

# Meadows and Grazing in the Sierra Nevada: Mapping Meadows on Public and Private Lands throughout the Sierra Nevada



Mountain Meadows in the  
Sierra Nevada

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## *Introduction*

The goal of the Mountain Meadows and Grazing Project is to quantify the costs and benefits of meadow restoration on private and public lands, as they relate to grazing. As a sub-task we have developed a GIS-based map of meadows on private and public land (defined below as Public Conservation Trust lands, PCT) in the Sierra Nevada. We also highlight limitations of available data

## *Products*

- 1) **ESRI Shapefile** of Sierra Meadows. The associated database file includes the proportion of each meadow that is found on public land (PCT lands) as well as the number of acres on public land. The database file also includes all of the fields produced by the California Department of Fish and Game (CADFG) in their original meadow delineations (including meadow acreage, elevation, slope, and previous studies, when available).
- 2) **Summary Tables** – Information on public and private meadows organized by county and by watershed. Excel files with these data are also available.
- 3) **Google Earth KML files** – KML files can be downloaded and viewed in Google Earth. One file shows all Sierra Meadows (larger than 5 acres) grouped by the proportion of each meadow on public land. Another layer shows the watersheds (hydrologic units) for the Sierra.
- 4) **Produced Maps** – This document contains maps of meadow ownership. Meadows shown in red are mostly private; green shows public meadows.

## *The Data*

For this analysis we used a meadow layer delineated by the California Department of Fish and Game – Resource Assessment Program using data from 2004 and 2005. Previous experience ground-truthing meadows in the Yuba watershed have led us to conclude that this delineation of Sierra meadows is superior to the delineation created by the USDA Forest Service – Pacific Southwest Remote Sensing Lab. For this analysis, we excluded meadows smaller than 5 acres and set a northern limit of the Pit River and Surprise Valley Watersheds. The public lands layer (Public Conservation Trust Land layer) was created by California Resources Agency Legacy Project in 2003. This layer identifies Public Conservation Trust lands administered by government agencies (federal, state, and local), land trusts, and non-governmental organizations.

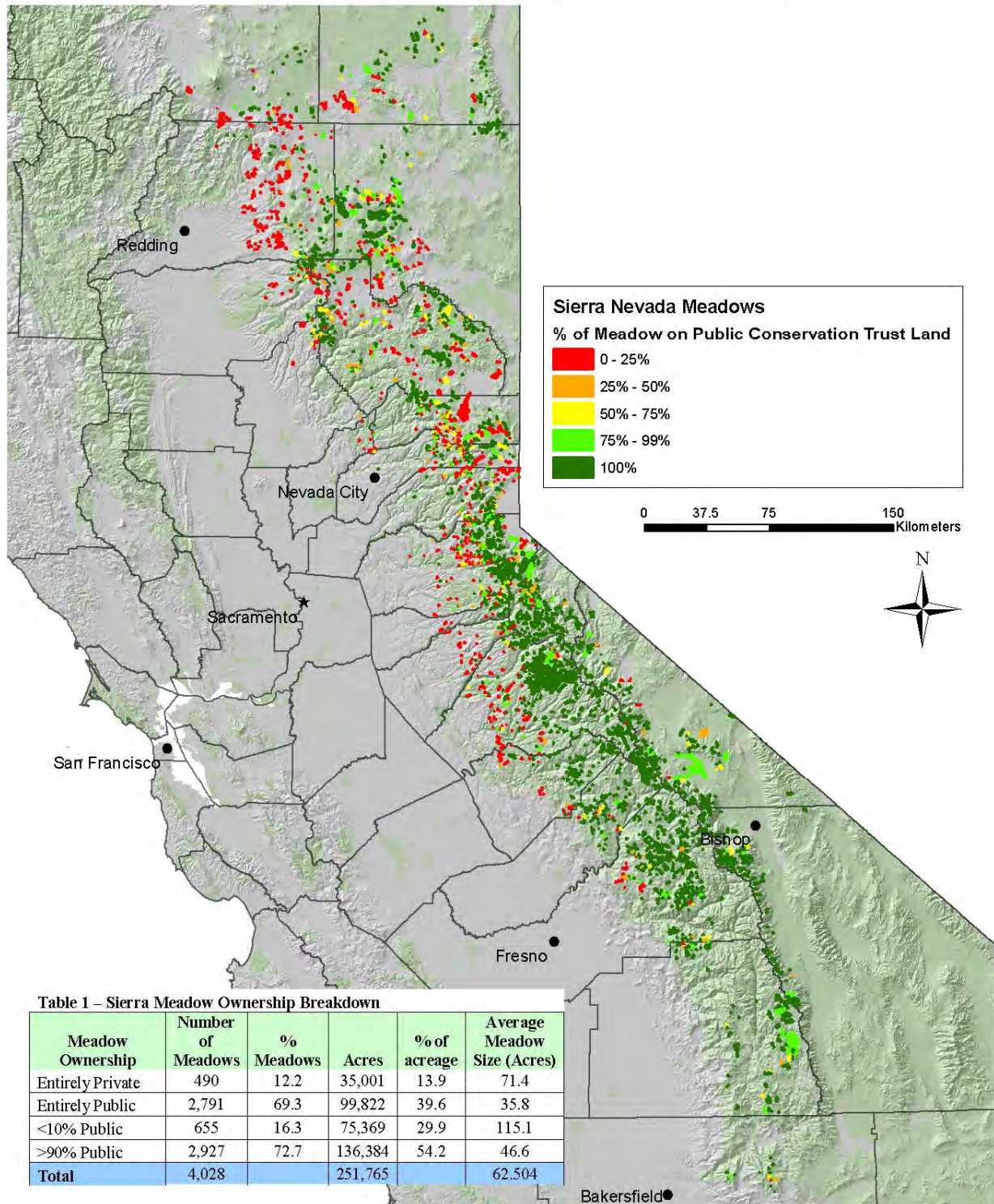
## *Limitations*

While we have found the CADFG Meadow Delineation to be the best currently available delineation, ground-truthing conducted last year by AR in the Yuba watershed found that the CADFG meadows were over-delineated by nearly 100%, on average. That is, the actual area of meadows in the Yuba watershed is approximately half the area that would be estimated using the CADFG database (in the size class considered by the AR study: meadows > 15 acres). This percentage of over-delineation is unlikely to be consistent throughout the Sierra, as northern meadows and east-slope meadows have notably different characteristics than those in the Yuba watershed. Over-delineation (and possibly under-delineation in some watersheds) is an important caveat to consider when using these data for quantitative purposes.

The public (PCT) land layer used in this analysis was created in 2003, and may be outdated in certain areas. Accurate and current landownership data is available for each county through county assessor's offices. For county-wide GIS layers the counties often charge up to \$1000. For information on specific parcels one can often find the information for free from the county assessors, although the process varies from county to county. Parcel numbers are available with Google Earth Pro. Landowner contact information is only available through the county assessor's office.

## Meadow Ownership Overview

### Meadows on Public Conservation Trust and Private Lands in the Sierra Nevada



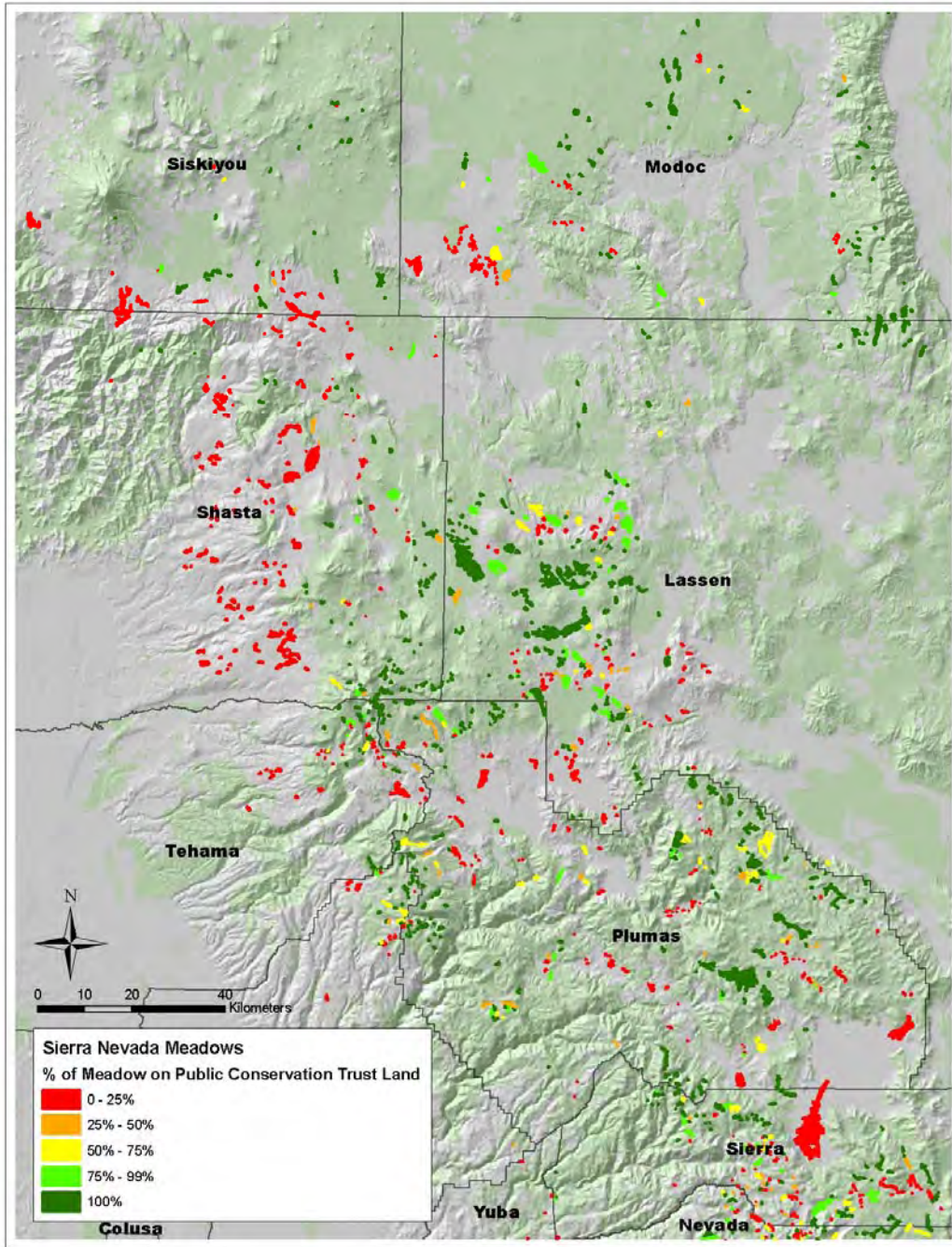
**Figure 1.** Sierra Meadows layer delineated by the California Department of Fish and Game (2004-2005) as part of the Mountain Meadow Project. Only meadows greater than 5 acres were considered. Meadows are represented by the percent of each meadow on public (Public Conservation Trust, PCT) land. PCT land layer was developed for the California Resources Agency’s Legacy Project 2003.



**Table 2 – Meadow Ownership by County**

County	#of Meadows	# of Public Meadows	# of Private Meadows	>90% Public	> 90% Private	Total Acres	Public Acres	Private Acres	% of Meadow on PCTL	Average Meadow Size (acres)
Plumas	284	165	37	173	57	35,376	11,306	24,070	32	125
Shasta	265	98	130	102	132	18,992	4,630	14,362	24	72
Lassen	235	134	40	139	46	34,428	21,687	12,742	63	147
Modoc	96	65	8	71	10	19,170	7,177	11,992	37	200
Sierra	151	72	18	80	28	9,364	5,198	4,165	56	62
El Dorado	425	290	46	303	65	12,837	8,859	3,979	69	30
Tehama	58	25	18	26	23	4,404	1,097	3,307	25	76
Siskiyou	74	36	25	36	25	4,599	1,506	3,093	33	62
Tuolumne	534	437	42	336	63	18,560	15,783	2,776	85	35
Mono	237	207	5	212	7	24,143	21,391	2,752	89	102
Nevada	111	43	29	49	35	4,146	1,465	2,680	35	37
Mariposa	118	92	15	92	21	4,840	2,900	1,940	60	41
Placer	171	81	44	92	53	3,772	2,343	1,430	62	22
Alpine	264	227	3	235	5	10,600	9,185	1,415	87	40
Fresno	397	353	17	358	18	14,288	13,025	1,263	91	36
Calvaras	45	12	22	14	23	1,054	326	728	31	23
Butte	33	15	6	15	9	1,197	557	641	47	36
Tulare	116	101	0	105	2	15,225	14,678	547	96	131
Madera	186	168	2	170	4	5,379	4,960	420	92	29
Amador	63	47	6	49	6	1,092	724	368	66	17
Kern	15	10	0	10	0	726	449	277	62	48
Inyo	146	137	0	140	0	6,780	6,571	209	97	46
Yuba	8	0	7	0	7	113	1	112	1	14

**Figure 2**  
Northern Sierra Meadows by County

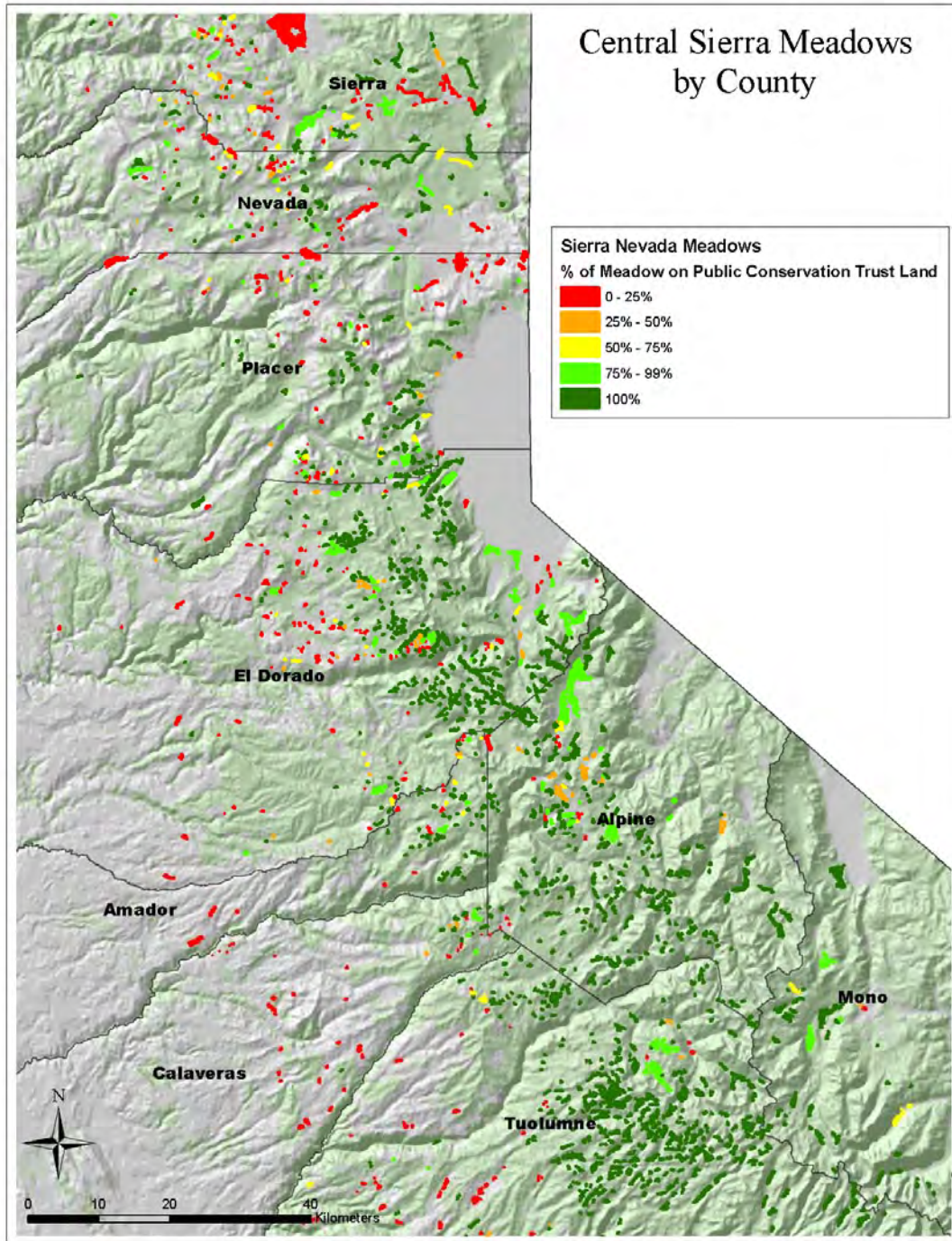


**Table 3 – Meadow Ownership by County – Northern Sierra**

County	#of Meadows	# of Public Meadows	# of Private Meadows	>90% Public	> 90% Private	Total Acres	Public Acres	% of Meadow on Public Land	Average Meadow Size
Butte	33	15	6	15	9	1,197.4	556.8	46.50	36.28
Lassen	235	134	40	139	46	34,428.2	21,686.5	62.99	146.50
Modoc	96	65	8	71	10	19,169.6	7,177.3	37.44	199.68
Plumas	284	165	37	173	57	35,376.2	11,306.0	31.95	124.56
Shasta	265	98	130	102	132	18,992.3	4,630.1	24.37	71.66
Sierra	151	72	18	80	28	9,363.6	5,198.2	55.51	62.01
Siskiyou	74	36	25	36	25	4,598.7	1,505.6	32.73	62.14
Tehama	58	25	18	26	23	4,404.2	1,097.2	24.91	75.93



Figure 3



**Table 4 – Meadow Ownership by County – Central Sierra**

County	#of Meadows	# of Public Meadows	# of Private Meadows	>90% Public	> 90% Private	Total Acres	Public Acres	% of Meadow on Public Land	Average Meadow Size
Alpine	264	227	3	235	5	10599.8	9185.1	86.65	40.15
Amador	63	47	6	49	6	1091.8	723.6	66.27	17.33
Calvaras	45	12	22	14	23	1054	326	30.92	23.42
El Dorado	425	290	46	303	65	12837.4	8858.5	69.00	30.20
Nevada	111	43	29	49	35	4145.6	1465.3	35.34	37.34
Placer	171	81	44	92	53	3772.36	2342.5	62.09	22.06
Sierra	151	72	18	80	28	9363.6	5198.2	55.51	62.01

Figure 4

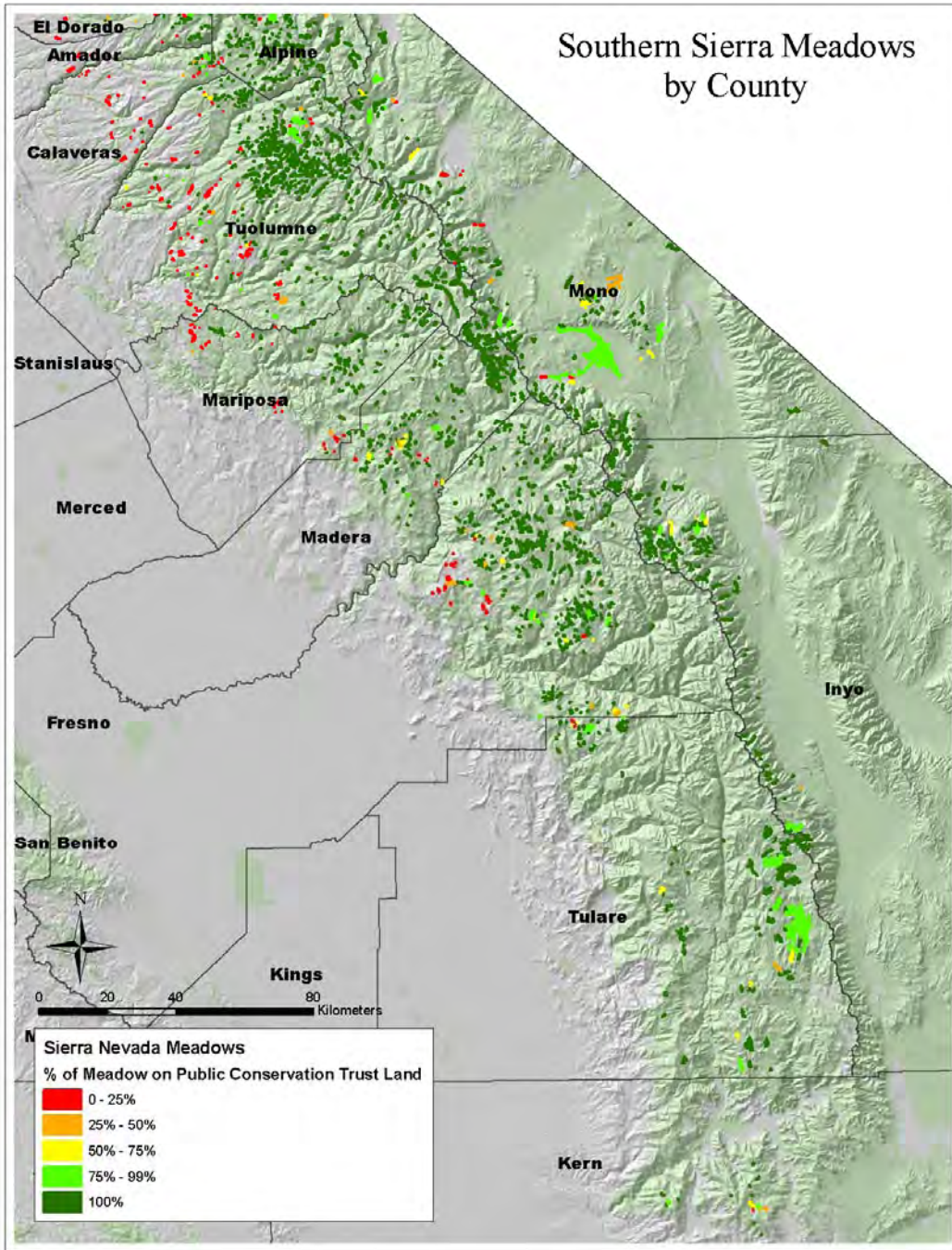


Table 5 – Meadow Ownership by County – Southern Sierra

County	#of Meadows	# of Public Meadows	# of Private Meadows	>90% Public	> 90% Private	Total Acres	Public Acres	% of Meadow on Public Land	Average Meadow Size
Calvaras	45	12	22	14	23	1054	326	30.92	23.42
Fresno	397	353	17	358	18	14287.7	13024.8	91.16	35.98
Inyo	146	137	0	140	0	6779.9	6570.5	96.91	46.43
Kern	15	10	0	10	0	726	448.7	61.80	48.70
Madera	186	168	2	170	4	5379.1	4959.6	92.21	28.91
Mariposa	118	92	15	92	21	4840	2899.6	59.90	41.01
Mono	237	207	5	212	7	24142.9	21391.4	88.60	101.86
Tulare	116	101	0	105	2	15224.5	14678	96.41	131.24
Tuolumne	534	437	42	336	63	18559.5	15783.1	85.04	34.75



Sierra Meadow Ownership by Watershed

Table 6

Watershed	#of Meadows	# of Public Meadows	# of Private Meadows	>90% Public	> 90% Private	Total Acres	Public Acres	% of Meadows on Public Land	Average Meadow Size
Lake Tahoe	140	108	6	116	9	6733.5	4902	72.80	48.1
Truckee	98	38	30	42	34	8133.6	3497.1	43.00	83.0
Upper Carson	77	63	0	67	0	5997	5245.6	87.47	77.9
East Walker	20	17	1	17	2	1203	657.3	54.64	60.2
West Walker	34	27	1	29	1	2995.1	2898.7	96.78	88.1
Fish Lake-Soda Spring Valleys	2	2	0	2	0	164.2	164.2	100.00	82.1
Lost	2	1	0	2	0	1103.4	1068	96.79	551.7
Upper Pit	98	71	4	75	6	17792.1	6670.6	37.49	181.6
Lower Pit	284	137	106	141	115	25586.6	12268.7	47.95	90.1
McCloud	31	13	13	13	13	3326.6	811.1	24.38	107.3
Sacramento Headwaters	3	0	3	0	3	721	0	0.00	240.3
North Fork Feather	176	115	22	121	30	21551.7	5959.1	27.65	122.5
East Branch North Fork Feather	116	53	21	54	30	11175.7	4680.5	41.88	96.3
Middle Fork Feather	72	43	10	45	16	16189.7	4387.4	27.10	224.9
Yuba	171	67	36	77	45	4563	2466.1	54.05	26.7
Bear	1	0	1	0	1	321.5	0	0.00	321.5
North Fork American	165	93	29	102	31	3241	2142.8	66.12	19.6
South Fork American	270	182	32	188	45	5940.3	4150.3	69.87	22.0
Cow	40	8	32	8	32	1387.9	223	16.07	34.7
Battle	43	8	25	8	27	4189.5	379.8	9.07	97.4
Sacramento-Thomes-Elder-Mill	38	16	11	19	13	1120.6	519.9	46.39	29.5
Sacramento-Deer	14	3	7	3	8	1747.6	227.7	13.03	124.8
Butte	18	11	4	11	5	626.4	424.6	67.78	34.8
Upper Kern	44	39	0	40	0	3043.8	2925.5	96.11	69.2
South Fork Kern	37	28	0	30	1	11536.8	10947.8	94.89	311.8
Lower Kern-Buena Vista Lake	7	6	0	6	0	169.7	155.8	91.81	24.2
Tule	7	7	0	7	0	126.6	126.6	100.00	18.1
Kaweah	15	15	0	15	0	264.5	264.5	100.00	17.6
Upper King	214	184	5	190	8	7390.2	6794.2	91.94	34.5
Upper San Joaquin	364	329	13	330	15	12503.8	11354.5	90.81	34.4
Chowchilla-Fresno	8	3	2	3	4	449.3	89.4	19.90	56.2
Merced	138	115	14	116	18	5030	3414.4	67.88	36.4
Tuolumne	331	270	28	276	43	12388.7	10405.8	83.99	37.4
Stanislaus	292	243	19	248	28	8430.4	7320.3	86.83	28.9
Calveras	7	1	6	1	6	115.3	11	9.54	16.5
Mokelumne	177	125	17	131	18	4311.8	3088.8	71.64	24.4
Cosumnes	25	8	9	9	9	609.9	256.5	42.06	24.4
Surprise Valley	11	10	0	11	0	398.3	397.8	99.87	36.2
Madeline Plains	1	1	0	1	0	9.98	9.98	100.00	10.0
Honey-Eagle Lakes	120	65	19	74	24	13183.7	10800.3	81.92	109.9
Mono Lake	93	81	1	83	1	6067.3	5055.72	83.33	65.2
Crowley Lake	204	189	2	192	3	18328.7	17066.2	93.11	89.8
Owens Lake	24	22	0	23	0	1462.8	1418.3	96.96	61.0
Eureka-Saline Valleys	1	1	0	1	0	167.4	167.4	100.00	167.4



Figure 5  
Northern Sierra Nevada/ Southern Cascade Meadows

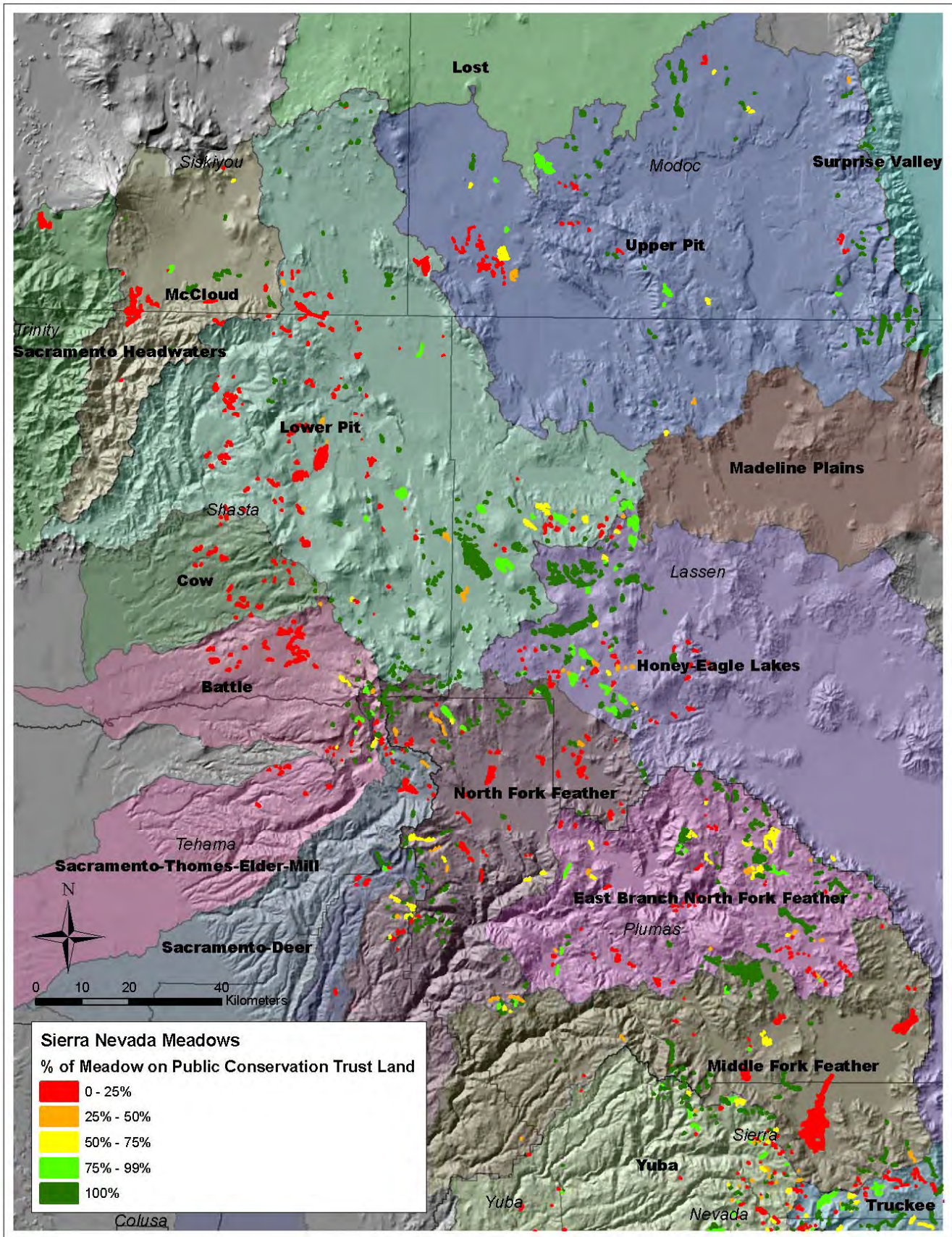




Figure 6

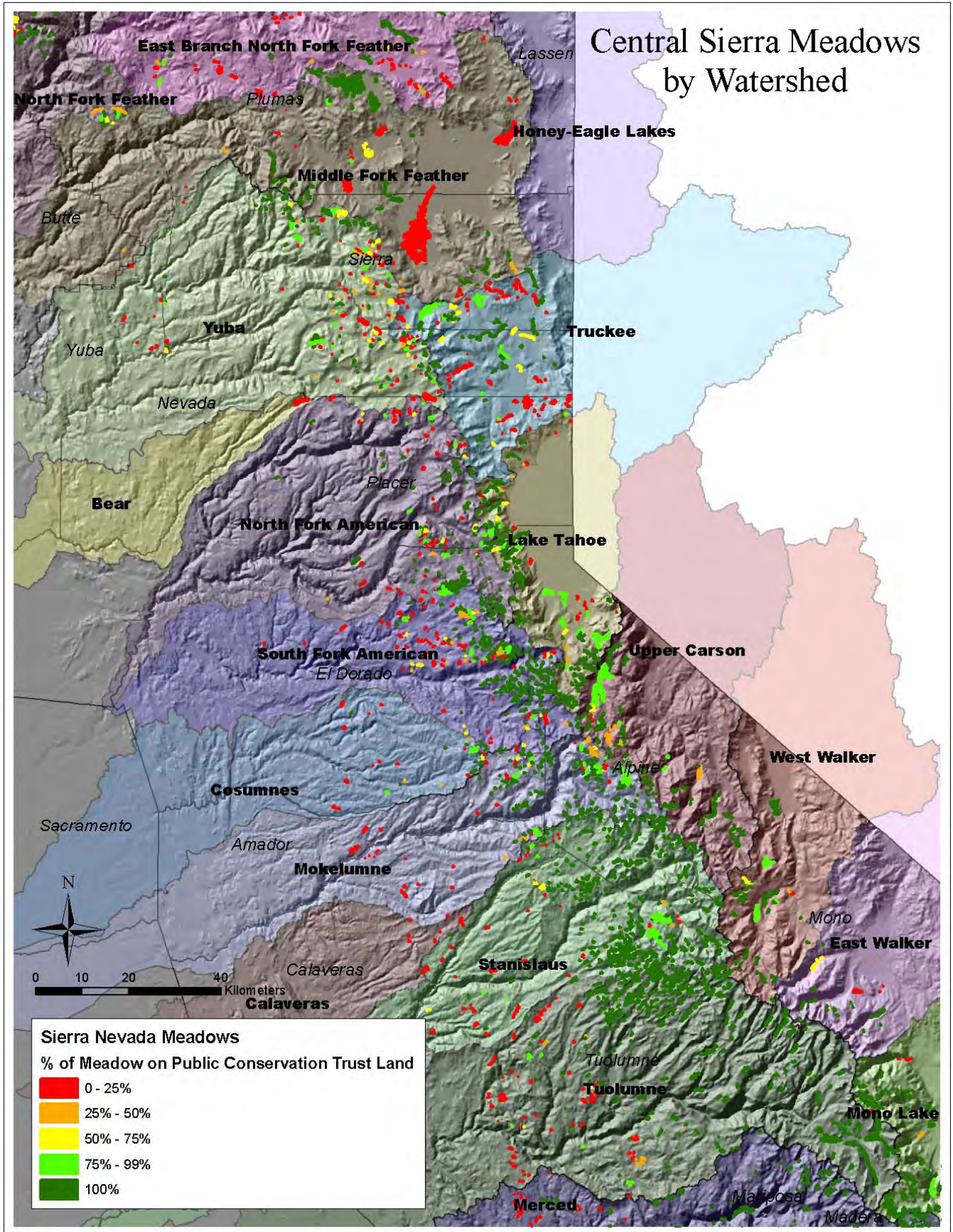




Figure 7

