Sudden Oak Death and Oak Mortality in California

An Assessment of Sudden Oak Death and Oak Mortality, 2000-2005

State and Private Forestry—Forest Health Protection **August 2006**

Questions:

- What is the current distribution of SOD in California?
  - By county?
  - By owner?
  - By risk of spread?
  - By elevation?
- Where has oak mortality been mapped in California?
- Based on where SOD has been confirmed, where we have mapped oak mortality, and the risk of spread of SOD in the state, where do we expect to see SOD in the future?

Confirmed SOD

Mapped Oak Mortality

Risk of Spread

SOD Management Priorities

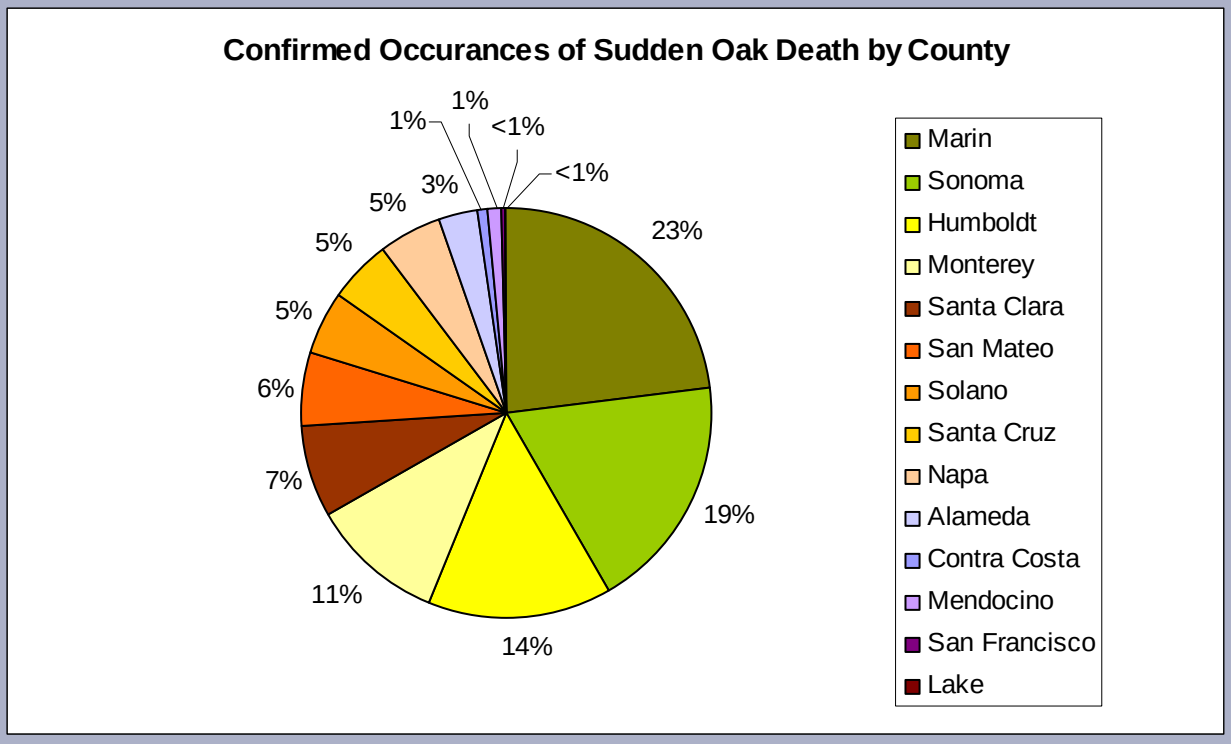
California Counties with Confirmed *P. ramorum**

* Including Curry County, Oregon

Locations of Confirmed isolation of *P. ramorum*

P. ramorum confirmations by County 2000-2005

- Since 2000, there have been 897 cases of confirmed isolation of P. ramorum in 14 coastal counties in California.
- Over 50% of these are found in Marin, Sonoma and Humboldt counties.
- 97% occur in coastal influence zones below 2000 feet.

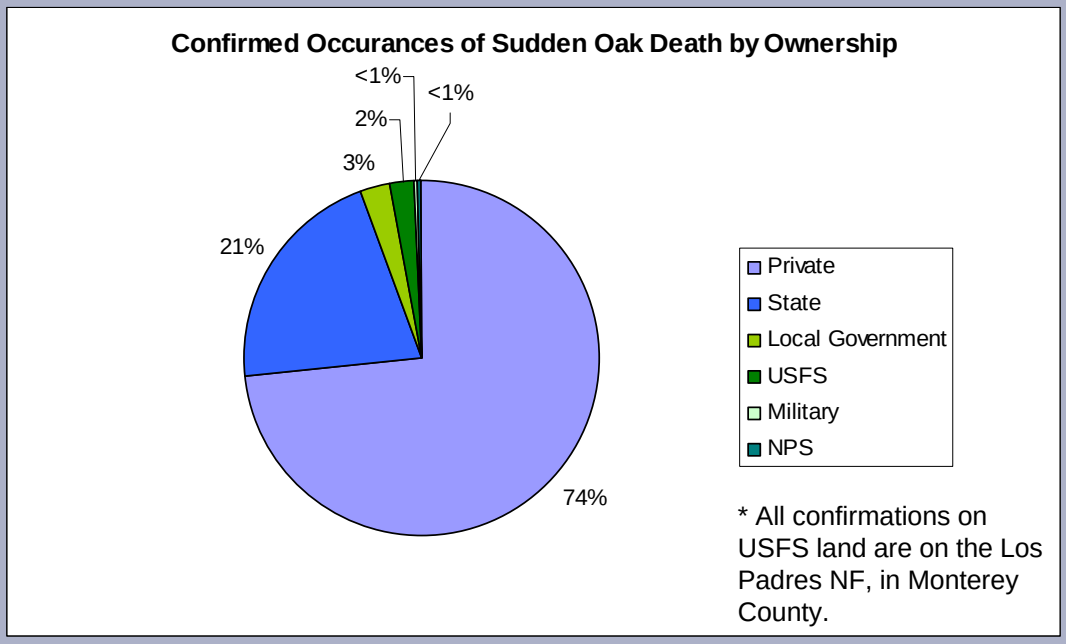


P. ramorum confirmations by County 2000-2005

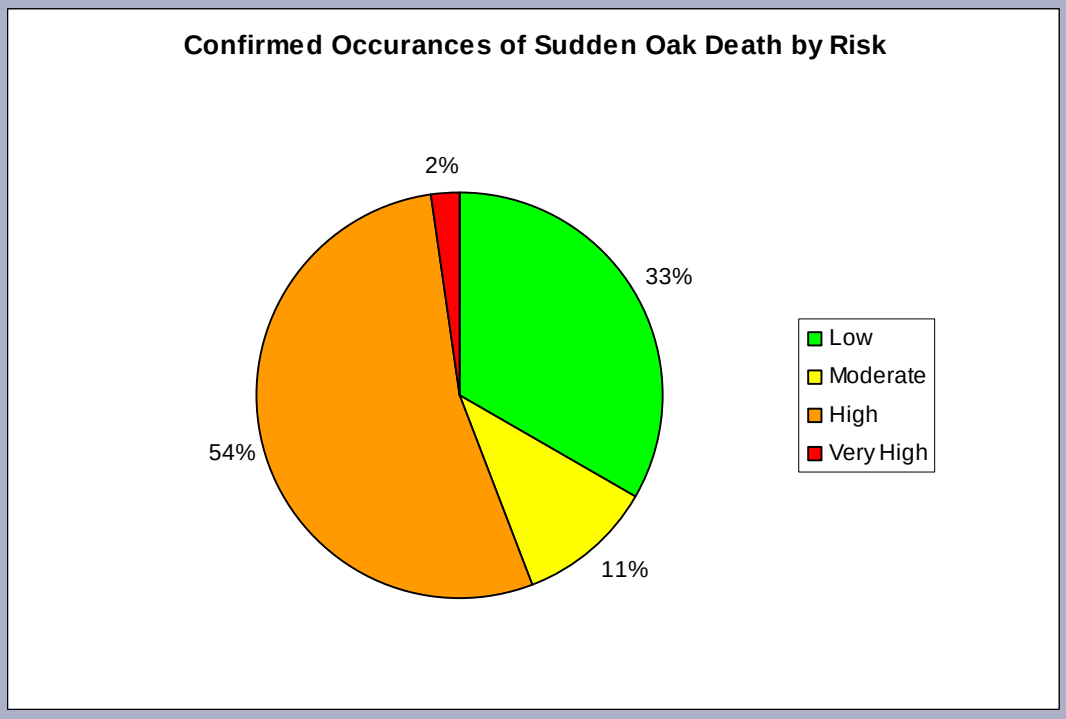
	Year					
County	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
ALAMEDA	0	4	1	0	6	16
CONTRA COSTA	0	3	2	2	2	0
HUMBOLDT	0	0	7	5	3	115
LAKE	0	0	0	0	1	0
MARIN	25	52	3	8	11	107
MENDOCINO	0	6	3	0	0	0
MONTEREY	3	1	9	81	1	0
NAPA	6	9	10	9	2	8
SAN FRANCISCO	0	0	0	0	2	0
SAN MATEO	0	6	4	14	5	23
SANTA CLARA	0	9	7	9	2	37
SANTA CRUZ	6	6	15	5	4	9
SOLANO	0	4	2	1	0	39
SONOMA	32	31	32	40	2	30
TOTAL	**72**	**131**	**95**	**174**	**41**	**384**

P. ramorum confirmations by owner 2000-2005

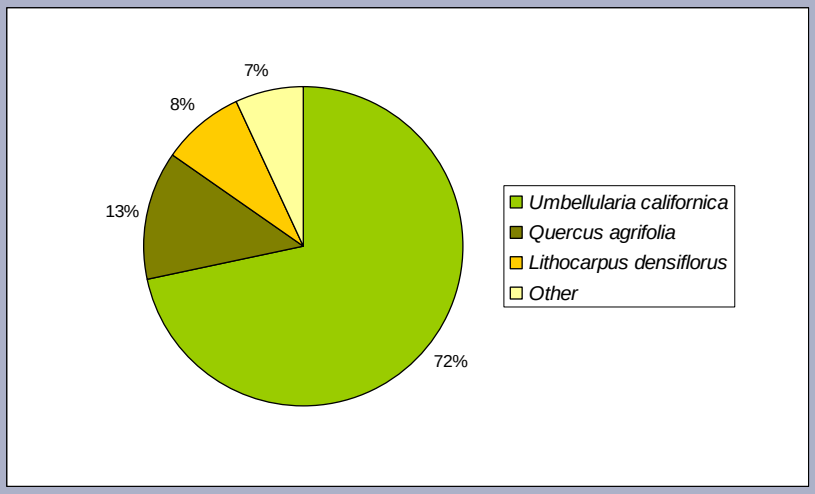
•Most confirmations of *P. ramorum* occur on private and state land



Distribution of *P. ramorum* from 2000-2005 by risk categories (Meentemeyer et al. 2004).



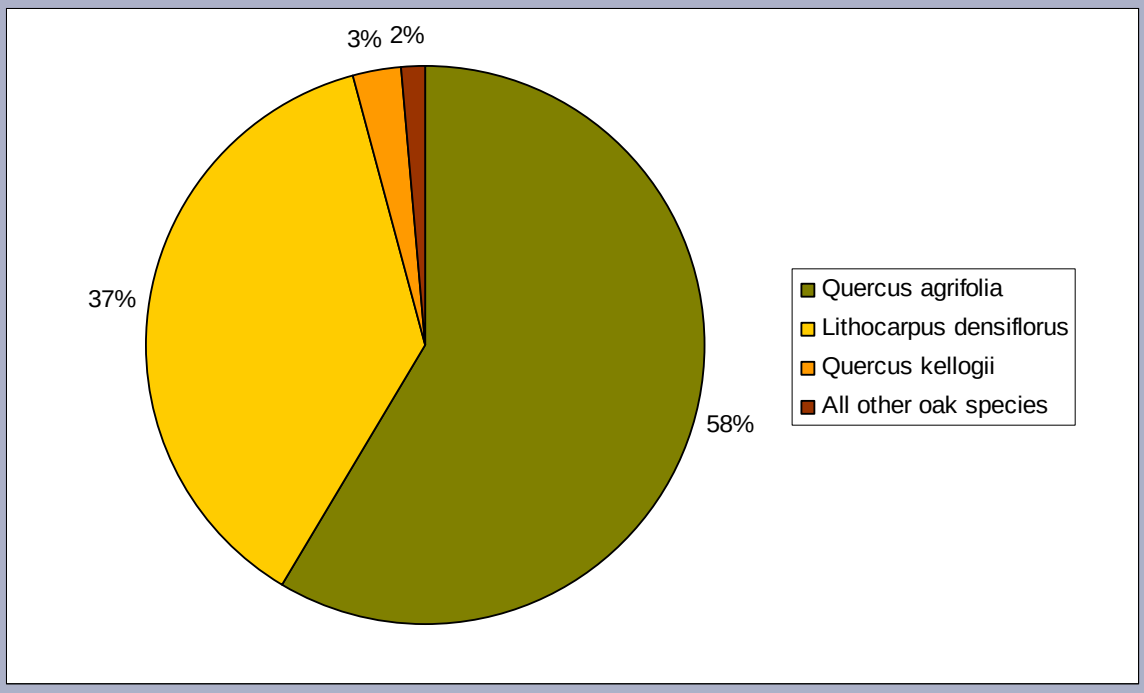
P. ramorum confirmations by host 2000-2005*



Host	Number	Percent
Umbellularia californica	644	72
Quercus agrifolia	116	13
Lithocarpus densiflorus	74	8
Vaccinium ovatum	12	1
Sequoia sempervirens	6	<1
Quercus kellogii	5	<1
Rhododendron macrophyllum	5	<1
Acer macrophyllum	3	<1
Arbutus menziesii	3	<1
Heteromeles arbutifolia	3	<1
Pseudotuga menziesii	2	<1
Adiantum jordanii	1	<1
Aesculus californica	1	<1
Corylus cornuta	1	<1
Lonicera sp.	1	<1
Osmorhiza chiliensis	1	<1
Quercus chrysolepis	1	<1
Quercus parvula	1	<1
Quercus sp.	1	<1
Rosa gymnocarpa	1	<1
Taxus brevifolia	1	<1
Acer circinatum	1	<1
unknown	13	1

* Most of these are foliar hosts that contract *P. ramorum* but are not killed.

P. ramorum confirmations by host 2000-2005 : host species killed by *P. ramorum*

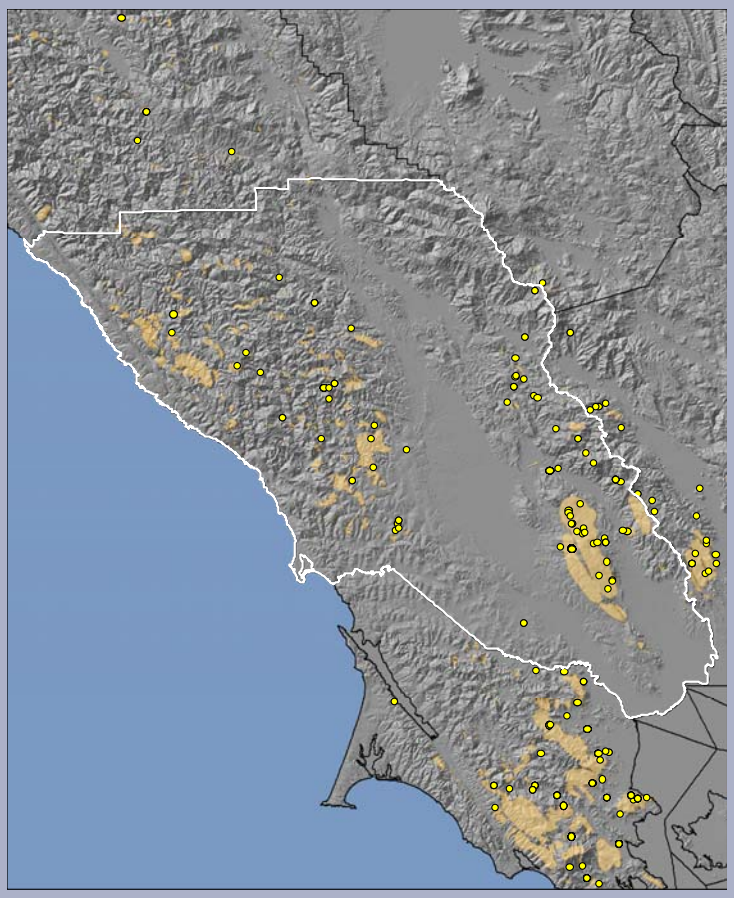


Host	Number	Percent
Quercus agrifolia	116	59
Lithocarpus densiflorus	74	37
Quercus kellogii	5	3
All other oak species	3	2

How do confirmed locations of *P. ramorum* compare with mapped oak mortality*?

- 57% of confirmed isolation of P. ramorum fall within ¼ mile (400m) of a mapped oak mortality polygon.
- 73% fall within ½ mile (800m) of a mapped oak mortality polygon
- 80% are within 1 km (0.62 miles)
- 95% are within 2.5 km (1.6 miles)
- Mean distance to mapped oak mortality polygon: 790m (0.49 miles)

*Based on data through 12/2005.

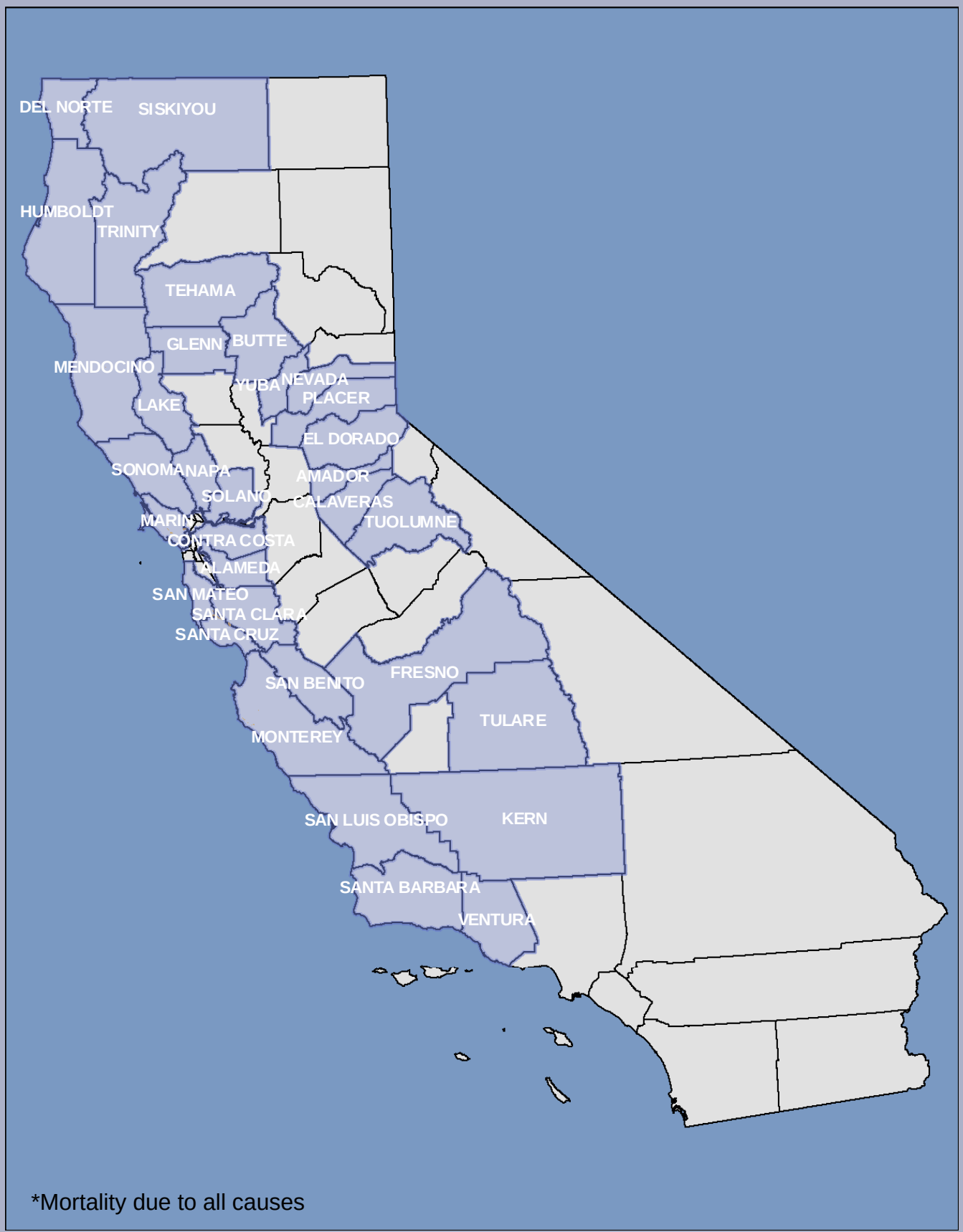


*Mortality due to all causes

California Mapped Oak Mortality* 2001-2005

*Mortality due to all causes

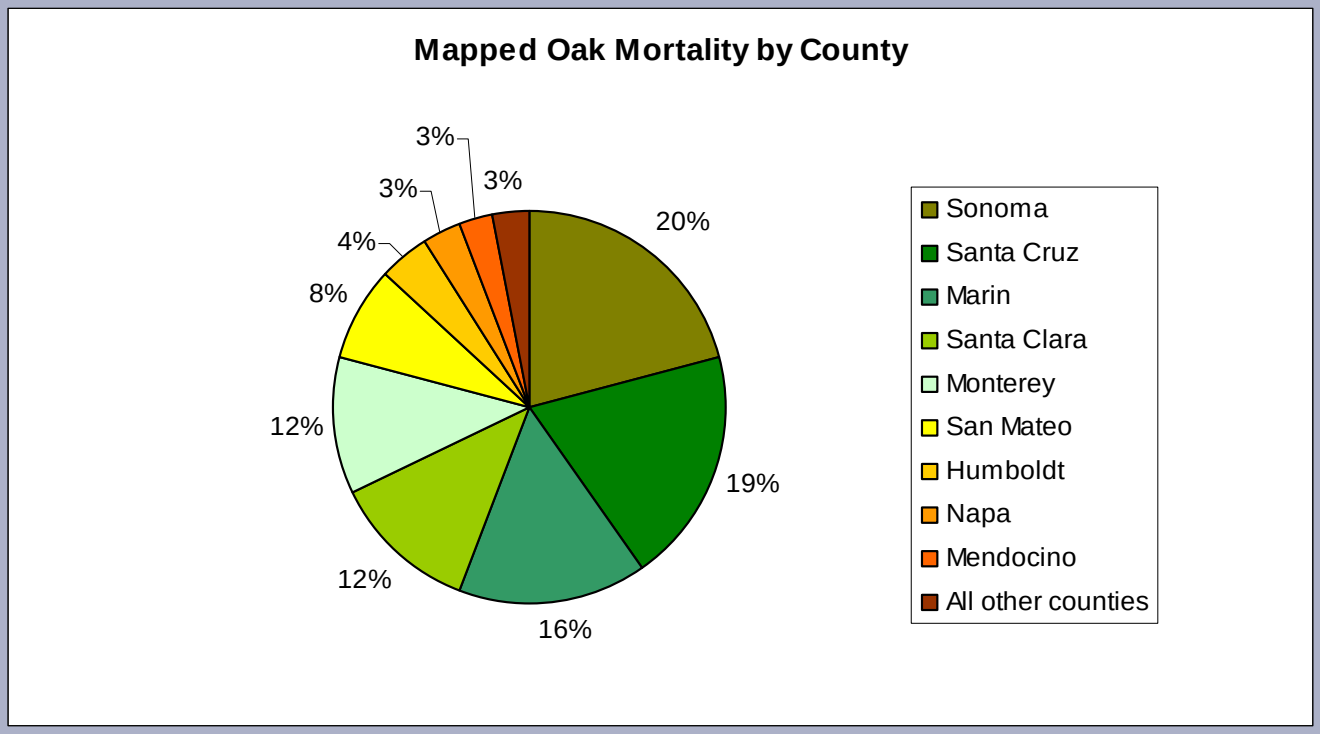
California Counties with Mapped Oak Mortality* 2001-2005



*Mortality due to all causes

Mapped Oak Mortality* by County 2001-2005

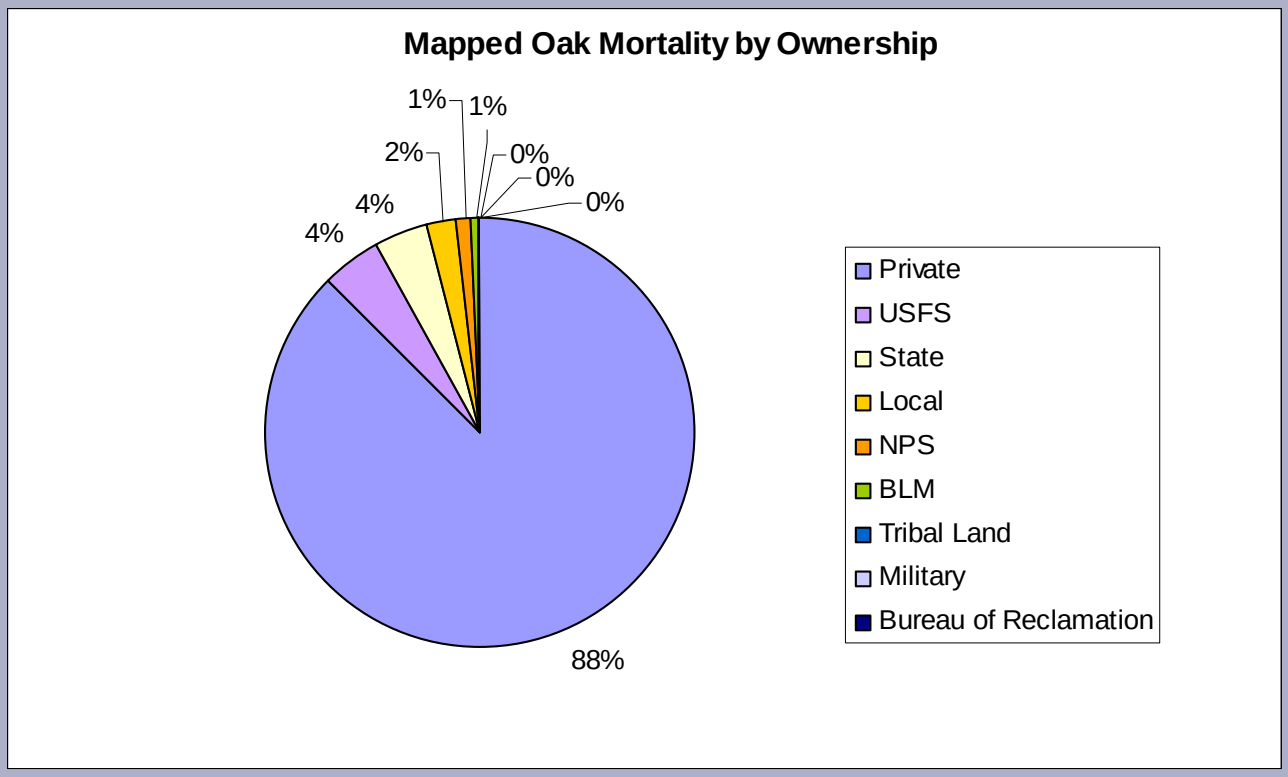
- 97% of Mapped Oak Mortality Occurs in 9 counties



*Mortality due to all causes

County	Acres	Percent
Sonoma	47661	20
Santa Cruz	44897	19
Marin	36112	16
Santa Clara	26947	12
Monterey	26596	12
San Mateo	17633	8
Humboldt	9737	4
Napa	6741	3
Mendocino	6634	3
All Other Counties	8033	3
TOTAL	230990	100

Mapped Oak Mortality* by Ownership 2001-2005



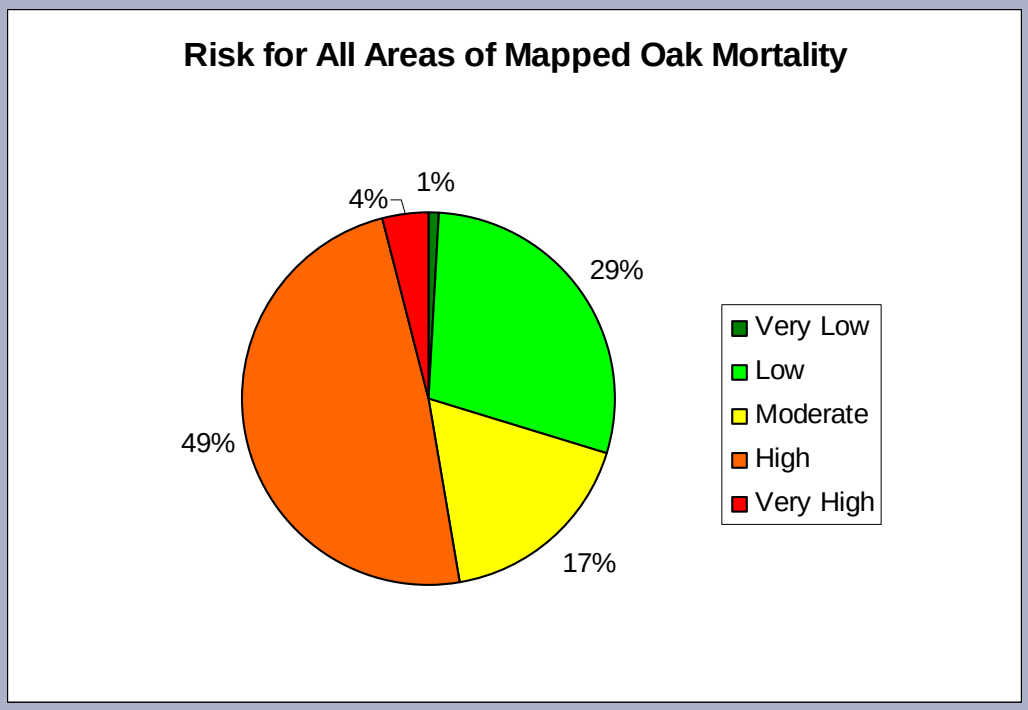
Owner	Acres	Percent
Private	202,291	88
USFS	10,062	4
State	9,625	4
Local	4,976	2
NPS	2,654	1
BLM	1,236	<1
Tribal Land	84	<1
Military	59	<1
Bureau of Reclamation	3	<1
Total	230,990	100

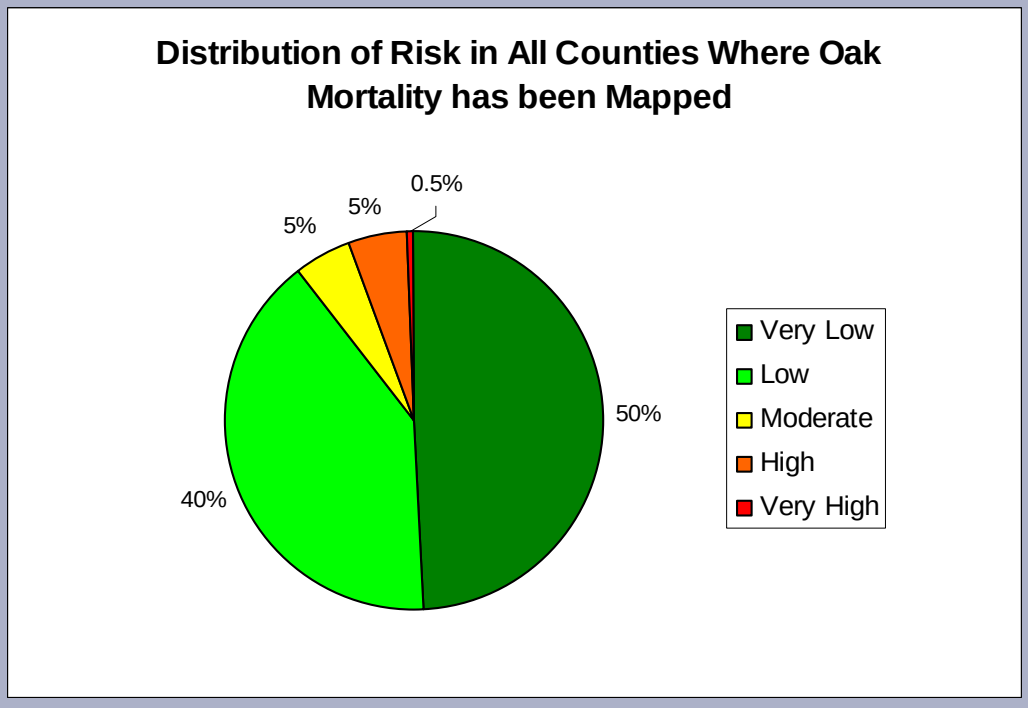
National Forest	Acres	Percent
Los Padres NF	8,649	86
Six Rivers NF	558	6
Sequoia NF	387	4
Klamath NF	198	2
Plumas NF	167	2
Mendocino NF	51	1
Eldorado NF	19	<1
Lassen NF	13	<1
Sierra NF	13	<1
Stanislaus NF	4	<1
Tahoe NF	2	<1
Total	10,062	100

*Mortality due to all causes

Mapped Oak Mortality* by Risk of Spread 2001-2005

- Most oak mortality has been mapped in high, moderate and low risk areas
- Within the counties where oak mortality has been mapped, most land area is in very low and low risk areas

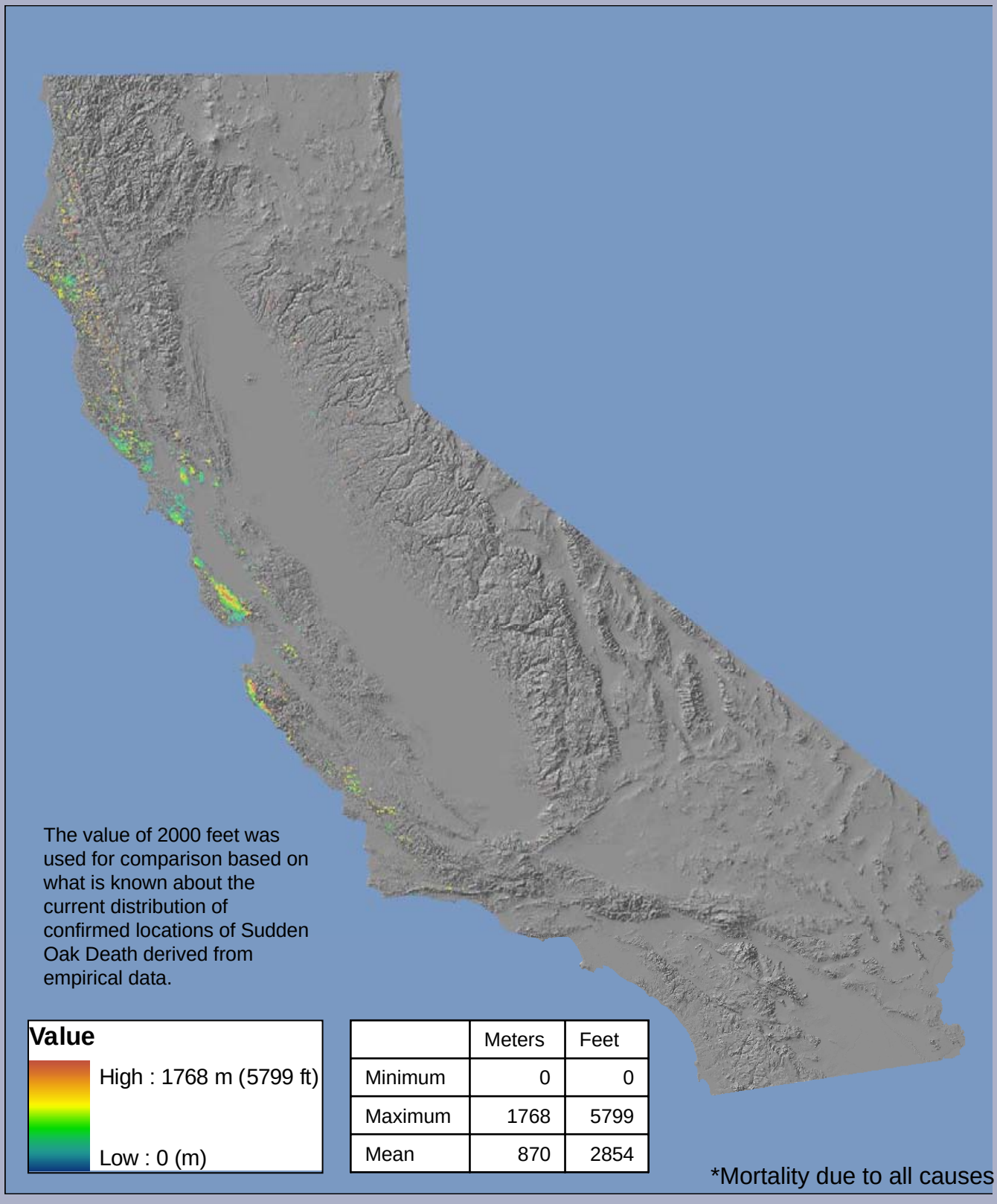




*Mortality due to all causes

Mapped Oak Mortality* Elevation Distribution

- 87% of Mapped Oak Mortality occurs at elevations < 2000 ft.*



The value of 2000 feet was used for comparison based on what is known about the current distribution of confirmed locations of Sudden Oak Death derived from empirical data.

Value

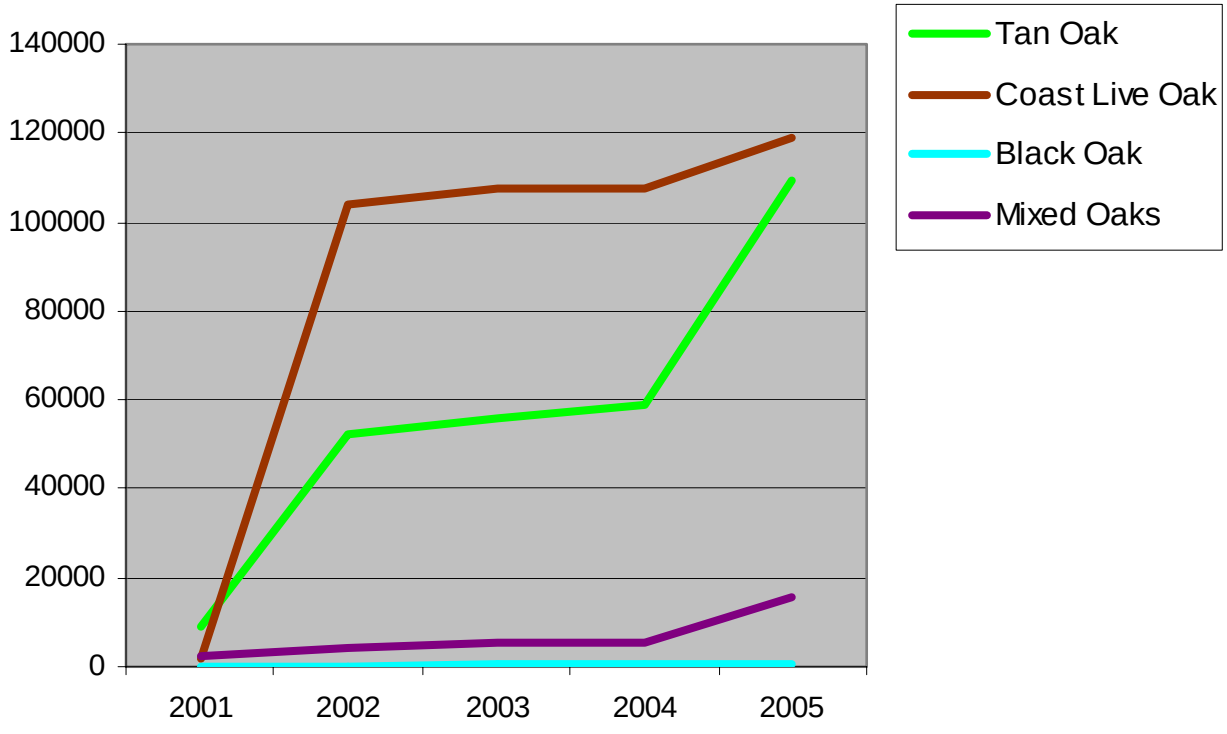
High : 1768 m (5799 ft)

Low : 0 (m)

	Meters	Feet
Minimum	0	0
Maximum	1768	5799
Mean	870	2854

*Mortality due to all causes

Oak Mortality* by Host 2001-2005



*Mortality due to all causes

Where do we expect SOD in the future?

- Risk of Spread in areas not yet mapped as Oak Mortality*, under 2000 feet

Risk	Acres	Percent
High	1,850,405	91
Very High	184,821	9
Total	2,035,226	100

Risk of Spread

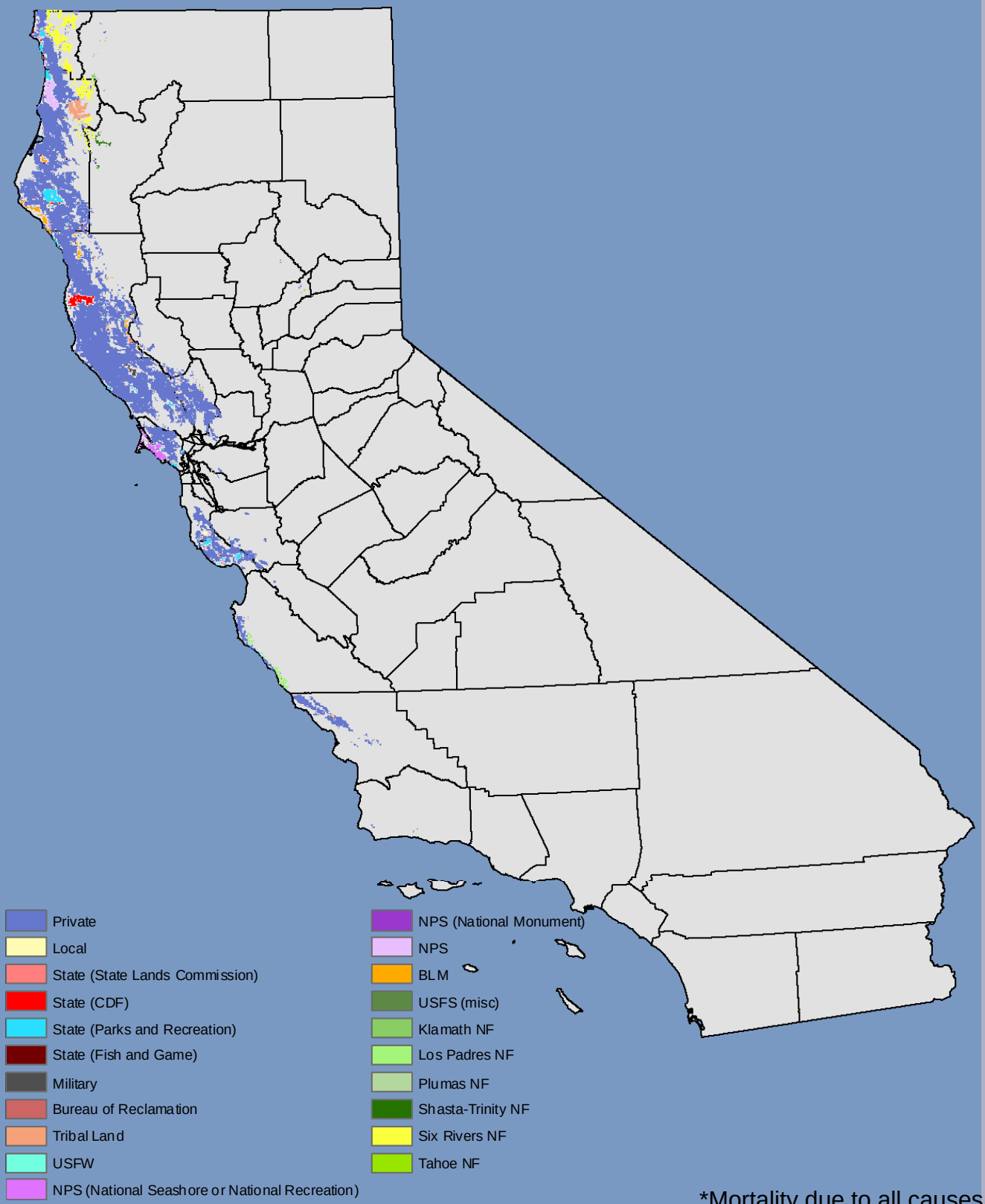
High

Very High

*Mortality due to all causes

Where do we expect SOD in the future?

Ownership in high and very high risk areas not yet mapped as Oak Mortality*, under 2000 feet



*Mortality due to all causes

Area classified as very high risk for SOD, where Oak mortality* has not been mapped, below 2000 feet, by county.

County	Acres	Percent	Risk
Humboldt	40,109	22	Very High
Santa Cruz	37,586	20	Very High
Del Norte	35,508	19	Very High
Sonoma	26,197	14	Very High
Mendocino	25,448	14	Very High
San Mateo	19,967	11	Very High
Monterey	7	0	Very High
Total	184,821	100	

*Mortality due to all causes

Area classified as high risk for SOD, where Oak mortality* has not been mapped, below 2000 feet, by county.

County	Acres	Percent	Risk
Humboldt	623,647	34	High
Mendocino	519,052	28	High
Sonoma	267,097	14	High
Del Norte	116,094	6	High
Napa	87,873	5	High
Marin	60,421	3	High
Santa Cruz	60,034	3	High
San Mateo	36,097	2	High
San Luis Obispo	22,834	1	High
Santa Clara	19,621	1	High
Monterey	17,989	1	High
Lake	6,643	<1	High
Trinity	3,729	<1	High
Alameda	3,061	<1	High
Solano	2,278	<1	High
Contra Costa	1,856	<1	High
Siskiyou	1,382	<1	High
San Benito	415	<1	High
Santa Barbara	225	<1	High
Yuba	34	<1	High
Nevada	13	<1	High
Butte	1	<1	High
Total	1,850,394	100	

*Mortality due to all causes

Ownerships with most area at risk for Sudden Oak Death in the Future:

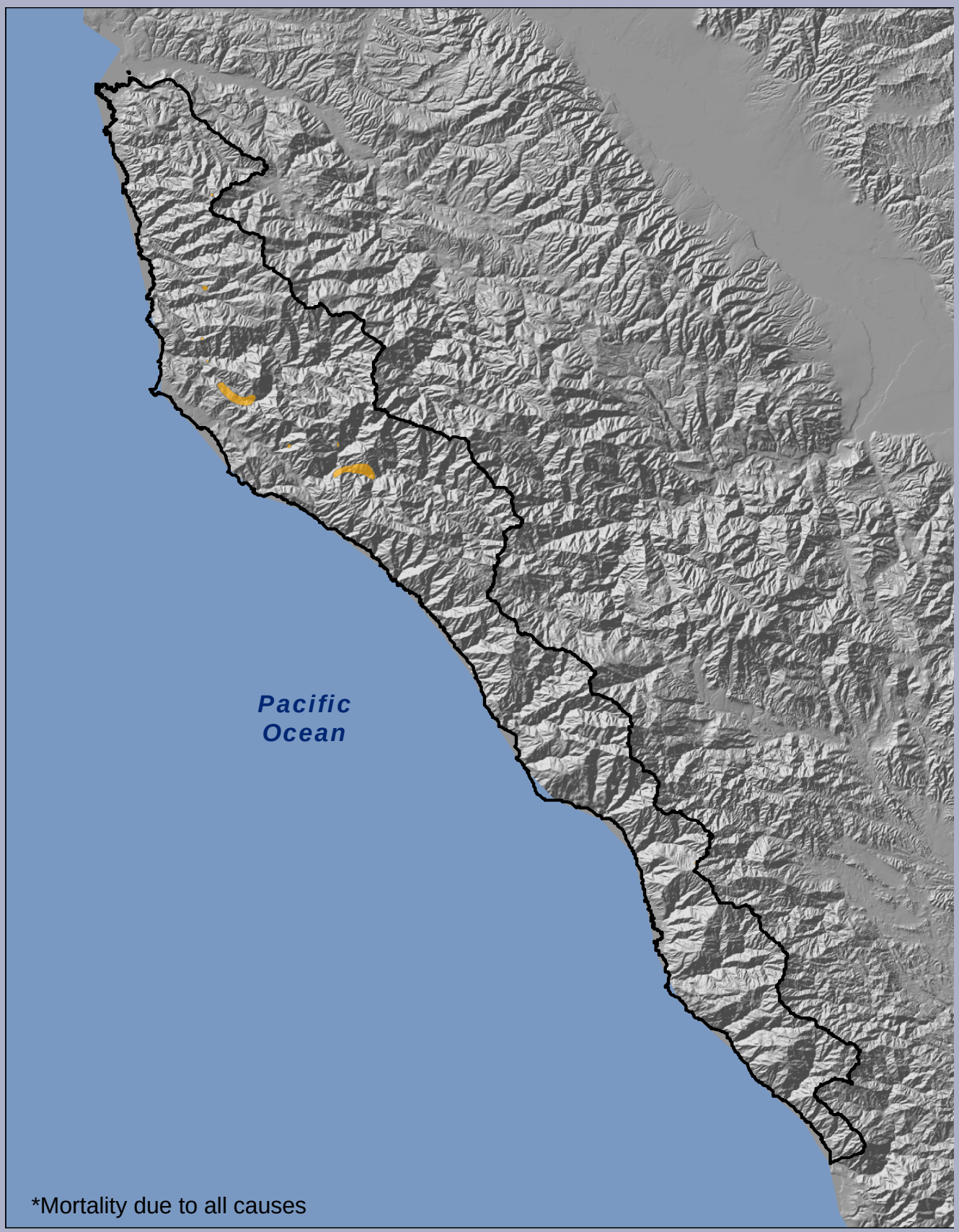
- Private Land
- State Land—Parks and Recreation
- Six Rivers National Forest
- Bureau of Land Management
- National Park Service

Area classified as high and very high risk for SOD, where Oak mortality* has not been mapped, below 2000 feet, by owner.

Owner	Acres	Percent
Private	1,703,883	84
State (Parks and Recreation)	102,361	5
Six Rivers NF	78,202	4
BLM	40,444	2
NPS	36,043	2
Tribal Land	19,281	1
Local	13,170	1
State (CDF)	13,086	1
NPS (National Seashore or National Recreation)	10,840	1
Los Padres NF	7,913	<1
Military	4,172	<1
State (State Lands Commission)	3,239	<1
Klamath NF	1,168	<1
Shasta-Trinity NF	538	<1
NPS (national monument)	487	<1
State (Fish and Game)	221	<1
USFS (misc)	42	<1
Tahoe NF	27	<1
Unknown	13	<1
Bureau of Reclamation	3	<1
USFW	1	<1
Plumas NF	0	<1
Total	2,035,134	100

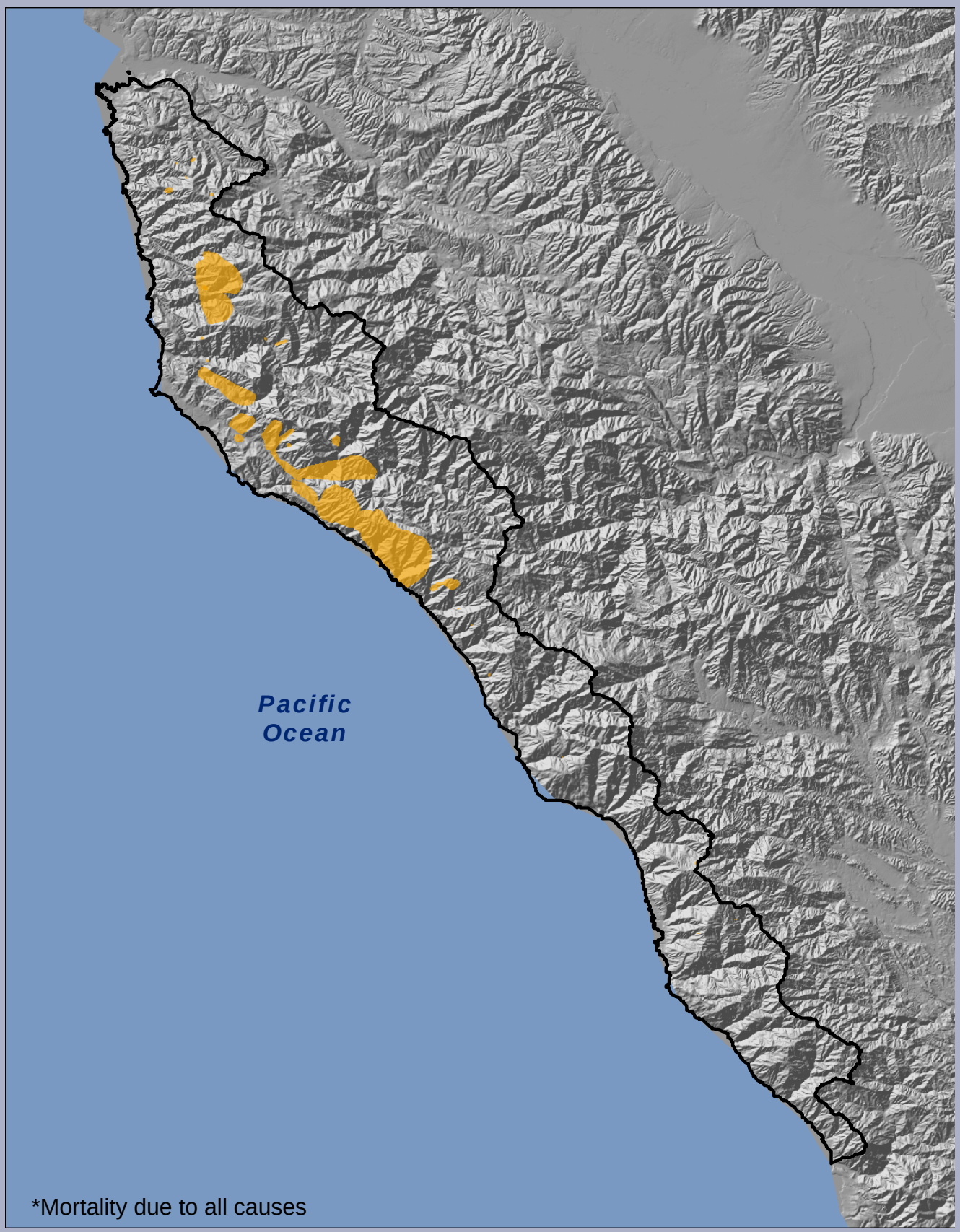
*Mortality due to all causes

Big Sur Ecoregion Oak Mortality* 2001



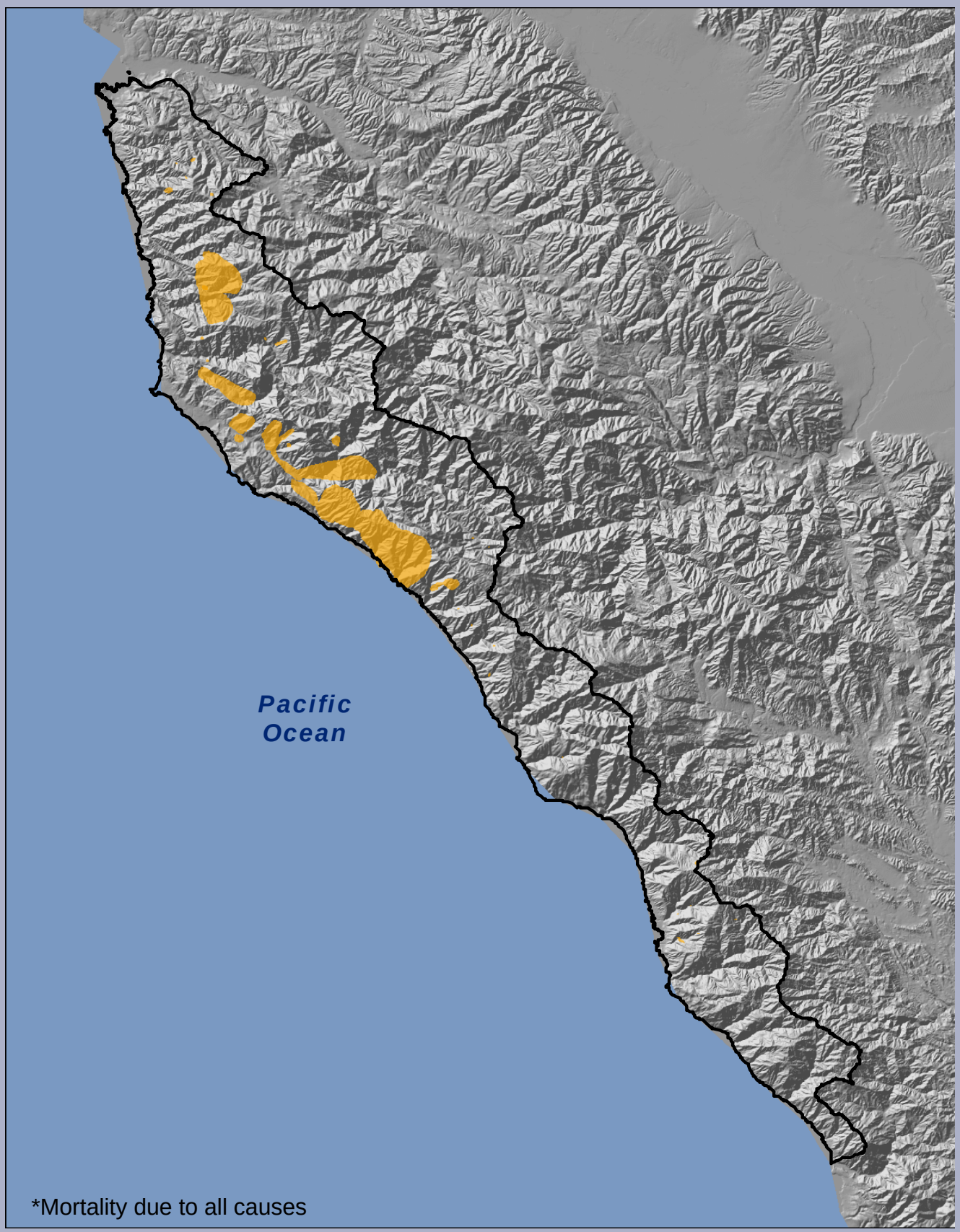
*Mortality due to all causes

Big Sur Ecoregion Oak Mortality* 2002



*Mortality due to all causes

Big Sur Ecoregion Oak Mortality* 2003



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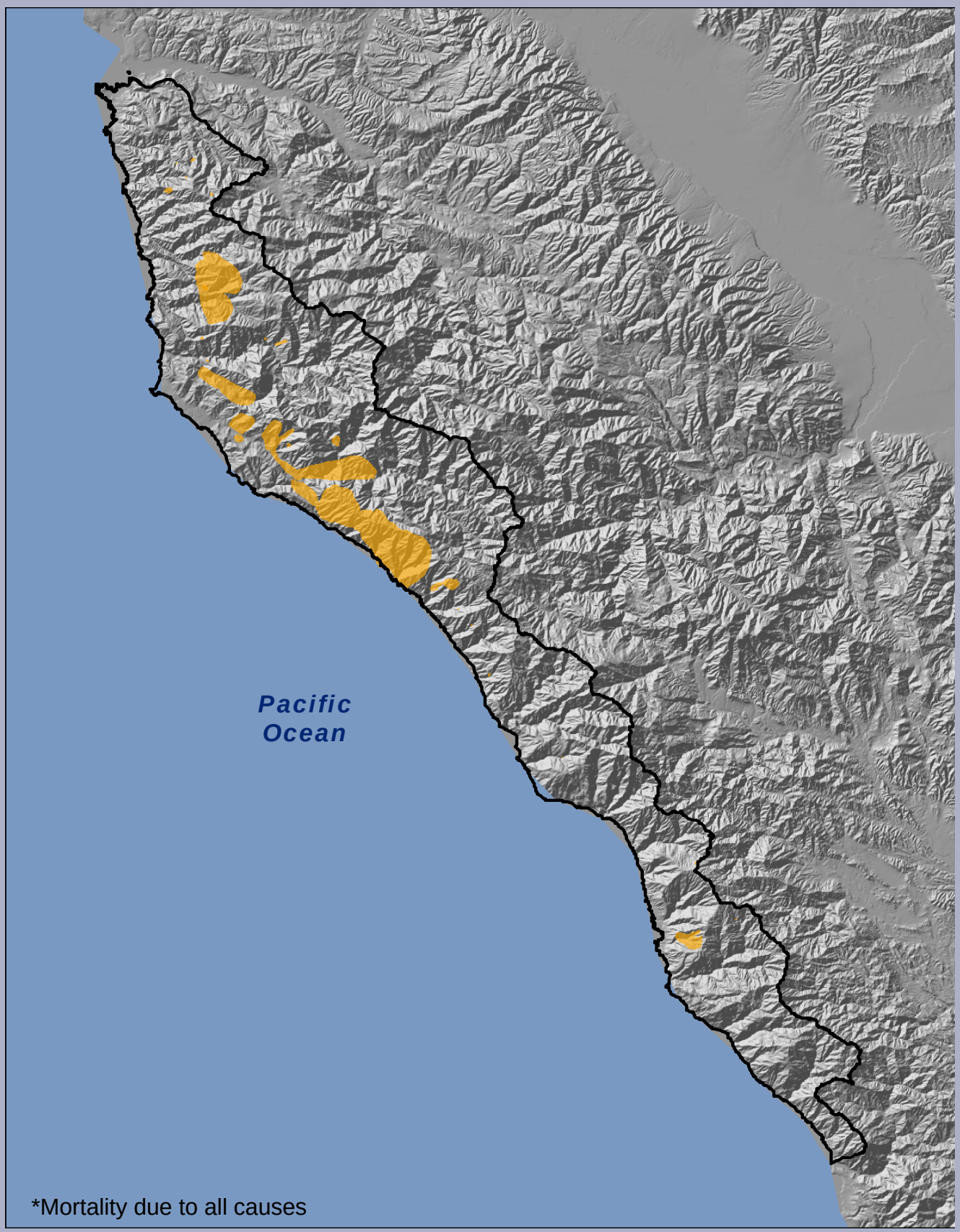
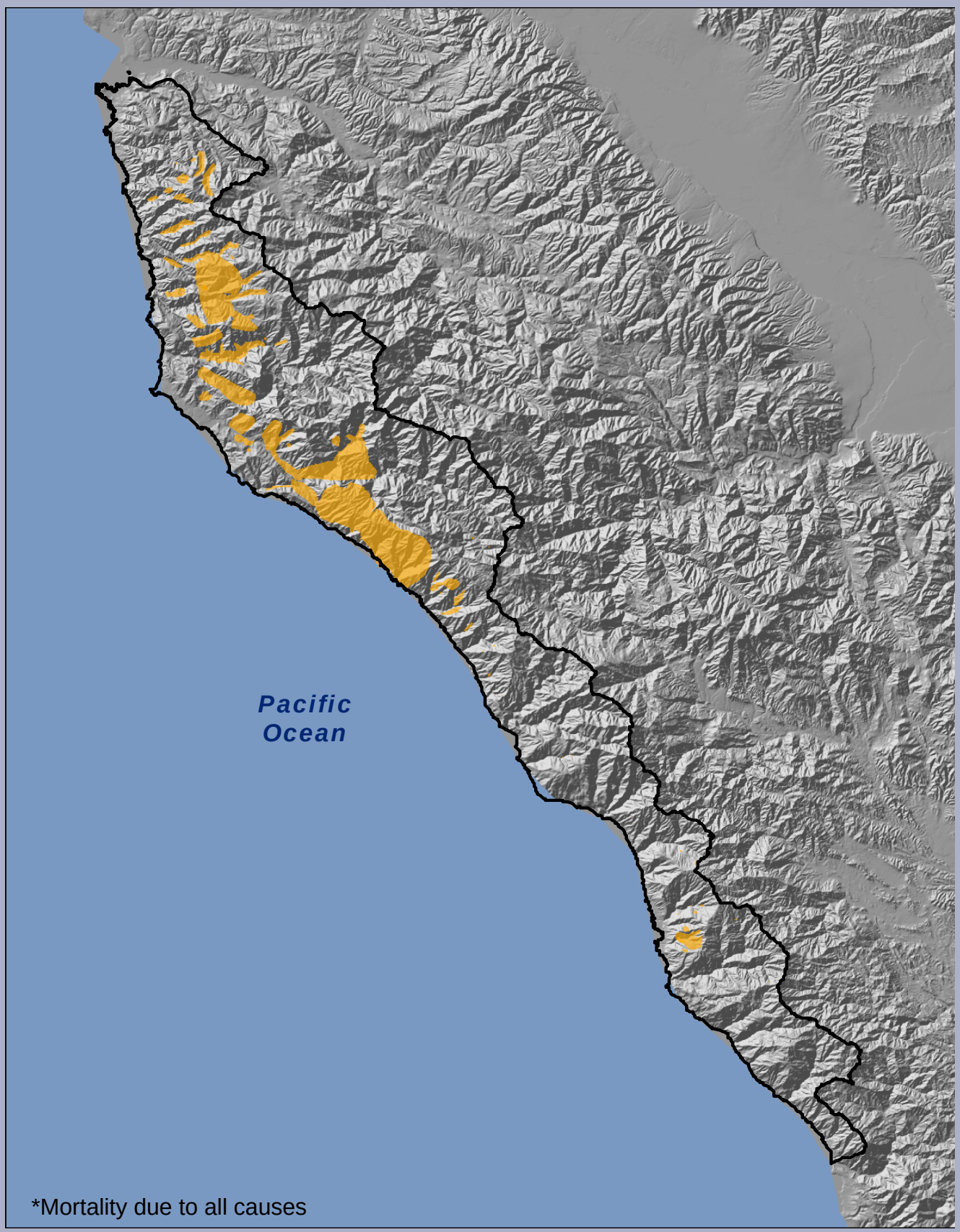
Big Sur Ecoregion Oak Mortality* 2004



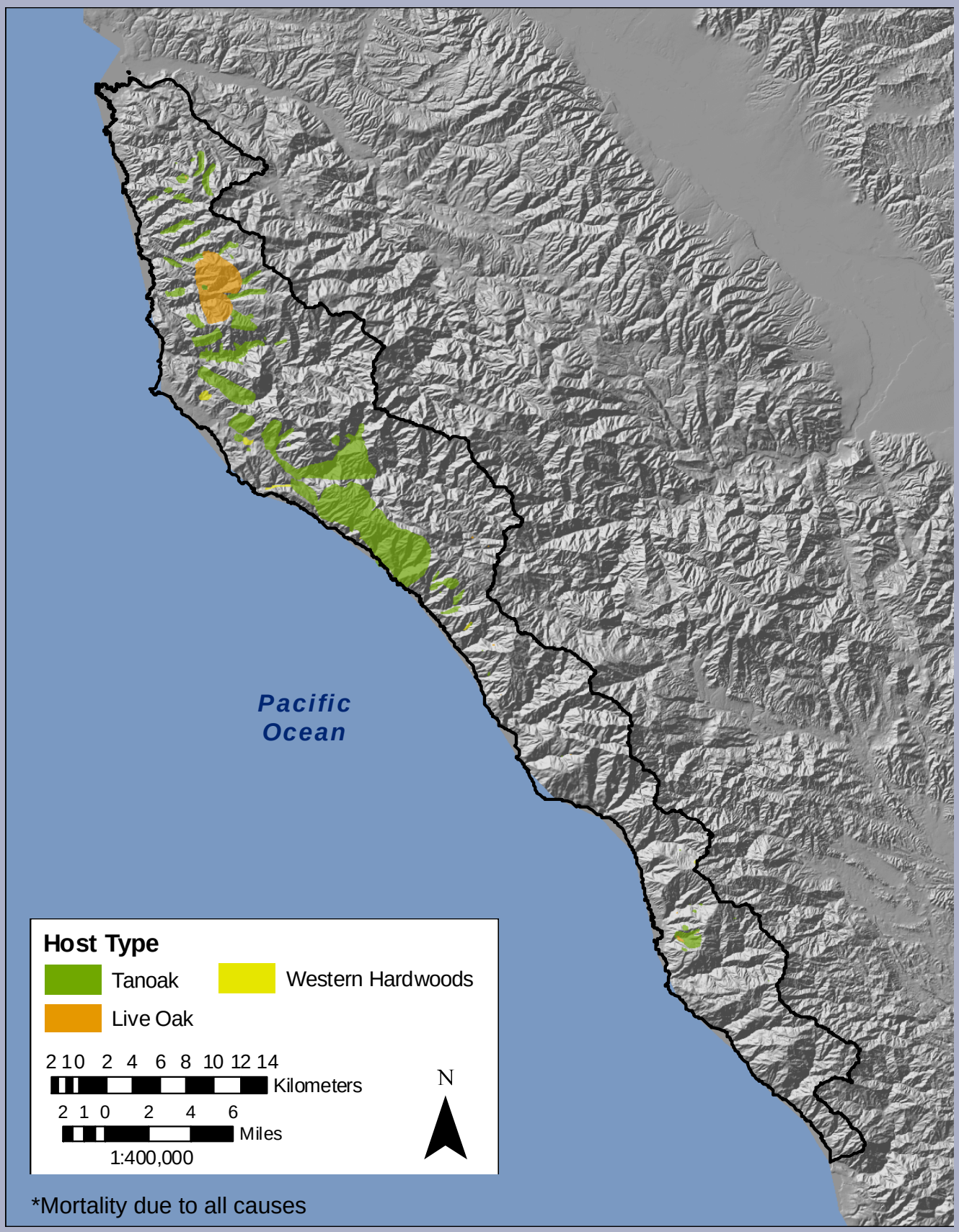
*Mortality due to all causes

Big Sur Ecoregion Oak Mortality* 2005



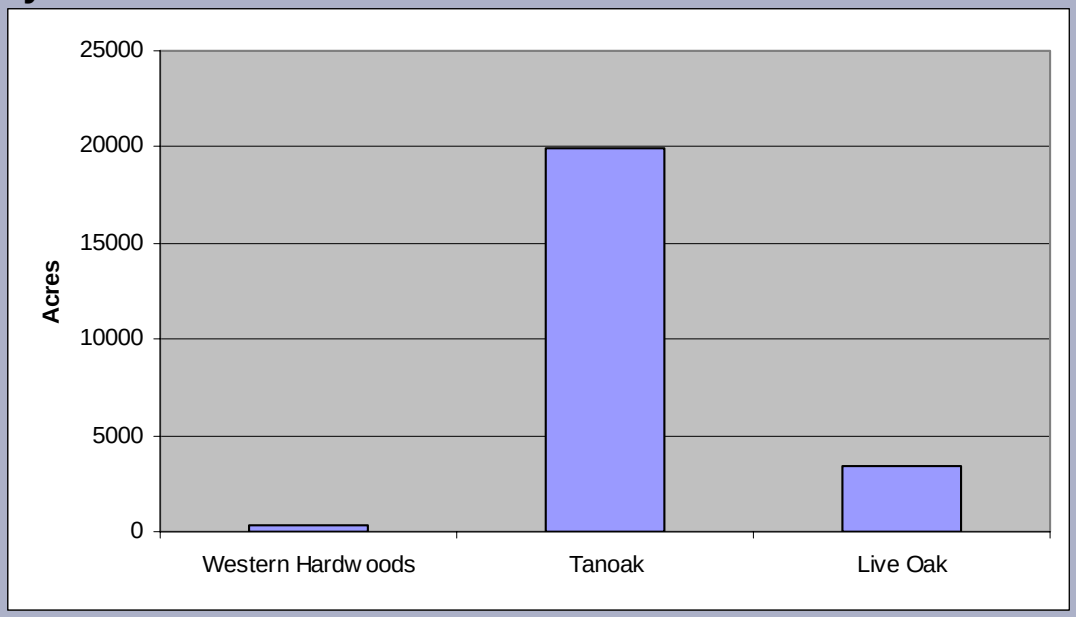
*Mortality due to all causes

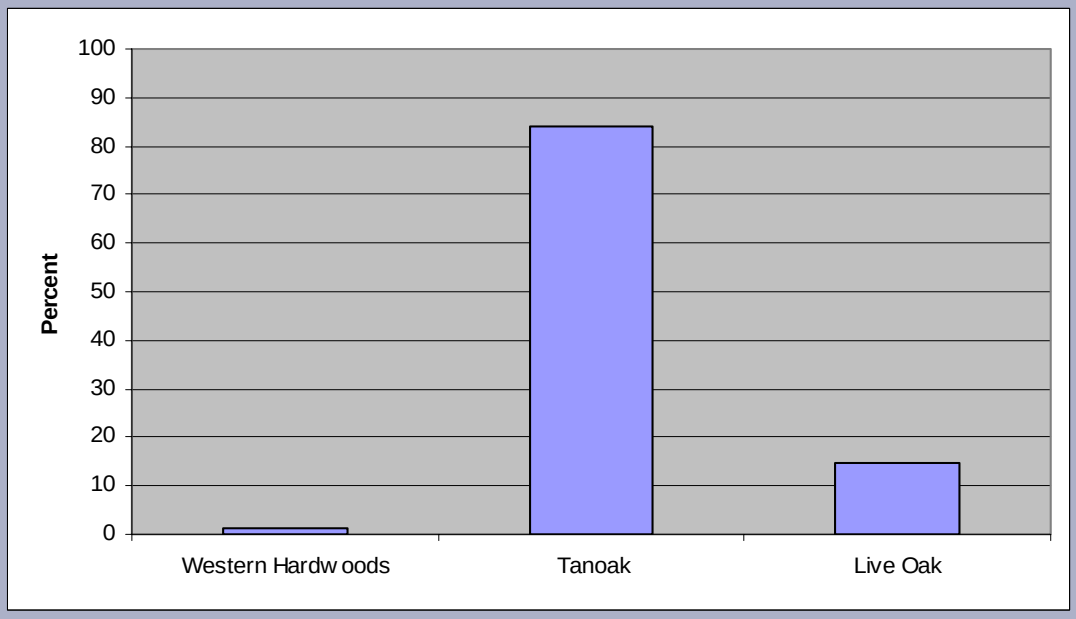
Big Sur Ecoregion Oak Mortality* by Host



*Mortality due to all causes

Cumulative Acres of Mortality* in Big Sur Ecoregion due to all causes by Host 2001-2005

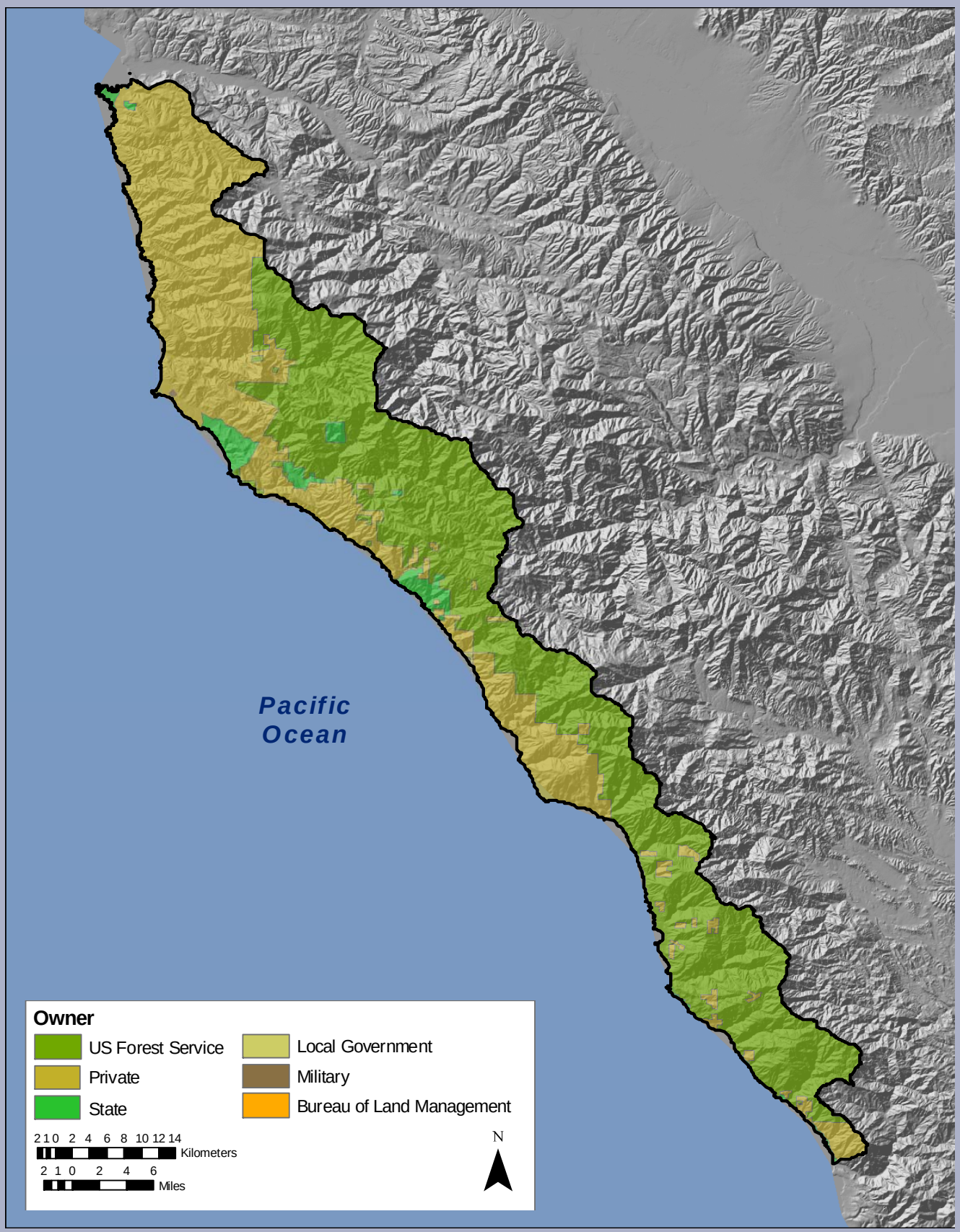




Host Type	Acres	Percent
Western Hardwoods	348	1
Tanoak	19907	84
Live Oak	3438	15
Total	23693	100

*Mortality due to all causes

Big Sur Ecoregion Ownership



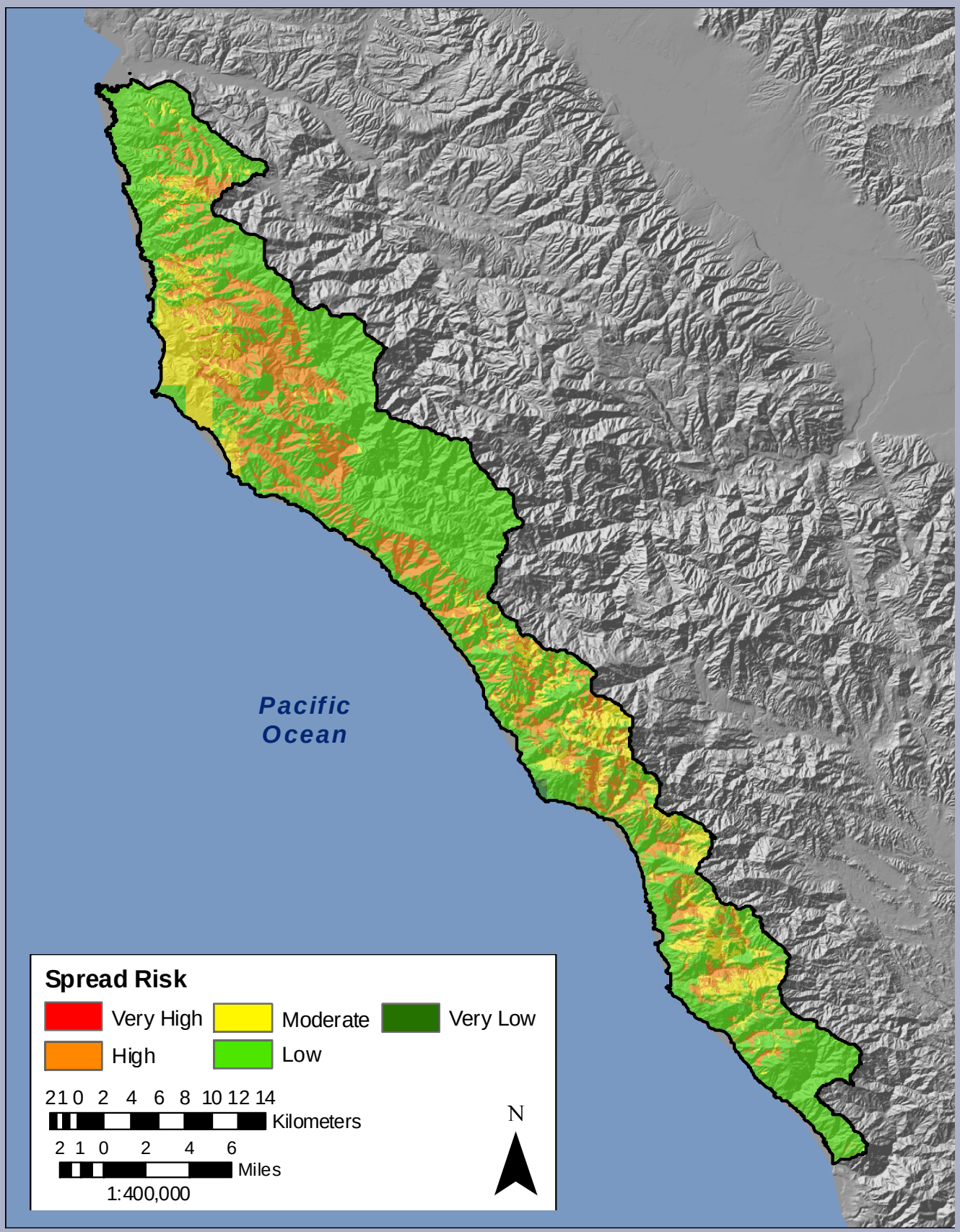
Big Sur Ecoregion Ownership

Owner	Acres	Percent
US Forest Service	111478	56
Private	78623	40
State	6212	3
Local Government	97	<1
Military	86	<1
Bureau of Land Management	3	<1
Total	196500	100

Big Sur Ecoregion Ownership in mortality areas

Owner	Acres	Percent
Private	14741	62
State	1422	6
US Forest Service	7493	32
	23656	100

Big Sur Ecoregion Sudden Oak Death Spread Risk



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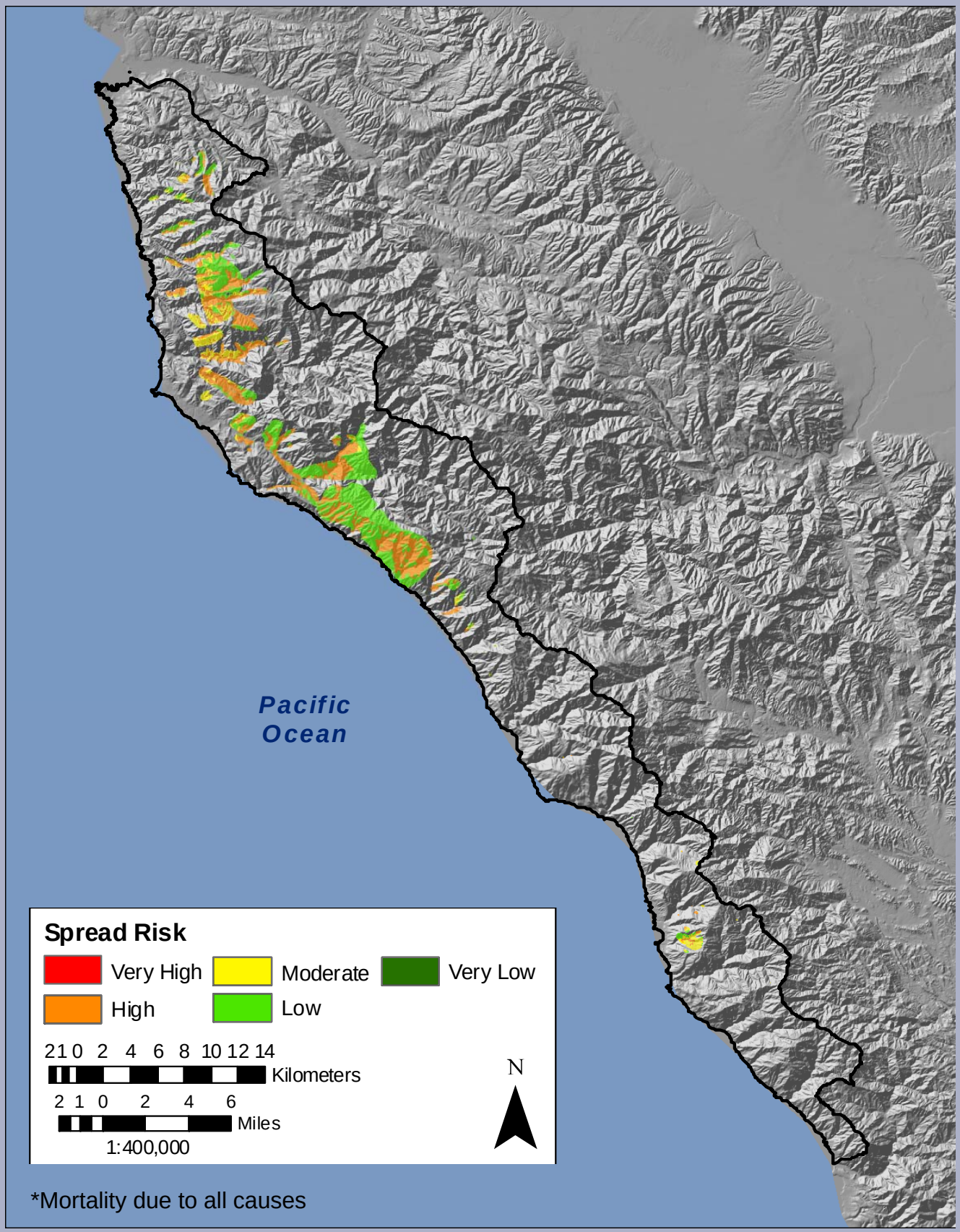
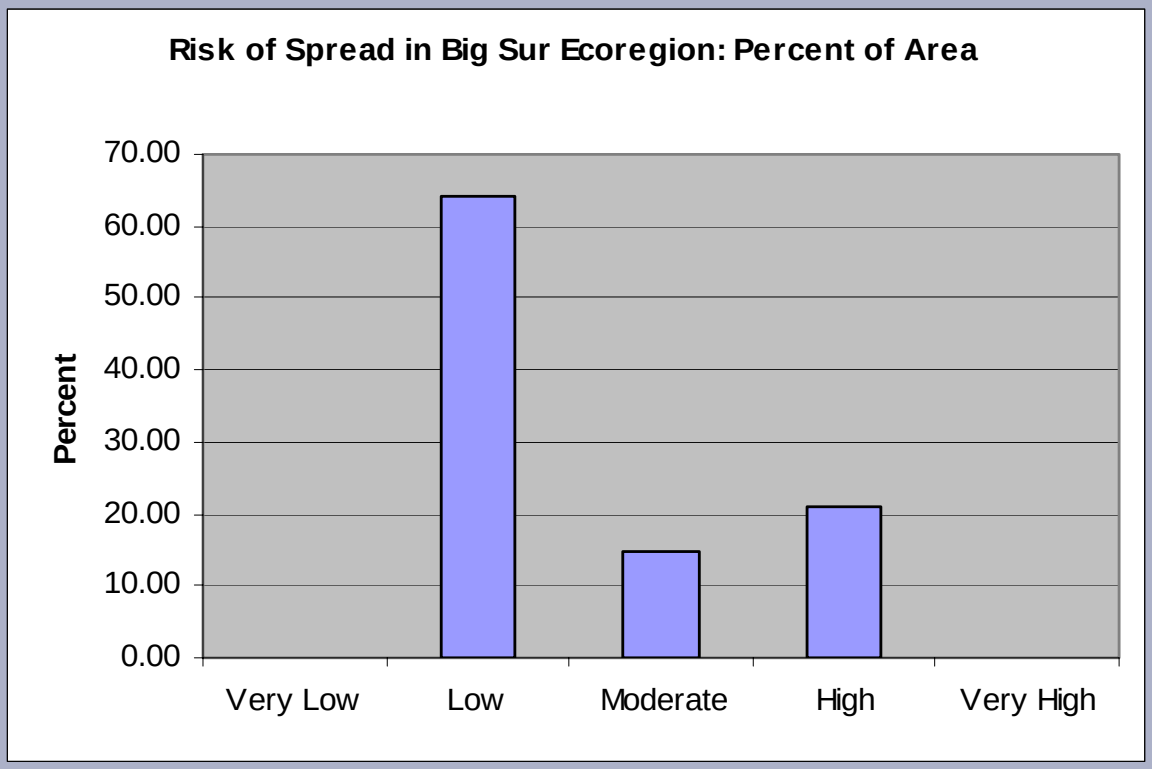
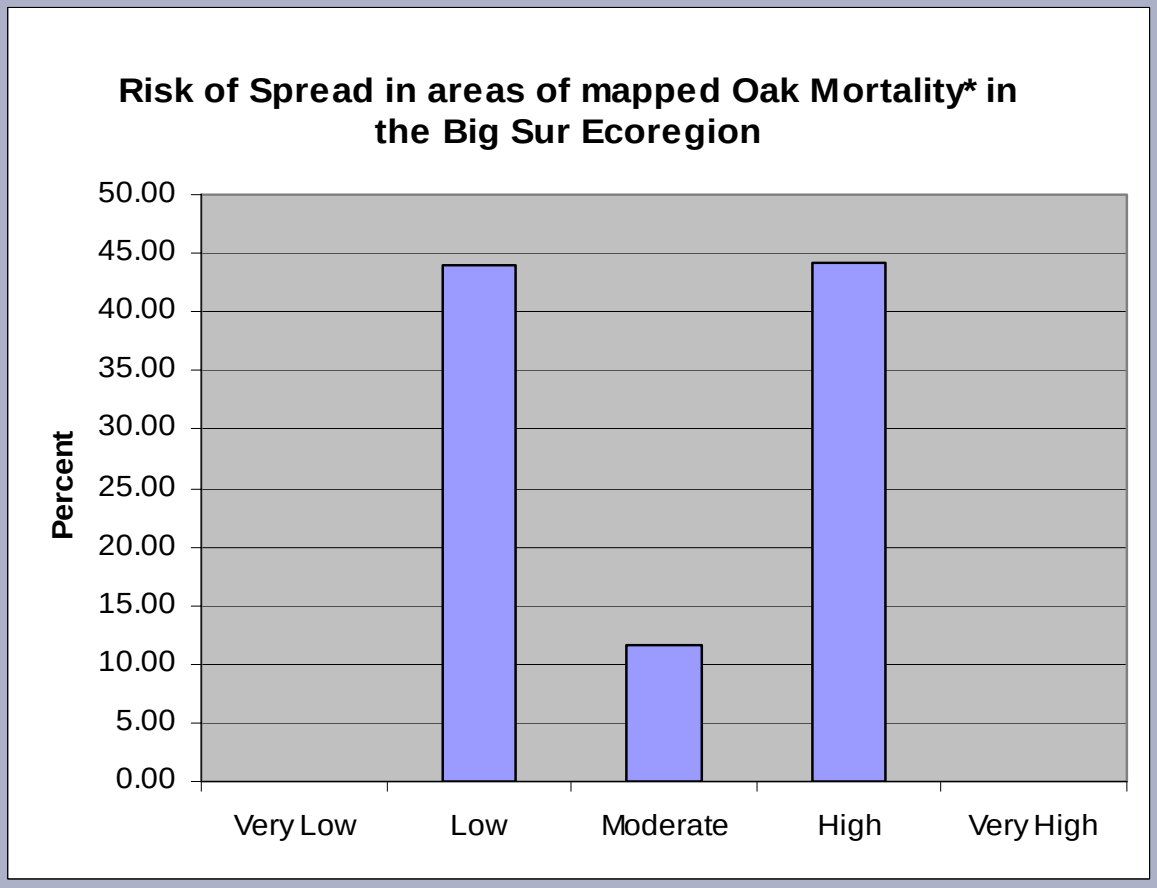
August 2006

SOD Risk of Spread in Oak Mortality* Areas 2001-2005



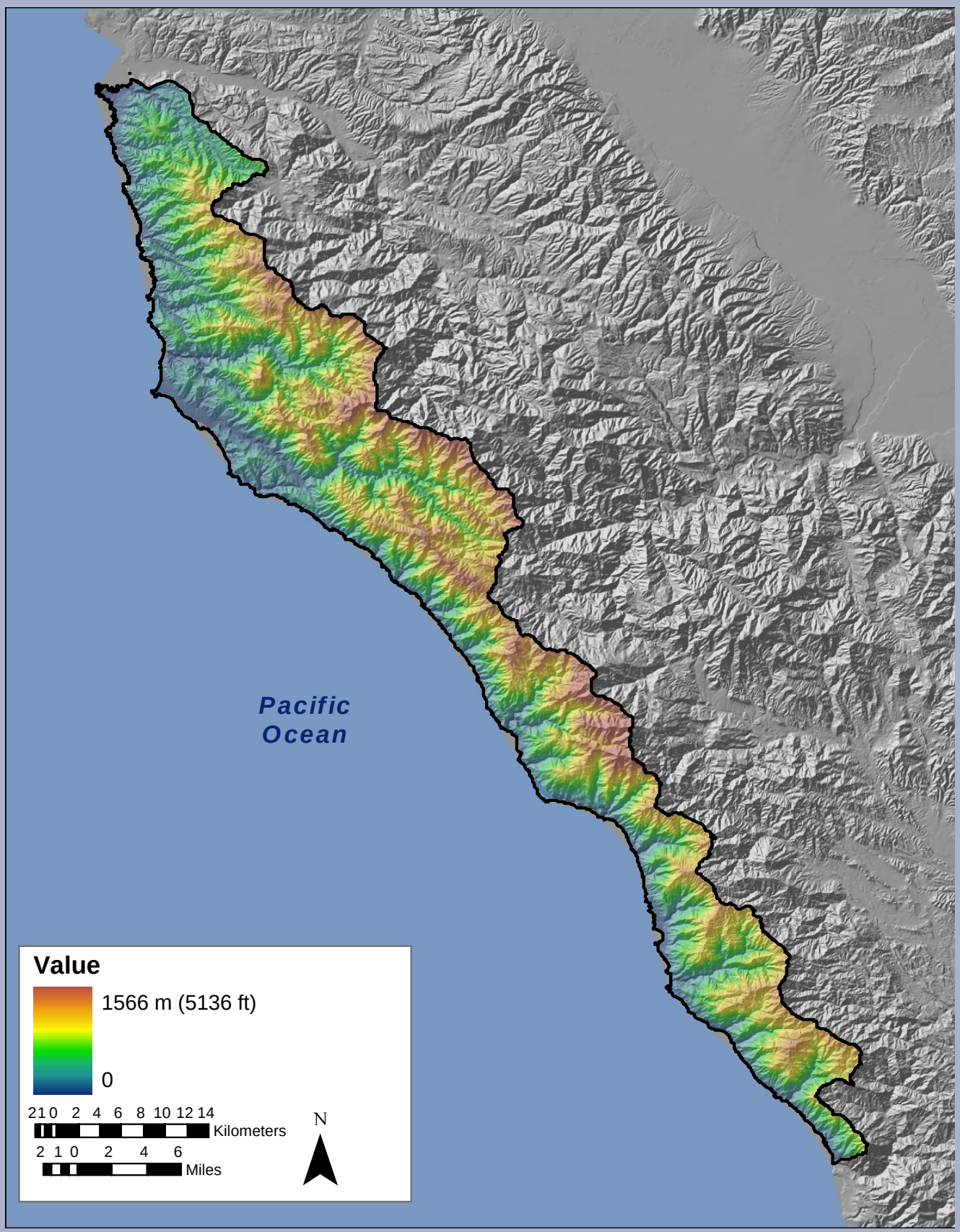
*Mortality due to all causes



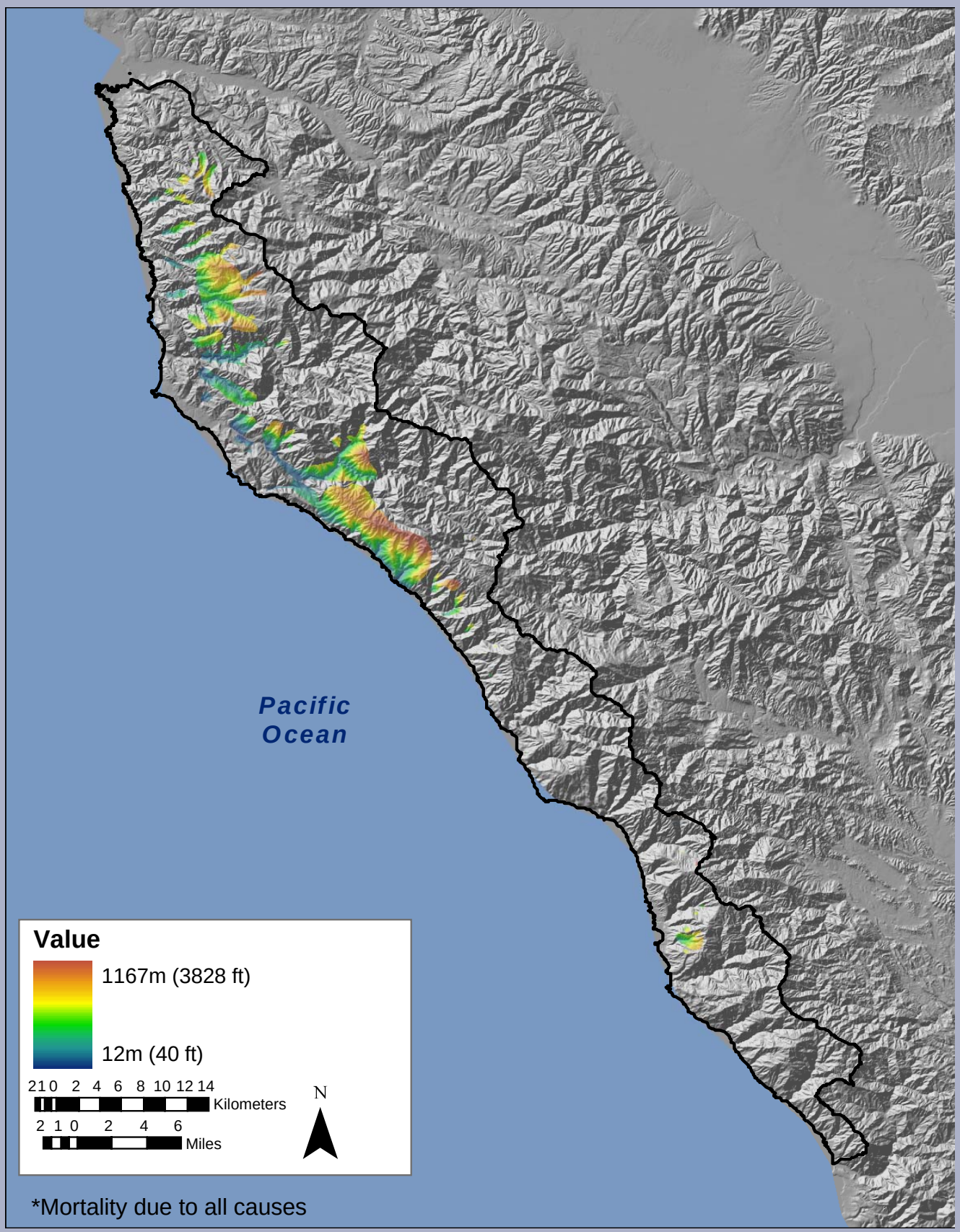


*Mortality due to all causes

Big Sur Ecoregion Elevation

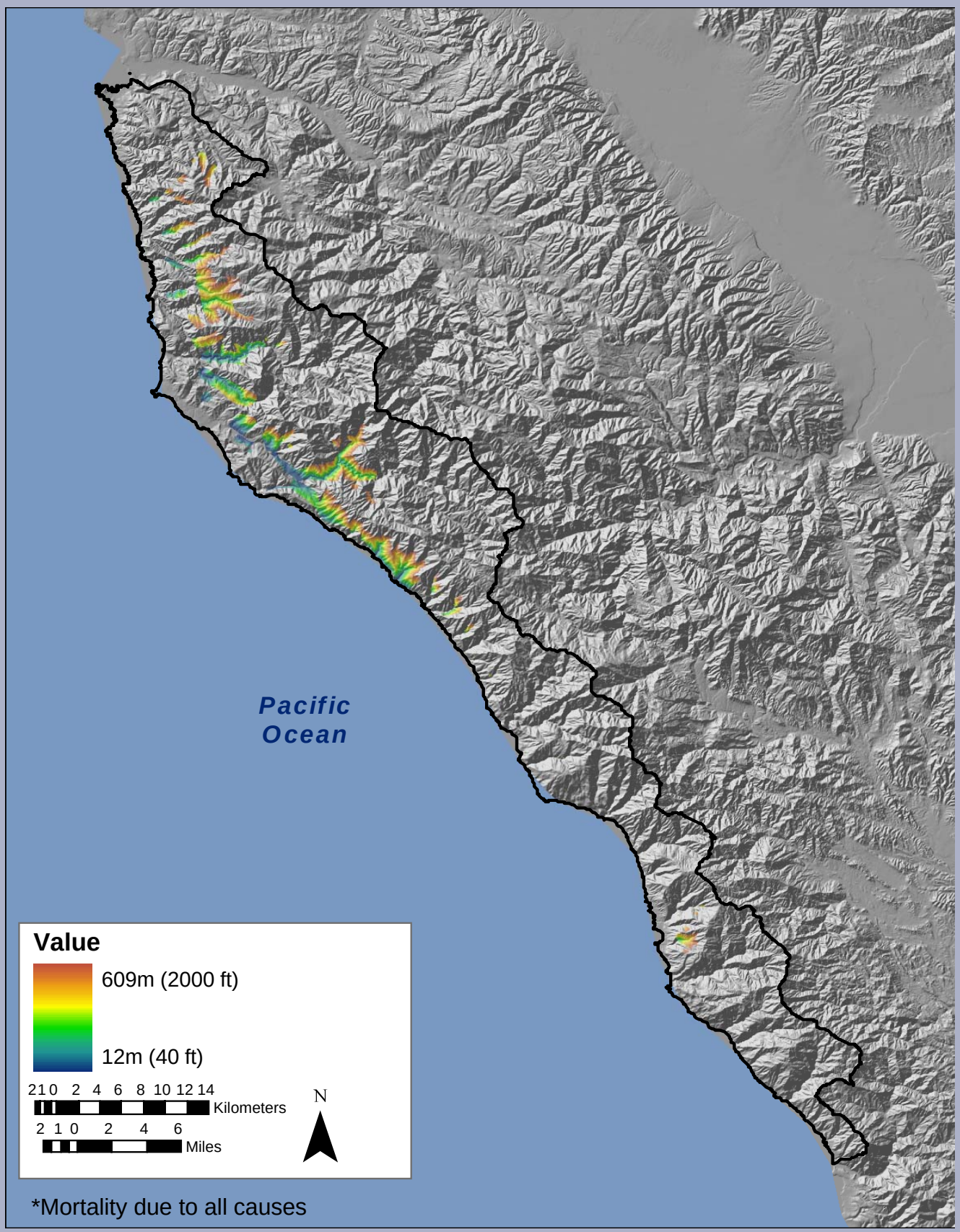


Big Sur Ecoregion – Elevation in Mapped Oak Mortality* Areas



*Mortality due to all causes

Big Sur Ecoregion – Elevation in Mapped Oak Mortality* Areas <2000ft



*Mortality due to all causes