

Table S1. Tree names used in the study and by surveyors in line and corner data

Common name used in this study	Surveyor Common Names	Likely Latin Names ¹
Alder	Alder, black alder	<i>Alnus incana</i> (L.) Moench subsp. <i>tenuifolia</i> (Nutt.) Breitung
Ash	Ash	<i>Fraxinus anomala</i> Torr. Ex S. Watson
Blue spruce	White spruce, silver spruce	<i>Picea pungens</i> Engelm.
Cottonwood	Cottonwood	Mostly <i>Populus angustifolia</i> James, but can include some <i>Populus</i> × <i>acuminata</i> Rydb. (pro sp.) [angustifolia × deltoides] or possibly at lower elevations some <i>Populus deltoides</i> W. Bartram ex Marshall ssp. <i>wislizeni</i> (S. Watson) Eckenwalder
Douglas-fir	Douglas fir	<i>Pseudotsuga menziesii</i> (Mirb.) Franco var. <i>glauca</i> (Beissn.) Franco
Gambel oak	Oak, oak brush, scrub oak	<i>Quercus gambelii</i> Nutt.
Juniper	Cedar, juniper	Mostly <i>Juniperus osteosperma</i> (Torr.) Little, but <i>J. scopulorum</i> Sarg. common in upper elevations of piñon-juniper and lower elevations of pine
Pine	Pine	Mostly <i>Pinus ponderosa</i> Lawson & C. Lawson var. <i>scopulorum</i> Engelm, possibly scattered <i>P. strobiformis</i> Engelm. or <i>P. flexilis</i> James
Ponderosa pine	Ponderosa pine, yellow pine, black pine	<i>Pinus ponderosa</i> Lawson & C. Lawson var. <i>scopulorum</i> Engelm.
Quaking aspen	Aspen, quaking aspen, quakenasp	<i>Populus tremuloides</i> Michx.
Spruce	Spruce	<i>Pseudotsuga menziesii</i> (Mirb.) Franco var. <i>glauca</i> (Beissn.) Franco or <i>Picea pungens</i> Engelm. or <i>Picea engelmannii</i> Parry ex Engelm.
Subalpine fir	Fir, balsam, balsam fir	<i>Abies lasiocarpa</i> (Hook.) Hutt.; also known as <i>Abies bifolia</i>
Twoneedle piñon	Pinion, pinon, piñon	<i>Pinus edulis</i> Engelm.
Unknown	Elm, hemlock	Unknown species
White fir	Fir, hemlock	<i>Abies concolor</i> (Gord. & Glend.) Lindl. ex Hildebr., occasionally <i>Pseudotsuga menziesii</i> (Mirb.) Franco var. <i>glauca</i> (Beissn.) Franco
Willow	Willow, willow timber	<i>Salix</i> spp.; including <i>Salix scouleriana</i> , which can be large

¹ Nomenclature follows USDA Plants: <http://plants.usda.gov>

Table S2. Vegetation and land-use information in township descriptions

Township	Surveyor/year	Human impacts and vegetation information in township description ¹
1. T032N R001E	James M. Gardner 1882	The grazing is good along the river and in the valleys. There is plenty of sawtimber. There are some large open Parks where the feed is good & abundant.
2. T032N R001W	James M. Gardner 1882	Good grass. Timber pine...Settler in S.E. part of Sec. 13.
3. T032N R001.5W	Robert E. Pratt 1911	A growth of yellow pine and douglas fir timber of good size and quality may be found throughout the Tp. Grazing is good in most portions of the Tp.
4. T032N R002E	Geo. D. Nickel 1880	...there are several Parks & valleys where there is good grazing, also along the river bottom. There is considerable of the timber which would make excellent lumber. The Pagosa & Conejos road passes through the Tp. From S.E. to N.W.
5. T032N R002W	C. C. Schrontz 1907	...covered more or less with scrub pine timber, there is very little 1 st class timber; some spruce cedar and pinon are also to be found...About 80 acres in the NW. 1/4 of Sec. 1 is being cultivated, a dwelling house with some minor improvements are on the place...some few improvements are to be found in Lots No. 2 and 3, and the NE. Of the NW. 1/4 of Sec. 18, also Lots 3 and 4, Sec. 6.
6. T032N R003W	Tyler & Medary 1881	The southern tier of Sections in this Township is mountainous and covered with a dense growth of Pine, Pinon, and Cedar and excellent grass...The Denver and Rio Grande R.R. runs through the Township.
7. T032N R004W	Tyler & Medary 1881	The Denver and Rio Grande Railroad follows the course of the river. There is a Mexican settlement near the centre of Sec. 23. Also a small settlement in the S.E. cor. of sec. 16. The balance of the Township is high rolling mesa covered with Pine, Pinon and Cedar, and an abundance of good grama grass.
8. T032N R005W	Tyler & Medary 1881	The balance of the Township is mountainous and covered with heavy Pine and Cedar timber. The D& R.R.G. Railroad passes through Secs. 13, 14, 15, 16, 17, 18, 19 and 20.
9. T032N R007W	Tyler & Medary 1881	The land in this township is principally high rolling mesa covered with a dense growth of sage brush and scattering scrub Pine Pinon & Cedar....The D&R.G.R.R. runs through secs. 4, 9, 10, 11, 12, 15 and 16.
10. T032N R008W	Cecil A. Deane 1901	This fract. Tp. embraces a portion of the high mesa country lying between the Rios Las Animas and Los Pinos, which is deeply scored by the drainage gulches and valleys leading generally Southward. In a few places these gulches widen to little valleys covered with a rank growth of Sage and oak brush. The Township is destitute of water and very little grass appears on any of the lines..The timber is Pinon and Cedar with a very few pine trees.
11. T032N R010W	Tyler & Medary 1881	There are a number of basins in the central and western portion with abundant grass. The timber is Pinon, Pine and Cedar.

12. T032N R013W	Tyler & Medary 1881	The balance of the Township is cut by canons and covered with a thick growth of Pine, Pinon and Cedar timber.
13. T033N R001E	Benjamin H. Smith 1883	Generally covered with dense oak brush. Spruce and aspen timber is found in Secs 1, 2, 11 & 12 and pines in the West half of the Township. When Ute land is clear it is covered with bunch grass affording good grazing. There are two settlers, Mess. Scott and Elmer on Violeta Creek in Sec. 34, who occupy about all the arable land in the Township
14. T033N R001W	Geo. D. Nickel 1880	From N.W. Cor. Of Sec. 18 where Archuleta Cattle herders live...There is good grazing & hay land in many parts of the Tp. & much of the Timber used for lumber and the Soil in some portions is first-rate
15. T033N R001.5W	Robert E. Pratt 1911	There is a small body of timber, of merchantable size and quality in section 36, consisting largely of yellow pine and douglas fir. The major portion of the remaining timber in the township, is a scrubby growth of pinon pine and juniper. The grasses, while not abundant, furnish ample grazing for the sheep and goats which are raised in this vicinity...There are no settlers in this township.
16. T033N R002E	Edwin Kellogg 1897	The lower country is covered with by far the densest growth of oak brush I have ever encountered, adding not a little to the difficulties of Survey. There is very little timber of commercial value in the Tp. A few pines in the South, white spruce, balsam fir, and aspen higher up neither of much value. Three settlements have been made along the Big Navajo. One in Sec. 35. Name unknown. Mr. Peterson in secs. 13 and 24 and Mr. Fitzgerald in sec. 1.
17. T033N R002W	Robert E. Pratt 1911	There is a fine growth of yellow pine, white spruce and Douglas fir timber of considerable value in the western portion of the township, the variety first named predominating. A scrubby species of pinon pine and juniper is also to be found in varying quantities. The nutritious grasses which abound every where make this an excellent grazing country. A great many sheep and goats are raised in this vicinity, but very few horses and cattle.
18. T033N R003W	Tyler & Medary 1881	There is abundant grass and water. A heavy growth of Pine timber in the North Western portion of the Township.
19. T033N R004W	Edmund W. Hathaway 1899	There is an abundance of fine pine timber in the southeastern portion of the township, and along the high ridges, along the eastern and in the northern portions; the balance of the township is timbered with pinons and cedars...There are no settlers in the township.
20. T033N R005W	Tyler & Medary 1881	The west side of the Township is traversed by open valleys with a South Easterly course that afford excellent pastoral lands. Wood is abundant both for fuel and building purposes and is of the Pine, Pinon, Cedar and Cottonwood variety.
21. T033N R006W	Edmund W. Hathaway 1899	The land surveyed by me in this township, consists of every variety from sagebrush valleys to timber-covered mountainous ridges. There is considerable good grass in the valleys and scattering on the ridges...The ridges are generally heavily timbered with pinon and cedar, and the valleys covered with dense sage brush. There are no settlers in the township. The land is chiefly valuable for grazing.

22. T033N R006W	Roy E. Chase 1936	Some yellow pine and fir timber is found on the higher portions, but most of the timber is cedar and pinon. Most of this area is covered with a dense growth of oak and service undergrowth, with some mountain mahogany. A considerable amount of yellow pine timber has been cut near the head of the Sambrites Canyon in secs. 11, 12, 13, and 14...Sheep grazing is the principal industry, mostly in the fall.
23. T033N R008W	Tyler & Medary 1881	...covered with a fine growth of XXXX grass furnishing the best of grazing [cannot read word at XXXX]. Portions of the township are covered with a dense growth of scrub Pinon and Cedar timber. The Durango and Rio Grande passes through the N.E. corner of this township.
24. T033N R010W	Tyler & Medary 1881	Innumerable valleys produce abundance of good grass. Nearly the entire Twp is valuable for either agricultural or grazing purposes.
25. T033N R011W	Cecil A. Deane 1901	Heavy Pinon and Cedar timber grows on the uplands while the valleys are covered with rank sage brush. The highest elevation is in the extreme N.E. cor. where a few pine trees are seen...So little grass grows in this region that no cattle were seen. The timber has little or no commercial value.
26. T033N R012W	Tyler & Medary 1880	It is mostly covered with a dense growth of Pine, Pinon and Cedar timber...Sections 2, 3, 4, 7, 8, 9, 10, 16, 17, and 18 is a high mesa and covered with a thick growth of sage brush and scattering Pine, Pinon and Cedar.
27. T034N R001E	Benjamin H. Smith 1883	The surface is almost entirely covered with oak brush. Spruce and Aspens abound in the S.E. quarter and scattering pines in the West half. There are no settlers. Bunch grass abounds in the open parks affording good grazing.
28. T034N R001W	Geo. D. Nickel 1880	In this Tp. there is good Pine timber and excellent feed. In many places the grass could be cut for hay.
29. T034N R001.5W	Robert E. Pratt 1911	The 5 North secs. Are largely covered with a heavy growth of yellow pine and douglas fir timber, a large per cent of which is of merchantable size and quality and quite accessible. Scrub pinon pine, juniper and cottonwood predominate in sec. 36. Grass is abundant in most parts of the township, furnishing excellent grazing.
30. T034N R002E	Frank P. Monroe 1892	The bottom lands in the valleys of the Navajo and Big Blanco rivers comprise about 1200 acres and are almost wholly covered with a dense growth of willow brush...grass grows in abundance. The mountainous portion of the township is covered with forests of spruce, aspen and balsam. Portions of this timber have been destroyed by forest fires and are succeeded by a dense growth of young aspen. Cottonwood is found growing to 5 extent along the river, also scattering pines in the bottom lands. There is one settler in sec. 6 and 2 in sec. 36.
31. T034N R002W	Robert E. Pratt 1911	There is a very valuable growth of yellow pine, douglas fir, and white spruce in this township, while a scrubby variety of pinon pine and juniper may be found in many localities...Nutritious grasses are found in nearly all portions of the townships making this an ideal grazing country.
32. T034N R003W N of Ute	Geo. D. Nickel 1880	Timber mostly pine with a dense undergrowth of Oak brush in all parts of Twp...G.F. Stalls...has a house & Ranch in S.W 1/4 of Sec. 10

33. T034N R003W S of Ute	Edmund W. Hathaway 1899	This entire TP. with the exception of a few small valleys is covered with a dense growth of oak brush, from 3 to 10 feet in height. With the exception of 3 or 4 secs. In the Southwestern portion, this township is covered with an abundance of fine pine timber, which is mostly of large growth and of the Black Jack and Yellow Pine varieties; in the past, fires have burned over this township, destroying the smaller growth and leaving the large timber...The grass is good, through most of the township, and on the high ridges in the Northeastern portions, is excellent. There are no white settlers in this township, but along Cat creek there are a number of Ute Indians, who have herds of sheep and ponies, which graze over the township.
34. T034N R004W N of Ute	Geo. D. Nickel 1882	The timber spruce & pine with a dense undergrowth of Oak brush....post office N.E. 1/4 of Sec. 18
35. T034N R004W S of Ute	Tyler & Medary 1881	This township is mainly high rolling mesa, covered with a heavy growth of Pine, Pinon and Cedar and abundance of good grass.
36. T034N R005W N of Ute	Geo. D. Nickel 1882	There is a fine growth of pine timber...Settlers located in the S.W. 1/4 of the N.W. 1.4 of Sec. 11.
37. T034N R005W S of Ute	Tyler & Medary 1881	Soil of a 2 nd rate which produces good grass. Pine Pinon & Cedar abund. And in places the Pines are tall & straight making good building timber. Oak brush is to be found on the N slopes.
38. T034N R006W N of Ute	Geo. D. Nickel 1882	Settlers located N.E. 1/4 of Sec. 16. The timber is mostly pine.
39. T034N R006W S of Ute	Edmund W. Hathaway 1899	The timber is pinon and cedar on the lower ridges, and some pine on the higher ridges in the eastern and northern portions of the township. Oak and black brush is found in dense growth in the ravines and on the north slopes. In the western portion of the Township the ravines and valleys are filled with a dense growth of sage brush, from 2 to 5 feet in height...There are no settlers in the Township.
40. T034N R007W N of Ute	Geo. D. Nickel 1882	Along the Los Pinos River there is considerable fine farming Land with very fine growth of grass...The timber is Pine, cedar & cottonwood. T. Ducal has a house & enclosed field in the N.W. 1/4 of the N.W. 1/4 of Sec. 13. H.C. Schneider has house and some improvements in N.W. 1/4 of Sec. 12.
41. T034N R007W S of Ute	Tyler & Medary 1881	The surface of this Township is generally rolling mesa with dense Sage brush in valleys and belts of Pinon and Cedar. ..bottom lands are 1 st rate covered with an undergrowth of Willow squaw brush and Cottonwood...Good Grass abounds...there is one Ranch in Sec. 2.
42. T034N R008W N of Ute	Frank W. Gove 1880	This township embraces fine grazing lands. The bottom land is extremely productive. The mesa land can be made so by irrigation. The surface west of the Florida is nearly level. East of the river it is rolling and has pine cedar & pinon timber. Several ranches are occupied in the best locations along the river.

43. T034N R009W S of Ute	Tyler & Medary 1881	On the higher Mesa land there is an abundance of good grass in the Eastern and Middle portions of the Township making the best of grazing for stock...The Denver and Rio Grande R.R. passes through the NE part of the Township and the wagon roads to the Rio Florida and Durango run thr'o the Township from S to N.
44. T034N R010W S of Ute	Tyler & Medary 1881	Good grass. Timbered with Pine, Pinon and Cedar.
45. T034N R011W N of Ute	Blaire Burwell 1896	Some good pine timber is to be found in pine gulch. Pinon and cedar are abundant in the west half, while the east half is generally clear of anything except dense thickets of oak brush, service berries and wild apples
46. T034N R011W S of Ute	Tyler & Medary 1881	The Western portion of the Township is mountainous and covered with a dense growth of Pine, Pinon and Cedar. The North Eastern part is a high mesa and covered with a dense undergrowth of Sage and Oak brush.
47. T034N R012W N of Ute	Charles Keemle 1883	This fractional Township is...good for grazing purposes. Grass being more or less heavy along the Creek bottoms. Timber is found in all portions...cabins are noted in these notes.
48. T034N R012W S of Ute	Tyler & Medary 1881	The balance of the Township is mountainous covered with Pine Pinon and Cedar Timber
49. T035N R001E	William H. Cochrane 1887	Contains a great quantity of good yellow pine saw timber. There is a settler in the N.E. 1/4 of N.W. 1/4 sect 7, one in the N.W. 1/4 of N.E. 1/4 of S.W. 1/4 of sect. 33, and one on the East line sect. 25.
50. T035N R001W	William H. Cochrane 1887	Between little Blanco and Mill Creek the country is mountainous and fairly wooded. Settlers are located as indicated in the boundary of the notes.
51. T035N R002E	Frank P. Monroe 1892	The soil of the bottoms is alluvial and covered with an abundant growth of grass, willow young aspen, alder and scattering groves of Cottonwood and pine timber. The mountainous portion of the township is covered with a heavy growth of aspen, spruce, balsam and pine, and portions of it with a dense undergrowth of oak, service and young aspen...There are two settlers in the township located in secs. 31 & 32.
52. T035N R002W	Geo. D. Nickel 1881	In the northern part this Township forms an extensive plateau covered with Pine and scrub oak leaving parts of excellent grazing ground...On the South of Township a series of ridges and hills makes the surface mountainous, some good grazing and timber occurs.
53. T035N R002.5W	Edwin H. Kellogg 1897, 1899	One of these valleys in sec. 35 is claimed by Mr. Basye and used for hay ground. All the ridges and most of the valleys are covered with dense oak undergrowth and scattered pine timber. North of the district above described the general surface is an elevated plateau deeply scored by Mitria Cañon and its tributaries and covered with a heavy growth of remarkably fine pine timber.

54. T035N R003W	Gardner & Cleghorn 1880	The surface of this township is mountainous timbered with pine & oak brush good grass in places...A sheep ranch is located in the western part of sec. 3 and a settler in the SE 1/4 of the N.W. 1/4 of sec. 36.
55. T035N R004W	Geo. D. Nickel 1882	Timbered with Spruce & Pine timber, Aspen & Oak brush. There is considerable good grass....A ranch is located in the valley of the Rio Piedra in the N.E. 1/4 of Sec. 32.
56. T035N R005W	J. Gardner 1882	Timber Pine, Spruce, Aspen & small oak with a dense undergrowth of small aspen, oak and other brush with some good grass in places. Ranches in the SW 1/4 of section 18 and SW 1/4 of section 19.
57. T035N R006W	Edward D. Bright 1890	For 1 mile to N and nearly 2 miles to S of the creek is a magnificent belt of pine timber...The whole Tp. Is especially for grazing...
58. T035N R007W	Geo. D. Nickel 1882	Timber mostly pine and aspen with dense undergrowth of oakbrush...willows and cottonwood along the stream.
59. T035N R008W	Henry C. Hopper 1877	The timber is chiefly yellow pine and in many places will saw into a good clear lumber.
60. T035N R009W	Jason S. Fahringer 1877	A great deal of the land in the River Valley is excellent for farming and all is of the best for stock raising, fine pasturage being found on all the surrounding hills. ..The Township is remarkable for its high mesas (about 8,500 feet above Sea level) which are covered with rich grasses and scattered pine timber. "Animas City" is at present but a hamlet of some twenty or more houses...
61. T035N R010W	Henry C. Hopper 1877	In section 19, 20, 21, 28, 29, 30, 31 & 32 There is valuable pine timber.
62. T035N R011W	Frank W. Gove 1880	Heavy pine timber is found in abundance in many parts, while several sections are mountainous, with - no timber. But covered with - oak brush, and usually affording excellent grass. Numerous placer diggings have been marked in the upper part of the Tp, in La Plata River.
63. T035N R012W	Frank W. Gove 1880	In the S.W. part deep gulches prevail, while in the N.W. part Heavy pine timber. In the S.W. sandstone ledges prevail...Spruce, Cedar, Pine and Cottonwood timber is found throughout the Tp. There are but few settlers in the Tp., two being in sec. 36 and several in secs. 2, 3, 4, 5, 8, 9 & 17.
64. T035N R013W	Jason S. Fahringer 1877	No township description could be found
65. T035N R018W	M. Mack 1889	Scrub oak brush abounds on all the high ridges. In the S.E. cor of the Tp. Cedar and pinon pine timber covers the entire N.W. part. This timber is fit only for fuel and fencing. During the rainy season there is a fairly good growth of grass throughout the entire Tp. and especially above the high ridges in the Sierra XXXX Mts [cannot read at XXXX].

66. T036N R001E	Edwin H. Kellogg 1897	The timber on all the lower mountains has been badly damaged or wholly destroyed by fire, and in three parts the undergrowth of young aspens, willows, bush maple and sarvis, with-fallen timber made the work extremely difficult. On the higher parts and on N. Hillside, while pine and spruce, balsam and aspen timber of good size is found but in such inaccessible places as to make it commercially valueless.
67. T036N R001W	William H. Cochrane 1887	...the slopes afford good grazing. Location of settlers are noted in the body of these field notes.
68. T36N R002E	Edwin H. Kellogg 1897	These ranges surround a basin of lower elevation made up of very rough mountains covered in places with dense forests of fir and aspen timber. In other and probably the larger part this timber has been fire killed. Recent fires in the northern portion have destroyed large tracts of timber.
69. T036N R002W	Geo. D. Nickel 1882	The timber is spruce and pine. There is a dense undergrowth of sagebrush and oak [Hard to read]
70. T036N R002.5W	Edwin H. Kellogg 1899	Sections 35 and 36 with parts of Secs. 25 and 26, may be described as rolling table lands, mostly covered with beautiful pine timber. There are also several open parks in these sections, as also in secs. 23-14 and 2, which are open and rolling, of good soil, producing fine grass, making an excellent stock range. The N 1/2 of the Tp. is essentially mountainous and covered with pine, spruce and aspen timber more or less scattered and nearly everywhere are dense undergrowths of oak aspen and un-de-gato brush, exceedingly trying to surveyors. No one so far living in this township.
71. T036N R003W	Gardner & Cleghorn 1880	There is scrub XXXX [Can't read] fine grazing country. Timber mostly Pine.
72. T036N R004W	Geo. D. Nickel 1882	Covered with a fine growth of Spruce; pine and aspen timber...there is a dense undergrowth of Oak brush.
73. T036N R005W	Gardner & Cleghorn 1880	Covered with Pine & Spruce timber and Aspen & oak brush...Ranches located in S.W. 1/4 of Sec. 12 and N.E. 1/4 of Sec. 13.
74. T036N R006W	Geo. D. Nickel 1882	There is some good grazing. Timber Pine & spruce.
75. T036N R007W	Gardner & Cleghorn 1882	The surface of this township is mountainous covered with pine, spruce and aspen timber and some cottonwood along the streams. This township is well adapted for grazing as there is fine growth of good grass in many places. There is a cabin in the S.W. 1/4 of Sec. 24 and John Patrick's house in the S.E. cor. of sec. 13 very near the township line.
76. T036N R008W	James R. Morrison 1881	Good grazing in the narrow valley & also on the hillsides near the tributaries of said Florida River. A settler is located in the N.W. 1/4 of the S.W. 1/4 of sec. 25.
77. T036N R009W	Jason S. Fahringer 1877	The only arable land in this Tp. is that in the River Valley, a large share of it being already cultivated...Some portions, notably the extreme west, afford a large & rich pasturage. A fine body of timber extends through secs 9-16 & 21.

78. T036W R010W	William H. Clark 1882	There are places along streams where good grazing can be found...The timber pine spruce & aspen.
79. T036W R011W	William H. Clark 1882	[No vegetation description]. Settlers are located in S.W. 1/4 of Sec. 34, S.E. 1/4 of Sec. 28, S.W. 1/4 of Sec. 28, S.W. 1/4 of Sec. 3, S.W. 1/4 of Sec. 9, N.W. 1/4 of Sec. 16.
80. T036N R012W	Frank W. Gove 1881	The southern & western portions are covered with heavy pine timber...Sawmill is located in section 36 & several timber claims held in that portion of the township by unknown parties.
81. T036N R013W	Jason S. Fahringer 1877	Much of it...having fine grass and good pine timber with some Pinon & Cedar. The So. Eastern part is hilly & broken, but with good grass & Pinon timber. The North Western portion carries heavy pine timber with open glades of fine gramma & Buffalo grass
82. T036N R014W	Frank M. Gove 1880	The Tp. Is mostly covered with pinon & cedar timber. Secs. 1, 2, 3, 10, 11, 12, 13 & 14 contain considerable pine timber. Two wagon roads cross the Tp. From the Utah wagon road to the Mancos Valley...Grass grows in abundance.
83. T037N R001E	W. W. Allen 1881	...with a dense growth of spruce & Pine timber. A cabin is situated in the NW 1/4 of the S.E 1/4 Sect. 20. Another is in N.W. 1/4 of the SE 1/4 of Sec. 29, Another is in NW 1/4 of the NE 1/4 of Sec. 32, Another is in NE 1/4 of the SW 1/4 of Sec. 32.
84. T037N R001W	James M. Boggs 1883	Although largely covered with timber most of it is useless for other than ranch purposes being small and dwarf. There is fair grazing and on some of the creeks fine natural meadows.
85. T037N R002E	W. W. Allen 1881	The surface of this Township is...covered with spruce and Pine timber...A Park is situated on N. Side of River in which located several cabins. In the N.E. 1/4 of Sec. 31 Messers Cabin. John Laugh lives in the S.E. 1/4 of Sec. 28. Also another in S.W. 1/4 of Sec. 28.
86. T037N R002W	James M. Boggs 1883	This township is largely covered with a fair growth of pine and spruce timber with the exception of the small valley on the Rio Pedra where there is fine grass and meadow lands excepting also the higher parks of Pagosa mountain, but even this is fine summer range for stock of any kind...Much of the timber is of good quality.
87. T037N R003W	James M. Boggs 1883	The valleys and slopes are covered with rich grass and some good timber on ridge top is found. A settler in S.W. 1/4 sec. 14.
88. T037N R004W	James M. Boggs 1883	The slopes are well covered with spruce and pine. Also spruce on side ridges of this main ridge. Good grazing is found on the lower ridges and fine grass in and along the creek beds.
89. T037N R005W	John A. Bennett 1897	The soil of the bottom land along Pine River...affords good grazing lands for stock. The soil of lands along Graham Creek and in bed of canon in S.E. cor. Of Tp...affords fine grazing lands for sheep and other stock. ...except a small strip lying in secs. 13, 14, 23 and 24 on E side of Tp. which can be classed as second rate, producing some fine grass for pasturage. Spruce, Quaking Asp. And some cottonwood timber is found along Pine River. Upon the high mountains, a dense growth of Spruce timber is found, while lower down on the mountains is a dense growth of small Quaking Asp.

90. T037N R006W	John S. Knowles 1938	The entire region is heavily forested with a mixed stand of large timber, varying from yellow pine, Douglas fir, Colorado spruce and aspen at the lower levels to spruce, alpine fir and limber pine in the sub-alpine areas. A rank growth of oak, service, alder, birch and willow represents in general the undergrowth on all the slopes.
91. T037N R007W	James R. Morrison 1881	...a scattering growth of Spruce pine & pinon timber...A Ranch is Located in the South West 1/4 of the South East 1/4 of Sec 29.
92. T037N R008W	William M. May 1878	[No township description]
93. T037N R009W	John B. Cromwell and William M. May 1875	Along the river are several fine farms. Settler S.E. 1/4 of Sec. 20. There is an abundance of fine timber and grass.
94. T037N R010W	William H. Clark 1882	Timber mostly pine & spruce. Settlers located in central part of Sec. 10.
95. T037N R012W	Frank W. Gove 1882	The N portion is heavily timbered with Spruce and Aspen...C.A. Clayton has a Ranch in Sec 8. The western portion is fine for grass and meadow land.
96. T037N R013W	Frank W. Gove 1881	The township is mainly high-rolling mesa, covered with very heavy pine timber & dense Aspen Groves; with a growth of grass in the openings....Paul Townsend claims the N.E. 1/4 Sec. 36.
97. T037N R014W	Frank W. Gove 1881	Covered with fine pine timber. In Lost Cañon and on the Dolores is some pine land taken up by settlers and under cultivation.
98. T037N R015W	William M. May 1877	In the N.E. Part of the Township is Some good Pine timber suitable for lumber-other parts of the township is wooded with Pinon & Cedar. The high table lands are Clothed with an abundance of very nutritious grasses capable of sustaining large herds of stock.
99. T037N R016W	Frank W. Gove 1880	This Tp. Is mostly covered with pinon & cedar timber...The grass is good in all parts of the Tp. There are no wagon roads and few, if any prominent trails.
100. T038N R001W	James M. Boggs 1883	There is fair grazing over a large part of it. The timber is Pine, Spruce & Aspen, some large enough for timber, but mostly fitted for Rail Road Cross ties & for Ranch purposes.
101. T038N R002W	James M. Boggs 1883	In the South Western part on Alboroto Creek is some fine grass and grazing lands and other parts have fair pine and spruce timber...Many cattle winter in these hills and do well.
102. T038N R003W	James M. Boggs 1884	Good grazing along XXXX [Can't read] and slopes. The southern part of Tp. affords in general good grazing for cattle and sheep. Several locations of settlers are found along their creeks, but no improvements more than cabins are observed. The northern part of this Tp.is very mountainous and rocky. It has considerable pine and spruce timber.
103. T038N R004W	James M. Boggs 1884	In the western part the ridges and slopes of these mountains are clad with pine and spruce. The Eastern part is less timber, but fine grazing along the Weminuche Creek...Settler in S.W. 1/4 sec. 24.

104. T038N R006W	William H. Clark 1881	There is a scattering growth of Spruce and Pine timber...A Ranch is located S.E. 1/4 of Sec. 28.
105. T038N R009W	Frank W. Gove 1881	The Western portion of this Tp. Is very mountainous and much broken by high ridges and deep gulches...The timber is almost exclusively that of high altitudes, the Quaking aspen and the spruce...[no veg. information for the eastern portion]. The settlers in the tp. Are: in Sec. 1 S. Sruith, in Sec. 2-John Young, in Sec. 11. Alech Ptolemy, in Sec. 11. Edward Ptolemy, in Sec. 12, Frank Deputy.
106. T038N R010W	Frank W. Gove 1881	Grass grows very well all over the Tp. and makes fine grazing during the summer months.
107. T038N R011W	Timothy Caruthers 1882	Covered with dense undergrowth of Oak brush...There is very good growth of spruce & pine timber...Bear Creek flows N.W. across S.W. of Twp. There are places along this stream & the Cashe Creek where very good grazing can be found. Settler is located in N.W. 1/4 of Sec. 5.
108. T038N R012W	Frank W. Gove 1882	In the Southern portion of this Tp. Is a heavy growth of Pine timber, and good grass. J.F. Robison owns a ranch in Sec. 9
109. T038N R013W	Frank W. Gove 1881	The township is mostly high rolling Mesa with scattering Pine timber in South Western portion and heavy Pine & Aspen timber in Northern and NE portion. The grass is good in all parts of the township.
110. T038N R014W	Frank W. Gove 1881	The township is mainly high, rolling mesa, covered with - heavy pine trees and dense undergrowth of oak brush, with - aspen groves in the gulches. Grass is good throughout the Tp. and some hay is cut in the northern portions of the Tp. The Dolores Bottom is very fertile and ranches are already claimed [lists names, some of which are difficult to read, in sections 10, 15, 22, 27, 33, and 34]
111. T038N R015W	Frank W. Gove 1880	The soil is rich and produces fine grass. The eastern part of the Tp. Is covered with heavy pine timber and the remainder with scattered piñon & cedar and dense oak brush. [Lists one settler in sec. 30 and two in sec. 31].
112. T039N R007W	James R. Morrison 1881	A wagon road follows River. The timber is Pine, spruce & aspen. Cabin of settlers S.E. 1/4 of Sec. 6.
113. T039N R008W	Unknown 1882	The slopes have good grass. In general there is a little timber in this township. Needleton a little mountain and railway XXXX [cannot read] is located in the NW 1/4 of Sec. 25.
114. T039N R009W	Frank W. Gove 1882	Daniel Murmane has a Ranch in Sec. 35 and O. Pile has 160 acres in Sec 24 and 25...The entire Tp affords fine grazing in Summer.
115. T039N R010W	Frank W. Gove 1881	It is...covered with excellent heavy spruce timber and the Hermosa Valley widens out in sec. 24 and 25 and leaves a beautiful park, about 8500 ft elevation. The grass is excellent throughout the Tp. Paul Winter claims a ranch in Sec. 14. Wm McKee in east part of Sec. 24, James Heardy in Sec. 25, F.W. Gove in West part sec. 24.

116. T039N R011W	Frank W. Gove 1882	The southeastern portion is heavily timbered with spruce and aspen. Northeastern portion is of a mineral character...The North Western portion is fine for grazing purposes. W. H. Dawson has a ranch in section thirty one. W. J. Snyder is located in section thirty eight. The timber in this township is principally Pine and Spruce.
117. T039N R012W	Timothy Caruthers 1882	The central portion of this Twp is a high mountainous XXXX [cannot read] or plateau covered with a dense undergrowth of Oak brush. Timber is a fine quality of pine and spruce. Settler is located in S.W. 1/4 of Sec. 4.
118. T039N R013W	Frank W. Gove 1881	Such mesa country as there is between these canons has fine grass in the opens and is timbered in the northwestern portions mainly with Pine and in the Southeastern with Aspen and spruce. In the West Dolores bottom is considerable irrigable land on which ranches have been take by B.E. Girn in section 8 and by Charles Jones in section 18.
119. T039N R014W	Frank W. Gove 1881	This Tp. Is mainly a high rolling Mesa, well timbered with fine pine, having an oak underbrush, and groves of aspen in some portions. Toward the north the grass is good...In the bottom of this cañon [West Dolores] there is considerable irrigable land, on which ranches have been taken and improvements made by S.W. Aven and William Sanderford...Peter Allen has taken and improved a hay ranch in sec. 3.
120. T039N R015W	Frank W. Gove 1881	The main part of the township is high rolling mesa covered with heavy pine timber interspersed with aspen brush and groves...In the openings toward the western part of the township the country opens out into fine grazing land...covered with a fine growth of bunch grass. The pine timber is of excellent quality. [Two settlers listed in secs. 2 and 3].
121. T039N R016W	Frank W. Gove 1881	The greater part of this township consists of high rolling mesa covered for the most part with Heavy pine timber, with an underbrush of Oak scrub. In the northeastern portion it opens into an open prairie like country - interspersed with strips & groves of aspen and pine. In this part the grass is excellent as it also is in other portions of the Tp. Where the timber is not too heavy. [Lists two settlers, in sec. 21 and 19].
122. T039N R017N	Wallace G. Shapcott 1914	The fertility of the rolling land is evidenced by the dense growth of sage brush...Long-leaf cottonwoods grow along the banks of the Dolores River and Narraguinnep Creek. The timber on the remainder of the Tp. Is cedar, pinon and pine. There are settlers in secs. 4, 8, 9, 14, 15, 16, 17, 20, 22, 23, 24, 31, 32, 33, 34, 35 and 36.
123. T040N R007W	William H. Clark 1881	The timber is scattering pinon & cedar and small pine. Four Mile House is Located N.E. 1/4 of Sec. 14. A ranch is Located on the Animas River in the S.E. 1/4 of Sec 17.
124. T040N R011W	Timothy Caruthers 1882	In the Northern part the W. Fork of Dolores flows through a narrow grassy valley.
125. T040N R012W	Timothy Caruthers 1882	Timber pine, spruce & aspen & Oak Brush; some good grass spots along streams. Settler in SW 1/4 of Sec. 5
126. T040N R013W	Frank W. Gove 1881	This township is for the most part a high rolling country, with aspen groves & fine grass...In the West Dolores bottom on which a ranch has een take & improved by Cyrus Young.

127. T040N R014W	Frank W. Gove 1881	The northern part of this township which extends over Lone Mesa is very rough and mountainous, interspersed by aspen groves & scattering spruce & pine timber. The rest is hilly or rolling with fine grass especially near Beaver Creek in eastern portion...an improved hay ranch is held in section 26 by George Fill.
128. T040N R015W	Frank W. Gove 1881	There is some pine timber in the southern part & some on Plateau Creek in the North eastern. The rest of the Tp. Is largely covered with oak scrub & pucker brush. Thomas Murphy has taken & improved a ranch in Sec. 13 on Plateau creek for hay & stock purposes.
129. T040N R016W	Frank W. Gove 1881	The western part of this township is covered with pine timber, while the eastern is mainly open, with a little aspen toward the north. All this eastern portion is covered with good grass & offers fine grazing facilities. L.R. Clements has take & improved a ranch near Narraguinnep Spring in Sec. 14 for stock raising.
130. T040N R017W	Wallace G. Shapcott 1914- 1915	The portion of this township embraced in the resurvey consists of gently rolling land. On the west side of the river...the soil...very rich...produces an abundant growth of wild grasses and the land is well suited for grazing. Cedar, pinon, black and yellow pine, with a few scattering cottonwoods along the river banks, comprise the varieties of timber found in this township. There is a dense growth of sage brush in secs. 19, 20, 29, 30, 31 and 32, and a fairly dense covering of scrub oak brush in the remaining sections. Service and buck brush grows on the steeper slopes. There are deserted cabins in secs. 1 and 13...there is a squatter in sec. 30.
131. T040N R018W	Hans D. Voigt & Albert B. Rich 1926	This township is well timbered throughout; cedar and pinon are predominant; the central portion especially is covered with a heavy and dense growth. Yellow pine can be found in the extreme northeastern portion of the township. The undergrowth consists mainly of high and dense sagebrush, however in the east portion of the township thick and high oakbrush as well as service and buckbrush can be found. This township is thickly settled and only a small portion of unentered land remains open for settlement.
132. T041N R011W	Geo. D. Nickel 1882	In the central and south western portions the country is more flat and is covered with a good growth of Spruce & Aspen timber...A great portion of the township is well adapted for grazing. A settler is located in the N.W. 1/4 of Sec. 33.
133. T041N R012W	Geo. D. Nickel 1881	The timber is spruce and aspen. A Ranch is located in the N.W. 1/4 of the N.E. 1/4 of Sec. 84.
134. T041N R013W	Geo. D. Nickel 1881	Timber Spruce Aspen Pine with some pinon & cedar, cottonwood and willow along the streams. A great portion of the Township is covered with a dense undergrowth of Oak brush. Ranch in N.E. 1/4 of S.W. 1/4 of Sec. 8.
135. T041N R014W	Geo. D. Nickel 1881	Settlers are located in the NW 1/4 of section 1 & the NE 1/4 of section 2.
136. T041N R015W	Geo. D. Nickel 1881	Timber is pinon, spruce & aspen. Sage and Oakbrush. Settler in S.E. 1/4 of N.E. 1/4 of Sec. 6.
137. T041N R016W	Geo. D. Nickel 1882	Timber Pinion & Pine with a Very Heavy undergrowth of Sage & Oakbrush. Settlers in the S.E. 1/4 of Sec. 1 and in S.E. 1/4 of Sec. 6.

138. T041N R017W	Wallace G. Shapcott 1915	The portion of this township embraced in the survey consists of high gently rolling table land. Splendid grazing is afforded on the surveyed portion of the township. "The Glade" is a gently sloping open meadow covered with a heavy growth of wild grass. Pine, aspen, cedar, pinon and a few scattering spruce comprise the variety of timber in the township. The pine timber is of marketable size. The yellow pine variety averages three feet in diameter. Patches of scrub oak are found over the entire township. Buck and service brush grow on the canon slopes. The saw-mill in section 12, which furnishes lumber for Disappointment Valley, about 6 miles to the north and the cabin in section 5 used as a summer cow camp are the only forms of settlement in the township.
139. T041N R018W	John F. Wilson 1908	The soil is very fertile, producing an enormous growth of chaparral brush and oak brush. Cedar, pine and pinon are found in the Township in patches, the main timbered section having been burned off by forest fires. There are no settlers in the Township.
140. T042N R013W	Geo. D. Nickel 1881	Timber Pine Spruce & Aspen with Oakbrush. Very good grazing in the N.W. part of the Twp. Settlers Located in the S.E. 1/4 of Sec. 6 and in the SW 1/4 of Sec. 36.
141. T042N R017W	John F. Wilson 1908	The lands in the township are chiefly valuable for timber and grazing lands. In the South part of the Township a fine growth of pine trees are found, while in the Northern part cedars and pinons of good size and quality are abundant. The grazing is good throughout the township. There is one settler in sec. 1.
142. T042N R018W	Hans D. Voigt 1922	This township consists of rough mountainous, rolling mountainous, and high rolling mesa land. The average soil...covered with dense sage, service, buck, and exceptionally heavy oak brush. There is a good stand of yellow pine throughout the 3 rd and 4 th ranges of sections. In the north west portion of the township the timber consists of juniper and pinon. A saw mill is located in sec. 16 and a good road leading therefrom to Dove Creek and Egnar. Several settlers are located in the south west portion of the township.

Table S3. Shrub names used in the study and by surveyors in line data

Common name used in this study	Surveyor Common Names	Likely Latin Names ¹
American plum	Plum	<i>Prunus americana</i> Marshall
Black sagebrush	Black brush, black bush	<i>Artemisia nova</i> A. Nelson
Chokecherry	Cherry, cherry brush, wild cherry	<i>Prunus virginiana</i> L.
Currant	Gooseberry, wild currant	<i>Ribes</i> sp. L.
Gambel oak	Oak, oak brush, oak scrub, oakscrub, scrub oak, white oak	<i>Quercus gambelii</i> Nutt., possibly some <i>Q. x pauciloba</i> Rydb. (pro sp.) [<i>gambelii x turbinella</i>] or <i>Q. turbinella</i> Greene in places
Mountain mahogany	Mountain mahogany	<i>Cercocarpus montanus</i> Raf.
Pucker brush	Pucker brush, pucker bush	Unknown, possibly <i>Purshia tridentata</i> (Pursh) DC?
Rabbitbrush	Rabbit brush	<i>Chrysothamnus</i> spp. Nutt.; <i>Ericameria</i> spp. Nutt.
Rocky Mountain Maple	Mountain maple brush	<i>Acer glabrum</i> Torr.
Roundleaf snowberry	Buck, buck brush	<i>Symphoricarpos rotundifolius</i> A. Gray
Sagebrush	Sage, sagebrush, sage brush	<i>Artemisia bigelovii</i> A. Gray on lower-elevation rocky canyon sides, <i>A. cana</i> Pursh ssp. <i>viscidula</i> (Osterh.) Beetle in higher-elevation swales, <i>A. nova</i> A. Nelson on calcareous rocks, <i>A. tridentata</i> Nutt. ssp. <i>tridentata</i> on ephemeral drainages, <i>A. tridentata</i> Nutt. ssp. <i>vaseyana</i> (Rydb.) Beetle in upper montane, <i>A. tridentata</i> Nutt. ssp. <i>wyomingensis</i> Beetle & Young in lower montane
Skunkbush sumac	Squawbush, squaw berry, squaw	<i>Rhus trilobata</i> Nutt.
Unidegato	Uni-degato, uni de gato	Unknown-this name is similar to a Peruvian herb called cat's claw, so it may be a thorny species, such as <i>Ceanothus fendleri</i>
Unknown	Mansanita brush, mesquite	
Utah serviceberry	Sarvis, sarvis brush, sarvice bush, service, service brush	<i>Amelanchier utahensis</i> Koehne, possibly some <i>A. alnifolia</i> (Nutt.) Nutt. Ex M. Roem. in places
Wild crab apple	Wild crab apple, chaparral, chaparral brush	<i>Peraphyllum ramosissimum</i> Nutt.
Willow	Willow, willow brush	<i>Salix</i> spp. L.–many possible species

Table S4. Information recorded by surveyors in the study area.

Surveyor	Years surveyed	Line length surveyed (km)	Recorded vegetation density	Recorded understory trees	Recorded understory shrubs	Recorded understory grass	Recorded understory density	Recorded entries/exits	Mean spatial error (m)
Benjamin H. Smith	1883	239.2	Yes	Yes	Fair	Yes	Yes	Yes	-
Blair Burwell	1896	14.9	Yes	No	Fair	No	Yes	No	15
C. A. Wheeler	1881	38.0	Yes	No	Fair	No	Yes	Yes	-
C. C. Schrontz	1907	46.0	Yes	No	Very good	Yes	Yes	Yes	17
Cecil A. Deane	1899, 1901	23.1	Yes	No	Poor	No	Yes	Yes	-
Charles Keemle	1883	12.3	Yes	No	Poor	Yes	Yes	Yes	-
Edmund W. Hathaway	1899	233.1	Yes	Yes	Good	No	Yes	Yes	33
Edward D. Bright	1884, 1890	52.1	Yes	No	Poor	No	Yes	Yes	58
Edwin H. Kellogg	1897, 1899	151.4	Yes	Yes	Poor	Yes	Yes	Yes	45
Frank P. Monroe	1892	37.1	Yes	Yes	Poor	No	Yes	Yes	64
Frank W. Gove	1880-1882	2144.0	Yes	Yes	Fair	Yes	Yes	Yes	56
Gardner & Cleghorn	1882-1883	397.5	Yes	Yes	Fair	Yes	Yes	Yes	45
Geo. D. Nickel	1878, 1880-1883	1434.3	Yes	Yes	Fair	Yes	Yes	Yes	41
Hans D. Voigt	1922	7.4	Yes	No	Good	No	Yes	Yes	12
Hans D. Voigt & Albert B. Rich	1926	3.9	Yes	No	Poor	No	Yes	Yes	-
Henry C. Hopper	1877	184.5	Yes	No	Poor	Yes	Yes	Yes	-
James Luttrell	1880	4.3	Yes	No	Poor	Yes	No	Yes	20
James M. Boggs	1883-1884	363.6	Yes	Yes	Poor	Yes	No	Yes	74

James M. Gardner	1882-1883	151.1	Yes	Yes	Fair	Yes	Yes	Yes	31
James R. Morrison	1881	109.1	Yes	No	Poor	No	No	No	90
Jason S. Fahringer	1876-1877	329.5	Yes	No	Poor	Yes	Yes	Yes	-
John A. Bennett	1897	16.2	Yes	Yes	Poor	No	No	Yes	46
John B. Cromwell	1875	73.5	Yes	No	Poor	No	Yes	Yes	-
John F. Wilson	1908	122.4	Yes	No	Fair	No	Yes	Yes	22
John S. Knowles & Jim B. Bulkeley	1938	35.8	Yes	No	Very good	No	Yes	Yes	-
Kimball Wheeler	1880	2.3	Yes	No	Poor	No	Yes	No	-
M. Mack	1889	40.8	Yes	No	Poor	No	No	Yes	132
Robert E. Pratt	1911	100.1	Yes	Yes	Very good	No	Yes	Yes	25
Roy E. Chase	1936	25.2	Yes	No	Very good	No	Yes	Yes	22
Timothy Caruthers	1882	91.1	Yes	No	Poor	No	Yes	Yes	46
Tyler & Medary	1877, 1880-1882	1176.1	Yes	No	Fair	Yes	Yes	Yes	36
Unknown	1882, 1900	70.9	Yes	No	Poor	Yes	No	No	-
W. W. Allen	1881	98.3	Yes	No	Poor	No	No	Yes	32
Wallace G. Shapcott	1914, 1916	92.9	Yes	Yes	Very good	No	Yes	Yes	18
William H. Clark	1875, 1881-1882	237.1	Yes	Yes	Poor	No	No	Yes	78
William H. Cochrane	1887	215.5	Yes	Yes	Fair	Yes	Yes	Yes	-
William M. May	1877-1878	54.9	Yes	Yes	Poor	Yes	No	Yes	40
Wm. C. Perkins	1917	4.4	Yes	No	Fair	No	Yes	Yes	-

Notes

¹ An entry of “Yes” means that the surveyor recorded something for at least one section line.

² Poor means surveyor recorded ≤ 3 understory shrubs on $\leq 25\%$ of line segments, Fair means surveyor recorded > 3 shrubs or shrubs on $> 25\%$ of line segments, Good means > 3 shrubs on $> 50\%$ of lines, Very good means ≥ 5 shrubs or $> 75\%$ of lines

³ Calculated as the mean across the townships completed by the surveyor

⁴ These are original surveyor corners relocated during later remonumentations, dependent resurveys, or other surveying actions

Table S5. Equations used in the reconstructions

	Ln crown radius (CR)	Ln Voronoi area
Species	SPECIES EQUATIONS ¹	SPECIES EQUATIONS ²
<i>Abies concolor</i>	$-1.071 + 0.580 \ln(\text{dsh}), n = 18, R^2_{\text{adj}} = 0.72$	$-0.114 + 0.737 \ln(\text{CR}/(1/\text{Meandist}^2)), n = 17, R^2_{\text{adj}} = 0.83$
<i>Abies lasiocarpa</i>	$-0.744 + 0.447 \ln(\text{dsh}), n = 20, R^2_{\text{adj}} = 0.64$	$0.038 + 0.795 \ln(\text{CR}/(1/\text{Meandist}^2)), n = 20, R^2_{\text{adj}} = 0.70$
<i>Juniperus osteosperma</i>	$-0.934 + 0.468 \ln(\text{dsh}), n = 18, R^2_{\text{adj}} = 0.53$	$0.496 + 0.721 \ln(\text{CR}/(1/\text{Meandist}^2)), n = 21, R^2_{\text{adj}} = 0.79$
<i>Juniperus scopulorum</i>	$-1.666 + 0.832 \ln(\text{dsh}), n = 10, R^2_{\text{adj}} = 0.643$	$-0.797 + 0.954 \ln(\text{CR}/(1/\text{Meandist}^2)), n = 10, R^2_{\text{adj}} = 0.94$
<i>Picea engelmannii</i>	$-0.895 + 0.543 \ln(\text{dsh}), n = 29, R^2_{\text{adj}} = 0.680$	$0.855 + 0.497 \ln(\text{CR}/(1/\text{Meandist}^2)), n = 29, R^2_{\text{adj}} = 0.52$
<i>Picea pungens</i>	$0.159 + 0.298 \ln(\text{dsh}), n = 23, R^2_{\text{adj}} = 0.585$	$0.177 + 0.669 \ln(\text{CR}/(1/\text{Meandist}^2)), n = 25, R^2_{\text{adj}} = 0.78$
<i>Pinus edulis</i>	$-1.217 + 0.646 \ln(\text{dsh}), n = 22, R^2_{\text{adj}} = 0.556$	$0.797 + 0.633 \ln(\text{CR}/(1/\text{Meandist}^2)), n = 21, R^2_{\text{adj}} = 0.77$
<i>Pinus ponderosa</i>	$-1.906 + 0.829 \ln(\text{dsh}), n = 34, R^2_{\text{adj}} = 0.801$	$0.119 + 0.723 \ln(\text{CR}/(1/\text{Meandist}^2)), n = 32, R^2_{\text{adj}} = 0.82$
<i>Pinus strobiformis</i>	$-0.586 + 0.543 \ln(\text{dsh}), n = 5, R^2_{\text{adj}} = 0.834$	Not usable; use <i>Pinus ponderosa</i> equation
<i>Populus tremuloides</i>	$-0.721 + 0.517 \ln(\text{dsh}), n = 28, R^2_{\text{adj}} = 0.525$	$-0.385 + 0.822 \ln(\text{CR}/(1/\text{Meandist}^2)), n = 26, R^2_{\text{adj}} = 0.83$
<i>Pseudotsuga menziesii</i>	$-0.834 + 0.572 \ln(\text{dsh}), n = 26, R^2_{\text{adj}} = 0.735$	$-0.456 + 0.624 \ln(\text{CR}/(1/\text{Meandist}^2)), n = 24, R^2_{\text{adj}} = 0.76$
Group	GROUP EQUATIONS	GROUP EQUATIONS
Juniper ³	Use <i>Juniperus osteosperma</i> equation ⁶	$-0.015 + 0.821 \ln(\text{CR}/(1/\text{Meandist}^2)), n = 31, R^2_{\text{adj}} = 0.83^8$
Spruce ⁴	$-0.832 + 0.550 \ln(\text{dsh}), n = 84, R^2_{\text{adj}} = 0.674$	$0.277 + 0.651 \ln(\text{CR}/(1/\text{Meandist}^2)), n = 77, R^2_{\text{adj}} = 0.82$
Pine ⁵	Use <i>Pinus ponderosa</i> equation ⁷	Use <i>Pinus ponderosa</i> equation
All species (pooled)	$-1.122 + 0.610 \ln(\text{dsh}), n = 245, R^2_{\text{adj}} = 0.633$	$0.310 + 0.683 \ln(\text{CR}/(1/\text{Meandist}^2)), n = 240, R^2_{\text{adj}} = 0.75$

¹ dsh = diameter at stump height (about 0.30 m)

² CR = crown radius; Meandist is a measure of local tree density, based on the mean distance among the closest tree in each 90-degree quadrant starting with azimuth = 0 degrees.

³ Juniper group includes *J. osteosperma* and *J. scopulorum*.

⁴ Spruce group includes *Picea pungens*, *Picea engelmannii*, and *Pseudotsuga menziesii*.

⁵ Pine group includes *Pinus ponderosa*, *P. flexilis*, and *P. strobiformis*

⁶ A pooled crown radius equation had poor fit. Since *Juniperus osteosperma* is more abundant, the equation for this species is used

⁷ *Pinus ponderosa* likely represents a very high percentage of pines, thus its equation is used

Table S6. Landfire existing vegetation types (LF 2.0.0–circa 2016 data) used to identify modern upland forests.

Forest Type	Landfire Name	Value
Piñon-juniper ¹	Colorado Plateau Pinyon-Juniper Woodland	7016
	Southern Rocky Mountain Pinyon-Juniper Woodland	7059
	Colorado Plateau Pinyon-Juniper Shrubland	7102
	Inter-Mountain Basins Juniper Savanna	7115
Pine and piñon-juniper and Pine	Southern Rocky Mountain Ponderosa Pine Woodland	7054
	Southern Rocky Mountain Ponderosa Pine Savanna	7117
Dry mixed-conifer	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	7051
Moist mixed-conifer	Rocky Mountain Aspen Forest and Woodland	7011
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	7052
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	7061
Subalpine forests ¹	Rocky Mountain Lodgepole Pine Forest	7050
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	7055
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	7056
	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	7057
Unknown forest	Recently Logged-Herb and Grass Cover	7191
	Recently Logged-Shrub Cover	7192
	Recently Logged-Tree Cover	7193
	Recently Burned-Herb and Grass Cover	7195
	Recently Burned-Shrub Cover	7196
	Recently Burned-Tree Cover	7197

Notes: Pinyon-juniper woodlands and subalpine forests are not the subject of this study. Limited areas of these forests are identified by Landfire, generally near the lower (Pinyon-juniper) or upper (Subalpine forests) margin of the montane. I am not so sure they truly are these kinds of forests today, but it is also possible that some areas of historical forests are inaccurate in these areas.

Table S7. Early observations (up to about 1920) about historical fire and forest structure in forests in and near the study area. Observations are arranged by topic.

Source	Location	Quote	Interpretation
High-severity fires occurred historically in mixed-conifer forests			
[65] quoted in [52] (p. 462)	Sangre de Cristo Mountains, northern New Mexico	Q1: "...the thick-barked yellow pines and douglas spruce [Douglas fir] of the transition zone [ponderosa pine] have only half yielded to the repeated burnings. Thousands of magnificent old trees 2 to 5 feet in diameter and 75 to 100 feet high stand singly or in groups, often deeply fire scarred at the base, only waiting for a high wind to give place to the young trees pushing up below..."	Moderate- to high-severity fires in dry mixed-conifer forests
[66] (p. 328-329)	Northern New Mexico, Pecos River, Sangre de Cristo Mountains	Q2: "At a height of about 7500 feet, scattered aspens begin to put in an appearance, and soon assert a place for themselves in the shape of large groves. Wherever fire has devastated the pine tracts the fire-cleared space is immediately occupied by aspens, which spring up in the shape of extremely dense thickets—so dense that in them the vision is limited to the space of a very few feet."	High-severity fire in dry mixed-conifer forests
[28] (p. 249)	Including northern New Mexico	Q3: "The greater portions of the burns have grown up to quaking aspen (<i>Populus tremuloides</i>), but extensive areas are practically bare. Scattering trees of the original forest usually remain, and where this condition exists or where the burn is comparatively small conifers are generally restocking the land."	High-severity fires in mixed conifer forests
Historical forest structure: varying from open, park-like ponderosa pine forests to denser forests			
[27] (p. 24)	Including northern New Mexico	Q4: "The typical western yellow pine forest of the Southwest is a pure park-like stand made up of scattered groups of from 2 to 20 trees. Openings are frequent and vary greatly in size."	Open park-like ponderosa pine forests
[15] (p. 7)	Whole San Juans	Q5: for the "Bull Pine Type": "It varies greatly in density, with parks in every bottom, and will cut from 2,000 to 10,000 feet to the acre."	Ponderosa pine forests were highly variable in tree density and timber volume
Historical forest structure: young forests, often with abundant aspen, with scattered larger conifer survivors			
[27] (p. 24)	Including northern New Mexico	Q6: "Varying age classes give pure western yellow pine a variety of aspects. In places it is made up of thrifty pole stands of blackjack, with an occasional mature yellow pine fast declining in vigor. In others there may be an old mature stand of veterans, with complete reproduction beneath."	Young ponderosa pine forests with scattered large survivors

[28] (p. 249)	Including northern New Mexico	Q7: “The greater portions of the burns have grown up to quaking aspen (<i>Populus tremuloides</i>), but extensive areas are practically bare. Scattering trees of the original forest usually remain, and where this condition exists or where the burn is comparatively small conifers are generally restocking the land.”	Scattered trees in mixed-conifer forests represent survivors after moderate- to high-severity fires
[16] (p. 21)	Western San Juan National Forest, Colorado	Q8: “It is safe to say that 50 per cent of the area classified as woodland has been run over and seriously damaged by fire. This would give 121,300 acres or about twenty per cent of the total area, thus affected. These burns are in all stages, from areas covered with dead standing trees and down timber with no re-growth what so ever on the ground, such as the area at the head of Burnt Timber Creek in the La Plata, to large areas covered by stands of aspen of varying ages with a few scattering groups of conifers in mixture, such as are found on the hills on each side of the main Dolores along which runs the railroad.”	Scattered trees in mixed-conifer forests represent survivors after moderate- to high-severity fires
[15] (p. 21)	Eastern San Juans, Rio Grande National Forest, Colorado	Q9: “All the Rio Grande side of the range from Hot Springs east, with the exception of bodies of spruce on the heads of creeks, has been burnt, much of it repeatedly. The result is a stand of aspen of varying ages, containing scattering small bodies of conifers, the ground throughout being covered with down timber and thick underbrush.”	Scattered groups of surviving conifers in aspen forests indicate moderate- to high-severity fires
Historical forest structure: understory small trees and dense shrubs in mature forests			
[27] (p. 24)	Including northern New Mexico	Q10: “Varying age classes give pure western yellow pine a variety of aspects. In places it is made up of thrifty pole stands of blackjack, with an occasional mature yellow pine fast declining in vigor. In others there may be an old mature stand of veterans, with complete reproduction beneath.”	Varying density and age-class structure in ponderosa pine forests, including abundant small trees in places
[15] quoted in [52] (p. 462)	Sangre de Cristo Mountains, northern New Mexico	Q11: “...the thick-barked yellow pines and douglas spruce [Douglas fir] of the transition zone [ponderosa pine] have only half yielded to the repeated burnings. Thousands of magnificent old trees 2 to 5 feet in diameter and 75 to 100 feet high stand singly or in groups, often deeply fire scarred at the base, only waiting for a high wind to give place to the young trees pushing up below...”	Small trees common in mature dry mixed-conifer forests
High-severity fires led to dense young aspen			
[28] (p. 249)	Including northern New Mexico	Q12: “The greater portions of the burns have grown up to quaking aspen (<i>Populus tremuloides</i>), but extensive areas are practically bare. Scattering trees of the original forest usually remain, and where this condition exists or where the burn is comparatively small conifers are generally restocking the land.”	Dense young aspen and some small conifers after high-severity fire in mixed-conifer forests
[66] (p. 328-329)	Northern New Mexico, Pecos River, Sangre de Cristo Mountains	Q13: “At a height of about 7500 feet, scattered aspens begin to put in an appearance, and soon assert a place for themselves in the shape of large groves. Wherever fire has devastated the pine tracts the fire-cleared space is immediately occupied by aspens, which spring up in the shape of extremely dense thickets—so dense that in them the vision is limited to the space of a very few feet.”	Dense young aspen after high-severity fire in dry mixed-conifer forests

1879 severe fires			
[67] (p. 196)	Western Colorado, including the Uncompahgre Plateau and San Juan Mountains	Q14: “Extensive fires also occurred in the western part of the State in 1879...Hundreds of square miles were burned over and immense damages were done to the timber...It is estimated by well-informed persons that fully one-third of all the timber accessible among the mountains in this State has been burned over and killed by fire within the last six years.”	Severe 1879 fires in western Colorado
[68] (p. 183)	Western Colorado, including the Uncompahgre Plateau and San Juan Mountains	Q15: “At least one-half of the woodlands have been injured by forest fires. In 1879 the Ute Indians burnt millions of acres of timber on the western slope.”	Severe 1879 fires in western Colorado

Table S8. General cross-validation of the historical GLO median tree-density estimate with the only available tree-ring estimate of historical tree density for the study area.

General estimate/specific comparison, forest zone	Author	Method¹	Author estimate (trees/ha)	Year	GLO estimate (trees/ha)	Year	RMAE (%)
General estimate							
Dry mixed conifer	[40] Table 3	Tree-rings	154.3 ²	1870	200.0 ³	1881 ⁴	29.6

Notes

¹ Tree-ring methods reconstruct the size of each tree, using its annual rings, at a date in the late-1800s.

² The authors provided estimates for four blocks, which were each multiplied by 1.09, then averaged. Since Moore et al. (2004) found that an average of 9% of tree-ring evidence was missing, I multiplied tree-ring estimates by 1.09.

³ This is the median value from Table 6 for dry mixed conifer

⁴ The median survey year (Fig. 3) was 1881.

Table S9. General cross-validation of the historical GLO median basal-area estimate with the only available tree-ring estimate of historical basal area for the study area.

General estimate/specific comparison, forest zone	Author	Method¹	Author estimate (m²/ha)	Year	Survey estimate (m²/ha)	Year	RMAE (%)
General estimate							
Dry mixed conifer	[40] Table 3	Tree-rings	12.0 ²	1870	10.4 ³	1881 ⁴	13.3

Notes

¹ Tree-ring methods reconstruct the size of each tree, using its annual rings, at a date in the late-1800s.

² The authors provided estimates for four blocks, which were each multiplied by 1.09, then averaged. Since Moore et al. (2004) found that an average of 9% of tree-ring evidence was missing, I multiplied tree-ring estimates by 1.09.

³ This is the median value from Table 7 for dry mixed conifer

⁴ The median survey year (Fig. 3) was 1881.

Table S10. GLO-based reconstructions of fire severity and high-severity fire rotation cross-validated with tree-ring and charcoal estimates. HS = high severity.

Forest zone, General estimate/specific comparison	Author and site	Source	Author estimates ¹		GLO-based estimates ¹	
			Fire severity	HS Fire rotation (years)	Fire severity	HS Fire rotation (years)
Pine and piñon-juniper and Pine						
General estimates ²	None					
Specific comparisons ²	None					
Dry mixed conifer						
General estimates	[40], [71] Lower Middle Mountain	Fire scars, age struct.	Low/mixed ³	Not calc.	Low-23% Mixed-27% High-50% ²	184 ⁴
	[69] Grassy Mountain	Fire scars, age struct.	Low	Not calc.	Low-23% Mixed-27% High-50% ²	184 ⁴
	[70, 71] ⁵					
	Haflin Creek Watershed	Fire scars, age struct.	Low-1 plot Mixed-1 plot Unknown-1 plot	Not calc.	Low-23% Mixed-27% High-50% ²	184 ⁴
	Steven's Creek Watershed	Fire scars, age struct.	Low-2 plots Mixed-1 plot	Not calc.	Low-23% Mixed-27% High-50% ²	184 ⁴
	Marina Watershed	Fire scars, age struct.	Low-1 plot	No high-severity found	Low-23% Mixed-27% High-50% ²	184 ⁴
	Haflin, Steven's, Marina, Freed, Woodard, Country Market	Charcoal	Low-2 events High-7 events in last 550 years	Not calc. 471 ⁶	Low-23% Mixed-27% High-50% ²	184 ⁴

	[56]					
	BPK1	Fire scars, age struct.	High, in 1879	Not calc.	Low-23% Mixed-27% High-50% ²	184 ⁴
	CRL1	Fire scars, age struct.	High, in 1748, Mixed after	Not calc.	Low-23% Mixed-27% High-50% ²	184 ⁴
	[56] JAK5, [69] Jackson Mountain	Fire scars, age struct.	High in 1748 and mid-1800s	Not calc.	Low-23% Mixed-27% High-50% ²	184 ⁴
Moist mixed conifer						
General estimates	[41] All but Dolomite Lake	Fire scars, age struct.	25% Mixed 45% High	Not calc.	Low-2% Mixed-22% High-73%	121 ⁴
	[70, 71] ⁵					
	Haflin Creek Watershed	Fire scars, age struct.	Mixed-3 plots	Not calc.	Low-2% Mixed-22% High-76%	121 ⁴
	Steven's Creek Watershed	Fire scars, age struct.	Mixed-3 plots	Not calc.	Low-2% Mixed-22% High-76%	121 ⁴
	Marina Watershed	Fire scars, age struct.	Mixed-1 plot	Not calc.	Low-2% Mixed-22% High-76%	121 ⁴
	Haflin, Steven's, Marina, Freed, Woodard, Country Market	Charcoal	Low-2 events High-7 events in last 550 years	Not calc. 471 ⁶	Low-2% Mixed-22% High-76%	121 ⁴
	[56]					
	BPK2	Fire scars, age struct.	High in 1748, Mixed after	Not calc.	Low-2% Mixed-22% High-76%	121 ⁴

	JAK1, JAK4	Fire scars, age struct.	High in 1873	Not calc.	Low-2% Mixed-22% High-76%	121 ⁴
	JAK2, JAK3	Fire scars, age struct.	High in 1748, Mixed after	Not calc.	Low-2% Mixed-22% High-76%	121 ⁴
	CRL2	Fire scars, age struct.	High in 1851	Not calc.	Low-2% Mixed-22% High-76%	121 ⁴
Specific comparison	[41] Dolomite Lake	Fire scars, age struct.	Mixed 20%, rest not fire initiated, not determined	Not calc.	High 0.8 km N, Low 0.8 km SE	121 ⁴
Undifferentiated dry and moist mixed conifer						
General estimates	[41] ⁷ : Squaretop Mountain, Williams Creek	Fire scars, age struct.	Variable fire severities, including mixed & high severity	Not calc.	Low-23% Mixed-27% High-50% ²	184 ⁴
Specific comparison	[42] ⁸	Age struct.	High	140	18.0% low, 28.2% mixed, 55.6% high	110-165 years, 17.9-21.4% RMAE

Notes

¹ Fire severity is shown as reported by authors, the GLO estimate is from Table 12.

² General estimates mean that GLO data were lacking or poor in quality; the evidence that is presented from the source is compared to overall estimates for the study area (e.g., San Juan Mountains). Specific comparisons are possible where GLO data were available and sufficient in quality usually within no more than 1.6 km (1 mile) of the source, but even with specific comparison the fire rotation is only for the study-area scale (e.g., whole San Juan Mountains), as it is not possible to accurately estimate fire rotation for areas as small as the cross-validation sites using GLO data.

³ [40] (p. 1205) indicate that fire severity was generally low, but "...patches of lethal fire behavior may have occurred when the quiescent periods were ended." This suggests mixed-severity fire, but was reported as low. Since no estimate of the area of high-severity fire was reported, an estimate of HS fire rotation was not possible. [69] underscores that Lower Middle Mountain may have had mixed-severity fire.

⁴ Fire rotation is given for the study area as a whole, as GLO data are insufficient to estimate fire rotation within the author's study area.

⁵ [71, 72] describe the sample forests as pine-dominated and fir-dominated, but descriptions on p. 87 in [74] suggest they were dry mixed conifer and moist mixed conifer, following [12] and the zones used in this study.

⁶ Bigio et al. [70-71] did not estimate high-severity fire rotation. I made this estimate using their data. [72] (p. 144) shows that there were seven high-severity events in the six sampled watersheds in the last 550 years, thus high-severity fire rotation is roughly given by $550/(7/6) = 471$

years. I first reported this estimate in [47]. This estimate is not available separately for dry mixed conifer and moist mixed conifer, thus the single estimate is repeated for both of these vegetation types.

⁷ Tepley and Veblen [49] is difficult to compare to my study area, as there is no easily interpreted map of where the dry and moist mixed conifer parts were, and they use more sophisticated methods of categorizing fire severity that do not correspond with the low, mixed, and high used here. In the Williams Creek study area, GLO tree data were too poor to be usable. Section-line data were recorded by James Boggs in 1883 as generally a grassland or scattered timber along the few lines that intersected the Tepley and Veblen sampling area, and these lines had become forested by 2016. These generally indicate moderate- to high-severity fire sometime in the preceding 92 years, which include parts of fires mapped by Tepley and Veblen in 1879, 1861, 1851, 1836, 1820/22, 1797/1806 and 1786 that together could have left substantial area with little timber by 1883, that slowly reforested by 2016. Thus, the GLO and fire-history mapping might roughly agree in a general sense, but Tepley and Veblen clearly found more timber than indicated by Boggs. Moreover, Boggs' survey records are vague and uncertain relative to the detailed reconstruction and mapping of Tepley and Veblen, which is undoubtedly more accurate, to leave this comparison of limited and only general value. Some parts of these areas remained grassland on Tepley and Veblen's map, suggesting these were more permanent, rather than successional grasslands. In the Squaretop Mountain study area, tree data were also too poor to allow reconstructions, but section line data by William Cochran in 1887 show a mixture of scattered timber (likely produced by the 1878/9 fire) and spruce and/or aspen forest likely indicating unburned or lightly burned forests, roughly consistent with the spatially complex mixture of fire severities in 1878/9 mapped by Tepley and Veblen in this area (their Appendix D). Near the bottom of the Squaretop study area, an 1883 survey by Benjamin Smith recorded areas of pine with oakbrush mixed with areas of aspen with a few pines, also roughly consistent with the mixture of fire severities from the 1878/9 fire shown in Appendix D of Tepley and Veblen.

⁸ The Romme et al. [42] study area (Pers. Comm. from William H. Romme, Jan. 5, 2016) was in T37N R12W (entire township), T37N R13W (northeastern corner), T38NR12W (southernmost portion), and T38NR13W (southeastern corner). The GLO data show this area to have been 84% dry mixed conifer and 16% moist mixed conifer (excluding ponderosa pine area, where Romme et al. could not have reconstructed fire in aspen). The fire-severity reconstruction for this area shows 18.0% low severity, 28.2% mixed severity and 55.6% high severity. Based on 55.6% high severity in the 92-year reconstruction period, the GLO estimate of fire rotation would have been 165 years. Similarly, based on 55.6% high + 28.2% mixed, the mixed- to high-severity fire rotation would have been 110 years. Thus, if the Romme et al. (2001) high-severity fire rotation of 140 years is considered the truth, then the GLO high-severity fire rotation of 165 years would have an RMAE of 17.9%, which is relatively low error. If Romme et al. (2001) was instead detecting cohorts initiated after both mixed- and high-severity fires, then the GLO mixed- to high-severity fire rotation of 110 years would have an RMAE of 21.4%, also relatively low error. About 48% of the GLO fire evidence in the Romme et al. study area was from scattered timber that recovered to forest by 2016 and 28% was from nonforest that recovered to forest by 2016, thus 76% of the evidence of fire, which further validates these two indicators of mixed- to high-severity fire.

Figure S1. Reconstructed tree density (trees/ha) for sample ponderosa pine and piñon-juniper forests in the study area.

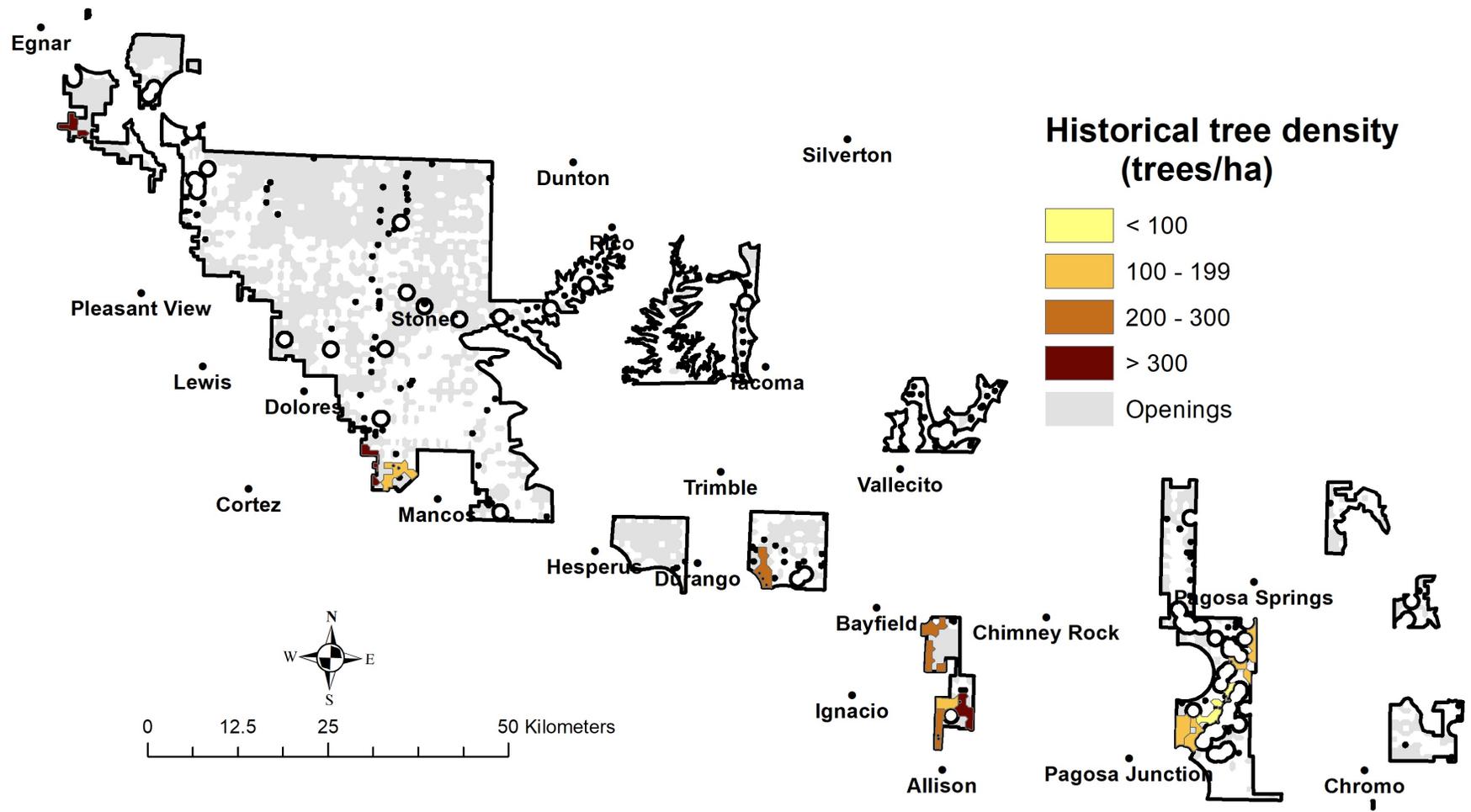


Figure S2. Reconstructed tree density (trees/ha) for sample ponderosa pine forests in the study area.

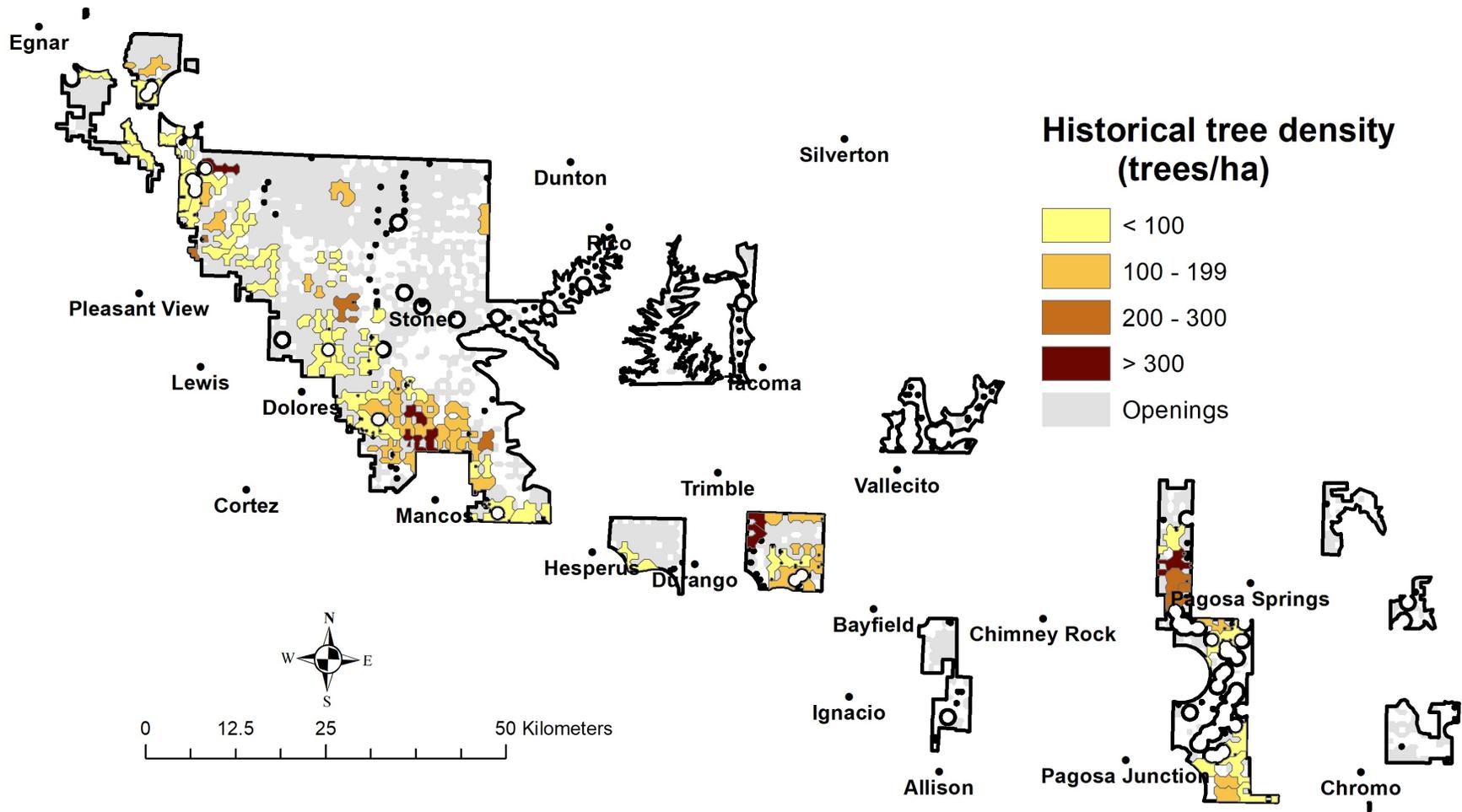


Figure S3. Reconstructed tree density (trees/ha) for sample dry mixed-conifer forests in the study area.

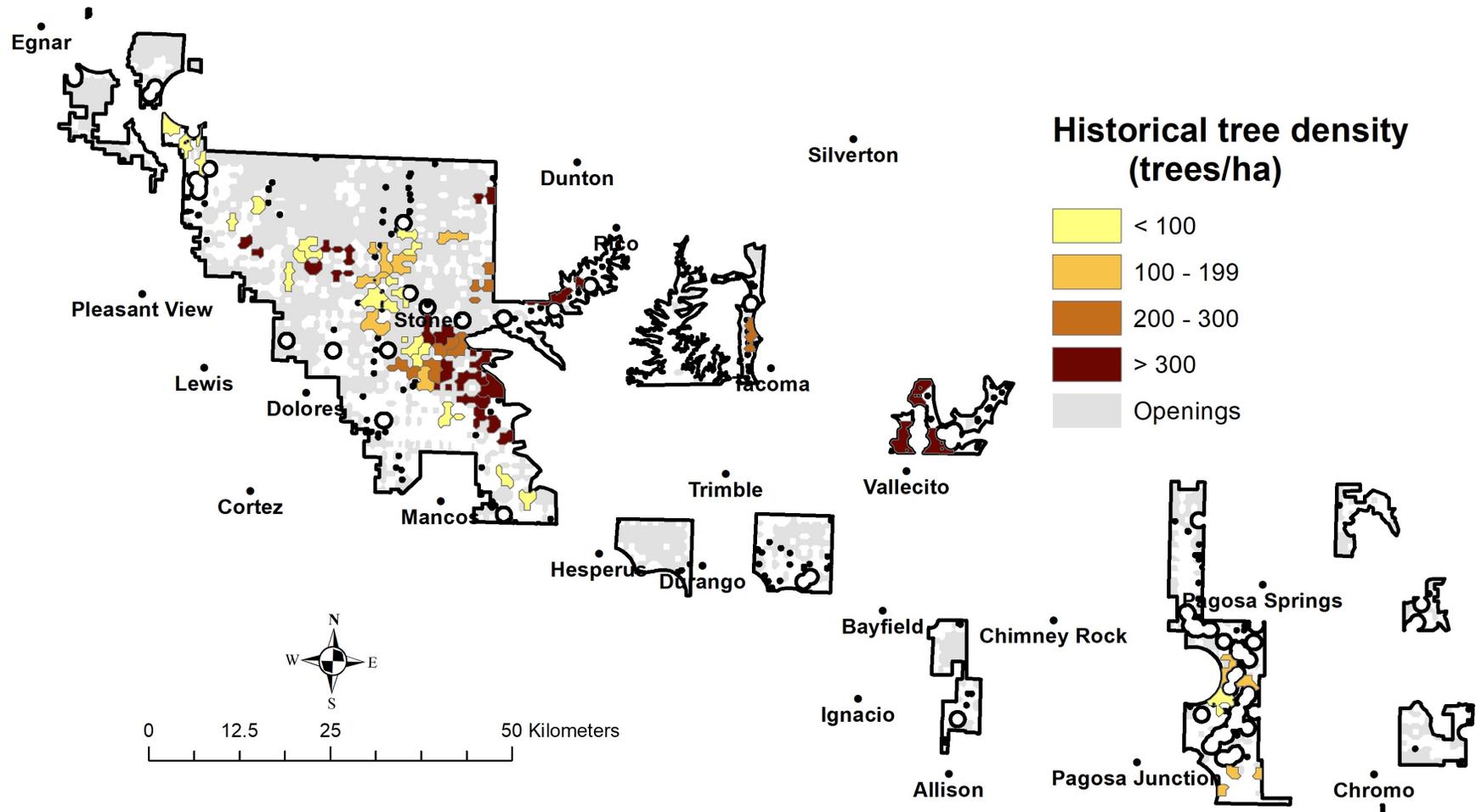


Figure S4. Reconstructed tree density (trees/ha) for sample moist mixed-conifer forests in the study area.

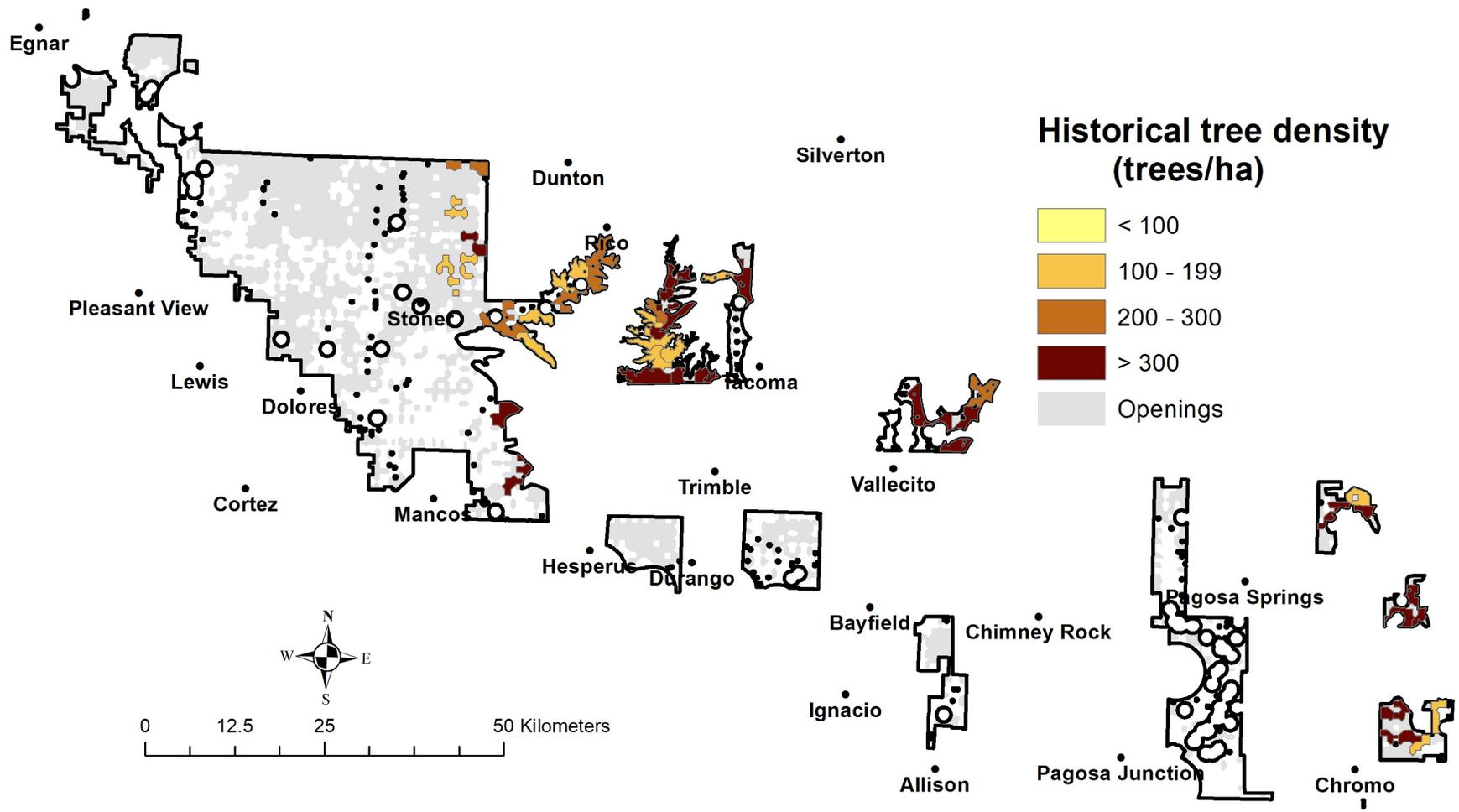


Figure S5. Reconstructed tree density (trees/ha) for dry forests in the study area.

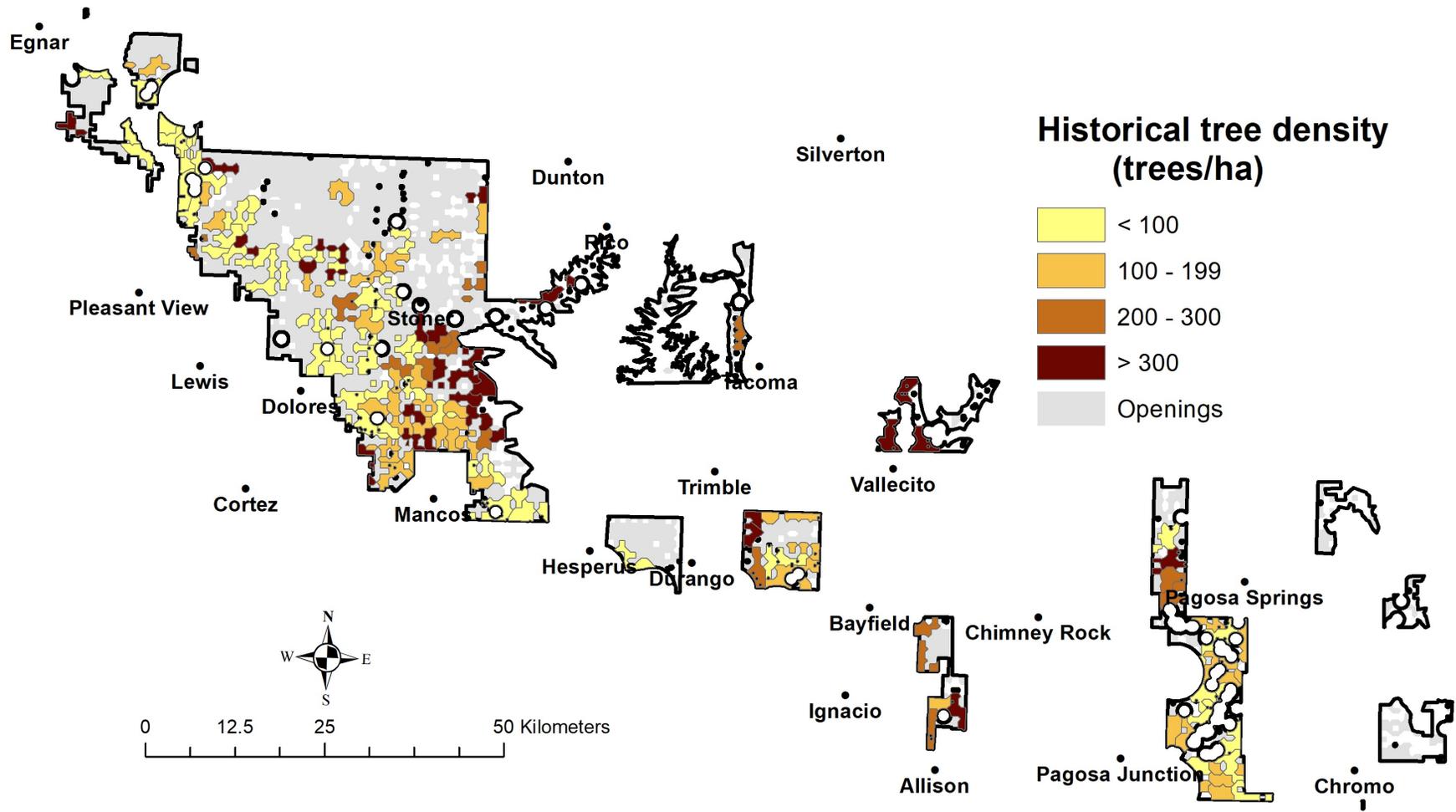


Figure S6. Reconstructed basal area (m^2/ha) for sample ponderosa pine and piñon-juniper forests in the study area.

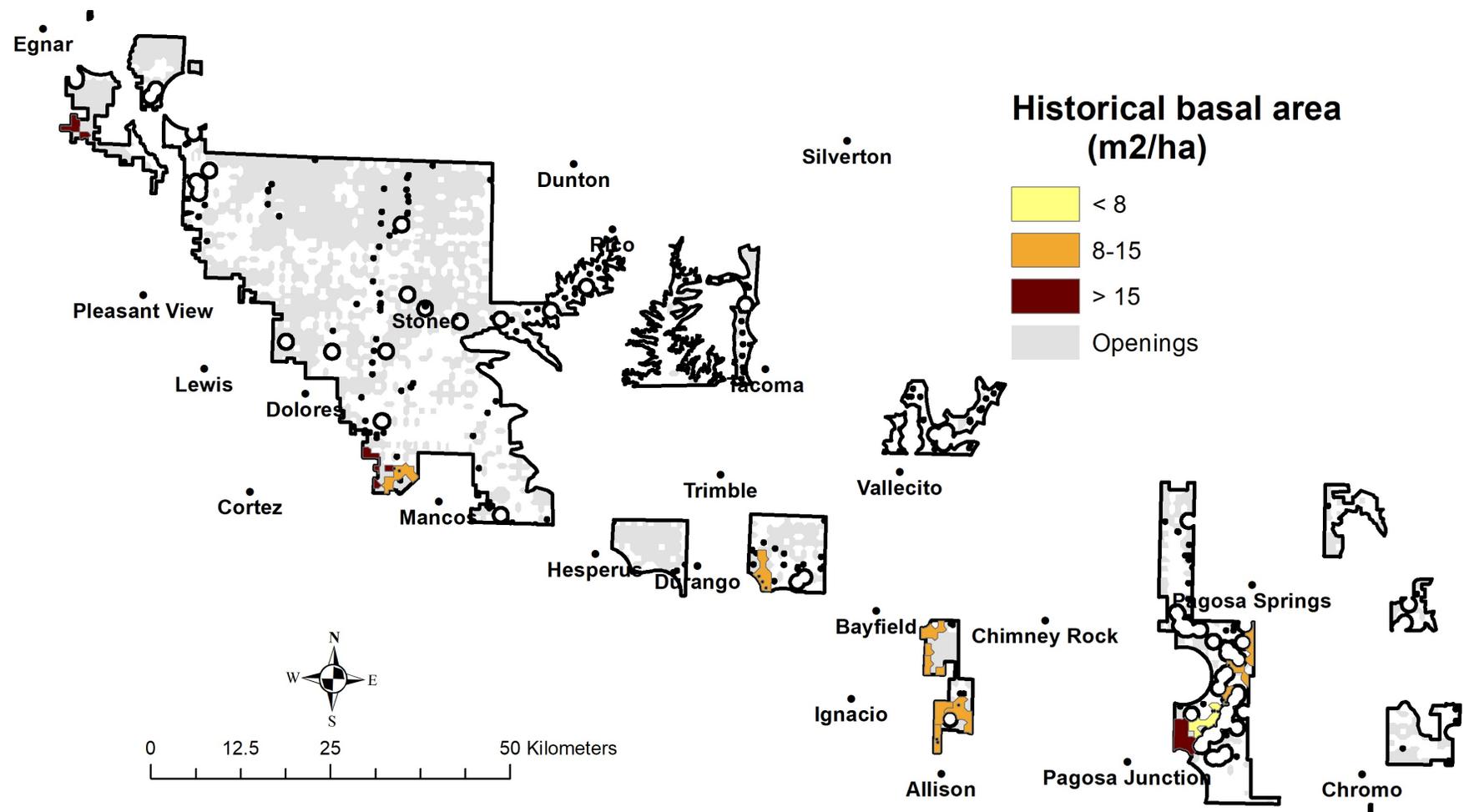


Figure S7. Reconstructed basal area (m²/ha) for sample ponderosa pine forests in the study area.

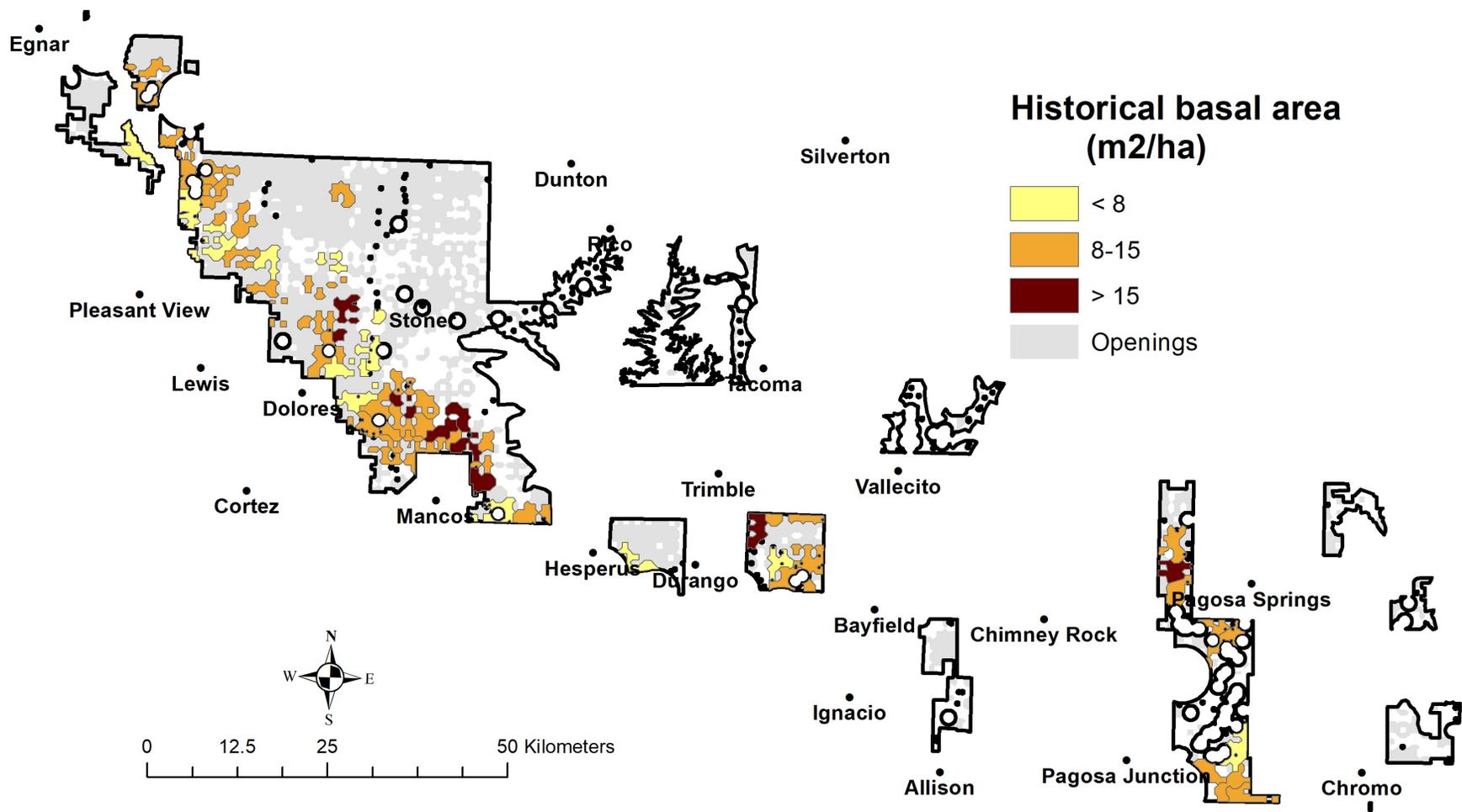


Figure S8. Reconstructed basal area (m^2/ha) for sample dry mixed-conifer forests in the study area.

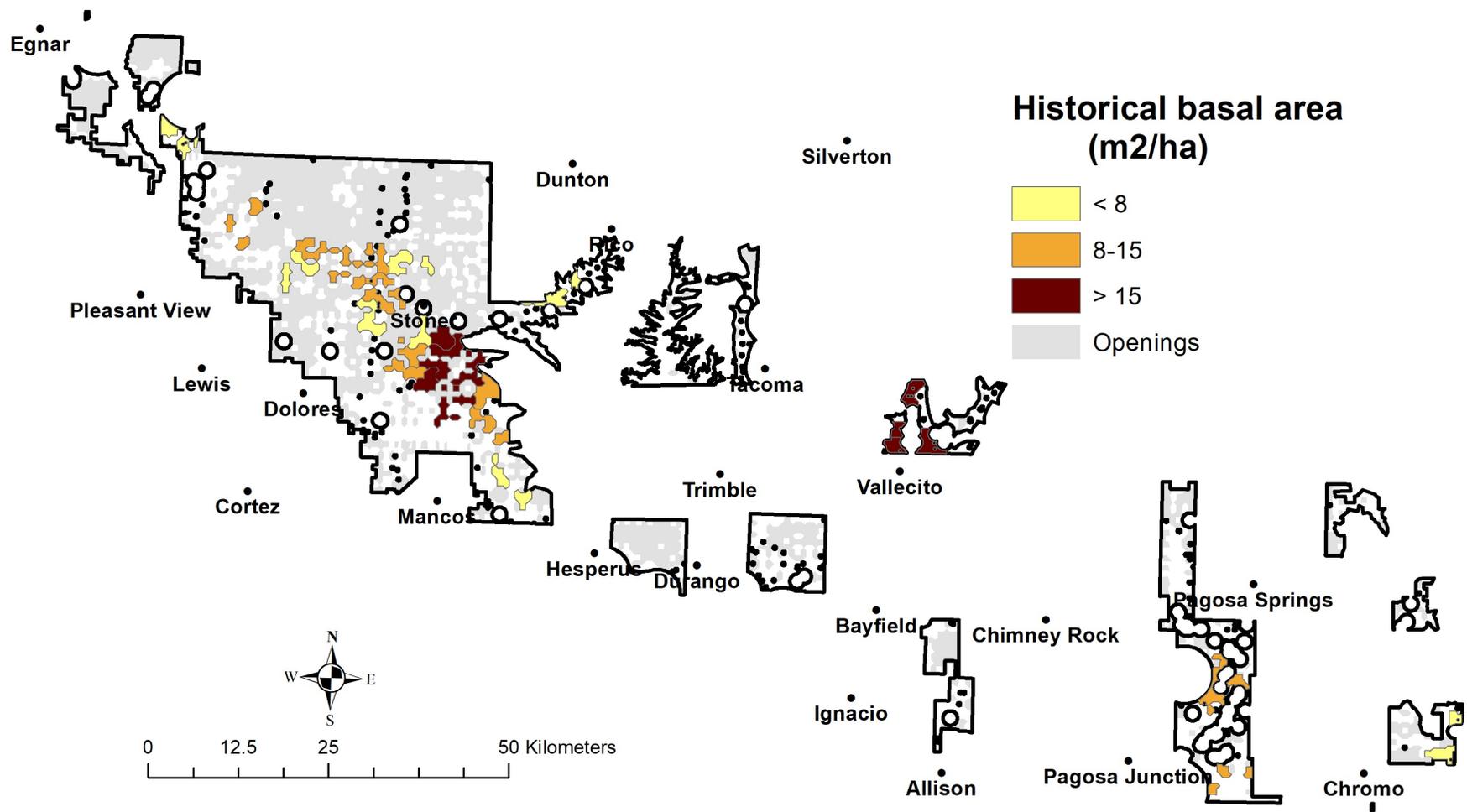


Figure S9. Reconstructed basal area (m^2/ha) for sample moist mixed-conifer forests in the study area.

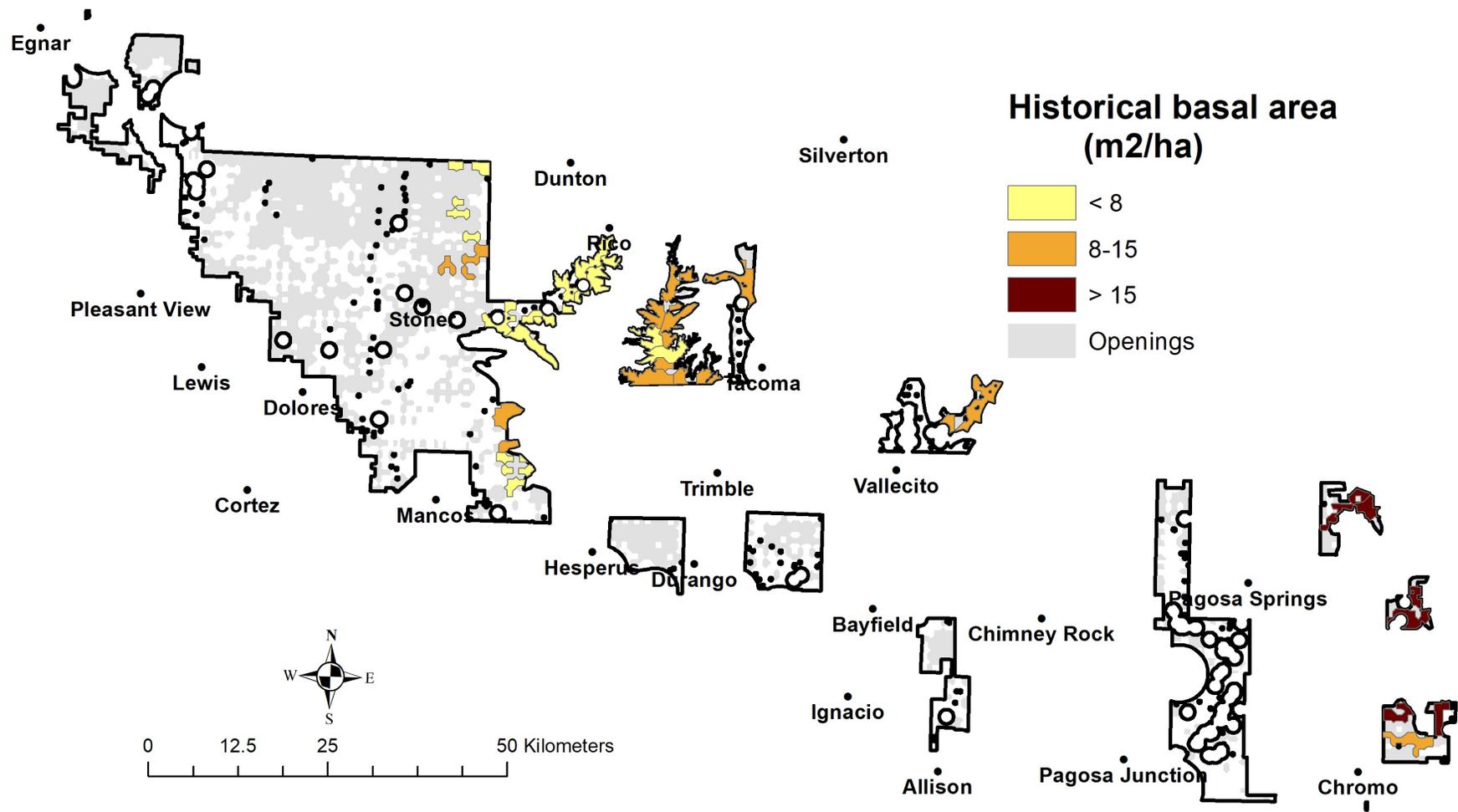


Figure S10. Reconstructed basal area (m²/ha) for sample dry forests in the study area.

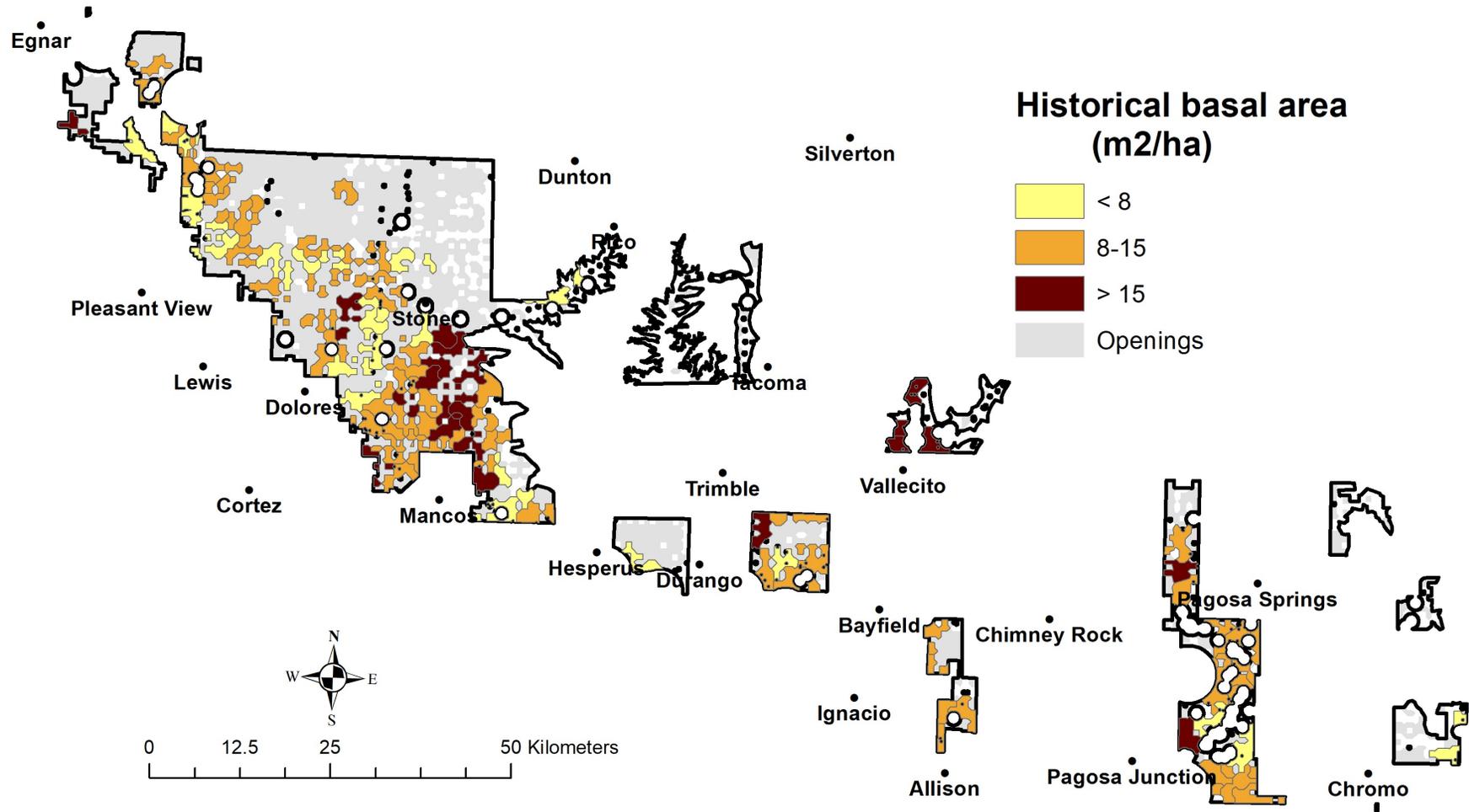


Figure S11. Reconstructed quadratic mean diameter (QMD) in montane forests in the study area.

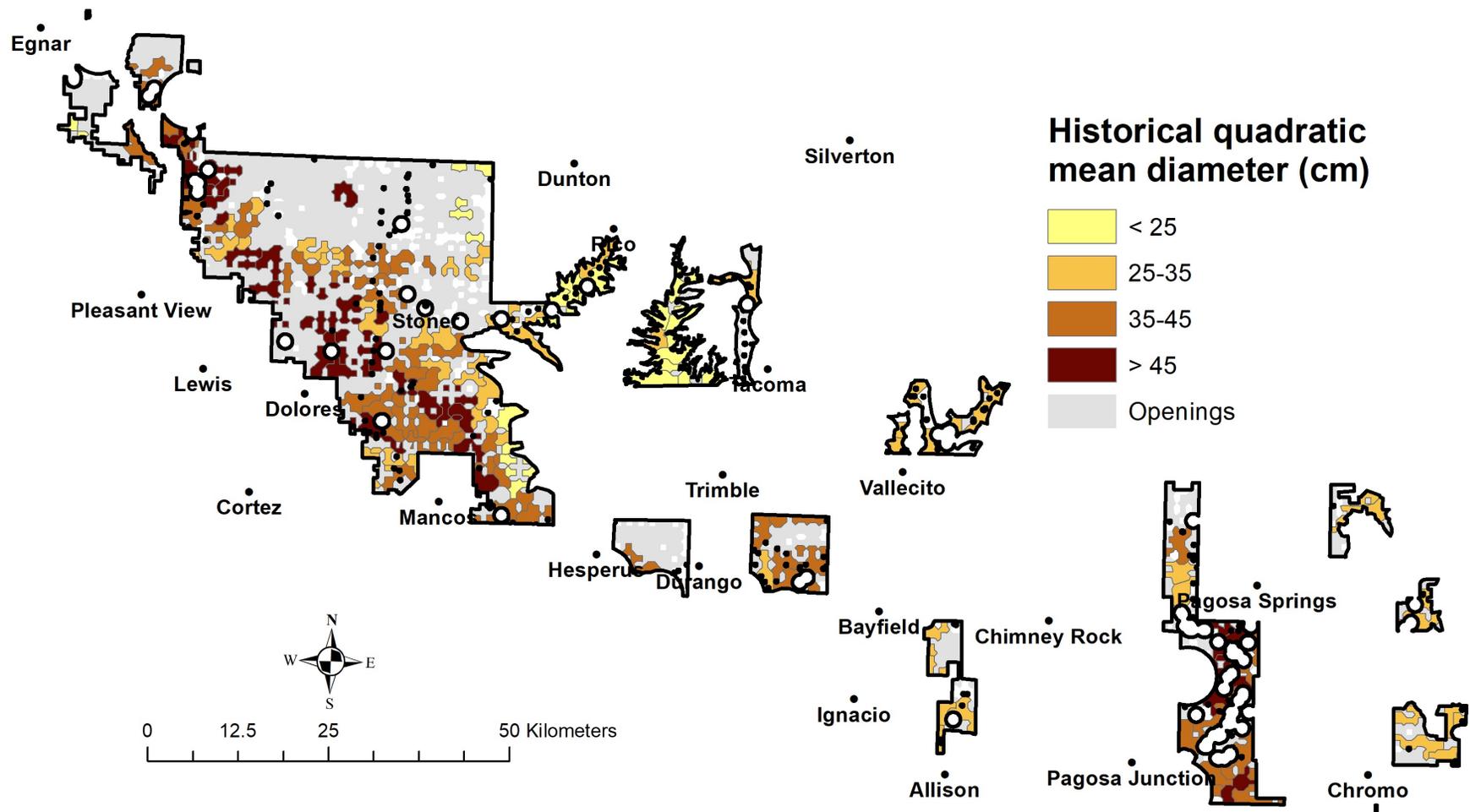


Figure S12. Reconstructed fire severity in the pine and piñon-juniper zone.

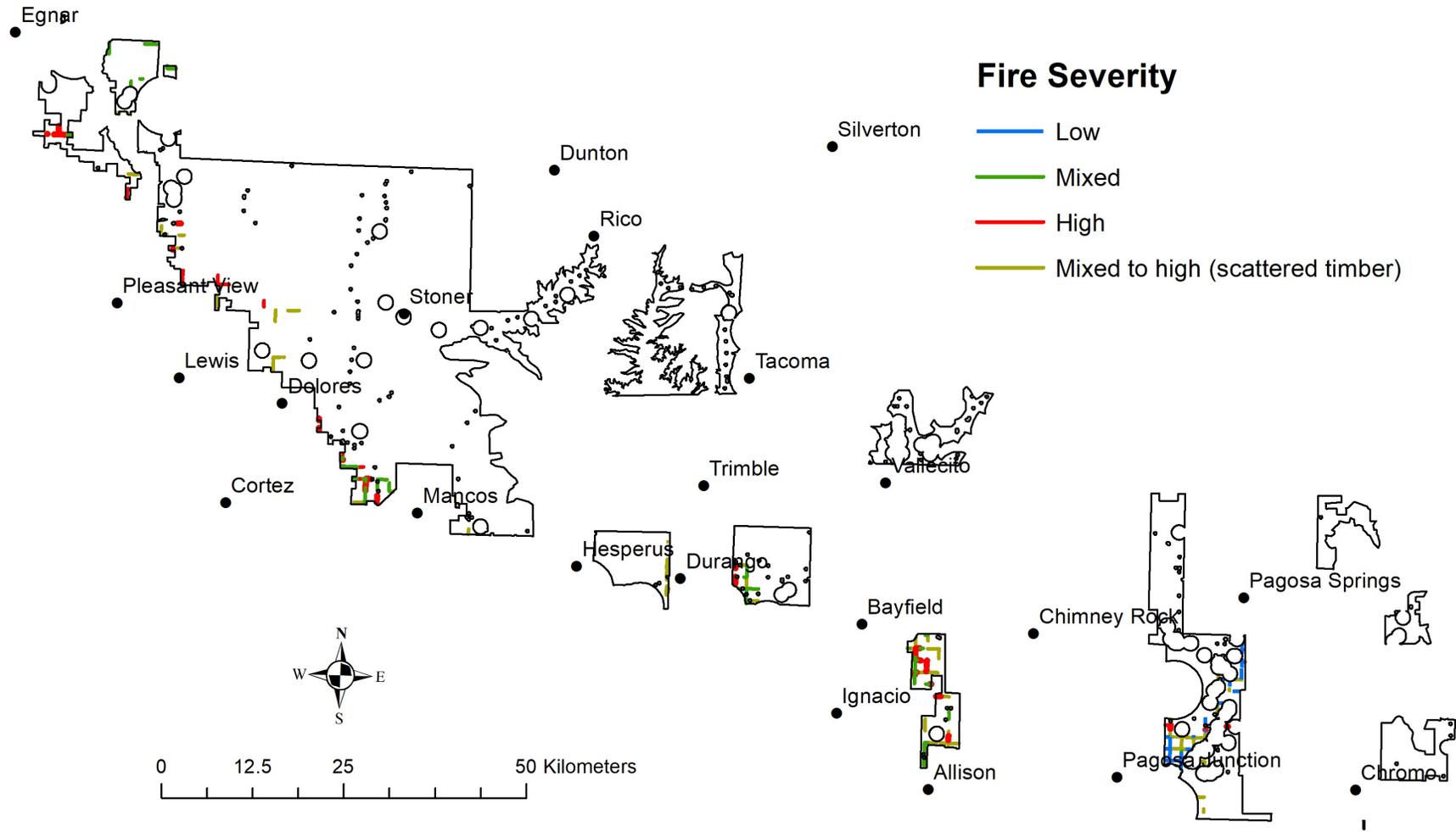


Figure S13. Reconstructed fire severity in the pine zone.

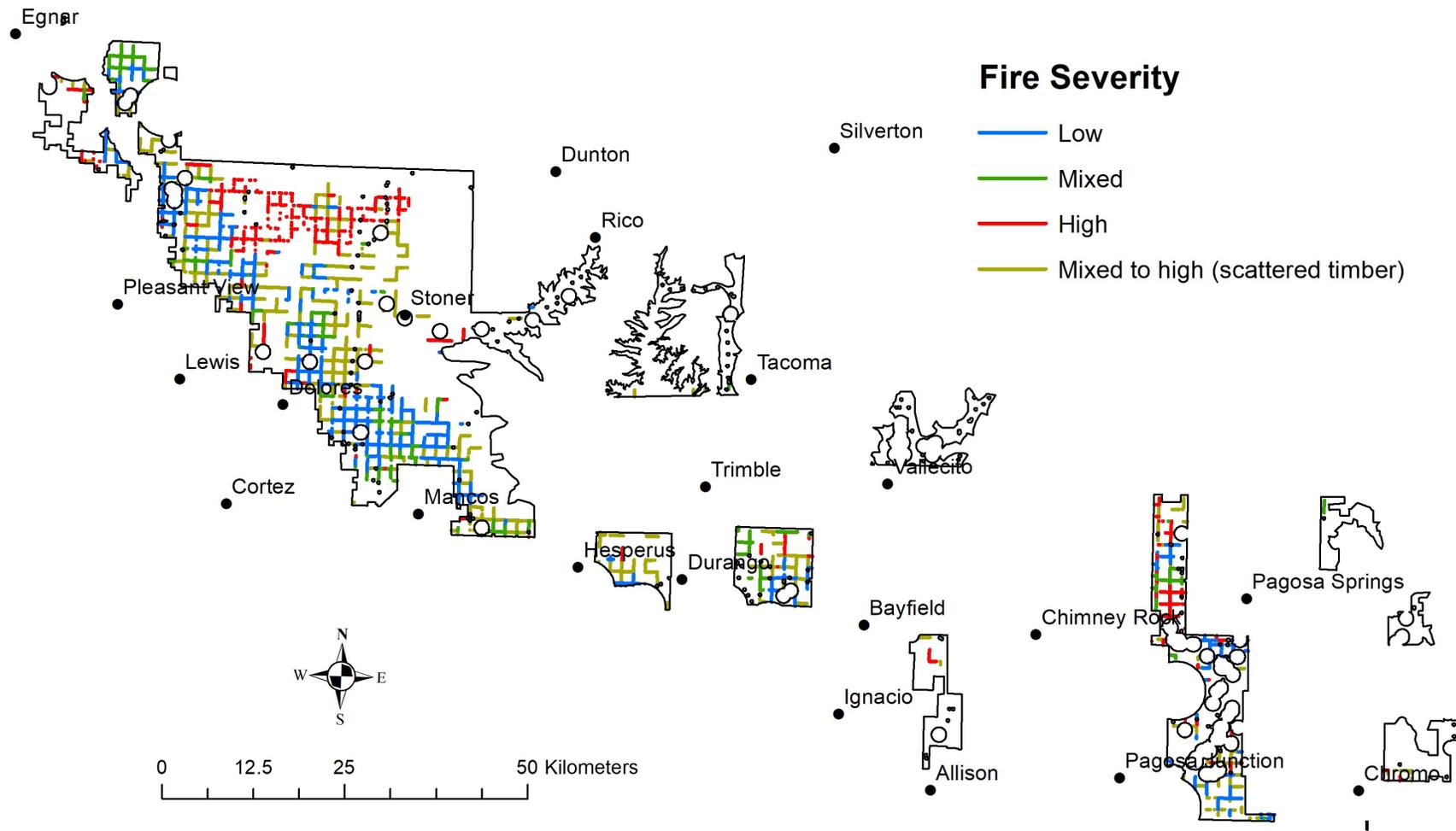


Figure S14. Reconstructed fire severity in the dry mixed-conifer zone.

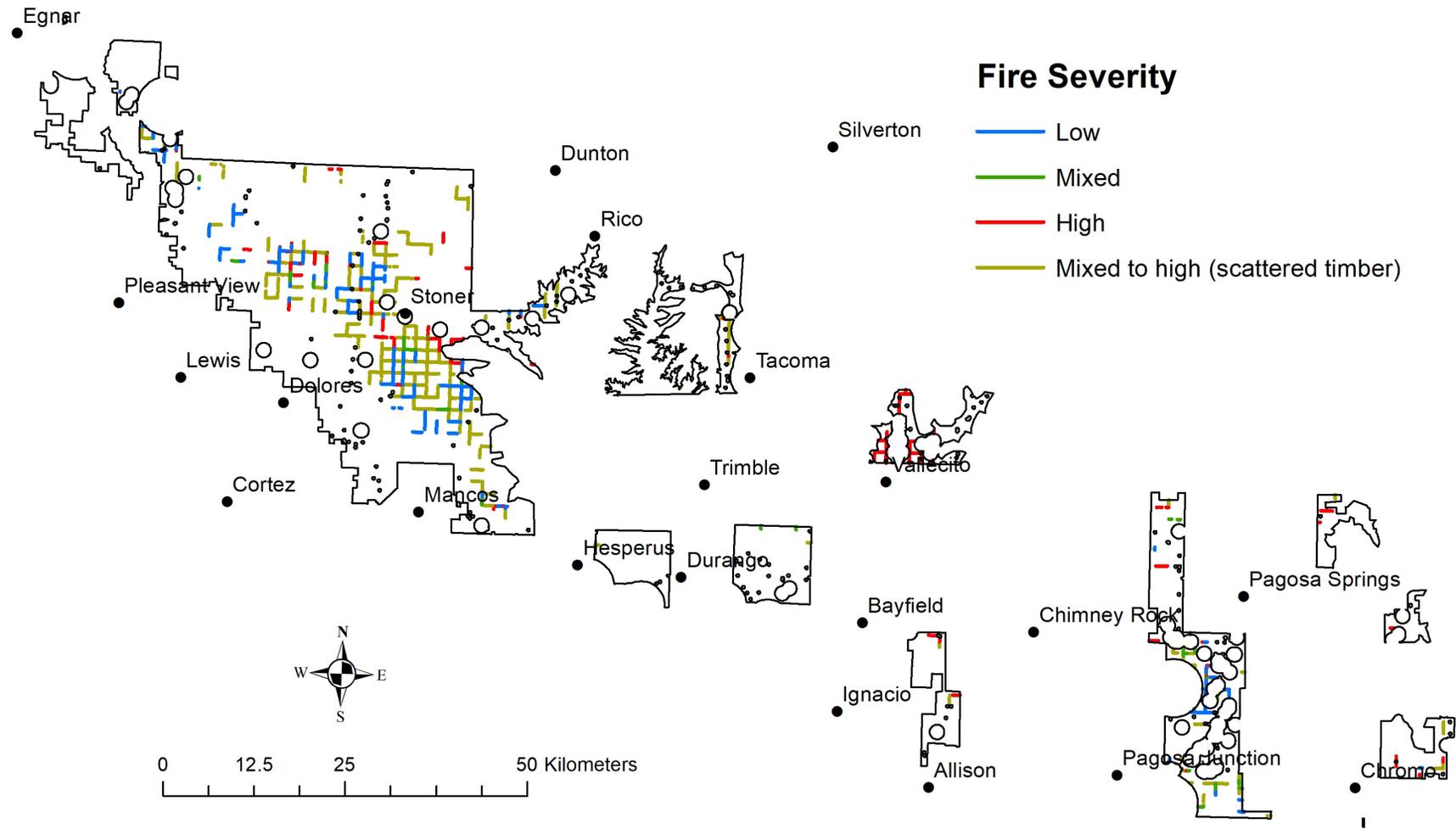


Figure S15. Reconstructed fire severity in the moist mixed-conifer zone.

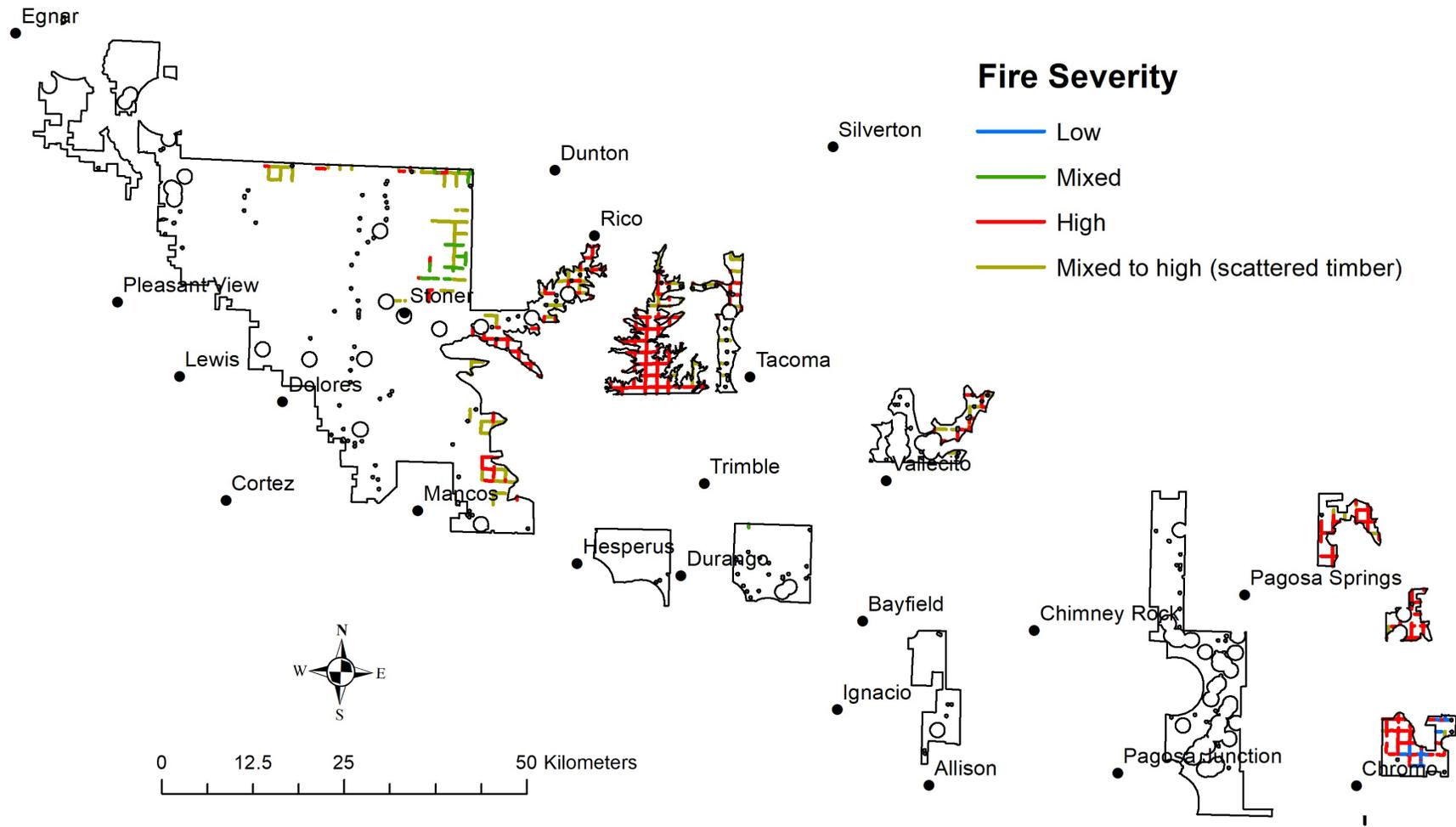


Figure S16. Reconstructed old-growth forests of the pine and piñon-juniper zone in the study area

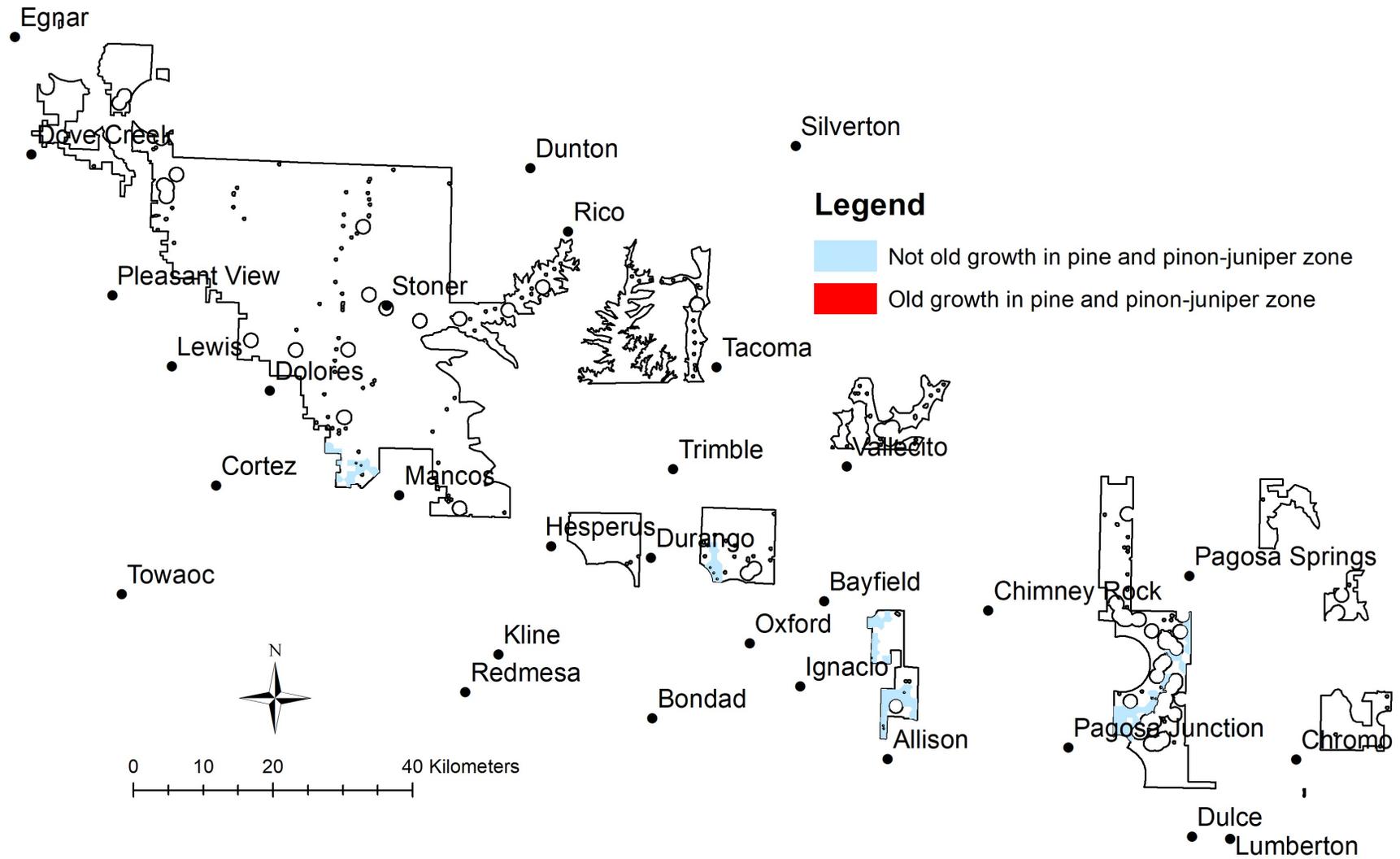


Figure S17. Reconstructed old-growth forests of the pine zone in the study area

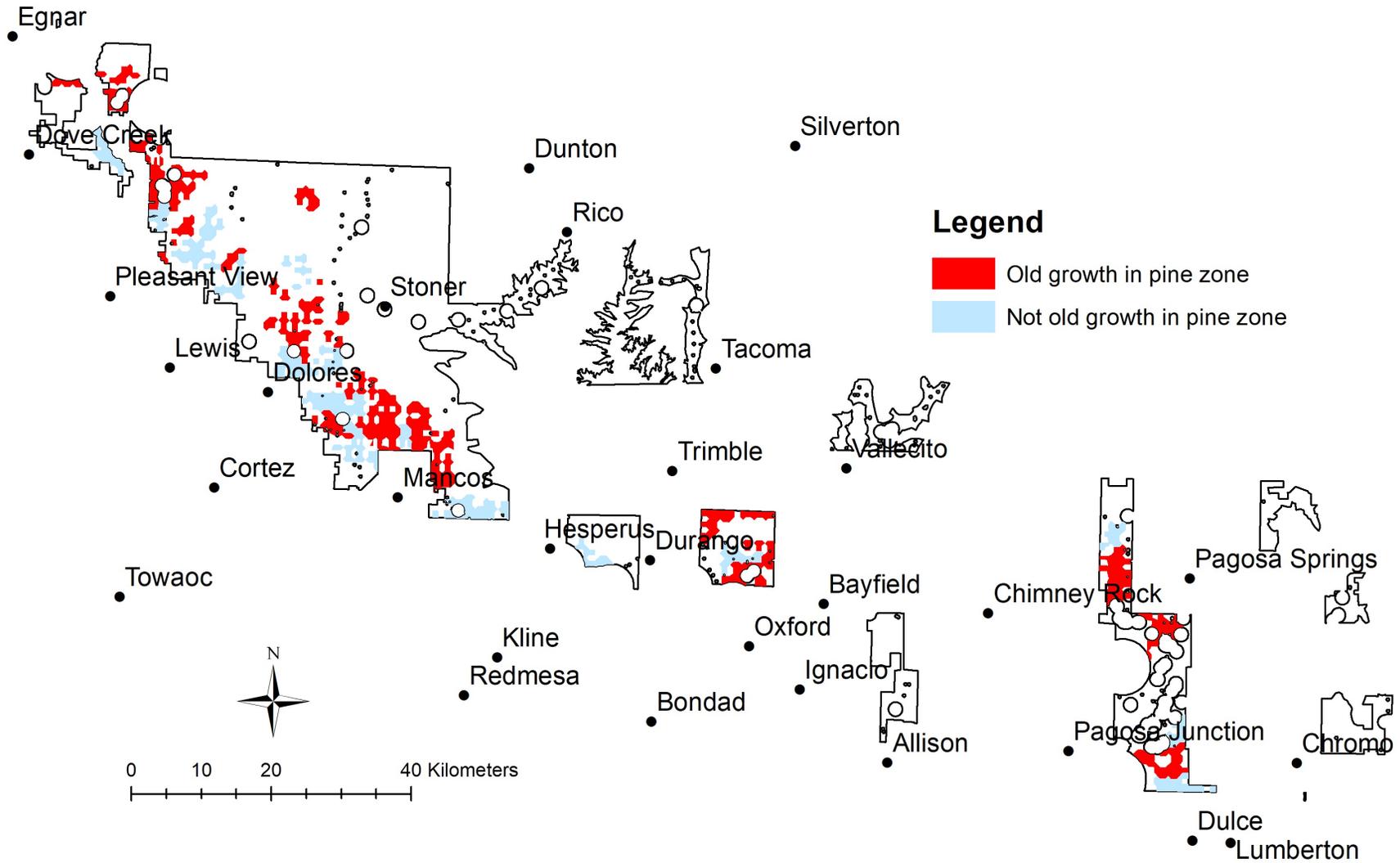


Figure S18. Reconstructed old-growth forests of the dry mixed-conifer zone in the study area

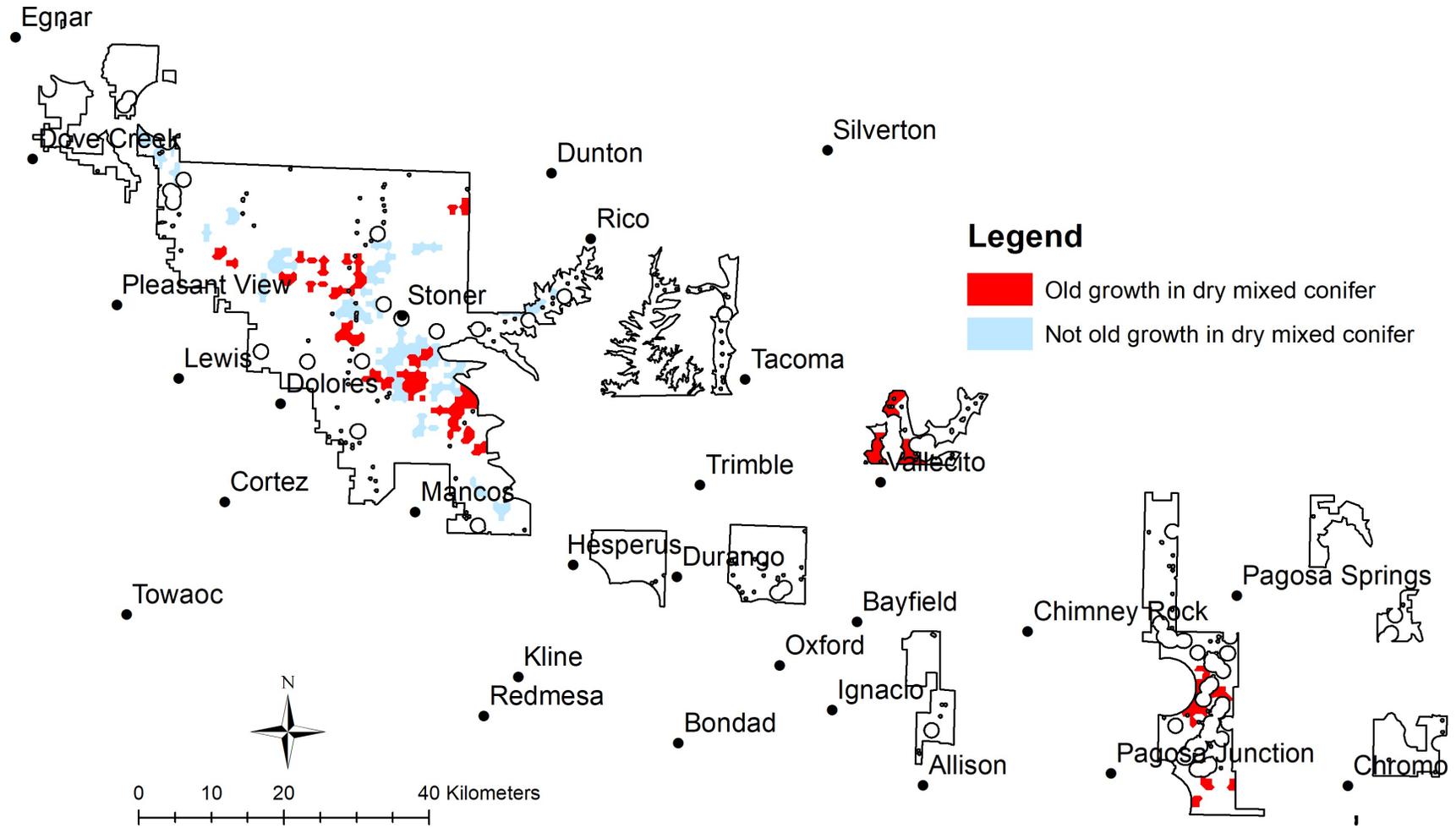


Figure S19. Reconstructed old-growth forests of the moist mixed-conifer zone in the study area

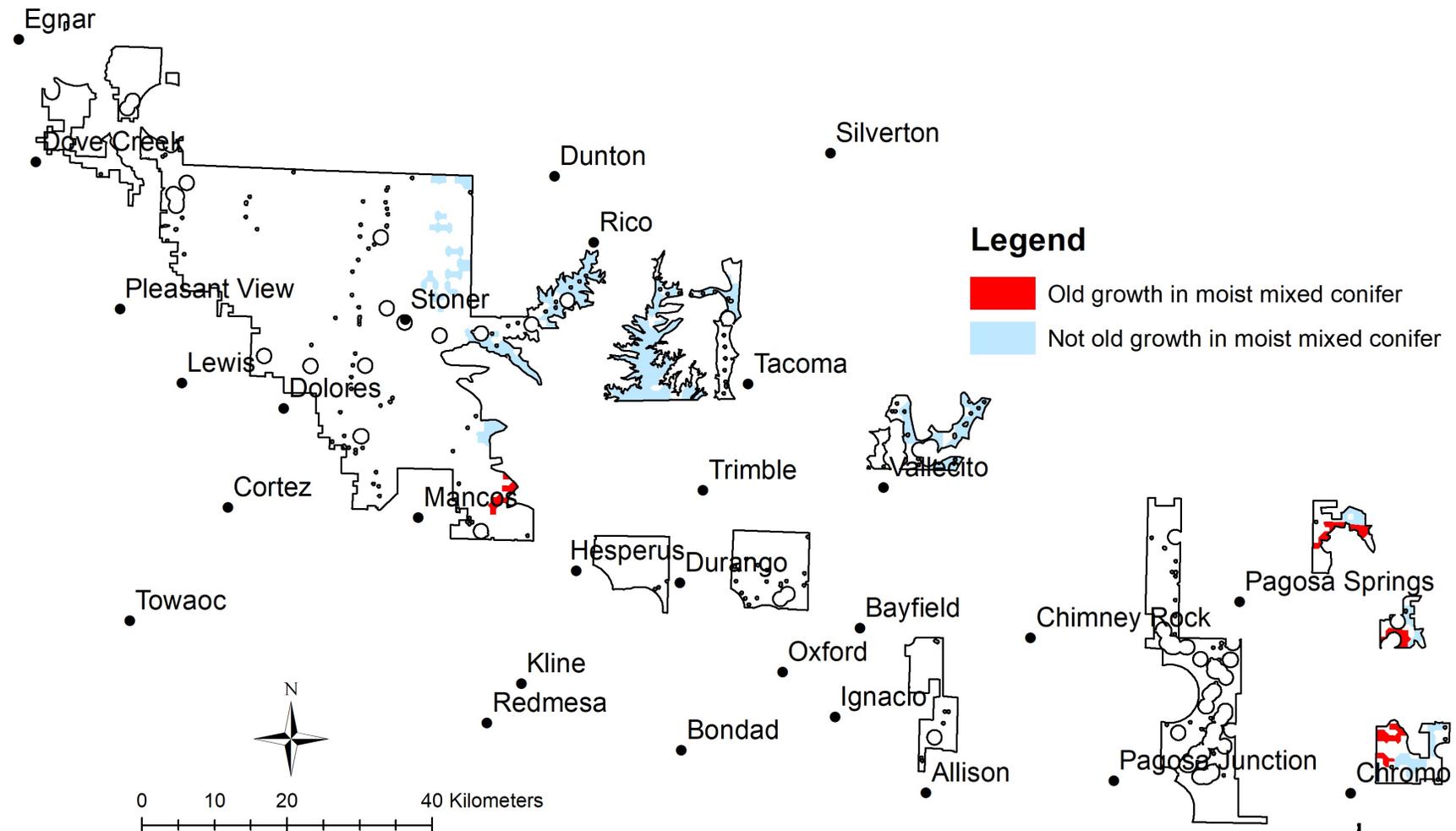
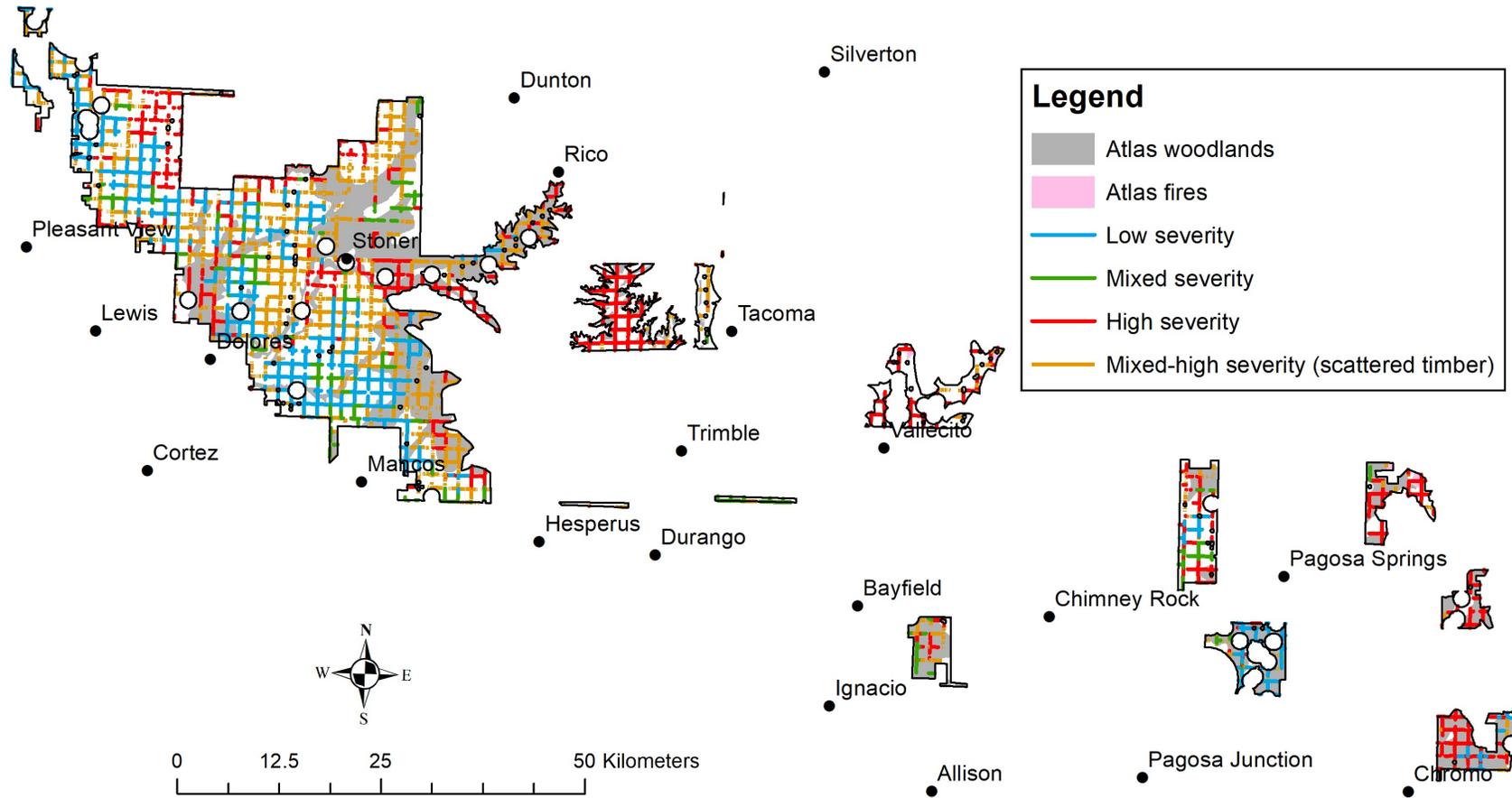
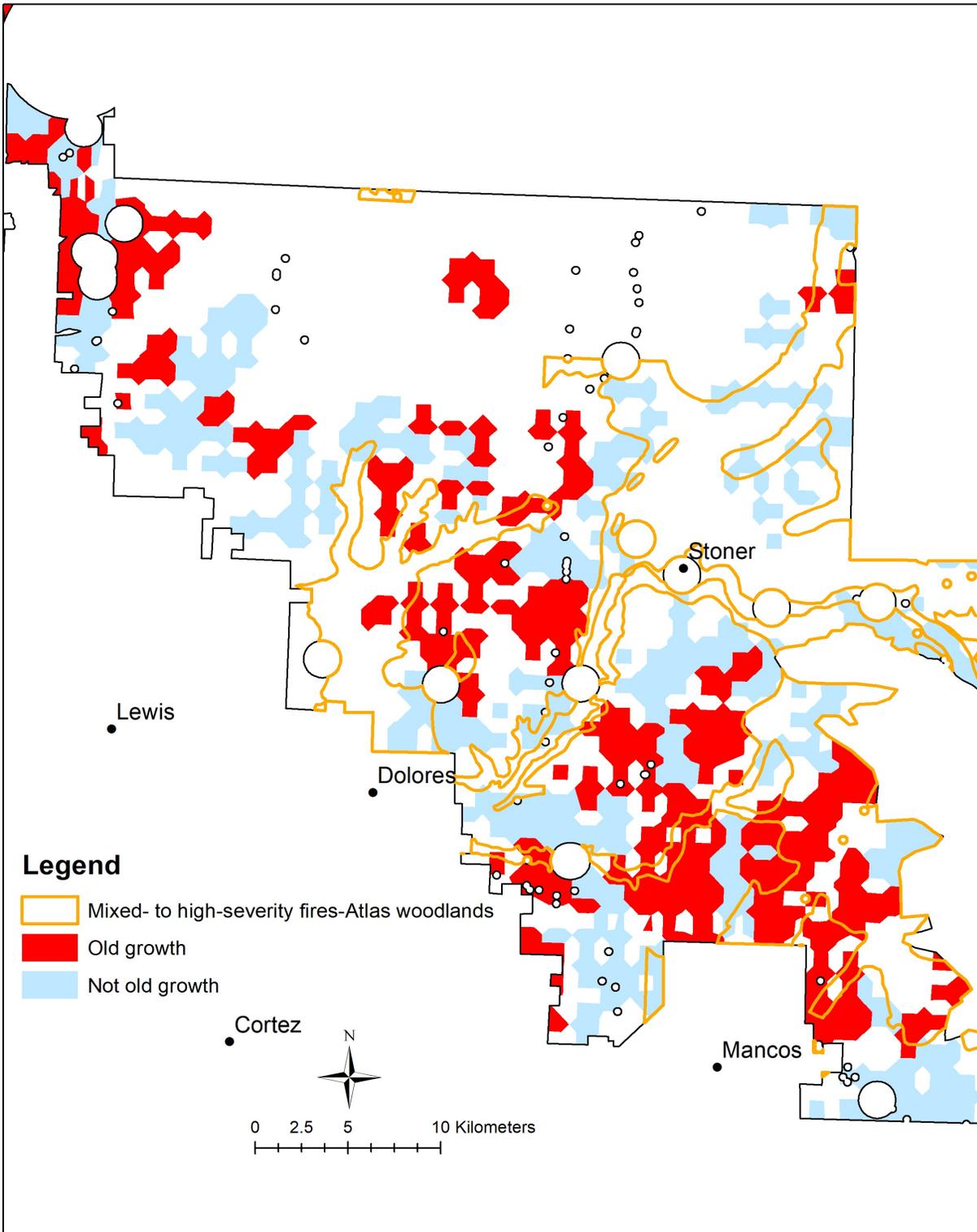


Figure S20. Cross-validation of the GLO fire-severity reconstruction with woodlands and fires mapped in early forest-atlases. Note that atlas woodlands occur in areas where the fire-severity reconstruction indicates mixed- to high-severity fires had occurred by the time of the surveys.



Notes: Woodlands mapped in forest atlases likely represent partly mixed-severity and partly high-severity fires, whereas fires mapped in these atlases likely represent stand-replacing high-severity fires [7].

Figure S21. Cross-validation of the GLO old-growth reconstruction with woodlands, representing mixed- to high-severity fires, mapped in 1908-1909 forest-atlases [7]. Note that most old-growth patches are outside the boundary of atlas woodlands, which confirms that they had not burned in moderate- to high-severity fires during 1850-1910, the period that the woodlands likely indicate mixed- to high-severity fires. A large exception is north of Mancos, where it is likely that old growth present at the time of the surveys had been burned in mixed- to high-severity fires by 1908-1909. Post-survey fires are also suggested in a few other small locations.



Text S1. *Limitations and critiques of GLO reconstructions*

GLO-based studies have some limitations. Surveyors did not always follow instructions (Table S4). They made location errors, and coverage can be uneven, incomplete, or imprecise in places. Some recording errors occurred, and handwritten field notes can be difficult to read. For section-line data, vegetation may at times be too generalized. For tree data, a six-corner pool covers 518 ha, providing no information about variability at finer levels. Data are from only one historical period, providing limited temporal evidence about the overall historical range of variability [73]. Fire-severity reconstructions are calibrated with tree-ring reconstructions, which can also have error. Fire cannot always be distinguished from other disturbances [1]. Some sharp contrasts across lines (e.g., near Tacoma--Figure 1) likely represent an error, but in which survey is unclear. In some cases, available digital lines may not necessarily be in their original locations, since some section corners have not been physically relocated.

GLO studies have been critiqued, raising other issues. Fulé et al. [74] said fire severity could not be accurately reconstructed from forest structure, but overlooked published evidence of accurate calibration, validation and corroboration [25]. Maxwell et al. [75] and Collins et al. [76] thought surveyor data were biased, but missed Williams and Baker [21], which specifically found low surveyor bias and error in dry forests. Sample sizes of GLO data were critiqued as small by Maxwell et al. [75], but their own sample, typical for tree-ring reconstructions, was ~1 tree per 53 ha, whereas GLO data provide much more data, ~1 tree per 32 ha [19]. Early timber inventories from ~1910-1925 were used to suggest our GLO method overestimates tree density and fire severity [77-79]. However, these studies did not report that in the early 1900s these timber inventories were documented to underestimate tree density by a factor of 2.0-2.5 and were abandoned because of their unreliability [80]. Levine et al. [81] claimed our GLO method for reconstructing tree density had inherent methodological flaws, but in Baker and Williams [3] we showed that Levine et al. [81] just incorrectly coded our method. Levine et al. [83] revised their code, and again claimed our method did not work. However, we showed that Levine et al.'s revised testing this time used incorrect equations, and worked very well if correct equations were used [83]. The GLO-based method has so far survived considerable validation and scrutiny; its accuracy has been shown to be pretty high, and its strengths and limitations are well known [3].

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