

## WILDLIFE MANAGEMENT UNIT 1 - BOX ELDER

### Boundary Description

**Box Elder, Tooele, Salt Lake, Davis and Weber counties** - Boundary begins at the Utah-Idaho state line and Interstate 15; then west along this state line to the Utah-Nevada state line, south along this state line to Interstate 80, east on I-80 to I-15, north on I-15 to the Utah-Idaho state line.

### Management Unit Description

The Box Elder Management Unit is one of the largest in the state. However, big game range accounts for less than one-third of the unit. The Box Elder Subunit 1B (Promontory region) is located in the east side and consists primarily of private land that was considered unsuitable for permanent trend studies. The Pilot Mountain Subunit 1C is made up of the most southern portion of the unit and Pilot Mountain. The Raft River Subunit 1A (western portion of the unit), is where all of the permanent range studies have been established. The land area of this subunit is comprised mostly of the Raft River, Grouse Creek, and Goose Creek Mountains. Here again, private land accounts for almost 70% of what is considered "normal" winter range (King and Muir 1971) and is arranged in a checkerboard pattern with public lands. Towns located within this area are Etna, Grouse Creek, Lynn, Yost, and Park Valley.

The Raft River Mountains run east-west, parallel to the Utah-Idaho border. Slopes on this mountain range are moderately steep on the south and east, and gentler on the north and west. The highest point is 9,925 feet on Dunn Benchmark peak at the head of the Clear Creek drainage. The Grouse Creek Mountains are relatively narrow and steep, and run north-south. At 9,000 feet, Red Butte is the highest point in the Grouse Creek Range. The topography of the Goose Creek Mountains is generally more nominal, the highest point being 8,584 feet on Twin Peaks. The Dove Creek Mountains are rougher, but the terrain becomes gentler near the Three Corners area.

Seasonal migration consists mainly of elevational and north to south migrations from summer range to winter range. A substantial number of deer spend their summers in Idaho then migrate south onto Unit 1 winter ranges. King and Muir (1971) estimated that the summer range was restricted to 194,612 acres (only 17% of the range) located in the upper portions of the Raft River, Goose Creek and Grouse Creek Mountains. They considered this quality summer range to be crucial to the unit's big-game herds, especially deer. Areas specifically listed as summer concentration areas for deer are the uppermost elevations of the Raft River Mountains, Johnson Creek Drainage, the head of Lynn Valley, the crest of the Grouse Creek Mountains, and Hardister Creek Plateau.

There is an estimated 931,645 acres of normal deer winter range that mostly follows the foothills of the major mountain ranges within the sub-unit. The upper limit of normal deer winter range varies from 6,000 to 8,000 feet over the sub-unit based on the mountain range on which it occurs. The lower limit of normal deer winter range typically follows the line of Hwy 30 from Curlew Junction to the Nevada border, with further deer winter range occurring in Nevada and Idaho. This sub-unit has a unique situation during severe winters. The limits for the severe deer winter range are not only lowered at the upper limit, but are also raised at the lower limit. This is because the low growing vegetation at the lower limits of normal deer winter range are easily covered by heavy snowfall, making them unavailable for big game use. During severe winter's, deer winter range is estimated to be reduced to 240,989 acres (King and Muir 1971).

King and Muir (1971) also describe seven general vegetation types which appear to dominate the big-game range. Sagebrush makes up 55% of the winter range and 58% of the summer range. Black sagebrush occupies ridge tops within the summer range and the upper reaches of the winter range. On the summer range, the black sagebrush type has the highest abundance of grasses and forbs. Within the summer range, the browse type is dominated by curlleaf mountain mahogany on the drier sites and by maple on the more mesic sites. This type

provides a good variety of spring-fall forage, yet makes up less than 1% of the winter range. The sagebrush-juniper and juniper types, together account for 31% of the winter range. In these vegetation types, juniper trees are more important for the thermal cover than for forage. Although small amounts of the aspen-timber and forb-grass types are found along the upper edges of winter range, their primary value is as summer range. A more detailed description and vegetation maps of the different vegetation types for Wildlife Management Unit 1 can be found in the 1970 Range Inventory Report published in 1971 by King and Muir.

### **Range Trend Studies**

Nineteen interagency range trend studies were sampled in Unit 1 during the summer of 2011. A total of twenty-four studies have been established within Unit 1. Fourteen studies were established in 1984, and of these studies, four studies [Rosette (1-2), Mud Springs Basin (1-8), South West Rosette (1-9), and Raft River Narrows (1-13)] sample Wyoming big sagebrush communities, three studies [Chokecherry Springs (1-4), Red Butte Exclosure (1-12), and Broad Hollow (1-14)] sample mountain brush communities, five studies [Rosebud Hills (1-3), Devils Playground (1-5), South Side Emigrant Pass (1-7), Kilgore Basin (1-10), and Kimber Ranch (1-11)] sample black sagebrush communities, and two studies [Kelton (1-1), Bovine Exclosure (1-6)] sample basin big sagebrush sagebrush communities. One range trend study [Cedar Hills (1-15)] was established in 1990 and monitors a burned pinyon and juniper community. Nine range trend studies were established in 1996 to provide data in other areas of concern. These include mixed mountain brush sites [Nut Pine Hills (1-16), Clark's Basin (1-17), and Keg Springs (1-21)], a high elevation black sagebrush site [Bally Mountain (1-19)], and an aspen site [Cotton Thomas (1-20)]. Due to the increasing elk numbers on the Pilot Range, two studies [Patterson Pass (1-23) and Sheep Range Spring (1-24)] were also established, and an additional site [Dake Pass (1-22)] was established to monitor a black sagebrush wintering area for elk north of the Pilot Mountains.

In 2006, five studies (Kelton, Rosebud Hills, Southwest Rosette, Cotton Thomas, and Keg Spring) were suspended due to lack of use by wildlife. If the need arises in the future these studies can be sampled again. To access maps, discussions, and data tables for suspended studies see: <http://www.wildlife.utah.gov/range>.

## SUMMARY

### WILDLIFE MANAGEMENT UNIT 1 - BOX ELDER

#### Community Types

Deer winter range within a unit is summarized into three categories based on ecological potentials which include **low potential**, **mid-level potential** and **high potential**. Low potential sites include desert shrub, Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and cliffrose (*Cowania mexicana* ssp. *stansburiana*) communities. Mid-level potential sites include mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) communities. High potential sites include mountain brush communities. Low sagebrush (*A. arbuscula*), black sagebrush (*A. nova*), and basin big sagebrush (*A. tridentata* ssp. *tridentata*) communities are placed within the low potential or mid-level potential scales based on precipitation and elevation. Deer **summer range** is summarized separately from winter range as a fourth category and typically includes aspen (*Populus tremuloides*) and high elevation mountain brush communities. Nineteen interagency range trend studies were sampled in Unit 1 during the summer of 2011.

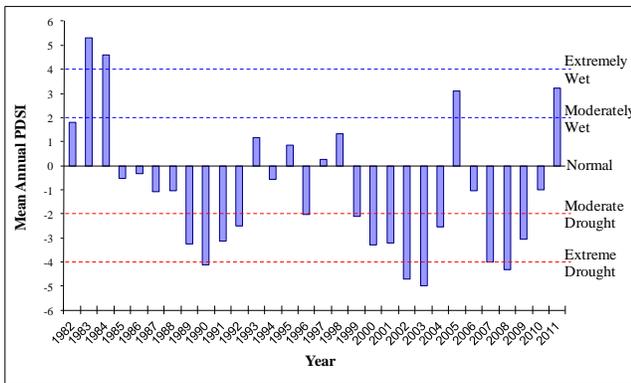
Ten of the studies [Chokecherry Springs (1-4), Bovine Exclosure (1-6), Red Butte Exclosure (1-12), Broad Hollow (1-14), Cedar Hills (1-15), Nut Pine Hills (1-16), Clarks Basin (1-17), Bally Mountain (1-19), Patterson Pass (1-23), and Sheep Range Spring (1-24)] are categorized as mid-level potential sites for deer winter range, and sample mountain big sagebrush, basin big sagebrush, and black sagebrush communities. Though categorized as deer winter range in this summary, the Nut Pine Hills, Clark's Basin, Patterson Pass, and Sheep Range Spring studies are considered to be crucial deer summer range and fawning habitat. The Bovine Exclosure and Red Butte Exclosure studies are considered to be elk year-long range; the Bally Mountain study is considered to be elk winter range; and the Patterson Pass and Sheep Range Spring studies are considered important elk summer range.

The remaining nine studies [Rosette (1-2), Devils Playground (1-5), South Side Emigrant Pass (1-7), Mud Springs Basin (1-8), Kilgore Basin (1-10), Kimber Ranch (1-11), Raft River Narrows (1-13), Bedke Spring (1-18), and Dake Pass (1-22)] are classified as low potential deer winter range sites, and sample Wyoming big sagebrush or black sagebrush communities. All of the studies except Raft River Narrows and Bedke Spring are also considered to be elk year-long range.

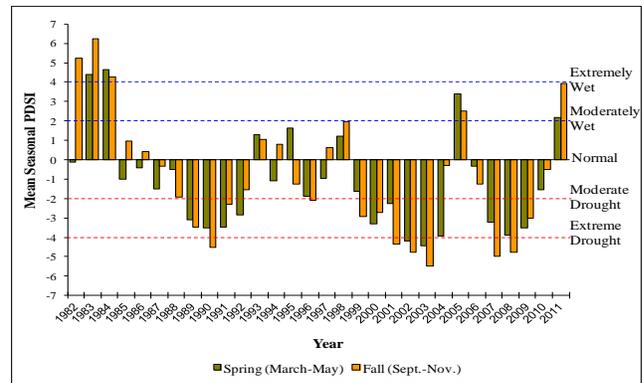
#### Precipitation

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Precipitation and Palmer Drought Severity Index (PDSI) data for the unit were compiled from the National Oceanic and Atmospheric Administration (NOAA) Physical Sciences Division (PSD) as part of Western Utah (Division 1). Western Utah had a historic annual mean precipitation of 8.69 inches from 1895 to 2011. The mean annual PDSI of Western Utah displays predominance to drought in the division over most of study years. Wetter than normal years in Western Utah included 1983-1984, 2005, and 2011; and drought years included 1989-1992, 1996, 1999-2004 and 2007-2009 (Figure 1 and Figure 2) (Time Series Data 2012).

The 1961-1990 mean annual precipitation was 8-10 in. on the Dake Pass study; 10-12 in. on the Rosette, Devils Playground, South Side Emigrant Pass, Mud Springs Basin, Kilgore Basin, Kimber Ranch, and Bedke Spring studies; 12-14 in. on the Patterson Pass and Sheep Rang Spring studies; 14-16 in. on the Chokecherry Springs, Bovine Exclosure, Raft River Narrows, and Cedar Hills studies; 16-18 in. on the Red Butte Exclosure, Broad Hollow, Nut Pine Hills, and Bally Mountain studies; and 18-20 in. on the Clark's Basin study (PRISM Climate Group 2011).



**Figure 1.** The 30 year mean annual Palmer Drought Severity Index (PDSI) for Western Utah (Division 1). The PDSI is based on climate data gathered from 1895 to 2011. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is  $\geq 4.0$  = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and  $\leq -4.0$  = Extreme Drought (Time Series Data 2012).



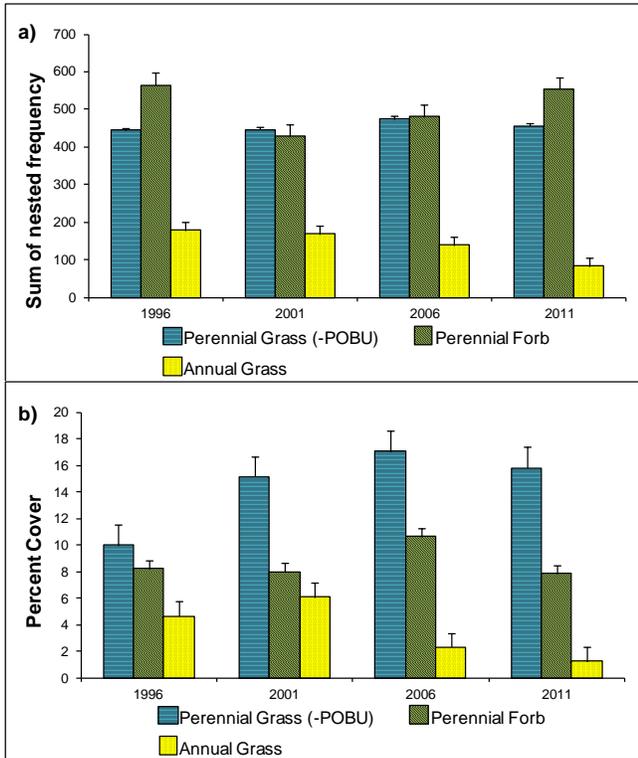
**Figure 2.** The 30 year mean spring (March-May) and fall (Sept.-Nov.) Palmer Drought Severity Index (PDSI) for Western Utah (Division 1). The PDSI is based on climate data gathered from 1895 to 2011. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is  $\geq 4.0$  = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and  $\leq -4.0$  = Extreme Drought (Time Series Data 2012).

## Mountain/Basin Big Sagebrush and Black Sagebrush Communities (Mid-Level Potential)

**Browse:** The mid-level potential site cumulative median browse has remained similar over the course of the study (Figure 8a). The dominant browse species on the majority of the mid-level potential studies is mountain big sagebrush, though basin big sagebrush is the dominant species on the Bovine Exclosure and Red Butte Exclosure studies. The two big sagebrush species were averaged together in this summary. Wildfires occurred on the Broad Hollow and Cedar Hills studies in 1996 and 2000, respectively. The wildfire on the Broad Hollow study occurred following the sample in 1996, and burned just part of the transect. The wildfire on the Cedar Hills study was larger and burned the entire study area, removing nearly all of the browse species. Decreases in density due to the fires on these sites comprised much of the decrease in the mean density of big sagebrush in 2001. The mean density of big sagebrush decreased significantly from 1996 to 2001, and significantly again from 2001 to 2006. Density of big sagebrush remained similar from 2006 to 2011 (Figure 4a). Despite the changes in density, mean cover of big sagebrush was higher in 2001 and 2006 than in 1996 and 2011 (Figure 4b). The mean decadence of big sagebrush has been moderately high since 1996, with the highest decadence in 2006 (Figure 4c).

Black sagebrush is the dominant browse on the Bally Mountain study, and is also common on the Bovine Exclosure, Nut Pine Hills, Clark's Basin, Patterson Pass, and Sheep Range Spring studies. A prescribed fire in 2003 removed a large portion of the black sagebrush on the Bally Mountain study. Because the prescribed fire had a large influence on the mean trends, the Bally Mountain study was excluded from the summary of black sagebrush. For further information on black sagebrush on the Bally Mountain study, refer to the discussion section. The mean black sagebrush density and cover, excluding Bally Mountain, remained similar from 1996 to 2006, and then increased significantly in 2011 (Figure 4a and Figure 4b). Mean decadence of black sagebrush was moderate in 1996 and 2006, but was low in 2001 and 2011 (Figure 4c).

**Herbaceous Understory:** The mid-level potential median cumulative grass trend for the unit has increased over the course of the study. There was a large increase in 1990, and a slight increase in 2006 (Figure 8a). Grasses within these communities are typically diverse and abundant. Annual grass species, comprised primarily of cheatgrass (*Bromus tectorum*), are common, but are generally less prevalent than perennial species. Mean sum of nested frequency of perennial grasses has remained fairly similar since 1996, but cover increased



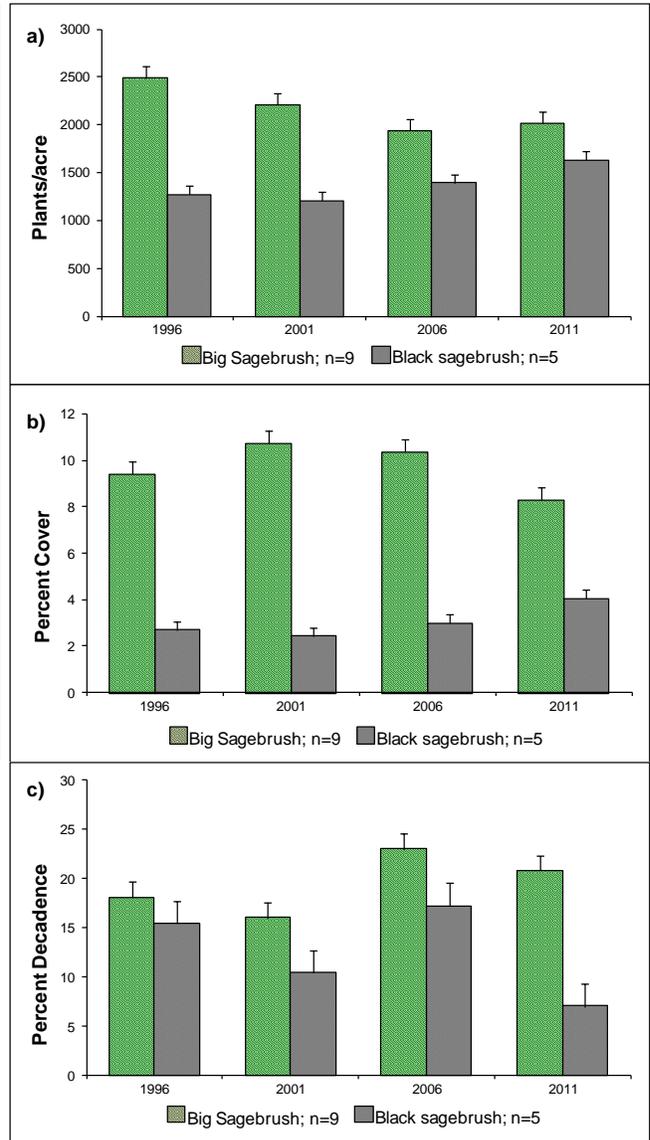
**Figure 3.** a) Mid-level potential sites mean perennial grass (excluding bulbous bluegrass), perennial forb and annual grass sum of nested frequency by year for WMU 1, Box Elder. b) Mid-level potential sites mean perennial grass (excluding bulbous bluegrass), perennial forb and cheatgrass cover by year for WMU 1.

significantly in 2001 and has remained higher since that time. The mean nested frequency and cover of annual grasses has steadily decreased since 2001 (Figure 3a and Figure 3b).

The mid-level potential median cumulative forb trend for the unit has increased slightly over the study years. There was a decrease in trend in 2001, but trend increased again in 2006 and increased slightly in 2011 (Figure 8a). Perennial forbs are also diverse and abundant within the sampled communities. The mean sum of nested frequency of perennial forbs was significantly higher in 1996 and 2011 than in 2001 and 2006 (Figure 3a). However, mean cover of perennial forbs was significantly higher in 2006 than the other sample years (Figure 3b).

**Browse Utilization & Animal Presence:** Big sagebrush plants on all of the mid-level potential studies have primarily displayed light to moderate use over the course of the study years. While prolonged heavy utilization of browse can have detrimental effects on the health of the browse community, it does not appear that animal utilization of big sagebrush is a primary concern for the mid-level potential studies on this unit.

Pellet group data indicates that most of the study areas are predominantly occupied by deer, though several study areas are more highly occupied by elk. The mean abundance of sampled deer pellet groups on the mid-level potential studies in the unit has been moderate since 2001. Pellet groups for deer have been sampled in the highest abundance on the Broad Hollow, Nut Pine Hills, and Clark's Basin studies. Deer pellet group



**Figure 4.** a) Mid-level potential sites mean density of big sagebrush (*Artemisia tridentata*) and black sagebrush (*A. nova*), excluding Bally Mountain, by year for WMU 1, Box Elder. b) Mid-level potential sites mean cover of big sagebrush and black sagebrush, excluding Bally Mountain, by year for WMU 1. c) Mid-level potential sites mean decadence of big sagebrush and black sagebrush, excluding Bally Mountain by year for WMU 1.

abundance has increased on the Broad Hollow study since 2001, but decreased on the Clark's Basin study in 2011. Elk pellet groups are rare on most of the mid-level potential studies, but have been sampled in high and moderate abundance on the Patterson Pass and Sheep Range Spring studies, respectively. Livestock sign from cattle or sheep has been sampled in low abundance on most mid-level potential studies. However, livestock sign was sampled in particularly high abundance on the Red Butte Exclosure and Cedar Hills studies in 2006 and the Bally Mountain study in 2011, but has been low on these studies in other sample years. Livestock sign was sampled in moderate abundance on the Clark's Basin study in 2006 and 2011 (Figure 9a).

Deer Desirable Components Index (DCI): The mid-level potential deer DCI has remained fairly stable since 1996, with rankings ranging from fair to fair-good throughout the sample years. Attributes of preferred browse species have decreased slightly since 1996, but perennial grass cover has increased and annual grass cover has decreased (Table 1 and Figure 7).

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	19.7	10.4	6.3	19.3	-3.1	8.4	0.0	<b>61.0</b>	Fair
01	21.4	9.4	3.9	24.0	-4.1	7.7	0.0	<b>62.3</b>	Fair
06	19.2	7.2	2.3	23.7	-1.6	8.9	0.0	<b>59.6</b>	Fair
11	17.8	8.6	3.9	25.2	-0.8	8.6	0.0	<b>63.3</b>	Fair-Good

**Table 1.** Mid-level potential scale mean deer DCI scores and rankings (n=10) by year for WMU 1, Box Elder. The deer DCI rankings are divided into three categories based on ecological potentials which include low, mid-level and high.

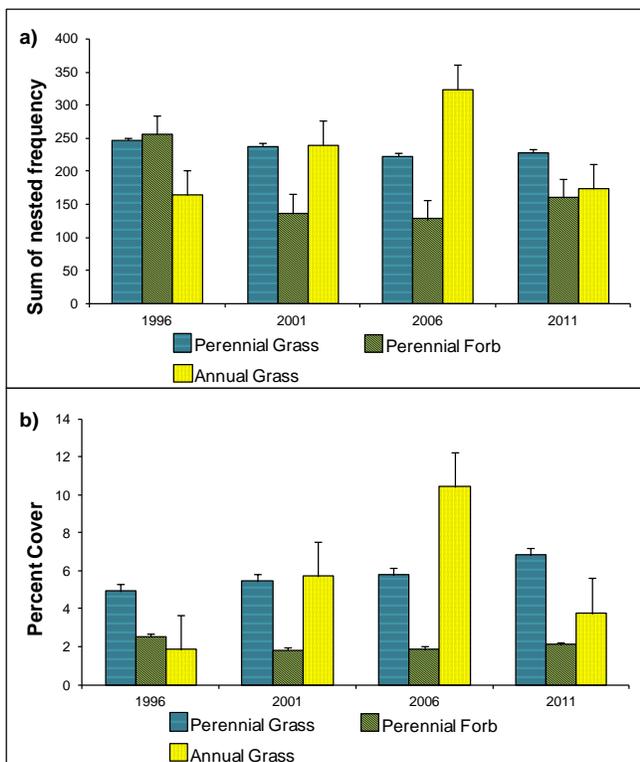
Discussion: The decline of big sagebrush populations on these important winter ranges gives reason for concern, but big sagebrush remains prevalent on most of the mid-level potential studies on the unit. The Chokecherry Springs, Bovine Exclosure, Broad Hollow, Cedar Hills, and Patterson Pass studies have driven the pattern of big sagebrush decline for mid-level potential studies on the unit. Wildfires occurred on the Broad Hollow and Cedar Hills studies in 1996 and 2000, respectively. The wildfire on the Broad Hollow study occurred following the sample in 1996, and burned just part of the transect. The wildfire on the Cedar Hills study was larger and burned the entire study area, removing nearly all of the browse species. Decreases in density due to the fires on these sites comprised much of the decrease in the mean density of big sagebrush in 2001, but density of big sagebrush has continued to decrease on the Broad Hollow study and many of the other mid-level potential studies in subsequent sample years.

Causes of sagebrush decline are varied and multiple causes may have compounded effects on the mid-level potential studies in this unit. Drought has been a predominant factor in this area over the course of the study years (Figure 1 and Figure 2), but these mid-level potential studies are at higher elevations and drought was likely not as acute as lower elevation studies. While lack of precipitation may have caused some stress on plants, it does not appear to be the primary cause of the decline on the mid-level potential studies. The abundance of the annual grass species cheatgrass is a more likely primary cause of sagebrush decline. This weedy species can form dense mats of cover that compete with seedling and young sagebrush plants, which thereby limits establishment of new sagebrush plants into the population. As the sagebrush population matures, decadence increases and density decreases as old plants begin to die. Cheatgrass can also increase fuel loads and increase the chance of a catastrophic fire event. Cheatgrass has been especially prevalent on the Chokecherry Springs, Bovine Exclosure, Red Butte Exclosure, Broad Hollow, and Sheep Range Spring studies. However, cheatgrass has decreased on each of these studies since 1996. It appears that cheatgrass is having the largest impact on the big sagebrush populations on the Chokecherry Springs, Bovine Exclosure, and Broad Hollow studies.

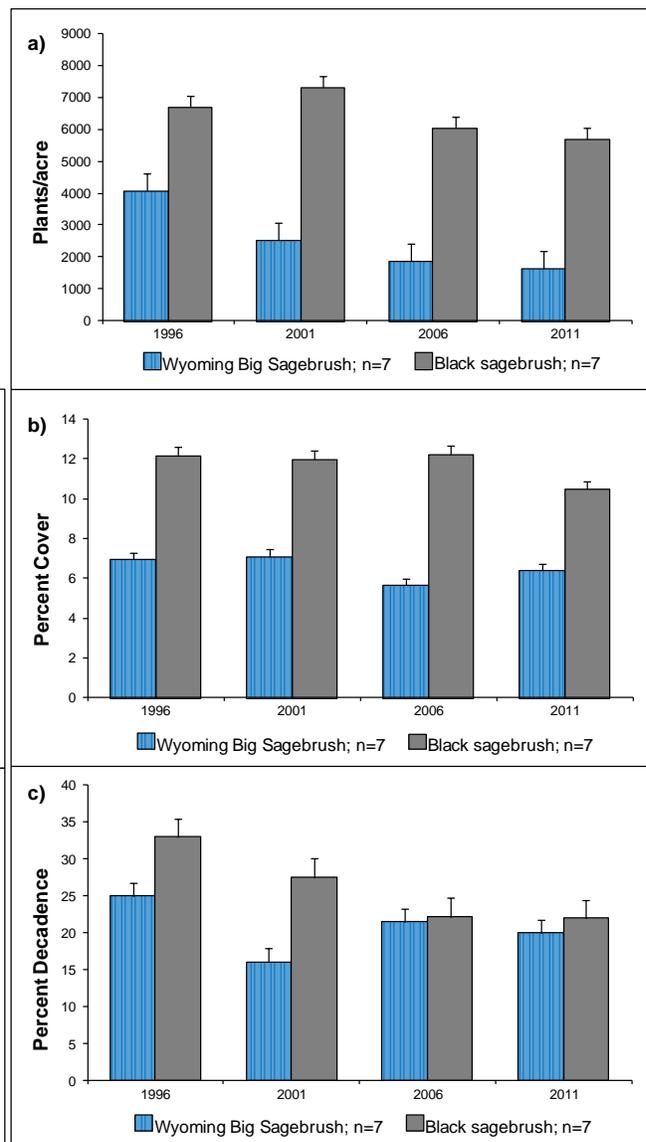
## Wyoming Big Sagebrush and Black Sagebrush Communities (Low Potential)

**Browse:** The low potential site cumulative median browse trend has remained similar over the course of the study. There was a slight increase in trend in 1996, but a slight decrease again in 2006 (Figure 8b). Wyoming big sagebrush is the dominant browse species on the Rosette, Mud Springs Basin, Raft River Narrows, and Bedke Spring, with less dense populations also occurring on the Devils Playground, Kilgore Basin, and Kimber Ranch studies. Part of the Raft River study was burned in a backfire set in 2000; however, if this site were excluded trends would remain similar for Wyoming big sagebrush. The mean density of Wyoming big sagebrush has steadily decreased since 1996. The largest decrease in 2001 was primarily due to the aforementioned fire on the Raft River study (Figure 6a). Mean cover of Wyoming big sagebrush has remained fairly similar, though cover was significantly lower in 2006 than the other sample years (Figure 6b). Mean decadence of Wyoming big sagebrush has generally been moderately high on the studies, but was significantly lower in 2001 than the other sample years (Figure 6c).

Black sagebrush is the dominant browse species on the Devils Playground, South Side Emigrant Pass, Kilgore Basin, Kimber Ranch, and Dake Pass studies, with less dense populations also occurring on the Mud Springs Basin and Bedke Spring studies. Mean density of black sagebrush was highest in 2001, but decreased significantly in 2006, and remaining at the lower rates in 2011 (Figure 6a).



**Figure 5. a)** Low potential sites mean perennial grass, perennial forb and annual grass sum of nested frequency by year for WMU 1, Box Elder. **b)** Low potential sites mean perennial grass, perennial forb and cheatgrass cover by year for WMU 1.



**Figure 6. a)** Low potential sites mean density of Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and black sagebrush (*A. nova*) by year for WMU 1, Box Elder. **b)** Low potential sites mean cover of Wyoming big sagebrush and black sagebrush by year for WMU 1. **c)** Low potential sites mean decadence of Wyoming big sagebrush and black sagebrush by year for WMU 1.

Mean cover of black sagebrush remained similar from 1996 to 2006, then decreased significantly in 2011 (Figure 6b). Mean decadence of black sagebrush decreased significantly in 2001, and again in 2006, but remained similar at the lower rate in 2011 (Figure 6c).

Herbaceous Understory: The low potential median cumulative grass trend for the unit has increased slightly over the course of the study. There was a slight increase in the trend in 1990, a slight decrease in 2006, but a slight increase again in 2011 (Figure 8b). Grasses within these communities are moderately diverse and abundant. However, annual grass species, predominantly cheatgrass (*Bromus tectorum*), are common and have been the dominant component on many of the studies during many of the sample years. Mean sum of nested frequency of perennial grasses has remained similar throughout the sample years, but cover has steadily increased and was significantly higher in 2011 than in 1996. The mean nested frequency and cover of annual grasses steadily increased from 1996 to 2006, but both decreased significantly in 2011, returning to 1996 levels (Figure 5a and Figure 5b).

The low potential median cumulative forb trend for the unit has increased slightly over the course of the study. There was a large increase in 1996, but a large decrease in 2001. Trend increased slightly again in 2011 (Figure 8b). Perennial forbs are also moderately diverse, but are not as abundant as perennial grasses within the sampled communities. The mean sum of nested frequency of perennial forbs was similar to that of perennial grasses in 1996, but decreased significantly in 2001 and has remained at decreased levels since that time (Figure 5a). Mean cover of perennial forbs has followed a similar trend as the mean sum of nested frequency, but mean perennial forb cover has been substantially lower than perennial grasses over the course of the study (Figure 5b).

Browse Utilization & Animal Presence: Wyoming big sagebrush and black sagebrush plants on most of the low potential studies displayed moderate to heavy utilization at the outset of the studies in 1984, but have primarily displayed light to moderate utilization in the subsequent sample years. Black sagebrush on the Dake Pass study displayed moderate to heavy utilization in 1996 and 2011, but much lighter use in the other sample years. While prolonged heavy utilization of browse can have detrimental effects on the health of the browse community, it does not appear that animal utilization of Wyoming big sagebrush and black sagebrush is a primary concern for the low potential studies on this unit.

Pellet group transect data indicates that deer predominantly occupy these study areas. The mean abundance of sampled deer pellet groups has increased slightly from lightly moderate to more moderate abundance since 2001. Deer pellet groups have been sampled in the highest abundance on the Rosette, Devils Playground, South Side Emigrant Pass, Mud Springs Basin, Kimber Ranch, and Raft River Narrows studies. The abundance of sampled deer pellet groups has increased on the Kimber Ranch study from moderate abundance in 2001 to high abundance in 2011. The abundance of sampled elk pellet groups was low on all the studies except the South Side Emigrant Pass and Dake Pass studies. The abundance of sampled pellet groups for elk was very high on the South Side Emigrant Pass study in 2001, but has been low in the other sample years. The mean abundance of livestock pellet groups has been low on the study sites since 2001 (Figure 9b).

Deer Desirable Components Index (DCI): The low potential deer DCI steadily decreased from good in 1996 to fair in 2006, but increased again in 2011, returning to 2001 levels. Much of the change in the DCI score is due to fluctuations in annual grass cover, but there has also been a decrease in preferred browse cover and recruitment of young preferred browse plants since 1996. Increases in perennial grass cover has compensated for some of the loss in preferred browse (Table 2 and Figure 7).

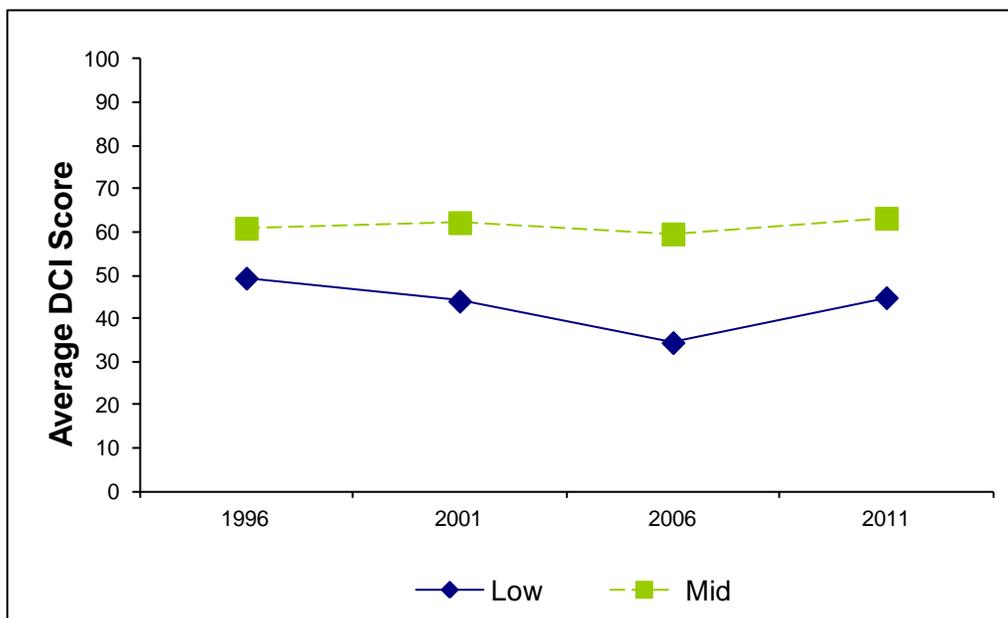
Discussion: The decline in density of Wyoming big sagebrush and black sagebrush is a cause of concern for these important deer winter ranges, though cover has remained relatively stable over the course of the study years. The Rosette, Mud Springs Basin, Raft River Narrows, and Bedke Springs studies have driven the pattern of Wyoming big sagebrush decline for low potential studies on the unit. A wildfire occurred on the Raft River Narrows study in 2000. The wildfire burned just part of the study transect, but reduced density on

the study. Decreases in density due to the fire on this site comprised much of the decrease in the mean density of Wyoming big sagebrush in 2001, but density has continued to decrease on the Raft River Narrows study and many of the other low potential studies in subsequent sample years. The Devils Playground, Kimber Ranch, and Dake Pass studies have driven the pattern of decline of black sagebrush for the low potential studies on the unit.

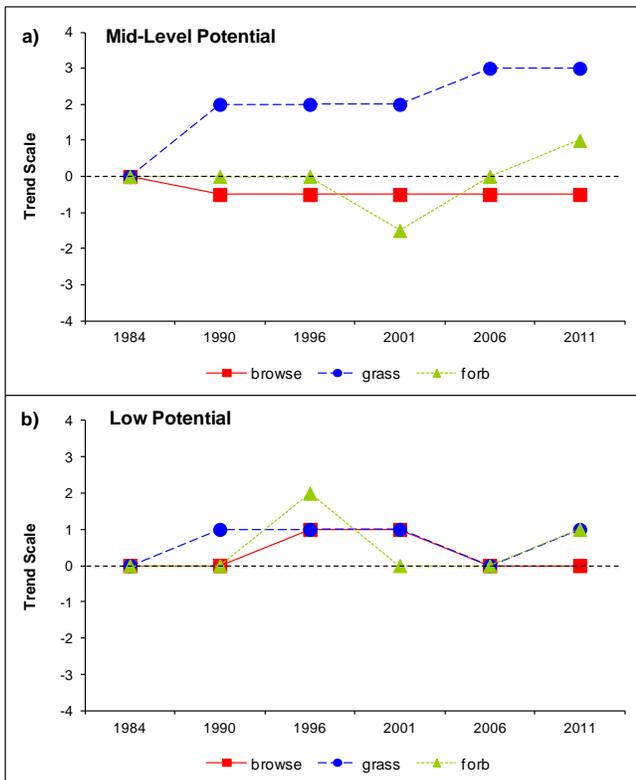
Causes of sagebrush decline are varied and multiple causes may have compounded effects on the low potential studies in this unit. Drought has been a predominant factor in this area over the course of the study years (Figure 1 and Figure 2), and has likely negatively impacted these low elevation studies. The abundance of the annual grass species, especially the weedy species cheatgrass, is also likely a primary cause of sagebrush decline. Cheatgrass has been especially prevalent on the Rosette, Devils Playground, Mud Springs Basin, Kilgore Basin, Kimber Ranch, Raft River Narrows, Bedke Spring, and Dake Pass studies. It appears that cheatgrass is having the largest impact on the sagebrush populations on the Rosette, Mud Springs Basin, Kimber Ranch, Raft River Narrows, Bedke Springs, and Dake Pass studies.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
96	19.5	8.6	8.4	9.8	-1.4	4.3	0.0	<b>49.4</b>	Good
01	19.3	8.5	7.0	10.9	-4.3	2.6	0.0	<b>44.1</b>	Fair-Good
06	18.4	6.6	2.9	11.5	-7.8	2.7	0.0	<b>34.5</b>	Fair
11	17.4	8.6	4.8	13.6	-2.8	3.3	0.0	<b>44.9</b>	Fair-Good

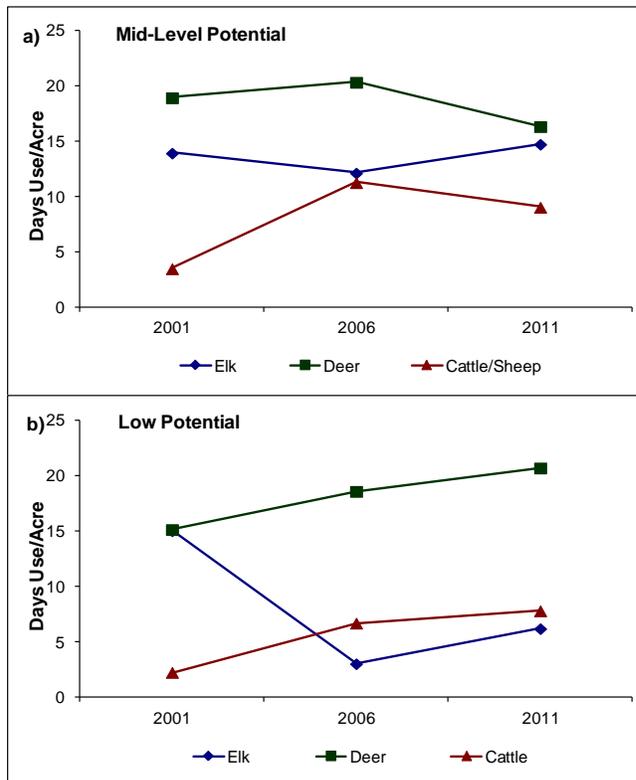
**Table 2.** Low potential scale mean deer DCI scores and rankings (n=3) by year for WMU 1, Box Elder. The deer DCI rankings are divided into three categories based on ecological potentials which include low, mid-level and high.



**Figure 7.** Mean low (n=9) and mid-level (n=10) potential scale deer DCI scores by year for WMU 1, Box Elder. The deer DCI rankings are divided into three categories based on ecological potentials which include low, mid-level and high.



**Figure 8.** a) Mid-level potential sites cumulative median browse, grass and forb trends by year for WMU 1, Box Elder. b) low potential sites cumulative median browse, grass and forb trends by year for WMU 1.



**Figure 9.** a) Mid-level potential sites mean animals days use/acre (n=10) by year for WMU 1, Box Elder. b) Low potential sites mean animal days use/acre (n=9) by year for WMU 1.