Cedar River Municipal Watershed Fuelbed Decomposition Study

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Photo: Morris C. Johnson

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Executive Summary

Fuel decomposition was measured in the Cedar River Municipal Watershed in order to provide fine-scale temporal data on fuel succession that will inform the coarse-scale assessment of fire hazard for different management options. Specifically the objectives of this study are: (1) quantify fuelbed characteristics (e.g., fuelbed loadings and fuelbed depth) in stands that were thinned at different times, (2) examine the effect of surface fuel treatments on fuelbed characteristics, and (3) estimate fuel loading over time. Brown's transects were installed to measure fuelbed loading (i.e., tons per acre) and fuelbed depth in stands treated from 2001-2005. Mean loading per size class and mean fuelbed depth were calculated in the DRA program. A single-exponential decay model was used to estimate the duration of fuel loading.

There were no noticeable differences among mean fuel loading and fuelbed depth in the 11 stands inventoried with the exception of the lopped and masticated stands. However, the mean fuelbed depth in the older restoration stands (e.g., 2001 & 2002) was lower than the recent restoration stands (e.g., 2003 & 2004). The 3-9 inch woody fuel size class was the most abundant fuel class. Woody fuel size class 20-99 inch diameter was not abundant.

Surface fuel treatments (i.e., lopping and mastication) did not reduced mean fuelbed depth and fuel particle size distribution (i.e., changed larger size class to 1-hr fuel classes); however, the total fuel loading within each stand were similar to the untreated stands.

The single-exponential decay model indicates it will require a long time for significant mass loss of Pacific silver fir fuel loadings. For example, it would require 138 years to reduce current fuel loading 50%.

The most effective surface fuel treatment (i.e., mastication) is probably not a feasible management option to implement at the broad scale; however, it will probably be the best management practice to build defensible space around key assets. It is important to understand that it is primarily the small fuels (i.e., < 3 inches) that contribute to fire spread and intensity and should be the target fuel class when deciding on the type of surface fuel treatment to implement. Removing the larger boles (i.e., > 3 inches) does not necessarily reduce fire hazard compared to removing the small fuels.

Introduction

The potential increase in fire hazard as a result of forest management activities is a concern of forest managers throughout the United States. Forest and resource managers in the Cedar River Municipal Watershed (CRMW) have concerns about activity fuels produced from restoration thinning treatments designed to accelerate development of late-successional forest habitat. The current practice of leaving activity fuels on-site following thinning of smaller stems in second-growth stands at CRMW increases fire hazard – at least in the short term – due to increased quantities of fine fuels. Although Christiansen and Pickford (1991) suggest that fine fuels will decrease rapidly within a few years, the environmental and microclimatic conditions at CRMW may differ from those in this earlier study. Therefore, the change in activity fuelbeds over time needs to be quantified in order to accurately characterize temporal variation in fire hazard.

This study provides fine-scale temporal data on fuel succession to inform the coarse-scale assessment of fire hazard for different management options. This study is an extension of the Cedar River Fire Hazard Assessment that examined short-term fire hazard effects using a forest computer simulation program. The objectives of this study are: (1) quantify fuelbed characteristics (e.g., fuelbed loadings and fuelbed depth) in stands that were thinned at different times, (2) examine the effect of surface fuel treatments on fuelbeds, and (3) estimate fuel loading residence time.

Woody Debris Decomposition Overview

Decomposition is a complex, biological process responsible for woody debris loadings, nutrient cycling, carbon storage, and forest productivity (Agee and Huff 1987; Arthur and Fahey

1990; Laiho and Prescott 2004). Decomposition is the process whereby the organic structure of biological material, such as wood, is condensed to its mineral form and is influenced by several physical and chemical processes (Swift 1977). Harmon et al. (1986) identified eight processes responsible for decomposition: (1) leaching, (2) fragmentation, (3) transport, (4) collapse and settling, (5) seasoning, (7) biological transformation and (8) respiration. Of these, respiration is considered the key factor of decomposition (MacKensen et al. 2003). In terrestrial ecosystems, microbes, predominantly fungi (basidiomycetes), account for the majority of respirational loss (Swift 1977). Microbes transform organically bound carbon, which accounts for approximately 50% of the organic material, into CO_2 through respiration (Harmon et al. 1986). Chambers et al. (2001) estimated that respiration was responsible for reducing 76% of the carbon in dead wood.

The three stages of decomposition are: (1) colonization stage (2) decomposition (3) terminal stage (Swift 1977). The first stage of decomposition proceeds slowly as the woody material becomes colonized and assumes a moisture status suitable for decomposer organisms. Depending on species and environmental conditions, this process usually takes around five yearsal. 2000). This is followed by a relatively fast decomposition stage as liable carbon compounds and cellulose are decomposed and then a slow terminal stage of lignin decomposition (Means et al., 1992; Daniels et al. 1997).

Many factors regulate forest decomposition: oxygen and carbon dioxide concentration, substrate quality, organisms, moisture concentration and temperature (Abbott and Crossley 1982; Fahey 1983; Erickson et al. 1985; Harmon et al. 1986, Edmonds and Eglitis 1989; Naesset 1999). The key factors that regulate decomposition are substrate quality and environment, specifically, temperature, moisture, and aeration; all other factors are derivatives of these (Laiho and Prescott 2004). In the CRMW, temperature and moisture are probably the most important decomposition factors because the study areas are predominantly located above 3000 ft elevation. Temperature is important for wood-decaying fungi since most are mesophlilic (i.e., cannot grow above 104°F) and have an optimum temperature range of 77°-86°F (Kaarik 1974). Moisture concentration of woody material can limit decay organisms activity and survival. When the moisture concentration is below the fiber saturation point (i.e., 30% moisture content), water is usually not accessible for microbes, so decomposition is low (Griffin 1977). On the other hand, when the concentration is above 30%, water is available and microbial activity increases; however, as moisture increases to the point of saturation, the lack of oxygen inhibits decomposition (Rayner and Boddy 1988). Moisture content regulates carbon dioxide and oxygen concentration within woody material.

Another important factor that determines the rate and type of decay are the organisms involved (Harmon et al. 1986). The effects of temperature, moisture, aeration, substrate quality and size on decay rates are expressed through these organisms (Harmon et al. 1986). Functionally, microbes decomposing wood can be divided into those that live on cell contents (molds and stains) and those that degrade cell wall components (bacteria, soft rots, brown rots, and white rots) (Swift 1977). Invertebrates such as insects play a significant role in the decomposition of woody debris by attacking wood directly or by influencing other organisms. The effect of invertebrates on woody debris depends upon several factors: the stage of the tree during attack (e.g., decay class, substrate quality), the part of the tree utilized, and the associated organisms. Substrate quality and extractives profoundly influence the extent and rate to which woody debris is colonized (Harmon et al. 1986).

Estimating forest decomposition decay rates

Forest decomposition rates are generally expressed through decomposition constants or fractional loss rates (*k*, percent loss year^{-1}). Long-term studies provided the best estimate of decomposition constants (Harmon et al. 1986). Few studies of coarse woody detritus dynamics are able to commit to long-term experiments and monitoring (Mackensen et al. 2003, Harmon et al. 1999). To measure quantitative changes in fuelbed characteristics, it is common to sample fuelbed loadings created at various times in the past, and the results are interpreted as if the same unit were inventoried in successive years (Harmon et al. 1999). This procedure establishes a baseline for developing a fuel decomposition chronosequence. Chronosequence studies assume measurement units originally had identical ecological conditions, treatments, and post-disturbance conditions; thus, time since disturbance is the only variable (Yarie et al. 1989). Chronosequence studies generally derive decomposition rates from the change in wood density, volume or other characteristics over time and neglect losses caused by fragmentation (Mackensen et al. 2003). Most studies of woody detritus dynamics have used a chronosequence approach (Lambert et al. 1980; Tritton 1980; Foster and Lang 1982; Graham and Cromack 1982; Harmon et al. 1986; Sollins et al. 1987; MacMillan 1988; Harmon and Chen 1991; Means et al. 1992; Busse 1994). This approach provides rapid estimates of long-term decomposition rates; however, one important limitation of this approach should be recognized. Given that space is substituted for time, local-climatic factors rather than temporal factors may cause differences in observed decomposition rates (Harmon et al. 1999, Janisch et al. 2005).

Mathematical models have been developed to describe and estimate decomposition patterns. The four most common models are: multiple-exponential, lag-time, linear model, and single-exponential (Mackensen et al. 2003). The single-exponential decay model is most commonly used in decomposition studies involving many species (Erickson et al. 1985, Edmonds 1987, Busse 1994; Stone et al. 1998; Harmon et al. 2000). This model is based on the assumption that the decomposition rate is proportional to the amount of matter remaining and the combination of factors driving decomposition remains constant (Olson 1963). Therefore, the proportion of wood that is lost during a given time period remains constant. Assuming an exponential decay model, the time to decompose can be calculated according to the equations below (Olson 1963).

[1] $X/X_0 = e^{-kt}$

where X = present wood density, X_0 = initial wood density, k = decomposition constant, t = time.

[2] $t_{0.5} = -\ln(0.5)/k=0.693/k$, and

[3] $t_{0.95}=-\ln(0.05/k=3/k$

where $t_{0.5}$ = the time required to lose 50% mass and $t_{0.95}$ = the time required to lose 95% mass.

Literature review: Chronosequence study in CRMW

There are numerous decomposition studies completed to estimate decomposition rates and patterns for various ecosystems. Decay relationships and environmental factors information is scarce in the Pacific silver fir (*Abies amabilis)* forest ecosystems (Hope 1987). An extensive literature review revealed one study particularly relevant to this project. The Erickson et al. (1985) study was designed to quantify logging residue decomposition rates in four coniferous ecosystems in the State of Washington to examine the influence of microclimate, residue diameter, residue chemistry, and contact with the soil surface on these rates. The Pacific silver fir study site was located in the CRMW (mean elevation 3700 ft; mean annual temperature 40°F; mean maximum July temperature 63°F; mean annual precipitation 91 inches). Specific gravity (i.e., density) was used to calculate decay rates (Foster and Lang 1982). Logging residue samples were collected from 0, 2, 5, and 8 year old harvest units with similar aspect, slope, original stand composition, and soil type. Within each ecosystem, the only residues sampled were of the same species as the name of that ecosystem (e.g., in Pacific silver fir ecosystem, only Pacific silver fir residues were sampled).

Residues were collected from two diameter classes 0.39-0.79 inch and 3.14-4.72 inch diameter inside bark, (DIB) and from two vertical locations, on the ground and > 7.87 inch above the soil surface. Within each harvest unit (except time 0), an average of 25 samples were collected for each diameter class-vertical location combination. A total of 429 residue samples (223 from 0.39-0.79 inch DIB class and 196 from 3.14-4.72 inch DIB class) were collected. Specific gravity was expressed on an oven dry weight per "green" (saturated) volume basis (Anonymous 1974). Samples were saturated overnight in distilled water under a vacuum. Volume determinations were made by a water displacement technique (Anonymous 1974). Residue decomposition rates were estimated using an exponential decay model (multiplicative error assumed), which has found wide use in studies of this nature (Barber and Van Lear 1984; Foster and Lang 1982; Graham and Cromack 1982):

[4] $Y_t = Y_0 e^{-kt}$

where Y_t represents specific gravity at time t, Y_0 is the specific gravity at time 0, t is the years since harvesting, e is the base of natural logarithms, and k is the coefficient of residue decay. By taking the logarithm ($\log_e$) of both sides, the above model was converted into the form used in making actual calculations:

[5] $\log_e Y_t = \log_e Y_o - kt$.

There were two approaches to performing the decomposition study in CRMW: (1) calculate decomposition or fractional loss rates (*k*, percent loss year^{-1}) (e.g., Erickson et al. 1985) or (2) measure fuel loading and depth by installing Brown's transects and use Erickson's estimates to calculate decay rates over time. We chose to install permanent plots because this approach establishes a framework for future quantitative (i.e., re-measurement of Brown transects) or qualitative (i.e., examine digital photographs) monitoring of fuelbed changes.

Measuring fuelbed depths and fuel loading: Brown's transects

While the Erickson et al. (1985) approach to estimating fuel decomposition involved measuring residue specific gravity to calculate decomposition constants or fractional loss (k, year^{-1}), Brown's transects are used to estimate fuelbed characteristics (i.e., loading and fuelbed depth). This approach does not calculate decomposition constants. The inventory of volumes and weights is based on the planar intersect technique (Brown 1971; Brown and Roussopoulos 1974), that has the same theoretical basis as the line intersect technique (Van Wagner 1968). The planar intersect technique involves counting intersections of woody pieces with vertical sampling planes that resemble guillotines dropped through the downed debris. Mass (i.e., tons per acre by size class) is estimated from volume by applying estimates of specific gravity of woody material. The fuel sampling approach is nondestructive and avoids the time-consuming and impractical task of collecting and weighing large quantities of forest debris.

Woody fuel particles are categorized according to their time lag. Time lags are proportional to particle diameter and refer to the time required for a particle to respond to within 63.2% (1-1/e) of the new equilibrium moisture content (either drying or wetting). Larger-diameter fuels have long time lags, meaning they respond slowly to environmental fluctuations. Time lag categories traditionally used for fire behavior and fire danger rating are specified as: 1-, 10-, 100-, and 1000-hr and correspond to round woody fuels in the size range of: 0-0.25", 0.25-1", 1-3", and 3-8" respectively. Loadings (weight/area) of dead fuels in these size-classes are required to describe surface fuels for fire modeling (Anderson 1982).

Methods

This study was conducted within the 92,000 acre CRMW, approximately 31 miles east-southeast of Seattle, Washington near the town of North Bend, WA, in the west Cascade Mountains during the summer of 2006. Elevation of the areas sampled ranged from 3000 to 3300 m. Mean annual temperature is 40°F. Mean maximum temperature in July is 63°F. Mean annual precipitation is 91 inches; mostly snow packs 3.3 to 9.9 feet. The Pacific silver fir vegetation zone is commonly found between the temperate mesophytic *Tsuga heterophylla* zone of the lowlands and the subalpine *Tsuga mertensiana* zone. CRMW is dominanted by four plant associations: Pacific silver fir/big huckleberry/pyrola (*Vaccinium membranaceum, Pyrola secunda),* Pacific silver fir/Alaska huckleberry/queenscup *(Vaccinium alaskaense, Clintonia uniflora),* western hemlock/ swordfern-oregongrape *(Polystichum munitum-Berberis nervosa),* and western hemlock/salal (*Gaultheria shallon).*

Pilot study to determine sample design

We began with a pilot study to determine appropriate sampling size for this study. We selected stand CRMW 5.1 (2003) as the pilot study stand to determine the number of samples necessary to be within x percent of the mean y percent of the time (e.g., the number of samples to be within 5% of a mean of 95% of the time). Fourteen plots were installed. The average mean and standard deviation for each time lag particle (1-, 10-, 100-hr fuel classes) was calculated using the DRA program (Table 1a; Table 1b). DRA is a computer program that calculates fuel loading and consumption for scientists and resource managers who study and manage prescribed fire for management of forest and rangeland resources (Anderson et al. 2005). We used Hoshmand's (1988) sample size equation to determine number of plots to install in the other units.

Example

Estimate n for bulk density samples to be within 5% of the mean (i.e., ± 10%) 95% of the time, where mean=3.0 and SD=0.5.

[6] n = (((1.96)*(0.5))/(0.6))^2

[7] n = 2.65 or 3

[8] n = ((z*s)/E)^2 or n = ((z^2)*(s^2))/(E^2)

where:

[9] z = z-score associated with the selected degree of confidence (e.g., 95% confidence interval= 1.96)

[10] s = sample standard deviation of the mean from a pilot study or other source

[11] E = allowable error (e.g., within 5% of a mean of 90: E=9). Sample size is expressed as the number of samples necessary to be within x% of the mean y% of the time (e.g., the number of samples to be within 5% of a mean of 90, 95% of the time).

The pilot study indicated that 11, 13, and 16 transect lines for the 1-, 10-, and 100-hr fuel size classes, respectively, were required to be within 5% of the mean 95% of the time (Table 1a, Table 1b).

Table 1a. Pilot study data from stand CRMW 5.1 (2003).

Diameter class	QMD[1]	No. sticks	Mean	SD[2]	SE[3]	95% CI[4]
1-hr (0-0.24 in)	0.12	1421	1.47	0.49	0.13	0.28
10-hr (0.24-1 in)	0.54	372	2.17	0.80	0.21	0.46
100-hr (1-3 in)	1.66	192	4.17	1.73	0.46	1.00

[1]QMD: quadratic mean diameter; [2]SD: standard deviation, [3]SE: Standard error; [4]CI: confidence interval

Table 1b. Sample size calculation to be within 5-, 10-, 15-, and 20-% of the mean 95% of the time.

	1-hr				10-hr				100-hr			
	5%	10%	15%	20%	5%	10%	15%	20%	5%	10%	15%	20%
Mean	1.47	1.47	1.47	1.47	2.17	2.17	2.17	2.17	4.17	4.17	4.17	4.17
SD	.49	.49	.49	.49	0.81	0.81	0.81	0.81	1.71	1.71	1.71	1.71
x% of mean	.294	.147	.098	.074	.434	.217	.145	.109	.834	.417	.278	.209
z-value	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96
N required	11	42	88	170	13	53	121	209	16	64	145	264

Note: N = number of Brown's transect lines required in each stand. N = ((z*sd)/E)^2 where E = Mean/x% of mean. z = z-score associated with the selected degree of confidence (e.g., 95% confidence interval= 1.96). s = sample standard deviation of the mean from a pilot study or other source. E = allowable error (e.g., within 10% of a mean of 90: E=9). Sample size would then be expressed as the number of samples necessary to be within x% of the mean y% of the time (e.g., the number of samples to be within 10% of a mean of 90, 95% of the time). For example to be within 5% of the mean 95% of the time 11, 13, and 16 Brown's transect lines are required for the 1-, 10-, and 100-hr fuel classes respectively

Inventory protocol

Details on the sampling design and plot relocation

Fifty-one stands were thinned from 2000 to 2004 (Table 2). Restoration stands were selected and inventoried according to the following stand criteria: dominant overstory species composition, thinning prescription (i.e., spacing target and maximum dbh limit), and elevation. The objective was to inventory stands with identical treatment history (i.e., thinning prescription) and species composition from multiple years. Different thinning prescriptions reduced the initial sample size of 51 stands. We did not inventory five stands treated in 2000 and 2003 because of the 13 x 13-ft thinning prescription. Likewise, five stands were eliminated in 2004 because of the 16 x 16-ft thinning prescription. Stands treated > 5 years ago were not sampled because the thinning prescriptions and initial conditions differ from the current prescriptions and were not in the same vegetation type. The overstory species composition is a mixture of Douglas-fir and Pacific silver fir. We thus concentrated the sampling in stands thinned to 15 x 15-ft spacing (Table 3).

Eleven restoration thinned stands from 2001-2005 were inventoried: one in 2001, two in 2002, three each in 2003 and 2004, and two in 2005. Surface fuel treatments had been applied in the two 2005 stands. Fourteen plots were installed within unit 5.1 (2003), the pilot study stand. Ten plots were installed in unit 4.2 (2002), 2.1 (2001), 4.1 (2002), 3.4a (2003), and 2 (2004). Unit 2 (2004) was subdivided into 26ABC (2004) because of a forest type transition and thinning prescription change. Three plots were installed within the new unit. Likewise, unit 4 (2004) was subdivided into unit 4Z (2004). Two plots were established and the rest of the unit was not sampled because of stand composition and a resulting change in thinning prescription. Five plots were installed in the mastication unit and unit 1.1 (2003). Finally, 10 plots were installed in the lopped unit 25B-Lop (2005). A few stands were subdivided because of stand heterogeneity and a change in thinning prescription.

We systematically installed several plots within the boundary of the selected stands. Plot centers were one chain (66 ft) apart. Ten plots were installed in each unit with the exception of the units that were subdivided. Plots were at least two chains (132 ft) from road edges, meadows, and other treated stands. A 4-ft aluminum conduit with a 1-inch metal identification tag was installed to mark plot centers. Slope, aspect, and elevation were recorded. Digital photographs were taken in each cardinal direction, starting with due north and preceding clockwise, from plot center. Geographical position system (GPS) coordinates of plot center were captured when possible with a Garmin GPSMAP 76CS. GPS coordinates X,Y and stand ID can be used to relocated plot centers.

Surface fuels were measured using a modified version of Brown's (1974) fuel transect method. At each plot two 50-ft transects were deployed from two random compass azimuths obtained from a random number generator table. Fuel load, high particle density height, canopy cover, and duff and litter depths were measured. At the end of each Brown's transect line, a 12 inch, orange-tip wielding rod was installed to mark end point. The 1-hr (0-0.25 inch) and 10-hr (0.25-1 inch) fuel particle intercepts were tallied from 47 to 50-ft. The 100-hr (1-3 inch) fuel particle intercept was from 40 to 50-ft. The 1000-hr fuel (> 3 inches) particle intercept was tallied and measured 0 to 50-ft. Calipers were used to measure diameter of all fuel greater than 3 inches at point of intersection. Species, decay class (Table 4), and fuel position (i.e., on/off ground) were recorded. Litter and duff depth, particle height, and canopy cover were measured at 15-, 30-, and 45-ft. Canopy cover was measured with a moosehorn. Measurements were recorded on a data sheet and entered into the DRA program.

Table 2. CRMW stand attribute and thinning prescription data for all restoration thinned stands (2000-2005).

StandID	Section	TS	Rng	Year	Age	Acres	Elev. (ft)	Slope	Aspect	Restoration thinning prescription		
										Target TPA	Spacing	Max dbh
1.1	9	22	7	2000		25	800		w	258	13x	5.5"
1.2	10	22	7	2000		22	800		s	258	13x	5.5"
2.1	20	22	7	2000		17	800		flat	258	13x	5.5"
2.2	10	22	8	2000		66	2400		w	258	13x	5.5"
3.1	15	22	8	2000		42	2400		sw	258	13x	5.5"
3.2	15	22	8	2000		13	3600		ne	258	13x	5.5"
3.3	15	22	8	2000		44	3600		n	258	13x	5.5"
4	7	21	9	2000		270	4000		s&n	258	13x	5.5"
2.1	7	21	10	2003		33				258	13x	
3.2	12 etc.	21	10	2003	31	37	2800	30	s	258	13x	
3.3	6,7	21	11	2003		9	3200		se	258	13x	
3.4b	7	21	11	2003	25	80	4000	54	n	258	13x	
3.7	5	21	11	2003	30	109		36		258	13x	
4.1	24	21	11	2003	15	45		32		258	13x	
4.2	24 etc.	21	10	2003	22	119		29		258	13x	
4.3	17,18,19	22	8	2001	11	33	1200	14	flat	193	15x	7"
4.1	24	22	7	2001	16	47	1200	6	flat	193	15x	7"
4.2	18	22	8	2001	14	62	1200	9	flat	193	15x	7"
4.4	20,29	22	8	2001	19	39	1600	3	flat	193	15x	7"
4.5	29,32	22	8	2001	10	86	1600	4	flat	193	15x	7"
3.1	9,16	21	10	2001	23	229	3200	43	e	193	15x	7"
2.3	19	21	10	2001	30	9	3600	15	se	193	15x	7"
2.2	18,19	21	10	2001	35	35	3600	14	se	193	15x	7"
1.2	13etc.	21	9	2001	21	290	3600	25	e&se	193	15x	7"
1.1	15 etc	21	9	2001	25	362	3600	31	e&n	193	15x	7"
2.1	17 etc.	21	10	2001	25	465	4000	41	e&w	193	15x	7"
1.1	24	22	7	2002	10	41	1200	21	n	193	15x	7"
1.2	30	22	8	2002	10	162	1200	9	flat	193	15x	7"
2.1	8,9	21	10	2002		73	3600		ne	193	15x	7"
3.1	14,15	21	10	2002		35	2800		se	193	15x	7"
4.1	23,24	21	10	2002	20	201	3200	42	se	193	15x	7"
4.2	23,24,etc	21	10	2002	29	451	3200	31	all	193	15x	7"
4.3	24	21	10	2002	25	142	4000	48	sw	193	15x	7"
2	10	21	10	2004	18	90	2400	18	sw	194	15x	
9	23	21	10	2004	42	31	3000	20	ne	194	15x	
4	8,17,18	21	10	2004	30	326	3200	32	se,nw	194	15x	
6	22,23	21	10	2004	41	24	3200	37	ne	194	15x	
1.1	8,9	21	10	2003	38	72	3200	45	se	194	15x	
3.1	1,12 etc.	21	10	2003	30	135	3200	38	e,se,ne	194	15x	
3.4a	12 etc.	21	10	2003	37	109	3400	55	n	194	15x	
3.5	6,7	21	11	2003		128				194	15x	
3.8	5,6	21	11	2003	38	14		33		194	15x	
4.3	19,30	21	11	2003	29	43		51		194	15x	
5.1	9,10,15	21	10	2003	35	60	2400	30	n	194	15x	
5.2	9,15,16	21	10	2003		84	3000	49	ne			
3	5	21	10	2004	18	18	2800	59	e	170	16x	
1	3	21	10	2004	32	11	3000	36	sw	170	16x	
5	22	21	10	2004	30	77	3000	40	ne	170	16x	
7	22,23,27	21	10	2004	42	25	3400	28	ne,e	170	16x	
8	26	21	10	2004	23	45	3600	55	n	170	16x	
3.6	7,8,17	21	11	2003	20	77		24		302	12x	

Table 3. CRMW stand attribute and thinning prescription data for stands inventoried (2000-2005).

StandID	Section	TS	Rng	Year	Age	Acres	Elev. (ft)	Slope	Asp.	Restoration thinning prescription		
										target tpa	spacing	max dbh
5.1	9,10,15	21	10	2003	35	60	2400	30	n	194	15x	
4.2	23,24	21	10	2002	29	451	3200	31	all	194	15x	7"
2.1	17 etc.	21	10	2001	25	465	4000	41	e&w	194	15x	7"
4.1	23,24	21	10	2002	20	201	3200	42	se	194	15x	7"
3.4a	12 etc.	21	10	2003	37	109	3400	55	n	194	15x	-
4Z	8,17,18	21	10	2004	30	326	3200	32	se,nw	194	15x	-
26-2004_2	10	21	10	2004	18	90	2400	18	sw	194	15x	-
UB40-2003-1.1	8,9	21	10	2003	38	72	3200	45	se	194	15x	-
D1-Mas	25,30	21	10	2005	-	-	3500		ne			-
26 ABC-2004-2	10	21	10	2004	18	90	2400	18	sw	194	15x	-
25B-Lop	25,30	21	10	2005	-	-	3500		ne		-	-

Table 4. Decay classes for large downed woody debris (3 in +, 1000 hr fuels)

	Decay class				
	1	2	3	4	5
Bark	intact	intact	Sloughing &/or absent	Detached or absent	Detached or absent
Needles	present	absent	absent	absent	absent
Branches	Fine twigs present	Larger twigs present, branch system entire	Larger branches present	Large branches present, but reduced a lot	Detached or easily removed
Structural integrity	sound	sound	Mostly sound buy may be punky	Mostly rot, although center of larger logs often sound	Rot throughout but may have small sound sections
Shape	round	round	round	Round to slightly oval	oval to collapsed

Data Analysis

The Brown’s transect data were analyzed in the DRA program. DRA calculates several statistical computations for each fuelbed (Table 5). Mean fuelbed depth and fuelbed loading per fuel size class (tons per acre) were the most important statistics to examine fuelbed characteristics generated from thinning treatments. These statistical parameters were analyzed to determine fuelbed changes over time and response to surface fuel treatments. DRA woody loading report equations are derived from Brown (1974).

Woody loading for diameters £ 3” (see Brown 1974):

[12] $$\text{Loading (tons/acre)} = \frac{11.64 \times n \times d^2 \times s \times a \times c}{N\ell}$$

[13] n = total number of intersected pieces of the sample unit.

[14] d^2 = weighted, species based squared QMD (inches) for each size class derived from:

[15] $$d^2 = \frac{P_1 d_1^2 + P_2 d_2^2 + P_3 d_3^2}{P_1 + P_2 + P_3}$$

[16] where: P_1, P_2, P_3… P_n and d_1, d_2, d_3,…,d_n represent the percentage and QMD of each different species in the total sample

[17] s = specific gravity (which, like d^2 above, is also a weighted average value based on species composition)

[18] a = non-horizontal angle correction factor which is determined by species, size class and whether the material being sampled is freshly fallen ("fresh slash") or older slash (everything else).

[19] c = slope correction factor; with field slope correction this value is 1

[20] N = total number of sampling transects for the sample unit

[21] ℓ = length (ft) of sampling unit transect

Woody loading for diameters > 3" (see Brown 1974): all variables are the same as above

[22] $$\text{Loading (tons/acre)} = \frac{11.64 \times \sum d^2 \times s \times a \times c}{N\ell}$$

[23] Σd^2 = sum of the squared QMD of each intersected piece

Pacific silver fir decomposition rate constant (Erickson et al., 1985) was used to develop graphs to estimate the time required to decompose a certain percentage of the three fuel size classes (Table 5) and to develop a 50-year fuelbed decomposition trajectory (Table 6). For example, the time required to reduce the initial 1-hr fuel loading 50% is estimated using the negative exponential decay model.

Results

Fuelbed comparison results are based on summary statistics. Statistical analysis beyond summary statistics could not be calculated because of the small sample size and lack of replication. Overall, there are no noticeable differences among mean fuelbed depth and fuel loading in the 11 stands inventoried with the exception of the lopped and masticated stands (Table 5, Fig. 1). However, it does appear the older restoration thinned stands (e.g., 2001 & 2002) mean fuel bed depth is lower than the recent stands (e.g., 2003 & 2004). The average fuelbed depth for stand 2.1 (2001), 4.2 (2002), and 4.1 (2002) was 2.3 ft. The average fuelbed depth for stand 3.4A and 5.1 was 2.9 ft (Table 5, Fig. 1). This seems to indicate a small reduction in fuelbed depth and a potential change in fire behavior. For comparison, fuel model 12 (i.e., medium logging slash) and 13 (i.e., heavy logging slash) fuelbed depth is 2.3 and 3.0 ft, respectively (Anderson 1982). The 3-9 inch (decay class 1-3) woody fuel was the most abundant (Fig. 2; Fig. 3) compared to the 9-20 inch (decay class 1-5) size class (Fig. 4) Large woody fuel 20-99 inch diameter was not abundant within the inventory units (Appendix A). One log was recorded in unit 5.1. There were no 20-99 inch diameter woody fuels recorded in the other units.

Table 5. DRA small fuel woody loading (< 3 inch) summary for the 11 inventoried stands.

StandID	Year	Fuel size class	Count	Loading tons/acre				Mean fuelbed depth (ft)	No. plots
				Mean	SD[1]	SE[2]	95% CI[3]		
5.1	2003	1-hr	2494	1.47	0.49	0.13	0.28	2.8	14
		10-hr	410	2.17	0.81	0.21	0.46		
		100-hr	201	4.17	1.73	0.46	1.00		
4.2	2002	1-hr	1639	2.38	0.87	0.28	0.62	2.2	10
		10-hr	323	2.64	1.00	0.32	0.72		
		100-hr	391	11.88	5.79	1.83	4.14		
2.1	2001	1-hr	1652	2.40	2.70	0.86	1.93	2.4	10
		10-hr	424	3.47	1.90	0.60	1.36		
		100-hr	195	5.94	2.88	0.91	2.06		
25B-Lop	2005	1-hr	1148	1.67	0.50	0.16	0.36	1.5	10
		10-hr	332	2.72	0.89	0.28	0.64		
		100-hr	253	7.71	3.06	0.97	2.19		
4.1	2002	1-hr	1732	2.51	1.70	0.54	1.22	2.2	10
		10-hr	332	2.72	1.23	0.39	0.88		
		100-hr	291	8.85	2.90	0.92	2.07		
3.4a	2003	1-hr	1268	1.85	1.00	0.32	0.71	2.9	10
		10-hr	276	2.26	0.87	0.27	0.62		
		100-hr	254	7.75	3.14	0.99	2.25		
26-2004_2	2004	1-hr	1237	2.11	1.46	0.46	1.04	2.8	10
		10-hr	228	2.20	0.64	0.20	0.45		
		100-hr	155	5.55	2.67	0.84	1.91		
UB40-1.1	2003	1-hr	926	2.70	1.08	0.48	1.34	2.0	5
		10-hr	169	2.78	0.37	0.17	0.46		
		100-hr	159	9.73	4.48	2.01	5.57		
D1-Mas	2005	1-hr	572	1.66	0.76	0.34	0.95	0.58	5
		10-hr	331	5.41	2.74	1.22	3.40		
		100-hr	216	13.07	3.80	1.70	4.72		
26 ABC	2004	1-hr	520	2.44	0.95	0.55	2.35	4.4	3
		10-hr	246	6.57	6.38	3.68	15.84		
		100-hr	61	6.03	3.39	1.95	8.41		
4Z	2004	1-hr	162	1.17	0.31	0.22	2.76	2.8	2
		10-hr	100	4.09	1.96	1.39	17.65		
		100-hr	57	8.66	1.07	0.76	9.65		

[1]SD: standard deviation, [2]SE: Standard error; [3]CI: confidence interval

Table 6. Decomposition rate constant from the Erickson et al. (1985) decomposition study in the CRMW.

<table>
<tr><th>Fuel size classes</th><th>Measured fuel size classes (in)</th><th>Erickson et al. fuel size class (in)</th><th>Decomposition constant</th></tr>
<tr><td>1-hr</td><td>0-0.25</td><td rowspan="2">0.39-0.78</td><td rowspan="3">k=0.005[a]</td></tr>
<tr><td>10-hr</td><td>0.25-1</td></tr>
<tr><td>100-hr</td><td>1-3</td><td>3.14-4.72</td></tr>
</table>

[a]Erickson, H.E., Edmonds, R.L., Peterson, CE. 1985. Decomposition of logging residues in Douglas-fir, western hemlock, pacific silver fir and ponderosa pine ecosystems. Can. J. For. Res. 15, 914-921.

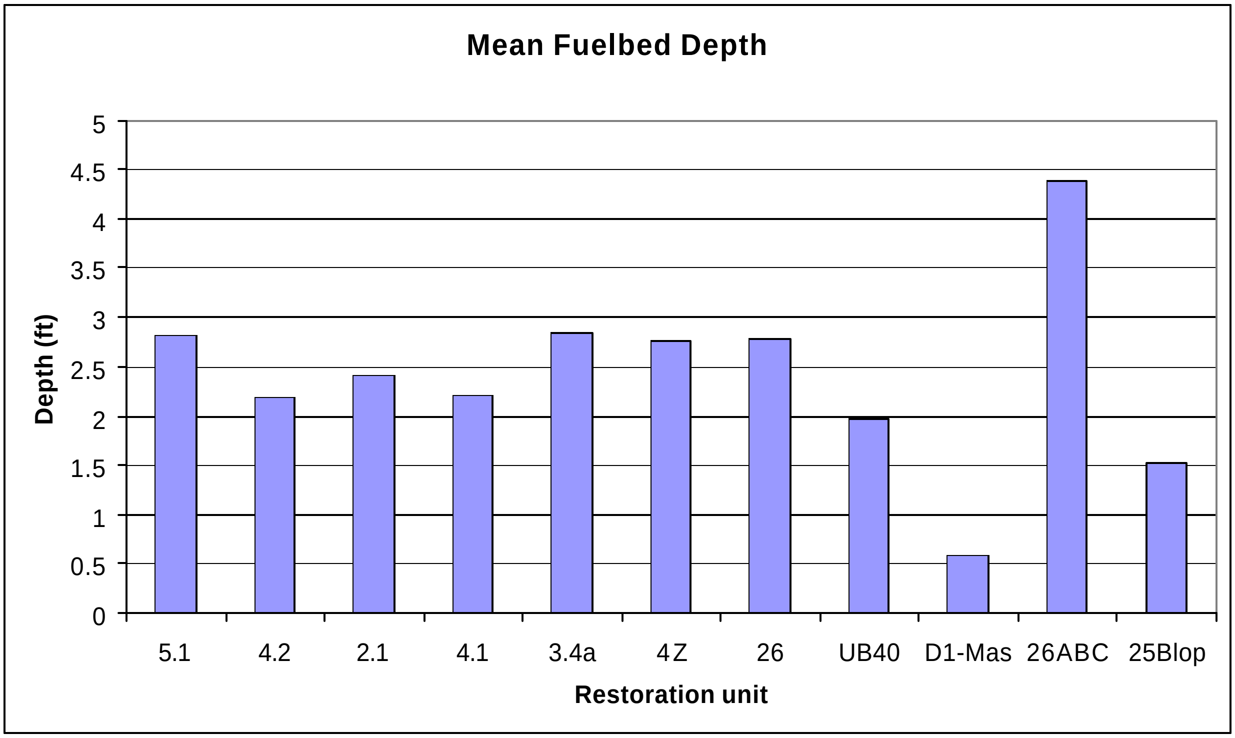

Fig. 1. Mean fuelbed depth comparisons.

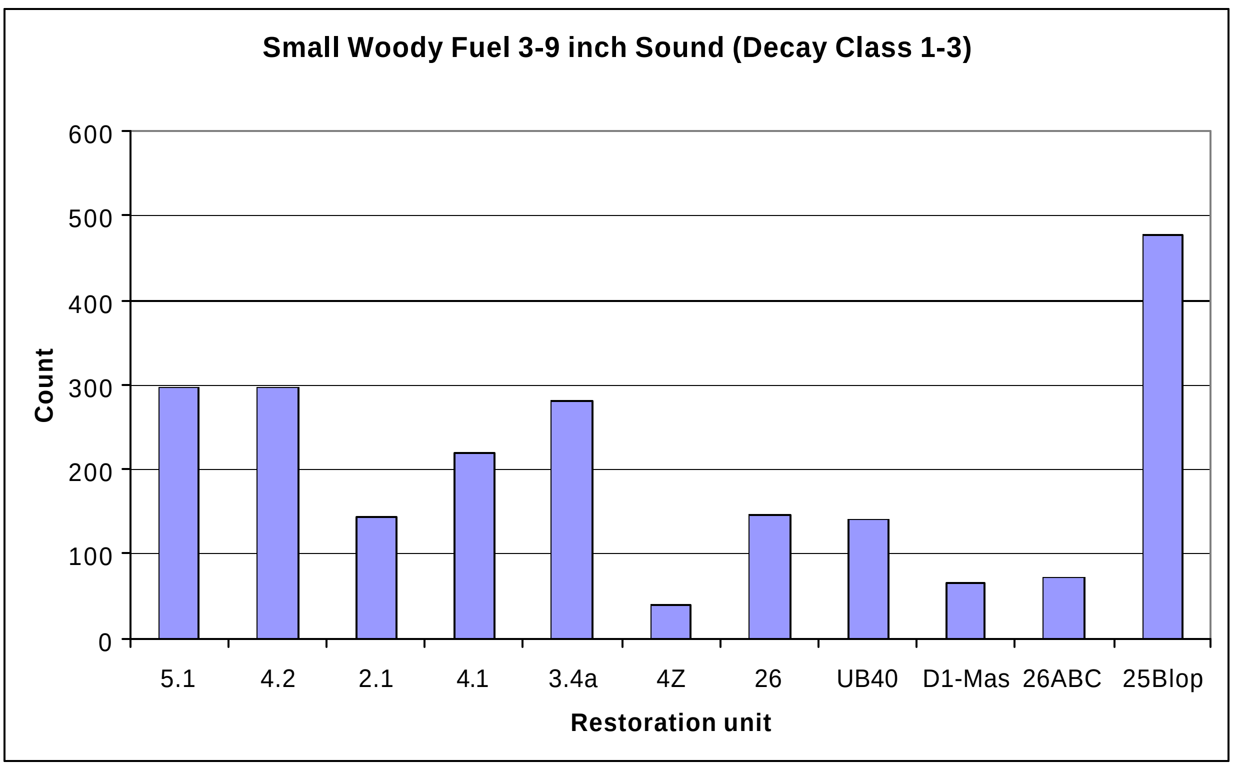

Fig. 2. Small Woody Fuel 3-9 inch Sound (Decay Class 1-3).

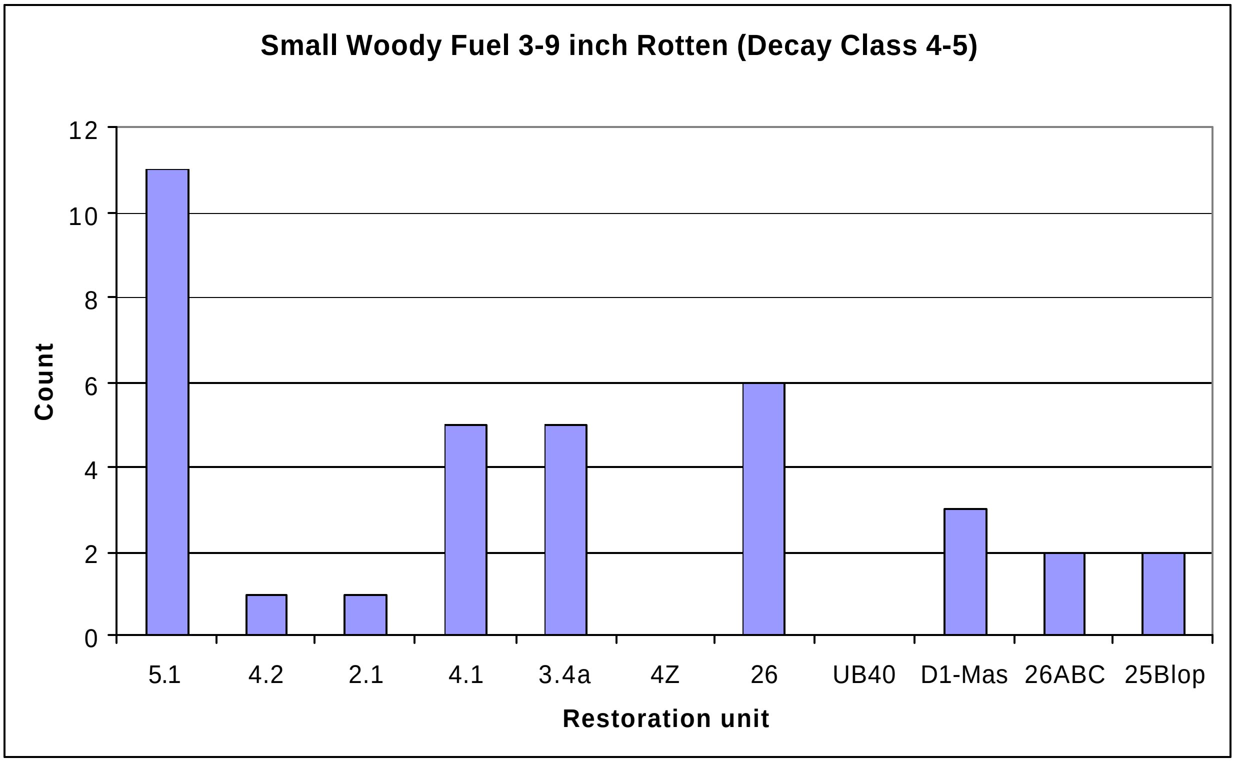

Fig. 3. Small Woody Fuel 3-9 inch Rotten (Decay Class 4-5)

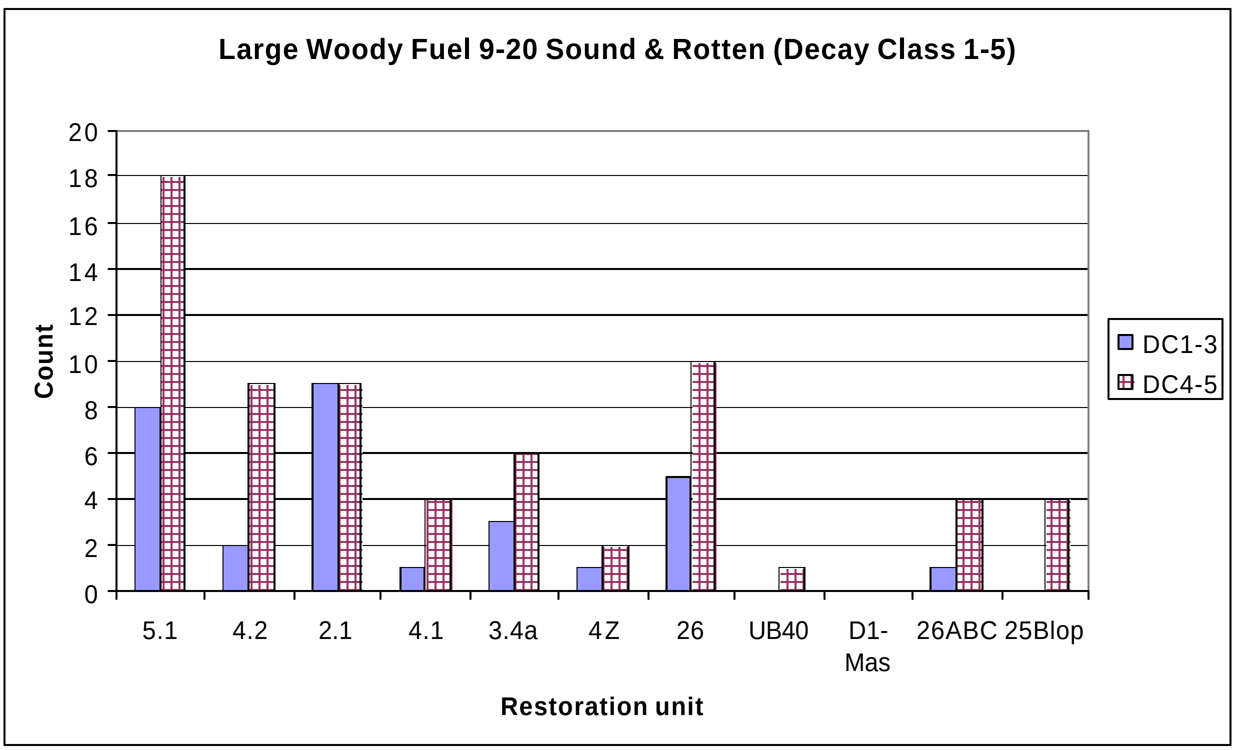

Fig. 4. Large woody fuel (9-20) inch decay class 1-5.

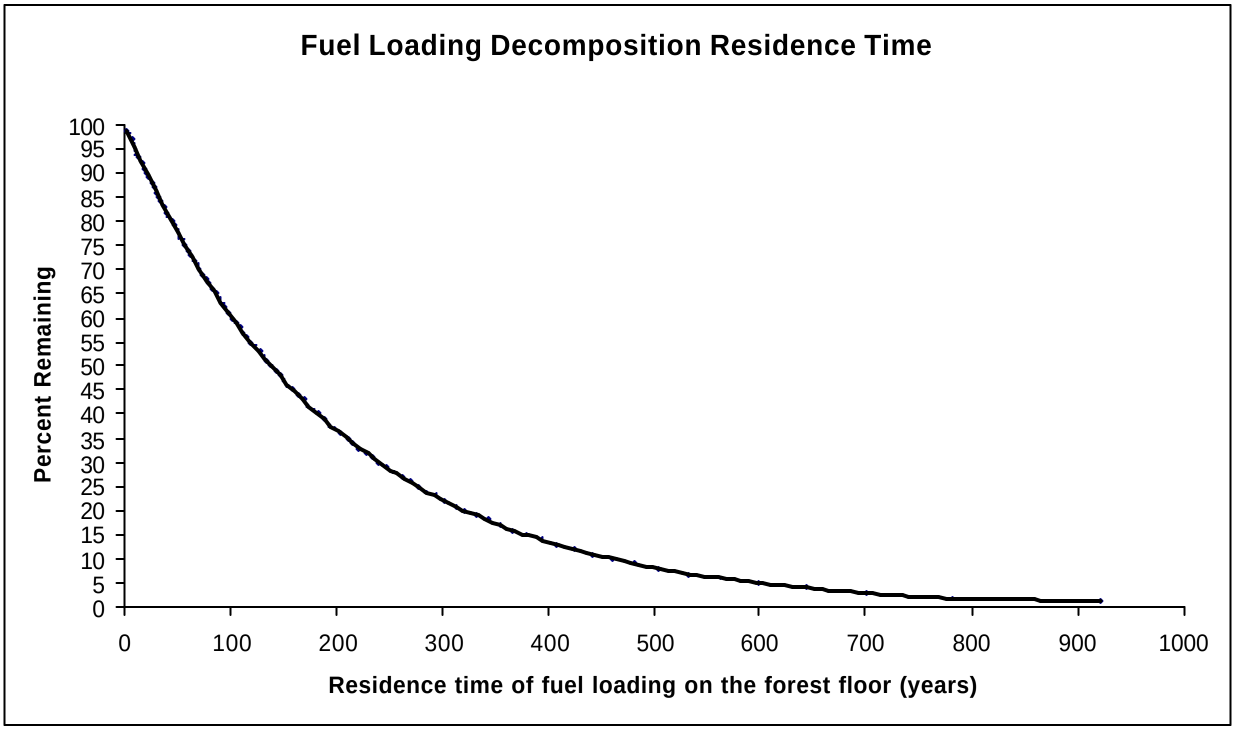

Fig. 5. Fuel loading residence time using Erickson et al. (1985) decomposition constant.

Surface fuel treatments (i.e., lopping and mastication) did reduce mean fuelbed depth and fuel particle size distribution (i.e., changed larger size class to 1-hr fuel classes); however, the total fuel loadings within each stand were similar to the untreated stands (Table 5, Fig. 1). Mean fuelbed depth averaged 2.70, 0.58, and 1.52-ft in the untreated, masticated and lopped units, respectively (Table 5, Fig. 1).

The decomposition constant obtained from the Erickson et al. (1985) study for 1-, 10-, and 100-hr fuel was (k = 0.005) (Table 6). This constant was used to estimate slash residence time. Results indicate it would require 138 years for 50% mass loss of 1-hr fuel to decrease from 2.4 tons per acre to 1.2 tons per acre in stand 5.1 (Fig. 5, Table 7). The Pacific silver decomposition constant is low compared to other species in the region. For comparison, it would require 23 years for 50% mass loss of the 3-4.72 in western hemlock fuel size class fuelbeds (i.e., decomposition constant equals 0.03) (Table 8). Decomposition studies have been done for many other coniferous species other the Pacific Northwest (Table 9). This table is useful for comparing CRMW findings with other forest ecosystems. This modeling exercise assumes no input of woody fuel.

Table 7. Mean fuelbed loading 50-year trajectory using Erickson et al. (1985) decomposition rate constant (0.005 year $^{-1}$) for all fuel size classes.

StandID	Year	Fuel size class	Mean loading (tons/acre)					
			2006	2016	2026	2036	2046	2056
5.1	2003	1-hr	2.4	2.3	2.2	2.1	2.0	1.9
		10-hr	2.2	2.1	2.0	1.9	1.8	1.7
		100-hr	4.1	3.9	3.7	3.5	3.3	3.2
4.2	2002	1-hr	2.4	2.3	2.1	2.0	2.0	1.9
		10-hr	2.6	2.5	2.4	2.3	2.2	2.1
		100-hr	11.9	11.3	10.7	10.2	9.7	9.3
2.1	2001	1-hr	2.4	2.3	2.2	2.1	2.0	1.9
		10-hr	3.5	3.3	3.1	3.0	2.8	2.7
		100-hr	5.9	5.6	5.3	5.1	4.9	4.6
25B-Lop	2005	1-hr	1.7	1.6	1.5	1.4	1.4	1.3
		10-hr	2.7	2.6	2.4	2.3	2.2	2.1
		100-hr	7.7	7.3	6.9	6.6	6.3	6.0
4.1	2002	1-hr	2.5	2.4	2.3	2.2	2.1	2.0
		10-hr	2.7	2.6	2.4	2.3	2.2	2.1
		100-hr	8.9	8.4	8.0	7.6	7.3	6.9
3.4A	2003	1-hr	1.9	1.8	1.7	1.6	1.5	1.4
		10-hr	2.3	2.1	2.0	1.9	1.9	1.8
		100-hr	7.8	7.4	7.0	6.7	6.4	6.0
26-2004_2	2004	1-hr	2.1	2.0	1.9	1.8	1.7	1.6
		10-hr	2.2	2.1	2.0	1.9	1.8	1.7
		100-hr	5.6	5.3	5.0	4.8	4.6	4.3
UB40-2003-1.1	2003	1-hr	2.7	2.6	2.4	2.3	2.2	2.1
		10-hr	2.8	2.6	2.5	2.4	2.3	2.2
		100-hr	9.7	9.2	8.8	8.4	8.0	7.6
D1-Mastcation	2005	1-hr	1.7	1.6	1.5	1.4	1.4	1.3
		10-hr	5.4	5.1	4.9	4.7	4.4	4.2
		100-hr	13.1	12.4	11.8	11.2	10.7	10.2
26 ABC-2004-2	2004	1-hr	2.4	2.3	2.2	2.1	2.0	1.9
		10-hr	6.6	6.2	5.9	5.7	5.4	5.1
		100-hr	6.0	5.7	5.4	5.2	4.9	4.7
4_2004	2004	1-hr	1.2	1.1	1.1	1.0	1.0	0.9
		10-hr	4.1	3.9	3.7	3.5	3.4	3.2
		100-hr	8.7	8.2	7.8	7.4	7.1	6.8

Fuel size classes (in): 1-hr = 0-0.25; 10-hr = 0.25-1; 100-hr = 1-3.

Table. 8. Decomposition rates constants calculated for other species in the region.

Species	Fuel size class (in)	Decomposition constants *k* values (year $^{-1}$)	Reference	Model
Douglas-fir *Pseudotsuga menziesii*	2.36-3.93	0.06	Edmonds 1987	Best fit regression
	3.14-4.72	0.016[a]	Erickson et. al 1985	Exponential decay model
	3.14-4.72	0.037[o]	Erickson et. al 1985	Exponential decay model
	0.39-0.79	0.004[a]	Erickson et. al 1985	Exponential decay model
	0.39	0.011[o]	Erickson et. al 1985	Exponential decay model
	0.39	0.060[o]/0.048[a]	Edmonds et. al 1986	Exponential decay model
	1.57-2.36	0.047[o]/0.040[a]	Edmonds et. al 1986	Exponential decay model
	3.14-4.72	0.019[o]/0.017[a]	Edmonds et. al 1986	Exponential decay model
	0.39-.078	0.035[o]/0.015[a]	Edmonds et. al 1986	Best fit regression
	1.57-2.36	0.062[o]/0.010[a]	Edmonds et. al 1986	Best fit regression
Western hemlock *Tsuga heterophylla*	2.36-3.93	0.08	Edmonds 1987	Best fit regression
	3.14-4.72	0.030[ao]	Erickson et. al 1985	Exponential decay model
	0.39-0.78	0.010[ao]	Erickson et. al 1985	Exponential decay model
Red alder *Alnus rubra*	2.36-3.93	0.11	Edmonds 1987	Best fit regression
	0.39-0.78	0.285[o]/0.151[a]	Edmonds et. al 1986	Exponential decay model
	1.57-2.36	0.127[o]/0.151[a]	Edmonds et. al 1986	Exponential decay model
	3.14-4.72	0.135[o]/0.085[a]	Edmonds et. al 1986	Exponential decay model
	0.39-0.78	0.330[o]/0.158[a]	Edmonds et. al 1986	Best fit regression
	1.57-2.36	0.164[o]/0.52[a]	Edmonds et. al 1986	Best fit regression
	3.14-4.72	0.194[o]/0.090[a]	Edmonds et. al 1986	Best fit regression
Ponderosa pine *Pinus ponderosa*	3.14-4.72; 0.39-0.78	0.010	Erickson et. al 1985	Exponential decay model
Pacific silver fir *Abies amabilis*	2.36-3.93	0.03	Edmonds 1987	Best fit regression

[a]= >7.87 inches above ground, [o] = on ground

Table. 9. Decomposition rates constants calculated for other coniferous species.

Species	Location	Decomposition constants *k* values (year $^{-1}$)	Reference	Stand age
Balsam fir *Abies balsamea*	New Hampshire	0.0299	Lambert et al. 1980	15
White fir *Abies concolor*	California	0.0275-0.049	Harmon et al. 1987	
Subapline fir *Abies lasiocarpa*	Alberta	0.0286	Laiho and Prescott 1999	350
Norway spruce *Picea abies*	Norway	0.0435	Naesset 1999	
Engelmannii spruce *Picea engelmannii*	Alberta	0.0054	Johnson and Greene	99
White spruce *Picea glauca*	Alberta	0.0271	Laiho and Prescott 1999	120
	Minnesota	0.071	Alban and Pastor 1993	40
Red spruce *Picea rubens*	New Hampshire	0.0096-0.033	Foster and Lang 1982	64
Sitka spruce *Picea sitchensis*	Washington	0.0119	Graham and Cro mack 1982	Old growth
Jack pine *Pinus banksiana*	Minnesota	0.042	Alban and Pastor	40
Lodg pole pine *Pinus contorta*	Alberta	0.0507	Laiho and Prescott 1999	100
	Oregon	0.027	Busse 1994	100
	Wyoming	0.016	Fahey 1983	
	Alberta	0.0171	Johnson and Greene 1991	58
Red pine *Pinus resinosa*	Minnesota	0.055	Alban and Pastor 1993	40
Scots pine *Pinus sylvestris*	Northwestern Russia	0.024	Harmon et al. 2000	

Discussion

There were no noticeable differences among mean fuel loading and fuelbed depth in the 11 stands inventoried with the exception of the lopped and masticated stands. The CRMW chronosequence study spanned a four-year period (2001-2004). In many cases, comparisons are made between stands thinned fewer than three years apart. This may not be enough time between treatments to observe or measure significant changes in fuelbed loading and depth, especially since several decomposition studies have identified decomposition lag-phases

(Ausmus 1977). In other words, it may require several years for the host material (i.e., wood) to become suitable habitat for the decomposing microbes (Means et al. 1985). In Erickson et al. (1985) chronosequence study, decomposition rates were measured in Pacific silver stands thinned 0, 2, 5, and 8 years, and the authors concluded that a longer time may be necessary to observe decay rate differences among woody substrates in these ecosystems.

Microclimate (i.e., temperature and moisture) may be the limiting factor regulating decomposition in CRMW fuelbeds. The temperature within decaying logs is strongly influenced by factors such as surrounding temperature, moisture content, log diameter; surface volume ratio and bark cover (Mackensen et al. 2003). Erickson et al. (1985) concluded low mean annual temperature at the Pacific silver study site contributed to microclimates that resulted in lower decomposition rates. A majority of the restoration thinnings occurred in the Pacific silver zone, an area that has climatic extremes characterized by winter minimum air temperatures typically below 0°C and extended periods of snow pack (Erickson et al. 1985). Therefore, several years or even decades may be necessary to observe or measure noticeable changes in fuelbed loadings and depth in the CRMW restoration thinned fuelbeds.

Lopping and mastication were effective surface fuel treatments. Lopping reduced fuelbed depth and mastication substantially decreased fuelbed depth and changed fuel particle size. Lopping could also reduce fire intensity and spread because this treatment changes the fuelbed optimal packing ratio. Fuelbed packing ratio is a measure of compactness and is defined as the fraction of the fuel array volume that is occupied by fuel, whereas the optimum packing ratio is the most favorable fraction of the fuel array volume occupied by fuel (Rothermel 1972).

Lopping is commonly used to promote decomposition by increasing fuel ground contact. However, in their Pacific silver fir study, Erickson et al. (1985) found no significant difference between decomposition rates in either residue diameter (0.39-0.78 in and 3.14-4.72 in) or vertical location (on the ground and > 7.87 in above soil surface). This means lopping may not promote an increase in decomposition rates in CRMW. The only benefit is reduced fuelbed depth. However, Erickson et al. (1985) reported the 3.14-to-4.72 inch residuals seem to decompose faster than the 0.39-to-0.78-inch classes. Barber and van Lear (1984) suggested that decay retardation in small branches is attributed to case hardening which is the early and complete drying of the outer sapwood (Spaulding and Hansbrough 1944). Earlier studies predict that small branches may remain virtually intact several years after logging (Spaulding 1929; Wagener and Offord 1972). Collectively, lopping and mastication probably will not alter fire intensity and spread since the amount of biomass available for combustion does not change (one of the conclusions in the CRMW fire hazard assessment) (Johnson et al. 2007). In the event of a wildfire, smoldering will probably cause substantial basal area mortality or tree death to the residue trees.

General recommendations/conclusions

The potential increase in fire hazard as a result of forest management activities is a legitimate concern of CRMW forest managers. The increase in slash loads will increase fire hazard and fire spread in the short term. The key to successful management of fire hazard is to determine how long fire hazard will persist on the landscape by understanding the natural processes that affect the decomposition of fuels and to explore alternative management alternatives that will decrease fire hazard.

Surface fuel treatments (i.e., lopping and mastication) did reduce fuelbed depth and particle size distribution. The most effective surface fuel treatment (i.e., mastication) is probably not a feasible management option to implement at the broad scale due to cost per and stand accessibility. However, according to Fahnestock (1960) mastication or lopping will probably be the best management tool to build defensible space around key assets, a recommendation from the CRMW Fire Hazard Assessment report. In theory, these treatments compact or reduce fuelbed depth. Compaction reduces oxygen availability, increases fuel moisture by shading and proximity to ground, and decreases radiation efficiency (Fahnestock 1960). Therefore, utilizing this as a management tool could potentially have a direct affect on modifying wildfire behavior. It is important to understand that it is primarily the small fuels (i.e., < 3 inches) that contribute to fire spread and intensity and should be the target fuel class when deciding on the type of surface fuel treatment to implement. Removing the larger boles (i.e., > 3 inches) does not necessarily reduce fire hazard compared to removing the small fuels.

Permanent sample plots are excellent for long-term monitoring of fuelbed changes. Managers may want to consider ocular assessment of several fuelbeds within the next five years. The assessments will help determine if re-measurements are necessary. The addition of more plots within the stands that have already been measured probably will not change the observed pattern of decomposition. It would be beneficial increase the number of stands inventoried in each year. For example, measuring a few more in each year stands would increase replication. Permanent plots could be installed in future restoration thinned stands in order to establish baseline fuelbed characteristics. Fuelbed characteristics immediately after restoration thinned stands have not been measured. The youngest restoration thinned stand with recorded data is from 2004. Fuelbed depth may have decreased within the 2-year time span between the restoration thinnings in 2004 and the installation of the permanent sample plots in 2006. The data collected in the summer of 2006 will facilitate comparison of decomposition with future restoration stands. Detectable but probably small changes may be recognized after 10-15 years.

However, this is just an estimate; it is difficult to predict when changes may occur because of the many controlling factors associated with decomposition.

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Appendix A. DRA large fuel woody loading fuel summary.

StandID	Size class	Spp	Decay class	SG	No_Logs	Perc_tot	QMD_in	Mean_TPA	SD_TPA	SE_TPA	95CI_TPA	No_per_acre
CRW 2.1	3 to 9	ABAM	1	0.43	5	3.42	3.85	0.37	0.52	0.16	0.37	29.20
CRW 2.1	3 to 9	ABAM	2	0.43	128	87.67	4.18	11.17	8.85	2.80	6.33	747.48
CRW 2.1	3 to 9	ABAM	3	0.43	4	2.74	4.14	0.34	0.75	0.24	0.54	23.36
CRW 2.1	3 to 9	ABAM	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	3 to 9	ABAM	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	3 to 9	ABAM	Sound	0.43	137	93.84	4.16	11.89	9.01	2.85	6.44	800.04
CRW 2.1	3 to 9	ABAM	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	3 to 9	ABAM	Total	0.43	137	93.84	4.16	11.89	9.01	2.85	6.44	800.04
CRW 2.1	3 to 9	UNKN	1	0.43	1	0.68	4.70	0.11	0.35	0.11	0.25	5.84
CRW 2.1	3 to 9	UNKN	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	3 to 9	UNKN	3	0.47	3	2.05	7.84	1.00	2.13	0.67	1.52	17.52
CRW 2.1	3 to 9	UNKN	4	0.30	1	0.68	8.20	0.23	0.74	0.23	0.53	5.84
CRW 2.1	3 to 9	UNKN	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	3 to 9	UNKN	Sound	0.46	4	2.74	7.18	1.11	2.10	0.66	1.50	23.36
CRW 2.1	3 to 9	UNKN	Rotten	0.30	1	0.68	8.20	0.23	0.74	0.23	0.53	5.84
CRW 2.1	3 to 9	UNKN	Total	0.43	5	3.42	7.40	1.34	2.10	0.66	1.50	29.20
CRW 2.1	3 to 9	TSHE	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	3 to 9	TSHE	2	0.45	4	2.74	4.20	0.37	0.79	0.25	0.57	23.36
CRW 2.1	3 to 9	TSHE	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	3 to 9	TSHE	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	3 to 9	TSHE	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	3 to 9	TSHE	Sound	0.45	4	2.74	4.20	0.37	0.79	0.25	0.57	23.36
CRW 2.1	3 to 9	TSHE	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	3 to 9	TSHE	Total	0.45	4	2.74	4.20	0.37	0.79	0.25	0.57	23.36
CRW 2.1	3 to 9	Total	1	0.43	6	4.11	4.00	0.48	0.78	0.25	0.56	35.04
CRW 2.1	3 to 9	Total	2	0.43	132	90.41	4.18	11.54	8.92	2.82	6.38	770.84
CRW 2.1	3 to 9	Total	3	0.45	7	4.79	6.01	1.34	2.09	0.66	1.49	40.88
CRW 2.1	3 to 9	Total	4	0.30	1	0.68	8.20	0.23	0.74	0.23	0.53	5.84
CRW 2.1	3 to 9	Total	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	3 to 9	Total	Sound	0.43	145	99.32	4.28	13.36	8.73	2.76	6.25	846.76
CRW 2.1	3 to 9	Total	Rotten	0.30	1	0.68	8.20	0.23	0.74	0.23	0.53	5.84
CRW 2.1	3 to 9	Total	Total	0.43	146	100.00	4.32	13.60	8.59	2.72	6.15	852.60
CRW 2.1	9 to 20	PSME	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	9 to 20	PSME	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	9 to 20	PSME	3	0.48	3	16.67	10.03	1.69	2.75	0.87	1.97	17.52
CRW 2.1	9 to 20	PSME	4	0.30	1	5.56	15.90	0.88	2.79	0.88	2.00	5.84
CRW 2.1	9 to 20	PSME	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	9 to 20	PSME	Sound	0.48	3	16.67	10.03	1.69	2.75	0.87	1.97	17.52
CRW 2.1	9 to 20	PSME	Rotten	0.30	1	5.56	15.90	0.88	2.79	0.88	2.00	5.84
CRW 2.1	9 to 20	PSME	Total	0.44	4	22.22	11.77	2.57	3.47	1.10	2.49	23.36

Spp = species: ABAM = *Abies amabilis*, UNKN = unknown species, TSHE =*Tsuga heterophylla*, PSME = *Pseudotsuga menziesii*; THPL = *Thuja plicata*, DC = decay class; SG = specific gravity; No. logs = number of logs measured; Perc_tot = percent total; QMD_ in = quadratic mean diameter; Mean_TPA = mean trees per acre; SD_TPA = standard deviation tree per acre; 95CI_TPA = Ninety-five percent confidence interval; No_per_ acre = number per acre.

Appendix A. DRA large fuel woody loading fuel summary.

StandID	Size class	Code	Decay class	SG	No_Logs	Perc_tot	QMD_in	Mean_TPA	SD_TPA	SE_TPA	95CI_TPA	No_per_acre
CRW 2.1	9 to 20	ABAM	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	9 to 20	ABAM	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	9 to 20	ABAM	3	0.43	3	16.67	11.87	2.11	6.69	2.11	4.78	17.52
CRW 2.1	9 to 20	ABAM	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	9 to 20	ABAM	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	9 to 20	ABAM	Sound	0.43	3	16.67	11.87	2.11	6.69	2.11	4.78	17.52
CRW 2.1	9 to 20	ABAM	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	9 to 20	ABAM	Total	0.43	3	16.67	11.87	2.11	6.69	2.11	4.78	17.52
CRW 2.1	9 to 20	UNKN	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	9 to 20	UNKN	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	9 to 20	UNKN	3	0.47	3	16.67	13.34	2.91	4.71	1.49	3.37	17.52
CRW 2.1	9 to 20	UNKN	4	0.30	6	33.33	12.65	3.35	4.82	1.52	3.44	35.04
CRW 2.1	9 to 20	UNKN	5	0.30	2	11.11	14.20	1.41	4.45	1.41	3.19	11.68
CRW 2.1	9 to 20	UNKN	Sound	0.47	3	16.67	13.34	2.91	4.71	1.49	3.37	17.52
CRW 2.1	9 to 20	UNKN	Rotten	0.30	8	44.44	13.06	4.76	8.44	2.67	6.04	46.72
CRW 2.1	9 to 20	UNKN	Total	0.35	11	61.11	13.13	7.67	8.80	2.78	6.29	64.24
CRW 2.1	9 to 20	Total	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	9 to 20	Total	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	9 to 20	Total	3	0.46	9	50.00	11.82	6.71	8.23	2.60	5.89	52.56
CRW 2.1	9 to 20	Total	4	0.30	7	38.89	13.16	4.24	6.98	2.21	4.99	40.88
CRW 2.1	9 to 20	Total	5	0.30	2	11.11	14.20	1.41	4.45	1.41	3.19	11.68
CRW 2.1	9 to 20	Total	Sound	0.46	9	50.00	11.82	6.71	8.23	2.60	5.89	52.56
CRW 2.1	9 to 20	Total	Rotten	0.30	9	50.00	13.40	5.64	11.03	3.49	7.89	52.56
CRW 2.1	9 to 20	Total	Total	0.38	18	100.00	12.64	12.36	11.16	3.53	7.98	105.11
CRW 2.1	20 to 99	Total	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	20 to 99	Total	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	20 to 99	Total	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	20 to 99	Total	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	20 to 99	Total	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	20 to 99	Total	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	20 to 99	Total	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 2.1	20 to 99	Total	Total	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Spp = species: ABAM = *Abies amabilis*, UNKN = unknown species, TSHE =*Tsuga heterophylla*, PSME = *Pseudotsuga menziesii*; THPL = *Thuja plicata*, DC = decay class; SG = specific gravity; No. logs = number of logs measured; Perc_tot = percent total; QMD_ in = quadratic mean diameter; Mean_TPA = mean trees per acre; SD_TPA = standard deviation tree per acre; 95CI_TPA = Ninety-five percent confidence interval; No_per_ acre = number per acre.
Appendix A. DRA large fuel woody loading fuel summary.

StandID	Size class	Code	Decay class	SG	No_Logs	Perc_tot	QMD_in	Mean_TPA	SD_TPA	SE_TPA	95CI_TPA	No_per_acre
CRW 5.1	3 to 9	PSME	1	0.48	3	0.97	5.11	0.29	0.61	0.16	0.34	11.68
CRW 5.1	3 to 9	PSME	2	0.48	22	7.14	4.96	2.01	1.38	0.36	0.76	85.65
CRW 5.1	3 to 9	PSME	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	3 to 9	PSME	4	0.30	2	0.65	5.12	0.12	0.47	0.12	0.26	7.79
CRW 5.1	3 to 9	PSME	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	3 to 9	PSME	Sound	0.48	25	8.12	4.98	2.31	1.54	0.40	0.85	97.33
CRW 5.1	3 to 9	PSME	Rotten	0.30	2	0.65	5.12	0.12	0.47	0.12	0.26	7.79
CRW 5.1	3 to 9	PSME	Total	0.47	27	8.77	4.99	2.43	1.67	0.43	0.92	105.11
CRW 5.1	3 to 9	ABAM	1	0.43	12	3.90	4.42	0.78	1.20	0.31	0.67	46.72
CRW 5.1	3 to 9	ABAM	2	0.43	244	79.22	4.43	15.96	6.65	1.72	3.68	949.93
CRW 5.1	3 to 9	ABAM	3	0.43	11	3.57	5.28	1.02	1.98	0.51	1.10	42.82
CRW 5.1	3 to 9	ABAM	4	0.30	1	0.32	8.50	0.17	0.65	0.17	0.36	3.89
CRW 5.1	3 to 9	ABAM	5	0.30	1	0.32	9.00	0.19	0.73	0.19	0.40	3.89
CRW 5.1	3 to 9	ABAM	Sound	0.43	267	86.69	4.47	17.77	7.64	1.97	4.23	1,039.47
CRW 5.1	3 to 9	ABAM	Rotten	0.30	2	0.65	8.75	0.36	0.94	0.24	0.52	7.79
CRW 5.1	3 to 9	ABAM	Total	0.43	269	87.34	4.51	18.12	7.57	1.96	4.19	1,047.25
CRW 5.1	3 to 9	UNKN	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	3 to 9	UNKN	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	3 to 9	UNKN	3	0.46	2	0.65	7.33	0.38	1.05	0.27	0.58	7.79
CRW 5.1	3 to 9	UNKN	4	0.30	3	0.97	6.74	0.32	0.75	0.19	0.42	11.68
CRW 5.1	3 to 9	UNKN	5	0.30	2	0.65	7.75	0.28	0.74	0.19	0.41	7.79
CRW 5.1	3 to 9	UNKN	Sound	0.46	2	0.65	7.33	0.38	1.05	0.27	0.58	7.79
CRW 5.1	3 to 9	UNKN	Rotten	0.30	5	1.62	7.17	0.60	1.04	0.27	0.58	19.47
CRW 5.1	3 to 9	UNKN	Total	0.34	7	2.27	7.21	0.98	1.64	0.42	0.91	27.25
CRW 5.1	3 to 9	TSHE	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	3 to 9	TSHE	2	0.45	3	0.97	4.84	0.25	0.95	0.25	0.53	11.68
CRW 5.1	3 to 9	TSHE	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	3 to 9	TSHE	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	3 to 9	TSHE	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	3 to 9	TSHE	Sound	0.45	3	0.97	4.84	0.25	0.95	0.25	0.53	11.68
CRW 5.1	3 to 9	TSHE	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	3 to 9	TSHE	Total	0.45	3	0.97	4.84	0.25	0.95	0.25	0.53	11.68
CRW 5.1	3 to 9	THPL	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	3 to 9	THPL	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	3 to 9	THPL	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	3 to 9	THPL	4	0.30	2	0.65	8.60	0.34	1.33	0.34	0.74	7.79
CRW 5.1	3 to 9	THPL	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	3 to 9	THPL	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	3 to 9	THPL	Rotten	0.30	2	0.65	8.60	0.34	1.33	0.34	0.74	7.79
CRW 5.1	3 to 9	THPL	Total	0.30	2	0.65	8.60	0.34	1.33	0.34	0.74	7.79

Spp = species: ABAM = *Abies amabilis*, UNKN = unknown species, TSHE =*Tsuga heterophylla*, PSME = *Pseudotsuga menziesii*; THPL = *Thuja plicata*, DC = decay class; SG = specific gravity; No. logs = number of logs measured; Perc_tot = percent total; QMD_ in = quadratic mean diameter; Mean_TPA = mean trees per acre; SD_TPA = standard deviation tree per acre; 95CI_TPA = Ninety-five percent confidence interval; No_per_ acre = number per acre.

Appendix A. DRA large fuel woody loading fuel summary.

StandID	Size class	Code	Decay class	SG	No_Logs	Perc_tot	QMD_in	Mean_TPA	SD_TPA	SE_TPA	95CI_TPA	No_per_acre
CRW 5.1	3 to 9	Total	1	0.44	15	4.87	4.56	1.07	1.63	0.42	0.90	58.40
CRW 5.1	3 to 9	Total	2	0.43	269	87.34	4.48	18.22	6.94	1.79	3.84	1,047.25
CRW 5.1	3 to 9	Total	3	0.43	13	4.22	5.64	1.41	2.05	0.53	1.13	50.61
CRW 5.1	3 to 9	Total	4	0.30	8	2.60	7.15	0.95	1.52	0.39	0.84	31.15
CRW 5.1	3 to 9	Total	5	0.30	3	0.97	8.19	0.47	0.98	0.25	0.55	11.68
CRW 5.1	3 to 9	Total	Sound	0.43	297	96.43	4.54	20.70	8.00	2.07	4.43	1,156.26
CRW 5.1	3 to 9	Total	Rotten	0.30	11	3.57	7.45	1.42	2.14	0.55	1.18	42.82
CRW 5.1	3 to 9	Total	Total	0.43	308	100.00	4.68	22.13	8.46	2.18	4.69	1,199.09
CRW 5.1	9 to 20	PSME	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	9 to 20	PSME	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	9 to 20	PSME	3	0.48	2	7.69	14.00	1.46	5.66	1.46	3.13	7.79
CRW 5.1	9 to 20	PSME	4	0.30	6	23.08	14.64	2.99	5.63	1.45	3.12	23.36
CRW 5.1	9 to 20	PSME	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	9 to 20	PSME	Sound	0.48	2	7.69	14.00	1.46	5.66	1.46	3.13	7.79
CRW 5.1	9 to 20	PSME	Rotten	0.30	6	23.08	14.64	2.99	5.63	1.45	3.12	23.36
CRW 5.1	9 to 20	PSME	Total	0.35	8	30.77	14.48	4.45	7.37	1.90	4.08	31.15
CRW 5.1	9 to 20	ABAM	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	9 to 20	ABAM	2	0.43	1	3.85	9.40	0.29	1.14	0.29	0.63	3.89
CRW 5.1	9 to 20	ABAM	3	0.43	1	3.85	13.40	0.60	2.32	0.60	1.29	3.89
CRW 5.1	9 to 20	ABAM	4	0.30	1	3.85	10.60	0.26	1.01	0.26	0.56	3.89
CRW 5.1	9 to 20	ABAM	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	9 to 20	ABAM	Sound	0.43	2	7.69	11.57	0.89	2.51	0.65	1.39	7.79
CRW 5.1	9 to 20	ABAM	Rotten	0.30	1	3.85	10.60	0.26	1.01	0.26	0.56	3.89
CRW 5.1	9 to 20	ABAM	Total	0.39	3	11.54	11.26	1.16	2.61	0.68	1.45	11.68
CRW 5.1	9 to 20	UNKN	1	0.44	1	3.85	10.90	0.41	1.57	0.41	0.87	3.89
CRW 5.1	9 to 20	UNKN	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	9 to 20	UNKN	3	0.38	2	7.69	15.56	1.31	3.71	0.96	2.06	7.79
CRW 5.1	9 to 20	UNKN	4	0.30	7	26.92	15.99	4.17	6.12	1.58	3.39	27.25
CRW 5.1	9 to 20	UNKN	5	0.30	4	15.38	13.14	1.61	4.21	1.09	2.33	15.57
CRW 5.1	9 to 20	UNKN	Sound	0.40	3	11.54	14.18	1.71	3.89	1.00	2.15	11.68
CRW 5.1	9 to 20	UNKN	Rotten	0.30	11	42.31	15.02	5.78	7.95	2.05	4.40	42.82
CRW 5.1	9 to 20	UNKN	Total	0.32	14	53.85	14.84	7.49	9.76	2.52	5.40	54.50
CRW 5.1	9 to 20	THPL	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	9 to 20	THPL	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	9 to 20	THPL	3	0.32	1	3.85	18.00	0.80	3.12	0.80	1.73	3.89
CRW 5.1	9 to 20	THPL	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	9 to 20	THPL	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	9 to 20	THPL	Sound	0.32	1	3.85	18.00	0.80	3.12	0.80	1.73	3.89
CRW 5.1	9 to 20	THPL	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	9 to 20	THPL	Total	0.32	1	3.85	18.00	0.80	3.12	0.80	1.73	3.89

Spp = species: ABAM = *Abies amabilis*, UNKN = unknown species, TSHE =*Tsuga heterophylla*, PSME = *Pseudotsuga menziesii*; THPL = *Thuja plicata*, DC = decay class; SG = specific gravity; No. logs = number of logs measured; Perc_tot = percent total; QMD_ in = quadratic mean diameter; Mean_TPA = mean trees per acre; SD_TPA = standard deviation tree per acre; 95CI_TPA = Ninety-five percent confidence interval; No_per_ acre = number per acre.

Appendix A. DRA large fuel woody loading fuel summary.

StandID	Size class	Code	Decay class	SG	No_Logs	Perc_tot	QMD_in	Mean_TPA	SD_TPA	SE_TPA	95CI_TPA	No_per_acre
CRW 5.1	20 to 99	PSME	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	20 to 99	PSME	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	20 to 99	PSME	3	0.48	1	100.00	27.00	2.72	10.52	2.72	5.82	3.89
CRW 5.1	20 to 99	PSME	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	20 to 99	PSME	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	20 to 99	PSME	Sound	0.48	1	100.00	27.00	2.72	10.52	2.72	5.82	3.89
CRW 5.1	20 to 99	PSME	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	20 to 99	PSME	Total	0.48	1	100.00	27.00	2.72	10.52	2.72	5.82	3.89
CRW 5.1	9 to 20	Total	1	0.44	1	3.85	10.90	0.41	1.57	0.41	0.87	3.89
CRW 5.1	9 to 20	Total	2	0.43	1	3.85	9.40	0.29	1.14	0.29	0.63	3.89
CRW 5.1	9 to 20	Total	3	0.41	6	23.08	15.16	4.17	8.40	2.17	4.65	23.36
CRW 5.1	9 to 20	Total	4	0.30	14	53.85	15.09	7.42	6.87	1.77	3.80	54.50
CRW 5.1	9 to 20	Total	5	0.30	4	15.38	13.14	1.61	4.21	1.09	2.33	15.57
CRW 5.1	9 to 20	Total	Sound	0.42	8	30.77	14.08	4.87	8.47	2.19	4.69	31.15
CRW 5.1	9 to 20	Total	Rotten	0.30	18	69.23	14.68	9.03	8.25	2.13	4.57	70.08
CRW 5.1	9 to 20	Total	Total	0.34	26	100.00	14.50	13.90	14.29	3.69	7.91	101.22
CRW 5.1	20 to 99	Total	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	20 to 99	Total	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	20 to 99	Total	3	0.48	1	100.00	27.00	2.72	10.52	2.72	5.82	3.89
CRW 5.1	20 to 99	Total	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	20 to 99	Total	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	20 to 99	Total	Sound	0.48	1	100.00	27.00	2.72	10.52	2.72	5.82	3.89
CRW 5.1	20 to 99	Total	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 5.1	20 to 99	Total	Total	0.48	1	100.00	27.00	2.72	10.52	2.72	5.82	3.89

Spp = species: ABAM = *Abies amabilis*, UNKN = unknown species, TSHE =*Tsuga heterophylla*, PSME = *Pseudotsuga menziesii*; THPL = *Thuja plicata*, DC = decay class; SG = specific gravity; No. logs = number of logs measured; Perc_tot = percent total; QMD_ in = quadratic mean diameter; Mean_TPA = mean trees per acre; SD_TPA = standard deviation tree per acre; 95CI_TPA = Ninety-five percent confidence interval; No_per_ acre = number per acre.

Appendix A. DRA large fuel woody loading fuel summary.

StandID	Size class	Species	Code	Decay class	SG	No_Logs	Perc_tot	QMD_in	Mean_TPA	SD_TPA	SE_TPA	95CI_TPA	No_per_acre
CRW D1	3 to 9	Total	Total	Sound	0.43	66	95.65	4.10	11.25	5.01	2.24	6.21	770.84
CRW D1	3 to 9	Total	Total	Rotten	0.30	3	4.35	5.88	0.72	1.62	0.72	2.01	35.04
CRW D1	3 to 9	Total	Total	Total	0.43	69	100.00	4.20	11.97	4.62	2.07	5.74	805.88
CRW D1	9 to 20	Total	Total	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW D1	9 to 20	Total	Total	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW D1	9 to 20	Total	Total	Total	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW D1	20 to 99	Total	Total	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW D1	20 to 99	Total	Total	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW D1	20 to 99	Total	Total	Total	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Spp = species: ABAM = *Abies amabilis*, UNKN = unknown species, TSHE =*Tsuga heterophylla*, PSME = *Pseudotsuga menziesii*; THPL = *Thuja plicata*, DC = decay class; SG = specific gravity; No. logs = number of logs measured; Perc_tot = percent total; QMD_ in = quadratic mean diameter; Mean_TPA = mean trees per acre; SD_TPA = standard deviation tree per acre; 95CI_TPA = Ninety-five percent confidence interval; No_per_ acre = number per acre.

Appendix A. DRA large fuel woody loading fuel summary.

StandID	Size class	Code	Decay class	SG	No_Logs	Perc_tot	QMD_in	Mean_TPA	SD_TPA	SE_TPA	95CI_TPA	No_per_acre
CRW 25B	3 to 9	PSME	1	0.48	13	2.70	3.86	1.08	3.17	1.00	2.27	75.92
CRW 25B	3 to 9	PSME	2	0.48	4	0.83	4.81	0.52	0.96	0.30	0.69	23.36
CRW 25B	3 to 9	PSME	3	0.48	1	0.21	3.20	0.06	0.18	0.06	0.13	5.84
CRW 25B	3 to 9	PSME	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	3 to 9	PSME	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	3 to 9	PSME	Sound	0.48	18	3.74	4.06	1.66	3.54	1.12	2.53	105.11
CRW 25B	3 to 9	PSME	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	3 to 9	PSME	Total	0.48	18	3.74	4.06	1.66	3.54	1.12	2.53	105.11
CRW 25B	3 to 9	ABAM	1	0.43	167	34.72	5.11	21.86	19.73	6.24	14.11	975.23
CRW 25B	3 to 9	ABAM	2	0.43	274	56.96	5.13	36.06	27.91	8.82	19.96	1,600.08
CRW 25B	3 to 9	ABAM	3	0.43	8	1.66	4.29	0.74	1.06	0.34	0.76	46.72
CRW 25B	3 to 9	ABAM	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	3 to 9	ABAM	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	3 to 9	ABAM	Sound	0.43	449	93.35	5.11	58.65	20.19	6.38	14.44	2,622.03
CRW 25B	3 to 9	ABAM	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	3 to 9	ABAM	Total	0.43	449	93.35	5.11	58.65	20.19	6.38	14.44	2,622.03
CRW 25B	3 to 9	UNKN	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	3 to 9	UNKN	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	3 to 9	UNKN	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	3 to 9	UNKN	4	0.30	1	0.21	7.00	0.17	0.54	0.17	0.39	5.84
CRW 25B	3 to 9	UNKN	5	0.30	1	0.21	8.10	0.23	0.72	0.23	0.52	5.84
CRW 25B	3 to 9	UNKN	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	3 to 9	UNKN	Rotten	0.30	2	0.42	7.57	0.40	0.85	0.27	0.61	11.68
CRW 25B	3 to 9	UNKN	Total	0.30	2	0.42	7.57	0.40	0.85	0.27	0.61	11.68
CRW 25B	3 to 9	TSHE	1	0.45	4	0.83	6.73	0.95	2.23	0.71	1.60	23.36
CRW 25B	3 to 9	TSHE	2	0.45	8	1.66	5.92	1.47	2.02	0.64	1.44	46.72
CRW 25B	3 to 9	TSHE	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	3 to 9	TSHE	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	3 to 9	TSHE	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	3 to 9	TSHE	Sound	0.45	12	2.49	6.20	2.42	2.44	0.77	1.75	70.08
CRW 25B	3 to 9	TSHE	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	3 to 9	TSHE	Total	0.45	12	2.49	6.20	2.42	2.44	0.77	1.75	70.08
CRW 25B	3 to 9	Total	1	0.43	184	38.25	5.08	23.89	20.66	6.53	14.78	1,074.51
CRW 25B	3 to 9	Total	2	0.43	286	59.46	5.15	38.04	27.30	8.63	19.53	1,670.16
CRW 25B	3 to 9	Total	3	0.44	9	1.87	4.18	0.79	1.03	0.33	0.74	52.56
CRW 25B	3 to 9	Total	4	0.30	1	0.21	7.00	0.17	0.54	0.17	0.39	5.84
CRW 25B	3 to 9	Total	5	0.30	1	0.21	8.10	0.23	0.72	0.23	0.52	5.84
CRW 25B	3 to 9	Total	Sound	0.43	479	99.58	5.10	62.72	19.07	6.03	13.64	2,797.22
CRW 25B	3 to 9	Total	Rotten	0.30	2	0.42	7.57	0.40	0.85	0.27	0.61	11.68
CRW 25B	3 to 9	Total	Total	0.43	481	100.00	5.12	63.12	18.94	5.99	13.55	2,808.90

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Appendix A. DRA large fuel woody loading fuel summary.

StandID	Size class	Code	Decay class	SG	No_Logs	Perc_tot	QMD_in	Mean_TPA	SD_TPA	SE_TPA	95CI_TPA	No_per_acre
CRW 25B	9 to 20	PSME	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	9 to 20	PSME	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	9 to 20	PSME	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	9 to 20	PSME	4	0.30	1	25.00	11.40	0.45	1.44	0.45	1.03	5.84
CRW 25B	9 to 20	PSME	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	9 to 20	PSME	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	9 to 20	PSME	Rotten	0.30	1	25.00	11.40	0.45	1.44	0.45	1.03	5.84
CRW 25B	9 to 20	PSME	Total	0.30	1	25.00	11.40	0.45	1.44	0.45	1.03	5.84
CRW 25B	9 to 20	UNKN	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	9 to 20	UNKN	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	9 to 20	UNKN	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	9 to 20	UNKN	4	0.30	2	50.00	17.40	2.11	6.69	2.11	4.78	11.68
CRW 25B	9 to 20	UNKN	5	0.30	1	25.00	9.70	0.33	1.04	0.33	0.74	5.84
CRW 25B	9 to 20	UNKN	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	9 to 20	UNKN	Rotten	0.30	3	75.00	15.27	2.44	6.65	2.10	4.76	17.52
CRW 25B	9 to 20	UNKN	Total	0.30	3	75.00	15.27	2.44	6.65	2.10	4.76	17.52
CRW 25B	9 to 20	Total	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	9 to 20	Total	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	9 to 20	Total	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	9 to 20	Total	4	0.30	3	75.00	15.66	2.57	6.68	2.11	4.78	17.52
CRW 25B	9 to 20	Total	5	0.30	1	25.00	9.70	0.33	1.04	0.33	0.74	5.84
CRW 25B	9 to 20	Total	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	9 to 20	Total	Rotten	0.30	4	100.00	14.40	2.90	6.62	2.09	4.74	23.36
CRW 25B	9 to 20	Total	Total	0.30	4	100.00	14.40	2.90	6.62	2.09	4.74	23.36
CRW 25B	20 to 99	Total	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	20 to 99	Total	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	20 to 99	Total	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	20 to 99	Total	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	20 to 99	Total	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	20 to 99	Total	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	20 to 99	Total	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 25B	20 to 99	Total	Total	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Spp = species: ABAM = *Abies amabilis*, UNKN = unknown species, TSHE =*Tsuga heterophylla*, PSME = *Pseudotsuga menziesii*; THPL = *Thuja plicata*, DC = decay class; SG = specific gravity; No. logs = number of logs measured; Perc_tot = percent total; QMD_ in = quadratic mean diameter; Mean_TPA = mean trees per acre; SD_TPA = standard deviation tree per acre; 95CI_TPA = Ninety-five percent confidence interval; No_per_ acre = number per acre.

Appendix A. DRA large fuel woody loading fuel summary.

StandID	Size class	Code	Decay class	SG	No_Logs	Perc_tot	QMD_in	Mean_TPA	SD_TPA	SE_TPA	95CI_TPA	No_per_acre
CRW 4.1	3 to 9	PSME	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	3 to 9	PSME	2	0.48	1	0.44	5.00	0.14	0.44	0.14	0.32	5.84
CRW 4.1	3 to 9	PSME	3	0.48	1	0.44	3.40	0.06	0.20	0.06	0.15	5.84
CRW 4.1	3 to 9	PSME	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	3 to 9	PSME	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	3 to 9	PSME	Sound	0.48	2	0.89	4.28	0.20	0.65	0.20	0.46	11.68
CRW 4.1	3 to 9	PSME	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	3 to 9	PSME	Total	0.48	2	0.89	4.28	0.20	0.65	0.20	0.46	11.68
CRW 4.1	3 to 9	ABAM	1	0.43	8	3.56	4.18	0.70	1.03	0.33	0.74	46.72
CRW 4.1	3 to 9	ABAM	2	0.43	199	88.44	4.07	16.52	12.22	3.86	8.74	1,162.10
CRW 4.1	3 to 9	ABAM	3	0.43	7	3.11	5.21	0.95	1.14	0.36	0.81	40.88
CRW 4.1	3 to 9	ABAM	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	3 to 9	ABAM	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	3 to 9	ABAM	Sound	0.43	214	95.11	4.12	18.17	12.51	3.96	8.95	1,249.70
CRW 4.1	3 to 9	ABAM	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	3 to 9	ABAM	Total	0.43	214	95.11	4.12	18.17	12.51	3.96	8.95	1,249.70
CRW 4.1	3 to 9	UNKN	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	3 to 9	UNKN	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	3 to 9	UNKN	3	0.44	1	0.44	5.00	0.13	0.40	0.13	0.29	5.84
CRW 4.1	3 to 9	UNKN	4	0.30	4	1.78	6.01	0.50	0.92	0.29	0.66	23.36
CRW 4.1	3 to 9	UNKN	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	3 to 9	UNKN	Sound	0.44	1	0.44	5.00	0.13	0.40	0.13	0.29	5.84
CRW 4.1	3 to 9	UNKN	Rotten	0.30	4	1.78	6.01	0.50	0.92	0.29	0.66	23.36
CRW 4.1	3 to 9	UNKN	Total	0.33	5	2.22	5.82	0.63	1.03	0.33	0.74	29.20
CRW 4.1	3 to 9	TSHE	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	3 to 9	TSHE	2	0.45	2	0.89	4.03	0.17	0.54	0.17	0.39	11.68
CRW 4.1	3 to 9	TSHE	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	3 to 9	TSHE	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	3 to 9	TSHE	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	3 to 9	TSHE	Sound	0.45	2	0.89	4.03	0.17	0.54	0.17	0.39	11.68
CRW 4.1	3 to 9	TSHE	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	3 to 9	TSHE	Total	0.45	2	0.89	4.03	0.17	0.54	0.17	0.39	11.68
CRW 4.1	3 to 9	THPL	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	3 to 9	THPL	2	0.32	1	0.44	3.40	0.04	0.14	0.04	0.10	5.84
CRW 4.1	3 to 9	THPL	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	3 to 9	THPL	4	0.30	1	0.44	6.40	0.14	0.45	0.14	0.32	5.84
CRW 4.1	3 to 9	THPL	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	3 to 9	THPL	Sound	0.32	1	0.44	3.40	0.04	0.14	0.04	0.10	5.84
CRW 4.1	3 to 9	THPL	Rotten	0.30	1	0.44	6.40	0.14	0.45	0.14	0.32	5.84
CRW 4.1	3 to 9	THPL	Total	0.31	2	0.89	5.12	0.19	0.46	0.14	0.33	11.68

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Appendix A. DRA large fuel woody loading fuel summary.

StandID	Size class	Code	Decay class	SG	No_Logs	Perc_tot	QMD_in	Mean_TPA	SD_TPA	SE_TPA	95CI_TPA	No_per_acre
CRW 4.1	3 to 9	Total	1	0.43	8	3.56	4.18	0.70	1.03	0.33	0.74	46.72
CRW 4.1	3 to 9	Total	2	0.43	203	90.22	4.07	16.87	12.33	3.90	8.82	1,185.46
CRW 4.1	3 to 9	Total	3	0.44	9	4.00	5.02	1.14	1.04	0.33	0.74	52.56
CRW 4.1	3 to 9	Total	4	0.30	5	2.22	6.09	0.65	0.94	0.30	0.68	29.20
CRW 4.1	3 to 9	Total	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	3 to 9	Total	Sound	0.43	220	97.78	4.12	18.72	12.42	3.93	8.89	1,284.74
CRW 4.1	3 to 9	Total	Rotten	0.30	5	2.22	6.09	0.65	0.94	0.30	0.68	29.20
CRW 4.1	3 to 9	Total	Total	0.43	225	100.00	4.17	19.36	12.20	3.86	8.73	1,313.93
CRW 4.1	9 to 20	UNKN	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	9 to 20	UNKN	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	9 to 20	UNKN	3	0.48	1	20.00	13.90	1.08	3.41	1.08	2.44	5.84
CRW 4.1	9 to 20	UNKN	4	0.30	2	40.00	12.15	1.03	2.17	0.69	1.55	11.68
CRW 4.1	9 to 20	UNKN	5	0.30	2	40.00	10.09	0.71	1.53	0.48	1.10	11.68
CRW 4.1	9 to 20	UNKN	Sound	0.48	1	20.00	13.90	1.08	3.41	1.08	2.44	5.84
CRW 4.1	9 to 20	UNKN	Rotten	0.30	4	80.00	11.17	1.74	3.20	1.01	2.29	23.36
CRW 4.1	9 to 20	UNKN	Total	0.34	5	100.00	11.77	2.82	4.21	1.33	3.01	29.20
CRW 4.1	9 to 20	Total	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	9 to 20	Total	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	9 to 20	Total	3	0.48	1	20.00	13.90	1.08	3.41	1.08	2.44	5.84
CRW 4.1	9 to 20	Total	4	0.30	2	40.00	12.15	1.03	2.17	0.69	1.55	11.68
CRW 4.1	9 to 20	Total	5	0.30	2	40.00	10.09	0.71	1.53	0.48	1.10	11.68
CRW 4.1	9 to 20	Total	Sound	0.48	1	20.00	13.90	1.08	3.41	1.08	2.44	5.84
CRW 4.1	9 to 20	Total	Rotten	0.30	4	80.00	11.17	1.74	3.20	1.01	2.29	23.36
CRW 4.1	9 to 20	Total	Total	0.34	5	100.00	11.77	2.82	4.21	1.33	3.01	29.20
CRW 4.1	20 to 99	Total	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	20 to 99	Total	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	20 to 99	Total	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	20 to 99	Total	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	20 to 99	Total	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	20 to 99	Total	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	20 to 99	Total	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.1	20 to 99	Total	Total	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Spp = species: ABAM = *Abies amabilis*, UNKN = unknown species, TSHE =*Tsuga heterophylla*, PSME = *Pseudotsuga menziesii*; THPL = *Thuja plicata*, DC = decay class; SG = specific gravity; No. logs = number of logs measured; Perc_tot = percent total; QMD_ in = quadratic mean diameter; Mean_TPA = mean trees per acre; SD_TPA = standard deviation tree per acre; 95CI_TPA = Ninety-five percent confidence interval; No_per_ acre = number per acre.

Appendix A. DRA large fuel woody loading fuel summary.

StandID	Size class	Code	Decay class	SG	No_Logs	Perc_tot	QMD_in	Mean_TPA	SD_TPA	SE_TPA	95CI_TPA	No_per_acre
CRW 3.4 A	3 to 9	PSME	1	0.48	1	0.35	3.20	0.06	0.18	0.06	0.13	5.84
CRW 3.4 A	3 to 9	PSME	2	0.48	4	1.39	4.47	0.45	0.81	0.26	0.58	23.36
CRW 3.4 A	3 to 9	PSME	3	0.48	1	0.35	5.20	0.15	0.48	0.15	0.34	5.84
CRW 3.4 A	3 to 9	PSME	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	3 to 9	PSME	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	3 to 9	PSME	Sound	0.48	6	2.09	4.42	0.65	0.83	0.26	0.59	35.04
CRW 3.4 A	3 to 9	PSME	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	3 to 9	PSME	Total	0.48	6	2.09	4.42	0.65	0.83	0.26	0.59	35.04
CRW 3.4 A	3 to 9	ABAM	1	0.43	46	16.03	4.04	3.76	7.83	2.48	5.60	268.63
CRW 3.4 A	3 to 9	ABAM	2	0.43	196	68.29	4.28	17.94	9.31	2.94	6.66	1,144.58
CRW 3.4 A	3 to 9	ABAM	3	0.43	18	6.27	4.73	2.02	2.58	0.81	1.84	105.11
CRW 3.4 A	3 to 9	ABAM	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	3 to 9	ABAM	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	3 to 9	ABAM	Sound	0.43	260	90.59	4.27	23.71	6.95	2.20	4.97	1,518.32
CRW 3.4 A	3 to 9	ABAM	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	3 to 9	ABAM	Total	0.43	260	90.59	4.27	23.71	6.95	2.20	4.97	1,518.32
CRW 3.4 A	3 to 9	UNKN	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	3 to 9	UNKN	2	0.43	2	0.70	6.35	0.40	0.85	0.27	0.61	11.68
CRW 3.4 A	3 to 9	UNKN	3	0.43	1	0.35	7.10	0.25	0.80	0.25	0.57	5.84
CRW 3.4 A	3 to 9	UNKN	4	0.30	5	1.74	7.22	0.91	1.93	0.61	1.38	29.20
CRW 3.4 A	3 to 9	UNKN	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	3 to 9	UNKN	Sound	0.43	3	1.05	6.61	0.66	1.07	0.34	0.76	17.52
CRW 3.4 A	3 to 9	UNKN	Rotten	0.30	5	1.74	7.22	0.91	1.93	0.61	1.38	29.20
CRW 3.4 A	3 to 9	UNKN	Total	0.35	8	2.79	7.00	1.57	2.30	0.73	1.65	46.72
CRW 3.4 A	3 to 9	TSHE	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	3 to 9	TSHE	2	0.45	13	4.53	4.35	1.29	1.97	0.62	1.41	75.92
CRW 3.4 A	3 to 9	TSHE	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	3 to 9	TSHE	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	3 to 9	TSHE	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	3 to 9	TSHE	Sound	0.45	13	4.53	4.35	1.29	1.97	0.62	1.41	75.92
CRW 3.4 A	3 to 9	TSHE	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	3 to 9	TSHE	Total	0.45	13	4.53	4.35	1.29	1.97	0.62	1.41	75.92
CRW 3.4 A	3 to 9	Total	1	0.43	47	16.38	4.03	3.82	7.81	2.47	5.58	274.47
CRW 3.4 A	3 to 9	Total	2	0.43	215	74.91	4.31	20.08	9.33	2.95	6.67	1,255.54
CRW 3.4 A	3 to 9	Total	3	0.43	20	6.97	4.90	2.42	3.00	0.95	2.14	116.79
CRW 3.4 A	3 to 9	Total	4	0.30	5	1.74	7.22	0.91	1.93	0.61	1.38	29.20
CRW 3.4 A	3 to 9	Total	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	3 to 9	Total	Sound	0.43	282	98.26	4.31	26.32	6.74	2.13	4.82	1,646.80
CRW 3.4 A	3 to 9	Total	Rotten	0.30	5	1.74	7.22	0.91	1.93	0.61	1.38	29.20
CRW 3.4 A	3 to 9	Total	Total	0.43	287	100.00	4.38	27.23	6.32	2.00	4.52	1,676.00

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Appendix A. DRA large fuel woody loading fuel summary.

StandID	Size class	Code	Decay class	SG	No_Logs	Perc_tot	QMD_in	Mean_TPA	SD_TPA	SE_TPA	95CI_TPA	No_per_acre
CRW 3.4 A	9 to 20	UNKN	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	9 to 20	UNKN	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	9 to 20	UNKN	3	0.43	3	33.33	13.07	2.57	4.60	1.45	3.29	17.52
CRW 3.4 A	9 to 20	UNKN	4	0.30	6	66.67	11.68	2.86	6.65	2.10	4.76	35.04
CRW 3.4 A	9 to 20	UNKN	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	9 to 20	UNKN	Sound	0.43	3	33.33	13.07	2.57	4.60	1.45	3.29	17.52
CRW 3.4 A	9 to 20	UNKN	Rotten	0.30	6	66.67	11.68	2.86	6.65	2.10	4.76	35.04
CRW 3.4 A	9 to 20	UNKN	Total	0.34	9	100.00	12.16	5.43	7.25	2.29	5.18	52.56
CRW 3.4 A	9 to 20	Total	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	9 to 20	Total	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	9 to 20	Total	3	0.43	3	33.33	13.07	2.57	4.60	1.45	3.29	17.52
CRW 3.4 A	9 to 20	Total	4	0.30	6	66.67	11.68	2.86	6.65	2.10	4.76	35.04
CRW 3.4 A	9 to 20	Total	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	9 to 20	Total	Sound	0.43	3	33.33	13.07	2.57	4.60	1.45	3.29	17.52
CRW 3.4 A	9 to 20	Total	Rotten	0.30	6	66.67	11.68	2.86	6.65	2.10	4.76	35.04
CRW 3.4 A	9 to 20	Total	Total	0.34	9	100.00	12.16	5.43	7.25	2.29	5.18	52.56
CRW 3.4 A	20 to 99	Total	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	20 to 99	Total	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	20 to 99	Total	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	20 to 99	Total	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	20 to 99	Total	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	20 to 99	Total	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	20 to 99	Total	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 3.4 A	20 to 99	Total	Total	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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Appendix A. DRA large fuel woody loading fuel summary.

StandID	Size class	Code	Decay class	SG	No_Logs	Perc_tot	QMD_in	Mean_TPA	SD_TPA	SE_TPA	95CI_TPA	No_per_acre
CRW 26	3 to 9	PSME	1	0.48	3	1.96	3.89	0.30	0.62	0.20	0.44	20.61
CRW 26	3 to 9	PSME	2	0.48	8	5.23	5.10	1.37	1.97	0.62	1.41	54.96
CRW 26	3 to 9	PSME	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	3 to 9	PSME	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	3 to 9	PSME	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	3 to 9	PSME	Sound	0.48	11	7.19	4.80	1.66	2.55	0.81	1.82	75.57
CRW 26	3 to 9	PSME	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	3 to 9	PSME	Total	0.48	11	7.19	4.80	1.66	2.55	0.81	1.82	75.57
CRW 26	3 to 9	TSME	1	0.45	1	0.65	6.40	0.25	0.68	0.21	0.49	6.87
CRW 26	3 to 9	TSME	2	0.45	3	1.96	4.48	0.37	1.00	0.32	0.72	20.61
CRW 26	3 to 9	TSME	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	3 to 9	TSME	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	3 to 9	TSME	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	3 to 9	TSME	Sound	0.45	4	2.61	5.03	0.62	1.15	0.36	0.82	27.48
CRW 26	3 to 9	TSME	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	3 to 9	TSME	Total	0.45	4	2.61	5.03	0.62	1.15	0.36	0.82	27.48
CRW 26	3 to 9	ABAM	1	0.43	54	35.29	4.61	6.75	6.07	1.92	4.34	370.99
CRW 26	3 to 9	ABAM	2	0.43	69	45.10	4.62	8.66	7.96	2.52	5.69	474.05
CRW 26	3 to 9	ABAM	3	0.43	5	3.27	5.60	0.92	1.36	0.43	0.97	34.35
CRW 26	3 to 9	ABAM	4	0.30	1	0.65	3.30	0.04	0.12	0.04	0.09	6.87
CRW 26	3 to 9	ABAM	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	3 to 9	ABAM	Sound	0.43	128	83.66	4.66	16.33	13.90	4.39	9.94	879.39
CRW 26	3 to 9	ABAM	Rotten	0.30	1	0.65	3.30	0.04	0.12	0.04	0.09	6.87
CRW 26	3 to 9	ABAM	Total	0.43	129	84.31	4.65	16.38	13.98	4.42	10.00	886.26
CRW 26	3 to 9	UNKN	1	0.43	1	0.65	8.20	0.40	1.07	0.34	0.76	6.87
CRW 26	3 to 9	UNKN	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	3 to 9	UNKN	3	0.44	2	1.31	7.15	0.61	1.65	0.52	1.18	13.74
CRW 26	3 to 9	UNKN	4	0.30	5	3.27	7.68	1.21	1.79	0.57	1.28	34.35
CRW 26	3 to 9	UNKN	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	3 to 9	UNKN	Sound	0.44	3	1.96	7.52	1.01	1.87	0.59	1.34	20.61
CRW 26	3 to 9	UNKN	Rotten	0.30	5	3.27	7.68	1.21	1.79	0.57	1.28	34.35
CRW 26	3 to 9	UNKN	Total	0.35	8	5.23	7.62	2.22	2.67	0.85	1.91	54.96
CRW 26	3 to 9	TSHE	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	3 to 9	TSHE	2	0.45	1	0.65	4.20	0.11	0.29	0.09	0.21	6.87
CRW 26	3 to 9	TSHE	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	3 to 9	TSHE	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	3 to 9	TSHE	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	3 to 9	TSHE	Sound	0.45	1	0.65	4.20	0.11	0.29	0.09	0.21	6.87
CRW 26	3 to 9	TSHE	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	3 to 9	TSHE	Total	0.45	1	0.65	4.20	0.11	0.29	0.09	0.21	6.87

Spp = species: ABAM = *Abies amabilis*, UNKN = unknown species, TSHE =*Tsuga heterophylla*, PSME = *Pseudotsuga menziesii*; THPL = *Thuja plicata*, DC = decay class; SG = specific gravity; No. logs = number of logs measured; Perc_tot = percent total; QMD_ in = quadratic mean diameter; Mean_TPA = mean trees per acre; SD_TPA = standard deviation tree per acre; 95CI_TPA = Ninety-five percent confidence interval; No_per_ acre = number per acre.

Appendix A. DRA large fuel woody loading fuel summary.

StandID	Size class	Code	Decay class	SG	No_Logs	Perc_tot	QMD_in	Mean_TPA	SD_TPA	SE_TPA	95CI_TPA	No_per_acre
CRW 26	3 to 9	Total	1	0.43	59	38.56	4.69	7.70	7.65	2.42	5.48	405.34
CRW 26	3 to 9	Total	2	0.44	81	52.94	4.66	10.50	9.20	2.91	6.58	556.49
CRW 26	3 to 9	Total	3	0.43	7	4.58	6.09	1.54	1.92	0.61	1.37	48.09
CRW 26	3 to 9	Total	4	0.30	6	3.92	7.14	1.26	1.76	0.56	1.26	41.22
CRW 26	3 to 9	Total	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	3 to 9	Total	Sound	0.43	147	96.08	4.75	19.74	15.99	5.06	11.44	1,009.93
CRW 26	3 to 9	Total	Rotten	0.30	6	3.92	7.14	1.26	1.76	0.56	1.26	41.22
CRW 26	3 to 9	Total	Total	0.43	153	100.00	4.87	21.00	15.94	5.04	11.40	1,051.15
CRW 26	9 to 20	PSME	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	9 to 20	PSME	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	9 to 20	PSME	3	0.48	1	6.67	15.50	1.58	4.25	1.34	3.04	6.87
CRW 26	9 to 20	PSME	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	9 to 20	PSME	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	9 to 20	PSME	Sound	0.48	1	6.67	15.50	1.58	4.25	1.34	3.04	6.87
CRW 26	9 to 20	PSME	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	9 to 20	PSME	Total	0.48	1	6.67	15.50	1.58	4.25	1.34	3.04	6.87
CRW 26	9 to 20	UNKN	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	9 to 20	UNKN	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	9 to 20	UNKN	3	0.43	4	26.67	14.68	5.11	8.66	2.74	6.20	27.48
CRW 26	9 to 20	UNKN	4	0.30	7	46.67	13.17	4.99	5.35	1.69	3.83	48.09
CRW 26	9 to 20	UNKN	5	0.30	1	6.67	9.80	0.39	1.06	0.34	0.76	6.87
CRW 26	9 to 20	UNKN	Sound	0.43	4	26.67	14.68	5.11	8.66	2.74	6.20	27.48
CRW 26	9 to 20	UNKN	Rotten	0.30	8	53.33	12.79	5.38	5.57	1.76	3.98	54.96
CRW 26	9 to 20	UNKN	Total	0.34	12	80.00	13.45	10.49	10.17	3.21	7.27	82.44
CRW 26	9 to 20	TSHE	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	9 to 20	TSHE	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	9 to 20	TSHE	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	9 to 20	TSHE	4	0.30	1	6.67	15.10	0.94	5.08	1.61	3.64	6.87
CRW 26	9 to 20	TSHE	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	9 to 20	TSHE	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	9 to 20	TSHE	Rotten	0.30	1	6.67	15.10	0.94	5.08	1.61	3.64	6.87
CRW 26	9 to 20	TSHE	Total	0.30	1	6.67	15.10	0.94	5.08	1.61	3.64	6.87
CRW 26	9 to 20	THPL	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	9 to 20	THPL	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	9 to 20	THPL	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	9 to 20	THPL	4	0.30	1	6.67	11.80	0.57	1.54	0.49	1.10	6.87
CRW 26	9 to 20	THPL	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	9 to 20	THPL	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	9 to 20	THPL	Rotten	0.30	1	6.67	11.80	0.57	1.54	0.49	1.10	6.87
CRW 26	9 to 20	THPL	Total	0.30	1	6.67	11.80	0.57	1.54	0.49	1.10	6.87

Spp = species: ABAM = *Abies amabilis*, UNKN = unknown species, TSHE =*Tsuga heterophylla*, PSME = *Pseudotsuga menziesii*; THPL = *Thuja plicata*, DC = decay class; SG = specific gravity; No. logs = number of logs measured; Perc_tot = percent total; QMD_ in = quadratic mean diameter; Mean_TPA = mean trees per acre; SD_TPA = standard deviation tree per acre; 95CI_TPA = Ninety-five percent confidence interval; No_per_ acre = number per acre.

CRW 26	9 to 20	Total	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	9 to 20	Total	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	9 to 20	Total	3	0.44	5	33.33	14.85	6.69	8.98	2.84	6.42	34.35
CRW 26	9 to 20	Total	4	0.30	9	60.00	13.25	6.49	6.34	2.01	4.54	61.83
CRW 26	9 to 20	Total	5	0.30	1	6.67	9.80	0.39	1.06	0.34	0.76	6.87
CRW 26	9 to 20	Total	Sound	0.44	5	33.33	14.85	6.69	8.98	2.84	6.42	34.35
CRW 26	9 to 20	Total	Rotten	0.30	10	66.67	12.95	6.89	6.40	2.02	4.58	68.70
CRW 26	9 to 20	Total	Total	0.35	15	100.00	13.61	13.58	10.29	3.25	7.36	103.05
CRW 26	20 to 99	Total	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	20 to 99	Total	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	20 to 99	Total	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	20 to 99	Total	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	20 to 99	Total	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	20 to 99	Total	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	20 to 99	Total	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26	20 to 99	Total	Total	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Spp = species: ABAM = *Abies amabilis*, UNKN = unknown species, TSHE =*Tsuga heterophylla*, PSME = *Pseudotsuga menziesii*; THPL = *Thuja plicata*, DC = decay class; SG = specific gravity; No. logs = number of logs measured; Perc_tot = percent total; QMD_ in = quadratic mean diameter; Mean_TPA = mean trees per acre; SD_TPA = standard deviation tree per acre; 95CI_TPA = Ninety-five percent confidence interval; No_per_ acre = number per acre.

Appendix A. DRA large fuel woody loading fuel summary.

StandID	Size class	Code	Decay class	SG	No_Logs	Perc_tot	QMD_in	Mean_TPA	SD_TPA	SE_TPA	95CI_TPA	No_per_acre
CRW 4.0	3 to 9	ABAM	1	0.43	25	62.50	4.07	10.34	3.21	2.27	28.83	729.96
CRW 4.0	3 to 9	ABAM	2	0.43	15	37.50	4.15	6.46	3.36	2.37	30.17	437.98
CRW 4.0	3 to 9	ABAM	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.0	3 to 9	ABAM	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.0	3 to 9	ABAM	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.0	3 to 9	ABAM	Sound	0.43	40	100.00	4.10	16.80	0.15	0.11	1.34	1,167.94
CRW 4.0	3 to 9	ABAM	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.0	3 to 9	ABAM	Total	0.43	40	100.00	4.10	16.80	0.15	0.11	1.34	1,167.94
CRW 4.0	3 to 9	Total	1	0.43	25	62.50	4.07	10.34	3.21	2.27	28.83	729.96
CRW 4.0	3 to 9	Total	2	0.43	15	37.50	4.15	6.46	3.36	2.37	30.17	437.98
CRW 4.0	3 to 9	Total	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.0	3 to 9	Total	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.0	3 to 9	Total	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.0	3 to 9	Total	Sound	0.43	40	100.00	4.10	16.80	0.15	0.11	1.34	1,167.94
CRW 4.0	3 to 9	Total	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.0	3 to 9	Total	Total	0.43	40	100.00	4.10	16.80	0.15	0.11	1.34	1,167.94
CRW 4.0	9 to 20	UNKN	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.0	9 to 20	UNKN	2	0.43	1	33.33	14.80	5.48	7.75	5.48	69.65	29.20
CRW 4.0	9 to 20	UNKN	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.0	9 to 20	UNKN	4	0.30	2	66.67	12.23	5.22	7.38	5.22	66.32	58.40
CRW 4.0	9 to 20	UNKN	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.0	9 to 20	UNKN	Sound	0.43	1	33.33	14.80	5.48	7.75	5.48	69.65	29.20
CRW 4.0	9 to 20	UNKN	Rotten	0.30	2	66.67	12.23	5.22	7.38	5.22	66.32	58.40
CRW 4.0	9 to 20	UNKN	Total	0.34	3	100.00	13.14	10.70	15.13	10.70	135.98	87.60
CRW 4.0	9 to 20	Total	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.0	9 to 20	Total	2	0.43	1	33.33	14.80	5.48	7.75	5.48	69.65	29.20
CRW 4.0	9 to 20	Total	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.0	9 to 20	Total	4	0.30	2	66.67	12.23	5.22	7.38	5.22	66.32	58.40
CRW 4.0	9 to 20	Total	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.0	9 to 20	Total	Sound	0.43	1	33.33	14.80	5.48	7.75	5.48	69.65	29.20
CRW 4.0	9 to 20	Total	Rotten	0.30	2	66.67	12.23	5.22	7.38	5.22	66.32	58.40
CRW 4.0	9 to 20	Total	Total	0.34	3	100.00	13.14	10.70	15.13	10.70	135.98	87.60
CRW 4.0	20 to 99	Total	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.0	20 to 99	Total	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.0	20 to 99	Total	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.0	20 to 99	Total	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.0	20 to 99	Total	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.0	20 to 99	Total	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.0	20 to 99	Total	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.0	20 to 99	Total	Total	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Spp = species: ABAM = *Abies amabilis*, UNKN = unknown species, TSHE =*Tsuga heterophylla*, PSME = *Pseudotsuga menziesii*; THPL = *Thuja plicata*, DC = decay class; SG = specific gravity; No. logs = number of logs measured; Perc_tot = percent total; QMD_ in = quadratic mean diameter; Mean_TPA = mean trees per acre; SD_TPA = standard deviation tree per acre; 95CI_TPA = Ninety-five percent confidence interval; No_per_ acre = number per acre.

Appendix A. DRA large fuel woody loading fuel summary.

StandID	Size class	Code	Decay class	SG	No_Logs	Perc_tot	QMD_in	Mean_TPA	SD_TPA	SE_TPA	95CI_TPA	No_per_acre
CRW 26 A B C	3 to 9	ABAM	1	0.43	18	24.00	4.43	5.90	6.11	3.53	15.18	350.38
CRW 26 A B C	3 to 9	ABAM	2	0.43	50	66.67	4.53	17.15	6.91	3.99	17.17	973.28
CRW 26 A B C	3 to 9	ABAM	3	0.43	1	1.33	3.70	0.23	0.40	0.23	0.98	19.47
CRW 26 A B C	3 to 9	ABAM	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	3 to 9	ABAM	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	3 to 9	ABAM	Sound	0.43	69	92.00	4.50	23.27	9.90	5.72	24.59	1,343.13
CRW 26 A B C	3 to 9	ABAM	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	3 to 9	ABAM	Total	0.43	69	92.00	4.50	23.27	9.90	5.72	24.59	1,343.13
CRW 26 A B C	3 to 9	TSHE	1	0.45	1	1.33	4.60	0.37	0.64	0.37	1.59	19.47
CRW 26 A B C	3 to 9	TSHE	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	3 to 9	TSHE	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	3 to 9	TSHE	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	3 to 9	TSHE	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	3 to 9	TSHE	Sound	0.45	1	1.33	4.60	0.37	0.64	0.37	1.59	19.47
CRW 26 A B C	3 to 9	TSHE	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	3 to 9	TSHE	Total	0.45	1	1.33	4.60	0.37	0.64	0.37	1.59	19.47
CRW 26 A B C	3 to 9	THPL	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	3 to 9	THPL	2	0.32	2	2.67	4.46	0.49	0.85	0.49	2.12	38.93
CRW 26 A B C	3 to 9	THPL	3	0.32	1	1.33	8.60	0.92	1.59	0.92	3.95	19.47
CRW 26 A B C	3 to 9	THPL	4	0.30	2	2.67	6.49	0.98	0.91	0.53	2.27	38.93
CRW 26 A B C	3 to 9	THPL	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	3 to 9	THPL	Sound	0.32	3	4.00	6.16	1.41	1.38	0.80	3.42	58.40
CRW 26 A B C	3 to 9	THPL	Rotten	0.30	2	2.67	6.49	0.98	0.91	0.53	2.27	38.93
CRW 26 A B C	3 to 9	THPL	Total	0.31	5	6.67	6.29	2.39	2.29	1.32	5.69	97.33
CRW 26 A B C	3 to 9	Total	1	0.43	19	25.33	4.44	6.27	5.70	3.29	14.17	369.85
CRW 26 A B C	3 to 9	Total	2	0.43	52	69.33	4.53	17.64	6.24	3.60	15.50	1,012.22
CRW 26 A B C	3 to 9	Total	3	0.38	2	2.67	6.62	1.15	1.43	0.83	3.56	38.93
CRW 26 A B C	3 to 9	Total	4	0.30	2	2.67	6.49	0.98	0.91	0.53	2.27	38.93
CRW 26 A B C	3 to 9	Total	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	3 to 9	Total	Sound	0.43	73	97.33	4.58	25.05	9.18	5.30	22.81	1,420.99
CRW 26 A B C	3 to 9	Total	Rotten	0.30	2	2.67	6.49	0.98	0.91	0.53	2.27	38.93
CRW 26 A B C	3 to 9	Total	Total	0.42	75	100.00	4.64	26.04	9.15	5.28	22.72	1,459.93
CRW 26 A B C	9 to 20	UNKN	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	9 to 20	UNKN	2	0.43	1	20.00	9.40	1.47	2.55	1.47	6.34	19.47
CRW 26 A B C	9 to 20	UNKN	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	9 to 20	UNKN	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	9 to 20	UNKN	5	0.30	1	20.00	13.00	1.97	3.41	1.97	8.46	19.47
CRW 26 A B C	9 to 20	UNKN	Sound	0.43	1	20.00	9.40	1.47	2.55	1.47	6.34	19.47
CRW 26 A B C	9 to 20	UNKN	Rotten	0.30	1	20.00	13.00	1.97	3.41	1.97	8.46	19.47
CRW 26 A B C	9 to 20	UNKN	Total	0.37	2	40.00	11.34	3.44	5.96	3.44	14.81	38.93

Spp = species: ABAM = *Abies amabilis*, UNKN = unknown species, TSHE =*Tsuga heterophylla*, PSME = *Pseudotsuga menziesii*; THPL = *Thuja plicata*, DC = decay class; SG = specific gravity; No. logs = number of logs measured; Perc_tot = percent total; QMD_ in = quadratic mean diameter; Mean_TPA = mean trees per acre; SD_TPA = standard deviation tree per acre; 95CI_TPA = Ninety-five percent confidence interval; No_per_ acre = number per acre.

Appendix A. DRA large fuel woody loading fuel summary.

StandID	Size class	Code	Decay class	SG	No_Logs	Perc_tot	QMD_in	Mean_TPA	SD_TPA	SE_TPA	95CI_TPA	No_per_acre
CRW 26 A B C	9 to 20	THPL	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	9 to 20	THPL	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	9 to 20	THPL	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	9 to 20	THPL	4	0.30	3	60.00	11.47	4.60	4.63	2.67	11.50	58.40
CRW 26 A B C	9 to 20	THPL	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	9 to 20	THPL	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	9 to 20	THPL	Rotten	0.30	3	60.00	11.47	4.60	4.63	2.67	11.50	58.40
CRW 26 A B C	9 to 20	THPL	Total	0.30	3	60.00	11.47	4.60	4.63	2.67	11.50	58.40
CRW 26 A B C	9 to 20	Total	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	9 to 20	Total	2	0.43	1	20.00	9.40	1.47	2.55	1.47	6.34	19.47
CRW 26 A B C	9 to 20	Total	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	9 to 20	Total	4	0.30	3	60.00	11.47	4.60	4.63	2.67	11.50	58.40
CRW 26 A B C	9 to 20	Total	5	0.30	1	20.00	13.00	1.97	3.41	1.97	8.46	19.47
CRW 26 A B C	9 to 20	Total	Sound	0.43	1	20.00	9.40	1.47	2.55	1.47	6.34	19.47
CRW 26 A B C	9 to 20	Total	Rotten	0.30	4	80.00	11.87	6.56	5.72	3.30	14.20	77.86
CRW 26 A B C	9 to 20	Total	Total	0.33	5	100.00	11.42	8.04	7.51	4.33	18.64	97.33
CRW 26 A B C	20 to 99	Total	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	20 to 99	Total	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	20 to 99	Total	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	20 to 99	Total	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	20 to 99	Total	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	20 to 99	Total	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	20 to 99	Total	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 26 A B C	20 to 99	Total	Total	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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Appendix A. DRA large fuel woody loading fuel summary.

StandID	Size class	Code	Decay class	SG	No_Logs	Perc_tot	QMD_in	Mean_TPA	SD_TPA	SE_TPA	95CI_TPA	No_per_acre
CRW UB40	3 to 9	PSME	1	0.48	1	0.71	3.20	0.11	0.26	0.11	0.32	11.68
CRW UB40	3 to 9	PSME	2	0.48	5	3.55	5.35	1.60	2.50	1.12	3.10	58.40
CRW UB40	3 to 9	PSME	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	3 to 9	PSME	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	3 to 9	PSME	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	3 to 9	PSME	Sound	0.48	6	4.26	5.06	1.71	2.42	1.08	3.00	70.08
CRW UB40	3 to 9	PSME	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	3 to 9	PSME	Total	0.48	6	4.26	5.06	1.71	2.42	1.08	3.00	70.08
CRW UB40	3 to 9	ABAM	1	0.43	55	39.01	4.05	9.05	4.05	1.81	5.03	642.37
CRW UB40	3 to 9	ABAM	2	0.43	79	56.03	4.21	14.00	6.87	3.07	8.54	922.67
CRW UB40	3 to 9	ABAM	3	0.43	1	0.71	3.10	0.10	0.22	0.10	0.27	11.68
CRW UB40	3 to 9	ABAM	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	3 to 9	ABAM	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	3 to 9	ABAM	Sound	0.43	135	95.74	4.14	23.15	9.84	4.40	12.22	1,576.72
CRW UB40	3 to 9	ABAM	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	3 to 9	ABAM	Total	0.43	135	95.74	4.14	23.15	9.84	4.40	12.22	1,576.72
CRW UB40	3 to 9	Total	1	0.43	56	39.72	4.04	9.17	3.86	1.73	4.79	654.05
CRW UB40	3 to 9	Total	2	0.43	84	59.57	4.28	15.60	8.85	3.96	10.99	981.07
CRW UB40	3 to 9	Total	3	0.43	1	0.71	3.10	0.10	0.22	0.10	0.27	11.68
CRW UB40	3 to 9	Total	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	3 to 9	Total	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	3 to 9	Total	Sound	0.43	141	100.00	4.18	24.86	11.09	4.96	13.77	1,646.80
CRW UB40	3 to 9	Total	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	3 to 9	Total	Total	0.43	141	100.00	4.18	24.86	11.09	4.96	13.77	1,646.80
CRW UB40	9 to 20	UNKN	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	9 to 20	UNKN	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	9 to 20	UNKN	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	9 to 20	UNKN	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	9 to 20	UNKN	5	0.30	1	100.00	9.80	0.67	1.50	0.67	1.86	11.68
CRW UB40	9 to 20	UNKN	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	9 to 20	UNKN	Rotten	0.30	1	100.00	9.80	0.67	1.50	0.67	1.86	11.68
CRW UB40	9 to 20	UNKN	Total	0.30	1	100.00	9.80	0.67	1.50	0.67	1.86	11.68
CRW UB40	9 to 20	Total	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	9 to 20	Total	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	9 to 20	Total	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	9 to 20	Total	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	9 to 20	Total	5	0.30	1	100.00	9.80	0.67	1.50	0.67	1.86	11.68
CRW UB40	9 to 20	Total	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	9 to 20	Total	Rotten	0.30	1	100.00	9.80	0.67	1.50	0.67	1.86	11.68
CRW UB40	9 to 20	Total	Total	0.30	1	100.00	9.80	0.67	1.50	0.67	1.86	11.68

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Appendix A. DRA large fuel woody loading fuel summary.

StandID	Size class	Code	Decay class	SG	No_Logs	Perc_tot	QMD_in	Mean_TPA	SD_TPA	SE_TPA	95CI_TPA	No_per_acre
CRW UB40	20 to 99	Total	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	20 to 99	Total	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	20 to 99	Total	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	20 to 99	Total	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	20 to 99	Total	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	20 to 99	Total	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	20 to 99	Total	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	20 to 99	Total	Total	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	20 to 99	Total	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	20 to 99	Total	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	20 to 99	Total	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	20 to 99	Total	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	20 to 99	Total	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	20 to 99	Total	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	20 to 99	Total	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW UB40	20 to 99	Total	Total	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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Appendix A. DRA large fuel woody loading fuel summary.

StandID	Size class	Code	Decay class	SG	No_Logs	Perc_tot	QMD_in	Mean_TPA	SD_TPA	SE_TPA	95CI_TPA	No_per_acre
CRW 4.2 (2003)	3 to 9	PSME	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	3 to 9	PSME	2	0.48	5	1.68	3.93	0.43	0.87	0.27	0.62	29.20
CRW 4.2 (2003)	3 to 9	PSME	3	0.48	1	0.34	7.70	0.33	1.05	0.33	0.75	5.84
CRW 4.2 (2003)	3 to 9	PSME	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	3 to 9	PSME	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	3 to 9	PSME	Sound	0.48	6	2.02	4.77	0.76	1.24	0.39	0.88	35.04
CRW 4.2 (2003)	3 to 9	PSME	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	3 to 9	PSME	Total	0.48	6	2.02	4.77	0.76	1.24	0.39	0.88	35.04
CRW 4.2 (2003)	3 to 9	ABAM	1	0.43	10	3.37	3.57	0.64	2.01	0.64	1.44	58.40
CRW 4.2 (2003)	3 to 9	ABAM	2	0.43	272	91.58	4.22	24.21	12.81	4.05	9.17	1,588.40
CRW 4.2 (2003)	3 to 9	ABAM	3	0.43	3	1.01	4.31	0.28	0.68	0.21	0.48	17.52
CRW 4.2 (2003)	3 to 9	ABAM	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	3 to 9	ABAM	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	3 to 9	ABAM	Sound	0.43	285	95.96	4.20	25.12	12.40	3.92	8.87	1,664.32
CRW 4.2 (2003)	3 to 9	ABAM	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	3 to 9	ABAM	Total	0.43	285	95.96	4.20	25.12	12.40	3.92	8.87	1,664.32
CRW 4.2 (2003)	3 to 9	UNKN	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	3 to 9	UNKN	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	3 to 9	UNKN	3	0.44	5	1.68	6.52	1.07	2.49	0.79	1.78	29.20
CRW 4.2 (2003)	3 to 9	UNKN	4	0.30	1	0.34	4.20	0.06	0.19	0.06	0.14	5.84
CRW 4.2 (2003)	3 to 9	UNKN	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	3 to 9	UNKN	Sound	0.44	5	1.68	6.52	1.07	2.49	0.79	1.78	29.20
CRW 4.2 (2003)	3 to 9	UNKN	Rotten	0.30	1	0.34	4.20	0.06	0.19	0.06	0.14	5.84
CRW 4.2 (2003)	3 to 9	UNKN	Total	0.41	6	2.02	6.19	1.13	2.47	0.78	1.77	35.04
CRW 4.2 (2003)	3 to 9	Total	1	0.43	10	3.37	3.57	0.64	2.01	0.64	1.44	58.40
CRW 4.2 (2003)	3 to 9	Total	2	0.43	277	93.27	4.21	24.64	12.67	4.01	9.06	1,617.60
CRW 4.2 (2003)	3 to 9	Total	3	0.44	9	3.03	6.03	1.68	2.98	0.94	2.13	52.56
CRW 4.2 (2003)	3 to 9	Total	4	0.30	1	0.34	4.20	0.06	0.19	0.06	0.14	5.84
CRW 4.2 (2003)	3 to 9	Total	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	3 to 9	Total	Sound	0.43	296	99.66	4.26	26.96	13.82	4.37	9.88	1,728.55
CRW 4.2 (2003)	3 to 9	Total	Rotten	0.30	1	0.34	4.20	0.06	0.19	0.06	0.14	5.84
CRW 4.2 (2003)	3 to 9	Total	Total	0.43	297	100.00	4.26	27.02	13.82	4.37	9.89	1,734.39
CRW 4.2 (2003)	9 to 20	PSME	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	9 to 20	PSME	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	9 to 20	PSME	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	9 to 20	PSME	4	0.30	1	9.09	14.20	0.70	2.23	0.70	1.59	5.84
CRW 4.2 (2003)	9 to 20	PSME	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	9 to 20	PSME	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	9 to 20	PSME	Rotten	0.30	1	9.09	14.20	0.70	2.23	0.70	1.59	5.84
CRW 4.2 (2003)	9 to 20	PSME	Total	0.30	1	9.09	14.20	0.70	2.23	0.70	1.59	5.84

Spp = species: ABAM = *Abies amabilis*, UNKN = unknown species, TSHE =*Tsuga heterophylla*, PSME = *Pseudotsuga menziesii*; THPL = *Thuja plicata*, DC = decay class; SG = specific gravity; No. logs = number of logs measured; Perc_tot = percent total; QMD_ in = quadratic mean diameter; Mean_TPA = mean trees per acre; SD_TPA = standard deviation tree per acre; 95CI_TPA = Ninety-five percent confidence interval; No_per_ acre = number per acre.

Appendix A. DRA large fuel woody loading fuel summary.

StandID	Size class	Code	Decay class	SG	No_Logs	Perc_tot	QMD_in	Mean_TPA	SD_TPA	SE_TPA	95CI_TPA	No_per_acre
CRW 4.2 (2003)	9 to 20	ABAM	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	9 to 20	ABAM	2	0.43	2	18.18	12.78	1.64	3.62	1.15	2.59	11.68
CRW 4.2 (2003)	9 to 20	ABAM	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	9 to 20	ABAM	4	0.30	2	18.18	14.95	1.56	3.29	1.04	2.36	11.68
CRW 4.2 (2003)	9 to 20	ABAM	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	9 to 20	ABAM	Sound	0.43	2	18.18	12.78	1.64	3.62	1.15	2.59	11.68
CRW 4.2 (2003)	9 to 20	ABAM	Rotten	0.30	2	18.18	14.95	1.56	3.29	1.04	2.36	11.68
CRW 4.2 (2003)	9 to 20	ABAM	Total	0.37	4	36.36	13.91	3.20	5.36	1.70	3.84	23.36
CRW 4.2 (2003)	9 to 20	UNKN	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	9 to 20	UNKN	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	9 to 20	UNKN	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	9 to 20	UNKN	4	0.30	6	54.55	12.57	3.31	6.29	1.99	4.50	35.04
CRW 4.2 (2003)	9 to 20	UNKN	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	9 to 20	UNKN	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	9 to 20	UNKN	Rotten	0.30	6	54.55	12.57	3.31	6.29	1.99	4.50	35.04
CRW 4.2 (2003)	9 to 20	UNKN	Total	0.30	6	54.55	12.57	3.31	6.29	1.99	4.50	35.04
CRW 4.2 (2003)	9 to 20	Total	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	9 to 20	Total	2	0.43	2	18.18	12.78	1.64	3.62	1.15	2.59	11.68
CRW 4.2 (2003)	9 to 20	Total	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	9 to 20	Total	4	0.30	9	81.82	13.32	5.58	9.24	2.92	6.61	52.56
CRW 4.2 (2003)	9 to 20	Total	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	9 to 20	Total	Sound	0.43	2	18.18	12.78	1.64	3.62	1.15	2.59	11.68
CRW 4.2 (2003)	9 to 20	Total	Rotten	0.30	9	81.82	13.32	5.58	9.24	2.92	6.61	52.56
CRW 4.2 (2003)	9 to 20	Total	Total	0.32	11	100.00	13.22	7.21	10.09	3.19	7.22	64.24
CRW 4.2 (2003)	20 to 99	Total	1	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	20 to 99	Total	2	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	20 to 99	Total	3	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	20 to 99	Total	4	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	20 to 99	Total	5	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	20 to 99	Total	Sound	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	20 to 99	Total	Rotten	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW 4.2 (2003)	20 to 99	Total	Total	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Spp = species: ABAM = *Abies amabilis*, UNKN = unknown species, TSHE =*Tsuga heterophylla*, PSME = *Pseudotsuga menziesii*; THPL = *Thuja plicata*, DC = decay class; SG = specific gravity; No. logs = number of logs measured; Perc_tot = percent total; QMD_ in = quadratic mean diameter; Mean_TPA = mean trees per acre; SD_TPA = standard deviation tree per acre; 95CI_TPA = Ninety-five percent confidence interval; No_per_ acre = number