and has not exceeded the permitted AUMs over the last 19 years.

The utilization data collected is shown by year and pasture in Tables 4-7. The target utilization for crested wheatgrass seedings is 60%. The average utilization level in the three crested wheatgrass seeding pastures was 46%, 50% and 51% over the last 19 years (Table 4). The target utilization levels in the native pastures is 50%. The average utilization ranged between 31% and 50% over last 19 years in 12 of 13 native pastures (Tables 4-7). The average utilization (57%) exceeded the target utilization in the Horsehead pasture (Table 4). The Horsehead pasture is used every other year and if the rest years were included the average utilization would have been 29%.

Weeds

Small isolated patches of broadleaf invasive species are scattered across the allotment. The known invasive plants within the allotments are Russian kapweed (2 sites, 6.4 gross acres), Canada thistle (15 sites, 10.4 gross acres), bull thistle (27 sites, 29.7 gross acres), halogeton (28 sites, 58 gross acres), Mediterranean sage (32 sites, 462.7 gross acres), and spiny cocklebur (19 sites and 1.1 gross acres). The majority of the weeds are located within Pasture 5 near Calderwood reservoir in an old burn scar. The Calderwood reservoir areas is a priority area for weed control due to it being the furthest east infestation of Mediterranean sage. The Mediterranean sage sites are managed by the Oregon Department of Agriculture through an assistance agreement at the State Office.

Halogeton is located along many of the roads within the 216 O'Keefe Individual allotment. Prior to 2015 none of the BLM approved herbicides controlled halogeton. In 2015 a new EA was completed, which allowed the Lakeview Resource Area to use more effective herbicides to control species such as halogeton. The past two years the Lakeview BLM has aggressive controlled the roadside halogeton within the allotment.

Invasive annual grass species were discussed under standard 1.

Recommendations

To continue to meet Standard 3, Continue to control all non-native invasive species, both small isolated infestation and large infestations through the most updated invasive plant management plan. Prevent the spread of new infestations by minimizing disturbance.

Wildlife

In the 1999, the Land Health Evaluation for this standard was met. The allotment provided habitat for terrestrial wildlife species, such as California bighorn sheep (*Ovis canadensis californiana*), Rocky Mountain elk (*Cervus elaphus nelsoni*), mule deer (*Odocoileus hemionus*), pronghorn (*Antilocapra americana*), and Greater Sage-Grouse (*Centrocercus urophasianus*). No major competition between wildlife and domestic livestock for forage existed.

This standard is currently met from the aspect of native wildlife populations, diversity, and sustainability with current environmental conditions. Habitats within the allotment are in functional condition and support natural ecological processes typically found within sagebrush-steppe communities in the northern Great Basin. Habitat quality and population levels fluctuate over time, and generally represent natural trends in the ecosystem; however, some species may show erratic or negative trends. These trends are determined through monitoring of habitat and animal composition and community structure. The allotment provides functional habitat for populations of mule deer, pygmy rabbits (*Brachylagus idahoensis*), pronghorn, California bighorn sheep, and Greater Sage-Grouse, where appropriate. Previously there were 260 AUMs allocated for wildlife, which has since been updated, to 417 AUMs. Portions of the allotment lie within the Oregon Department of Fish and Wildlife (ODFW) Warner Big Game Management Unit for mule deer, elk, and pronghorn. Current populations are moving in an upward trend, but still below management objectives.

STANDARD 4: Water Quality – Surface water and groundwater quality, influenced by agency actions, complies with State water quality standards.

Not Applicable:

This standard is not applicable. There are no perennial or major intermittent streams in this allotment. No water quality problems have been identified. There are no streams listed as Water Quality Impaired in the Allotment.

STANDARD 5: Native, T&E, and Locally Important Species – Habitats support healthy, productive and diverse populations and communities of native plants and animals (including special status species and species of local importance appropriate to soil, climate and landform.

Fish/Fish Habitat

In the 1999 RHA this standard was met, and is currently being met in 2017. The Warner sucker is listed as a Threatened Species under the ESA. The intermittent channel from the west side of this allotment flows into Crump Lake, which is occupied by suckers. There is no occupied habitat in the allotment. A Biological Evaluation was completed in 1995 which concluded that grazing in this allotment would have no effect on suckers.

Wildlife

In 1999, this standard was met and is currently being met. The diversity of wildlife species was consistent with productive sagebrush-steppe communities, which is an indication of health and productivity. Mule deer and pronghorn populations were healthy, while Rocky Mountain elk populations were expanding. Coyote predation on fawns was thought to be depressing mule deer recruitment, but these populations also tend to fluctuate. The allotment was considered marginal habitat for California bighorn sheep. Greater Sage-Grouse populations were stable to declining, with eighteen (18) known leks within the allotment. Additionally, the allotment was used by wintering Bald Eagles, various bat species, and possibly pygmy rabbits.

Special status wildlife species and/or their habitats that are present within this allotment include: Bald Eagle (*Haliaetus leucocephalus*), Greater Sage-Grouse (*Centrocercus urophasianus*), gray wolf (*Canis lupus*), pallid bat (*Antrozous pallidus),* pygmy rabbit (*Brachylagus idahoensis*), and western bumblebee (*Bombus occidentalis*). There are also species of high public interest or other special management designations, which include, but are not limited to: mule deer (*Odocoileus hemionus*), pronghorn (*Antilocapra americana*), California bighorn sheep (*Ovis canadensis californiana*), Burrowing Owl (*Athene cunicularia*), Golden Eagle (*Aquila chrysaetos*), and Ferruginous Hawk (*Buteo regalis*).

Migratory birds use a variety of habitats within the allotment for nesting, foraging, and resting as they make their yearly migrations. Formal surveys have not been conducted for monitoring of migratory birds within the allotment. There are no known conflicts to have occurred for these species.

The Allotment wholly or partially supports seven known Golden Eagle breeding areas (Fisher Canyon Mouth, Fisher Lake, Greaser Canyon, Greaser Reservoir, Horsehead Lake, Mud Lake Reservoir, and Robinson Lake). From 2012 to 2016 many of the breeding pairs associated with these areas successfully produced one or two eaglets. Bald and Golden Eagle foraging does occur throughout the allotment and Golden Eagles have been observed foraging within the allotment.

Foraging and nesting habitat for many raptor species, including Ferruginous Hawks, exists throughout the allotment. Red-tailed Hawk (*Buteo jamaicensis*) nests have been documented on the O'Keeffe Allotment and Burrowing Owls have also been observed.

One Bureau Sensitive Species of bat potentially occurs in the O'Keeffe Allotment. This is the pallid bat. Pallid bats are typically found in sage steppe ecosystems. No known hibernacula are present on the allotment, however bat roosting habitat is present in the form of rock outcrops and juniper tree bark.

Gray wolves are habitat generalists, provided abundant prey resources, especially elk and deer are available. Although gray wolves are known to disperse long distances and have traveled through much of the Lakeview Resource Area, the O'Keeffe Allotment is not within an Area of Known Wolf Activity (AKWA) designated by ODFW. The O'Keeffe Allotment is within the East Wolf Management Zone and wolves are still federally listed in this area. There is the potential for conflicts to occur as more gray wolves move in the Lakeview Resource Area.

Mapped Pygmy rabbit habitat (buffered burrow locations) is located in the south-central portion of the allotment. Pygmy rabbit burrows (2) have been documented within the allotment near Mud Lake and Horsehead Lake. However that area is not representative of typical pygmy rabbit habitat and possibly represents a few dispersing individuals from Greaser Basin south of the allotment which does provide typical habitat in the form of islands of big sagebrush among low sagebrush. The O'Keeffe Allotment does provide vast expanses of intact sagebrush for this sagebrush obligate species and there are about 11,220 acres of pygmy rabbit habitat within the allotment. However, because this is merely a 2 mile buffer around known burrows, the mapped habitat is likely overestimated and may not reflect what is truly usable or suitable to the species based on soil and microsite characteristics..

There is no designated elk habitat on the O'Keeffe Allotment. However, they do occasionally move through on the way to Hart Mountain National Antelope Refuge.

Mule deer occupy the entire allotment. There are 38,425 acres are identified by ODFW as winter range, encompassing all lower and mid elevation pastures and the majority of Juniper Pasture. Conflicts between livestock and mule deer do not generally occur, due to the difference in diet. Western juniper (*Juniperus occidentalis*) encroachment may hinder mule deer winter range conditions throughout the allotment.

Pronghorn occur throughout the allotment. All but the western-most portion and the center ridge running north and south through the allotment is identified as habitat. There are approximately 45,485 acres available to pronghorn within the O'Keeffe Allotment. Pronghorn use occurs in areas of low

sagebrush or shorter Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). Increasing encroachment of western juniper could potentially decrease available habitats for pronghorn in low sagebrush habitats within the allotment. There are no major resource conflicts for this species. Diet overlap between cattle and pronghorn is low, ranging from only 8% in winter to 25% in spring (McInnis and Vavra 1987).

The northwestern and western portions of the allotment have been identified as bighorn sheep habitat. There are approximately 20,901acres of identified bighorn sheep habitat. Although some competition for forage grasses may occur between cattle and bighorn sheep, it is likely insignificant. Direct conflict with livestock are unlikely to occur at lambing sites because ewes tend to choose rugged steep terrain for parturition sites (Smith et al. 2015). These microsites used for lambing are unlikely to be frequented by cattle.

O'Keeffe Allotment provides habitat capable of supporting varying mammal species, which include: gray wolves, coyotes (*Canis latrans*), jackrabbits (*Lepus* ssp.), cottontails (*Sylvilagus* ssp.), ground squirrels (*Urocitellus* spp.), American badgers (*Taxidea taxus*), and other shrub-steppe mammal species, as well as, reptiles such as: Sagebrush Lizard (*Sceloporus graciosus),* Northern Alligator Lizard (*Elgaria coerulea*), Great Basin Gopher Snake (*Pituophis catenifer deserticola*), and Great Basin Rattlesnake (*Crotalus viridis lutosus*).

It is determined that the O'Keeffe Allotment meets Standard 5 for the above mentioned wildlife and no major resource conflicts are present which may affect that conclusion. The allotment supports multiple successfully breeding pairs of Golden Eagles which require a healthy prey base to sustain them year after year. Pygmy rabbits occupy areas capable of supporting the species based on soils, yet the allotment provides the requisite vast expanse of sagebrush to allow for dispersal of pygmy rabbits to other occupied or suitable areas. The allotment is sustainably providing adequate forage for ungulate populations to coexist with the livestock.

Greater Sage-Grouse

Updates to Standard 5, concerning wildlife habitat and associated species, predominately concern Greater Sage-Grouse (hereafter referred to as sage grouse).

Sage grouse are generally traditional in their seasonal movement patterns and select seasonal habitats within their respective home ranges, which include: breeding, summer/late brood-rearing, and winter habitat. Bureau of Land Management field offices that manage sage grouse habitat are required to incorporate the use of mid-, fine-, and site-scale indicators (Table 2-2 of ARMPA) and the habitat suitability rating process provided by the Sage-Grouse Habitat Assessment Framework (HAF; Technical Reference 6710-1, Stiver et al. 2015) when assessing habitat for a population or subpopulation or other biologically relevant area. The BLM Habitat Assessment Summary Report (BLM 2018) describes habitat suitability at the mid-scale (2nd Order), fine-scale (3rd Order) and site-scale (4th Order). The mid-scale is comprised of 11.7 million acres and represents sage grouse subpopulations and PACs (Map 6). Areas with potential to provide habitat are identified and seasonal habitats and landscape indicators are mapped (BLM 2018). The fine-scale is comprised of 1,839,452 acres and represents lek clusters and leks.

Seasonal use areas and connectivity between use areas are identified, and human disturbances are assessed (BLM 2018). The fine-scale habitat analysis area encompasses the Beaty Butte PAC (including the O'Keeffe Allotment) as well as the Sheldon-Hart National Wildlife Refuges (Map 6). The fine-scale analysis area is comprised of land cover types that provide existing or potential seasonal habitats for sage grouse (Table 60). Sage grouse require large tracts of connected habitat for viability. There is a high degree of connectivity within the fine-scale area among winter, breeding, and summer habitat, which extends well beyond the allotment itself. Anthropogenic disturbances which potentially disrupt seasonal movements and/or cause mortality are not widely occurring within the fine-scale area. Both the mid-scale and fine scale areas were rated suitable by an interdisciplinary (ID) team (BLM 2018).

Vegetation composition, structure, and diversity is vital to the viability of sage grouse populations. Sage grouse wholly depend on vegetation for a variety of reasons. During the early breeding/nesting period, chicks require copious amounts of insects, of which, use varying species of vegetation. Hens forage on forbs nearest their nest site. Native perennial bunchgrasses of adequate height are important for nest screening. During the late summer/brood-rearing period, chicks transition from a diet of insects to one dominated by perennial forbs. Forbs remain an important part of the sage grouse diet through summer until transitioning to sagebrush in the fall. The availability of sagebrush cover for suitable breeding (nesting/early brood-rearing) and winter habitat is appropriate at 10-25%, whereas the marginal habitat may have well above or slightly below the appropriate coverage of sagebrush. Sagebrush, utilized as forage and cover in the winter, is crucial due to the lack of grasses and forbs available at that time.

The site-scale addresses indicators (predominantly vegetation centered and described above) identified within the ARMPA (Table 2-2) (ARMPA; BLM 2015). Assessment, Inventory, and Monitoring (AIM) data, with HAF supplementary indicators, were collected at 64 site scale plots (approximately 0.7 acres/plot) throughout the Beaty Fine Scale area during the 2015 and 2016 field season. Table 61 displays the habitat suitability ratings and proportional area by season for the entire fine scale analysis area.

Sage grouse occur throughout the majority of the O'Keefe Allotment; 35,815 acres (66%) of the 54,036-acre allotment is spring seasonal sage grouse habitat, 36,678 acres (68%) is summer seasonal sage grouse habitat, and 33,708 acres (62%) is winter seasonal sage grouse habitat. Within the allotment, there are two habitat management areas: Priority Habitat Management Area (PHMA) in a Sagebrush Focal Area (SFA) and General Habitat Management Area (GHMA) making up 88% and 8% of the allotment respectively. Sage grouse densities within SFAs are considered higher when compared to other areas. Therefore SFAs are important for the persistence of the species.

Eighteen of the 64 site scale HAF plots actually fell within the allotment. Weighted proportions of habitat suitability by season for the O'Keeffe Allotment are displayed in tables 62 and 63. The proportional area of suitable habitat from AIM data collections in breeding seasonal habitat was 88% ± 13.5% suitable and 12% ± 12.4% marginal (Table 62). Plots deemed marginal and/or unsuitable generally did not have enough sagebrush cover, perennial grass cover, and/or forb production. Some sites had greater than 25% sagebrush cover, which is a marginal indicator. This suggests that the overabundance of sagebrush cover in some areas could potentially prevent native grasses from establishing within the allotment. No plots on the allotment were measured during the summer season. All of the winter habitat on the allotment was suitable. There are portions of the allotment that do not support sage

grouse seasonal habitat due to plant structure characteristics. None of the AIM plots that fell outside of seasonal sage grouse habitat (n=3) were found to be suitable breeding habitat. Currently, there are no known resource conflicts on the allotment for this species.

Long term trend plot data is not easily comparable to HAF site scale data due to the resulting data type of basal versus canopy cover and the plot locations tending to be relatively close to roads or near water sources where cattle congregate. However, the trend data does add information on the stability of the perennial grasses and shrubs to help provide rationale for an overall assessment of whether the allotment is meeting Standard 5 for sage grouse. The Long Lake Plot (OK-04; Table 25) indicates that total perennial grass cover ranged from 3% to 13% from 1987 to 2016, with *Poa cusickii* remaining stable while other species fluctuate more and silver sage has increased. Silver sage canopy cover was 17.2% in 2012 (Table 25). Data from the Fairy Flat Plot (OK-07) in 2016 indicated total basal cover of perennial grasses was 11% (Table 27) and fluctuations in grass cover coincided with average annual precipitation. Sagebrush cover within this plot however was high marginal at 29.7% (Table 27). The Juniper Pasture plot (OK-10) indicates low sagebrush cover has been stable from 1987 to present (Table 16). In the year 2012, low sagebrush canopy cover averaged 10.7% over three transects, putting the plot in suitable range for that indicator. Total basal cover of native perennial bunchgrasses (Idaho fescue + Sandberg bluegrass + Thurber's needlegrass + bottlebrush squirreltail) ranges from 12% to 31% in sample years from 1985 to 2015. Therefore canopy cover is likely higher and well within suitable range for that indicator.

Based on ODFW's 2017 conservation status, there is one occupied lek, 13 pending leks (three of which have been active in the last two years), and four unoccupied leks located in the O'Keeffe Allotment. There are seven suitable leks (39%), six marginal (33%), and five unsuitable (28%). The occupied, as well as the pending (but active) leks are all rated suitable using the HAF methods. The unsuitable leks are all pending (inactive in the last two years) and the rating is largely due to juniper encroachment within three km of the lek, increasing probability of mortality. Marginal leks have some juniper within three km, but generally a little farther out, compared to unsuitable leks, or lack an additional unsuitable indicator such as a fence or road that added to the unsuitability of some leks.

Ten lentic riparian / late brood rearing sites within the allotment were assessed in 2017 (BLM 2018). Indicators used to assess these sites included perennial herbaceous cover, preferred forb diversity and availability, and riparian stability based on Proper Functioning Condition (PFC). Eighty percent of the sites were rated suitable, including the largest, Long Lake. There was one unsuitable (Wool Lake) and one marginal (Mud Lake Reservoir) site. No lotic late brood rearing sites are present within the allotment.

The Oregon state and transition threat-based models (hereafter, STMs for simplicity) were used to map primary threats to sage grouse habitat on the O'Keeffe Allotment. The STM assesses and stratifies sagebrush-steppe landscapes based on vegetation states and associated primary threats, including wildfire, invasive annual grasses, and conifer encroachment (Boyd et al. 2014). These models provide a

method to measure and compare land conditions against the model, which provides a link between expectations and management response (Bestelmeyer et al. 2003).

The STMs are comprised of four to five different ecological states depending on the threat model (Appendix B) used (Map 5). State A represents potential year-round sage grouse habitat and is the preferred ecological state. State A consists of sagebrush cover greater than 10% with an understory of native perennial grasses of greater density compared to invasive annual grasses. These sites are resilient to fire, drought, and other disturbances as well as erosion. State B, if comprised of native grasses, may represent potential seasonal habitat for sage grouse. However, on the O'Keeffe Allotment, State B refers to crested wheat seedings and those areas are not sage grouse habitat. State C is in an intermediate condition and less desirable from a sage grouse habitat perspective, but in a condition where proper management actions can restore the site to a more suitable state A or B. State C sites are either sagebrush sites with an invasive annual grass understory depleted of native bunchgrasses (Figure 1), or sites co-dominated by juniper and sagebrush (Figures 2 and 3). Often the landscape has been depleted of native seedbanks (IAG model) and has lowered resistance and/or resilience to fire, drought, and other disturbances. States D and E are least desirable within a landscape. These states represent a landscape that is unsuitable or non-habitat (if on steep slopes) for sage grouse due to dominance of site by conifers or annual grasses and lack of sagebrush and native perennial bunchgrasses. These sites have a lowered resistance and resilience to fire, drought, and other disturbance. Often these landscapes are beyond repair or much less feasible to attempt restoration.

Invasive species as well as native invaders have dramatically altered the landscape by changing the vegetation structure and fire regime; forming dense, dry grass stands and promoting frequent fire (Pellant 1996). Western juniper is native to eastern Oregon, but has expanded beyond its historical range due to fire suppression, reduction in fuels from livestock grazing, and precipitation pattern changes. Western juniper can deplete soils of water, alter species composition and biodiversity of shrub-steppe, increase erosion, reduce stream flows, and reduce forage production for livestock (Miller et al. 2000). The Oregon STMs complement the HAF by providing spatial reference for the site-scale suitability determinations. Suitability ratings at AIM plots correlated closely with the STM. In breeding seasonal habitat, 13 plots fell in state A and two plots fell in state C. Twelve (12) of the 13 plots in state A were rated as suitable with the remaining plot rated as marginal. In winter seasonal habitat, we found 13 plots in state A and 1 plot in state C. All were suitable. Most (74%) of the breeding season habitat within the allotment is state A, 20% is state C, 1% is state D, and <1% is state E. It is important to note that both seasonal habitat and STMs were coarsely mapped and much of where State D overlaps seasonal habitat is actually persistently non-habitat due to steep slopes. Therefore both states D and E represent an insignificant portion of seasonal habitat within the O'Keeffe Allotment. Thus, the results from HAF and Oregon STM indicate >70% of the breeding season habitat within the allotment is in suitable condition.

It is determined that the O'Keeffe Allotment meets Standard 5 for sage grouse based on site scale HAF, long term trend data, and STM results within the allotment as well as how the allotment contributes to the overall suitability at the fine scale. The O'Keeffe Allotment, located on the western edge of the

Beaty Fine Scale area (Map 6), is contributing significantly to the amount of quality year-round sage grouse habitat at a connectivity corridor between Hart Mountain and use areas to the south. If the eastern half of the allotment were not in such a healthy State A condition, the connectivity corridor would be a pinch point at half the width and may affect sage grouse seasonal movement and/or dispersal.

Special Status Plants

Currently this standard is being met for native, T&E and locally important plant species in the O'Keeffe Allotment. In 1999, this standard was met. The diversity of plant species was consistent with productive sagebrush-steppe communities. In the 1999 RHA, no special status plants were within the O'Keeffe Allotment and the standard was met for vegetation.

Currently, there are two special status plants within the O'Keeffe allotment. These are broadtooth monkeyflower and Cussick's giant hyssop. These two species are mapped in the northern portion of O'Keeffe allotment and may expand into the allotment in the future.

In September of 2015, a survey was undertaken broadtooth monkeyflower plant near Wool Lake but no plants were found. The lake had standing water, but the majority of the channel was dry and wetland plants were not common along the survey area. In 1991, a survey was performed for this plant, along the drainage southeast of Wool Lake but the plant was not found. This population is possibly extirpated. Associated species are *Ericameria nauseosa, Epilobium* sp. *Lomatium triternatum*, *Phacelia* sp. and *Gilia capillaris*.

In 2015, Cussick's giant hyssop was found in the cliff bands near road 5921, about 0.5 miles SE of May Lake. Associated Species were *Agastache utricifolia, Poa secunda, Pseudoroegneria spicata, Artemesia arbuscula, Symphoricarpos oreophilus, Ribes cernum, Prunus emarginata*, and *Juniperus urticifolia*.

In April 2017 special status plants were not seen on two trips, but the area was flooded and access was limited.

Recommendations

To continue to meet Standard 1, 3, and 5 treatment of areas with juniper expansion is recommended within the O'Keeffe Allotment.

In the analysis of Standards 1 and 3 there are long term trend plots in West Mud Lake pasture, and Fisher Canyon pasture that recorded the expansion of juniper. The continued expansion of juniper would result in a loss of grass and shrub cover resulting in increased soil erosion and loss of plant and animal diversity. These impacts to the soil and vegetation community could result in these areas not meeting standards in the future.

In the analysis of standard 5, juniper cover was the primary cause of some leks being rated marginal to unsuitable, in an area otherwise considered suitable for sage grouse. Juniper at only 3% cover lowers

sage grouse nesting probability (Severson et al. 2016), and survival and nest success decrease because juniper provides perch sites for raptors and corvids which prey on the grouse and/or depredate nests; however, juniper cover is not an indicator within the ARMPA Table 2-2 for early nesting, upland summer, or winter habitat. STM State A suggests that juniper is a low occurring vegetation cover within those tracts of habitat. However, juniper may be affecting habitat at a smaller scale, though this is not captured with the HAF. Severson et al. (2017a) linked conifer removal treatments to improved demographic rates. The two most important demographic parameters affecting population growth, female survival and nest survival, increased with treatment in the South Warners by 6.6% and 18.8% respectively from 2010 to 2014 (Severson et al. 2017a). Positive vegetation responses to juniper removal have been observed within three years of treatment in the South Warners (Severson et al. 2017b). Following treatment, sagebrush height increased and perennial grass and tall herbaceous cover significantly increased (Severson et al. 2017b).

The STM map 5 illustrates the problem of juniper expansion as most of mid elevation pastures (Horsehead Lake, Mud Lake, West Mud Lake, Fisher Canyon, Wool Lake) are in Class C under dual threat, which includes the threat of juniper replacing grass and shrubs as the dominant vegetation. Tables 59b and 59c show that 8,546 acres are in State C either under dual threat or juniper threat. Juniper control, cutting or burning is recommended to reduce juniper expansion and keep these areas from trending away from sagebrush/grass communities to woodlands. Spot control of juniper in state A within 3 km of leks would help maintain or improve lek suitability.

The STM map 5 illustrates the threat of annual grasses in the allotment. All or parts of Calderwood, Fish Lake and Famine Lake pastures are in State C under the threat of invasive annual grasses. The mid elevation pastures, listed above, are under the dual threat that includes annual grasses. To manage and control this threat, the recommendation is to maintain or increase desirable vegetation, (i.e. deep-rooted perennial plants) by continuing the rest rotation system grazing system currently used. This management provides periods of rest when plants are actively growing and limits utilization levels to keep forage demand in balance with forage supply (50% utilization levels).

ID Team Members

Name	Title
Les Boothe	Rangeland Management Specialist
Theresa Romasko	Assistant Field Manager
Grace Haskins	Weed Management Specialist
John Klock	Botanist
Jimmy Leal	Fisheries Biologist
Jami Ludwig	Assistant Field Manager
LeeAnn McDonald	Wildlife Biologist
Kate Yates	Wildlife Biologist
Paul Whitman	Planning and Environmental Coordinator

Guidelines for Livestock Management

Existing grazing management practices and levels of grazing use on the O'Keeffe Ind. Allotment is consistent with the Guidelines for Livestock Grazing Management (August 12, 1997).

2015 Determination

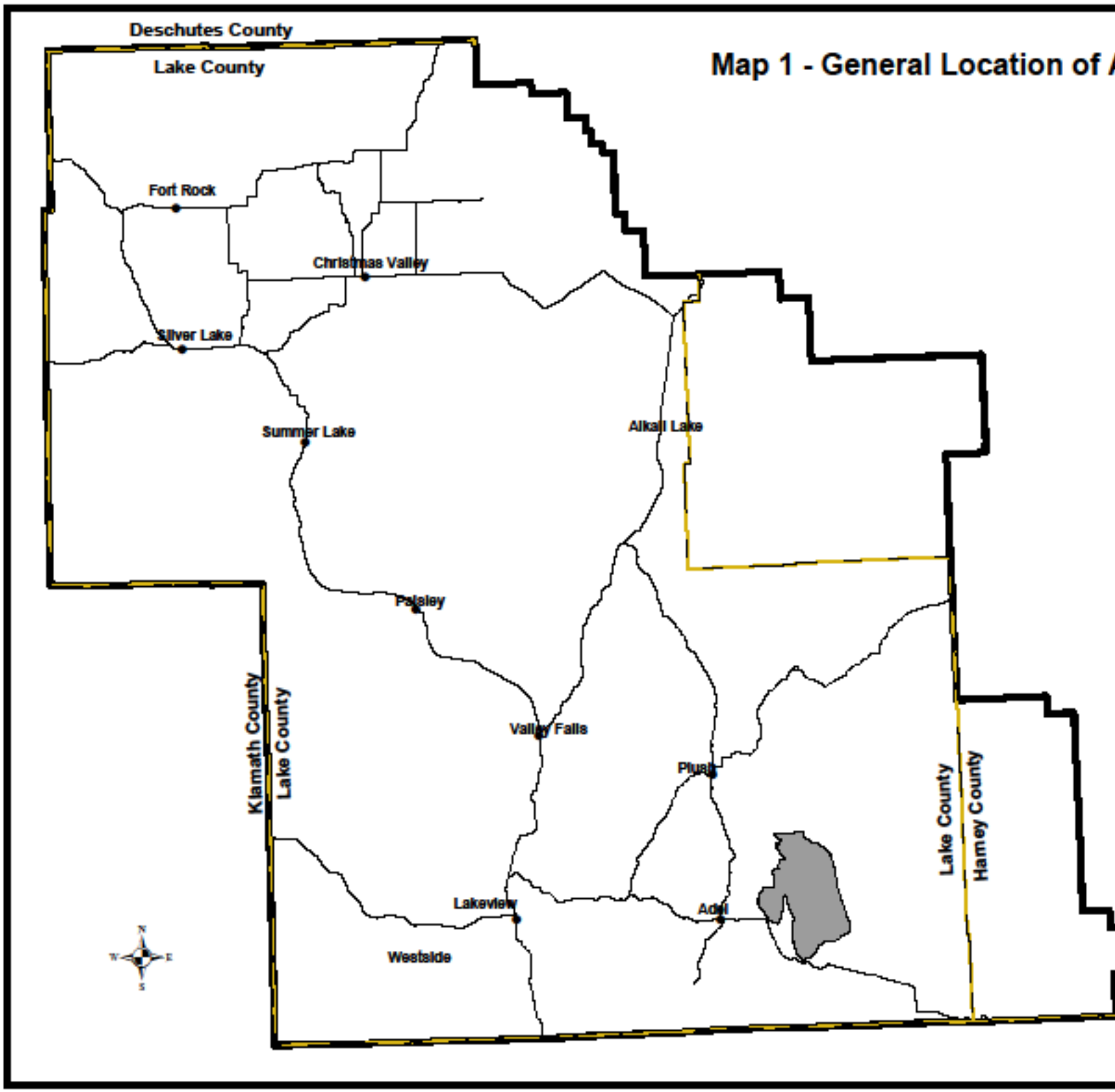
(X) Existing grazing management practices on the O'Keeffe Individual Allotment promote achievement of, or significant progress towards the Oregon Standards for Rangeland Health and conform with the applicable Guidelines for Livestock Grazing Management.

( ) Existing grazing management practices on the O'Keeffe Individual Allotment will require modification or change prior to the next grazing season to promote achievement of the Oregon Standards for Rangeland Health and conform with the applicable Guidelines for Livestock Grazing Management.

5/10/18

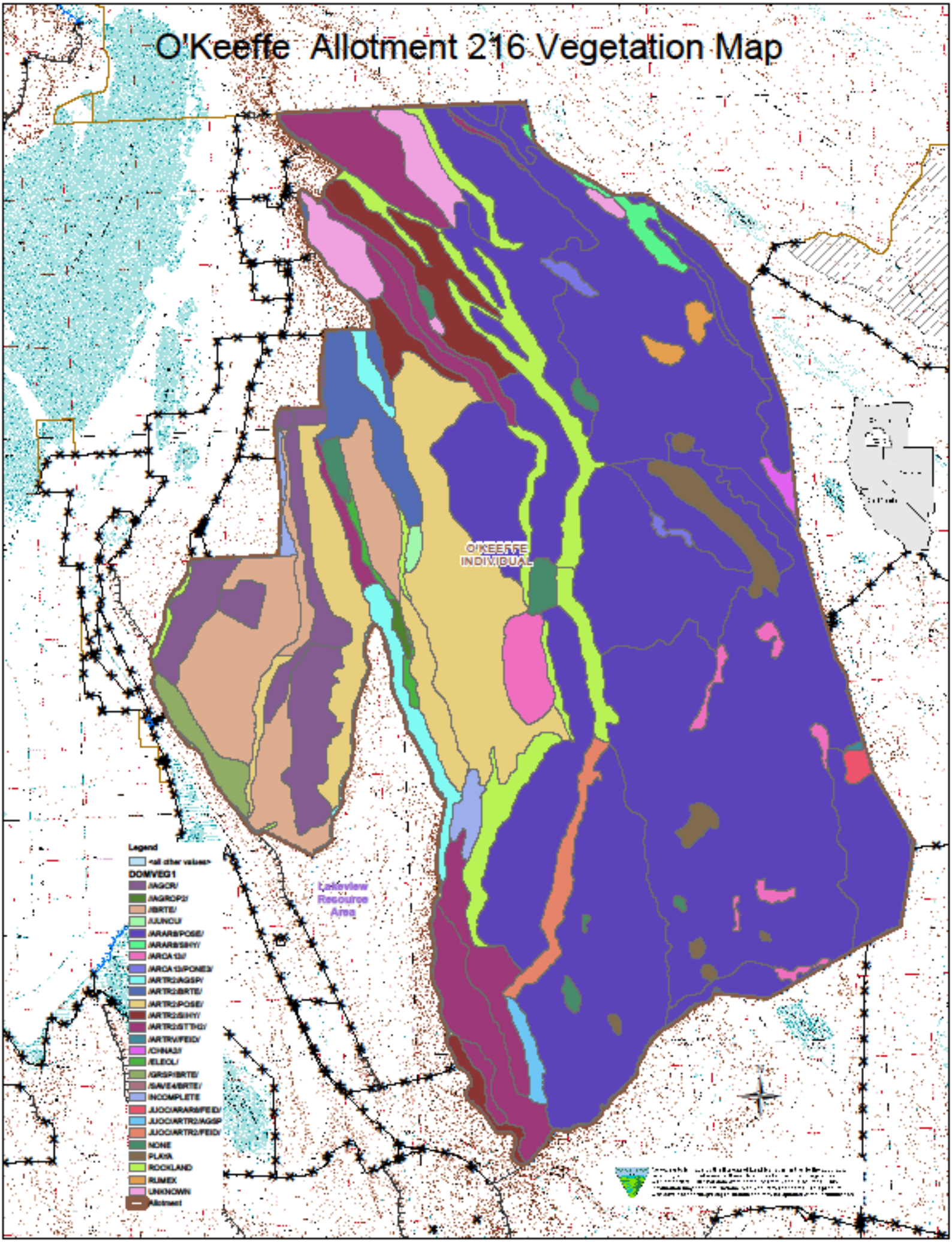
J. Todd Forbes ← Jami Ludwig (Acting FM) for
Field Manager
Lakeview Resource Area

Date

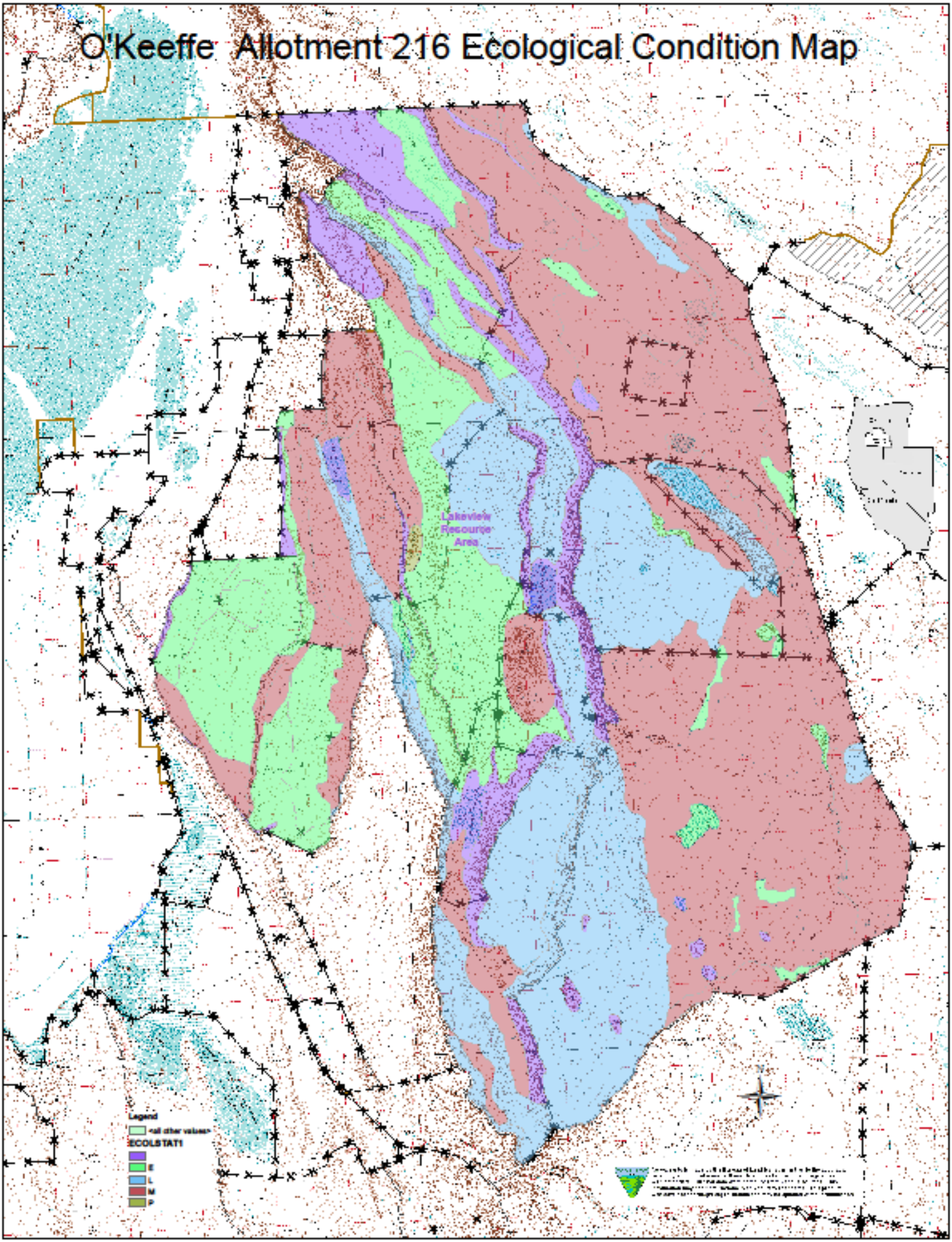

Deschutes County
Lake County
Map 1 - General Location of A
Fort Rock
Christmas Valley
Silver Lake
Summer Lake
Alkali Lake
Paisley
Klamath County
Lake County
Valley Falls
Plush
Lake County
Harney County
Lakeview
Adel
Westside
N
W
E
S


O'Keeffe Allotment 216 Map
Wool Lake (16)
Robinson Lake (15)
May Lake (7)
Famine Lake (14)
Fisher Canyon (6)
Calderwood (5)
Long Lake (9)
West Mud Lake (4)
Monument (8)
Verlay (12)
Mud Lake (1)
O'KEEFFE INDIVIDUAL
Fish Lake (3)
Upper Calderwood (13)
Horsehead Lake (2)
Juniper (10)
Fairy Flat (11)
Legend
Allotment
Pastures
Bureau of Land Management
U.S. Forest Service
National Park Service
U.S. Fish and Wildlife Service
Bureau of Indian Affairs
Other Federal
State
Local Government
Private/Unknown
1.5 0.75 0 1.5 Miles

O'Keeffe Allotment 216 Vegetation Map

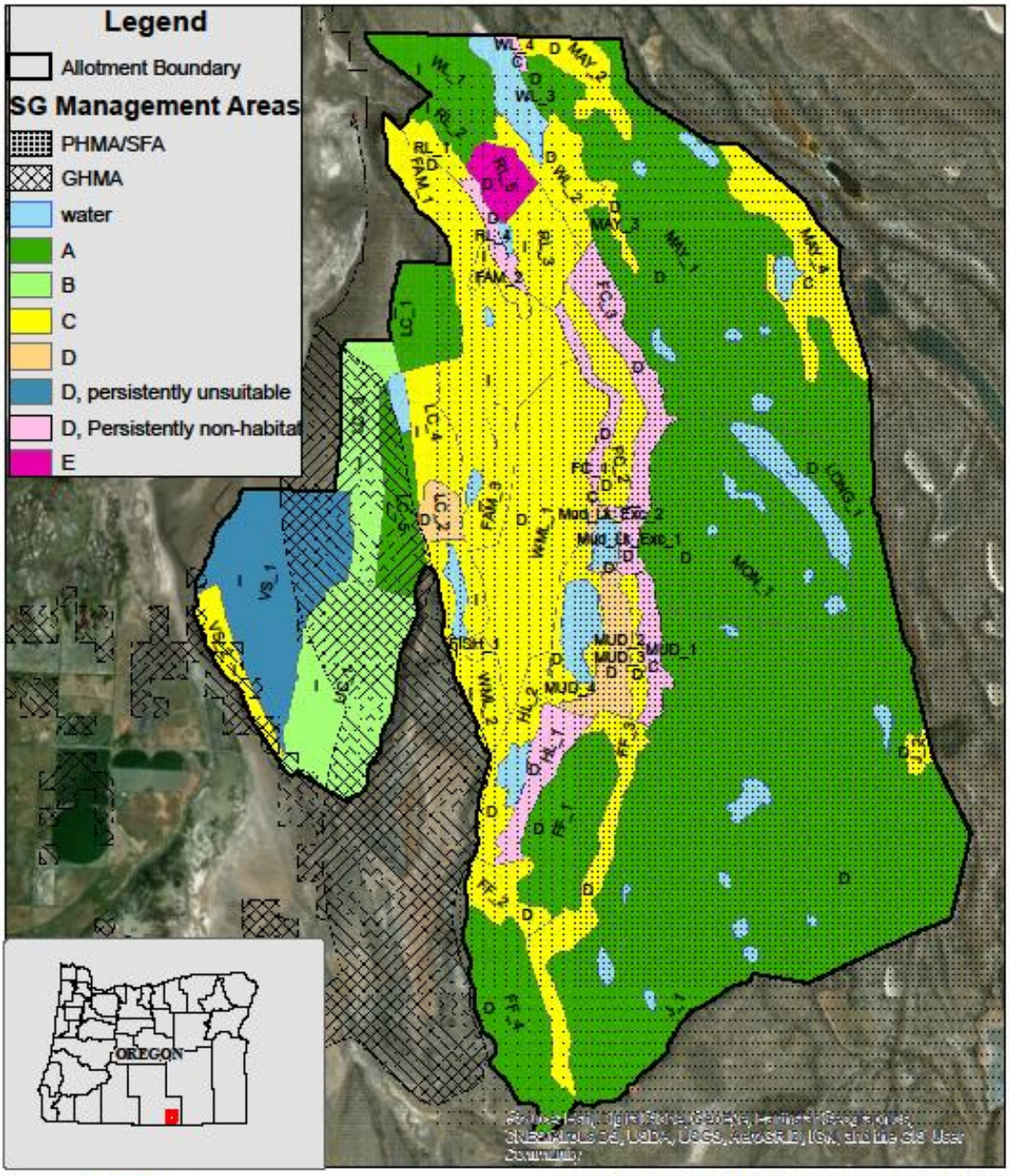


O'Keeffe Allotment 216 Ecological Condition Map



Map # 5. O'Keeffe Allotment and State-and-Transition Model Pilot Project.

O'Keeffe Allotment CCA Ecological State Map with Polygon Codes



Ecological State Polygons are labeled as follows:
I = Invasive Annual Grass Model
D = Dual Threat Model
C = Conifer Threat Model

Appendix A: O'Keeffe Allotment Monitoring Summary

O'Keeffe Allotment (#00216) Actual Use and Utilization Data by Year

Table 4. Actual Use and Percent Utilization in Early Season Pastures and Horsehead Pasture

YEAR	Verlay AUMS	Verlay % Utilization	Upper Calderwood AUMS	Upper Calderwood % Utilization	Lower Calderwood AUMS	Lower Calderwood % Utilization	Horsehead AUMS	Horsehead % Utilization
2016	400	30%	229	35%	434	AGCR 52%	66	44%
2015	REST	REST	REST	REST	REST	REST	REST	REST
2014	569	61%	270	62%	246	AGCR 57%	135	
2013	400		319	55%	234		REST	REST
2012	348	41%	272	36%	272	AGCR 48%	144	64%
2011	197	37%	404	50%	274	AGCR 43%	REST	REST
2010	472	50%	357	45%	369	AGCR 40%	31	
2009	367	46%	290	55%	318	AGCR 64%	REST	REST
2008	75	53%	177		37	AGCR 35%	84	
2007	661	65%	520	56%	475	AGCR 64%	REST	REST
2006	760	35%	559	50%	508	AGCR 61%	161	
2005	256	54%	160		337	AGCR 30%	REST	REST
2004	281		292		409		104	
2003	566	42%	295	42%	250	AGCR 46%	REST	REST
2002	265		121	43%	185	AGCR 52%	76	63%
2001	360		286		534		REST	REST
2000	51	50%	547	58%	319	AGCR 52%	75	58%
1999	651	66%	779	67%	550	AGCR 63%	REST	REST
1998	205	38%	416	44%	474		165	
AVE	**382**	**46%**	**350**	**50%**	**346**	**AGCR 51%**	**104**	**57%***

- This pasture is used every other year and if the rest years were averaged with use years the average utilization would be 28%.

The Verlay, Upper Calderwood and Lower Calderwood pastures are primarily crested wheatgrass seedings and are grazed almost every year. The grazing schedule varies for a period of time between Mid-March to late April each year.

The Horsehead pasture is a mid-elevation pasture which is rested every other year. The grazing period varies between late April and early June and is 7-10 days long.

Table 5. Actual Use and Percent Utilization in the Mid-Elevation Pastures

YEAR	West Mud Lake AUMS	West Mud Lake % Utilization	Fairy Flat AUMS	Fairy Flat % Utilization	Famine Lake AUMS	Famine Lake % Utilization	Fisher Canyon AUMS	Fisher Canyon % Utilization
2016	REST	REST	REST	REST	REST	REST	139	52%
2015	256	47%	238	37%	REST	REST	REST	REST
2014	REST	REST	REST	REST	REST	REST	112	
2013	150		294		293		REST	REST
2012	REST	REST	REST	REST	REST	REST	49	43%
2011	310	40%	369	41%	411	27%	REST	REST
2010	REST	REST	REST	REST	REST	REST	128	
2009	240	38%	249	41%	REST	REST	REST	REST
2008	REST	REST	240		REST	REST	188	
2007	291	54%	REST	REST	233	67%	REST	REST
2006	REST	REST	REST	REST	REST	REST	175	
2005	397		408	41%	491	50%	REST	REST
2004	REST	REST	REST	REST	REST	REST	176	
2003	272	45%	426		106	43%	REST	REST
2002	REST	REST	REST	REST	REST	REST	114	39%
2001	315		393		39		REST	REST
2000	REST	REST	REST	REST	REST	REST	114	32%
1999	325	45%	283	7%	478	43%	REST	REST
1998	315		REST	REST	REST	REST	121	
AVE *	**287**	**45%**	**322**	**33%**	**292**	**46%**	**132**	**42%**

- These mid-elevation pastures are on alternate year schedule, grazing one year and rested the next. Therefore the average AUMS and utilization numbers are an average of the years they are used.

West Mud Lake, Fairy Flat and Famine Lake pastures are all mid-elevation pastures on the same grazing schedule. They are all grazed the same year and rested the next year. Fisher Canyon pasture is on the alternate schedule and grazed when the other three pastures shown here are rested.

Table 6. Actual Use and Percent Utilization in the Mid-Elevation Pastures

YEAR	Wool Lake AUMS	Wool Lake % Utilization	Robinson Lake AUMS	Robinson Lake % Utilization	Mud Lake AUMS	Mud Lake % Utilization	Fish Lake AUMS	Fish Lake % Utilization
2016	325	53%	189	50%	251		114	
2015	REST	REST	REST		REST	REST	REST	REST
2014	164		206		217		112	
2013	REST	REST	REST	REST	REST	REST	85	
2012	287		REST	REST	289	53%	92	
2011	REST	REST	REST	REST	REST	REST	84	24%
2010	304	53%	112	46%	279		REST	REST
2009	REST	REST	REST	REST	REST	REST	83	28%
2008	286	51%	218	51%	158		93	39%
2007	REST	REST	REST	REST	REST	REST	164	
2006	238		308		299		129	
2005	REST	REST	REST	REST	REST	REST	87	
2004	145		138		305		85	
2003	REST	REST	REST	REST	REST	REST	18	47%
2002	337	43%	260	38%	151	53%	60	50%
2001	REST	REST	REST	REST	REST	REST	135	
2000	211	39%	286	45%	263	46%	175	50%
1999	REST	REST	REST	REST	REST	REST	111	26%
1998	290		260		400	48%	104	
AVE*	**259**	**48%**	**220**	**46%**	**261**	**50%**	**102**	**38%**

- These mid-elevation pastures are on alternate year schedule, grazing one year and rested the next. Therefore the average AUMS and utilization numbers are an average of the years they are used.
- Wool Lake , Robinson Lake and Mud Lake are on the same grazing schedule as Horsehead Lake in Table__.
- Fish Lake is primarily used as a trialing pasture and therefore is used a low level during most years.

Table 7. Actual Use and Utilization in the Late Season Pastures

YEAR	Monument AUMS	Monument % Utilization	May Lake AUMS	May Lake % Utilization	Long Lake AUMS	Long Lake % Utilization	Juniper AUMS	Juniper % Utilization
2016	REST		598 E	38%	128		244 L	32%
2015	172	44%	418 L		44	21%	483 E	37%
2014	REST		475 E		107		271 L	
2013	155		207 L		50		613 E	
2012	185	47%	475 E	36%	93		257 L	36%
2011	176	31%	400 L	29%	77	55%	893 E	31%
2010	REST		576 E		121		311 L	
2009	242	26%	315 L	34%	57		920 E	42%
2008	REST		606 E		118		311 L	
2007	152		351 L	35%	76		1044 E	
2006	REST		820 E		187		469 L	
2005	142		231 L		37		887 E	
2004	REST		842 E		131		468 L	
2003	128		407 L		REST		920 E	
2002	REST		694 E		147		694 L	
2001	184		393 L		184		787 E	
2000	137*		675 E	18%	137*	27%	668 L	18%
1999	133	28%	507 L		REST		1038 E	
1998	REST		598 E	30%	181		618 L	33%
AVE	**164**	**35%**	**Early* 636**	**31%**	**110**	**34%**	**Early* 843**	**37%**
			Late 359**	**33%**			**Late** 431**	**30%**

- Early Season was growing season and varied from Late May-Mid July and was about 35 days

** Late season was deferred till after seed ripe and varied from Mid-July to Mid-August and was about 20-25 days

Monument pastures is grazed when Juniper pasture is used early and cattle use Monument before going into May Lake. It is usually rested when the May Lake is used early and Juniper Late.

Long Lake is used when May Lake is early used early and before cattle move into Juniper. Long Lake is also briefly used at the end of the season as a holding pasture when May Lake is used late.

Table 8. Dominant Vegetation in the O'Keeffe Allotment (00216)

Vegetation Type	Acres	Percent of Allotment
AGCR - Crested Wheatgrass	**1973**	4%
BRTE - Cheatgrass	**2645**	5%
ELEOL - spikerush	**73**	0.1%
AGROP2- Intermediate wheatgrass	**61**	0.1%
JUNCU* - Rush	**65**	0.1%
RUMEX - Dock	**88**	0.2%
Shrubs		
ARTRV Mountain big sagebrush	37	T
CHNA2 – rubber rabbitbrush	87	0.2%
ARCA 13 Silver sagebrush	741	1%
ARCA 13 –AGROP2 Silver sagebrush-wheatgrass	75	0.1%
Shrubs TOTAL	**940**	**2%**
Shrubs/Grasses		
CHRYS9-POSE rabbitbrush-Sandberg bluegrass	65	0.1%
ARCA13-PONE3 Silver sagebrush/Nevada bluegrass	355	0.7%
GRSP-BRTE spiney hopsage- cheatgrass	324	0.6%
SAVE-BRTE Greasewood-cheatgrass	1	T
Shrub/Grass TOTAL	**745**	**1.4%**
Low sagebrush/Grass		
ARAR-STTH Low sagebrush/Thurber's needlegrass	8	T
ARAR-POSE Low sagebrush/Sandberg bluegrass	27,861	52%
ARAR-SIHY Low sagebrush/bottlebrush squirreltail	239	0.4%
Low sagebrush/Grass TOTAL	**28,108**	**52%**
Big Sagebrush/Grass		
ARTRT-AGSP big sagebrush/blue bunch wheatgrass	723	1.3%
ARTR-BRTE big sagebrush/cheatgrass	789	1.5%
ARTRT-POSE big sagebrush/Sandberg bluegrass	3,194	6%
ARTRT-SIHY big sagebrush/bottlebrush squirreltail	745	1.4%
ARTRT-STTH big sagebrush/Thurber's needlegrass	2,268	4%
Big Sage/Grass TOTAL	**7,719**	**14%**
Mountain Big Sagebrush/Grass		
ARTRV-FEID Mountain big sage/Idaho fescue	11	T
Mountain Big Sagebrush/Grass TOTAL	**11**	**T**
Juniper/ Big Sagebrush/Grass		
JUOC-ARTR-FEID Juniper/ Big Sagebrush/Idaho fescue	441	0.8%
JUOC-ARTR-POA++ Juniper/ Big Sagebrush/bluegrass	107	0.2%
JUOC-ARTR-ELCI Juniper/ Big Sagebrush/basin wildrye	315	0.6%
Juniper/ Big Sagebrush/Grass TOTAL	**863**	**2%**

JUOC/ARAR/FEID Juniper/ Low Sagebrush/Idaho fescue	**80**	0.1%
TOTAL VEGETATION	**43,371**	**80%**
Playa	81	0.2%
Water	448	0.8%
Rockland/Rubble	1,989	4%
Unknown	1,390	2.5%
Incomplete	182	0.3%
Inclusions**	6,514	12%
ALLOTMENT TOTAL	**53,975**	

** The plant codes represent genus-species abbreviations adopted by USDA-NRCS; see also Plants Database available at http://www.plants.usda.gov).*

*** Every Site Writeup Area (SWA) has a 10-15% portion of that area that is considered inclusions of different (often unknown or unmapped) vegetation communities.*

Table 9. Observed Apparent Trend of Vegetation in the O'Keeffe Allotment (00216)

Vegetation Type	Acres	Percent of Allotment	OAT Acres			
			up	Static	Down	unk
AGCR - Crested Wheatgrass	**1973**	4%	3	1969	-	
BRTE - Cheatgrass	**2645**	5%	-	1276	1369	
ELEOL - spikerush	**73**	0.1%		73		
AGROP2- wheatgrass	**61**	0.1%		61		
JUNCU* - Rush	**65**	0.1%	-	-	65	
RUMEX - Dock	**88**	0.2%	3	85	-	
Shrubs						
ARTRV Mountain big sagebrush	37	T	-	-	-	37
CHNA2 – rubber rabbitbrush	87	0.2%	-	87	-	
ARCA 13 Silver sagebrush	741	1%	-	741	-	
ARCA 13 –AGROP2 Silver sagebrush-wheatgrass	75	0.1%	-	75	-	
Shrubs TOTAL	**940**	**2%**	**-**	**940**	**-**	
Shrubs/Grasses						
CHRYS9-POSE rabbitbrush-Sandberg bluegrass	65	0.1%	-	65	-	
ARCA13-PONE3 Silver sagebrush/Nevada bluegrass	355	0.7%	-	355	-	
GRSP-BRTE spiney hopsage- cheatgrass	324	0.6%	-	324	-	
SAVE-BRTE Greasewood-cheatgrass	1	T	-	1	-	
Shrub/Grass TOTAL	**745**	**1.4%**	**-**	**745**		
Low sagebrush/Grass						
ARAR-STTH Low sagebrush/Thurber's needlegrass	8	T	-	8	-	
ARAR-POSE Low sagebrush/Sandberg bluegrass	27,861	52%	1254	26,607	-	
ARAR-SIHY Low sagebrush/bottlebrush squirreltail	239	0.4%	-	239	-	
Low sagebrush/Grass TOTAL	**28,108**	**52%**	**1254**	**26854**		
Big Sagebrush/Grass						
ARTRT-AGSP big sagebrush/blue bunch wheatgrass	723	1.3%	103	620	-	
ARTR-BRTE big sagebrush/cheatgrass	789	1.5%	-	789	-	
ARTRT-POSE big sagebrush/Sandberg bluegrass	3,194	6%	-	3194	-	
ARTRT-SIHY big sagebrush/bottlebrush squirreltail	745	1.4%	-	745		
ARTRT-STTH big sagebrush/Thurber's needlegrass	2,268	4%	796	1166	306	
Big Sage/Grass TOTAL	**7,719**	**14%**	**899**	**6514**	**306**	
Mountain Big Sagebrush/Grass						
ARTRV-FEID Mountain big sage/Idaho fescue	11	T	11	-	-	

Mountain Big Sagebrush/Grass TOTAL	**11**	**T**	**11**	**-**	**-**	
Juniper/ Big Sagebrush/Grass						
JUOC-ARTR-FEID Juniper/ Big Sagebrush/Idaho fescue	441	0.8%	441	-	-	
JUOC-ARTR-POA++ Juniper/ Big Sagebrush/bluegrass	107	0.2%	107	-	-	
JUOC-ARTR-ELCI Juniper/ Big Sagebrush/basin wildrye	315	0.6%	315	-	-	
				-	-	
Juniper/ Big Sagebrush/Grass TOTAL	**863**	**2%**	**863**	**-**	**-**	
JUOC/ARAR/FEID Juniper/ Low Sagebrush/Idaho fescue	**80**	0.1%	80	-	-	
TOTAL VEGETATION	**43,371**	**80%**	**3200**	**38,531**	**1740**	
Playa	81	0.2%				
Water	448	0.8%				
Rockland/Rubble	1,989	4%				
Unknown	1,390	2.5%				
Incomplete	182	0.3%				
Inclusions**	6,514	12%				
ALLOTMENT TOTAL	**53,975**					

** The plant codes represent genus-species abbreviations adopted by USDA-NRCS; see also Plants Database available at http://www.plants.usda.gov).*

*** Every Site Writeup Area (SWA) has a 10-15% portion of that area that is considered inclusions of different (often unknown or unmapped) vegetation communities.*

Table 10. Ecological Condition Rating Vegetation in the O'Keeffe Allotment (00216)

Vegetation Type	Acres	Percent of Allotment	Acres within seral Stage				
			PNC	Late	Mid	Early	Unknown
AGCR - Crested Wheatgrass	**1973**	4%		3	-	1970 66%D(I) 34%B	-
BRTE - Cheatgrass	**2645**	5%	-	-	551 75%D(I) 25%C(I)	2094 35%B 65%D(I)	-
ELEOL - spikerush	**73**	0.1%	-	73*	-	-	-
AGROP2- wheatgrass	**61**	0.1%	-	-	-	61*	-
JUNCU** - Rush	**65**	0.1%	65*	-	-	-	-
RUMEX - Dock	**88**	0.2%	-	-	88*	-	-
Shrubs							
ARTRV Mountain big sagebrush	37	T	-	-	-		37C(I)
CHNA2 – rubber rabbitbrush	87	0.2%	-	-	-	87A	-
ARCA 13 Silver sagebrush	741	1%	-	-	--	741*	-
ARCA 13 –AGROP2 Silver sagebrush-wheatgrass	75	0.1%	-	-	-	75*	-
Shrubs TOTAL	**940**	**2%**	**-**	**-**	**-**	**903**	**37**
Shrubs/Grasses							
CHRYS9-POSE rabbitbrush-Sandberg bluegrass	65	0.1%	-	-	65A	-	-
ARCA13-PONE3 Silver sagebrush/Nevada bluegrass	355	0.7%	-	163*	62*	130*	-
GRSP-BRTE spiney hopsage-cheatgrass	324	0.6%	-	-	324C(I)	-	-
SAVE-BRTE Greasewood-cheatgrass	1	T	-	1		-	-
Shrub/Grass TOTAL	**745**	**1.4%**	**-**	**164**	**541**	**130**	**-**
Low sagebrush/Grass							
ARAR-STTH Low sagebrush/Thurber's needlegrass	8	T	-	-	8A	-	-
ARAR-POSE Low sagebrush/Sandberg bluegrass	27,861	52%	-	9265 69%A 24%C(D) 7%D(D)	18583 84%A 16%C(D)	-	13C(D)
ARAR-SIHY Low sagebrush/bottlebrush squirreltail	239	0.4%	-	239A	-	-	-
Low sagebrush/Grass TOTAL	**28,108**	**52%**	**-**	**9504**	**18591**	**-**	**13**
Big Sagebrush/Grass							

ARTRT-AGSP big sagebrush/blue bunch wheatgrass	723	1.3%	-	562C(D)	161A	-	-
ARTR-BRTE big sagebrush/cheatgrass	789	1.5%	-	-	789 54%A 46%C(D)	-	-
ARTRT-POSE big sagebrush/Sandberg bluegrass	3,194	6%	-	-	2759 26%A 15%B 41%C(D) 33%E	435C(I)	-
ARTRT-SIHY big sagebrush/bottlebrush squirreltail	745	1.4%	-	144A	-	601 33%A 33%C(D) 33%E	-
ARTRT-STTH big sagebrush/Thurber's needlegrass	2,268	4%	-	1100 96%A 4%D(D)	710 49%A 51%C(D)	-	458A
Big Sage/Grass TOTAL	**7,719**	**14%**	**-**	**1806**	**4419**	**1036**	**458**
Mountain Big Sagebrush/Grass							
ARTRV-FEID Mountain big sage/Idaho fescue	11	T	-	11A	-	-	-
Mountain Big Sagebrush/Grass TOTAL	**11**	**T**	**-**	**11**	**-**	**-**	**-**
Juniper/ Big Sagebrush/Grass							
JUOC-ARTR-FEID Juniper/ Big Sagebrush/Idaho fescue	441	0.8%	-	441C(D)	-	-	-
JUOC-ARTR-POA++ Juniper/ Big Sagebrush/bluegrass	107	0.2%	-	-	-	107D(D)	-
JUOC-ARTR-ELCI Juniper/ Big Sagebrush/basin wildrye	315	0.6%	-	-	315D(D)	-	-
Juniper/ Big Sagebrush/Grass TOTAL	**863**	**2%**	**-**	**441**	**315**	**107**	**-**
JUOC/ARAR/FEID Juniper/ Low Sagebrush/Idaho fescue	**80**	0.1%	-	80C(D)	-	-	-
TOTAL VEGETATION	**43,371**	**80%**	**65***	**12082 65%A 27%C(D) 6%D(D) 2%***	**24415 71%A 20%C(D) 4%C(I) 1%D(D) 2%D(I) 2%B**	**6301 5%A 22%B 10%C(D) 7%C(I) 42%D(I) 3%E 16%***	**508 90%A 7%C(I) 3%C(D)**
Playa	81	0.2%					

Water	448	0.8%					
Rockland/Rubble	1,989	4%					
Unknown	1,390	2.5%					
Incomplete	182	0.3%					
Inclusions***	6,514	12%					
ALLOTMENT TOTAL	**53,975**						

** The vegetation is mapped in the STM model as water or lakebed and has no state designation*

***The plant codes represent genus-species abbreviations adopted by USDA-NRCS; see also Plants Database available at http://www.plants.usda.gov).*

**** Every Site Writeup Area (SWA) has a 10-15% portion of that area that is considered inclusions of different (often unknown or unmapped) vegetation communities.*

Table 10a. Ecological Condition Rating of each mapped State (STM) in the O'Keeffe Allotment (00216)

The percent of each mapped state (STM) by Ecological condition rating (ESI)								
Ecological condition	State A	State B	State C(I)	State C(D)	State D(I)	State D(D)	State E	Lakebed or water
Climax	0	0	0	0	0	0	0	5%
Late	31%	0	0	40%	0	62%	0	17%
Mid	68%	0	67%	58%	13%	28%	0	6%
Early	1%	100%	30%	2%	87%	10%	100%	72%
Unknown	0.2%	0	3%	T	0	0	0	0
Percent of mapped vegetation in allotment	60%	4%	3%	19%	7%	3%	0.5%	3%

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Table 11. Long Term Monitoring Points located in O'Keeffe Individual Allotment

Pasture	ESI Vegetation type	Plot #	Year Est.	Plot Type
Mud Lake	ARCA13 Silver sagebrush 23-200	OK-01	1966	PP
Horsehead Lake	ARCA13-AGROP Silver sagebrush/wheatgrass 23-200	OK-02	1966	PP / Step-toe
Upper Calderwood	AGCR crested wheatgrass 24-016	OK-03	1966	PP / Step-toe
Long Lake	ARCA13-PONE Silver sagebrush/Nevada bluegrass 23-200	OK-04	1966	PP / Step-toe
Mud Lake	ARCA13 Silver sagebrush/ 23-200	OK-05	1964	PP / Step-toe
Mud Lake	ARCA13 Silver sagebrush/ 23-200	OK-06	1964	PP
Fairy Flat	ARAR-POSE low sagebrush/Sandberg bluegrass 23-218	OK-07	1964	PP / Step-toe
West Mud Lake	ARTR-POSE big sagebrush/ Sandberg bluegrass 23-220	OK-08	1987	PP / Step-toe
Fish Lake	AGROP wheatgrass 23-200	OK-09	1968	PP
Juniper	ARAR-POSE low sagebrush/Sandberg bluegrass 23-218	OK-10	1971	PP / Step-toe
May Lake	ARAR-POSE low sagebrush/Sandberg bluegrass 23-214	OK-11	1971	PP / Step-toe
Verley Seeding	AGCR crested wheatgrass 24-016	OK-12	1973	PP / Step-toe
Lower Calderwood	AGCR crested wheatgrass 24-016	OK-13	1970	PP / Step-toe
Verley Seeding	BRTE cheatgrass 24-016	OK-14	2000	PP / Step-toe
Verley Seeding	BRTE cheatgrass 24-016	OK-15	2000	PP / Step-toe
Verley Seeding	BRTE cheatgrass 24-016	OK-16	2000	PP
Verley Seeding	BRTE cheatgrass 24-016	OK-17	2000	PP
Wool Lake	ARAR-POSE low sagebrush/Sandberg bluegrass 23-218	OK-18	1972	PP / Step-toe
Robinson Lake	ARTR-SIHY big sagebrush/bottle squirreltail 23-220	OK-19	1972	PP / Step-toe
Robinson Lake	ARAR-POSE low sagebrush/Sandberg bluegrass 23-218	OK-20	1975	PP / NF
Fisher Canyon	ARAR-POSE low sagebrush/Sandberg bluegrass 23-218	OK-21	1995	PP / NF

Table 12. Summary of long-term plots including photos and transect data by pasture

Mud Lake Pasture			
Transects	**OK-01**	**OK-05**	**OK-06**
ESI Vegetation	ARCA13-AGROP Silver sagebrush/Intermediate Wheatgrass	ARCA Silver sagebrush	ARCA Silver sagebrush
Potential			

TREND ANALYSIS OK-01, OK-05 and OK-06

Sites were seeded in 1960's and 13-17 years of photos were taken between 1966-2015 at each of the Trend Plots. At OK-1 and OK-06 the crested wheatgrass plants had disappeared by 1996, as the Mud Lake reservoir was drained and the Mud Flat was flooded for about 2 months. This action killed all the perennial grass on the southern 3/4 of the lakebed and this included OK-01 and OK-06. Currently these sites are dominated by Silver Sagebrush and annual forbs. The photos indicate significant annual forb production and sagebrush ground cover and no apparent soil erosion in this lakebed. The photos OK-05 was invaded by Sagebrush by 1985 but Crested Wheatgrass persists. A step-toe cover transect was established at OK-05 in 2012 and the Crested wheatgrass cover was 15% in 2012 and 25% in 2016 (Table).

In the last 20 years these trend plots in Mud lake have been stable even as OK-1 and Ok -06 have remained at an early seral stage and would require some rehabilitation effort to restore perennial grass to this site.

Table 13. Summary of long-term plots including photos and transect data by pasture

Horsehead Lake Pasture		Upper Calderwood
Transects	**OK-02.**	**OK-03**
ESI Vegetation	ARCA Silver sagebrush	AGCR Crested Wheatgrass
Potential		

TREND ANALYSIS OK-02 and OK-03

The OK-02 Site was seeded in 1960's and 14 years of photos were taken between 1966-2016 at the Trend Plot. At OK-2 the crested wheatgrass plants had disappeared by 1996 and this site became dominated by Silver Sagebrush and annual forbs.

The OK-03 site in Upper Calderwood pasture was sprayed and seeded to crested wheatgrass in 1963. There were 12 years of photos taken between 1966 and 2016 and the crested wheatgrass stand has remained stable during this entire period. A step-toe cover transect was established at OK-03 in 2012 and the Crested wheatgrass cover was 22% in 2016 (Table 21).

In the last 20 years these trend plots in both Horsehead and Upper Calderwood Pastures have been stable even as OK-2 has remained at an early seral stage and would require some rehabilitation effort to restore perennial grass to this site.

Table 14. Summary of long-term plots including photos and transect data by pasture

	Long Lake Pasture	Fairy Flat Pasture
Transects	OK-04.	OK-07
ESI Vegetation	ARCA13-PONE Silverbrush/Nevada bluegrass	ARAR-POSE low sagebrush/Sandberg bluegrass
Potential	23-200	23-218

TREND ANALYSIS OK-04 and OK-07

The OK-4 Site re-established in 1987 and 9 years photos were taken between 1987 and 2016. In 1987 some silver sagebrush had reinvaded the site and has increased in density and production since that time. A step-toe cover transect was established at OK-04 in 1987 and the transect was sampled 7 times between 1987 and 2016. The cover and relative frequency data shows Cusick's bluegrass has remained stable but there is an increase in Silver sagebrush from 1987 to the present. The herbaceous plants (grasses and forbs) increase during the wetter years (2005 and 2011) and decreased during droughts like 2012 (Table 25).

It appears that the construction of the Long Lake Dike in 1984 altered the water flow and changed the vegetation composition at OK-04. Since 1984 water has been impounded south of the transect resulting in that portion of the playa north of the dam rarely get flooded, which has allowed silver sage to invade the site around OK-04.

At OK-07 there were 9 years of photos taken between 1966 and 2016. The low sagebrush cover and density appeared to be stable during this time, but there may have been less grass cover in 2012 and 2015 than in previous years. This would correspond with drought that occurred between in 2012 and 2015.
Sandberg bluegrass cover was 9% and low sagebrush was 22% basal cover in 2015 (Table 27). The relative frequency of Sandberg bluegrass was 41% in both 2012 and 2015 with low sagebrush at 35% and 39% in 2012 and 2015 respectively (Table 27). These are relative composition percentages in line with the expected plant composition for a low sagebrush/Sandberg bluegrass site.

Table 15. Summary of long-term plots including photos and transect data by pasture

West Mud Lake Pasture		Fish Lake Pasture
Transects	**OK-08.**	**OK-09**
ESI Vegetation	ARTR-POSE big sagebrush/ Sandberg bluegrass	AGROP wheatgrass
Potential	23-220	23-200

TREND ANALYSIS OK-08 and OK-09

The OK-8 Site established in 1987 and 7 years of photos and step-toe cover transect data were collected between 1987 and 2016. The herbaceous cover of grasses and forbs were stable during this period with Sandberg bluegrass and Thurber's needlegrass being the dominant grasses (Table 28). However the big sagebrush cover and relative frequency appears to have declined while the density and size of juniper trees has increased. This is apparent in the photos and with line intercept transect data taken in 2000 and 2012 (Table 28).

At OK-09 there were 16 years of photos taken between 1964 and 2016. The lakebed was seeded to intermediate wheatgrass in 1964. There was wheatgrass present and vigorous in 1985 but by 1996 the wheatgrass was scattered and only vigorous along the drainage. It appears the drought in the early 1990's may have resulted in the loss of most of the intermediate wheatgrass plants with the exception of the plants along the drainage. The photos indicate significant annual forb production and ground cover and no apparent soil erosion in this lakebed. This condition has remained stable from 1996 until 2016.

In the last 20 years these trend plots in both pastures appear to be stable with the exception of an increase in juniper density and the resulting loss of sagebrush cover in the West Mud Lake pasture.

Table 16. Summary of long-term plots including photos and transect data by pasture

Juniper Pasture		May Lake Pasture	
Transects	OK-10	OK-11	
ESI Vegetation	ARAR-POSE low sagebrush/Sandberg bluegrass 23-218	ARAR-POSE low sagebrush/Sandberg bluegrass	
Potential	23-218	23-214	

TREND ANALYSIS OK-10 and OK-11

The OK-10 Site established in 1971 and 11 of years photos were taken between 1971 and 2016. In 1985 a step-toe cover transect was established and 8 years of cover and frequency data have been collected (Table 29). The exception was 1990 when nested frequency method was used and therefore cannot be compared to other years. The photos shows the presence of low sagebrush and Sandberg bluegrass in similar proportions thru the years, with vigor and production oscillating in response to precipitation. The cover and relative frequency data shows Sandberg bluegrass and low sagebrush are the dominant plants and remained relatively stable 1987 to the present (Table 29).

At OK-11 there were 16 years of photos taken between 1971 and 2016. The grass and low sagebrush cover and density appeared stable during this time. There was a step-toe cover transect established in 2012 and Sandberg bluegrass and low sagebrush is the dominant cover vegetation at this site (Table 30). Trend cannot be determined from only two years of data. The cover and relative composition percentages are in line with the expected plant composition for a low sagebrush Sandberg bluegrass site.

Table 17. Summary of long-term plots including photos and transect data by pasture

	Verlay Seeding					Lower Calderwood
Transects	**OK-12.**	**OK-14**	**OK-15**	**OK-16**	**OK-17**	**OK-13**
ESI Vegetation	AGCR Crested Wheatgrass	BRTE cheatgrass	BRTE cheatgrass	BRTE cheatgrass	BRTE cheatgrass	AGCR Crested Wheatgrass
Potential		24-016	24-016	24-016	24-016	24-016

TREND ANALYSIS

The OK-12 Site established in 1976 and 11 of years photos were taken between 1976 and 2016. The photos show a vigorous crested wheatgrass seeding that has remained stable. There was a step-toe cover transect established in 2000 and 5 years of data were collected between 2000 and 2016 (Table 22). Crested wheatgrass is the dominant perennial species but cheatgrass is also present. The plant cover and frequency has been stable and is consistent with crested wheatgrass seeding.

The OK-14, OK-15, OK-16 and OK-17 were established in 2000 to monitor the broadcast seeding that was done in 1999 following a wildfire in this area. The photos for these sites illustrate that the broadcast seeding was not very successful as all the sites are dominated by cheatgrass and annual forbs. There is only scattered crested wheatgrass and bottlebrush squirreltail present.

The OK-13 site was established in 1970 and 13 years of photos were taken between 1970 and 2016. The photos illustrate the crested wheatgrass is stable but there is some invasion of rabbitbrush and later sagebrush into the edges of the seeding in recent years. In 2012 a step-toe cover transect was established and crested wheatgrass is the dominant vegetation at this site (Table 23). Trend cannot be determined from only two years of data. The cover and relative composition percentages are in line with the expected plant composition for a crested wheatgrass seeding, but the 5% cover of Wyoming big sagebrush does demonstrate that sagebrush is slowly returning to the site (Table 23).

Table 18. Summary of long-term plots including photos and transect data by pasture

Wool Lake Pasture		Fisher Canyon Pasture
Transects	**OK-18**	**OK-21**
ESI Vegetation	ARAR-POSE low sagebrush/Sandberg bluegrass 23-218	ARAR-POSE low sagebrush/Sandberg bluegrass
Potential	23-218	23-218

TREND ANALYSIS OK-18 and OK-21

The OK-18 site established in 1972 and 9 of years photos were taken between 1972 and 2016. The photos illustrate in increase in vegetation cover and vigor since 1972. In 1975 a step-toe cover transect was established and 5 years of cover and frequency data have been collected (Table 31). The cover data shows an increase in vegetation cover from 10% in 1975 to 34% in 2016 (Table 31). The site appear to be trending toward more upland vegetation. The cover and relative frequency data shows Sandberg bluegrass and low sagebrush are the dominant plants and remained relatively stable 2002 to the present (Table 31).

There was a prescribed fire in Fisher canyon in 1995 and OK-21 was established to monitor any changes. There were 3 years of photos taken between 1995 and 2016. The photos don't show any noticeable changes except for a continued increase in the density and size of the juniper trees. In 1998 about 10% of the site around OK-21 was actually burned during the prescribed fire. There was nested frequency transect established in 1995 before the fire and read again in 1996, 1998 and 2012 (Table 34). The grass and low sagebrush cover and density appeared stable during this time.

Table 19. Summary of long-term plots including photos and transect data by pasture

Robinson Lake		
Transects	OK-19	OK-20
ESI Vegetation	ARTR-SIHY big sagebrush/bottle squirreltail	ARAR-POSE low sagebrush/Sandberg bluegrass
Potential	23-220	23-218

TREND ANALYSIS OK-19 and OK-20

The OK-19 Site established in 1972 and 12 of years photos were taken between 1972 and 2016. This site is at the southern edge of the big sagebrush/ bottlebrush squirreltail community and near the boundary of a low sagebrush/Sandberg bluegrass community. It should have been mapped as a low sagebrush/Sandberg bluegrass community. In 1975 a step-toe cover transect was established and 6 years of cover and frequency data have been collected (Table 32). The site was partially burned by prescribed fire in 1996. In the photos prior to the prescribed fire in 1996 the site was stable with sagebrush and Sandberg bluegrass being dominant. After the fire there was a reduction of sagebrush on part of the site and an increase in grass cover. By 2012 there was a return of sagebrush to the site. The cover and relative frequency data shows Sandberg bluegrass and low sagebrush are the dominant plants with sagebrush being reduced by the fire but recovered by 2012 (Table 32). The prescribed burn reduced the juniper density, and the grass and shrub composition and cover were in line with the expected composition for a low sagebrush Sandberg bluegrass site.

At OK-20 there were 4 years of photos taken between 1995 and 2012. Following the prescribed burn in 1996 there was an obvious reduction in shrubs and an increase in in grasses and forb cover, especially annual grasses. By 2012 the shrubs are still largely absent but there is more perennial grass. The nested frequency transects (Table 33) demonstrated an increase in the frequency of perennial grasses, Sandberg bluegrass (27%-70%), Thurber's needlegrass (8%-24%) and bottlebrush squirreltail (7%-26%) between 1995 and 2012. There was no measureable increase in sagebrush cover or frequency from 1996- 2012 (Table 33). The site is stable following the prescribed fire, but low sagebrush is slow to recover following a fire and this site demonstrates the long term effects of burning in low sagebrush communities.

Table 20. AIM PLOTS BY PASTURE, ESI MAPPED VEGETATION, SOILS AND ESD

Pasture	Plot ID	ESI Vegetation	Soil	Ecological Site Description (ESD)
Calderwood Seeding	LA_INT-01	ARTR/BRTE big sagebrush/ cheatgrass	Very Cobbly Loam	ARTRWY/ACTH/PSSP Wyoming big sagebrush/Thurbers needlegrass/bluebunch wheatgrass
Calderwood Seeding	LA_INT-05	BRTE cheatgrass	Very Cobbly Loam	ARTRWY/ACTH/PSSP Wyoming big sagebrush/Thurbers needlegrass/bluebunch wheatgrass
Fairy Flat	LA_INT-014	ARTR-STTH	Loam with Claypan	ARTRWY/PSSP Wyoming big sagebrush/bluebunch wheatgrass
West Mud Lake	SFA_UPS_SS-647	ARTR-POSE ARAR-POSE	Very Stoney Loam Thin Surface	ARTRWY/PSSP Wyoming big sagebrush/bluebunch wheatgrass
Famine Lake	SFA_WE_RI-799	ARAR-POSE	Very Stoney Loam Thin Surface	ARTRWY/PSSP Wyoming big sagebrush/bluebunch wheatgrass
Wool Lake	LA_INT-019	ARAR-POSE	Extremely Stoney Loam	ARAR/PSSP Low sagebrush/bluebunch wheatgrass
Monument	SFA_GRSG-093	ARAR-POSE	Loam with Claypan	ARAR/PSSP Low sagebrush/bluebunch wheatgrass
May Lake	LA-INT-007	ARAR-POSE	Very Stoney Loam Thin Surface	ARAR/PSSP Low sagebrush/bluebunch wheatgrass
May Lake	LA_INT-011	ARAR-POSE	Loam with Claypan	ARAR/PSSP Low sagebrush/bluebunch wheatgrass
May Lake	SFA_UPSH-664	ARAR-POSE	Loam with Claypan	ARAR/PSSP Low sagebrush/ bluebunch wheatgrass
May Lake	LA_UPSH-646	ARAR-POSE	Loam with Claypan	ARAR/POSE Low sagebrush/ Sandberg bluegrass
Juniper Lake	LA_INT-015	ARAR-POSE	Very Stoney Loam Thin Surface	ARAR/PSSP Low sagebrush/ bluebunch wheatgrass
Juniper Lake	LA_GRSG-206	ARAR-POSE	Loam with Claypan	ARAR/PSSP Low sagebrush/bluebunch wheatgrass
Juniper Lake	LA_INT-03	ARAR-POSE	Very stoney loam thin surface	ARAR/POSE Low sagebrush/ Sandberg bluegrass
Juniper Lake	LA_INT-018	ARAR-POSE	Very stoney loam thin surface	ARAR/POSE Low sagebrush/Sandberg bluegrass
Juniper Lake	LA_GRSG-095	ARAR-POSE	Very stoney loam thin surface	ARAR/POSE Low sagebrush/Sandberg bluegrass
Juniper Lake	SFA_UPSH-657	ARAR-POSE	Very stoney loam thin surface	ARAR/POSE Low sagebrush/Sandberg bluegrass
Juniper Lake	LA_UPSH-758	ARAR-POSE	Very stoney loam thin surface	ARAR/POSE Low sagebrush/Sandberg bluegrass

Table 21. FREQUENCY/PACE TOE POINT SUMMARY
VERLAY PASTURE STUDY PLOT: OK-03

YEAR	2012	2016
BAREGROUND	**The cover data was collected incorrectly Therefore is not used**	18%
ROCK		1%
LITTER		55%
VEGETATION		26%
Species		
AGCR		22%
POSE		1%
BRTE		2%
PPFF		1%
FREQUENCY		
AGCR	100%	94%
POSE	0	5%
BRTE	29%*	17%*
ERCI Erodium	0	12%*
PPFF	0	1%

- These are Annual plants and the frequency was recorded as the closest plant but closet perennial was also recorded and therefore total exceeds 100%.

Table 22. NESTED FREQUENCY SUMMARY
VERLAY SEEDING STUDY PLOT: OK-12

YEAR	2000	2003	2006	2012	2016
BAREGROUND	4%	11%	11%	18%	27%
ROCK/Gravel	4%	4%	1%	9%	5%
LITTER	60%	27%	53%	15%	47%
VEGETATION	32%	58%	35%	57%	21%
AGCR	19%	27%	18%	17%	14%
BRTE	12%	21%	17%	39%	6%
FORB	1%	10	0	1%	0
DEPI	0	0	0	0	1%
FREQUENCY*					
AGCR	70%	68%	41%	100%	100%
FORB	15%	10%	0	0	0
BRTE	15%	21%	59%	46%	50%*
DEPI	0	0	0	0	5%*
PHGR	0	0	0	0	7%*
SYAL	0	0	0	0	1%*

* The closest plant is used instead of just perennial plant. Otherwise AGCR is 100%

Table 23. FREQUENCY/PACE TOE POINT SUMMARY
CALDERWOOD PASTURE STUDY PLOT: OK-13

YEAR	2012	2016
BAREGROUND	**The cover data was collected incorrectly Therefore is not used**	24%
ROCK		4%
LITTER		35%
VEGETATION		37%
Species		
AGCR		11%
POSE		3%
BRTE		13%
MOSS		1%
CRCA2		1%
PPFF		2%
CHRY		1%
ARTRW		5%
RELATIVE FREQUENCY		
AGCR	68%	66%
POSE	0	17%
BRTE	19%*	33%*
DEPI	0	2%
PHDI	0	1%
CHRY	7%	1%
ARTRW	23%	6%
TECA	2%	0

- These are Annual plants and the frequency was recorded as the closest plant but closet perennial was also recorded and therefore total exceeds 100%.

The Line intercept transects (3) done in 2012 found shrub canopy cover

TRANSECT #	ARTRW	CHRY
1North	4%	0
2West	13.2%	0
3South	2.1%	0.6%
AVERAGE	6.4%	0.2%

Table 24. NESTED FREQUENCY SUMMARY

VERLAY SEEDING STUDY PLOT: OK-15

YEAR	2000	2006	2012	2016
BAREGROUND	7%	2%	6%	9%
ROCK/Gravel	16%	15%	5%	21%
LITTER	24%	43%	14%	24%
MOSS	0	0	0	1%
VEGETATION	52%	40%	75%	40%
AGCR	0	0%	0	0
SIHY	2%	5%	0	3%
BRTE	31%	35%	66%	18%
ATRIPLEX	1%	0	1%	1%
FORB	18%	0	5%	0
ERCI	0	0	0	15%
DEPI	0**	0	3%	5%
Lepidium	0	0	0	2%
FREQUENCY				
SIHY	95%	7%	0	89%
ATRIPLEX	1%	0	100%	10%
AGCR	4%	0	0	0
POSE	0	1%	0	0
FORB	39%	0	0	0
BRTE	54%	91%	88%*	33%*
DEPI	0**	0	8%	7%*
ERCI	0	0	0	34%*
Astragalus	0	0	0	1%

These are Annual plants and the frequency was recorded as the closest plant but closet perennial was also recorded and therefore total exceeds 100%.

Descurainia piñata or tumble mustard was common it was not recorded.

Table 25. FREQUENCY/PACE TOE POINT SUMMARY

Long Lake Pasture Study Plot OK-4

YEAR	1987	2000	2005	2008	2011	2012	2016
BAREGROUND	51%	47%	51%	63%	62%	76%	47%
ROCK	0	0	0	0	0	0	0
LITTER	21%	34%	21%	25%	12%	2%	24%
VEGETATION	28%	19%	28%	12%	26%	22%	29%
Species							
HOJU	9%	0	0	0	0	0	2%
POSE	0	1%	0	0	0	0	4%
POCU	1%	7%	11%	4%	11%	3%	7%
JUNCUS	8%	0	0	0	1%	0	0
RUMEX	1%	0	0	0	0	0	0
FORBS	3%	0	0	0	0	0	0
ARCA	6%	6%	13%	5%	14%	19%	12%
CAREX	0	5%	2%	3%	0	0	0
Antennaria	0	0	0	0	0	0	1%
AAFF	0	0	2%	0	0	0	3%
RELATIVE FREQ							
HOJU	39%	0	0	0	0	0	7%
POSE	2%	2%	0	0	0	0	24%
POCU	5%	51%	48%	36%	35%	23%	41%
AGIN	1%	0	0	0	0	0	0
JUNCUS	24%	0	3%	0	11%	0	0

RUMEX	8%	0	0	0	0	0	0
FORBS	4%	0	0	0	0	0	0
ARCA	17%	13%	39%	40%	55%	60%	24%
CAREX	0	23%	10%	22%	0	7%	0
AAFF	0	10%	0	0	0	0	9%*
CHRYSOTHAM	0	1%	0	1%	0	0	0
Crepis	0	0	0	0	0	10%	0
Antennaria	0	0	0	0	0	0	1%
PLPA*	0	0	0	0	0	0	6%*
Erigeron	0	0	0	0	0	0	2%

- These are Annual plants and the frequency was recorded as the closest plant but closet perennial was also recorded and therefore total exceeds 100%.

The Line intercept transects (3) done in 2012 found shrub canopy cover

TRANSECT #	**ARCA**
1West	12.5%
2North	18.9%
3East	20.3%
AVERAGE	17.2%

Table 26. FREQUENCY/PACE TOE POINT SUMMARY
MUD LAKE PASTURE STUDY PLOT: OK-05

YEAR	2012	2016
BAREGROUND	33%	36%
LITTER	29%	17%
MOSS	0	1%
VEGETATION	35%	46%
Species Cover		
AGCR	15%	25%
POSE	10%	8%
BRTE	0	2%
KOCR	0	1%
PPFF	0	1%
DEPI	0	1%
ARCA	0	1%
ARAR	10%	7
Relative Frequency		
AGCR	54%	44%
KOCR	0	6%
POSE	24%	36%
BRTE	3%*	5%*
PPFF	0	1%
Carex	0	1%
ARCA	0	3%
ARAR	21%	8%

- These are Annual plants and the frequency was recorded as the closest plant but closet perennial was also recorded and therefore total exceeds 100%.

The Line intercept transects (3) done in 2012 found shrub canopy cover

TRANSECT #	ARAR	CHVI
1	15.0%	3.8%
2	25.4%	0
3	39.1%	0
AVERAGE	26.5%	1.3%

Table 27. FREQUENCY/PACE TOE POINT SUMMARY
FAIRY FLAT PASTURE STUDY PLOT OK-07

YEAR	2012	2016	
BAREGROUND	**The cover data was collected incorrectly Therefore is not used**	30%	
ROCK		17%	
LITTER		10%	
VEGETATION		43%	
Species Cover			
AGSP		1%	
POSE		9%	
BRTE		2%	
SIHY		1%	
PHLOX		2%	
MOSS		3%	
CHRY		3%	
ARAR		22%	
RELATIVE FREQUENCY			
AGSP	0	3%	
POSE	41%	41%	
BRTE	7*	6%*	
SIHY	1%	6%	
PHLOX	9%	4%	
CHRY	5%	5%	
ARAR	35%	39%	
FEID	2%	0	

- These are Annual plants and the frequency was recorded as the closest plant but closet perennial was also recorded and therefore total exceeds 100%.

The Line intercept transects (3) done in 2012 found shrub canopy cover

TRANSECT #	ARAR	CHRY
1North	24.2%	14.3%
2WEST	27.4%	8.4%
3South	37.6%	4.1%
AVERAGE	29.7%	8.9

Table 28. FREQUENCY/PACE TOE POINT SUMMARY

WEST MUD LAKE PASTURE STUDY PLOT OK-08

YEAR	1987	1990	2000	2006	2009	2012	2015
Bareground	30%	38%	18%	27%	24%	**The cover data was collected incorrectly Therefore is not used**	34%
Gravel	16%	0	0	0	3%		0
Rock	6%	14%	8%	9%	8%		5%
Litter	28%	0	32%	24%	36%		30%
Vegetation	20%	48%	41%	40%	29%		31%
STTH	1%	4%	2%	1%	5%		4%
SIHY	0	1%	1%	0	5%		1%
ELTR	0	1%	0	0	0		0
FEID	0	0	2%	0	0		0
POSE	10%	14%	19%	27%	9%		15%
KOCR	0	0	0	0	1%		0
ELCI	0	0	0	0	1%		0
JUOC	0	0	0	0	2%		0
PPFF	0	20%	0	0	0		0
ERIGERON	2%	0	0	0	0		0
BRTE	0	1%	0	1%	0		5%
CHRY	0	0	1%	2%	3%		0
ERIOG	1%	0	3%	0	0		0
PHLOX	2%	0	0	0	0		0
ARTR	3%	7%	13%	6%	2%		6%
MOSS	1%	0	0	3%	0		0
POA Species	0	0	0	0	1%		0
% FREQUENCY							
STTH	3%	8%	11%	2%	15%	1%	6%
AGSP	1%	0	0	0	0	10%	0
POSE	57%	63%	56%	87%	50%	46%	76%
SIHY	6%	4%	7%	2%	15%	40%	11%

KOCR	0	0	0	0	2%	0	0
ELCI	0	0	0	0	3%	0	0
FEID	0	0	7%	0	1%	2%	0
POASPP	0	0	1%	0	3%	0	0
ELTR	0	1%	0	0	0	0	0
CAREX	0	1%	0	0	0	0	0
BRTE**	**0**	**3%**	**4%**	**1%**	0	0	**5%**
ASTRAG	2%	0	0	0	0	0	0
ERIOG	2%	0%	3%	0	0	0	0
ERIGERON	6%	0%	0	0	0	0	0
ARTR	12%	23%	14%	6%	2%	1%	6%
CHRYSO	1%	0	1%	2%	3%	0	0
PPFF	0	**32%***	1%	0	0	0	0
TRDU	0	0	0	0	3%	0	0
Antennnaria	0	0	0	0	1%	0	0
PHLOX	9%	0	0	0	0	0	0
JUOC	0	0	0	0	2%	0	1%

* This number in the PPFF includes all forbs and the nearest perennial grass or shrub was also included so this 32% is not included in the 100% frequency.

** The frequency of BRTE Bromus tectorium (Cheatgrass) was calculated when it was the closet plant. All the other frequency measures were measures of the closet perennial plants ignoring the cheatgrass.

The Line intercept transect (1) done in 2000 found shrub canopy cover

TRANSECT #	ARTR
1	**23%**

This transect was run North from Photo stake and was in the same general direction as the North transect read in 2012.

The Line intercept transects (3) done in 2012 found shrub canopy cover

TRANSECT #	ARTR	CHNA	JUOC	CHVI	
1 West	8.9%	4.4%	5.9%	0	
2 North	2.6%	5.6%	0	1.7%	
3 East	0	2.1%	10.1%	0	
AVERAGE	3.8%	4%	5.3%	0.6%	

TABLE 29. NESTED FREQUENCY SUMMARY

JUNIPER PASTURE STUDY PLOT: OK-10

PERCENT BASAL GROUND COVER								
YEAR	1985	1990*	1998	2005	2008	2011	2012	2015
BAREGROUND	16%	33%	5%	18%	11%	1%	18%	18%
ROCK/Gravel	19%	23%	34%	21%	37%	39%	41%	19%
LITTER	12%	21%	16%	29%	20%	34%	9%	24%
VEGETATION	53%	23%	44%	28%	32%	26%	32%	39%
STTH	0		3%	1%	1%	0	0	0
SIHY	5%		1%	0	2%	0	1%	0
POSE	22%		15%	11%	19%	13%	11%	22%
ARAR	5%		8%	14%	8%	10%	10%	11%
AAFF	7%		4%	0	1%	0	0	0
FEID	4%		0	0	1%	2%	4%	0
ERIOGONUM	3%		0	0	0	0	0	0
Phlox	6%		11%	2%	0	0	6%	2%
MOSS	1%		1%	4%	0	1%	0	1%
RELATIVE FREQUENCY								
SIHY	13%	48%	4%	3%	11%	0	3%	2%
STTH	0	6%	6%	6%	1%	0	0	0
POSE	42%	90%	49%	54%	70%	69%	45%	80%
ARAR	11%		21%	28%	11%	16%	15%	16%
AAFF	19%	0	8%*	0	0	0	0	0
FEID	4%	0	0	0	2%	15%	13%	0

Phlox	1%	0	20%	10%	0	0	14%	2%

* IN 1990 the transect was done using a polycorder and the Nested Frequency method was used. Therefore this year is impossible to compare to the other years when the step-toe transect method was used.

The Line intercept transects (3) done in 2012 found shrub canopy cover in OK-10

TRANSECT #	**ARAR**
1 SOUTH	10.7%
2 EAST	14.4%
3 NORTH	6.9%
AVERAGE	10.7%

Table 30. FREQUENCY/PACE TOE POINT SUMMARY
MAY LAKE PASTURE STUDY PLOT: OK-11

YEAR	2012	2016
BAREGROUND	The cover data was collected incorrectly Therefore is not used	34%
ROCK		13%
LITTER		16%
VEGETATION		37%
Species		
SIHY		5%
POSE		5%
BRTE		6%
Carex		2%
AAFF		4%
ARAR		15%
RELATIVE FREQUENCY		
SIHY	26%	14%
POSE	27%	50%
BRTE	0	15%*
AAFF	4%*	25%*
Phlox	8%	0
PPFF	0	1%*
Carex	1%	2%
POCU	0	1%
ARAR	38%	32%

- These are Annual plants and the frequency was recorded as the closest plant but closet perennial was also recorded and therefore total exceeds 100%.

The Line intercept transects (3) done in 2012 found shrub canopy cover

TRANSECT #	ARAR
1North	12.1%
2East	21.1%
3South	19.2%
AVERAGE	**21.8%**

TABLE 31. Step-Toe FREQUENCY SUMMARY

WOOL LAKE PASTURE STUDY PLOT: OK-18

PERCENT BASAL GROUND COVER					
YEAR	**1975**	**2002**	**2010**	**2012**	**2016**
BAREGROUND	42%	24%	18%	27%	13%
ROCK/Gravel	28%	28%	22%	16%	35%
LITTER	20%	27%	22%	10%	18%
VEGETATION	10%	21%	38%	47%	34%
Crpytogram	0	1%	1%	0	0
STTH	1%	0	2%	1%	1%
SIHY	1%	1%	0		1%
POSE	4%	12%	13%	10%	13%
ARAR	0	6%	19%	18%	16%
Crepis	0	0	1%	0	0
POA	2%	0	1%	0	0
Carex	1%	1%	1%	0	1%
AGSP	1%	0	0	0	0
BRJA	0	0	0	0	2%
JUOC	0	0	0	18%	0
RELATIVE FREQUENCY					
SIHY	11%	5%	5%	0	6%
STTH	1%	1%	6%	2%	2%
POSE	21%	61%	57%	50%	58%
ARAR	23%	23%	23%	30%	28%
Chrysothmnus	0	1%	1%	0	0
Carex	22%	9%	4%	0	4%
Crepis	0	0	1%	0	0
AGSP	5%	0	0	0	1%
ARTR	0	0	0	0	1%
JUOC	3%	0	0	18%	0
Aster	1%	0	0	0	0
PONE	2%	0	3%	0	0
Lomatium	5%	0	0	0	0
Rumex	2%	0	0	0	0
Aster	1%	0	0	0	0
BRJA	0	0	0	0	14%*
AAFF	0	0	0	0	1%*

- These are Annual plants and the frequency was recorded as the closest plant but closet perennial was also recorded and therefore total exceeds 100%.

TABLE 32. NESTED FREQUENCY SUMMARY

ROBINSON LAKE PASTURE STUDY PLOT: OK-19

PERCENT BASAL GROUND COVER						
YEAR	1975	1998*	2002	2010	2012	2016
BAREGROUND	33%	24%	22%	18%	23%	15%
ROCK/Gravel	22%	26%	8%	14%	10%	16%
LITTER	31%	24%	22%	26%	12%	24%
VEGETATION	14%	26%	48%	42%	55%	44%
Crpytogram	0	0	0	3%	0	1%
STTH	1%	1%	0	1%	0	0
SIHY	1%	1%	5%	2%	1%	0
POSE	10%	4%	20%	16%	25%	9%
ARTR**	1%	0	0	0	0	0
ARAR**	0	19%	17%	18%	26%	33%
Crepis	0	0	3%	0	0	0
FEID	1%	0	0	0	0	0
FORB	0	1%	0	0	0	0
Phlox	0	0	0	0	1%	0
Carex	0	0	1%	0	0	0
Chrysothamnus	0	0	2%	2%	2%	1%
FREQUENCY						
SIHY	10%	5%	5%	7%	1%	2%
STTH	1%	9%	1%	3%	1%	4%
POSE	36%	30%	54%	64%	60%	56%
ARAR	22%	42%	33	23%	35%	36%
Chrysothmanus	1%	0	3	2%	2%	2%
Carex	2%	0	1	1%	0	0
Crepis	0	0	3	0	0	0
KOCR	0	6	0	0	0	0
AGSP	1%	1	0	0	0	0
ARTR	10%	0	0	0	0	0
JUOC	2%	0	0	0	0	0
Aster	2%	0	0	0	0	0
Phlox	2%	0	0	0	1%	0
Pone	6%	0	0	0	0	0
Eriogonum	1%	0	0	0	0	0
FEID	3%	0	0	0	0	0

** The site was a mixture of low sagebrush (ARAR) and big Sagebrush (ARTR) in 1975,but following the site being burned in 1996 the identification of the sagebrush became more difficult but it appears that most of the sagebrush that has recovered is the low sage (ARAR).

The Line intercept transects (3) done in 2012 found shrub canopy cover

TRANSECT #	**ARAR**	**JUOC**			
1 Southeast	21.4%	0			
2 West	21.1%	0.3%			
3 Northwest	22.7%	0			
AVERAGE	**21.7%**	**0.1%**			

Table 33. NESTED FREQUENCY SUMMARY
ROBINSON LAKE STUDY PLOT: OK-20

YEAR	1995*	1996	1998	2012
BAREGROUND	17%	27%	9%	17%
ROCK/Gravel	22%	26%	15%	13%
LITTER	41%	32%	45%	11%
MOSS	0	0	0	0
VEGETATION	20%	15%	31%	59%
POSE	4%	1%	No cover data collected by species	3%
BRJA	0	0		4%
SIHY	1%	0.5%		2%
BRTE	4%	8%		44%
STTH	0.5%	0.25%		3%
AGSP	0.25%	0.25%		0
ARAR	9%	1%		0
ARTR	0.75%	1%		1%
FORBS	0.5%	3%		2%
CHNA	0.25%	0		0
FREQUENCY				
SIHY	7%	17%	38%	26%
CAREX	0	0	0	0
PONE	7%	0	0	0
POSE	27%	23%	8%	70%
BRJA	0	0	0	86%
BRTE	49%	83%	99	96%
STTH	8%	3%	11%	24%
FEID	0	0	2%	0
Erigeron	0	0	0	8%
AAFF	56%	66%	98%	10%
Eriogonum	0	0	0	2%
ARAR	38%	0	0	0
ARTR	3%	4%	6%	2%
AGSP	1%	3%	4%	2%
DEPI	0	0	0	46%
CHVI	1%	0	0	4%

- The 1995 transect was run before the Fisher Canyon prescribed fire

TABLE 34. NESTED FREQUENCY SUMMARY
FISHER CANYON STUDY PLOT: OK-21

YEAR	1995*	1996	1998	2012	
BAREGROUND	18%	10%	14%	15%	
ROCK/Gravel	21%	34%	30%	14%	
LITTER	32%	29%	26%	10%	
MOSS	0	0	0	6%	
VEGETATION	29%	27%	30%	55%	
POSE	4%	9%	No cover data collected by species	13%	
SIHY	T	1		0.4%	
BRJA	0	0		1%	
CAREX	0	6%		4%	
STTH	2%	0		5%	
FEID	1%	2%		0	
AGSP	1%	0		0	
KOCR	2%	T		0	
Eriogonum	0	0		4%	
Erigeron	0	0		0.4%	
PHLOX	0	0		0.4%	
ARAR	12%	9%		17%	
JUOC	4%	0		9%	
CHVI	2%	0		0.4%	
FREQUENCY*					
SIHY	13%	11%	12%	14%	
CAREX	0	40%	23%	34%	
PONE	0	20%	62%	0	
POSE	51%	79%	48%	92%	
BRJA	0	0	33%	28%	
BRTE	1%	11%	0	4%	
STTH	31%	0	9%	42%	
AGSP	16%	0	0	0	
KOCR	9%	5%	1%	0	
FEID	2%	9%	0	0	
PHLOX	0	0	0	4%	
Erigeron	0	0	0	8%	
PPFF	17%	43%	81%	2%	
AAFF				12%	

Eriogonum	0	0	0	24%	
ARAR	37%	40%	37%	54%	
JUOC	5%	2%	1%	16%	
ARCA	0	0	5%	0	
CHVI	20%	0	4%	4%	

- The 1995 transect was run before the Fisher Canyon prescribed fire

The Line intercept transects (3) done in 2012 found shrub canopy cover

TRANSECT #	**ARAR**	**JUOC**
1 North	4.2%	0
2 East	25.8%	10.4%
3 South	37.8%	0
AVERAGE	**22.6%**	**3.5%**

Table 35. LA_INT-01 Calderwood Seeding ARTR/BTRE

Cover/Litter Report

Summary Category	Total Points	Avg Percent
Foliar Cover	77	51.3
Bare Ground	40	26.7
Basal Cover	2	1.3
Total Ground Cover	77	51.3
Ground Cover Between-Plant Cover	33	22.0
Ground Cover Under-Plant Cover	44	29.3
Total Litter	45	30.0
Litter Between-Plant Cover	10	6.7
Litter Under-Plant Cover	35	23.3

Cover Estimates by Species

Species	Scientific	Common	Year	Average Annual Foliar Cover %	Average Annual Basal Cover %
ARTRT	A. tridentata spp. tridentata	Basin big sagebrush	2016	2.7	0.0
ARTRW8	A. tridentata spp. wyomingensis	Wyoming big sagebrush	2016	18.0	1.3
BRTE	Bromus tectorum	Cheatgrass	2016	38.0	0.0
PLMA4	Plectritis macrocera	Longhorn plectritis	2016	1.3	0.0
POSE	Poa secunda	Sandberg bluegrass	2016	2.0	0.0

Table 36. LA_INT-05 Calderwood Pasture BRTE

Cover/Litter Report

Summary Category	Total Points	Avg Percent
Foliar Cover	80	53.3
Bare Ground	28	18.7
Basal Cover	1	0.7
Total Ground Cover	69	46.0
Ground Cover Between-Plant Cover	42	28.0
Ground Cover Under-Plant Cover	27	18.0
Total Litter	40	26.7
Litter Between-Plant Cover	24	16.0
Litter Under-Plant Cover	16	10.7

Cover Estimates by Species

Species	Scientific	Common	Year	Average Annual Foliar Cover %	Average Annual Basal Cover %
AMMEI2	Amsinckia menziesii var. intermedia	common fiddleneck	2016	4.7	0.0
ARTRW8	A. tridentata spp. wyomingensis		2016	3.3	0.0
BRTE	Bromus tectorum	Cheatgrass	2016	30.0	0.7
CHVI8	Chrysothamnus viscidiflorus	Green rabbitbrush	2016	2.7	0.0
CRAC2	Crepis acuminata	tapertip hawksbeard	2016	1.3	0.0
CROC	Crepis occidentalis	largeflower hawksbeard	2016	0.7	0.0
DRVE2	Draba verna	spring draba	2016	3.3	0.0
ELEL5	Elymus elymoides	squirreltail	2016	0.7	0.0
ERNA10	Ericameria nauseosa	Rubber rabbitbrush	2016	1.3	0.0
PHHO	Phlox hoodii	spiny phlox	2016	1.3	0.0
PHLOL2	Phlox longifolia ssp. longifolia	longleaf phlox	2016	0.7	0.0
POSE	Poa secunda	Sandberg bluegrass	2016	13.3	0.0

Table 37. SFA_GRSG-093 Monument Pasture ARAR-POSE

Cover/Litter Report

Summary Category	Total Points	Avg Percent
Foliar Cover	100	66.7
Bare Ground	18	12.0
Basal Cover	2	1.3
Total Ground Cover	104	69.3
Ground Cover Between-Plant Cover	32	21.3
Ground Cover Under-Plant Cover	72	48.0
Total Litter	18	12.0
Litter Between-Plant Cover	4	2.7
Litter Under-Plant Cover	14	9.3

Cover Estimates by Species

Species	Scientific	Common	Year	Average Annual Foliar Cover %	Average Annual Basal Cover %
AGGLL	Agoseris glauca var. laciniata	false agoseris	2016	3.3	0.0
ALPA3	Allium parvum	small onion	2016	0.7	0.0
ARAC2	Arenaria aculeata	prickly sandwort	2016	9.3	0.0
ARARA	Artemisia arbuscula ssp. arbuscula	low sagebrush	2016	14.0	1.3
ASFI	Astragalus filipes	basalt milkvetch	2016	0.7	0.0
COGR2	Collinisia grandiflora	giant blue-eyed Mary	2016	0.7	0.0
ELEL5	Elymus elymoides	squirreltail	2016	4.7	0.0
ERBL	Erigeron bloomeri	scabland fleabane	2016	0.7	0.0
LOTR2	Lomatium triternatum	nineleaf biscuitroot	2016	18.7	0.0
PHHO	Phlox hoodii	spiny phlox	2016	2.0	0.0
PHLOL2	Phlox longifolia ssp. longifolia	longleaf phlox	2016	1.3	0.0
POSE	Poa secunda	Sandberg bluegrass	2016	25.3	0.0
TRMA3	Trifolium macrocephalum	largehead clover	2016	5.3	0.0

Table 38. SFA_UPS_SS-647 West Mud Lake ARTR/POSE ARAR-POSE

Cover/Litter Report

Summary Category	Total Point	Avg Percen
Foliar Cover	98	65.3
Bare Ground	42	28.0
Basal Cover	9	6.0
Total Ground Cover	50	33.3
Ground Cover Between-Plant Cover	10	6.7
Ground Cover Under-Plant Cover	40	26.7
Total Litter	23	15.3
Litter Between-Plant Cover	1	0.7
Litter Under-Plant Cover	22	14.7

Cover Estimates by Species

Species	Scientific	Common	Year	Average Annual Foliar Cover %	Average Annual Basal Cover %
ARARA	Artemisia arbuscula ssp. arbuscula	low sagebrush	2016	14.7	1.3
ARCO5	Arenaria congesta	ballhead sandwort	2016	0.7	0.0
ARTRW8	A. tridentata spp. wyomingensis	Wyoming big sagebrush	2016	5.3	0.7
BRTE	Bromus tectorum	Cheatgrass	2016	24.0	0.0
DEINI2	Descurainia incana ssp. incisa	mountain tansymustard	2016	2.0	0.0
ELEL5	Elymus elymoides	squirreltail	2016	5.3	0.0
ERBL	Erigeron bloomeri	scabland fleabane	2016	0.7	0.0
ERNA10	Ericameria nauseosa	Rubber rabbitbrush	2016	3.3	0.0
POSE	Poa secunda	Sandberg bluegrass	2016	29.3	4.0

Table 39. SFA_WE_RI-799 Famine Lake ARAR-POSE

Cover/Litter Report

Summary Category	Total Points	Avg Percent
Foliar Cover	118	78.7
Bare Ground	14	9.3
Basal Cover	1	0.7
Total Ground Cover	92	61.3
Ground Cover Between-Plant Cover	18	12.0
Ground Cover Under-Plant Cover	74	49.3
Total Litter	59	39.3
Litter Between-Plant Cover	5	3.3
Litter Under-Plant Cover	54	36.0

Cover Estimates by Species

Species	Scientific	Common	Year	Average Annual Foliar Cover %	Average Annual Basal Cover %
ACTH7	Achnatherum thurberianum	Thurber's needlegrass	2016	4.0	0.0
ARARA	Artemisia arbuscula ssp. arbuscula	low sagebrush	2016	21.3	0.0
BASE4	Balsamorhiza sericea	silky balsamroot	2016	0.7	0.0
BRTE	Bromus tectorum	Cheatgrass	2016	42.7	0.0
CRAC2	Crepis acuminata	tapertip hawksbeard	2016	0.7	0.0
DEPI	Descurainia pinnata	western tansymustard	2016	0.7	0.0
JUOC	Juniperus occidentalis	Western juniper	2016	8.7	0.7
LAGL5	Layia glandulosa	whitedaisy tidytips	2016	0.7	0.0
MIGR	Microseris gracilis	slender phlox	2016	1.3	0.0
POSE	Poa secunda	Sandberg bluegrass	2016	18.0	0.0
TEGL	Tetradymia glabrata	littleleaf horsebrush	2016	2.7	0.0

Table 40. LA-INT-019 Wool Lake ARAR-POSE

Cover/Litter Report

Summary Category	Total Points	Avg Percent
Foliar Cover	73	48.7
Bare Ground	58	38.7
Basal Cover	1	0.7
Total Ground Cover	55	36.7
Ground Cover Between-Plant Cover	19	12.7
Ground Cover Under-Plant Cover	36	24.0
Total Litter	41	27.3
Litter Between-Plant Cover	13	8.7
Litter Under-Plant Cover	28	18.7

Cover Estimates by Species

Species	Scientific	Common	Year	Average Annual Foliar Cover %	Average Annual Basal Cover %
AGGLL	Agoseris glauca var. laciniata	false agoseris	2016	2.0	0.0
ALAC4	Allium acuminatum	tapertip onion	2016	1.3	0.0
ARARA	Artemisia arbuscula ssp. arbuscula	low sagebrush	2016	32.0	0.0
ASFI	Astragalus filipes	basalt milkvetch	2016	3.3	0.0
COPA3	Collinsia parviflora	maiden blue-eyed Mary	2016	1.3	0.0
PF021			2016	0.7	0.0
PF18			2016	0.7	0.0
PHLOL2	Phlox longifolia ssp. longifolia	longleaf phlox	2016	0.7	0.0
POSE	Poa secunda	Sandberg bluegrass	2016	14.0	0.7
TRMA3	Trifolium macrocephalum	largehead clover	2016	0.7	0.0

Table 41. LA_INT-014 Fairy Flat ARTR-STTH

Cover/Litter Report

Summary Category	Total Points	Avg Per cent
Foliar Cover	78	52.0
Bare Ground	59	39.3
Basal Cover	2	1.3
Total Ground Cover	47	31.3
Ground Cover Between-Plant Cover	13	8.7
Ground Cover Under-Plant Cover	34	22.7
Total Litter	43	28.7
Litter Between-Plant Cover	12	8.0
Litter Under-Plant Cover	31	20.7

Cover Estimates by Species

Species	Scientific	Common	Year	Average Annual Foliar Cover %	Average Annual Basal Cover %
ACTH7	Achnatherum thurberianum	Thurber's needlegrass	2016	5.3	0.0
ARAR8	Artemisia arbuscula	Low sagebrush	2016	14.0	0.7
ARTRW8	A. tridentata spp. wyomingensis	Wyoming big sagebrush	2016	13.3	0.7
ASCU4	Astragalus curvicarpus	curvepod milkvetch	2016	0.7	0.0
BRTE	Bromus tectorum	Cheatgrass	2016	2.0	0.0
CHVI8	Chrysothamnus viscidiflorus	Green rabbitbrush	2016	5.3	0.0
COGR2	Collinisia grandiflora	giant blue-eyed Mary	2016	2.7	0.0
COPA3	Collinsia parviflora	maiden blue-eyed Mary	2016	0.7	0.0
CRAM3	Cryptantha ambigua	basin cryptantha	2016	0.7	0.0

CROC	Crepis occidentalis	largeflower hawksbeard	2016	0.7	0.0
ELEL5	Elymus elymoides	squirreltail	2016	2.0	0.0
EPBR3	Epilobium brachycarpum	tall annual willowherb	2016	1.3	0.0
LECI4	Leymus cinereus	Basin wildrye	2016	3.3	0.0
LOVA	Lomatium vaginatum	broadsheath desertparsley	2016	0.7	0.0
MIGR	Microseris gracilis	slender phlox	2016	2.7	0.0
PHLO2	Phlox longifolia	longleaf phlox	2016	0.7	0.0
POSE	Poa secunda	Sandberg bluegrass	2016	4.0	0.0
TRMA3	Trifolium macrocephalum	largehead clover	2016	2.7	0.0

Table 42. LA_INT-011 May Lake ARAR-POSE

Cover/Litter Report

Summary Category	Total Points	Avg Percent
Foliar Cover	73	48.7
Bare Ground	21	14.0
Basal Cover	4	2.7
Total Ground Cover	100	66.7
Ground Cover Between-Plant Cover	56	37.3
Ground Cover Under-Plant Cover	44	29.3
Total Litter	21	14.0
Litter Between-Plant Cover	8	5.3
Litter Under-Plant Cover	13	8.7

Cover Estimates by Species

Species	Scientific	Common	Year	Average Annual Foliar Cover %	Average Annual Basal Cover %
AGGLL	Agoseris glauca var. laciniata	false agoseris	2016	3.3	0.0
ARARA	Artemisia arbuscula ssp. arbuscula	low sagebrush	2016	14.7	2.0
COPA3	Collinsia parviflora	maiden blue-eyed Mary	2016	2.0	0.0
ELEL5	Elymus elymoides	squirreltail	2016	5.3	0.7
ERBL	Erigeron bloomeri	scabland fleabane	2016	1.3	0.0
GETR	Geum triflorum	old man's whiskers	2016	0.7	0.0
LOTR2	Lomatium triternatum	nineleaf biscuitroot	2016	2.0	0.0
LOVA	Lomatium vaginatum	broadsheath desertparsley	2016	20.0	0.0
POSE	Poa secunda	Sandberg bluegrass	2016	6.7	0.0
TRMA3	Trifolium macrocephalum	largehead clover	2016	2.0	0.0

Table 43. LA_UPSH-646 May Lake ARAR-POSE

Cover/Litter Report

Summary Category	Total Points	Avg Percent
Foliar Cover	90	60.4
Bare Ground	34	22.8
Basal Cover	1	0.7
Total Ground Cover	57	38.4
Ground Cover Between-Plant Cover	25	16.8
Ground Cover Under-Plant Cover	32	21.6
Total Litter	30	20.2
Litter Between-Plant Cover	11	7.4
Litter Under-Plant Cover	19	12.8

Cover Estimates by Species

Species	Scientific	Common	Year	Average Annual Foliar Cover %	Average Annual Basal Cover %
ALAC4	Allium acuminatum	tapertip onion	2016	3.3	0.0
ARARA	Artemisia arbuscula ssp. arbuscula	low sagebrush	2016	33.0	0.0
ASFI	Astragalus filipes	basalt milkvetch	2016	2.7	0.0
COPA3	Collinsia parviflora	maiden blue-eyed Mary	2016	3.3	0.0
ELEL5	Elymus elymoides	squirreltail	2016	1.3	0.0
LONE	Lomatium nevadense	Nevada biscuitroot	2016	2.0	0.0
PF18			2016	0.7	0.0
PF27			2016	0.7	0.0
PHLOL2	Phlox longifolia ssp. longifolia	longleaf phlox	2016	2.0	0.0
POPO4	Polygonum polygaloides	milkwort knotweed	2016	6.7	0.0

POSE	Poa secunda	Sandberg bluegrass	2016	16.7	0.7

Table 44. SFA_UPSH-664 May Lake ARAR-POSE

Cover/Litter Report

Summary Category	Total Points	Avg Percent
Foliar Cover	123	82.0
Bare Ground	16	10.7
Basal Cover	3	2.0
Total Ground Cover	80	53.3
Ground Cover Between-Plant Cover	11	7.3
Ground Cover Under-Plant Cover	69	46.0
Total Litter	67	44.7
Litter Between-Plant Cover	6	4.0
Litter Under-Plant Cover	61	40.7

Cover Estimates by Species

Species	Scientific	Common	Year	Average Annual Foliar Cover %	Average Annual Basal Cover %
AF002			2016	0.7	0.0
AGGLL	Agoseris glauca var. laciniata	false agoseris	2016	5.3	0.0
ALAC4	Allium acuminatum	tapertip onion	2016	3.3	0.0
ALFI	Allium fibrillum	Cuddy Mountain onion	2016	0.7	0.0
ANST2	Antennaria stenophylla	narrowleaf pussytoes	2016	1.3	0.0
ARARA	Artemisia arbuscula ssp. arbuscula	low sagebrush	2016	34.0	2.0
ARCOC	Arenaria congesta var. cephaloidea	sharptip sandwort	2016	0.7	0.0
CADO2	Carex douglasii	Douglas’sedge	2016	1.3	0.0
CAMA5	Calochortus macrocarpus	sagebrush mariposa lily	2016	1.3	0.0
COGR2	Collinisia grandiflora	giant blue-eyed Mary	2016	0.7	0.0
COPA3	Collinsia parviflora	maiden blue-eyed Mary	2016	10.7	0.0
DENU3	Delphinium nuttallii	upland larkspur	2016	4.7	0.0
DRVE2	Draba verna	spring draba	2016	2.0	0.0
ELEL5	Elymus elymoides	squirreltail	2016	0.7	0.0
GR005			2016	0.7	0.0
HISC2	Hieracium scouleri	Scouler's woollyweed	2016	1.3	0.0
LEMO4	Leucocrinum montanum	common starlily	2016	0.7	0.0
LOTR2	Lomatium triternatum	nineleaf biscuitroot	2016	4.7	0.0
MEBU	Melica bulbosa	Oniongrass	2016	7.3	0.0
PF069			2016	0.7	0.0
POSE	Poa secunda	Sandberg bluegrass	2016	34.7	0.0
TROL	Trifolium oliganthum	fewflower clover	2016	5.3	0.0

Table 45. LA_INT_07 May Lake ARAR-POSE

Cover/Litter Report

Summary Category	Total Points	Avg Percent
Foliar Cover	89	59.3
Bare Ground	24	16.0
Basal Cover	1	0.7
Total Ground Cover	86	57.3
Ground Cover Between-Plant Cover	37	24.7
Ground Cover Under-Plant Cover	49	32.7
Total Litter	27	18.0
Litter Between-Plant Cover	7	4.7
Litter Under-Plant Cover	20	13.3

Cover Estimates by Species

Species	Scientific	Common	Year	Average Annual Foliar Cover %	Average Annual Basal Cover %
AGGLL	Agoseris glauca var. laciniata	false agoseris	2016	2.0	0.0
ARARA	Artemisia arbuscula ssp. arbuscula	low sagebrush	2016	28.0	0.7
ASFI	Astragalus filipes	basalt milkvetch	2016	0.7	0.0
CETE5	Ceratocephala testiculata	Bur buttercup	2016	0.7	0.0
COPA3	Collinsia parviflora	maiden blue-eyed Mary	2016	4.7	0.0
CROC	Crepis occidentalis	largeflower hawksbeard	2016	0.7	0.0
ELEL5	Elymus elymoides	squirreltail	2016	2.0	0.0
ERBL	Erigeron bloomeri	scabland fleabane	2016	2.7	0.0
ERUM	Eriogonum umbellatum	sulphur-flower buckwheat	2016	0.7	0.0
LONE	Lomatium nevadense	Nevada biscuitroot	2016	3.3	0.0
MIGR	Microseris gracilis	slender phlox	2016	0.7	0.0
PF33			2016	2.0	0.0
PHHO	Phlox hoodii	spiny phlox	2016	2.0	0.0
POPO4	Polygonum polygaloides	milkwort knotweed	2016	6.0	0.0
POSE	Poa secunda	Sandberg bluegrass	2016	13.3	0.0

Table 46. LA_INT-015 Juniper ARAR-POSE

Cover/Litter Report

Summary Category	Total Points	Avg Percent
Foliar Cover	70	46.7
Bare Ground	19	12.7
Basal Cover	0	0.0
Total Ground Cover	94	62.7
Ground Cover Between-Plant Cover	61	40.7
Ground Cover Under-Plant Cover	33	22.0
Total Litter	26	17.3
Litter Between-Plant Cover	12	8.0
Litter Under-Plant Cover	14	9.3

Cover Estimates by Species

Species	Scientific	Common	Year	Average Annual Foliar Cover %	Average Annual Basal Cover %
AGGL	Agoseris glauca	pale agoseris	2016	0.7	0.0
ARAC2	Arenaria aculeata	prickly sandwort	2016	4.7	0.0
ARAR8	Artemisia arbuscula	Low sagebrush	2016	16.0	0.0
ASFI	Astragalus filipes	basalt milkvetch	2016	0.7	0.0
COPA3	Collinsia parviflora	maiden blue-eyed Mary	2016	0.7	0.0
CROC	Crepis occidentalis	largeflower hawksbeard	2016	0.7	0.0
ELEL5	Elymus elymoides	squirreltail	2016	2.0	0.0
EPBR3	Epilobium brachycarpum	tall annual willowherb	2016	0.7	0.0
ERBL	Erigeron bloomeri	scabland fleabane	2016	0.7	0.0
ERSP7	Eriogonum sphaerocephalum	rock buckwheat	2016	0.7	0.0
LOVA	Lomatium vaginatum	broadsheath desertparsley	2016	8.7	0.0
PHHO	Phlox hoodii	spiny phlox	2016	2.7	0.0
POSE	Poa secunda	Sandberg bluegrass	2016	14.7	0.0
TRMA3	Trifolium macrocephalum	largehead clover	2016	1.3	0.0

Table 47. LA_INTS-018 Juniper ARAR-POSE

Cover/Litter Report

Summary Category	Total Points	Avg Percent
Foliar Cover	66	44.0
Bare Ground	16	10.7
Basal Cover	1	0.7
Total Ground Cover	123	82.0
Ground Cover Between-Plant Cover	68	45.3
Ground Cover Under-Plant Cover	55	36.7
Total Litter	41	27.3
Litter Between-Plant Cover	9	6.0
Litter Under-Plant Cover	32	21.3

Cover Estimates by Species

Species	Scientific	Common	Year	Average Annual Foliar Cover %	Average Annual Basal Cover %
ARAR8	Artemisia arbuscula	Low sagebrush	2016	16.7	0.0
BRTE	Bromus tectorum	Cheatgrass	2016	2.0	0.0
COGR2	Collinisia grandiflora	giant blue-eyed Mary	2016	0.7	0.0
COPA3	Collinsia parviflora	maiden blue-eyed Mary	2016	4.0	0.0
ELEL5	Elymus elymoides	squirreltail	2016	1.3	0.0
ERBL	Erigeron bloomeri	scabland fleabane	2016	0.7	0.0
ERNA10	Ericameria nauseosa	Rubber rabbitbrush	2016	3.3	0.0
FEID	Festuca idahoensis	Idaho fescue	2016	3.3	0.0
LIPA5	Lithophragma parviflorum	smallflower woodland-star	2016	0.7	0.0
PHCH	Phoenicaulis cheiranthoides	wallflower phoenicaulis	2016	1.3	0.0
POSE	Poa secunda	Sandberg bluegrass	2016	18.0	0.7

Table 48. LA_INTS-03 Juniper ARAR-POSE

Cover/Litter Report

Summary Category	Total Points	Avg Percent
Foliar Cover	62	41.3
Bare Ground	32	21.3
Basal Cover	0	0.0
Total Ground Cover	94	62.7
Ground Cover Between-Plant Cover	56	37.3
Ground Cover Under-Plant Cover	38	25.3
Total Litter	31	20.7
Litter Between-Plant Cover	10	6.7
Litter Under-Plant Cover	21	14.0

Cover Estimates by Species

Species	Scientific	Common	Year	Average Annual Foliar Cover %	Average Annual Basal Cover %
AGGL	Agoseris glauca	pale agoseris	2016	1.3	0.0
ANDI2	Antennaria dimorpha	low pussytoes	2016	1.3	0.0
ARAC2	Arenaria aculeata	prickly sandwort	2016	2.0	0.0
ARAR8	Artemisia arbuscula	Low sagebrush	2016	23.3	0.0
ASFI	Astragalus filipes	basalt milkvetch	2016	1.3	0.0
CHVI8	Chrysothamnus viscidiflorus	Green rabbitbrush	2016	0.7	0.0
COPA3	Collinsia parviflora	maiden blue-eyed Mary	2016	0.7	0.0
ELEL5	Elymus elymoides	squirreltail	2016	0.7	0.0
EPBR3	Epilobium brachycarpum	tall annual willowherb	2016	0.7	0.0
ERBL	Erigeron bloomeri	scabland fleabane	2016	1.3	0.0
ERLI	Erigeron linearis	desert yellow fleabane	2016	0.7	0.0
ERSP7	Eriogonum sphaerocephalum	rock buckwheat	2016	0.7	0.0
LOVA	Lomatium vaginatum	broadsheath desertparsley	2016	1.3	0.0
POSE	Poa secunda	Sandberg bluegrass	2016	8.7	0.0
TRMA3	Trifolium macrocephalum	largehead clover	2016	0.7	0.0

Table 49. SFA_UPSH-657 Juniper Lake ARAR-POSE

Cover/Litter Report

Summary Category	Total Points	Avg Percent
Foliar Cover	56	37.3
Bare Ground	28	18.7
Basal Cover	1	0.7
Total Ground Cover	94	62.7
Ground Cover Between-Plant Cover	66	44.0
Ground Cover Under-Plant Cover	28	18.7
Total Litter	21	14.0
Litter Between-Plant Cover	10	6.7
Litter Under-Plant Cover	11	7.3

Cover Estimates by Species

Species	Scientific	Common	Year	Average Annual Foliar Cover %	Average Annual Basal Cover %
AGGL	Agoseris glauca	pale agoseris	2016	0.7	0.0
ARAC2	Arenaria aculeata	prickly sandwort	2016	2.7	0.0
ARAR8	Artemisia arbuscula	Low sagebrush	2016	14.0	0.0
ASFI	Astragalus filipes	basalt milkvetch	2016	0.7	0.0
COPA3	Collinsia parviflora	maiden blue-eyed Mary	2016	2.0	0.0
ELEL5	Elymus elymoides	squirreltail	2016	0.7	0.7
EPBR3	Epilobium brachycarpum	tall annual willowherb	2016	1.3	0.0
ERBL	Erigeron bloomeri	scabland fleabane	2016	2.0	0.0
PHHO	Phlox hoodii	spiny phlox	2016	5.3	0.0
PHLO2	Phlox longifolia	longleaf phlox	2016	1.3	0.0
POSE	Poa secunda	Sandberg bluegrass	2016	13.3	0.0

Table 50. LA_GRSG-206 Juniper Pasture ARAR-POSE

Cover/Litter Report

Summary Category	Total Points	Avg Percent
Foliar Cover	103	68.7
Bare Ground	25	16.7
Basal Cover	0	0.0
Total Ground Cover	52	34.7
Ground Cover Between-Plant Cover	22	14.7
Ground Cover Under-Plant Cover	30	20.0
Total Litter	34	22.7
Litter Between-Plant Cover	11	7.3
Litter Under-Plant Cover	23	15.3

Cover Estimates by Species

Species	Scientific	Common	Year	Average Annual Foliar Cover %	Average Annual Basal Cover %
AGGL	Agoseris glauca	pale agoseris	2016	2.7	0.0
ALAC4	Allium acuminatum	tapertip onion	2016	0.7	0.0
ALPA3	Allium parvum	small onion	2016	2.0	0.0
ANDI2	Antennaria dimorpha	low pussytoes	2016	1.3	0.0
ARAC2	Arenaria aculeata	prickly sandwort	2016	2.7	0.0
ARARA	Artemisia arbuscula ssp. arbuscula	low sagebrush	2016	35.3	0.0
ASFI	Astragalus filipes	basalt milkvetch	2016	8.7	0.0
BRTE	Bromus tectorum	Cheatgrass	2016	2.0	0.0
COGR2	Collinisia grandiflora	giant blue-eyed Mary	2016	2.7	0.0
COPA3	Collinsia parviflora	maiden blue-eyed Mary	2016	0.7	0.0
ELEL5	Elymus elymoides	squirreltail	2016	2.0	0.0
ERBL	Erigeron bloomeri	scabland fleabane	2016	0.7	0.0
LOCA4	Lomatium canbyi	Canby's biscuitroot	2016	10.0	0.0
PF82		AIM Generic Code - Perennial Forb	2016	1.3	0.0
PHLOL2	Phlox longifolia ssp. longifolia	longleaf phlox	2016	1.3	0.0
POSE	Poa secunda	Sandberg bluegrass	2016	20.7	0.0

Table 51. LA_UPSH-758 Juniper ARAR-POSE

Cover/Litter Report

Summary Category	Total Points	Avg Percent
Foliar Cover	84	56.0
Bare Ground	40	26.7
Basal Cover	3	2.0
Total Ground Cover	66	44.0
Ground Cover Between-Plant Cover	26	17.3
Ground Cover Under-Plant Cover	40	26.7
Total Litter	33	22.0
Litter Between-Plant Cover	9	6.0
Litter Under-Plant Cover	24	16.0

Cover Estimates by Species

Species	Scientific	Common	Year	Average Annual Foliar Cover %	Average Annual Basal Cover %
AGGI	Agrostemma githago	common corncockle	2016	0.7	0.0
ARAC2	Arenaria aculeata	prickly sandwort	2016	2.0	0.0
ARAR8	Artemisia arbuscula	Low sagebrush	2016	35.3	1.3
BRTE	Bromus tectorum	Cheatgrass	2016	1.3	0.0
CETE5	Ceratocephala testiculata	Bur buttercup	2016	0.7	0.0
CHVI8	Chrysothamnus viscidiflorus	Green rabbitbrush	2016	0.7	0.0
COPA3	Collinsia parviflora	maiden blue-eyed Mary	2016	2.0	0.0
CRAC2	Crepis acuminata	tapertip hawksbeard	2016	0.7	0.0
ELEL5	Elymus elymoides	squirreltail	2016	4.0	0.0
LOTR	Lomatium tracyi	Tracy's desertparsley	2016	3.3	0.0
LOVA	Lomatium vaginatum	broadsheath desertparsley	2016	0.7	0.0
MIGR	Microseris gracilis	slender phlox	2016	1.3	0.0
NABR	Navarretia breweri	Brewer's navarretia	2016	0.7	0.0
PHHO	Phlox hoodii	spiny phlox	2016	0.7	0.0
PHLO2	Phlox longifolia	longleaf phlox	2016	0.7	0.0

POSE	Poa secunda	Sandberg bluegrass	2016	17.3	0.7
TRMA3	Trifolium macrocephalum	largehead clover	2016	6.7	0.0

Table 52. LA_GRSG-095 Juniper ARAR-POSE

Cover/Litter Report

Summary Category	Total Points	Avg Percent
Foliar Cover	82	54.7
Bare Ground	46	30.7
Basal Cover	2	1.3
Total Ground Cover	74	49.3
Ground Cover Between-Plant Cover	22	14.7
Ground Cover Under-Plant Cover	52	34.7
Total Litter	52	34.7
Litter Between-Plant Cover	9	6.0
Litter Under-Plant Cover	43	28.7

Cover Estimates by Species

Species	Scientific	Common	Year	Average Annual Foliar Cover %	Average Annual Basal Cover %
ACTH7	Achnatherum thurberianum	Thurber's needlegrass	2016	1.3	0.0
AF476			2016	0.7	0.0
ARAR8	Artemisia arbuscula	Low sagebrush	2016	35.3	0.0
ARTRT	A. tridentata spp. tridentata	Basin big sagebrush	2016	5.3	0.0
CHVI8	Chrysothamnus viscidiflorus	Green rabbitbrush	2016	1.3	0.0
COPA3	Collinsia parviflora	maiden blue-eyed Mary	2016	2.0	0.0
ELEL5	Elymus elymoides	squirreltail	2016	2.7	0.0
FEID	Festuca idahoensis	Idaho fescue	2016	2.0	0.0
LONEN	Lomatium nevadense var. nevadense	Nevada biscuitroot	2016	2.0	0.0
LUAR3	Lupinus argenteus	silvery lupine	2016	0.7	0.0
MIGR	Microseris gracilis	slender phlox	2016	4.7	0.0
POSE	Poa secunda	Sandberg bluegrass	2016	4.0	1.3

Table 53. Soil Stability Ratings

Plot ID	Pasture	Plot Average across three lines		
		All samples	Samples with foliar cover	Samples without foliar cover
LA-001	Calderwood	1.5	1.9	1.0
LA-005	Calderwood	3.2	4.4	2.0
SFA-093	Monument	2.2	1.9	2.7
SFA-647	West Mud Lake	2.8	2.4	3.8
SFA-799	Famine Lake	3.4	3.7	2.8
LA-019	Wool Lake	1.9	2.2	1.6
LA-014	Fairy Flat	2.2	2.1	2.3
LA-011	May Lake	1.7	2.2	1.0
LA-646	May Lake	3.1	3.9	2.5
SFA-664	May Lake	2.3	2.7	1.0
LA-007	May Lake	2.3	2.6	1.8
LA-015	Juniper	1.8	1.7	1.9
LA-018	Juniper	1.6	1.6	1.5
LA-003	Juniper	2.2	2.0	2.8
SFA-657	Juniper	3.6	5.0	3.1
LA-206	Juniper	1.6	1.6	2.0
LA-758	Juniper	2.8	2.9	2.3
LA-095	Juniper	1.9	2.0	1.9

Table 54. Rangeland Health Quality Assessment

SFA-WE-RI-799 Famine Lake

Soil/Site Stability						Hydrologic Function						Biotic Integrity					
				9													
				8						14			16			17	
				7					11	9			13			14	
		4	3	6			11	4	3	8			12			9	
	11	1	2	5			10	1	2	5			11			8	
ET	ME	M	SM	NS		ET	ME	M	SM	NS		ET	ME	M	SM	NS	

Average rating SM Average rating SM Average rating SM

Indicators
1: Rills
2: Water flow patterns
3: Pedestals and/or Terracettes
4: Bare ground
5: Gullies
6: Wind scour and/or Depositional areas
7: Litter movement
8: Soil surface resistance to erosion
9: Soil surface loss/degradation
10: Plant community relative to infiltration/runoff
11: Soil compaction layer(s)
12: Functional/Structural groups
13: Plant mortality/decadence
14: Litter amount
15: Annual production (not recorded
16: Invasive plants
17: Reproductive capability of perennials

Departure from Reference
ET is Extreme to Total
ME is Moderate to Extreme
Moderate
Slight to Moderate
None to Slight

Table 55. Rangeland Health Quality Assessment
SFA-UPS-SS-647 West Mud lake

Soil/Site Stability						Hydrologic Function						Biotic Integrity					
			11	9					14							17	
			6	8				10	11	9						13	
		3	4	7				3	4	8				16	14	9	
		1	2	5				1	2	5				12	11	8	
ET	ME	M	SM	NS		ET	ME	M	SM	NS		ET	ME	M	SM	NS	

Average rating SM Average rating SM Average rating SM

Indicators
1: Rills
2: Water flow patterns
3: Pedestals and/or Terracettes
4: Bare ground
5: Gullies
6: Wind scour and/or Depositional areas
7: Litter movement
8: Soil surface resistance to erosion
9: Soil surface loss/degradation
10: Plant community relative to infiltration/runoff
11: Soil compaction layer(s)
12: Functional/Structural groups
13: Plant mortality/decadence
14: Litter amount
15: Annual production (not recorded
16: Invasive plants
17: Reproductive capability of perennials

Departure from Reference
ET is Extreme to Total
ME is Moderate to Extreme
Moderate
Slight to Moderate
None to Slight

Table 56. Rangeland Health Quality Assessment

SFA-GRSG-093 Monument

Soil/Site Stability						Hydrologic Function						Biotic Integrity					
										14							
				11						11							
				9						10						17	
				8						9						14	
				6						8						12	
				5						5						11	
			7	3						3					13	9	
		4	2	1				4	2	1					16	8	
ET	ME	M	SM	NS		ET	ME	M	SM	NS		ET	ME	M	SM	NS	

Average rating SM Average rating SM Average rating NS

Indicators
1: Rills
2: Water flow patterns
3: Pedestals and/or Terracettes
4: Bare ground
5: Gullies
6: Wind scour and/or Depositional areas
7: Litter movement
8: Soil surface resistance to erosion
9: Soil surface loss/degradation
10: Plant community relative to infiltration/runoff
11: Soil compaction layer(s)
12: Functional/Structural groups
13: Plant mortality/decadence
14: Litter amount
15: Annual production (not recorded
16: Invasive plants
17: Reproductive capability of perennials

Departure from Reference
ET is Extreme to Total
ME is Moderate to Extreme
Moderate
Slight to Moderate
None to Slight

Table 57. Rangeland Health Quality Assessment

SFA-UPSH-657 Juniper

Soil/Site Stability						Hydrologic Function						Biotic Integrity					
																17	
										14						16	
										11						14	
			7	11						10						12	
			6	9						9						11	
		3	4	8				3	4	8						9	
		1	2	5				1	2	5					13	8	
ET	ME	M	SM	NS		ET	ME	M	SM	NS		ET	ME	M	SM	NS	

Average rating SM Average rating SM Average rating NS

Indicators
1: Rills
2: Water flow patterns
3: Pedestals and/or Terracettes
4: Bare ground
5: Gullies
6: Wind scour and/or Depositional areas
7: Litter movement
8: Soil surface resistance to erosion
9: Soil surface loss/degradation
10: Plant community relative to infiltration/runoff
11: Soil compaction layer(s)
12: Functional/Structural groups
13: Plant mortality/decadence
14: Litter amount
15: Annual production (not recorded
16: Invasive plants
17: Reproductive capability of perennials

Departure from Reference
ET is Extreme to Total
ME is Moderate to Extreme
Moderate
Slight to Moderate
None to Slight

Table 58. Rangeland Health Quality Assessment

SFA-UPSH-664 May Lake

Soil/Site Stability						Hydrologic Function						Biotic Integrity					
																17	
																16	
				9						14						14	
				8						10						13	
				7						9						12	
2			11	6		2			11	8						9	
1	4		2	5		1	4		3	5					11	8	
ET	ME	M	SM	NS		ET	ME	M	SM	NS		ET	ME	M	SM	NS	

Average rating SM Average rating SM Average rating NS

Indicators
1: Rills
2: Water flow patterns
3: Pedestals and/or Terracettes
4: Bare ground
5: Gullies
6: Wind scour and/or Depositional areas
7: Litter movement
8: Soil surface resistance to erosion
9: Soil surface loss/degradation
10: Plant community relative to infiltration/runoff
11: Soil compaction layer(s)
12: Functional/Structural groups
13: Plant mortality/decadence
14: Litter amount
15: Annual production (not recorded
16: Invasive plants
17: Reproductive capability of perennials

Departure from Reference
ET is Extreme to Total
ME is Moderate to Extreme
Moderate
Slight to Moderate
None to Slight

Appendix B: STM Summary

Figure 1. STM Annual Grass Threat Model

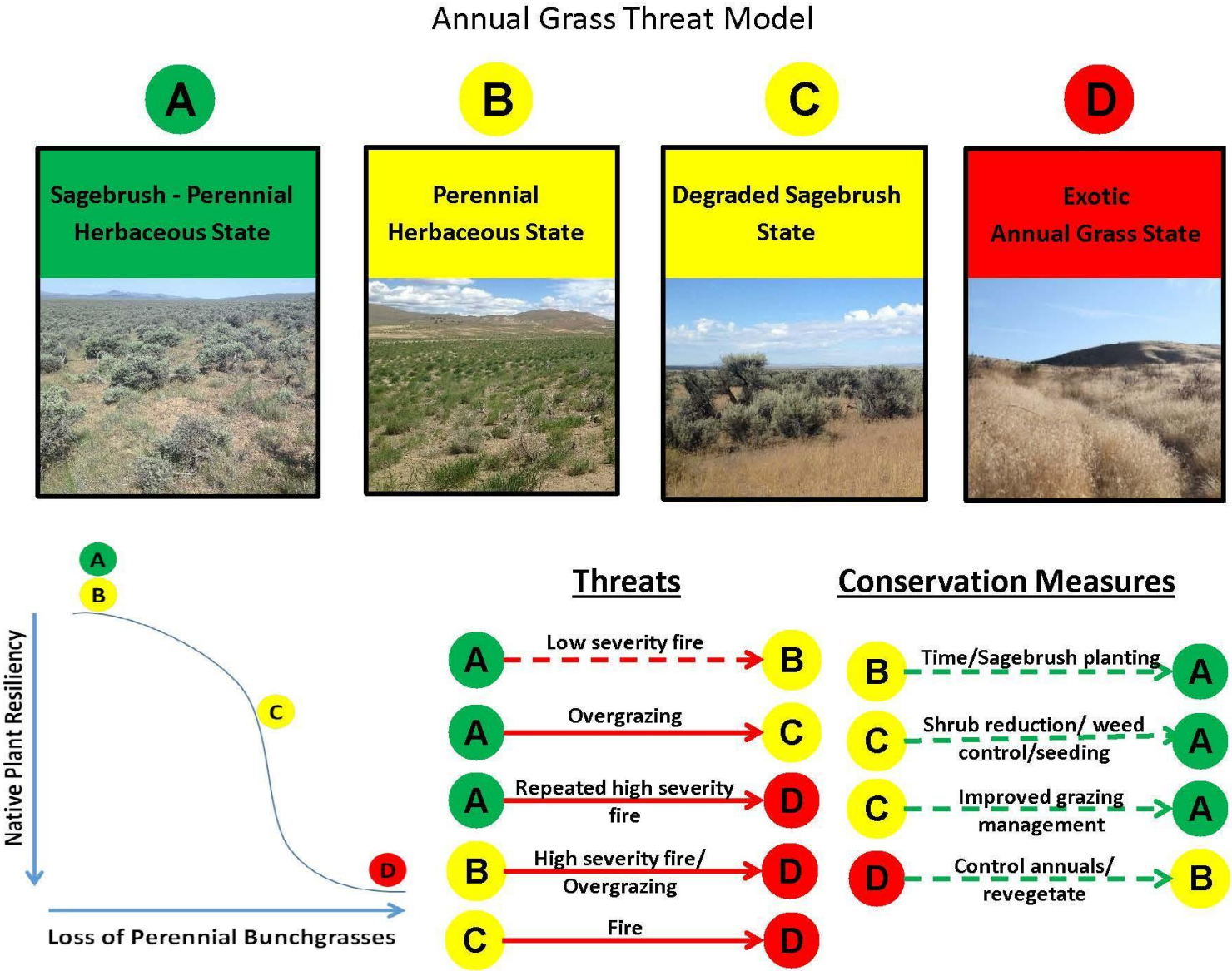


Figure 2. STM Mixed Threat Model

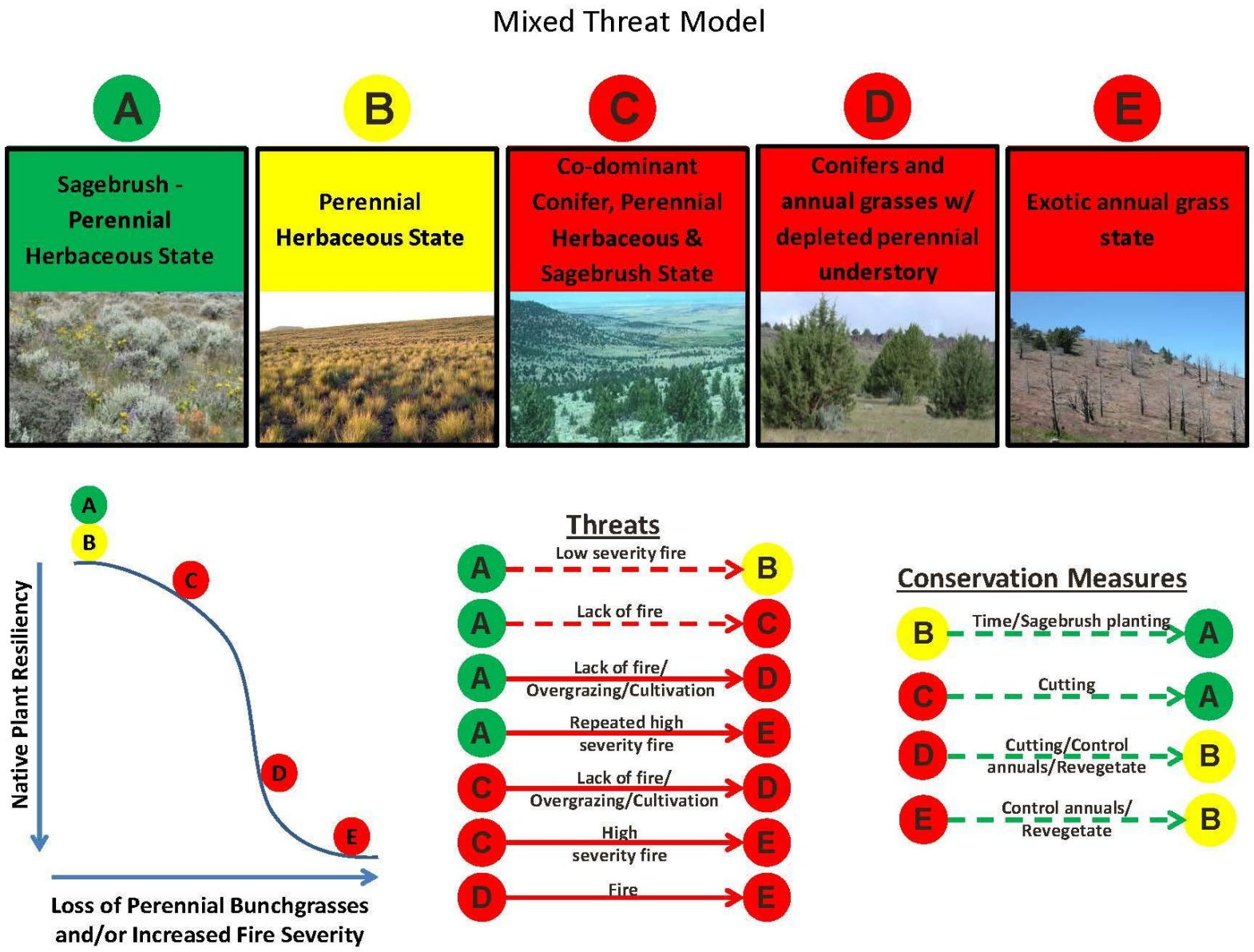


Figure 3. STM Conifer Threat Model

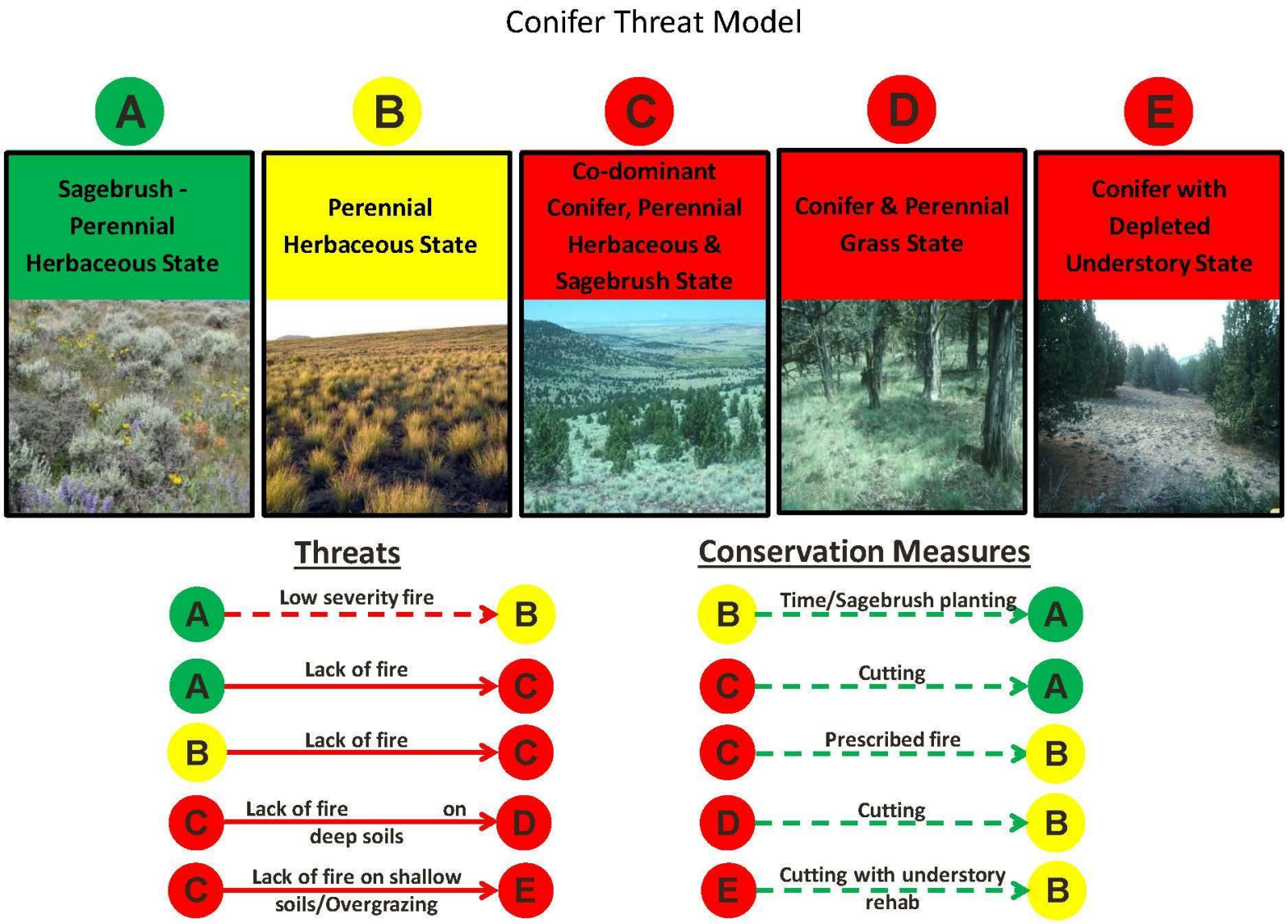


Table 59a: Annual Grass Threat State Determinations within the Allotment

State	Acres PHMA/SFA
A	1820
B	162
C	4813
State	**Acres GHMA**
A	675
B	2488
C	281
Persistently Unsuitable	857
State	**Acres Non-Habitat**
B	588
C	178
Persistently Unsuitable	1529

Table 59b: **Dual Threat State Determinations within the Allotment**

State	Acres PHMA/SFA
A	26010
C	7272
D	804
Persistently Non-habitat	1937
E	375
State	**Acres GHMA**
C	30
D	4

Table 59c: **Juniper Threat State Determinations within the Allotment**

State	Acres PHMA/SFA
C	1244
D	34
Persistently Non-habitat	373

Appendix C: HAF Monitoring Summary

Map # 6. Sage grouse habitat boundaries depicting the mid-scale, fine-scale, and O'Keeffe Allotment.

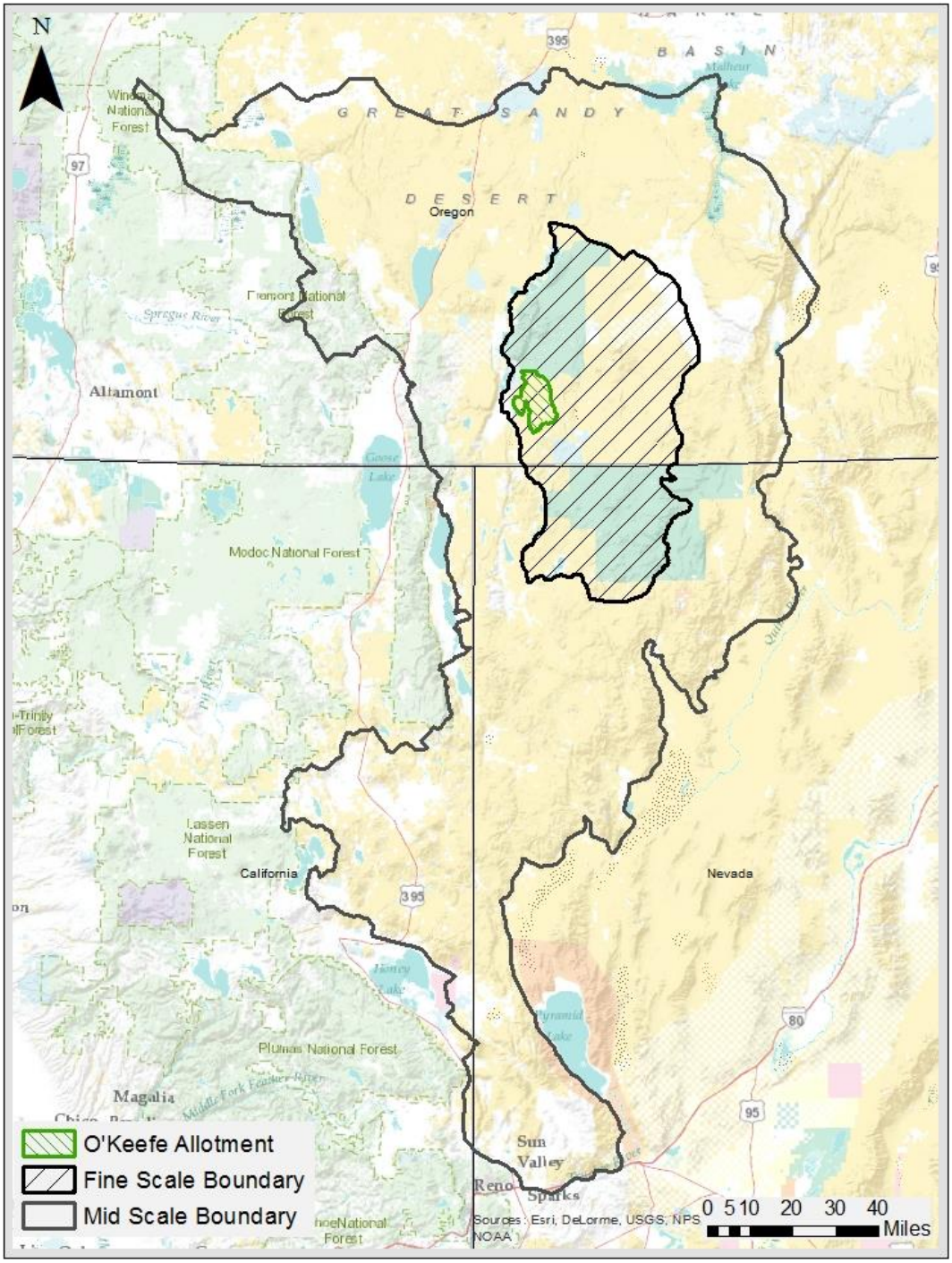


Table 60. Summary of Beaty Butte Fine-scale habitat[1].

Fine-Scale Habitat Suitability	Habitat (km^2)	Suitable Landcover (km^2)	Percent Suitable	Occupied Area (km^2)
Breeding Habitat	4,659	4,384	94%	4,212
Late Brood-Rearing/ Upland Summer	3,982	3,617	91%	3,568
Winter Habitat	4,524	4,270	94%	4,046

Table 61. Summary of site-scale sage-grouse habitat suitability ratings and proportional area estimates (80% confidence interval) for seasonal habitat types in the Beaty Butte fine-scale habitat analysis area, Oregon. Proportional area estimate is based on unequal weighting of plots.

Seasonal Habitat	Number of Leks, Plots or Sites			Proportional Area Estimate		
	Suitable	Marginal	Unsuitable	Suitable	Marginal	Unsuitable
Breeding (Lekking)	102 leks	38 leks	8 leks	NA	NA	NA
Breeding (Nesting/Early Brood-rearing)	28 plots	5 plots	1 plot	74.1% CI [63.7, 84.5]	19.3% CI [10.3, 28.4]	6.5% CI [0, 13.2]
Upland Summer/Late Brood-rearing	6 plots	1 plots	0 plots	88.1% CI [75.5, 100]	11.9% CI [0, 24.5]	0%
Riparian Summer/Late Brood-rearing	14 sites	3 sites	1 site	NA	NA	NA
Winter	43 plots	2 plots	0 plots	93.9% CI [89.3, 98.5]	6.1% CI [1.5, 10.7]	0%

[1] Calculations determined by Bureau of Land Management Oregon State Office, Portland, OR

Table 62. Greater sage-grouse nesting/early brood-rearing (spring) habitat suitability proportional area estimates within the O'Keeffe Allotment (80% confidence Interval, n = 15, percent of area with inference = 96.7%).

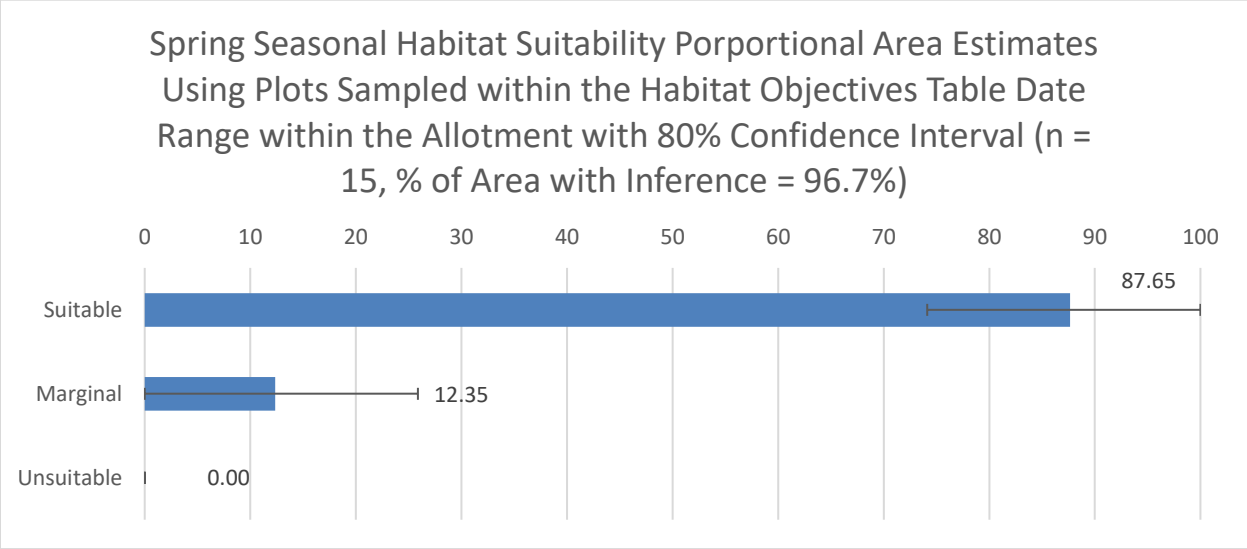
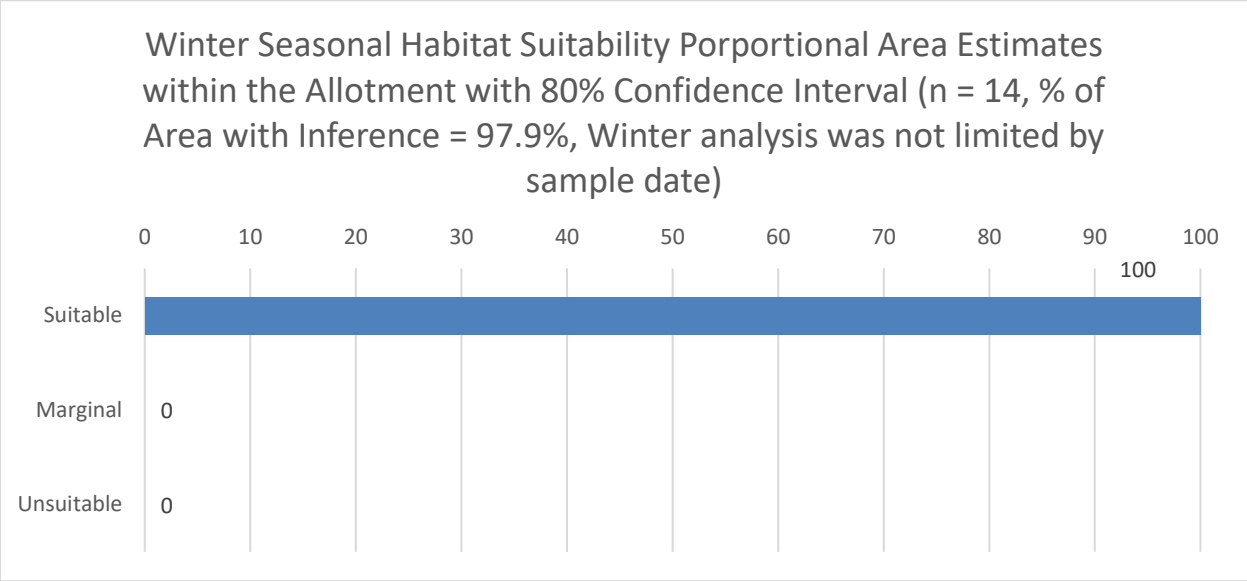


Table 63. Greater sage-grouse winter habitat suitability proportional area estimates within the O'Keeffe Allotment (n = 14, percent of area with inference = 97.9%) Winter analysis was not limited by sample date; confidence interval is unknown.



Appendix C: Literature Cited

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