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Southwest Oregon Biscuit Fire: An Analysis of Forest Resources and Fire Severity

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Abstract

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The Biscuit Fire in southwestern Oregon was one of the largest and most costly
in recent history, burning over 499,000 acres and costing over 150 million dollars
in suppression efforts. This study uses prefire resource information in conjunction
with postfire burn severity to generate statistically reliable prefire resource esti-
mates for the land within the Biscuit Fire perimeter. Resource parameters such as
timber volume, down woody material, area by forest type, and understory cover are
compared between burn severity classes.

Keywords: Forest inventory, fire severity, forest resources, Biscuit Fire.

Executive Summary

This analysis summarized prefire field inventory data (collected 1993-97) in rela-
tion to postfire mapped fire-severity classes for the portion of the Siskiyou National
Forest within the 2002 Biscuit Fire perimeter in southwestern Oregon. The analysis
used the fire-severity classification that was done by the multiagency Burn Area
Emergency Rehabilitation (BAER) team immediately following the fire. The BAER
fire-severity maps are used throughout the Nation as a standardized, well-docu-
mented method of assessing burn severity. Still, the map represents a rough, post-
fire tool to assess fire severity, and thus, our summarization is only a preliminary
assessment. Field crews remeasured the original inventory plots during the summer
and fall of 2003. After compilation of the remeasurement data collected in late
2003, it will be possible to validate and refine the summary of initial prefire data by
using field measurements of burn severity and fire effects.

These inventory data represent a statistically valid field sample across the
landscape and, in combination with remeasured plots, will provide a compre-
hensive look at the effects of fire on a large scale.

- Almost 70 percent of the sampled area was classified as softwood forest
types, 26 percent as hardwood, and slightly more than 4 percent as non-
stocked.
- Tanoak forest types dominated the hardwood types, occurring on approxi-
mately 17 percent of the sample area.

- Douglas-fir is the predominant type occurring on over 44 percent of the sample area and accounting for 71 percent of the board-foot volume across all forest types and administrative statuses.
- Almost 45 percent of the sampled area was classified as low productivity (site class VI or VII).
- Ninety-two percent of the nonreserved softwood area and 63 percent of the nonreserved hardwood area are stands of large trees.
- Sixty-three percent of the combined sample of nonreserved and wilderness land was classified as low/very low burn severity.
- Within each broad forest type, 55 percent of the softwood area and 82 percent of the hardwood area was classified as low/very low burn severity.
- Douglas-fir forest types burned less severely than most other softwood forest types, with less than 35 percent classified as high/moderate burn severity.
- Less than 6 percent of the tanoak area was classified as high/moderate burn severity.
- For hardwoods and softwoods combined, 76 percent of the stands of very large trees (trees ≥20 inches in diameter at breast height) was classified as low/very low severity.
- Sites classified predominantly as high/moderate fire severity tended to have more prefire brush, have lower stand volumes, contain less large-diameter woody debris, and occur on low-productivity land.

Introduction

This report summarizes forest inventory data from 1993 through 1997 for the 92 percent of the southwest Oregon 2002 Biscuit Fire that fell within the Siskiyou National Forest. The report contains statistically valid, field-plot-based estimates of the forest resources by fire-severity class as determined by a geographic information system (GIS) overlay of postburn fire severity. This information will help to identify the forest size and structural classes that are associated with high fire severity, and provide a basis for discussion of management alternatives to reduce fire severity in similar forested conditions across the West. If areas prone to high fire severity can be identified and reduction of severity is an objective, then focusing on these areas should produce the greatest benefit.

The USDA Forest Service Forest Inventory and Analysis (FIA) program together with the National Forest System are responsible for the systematic assessment of forest resources across the United States. Through a combination of remote sensing techniques and data collection across a systematic network of field plots, FIA and the National Forest System provide estimates of the status and trend in our Nation's forests.

Currently, one of the major issues concerning Western U.S. forests is fire, along with forest fragmentation, invasive species, and recreation management. Recent climatic patterns coupled with fuel conditions have resulted in large wildland fires that are of increasing concern to land managers and the public. Changes in fuel structure have occurred in forests owing to a variety of management actions of the past century. Of note among these policy decisions was the adherence to a strict fire-suppression policy. This policy was formalized in the early 1900s, and staffed and equipped sufficiently by the 1940s in southwest Oregon. Forests that historically had short intervals between successive fires (5-20 years) have typically become more dense with small trees and have increased in structural complexity in the lower portion of the canopy. Forests that had long intervals between successive fires (60-300 years) may not have been appreciably affected by fire suppression over the 60-year period that the fire-suppression policy has been in effect. Recognizing how humans have impacted the fire regime and the progression of fuels in a landscape provides information to help land managers prioritize new fuel treatments that mimic the natural disturbance regime for a particular landscape.

Objectives

Given the difficult decisions that occur during postfire restoration, we sought
to provide decisionmakers with relevant data through the following objectives:

1. Classify acreage and wood volume for species and forest types according
   to burn severity on reserved wilderness and nonreserved lands.
2. Explore the associations between burn severity and (a) forest stand size
   class, (b) timber volume, (c) understory vegetation, (d) down woody
   debris, and (e) site productivity.

Methods
Site Description

The Biscuit Fire was Oregon's largest single-year, contiguous fire in recorded his-
tory. The fire boundary stretched from 10 miles east of the coastal community of
Brookings, Oregon, south into northern California, east to the Illinois Valley, and
north to within a few miles of the Rogue River. The fire perimeter encompassed
all of the Kalmiopsis Wilderness. The portion of the Biscuit Fire that was within
the Siskiyou National Forest is approximately 460,000 acres—98 percent of the
Oregon portion of the Biscuit Fire and 92 percent of the entire Biscuit Fire. Sixty-
two percent of the Siskiyou National Forest in the burn perimeter is classified as
nonreserved, that is, the land has not been formally withdrawn from timber use by
law. The remaining 38 percent, the Kalmiopsis Wilderness Area, is classified as
reserved and is congressionally withdrawn from commercial use.

Although the Biscuit Fire burned into California, this report summarizes data
only for the Oregon portion within the fire perimeter. Also excluded from our
assessment are small areas of land that are privately owned or administered by the
Bureau of Land Management. Only prefire plot measurements, summarized by
mapped fire-severity class are presented in this report.   Resource estimates are
derived from 180 field plots measured on the Siskiyou National Forest in Oregon
from 1993 to 1997. Hereafter in text and tables, the term "Siskiyou Biscuit Fire"
refers to only the Siskiyou National Forest portion of the Biscuit Fire.

Southwestern Oregon is an extremely complex region environmentally, floristi-
cally, and geologically. Climate ranges from cool and moist in the coastal regions to
hot and dry toward the more continental interior. The extremes of climatic condi-
tions and biological complexity within the Biscuit Fire perimeter are well illustrated
by the large number of forest types and tree species present. Fifteen forest types, 13
softwood species, and 10 hardwood species have been identified in inventory work
in southwestern Oregon. Forest types are named for the dominant species present
but may include codominants and a wide variety of other tree species. The following

major forest types are found in the Biscuit Fire region: Douglas-fir, incense-cedar, Jeffrey pine, knobcone pine, ponderosa pine, Port-Orford-cedar, sugar pine, western white pine, white fir, bigleaf maple, California-laurel, canyon live oak, golden chinkapin, Pacific madrone, and tanoak. In terms of climatic demands, the softwood species range from moisture-demanding Port-Orford-cedar (see "Common and Scientific Names" section) to drought-tolerant species like ponderosa pine. Many other species are minor forest components, leading to high stand complexity, which contrasts with many other areas in Oregon where frequently a single species dominates.

Forest composition, structure, and distribution in the region are controlled to a large extent by disturbance, especially fire, insects, diseases, and timber harvesting. Fire shapes plant communities by excluding some fire-intolerant species, perpetuating fire-tolerant or fire-promoted species, and by resetting the successional time clock (Agee 1993, Crutzen and Goldammer 1993). Fire intensity, severity, frequency, spatial magnitude, spread rate, and predictability depend on the climate, topography, vegetation, and interacting disturbance regimes, whether human induced or environmental in origin. Both human-caused and lightning-ignited fires have shaped southwestern Oregon forests, as have recent fire-control activities.

Geology, soils, and topography of the region are diverse, influencing moisture and nutrient retention and the resulting composition and productivity of vegetation. Soil depths, parent materials, and weathering regimes are also very diverse; soils range from well-developed Ultisols to sandy Inceptisols and fragmented Entisols. Rocky soils of basalt and andesite, serpentine soils, schist, diorite, peridotite, shale, sandstone, hornblend-derived soils, granitic soils, ash, and pumice soils are all present in the region (Atzet et al. 1996, Orr and Orr 1999).

The Prefire Inventory Fieldwork

A prefire inventory in the area of the Siskiyou Biscuit Fire was conducted from 1993 to 1997. Data on 24 plots were collected in 1993, 10 plots in 1994, 47 in 1995, 85 in 1996, and 14 in 1997, for a total of 180 plots. Plots were spaced on a square grid with approximately 1.7 miles between plots, except in the Kalmiopsis Wilderness, where plots were spaced on a 3.4-mile grid. Plots were established and measured as part of the national forest inventory. Three plots did not have tree data associated with them because of accessibility issues and were not classified or used in the analysis.

Tree locations were mapped; heights, diameters, ages, and species of trees were recorded; and information was collected on site productivity, understory trees, down woody material (DWM), and shrub, forb, and grass cover. Forest type,

stand size class, and stand age class were determined based on stocking by species (USDA Forest Service 1995).

Mapped Fire Severity

After the fire, the area was mapped by the Burn Area Emergency Rehabilitation (BAER) team by using Landsat 7 satellite imagery (Parsons and Orlemann 2002). Areas within the burn perimeter were mapped according to four fire-severity classes: high, moderate, low, and very low (fig. 1, table 1). The forest also constructed a canopy mortality map (USDA Forest Service 2003) based on aerial photointerpretation of crown mortality classes. For our summary analysis, we chose to use the BAER fire-severity map because the BAER classification system is a nationally standardized, multiagency effort and the methods are well documented.
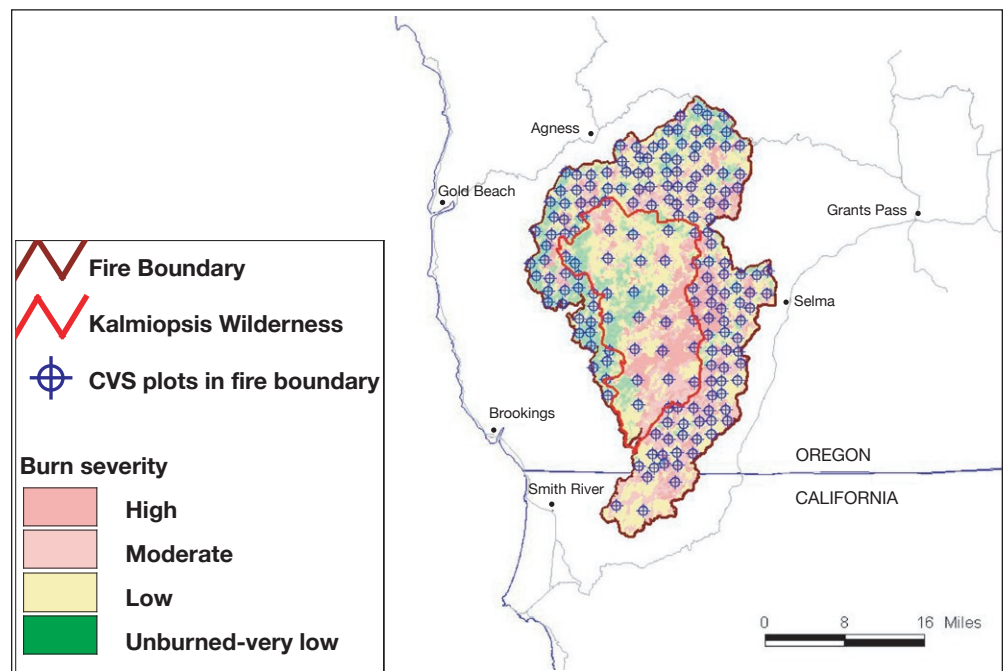
Figure 1—Biscuit Fire and wilderness area with inventory plot grid.
CVS = current vegetation survey.

Minimum mapped polygon size for the BAER map was approximately 50 acres. A GIS was used to overlay FIA field plots on the mapped fire-severity classes, assigning a burn severity to each plot center. Linking mapped burn severity to resource data from the inventory involves some uncertainty. Like any fire-severity mapping effort, there could well be variation in burn intensity within a mapped

class, and the fire effects at the location of the plot may not resemble the assigned severity class. Until remeasurement of the original field plots is completed, that uncertainty will exist. To simplify presentation, very low and low severity classes were combined into low/very low and high and moderate into high/moderate severity for some of our analyses.

Table 1—A description of BAER fire-severity classes

Collapsed class	BAER burn severity	Fire effects
Low/very low	Very low	Mosaic of unburned and very-low-severity ground fire. Consumption of ground cover and vegetation mortality are minimal. Canopy remains vigorous and green. Mortality of trees and shrubs is slight.
	Low	Vegetation is lightly scorched, few large trees are killed, very-small-diameter fuel is consumed.
High/moderate	Moderate	Much of the litter has been consumed. Fine fuels close to the ground may be all consumed, and trees may exhibit 40 to 80 percent mortality.
	High	Tree crowns are completely consumed, few to no leaves or needles remain on trees, and mortality can be assumed to be close to 100 percent.

Data Analysis

The data set collected on each plot is a statistically valid sample of the larger population, that is, the Siskiyou National Forest. The information in the sample is expanded to the population level by multiplying by a factor that assigns acreage to each sample plot based on the number of plots sampled in the entire population acreage. Because area per plot is based on the acreage in the Siskiyou National Forest, i.e., adding all the plot expansions together gives the total for the forest, summations on smaller units, like the Biscuit Fire, will yield slight discrepancies between the official burn area statistic of 461,738 acres and the plot-determined sample area of 460,111 acres.

An index of site productivity was estimated for each plot based on the relationship of tree ages to tree sizes (Hanson et al. 2002). Lower site-class rankings suggest more favorable conditions for tree growth.

A ratio of small-diameter to large-diameter trees was approximated by dividing the number of small trees by the number of large trees. Small diameter was defined

as less than 9 inches diameter at breast height (d.b.h.) for softwoods and 11 inches d.b.h. for hardwoods. This ratio was used as a surrogate for stand structure and was correlated with timber volume per acre. Timber volume per acre was also correlated with the percentage of understory cover, down woody material biomass, and the density of snags.

Standard errors for area statistics are based on the fire area in Oregon only. Error estimates are not calculated for individual cells within tables because of the sample size associated with the multiple divisions of the 180 field plots. Error estimates are calculated separately for reserved and nonreserved land owing to the different sampling intensities. Error estimates were combined when considering all land regardless of reserved status.

Administrative Definitions

The GIS layers prepared for the Siskiyou National Forest management plan were overlaid with plot locations to summarize acreage by reserve status and fire-severity classifications. Reserved land consisted entirely of land within the Kalmiopsis Wilderness Area. Nonreserved land included (1) administratively withdrawn, (2) late-successional reserves, (3) riparian reserves, and (4) matrix land. In the Kalmiopsis Wilderness, commercial enterprises are prohibited. Resource extraction is not congressionally prohibited in the other four administrative designations. These four designations are based on the forest's management plan. Administratively withdrawn areas usually emphasize recreational, aesthetic, or watershed uses over scheduled timber harvest. Late-successional reserves emphasize protection and enhancement of late-successional and old-growth forest characteristics. Riparian reserves include state-mandated buffers along riparian features designed to protect water quality and riparian habitat. Matrix land is managed for multiple uses including resource extraction.

Resource Highlights

Based on the map overlay with the BAER fire severity, the majority (63 percent) of the plots in our systematic sample were classified postfire as low and very low burn severity (low/very low) (table 2).

Table 2—Plot counts by burn severity

Burn severity	Plots	Percentage of plots
High	26	14
Moderate	41	23
Low	70	39
Very low	43	24
Total	180	100

Approximately 55 percent of the reserved wilderness area was classified as low/very low severity in contrast to 65 percent for the nonreserved area (app. table 12).

Forest-Type Area by Severity Class

Forests within the Oregon portion of the Biscuit burn perimeter are predominantly softwood forest types, accounting for 69 percent of the area, with 26.2 percent of the area in hardwood, and 4.8 percent nonstocked (defined as areas that are <10 percent stocked with commercial tree species; app. table 8). Douglas-fir was the predominant forest type in both reserved and nonreserved areas covering approximately 204,800 acres, or over 44 percent of the total burn area and 64 percent of the softwood-type area (app. table 8, fig. 2). Douglas-fir burned less severely than almost every other softwood type with just 34 percent of it classified as either high- or moderate-severity burn (app. table 9).
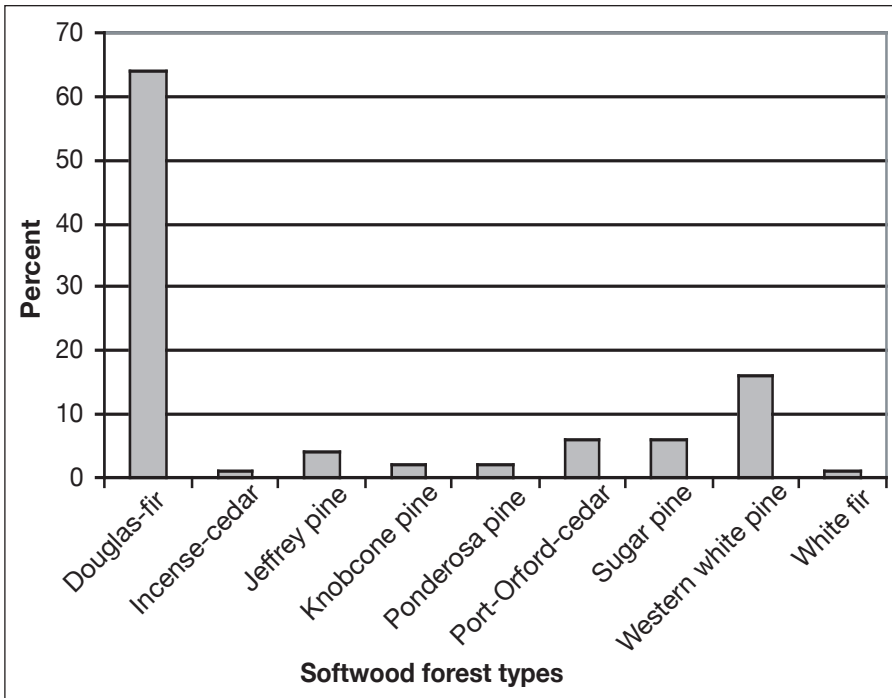
Figure 2—Softwood area proportion by forest type, Siskiyou Biscuit Fire.

The principal hardwood types in both nonreserved and reserved areas are tanoak and canyon live oak (app. table 8, fig. 3). Collectively they represent 83 percent of the nonreserved and 88 percent of the reserved hardwood forest area. The tanoak type occurs on 76,500 acres, which is 63 percent of the total hardwood area. Less than 15 percent of tanoak land was classified as high/moderate-severity burn (app. table 9).
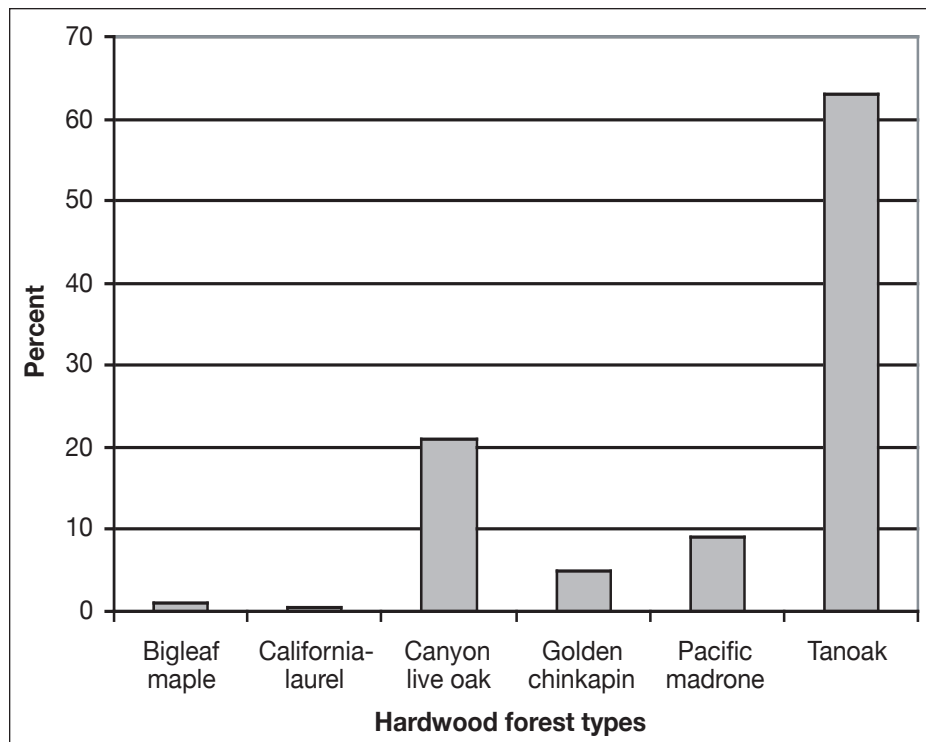
Figure 3—Hardwood area proportion by forest type, Siskiyou Biscuit Fire.

The majority of the hardwood types burned relatively lightly (fig. 4, app. table 9). Eighty-two percent of the area in hardwood types was classified as low/very low severity. In contrast, only 26 percent of the nonstocked area was classified as low/very low severity (app. table 9).

Stand Size Class and Burn Severity

Stands were classified into five size classes: (1) nonstocked, (2) seedling/sapling (<5 inches d.b.h.), (3) pole (5-9 inches d.b.h. for softwoods and 5-11 for hardwoods), (4) large (9-20 inches d.b.h. for softwoods and 11-20 for hardwoods), and (5) very large ($\geq$20 inches d.b.h.). Ninety-two percent of the nonreserved softwood area is classed as one of the larger sizes (softwoods $\geq$9 inches d.b.h.), leaving only 8 percent of the area in poletimber stands (5-9 inches d.b.h.; app. table 10). No softwood seedling or sapling stands were classified from the inventory data. Douglas-fir, the dominant forest type, was predominantly in the very large size class (fig. 5). In reserved areas, ponderosa pine had the greater proportion of its area in pole-sized stands (app. table 10).
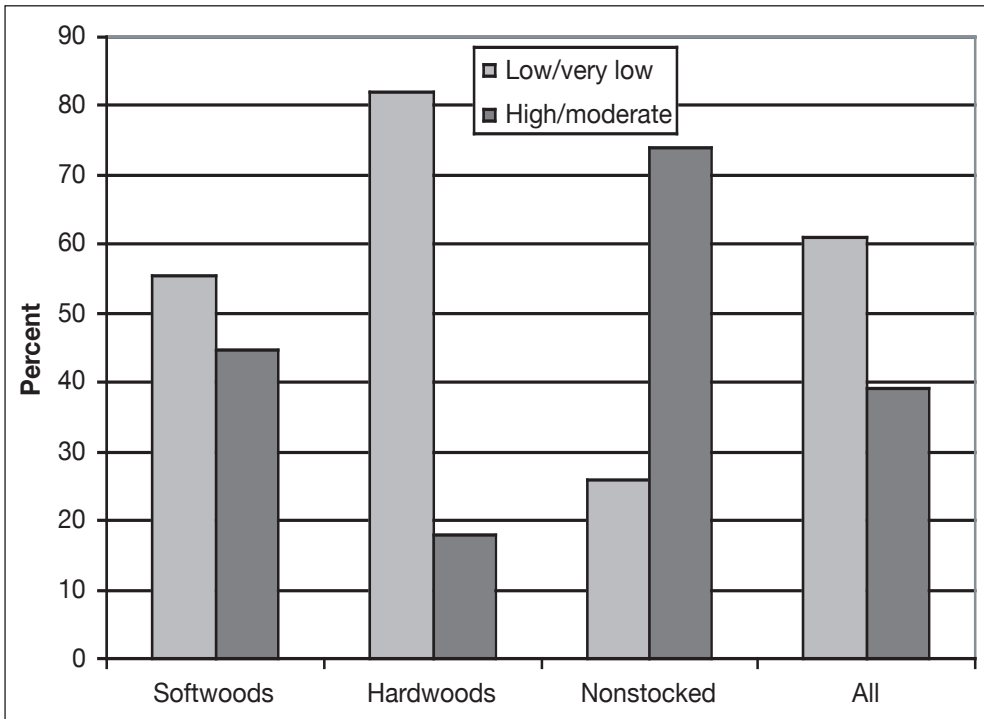
Figure 4—Proportion of area by type and burn-severity class, Siskiyou Biscuit Fire.
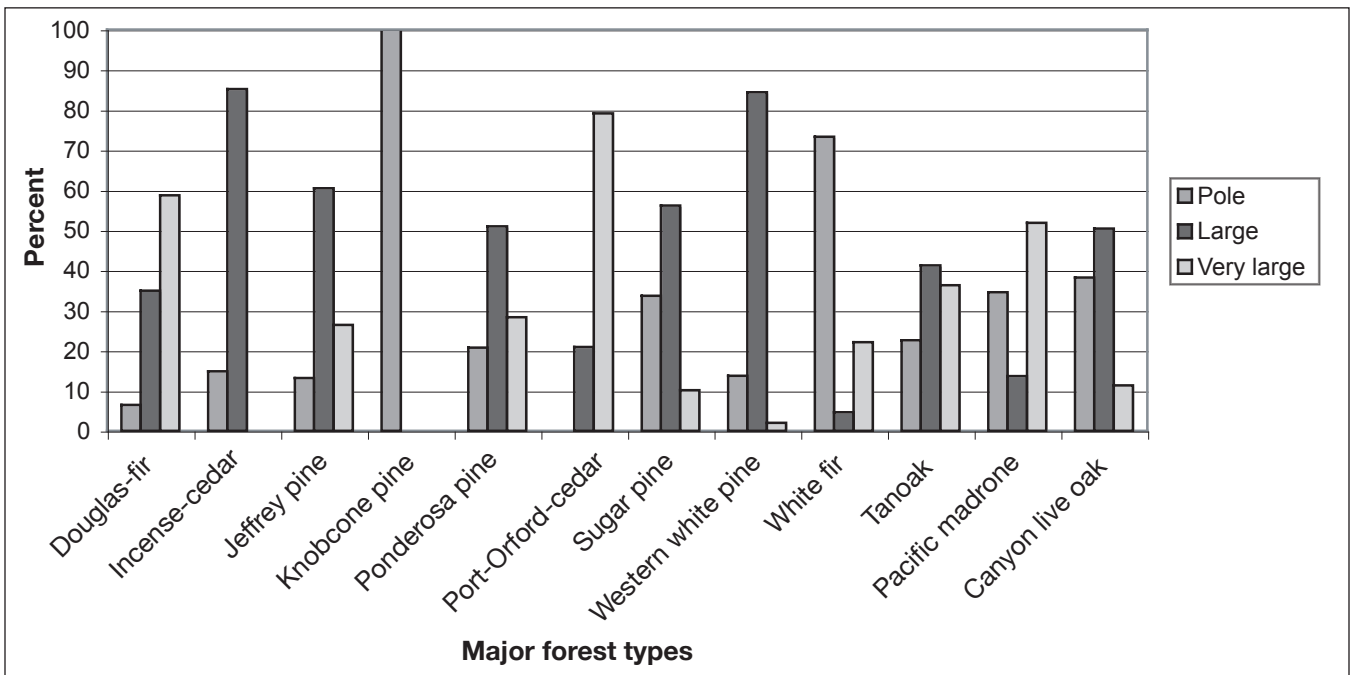
Figure 5—Proportion of area by stand size class and major forest type, Siskiyou Biscuit Fire.

For hardwoods on nonreserved lands, 63 percent of the area had stands of large and very large trees (hardwoods ≥11 inches d.b.h.), 3 percent of the area had seedling and sapling stands, and the remaining 34 percent of the area had pole-sized stands (5-11 inches d.b.h.; app. table 10).

Although stand size class was not strongly correlated with burn severity on a continuous scale, for all lands, 76 percent of the very large class (≥20 inches d.b.h.) was classified as low/very low severity (app. table 11). Forty-six percent of the large class was classified as low/very low severity, and only 26 percent of nonstocked land was classified as low/very low.

Timber Volume and Burn Severity

Two types of timber volume were calculated, cubic-foot and board-foot volume (Scribner rule), the main difference being merchantability standards for different-sized trees. Board-foot volumes per acre include only merchantable species valued for timber. Fuel hazards of small-diameter trees and ladder fuels of nonmerchantable species are better represented by examining the relationship between cubic-foot volume per acre existing prior to the fire and the mapped postfire burn severity. Prefire softwood and hardwood cubic-foot volumes were pooled for the entire burn area according to the postfire burn-severity classification. Sixty-four percent of all plots classified as high/moderate burn severity had low volume (zero to 2,000 cubic feet per acre), compared to only 32 percent for those classified as low/very low severity.

Of the combined total hardwood and softwood volume of 1.77 billion gross cubic feet, 71 percent was in softwood types, 28 percent in hardwood types, and less than 1 percent nonstocked (app. table 13). With the exception of nonstocked areas, the volume in the low and very low severity classes was at least twice the volume in the high and moderate severity classes (app. table 13, table 3).

Although the inventory sampled a large number of species, many of them are relatively limited in volume. Over 89 percent of the cubic-foot volume in nonreserved softwoods is accounted for by 3 of the 13 species: Douglas-fir (74.8 percent), sugar pine (9.9 percent), and Port-Orford-cedar (4.6 percent) (app. table 18).

Codominants and other species can be important components of the total forest-type volume. For example, sugar pine is frequently an important component of other forest types that burned to a degree of severity different than that of the sugar pine type. Although a high proportion (77 percent) of the volume for the sugar pine type is classified as high severity, a low proportion of sugar pine volume is found on land classified as high-severity burn.

The proportions of cubic-foot volume in burn-severity classes by forest type differ from the proportions by species because some species are major components of forest types named for other species (table 4).

Table 3—Percentage of prefire cubic-foot volume in burn-severity classes, by broad forest type

	Burn severity	
Forest type	High/Mod	Low/Very low
Softwood types:	28.1	71.9
Nonreserved	26.3	73.7
Reserved	32.1	67.9
Hardwood types:	5.6	94.4
Nonreserved	7.9	92.1
Reserved	3.3	96.7
Nonstocked:	84.7	16.9
Nonreserved	54.5	45.5
Reserved	100.0	0
All types	21.9	78.1

Table 4—Percentage of prefire cubic-foot volume in burn-severity classes by forest type or species

	High/moderate		Low/very low	
	Forest type	Individual species	Forest type	Individual species
		Percent		
Douglas-fir	22	19	78	81
Port-Orford-cedar	43	31	57	69
Sugar pine	77	30	23	70
Western white pine	68	73	32	27
Canyon live oak	14	16	86	84
Golden chinkapin	11	4	89	96
Pacific madrone	—	10	100	90
Tanoak	6	8	94	92

The gross Scribner standing prefire board-foot volume on all land was 7.018 billion board feet (app. table 15). Three-fourths of the total board-foot volume is accounted for in 5.3 billion board feet of softwood forest types. However, comparison of forest-type board-foot and species board-foot volumes demonstrates that there is a considerable mixture of softwood species in areas identified as hardwood types (app. tables 15 and 18). Softwood species, regardless of the forest type in which they occur, represent 92 percent of the total species board-foot volume. In the

nonreserved area, sawtimber-sized trees accounted for less than 4.4 billion board feet of softwood volume and slightly more than 250 million board feet of hardwood volume (app. table 19).

On all land, over 78 percent of the board-foot volume in softwood species was found on areas classified as low/very low severity (app. table 21). Of the softwood sawtimber board-foot volume on nonreserved land, 35 percent was in very low severity, 42 percent was in low, 12 percent was in moderate, and 10 percent was in high severity (app. table 22).

Prefire board-foot volume differed significantly between low/very-low-severity plots and the high/moderate-severity plots (table 5). Sixty-two percent of all low/very low plots exceeded 10,000 board feet of sawtimber per acre. In contrast, 26 percent of all plots classified as high/moderate burn severity had greater than 10,000 board feet of softwood sawtimber volume per acre.

Volume per acre was negatively correlated with low-stature brush cover and the ratio of nonsawtimber (small) trees to sawtimber (large) trees. Volume per acre was positively correlated with the number of snags and the biomass of large ($\geq$20 inches in diameter) down woody debris.

Table 5—Average board- and cubic-foot volume per acre with standard errors by burn area emergency rehabilitation (BAER) burn severity

	BAER burn severity			
	High	Moderate	Low	Very low
	1,000 board feet, Scribner rule			
Board-foot volume per acre	10.6	7.8	17.6	24.7
Standard error	2.5	1.7	1.8	2.6
	1,000 cubic feet			
Cubic-foot volume per acre	2.6	2.1	3.6	4.6
Standard error	.55	.42	.40	.56

Site and Fire Severity

Compared to all national forest land in western Oregon (table 6), the land within the Siskiyou Biscuit Fire perimeter is classified as lower productivity land (lower site class means higher productivity land). Low-productivity (site class VI and VII) land accounts for almost 45 percent of the Siskiyou Biscuit Fire land compared to 13 percent for all national forests in western Oregon. On the most productive land within the burn perimeter (site class III), only 20 percent of the plots were classified as high or moderate severity (fig. 6). As site productivity decreased, the proportion

of area classified as higher severity increased. At the lowest site productivity (site class VII), 73 percent of the area was classified as high/moderate severity (fig. 6).

Table 6—Comparison of productivity on the Siskiyou Biscuit Fire and all national forests in western Oregon

Site class	Burn area	All western Oregon national forests
	Percent	
I=High productivity	—	2.9
II	—	10.3
III	7.5	25.7
IV	19.7	29.0
V	28.2	18.8
VI	25.2	9.3
VII=Low productivity	19.3	4.0
Total	100	100
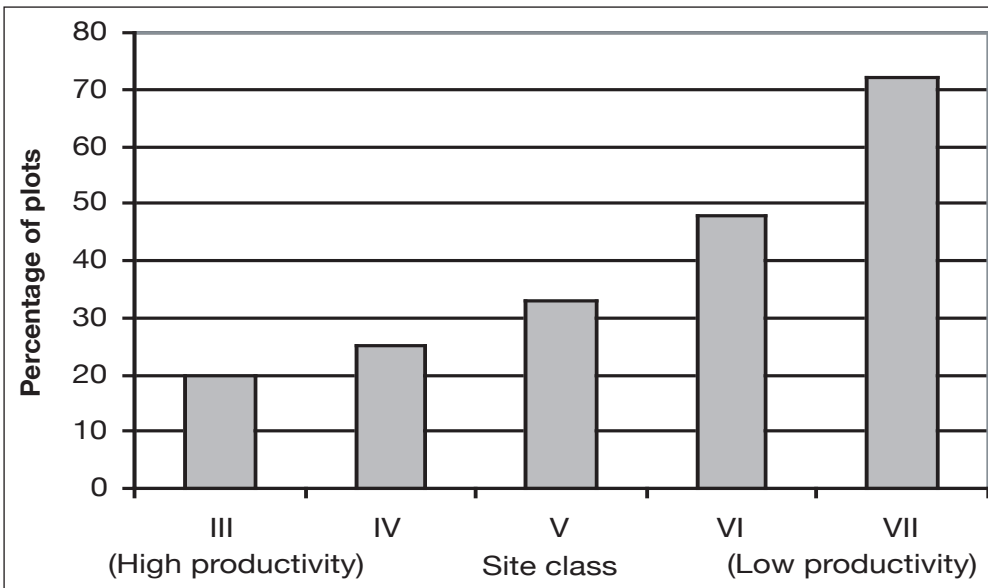
Figure 6—Percentage of plots that were rated as highly or moderately burned, by site class.

Understory Characteristics and Burn Severity

Prefire understory vegetation cover appears to be related to fire severity. Plots classed as very low in severity had significantly less understory vegetation cover in the 1-to-5-foot height range than did the highly or moderately burned plots (table 7).

Table 7—Average percentage of cover, down woody material, and large-to-small-tree ratio with standard errors, by burn severity

	BAER[a] burn severity			
	High	**Moderate**	**Low**	**Very low**
Cover in 1-5-foot height class (percent)	43	43	31	23
Standard error	5	3	4	4
Small to large tree ratio (number of trees)	94	103	77	30
Standard error	24	26	13	5
Down woody material >5 inches in diameter (tons/acre)	4.23	4.46	9.14	5.58
Standard error	1.84	1.27	1.97	1.45

[a] Burn area emergency rehabilitation.

We evaluated one component of potential ladder fuels by examining the ratio of pole-sized trees to large trees according to fire-severity class. The ratio of the small-diameter to large-diameter trees was higher in stands classified as high/moderate burn severity (99.5 pole/large trees) compared with low/very-low-severity stands (57.9 pole/large trees).

Biomass of DWM is calculated from cubic-foot volume by using an average specific gravity (USDA FS 1987) and an average decay class (Waddell 2002). The lowest prefire average biomass per acre of down woody material was estimated for plots classified as high-severity burn (mean = 4.23). Average down woody material biomass was estimated at 9.14 tons per acre on land classified as low burn severity, and 5.58 tons per acre on lands classified as very low.

Discussion

Plots with low and very low burn severity, which had greater timber volume than plots with high and moderate burn severity, generally had greater productivity, larger trees, less brush, and fewer small trees per large tree. Ecologically, these stands are likely at the stem exclusion stage (Oliver and Larson 1996) and later so that understory brush and subdominant trees are excluded or minimal in amount. We speculate that the lack of ladder fuels and the high canopy base kept the fire at a lower severity in these stands. There are several important factors that are not considered in this paper, most notably weather and slope. The addition of these variables along with field-based estimates of fire severity that will soon be in hand should provide an excellent opportunity to evaluate the conditions that produce extreme fire effects in these forests.

Although the fire area is divided into two historical management regimes, reserved and nonreserved, the forest statistics are remarkably similar. The percentage of area in the four major softwood types (Douglas-fir, sugar pine, western white pine, and Jeffrey pine) is roughly the same for both the nonreserved and reserved areas (63 percent). The nonreserved area has a slightly higher percentage of its pre-fire volume in softwood species than the reserved—94 and 85 percent, respectively. The greatest discrepancy shows up in the upper part of the age-class distribution, where the nonreserved and reserved areas have 37 versus 53 percent of the area in the 100-200 age class. Surprisingly, the nonreserved portion has a greater percentage of its area in the 200+ age class—29 percent versus 15 in the reserved. The relative similarity between the nonreserved and reserved areas suggests that factors other than active management, such as fire and insects, are the controlling influences within the fire area.

The use of a mapped product like the BAER fire-severity map, in conjunction with plot data can produce some anomalous results. The mapped product will depend on the sensitivity of the remotely sensed image to the ground parameters and the size of the minimum mapping unit. Fire severity is arbitrarily condensed into four classes for convenience. Although the severity estimates of the overall burn may be quite good, the actual severity of an individual plot could be quite different than how it was classed by the map overlay.

Considering present forest plan administrative divisions, less than 15 percent of national forest area falls into the riparian reserves and matrix land. The matrix land is where management for multiple uses including resource extraction is allowed. The subset of matrix land where all postfire recovery options, including resource extraction, brush control, and reforestation, may be used is relatively small. Recovery efforts, including salvage harvests will be limited by the area of land available for various treatments.

Areas with the highest fire severity have much of the litter and fine fuel consumed and greater than 40 percent tree mortality. These areas are probably the best candidates for recovery efforts such as reforestation and erosion control. With 44 percent of the burn area in site class VI and VII (correlated with high burn severity and low site productivity), recovery efforts such as reforestation will need careful consideration. Many of the low-productivity areas will be difficult to reforest with conifer species like Douglas-fir, although some of the hardwood species may be easier to establish.

Names of Trees

Common name	Scientific name[a]
Softwoods:	
Brewer spruce	*Picea breweriana* Wats.[b]
Douglas-fir	*Pseudotsuga menziesii* (Mirb.) Franco
Incense-cedar	*Calocedrus decurrens* (Torr.) Florin.
Jeffrey pine	*Pinus jeffreyi* Grev. & Balf.
Knobcone pine	*Pinus attenuata* Lemm.
Lodgepole pine	*Pinus contorta* Dougl. ex Loud.
Pacific yew	*Taxus brevifolia* Nutt.
Ponderosa pine	*Pinus ponderosa* Dougl. ex Laws.
Port-Orford-cedar	*Chamaecyparis lawsoniana* (A. Murr.) Parl.
Shasta red fir	*Abies shastensis* (Lemmon)
Sugar pine	*Pinus lambertiana* Dougl.
Western juniper	*Juniperus occidentalis* Hook.
Western white pine	*Pinus monticola* Dougl. ex D. Don
White fir	*Abies concolor* (Gord. & Glend.) Lindl. ex Hildebr.
Hardwoods:	
Bigleaf maple	*Acer macrophyllum* Pursh
California black oak	*Quercus kelloggii* Newb.
California-laurel	*Umbellularia californica* (Hook. & Arn.) Nutt.
Canyon live oak	*Quercus chrysolepis* Liebm.
Golden chinkapin	*Chrysolepis chrysophylla* (Dougl. ex Hook.) Hjelmqvist[b]
Pacific dogwood	*Cornus nuttallii* Audubon
Pacific madrone	*Arbutus menziesii* Pursh
Red alder	*Alnus rubra* Bong.
Tanoak	*Lithocarpus densiflorus* (Hook. & Arn.) Rehd.
White alder	*Alnus rhombifolia* Nutt.

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[a] Nomenclature per Little 1979.
[b] Nomenclature per USDA NRCS 2004.

Metric Equivalents

1 acre = 0.405 hectare

1 acre = 4046.86 square meters

1,000 acres = 404.7 hectares

1,000 cubic feet = 28.3 cubic meters

1 cubic foot per acre = 0.07 cubic meter per hectare

1 foot = 0.3048 meter

1 inch = 2.54 centimeters

1 mile = 1.609 kilometers

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Appendix

Table 8—Estimated area of forest land, by prefire forest type and land class, Biscuit Fire 2002, Siskiyou National Forest[a]

Forest type	Nonreserved	Reserved	Total
		Thousand acres	
Softwood types:			
Douglas-fir	132.0	72.8	204.8
Incense-cedar	2.6	—	2.6
Jeffrey pine	14.4	—	14.4
Knobcone pine	1.9	6.3	8.2
Ponderosa pine	3.4	1.9	5.3
Port-Orford-cedar	9.1	—	9.1
Sugar pine	6.1	12.6	18.6
Western white pine	28.0	23.8	51.9
White fir	2.3	—	2.3
Total softwood types	199.8	117.4	317.3
Hardwood types:			
Bigleaf maple	.8	—	.8
California-laurel	.4	—	.4
Canyon live oak	15.5	10.1	25.6
Golden chinkapin	—	6.3	6.3
Pacific madrone	11.0	—	11.0
Tanoak	43.2	33.3	76.5
Total hardwood types	70.8	49.6	120.5
Nonstocked[b]	14.8	7.5	22.3
All types	285.4	174.5	460.0

— = less than 500 acres found.
[a] Totals may be off because of rounding; data subject to sampling error.
[b] Nonstocked areas are less than 10 percent stocked with live trees.

Table 9—Estimated area of prefire forest type by burn-severity class on all lands, Biscuit Fire 2002, Siskiyou National Forest[a]

	Burn severity				
Forest type:	High	Moderate	Low	Very low	Total
	Thousand acres				
Softwood types:					
Douglas-fir	28.3	41.5	86.9	48.2	204.9
Incense-cedar	—	2.7	—	—	2.7
Jeffrey pine	5.3	7.6	1.5	—	14.4
Knobcone pine	8.2	—	—	—	8.2
Ponderosa pine	—	—	5.3	—	5.3
Port-Orford-cedar	1.9	3.4	3.8	—	9.1
Sugar pine	10.4	—	1.9	6.3	18.6
Western white pine	3.8	28.6	17.6	1.9	51.9
White fir	—	—	.4	1.9	2.3
Total softwood types	57.9	83.7	117.4	58.3	317.3
Hardwood types:					
Bigleaf maple	—	—	—	.8	.8
California-laurel	.4	—	—	—	.4
Canyon live oak	3.8	3.8	18.0	—	25.6
Golden chinkapin	—	—	—	6.3	6.3
Pacific madrone	1.9	—	1.9	7.2	11.0
Tanoak	3.4	8.2	29.6	35.3	76.5
Total hardwood types	9.5	12.0	49.5	49.5	120.5
Nonstocked[b]	3.8	12.7	5.8	—	22.3
All types	71.2	108.4	172.8	107.8	460.1
Standard error	15	17	19	16	5

— = less than 500 acres found.
[a] Totals may be off because of rounding; data subject to sampling error.
[b] Nonstocked areas are less than 10 percent stocked with live trees.

Table 10—Estimated area of prefire forest type and stand size class by land class, Biscuit Fire 2002, Siskiyou National Forest

Forest type	Nonreserved					Reserved					Grand total
	Seedling/ sapling	Pole	Large	Very large	Total	Seedling/ sapling	Pole	Large	Very large	Total	
						Thousand acres					
Softwoods:											
Douglas-fir	—	5.7	44.5	81.9	132.0	—	7.5	27.0	38.3	72.8	204.9
Incense-cedar	—	.4	2.3	—	2.7	—	—	—	—	—	2.7
Jeffrey pine	—	1.9	8.7	3.8	14.4	—	—	—	—	—	14.4
Knobcone pine	—	1.9	—	—	1.9	—	6.3	—	—	6.3	8.2
Ponderosa pine	—	—	1.9	1.5	3.4	—	1.1	.8	—	1.9	5.3
Port-Orford-cedar	—	—	1.9	7.2	9.1	—	—	—	—	—	9.1
Sugar pine	—	—	4.2	1.9	6.1	—	6.3	6.3	—	12.6	18.6
Western white pine	—	—	21.2	.8	28.0	—	6.3	17.6	—	23.9	51.9
White fir	—	—	.4	1.9	2.3	—	—	—	—	—	2.3
Total	—	15.9	85.0	98.9	199.8	—	27.5	51.6	38.3	117.4	317.3
Hardwoods:											
Bigleaf maple	—	—	.8	—	.8	—	—	—	—	—	.8
California-laurel	—	.4	—	—	.4	—	—	—	—	—	.4
Canyon live oak	1.9	9.1	1.9	2.7	15.5	—	—	10.1	—	10.1	25.6
Golden chinkapin	—	—	—	—	—	—	—	6.3	—	6.3	6.3
Pacific madrone	—	3.8	1.5	5.7	11.0	—	—	—	—	—	11.0
Tanoak	—	11.0	19.0	13.3	43.2	—	6.3	12.6	14.5	33.3	76.5
Total	1.9	24.2	23.1	21.6	70.9	—	6.3	28.9	14.4	49.6	120.5
Nonstocked	—	—	—	—	14.8	—	—	—	—	7.5	22.3
All types	1.9	40.2	108.1	120.5	285.5	—	33.8	80.5	52.8	174.6	460.1

— = less than 500 acres found.

Table 11—Estimated area of prefire stand size class on all lands, by burn-severity class, Biscuit Fire 2002, Siskiyou National Forest

Stand-size class	High	Moderate	Low	Very low	Total
		Thousand acres			
Seedling/sapling	—	—	1.9	—	1.9
Pole	15.8	3.9	34.8	19.5	74.0
Large	40.3	61.0	53.6	33.8	188.7
Very large	11.4	30.7	76.7	54.5	173.3
Nonstocked	3.8	12.7	5.8	—	22.3
Total	71.2	108.4	172.8	107.8	460.1

— = less than 500 acres found.

Table 12—Estimated area by burn severity and land class, Biscuit Fire 2002, Siskiyou National Forest

Land class	High	Moderate	Low	Very low	Total
		Thousand acres			
Admininistratively withdrawn	3.8	13.3	9.5	—	26.5
Congressionally withdrawn (wilderness area)	33.3	45.8	55.9	39.6	174.6
Late-successional reserves	32.2	39.8	86.5	43.6	202.1
Riparian reserves/matrix	1.9	9.5	20.8	24.6	56.9
Total	71.2	108.4	172.8	107.8	460.1

— = less than 500 acres found.

Table 13—Estimated gross prefire cubic-foot volume on reserved and nonreserved lands, by forest type and burn-severity class, Biscuit Fire 2002, Siskiyou National Forest[a]

Forest type	Burn severity				Total
	High	**Moderate**	**Low**	**Very low**	
	Million cubic feet				
Softwood types:					
Nonreserved	105.2	126.8	355.4	294.4	881.7
Reserved	61.2	61.7	166.0	94.0	382.9
Total	166.4	188.5	521.3	388.4	1,264.6
Hardwood types:					
Nonreserved	10.5	9.7	93.4	140.9	254.5
Reserved	7.1	.9	84.7	151.9	244.6
Total	17.6	10.6	178.1	292.8	499.0
Nonstocked:[b]					
Nonreserved	.7	.5	1.0	—	2.2
Reserved	—	3.8	—	—	3.8
Total	.7	4.3	1.0	—	5.9
All types	184.7	203.3	700.4	681.2	1,769.5

— = less than 500,000 cubic feet found.
[a] Totals may be off because of rounding; data subject to sampling error.
[b] Nonstocked areas are less than 10 percent stocked with live trees.

Table 14—Estimated prefire gross cubic-foot volume on reserved and non-reserved lands, by forest type and land class, Biscuit Fire 2002, Siskiyou National Forest[a]

Forest type	Nonreserved	Reserved	Total
	Million cubic feet		
Softwood types:			
Douglas-fir	768.3	323.8	1,092.1
Incense-cedar	3.5	—	3.5
Jeffrey pine	17.6	—	17.6
Knobcone pine	2.6	4.1	6.7
Port-Orford-cedar	30.6	—	30.6
Sugar pine	23.6	13.9	37.5
Western white pine	28.9	41.0	69.9
White fir	6.7	—	6.7
Total softwood types	881.7	382.9	1,264.6
Hardwood types:			
Bigleaf maple	3.7	—	3.7
California-laurel	.9	—	.9
Canyon live oak	22.6	41.4	64.0
Golden chinkapin	—	72.7	72.7
Pacific madrone	48.0	—	48.0
Tanoak	179.3	130.4	309.7
Total hardwood types	254.5	244.6	499.0
Nonstocked[b]	2.2	3.8	5.9
All types	1,138.4	631.2	1,769.5

— = less than 500,000 cubic feet found.
[a] Totals may be off because of rounding; data subject to sampling error.
[b] Nonstocked areas are less than 10 percent stocked with live trees.

Table 15—Estimated prefire gross board-foot volume on reserved and non-reserved lands, by forest type and land class, Biscuit Fire 2002, Siskiyou National Forest[a]

Forest type	Nonreserved	Reserved	Total
	Million board feet, Scribner rule		
Softwood types:			
Douglas-fir	3,408.7	1,305.0	4,713.7
Incense-cedar	10.9	—	10.9
Jeffrey pine	54.8	—	54.8
Knobcone pine	1.3	9.6	10.9
Port-Orford-cedar	117.3	—	117.3
Sugar pine	112.5	42.9	155.5
Western white pine	75.5	112.8	188.3
White fir	25.7	—	25.7
Total softwood types	3,806.8	1,470.4	5,277.2
Hardwood types:			
Bigleaf maple	13.9	—	13.9
California-laurel	2.1	—	2.1
Canyon live oak	69.1	141.5	210.6
Golden chinkapin	—	343.9	343.9
Pacific madrone	147.7	—	147.7
Tanoak	587.3	424.2	1,006.5
Total hardwood types	815.2	909.6	1,724.7
Nonstocked[b]	4.5	11.2	15.8
All types	4,626.5	2,391.1	7,017.6

— = less than 500,000 board feet found.
[a] Totals may be off because of rounding; data subject to sampling error.
[b] Nonstocked areas are less than 10 percent stocked with live trees.

Table 16—Estimated prefire gross cubic-foot volume on all lands, by forest type and burn-severity class, Biscuit Fire 2002, Siskiyou National Forest[a]

Forest type	High	Moderate	Low	Very low	Total
	Burn severity				
	Million cubic feet				
Softwood types:					
Douglas-fir	119.0	120.7	481.7	370.7	1,092.1
Incense-cedar	—	3.5	—	—	3.5
Jeffrey pine	6.1	9.7	1.8	—	17.6
Knobcone pine	6.7	—	—	—	6.7
Port-Orford-cedar	3.6	9.7	17.4	—	30.6
Sugar pine	28.8	—	1.2	7.6	37.5
Western white pine	2.3	45.0	19.2	3.3	69.9
White fir	—	—	—	6.7	6.7
Total softwood types	166.4	188.5	521.3	388.4	1,264.6
Hardwood types:					
Bigleaf maple	—	—	—	3.7	3.7
California-laurel	.9	—	—	—	.9
Canyon live oak	7.9	.9	55.3	—	64.0
Golden chinkapin	—	—	—	72.7	72.7
Pacific madrone	—	—	6.5	41.5	48.0
Tanoak	8.9	9.7	116.3	174.9	309.7
Total hardwood types	17.6	10.6	178.1	292.8	499.0
Nonstocked[b]	.7	4.3	1.0	—	6.0
All types	184.7	203.3	700.4	681.2	1,769.5

— = less than 500,000 cubic feet found.
[a] Totals may be off because of rounding; data subject to sampling error.
[b] Nonstocked areas are less than 10 percent stocked with live trees.

Table 17—Estimated gross prefire board-foot volume on all lands, by forest type and burn-severity class, Biscuit Fire 2002, Siskiyou National Forest[a]

Forest type	Burn severity				Total
	High	Moderate	Low	Very low	
	Million board feet, Scribner rule				
Softwood types:					
Douglas-fir	459.7	477.7	2,154.3	1,622.0	4,713.7
Incense-cedar	—	10.9	—	—	10.9
Jeffrey pine	18.0	32.3	4.5	—	54.8
Knobcone pine	10.9	—	—	—	10.9
Port-Orford-cedar	12.2	37.0	68.1	—	117.3
Sugar pine	130.6	—	3.1	21.8	155.5
Western white pine	5.8	129.5	42.8	10.2	188.3
White fir	—	—	—	25.7	25.7
Total softwood types	637.2	687.5	2,272.8	1,679.8	5,277.2
Hardwood types:					
Bigleaf maple	—	—	—	13.9	13.9
California-laurel	2.1	—	—	—	2.1
Canyon live oak	14.2	1.5	194.8	—	210.6
Golden chinkapin	—	—	—	343.9	343.9
Pacific madrone	—	—	26.5	121.2	147.7
Tanoak	19.0	36.8	378.2	572.4	1,006.5
Total hardwood types	35.3	38.4	599.6	1,051.4	1,724.7
Nonstocked[b]	1.4	12.2	2.1	—	15.8
All types	673.9	738.0	2,874.4	2,731.2	7,017.6

— = less than 500,000 board feet found.
[a] Totals may be off because of rounding; data subject to sampling error.
[b] Nonstocked areas are less than 10 percent stocked with live trees.

Table 18—Estimated gross prefire cubic-foot volume on reserved and non-reserved lands, by tree species and land class, Biscuit Fire 2002, Siskiyou National Forest[a]

Tree species	Nonreserved	Reserved	Total
	Million cubic feet		
Softwood species:			
Brewer spruce	.2	—	.2
Douglas-fir	715.2	345.3	1,060.5
Incense-cedar	14.4	2.1	16.5
Jeffrey pine	25.8	1.8	27.6
Knobcone pine	13.3	3.6	16.9
Lodgepole pine	1.1	4.0	5.2
Pacific yew	.9	.1	1.0
Ponderosa pine	4.1	4.4	8.5
Port-Orford-cedar	44.4	.6	45.0
Shasta red fir	1.6	—	1.6
Sugar pine	94.9	56.2	151.1
Western juniper	—	—	—
Western white pine	23.4	36.6	60.0
White fir	15.8	.2	16.0
Total softwoods	954.9	455.0	1,409.9
Hardwood species:			
Bigleaf maple	8.7	11.4	20.1
California black oak	4.4	.1	4.5
California-laurel	.9	.8	1.6
Canyon live oak	19.3	30.9	50.2
Golden chinkapin	15.2	25.9	41.1
Pacific dogwood	.4	.1	.5
Pacific madrone	46.1	39.7	85.8
Red alder	1.1	1.3	2.4
Tanoak	87.1	66.1	153.2
White alder	.2	—	.2
Total hardwoods	183.4	176.2	359.6
All species	1,138.4	631.2	1,769.5

— = less than 500,000 cubic feet found.
[a] Totals may be off because of rounding; data subject to sampling error.

Table 19—Estimated prefire gross board-foot volume on reserved and non-reserved lands, by tree species and land class, Biscuit Fire 2002, Siskiyou National Forest[a]

Species	Nonreserved	Reserved	Total
	Million board feet, Scribner rule		
Softwood species:			
Brewer spruce	0.1	—	0.1
Douglas-fir	3,356.1	1,615.2	4,971.3
Incense-cedar	48.1	4.4	52.5
Jeffrey pine	105.6	7.2	112.9
Knobcone pine	31.6	4.0	35.7
Lodgepole pine	.4	4.2	4.6
Pacific yew	.9	—	.9
Ponderosa pine	25.9	20.2	46.2
Port-Orford-cedar	182.8	2.3	185.2
Shasta red fir	4.8	—	4.8
Sugar pine	502.9	301.1	804.0
Western white pine	60.4	102.2	162.6
White fir	56.5	—	56.5
Total softwoods	4,376.2	2,061.0	6,437.2
Hardwood species:			
Bigleaf maple	7.7	9.5	17.2
California black oak	3.2	.1	3.3
California-laurel	.8	—	.8
Canyon live oak	5.0	12.5	17.5
Golden chinkapin	22.2	119.2	141.4
Pacific madrone	27.8	26.4	54.2
Red alder	4.0	6.1	10.1
Tanoak	178.8	156.5	335.3
White alder	.7	—	.7
Total hardwoods	250.3	330.2	580.4
All species	4,626.5	2,391.1	7,017.6

— = less than 500,000 board feet found.
[a] Totals may be off because of rounding; data subject to sampling error.

Table 20—Estimated prefire gross cubic-foot volume on all lands, by species and burn-severity class, Biscuit Fire 2002, Siskiyou National Forest[a]

Species	Burn severity				Total
	High	**Moderate**	**Low**	**Very low**	
	Million cubic feet				
Softwood species:					
Brewer spruce	—	0.1	0.1	—	0.2
Douglas-fir	97.6	104.3	458.8	399.9	1,060.5
Incense-cedar	3.1	8.5	1.8	3.1	16.5
Jeffrey pine	4.8	9.3	7.7	5.7	27.6
Knobcone pine	4.5	4.4	3.4	4.6	16.9
Lodgepole pine	.5	2.9	.2	1.6	5.2
Pacific yew	—	.4	.3	.2	1.0
Ponderosa pine	6.7	.2	1.6	—	8.5
Port-Orford-cedar	2.2	11.6	26.5	4.8	45.0
Shasta red fir	—	.4	—	1.2	1.6
Sugar pine	35.7	9.3	55.7	50.5	151.1
Western white pine	4.0	39.7	14.5	1.9	60.0
White fir	2.6	1.5	1.1	10.8	16.0
Total softwoods	161.6	192.5	571.6	484.1	1,409.9
Hardwood species:					
Bigleaf maple	1.0	1.0	6.3	11.8	20.1
California black oak	1.5	.1	—	3.0	4.5
California-laurel	—	.1	.8	.8	1.6
Canyon live oak	4.8	3.4	25.8	16.2	50.2
Golden chinkapin	1.6	.1	6.7	32.7	41.1
Pacific dogwood	—	—	.4	.1	.5
Pacific madrone	6.1	2.7	27.6	49.4	85.8
Red alder	—	—	.1	2.3	2.4
Tanoak	8.2	3.4	61.1	80.6	153.2
White alder	—	—	—	.2	.2
Total hardwoods	23.1	10.8	128.8	197.0	359.6
All species	184.7	203.3	700.4	681.2	1,769.5

— = less than 500,000 cubic feet found.
[a] Totals may be off because of rounding; data subject to sampling error.

Table 21—Estimated gross prefire board-foot volume on all lands, by species and burn-severity class, Biscuit Fire 2002, Siskiyou National Forest[a]

Species	Burn severity				Total
	High	**Moderate**	**Low**	**Very low**	
	Million board feet, Scribner rule				
Softwood species:					
Brewer spruce	—	—	0.1	—	0.1
Douglas-fir	385.8	448.3	2,201.5	1,935.8	4,971.3
Incense-cedar	8.1	26.6	4.8	13.0	52.5
Jeffrey pine	15.9	33.4	34.6	29.0	112.9
Knobcone pine	3.1	9.2	10.1	13.3	35.7
Lodgepole pine	.4	4.2	—	—	4.6
Pacific yew	—	.2	.3	.4	.9
Ponderosa pine	34.8	.6	10.8	—	46.2
Port-Orford-cedar	8.5	42.6	112.2	21.9	185.2
Shasta red fir	.9	—	4.0	4.8	9.7
Sugar pine	182.2	36.5	293.4	291.9	804.0
Western white pine	9.9	118.0	29.9	4.9	162.6
White fir	7.0	3.9	2.4	43.3	56.5
Total softwoods	655.6	724.3	2,699.9	2,357.3	6,437.2
Hardwood species:					
Bigleaf maple	1.2	1.0	3.3	11.6	17.2
California black oak	1.3	.1	—	1.9	3.3
California-laurel	—	—	.8	—	.8
Canyon live oak	1.9	.5	8.3	6.7	17.5
Golden chinkapin	1.0	—	11.9	128.5	141.4
Pacific madrone	2.9	1.0	16.1	34.3	54.2
Red alder	—	—	.4	9.8	10.1
Tanoak	10.1	11.1	133.7	180.4	335.3
White alder	—	—	—	.7	.7
Total hardwoods	18.3	13.7	174.6	373.9	580.4
All types	673.9	738.0	2,874.4	2,731.2	7,017.6

— = less than 500,000 board feet found.
[a] Totals may be off because of rounding; data subject to sampling error.

Table 22—Estimated gross prefire board-foot volume on nonreserved lands only, by species and burn-severity class, Biscuit Fire 2002, Siskiyou National Forest[a]

Species	Burn severity				Total
	High	Moderate	Low	Very low	
	Million board feet, Scribner rule				
Softwood species:					
Brewer spruce	—	—	0.1	—	0.1
Douglas-fir	237.0	355.0	1,413.7	1,350.4	3,356.1
Incense-cedar	3.9	26.5	4.8	13.0	48.1
Jeffrey pine	13.5	33.1	34.6	24.4	105.6
Knobcone pine	2.7	6.2	10.1	12.7	31.6
Lodgepole pine	.4	—	—	—	.4
Pacific yew	—	.2	0.3	.4	.9
Ponderosa pine	15.1	—	10.8	—	25.9
Port-Orford-cedar	8.5	42.6	109.8	21.9	182.8
Shasta red fir	—	.9	—	4.0	4.8
Sugar pine	147.1	29.9	251.2	74.6	502.9
Western white pine	8.7	25.3	21.6	4.9	60.4
White fir	7.0	3.9	2.4	43.3	56.5
Total softwood types	443.7	523.6	1,859.4	1,549.5	4,376.2
Hardwood species:					
Bigleaf maple	1.2	1.0	.7	4.8	7.7
California black oak	1.3	—	—	1.9	3.2
California-laurel	—	—	.8	—	.8
Canyon live oak	.2	.2	3.7	1.0	5.0
Golden chinkapin	1.0	—	11.9	9.3	22.2
Pacific madrone	2.2	1.0	4.9	19.7	27.8
Red alder	—	—	.4	3.7	4.0
Tanoak	9.3	5.4	55.5	108.6	178.8
White alder	—	—	—	.7	.7
Total hardwood species	15.2	7.6	77.8	149.7	250.3
All types	458.9	531.2	1,937.2	1,699.9	4,626.5
Standard error	164	168	317	327	405

— = less than 500,000 board feet found.
[a] Totals may be off because of rounding; data subject to sampling error.

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