

# 2010 Aerial Survey Results: California



USDA Forest Service  
Pacific Southwest Region  
Forest Health Protection

Forest Health Monitoring Program  
1731 Research Park Drive, Davis, CA 95618  
[www.fs.fed.us/r5/spf/fhp/fhm](http://www.fs.fed.us/r5/spf/fhp/fhm)



# 2010 Aerial Survey Results: California

Prepared by Zachary Heath<sup>1</sup>, Lisa Fischer<sup>1</sup>, Jeff Moore<sup>1</sup>, Brent Oblinger<sup>1</sup>, & Meghan Woods<sup>2</sup>

<b>Overview</b> .....	3	Kern County.....	45
<b>National Forests and Parks</b> .....	14	Kings County.....	43
Angeles National Forest.....	15	Lake County.....	40
Cleveland National Forest.....	16	Lassen County.....	46
Eldorado National Forest.....	17	Los Angeles County.....	47
Inyo National Forest.....	18	Madera County.....	48
Klamath National Forest.....	19	Marin County.....	49
Lake Tahoe Basin Management Unit.....	20	Mariposa County.....	48
Lassen National Forest.....	21	Mendocino County.....	50
Los Padres National Forest.....	22	Merced County.....	48
Mendocino National Forest.....	23	Modoc County.....	51
Modoc National Forest.....	24	Mono County.....	52
Plumas National Forest.....	25	Monterey County.....	53
Point Reyes National Seashore & Golden Gate National Recreation Area.....	26	Napa County.....	49
San Bernardino National Forest.....	27	Nevada County.....	42
Sequoia National Forest.....	28	Orange County.....	54
Sequoia-Kings National Park.....	29	Placer County.....	42
Shasta-Trinity National Forest & Whiskeytown National Recreation Area.....	30	Plumas County.....	39
Sierra National Forest.....	31	Riverside County.....	54
Six Rivers National Forest & Redwood State and National Parks.....	32	San Benito County.....	53
Stanislaus National Forest.....	33	San Bernardino County.....	54
Tahoe National Forest.....	34	San Diego County.....	55
Yosemite National Park.....	35	San Francisco County.....	37
<b>County</b> .....	36	San Joaquin County.....	70
Alameda County.....	37	San Luis Obispo County.....	56
Alpine County.....	38	San Mateo County.....	37
Amador County.....	38	Santa Barbara County.....	57
Butte County.....	39	Santa Clara County.....	37
Calaveras County.....	38	Santa Cruz County.....	37
Colusa County.....	40	Shasta County.....	58
Contra Costa County.....	37	Sierra County.....	39
Del Norte County.....	41	Siskiyou County.....	59
El Dorado County.....	42	Solano County.....	49
Fresno County.....	43	Sonoma County.....	49
Glenn County.....	40	Stanislaus County.....	37
Humboldt County.....	41	Tehama County.....	60
Inyo County.....	44	Trinity County.....	61
		Tulare County.....	62
		Tuolumne County.....	38
		Ventura County.....	57
		Yolo County.....	49
		Yuba County.....	39

Cover Photo: Mountain Pine Beetle activity on Yellow Mountain, Warner Mountains, Modoc National Forest, Photo by: Danny Cluck, US Forest Service

<sup>1</sup>USDA Forest Service  
Forest Health Protection  
<sup>2</sup>Sanborn Map Company  
1731 Research Park Drive  
Davis, California 95618

## Overview

Forest Service FHP annually conducts aerial detection surveys to map current year mortality and damage across all forested lands. Over 23,000 miles were flown covering approximately 44 million acres of forested land in 2010 and 750,000 acres containing elevated levels of tree mortality, defoliation, decline, topkill or branch flagging were mapped. The majority of this disturbance activity was tree mortality attributed primarily to bark beetles. Forest disturbance levels almost doubled from 2009. Season highlights include:

- **Fir engraver and western pine beetle activity doubled from 2009;**
- **Mountain pine beetle activity was locally very intense in areas such as the Warner Mountains, southern Cascades, and the eastern Sierra Range;**
- **Intense bark beetle activity was observed inside the perimeters of some of the 2008 fires;**
- **Acres with mortality attributed to Jeffrey pine beetle declined;**
- **Gold-spotted oak borer activity in San Diego County oak trees declined slightly to about 1,000 acres but increased in geographic distribution;**
- **Sudden oak death (SOD) mortality in tanoak and coast live oak decreased from last year both in terms of intensity and extent to about 2,700 trees over 1,500 acres. This is lowest amount of mortality attributed to SOD since aerial surveys began in 2001. Despite the decline in acreage SOD was detected with aerial surveys in new locations such as Redwood Creek in northern Humboldt County;**
- **Several hundred acres of bishop pine had mortality and damage from pitch canker at Point Reyes National Seashore.**

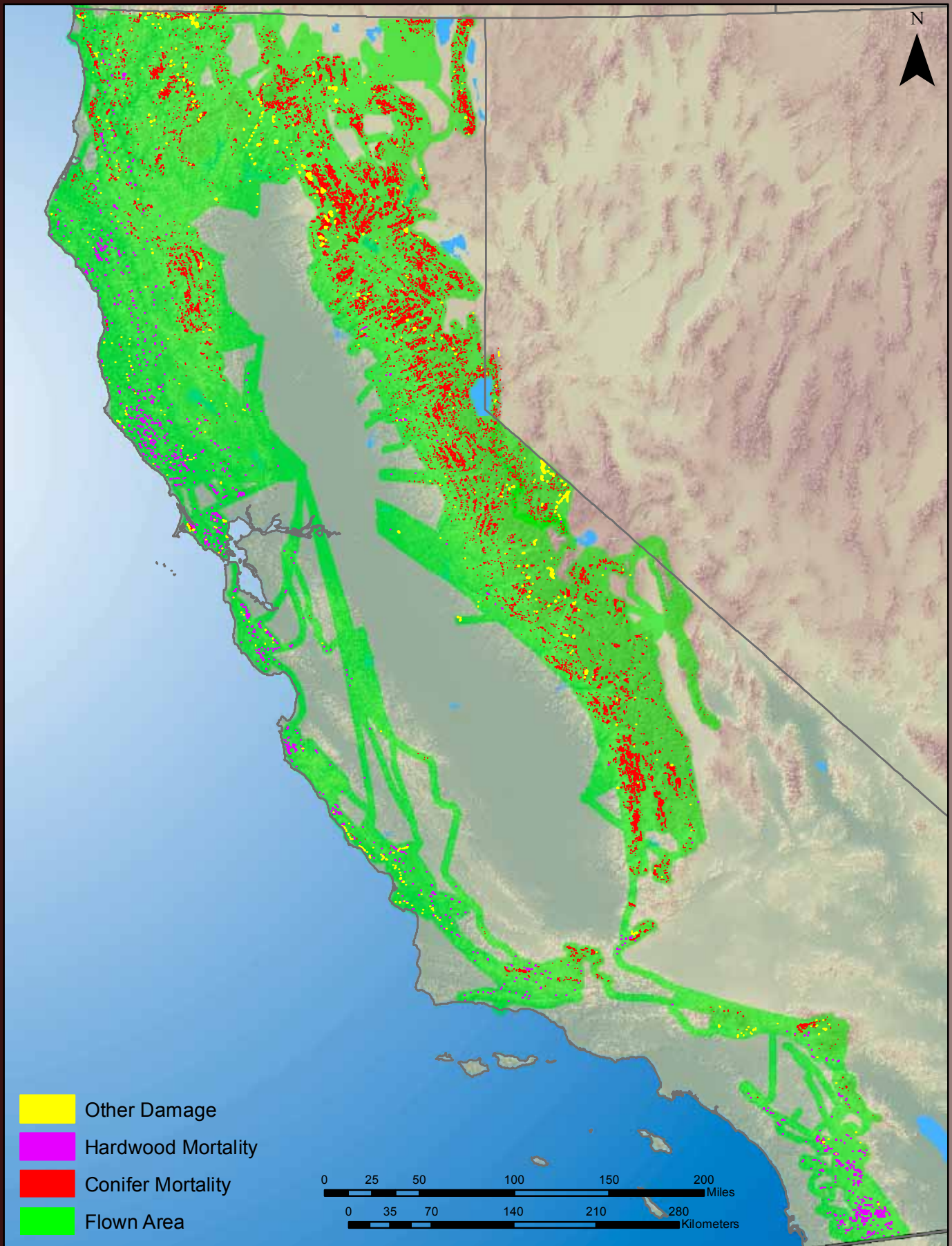
This report publishes the results of the 2010 aerial survey. Page 4 displays total area surveyed and extent of damage mapped by Region 5 FHP. The displayed damage includes data from Region 4 and 6 falling inside California. Page 5 displays biotic damage mapped annually (as a percentage of total area surveyed) in comparison to the percent of average rainfall statewide. Pages 6 – 12 display numbers of acres mapped and number of dead trees broken out by damage agent (bark beetles and other), by host (pine, fir, hardwood and mix (any combination of the previous 3 categories plus any other conifer species not included)), and by National Forest, Park, and county. Some units and counties are grouped onto one map. Lists of agents causing damage in each forest, park and county are also provided. This report is available online at [www.fs.fed.us/r5/spf/fhp/fhm/aerial](http://www.fs.fed.us/r5/spf/fhp/fhm/aerial).

## Methodology

Aerial observers survey and map current/recent tree damage and mortality from a small fixed-wing aircraft at approximately 1,000 feet above ground level. Observers look for any kind of forest disturbance and typically color is the primary indicator. Yellow, red or brown can indicate a tree has recently died and the foliage is drying out prior to falling off entirely. If these colors are more subdued or if the trees have a faded or thin appearance it can indicate defoliation from a pest or weather event which is compromising the health of the affected trees.

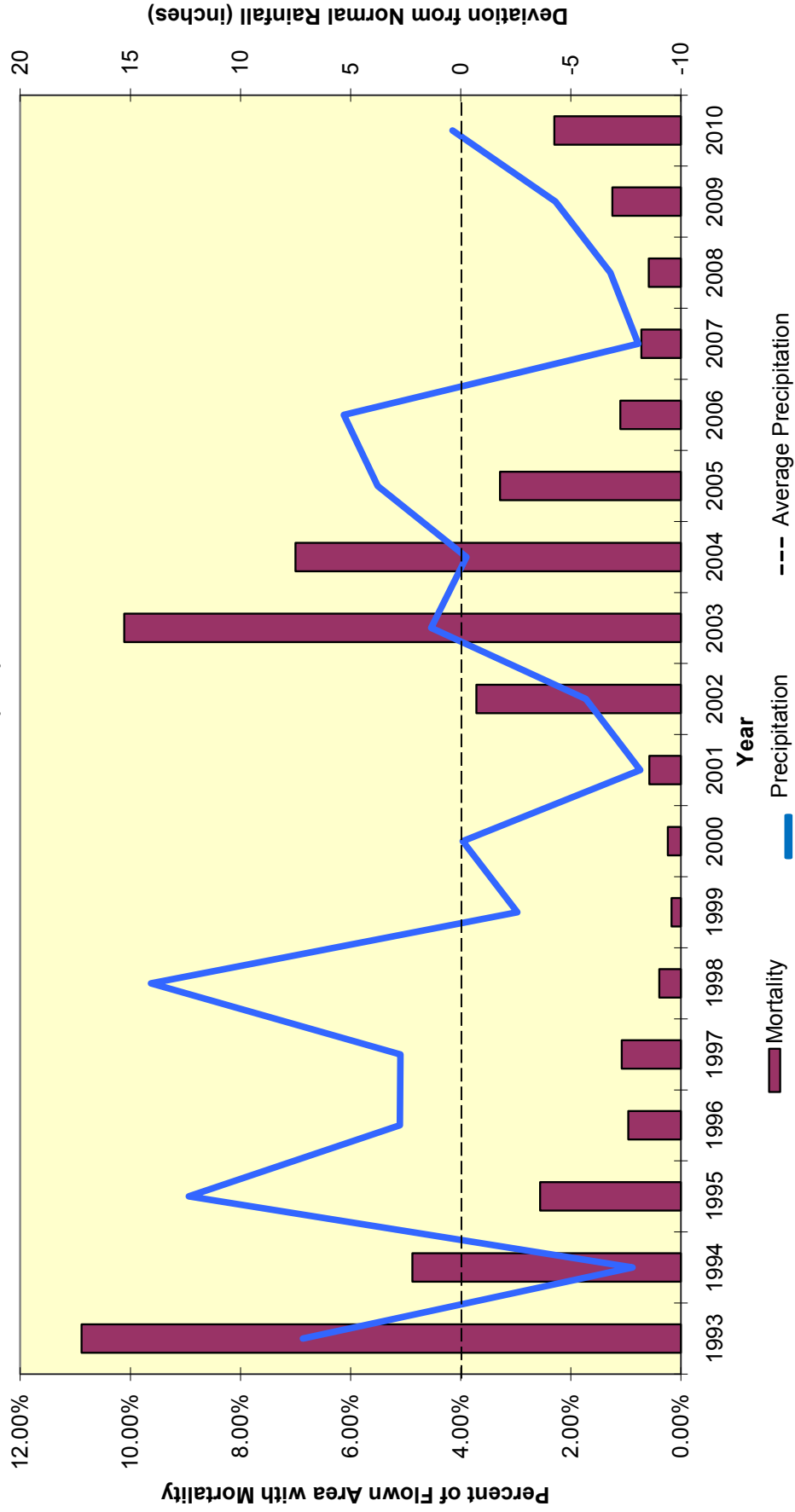
Forested areas are systematically flown in a grid pattern for more complete coverage. Typically two observers fly simultaneously surveying from opposite sides of the aircraft. When damage is detected the observer locates the area affected on a computer touch screen typically depicting enhanced satellite imagery and georeferenced by an onboard global positioning system. The observer draws a polygon on the screen where the damage would be located on the ground and then labels it with the tree species being affected, severity of damage or number of trees killed, and type of damage (defoliation, mortality, decline, etc). Multiple host and/or damage types may be attributed to the same polygon.

# Flown Area and Damage Mapped in 2010



### Precipitation vs Mapped Mortality for Region 5

Bark Beetle Mortality only



Acres of biotic-caused mortality, as a percentage of the area surveyed and deviation from normal rainfall. The precipitation data is based on average rainfall for the State of California over the past 30 years (Precipitation data source: California Department of Water Resources).

## Acres with Mortality by National Forest/Park

Unit	Bark Beetle				Other Agents					Unit Total
	Pine	Fir	Mix	Total	Pine	Fir	Mix	Hardwood	Total	
Angeles	318	7	0	325	1	0	0	0	1	326
Cleveland	73	2	0	75	2	0	1	765	768	843
Eldorado*	1,913	30,447	1,222	33,582	7	0	0	3	10	33,592
Inyo	6,900	4,487	2,435	13,822	0	0	0	1	1	13,823
Klamath**	5,124	14,262	19,561	38,947	296	0	884	0	1,180	40,127
Lassen	7,145	78,814	43,738	129,697	0	0	29	0	29	129,726
Los Padres	1,699	31	1,570	3,300	547	3	2,486	148	3,184	6,484
Mendocino	1,738	13,799	5,801	21,338	715	0	655	0	1,370	22,708
Modoc**	19,099	12,157	17,324	48,580	4	0	56	0	60	48,640
Plumas	4,548	46,947	9,718	61,213	10	0	35	0	45	61,258
San Bernardino	2,424	63	1,248	3,735	0	0	2	12	14	3,749
Sequoia	7,718	49,520	13,553	70,791	1	0	3	1	5	70,796
Shasta-Trinity	8,523	13,495	9,545	31,563	539	0	471	64	1,074	32,637
Sierra	6,326	16,201	1,292	23,819	105	0	4	0	109	23,928
Six Rivers	169	3,242	413	3,824	186	0	2,393	482	3,061	6,885
Stanislaus	2,693	9,862	2,539	15,094	14	0	4	0	18	15,112
Tahoe*	4,322	54,019	3,446	61,787	0	0	8	0	8	61,795
Tahoe Basin*	877	5,556	116	6,549	0	0	0	3	3	6,552
<b>Total Forest Service</b>	<b>81,609</b>	<b>352,911</b>	<b>133,521</b>	<b>568,041</b>	<b>2,427</b>	<b>3</b>	<b>7,031</b>	<b>1,479</b>	<b>10,940</b>	<b>578,981</b>
Golden Gate	0	0	1	1	0	0	29	34	34	35
Lassen Volcanic	3,197	5,415	9,804	18,416	0	0	1	0	1	18,417
Point Reyes	2	0	0	2	647	0	3	32	682	684
Redwood	0	0	108	108	0	0	2,111	0	2,111	2,219
Sequoia-Kings	4,995	15,309	2,218	22,522	0	0	1	0	1	22,523
Whiskeytown	0	0	0	0	0	0	0	0	0	0
Yosemite	1,384	3,728	782	5,894	0	0	1	1	2	5,896
<b>Total Park Service</b>	<b>9,578</b>	<b>24,452</b>	<b>12,913</b>	<b>46,943</b>	<b>647</b>	<b>0</b>	<b>2,146</b>	<b>67</b>	<b>2,831</b>	<b>49,774</b>

\*Includes mortality mapped by Region 4

\*\*Includes mortality mapped by Region 6

Unit	Other Mortality-Causing Events:
Angeles	Gray pine mortality
Cleveland	Ca flathead, flatheaded fir & gold-spotted oak borer, high water, unknown live oak mortality
Eldorado	Ca flathead borer, unknown hardwood mortality
Inyo	Unknown hardwood mortality
Klamath	Ca flathead & flatheaded fir borer, POC disease, bear
Lassen	Flatheaded fir borer
Los Padres	Sudden oak death, Ca flathead & flatheaded fir borer, unknown hardwood and fir mortality
Mendocino	Ca flathead & flatheaded fir borer, gray pine mortality
Modoc	Juniper mortality, Ca flatheaded borer
Plumas	Ca flathead & flatheaded fir borer, herbicide
San Bernardino	Flatheaded fir borer, unknown oak mortality
Sequoia	Gray pine, unknown conifer & hardwood mortality
Shasta-Trinity	Ca flathead & flatheaded fir borer, bear, high water, hardwood mortality
Sierra	Ca flathead & flatheaded fir borer
Six Rivers	Ca flathead & flatheaded fir borer, POC disease, bear, hardwood mortality
Stanislaus	Ca flathead & flatheaded fir borer, gray pine mortality
Tahoe	Flatheaded fir borer
Lake Tahoe Basin	Aspen mortality
Golden Gate	Sudden oak death, flatheaded fir borer
Lassen Volcanic	Flatheaded fir borer
Point Reyes	Pitch canker, sudden oak death, flatheaded fir borer
Redwood	Bear
Sequoia-Kings	Unknown conifer mortality
Whiskeytown	N/A
Yosemite	Flatheaded fir borer, aspen mortality



## Number of Dead Trees by National Forest/Park

Unit	Bark Beetle				Other Agents					Unit
	Pine	Fir	Mix	Total	Pine	Fir	Mix	Hardwood	Total	Total*
Angeles	798	12	0	810	5	0	0	0	0	810
Cleveland	308	4	0	312	7	0	1	1,312	1,313	1,625
Eldorado*	5,434	68,660	3,833	77,927	23	0	0	5	5	77,932
Inyo	67,997	10,220	6,743	84,960	0	0	1	3	4	84,964
Klamath**	22,132	48,293	230,947	301,372	1,321	0	2,262	0	2,262	303,634
Lassen	39,986	345,389	240,554	625,929	0	0	101	0	101	626,030
Los Padres	5,234	137	12,111	17,482	791	13	17,731	149	17,893	35,375
Mendocino	6,639	83,834	35,318	125,791	2,131	0	2,962	0	2,962	128,753
Modoc**	202,114	78,074	95,854	376,042	6	0	222	0	222	376,264
Plumas	21,990	158,587	38,035	218,612	14	0	41	0	41	218,653
San Bernardino	5,022	139	6,005	11,166	0	0	3	27	30	11,196
Sequoia	17,917	123,123	50,203	191,243	3	0	9	2	11	191,254
Shasta-Trinity	64,086	65,473	44,038	173,597	1,803	0	3,169	739	3,908	177,505
Sierra	41,894	29,092	10,937	81,923	875	0	10	0	10	81,933
Six Rivers	899	18,193	1,505	20,597	718	0	10,855	6,581	17,436	38,033
Stanislaus	9,145	34,916	5,059	49,120	39	0	6	0	6	49,126
Tahoe	9,658	148,531	6,614	164,803	0	0	14	0	14	164,817
Lake Tahoe Basin*	2,885	12,042	110	15,037	0	0	0	7	7	15,044
<b>Total Forest Service</b>	<b>524,138</b>	<b>1,224,719</b>	<b>787,866</b>	<b>2,536,723</b>	<b>7,736</b>	<b>13</b>	<b>37,387</b>	<b>8,825</b>	<b>46,225</b>	<b>2,582,948</b>
Golden Gate	0	0	2	2	0	0	125	56	181	183
Lassen Volcanic	28,351	21,590	37,644	87,585	0	0	2	0	2	87,587
Point Reyes	6	0	0	6	2,227	0	15	0	2,242	2,248
Redwood	0	0	128	128	0	0	4,959	0	4,959	5,087
Sequoia-Kings	12,525	58,115	5,214	75,854	0	0	1	0	1	75,855
Whiskeytown	0	0	0	0	0	0	0	0	0	0
Yosemite	3,769	4,238	1,176	9,183	0	0	1	10	11	9,194
<b>Total Park Service</b>	<b>44,651</b>	<b>83,943</b>	<b>44,164</b>	<b>172,758</b>	<b>2,227</b>	<b>0</b>	<b>5,103</b>	<b>66</b>	<b>7,396</b>	<b>180,154</b>

\*Includes mortality mapped by Region 4

\*\*Includes mortality mapped by Region 6

Unit	Other Mortality-Causing Events/Agents:
Angeles	Gray pine mortality
Cleveland	Ca flathead, flatheaded fir & gold-spotted oak borer, high water, unknown live oak mortality
Eldorado	Ca flathead borer, unknown hardwood mortality
Inyo	Flatheaded fir borer, unknown hardwood mortality
Klamath	Ca flathead & flatheaded fir borer, POC disease, bear
Lassen	Flatheaded fir borer
Los Padres	Sudden oak death, Ca flathead & flatheaded fir borer, unknown hardwood and fir mortality
Mendocino	Ca flathead & flatheaded fir borer, gray pine mortality
Modoc	Juniper mortality, Ca flatheaded borer
Plumas	Ca flathead & flatheaded fir borer, herbicide
San Bernardino	Flatheaded fir borer, unknown oak mortality
Sequoia	Gray pine and hardwood mortality
Shasta-Trinity	Ca flathead & flatheaded fir borer, bear, high water, hardwood mortality
Sierra	Ca flathead & flatheaded fir borer
Six Rivers	Ca flathead & flatheaded fir borer, POC disease, bear, hardwood mortality
Stanislaus	Ca flathead & flatheaded fir borer, gray pine mortality
Tahoe	Flatheaded fir borer
Lake Tahoe Basin	Aspen mortality
Golden Gate	Sudden oak death, flatheaded fir borer
Lassen Volcanic	Flatheaded fir borer
Point Reyes	Pitch canker, sudden oak death, flatheaded fir borer
Redwood	Bear
Sequoia-Kings	Flatheaded fir borer
Whiskeytown	N/A
Yosemite	Flatheaded fir borer, aspen mortality

## Other Damage by National Forest/Park

Unit	Defoliation	Discoloration	Dieback	Topkill	Flagging	Breakage	Total
Angeles	30	0	0	1	38	0	69
Cleveland	0	0	0	12	0	0	12
Eldorado	7	19	0	4	0	0	30
Inyo	0	1	2	11	152	0	166
Klamath	0	160	0	2	4,683	38	4,883
Lassen	207	3,156	0	3,158	22,989	0	29,510
Los Padres	22	0	0	4	3	0	29
Mendocino	0	0	0	1,789	292	379	2,460
Modoc	0	1,164	66	1,527	0	0	2,757
Plumas	0	0	0	1,226	9,773	0	10,999
San Bernardino	263	0	0	126	0	0	389
Sequoia	0	0	0	266	8,643	0	8,909
Shasta-Trinity	0	1,189	14	37	2,459	241	3,940
Sierra	0	0	0	5	4,771	0	4,776
Six Rivers	0	103	0	708	61	0	872
Stanislaus	0	0	0	219	337	0	556
Tahoe	25	1	3	1,618	9,367	0	11,014
Tahoe Basin	0	0	37	20	0	0	57
<b>Total Forest Service</b>	<b>554</b>	<b>5,793</b>	<b>122</b>	<b>10,733</b>	<b>63,568</b>	<b>658</b>	<b>81,428</b>
Golden Gate	2	0	29	1	1	0	33
Lassen Volcanic	0	0	0	665	2,877	0	3,542
Point Reyes	0	0	0	8	699	0	707
Redwood	0	0	0	0	0	0	0
Sequoia-Kings	0	0	0	1	7,295	0	7,296
Whiskeytown	0	0	0	0	0	0	0
Yosemite	2,568	0	0	1	3,274	0	5,843
<b>Total Park Service</b>	<b>2,570</b>	<b>0</b>	<b>29</b>	<b>676</b>	<b>14,146</b>	<b>0</b>	<b>17,421</b>

Unit	Other Damage-Causing Events/Agents:
Angeles	Alder flea beetle, fir engraver, hardwood flagging
Cleveland	Ips
Eldorado	Discoloration of hardwoods, pine defoliation, fir engraver
Inyo	Cytospora, Ips, aspen decline, hardwood discoloration
Klamath	Fir, pine & Doug-fir engraver, Cytospora, discoloration of Doug-fir & hardwoods, wind
Lassen	Aspen & pine defoliation, Cytospora, fir engraver, pine discoloration
Los Padres	Anthraxnose, Ips, live oak flagging
Mendocino	Fir engraver, Ips, landslide, Cytospora
Modoc	Pine discoloration, aspen decline, fir & pine engraver
Plumas	Cytospora, pine & fir engraver,
San Bernardino	Alder flea beetle, Ips, Tussock moth
Sequoia	Cytospora, fir engraver
Shasta-Trinity	Cytospora, wind, Diploidia, pine & fir engraver, pine discoloration, lodgepole decline
Sierra	Cytospora, Ips
Six Rivers	Animal damage, fir & Doug-fir engraver, pine discoloration, Cytospora
Stanislaus	Cytospora, fir & pine engraver
Tahoe	Lodgepole defoliation, Cytospora, fir engraver, aspen decline, sugar pine discoloration
Lake Tahoe Basin	aspen decline, fir engraver
Golden Gate	Twig beetles, Doug-fir engraver, Doug-fir defoliation
Lassen Volcanic	Cytospora, fir & pine engraver
Point Reyes	Doug-fir engraver, pitch canker
Redwood	N/A
Sequoia-Kings	Pine engraver, white pine blister rust, Cytospora
Whiskeytown	N/A
Yosemite	Lodgepole needleminer, Cytospora, pine engraver



## Acres with Mortality by County

County	Bark Beetle				Other Agents					County
	Pine	Fir	Mix	Total	Pine	Fir	Mix	Hardwood	Total	Total
Alameda	4	0	0	4	0	0	0	1	1	5
Alpine*	955	2,601	42	3,598	0	0	0	0	0	3,598
Amador	309	3,700	209	4,218	4	0	1	1	6	4,224
Butte	839	6,884	383	8,106	10	0	50	8	68	8,174
Calaveras	224	1,805	1,019	3,048	6	0	0	1	7	3,055
Colusa	11	95	17	123	222	0	1	6	229	352
Contra Costa	1	0	0	1	0	0	0	25	25	26
Del Norte**	18	1,171	66	1,255	162	0	4,488	452	5,102	6,357
El Dorado*	2,172	21,353	780	24,305	9	0	0	20	29	24,334
Fresno	8,110	13,969	2,223	24,302	21	0	1	0	22	24,324
Glenn	696	3,569	873	5,138	387	0	15	2	404	5,542
Humboldt	33	1,346	291	1,670	38	0	8,007	275	8,320	9,990
Inyo	1,563	93	58	1,714	0	0	0	1	1	1,715
Kern	4,019	5,633	2,310	11,962	2	0	11	226	239	12,201
Kings	1	0	0	1	0	0	0	0	0	1
Lake	162	1,228	46	1,436	261	0	77	8	346	1,782
Lassen*	7,752	35,736	31,264	74,752	4	0	68	0	72	74,824
Los Angeles	256	5	0	261	2	0	0	1	3	264
Madera	1,236	6,525	143	7,904	7	0	2	0	9	7,913
Marin	3	0	1	4	648	0	34	279	961	965
Mariposa	3,057	3,293	450	6,800	128	0	3	4	135	6,935
Mendocino	278	4,159	2,127	6,564	138	0	970	230	1,338	7,902
Merced	0	0	0	0	0	0	0	0	0	0
Modoc**	13,124	15,449	13,721	42,294	4	0	1	0	5	42,299
Mono*	7,049	2,322	125	9,496	0	0	0	1	1	9,497
Monterey	10	0	0	10	10	4	5	254	273	283
Napa	23	0	0	23	51	0	12	32	95	118
Nevada*	1,250	10,211	1,008	12,469	0	0	2	55	57	12,526
Orange	1	0	0	1	0	0	0	4	4	5
Placer*	2,368	31,484	1,704	35,556	3	0	1	0	4	35,560
Plumas	4,639	60,986	15,023	80,648	0	0	20	0	20	80,668
Riverside	158	11	136	305	0	0	0	80	80	385
San Benito	10	0	0	10	3	0	0	2	5	15
San Bernardino	2,346	55	1,105	3,506	0	0	1	7	8	3,514
San Diego	51	2	0	53	3	0	1	996	1,000	1,053
San Luis Obispo	31	0	1	32	33	13	0	46	92	124
San Mateo	1	0	3	4	3	0	4	152	159	163
Santa Barbara	44	0	1,317	1,361	80	0	2,311	104	2,495	3,856
Santa Clara	17	0	0	17	1	0	3	26	30	47
Santa Cruz	5	0	0	5	9	0	7	23	39	44
Shasta	6,481	42,772	28,786	78,039	24	0	63	2	89	78,128
Sierra*	1,607	27,914	944	30,465	0	0	9	0	9	30,474
Siskiyou**	15,962	25,054	26,550	67,566	870	0	1,149	0	2,019	69,585
Solano	0	0	0	0	0	0	0	0	0	0
Sonoma	5	0	0	5	16	0	26	484	526	531
Stanislaus	0	0	0	0	3	0	0	0	3	3
Tehama	1,994	17,282	4,692	23,968	53	0	41	0	94	24,062
Trinity	1,135	8,117	5,134	14,386	152	0	615	67	834	15,220
Tulare	7,694	60,934	15,294	83,922	0	0	0	1	1	83,923
Tuolumne	2,271	7,448	1,850	11,569	25	0	5	2	32	11,601
Ventura	649	0	0	649	467	0	158	6	631	1,280
Yolo	0	0	0	0	30	0	0	1	31	31
Yuba	56	35	43	134	0	0	5	0	5	139
<b>Total</b>	<b>100,680</b>	<b>423,241</b>	<b>159,738</b>	<b>683,659</b>	<b>3,889</b>	<b>17</b>	<b>18,167</b>	<b>3,885</b>	<b>25,958</b>	<b>709,617</b>

\* Includes acreage mapped by Region 4

\*\* Includes acreage mapped by Region 6

## Estimated Number of Dead Trees by County

County	Bark Beetle				Other Agents					County
	Pine	Fir	Mix	Total	Pine	Fir	Mix	Hardwood	Total	Total
Alameda	7	0	0	7	0	0	0	2	2	9
Alpine*	1,551	6,783	83	8,417	0	0	0	0	0	8,417
Amador	573	5,734	819	7,126	6	0	11	2	19	7,145
Butte	3,229	22,387	1,097	26,713	14	0	3	11	28	26,741
Calaveras	680	5,417	2,004	8,101	8	0	0	1	9	8,110
Colusa	75	417	20	512	362	0	2	8	372	884
Contra Costa	1	0	0	1	0	0	0	13	13	14
Del Norte**	15	4,592	948	5,555	658	0	12,748	6,529	19,935	25,490
El Dorado*	7,225	44,389	1,752	53,366	27	0	0	20	47	53,413
Fresno	40,548	28,279	13,342	82,169	17	0	2	0	19	82,188
Glenn	2,477	21,809	3,500	27,786	1,193	0	27	20	1,240	29,026
Humboldt	45	8,897	405	9,347	142	0	23,669	838	24,649	33,996
Inyo	12,727	577	266	13,570	0	0	0	3	3	13,573
Kern	19,798	36,614	22,637	79,049	8	0	17	244	269	79,318
Kings	2	0	0	2	0	0	0	0	0	2
Lake	381	3,271	144	3,796	490	0	189	14	693	4,489
Lassen*	81,248	185,434	184,291	450,973	6	0	254	0	260	451,233
Los Angeles	669	8	0	677	9	0	0	2	11	688
Madera	4,496	9,627	421	14,544	16	0	10	0	26	14,570
Marin	8	0	2	10	2,230	0	134	680	3,044	3,054
Mariposa	12,928	3,763	729	17,420	957	0	8	7	972	18,392
Mendocino	1,625	22,336	8,535	32,496	263	0	3,610	578	4,451	36,947
Merced	0	0	0	0	0	0	0	0	0	0
Modoc**	130,878	104,578	71,350	306,806	6	0	1	0	7	306,813
Mono*	54,891	3,183	412	58,486	0	0	0	4	4	58,490
Monterey	33	0	0	33	21	18	10	273	322	355
Napa	48	0	0	48	96	0	27	51	174	222
Nevada*	2,193	25,225	1,992	29,410	0	0	3	61	64	29,474
Orange	1	0	0	1	0	0	0	5	5	6
Placer*	4,476	81,740	3,597	89,813	5	0	1	0	6	89,819
Plumas	23,033	201,191	47,886	272,110	0	0	31	0	31	272,141
Riverside	507	25	196	728	0	0	0	70	70	798
San Benito	7	0	0	7	9	0	0	3	12	19
San Bernardino	4,814	119	5,769	10,702	0	0	2	17	19	10,721
San Diego	140	5	0	145	8	0	1	1,774	1,783	1,928
San Luis Obispo	53	0	2	55	49	52	0	114	215	270
San Mateo	4	0	4	8	6	0	18	228	252	260
Santa Barbara	133	0	10,989	11,122	50	0	17,211	85	17,346	28,468
Santa Clara	34	0	0	34	2	0	6	45	53	87
Santa Cruz	11	0	0	11	16	0	12	36	64	75
Shasta	46,832	226,672	146,998	420,502	31	0	104	17	152	420,654
Sierra*	5,245	85,917	2,325	93,487	0	0	15	0	15	93,502
Siskiyou**	90,783	78,503	246,329	415,615	0	0	3,598	0	3,598	419,213
Solano	0	0	0	0	0	0	0	0	0	0
Sonoma	8	0	0	8	33	0	47	740	820	828
Stanislaus	0	0	0	0	5	0	0	0	5	5
Tehama	17,007	77,147	29,652	123,806	446	0	124	0	570	124,376
Trinity	3,550	47,973	32,393	83,916	533	0	3,673	729	4,935	88,851
Tulare	13,483	175,311	44,913	233,707	0	0	0	1	1	233,708
Tuolumne	8,504	27,039	3,497	39,040	42	0	7	11	60	39,100
Ventura	894	0	0	894	740	0	476	10	1,226	2,120
Yolo	0	0	0	0	55	0	0	2	57	57
Yuba	133	77	43	253	0	0	11	0	11	264
<b>Total</b>	<b>598,003</b>	<b>1,545,039</b>	<b>889,342</b>	<b>3,032,384</b>	<b>8,559</b>	<b>70</b>	<b>66,062</b>	<b>13,248</b>	<b>87,939</b>	<b>3,120,323</b>

\* Includes acreage mapped by Region 4

\*\* Includes acreage mapped by Region 6

## Other Mortality-Causing Events by County

County	Agents
Alameda	Sudden oak death
Alpine	N/A
Amador	Gray pine & oak mortality, flatheaded fir borer, drought
Butte	Ca flatheaded & fir borer, herbicide, madrone & hardwood mortality
Calaveras	Gray pine & hardwood mortality
Colusa	Gray pine & oak mortality, Ca flatheaded & fir borer
Contra Costa	Sudden oak death
Del Norte	Ca flatheaded & fir borer, bear, POC disease, oak mortality
El Dorado	Gray pine, oak & madrone mortality, Ca flatheaded borer
Fresno	Gray pine mortality, Ca flatheaded & fir borer,
Glenn	Gray pine & live oak mortality, Ca flatheaded & fir borer,
Humboldt	Ca flatheaded & fir borer, POC disease, bear, sudden oak death, hardwood mortality
Inyo	Oak mortality
Kern	Gray pine & oak mortality, flatheaded fir borer
Kings	N/A
Lake	Gray pine & hardwood mortality, Ca flatheaded & fir borer, sudden oak death
Lassen	Ca flatheaded & fir borer, juniper mortality
Los Angeles	Gray pine & live oak mortality
Madera	Gray pine mortality, Ca flatheaded & fir borer,
Marin	Pitch canker, flatheaded fir borer, sudden oak death, hardwood mortality
Mariposa	Gray pine & live oak mortality, Ca flatheaded & fir borer,
Mendocino	Gray pine & hardwood mortality, Ca flatheaded & fir borer, bear, sudden oak death, herbicide
Merced	N/A
Modoc	Ca flatheaded borer, juniper mortality
Mono	Hardwood mortality
Monterey	Gray pine & hardwood mortality, Ca flatheaded & fir borer, sudden oak death
Napa	Gray pine & hardwood mortality, Ca flatheaded & fir borer, sudden oak death
Nevada	Flatheaded fir borer, madrone mortality
Orange	Live oak mortality
Placer	Gray pine mortality, flatheaded fir borer
Plumas	Flatheaded fir borer
Riverside	Oak mortality
San Benito	Gray pine & live oak mortality
San Bernardino	Flatheaded fir borer, oak mortality
San Diego	Ca flatheaded, fir & gold-spotted oak borer, high water, hardwood mortality
San Luis Obispo	Gray pine & hardwood mortality, Ca flatheaded borer
San Mateo	Ca flatheaded & fir borer, sudden oak death, hardwood mortality
Santa Barbara	Gray pine & hardwood mortality, Ca flatheaded & fir borer
Santa Clara	Gray pine & oak mortality, flatheaded fir borer, sudden oak death
Santa Cruz	Ca flatheaded & fir borer, sudden oak death, hardwood mortality
Shasta	Gray pine & oak mortality, Ca flatheaded & fir borer, high water
Sierra	Flatheaded fir borer
Siskiyou	Ca flatheaded & fir borer, POC disease, bear, high water, juniper mortality
Solano	N/A
Sonoma	Gray pine & hardwood mortality, Ca flatheaded & fir borer, sudden oak death
Stanislaus	Gray pine mortality
Tehama	Gray pine mortality, Ca flatheaded & fir borer, bear
Trinity	Gray pine & hardwood mortality, Ca flatheaded & fir borer, bear
Tulare	Black oak mortality
Tuolumne	Gray pine, juniper & hardwood mortality, Ca flatheaded & fir borer
Ventura	Ca flatheaded & fir borer, hardwood mortality
Yolo	Gray pine & oak mortality, Ca flatheaded borer
Yuba	Flatheaded fir borer



## Other Damage by County

County	Defoliation	Discoloration	Dieback	Topkill	Breakage***	Flagging	Total
Alameda	0	0	0	0	0	0	0
Alpine*	0	0	13	211	0	31	255
Amador	0	0	0	2	0	6	8
Butte	0	1	0	1	0	4295	4,297
Calaveras	0	0	0	12	0	0	12
Colusa	0	0	0	1	0	1	2
Contra Costa	0	0	0	0	0	0	0
Del Norte**	0	164	0	261	0	262	687
El Dorado*	16	19	0	4	0	0	39
Fresno	0	0	0	103	0	3923	4,026
Glenn	0	0	0	153	0	0	153
Humboldt	20	24	0	347	83	68	542
Inyo	0	0	2	0	0	1	3
Kern	10	0	0	3013	0	0	3,023
Kings	0	0	0	0	0	0	0
Lake	0	0	0	6	0	264	270
Lassen*	523	25	124	2436	0	0	3,108
Los Angeles	30	0	0	0	0	38	68
Madera	1,091	0	0	4	0	1,376	2,471
Marin	313	194	29	8	0	701	1,245
Mariposa	1,136	0	0	1	0	2,811	3,948
Mendocino	157	26	0	366	0	6	555
Merced	0	0	0	0	0	0	0
Modoc**	0	0	54	1,527	0	0	1,581
Mono*	9,611	1	1,192	10	0	21	10,835
Monterey	8	0	0	1	0	3	12
Napa	0	0	0	0	0	0	0
Nevada	0	0	3	1	0	747	751
Orange	0	0	0	0	0	0	0
Placer	0	4	0	58	0	44	106
Plumas	0	114	7	1,422	0	13,963	15,506
Riverside	8	0	0	1	0	0	9
San Benito	0	0	0	1	0	0	1
San Bernardino	254	0	0	125	0	37	416
San Diego	3	0	0	13	0	15	31
San Luis Obispo	95	0	0	1	0	1	97
San Mateo	0	1	0	3	0	1	5
Santa Barbara	0	0	0	0	0	0	0
Santa Clara	0	13	0	1	0	1	15
Santa Cruz	0	0	0	1	0	0	1
Shasta	0	121	0	2,471	0	20,311	22,903
Sierra*	25	1	0	1,655	0	8,935	10,616
Siskiyou**	0	2,146	14	32	301	7,495	9,988
Solano	0	0	0	0	0	0	0
Sonoma	70	1	0	13	0	1	85
Stanislaus	0	0	0	0	0	0	0
Tehama	0	0	0	65	380	6,135	6,580
Trinity	0	0	0	1,492	0	406	1,898
Tulare	0	0	0	137	0	15,543	15,680
Tuolumne	337	0	0	3	0	725	1,065
Ventura	0	0	0	0	0	0	0
Yolo	0	0	0	0	0	0	0
Yuba	0	8	0	0	0	0	8
<b>Total</b>	<b>13,707</b>	<b>2,863</b>	<b>1,438</b>	<b>15,962</b>	<b>764</b>	<b>88,167</b>	<b>122,901</b>

\* Includes acreage mapped by Region 4

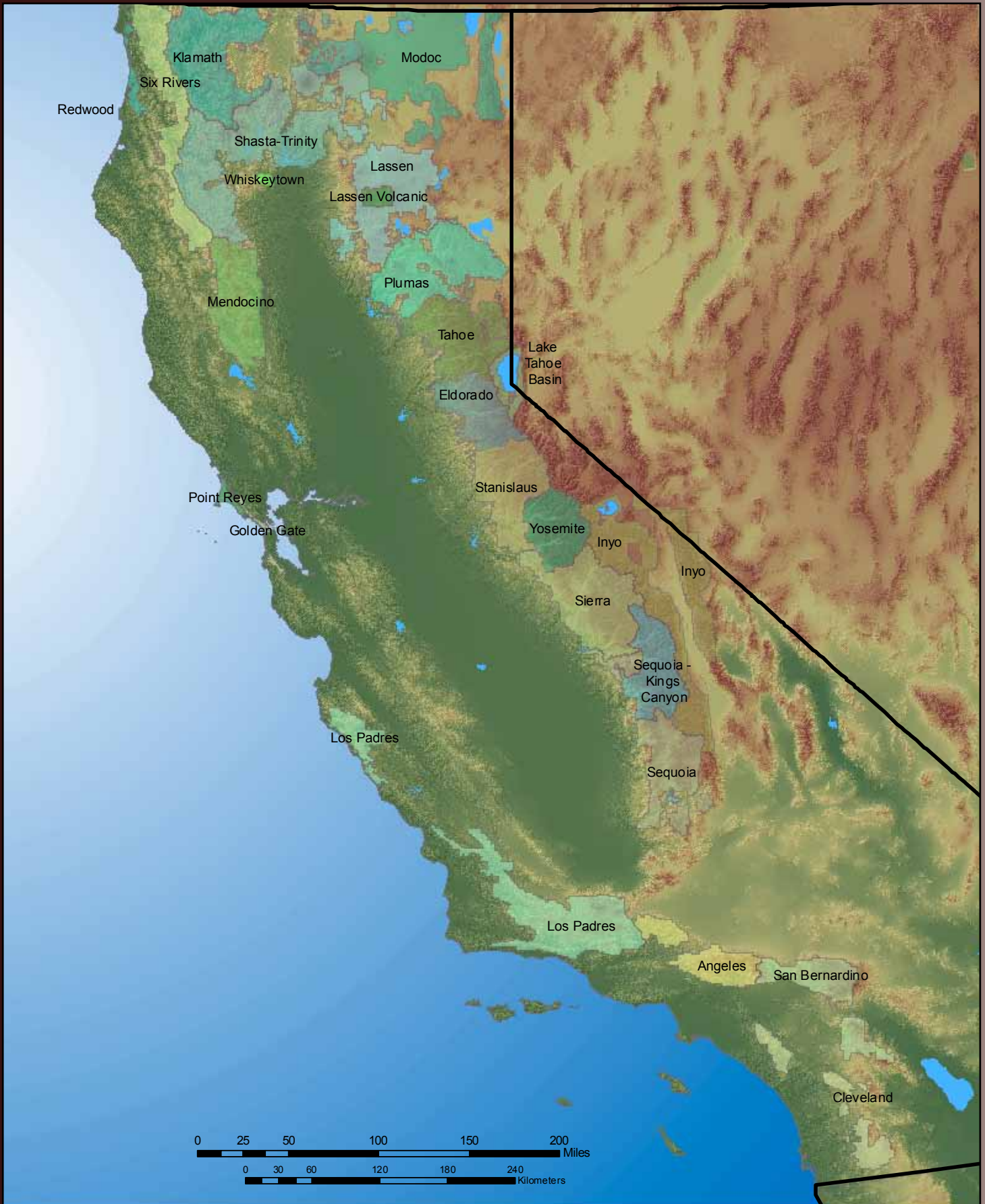
\*\*\* Includes broken limbs, broken main stems and uprooting

\*\* Includes acreage mapped by Region 6

## Other Damage-Causing Events by County

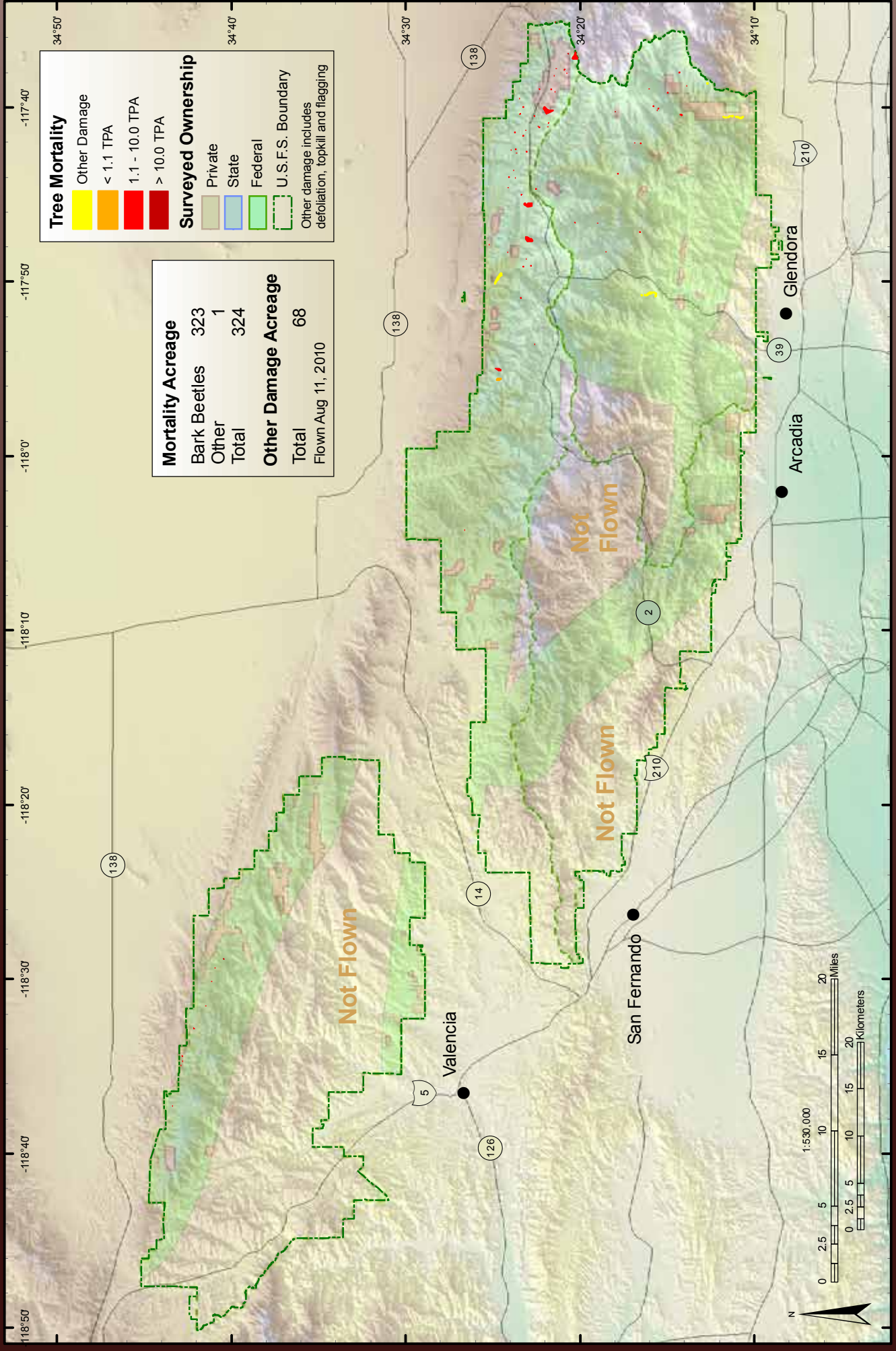
<b>County</b>	<b>Agents</b>
Alameda	N/A
Alpine	Mt mahogany dieback, pine & fir engraver, Cytospora
Amador	Fir engraver, hardwood flagging
Butte	Tanoak discoloration, fir engraver, Cytospora
Calaveras	Fir & pine engraver
Colusa	Ips
Contra Costa	N/A
Del Norte	Spruce aphid, tanoak & pine discoloration, fir engraver, animal damage, Cytospora
El Dorado	Hardwood defoliation/discoloration, pine needlecast, fir engraver
Fresno	Pine & fir engraver, Cytospora
Glenn	Fir engraver
Humboldt	Pine & fir defol/discoloration, fir & doug fir engraver, animal damage, Cytospora, hardwood flagging, wind
Inyo	Aspen decline, Cytospora
Kern	Pine needlecast, pine & fir engraver,
Kings	N/A
Lake	Fir & pine engraver, Ips, Cytospora
Lassen	Aspen defoliation, pine needlecast/discoloration, mistletoe, Mt mahogany dieback, aspen decline, fir engraver
Los Angeles	Alder flea beetle, hardwood flagging
Madera	Lodgepole defoliation, pine engraver, Cytospora
Marin	Oak & madrone defoliation/discoloration, twig beetles, Doug fir engraver, pitch canker
Mariposa	Lodgepole needleminer, pine engraver, Ips, Cytospora
Mendocino	Pine needlecast, redwood & pine discoloration, pine, fir, & Doug-fir engraver, animal damage, pitch canker
Merced	N/A
Modoc	Aspen decline, fir & pine engraver
Mono	Pinyon needle scale, hardwood discoloration, Mt mahogany dieback, pine engraver, Ips
Monterey	Anthracoze, pine & fir engraver, Ips, live oak flagging,
Napa	N/A
Nevada	Aspen decline, cedar bark beetle, Cytospora
Orange	N/A
Placer	Black oak discoloration, fir engraver, Cytospora
Plumas	Lodgepole discoloration, Mt. mahogany dieback, fir & pine engraver, Cytospora
Riverside	Blue oak defoliation, pine engraver
San Benito	Pine engraver
San Bernardino	Alder flea beetle, Doug-fir tussock moth, fir & pine engraver, live oak flagging
San Diego	Pine engraver, live oak flagging
San Luis Obispo	Anthracoze, pine & fir engraver, oak & cypress flagging
San Mateo	Redwood discoloration, cedar bark beetle, Doug-fir engraver, Douglas-fir flagging
Santa Barbara	N/A
Santa Clara	Madrone discoloration, doug-fir engraver, pine flagging
Santa Cruz	Doug-fir engraver
Shasta	Lodgepole discoloration, fir & pine engraver, Cytospora, Diplodia, Ips
Sierra	Lodgepole defoliation, sugar pine discoloration, fir engraver, Cytospora
Siskiyou	Pine & Doug-fir discoloration, lodgepole dieback, pine, Doug-fir & fir engraver, Cytospora, Diplodia, wind
Solano	N/A
Sonoma	Hardwood defoliation, redwood discoloration, pine & Doug-fir engraver, animal damage
Stanislaus	N/A
Tehama	Fir & pine engraver, Cytospora, landslide
Trinity	Fir, Doug-fir & pine engraver, Cytospora
Tulare	Fir & pine engraver, Ips, Cytospora, white pine blister rust
Tuolumne	Fir & pine engraver, Ips, Cytospora
Ventura	N/A
Yolo	N/A
Yuba	Hardwood discoloration

# Aerial Survey Results by National Forests and Parks



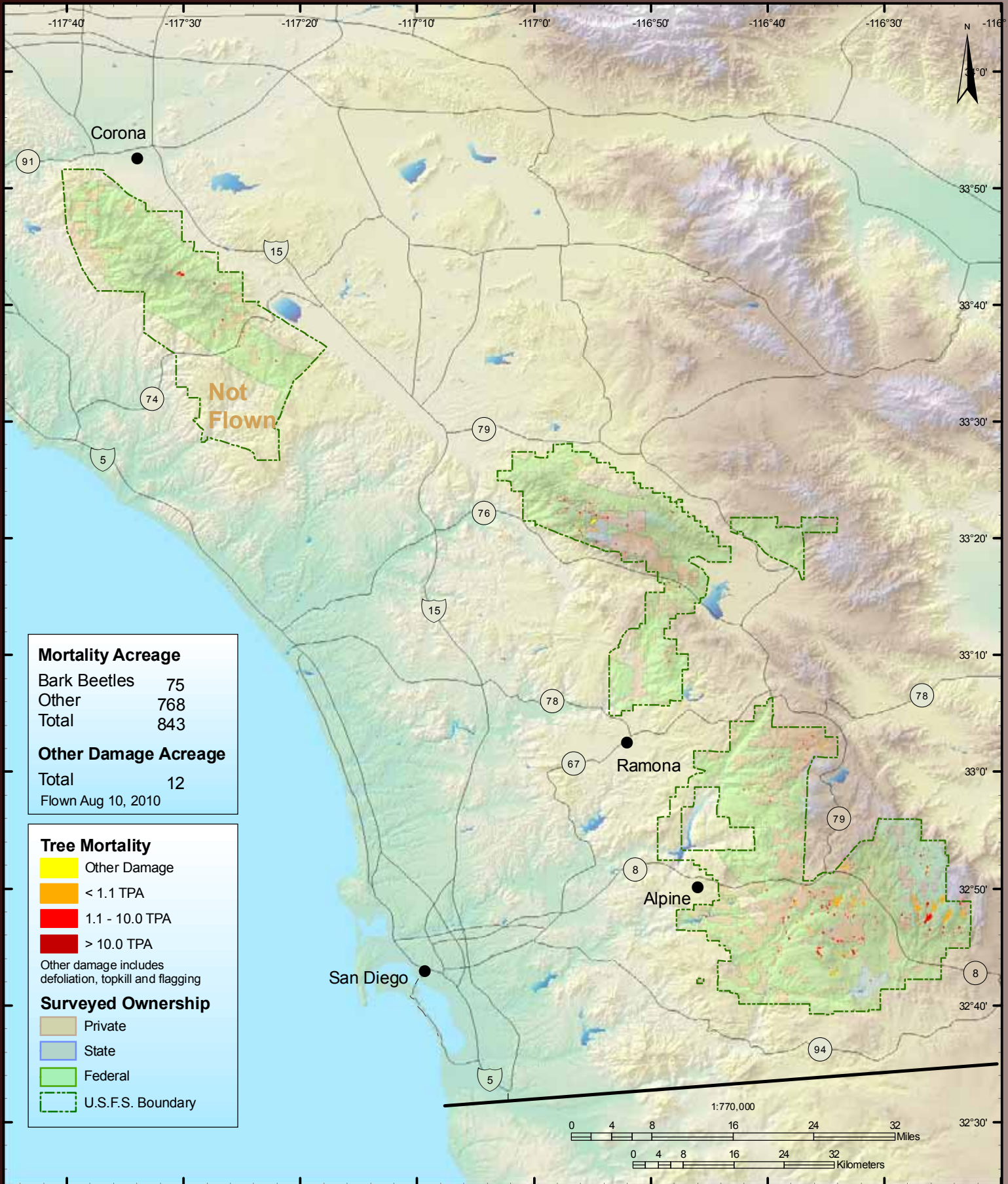


# Angeles National Forest



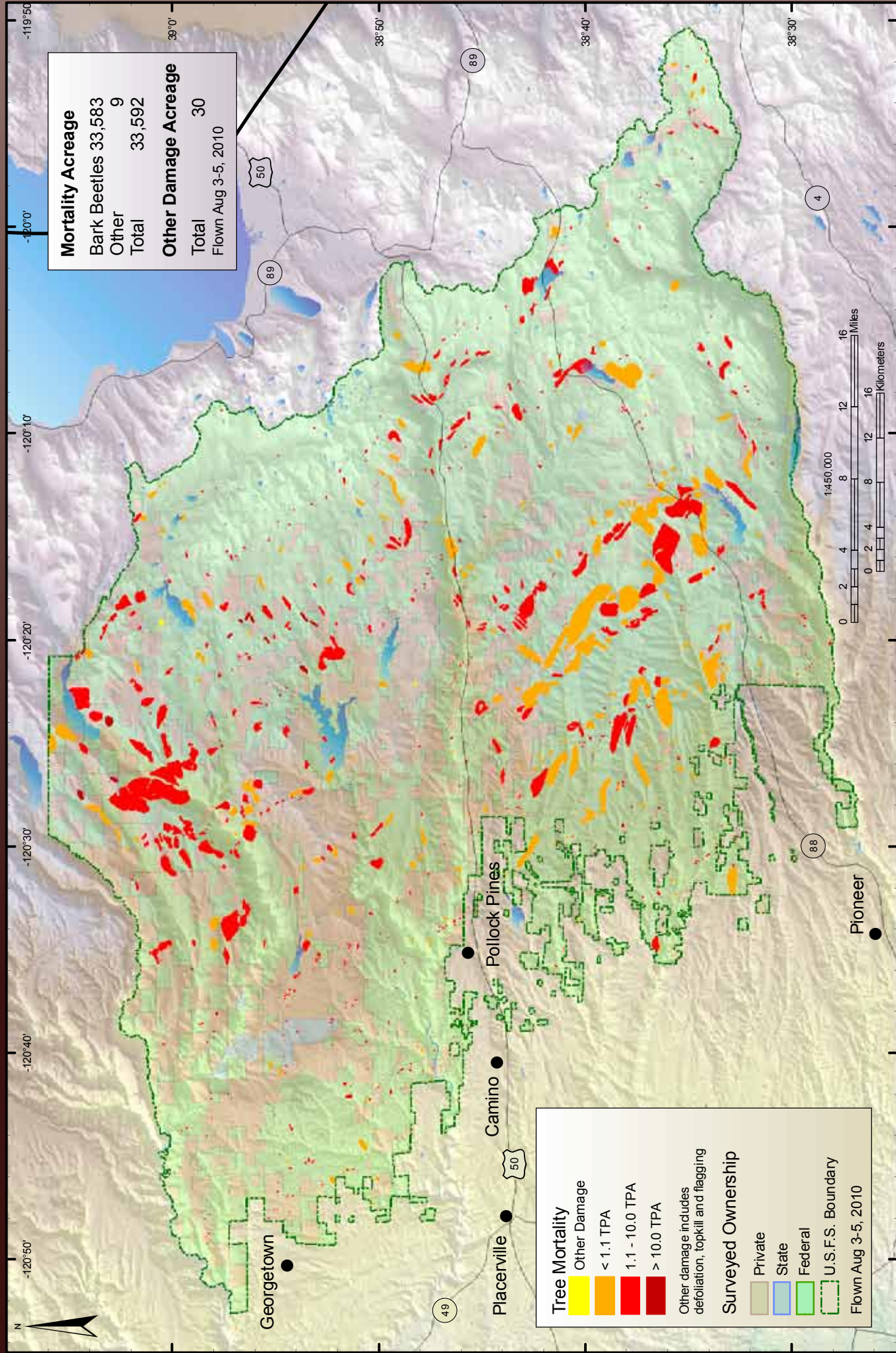


# Cleveland National Forest



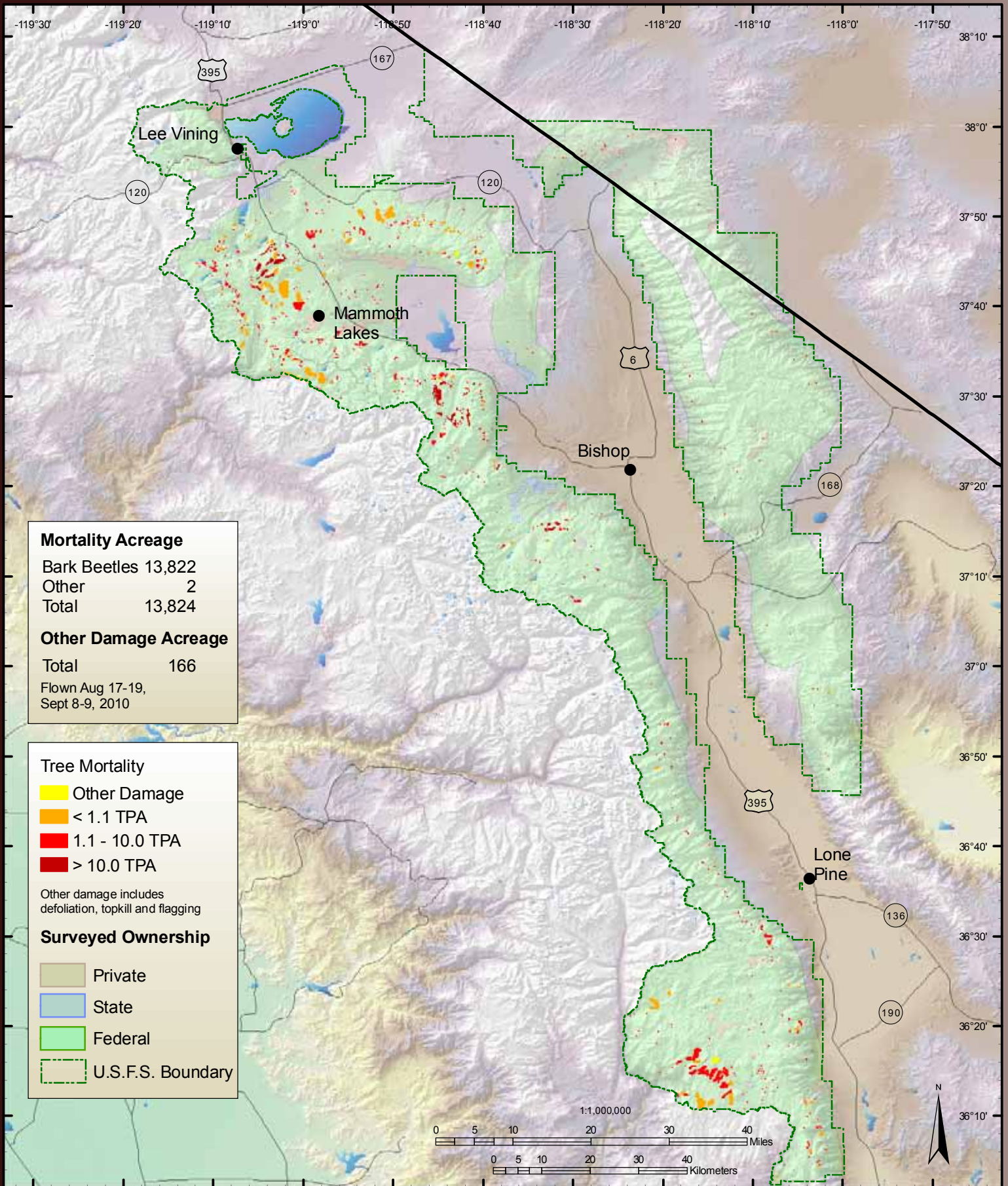


# Eldorado National Forest



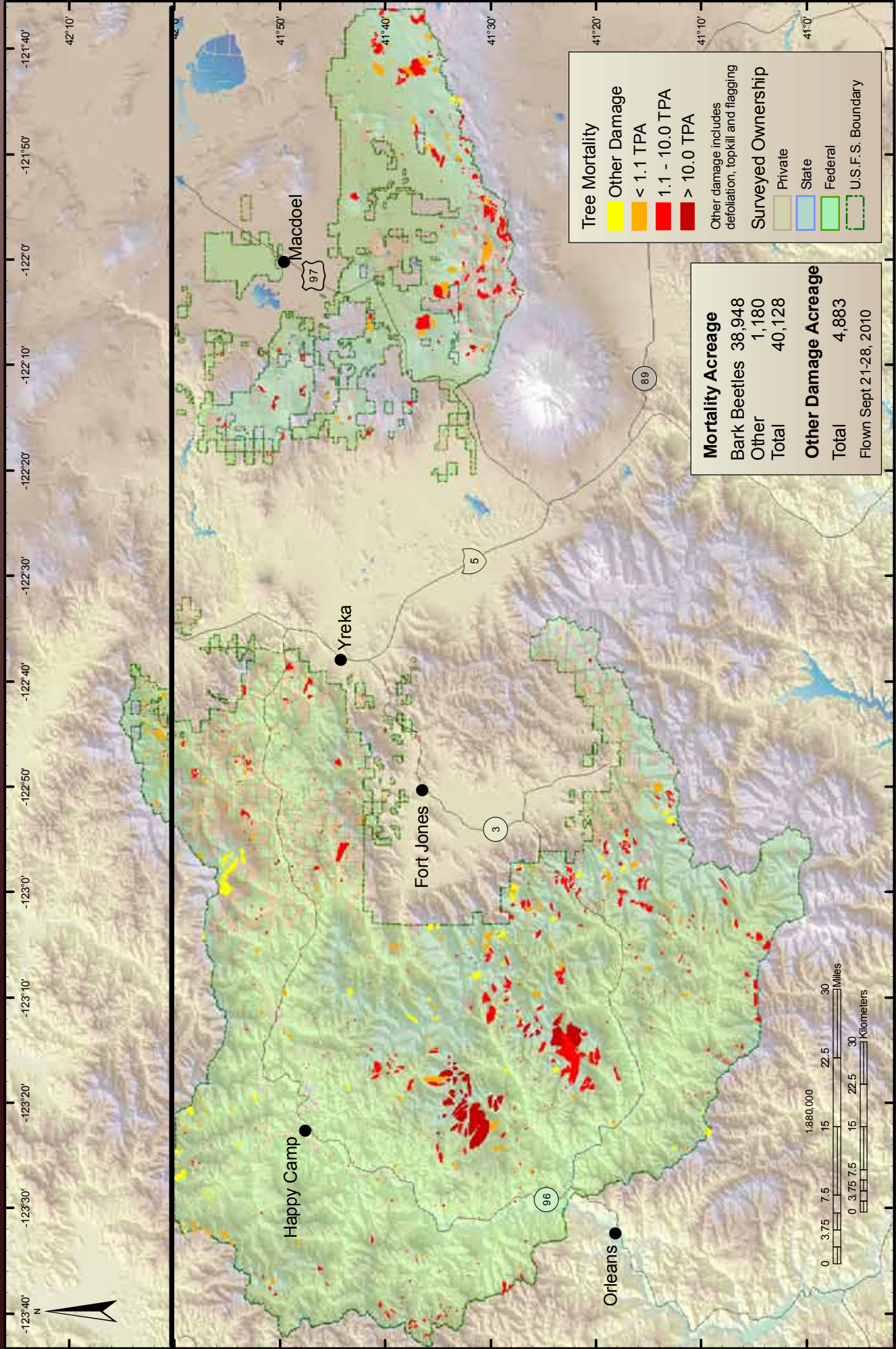


# Inyo National Forest



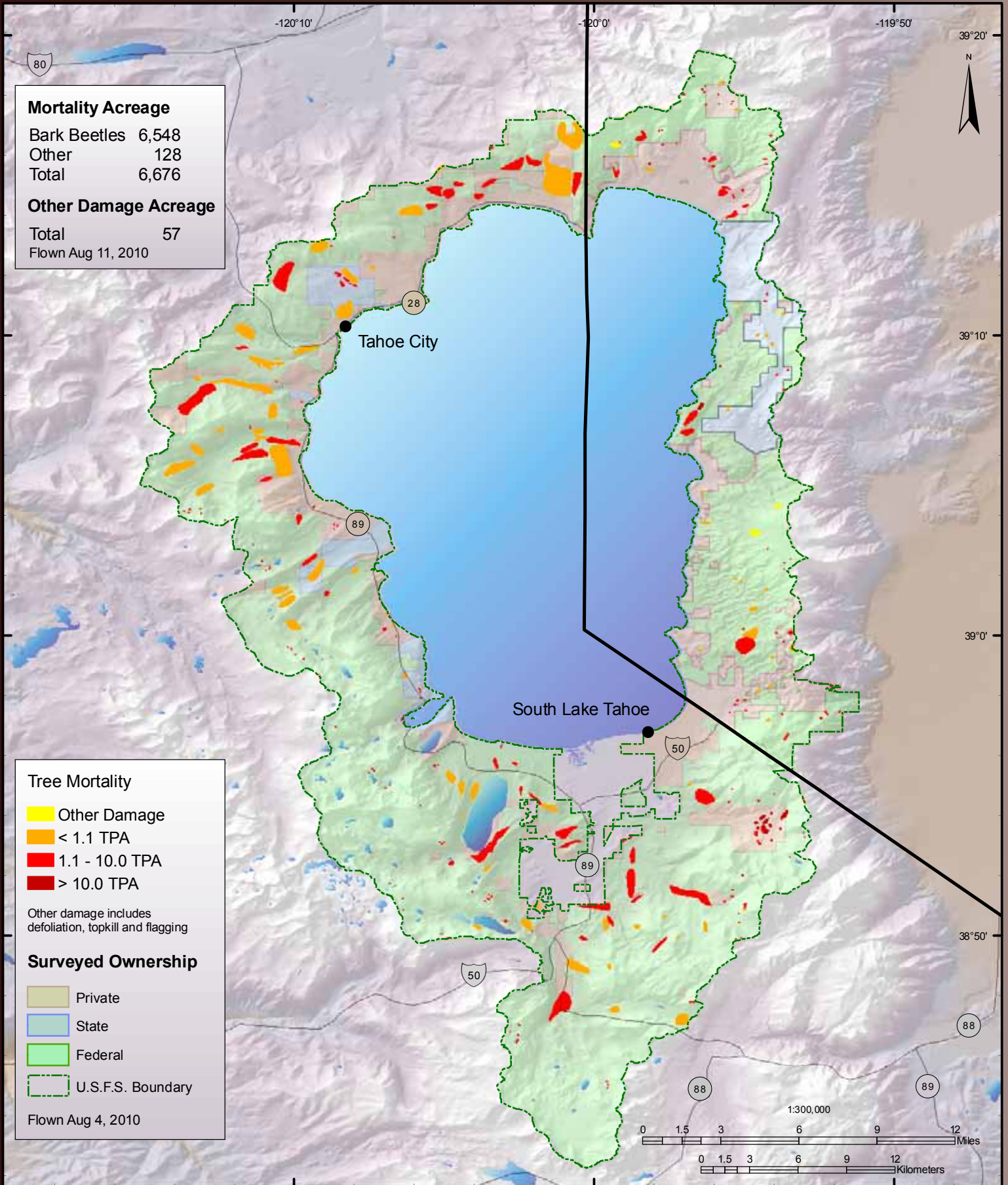


# Klamath National Forest



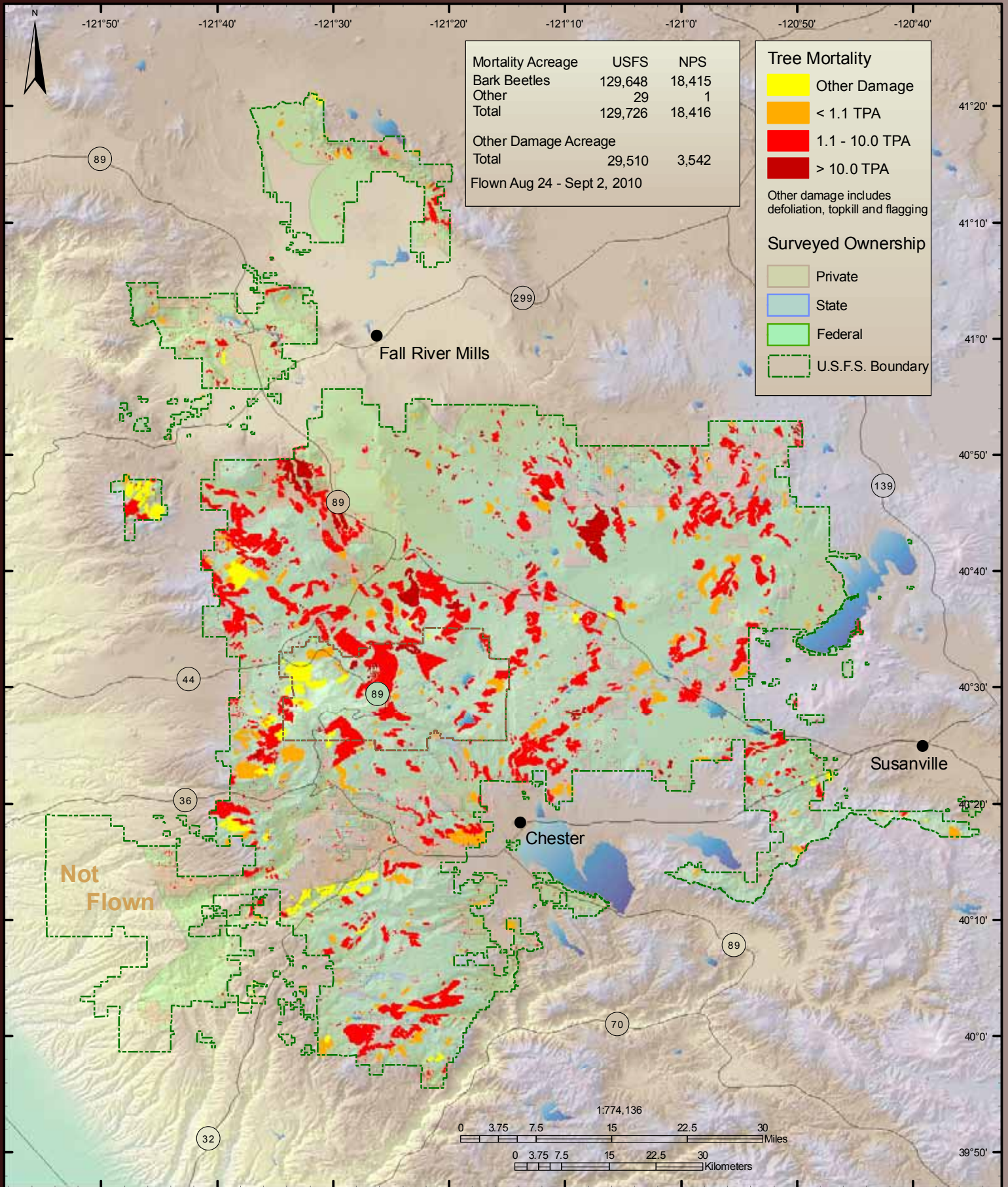


# Lake Tahoe Basin Management Unit



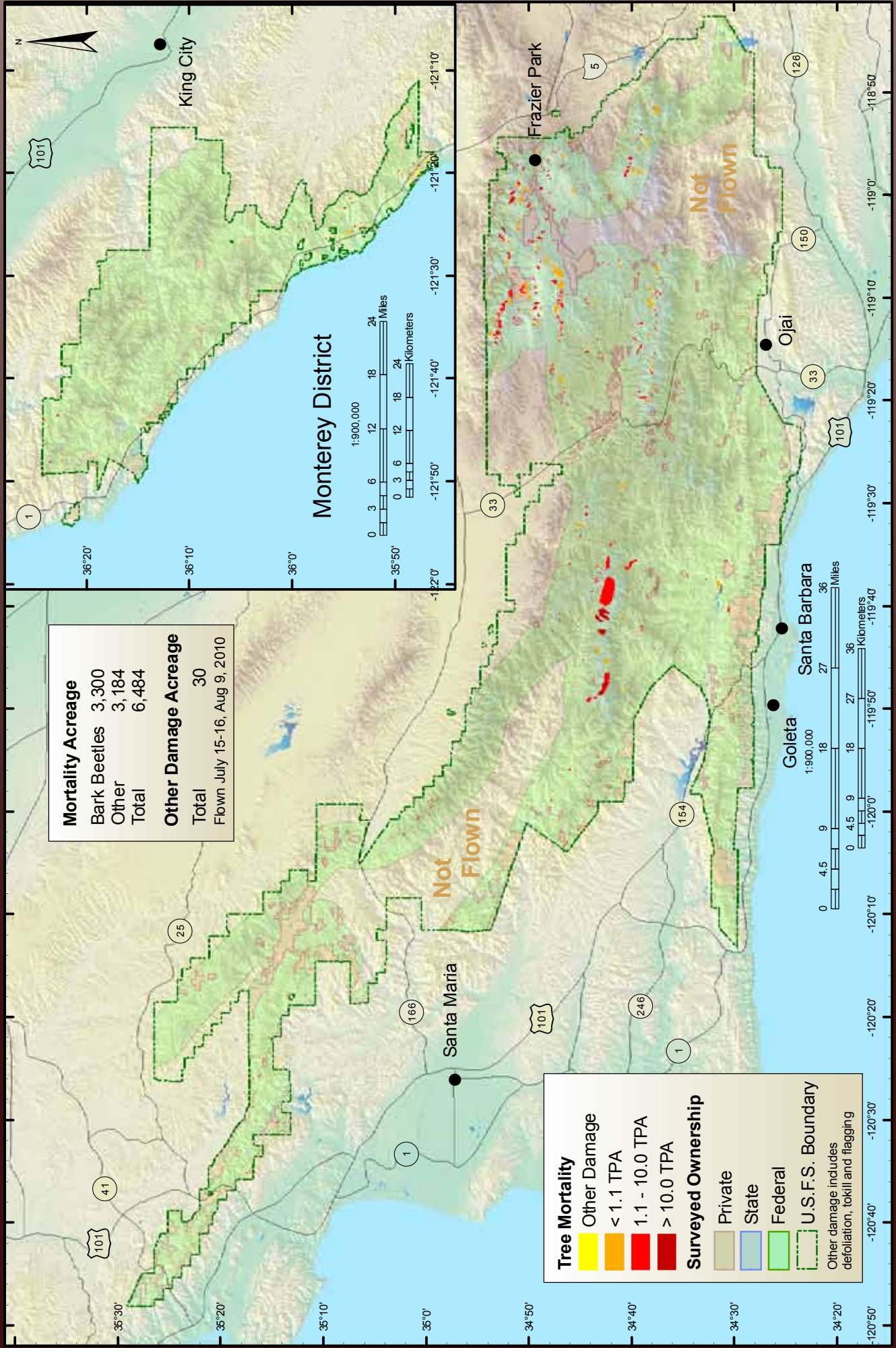


# Lassen National Forest & Lassen National Park



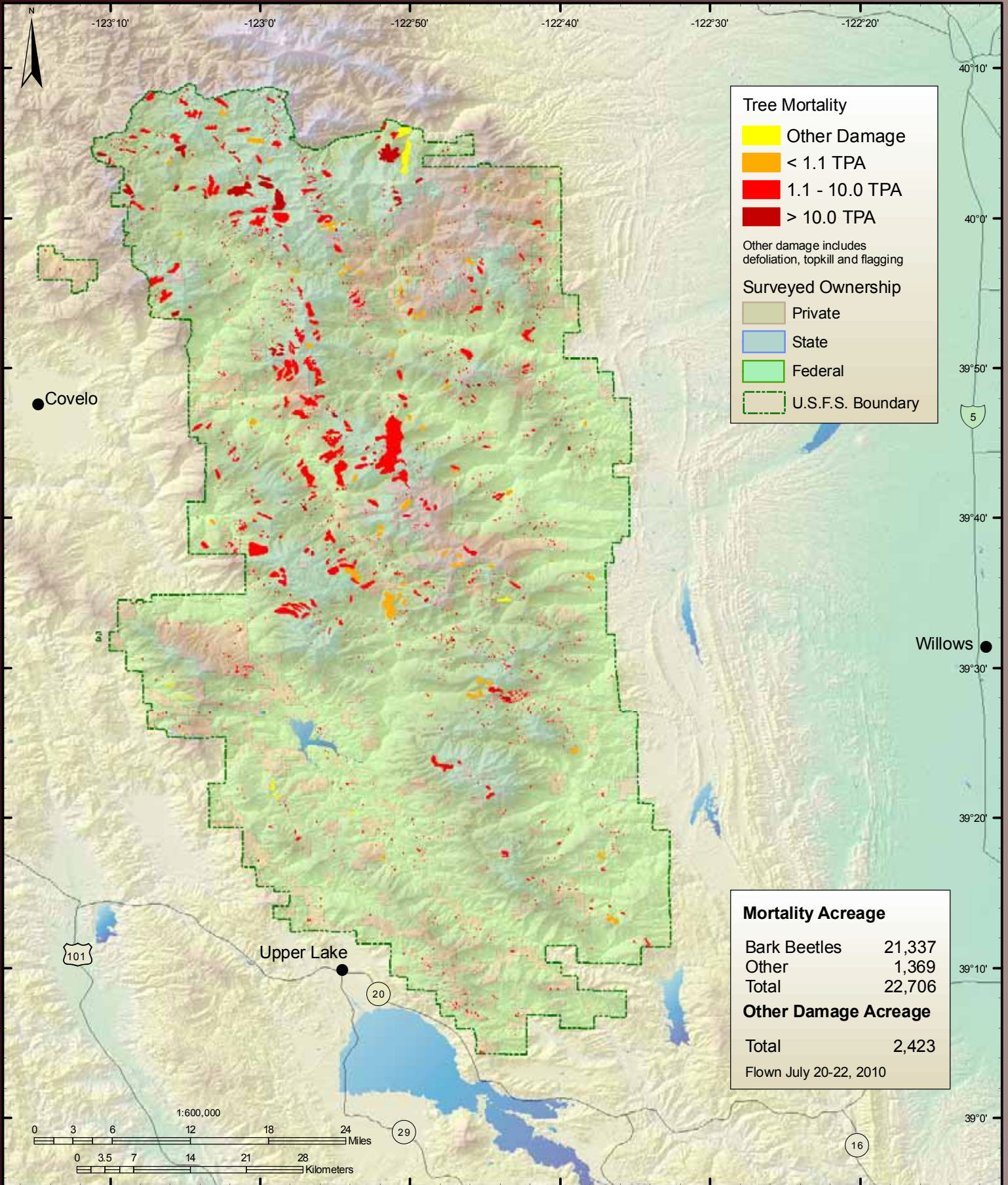


# Los Padres National Forest



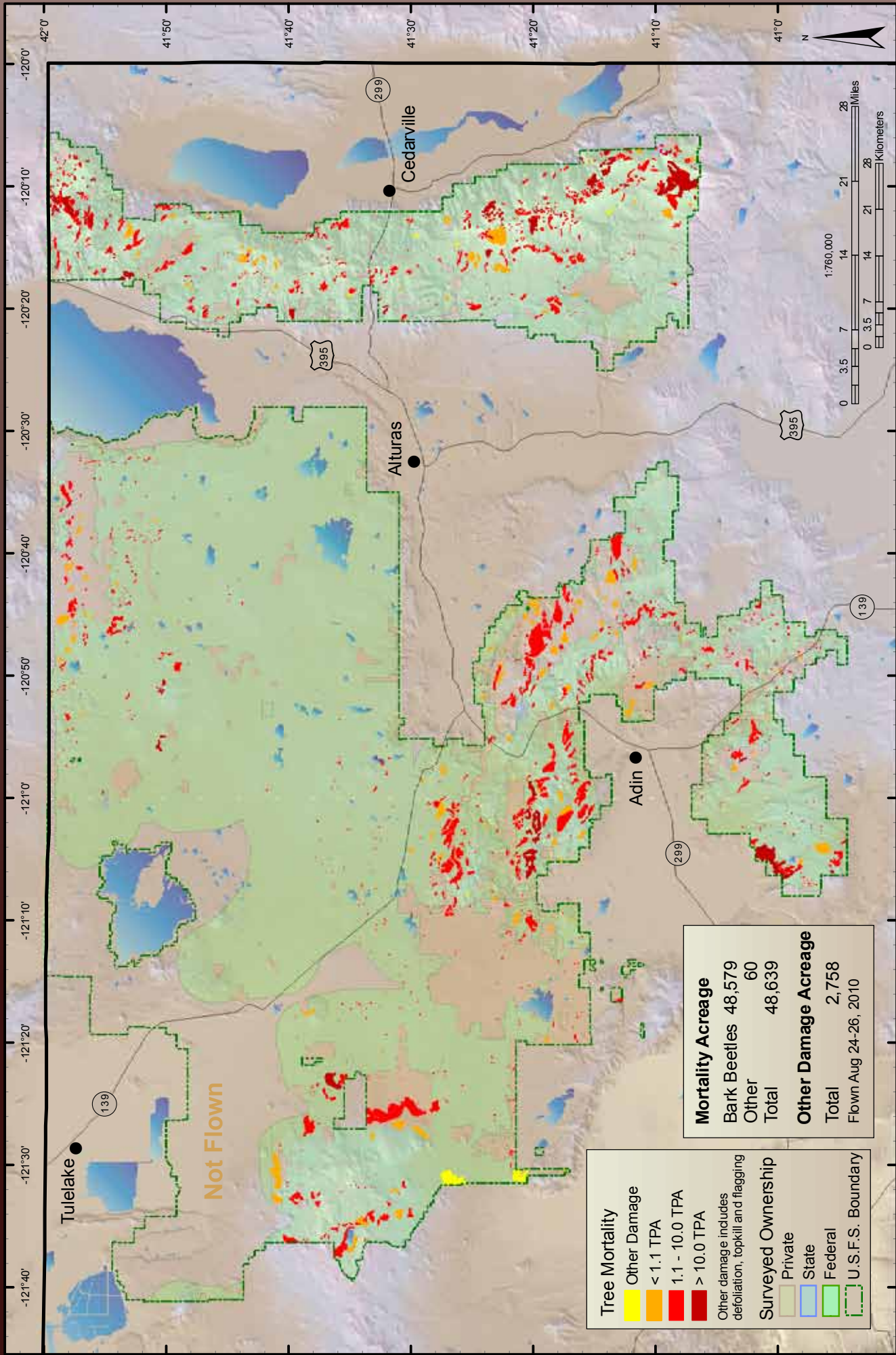


# Mendocino National Forest



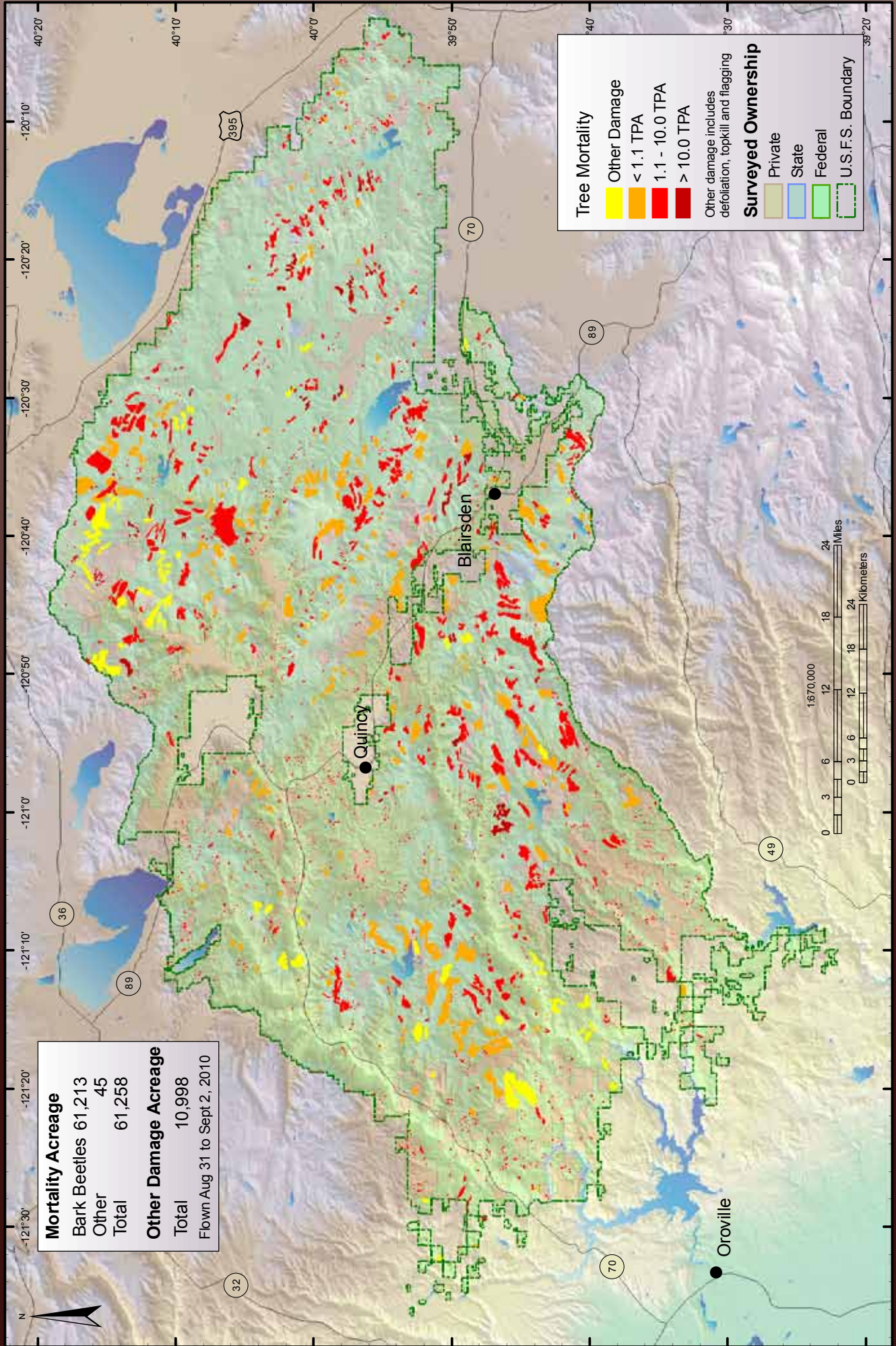


# Modoc National Forest



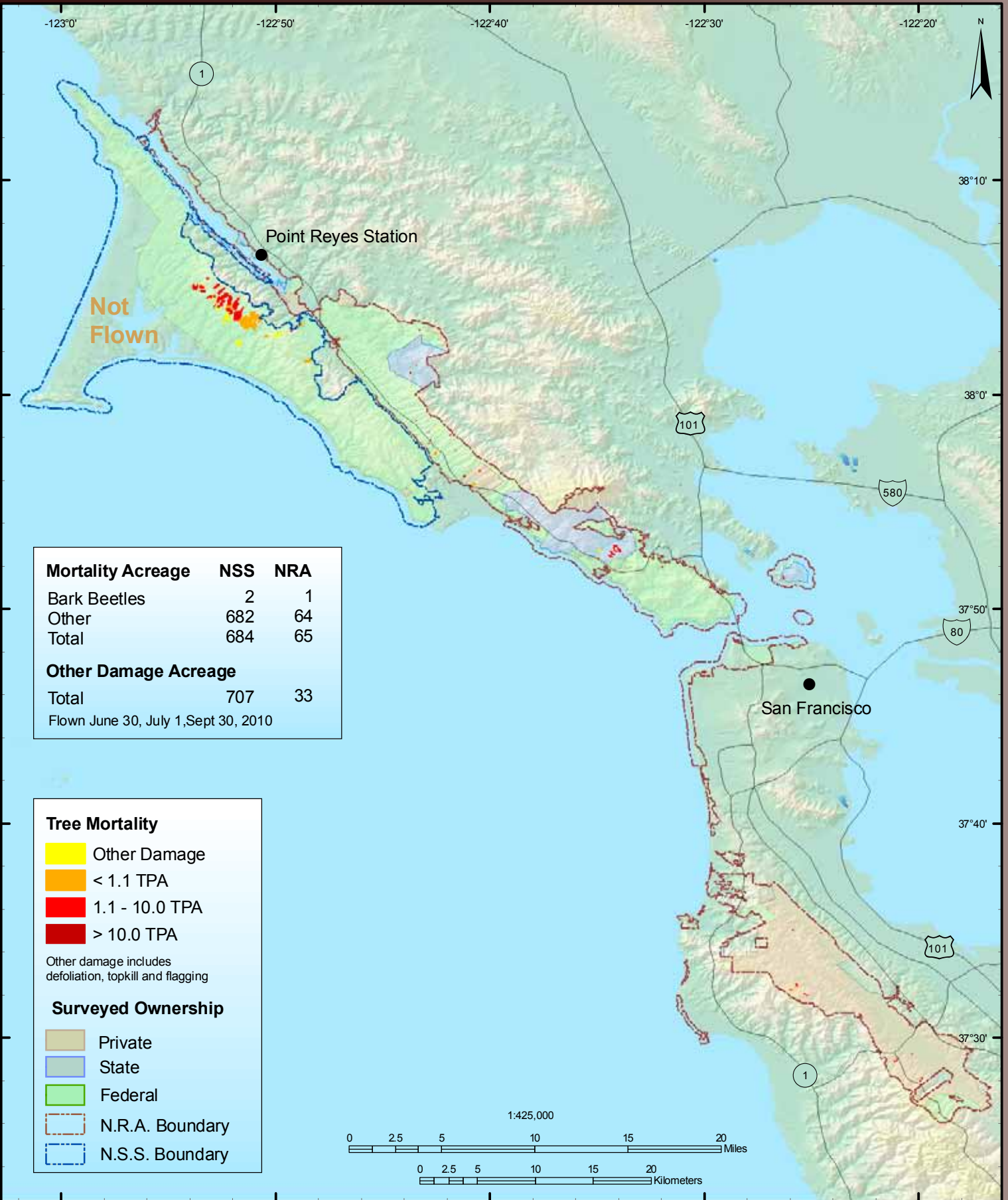


# Plumas National Forest



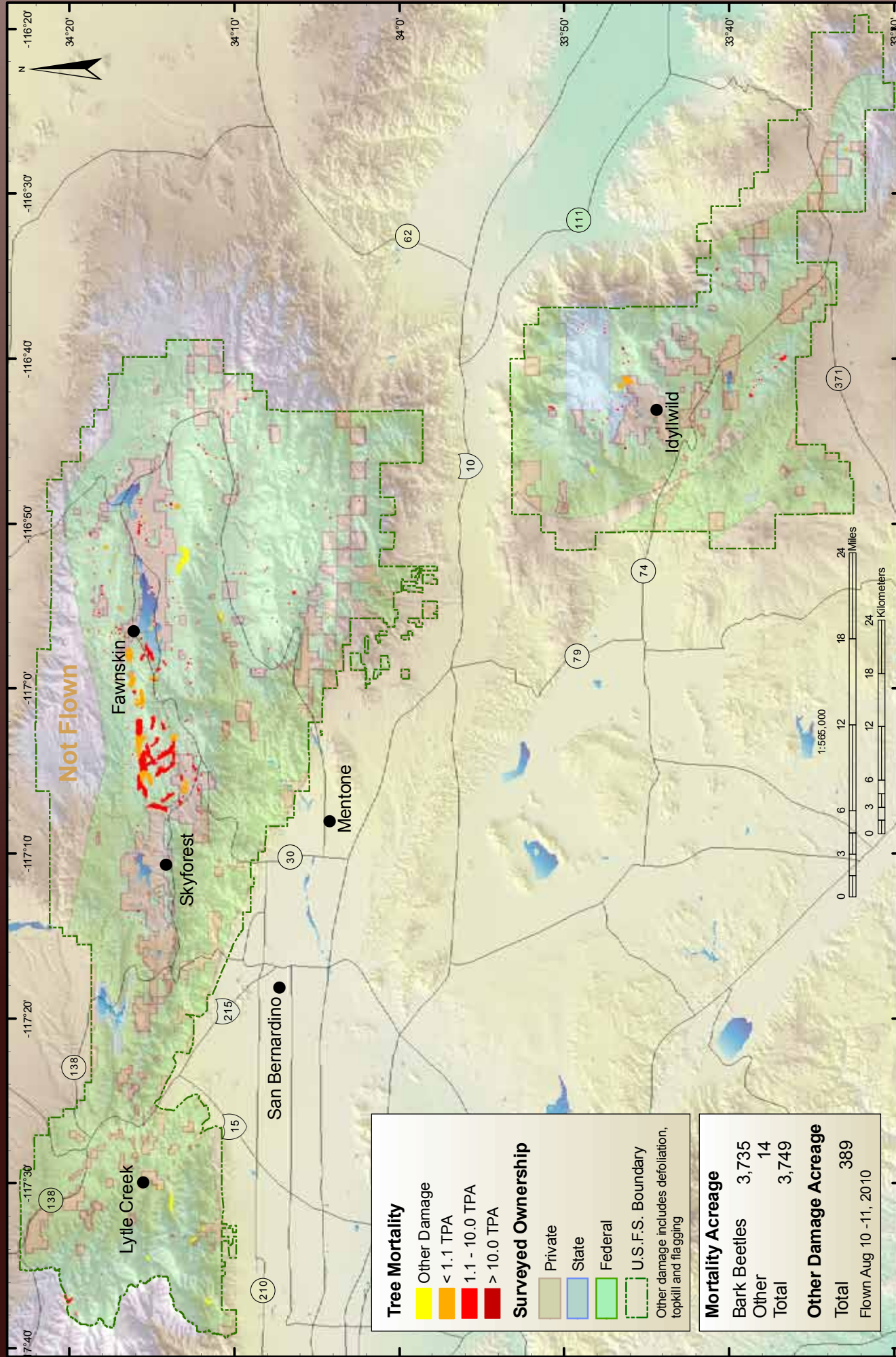


# Point Reyes National Seashore and Golden Gate National Recreation Area



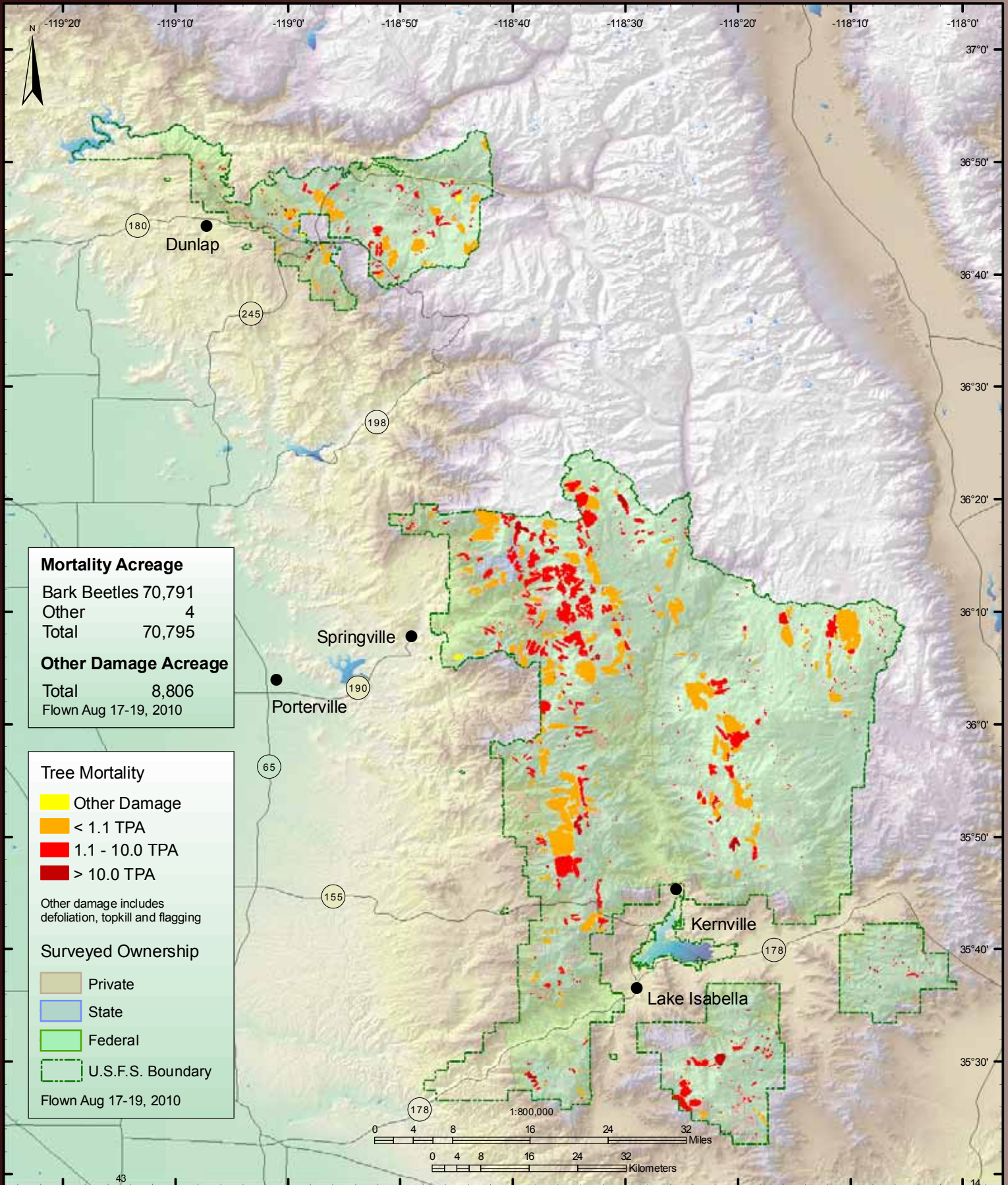


# San Bernardino National Forest



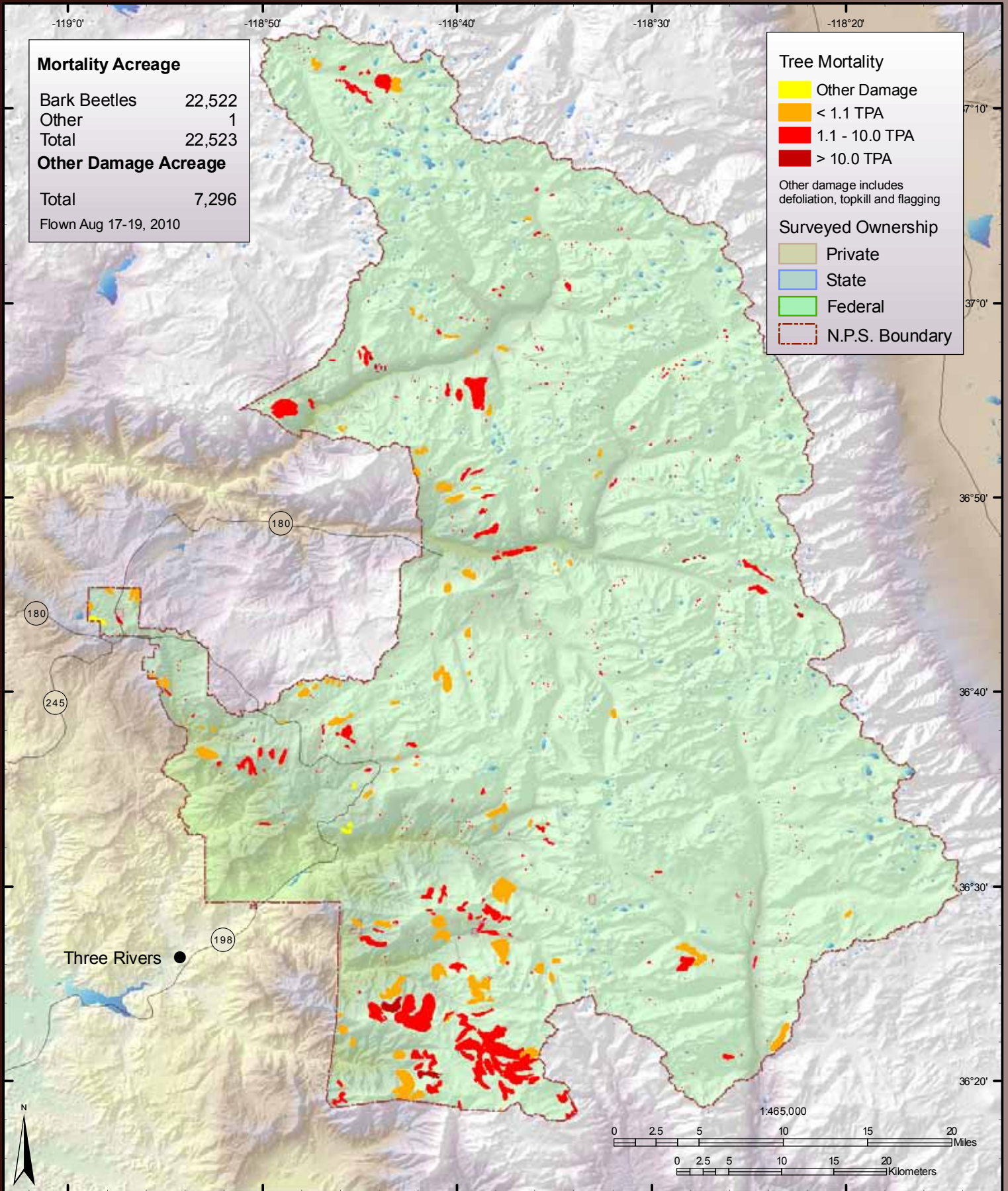


# Sequoia National Forest



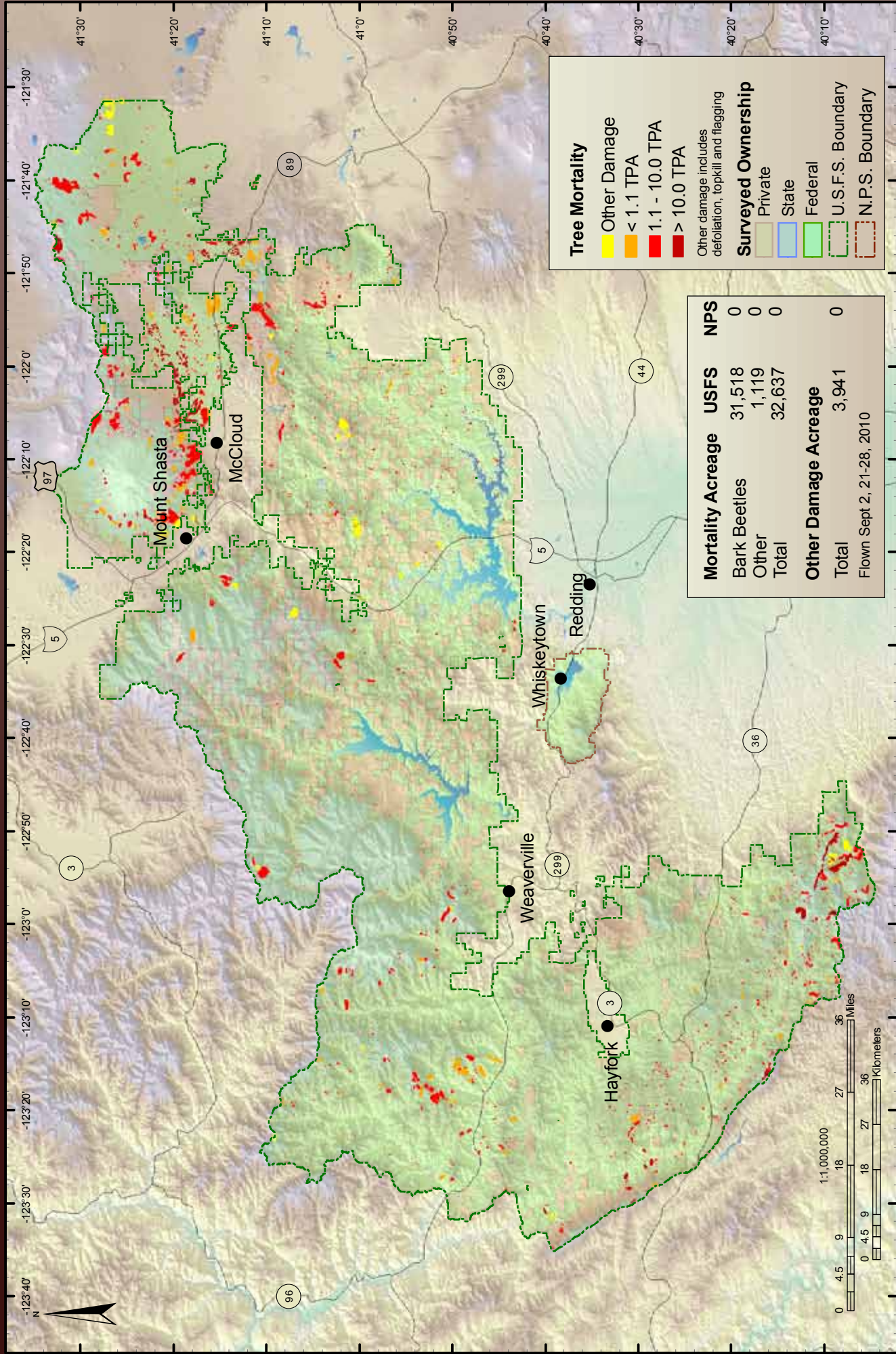


# Sequoia-Kings National Park



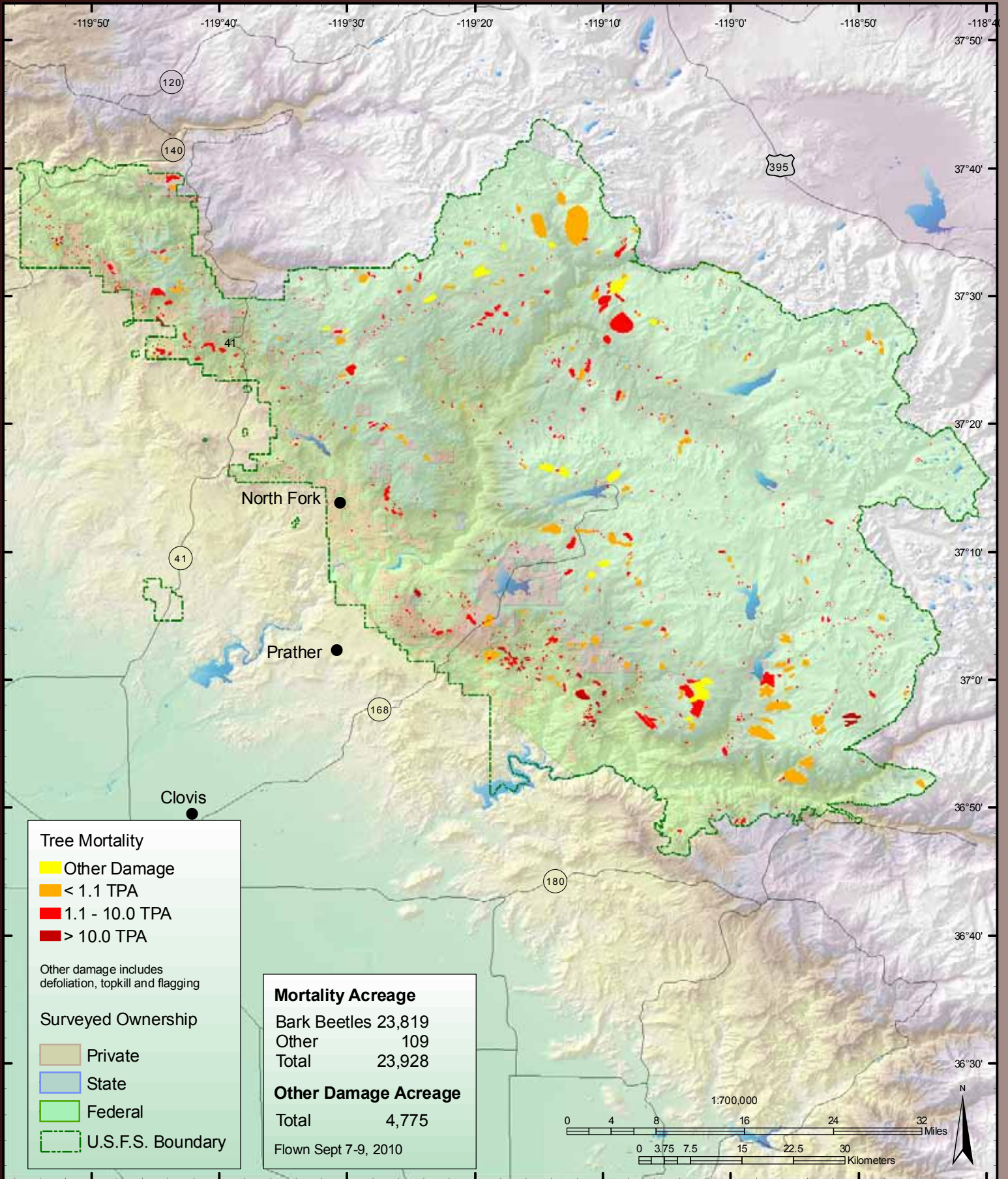


# Shasta-Trinity National Forest & Whiskeytown National Recreation Area



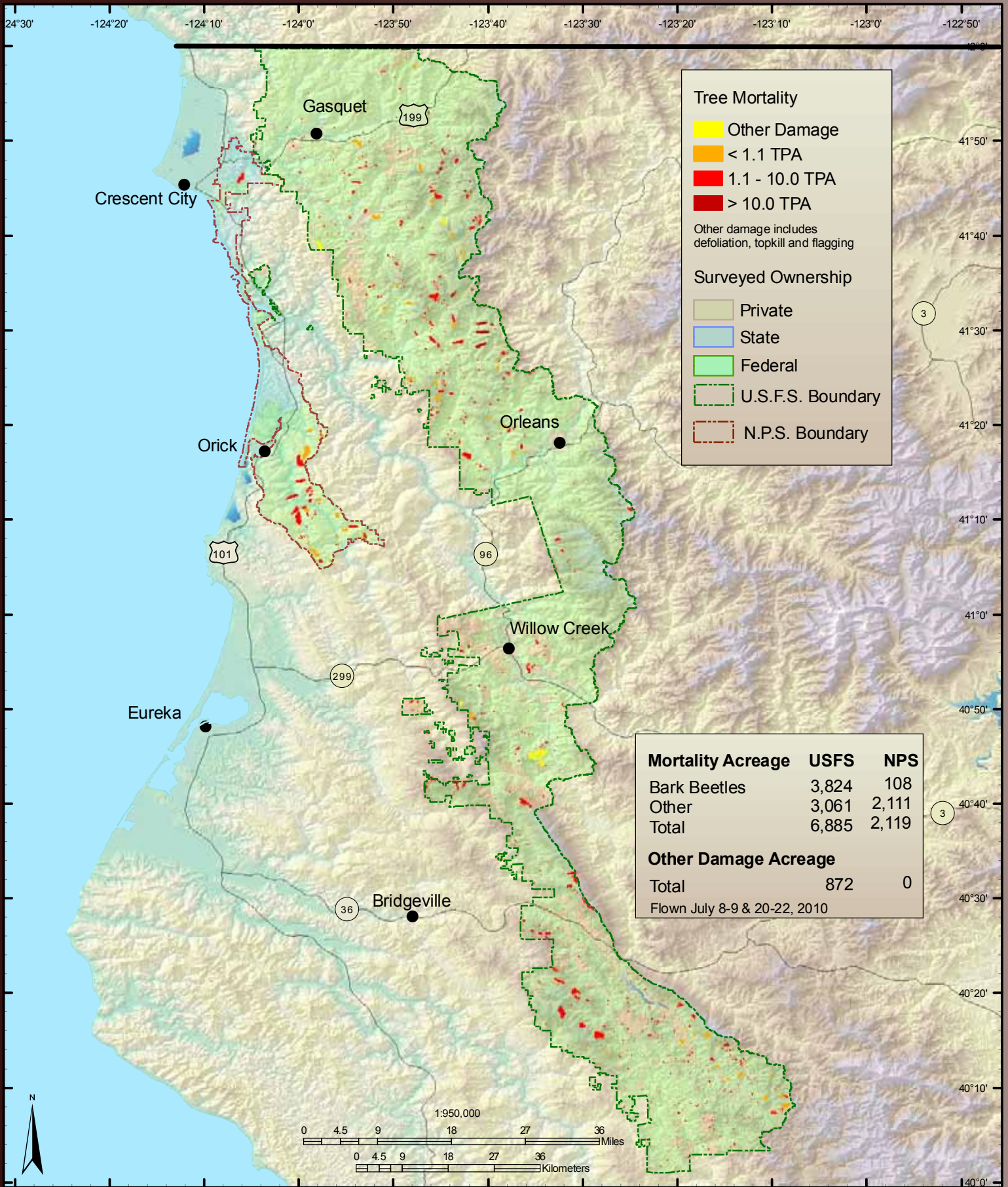


# Sierra National Forest



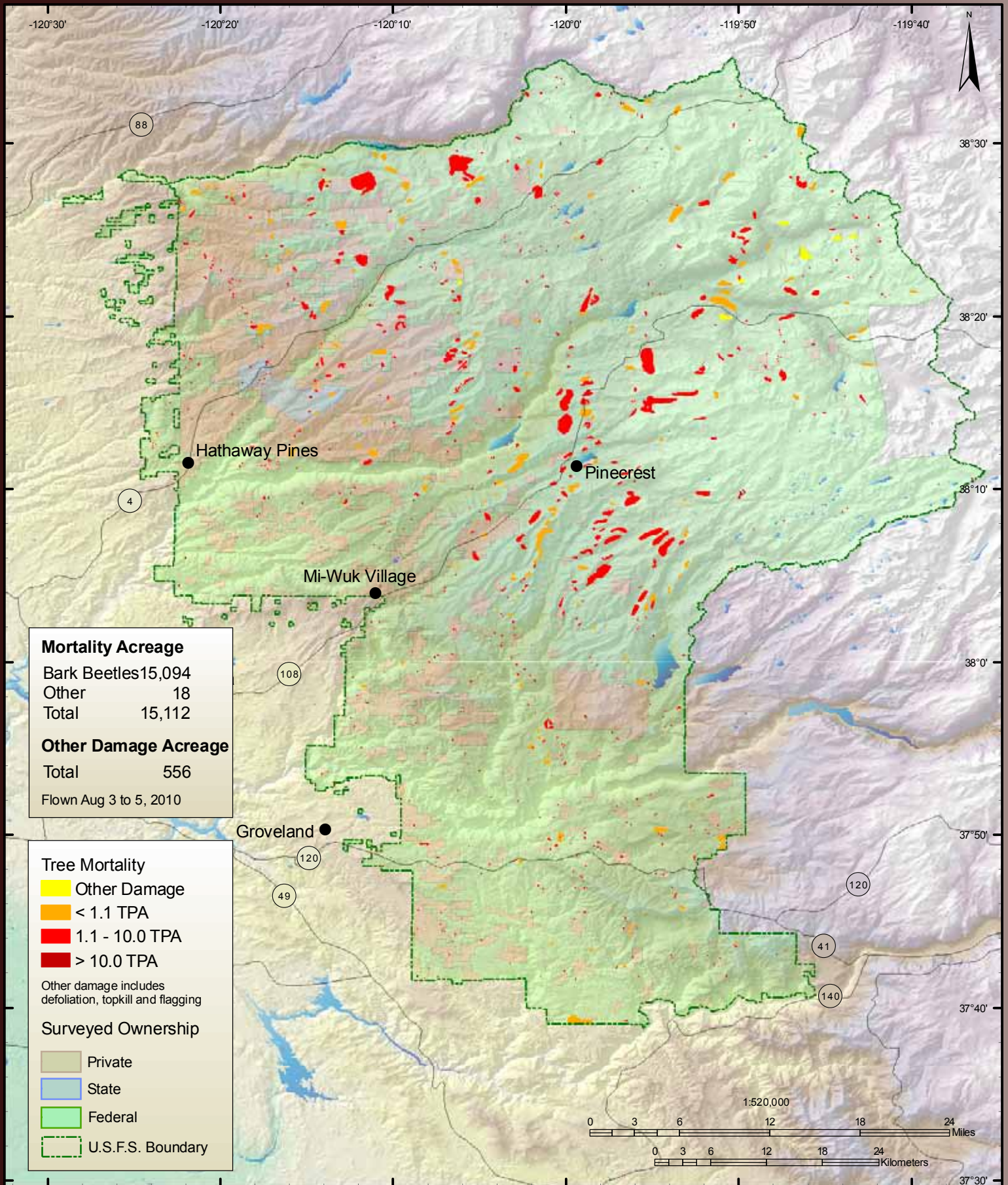


# Six Rivers National Forest & Redwood State and National Parks



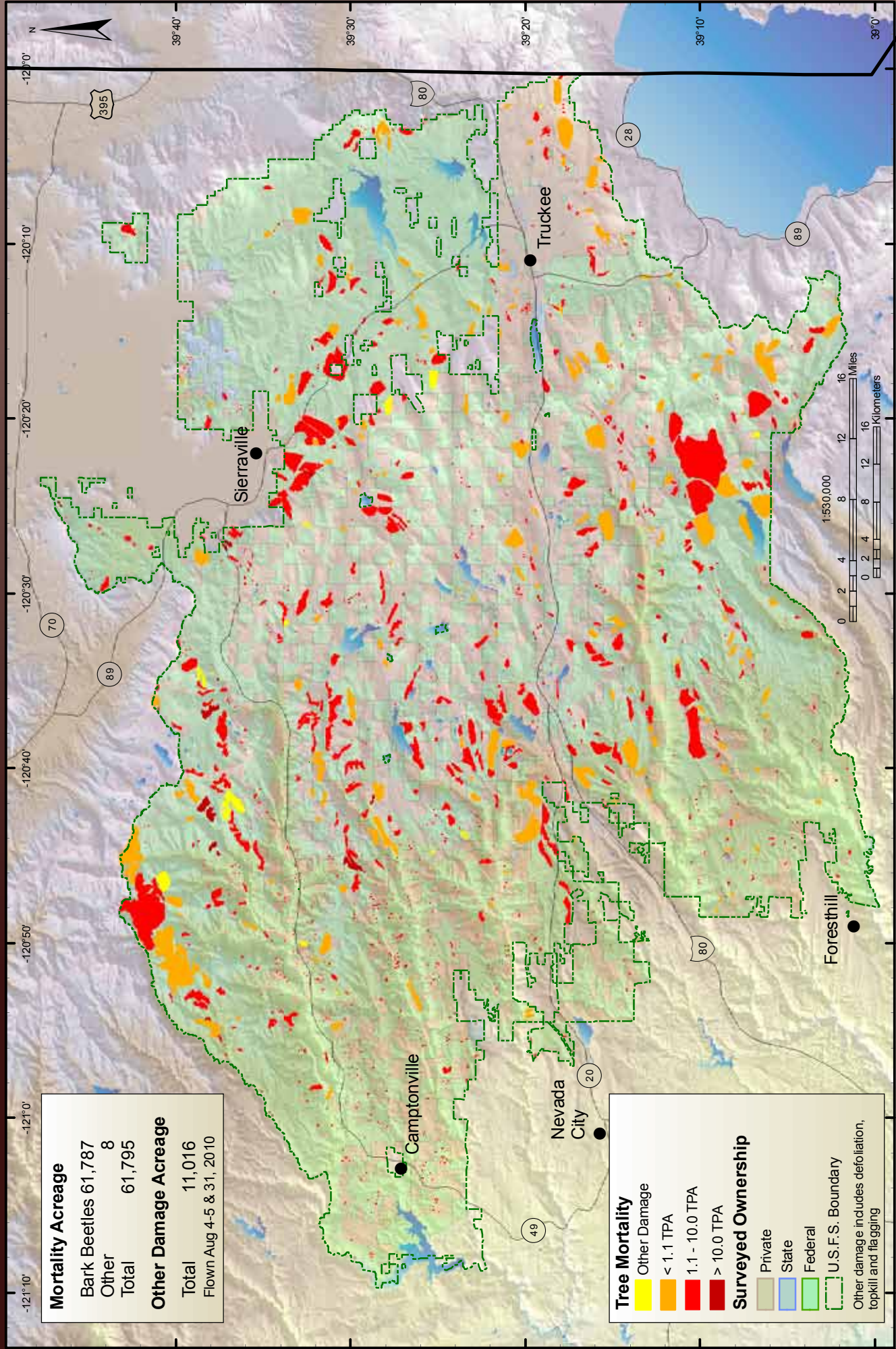


# Stanislaus National Forest



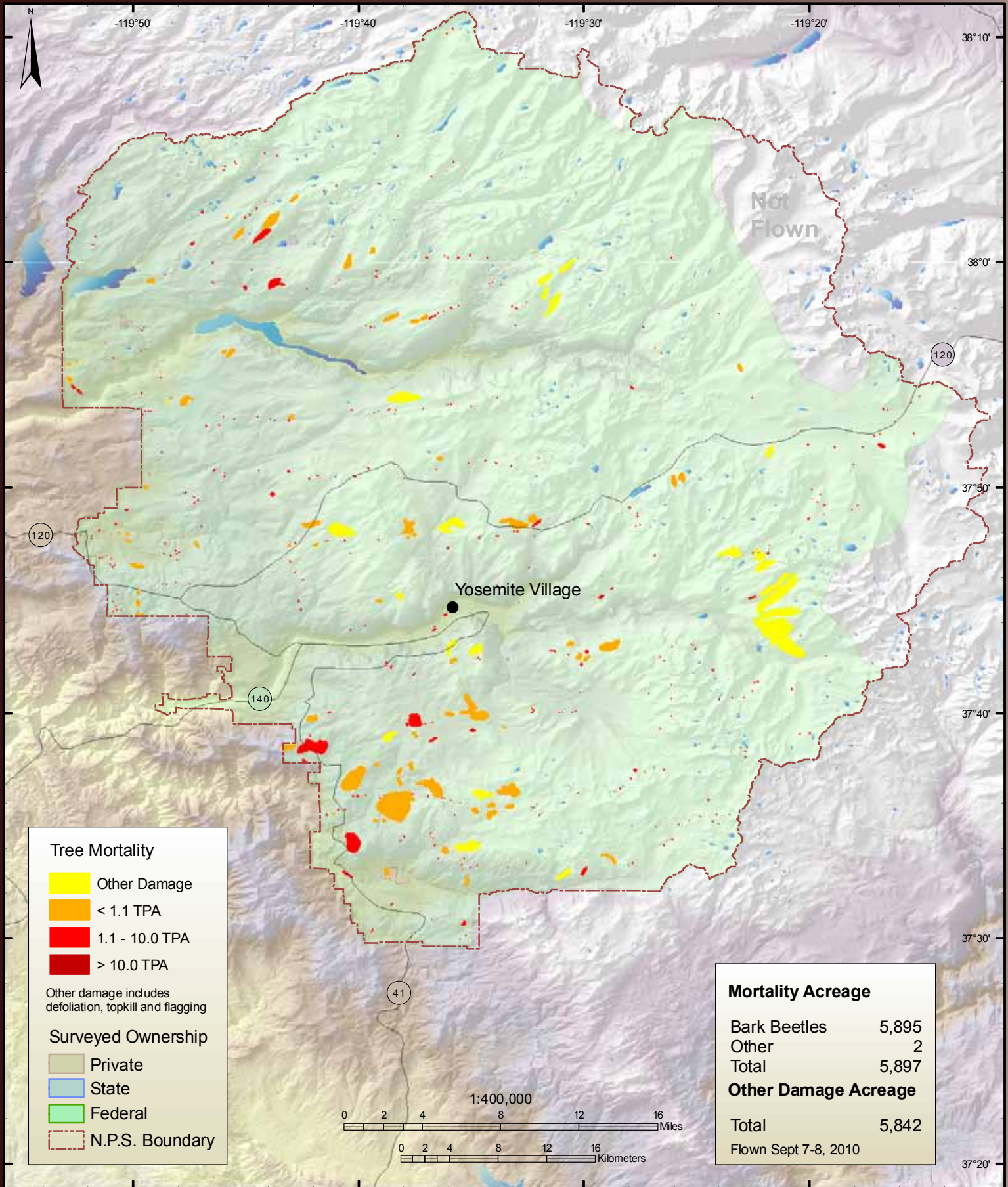


# Tahoe National Forest



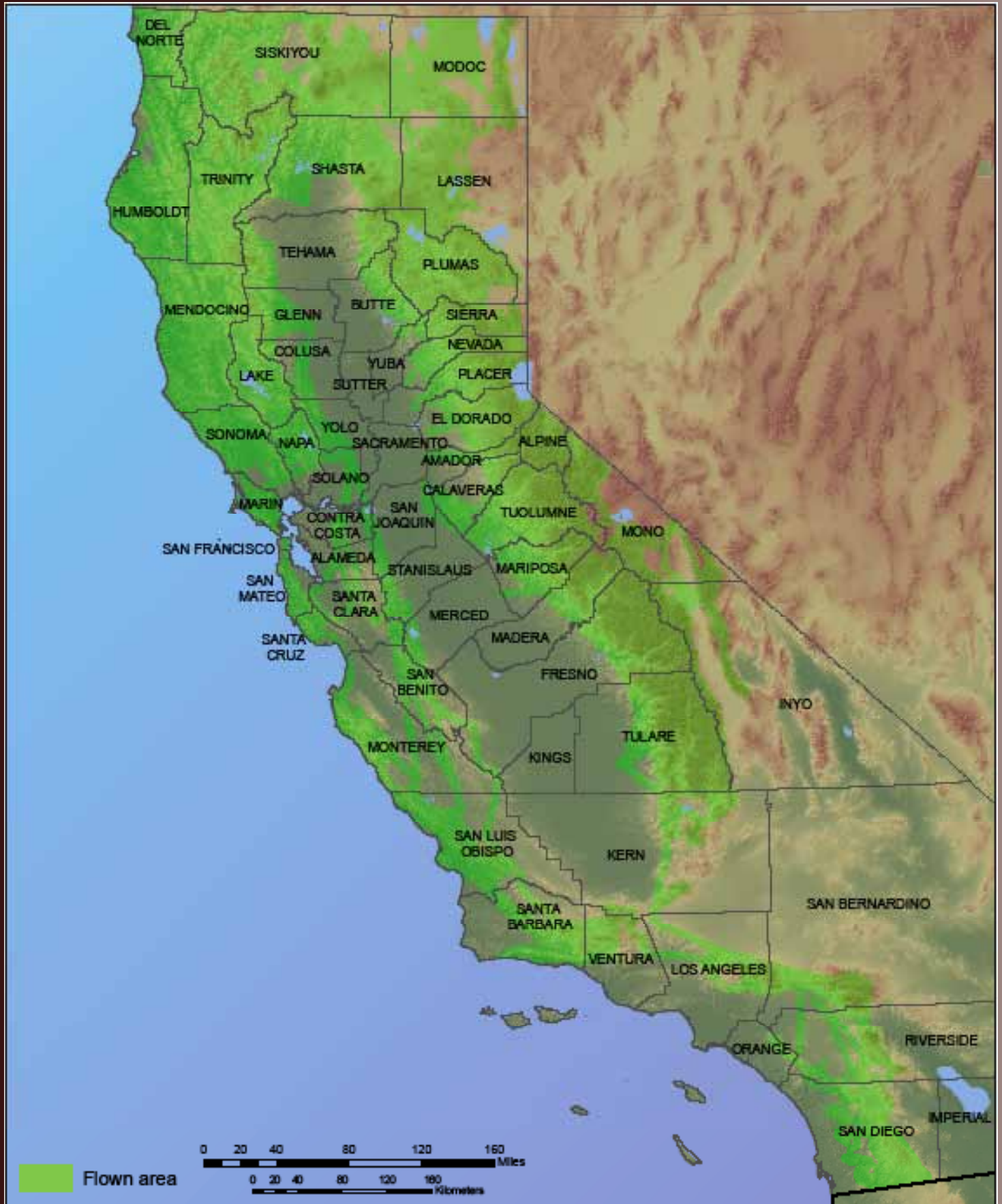


# Yosemite National Park



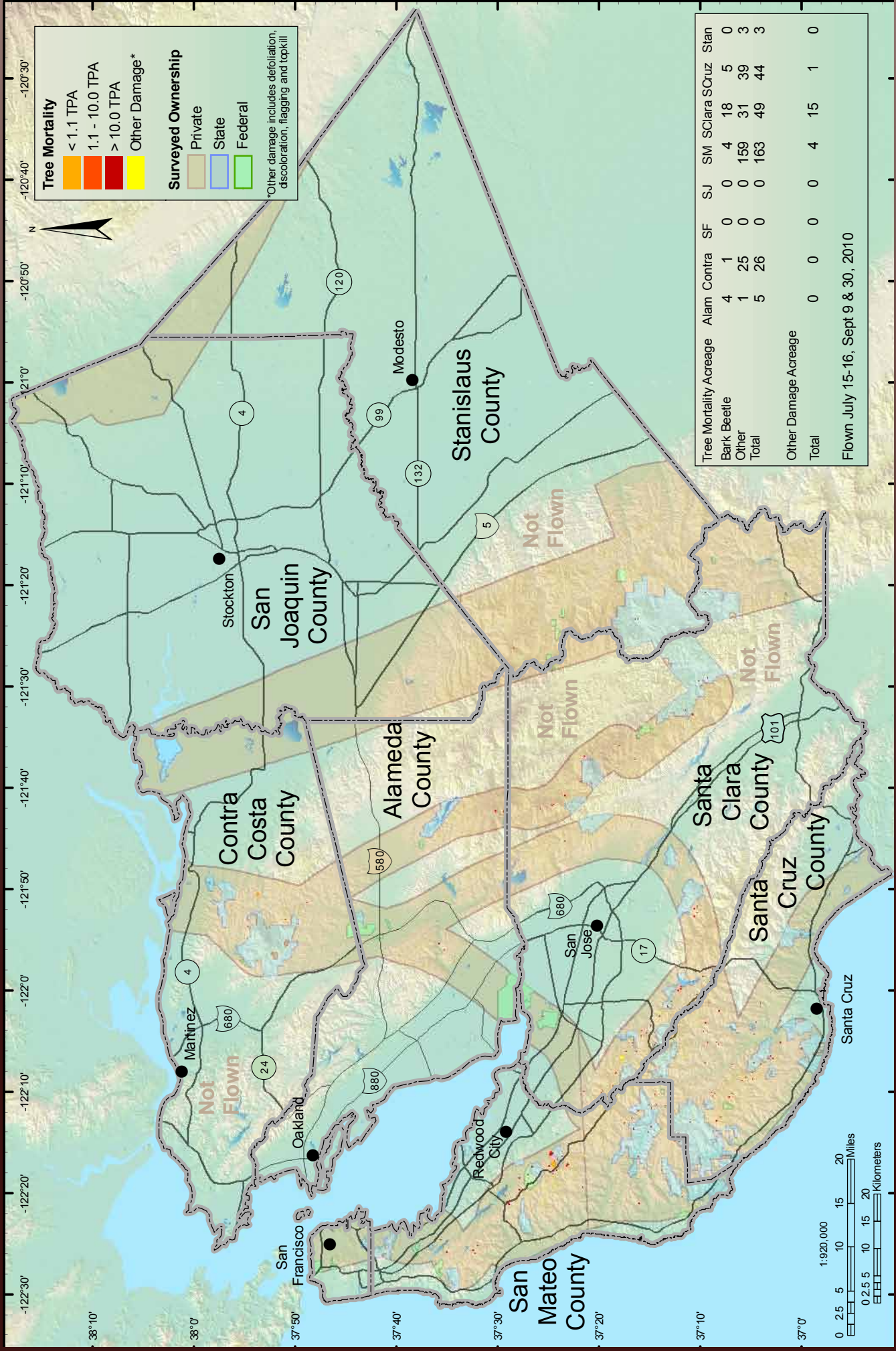


# Aerial Survey Results by County



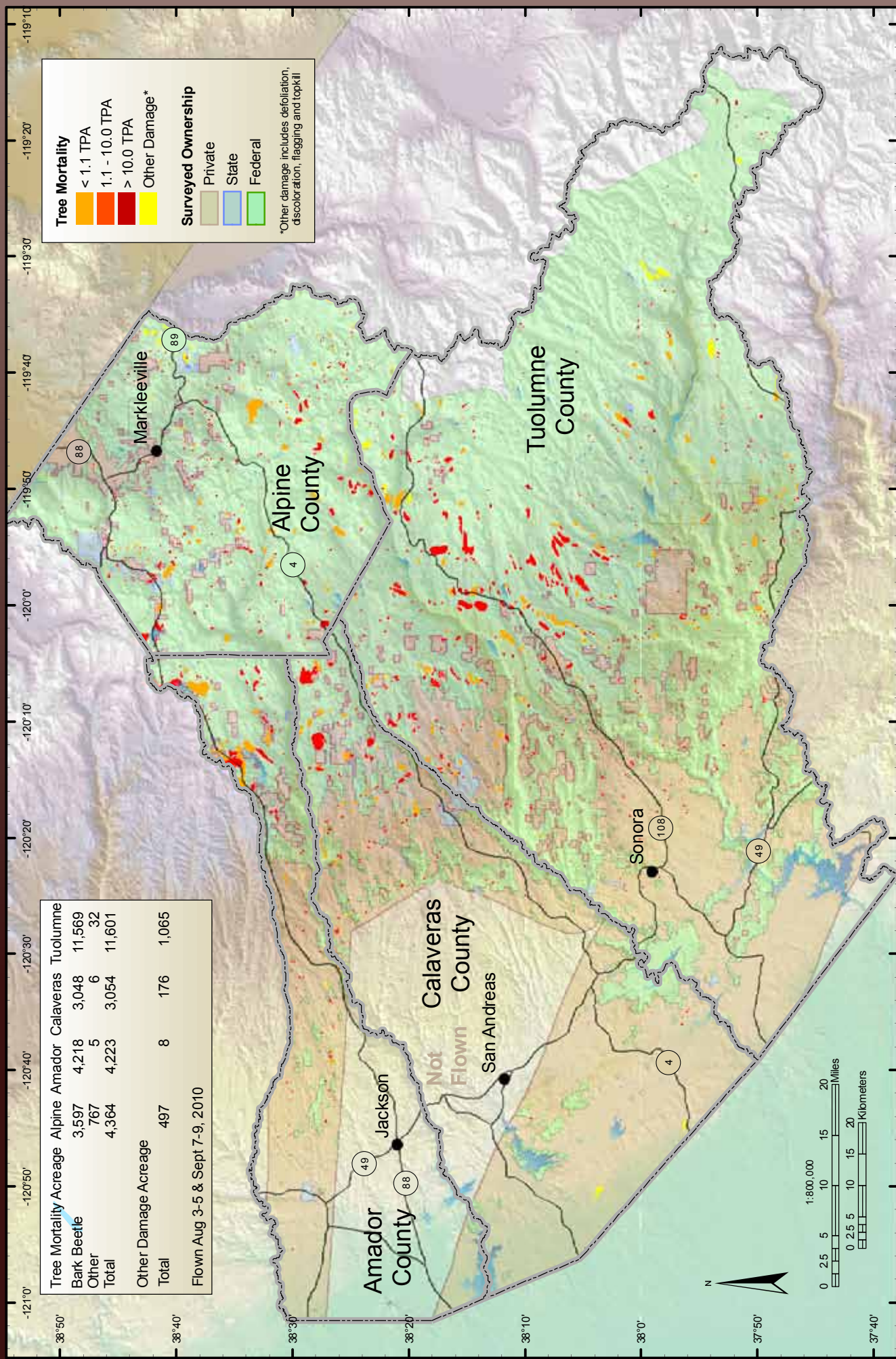


# Alameda, Contra Costa, San Francisco, San Joaquin, San Mateo, San Clara, Santa Cruz, and Stanislaus Counties





# Alpine, Amador, Calaveras, and Tuolumne Counties



Tree Mortality	Alpine	Amador	Calaveras	Tuolumne
Bark Beetle	3,597	4,218	3,048	11,569
Other	767	5	6	32
<b>Total</b>	<b>4,364</b>	<b>4,223</b>	<b>3,054</b>	<b>11,601</b>

Other Damage Acreage	Alpine	Amador	Calaveras	Tuolumne
<b>Total</b>	<b>497</b>	<b>8</b>	<b>176</b>	<b>1,065</b>

Flown Aug 3-5 & Sept 7-9, 2010

**Tree Mortality**

- < 1.1 TPA
- 1.1 - 10.0 TPA
- > 10.0 TPA
- Other Damage\*

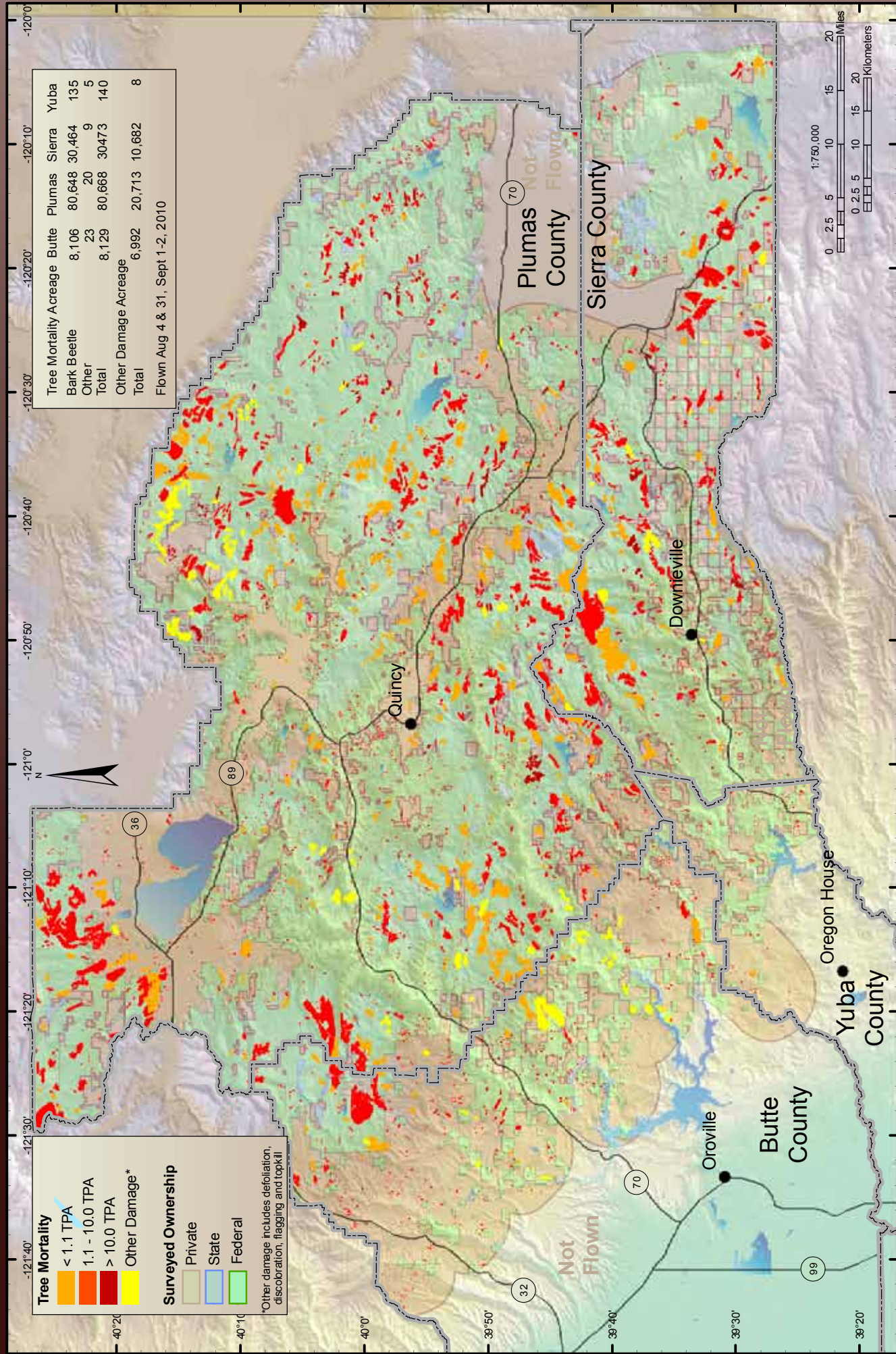
**Surveyed Ownership**

- Private
- State
- Federal

\*Other damage includes defoliation, discoloration, flagging and topkill



# Butte, Plumas, Sierra, and Yuba Counties

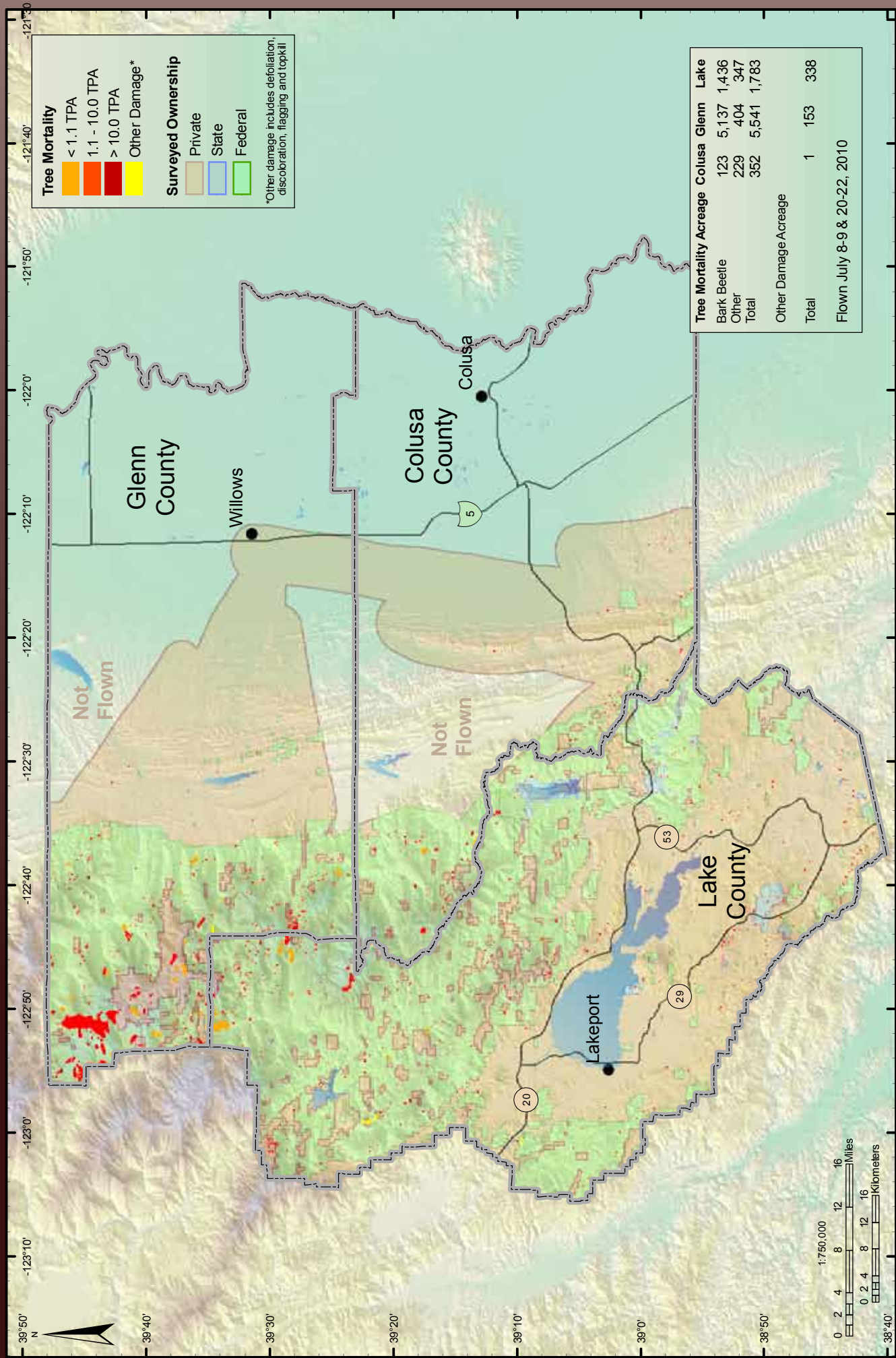


USDA Forest Service  
Pacific Southwest Region  
Forest Health Protection

Forest Health Monitoring Programs  
1731 Research Park Drive, Davis, CA 95618  
[www.fs.fed.us/r5/spffhp/fhm](http://www.fs.fed.us/r5/spffhp/fhm)

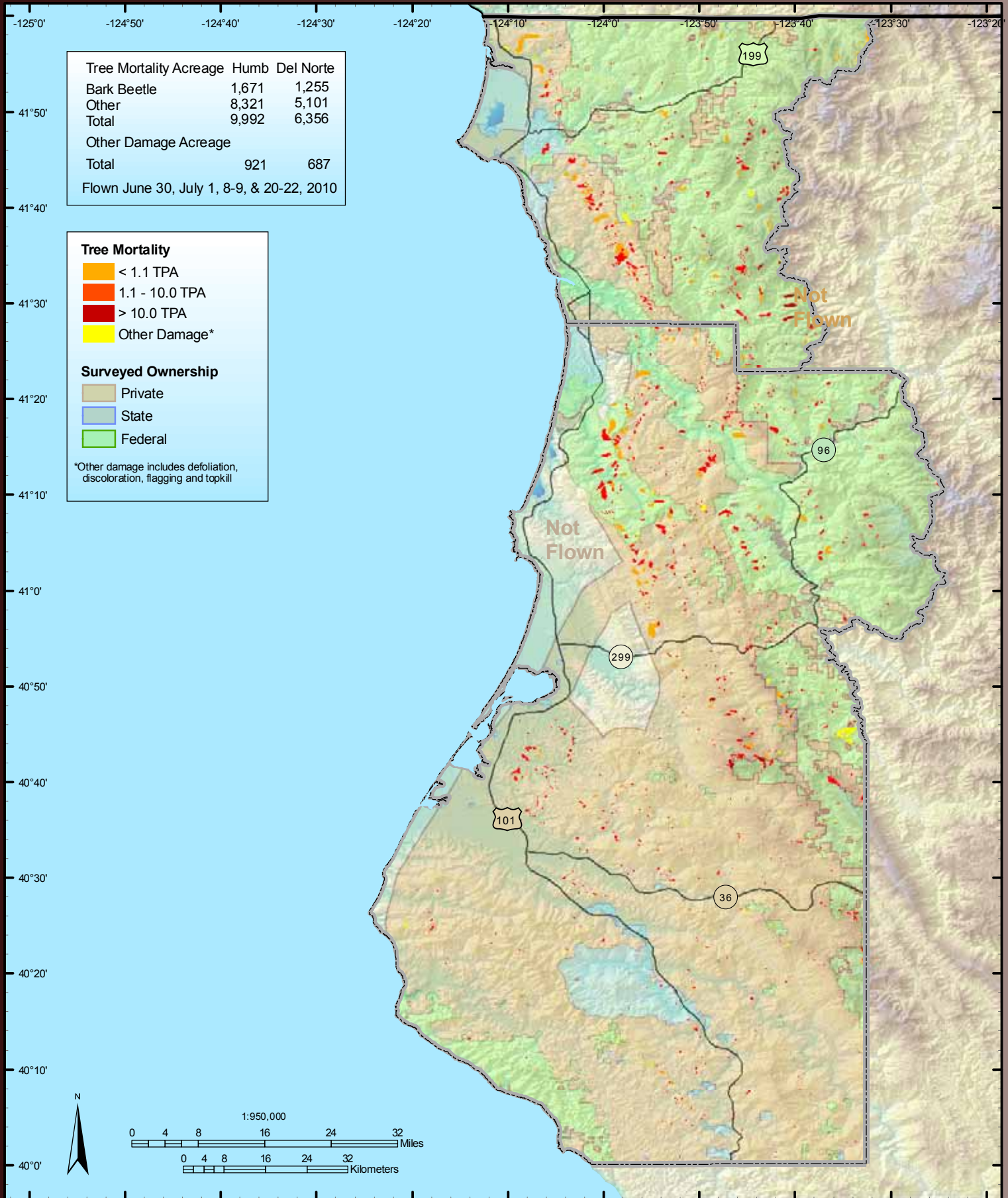


# Colusa, Glenn, and Lake Counties



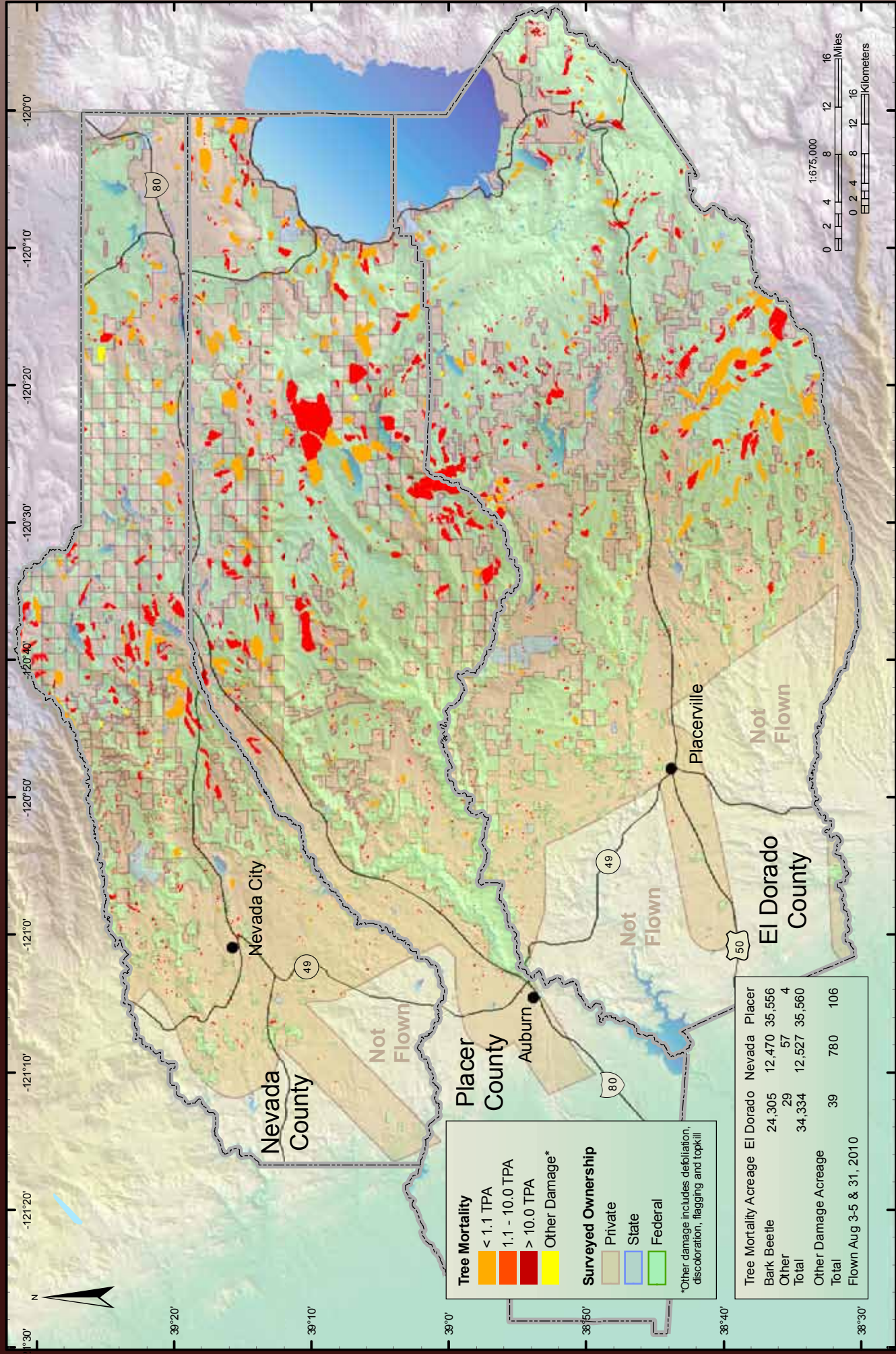


# Del Norte and Humboldt Counties



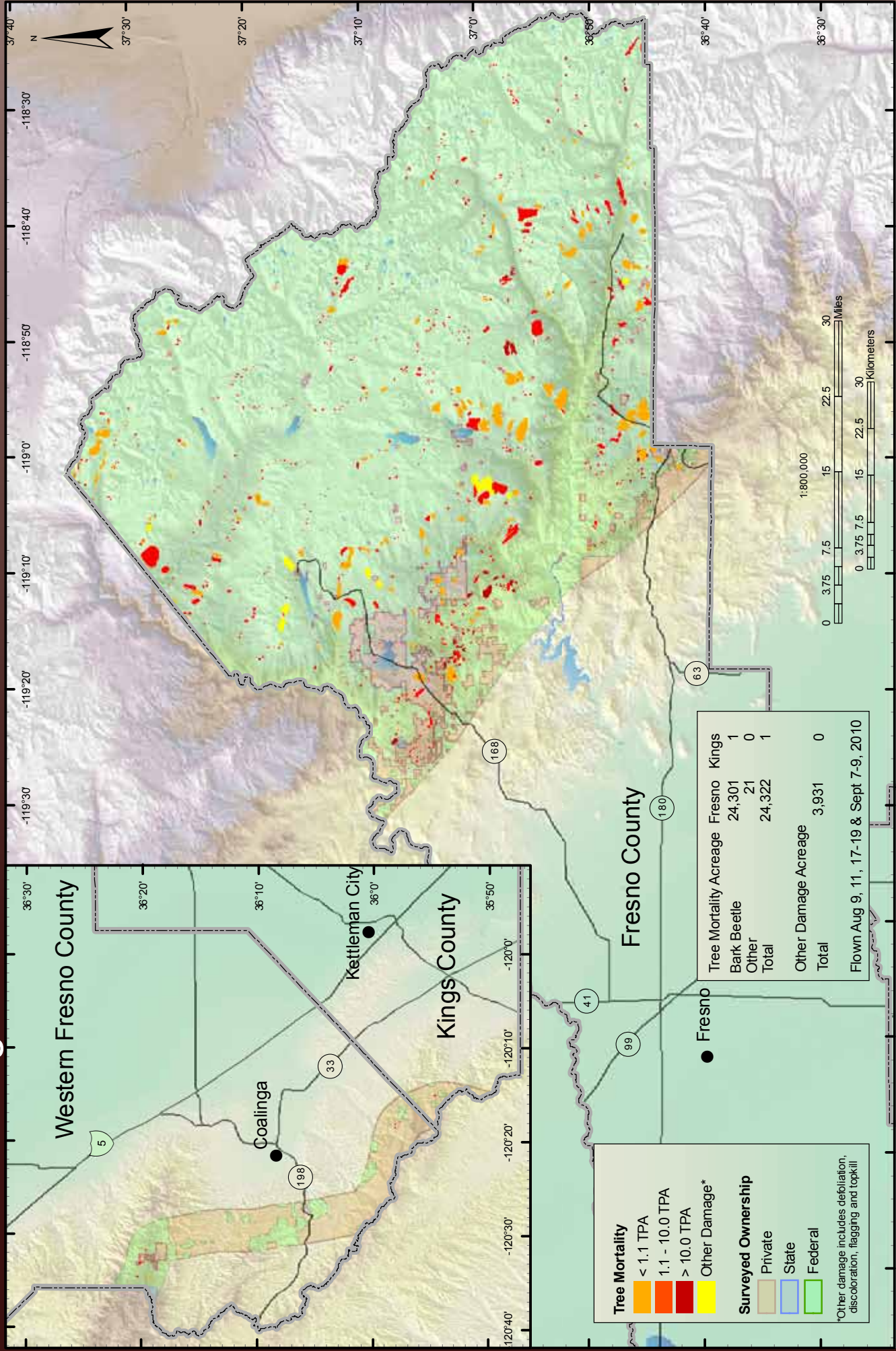


# El Dorado, Nevada, and Placer Counties



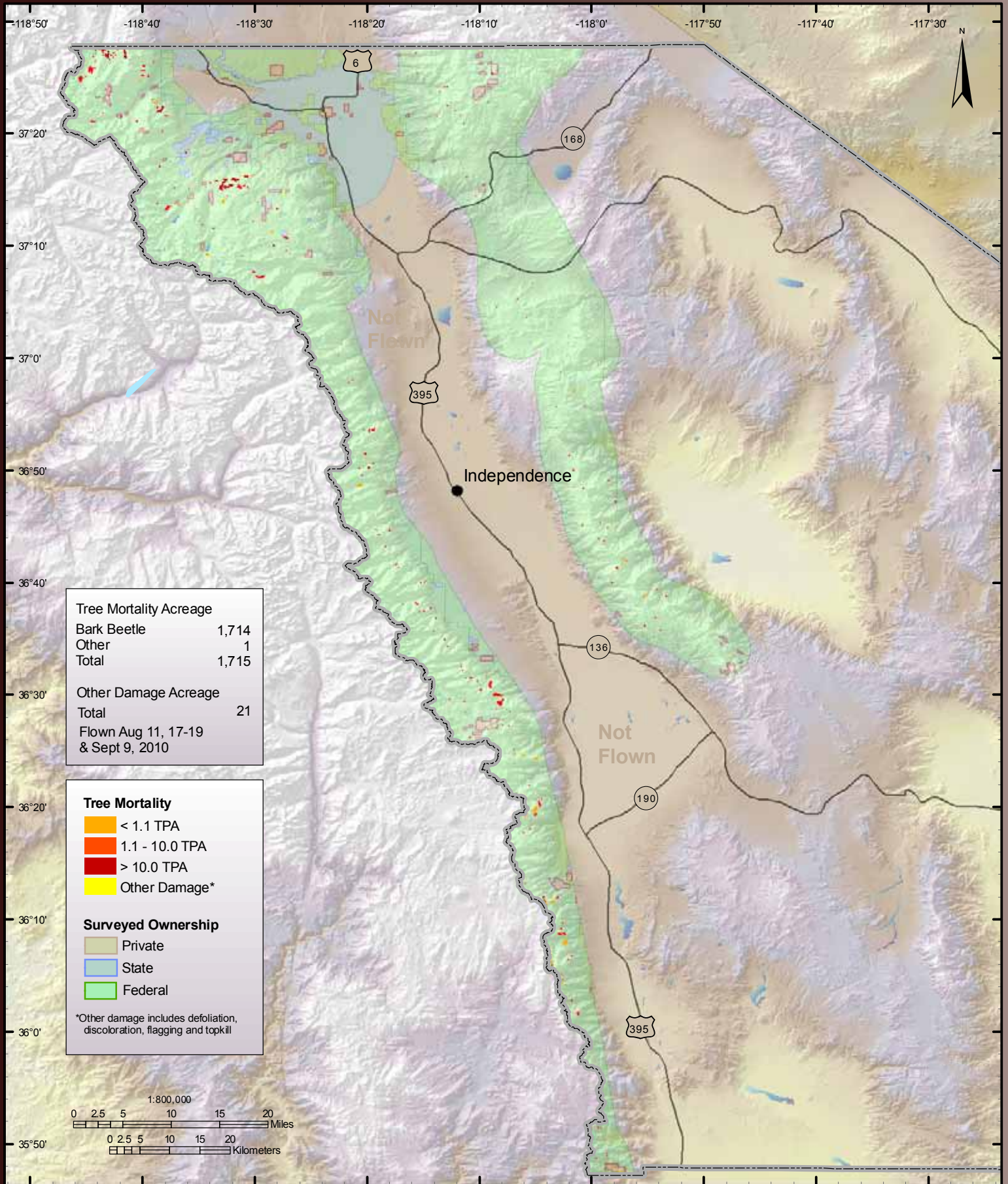


# Fresno and Kings Counties



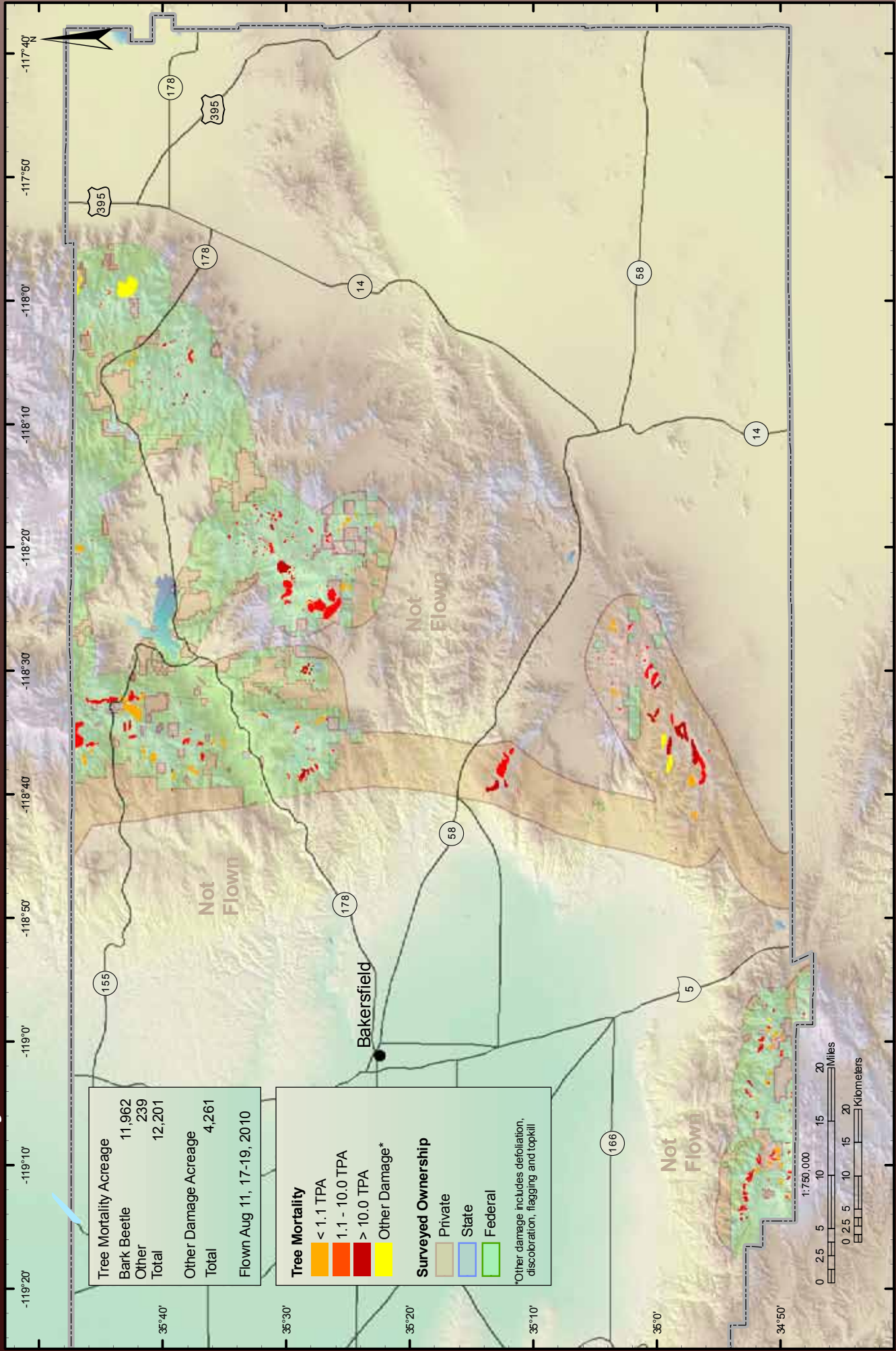


# Inyo County





# Kern County

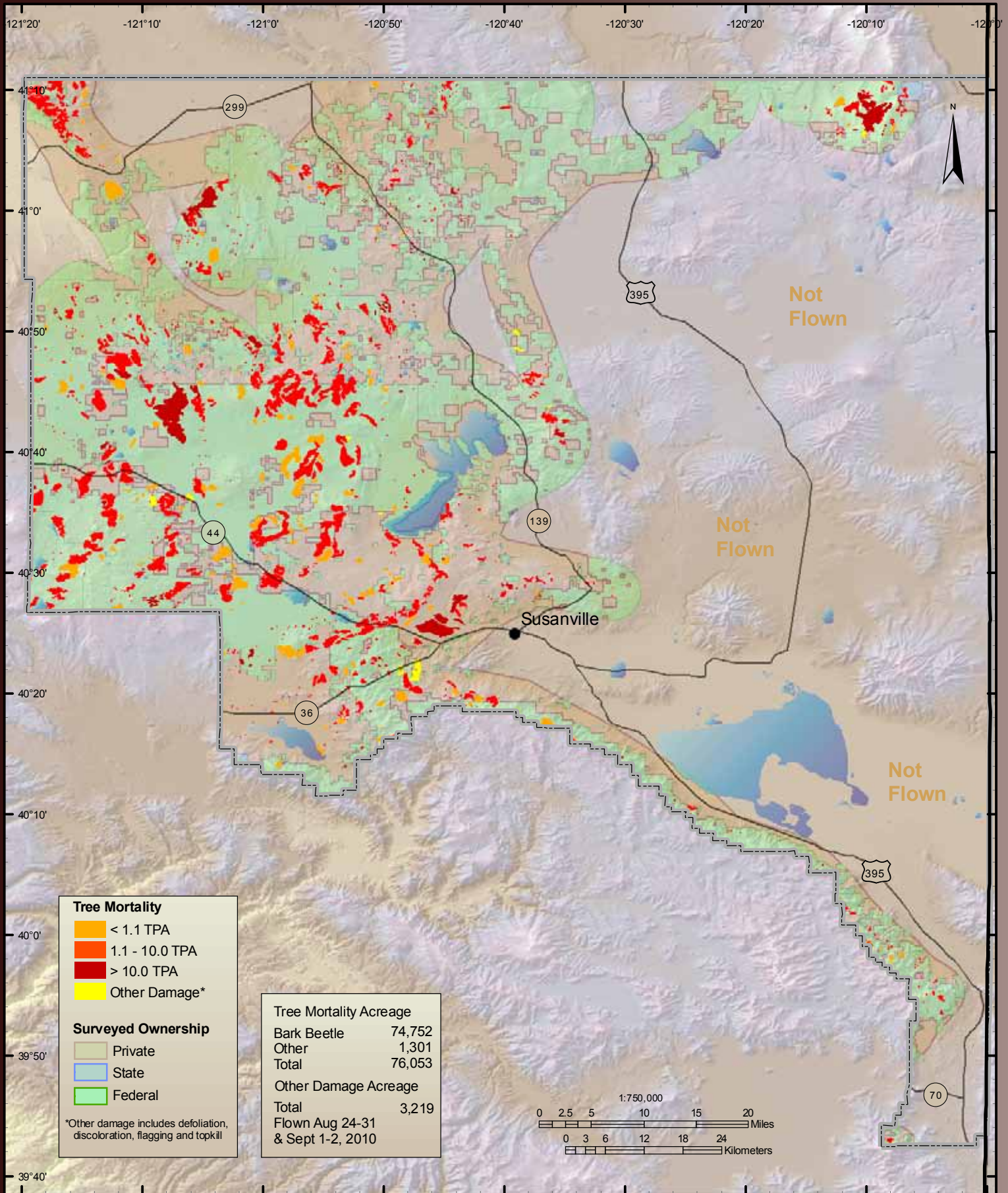


USDA Forest Service  
 Pacific Southwest Region  
 Forest Health Protection

Forest Health Monitoring Programs  
 1731 Research Park Drive, Davis, CA 95618  
[www.fs.fed.us/r5/spffhp/fhm](http://www.fs.fed.us/r5/spffhp/fhm)

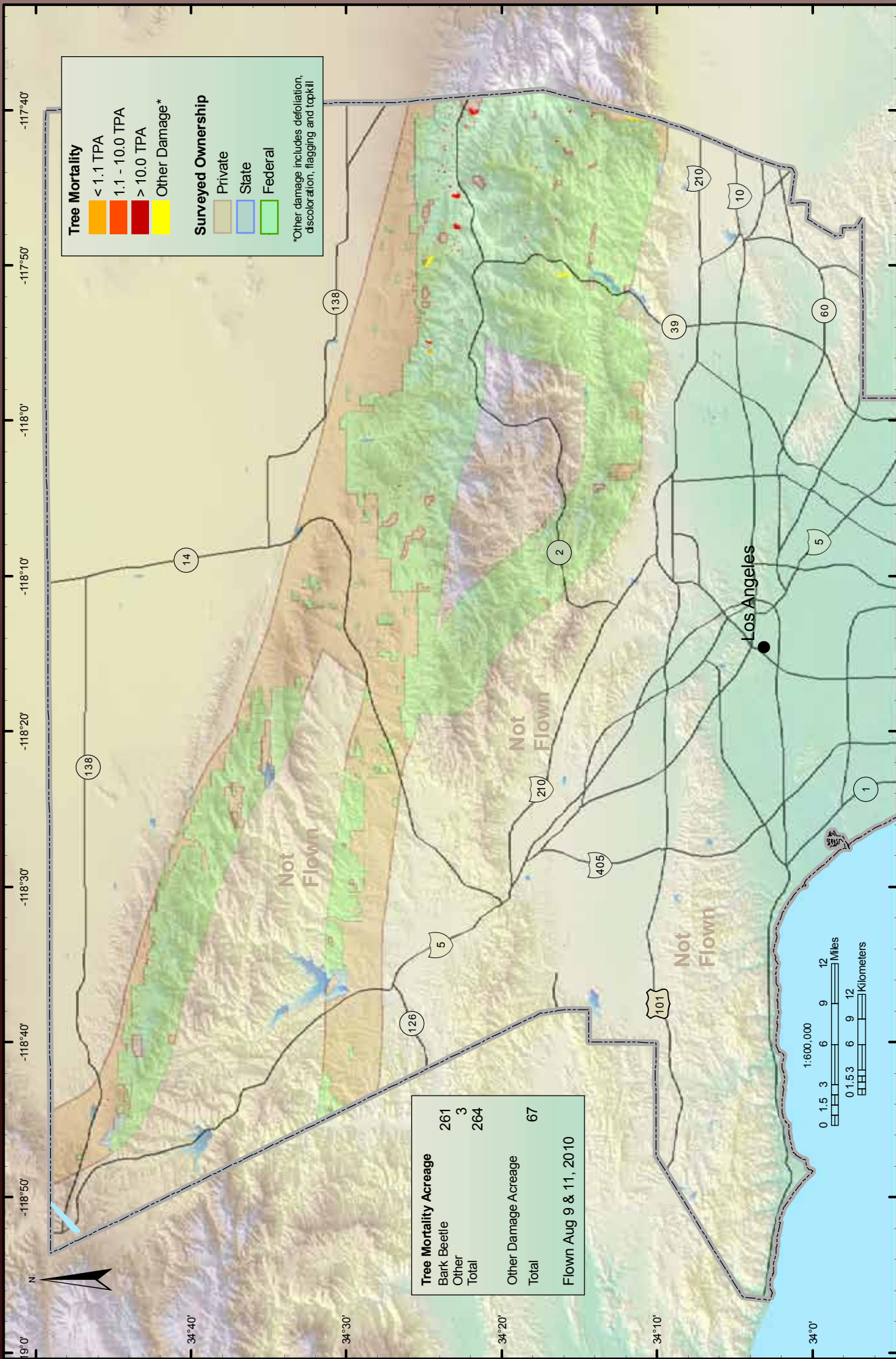


# Lassen County



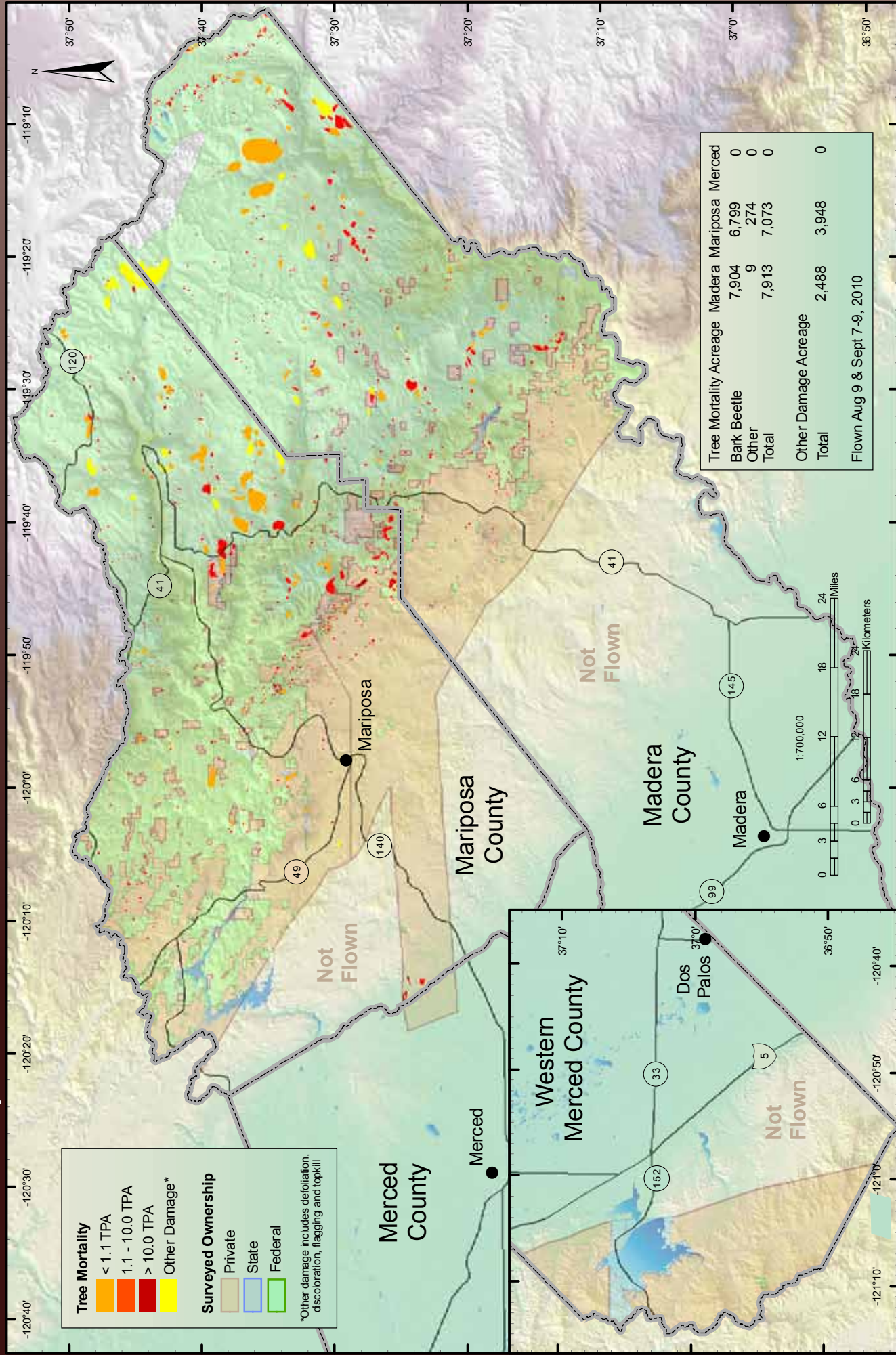


# Los Angeles County



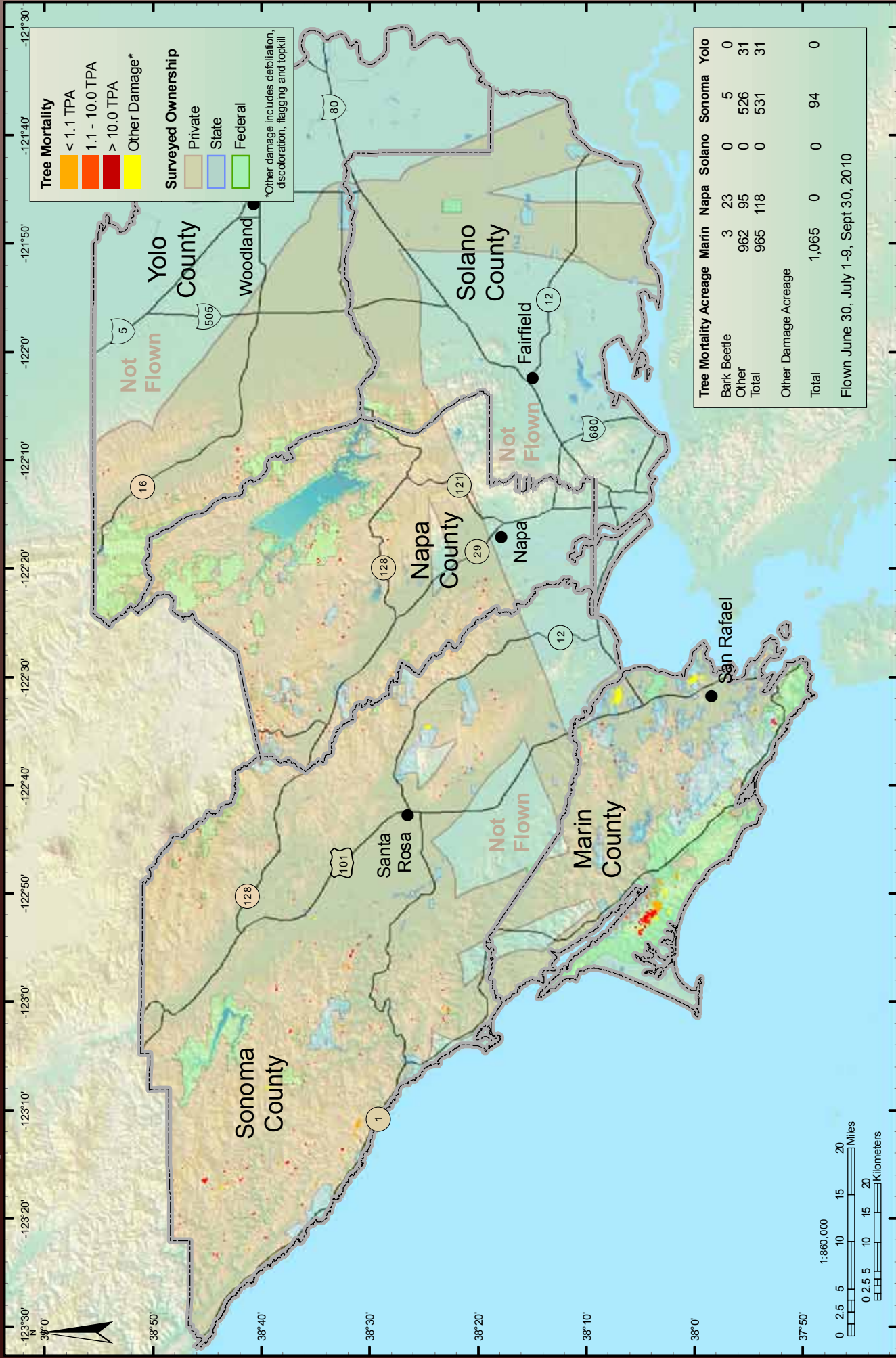


# Madera, Mariposa, and Merced Counties



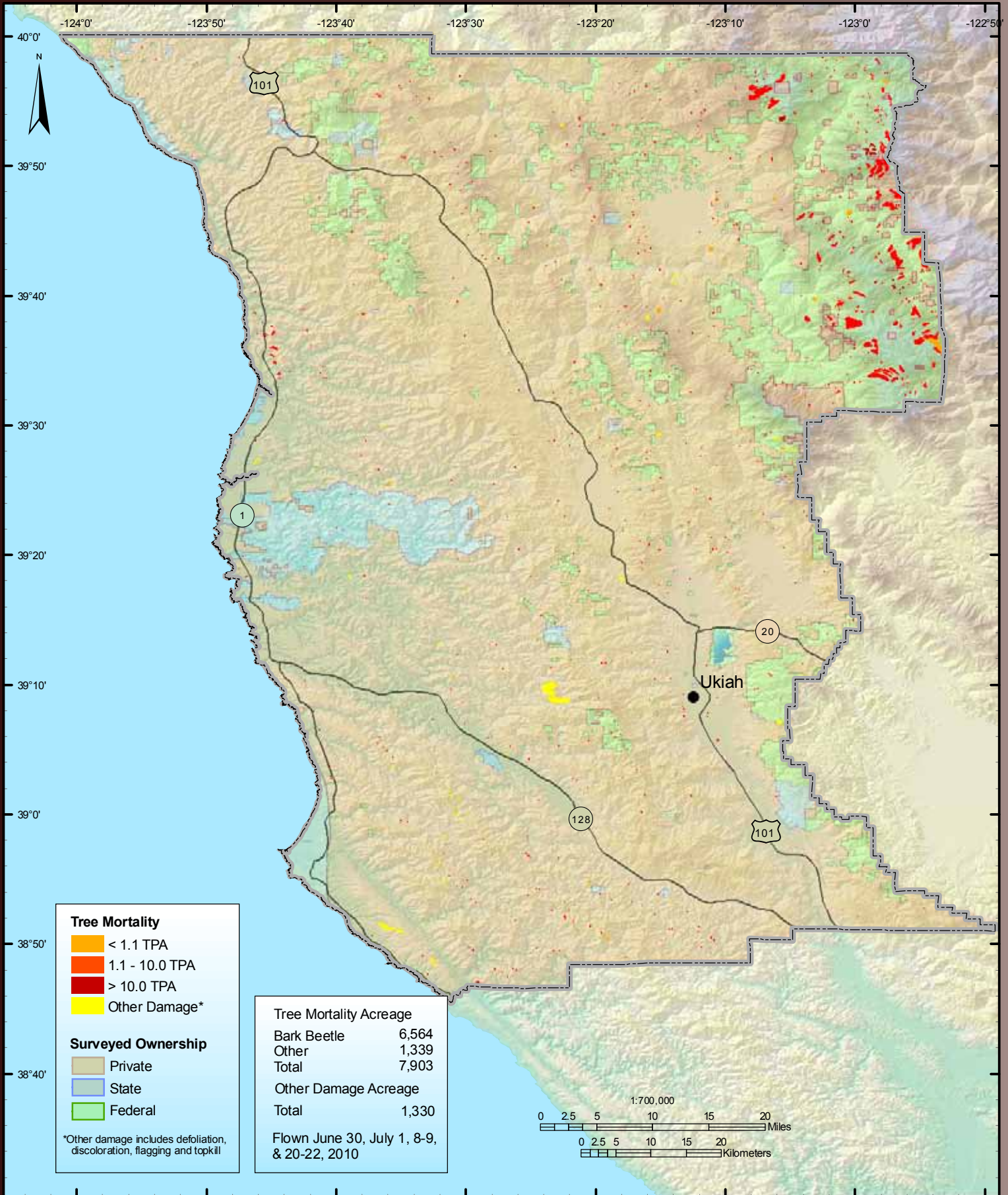


# Marin, Napa, Solano, Sonoma, and Yolo Counties



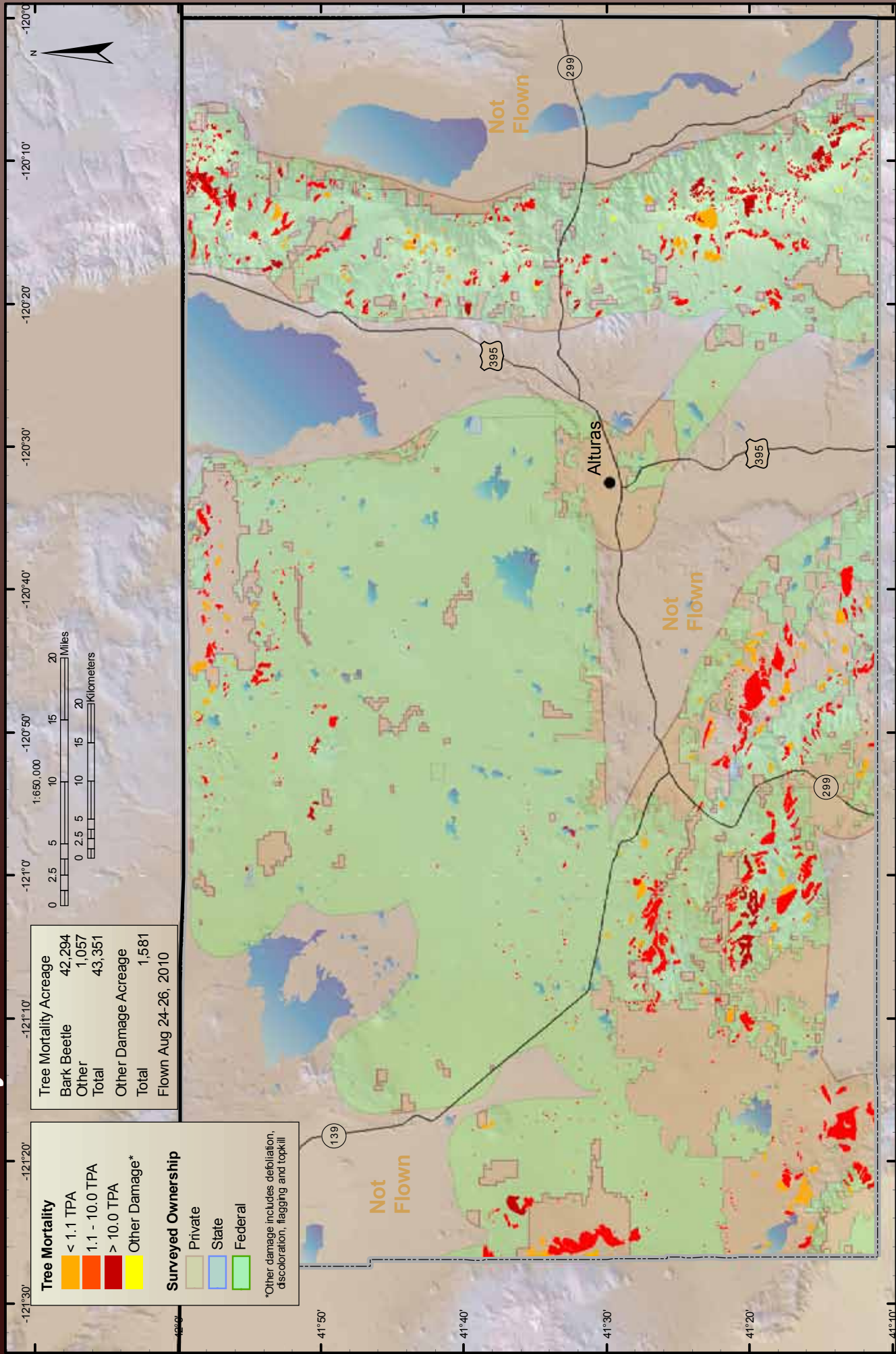


# Mendocino County



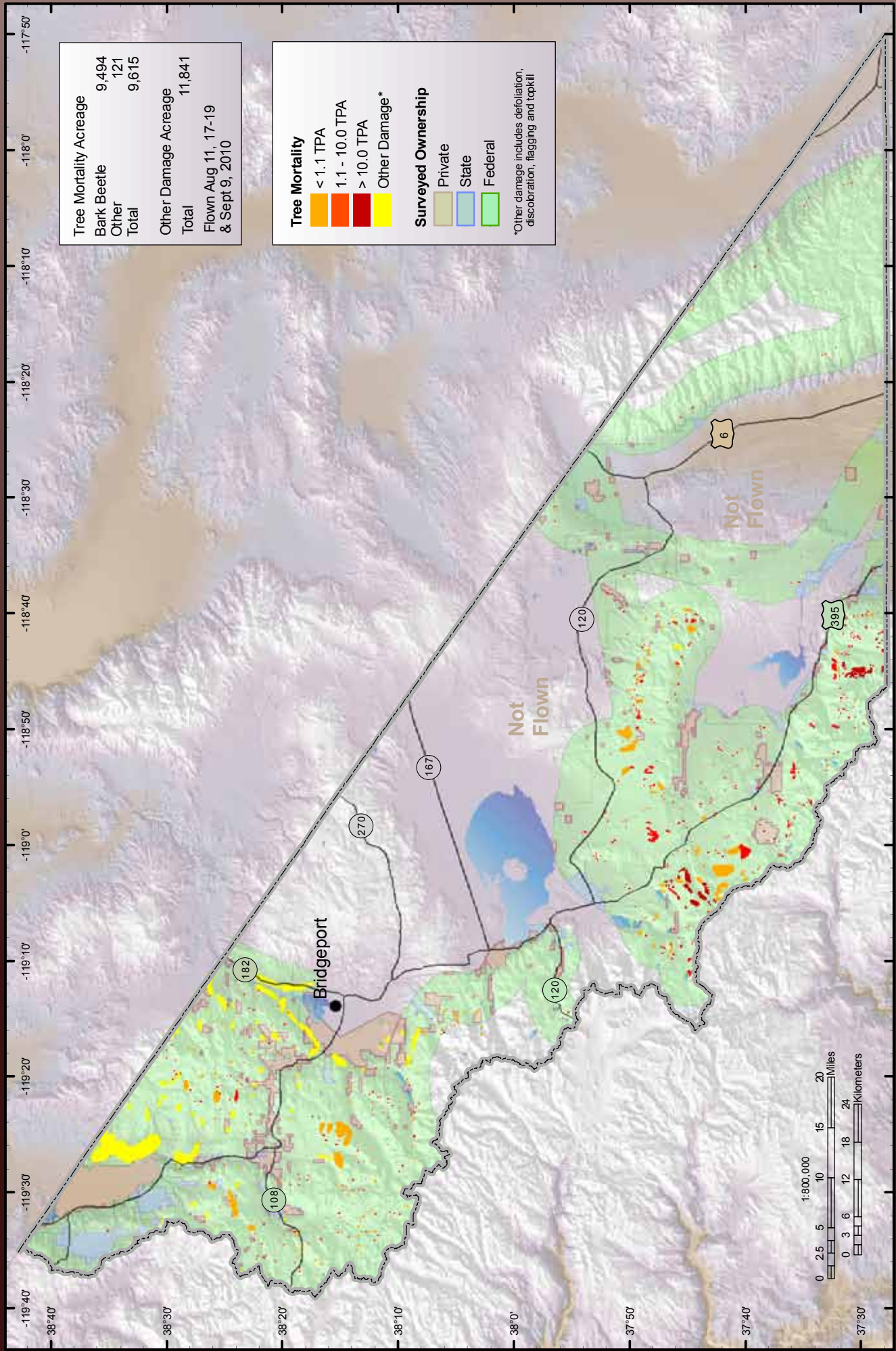


# Modoc County



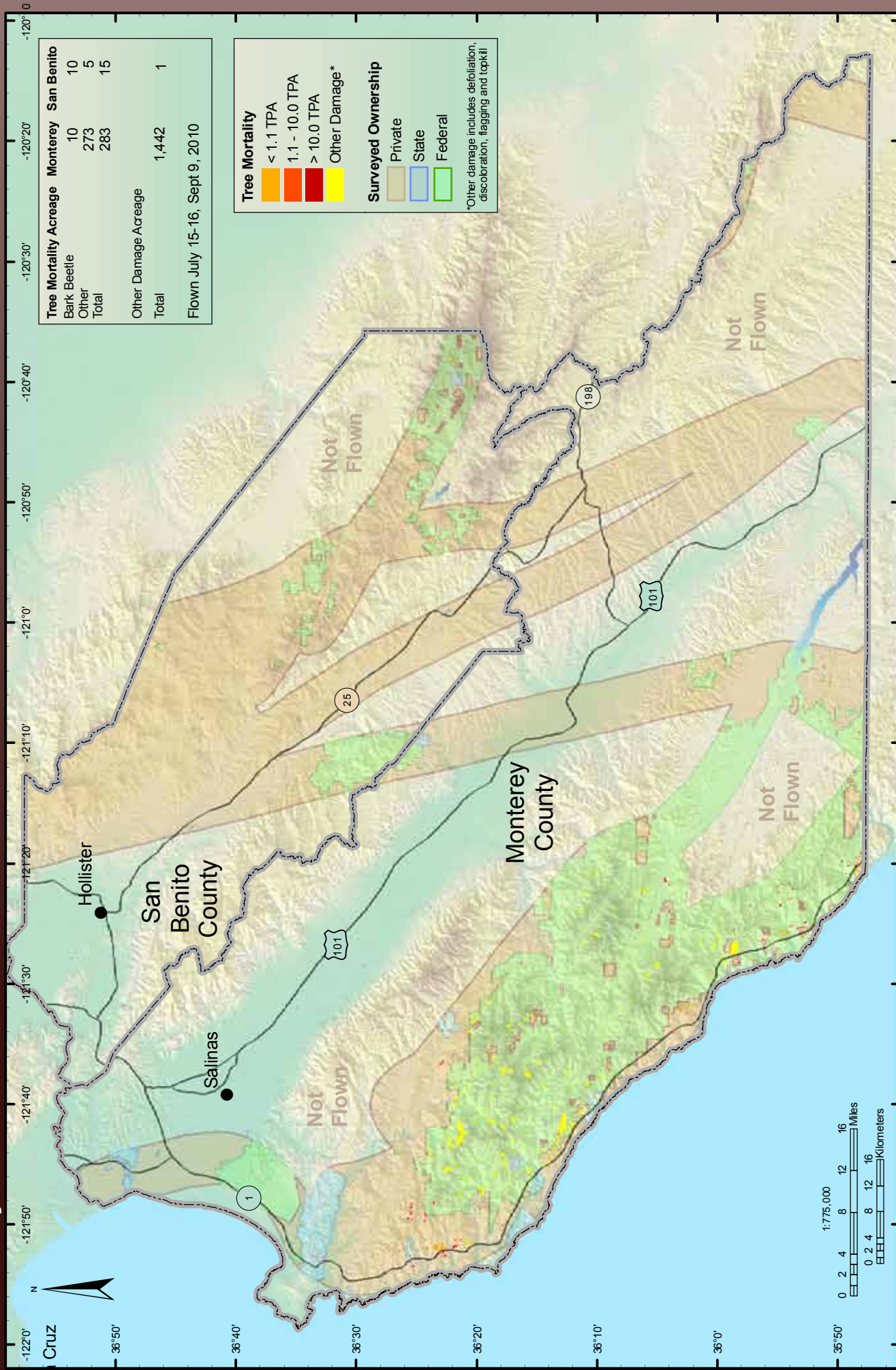


# Mono County



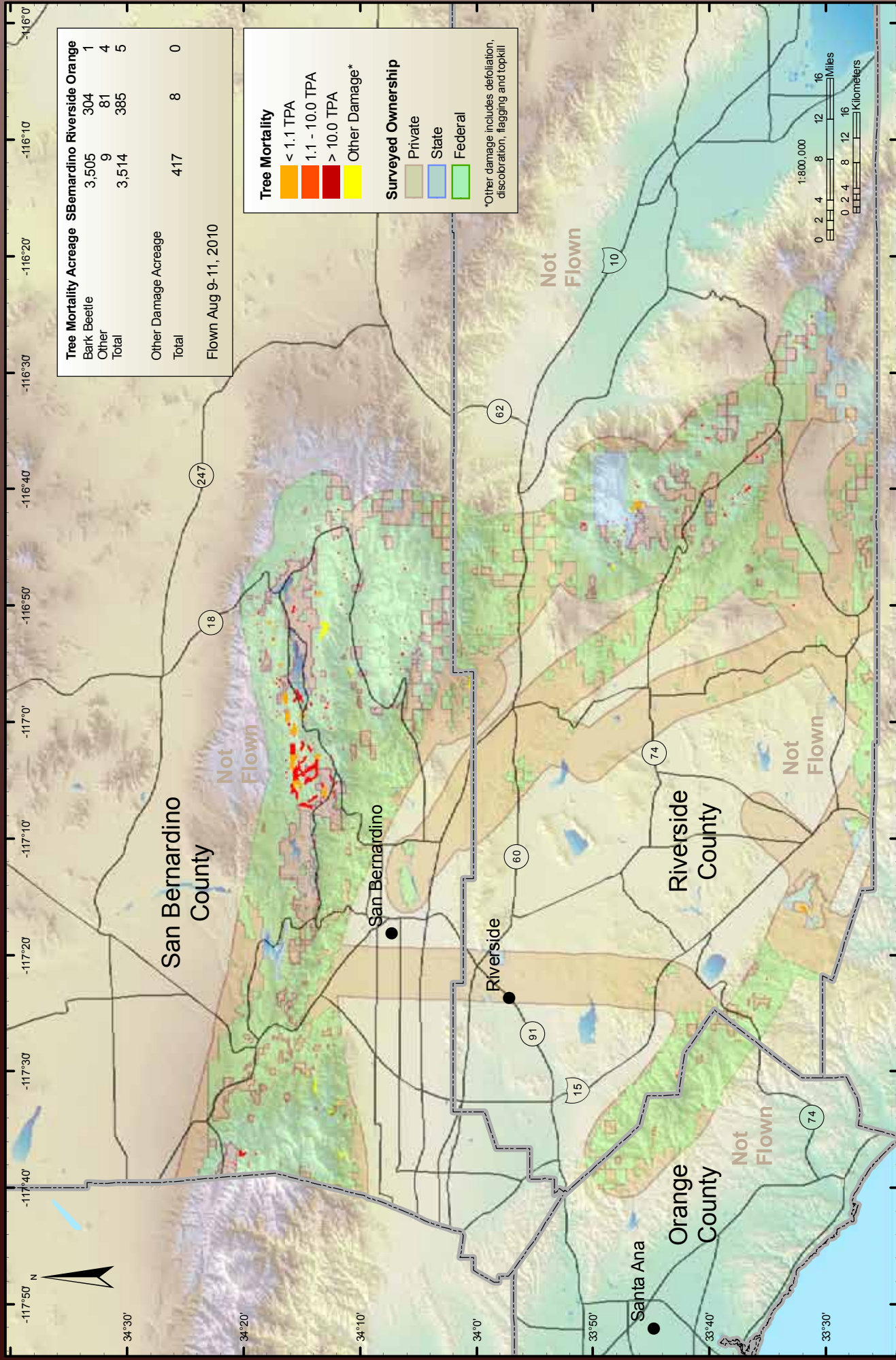


# Monterey and San Benito Counties



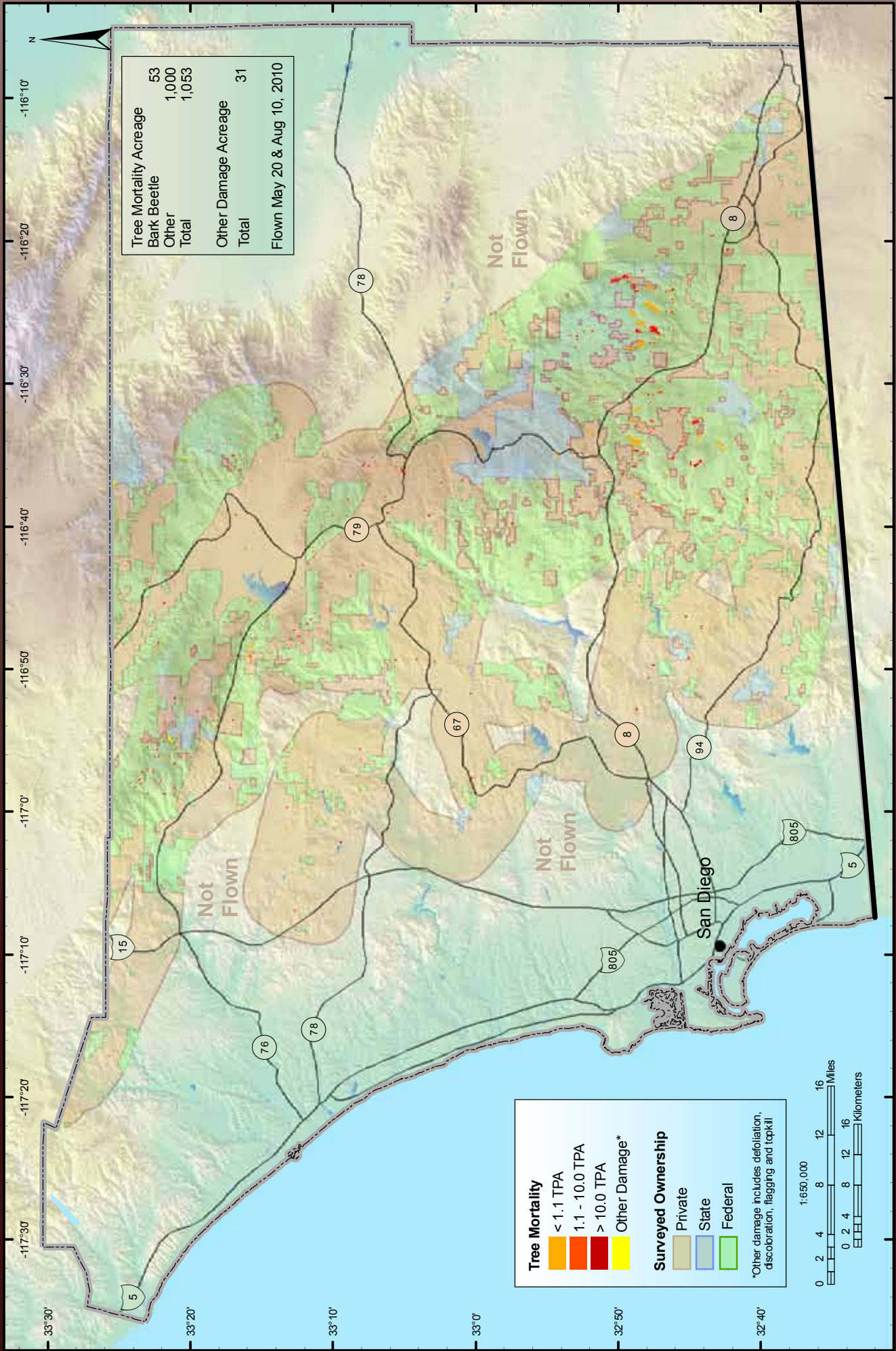


# Orange, Riverside, and San Bernardino Counties



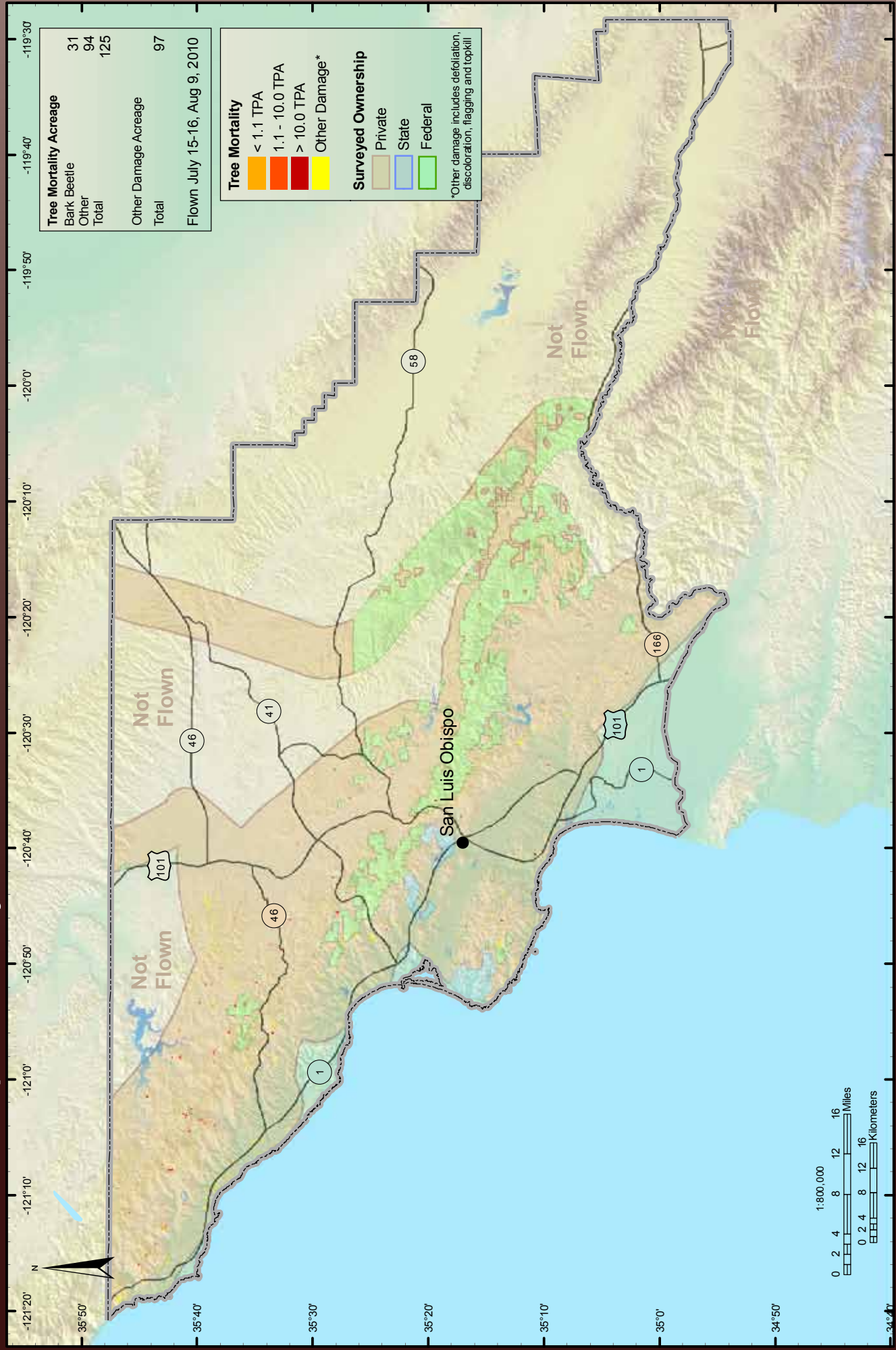


# San Diego County



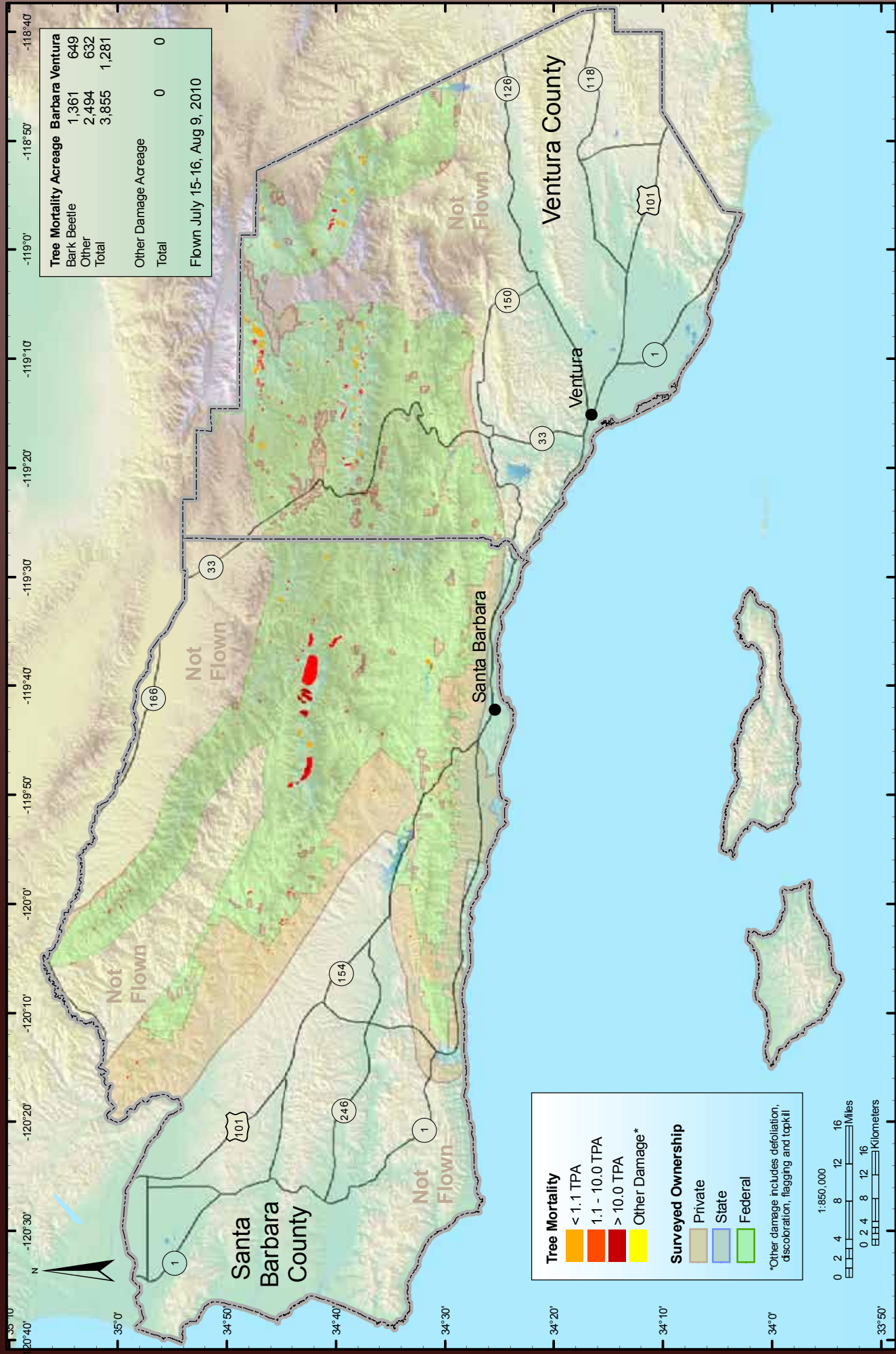


# San Luis Obispo County



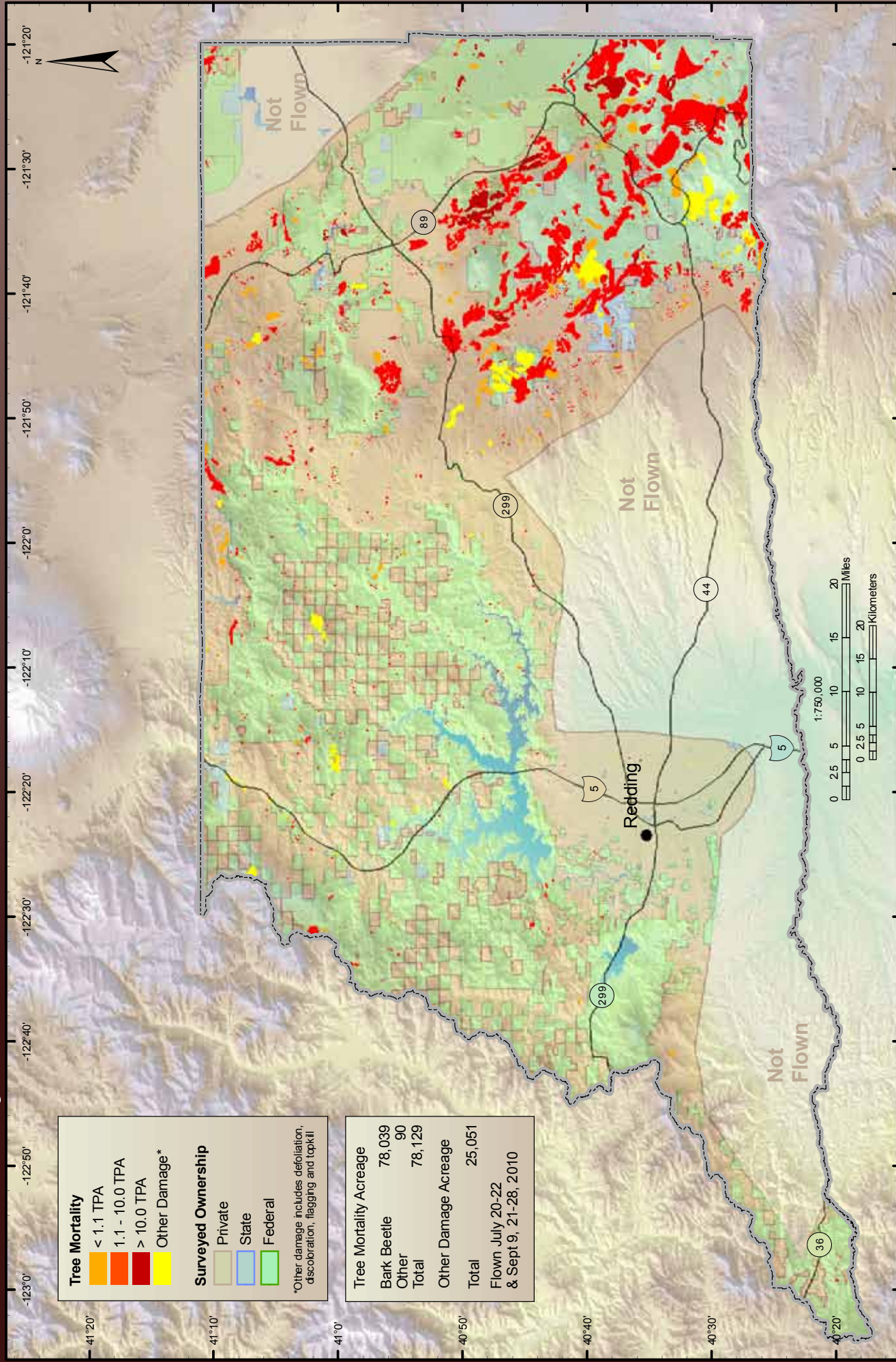


# Santa Barbara and Ventura Counties



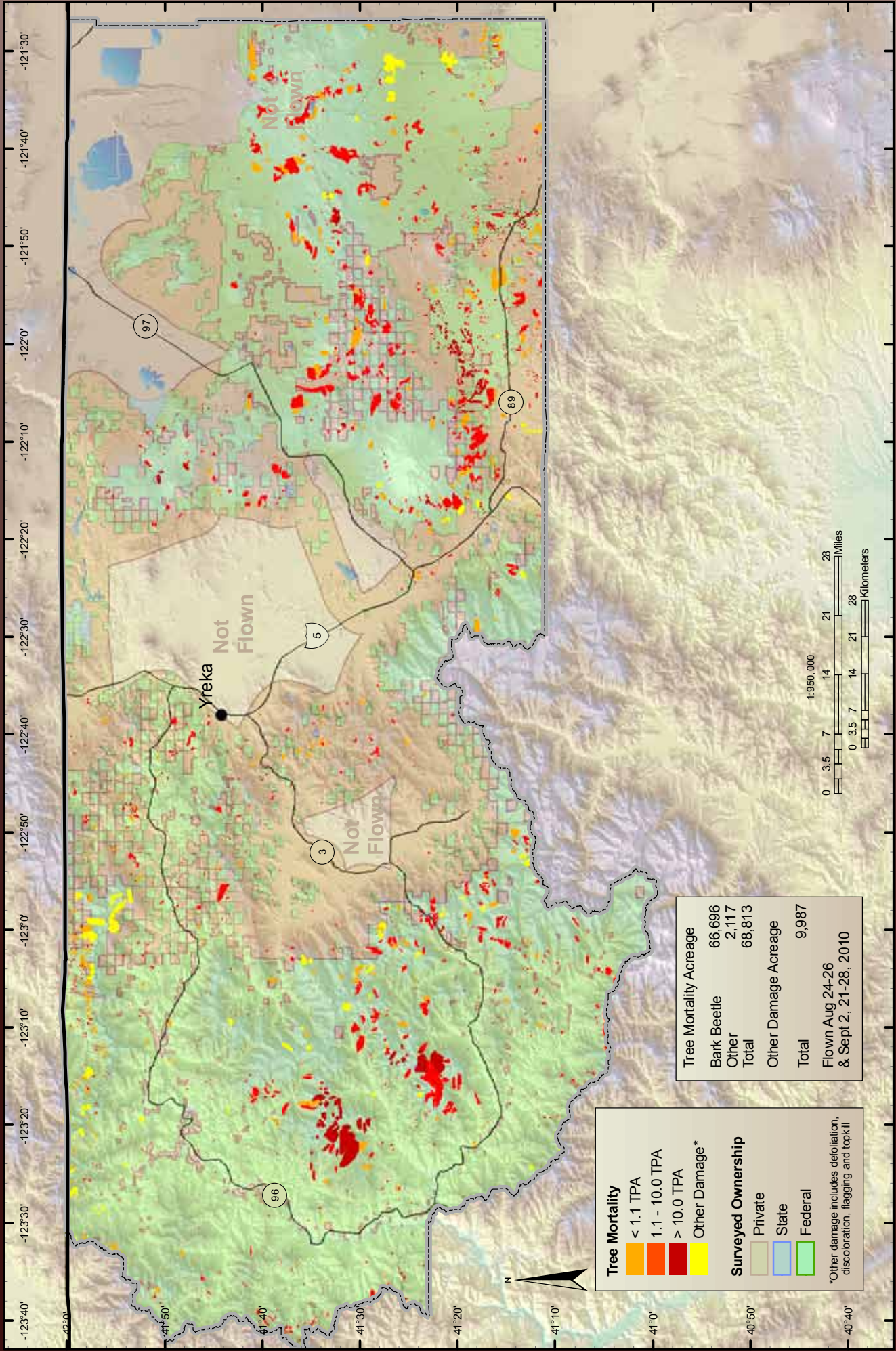


# Shasta County



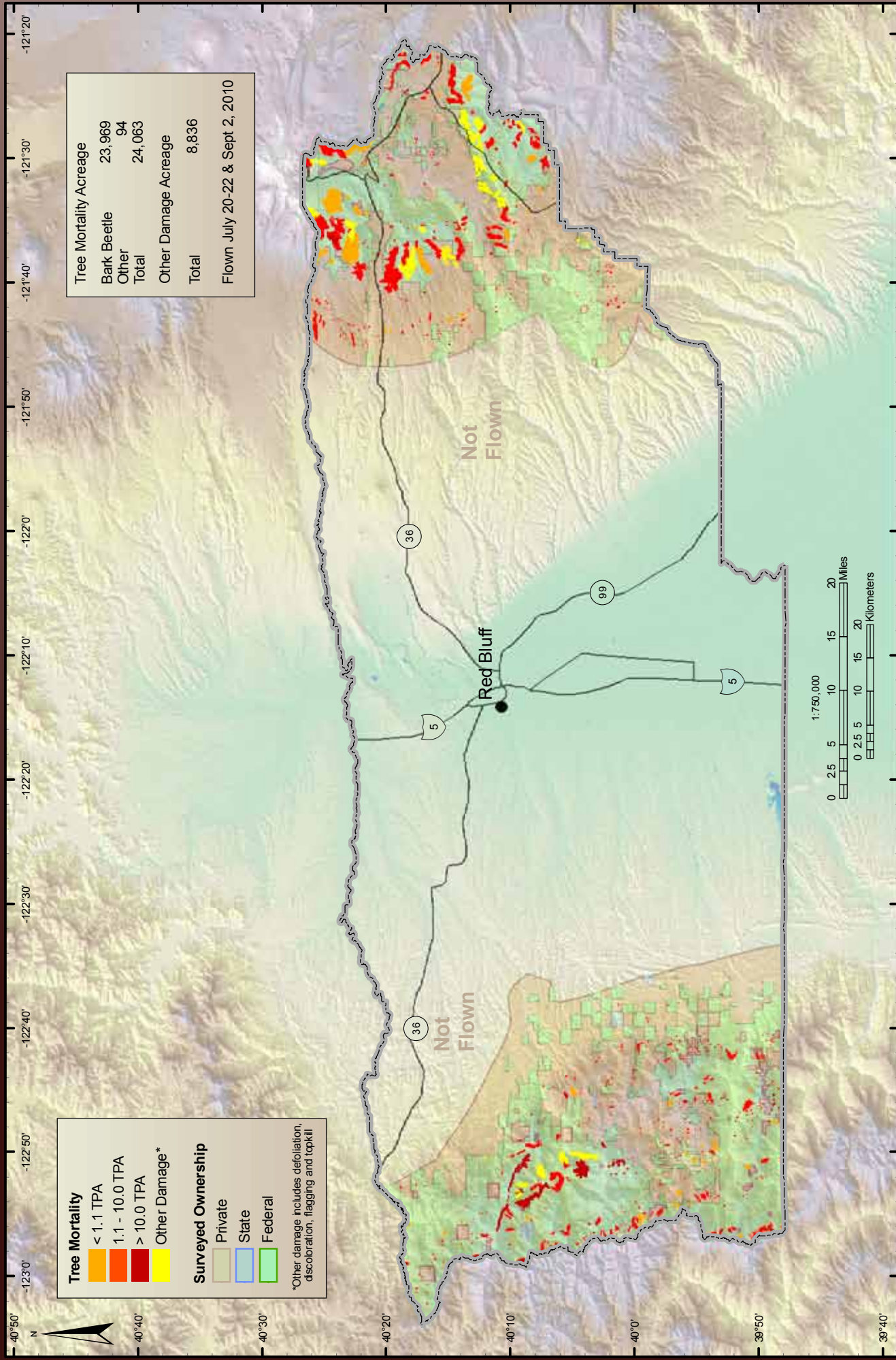


# Siskiyou County



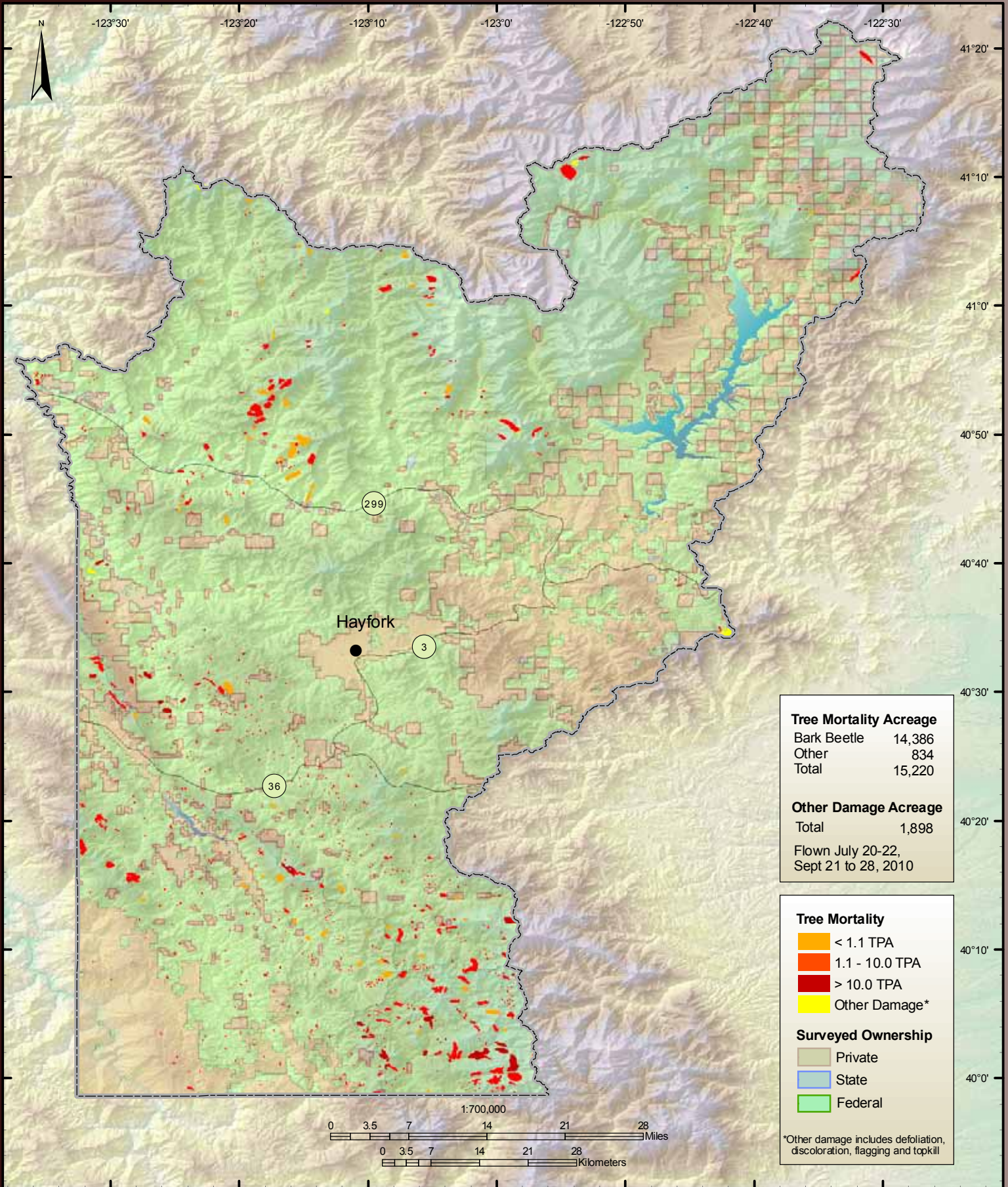


# Tehama County



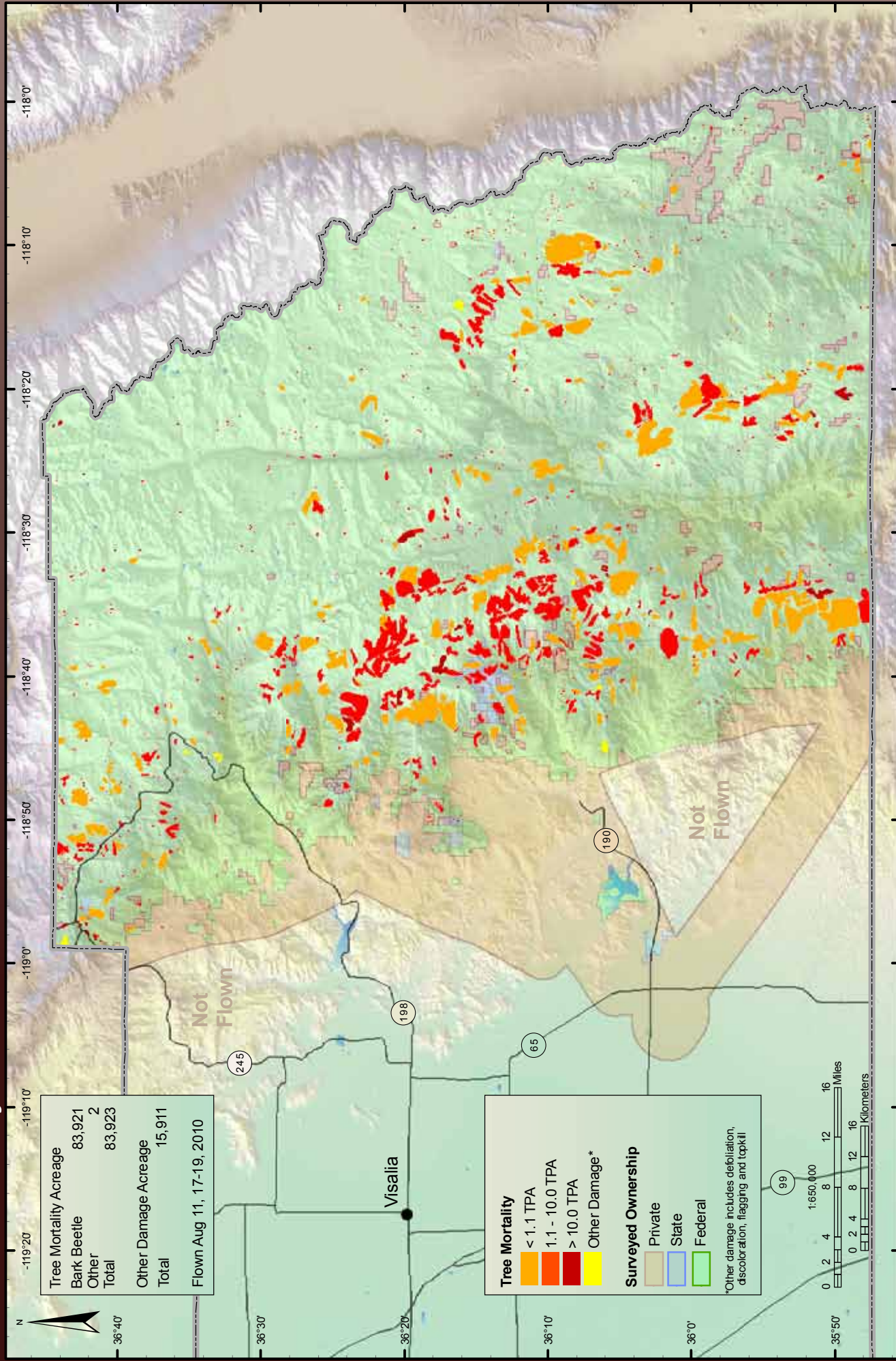


# Trinity County





# Tulare County





The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Ave, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.