SURVEYS AND EVALUATIONS – 2003

THE 2003 DOUGLAS-FIR TUSSOCK MOTH PHEROMONE DETECTION COOPERATIVE SURVEY

Within Table 2 are the results of the 2003 cooperative Douglas-fir tussock moth (DFTM) pheromone detection survey. Average trap catches for 2003 increased in many plots compared to 2002 catches. Data collected for 163 plots (5 traps/plot) during 2003 revealed 106 (65%) plots with an average of <25 males per trap and 57 plots (35%) that averaged 25 or more moths per trap. In 2002, only 4 % of the plots averaged >25 males moths per trap. Plots that averaged >25 moths per trap for 2003 were located on the following Ranger Districts: Amador, Placerville, and Pacific (Eldorado NF), Hat Creek (Lassen NF), Beckwourth and Mt. Hough (Plumas NF), Greenhorn and Tule River (Sequoia NF), Bass Lake (Sierra NF), Calaveras, Miwok and Summit (Stanislaus NF), and Downieville, Foresthill and Nevada City (Tahoe NF). In addition to these plots monitored on National Forest lands, there were three plots that exceeded 25 moths/trap on lands of other ownership. One plot was located in Yosemite National Park, 1 on BLM land near Widow Mountain, west of Bieber in Lassen County, and 1 plot monitored by CDF near Hilton, Modoc County.

Increases and declines in trap counts are very common with DFTM populations. Based on the results of the 2003 monitoring, there may be some increases in activity by DFTM during 2004. During the field season of this year federal and state Forest Health Protection staff will monitor other life stages in the areas where DFTM activity exceeded an average of 25 males/trap. Field going personnel are urged to continue to check for evidence of feeding and defoliation on white fir throughout the susceptible host type this summer and fall.

TABLE 2. Number of Douglas-fir Tussock Moth Pheromone Detection Survey Plots by Trap Catch, 1979 to 2003.

Year	Total No. of plots	**NUMBER OF PLOTS WITH AN AVERAGE MOTH CATCH PER TRAP OF**:													
		0<10	**10<20**	**20<25**	**25<30**	**30<35**	**35<40**	**40<45**	**45<50**	**50<55**	**55<60**	**60<65**	**65<70**	**70<75**	**75+**
1979	102	97	2	1	1	0	1	0	0	0	0	0	0	0	0
	100%	95%	2%	1%	1%		1%								
1980	99	99	0	0	0	0	0	0	0	0	0	0	0	0	0
	100%	100%													
1981	93	78	10	4	1	0	0	0	0	0	0	0	0	0	0
	100%	84%	10%	4%	2%										
1982	95	93	1	0	1	0	0	0	0	0	0	0	0	0	0
	100%	98%	1%		1%										
1983	98	87	6	1	1	3	0	0	0	0	0	0	0	0	0
	100%	89%	6%	1%	1%	3%									
1984	111	51	18	11	5	7	8	4	3	4	0	0	0	0	0
	100%	46%	16%	10%	4%	6%	7%	4%	3%	4%					
1985	105	58	14	4	7	6	5	1	2	4	1	2	0	1	0
	100%	55%	13%	4%	6%	6%	5%	1%	2%	4%	1%	2%		1%	
1986	107	64	16	4	8	6	1	3	0	1	0	1	1	1	1
	100%	60%	15%	3%	7%	6%	1%	3%		1%		1%	1%	1%	1%
1987	108	80	15	4	2	1	1	3	0	1	0	0	1	0	0
	100%	74%	14%	4%	2%	1%	1%	2%		1%			1%		
1988	124	106	9	3	3	0	2	1	0	0	0	0	0	0	0
	100%	86%	7%	2%	2%		2%	1%							
1989	130	129	1	0	0	0	0	0	0	0	0	0	0	0	0
	100%	99%	1%												

1990	138	135	1	0	1	1	0	0	0	0	0	0	0	0	0
	100%	97%	1%		1%	1%									
1991	143	135	4	1	0	0	2	1	0	0	0	0	0	0	0
	100%	94%	3%	1%			1%	1%							
1992	164	156	3	0	2	1	0	0	0	0	1	0	1	0	0
	100%	95%	1%		1%	1%					1%		1%		
1993	143	135	8	0	0	0	0	0	0	0	0	0	0	0	0
	100%	94%	6%												
1994	151	139	11	1	0	0	0	0	0	0	0	0	0	0	0
	100%	92%	7%	1%											
1995	158	77	35	13	16	7	7	3	0	0	0	0	0	0	0
	100%	49%	22%	8%	10%	4.5%	4.5%	2%							
1996	149	33	26	16	8	7	12	9	5	8	6	8	5	1	5
	100%	22%	17%	11%	6%	4%	8%	6%	3%	6%	4%	6%	3%	1%	3%
1997	142	88	27	10	9	4	3			1					
	100%	62%	19%	7%	6%	3%	2%			<1%					
1998	159	81	22	11	9	6	3	10	7	5	2	1	1	1	0
	100%	51%	14%	7%	6%	3%	2%	6%	4%	3%	1%	<1%	<1%	<1%	-
1999	159	126	20	5	3	2	2	0	0	0	1	0	0	0	0
	100%	79%	13%	3%	2%	1%	1%	-	-	-	1%	-	-	-	-
2000	185	154	15	4	4	0	1	2	2	2	0	0	1	0	0
	100%	83%	8%	2%	2%		<1%	2%	1%	1%			<1%		
2001	183	95	57	13	10	6	0	1	1	0	0	0	0	0	0
	100%	52%	31%	7%	5%	3%	0	<1%	<1%	0	0	0	0	0	0
2002	168	126	31	5	3	3	0	0	0	0	0	0	0	0	0
	100%	75%	18%	3%	2%	2%									
2003	**163**	**53**	**42**	**11**	**11**	**10**	**14**	**13**	**3**	**1**	**4**	**0**	**1**	**0**	**0**
	100%	**32%**	**26%**	**7%**	**7%**	**6%**	**8%**	**8%**	**2%**	**1%**	**2%**		**1%**		

WHITE PINE BLISTER RUST RESISTANCE SCREENING PROGRAM, STATUS REPORT FOR FY 2003

During Fiscal Year 2003, the program screened 500 sugar pine families from new candidate trees suspected of carrying major gene resistance (MGR) to blister rust; 72 proved to be from MGR trees. This brings the total number of live, proven resistant trees in the Pacific Southwest Region to 1,471 families. Due to the very low frequency of the MGR gene in northern California forests, another 280 families from that area were re-screened, in order to identify additional resistant seedlings that had inherited the MGR gene from an unknown pollen parent tree; 258 seedlings from 131 parents were found to be resistant. Spring 2003 sowing contained about 800 sugar pine families; screening will occur in Winter 2003/2004. Identification of over 540 new sugar pine candidate trees was completed on the northern National Forests of California in September 2003. In addition, cones were collected from a small number of western white pines and also sugar pine from southern California. Twenty-three lots of western white, four foxtail, and four whitebark seedlings will be propagated for a second year at the Placerville nursery to evaluate the protocol for their greenhouse development.

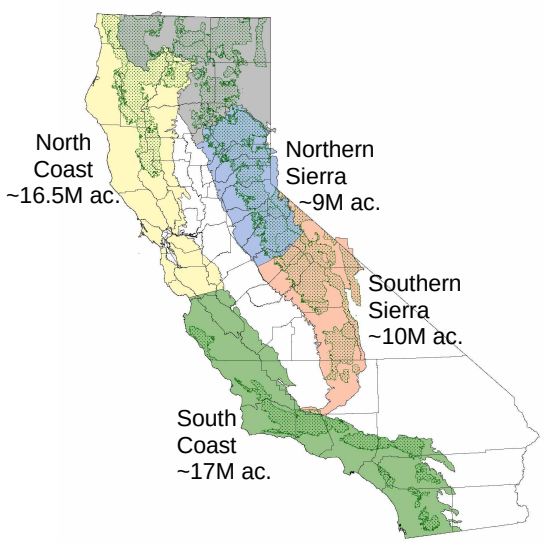
A total of 2,590 MGR sugar pine seedlings were planted at the Happy Camp Disease Garden for evaluation of multigenic, non-MGR forms of resistance, also called “slow rust resistance” (SRR). These seedlings either inherited the MGR gene from known MGR parent trees or from unknown parent trees who contributed MGR-pollen. At Happy Camp 123 individuals, from earlier plantings (1979-1982, 1991, and 1992) that contain 1,316 live plants from the 6,481 originally established, were selected for slow rust resistance traits. This material was grafted into Forest Service seed orchards and a subset into orchards private industry cooperators.

The pilot administrative study entitled *Mortality Analysis of Sugar Pine Seedlings for Identifying Heritable Slow Rusting Resistance to White Pine Blister Rust – A study to improve efficiency of screening methods* was initiated in 2001. The major objective is to identify slow rust resistance seedlings early in the greenhouse, as subsequent field tests can take 10 years to complete. Forty-eight sugar pine families were sown and cultured in spring 2001, then inoculated with rust the following fall. Rust scoring and mortality assessments have been completed for these containerized seedlings.

Survival surveys were completed for ten 2001 and 2002 sugar pine monitoring plantations on the Eldorado, Stanislaus, Sierra, and Sequoia National Forests. Five of the sites had over 80% survival. Reduced survival was noted on the other sites, and was due to gopher damage and/or droughty conditions. The plantations are comprised of MGR, SRR, and susceptible materials. With this combination of resistant types, monitoring infection levels and changes in virulence of the local rust are possible.

DETECTING VEGETATION CHANGES IN CALIFORNIA USING SATELLITE IMAGERY

In 1995, a cooperative program between the USDA Forest Service and the California Department of Forestry and Fire Protection was launched to address long-term monitoring strategies. This program is formally called the California Land Cover Mapping and Monitoring Program. The objective of the program is to create seamless vegetation and monitoring data across California's landscape for regional assessment across all ownerships and vegetation types. The program uses Landsat Thematic Mapper satellite imagery to derive land cover change over five-year time periods (Figure 11). The goal of the program is to implement a long-term, low-cost monitoring program to identify trends in forest health and assess changes in vegetation extent and composition. These monitoring data provide critical information on the impacts of vegetation change over large areas. They also provide timely data for planners, resource managers, landowners, industry, watershed groups and others for land use planning, biological diversity assessment, resource management and sustainable economic development.



Project Area	Monitoring Dates (nominal)	Change Data Complete
Project Area	**Monitoring**	**Dates**
Southern Sierra	1990 to 1995	1996
Cascade Northeast	1991 to 1996	1997
Northern Sierra	1991 to 1996	1997
South Coast	1993 to 1997	1999
North Coast	1994 to 1998	2000

Figure 11. Project areas for measuring land change over five-year periods.

In FY03 the final report for the North Coast project area was published and is available on the web at: http://www.fs.fed.us/r5/spf/publications/fhp-monitoring-pubs.shtml.

Accuracy assessment and cause collection are complete for Cascade Northeast project area and the data is available for downloading on the web site. The monitoring data for this project area have an overall accuracy of 84.5%. Results show that 95% of the vegetation in the assessed 10.8 million acres does not have a detectable change between the 1994 and 1999 change period. Decreases across all vegetation types occur on approximately 184,000 acres and increases occur on about 175,000 acres. The report of this project area will be available on the web by the end of the 2003 calendar year.

At the end of FY03, monitoring and analysis of the Northern Sierra area was completed. Results yield an estimated overall accuracy of 82%. The graph (Fig. 12) shows amounts of change by acres within the project area by change direction.

In FY04 we expect publication of the Northern Sierra Project report, completion and publication of the South Coast Project and report and initiation of the North Coast Project.

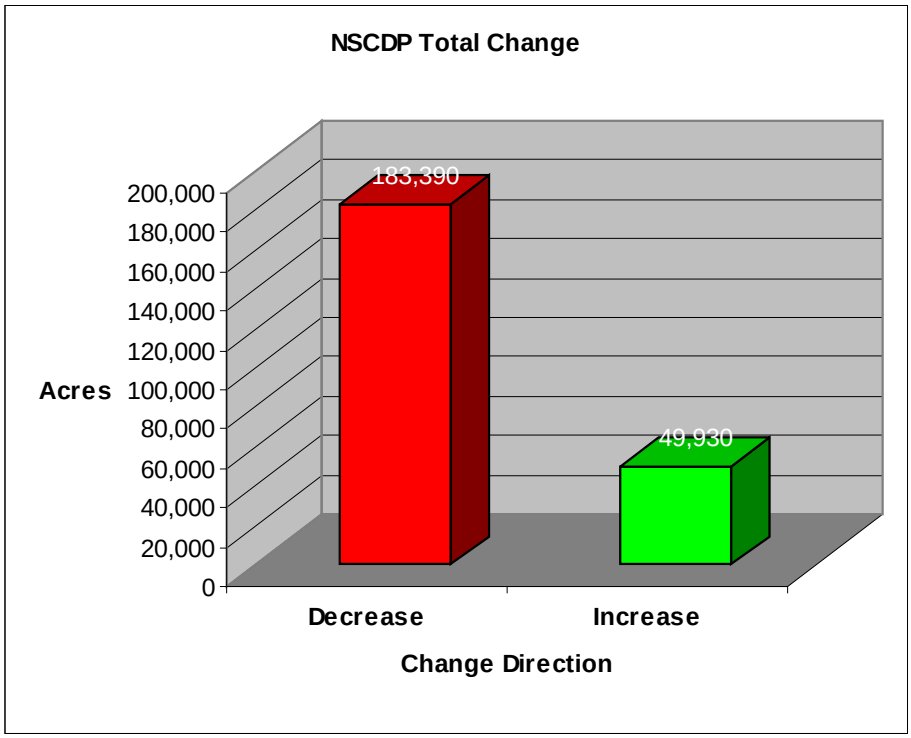


Figure 12. Land cover change in the Northern Sierra Project.

RESULTS OF 2003 AERIAL SURVEYS IN CALIFORNIA

Three large-scale surveys (Fig. 13) were conducted over California forests in 2003, including annual detection surveys over all National Forests and National Parks and two special surveys over various state, private, and federal lands specifically for pinyon pine mortality and Sudden Oak Death (SOD).

Almost 26,000,000 acres of the 39.5 million acres of California forests and woodlands were flown with increased levels of mortality observed for southern forests (Fig. 13). Almost 2.5 million acres had mortality from insects and diseases above annual background amounts. Drought and insect-induced

mortality remains active this year for the hard-hit San Bernardino National Forest and has notably increased in other areas such as Palomar and the Laguna Mountains on the Cleveland National Forest and nearby Santa Ysabel and Los Coyotes Indian Reservations, the Piute Mountains and Breckenridge areas of the Sequoia National Forest, as well as scattered areas on the Angeles National Forest.

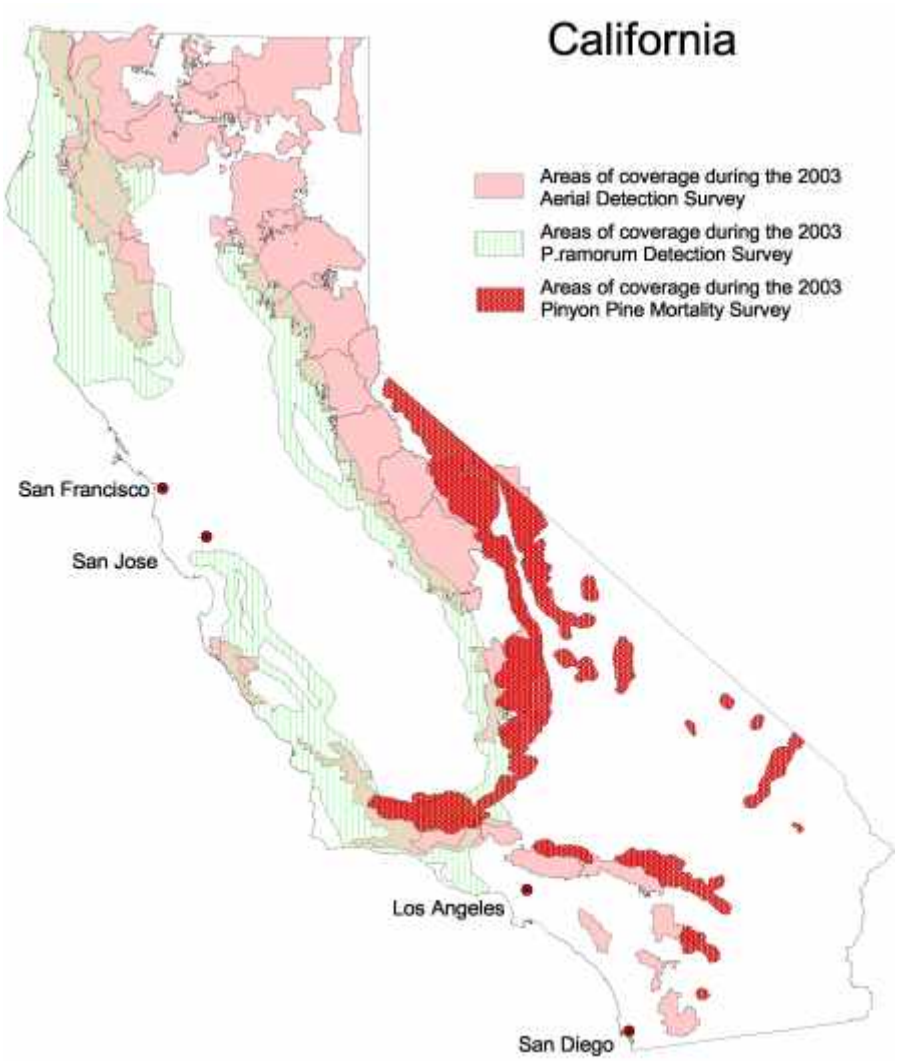


Figure 13. Aerial coverage for the annual aerial survey, Sudden Oak Death detection and pinyon pine mortality.

Predicted risk along with observed tree mortality is displayed in Figure 14. Areas predicted to be at risk, based on rule-based models, are experiencing increased levels of mortality (see calrisk02_1 at www.fs.fed.us/r5/rsl/clearinghouse/gis-download.shtml). Due to the rapid onset of tree mortality and interest from various agency and public entities, the San Bernardino N.F. was surveyed three times during 2003. Approximately 68% of the land base within the administrative boundary is currently affected, increasing from the 44% observed last April.

Figure 15 displays historic damage for all units surveyed. Of the acreage mapped in 2002, approximately 85% is attributed to insect and disease damage agents. The remainder of the acreage is attributed to abiotic agents such as fire, though not all fires are represented. Approximately 94% of the 2002 acreage represents various levels of tree mortality, the balance includes defoliation and top kill damage types. Generally, half of the total acreage affected is within the mixed conifer forest type, one quarter in pine types and the remainder distributed throughout various fir and hardwood types. Similar results are expected for the 2003 surveys to be compiled and analyzed by the end of the calendar year (see tree mortality at http://www.fs.fed.us/r5/rsl/clearinghouse/data.shtml).

Surveys for pinyon pine mortality covering approximately 8,500,000 acres were also conducted in California, with coverage expanding slightly into Nevada. This was part of a larger survey of pinyon mortality in the southwestern United States. Both old and recent mortality was observed in nearly all areas surveyed. Generally, the highest levels of pinyon pine mortality (averaging approximately 25%) were observed along the Hwy 395 corridor from Carson City to Bridgeport.

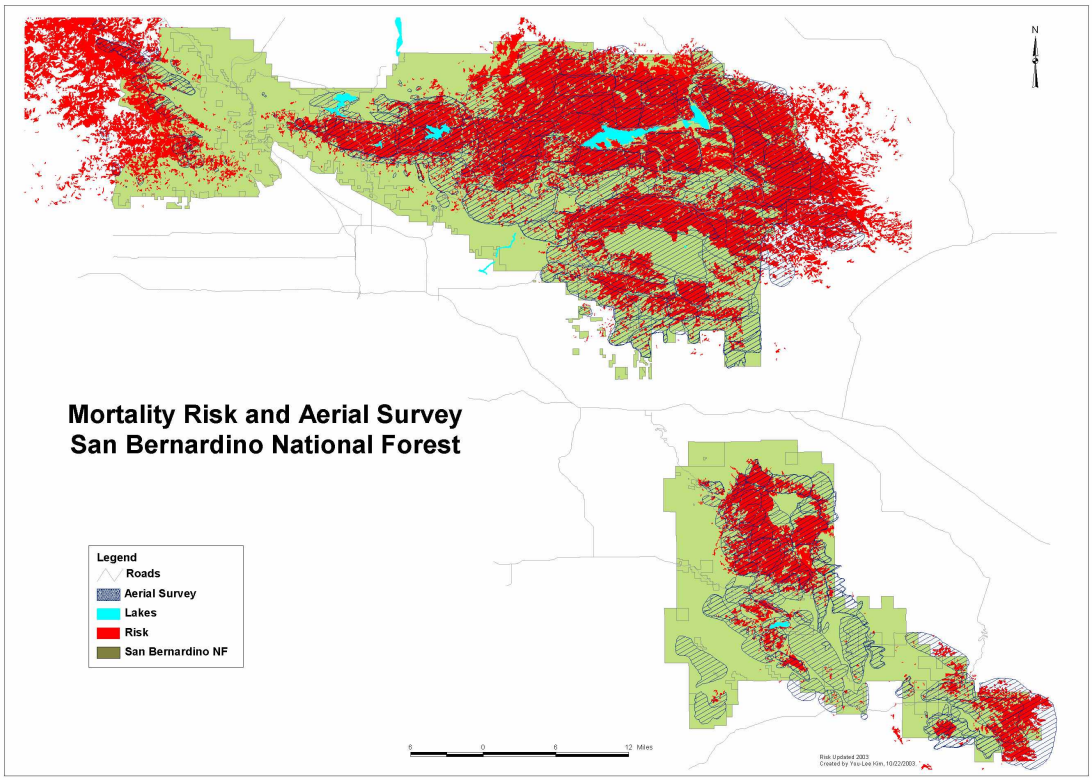


Figure 14. Mortality risk and aerial survey, San Bernardino National Forest.

Aerial surveys and field visits for Sudden oak Death have been completed. Approximately 10,000 miles were flown over 19 million acres of host habitat to map hardwood mortality potentially related to the pathogen and 425 mortality polygons were mapped, totaling approximately 8,200 acres. These acres are not necessarily acres of mortality because some polygons represent only one or two trees. Over 100 sites were prioritized largely on the basis of distances from currently confirmed infestations. No new counties were added to the regulated list as a result of the survey, however, one new positive near Plaskett in Monterey County extended the range approximately 15 miles to the south (see http://kellylab.berkeley.edu/SODmonitoring/OakMapper.htm).

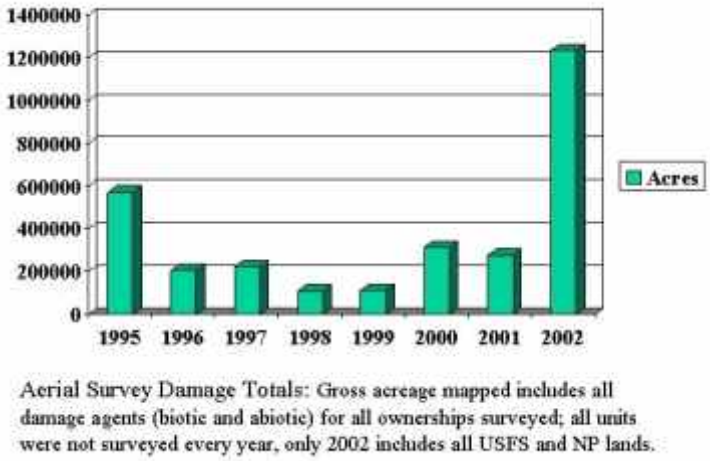


Figure 15. Gross acreage aerially surveyed in California, 1995 to 2002.

DEMONSTRATION THINNING PLOTS IN THE EASTSIDE PINE TYPE ON THE LASSEN NATIONAL FOREST.

In 1978-1979 the Forest Service established plots in the eastside pine type to show the effects of thinning on pest-caused losses in areas of high tree mortality. The stands chosen were mostly pole-size ponderosa pine mixed with some white fir and incense-cedar, growing on medium to low sites, and ranging in age from 70 to 90 years. Within the demonstration plots, four levels of stocking density — 40, 55, 70 and 100 percent of normal basal area — were established to demonstrate the biological and economic alternatives available for management planning. (Normal basal area is the basal area that a stand should have reached when fully stocked with trees, which in the demonstration areas ranges from 185 to 215 sq ft/ac depending on site quality.) Twenty-four years after thinning, the treatments had reduced mortality from 95 to 100 percent of the level in unthinned stands (Table 3).

TABLE 3. Commercial Tree Mortality by Stocking Level, 24 years after thinning [a]

Year	Residual Stocking After Thinning[b] 40%	55%	70%	100%
		Trees per Acre		
1980	0.0	0.2	0.2	2.4
1981	0.0	0.0	0.7	2.4
1982	0.0	0.5	0.3	3.6
1983	0.0	0.1	0.8	4.1
1984	0.0	0.0	0.0	1.0
1985	0.0	0.2	0.0	0.6
1986	0.0	0.0	0.0	1.3
1987	0.0	0.0	0.0	1.4
1988	0.0	0.0	0.0	0.0
1989	0.0	0.4	0.0	2.6
1990	0.0	0.0	0.0	2.6
1991	0.0	0.0	0.0	1.8
1992	0.0	0.2	0.0	3.0
1993	0.0	0.2	0.3	5.2
1994	0.0	0.0	0.0	4.8
1995	0.0	0.0	0.3	0.4
1996	0.0	0.2	0.0	1.3
1997	0.0	0.2	0.0	1.3
1998	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.9
2000	0.0	0.2	0.3	0.0
2001	0.0	0.2	0.3	0.9
2002	0.0	0.1	0.0	0.9
2003	0.3	0.0	0.3	1.7
Mean	0.0	0.1	0.15	1.84
Range	0-0.3	0-0.5	0-0.8	0-5.2
Percent Mortality Reduction Compared with normal Basal Area	100	95.0	92.0	—

[a.] Commercial trees are 8 inches dbh and larger, with straight boles, yielding at least one 10-foot log with a 6-inch top. Trees were killed by the mountain pine beetle. [b.] Percent of normal basal area.