Black Bear Damage to Northwestern Conifers in California: a Review[1]

Kenneth O. Fulgham[2] and Dennis Hosack[3]

A total of 789 black bear damaged trees were investigate over a multi-year period on 14 different study sites chosen on lands of four participating timber companies. The sites ranged from 30 to 50 years of age. Four different conifer species were found to have black bear damage: coastal redwood (*Sequoia sempervirens* (D. Don) Endl.), Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco), Sitka spruce (*Picea sitchensis* (Bong.) Carr.), and western hemlock (*Tsuga heterophylla* (Raf.) Sarg.). Numerous variables were measured on each black bear damaged tree (diameter at breast height [DBH; 1.37 m], distance to nearest neighbor, height to beginning of damage, age of damage, and tree species). Very important variables were: tree species, DBH, percent girdle, distance to road, and basal area.

Results are present in fig. 1 and tables 1 and 2. Black bear damaged trees varied widely in DBH from approximately 10.2 cm (4 inches) up to approximately 104.1 cm (41 inches), with the overall average DBH of about 45.7 cm (18 inches). Black bear damaged coastal redwood trees were found to be growing alone in about 33 percent of the population and 67 percent of the population growing as multiple stump sprouts. The black bear damage that occurred on any one tree varied from complete girdling to a small patch of bark removed near the base of the tree. Twice as many black bear-damaged redwood trees occurred in the 76 to 100 percent girdled-circumference group than occurred in the 1 to 25 percent girdled-circumference group. Mean trees damaged by black bears ranged from approximately 4.2 trees/ha (1.7 trees/ac) to 72.5 trees/ha (29.3 trees/ac), with the average approximately 19.0 trees/ha (7.7 trees/ac). Average annual increment of black bear damage ranged from 0.3 trees/ha (0.1 trees/ac) to 23.5 trees/ha (9.5 trees/ac). The mean annual increment of black bear damage was 6.0 trees/ha (2.4 trees/ac).
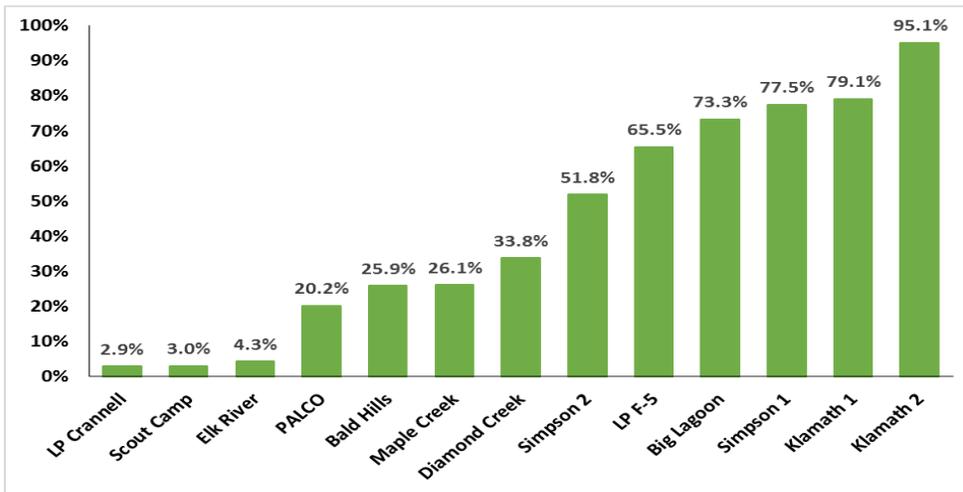

Figure 1—Percent of black bear-damaged redwoods by location.

Table 1—Number of black bear damaged trees per hectare or per acre on 14 sites

Site	Stand age	Damaged trees	Mean number damaged trees/ha	Mean number damaged trees/ac
Crannell	35/50	14	4.2	10.38
Scout Camp	17	13	5.1	12.60
ARCO	50	153	7.9	19.52
Elk River	23	27	9.7	23.97
Big Lagoon	38	224	14.8	36.57
Bald Hills	40	65	17.1	42.26
Simpson 2	35	91	21	51.89
Simpson 1	30	141	26.7	65.98
Diamond Creek	17	81	36.8	90.93
PALCO	30	101	38.5	95.14
Maple Creek	35	100	40.2	99.34
Klamath River 1	17	86	40.8	100.82
Klamath River 2	23	86	42	103.78
LP F-5	23	151	72.5	179.15
Mean	29	95	26.5	65.48

Black bear damage to regenerating redwoods conclusions from 1993 McIntire-Stennis Report #94[4] by Fulgham and Hosack are:

- o Mean annual bear damage to regenerating redwoods of six trees/ha/year (13.4 trees/ac/year) may represent a serious economic problem.
- o Bear damage at rotation age indicated that bear damaged redwoods was highly variable, but redwoods comprised almost all damaged trees.
- o Yield loss due to bear damage projected to rotations age (~50 years) was highly variable and averaged over 21 percent with the highest over 54 percent.
- o Precommercial thinning was not determined as no replicated paired plots were studied.
- o Personal communication during the period of this study indicated that most of the black bear damage to redwoods occurred in Humboldt and Del Norte counties with some observed damage.
- o Mean density of 26.5 bear-damaged trees per hectare (65.48/trees/ac) suggests serious impact on the regenerating stands studied (1998 to 1991).
- o On eight of 13 sites, redwood was damaged in significantly greater proportions than it was available in the stands studied.
- o Damaged redwoods had a larger mean DBH than the average redwood tree found in the stands studied.
- o There were more redwoods in the 76 to 100 percent girdling category than in the other three percentile categories in the stands studied.
- o More bear-damaged redwoods were found along roads and trails than were statistically suspected in the stands studied.

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[4] MS #94 can be found at: http://hdl.handle.net/10211.3/176892.

Only redwood trees that had received 100 percent girdled-circumference were considered for an estimate of economic loss. Total volume lost on all transects, average volume lost per unit area, and total volume lost per site were calculated. Therefore, the total economic loss per site was calculated and is presented.

Table 2—Loss estimation based on average prices for logs 43.2 cm (17 inches) or larger in city of Arcata Contract-2016

Study Site		BdFt-No Bear	BdFt-Bear	BdFt-Loss		Value Lost					
Big Lagoon		76,726	56,068	20,658	$	21,825.18					
Simpson 1		103,907	67,336	36,571	$	38,637.26	$ 22,381.38	Average loss per acre for all the stands shown			
Bald Hills		106,354	101,832	4,522	$	4,777.49					
Simpson 2		108,454	106,626	1,828	$	1,931.28					
PALCO		206,999	181,745	25,254	$	26,680.85	21,184	BdFt volume loss per acre averaged over the			
LP Crannell		149,375	147,027	2,348	$	2,480.66		13 Stands			
LP F-5		41,390	30,073	11,317	$	11,956.41					
Maple Creek		163,114	127,086	36,028	$	38,063.58	16%	This is the volume lost due to bear damage.			
Klamath 1		94,048	42,971	51,077	$	53,962.85					
Klamath 2		82,706	59,799	22,907	$	24,201.25					
Elk River		263,389	229,239	34,150	$	36,079.48					
Scout Camp		274,508	272,754	1,754	$	1,853.10					
Diamond Creek		53,078	26,094	26,984	$	28,508.60					
Sampled Stands	**#**	1,724,048	1,448,650	275,398	**$**	**290,957.99**	This represents the value lost on 13 acres of studied				
							timberland (one acre from each sampled stand)				