Ecological site group R023XY901NV
Shallow and Moderately Deep <12" PZ Low and Lahontan sagebrush and bluebunch wheatgrass/Thurber's needlegrass

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Key Characteristics

- Site does not pond or flood
- Landform other than dunes
- Surface soils are not clayey
- Sites are shrub or grass dominated
- MAP ≤ 10"
- Soil texture (PCS) clayey
- Site does not pond or flood
- Landform other than dunes
- Surface soils are not clayey
- Sites are shrub or grass dominated
- [Criteria]MAP >10"
- Soils is shallow to root restrictive layer
- Soils Molisols

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

Physiography

This group is on plateaus and mountains at elevations between 4,500 and 7,000 feet. Slopes are 4 to 40 percent, with most sites having a representative slope less than 20 percent.

Climate

The climate is classified as Cold Semi-Arid in the Koppen Classification System.

The area receives 8 to 13 inches of annual precipitation as snow in the winter and rain in spring and fall. Summers are generally dry.

The frost-free period is 60 to 110 days. The mean annual air temperature is 24 to 52 °F.

Soil features

The soils in this group are less than 35 inches to bedrock or another root restrictive layer. The textures are clayey, often with gravelly or cobbly surface textures.

Soil temperature regimes are generally mesic with a few frigid map units. Taxonomically, soils are a mix of Mollisols and Aridisols.

Common soil series in this group include Devada, Pickup, and Wylo.

Vegetation dynamics

An ecological site is the product of all the environmental factors responsible for its development. Each site has a set of key characteristics that influence its resilience to disturbance and resistance to invasives. According to Caudle et al. (2013), key characteristics include:

1. Climate factors such as precipitation and temperature.
2. Topographic characteristics such as aspect, slope, elevation, and landform.
3. Hydrologic processes such as infiltration and runoff.
4. Soil characteristics such as depth, texture, structure, and organic matter.
5. Plant communities and their functional groups and productivity.
6. Natural disturbance (fire, herbivory, etc.) regime.

Biotic factors that influence resilience include site productivity, species composition and structure, and population regulation and regeneration (Chambers et al., 2013).

The ecological sites in this group are dominated by deep-rooted, cool-season perennial bunchgrasses and long-lived shrubs (at least 50 years old) with high root to shoot ratios. The dominant shrubs usually root to the full depth of the winter-spring soil moisture recharge, which ranges from 1.0 to over 3.0 meters (Dobrowolski et al., 1990). However, community types with low sagebrush (*Artemisia arbuscula*) as the dominant shrub may only have available rooting depths of 71 to 81 centimeters (Jensen, 1990). These shrubs have a flexible generalized root system with development of both deep taproots and laterals near the surface (Comstock & Ehleringer, 1992).

Periodic drought regularly influences sagebrush ecosystems, and drought duration and severity have increased throughout the 20th century in much of the Intermountain West. Major shifts away from historical precipitation patterns have the greatest potential to alter ecosystem function and productivity. Species composition and productivity can be altered by the timing of precipitation and water availability within the soil profile (Bates et al., 2006).

Low sagebrush is fairly drought tolerant but also tolerates periodic wetness during some portion of the growing season (Fosberg & Hironaka, 1964; Blackburn et al., 1968a, 1968b, 1969). It grows on soils that have a strongly structured B2t (argillic) horizon close to the soil surface (Winward, 1980; Fosberg & Hironaka, 1964; Zamora & Tueller, 1973). Low sagebrush is also susceptible to the sagebrush defoliator known as the Aroga moth (Aroga websteri). While the Aroga moth can partially or entirely kill individual plants or entire stands of big sagebrush (*Artemisia tridentata*) (Furniss & Barr, 1975), research is inconclusive of the damage sustained by low sagebrush populations.

Lahontan sagebrush was only recently identified as a unique species of sagebrush (Winward & McArthur, 1995). Lahontan sagebrush is a cross between low sagebrush and Wyoming sagebrush (*Artemisia tridentata* ssp. wyomingensis). It typically grows near the old shorelines of Lake Lahontan from the Pleistocene Epoch. This subspecies grows on soils similar to low sagebrush with shallow depths and low water holding capabilities (Winward & McArthur, 1995).

Early sagebrush (also known as alkali sagebrush) is a unique subspecies of *Artemisia arbuscula* that is differentiated because it blooms in mid-June to July. It was originally named alkali sagebrush because it was found on alkaline limestone soils (Beetle, 1960). However, a body of research challenges this claim across the species' range (Passey & Hugie, 1962; Robertson et al., 1966; Zamora and Tueller, 1973). It grows on soils similar to low sagebrush, with a restrictive horizon close to the soil surface (Robertson et al., 1966; Zamora & Tueller, 1973).

The Great Basin sagebrush communities have high spatial and temporal variability in precipitation both among years and within growing seasons (MacMahon, 1980). Nutrient availability is typically low but increases with elevation and closely follows moisture availability. The invasibility of plant communities is often linked to resource availability. Disturbance changes resource uptake and increases nutrient availability, often to the benefit of non-native species; native species are often damaged and their ability to use resources is depressed for a time, but resource pools may increase from lack of use and/or the decomposition of dead plant material following disturbance (Whisenant, 1999; Miller et al., 2013). The invasion of sagebrush communities by cheatgrass (*Bromus tectorum*) has been linked to disturbances that result in fluctuations in resources such as fire and abusive grazing (Beckstead & Augspurger, 2004; Chambers et al., 2007; Johnson et al., 2011).

The ecological sites in this group have low to moderate resilience to disturbance and resistance to invasion. Resilience increases with elevation, northerly aspect, precipitation, and nutrient availability. Five possible stable states have been identified for this group.

Annual Invasive Grasses:

The species most likely to invade these sites are cheatgrass and medusahead (Taeniatherum). Both species are cool-season annual grasses that maintain an advantage over native plants in part because they are prolific seed producers, able to germinate in the autumn or spring, tolerant of grazing, and increase with frequent fire (Klemmedson & Smith, 1964; Miller et al., 1999). Medusahead and cheatgrass originated from Eurasia and both were first reported in North America in the late 1800s (Mack & Pyke, 1983; Furbush, 1953). Pellant and Hall (1994) found 3.3 million acres of public lands dominated by cheatgrass and suggested that another 76 million acres were susceptible to invasion by winter annuals including cheatgrass and medusahead. By 2003, medusahead occupied approximately 2.3 million acres in 17 western states (Rice, 2005). In the Intermountain West, the exponential increase in dominance by medusahead has largely been at the expense of cheatgrass (Harris, 1967; Hironaka, 1994).

Medusahead matures 2 to 3 weeks later than cheatgrass (Harris, 1967). Recently, James et al. (2008) measured leaf biomass over the growing season and found that medusahead maintained vegetative growth later in the growing season than cheatgrass. Mangla et al. (2011) also found medusahead had a longer period of growth and more total biomass than cheatgrass and hypothesized this difference in relative growth rate may be due to the ability of medusahead to maintain water uptake as upper soils dry compared to co-occurring species, especially cheatgrass. Medusahead litter has a slow decomposition rate because of its high silica content, allowing it to accumulate over time and suppress competing vegetation (Bovey et al., 1961; Davies & Johnson, 2008). Harris (1967) reported medusahead roots have thicker cell walls compared to those of cheatgrass, allowing it to more effectively conduct water, even in very dry conditions.

Recent modeling and empirical work by Bradford and Lauenroth (2006) suggest that seasonal patterns of precipitation input and temperature are also key factors determining regional variation in the growth, seed production, and spread of invasive annual grasses. Collectively, the body of research suggests that the invasion and dominance of medusahead onto native grasslands and cheatgrass-infested grasslands will continue to increase in severity because conditions that favor native bunchgrasses or cheatgrass over medusahead are rare (Mangla et al., 2011). Medusahead replaces native vegetation and cheatgrass directly by competition and suppression; it replaces native vegetation indirectly by increasing fire frequency.

Methods to control medusahead and cheatgrass include herbicide, fire, grazing, and seeding of primarily non-native wheatgrasses. Mapping potential or current invasion vectors is a management method designed to increase the cost effectiveness of control methods. A study by Davies et al. (2013) found an increase in medusahead cover near roads. Cover was higher near animal trails than random transects, but the difference was less evident. This implies that vehicles and animals aid the spread of the weed; however, vehicles are the major vector of movement. Spraying with herbicide (Imazapic or Imazapic and glyphosate) and seeding with crested wheatgrass (*Agropyron cristatum*) and Sandberg bluegrass (*Poa secunda*) have been more successful at combating medusahead and cheatgrass than spraying alone (Sheley et al., 2012). Where native bunchgrasses are missing from the site, revegetation of medusahead- or cheatgrass-invaded rangelands has a higher likelihood of success when using introduced perennial bunchgrasses such as crested wheatgrass (Davies et al., 2015). Butler et al. (2011) tested four herbicides (Imazapic, Imazapic + glyphosate, rimsulfuron and sulfometuron + Chlorsulfuron), using herbicide-only treatments for suppression of cheatgrass, medusahead, and ventenata (*Ventenata dubia*) within residual stands of native bunchgrass. Additionally, they tested the same four herbicides followed by seeding of six bunchgrasses (native and non-native) with varying success. Herbicide-only treatments appeared to remove competition for established bluebunch wheatgrass (*Pseudoroegneria spicata*) by providing 100 percent control of ventenata and medusahead and greater than 95 percent control of cheatgrass (Butler et al. 2011). However, caution in using these results is advised, as only one year of data was reported.

Prescribed fire has also been utilized in combination with the application of pre-emergent herbicide to control medusahead and cheatgrass (J. L. Vollmer & J. G. Vollmer, 2008). Mature medusahead or cheatgrass is very flammable and fire can be used to remove the thatch layer, consume standing vegetation, and even reduce seed levels. Furbush (1953) reported that timing a burn while the seeds were in the milk stage effectively reduced medusahead the following year. He further reported that adjacent unburned areas became a seed source for reinvasion the following year.

When considering the combination of pre-emergent herbicide and prescribed fire for invasive annual grass control, it is important to assess the tolerance of desirable brush species to the herbicide being applied. J. L. Vollmer and J. G. Vollmer (2008) tested the tolerance of mountain mahogany (*Cercocarpus montanus*), antelope bitterbrush (*Purshia tridentata*), and multiple sagebrush species to three rates of Imazapic and the same rates with methylated seed oil as a surfactant. They found a cheatgrass control program in an antelope bitterbrush community should not exceed Imazapic at 8 ounces per acre with or without surfactant. Sagebrush, regardless of species or rate of application, was not affected. However, many environmental variables were not reported in this study and managers should install test plots before broad scale herbicide application is initiated.

Fire Ecology:

Low sagebrush is killed by fire and does not sprout (Tisdale & Hironaka, 1981). Fire risk is greatest following a wet, productive year when there is greater production of fine fuels (Beardall & Sylvester, 1976). Fire return intervals are not well understood because these ecosystems rarely coincide with fire-scarred conifers, but a wide range of 20 to well over 100 years has been estimated (Miller & Rose, 1995, 1999; Baker, 2006; Knick et al., 2005). Historically, fires were probably patchy due to the low productivity of these sites (Beardall & Sylvester, 1976; Ralphs & Busby, 1979; Wright et al., 1979; Smith & Busby, 1981). Fine fuel loads generally average 100 to 400 pounds per acre (110 to 450 kilograms per hectare) but are occasionally as high as 600 pounds per acre (680 kilograms per hectare) in low sagebrush habitat types (Bradley et al., 1992). Reestablishment occurs from off-site wind-dispersed seed (Young, 1983). Recovery time of low sagebrush following fire is variable (Young, 1983). After fire, if regeneration conditions are favorable, low sagebrush recovers in 2 to 5 years (Young, 1983). On harsh sites where cover is low to begin with and/or erosion occurs after fire, recovery may require more than 10 years (Young, 1983). Slow regeneration may subsequently worsen erosion (Blaisdell et al., 1982). We were unable to find any substantial research on success of seeding low sagebrush after fire. To date, we have not been able to find specific research on the fire response of Lahontan sagebrush.

Antelope bitterbrush, a minor component on these sites, is moderately fire tolerant (McConnell & Smith, 1977). It regenerates from seed and resprouting (Blaisdell & Mueggler, 1956; McArthur et al., 1982). However, sprouting ability is highly variable and is attributed to genetics, plant age, phenology, soil moisture, soil texture, and fire severity (Blaisdell & Mueggler, 1956; Blaisdell et al., 1982; Clark et al., 1982; Cook et al., 1994). Bitterbrush sprouts from a region on the stem approximately 1.5 inches above and below the soil surface; the plant rarely sprouts if the root crown is killed by fire (Blaisdell & Mueggler, 1956). Low-intensity fires and springtime fires may allow bitterbrush to sprout; however, community response also depends on soil moisture levels at time of fire (Murray, 1983; Busse et al., 2000; Kerns et al., 2006). Lower soil moisture allows more charring of the stem below ground level (Blaisdell & Mueggler, 1956). If cheatgrass is present, bitterbrush seedling success is much lower; the factor that most limits establishment of bitterbrush seedlings is competition for water resources with the invasive species cheatgrass (Clements & Young, 2002).

The effect of fire on bunchgrasses relates to culm density, culm-leaf morphology, and the size of the plant. The two dominant grasses on this site, bluebunch wheatgrass and Thurber's needlegrass (*Achnatherum thurberianum*), have different responses to fire. Bluebunch wheatgrass has coarse stems with little leafy material; therefore, the plant's aboveground biomass burns rapidly, and little heat is transferred downward into the crowns (Young, 1983). Bluebunch wheatgrass is fairly tolerant of burning, except in May in eastern Oregon (Britton et al., 1990). Uresk et al. (1976) reported burning increased vegetative and reproductive vigor of bluebunch wheatgrass. Bluebunch wheatgrass experiences slight damage from fire but is more susceptible to fire damage in drought years (Young, 1983).

Conversely, Thurber's needlegrass is very susceptible to fire-caused mortality. Burning can decrease the vegetative and reproductive vigor of Thurber's needlegrass (Uresk et al., 1976). Fire can cause high mortality, in addition to reducing basal area and yield of Thurber's needlegrass (Britton et al., 1990). The fine leaves and densely tufted growth form make this grass susceptible to subsurface charring of the crowns (Wright & Klemmedson, 1965). Although timing of fire highly influences the response and mortality of Thurber's needlegrass, smaller bunch sizes are less likely to be damaged by fire (Wright & Klemmedson, 1965). However, Thurber's needlegrass often survives fire and will continue growth when conditions are favorable (Koniak, 1985). Thus, the initial condition of the bunchgrasses on the site and seasonality and intensity of the fire all factor into the individual species response.

Sandberg bluegrass, a minor component of these ecological sites, has been found to increase following fire likely due to its low stature and productivity (Daubenmire, 1975). It may impair reestablishment of more deeply rooted bunchgrasses (Daubenmire, 1975).

The grasses likely to invade the sites in this group are cheatgrass and medusahead. These invasive grasses displace desirable perennial grasses, reduce livestock forage, and accumulate large fuel loads that foster frequent fires (Davies & Svejcar, 2008). Invasion by annual grasses can alter the fire cycle by increasing fire size, fire season length, rate of spread, numbers of individual fires, and likelihood of fires spreading into native or managed ecosystems (D'Antonio & Vitousek, 1992; Brooks et al., 2004). While historical fire return intervals are estimated at 15 to 100 years, areas dominated by cheatgrass are estimated to have a fire return interval of 3 to 5 years (Whisenant, 1990). The mechanisms by which invasive annual grasses alter fire regimes likely interact with climate. For example, cheatgrass cover and biomass vary with climate (Chambers et al., 2007) and are promoted by wet and warm conditions during the fall and spring. Invasive annual species can take advantage of high nitrogen availability following fire because of their higher growth rates and increased seedling establishment relative to native perennial grasses (Monaco et al., 2003).

Livestock/Wildlife Grazing Interpretations:

Domestic sheep and, to a much lesser degree, cattle consume low sagebrush, particularly during the spring, fall, and winter (Sheehy & Winward, 1981). Heavy dormant season grazing by sheep will reduce sagebrush cover and increase grass production (Laycock, 1967). Trampling damage, particularly from cattle or horses, in low sagebrush habitat types is greatest on areas with highly clayey soils during spring snowmelt when surface soils are saturated. On drier areas with more gravelly soils, trampling is less of a problem (Hironaka et al., 1983). Bunchgrasses, in general, best tolerate light grazing after seed formation. Britton et al. (1990) observed the effects of clipping date on basal area of five bunchgrasses in eastern Oregon and found grazing from August to October (after seed set) has the least impact.

Heavy grazing during the growing season will reduce perennial bunchgrasses and increase sagebrush (Laycock, 1967). Abusive grazing by cattle or horses allows unpalatable plants like low sagebrush, rabbitbrush, and some forbs such as arrowleaf balsamroot (*Balsamorhiza sagittata*) to become dominant on the site. Sandberg bluegrass is grazing tolerant due to its short stature. Annual non-native weedy species such as cheatgrass, mustards, and medusahead may invade.

Throughout 2 years of site visits, Lahontan sagebrush was observed in a heavily-browsed state on several ecological sites in this group. This recently differentiated subspecies of low sagebrush (Winward & McArthur, 1995) is moderately to highly palatable to browse species (McArthur, 2005; Rosentreter, 2005). Dwarf sagebrush species such as Lahontan sagebrush, low sagebrush, and black sagebrush (*Artemisia nova*) are preferred by mule deer for browse among the sagebrush species.

Antelope bitterbrush, a minor component on sites in this group, is a critical browse species for mule deer, antelope, and elk and is often utilized heavily by domestic livestock (Wood et al., 1995). Grazing tolerance depends on site conditions (Garrison, 1953) and the shrub can be severely hedged during the dormant season for grasses and forbs.

Bluebunch wheatgrass is moderately tolerant of grazing and is very sensitive to defoliation during the active growth period (Blaisdell & Pechanec, 1949; Laycock, 1967; Anderson & Scherzinger, 1975; Britton et al., 1990). In a study, herbage and flower stalk production were reduced with clipping at all times during the growing season; clipping was most harmful, however, during the boot stage (Blaisdell & Pechanec, 1949). Tiller production and growth of bluebunch wheatgrass can be greatly reduced when clipping is coupled with drought (Busso & Richards, 1995). Mueggler (1975) estimated that low-vigor bluebunch wheatgrass may need up to 8 years rest to recover. Although an important forage species, it is not always the preferred species by livestock and wildlife.

Thurber's needlegrass is an important forage source for livestock and wildlife in the arid regions of the West (Ganskopp, 1988). Although the seeds are apparently not injurious, grazing animals avoid them when they begin to mature. Sheep, however, have been observed grazing the leaves closely, leaving stems untouched (Eckert & Spencer, 1987). Heavy grazing during the growing season has been shown to reduce the basal area of Thurber's needlegrass (Eckert & Spencer, 1987). This suggests that both seasonality and utilization are important factors in management of this plant. A single defoliation, particularly during the boot stage, can reduce herbage production and root mass thus potentially lowering the competitive ability of Thurber's needlegrass (Ganskopp, 1988).

Reduced bunchgrass vigor or density provides an opportunity for Sandberg bluegrass and/or cheatgrass and other invasive species to expand onto or occupy interspaces. Sandberg bluegrass increases under grazing pressure (Tisdale & Hironaka, 1981). It is capable of co-existing with cheatgrass or other weedy species. Excessive sheep grazing favors Sandberg bluegrass; however, where cattle are the dominant grazers, cheatgrass often dominates (Daubenmire, 1970). Thus, depending on the season of use, the type of grazing animal, and site conditions, either Sandberg bluegrass or cheatgrass may become the dominant understory species with inappropriate grazing management.

Inappropriate grazing practices can be tied to the success of medusahead. However, eliminating grazing will not eradicate medusahead if it is already present (Wagner et al., 2001). Sheley and Svejcar (2009) reported that even moderate defoliation of bluebunch wheatgrass resulted in increased medusahead density. They suggested that disturbances such as plant defoliation limit soil resource capture, which creates an opportunity for exploitation by medusahead. Avoidance of medusahead by grazing animals allows medusahead populations to expand. This creates seed reserves that can infest adjoining areas and cause changes to the fire regime. Medusahead replaces native vegetation and cheatgrass directly by competition and suppression; it replaces native vegetation indirectly by increasing fire frequency. Medusahead litter has a slow decomposition rate because of its high silica content, allowing it to accumulate over time and suppress competing vegetation (Bovey et al., 1961; Davies & Johnson, 2008).

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Major Land Resource Area

MLRA 023X
Malheur High Plateau

Subclasses

- R023XF081CA–SHALLOW STONY LOAM 9-12"
- R023XF083CA–SHALLOW STONY CLAY LOAM 9-12"
- R023XY021NV–SCABLAND 10-14 P.Z.
- R023XY031NV–CLAYPAN 10-14 P.Z.
- R023XY037NV–CLAY SLOPE 8-12 P.Z.
- R023XY059NV–GRAVELLY CLAYPAN 10-12 P.Z.
- R023XY060NV–COBBLY CLAYPAN 8-12 P.Z.
- R023XY093NV–GRAVELLY CLAY 10-12 P.Z.
- R023XY214OR–CLAYPAN 10-12 PZ
- R023XY215OR–SHALLOW GRAVELLY LOAM 10-12 PZ
- R023XY218OR–THIN SURFACE CLAYPAN 10-16 PZ
- R023XY324OR–SHALLOW SWALE 10-14 PZ
- R023XY600OR–CLAYPAN SOUTH 8-12 PZ

Correlated Map Unit Components

21659781, 21659206, 21660018, 21659215, 21659814, 21659540, 21659541, 21659846, 21659316, 21659356, 21660135, 21660599, 21660633, 21660521, 21660519, 21660407, 21660413, 21660531, 21660535, 21501018, 21501130, 21501418, 21501432, 21500809, 21500905, 21501176, 21501217, 21501162, 21500654, 21501366, 21501368, 21500662, 21501078, 21501100, 21500287, 21500924, 21501287, 21501291, 21501083, 21500584, 21501096, 21501087, 21501155, 21501116, 21500328, 21500681, 21500860, 21500845, 21500831, 21501424, 21501380, 21500406, 21501033, 21501028, 21501037, 21501039, 21500815, 21501373, 21501054, 21500672, 21500932, 21500933, 21500744, 21500350, 21500637, 21500639, 21500826, 21500642, 21501134, 21500385, 21500595, 21500687, 21500629, 21500984, 21501187, 21501186, 21500882, 21500885, 21500358, 21500362, 21500750, 21500751, 21500752, 21500913, 21481774, 21662837, 21590100, 21589978, 21589988, 21589614, 21589554, 21589556, 21589819, 21589982, 21589396, 21589994, 21589993, 21589822, 21589745, 21589749, 21589616, 21589618, 21589622, 21589433, 21590093, 21589567, 21589840, 21589843, 21589797, 21589905, 21590108, 21589514, 21589516, 21589563, 21589959, 21589536, 21589872, 21589697, 21589851, 21589508, 21589690, 21590464, 21590459, 21590644, 21590652, 21590524, 21590722, 21590646, 21590556, 21590713, 21590370, 21590417, 21590894, 21590934, 21590300, 21590932, 21590947, 21590657, 21590660, 21590850, 21590420, 21591894, 21604300, 21604246, 21604242, 21604897, 21604855, 21604372, 21605199, 21605201, 21604605, 21604161, 21604175, 21604468, 21604891, 21605065, 21604166, 21604467, 21604990, 21604279, 21604534, 21604521, 21604951, 21604505, 21604584, 21604808, 21604203, 21604200, 21604934, 21604832, 21605081, 21604880, 21604881, 21604761, 21605176, 21605177, 21604791, 21604799, 21729119, 21729124, 21729155, 21729169, 21729191, 21730189, 21728760, 21728761, 21728763, 21729446, 21729448, 21729451, 21729428, 21730013, 21729630, 21729523, 21729525, 21729528, 21729514, 21729293, 21729294, 21729286, 21729016, 21729551, 22170555, 22170553, 22170550, 22170547, 22171136, 22171143, 22171141, 22171121, 22170457, 22170928, 22170897, 22170919, 22170910, 22170786, 22170769, 22170767, 22170703, 22170628, 22170626, 22176545, 22176522, 22177016, 22177017, 22175004, 22176582, 22176551, 22176277, 22176470, 22175593, 22176428, 22176518, 22176378, 22175371, 22175616, 22175773, 22175191, 22175609, 22176514, 22175258, 22177396, 22177136, 22177397, 22177131, 22177171, 22177427, 22177182, 22177436, 22177072, 22177073, 22177439, 22177441, 22177211, 22177455, 22177218, 22177124, 22177125, 22177023, 22177675, 22176393, 22176531, 22176517, 22175442, 22175443, 22176271, 22177507, 22177510, 22177410, 22177430, 22177435, 22177324, 22177325

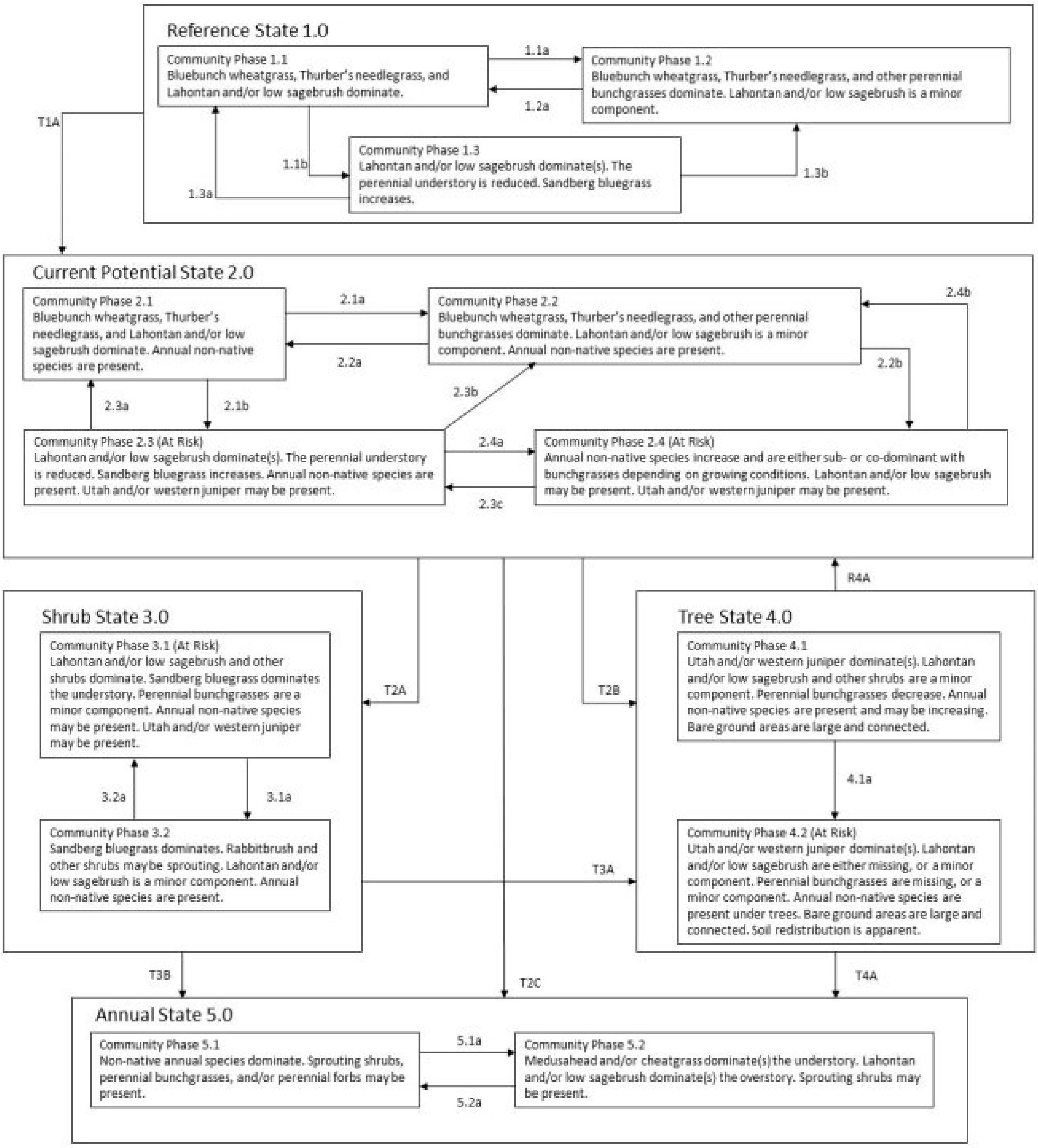
Stage

Provisional

Contributors

T Stringham (UNR under contract with BLM)
DMP

State and transition model



Reference State 1.0
Community Phase 1.1
Bluebunch wheatgrass, Thurber's needlegrass, and Lahontan and/or low sagebrush dominate.
1.1a
1.2a
Community Phase 1.2
Bluebunch wheatgrass, Thurber's needlegrass, and other perennial bunchgrasses dominate. Lahontan and/or low sagebrush is a minor component.
1.1b
1.3a
Community Phase 1.3
Lahontan and/or low sagebrush dominate(s). The perennial understory is reduced. Sandberg bluegrass increases.
1.3b
T1A
Current Potential State 2.0
Community Phase 2.1
Bluebunch wheatgrass, Thurber's needlegrass, and Lahontan and/or low sagebrush dominate. Annual non-native species are present.
2.1a
2.2a
Community Phase 2.2
Bluebunch wheatgrass, Thurber's needlegrass, and other perennial bunchgrasses dominate. Lahontan and/or low sagebrush is a minor component. Annual non-native species are present.
2.4b
2.2b
2.3b
2.3a
2.1b
Community Phase 2.3 (At Risk)
Lahontan and/or low sagebrush dominate(s). The perennial understory is reduced. Sandberg bluegrass increases. Annual non-native species are present. Utah and/or western juniper may be present.
2.4a
2.3c
Community Phase 2.4 (At Risk)
Annual non-native species increase and are either sub- or co-dominant with bunchgrasses depending on growing conditions. Lahontan and/or low sagebrush may be present. Utah and/or western juniper may be present.
R4A
Shrub State 3.0
Community Phase 3.1 (At Risk)
Lahontan and/or low sagebrush and other shrubs dominate. Sandberg bluegrass dominates the understory. Perennial bunchgrasses are a minor component. Annual non-native species may be present. Utah and/or western juniper may be present.
T2A
T2B
Tree State 4.0
Community Phase 4.1
Utah and/or western juniper dominate(s). Lahontan and/or low sagebrush and other shrubs are a minor component. Perennial bunchgrasses decrease. Annual non-native species are present and may be increasing. Bare ground areas are large and connected.
3.2a
3.1a
4.1a
Community Phase 3.2
Sandberg bluegrass dominates. Rabbitbrush and other shrubs may be sprouting. Lahontan and/or low sagebrush is a minor component. Annual non-native species are present.
T3A
Community Phase 4.2 (At Risk)
Utah and/or western juniper dominate(s). Lahontan and/or low sagebrush are either missing, or a minor component. Perennial bunchgrasses are missing, or a minor component. Annual non-native species are present under trees. Bare ground areas are large and connected. Soil redistribution is apparent.
T3B
T2C
T4A
Annual State 5.0
Community Phase 5.1
Non-native annual species dominate. Sprouting shrubs, perennial bunchgrasses, and/or perennial forbs may be present.
5.1a
5.2a
Community Phase 5.2
Medusahead and/or cheatgrass dominate(s) the understory. Lahontan and/or low sagebrush dominate(s) the overstory. Sprouting shrubs may be present.

Reference State 1.0 Community Phase Pathways
1.1a: Low-severity fire creates a grass/sagebrush mosaic. High-severity fire significantly reduces sagebrush and leads to an early or mid-seral community dominated by grasses and forbs.
1.1b: Time and lack of disturbance such as fire, or excessive herbivory reduce the perennial understory and facilitate this pathway.
1.2a: Time and lack of disturbance allows shrubs to reestablish.
1.3a: Low-severity fire, herbivory, or a combination of both reduces sagebrush.
1.3b: High-severity fire significantly reduces sagebrush and leads to an early or mid-seral community dominated by grasses and forbs.

Transition T1A: This transition occurs following the introduction of non-native annual species.

Current Potential State 2.0 Community Phase Pathways
2.1a: Low-severity fire creates a grass/sagebrush mosaic. High-severity fire significantly reduces sagebrush and leads to an early or mid-seral community dominated by grasses and forbs. Non-native annual species are present.
2.1b: Time and lack of disturbance such as fire facilitates this pathway. Inappropriate grazing management may also reduce perennial understory.
2.2a: Time and lack of disturbance allows shrubs to reestablish.
2.2b: This pathway occurs when fall and spring growing conditions favor the germination and production of non-native annual grasses. This pathway typically occurs three to five years post-fire. The resulting community, Community Phase 2.4, may be a transitory plant community.
2.3a: Low-severity fire, herbivory, brush management that minimally disturbs the soil, or a combination thereof creates a sagebrush/grass mosaic.
2.3b: High-severity fire significantly reduces sagebrush and leads to an early or mid-seral community. Brush management that causes minimal soil disturbance can also reduce sagebrush.
2.3c: This pathway occurs when fall and spring growing season conditions favor the germination and production of non-native annual grasses. The resulting community, Community Phase 2.4, may be a transitory plant community.
2.4a: This pathway occurs when growing season conditions favor perennial bunchgrass production and reduced cheatgrass production.
2.4b: This pathway occurs when growing season conditions favor perennial bunchgrass production and reduced cheatgrass production.

Transition T2A: Time and lack of disturbance, or inappropriate grazing management triggers a transition to Community Phase 3.1. Brush management of Community Phase 2.3 may result in Community Phase 3.2.
Transition T2B: Time and lack of fire allows Utah/western juniper to establish and overtop the sagebrush. Utah and/or western juniper dominate(s) site resources. This may be coupled with inappropriate grazing management.
Transition T2C: This transition occurs after a single severe fire or multiple fires.

Shrub State 3.0 Community Phase Pathways
3.1a: This pathway occurs after a high severity fire or brush management that causes minimal soil disturbance.
3.2a: Time and lack of disturbance facilitates this pathway. This pathway is unlikely. If it does occur, it may take many years to develop.

Transition T3A: Time and lack of fire allows Utah/western juniper to establish and dominate site resources. This may be coupled with inappropriate grazing management that reduces perennial grass density and increases tree establishment.
Transition T3B: The transition to Community Phase 5.1 can be triggered by several events: invasive annual grasses increase under shrubs, high-severity fire or multiple fires, and/or treatments that disturb the soil surface in the presence of non-native annual grasses.

Tree State 4.0 Community Phase Pathways
4.1a: Time without disturbance allows maturation of the tree community to occur.

Restoration R4A: Tree removal decreases tree cover and allows for the understory to recover. The site is restored to Community Phase 4.1.

Transition T4A: Catastrophic fire and/or inappropriate tree removal practices triggers a transition to Community Phase 5.1.

Annual State 5.0 Community Phase Pathways
5.1a: Time and lack of disturbance facilitates this pathway.
5.2a: This pathway occurs after fire.

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