Native Invasive Woody Species

The National Resources Inventory (NRI) is a statistical survey of natural resource conditions and trends on non-Federal land in the United States. Non-Federal land includes privately owned lands, tribal and trust lands, and lands controlled by state and local governments.

The NRI rangeland results presented here address current conditions. In the future, the NRI rangeland survey sample will include revisited sites. These data will allow estimates for change in rangeland resource conditions to be made.

Importance to the Nation

Once established, certain native woody plant species may become invasive and have the potential to outcompete native grasses and forbs in communities where they typically would be only minor components or absent from the plant community. Loss of native herbaceous species negatively impacts forage and watershed functions and can lead to land degradation and erosion. Land managers and policymakers need this information to support strategic decisions and to identify areas of risk and implement strategies to eradicate and control the spread of native invasive species.

Introduction

The NRI findings presented here provide information about native invasive woody plant species growing on non-Federal rangeland. Some native woody shrubs such as juniper and mesquite can invade areas replacing native grasses and forbs. Dense stands can alter nutrient and energy cycles, affect hydrology, and reduce wildlife habitat and forage for domestic animals and wildlife. Deep root systems of woody species such as mesquite can reduce water availability to other native plants and eventually animals. The native invasive woody species groups in this report include:

- Juniper species
- Mesquite species
- Pinyon pine species

Table 1 provides a list of species in each group.

Key Findings

- Although specific groups of invasive native woody species tend to be more prevalent in certain areas, as a whole they are widespread throughout the western part of the nation (Tables 2-16).
- Pacific juniper species are most common in Oregon where they are present on 18.0 (±4.0) percent of non-Federal rangeland (Table 2, Figure 1).
- Although Pacific juniper species are native, they are invading areas where they have not been present based on reference conditions described for the area's ecological sites. In Oregon, Pacific juniper species are present on 1.5 (±1.3) percent of non-Federal rangeland in areas where they have not been part of reference conditions (Table 16, Figure 2).

Figures 1. Non-Federal Rangeland Where Pacific Juniper Species Are Present. (Source: Table 2)

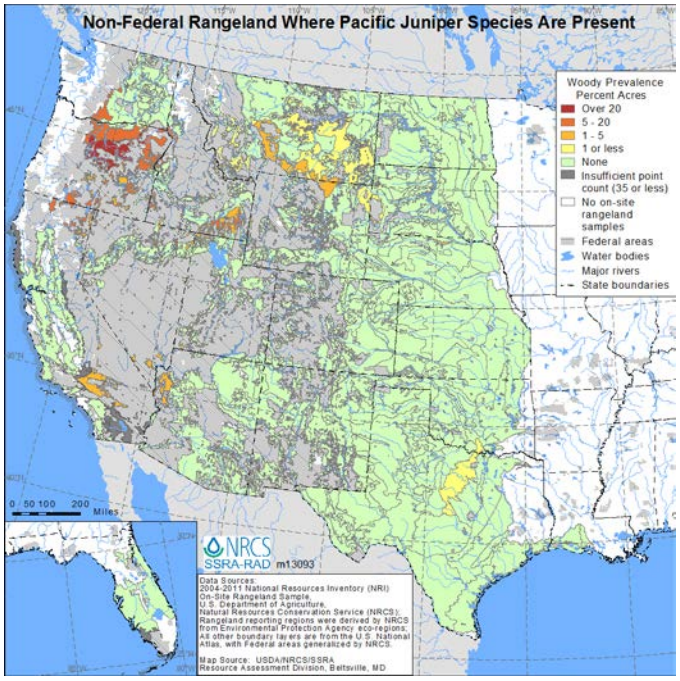
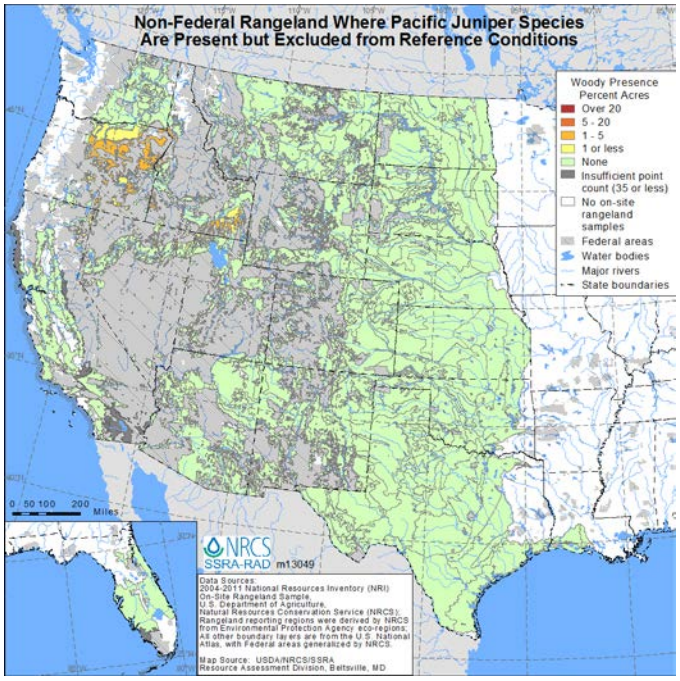


Figure 2. Non-Federal Rangeland Where Pacific Juniper Species Are Present but Excluded from Reference Conditions. (Source: Table 16)



- Plant canopy cover represents the proportion of the soil surface covered by an individual species. In Oregon, Pacific juniper species make up at least 15 percent of the plant canopy cover on 4.2 (±1.7) percent of non-Federal rangeland (Table 2, Figure 4).

Figures 3-6. Non-Federal Rangeland Where Pacific Juniper Species Cover at Least 5, 15, 30, or 50 Percent of the Soil Surface. (Source: Table 2)

Figure 3. At least 5%

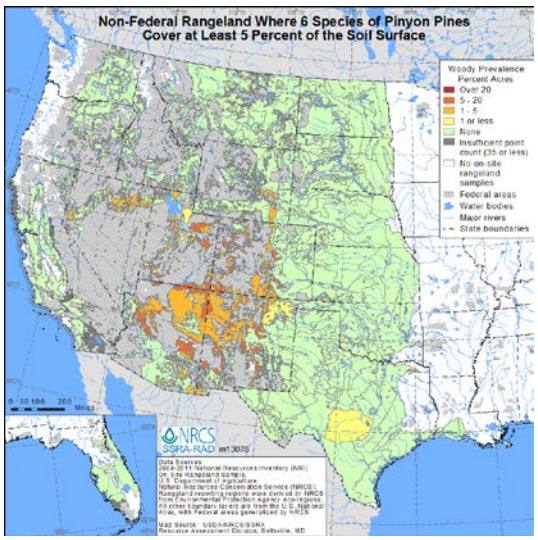


Figure 4. At least 15%

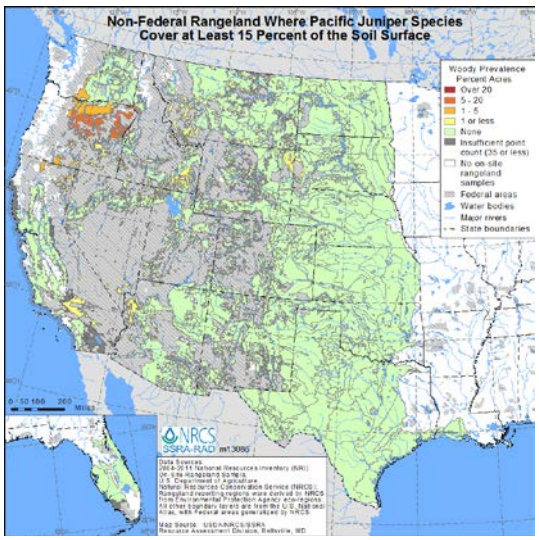


Figure 5. At least 30%

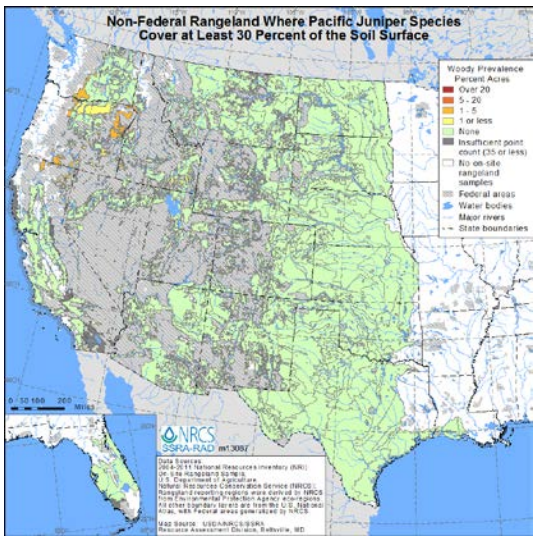
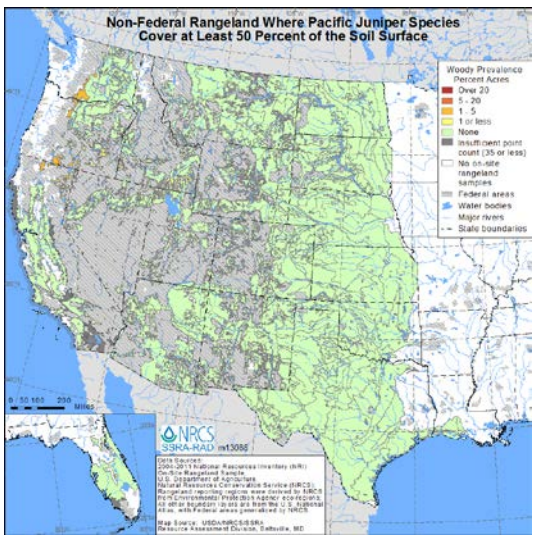


Figure 6. At least 50%



- Relative plant canopy cover is an indicator of species composition and therefore relative dominance. In Oregon, Pacific juniper species make up at least 15 percent of the relative plant canopy cover on 6.3 (±2.5) percent of non-Federal rangeland (Table 3, Figure 8).

Figures 7-10. Non-Federal Rangeland Where Pacific Juniper Species Make Up at Least 5, 15, 30, or 50 Percent of the Relative Plant Cover (Composition). (Source: Table 3)

Figure 7. At least 5%

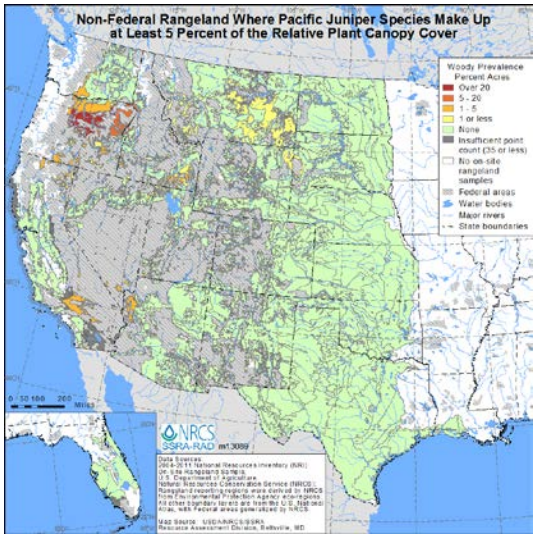


Figure 8. At least 15%

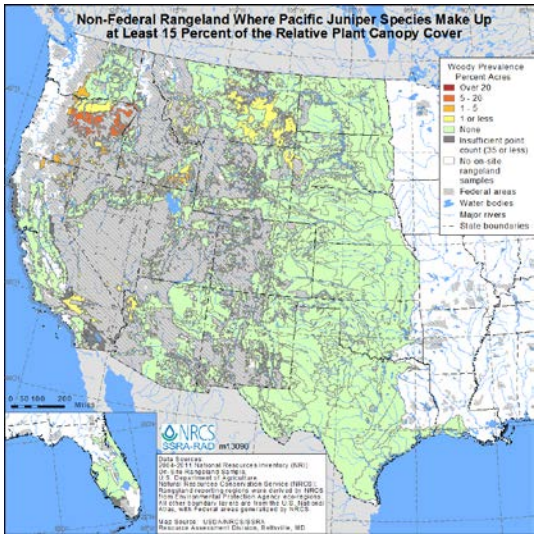


Figure 9. At least 5%

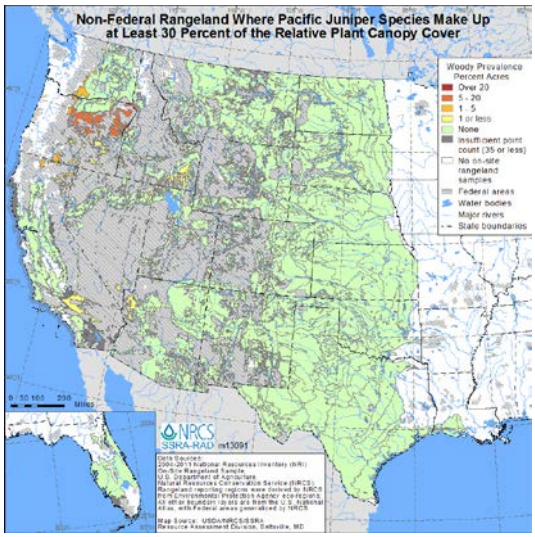
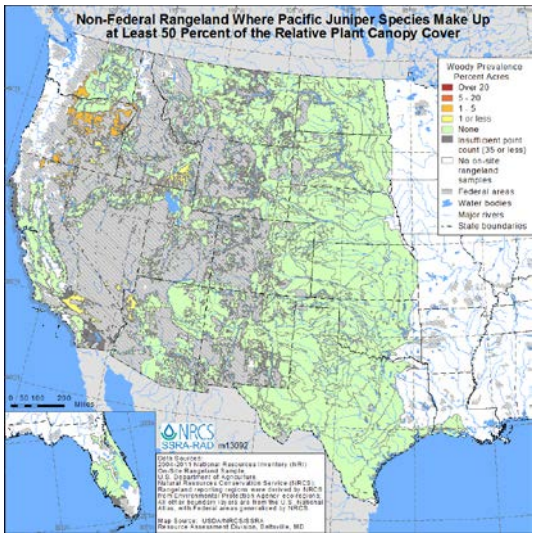


Figure 10. At least 15%



- Montane / Inter-Montane juniper species are most common in Utah where they are present on 15.1 (±3.8) percent of non-Federal rangeland (Table 4, Figure 11).
- In Utah, Montane / Inter-Montane juniper species are present on 2.0 (±1.3) percent of non-Federal rangeland in areas where they have not been part of reference conditions (Table 16, Figure 12).

Figure 11. Non-Federal Rangeland Where Montane / Inter-Montane Juniper Species Are Present. (Source: Table 4)

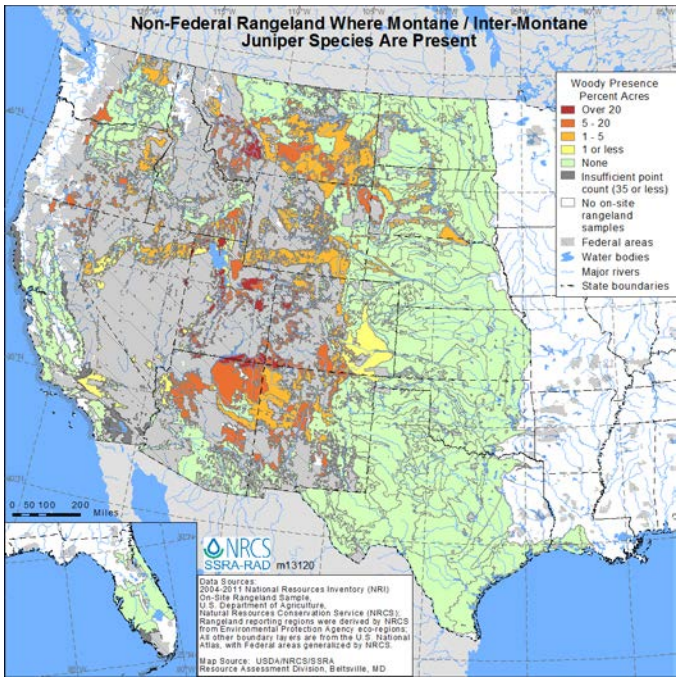
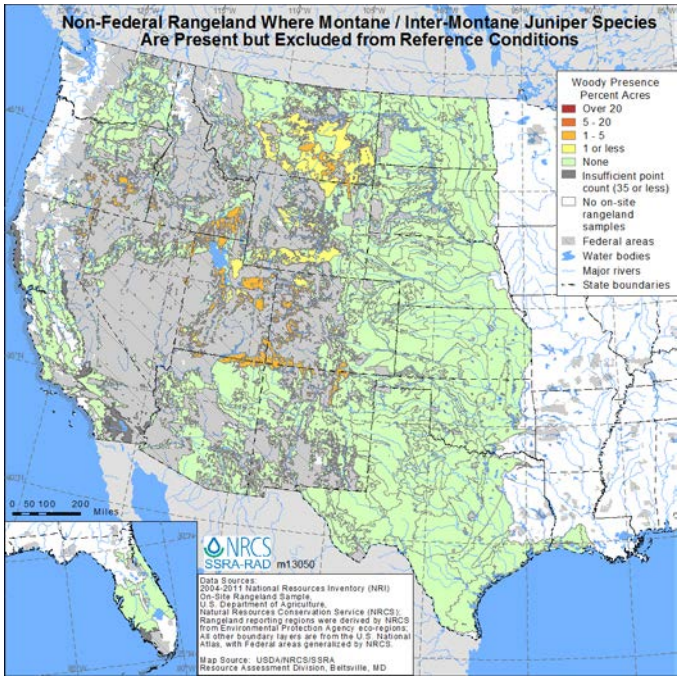


Figure 12. Non-Federal Rangeland Where Montane / Inter-Montane Juniper Species Are Present but Excluded from Reference Conditions. (Source: Table 16)



- In Utah, Montane / Inter-Montane juniper species cover at least 15 percent of the soil surface on 4.2 (±2.3) percent of non-Federal rangeland (Table 4).

Figures 13-16. Non-Federal Rangeland Where Montane / Inter-Montane Juniper Species Cover at Least 5, 15, 30, or 50 Percent of the Soil Surface. (Source: Table 4)

Figure 13. At least 5%

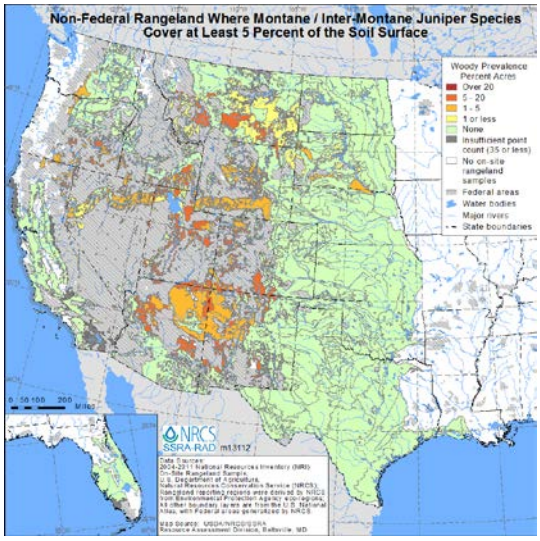


Figure 14. At least 15%

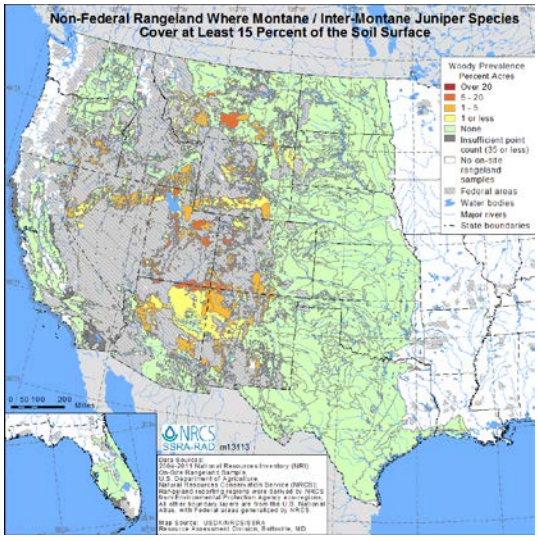


Figure 15. At least 30%

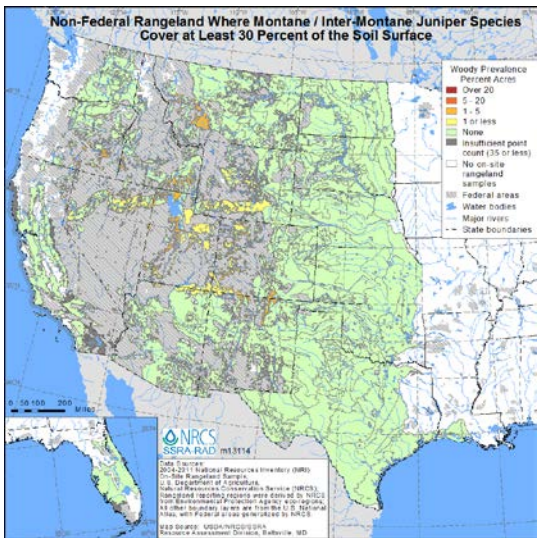
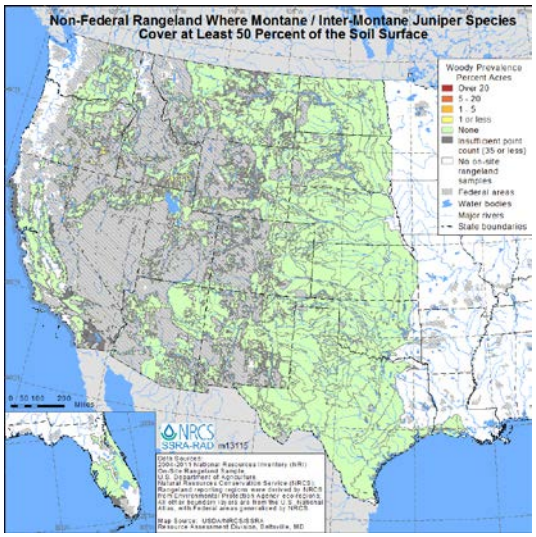


Figure 16. At least 50%



- In Utah, Montane / Inter-Montane juniper species make up at least 15 percent of the relative plant canopy cover (composition) on 7.5 (±2.7) percent of non-Federal rangeland (Table 5, Figure 17).

Figures 17-20. Non-Federal Rangeland Where Montane / Inter-Montane Juniper Species Make Up at Least 5, 15, 30, or 50 Percent of the Relative Plant Cover (Composition). (Source: Table 5)

Figure 17. At least 5%

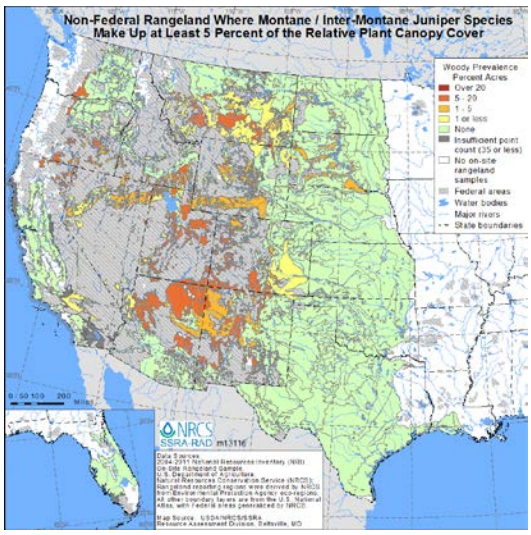


Figure 18. At least 15%

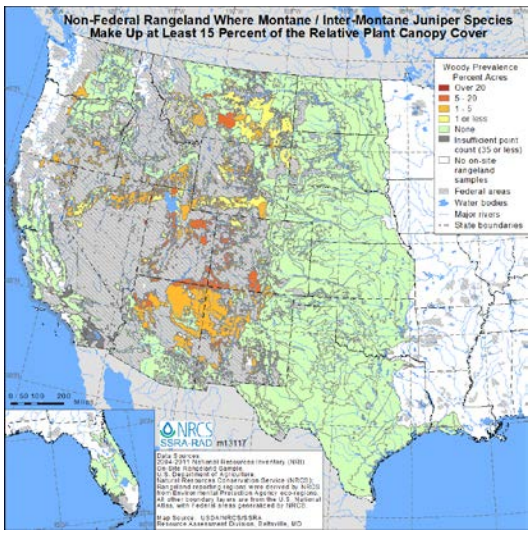


Figure 19. At least 30%

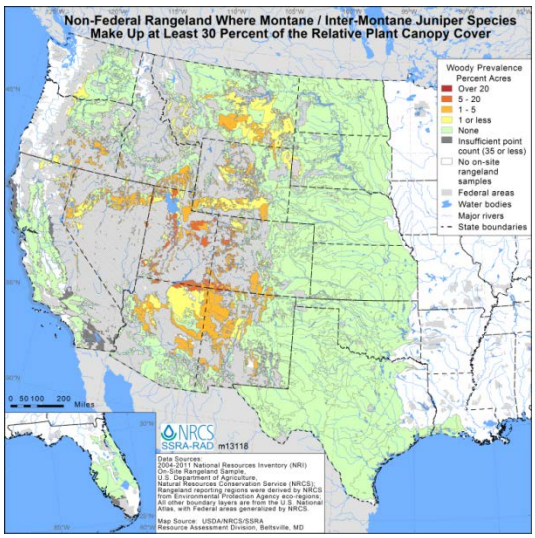
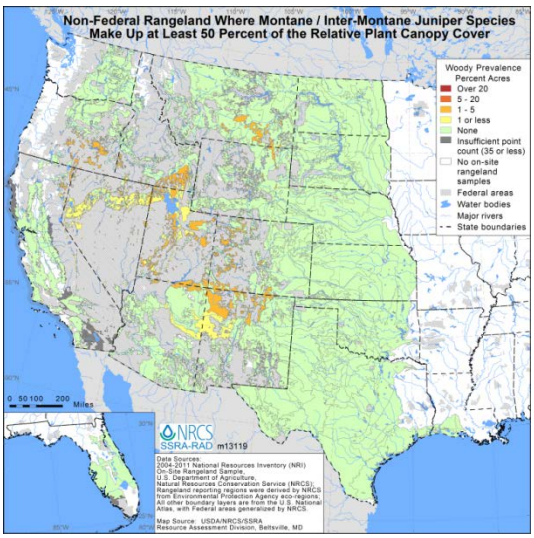


Figure 20. At least 50%



- Southern juniper species are present on 5.5 (±0.5) percent of the nation's non-Federal rangeland (Table 6, Figure 21).
- Nationally, Southern juniper species are present on 1.0 (±0.2) percent of non-Federal rangeland in areas where they have not been part of reference conditions (Table 16, Figure 22).

Figure 21. Non-Federal Rangeland Where Southern Juniper Species Are Present. (Source: Table 6)

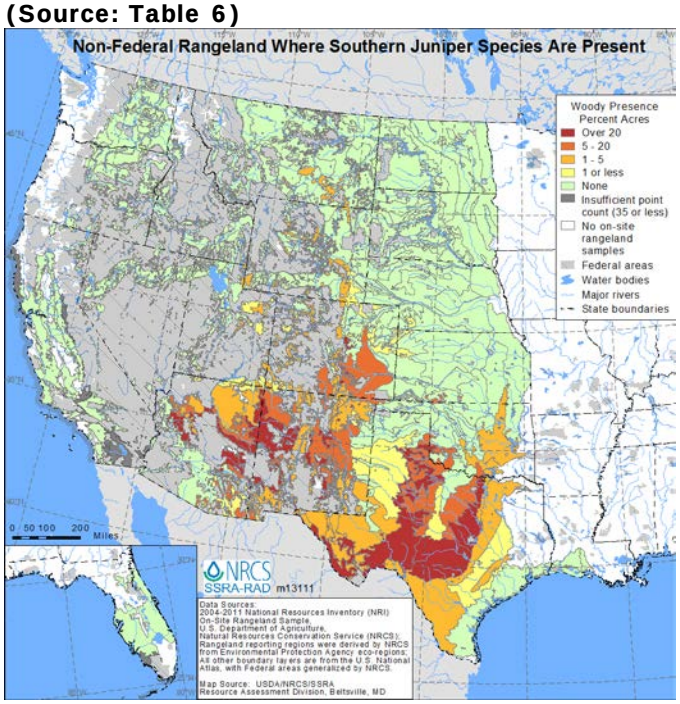
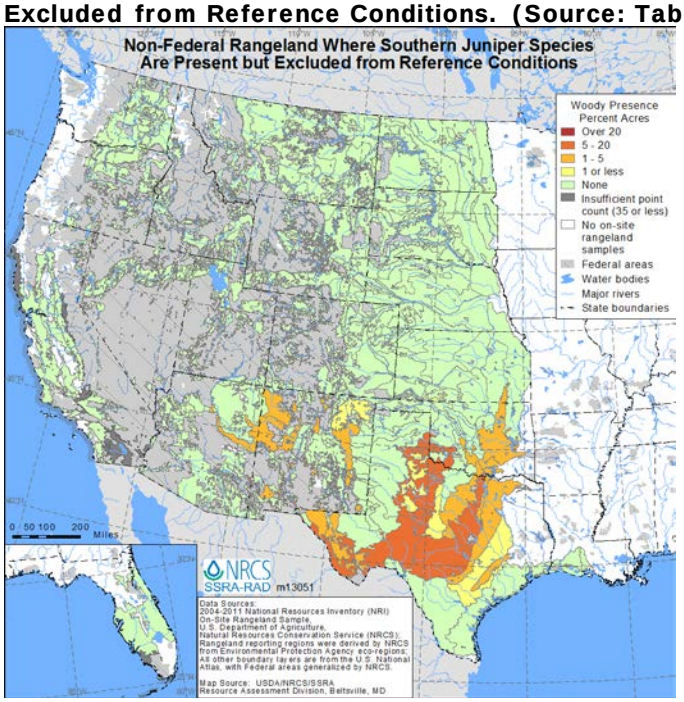


Figure 22. Non-Federal Rangeland Where Southern Juniper Species Are Present but Excluded from Reference Conditions. (Source: Table 16)



- In Texas, Southern juniper species cover at least 15 percent of the soil surface on 5.8 (±1.2) percent of non-Federal rangeland (Table 6, Figure 24).

Figures 23-26. Non-Federal Rangeland Where Southern Juniper Species Cover at Least 5, 15, 30, or 50 Percent of the Soil Surface. (Source: Table 6)

Figure 23. At least 5%

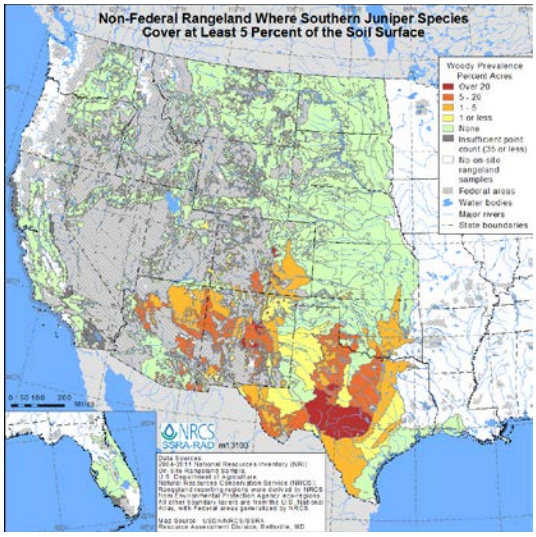


Figure 24. At least 15%

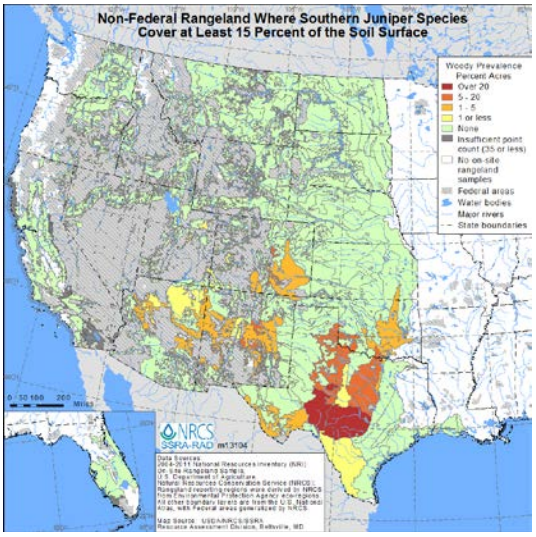


Figure 25. At least 30%

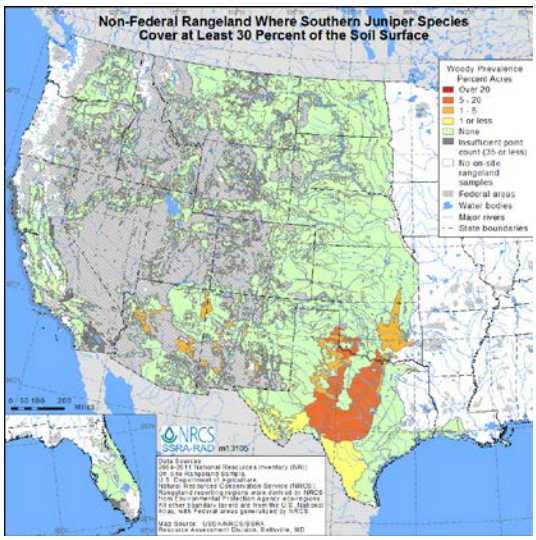
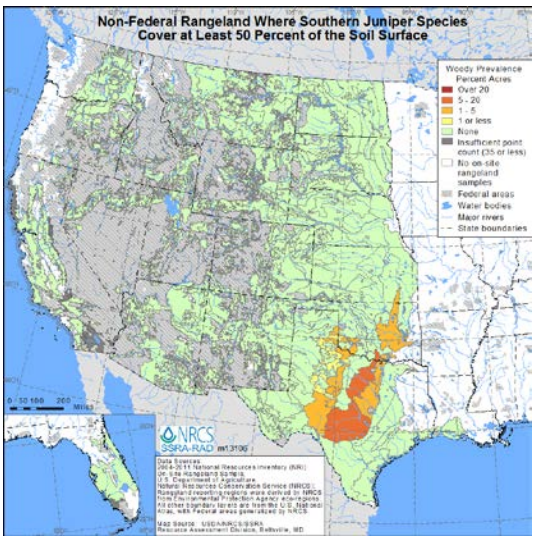


Figure 26. At least 50%



- In Texas, Southern juniper species make up at least 15 percent of the relative plant canopy cover (composition) on 6.3 (±1.2) percent of non-Federal rangeland (Table 7, Figure 28).

Figures 27-30. Non-Federal Rangeland Where Southern Juniper Species Make Up at Least 5, 15, 30, or 50 Percent of the Relative Plant Cover (Composition). (Source: Table 7)

Figure 27. At least 5%

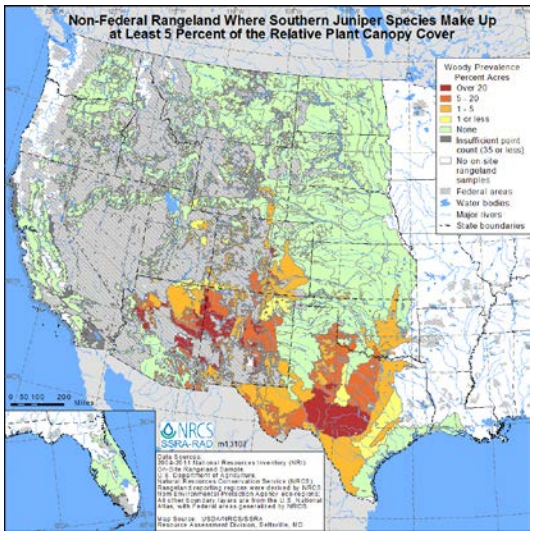


Figure 28. At least 15%

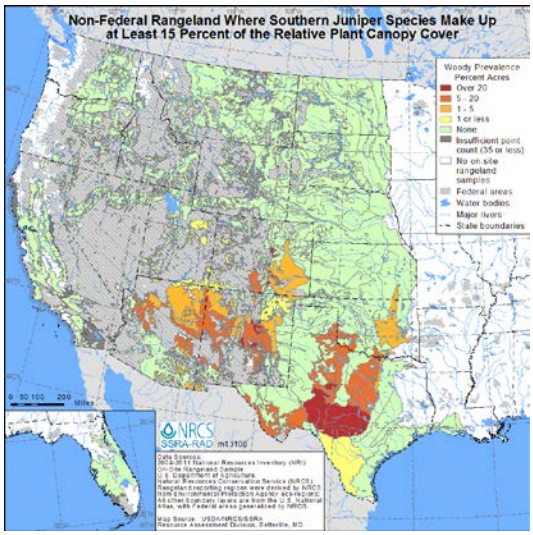


Figure 29. At least 30%

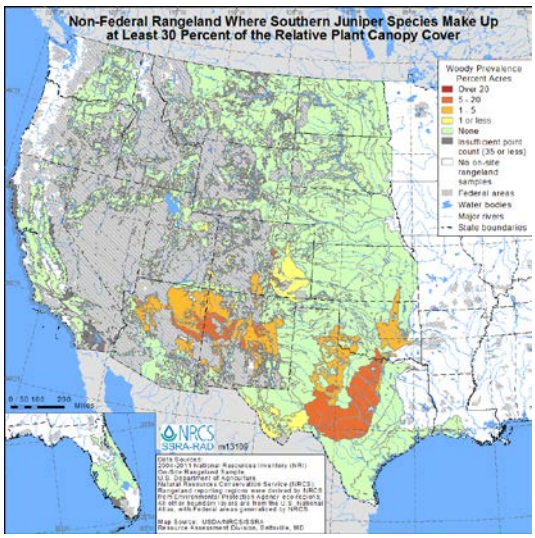
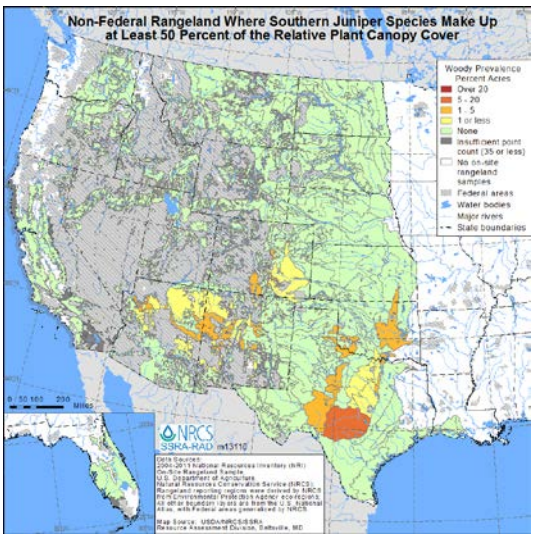


Figure 30. At least 50%



- Eastern juniper species are most common in Oklahoma, Kansas, and Nebraska where they present on 18.7 (±2.8), 5.2 (±1.3), and 5.0 (±1.7) percent, respectively, of the nation's non-Federal rangeland (Table 8, Figure 31).
- In Oklahoma, Nebraska, and Kansas, Eastern juniper species are present on 7.9 (±2.0), 1.0 (±0.5), and 0.9 (±0.6) percent, respectively, of non-Federal rangeland in areas where they have not been part of reference conditions (Table 16, Figure 32).

Figure 31. Non-Federal Rangeland Where Eastern Juniper Species Are Present. (Source: Table 8)

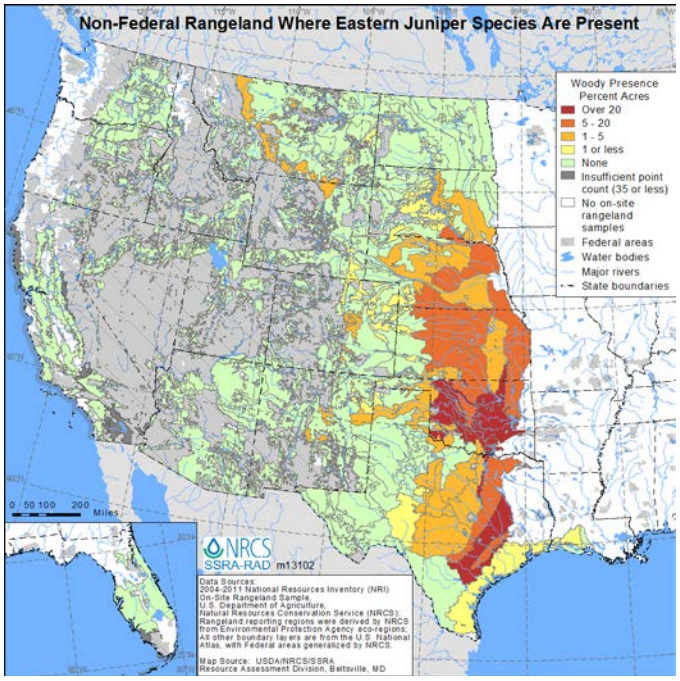
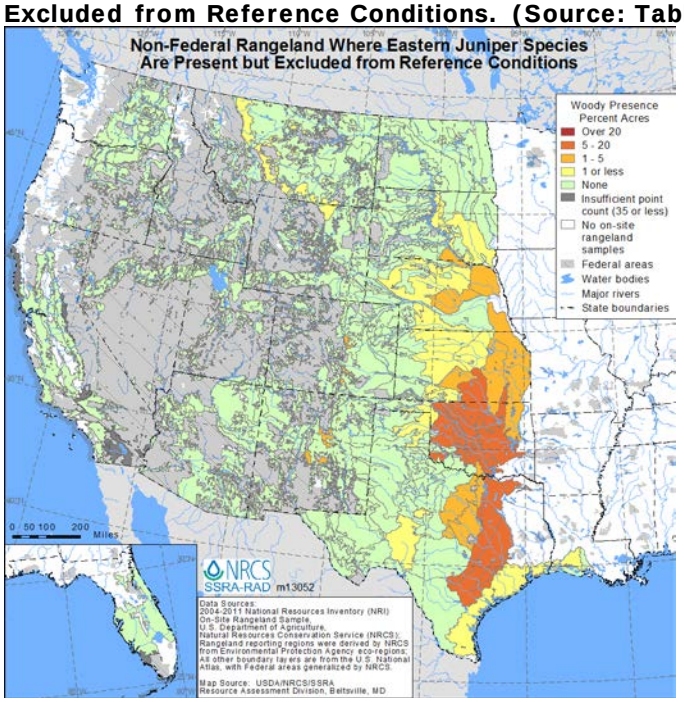


Figure 32. Non-Federal Rangeland Where Eastern Juniper Species Are Present but Excluded from Reference Conditions. (Source: Table 16)



- In Oklahoma, Eastern juniper species cover at least 15 percent of the soil surface on 5.5 (±1.2) percent of non-Federal rangeland (Table 8, Figure 34).

Figures 33-36. Non-Federal Rangeland Where Eastern Juniper Species Cover at Least 5, 15, 30, or 50 Percent of the Soil Surface. (Source: Table 8)

Figure 33. At least 5%

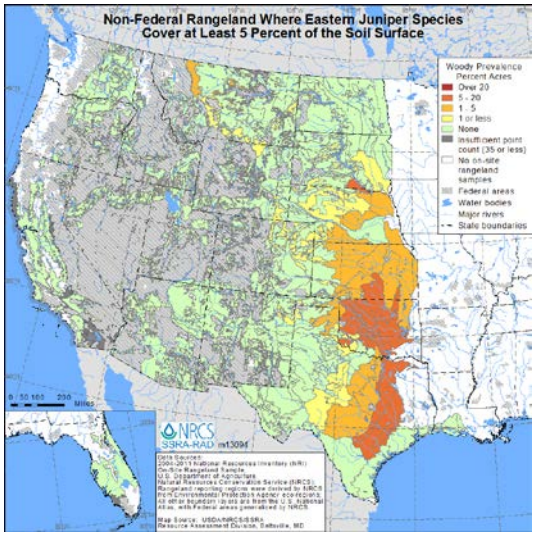


Figure 34. At least 15%

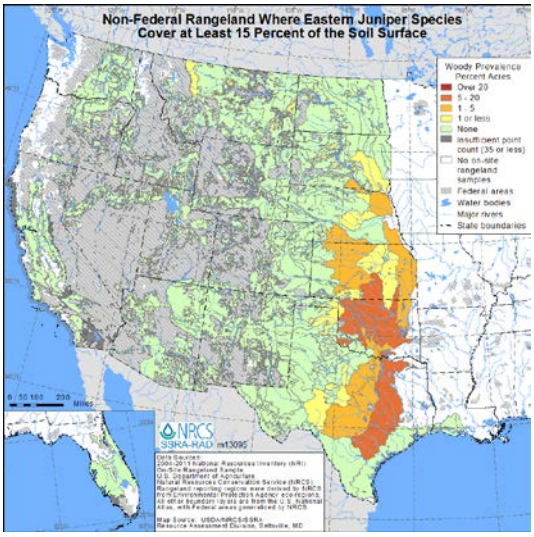


Figure 35. At least 30%

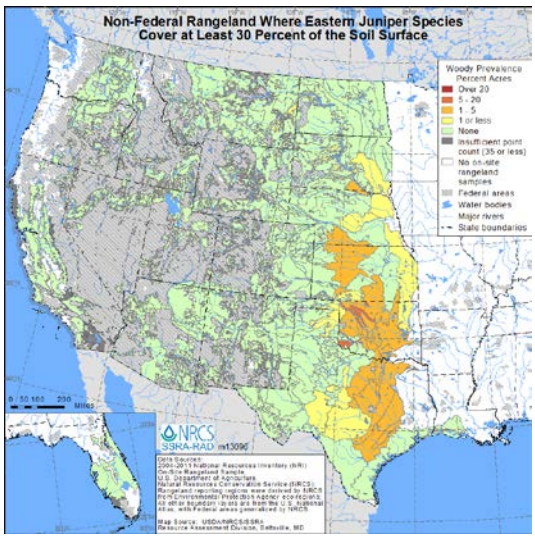
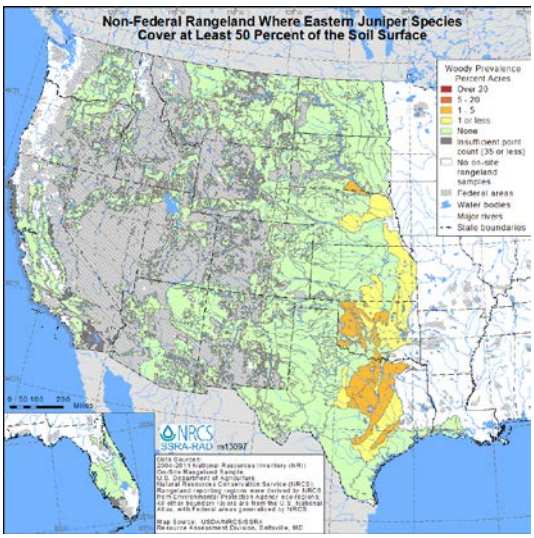


Figure 36. At least 50%



- In Oklahoma, Eastern juniper species make up at least 15 percent of the relative plant canopy cover (composition) on 3.5 (±1.0) percent of non-Federal rangeland (Table 9, Figure 38).

Figures 37-40. Non-Federal Rangeland Where Eastern Juniper Species Make Up at Least 5, 15, 30, or 50 Percent of the Relative Plant Cover (Composition). (Source: Table 9)

Figure 37. At least 5%

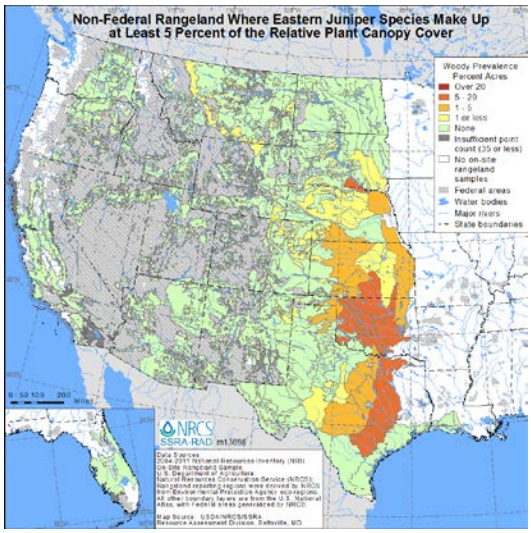


Figure 38. At least 15%

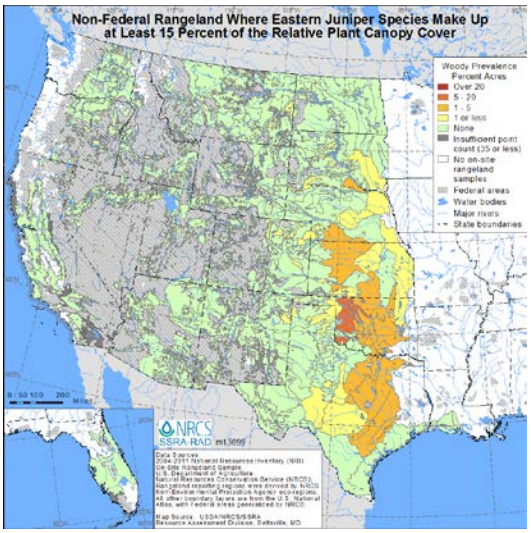


Figure 39. At least 30%

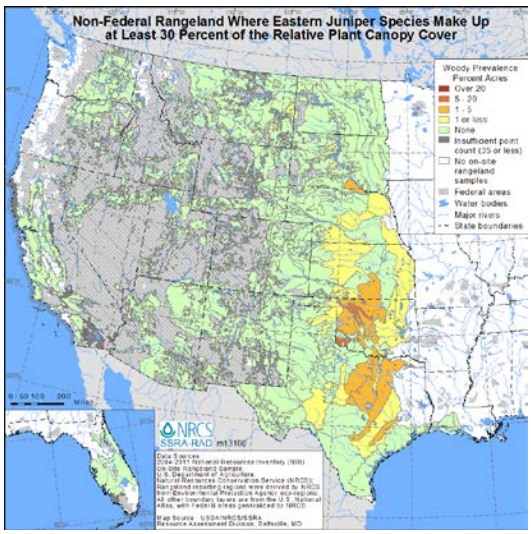
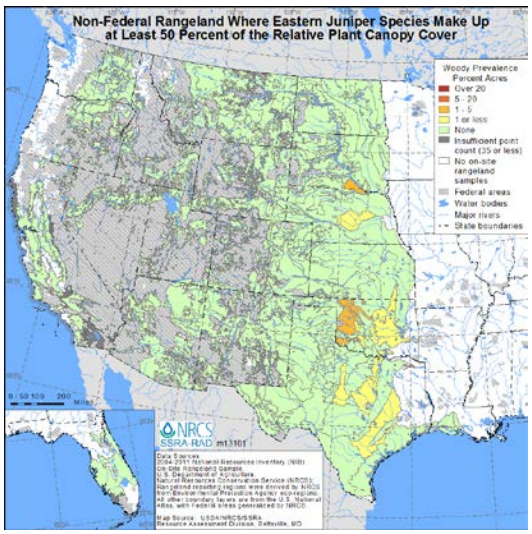


Figure 40. At least 50%



- Mesquite species are present on 15.2 (±0.8) percent of the nation's non-Federal rangeland (Table 10, Figure 41).
- Nationally, mesquite species are present on 4.5 (±0.4) percent of non-Federal rangeland in areas where they have not been part of reference conditions (Table 16, Figure 42).

Figure 41. Non-Federal Rangeland Where Mesquite Species Are Present. (Source: Table 10)

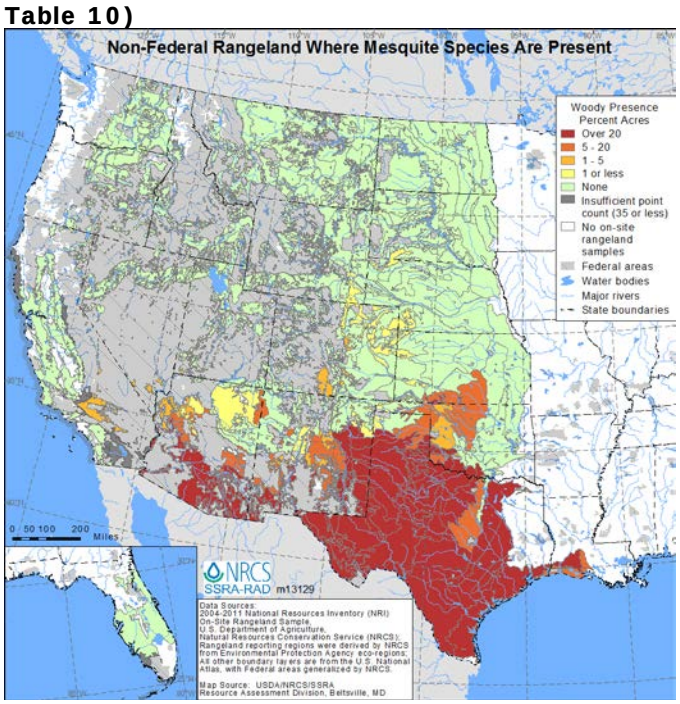
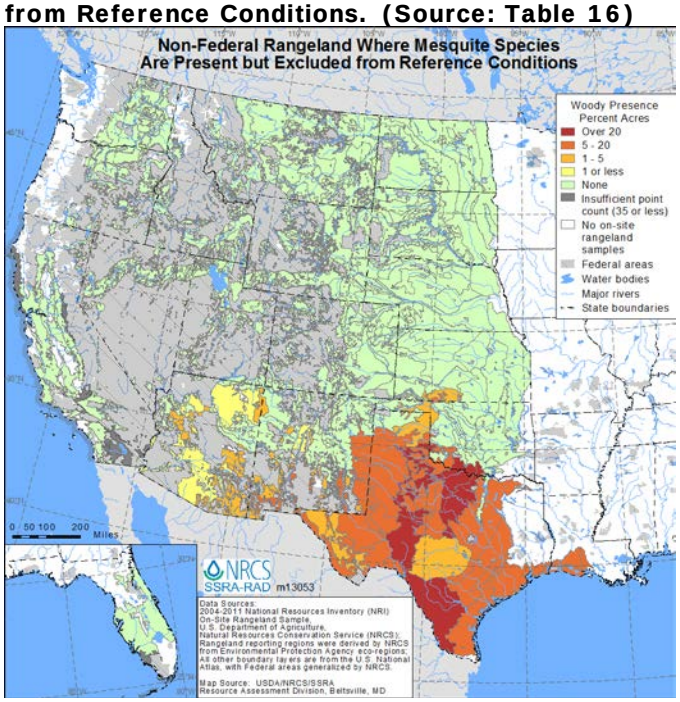


Figure 42. Non-Federal Rangeland Where Mesquite Species Are Present but Excluded from Reference Conditions. (Source: Table 16)



- In Texas, mesquite species cover at least 15 percent of the soil surface on 16.2 (±1.9) percent of non-Federal rangeland (Table 10, Figure 44).

Figures 43-46. Non-Federal Rangeland Where Mesquite Species Cover at Least 5, 15, 30, or 50 Percent of the Soil Surface. (Source: Table 10)

Figure 43. At least 5%

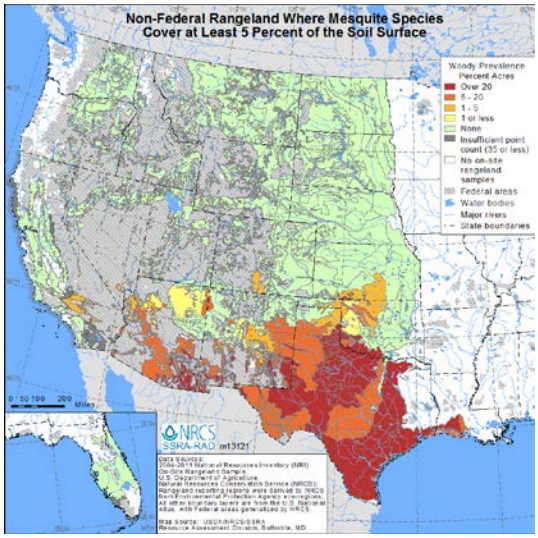


Figure 44. At least 15%

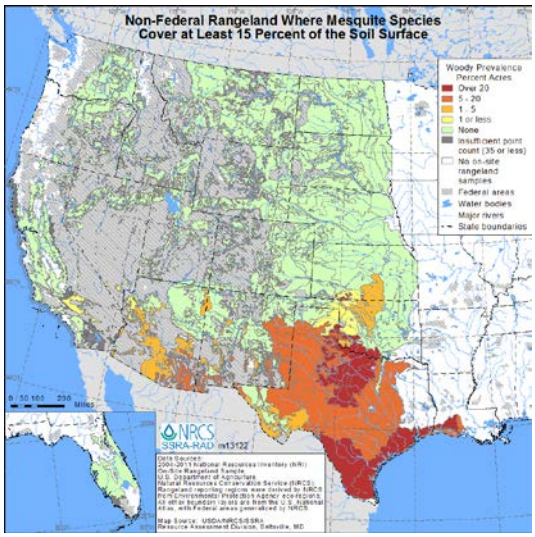


Figure 45. At least 30%

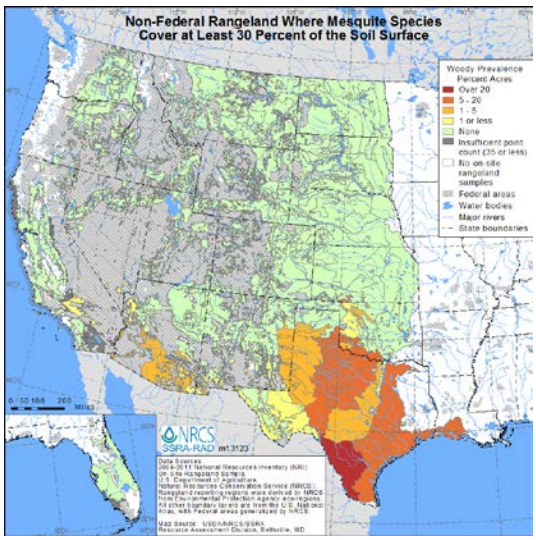
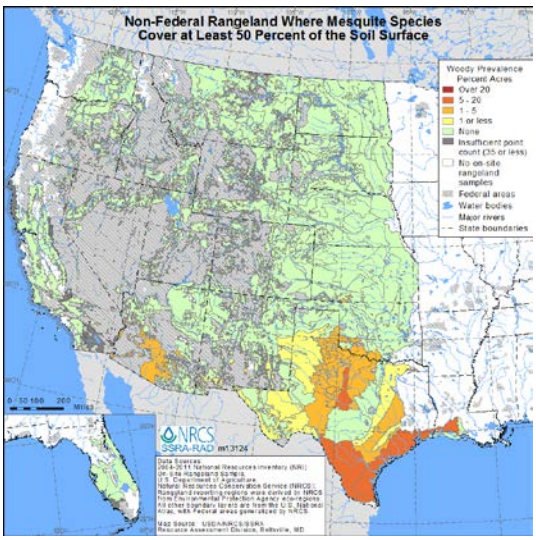


Figure 46. At least 50%



- In Texas, Arizona, and New Mexico, mesquite species make up at least 15 percent of the relative plant canopy cover (composition) on 17.0 (±2.2), 8.6 (±2.5), and 4.7 (±1.3) percent, respectively, of non-Federal rangeland (Table 11, Figure 48).

Figures 47-50. Non-Federal Rangeland Where Mesquite Species Make Up at Least 5, 15, 30, or 50 Percent of the Relative Plant Cover (Composition). (Source: Table 11)

Figure 47. At least 5%

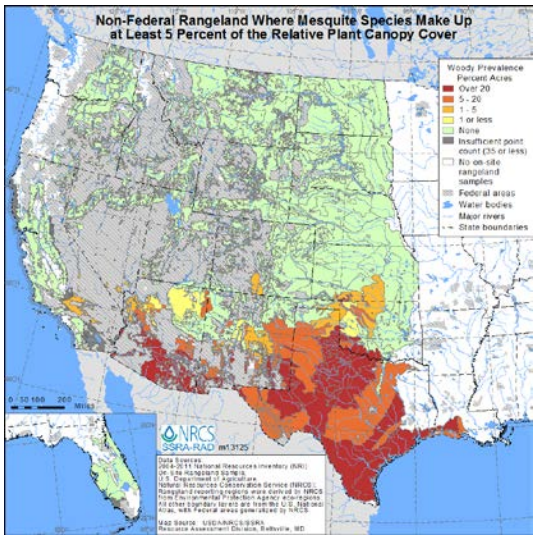


Figure 48. At least 15%

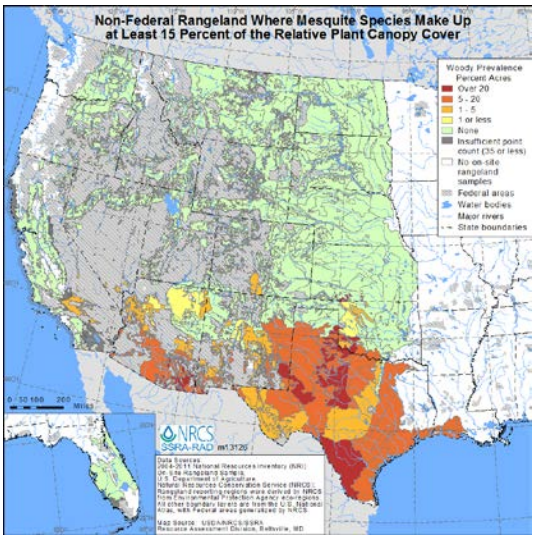


Figure 49. At least 30%

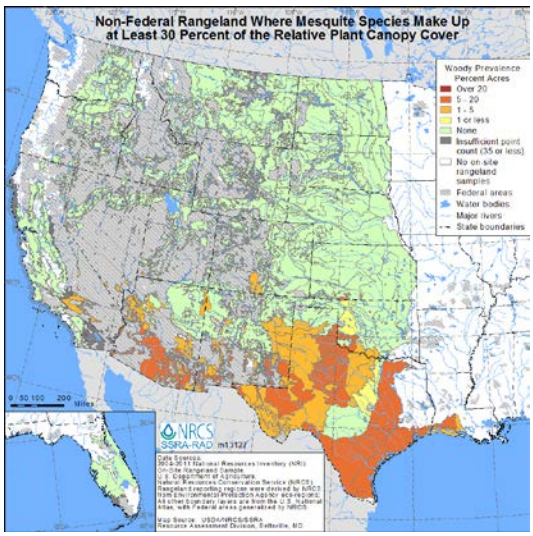
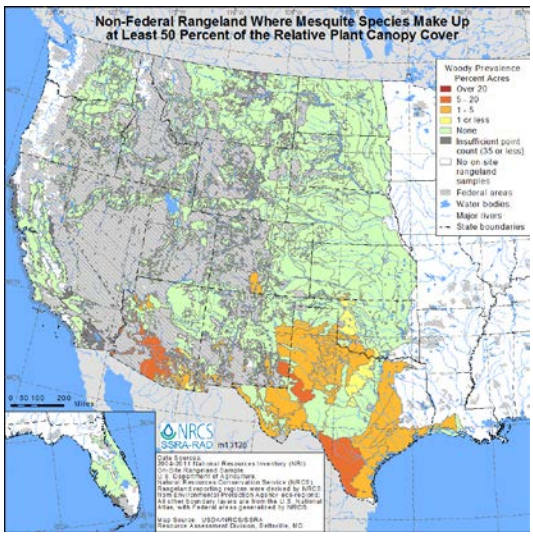


Figure 50. At least 50%



- The maps for pinyon pine species include the six species listed in Table 1. Pinyon pine species are most commonly found in Utah, Arizona, New Mexico, Colorado, and Nevada where they are present on 7.3 (±2.7), 4.2 (±1.8), 3.9 (±1.4), 3.0 (±1.3), and 2.5 (±2.2) percent, respectively, of non-Federal rangeland (Table 12, Figure 51).
- In Colorado, pinyon pine species are present on 0.7 (±0.6) percent of non-Federal rangeland in areas where they have not been part of reference conditions (Table 16, Figure 52).

Figure 51. Non-Federal Rangeland Where Pinyon Pine Species Are Present. (Source: Table 10)

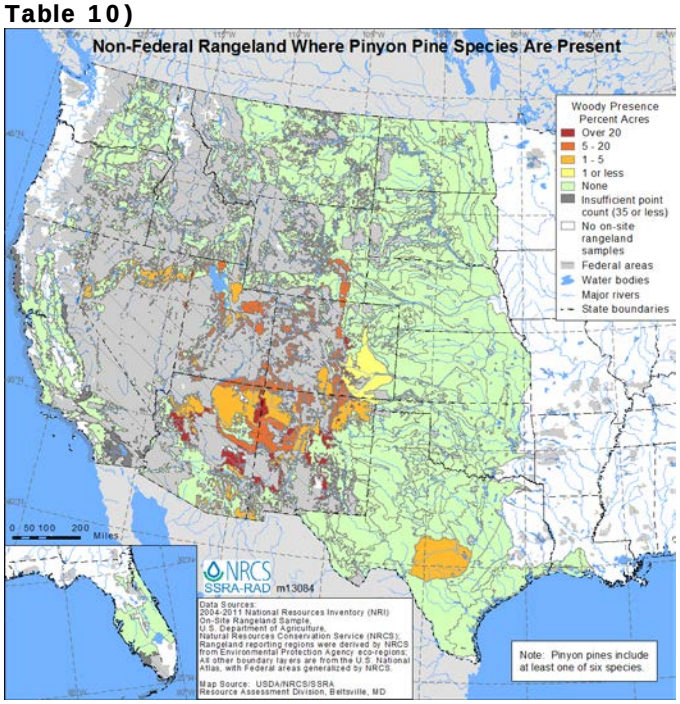
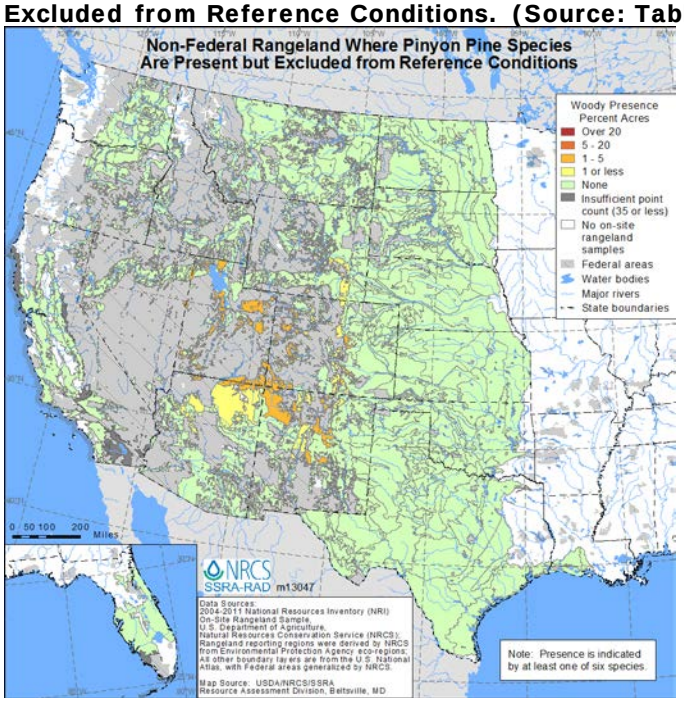


Figure 52. Non-Federal Rangeland Where Pinyon Pine Species Are Present but Excluded from Reference Conditions. (Source: Table 16)



- In Utah, pinyon pine species cover at least 15 percent of the soil surface on 1.3 (±1.1) percent of non-Federal rangeland (Table 12, Figure 54).

Figures 53-56. Non-Federal Rangeland Where Pinyon Pine Species Cover at Least 5, 15, 30, or 50 Percent of the Soil Surface. (Source: Table 12)

Figure 53. At least 5%

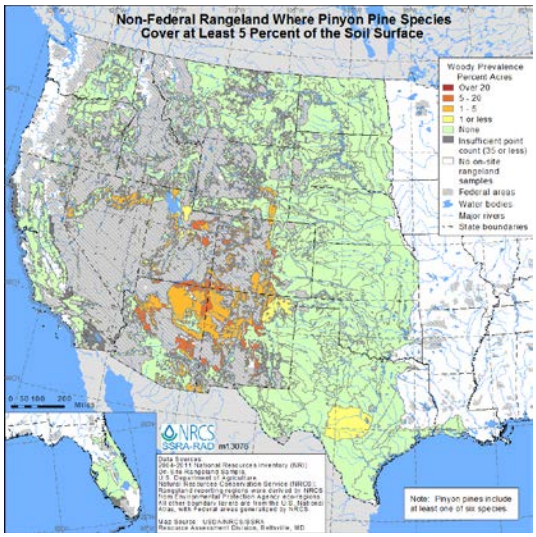


Figure 54. At least 15%

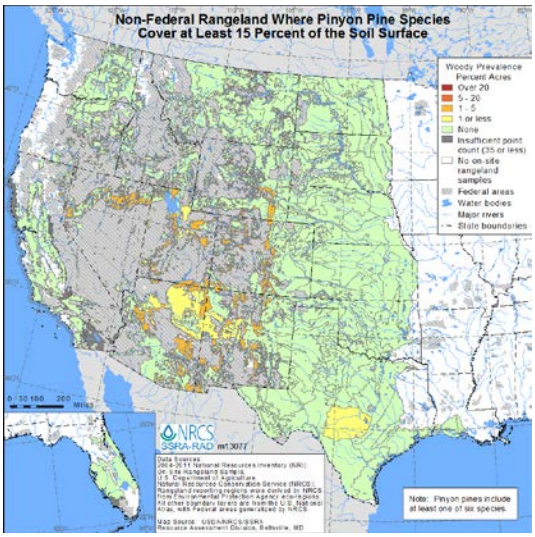


Figure 55. At least 30%

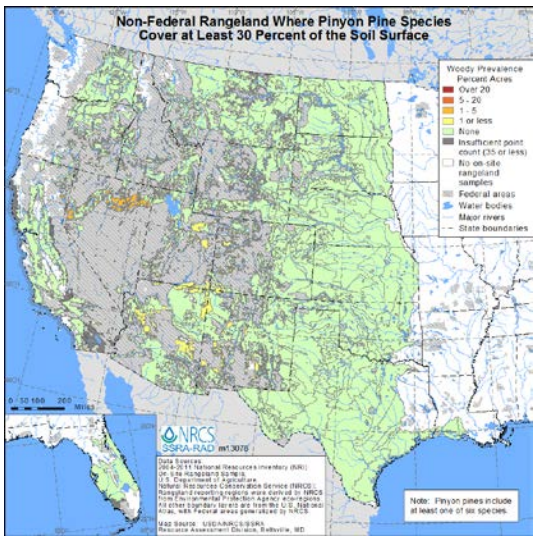
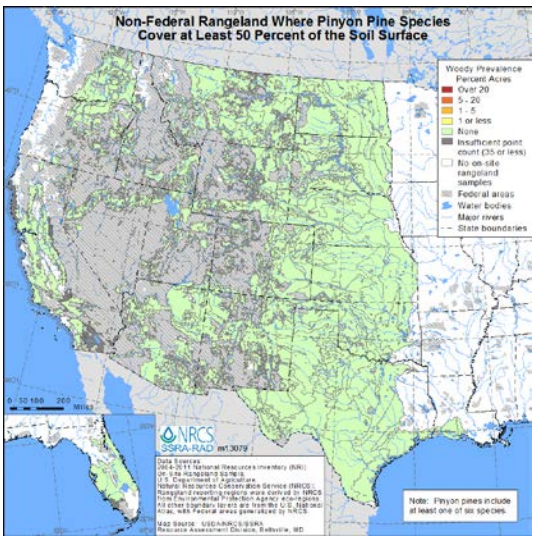


Figure 56. At least 50%



- In Utah, pinyon species make up at least 15 percent of the relative plant canopy cover (composition) on 2.9 (±1.5) percent of non-Federal rangeland (Table 13, Figure 58).

Figures 57-60. Non-Federal Rangeland Where Pinyon Pine Species Make Up at Least 5, 15, 30, or 50 Percent of the Relative Plant Cover (Composition). (Source: Table 13)

Figure 57. At least 5%

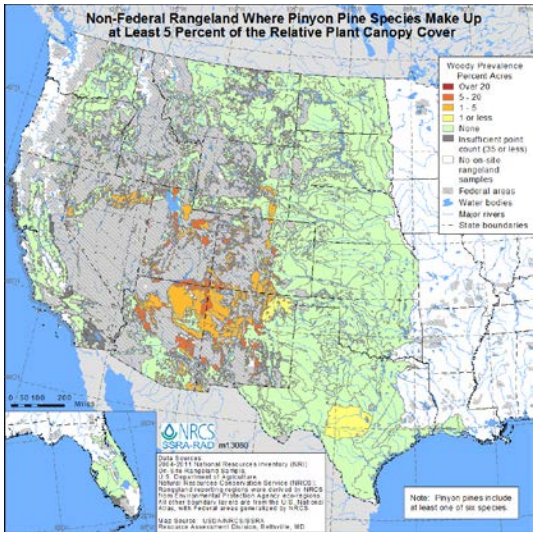


Figure 58. At least 15%

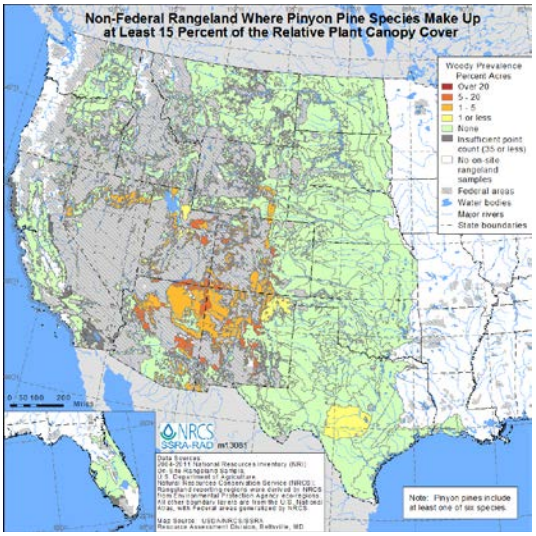


Figure 59. At least 30%

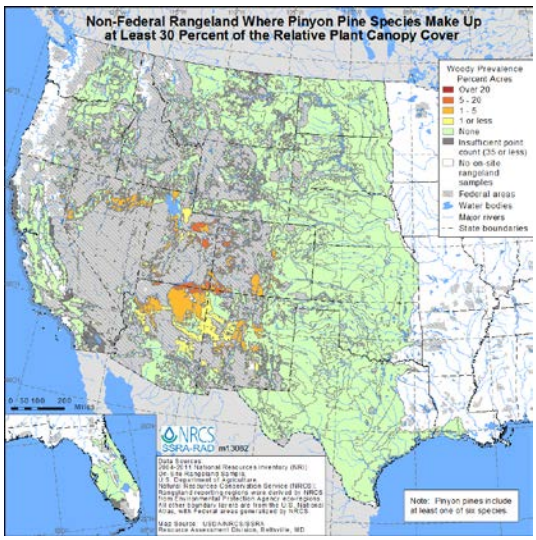
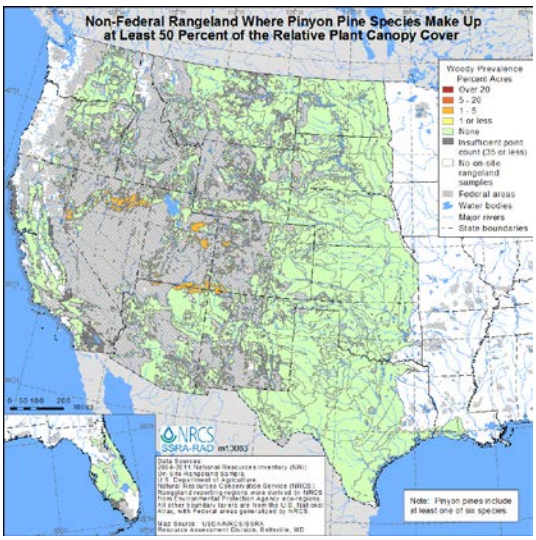


Figure 60. At least 50%



Significance of Findings

- "Stewardship of vegetation composition, cover, and production is the foundation of sustainable rangeland management. A key component of rangeland ecosystem management is maintaining vegetation ground cover and productivity within a desirable mix of herbaceous and woody plants" (Archer et al. 2010).
- "One of the most striking land cover changes on rangeland worldwide over the past 150 years has been the proliferation of trees and shrubs at the expense of perennial grasses. In some cases, native woody plants are increasing in stature and density within their historic geographic ranges; and in other cases non-native woody plants are becoming dominant. These shifts in the balance between woody and herbaceous vegetation represent a fundamental alteration of habitat for animals (microbes, invertebrates, and vertebrates) and hence a marked alteration of ecosystem trophic structure" (Archer et al. 2010).
- "In arid and semi-arid regions, increases in the abundance of xerophytic shrubs at the expense of mesophytic grasses represents a type of desertification often accompanied by accelerated rates of wind and water erosion. In semi-arid and subhumid areas, encroachment of shrubs and trees into grasslands and savannas may substantially promote primary production, nutrient cycling and accumulation of soil organic matter but potentially reduce stream flow, ground water recharge, livestock production and biological diversity" (Archer et al. 2010).
- The ability to predict changes in landscapes characterized by mixtures of herbaceous vegetation and woody plants began to emerge among the top priorities for global change research in the mid- to late 1990s (Daly et al. 2000; Houghton et al. 1999). The net result is a dramatic increase in wind and water erosion resulting from increased bare areas in shrublands

compared to the grasslands they replaced. Aeolian sediment flux in mesquite-dominated shrublands in the Chihuahuan Desert is tenfold greater than rates of wind erosion and dust emission from grasslands on similar soils (Gillette and Pitchford 2004).

- An improvement in our ability to accurately estimate vegetation biomass across large areas is required to reduce uncertainty in terrestrial carbon pool estimates (Schimel et al. 2006).
- Therefore, these new maps developed by NRI represent a way forward to accomplish several priority ecological goals.

Tables and Results

Estimates presented here are based upon rangeland data collected on-site as part of the National Resources Inventory (NRI), a sample survey using scientific statistical principles and procedures. These results are based upon NRI rangeland data collected in the field on rangeland during the period 2004 to 2011 and address current conditions. These estimates cover non-Federal rangeland in 17 western states (extending from North Dakota south to Texas and west) and to a limited extent in Florida and Louisiana.

Margins of error are reported for each NRI estimate and must be considered at all scales of analysis. The margin of error is used to construct the 95 percent confidence interval for the estimate. The lower bound of the interval is obtained by subtracting the margin of error from the estimate; the upper bound is obtained by adding the margin of error to the estimate. A 95 percent confidence interval means that in repeated samples from the same population, 95 percent of the time the true underlying population parameter will be contained within the lower and upper bounds of the interval. In the following tables, if there are instances where the margin of error is greater than or equal to the estimate, the confidence interval includes zero and the estimate should not be used. In those cases, the estimate in the table is replaced by the word "Trace."

Table 1. Invasive woody species groups.

Juniper*

- JUAS - *Juniperus ashei* J. Buchholz, Ashe's juniper, Cupressaceae
- JUCA7 - *Juniperus californica* Carrière, California juniper, Cupressaceae
- JUCO11 - *Juniperus coahuilensis* (Martiñez) Gaussen ex R.P. Adams, redberry juniper, Cupressaceae
- JUCO6 - *Juniperus communis* L., common juniper, Cupressaceae
- JUDE2 - *Juniperus deppeana* Steud., alligator juniper, Cupressaceae
- JUHO2 - *Juniperus horizontalis* Moench, creeping juniper, Cupressaceae

- JUMO - *Juniperus monosperma* (Engelm.) Sarg., oneseed juniper, Cupressaceae
- JUNIP - *Juniperus* L., juniper, Cupressaceae
- JUOC - *Juniperus occidentalis* Hook., western juniper, Cupressaceae
- JUOS - *Juniperus osteosperma* (Torr.) Little, Utah juniper, Cupressaceae
- JUPI - *Juniperus pinchotii* Sudw., Pinchot's juniper, Cupressaceae
- JUSC2 - *Juniperus scopulorum* Sarg., Rocky Mountain juniper, Cupressaceae
- JUVI - *Juniperus virginiana* L., Eastern redcedar, Cupressaceae

  * Four juniper summary groups include:
    - Pacific junipers (JUCA7 and JUOC)
    - Montane/Intermontane junipers (JUOS and JUSC2)
    - Southern junipers (JUAS, JUCO11, JUDE2, JUMO, and JUPI)
    - Eastern junipers (JUVI)

Mesquite

- PROSO - *Prosopis* L., mesquite
- PRGL2 - *Prosopis glandulosa* Torr., honey mesquite
- PRJU3 - *Prosopis juliflora* (Sw.) DC., mesquite
- PRVE - *Prosopis velutina* Woot., velvet mesquite
- PRJU, *Prosopis juliflora*
- PRGLG - *Prosopis glandulosa* Torr. var. *glandulosa*, honey mesquite (Note: none in database)

Pinyon Pines**

- PICE - *Pinus cembroides* Zucc., Mexican pinyon
- PIDI3 - *Pinus discolor* D.K. Bailey & Hawksw., border pinyon
- PIED - *Pinus edulis* Engelm., twoneedle pinyon
- PIMO - *Pinus monophylla* Torr. & Frém., singleleaf pinyon
- PIQU - *Pinus quadrifolia* Parl. ex Sudw., Parry pinyon
- PIRE5 - *Pinus remota* (Little) D.K. Bailey & Hawksw., papershell pinyon

  ** Two pinyon pine summary groups include:
  - All six pinyon pine species
  - PIED and PIMO only

Table 2. Non-Federal rangeland in 48 coterminous states where Pacific junipers are present or where they cover at least 5, 15, 30, or 50 percent of the soil surface, by state, with margins of error.

State	Present	At least 5%	At least 15%	At least 30%	At least 50%
	Percent	Percent	Percent	Percent	Percent
Arizona	Trace	Trace	Trace	0	0
California	Trace	Trace	0	0	0
Colorado	0	0	0	0	0
Florida	0	0	0	0	0
Idaho	Trace	Trace	Trace	Trace	Trace
Kansas	0	0	0	0	0
Louisiana	0	0	0	0	0
Montana	Trace	Trace	Trace	0	0
Nebraska	0	0	0	0	0
Nevada	0	0	0	0	0
New Mexico	0	0	0	0	0
North Dakota	0	0	0	0	0
Oklahoma	0	0	0	0	0
Oregon	18.0 ±4.0	10.4 ±2.5	4.2 ±1.7	Trace	Trace

South Dakota	0	0	0	0	0
Texas	Trace	0	0	0	0
Utah	0	0	0	0	0
Washington	0	0	0	0	0
Wyoming	0	0	0	0	0
Nation	0.5 ±0.1	0.3 ±0.1	0.1 ±0.0	Trace	Trace

Note: Estimates where margins of error are at least as large as the estimates are denoted as "Trace."

Table 3. Non-Federal rangeland in 48 coterminous states where Pacific junipers are present or where they comprise at least 5, 15, 30 or 50 percent of the relative plant cover (composition), by state, with margins of error.

State	Present	At least 5%	At least 15%	At least 30%	At least 50%
	Percent	Percent	Percent	Percent	Percent
Arizona	Trace	Trace	Trace	Trace	Trace
California	Trace	Trace	Trace	0	0
Colorado	0	0	0	0	0
Florida	0	0	0	0	0
Idaho	Trace	Trace	Trace	Trace	Trace
Kansas	0	0	0	0	0
Louisiana	0	0	0	0	0
Montana	Trace	Trace	Trace	0	0
Nebraska	0	0	0	0	0
Nevada	0	0	0	0	0
New Mexico	0	0	0	0	0
North Dakota	0	0	0	0	0
Oklahoma	0	0	0	0	0
Oregon	18.0 ±4.0	11.8 ±2.7	6.3 ±2.5	3.0 ±2.0	1.1 ±0.9

South Dakota	0	0	0	0	0
Texas	Trace	0	0	0	0
Utah	0	0	0	0	0
Washington	0	0	0	0	0
Wyoming	0	0	0	0	0
Nation	0.5 ±0.1	0.3 ±0.1	0.2 ±0.1	0.1 ±0.0	Trace

Note: Estimates where margins of error are at least as large as the estimates are denoted as "Trace."

Table 4. Non-Federal rangeland in 48 coterminous states where Montane/Intermontane junipers are present or where they cover at least 5, 15, 30, or 50 percent of the soil surface, by state, with margins of error

State	Present	At least 5%	At least 15%	At least 30%	At least 50%
	Percent	Percent	Percent	Percent	Percent
Arizona	5.9 ±2.1	3.3 ±1.4	0.9 ±0.6	0	0
California	Trace	Trace	0	0	0
Colorado	3.7 ±1.7	2.2 ±1.1	0.9 ±0.6	Trace	0
Florida	0	0	0	0	0
Idaho	2.9 ±1.5	1.9 ±1.2	Trace	Trace	Trace
Kansas	0	0	0	0	0
Louisiana	0	0	0	0	0
Montana	3.5 ±1.2	0.9 ±0.5	0.6 ±0.5	Trace	0
Nebraska	0	0	0	0	0
Nevada	4.1 ±2.7	2.9 ±2.3	1.5 ±1.4	Trace	0
New Mexico	Trace	0	0	0	0
North Dakota	Trace	Trace	0	0	0
Oklahoma	Trace	0	0	0	0
Oregon	Trace	0	0	0	0

South Dakota	Trace	Trace	0	0	0
Texas	0	0	0	0	0
Utah	15.1 ±3.8	9.4 ±3.5	4.2 ±2.3	1.1 ±1.0	0
Washington	0	0	0	0	0
Wyoming	1.9 ±1.3	Trace	Trace	Trace	0
Nation	1.8 ±0.3	0.9 ±0.2	0.4 ±0.1	0.1 ±0.0	Trace

Note: Estimates where margins of error are at least as large as the estimates are denoted as "Trace."

Table 5. Non-Federal rangeland in 48 coterminous states where Montane/Intermontane junipers are present or where they comprise at least 5, 15, 30 or 50 percent of the relative plant cover (composition), by state, with margins of error

State	Present	At least 5%	At least 15%	At least 30%	At least 50%
	Percent	Percent	Percent	Percent	Percent
Arizona	5.9 ±2.1	4.4 ±1.6	3.2 ±1.5	1.0 ±0.9	Trace
California	Trace	Trace	Trace	Trace	0
Colorado	3.7 ±1.7	3.0 ±1.4	1.7 ±0.9	1.3 ±0.8	Trace
Florida	0	0	0	0	0
Idaho	2.9 ±1.5	1.9 ±1.3	Trace	Trace	Trace
Kansas	0	0	0	0	0
Louisiana	0	0	0	0	0
Montana	3.5 ±1.2	1.3 ±0.7	0.6 ±0.5	Trace	Trace
Nebraska	0	0	0	0	0
Nevada	4.1 ±2.7	3.5 ±2.7	2.5 ±2.2	1.8 ±1.5	Trace
New Mexico	Trace	0	0	0	0
North Dakota	Trace	Trace	0	0	0
Oklahoma	Trace	Trace	0	0	0
Oregon	Trace	0	0	0	0

South Dakota	Trace	Trace	0	0	0
Texas	0	0	0	0	0
Utah	15.1 ±3.8	12.4 ±3.4	7.5 ±2.7	4.3 ±1.8	1.8 ±1.4
Washington	0	0	0	0	0
Wyoming	1.9 ±1.3	Trace	Trace	Trace	0
Nation	1.8 ±0.3	1.2 ±0.2	0.7 ±0.2	0.4 ±0.1	Trace

Note: Estimates where margins of error are at least as large as the estimates are denoted as "Trace."

Table 6. Non-Federal rangeland in 48 coterminous states where Southern junipers are present or where they cover at least 5, 15, 30, or 50 percent of the soil surface, by state, with margins of error

State	Present	At least 5%	At least 15%	At least 30%	At least 50%
	Percent	Percent	Percent	Percent	Percent
Arizona	8.4 ±2.2	5.2 ±1.8	1.2 ±0.7	Trace	0
California	0	0	0	0	0
Colorado	2.9 ±1.7	1.9 ±1.1	Trace	0	0
Florida	0	0	0	0	0
Idaho	0	0	0	0	0
Kansas	0	0	0	0	0
Louisiana	0	0	0	0	0
Montana	Trace	0	0	0	0
Nebraska	0	0	0	0	0
Nevada	0	0	0	0	0
New Mexico	10.1 ±2.0	4.2 ±1.8	1.1 ±0.9	Trace	0
North Dakota	0	0	0	0	0
Oklahoma	Trace	Trace	Trace	0	0
Oregon	0	0	0	0	0

South Dakota	0	0	0	0	0
Texas	15.0 ±1.9	9.6 ±1.4	5.8 ±1.2	3.7 ±1.1	1.9 ±0.7
Utah	0	0	0	0	0
Washington	0	0	0	0	0
Wyoming	Trace	0	0	0	0
Nation	5.5 ±0.5	3.3 ±0.4	1.6 ±0.3	0.9 ±0.3	0.5 ±0.2

Note: Estimates where margins of error are at least as large as the estimates are denoted as "Trace."

Table 7. Non-Federal rangeland in 48 coterminous states where Southern junipers are present or where they comprise at least 5, 15, 30 or 50 percent of the relative plant cover (composition), by state, with margins of error

State	Present	At least 5%	At least 15%	At least 30%	At least 50%
	Percent	Percent	Percent	Percent	Percent
Arizona	8.4 ±2.2	7.1 ±2.1	4.1 ±1.7	2.0 ±1.2	0.9 ±0.7
California	0	0	0	0	0
Colorado	2.9 ±1.7	2.4 ±1.4	Trace	Trace	Trace
Florida	0	0	0	0	0
Idaho	0	0	0	0	0
Kansas	0	0	0	0	0
Louisiana	0	0	0	0	0
Montana	Trace	0	0	0	0
Nebraska	0	0	0	0	0
Nevada	0	0	0	0	0
New Mexico	10.1 ±2.0	7.4 ±1.9	3.8 ±1.5	1.9 ±1.0	Trace
North Dakota	0	0	0	0	0
Oklahoma	Trace	Trace	Trace	0	0
Oregon	0	0	0	0	0

South Dakota	0	0	0	0	0
Texas	15.0 ±1.9	10.3 ±1.5	6.3 ±1.2	3.7 ±1.0	1.4 ±0.5
Utah	0	0	0	0	0
Washington	0	0	0	0	0
Wyoming	Trace	Trace	0	0	0
Nation	5.5 ±0.5	3.9 ±0.4	2.3 ±0.3	1.3 ±0.2	0.5 ±0.1

Note: Estimates where margins of error are at least as large as the estimates are denoted as "Trace."

Table 8. Non-Federal rangeland in 48 coterminous states where Eastern junipers are present or where they cover at least 5, 15, 30, or 50 percent of the soil surface, by state, with margins of error

State	Present	At least 5%	At least 15%	At least 30%	At least 50%
	Percent	Percent	Percent	Percent	Percent
Arizona	0	0	0	0	0
California	0	0	0	0	0
Colorado	Trace	0	0	0	0
Florida	0	0	0	0	0
Idaho	0	0	0	0	0
Kansas	5.2 ±1.3	1.7 ±0.8	0.5 ±0.4	Trace	0
Louisiana	0	0	0	0	0
Montana	0	0	0	0	0
Nebraska	5.0 ±1.7	1.5 ±0.6	0.6 ±0.4	0.4 ±0.3	Trace
Nevada	0	0	0	0	0
New Mexico	0	0	0	0	0
North Dakota	0	0	0	0	0
Oklahoma	18.7 ±2.8	10.4 ±1.7	5.5 ±1.2	2.3 ±0.8	1.0 ±0.6
Oregon	0	0	0	0	0

South Dakota	0.9 ±0.6	Trace	Trace	Trace	Trace
Texas	2.6 ±0.8	1.7 ±0.7	1.0 ±0.5	0.5 ±0.3	Trace
Utah	0	0	0	0	0
Washington	0	0	0	0	0
Wyoming	0	0	0	0	0
Nation	1.8 ±0.3	0.9 ±0.2	0.5 ±0.1	0.3 ±0.1	Trace

Note: Estimates where margins of error are at least as large as the estimates are denoted as "Trace."

Table 9. Non-Federal rangeland in 48 coterminous states where Eastern junipers are present or where they comprise at least 5, 15, 30 or 50 percent of the relative plant cover (composition), by state, with margins of error

State	Present	At least 5%	At least 15%	At least 30%	At least 50%
	Percent	Percent	Percent	Percent	Percent
Arizona	0	0	0	0	0
California	0	0	0	0	0
Colorado	Trace	0	0	0	0
Florida	0	0	0	0	0
Idaho	0	0	0	0	0
Kansas	5.2 ±1.3	1.3 ±0.7	Trace	Trace	0
Louisiana	0	0	0	0	0
Montana	0	0	0	0	0
Nebraska	5.0 ±1.7	1.2 ±0.6	0.5 ±0.3	Trace	Trace
Nevada	0	0	0	0	0
New Mexico	0	0	0	0	0
North Dakota	0	0	0	0	0
Oklahoma	18.7 ±2.8	9.2 ±1.6	3.5 ±1.0	1.4 ±0.7	0.9 ±0.6
Oregon	0	0	0	0	0

South Dakota	0.9 ±0.6	Trace	Trace	Trace	Trace
Texas	2.6 ±0.8	1.3 ±0.6	0.7 ±0.4	Trace	Trace
Utah	0	0	0	0	0
Washington	0	0	0	0	0
Wyoming	0	0	0	0	0
Nation	1.8 ±0.3	0.8 ±0.2	0.3 ±0.1	Trace	Trace

Note: Estimates where margins of error are at least as large as the estimates are denoted as "Trace."

Table 10. Non-Federal rangeland in 48 coterminous states where mesquite are present or where they cover at least 5, 15, 30, or 50 percent of the soil surface, by state, with margins of error

State	Present	At least 5%	At least 15%	At least 30%	At least 50%
	Percent	Percent	Percent	Percent	Percent
Arizona	18.2 ±3.9	10.1 ±3.1	2.4 ±1.2	1.0 ±0.8	Trace
California	0	0	0	0	0
Colorado	0	0	0	0	0
Florida	0	0	0	0	0
Idaho	0	0	0	0	0
Kansas	0	0	0	0	0
Louisiana	0	0	0	0	0
Montana	0	0	0	0	0
Nebraska	0	0	0	0	0
Nevada	Trace	Trace	0	0	0
New Mexico	15.9 ±3.0	7.1 ±1.6	2.2 ±1.0	Trace	Trace
North Dakota	0	0	0	0	0
Oklahoma	6.8 ±2.3	3.6 ±1.6	2.0 ±1.3	1.1 ±0.9	Trace
Oregon	0	0	0	0	0

South Dakota	0	0	0	0	0
Texas	49.9 ±2.8	32.0 ±2.1	16.2 ±1.9	7.5 ±1.1	2.3 ±0.7
Utah	0	0	0	0	0
Washington	0	0	0	0	0
Wyoming	0	0	0	0	0
Nation	15.2 ±0.8	9.3 ±0.6	4.4 ±0.5	1.9 ±0.3	0.6 ±0.2

Note: Estimates where margins of error are at least as large as the estimates are denoted as "Trace."

Table 11. Non-Federal rangeland in 48 coterminous states where mesquite are present or where they comprise at least 5, 15, 30 or 50 percent of the relative plant cover (composition), by state, with margins of error

State	Present	At least 5%	At least 15%	At least 30%	At least 50%
	Percent	Percent	Percent	Percent	Percent
Arizona	18.2 ±3.9	15.3 ±3.7	8.6 ±2.5	4.4 ±1.4	1.9 ±1.2
California	0	0	0	0	0
Colorado	0	0	0	0	0
Florida	0	0	0	0	0
Idaho	0	0	0	0	0
Kansas	0	0	0	0	0
Louisiana	0	0	0	0	0
Montana	0	0	0	0	0
Nebraska	0	0	0	0	0
Nevada	Trace	Trace	Trace	0	0
New Mexico	15.9 ±3.0	10.3 ±2.0	4.7 ±1.3	2.2 ±1.0	1.1 ±0.5
North Dakota	0	0	0	0	0
Oklahoma	6.8 ±2.3	3.5 ±1.5	1.4 ±0.9	Trace	Trace
Oregon	0	0	0	0	0

South Dakota	0	0	0	0	0
Texas	49.9 ±2.8	34.0 ±2.4	17.0 ±2.2	6.6 ±1.6	1.8 ±0.6
Utah	0	0	0	0	0
Washington	0	0	0	0	0
Wyoming	0	0	0	0	0
Nation	15.2 ±0.8	10.5 ±0.7	5.3 ±0.6	2.2 ±0.4	0.7 ±0.2

Note: Estimates where margins of error are at least as large as the estimates are denoted as "Trace."

Table 12. Non-Federal rangeland in 48 coterminous states where six species of pinyon pine (PICE, PIDI3, PIED, PIMO, PIQU, and PIRE5) are present or where they cover at least 5, 15, 30, or 50 percent of the soil surface, with margins of error

State	Present	At least 5%	At least 15%	At least 30%	At least 50%
	Percent	Percent	Percent	Percent	Percent
Arizona	4.2 ±1.8	2.7 ±1.4	Trace	0	0
California	Trace	0	0	0	0
Colorado	3.0 ±1.3	1.6 ±1.1	Trace	0	0
Florida	0	0	0	0	0
Idaho	0	0	0	0	0
Kansas	0	0	0	0	0
Louisiana	0	0	0	0	0
Montana	0	0	0	0	0
Nebraska	0	0	0	0	0
Nevada	2.5 ±2.2	Trace	Trace	Trace	0
New Mexico	3.9 ±1.4	1.2 ±0.7	Trace	Trace	0
North Dakota	0	0	0	0	0
Oklahoma	0	0	0	0	0
Oregon	0	0	0	0	0

South Dakota	0	0	0	0	0
Texas	Trace	Trace	Trace	0	0
Utah	7.3 ±2.7	3.9 ±1.7	1.3 ±1.1	Trace	0
Washington	0	0	0	0	0
Wyoming	0	0	0	0	0
Nation	1.2 ±0.2	0.6 ±0.1	0.2 ±0.1	Trace	0

Note: Estimates where margins of error are at least as large as the estimates are denoted as "Trace."

Table 13. Non-Federal rangeland in 48 coterminous states where six species of pinyon pine (PICE, PIDI3, PIED, PIMO, PIQU, and PIRE5) are present or where they comprise at least 5, 15, 30 or 50 percent of the relative plant cover (composition), by state, with margins of error

State	Present	At least 5%	At least 15%	At least 30%	At least 50%
	Percent	Percent	Percent	Percent	Percent
Arizona	4.2 ±1.8	3.1 ±1.7	1.6 ±0.9	Trace	0
California	Trace	0	0	0	0
Colorado	3.0 ±1.3	2.1 ±1.2	1.0 ±0.8	Trace	0
Florida	0	0	0	0	0
Idaho	0	0	0	0	0
Kansas	0	0	0	0	0
Louisiana	0	0	0	0	0
Montana	0	0	0	0	0
Nebraska	0	0	0	0	0
Nevada	2.5 ±2.2	2.2 ±2.0	Trace	Trace	Trace
New Mexico	3.9 ±1.4	2.4 ±1.0	1.4 ±1.0	Trace	0
North Dakota	0	0	0	0	0
Oklahoma	0	0	0	0	0
Oregon	0	0	0	0	0

South Dakota	0	0	0	0	0
Texas	Trace	Trace	Trace	0	0
Utah	7.3 ±2.7	5.9 ±2.2	2.9 ±1.5	1.8 ±1.2	Trace
Washington	0	0	0	0	0
Wyoming	0	0	0	0	0
Nation	1.2 ±0.2	0.8 ±0.2	0.5 ±0.1	0.2 ±0.1	Trace

Note: Estimates where margins of error are at least as large as the estimates are denoted as "Trace."

Table 14. Non-Federal rangeland in 48 coterminous states where two species of pinyon pine (PIED and PIMO) are present or where they cover at least 5, 15, 30, or 50 percent of the soil surface, by state, with margins of error

State	Present	At least 5%	At least 15%	At least 30%	At least 50%
	Percent	Percent	Percent	Percent	Percent
Arizona	4.2 ±1.8	2.7 ±1.4	Trace	0	0
California	Trace	0	0	0	0
Colorado	3.0 ±1.3	1.6 ±1.1	Trace	0	0
Florida	0	0	0	0	0
Idaho	0	0	0	0	0
Kansas	0	0	0	0	0
Louisiana	0	0	0	0	0
Montana	0	0	0	0	0
Nebraska	0	0	0	0	0
Nevada	2.5 ±2.2	Trace	Trace	Trace	0
New Mexico	3.9 ±1.4	1.2 ±0.7	Trace	Trace	0
North Dakota	0	0	0	0	0
Oklahoma	0	0	0	0	0
Oregon	0	0	0	0	0

South Dakota	0	0	0	0	0
Texas	Trace	0	0	0	0
Utah	7.3 ±2.7	3.9 ±1.7	1.3 ±1.1	Trace	0
Washington	0	0	0	0	0
Wyoming	0	0	0	0	0
Nation	1.2 ±0.2	0.6 ±0.1	0.2 ±0.1	Trace	0

Note: Estimates where margins of error are at least as large as the estimates are denoted as "Trace."

Table 15. Non-Federal rangeland in 48 coterminous states where two species of pinyon pine (PIED and PIMO) are present or where they comprise at least 5, 15, 30 or 50 percent of the relative plant cover (composition), by state, with margins of error

State	Present	At least 5%	At least 15%	At least 30%	At least 50%
	Percent	Percent	Percent	Percent	Percent
Arizona	4.2 ±1.8	3.1 ±1.7	1.6 ±0.9	Trace	0
California	Trace	0	0	0	0
Colorado	3.0 ±1.3	2.1 ±1.2	1.0 ±0.8	Trace	0
Florida	0	0	0	0	0
Idaho	0	0	0	0	0
Kansas	0	0	0	0	0
Louisiana	0	0	0	0	0
Montana	0	0	0	0	0
Nebraska	0	0	0	0	0
Nevada	2.5 ±2.2	2.2 ±2.0	Trace	Trace	Trace
New Mexico	3.9 ±1.4	2.4 ±1.0	1.4 ±1.0	Trace	0
North Dakota	0	0	0	0	0
Oklahoma	0	0	0	0	0
Oregon	0	0	0	0	0

South Dakota	0	0	0	0	0
Texas	Trace	0	0	0	0
Utah	7.3 ±2.7	5.9 ±2.2	2.9 ±1.5	1.8 ±1.2	Trace
Washington	0	0	0	0	0
Wyoming	0	0	0	0	0
Nation	1.2 ±0.2	0.8 ±0.2	0.4 ±0.1	0.2 ±0.1	Trace

Note: Estimates where margins of error are at least as large as the estimates are denoted as "Trace."

Table 16. Non-Federal rangeland in 48 coterminous states where native woody species groups are present but excluded from reference conditions, by state, with margins of error

State	Pacific Junipers	Montane / Intermontane Junipers	Southern Junipers	Eastern Junipers	Mesquite	Pinyon Pine (6 species)	Pinyon (PIED and PIMO)
	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Arizona	0	0	Trace	0	Trace	Trace	Trace
California	Trace	0	0	0	0	0	0
Colorado	0	Trace	0	Trace	0	0.7 ±0.6	0.7 ±0.6
Florida	0	0	0	0	0	0	0
Idaho	Trace	1.7 ±1.2	0	0	0	0	0
Kansas	Trace	Trace	0	0.9 ±0.6	0	0	0
Louisiana	0	0	0	0	0	0	0
Montana	0	Trace	0	0	0	0	0
Nebraska	0	0	0	1.0 ±0.5	0	0	0
Nevada	0	0	0	0	0	0	0
New Mexico	0	0	0.6 ±0.4	0	2.7 ±1.4	Trace	Trace
North Dakota	0	0	0	0	0	0	0
Oklahoma	0	0	Trace	7.9 ±2.0	2.1 ±1.1	0	0
Oregon	1.5 ±1.3	0	0	0	0	0	0

South Dakota	0	0	0	Trace	0	0	0
Texas	0	0	3.9 ±0.8	1.3 ±0.4	17.2 ±1.6	0	0
Utah	0	2.0 ±1.3	0	0	0	Trace	Trace
Washington	0	0	0	0	0	0	0
Wyoming	0	Trace	0	0	0	0	0
Nation	Trace	Trace	1.0 ±0.2	0.7 ±0.1	4.5 ±0.4	Trace	Trace

Note: Estimates where margins of error are at least as large as the estimates are denoted as "Trace."

About the Data

Estimates presented here are based upon rangeland data collected on-site as part of the National Resources Inventory (NRI). Rangeland is defined by the NRI as a Land cover/use category on which the climax or potential plant cover is composed principally of native grasses, grasslike plants, forbs, or shrubs suitable for grazing and browsing, and introduced forage species that are managed like rangeland. This includes areas where introduced hardy and persistent grasses, such as crested wheatgrass, are planted and such practices as deferred grazing, burning, chaining, and rotational grazing are used, with little or no chemicals or fertilizer being applied. Grasslands, savannas, many wetlands, some deserts, and tundra are considered to be rangeland. Certain communities of low forbs and shrubs, such as mesquite, chaparral, mountain shrub, and pinyon-juniper, are also included as rangeland.

These results are based upon NRI rangeland data collected in the field on rangeland during the period 2004 to 2011. Current estimates cover non-Federal rangeland in 17 western states (extending from North Dakota south to Texas and west) and to a limited extent in Florida and Louisiana.

The findings presented here summarize presence and prevalence of four native invasive woody species groups:

- Junipers including eastern redcedar
- Eastern redcedar
- Junipers excluding eastern redcedar
- Mesquite.

Quality assurance and statistical procedures are designed / implemented to ensure data are scientifically legitimate. Irrespective of the scale of analysis, margins of error must be considered. Margins of error (at the 95 percent confidence level) are presented for all NRI estimates.

About the Line Point Intercept Protocol

Line point intercept data are utilized in summaries of non-native plant species, non-native invasive herbaceous species, native invasive woody species, and bare ground. Line point

intercept data are collected along two intersecting 150-foot transects centered on each sample location. Data collectors record plant species, litter, lichen, moss, rock fragment, bedrock, and/or bare soil present at each 3-foot interval.

About the Native Invasive Woody Species Tables

The tables are constructed with NRI rangeland data collected in the field on rangeland during the period 2004 to 2011. Tables summarize the percent of non-Federal land where the species groups: (1) are present; (2) cover at least 5, 15, 30 or 50 percent of the soil surface; and (3) make up at least 5, 15, 30 or 50 percent of the relative plant canopy cover (composition).

Presence is calculated as the percent of non-Federal rangeland where at least one of the species is observed. Plant canopy cover represents the proportion of the soil surface covered by an individual species. For each sample site, plant canopy cover is calculated as the percent of marks at which a plant in the species group is observed. Relative plant canopy cover is an indicator of species composition and is calculated for each sample site as the percent of all foliar observations.

About the Native Invasive Woody Species Maps

The maps are constructed with NRI rangeland data collected in the field on rangeland during the period 2004 to 2011. The regions are based on level IV ecoregion boundaries defined by the U.S. Environmental Protection Agency Western Ecology Division (http://www.epa.gov/wed/pages/ecoregions/level_iii_iv.htm). In some cases level IV ecoregions were combined to include more sample sites. An additional category, referred to as "Insufficient point count (35 or less)", represents areas where there were too few data points. Regions without non-Federal rangeland are described as "No on-site rangeland samples". Areas of Federal land are depicted with cross-hatching.

The maps present the percent by classes (none, 1% or less, 1-5%, 5-20%, over 20%) of non-Federal rangeland where native invasive woody species groups are present or cover at least 5%, 15%, 30%, or 50% of the soil surface or relative of total plant intercepts for all species on the transects, with a maximum of one intercept per species per point.

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