# 1992

# OREGON SMOKE MANAGEMENT ANNUAL REPORT

OREGON DEPARTMENT OF FORESTRY

"STEWARDSHIP IN FORESTRY"

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# OREGON SMOKE MANAGEMENT

# ANNUAL REPORT

# 1992


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# OREGON DEPARTMENT OF FORESTRY
# SMOKE MANAGEMENT 1992 ANNUAL REPORT

## 1992 SUMMARY

- Acres and tonnage burned in 1992 was about half of average in western Oregon while almost average in eastern Oregon.
- 1992 recorded the least number of intrusions since the program began. The 10 intrusions were 60% below the average.
- Of the 10 intrusions; the average, designated area experienced an average of 5 hours of direct smoke impact. There were no known heavy smoke impacts.
- Emissions from western Oregon burning continue to decline and are now about 65% lower than the baseline period of the late 1970's.
- Good visibility in the Cascade wilderness areas during the summer has increased from 70% of the time in 1982 to almost 100% of the time in 1991 and 1992.

## INTRODUCTION

The Oregon Smoke Management plan was developed as a voluntary program in 1969 and adopted as a regulatory program by the State Forester and the Environmental Quality Commission (EQC) in 1972. The Plan has gone through several major revisions since then. The last major revision to the Plan occurred in 1992. Changes to the Plan are discussed under the Program Summary.

The Smoke Management Plan is administered to keep the smoke of forest land prescribed burning from being carried to certain "designated areas" or other areas sensitive to smoke. The Plan is a framework through which emission reduction goals will be achieved. The State Forester administers the Plan, in cooperation with landowners, land management agencies and air quality agencies. The plan applies to state, federal, and private forest land in Oregon. Mandatory smoke management constraints apply to burning in western Oregon and the Deschutes National Forest, while voluntary programs are in effect in the Klamath Falls and La Grande areas, as shown in Figure 1.

There are six objectives to the Smoke Management Plan. They are:

1. Protection of public health,
2. Minimize smoke intrusions into designated population areas,
3. Reduction of emissions from prescribed burning,
4. Protection of visibility in Class I wilderness areas during the summer months,
5. Maximize burning opportunities while minimizing emissions, and
6. Coordination with other state smoke management programs.

| City | Date | Highest Daily PM-10 Concentration | Standard |
|---|---|---|---|
| Klamath Falls | January 31 | 221 ug/$m^3$ | 150 ug/$m^3$ |
| Lakeview | January 9 | 155 ug/$m^3$ | " |
| Oakridge | January 9 | 161 ug/$m^3$ | " |
| | January 18 | 178 ug/$m^3$ | " |

Slash burning did not occur on any of those dates. On January 8 the Willamette National Forest burned piles in the Special Protection Zone just to the east of Oakridge. LRAPA attributed the standard violation in Oakridge on January 9 to woodstove smoke.

**Protection of Visibility:**

Visibility in the Class I areas continues to improve, due in part to the summer burning restrictions in the northern Oregon Cascades. Over the past ten years, good visibility in the Cascades during the protection period has improved from about 70% to nearly 100% of the time, as shown in Figure 4. This is an average obtained from all available Cascade monitoring sites. The number of hours of impairment includes impacts from all sources of emissions. Forest land managers have severely reduced burning in the Cascade Range during the protection period to prevent impacts on the Class I wilderness areas (Table 4) and have reduced burning during the protection period throughout the area (Figure 5). In addition, high fire danger during the summer of 1992 virtually eliminated all prescribed burning in the protection period.

## PROGRAM SUMMARY

**Review of the Smoke Management Plan and the Visibility Plan:**

The required review of the Smoke Management Plan was completed in October 1992. The directive was revised to reflect the following changes:

a. Addition of new fuel consumption models, data collection and data entry procedures.

b. Addition of Special Protection Zone protection measures for PM-10 nonattainment areas.

c. Addition of Contingency Measures for areas not meeting PM-10 standards in the future.

d. Deletion of the priority burning system.

e. Further definition of when the Smoke Management Plan applies.

f. Lengthening of the plan review cycle, changing the audit requirements, dropping mandatory burn plan preparation for air quality reasons, and encouraging notification of adjacent landowners about proposed burning.

The major changes to the Visibility Protection Plan included extending the visibility protection period to July 1 to September 15 (It had been July 4 to Labor Day), and reducing the acres available for exception. The Visibility Plan also put additional constraints on agricultural burning.

The section continued to introduce and further develop programs to assist managers in planning fuels consumption during burns. The programs included: ACOST (Automatic Calculation Of Slash Tonnage), a program designed to calculate consumption for broadcast burns; and PCOST (Piled Calculation of Slash Tonnage), a program designed to calculate tonnage in slash piles. Both programs are designed to run as a spreadsheet in EXCEL or as a BASIC program on any stand alone P.C. These programs allow managers to plan more easily, select burning conditions that will minimize consumption and emissions while meeting management objectives and increase data accuracy.

**Program Accomplishment Data:**

The attached tables and figures highlight the results of the 1992 smoke management program. The data reflects the marked decrease in burning. Note that the decrease in tons consumed was greater than that for acres treated. This is, in part, a result of the continuing efforts to expand alternative, emission reducing burning techniques.

One of the techniques for reducing emissions is to shift burning from the fall, as had been common practice through the early 1980's, to the spring. Figure 8 shows the monthly burning patterns for the restricted and non-restricted areas. Although there is still a fall peak in burning, the springtime peak has increased in western Oregon as more forest managers shift burning into that season. Another technique to reduce emissions has been to encourage pile burning instead of broadcast burning (see Figures 9 and 10).

**TABLE 1**
**1984-1992 ACCOMPLISHMENT SUMMARY**

Burning totals within the restricted area:

| Year | Total No. Units | No. Units Burned | Acres Burned | Tons Burned | No. Intrusions |
|---|---|---|---|---|---|
| 1984 | 6,221 | 3,453 | 121,727 | 2,879,477 * | 38 |
| 1985 | 6,738 | 4,065 | 128,242 | 2,903,021 * | 39 |
| 1986 | 7,119 | 4,300 | 127,033 | 2,999,039 * | 22 |
| 1987 | 7,236 | 3,909 | 100,062 | 2,763,158 | 26 |
| 1988 | 7,880 | 4,321 | 104,518 | 2,400,577 | 29 |
| 1989 | 5,511 | 4,682 | 108,648 | 2,649,523 | 20 |
| 1990 | 6,541 | 4,012 | 84,746 | 1,930,279 | 14 |
| 1991 | 4,625 | 2,934 | 57,585 | 1,348,631 | 14 |
| **1992** | **3,686** | **2,568** | **48,039** | **1,168,032** | **10** |
| Average | 6,173 | 3,805 | 97,844 | 2,337,971 | 24 |

* Adjusted to include duff consumption.

Burning totals outside of the restricted area:

| Year | Total No. Units | No. Units Burned | Acres Burned | Tons Burned |
|---|---|---|---|---|
| 1987 | 1,301 | 1,114 | 86,473 | 923,250 |
| 1988 | 1,556 | 970 | 83,410 | 1,017,734 |
| 1989 | 1,655 | 1,519 | 114,311 | 1,831,726 |
| 1990 | 1,414 | 989 | 79,146 | 841,472 |
| 1991 | 1,869 | 916 | 65,588 | 765,282 |
| **1992** | **1,528** | **1,110** | **76,154** | **1,060,863** |
| Average | 1,554 | 1,103 | 84,180 | 1,073,388 |

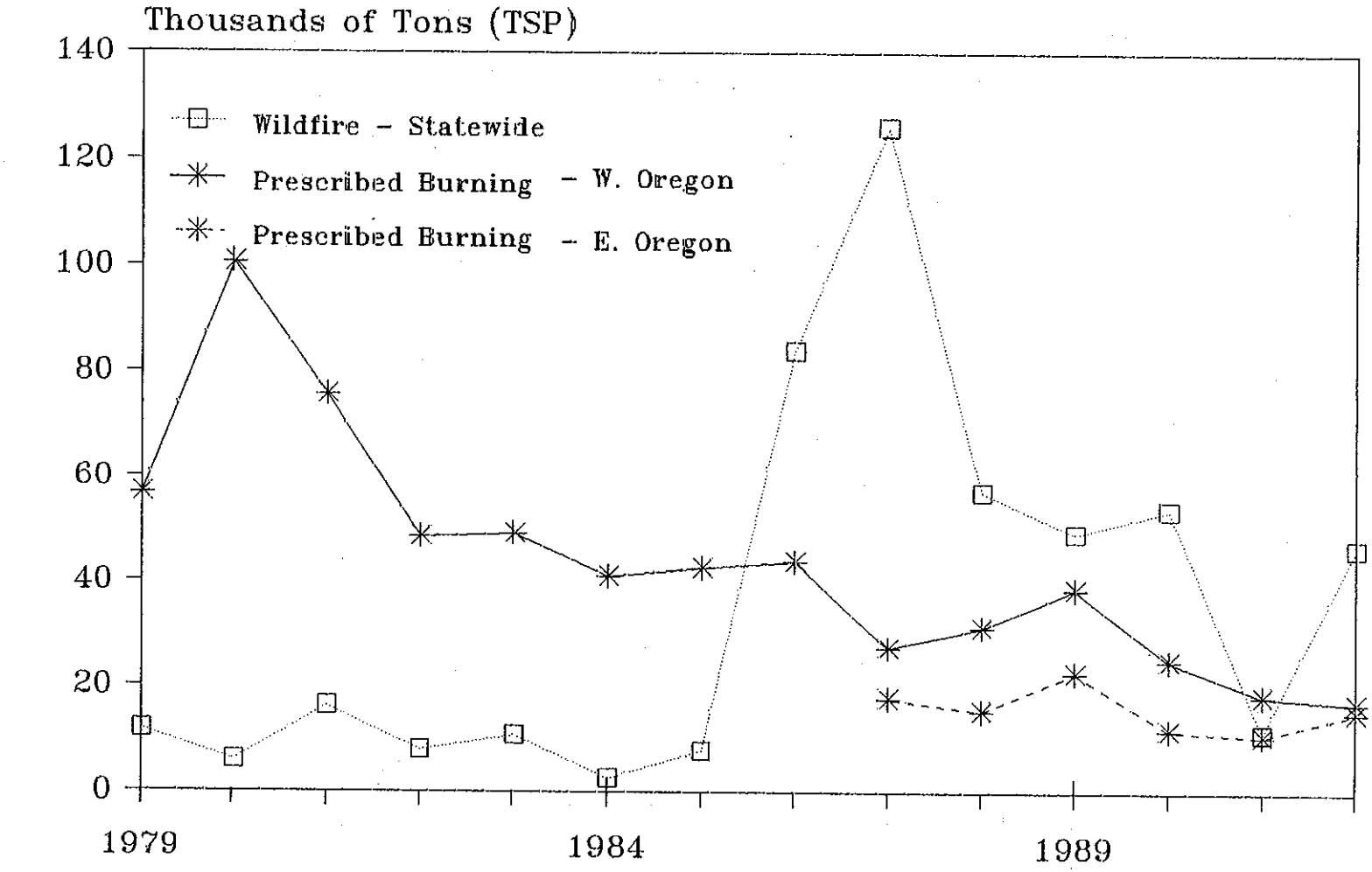
TABLE 3
INTRUSIONS BY MONTH
(Intrusion Days/Number of Intrusions/Number of Problem Burns)

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1983 | 0/0/0 | 0/0/0 | 0/0/0 | 0/0/0 | 6/8/5+ | 3/4/6 | 4/7/26 | 5/5/7 | 6/8/12 | 4/4/4 | 0/0/0 | 0/0/0 | 28/36/60+ |
| 1984 | 0/0/0 | 0/0/0 | 0/0/0 | 0/0/0 | 1/1/2 | 6/6/9 | 9/11/13+ | 9/9/11 | 5/6/5+ | 5/5/8 | 0/0/0 | 0/0/0 | 35/38/48+ |
| 1985 | 0/0/0 | 1/1/2 | 1/2/6 | 5/6/8 | 2/2/5 | 4/4/20+ | 2/2/4 | 8/11/20 | 6/6/30+ | 4/4/3 | 1/1/11 | 0/0/0 | 34/39/109+ |
| 1986 | 0/0/0 | 0/0/0 | 1/1/1 | 2/2/2 | 3/3/4+ | 7/9/16 | 3/5/4+ | 0/0/0 | 0/0/0 | 2/2/2 | 0/0/0 | 0/0/0 | 18/22/29+ |
| 1987 | 0/0/0 | 0/0/0 | 3/1/351+ | 10/8/13+ | 6/8/13+ | 6/7/8 | 0/0/0 | 2/2/2 | 0/0/0 | 0/0/0 | 0/0/0 | 0/0/0 | 27/26/387+ |
| 1988 | 0/0/0 | 2/2/3 | 2/2/58 | 1/1/2 | 6/6/16+ | 10/9/23+ | 4/3/4 | 0/0/0 | 1/1/1 | 4/5/29 | 0/0/0 | 0/0/0 | 30/29/136+ |
| 1989 | 0/0/0 | 0/0/0 | 0/0/0 | 6/5/7+ | 3/4/4 | 4/6/7+ | 0/0/0 | 0/0/0 | 1/1/1 | 3/3/3 | 0/0/0 | 1/1/2 | 18/20/24+ |
| 1990 | 0/0/0 | 0/0/0 | 3/4/9 | 3/3/10+ | 3/3/4 | 0/0/0 | 2/2/6 | 0/0/0 | 1/2/5 | 0/0/0 | 0/0/0 | 0/0/0 | 12/14/34+ |
| 1991 | 0/0/0 | 0/0/0 | 0/0/0 | 0/0/0 | 5/5/6 | 5/5/9 | 2/2/2 | 1/1/1 | 0/0/0 | 1/1/4 | 0/0/0 | 0/0/0 | 14/14/22 |
| 1992 | 0/0/0 | 0/0/0 | 1/1/1 | 0/0/0 | 5/5/12 | 0/0/0 | 0/0/0 | 0/0/0 | 0/0/0 | 5/4/5 | 0/0/0 | 0/0/0 | 11/10/18 |
| AVG: | 0/0/0 | 0/0/1 | 1/1/43 | 3/3/4 | 4/4/7 | 5/5/10 | 3/3/6 | 3/3/4 | 2/2/5 | 3/3/6 | 0/0/1 | 0/0/0 | 23/25/87+ |

NOTES:

1. "Intrusion Days" is the number of days on which intrusions occurred.
2. "Number of Intrusions" is total intrusions for the month (more than 1 can occur on a given day).
3. "+" indicates an unknown number of problem burns resulted in intrusions.
4. In March 1987 and May 1988 it was not possible to determine which units contributed to the western Oregon smoke episodes. All units were included since the impact was so widespread.

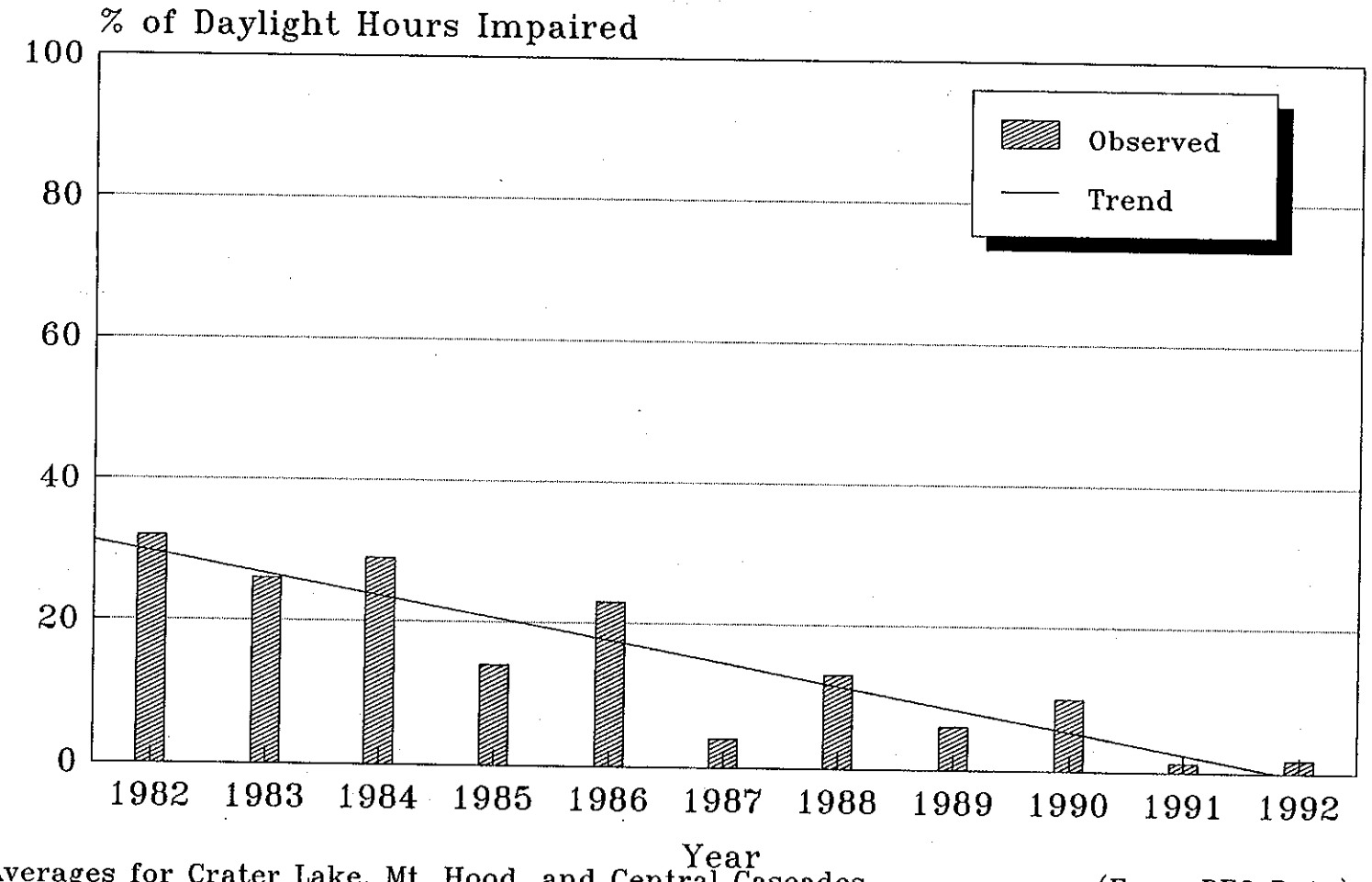
# Figure 3A
# Forest Land--Related Burning Emissions




All Forest Landowners

Figure 4

# Visibility Impairment Frequency
## July 1 – September 15

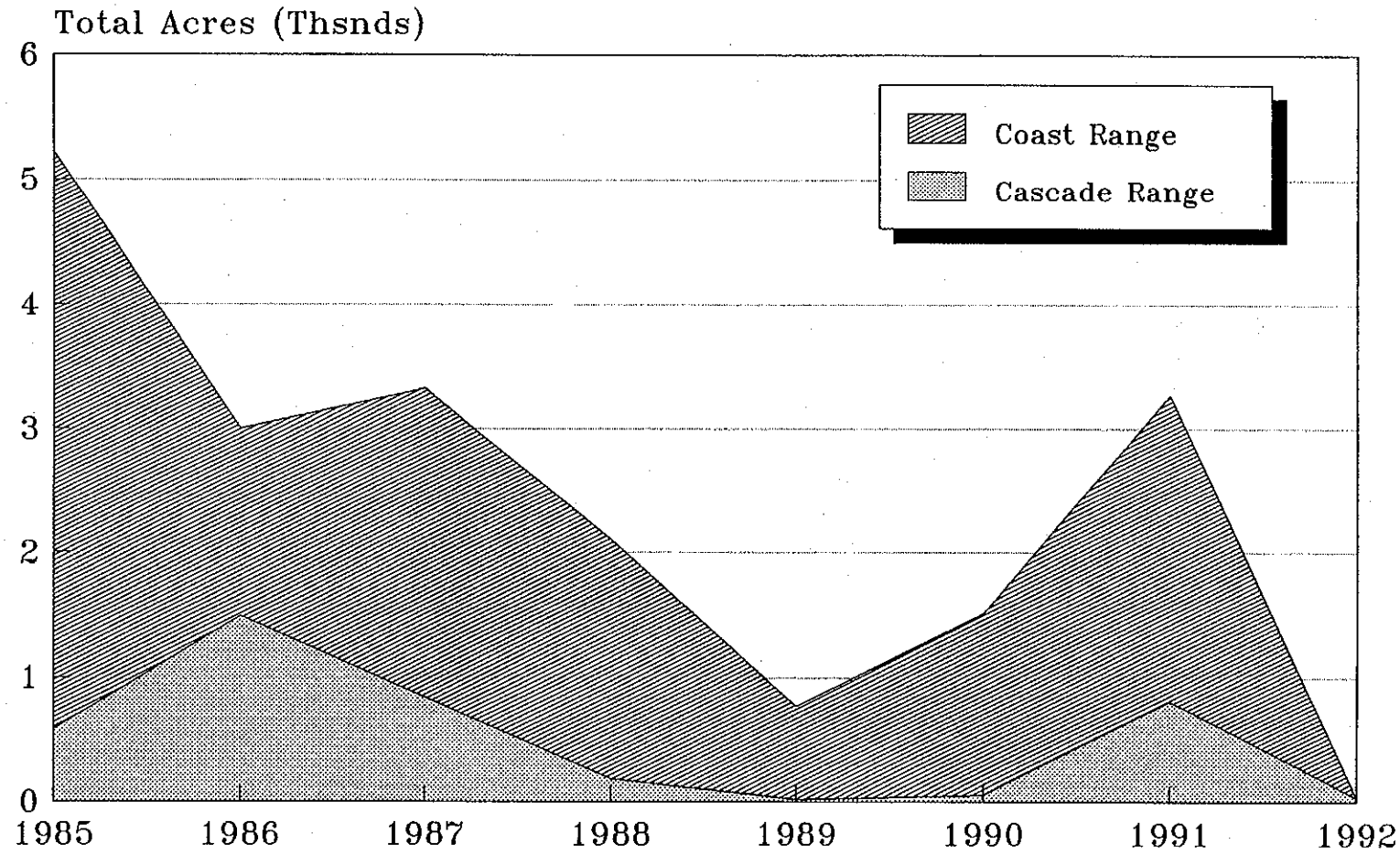



Averages for Crater Lake, Mt. Hood, and Central Cascades
July 4 – Labor Day weekend prior to 1992

(From DEQ Data)

Figure 5

# Burning Summary
## Class I Visibility Protection Period




Burning from Lane County north and west of the Cascade crest

Figure 8

# Monthly Slash Acres Burned

1992

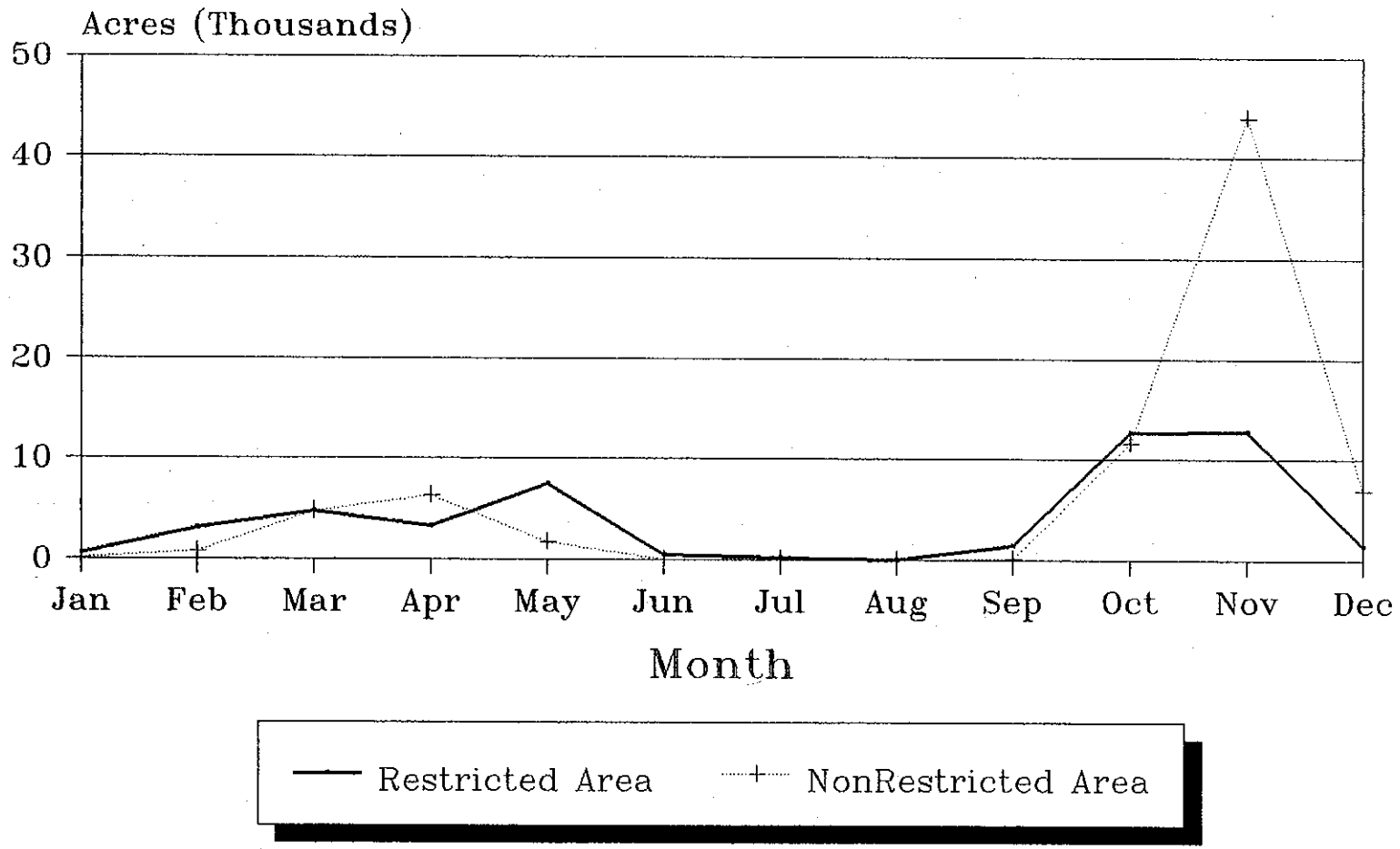


Table 5A
BURN SUMMARY BY DISTRICT - 1992
(Restricted Area)

| District/Forest | Units Burned | Acres Burned | Tons Burned |
|---|---|---|---|
| Astoria | 21 | 700 | 24,777 |
| Clackamas-Marion | 71 | 940 | 28,855 |
| Coos FPA | 376 | 5,886 | 188,143 |
| Douglas FPA | 169 | 2,110 | 54,104 |
| East Lane | 178 | 3,687 | 61,249 |
| Forest Grove | 71 | 1,840 | 38,173 |
| Linn | 96 | 3,257 | 109,303 |
| Southwest | 212 | 3,168 | 32,064 |
| Tillamook | 48 | 1,263 | 43,458 |
| West Lane | 170 | 2,626 | 65,032 |
| West Oregon | 226 | 6,126 | 150,946 |
| Klamath NF | 18 | 108 | 4,636 |
| Mt Hood NF | 116 | 1,987 | 66,605 |
| Rogue River NF | 128 | 1,407 | 26,117 |
| Siskiyou NF | 109 | 1,240 | 40,033 |
| Siuslaw NF | 33 | 619 | 18,963 |
| Umpqua NF | 144 | 2,003 | 41,229 |
| Willamette NF | 200 | 2,809 | 94,066 |
| Deschutes NF | 182 | 6,263 | 80,279 |
| TOTAL | 2,568 | 48,039 | 1,168,032 |

TABLE 5B
BURN SUMMARY BY DISTRICT - 1992
(Non-Restricted Area)

| District/Forest | Units Burned | Acres Burned | Tons Burned |
|---|---|---|---|
| Klamath-Lake | 83 | 9,922 | 33,173 |
| Northeast | 72 | 13,194 | 252,606 |
| Central Oregon | 59 | 12,614 | 324,675 |
| Walker Range | 15 | 11,511 | 20,442 |
| Crater Lake N.P. | 0 | 0 | 0 |
| Fremont NF | 16 | 3,481 | 41,801 |
| Malheur NF | 236 | 5,963 | 161,017 |
| Ochoco NF | 26 | 1,726 | 9,565 |
| Umatilla NF | 79 | 2,533 | 42,628 |
| Wallowa-Whitman NF | 249 | 6,425 | 68,364 |
| Winema NF | 275 | 8,785 | 106,592 |
| TOTAL | 1,110 | 76,154 | 1,060,863 |

Table 6B
Tons Burned by Month by District
1992
(Non-Restricted Area)

| District | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total by District |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Central Oregon | 75 | 24 | 7,098 | 5 | | | | | | 16,419 | 62,625 | 238,429 | 324,675 |
| Klamath-Lake | | | 1,644 | 19,592 | | | | | | 3,068 | 8,869 | | 33,173 |
| Northeast | 15 | 2,640 | 10 | 3,475 | 5 | | | | | 15,120 | 229,836 | 1,505 | 252,606 |
| Walker Range | | | 4,000 | | | | | | | 330 | 16,100 | 12 | 20,442 |
| Crater Lake NP | | | | | | | | | | | | | 0 |
| Fremont N.F. | | | | 9,000 | | 112 | | | | | 22,170 | 10,519 | 41,801 |
| Malheur N.F. | | 600 | 46,253 | 57,515 | 24,284 | | | | | 14,529 | 17,836 | | 161,017 |
| Ochoco N.F. | | | 7,275 | 1,785 | | | | | | 470 | 35 | | 9,565 |
| Umatilla N.F. | | | 21,152 | 14,538 | | | 1,994 | | | 4,474 | 470 | | 42,628 |
| Wallowa-Whitman N.F. | | 800 | 6,468 | 13,684 | 14,597 | | | | 372 | 21,232 | 11,211 | | 68,364 |
| Winema N.F. | | | | | | | | | | 15,405 | 91,187 | | 106,592 |
| District Total | 90 | 2,664 | 12,752 | 23,072 | 5 | 0 | 0 | 0 | 0 | 34,937 | 317,430 | 239,946 | 630,896 |
| Forest Total | 0 | 1,400 | 81,148 | 96,522 | 38,881 | 112 | 1,994 | 0 | 372 | 56,110 | 142,909 | 10,519 | 429,967 |
| Grand Total | 90 | 4,064 | 93,900 | 119,594 | 38,886 | 112 | 1,994 | 0 | 372 | 91,047 | 460,339 | 250,465 | 1,060,863 |

**Table 7B**
**Acres Burned by Month by District**
**1992**
**(Non-Restricted Area)**

| District | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total District |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Central Oregon | 15 | 15 | 160 | 5 | | | | | | 1,497 | 4,729 | 6,193 | 12,614 |
| Klamath-Lake | | | 124 | 1,030 | | | | | | 1,095 | 7,673 | | 9,922 |
| Northeast | 40 | 300 | 5 | 800 | 5 | | | | | 3,184 | 8,757 | 103 | 13,194 |
| Walker Range | | | 400 | | | | | | | 333 | 10,725 | 53 | 11,511 |
| Crater Lake N.P. | | | | | | | | | | | | | 0 |
| Fremont N.F. | | | | 1,600 | | 8 | | | | | 1,287 | 586 | 3,481 |
| Malheur N.F. | | 200 | 320 | 823 | 328 | | | | | 1,763 | 2,529 | | 5,963 |
| Ochoco N.F. | | | 1,398 | 231 | | | | | | 94 | 3 | | 1,726 |
| Umatilla N.F. | | 11 | 1,548 | 747 | | | 41 | | | 111 | 75 | | 2,533 |
| Wallowa-Whitman N.F. | | 200 | 708 | 1,072 | 1,389 | | | | 31 | 2,471 | 554 | | 6,425 |
| Winema N.F. | | | | | | | | | | 1,017 | 7,768 | | 8,785 |
| District Total | 55 | 315 | 689 | 1,835 | 5 | 0 | 0 | 0 | 0 | 6,109 | 31,884 | 6,349 | 47,241 |
| Forest Total | 0 | 411 | 3,974 | 4,473 | 1,717 | 8 | 41 | 0 | 31 | 5,456 | 12,216 | 586 | 28,913 |
| Grand Total | 55 | 726 | 4,663 | 6,308 | 1,722 | 8 | 41 | 0 | 31 | 11,565 | 44,100 | 6,935 | 76,154 |

TA 3B

## TONS BURNED BY MONTH WITHIN COUNTY

### (Non-Restricted Area)
### 1992

| COUNTY | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Baker | | 800 | 3,851 | 4,408 | 5,364 | | | | | 7,790 | 1,205 | 5 | 23,423 |
| Crook | | 24 | 170 | | | | | | | 6,070 | 43,250 | | 49,514 |
| Deschutes | 75 | | | 5 | | | | | | 10,849 | 2,950 | 100 | 13,979 |
| Grant | | 600 | 63,849 | 65,518 | 22,942 | | | | | 10,749 | 14,184 | 28,711 | 206,553 |
| Harney | | | 1,719 | | | | | | | 3,960 | 1,200 | | 6,879 |
| Hood River | | | 7,098 | | | | | | | 270 | 6,156 | 1,729 | 15,253 |
| Jefferson | | | | | | | | | | | 9,600 | | 9,600 |
| Klamath | | | 5,644 | 25,592 | | | | | | 20,095 | 109,704 | 12 | 161,047 |
| Lake | | | | 3,000 | | 112 | | | | | 26,630 | 10,519 | 40,261 |
| Morrow | | | 570 | 1,705 | | | | | | | 7,125 | 109,467 | 118,867 |
| Umatilla | | 154 | 10,452 | 13,035 | 5 | | 1,021 | | | 18,491 | 249 | | 43,407 |
| Union | 15 | 40 | 1,291 | 3,962 | 6,511 | | | | | 4,628 | 24,494 | 1,500 | 42,441 |
| Wallowa | | 2,600 | 1,471 | 5,233 | 2,554 | | | | 372 | 9,007 | 207,966 | | 229,203 |
| Wasco | | | | | | | | | | | 1,069 | 1,110 | 2,179 |
| Wheeler | | | | 945 | | | | | | | | 97,312 | 98,257 |
| **TOTAL** | **90** | **4,218** | **96,115** | **123,403** | **37,376** | **112** | **1,021** | | **372** | **91,909** | **455,782** | **250,465** | **1,060,863** |

TABLE 9B

1992 BURN DATA BY OWNER TYPE

(Non-Restricted Area)

| | Private | | | State | | | Federal, except USFS | | | USFS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| District/Forest | Units | Acres | Tons | Units | Acres | Tons | Units | Acres | Tons | Units | Acres | Tons |
| Central Oregon | 45 | 12,208 | 312,846 | 14 | 406 | 11,829 | | | | | | |
| Klamath-Lake | 53 | 8,728 | 11,858 | 2 | 12 | 20 | 28 | 1,182 | 21,295 | | | |
| Northeast | 72 | 13,194 | 252,606 | | | | | | | | | |
| Walker Range | 15 | 11,511 | 20,442 | | | | | | | | | |
| Crater Lake N.P. | | | | | | | | | | | | |
| Fremont N.F. | | | | | | | | | | 16 | 3,481 | 41,801 |
| Malheur N.F. | | | | | | | | | | 236 | 5,963 | 161,017 |
| Ochoco N.F. | | | | | | | | | | 26 | 1,726 | 9,565 |
| Umatilla N.F. | | | | | | | | | | 79 | 2,533 | 42,628 |
| Wallowa-Whitman N.F. | | | | | | | | | | 249 | 6,425 | 68,364 |
| Winema N.F. | | | | | | | | | | 275 | 8,785 | 106,592 |
| TOTALS | 185 | 45,641 | 597,752 | 16 | 418 | 11,849 | 28 | 1,182 | 21,295 | 881 | 28,913 | 429,967 |

Figure 12A

## Acres Burned by Owner Class

(Western Oregon only)

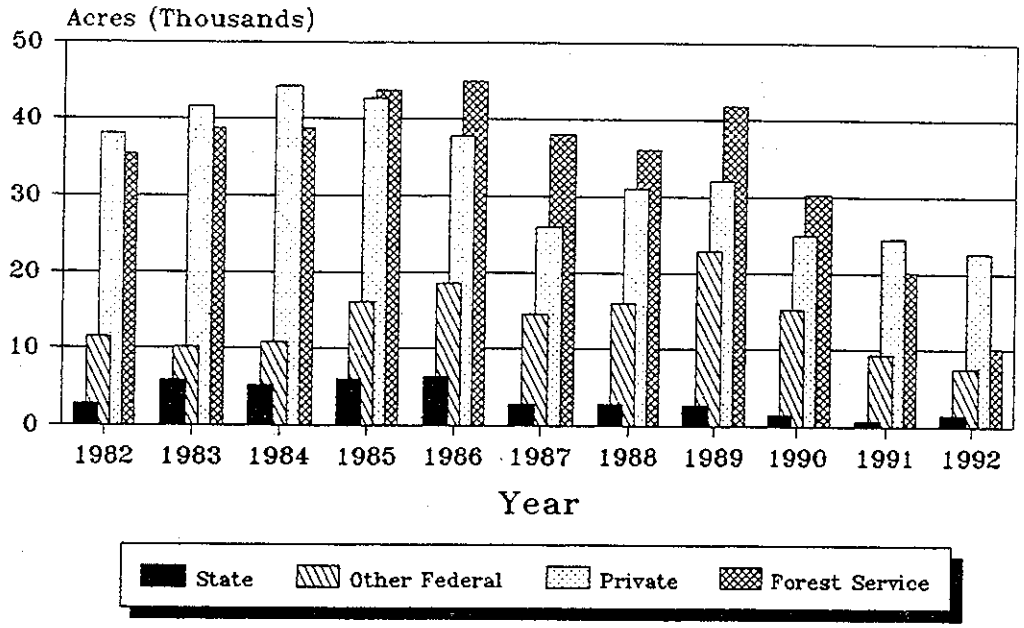
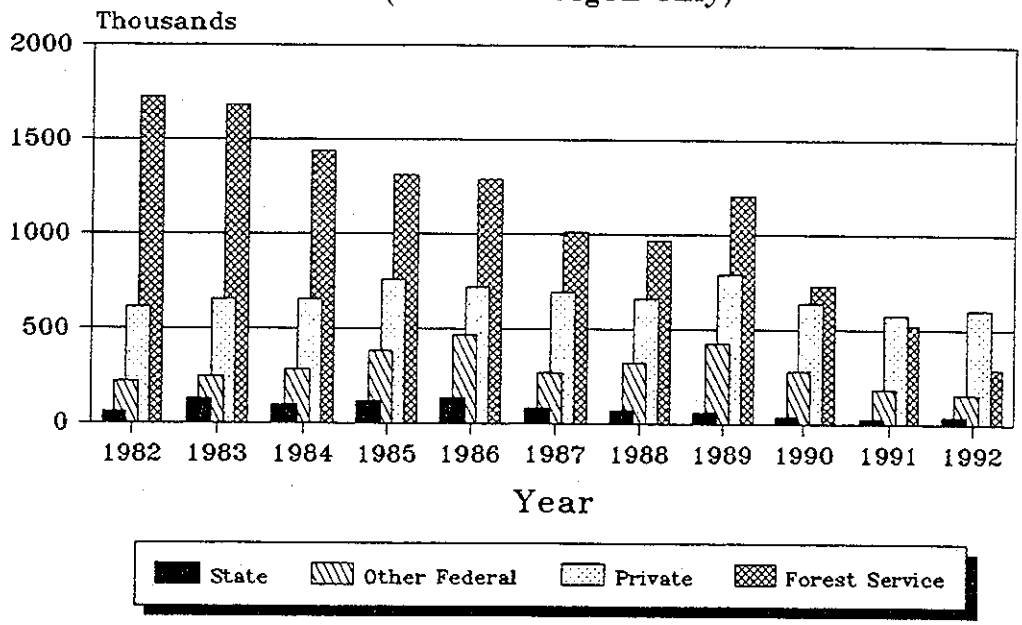



Figure 12B

## Tons Burned by Owner Class

(Western Oregon Only)




Tonnage estimates prior to 1987 revised to include duff consumption.