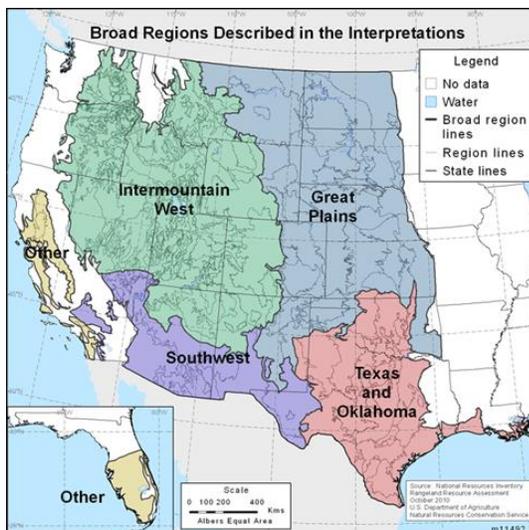


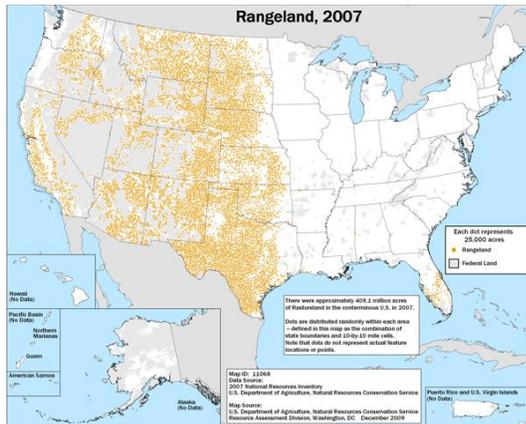
## Regional Interpretation - Texas and Oklahoma

Rangelands in delineated in this region are extremely diverse and include Gulf prairies and marshes, post oak savannahs, Blackland prairies, tall- and mixed-grass prairie, cross timbers and prairies, south Texas plains, and eastern fringe of the Edwards Plateau and Rolling Plains (Figures 1-2). This region exemplifies high diversity of rangeland plant community types: tallgrass and shortgrass prairies, thorn-shrub, to savannah. Climate in this region is variable from east-to-west and north-to-south, but is characterized as a warm-temperate/subtropical zone. The growing season is long, up to 330 days in the lower Rio Grande Valley of Texas. Rainfall is variable and ranges from 8 inches on the western fringe to 40 inches or more along the Gulf Coast. Winters are dry and summers are humid. Drought, a recurring phenomenon in Texas and Oklahoma, is generally unpredictable and can have an extreme effect on vegetation. Shrub invasion of juniper (*Juniperus* spp.) and honey mesquite (*Prosopis glandulosa* Torr) is a common problem and is exacerbated by a combination of events such as recurring drought, subsequent overgrazing, and lack of prescribed fire (Weltz and Spaeth 2012; Weltz et al. 2014). The potential for high runoff and erosion expands as juniper overstory increases and understory vegetation decreases (Pierson et al. 2007; Pierson et al. 2010; Weltz and Spaeth 2012; Weltz et al. 2014).

**Figure 1. Broad Regions Described in these Interpretations.**



**Figure 2. Acres of Non-Federal Rangeland, 2007.**



## Soil and Site Stability

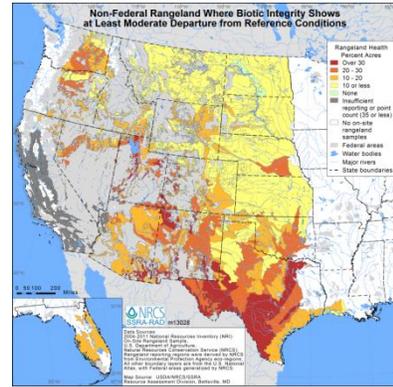
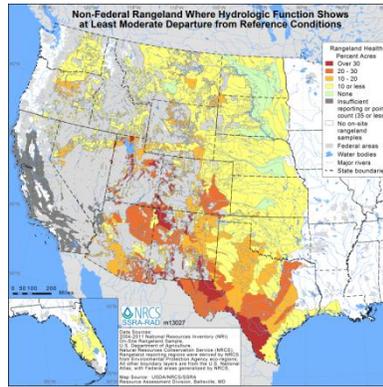
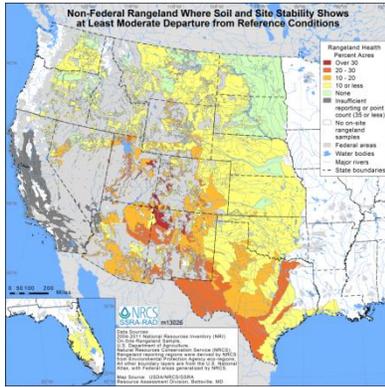
Although soil and site stability generally shows less departure from reference conditions than that of hydrologic function and biotic integrity (Figures 3-5), it shows moderate or greater levels of departure for relatively high proportions of non-Federal rangeland in this region, especially Texas. The proportion of non-Federal rangeland showing significant departure (20-30% of acres) is particularly high west of the Pecos River to the Rio Grande (the Trans Pecos, Mountains and Basins, the eastern part of the South Texas Plains). An increase and dominance of woody species such as Southern junipers (Figures 6-9), Eastern juniper (Figures 10-13) and mesquite (Figures 14-17) and creosote bush [*Larrea tridentata* (DC.) Coville], a simultaneous loss of native grasses, and increase of bare ground (Figure 18-21) are occurring in this region, which may explain a portion of the condition. In the Trans Pecos, 10-25% of the acres show 50% or greater bare ground; and 25-50% of the acres are 20-30% bare ground. Mesquite species throughout the area can comprise 5-15% canopy cover.

**Figures 3-5. Non-Federal Rangeland Where Soil and Site Stability, Hydrologic Function, or Biotic Integrity Show at Least Moderate Departure from Reference Conditions. (Source: Rangeland Health Table 2)**

Figure 3. Soil and Site Stability

Figure 4. Hydrologic Function

Figure 5. Biotic Integrity



**Figures 6-9. Non-Federal Rangeland Where Southern Juniper Species Are Present and Where They Cover at Least 15, 30, or 50 Percent of the Soil Surface. (Source: Native Invasive Woody Species Table 6)**

Figure 6. Present

Figure 7. At least 15%

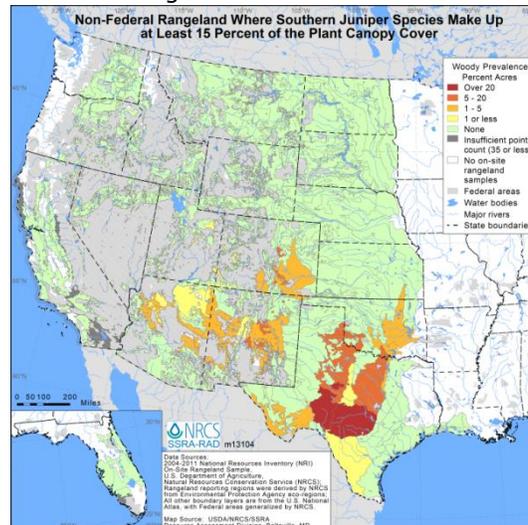
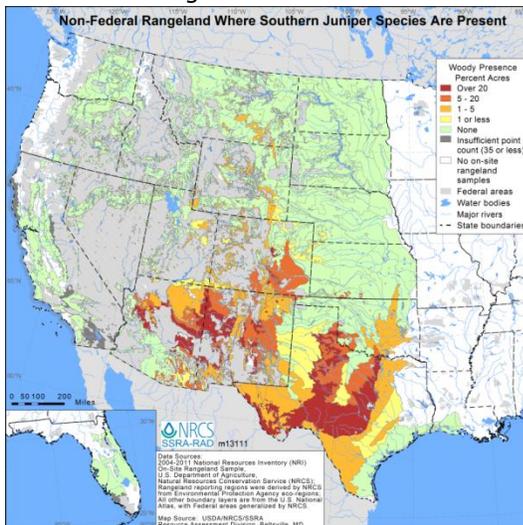


Figure 8. At least 30%

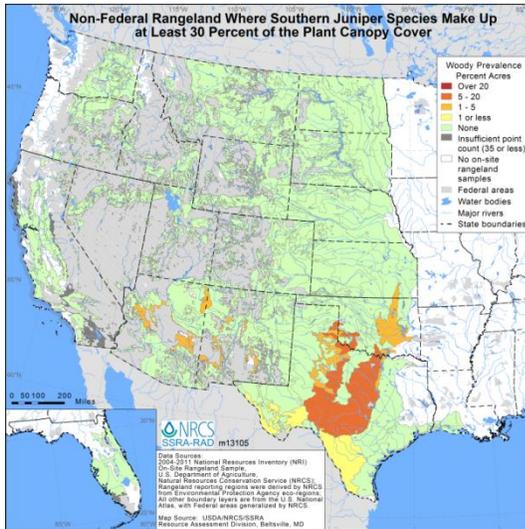
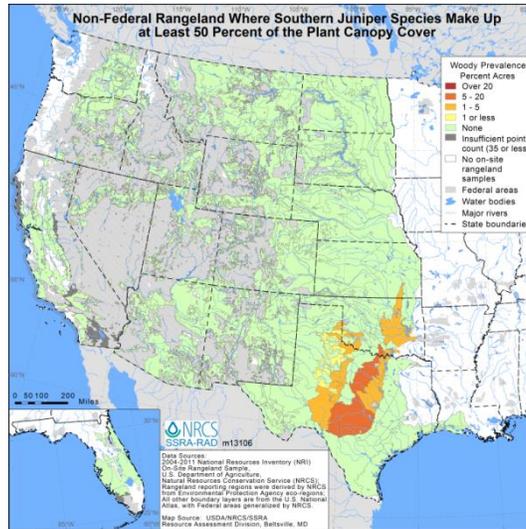


Figure 9. At least 50%



**Figures 10-13. Non-Federal Rangeland Where Eastern Juniper Species Are Present and Where They Cover at Least 15, 30, or 50 Percent of the Soil Surface. (Source: Native Invasive Woody Species Table 8)**

Figure 10. Present

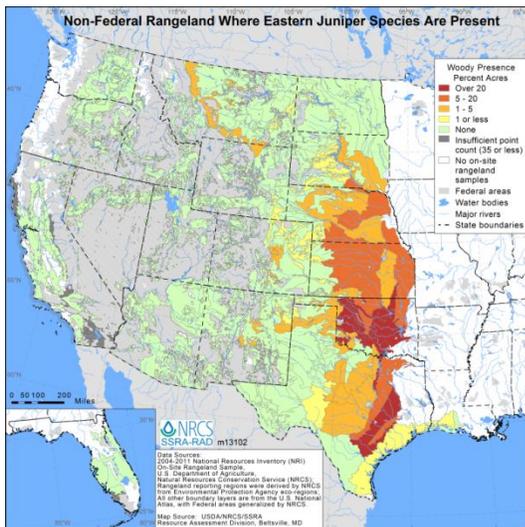


Figure 11. At least 15%

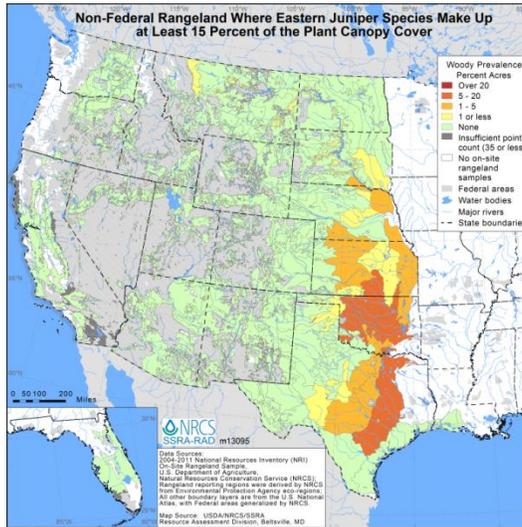


Figure 12. At least 30%

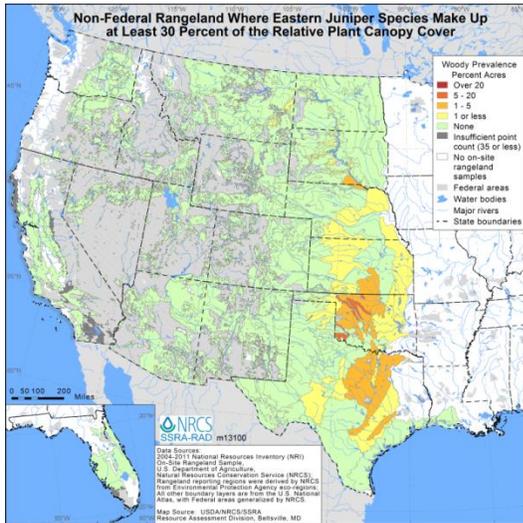
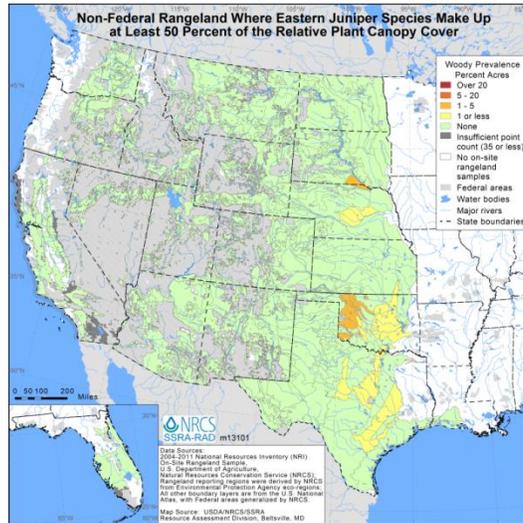


Figure 13. At least 50%



**Figures 14-17. Non-Federal Rangeland Where Mesquite Species Are Present and Where They Cover at Least 15, 30, or 50 Percent of the Soil Surface. (Source: Native Invasive Woody Species Table 10)**

Figure 14. Present

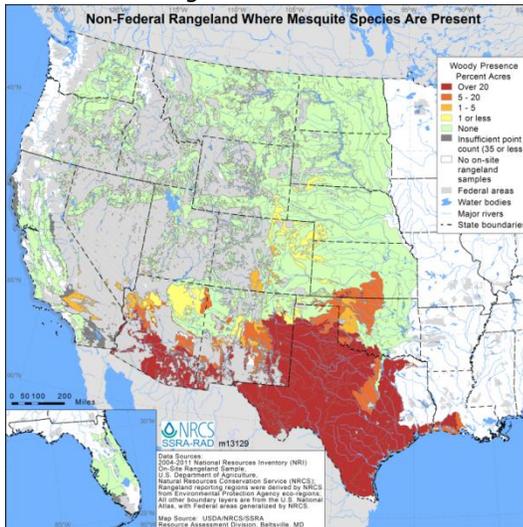


Figure 15. At least 15%

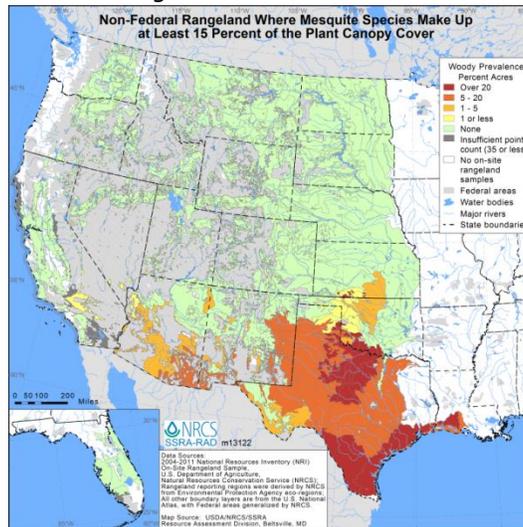


Figure 16. At least 30%

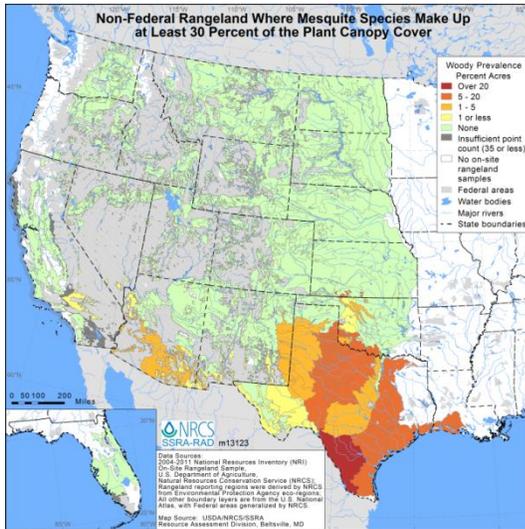
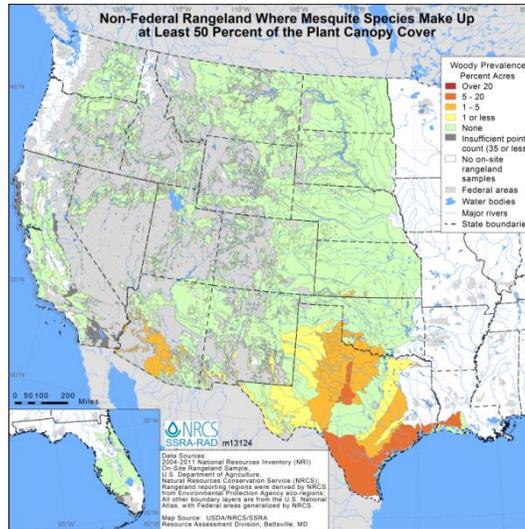


Figure 17. At least 50%



**Figures 18-21. Non-Federal Rangeland that is at Least 20, 30, 40, or 50 Percent Bare Ground (Source: Bare Ground, Inter-Canopy Gaps, and Soil Aggregate Stability Table 2)**

Figure 18. At Least 20%

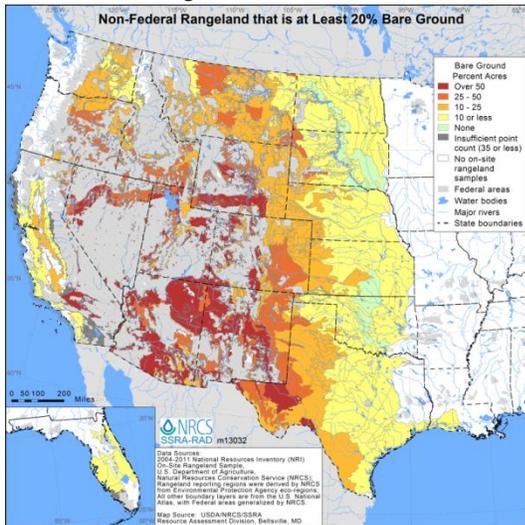


Figure 19. At Least 30%

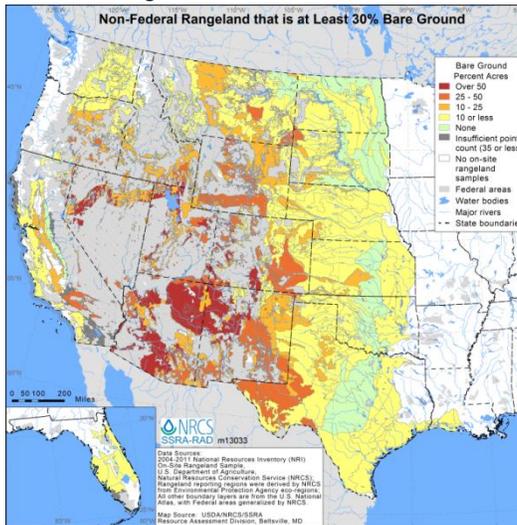


Figure 20. At Least 40%

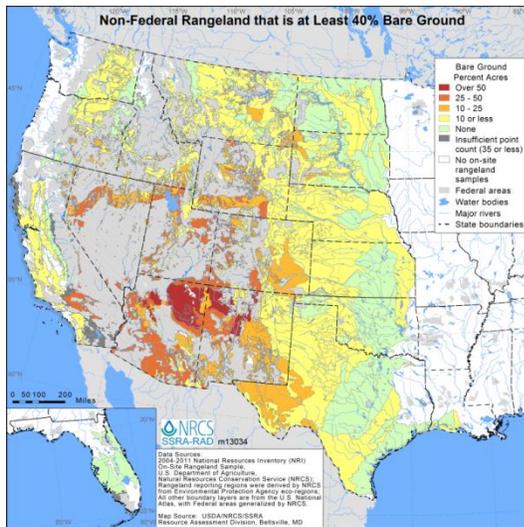
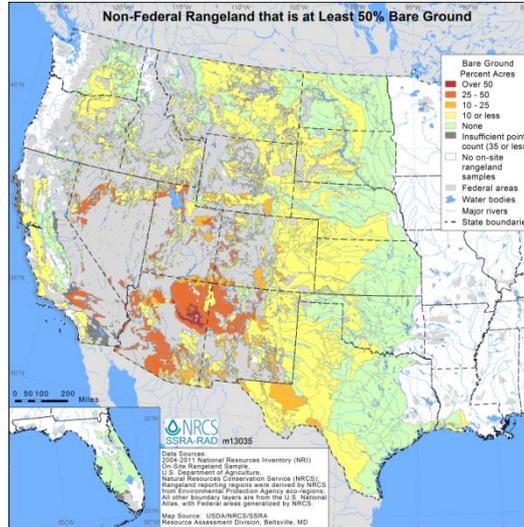


Figure 21. At Least 50%



## Hydrologic Function

Hydrologic function generally shows patterns of departure from reference conditions greater than that of soil and site stability, with even higher proportions of land showing at least moderate departure in many parts of the region (Figure 4). This is due to the sensitivity of hydrologic function to both soil degradation, and changes in plant community composition associated with invasive native woody plants. Juniper (Figures 6-13) and mesquite (Figures 14-17) are particularly widespread in this region. While native, they increase in heavily-grazed conditions and with the absence of fire. Where increased woody cover is associated with reduced grass cover, infiltration capacity can decline with increased runoff in interspace areas between shrubs (Pierson et al. 2007; Pierson et al. 2010; Weltz et al. 2014). Accelerated runoff over time can result in changes of natural water flow paths and the formation of interspace rills, which may develop into gullies (Weltz and Spaeth 2012; Weltz et al. 2014). If soil loss over time is excessive, recovery to reference conditions may be unattainable (Weltz and Spaeth 2012). On shallow soils, eroded water flow channels can quickly erode to bedrock. In contrast, sites with dense native grass cover and thick and deeper root mass have higher infiltration capacity, where water can percolate into the subsoil, more stable soil aggregates, and overall better soil health (Weltz and Spaeth 2012; Weltz et al. 2014).

## **Biotic Integrity**

Shifts in biotic integrity throughout Texas and Oklahoma are significant and generally have even greater departure from reference conditions than soil and site stability and hydrologic function. Moderate and greater departure from reference conditions for biotic integrity (Figure 5) in this region are associated with shifts in plant community composition associated with increased dominance of invasive species, both grasses and shrubs. The dominant invasive shrubs in this region are juniper (Figures 6-13) and mesquite (Figures 14-17) which are native plants throughout this region, but are expanding to areas where they were not part of the reference conditions (Figures 22-24). Where juniper is invasive, mainly due to lack of fire and improper grazing management, a loss of understory vegetation is common. Typically when juniper canopy cover reaches about 30% (depending on slope, soil profile characteristics, and other factors), soil stability, hydrologic, and biotic thresholds are often reached (Weltz and Spaeth 2012; Weltz et al. 2014). Juniper canopy closure rapidly increases from that point forward. As juniper canopy increases and closes in, understory grasses and forbs become depauperate, and bare soil increases between mature junipers (Pierson et al. 2007; Pierson et al. 2010; Weltz and Spaeth 2012; Weltz et al. 2014). The three rangeland health attributes are closely related and when shrub invasion is severe, they degrade in concert. For example, on degraded and disturbed rangelands, an increase in runoff and soil loss is typical because of the increased connectedness of bare soil patches that allow the formation of concentrated flow paths, which, in turn, initiates accelerated soil loss, rills, and gullies.

**Figures 22-24. Non-Federal Rangeland Where Southern Juniper Species, Eastern Juniper Species, or Mesquite Species Are Present but Excluded from Reference Conditions. (Source: Native Invasive Woody Species Table 16)**

Figure 22. Southern Juniper Species

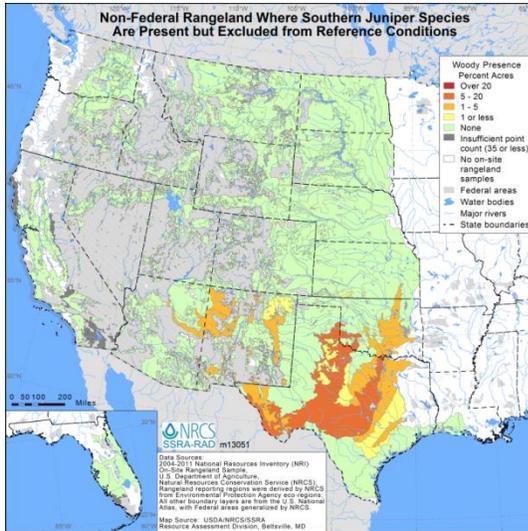


Figure 23. Eastern Juniper Species

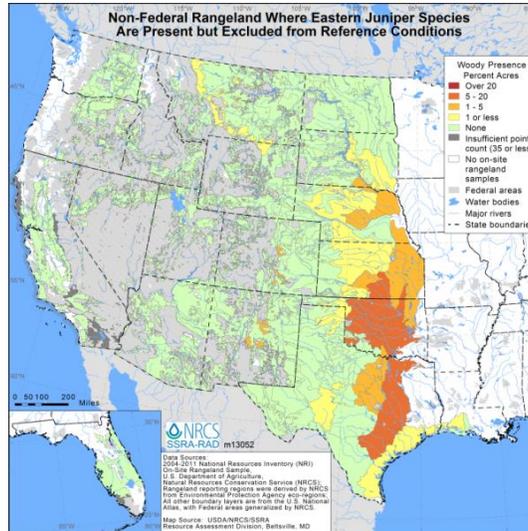
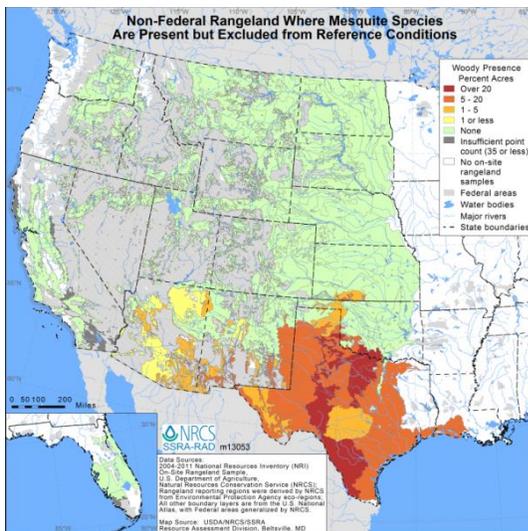
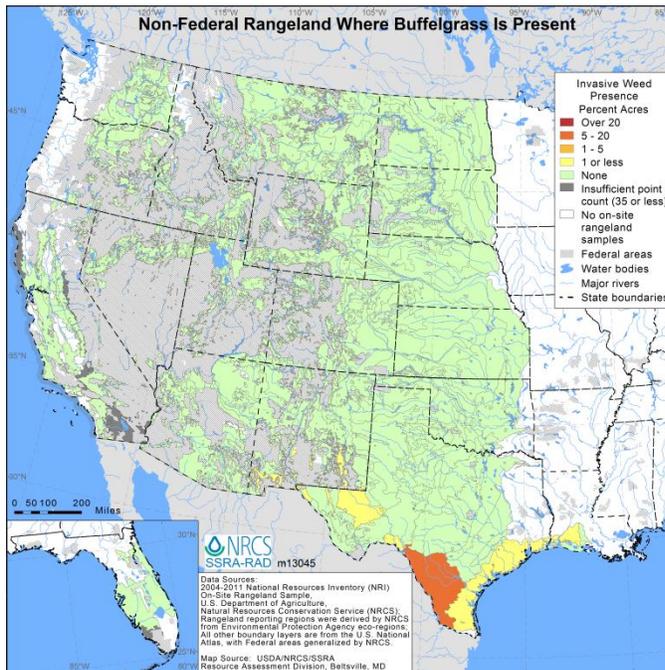


Figure 24. Mesquite Species



As described in the southwest region, there are other significant effects of non-native species including buffelgrass (*Pennisetum ciliare* (L.) Link; Figure 25) and Lehmann lovegrass (*Eragrostis lehmanniana* Nees). This shift in species composition negatively impacts nutrient cycling and the quality of wildlife habitat. Often with vegetation shifts, soil surface and soil-plant-water relations are also affected.

**Figure 25. Non-Federal Rangeland Where Buffelgrass Is Present. (Source: Non-Native Plant Species Table 11)**



## More Information

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