



**PORTLAND PARKS & RECREATION**

Healthy Parks, Healthy Portland



**Urban Forestry Elm Report 2013**  
Background, Findings, & Recommendations  
November 2013

# Urban Forestry Elm Report 2013

November 2013

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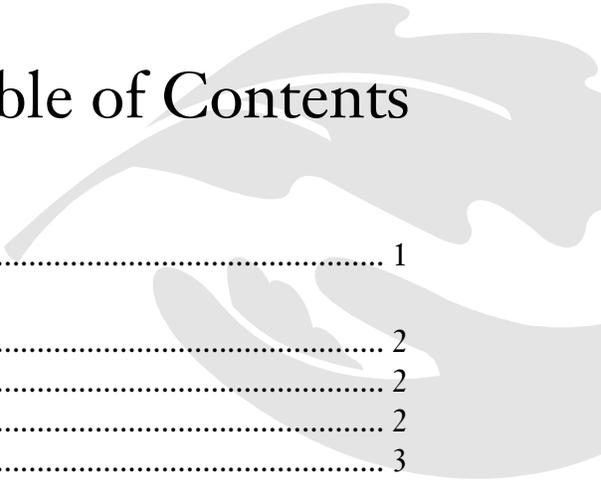
*Cover Photo: American elm (*Ulmus americana*) Heritage Tree in southwest Portland*

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# Table of Contents

Background..... 1

Portland’s Elm Strategy ..... 2

    Monitoring ..... 2

    Removal ..... 2

    Sanitation..... 3

    Inoculation..... 3

    Education and Outreach ..... 3

2013 Dutch Elm Disease Findings..... 4

    Lab Testing ..... 4

    Elm Inoculations ..... 5

    Outreach ..... 5

    Heritage Trees in NW District ..... 5

Elm Inventory Recommendations ..... 6

Figures ..... 7

Tables ..... 11

## Background

Dutch elm disease, or DED, is one of the most destructive plant pathogens in the United States and Europe, having killed millions of elm trees and persisting despite efforts to control it. DED is caused by two fungi, *Ophiostoma ulmi* and *Ophiostoma novo-ulmi*, which invade the vascular tissue of elms and prohibit water movement in the tree. An infected elm tree can die within weeks of showing the first symptoms of DED.

DED was first discovered in Europe in 1918, but the causal fungus was not identified until 1922 in the Netherlands. It was bestowed the name Dutch elm disease in honor of the Dutch scientists who isolated the fungus, Bea Schwarz and Christine Buisman. The popular theory is that DED originated in Asia, since Asian elm species are resistant to the fungus. American and European elms are highly susceptible to the disease.

In 1930 DED appeared in Ohio, having spread to the U.S. via shipping crates made of infected elm wood. The disease hit the east coast hard and by 1972 the European bark beetle, the primary DED vector, was found in all but four states. The first case of DED in Oregon was discovered in 1973. In 1977, a single case was discovered in Portland, in Overlook Park. The second case of DED in Portland was discovered in 1986, on 39<sup>th</sup> & E. Burnside Street. Since then, Urban Forestry's elm monitoring program has worked to slow the spread of DED throughout the city.

There are three ways the DED fungus spreads: bark beetles, root grafts, and human activity. Both the native elm bark beetle, *Hylurgopinus rufipes*, and the smaller European elm bark beetle, *Scolytus multistriatus*, are DED vectors. Elm bark beetles breed, feed, and overwinter in elm wood. In infected trees, spores of the DED fungus stick to the backs of bark beetles and are transported to healthy elms when beetles emerge to feed. The fungus spreads most rapidly through root grafts, which form between trees growing in close proximity. Human activity, such as transporting infected elm wood, also spreads the disease.

The fungus kills trees by invading and occluding the infected tree's xylem (vascular tissue), preventing water conduction and ultimately resulting in death. Visual symptoms of DED include localized leaf wilt and browning (termed *flagging*) and sapwood discoloration (termed *streaking*).

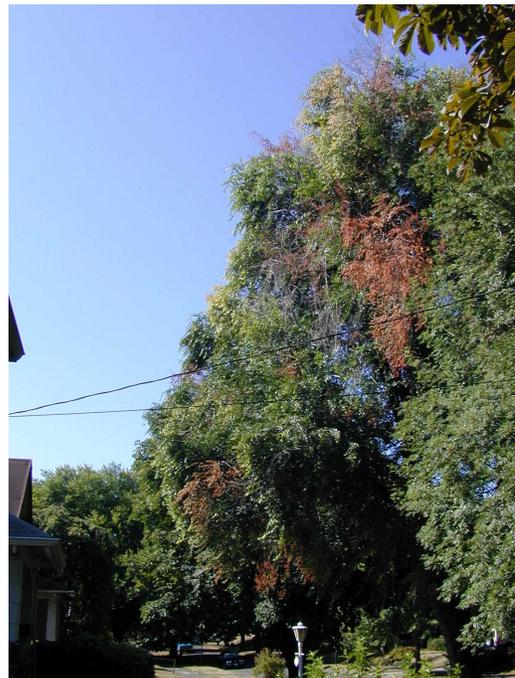
Infection can be prevented with commercial fungicides. There are several fungicides currently on the market, the most commonly used one being Arbotect. The fungicides vary in their application systems and their price ranges, but their mechanisms are similar. Fungicides help prevent DED infection in elms by disabling fungal spores when infected beetles feed on an elm. Fungicides are not 100% effective at preventing DED, however. There are no known cures for DED, but aggressive pruning of infected branches coupled with Arbotect inoculation has been known to delay mortality in some cases. A dedicated community with clear goals can take steps to slow the spread of DED in affected urban environments.

## Portland's Elm Strategy

On June 10, 1987, Portland City Council passed Ordinance No. 159750, declaring Dutch elm disease-infected trees a nuisance and declaring a state of emergency for Portland's elm canopy. The ordinance specifies that it is unlawful for elm trees infected with DED to remain on any lot or parcel of land in the city. Urban Forestry has an aggressive strategy for implementing Ordinance No. 159750 and controlling the spread of DED in Portland. Using a five-pronged approach, Urban Forestry addresses the issue from both the angles of preventing the disease and dealing with the elms that are already infected. With approximately 3,000 potentially susceptible elms throughout the city, DED would have a catastrophic impact on Portland's urban forest if allowed to prevail unchecked.

### MONITORING

Each summer, as the symptoms of DED become apparent, an elm monitor is hired to inspect the city's elms. The elm monitor looks for flagging, a sudden wilting or drooping of leaves in the tree, often on a single branch or limb. Flagging leaves quickly turn from grey-green to brown as the fungus invades the vascular tissue of the tree, blocking the tree's water supply. When flagging is noticed in an elm, the elm monitor instructs the Urban Forestry crew to sample the flagging branches. The crew cuts off a few small branches of the flagging limb and peels back the bark to look for streaking of the sapwood. Healthy elm wood is uniformly blond; DED infection causes brown or grey linear discolorations parallel to the twig. If this streaking is present in the branches, the sample is sent to the Oregon State University Plant Pathology Clinic for cultivation and identification. It can take two or three weeks for the laboratory cultures to mature. If the presence of the fungus is detected, steps are taken to remove the tree. The DED fungus is notoriously difficult to cultivate in the lab and infected trees are not always diagnosed correctly. If a sample comes back negative but the tree continues to decline, Urban Forestry uses their expert judgment to determine whether or not the elm should be removed despite a negative lab test.



*Elm flagging in a Portland neighborhood*

### REMOVAL

Swift removal lessens the opportunity for the infected tree to attract bark beetles or for the fungus to spread to adjacent trees via root grafts. Urban Forestry removes DED-infected elms in the right-of-way planting strip at no expense to the adjacent property owner. The property owner must sign a removal permit and commit to replanting in the following planting season. For DED-infected elms on private property, the property owner is required to remove the tree at their expense within 15 days of the diagnosis. After removal, stumps must be ground to prevent infection via root grafts.

## SANITATION

All elm wood must be disposed of in a controlled manner by chipping, de-barking, or burying so as not to attract bark beetles to the infected wood. All tools used on elm trees are disinfected before and after use so they do not become contaminated with fungal spores. Portland also observes a moratorium on pruning elms between April 15<sup>th</sup> and October 15<sup>th</sup> annually. Bark beetles are active during the spring and summer months and are attracted to open wound sites left by pruning. Deadwood pruning is conducted during the winter months to reduce sites that attract bark beetles.

## INOCULATION

Urban Forestry inoculates elms on a 3-year rotation with the fungicide Arbotect, targeting significant elms in Portland's parks and public spaces. In the past, we inoculated 157 trees in year one, 112 in year two, and 137 in year three. Beginning in 2015, we will inoculate Heritage Tree elms (21), for a total of 133 elms inoculated during year two. The nonprofit organization Save Our Elms and their affiliates raise money and organize neighborhood elm inoculations, treating about 300-400 elm trees with either Alamo or Arbotect fungicide on a 3-year cycle.

## EDUCATION AND OUTREACH

The elm monitor serves as the point contact between Urban Forestry and the rest of the community. Past elm monitors have held met with homeowners and neighbors, helped organize and coordinate community groups in elm inoculations, and provided educational events and programs to increase public awareness of Dutch elm disease. Some communities such as downtown near the park blocks, Eastmoreland, and Ladd's Addition are more aware of the disease due to the high numbers of elms and history of DED in their neighborhoods. A workshop was held in Eastmoreland in 2013 and it is recommended that future workshops be held in different quadrants of the city to increase citizen access to events. This will ensure that there are eyes and ears throughout the City to recognize early symptoms of DED. Working with community groups like Save Our Elms is important because many neighborhoods come up with the funding and volunteer time needed to inoculate their right-of-way trees. Effective education and outreach would include continuing to build relationships with neighbors that have trees in less high-profile neighborhoods.



*There are two methods for elm inoculation: microinjection (left) and macroinjection (right)*

## 2013 Dutch Elm Disease Findings

Thirty-seven trees were removed due to Dutch elm disease in 2013. Eight of these trees were on Parks' owned or managed property, fourteen were right-of-way trees, and fifteen were private property trees (Table 1). The diameter range of removed elms was 8-45 inches, with 28 inches as the average DBH (diameter at breast height) and a 11 inch standard deviation (Figure 1).

The majority of elms removed were in southeast Portland (24), with almost half of all removals from the Hosford-Abernethy and Sellwood-Moreland neighborhoods (7 elms removed from each neighborhood). Southwest Portland lost eight elms, five of which were from the Downtown neighborhood. Three elms were removed due to DED in northeast Portland, two in Piedmont and one from the Irvington neighborhood. Two Heritage Tree elms were removed from northwest Portland in the Northwest District neighborhood. No DED was detected in north Portland this year.

The number of elms removed in 2013 is just about average compared to the last decade of elm removals (Figure 2). Cases of DED by location in 2013 also followed the trend of the last decade (Figure 3), with most removals in southeast, followed by southwest. This year there were few removals in northeast and northwest Portland, and none in north Portland.

A total of 1,085 elm trees have been removed in Portland due to Dutch elm disease since the fungus has appeared in the city. Assuming that the elm population was about 3,700 in 1986, 29.3% of the elm population has been lost due to DED between 1986 and 2013, an average of 1-1.2% of the elm population lost per year. This is a very small loss rate, especially compared to historic loss rates on the east coast, where often 30-50% of a town's elm population died within a year. A majority of the elms removed in Portland are replanted, often with hybrid elms that are resistant to DED, so Portland's elm population has actually remained fairly stable over time.



*Elm removal by Urban Forestry in the Hosford-Abernethy neighborhood*

## LAB TESTING

Thirty-nine samples were sent to the Oregon State University Plant Pathology Clinic for testing. Samples were only sent to the lab when streaking was found under the bark of a sample. Twenty-one of the samples came back positive for the DED fungus. A few samples underwent two or three rounds of cultivation before the DED fungus was found on the sample. One Heritage Tree was sampled and tested twice. Five samples came back negative altogether. Twelve of the samples came back negative for DED, but showing results for other fungi such as *Phoma*, *Cytospora*, *Botryosphaeria*, *Penicillium*, or other secondary fungi. Some of the elms that came back negative for DED continued to decline and were removed.

There were some declining elms removed due to DED without laboratory testing in hotspots in line with elms that were removed due to DED in previous years. These elms were located on Parks' property or in the right-of-way planting strips; all private elms suspected of having DED were sampled and sent to the lab. In past years, Urban Forestry recommended skipping lab testing on public and right-of-way properties when the tree is in a hotspot and the visual symptoms were obvious in order to save on the costs of sampling and testing.

This year, we sampled more to ensure a positive result before removal, except in some cases where DED was travelling down a hotspot row of elms. So while we removed 37 trees and only had 21 positive samples, the 16 tree difference is due to: 1 completely dead tree, 1 smaller private property tree removed because it was right next to a large DED positive tree, 2 ODOT highway trees right next to a DED positive tree, 3 trees that were right next to two trees that came back positive for DED in the Springwater Corridor, 4 declining right-of-way trees (3 of which had secondary fungi) removed that were adjacent to 2013 DED positive trees, and 5 declining trees in DED hotspots from previous years.

## ELM INOCULATIONS

Urban Forestry inoculated 137 elms in twelve locations with the Arbotect macroinjection technique in the summer of 2013 (Table 2). Save Our Elms (SOE) and affiliates inoculated over 170 trees in several locations including Ladd's Addition, Eastmoreland, Laurelhurst, Grant Park, Beaumont, Wilshire, Irvington, and Richmond Elementary (Table 3).

## OUTREACH

The elm monitor talked to several homeowners about their DED-infected elms as well as several neighbors about the DED activity in their neighborhood. She also led a workshop, along with the Urban Forestry Outreach Coordinator, on Portland's elm program at the beginning of the season which was attended by about 20 community members. The workshop covered DED history, symptoms, spread, and the City ordinance and elm monitoring program. We discussed elm biology, benefits, importance of diversity, and how to recognize DED. In addition, three monthly reports on the city-wide status of DED were published in the *Urban Forestry Report* during the 2013 season.

## HERITAGE TREES IN NW DISTRICT

In 2013, Urban Forestry removed two large Heritage Tree elms (DBH of 43.7" and 45.5") that were adjacent to one another at 704 NW 21<sup>st</sup> Avenue. In an effort to save the third Heritage Tree in that row, we inoculated the tree with fungicide. Heritage Trees have not been on the Urban Forestry Arbotect rotation schedule in the past. Management has decided to place Heritage Elms (as of 2013, down to 21 trees from 23) on year two of the three year rotation cycle, placing them in line to be inoculated beginning in 2015.

## Elm Inventory Recommendations

In 2012, it was recommended that a thorough update of the elm inventory be conducted in 2013 to clear up inconsistencies in the database, which has not been updated since 2001. Elms that are removed due to reasons other than DED go through standard Urban Forestry processes and are not updated in the database. We do not have a protocol for forwarding this information on to the elm monitor. This results in inefficiencies for the elm monitor, who may be sent to monitor areas where elms have already been removed.

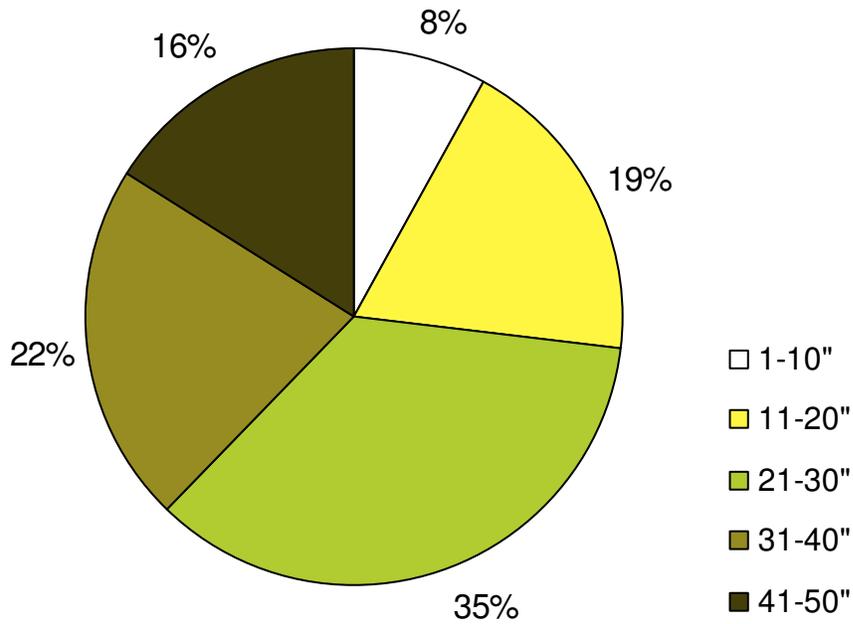
Also, in 2012 and 2013, the elm monitor found elms that were not mapped in the original elm database. A thorough re-assessment of the elms would increase the efficiency of the elm monitor's time as well as accuracy in our data and reports. It will also ensure that monitoring coverage for Dutch elm disease is thorough and complete. A thorough update could take up to a month of full-time duties in addition to the normal work performed by the elm monitor. The following are specific recommendations:

- An accurate recount and species determination of how many elms are remaining
- Update the database with how many elms were removed each year to match the data in annual DED reports
- Update spatial data of remaining elms to reflect accurate locations
- Clarification of the type of elm inventory data to be collected in the field for a consistent database
- Complete analysis of which species of elms have been affected by DED, as it is possible for Siberian elms to be carriers of the disease

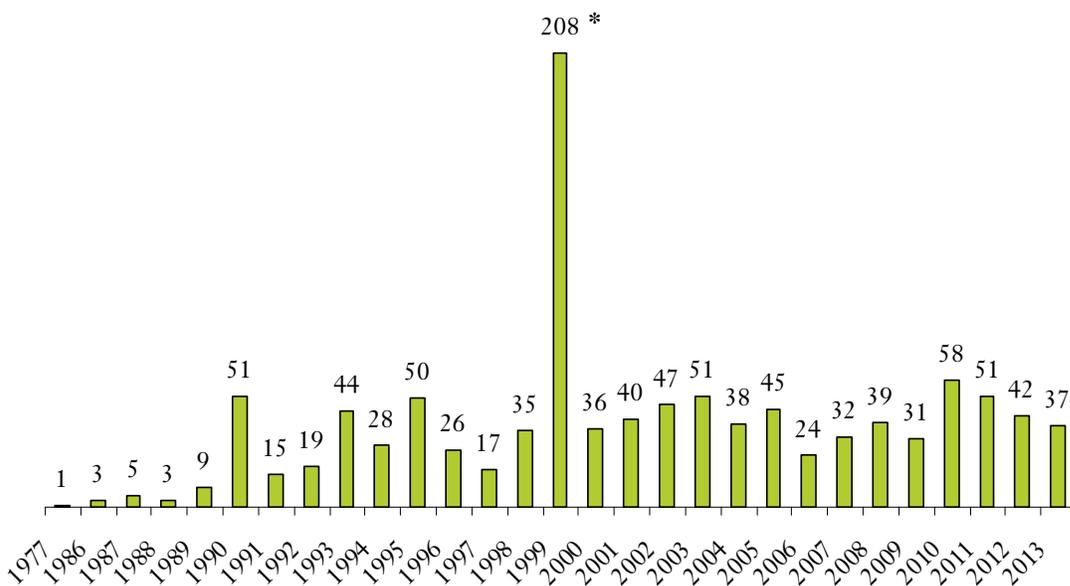
To best achieve these goals, it is recommended that the new data and updates be made through more user-friendly technology such as that which is being explored by Urban Forestry for the Tree Inventory Project. That project is exploring the use of iPhone and iPad technology that allows one to easily edit and update inventory data while in the field. The portable devices that have been used for elm monitoring in the past are less user friendly and require programming that is more involved. These devices are also becoming obsolete in addition to having slow speed and the inability to update data easily in the field.

## Figures

**FIGURE 1. PERCENT OF ELMS LOST TO DED IN 2013 BY DIAMETER SIZE CLASS (INCHES)**

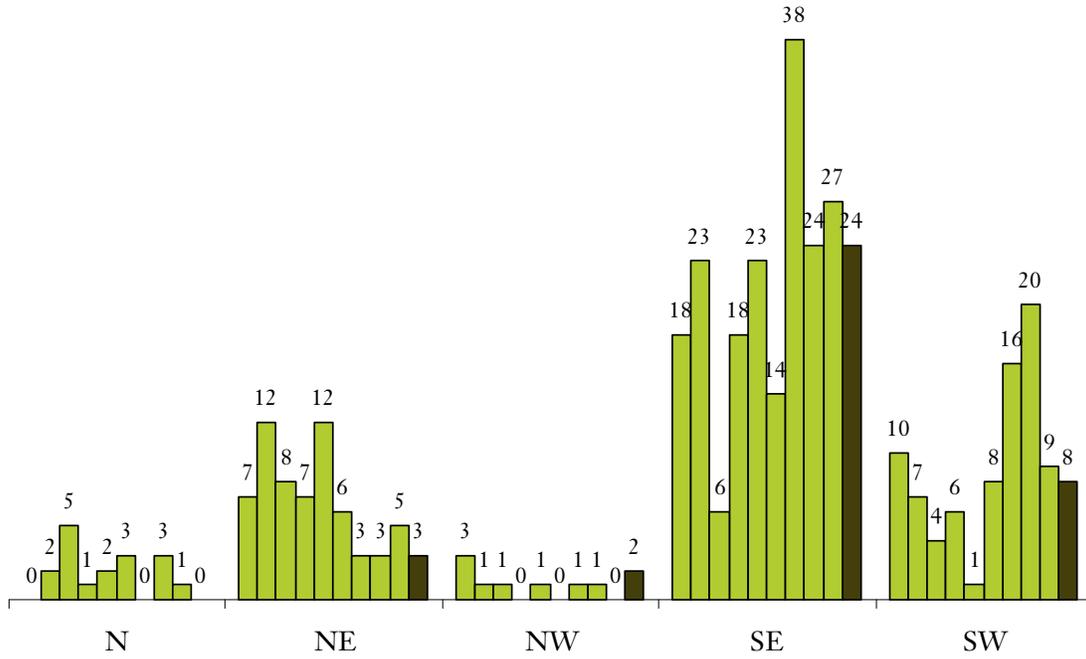


**FIGURE 2. NUMBER OF ELMS REMOVED EACH YEAR DUE TO DED IN PORTLAND (1977-2013)**



\* Majority of elms removed were young trees in a natural area

**FIGURE 3. NUMBER OF ELMS REMOVED EACH YEAR DUE TO DED PER QUADRANT OVER THE TEN YEARS (2004-2013)**



**FIGURE 4. LOCATIONS OF DED-POSITIVE ELMS IN PORTLAND (2013)**

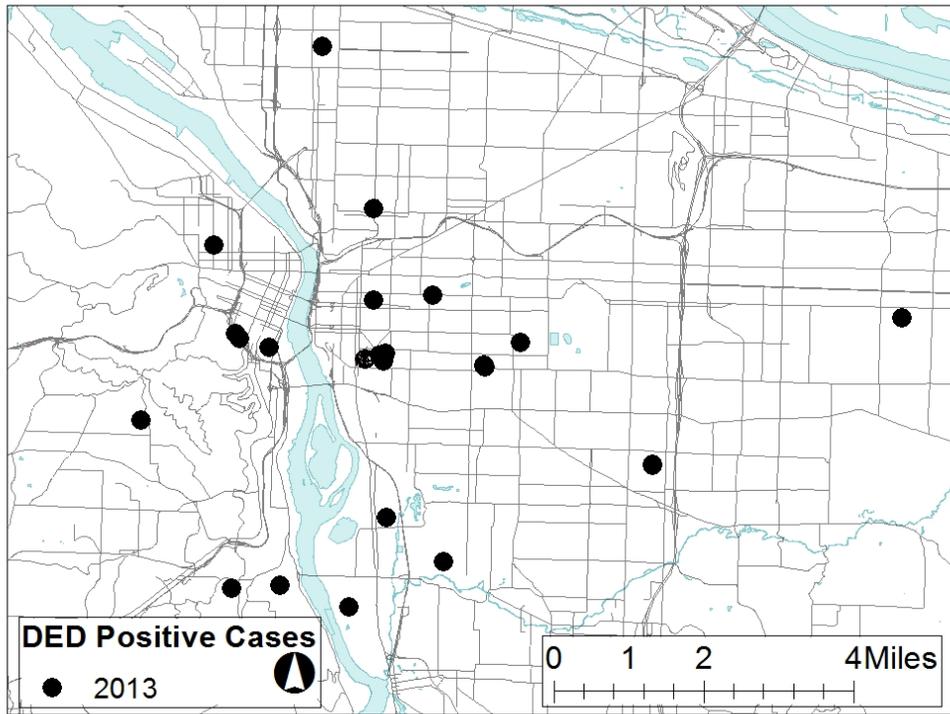


FIGURE 5. 2013 DED-POSITIVE ELMS COMPARED WITH 1977-2012 CASES

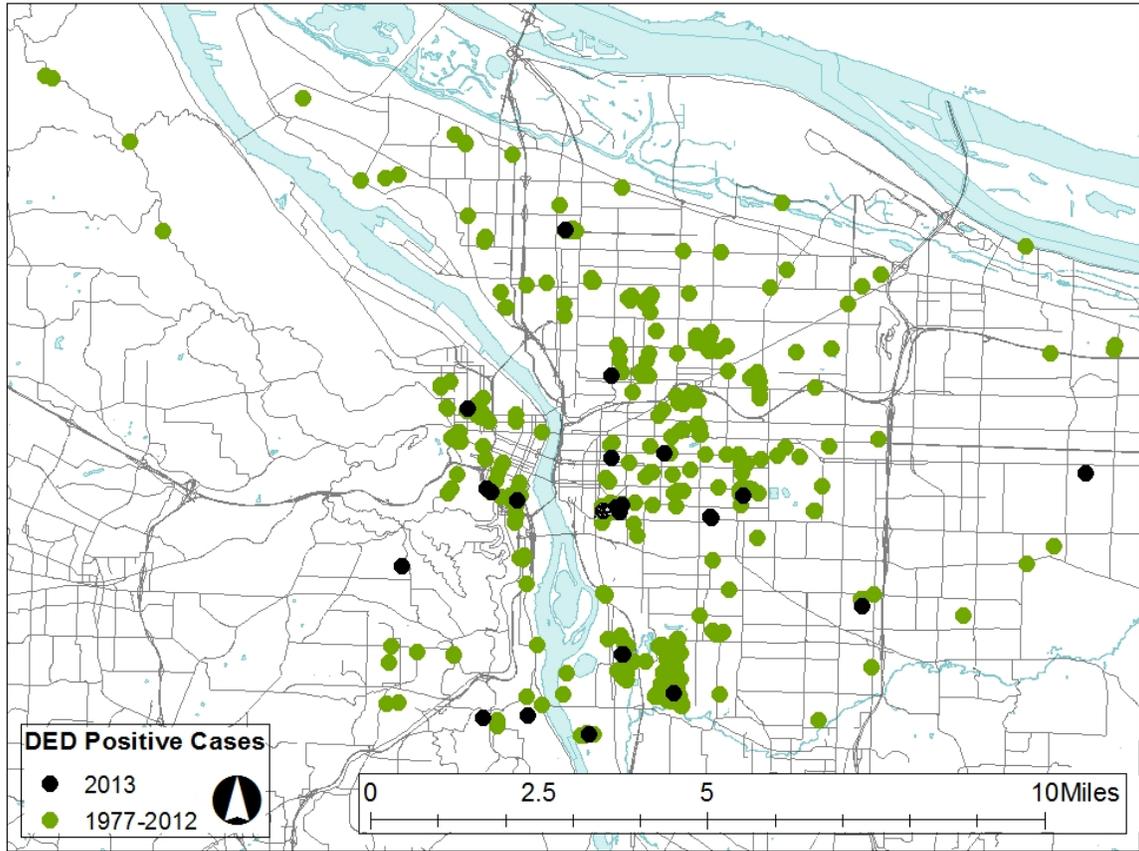
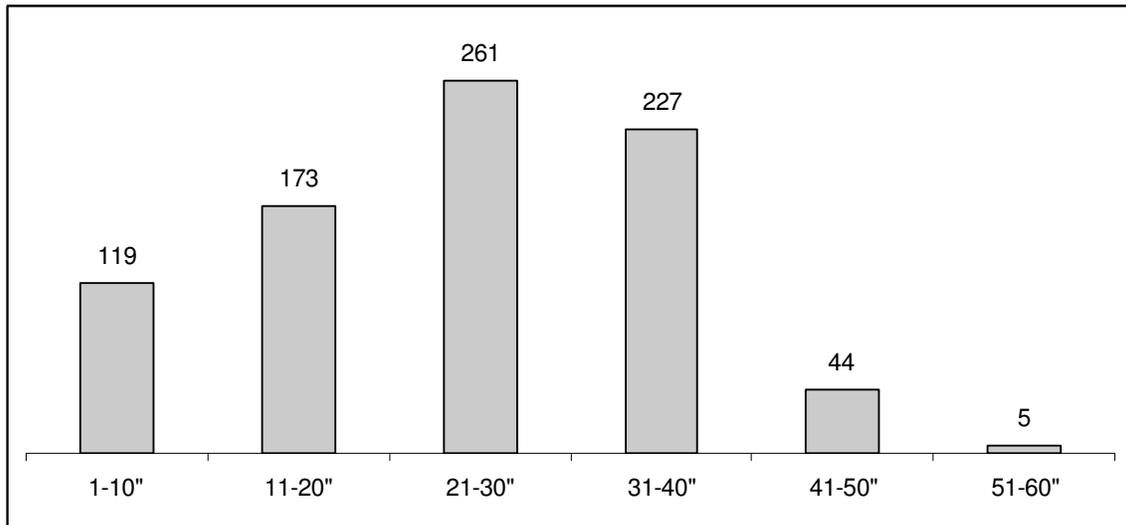
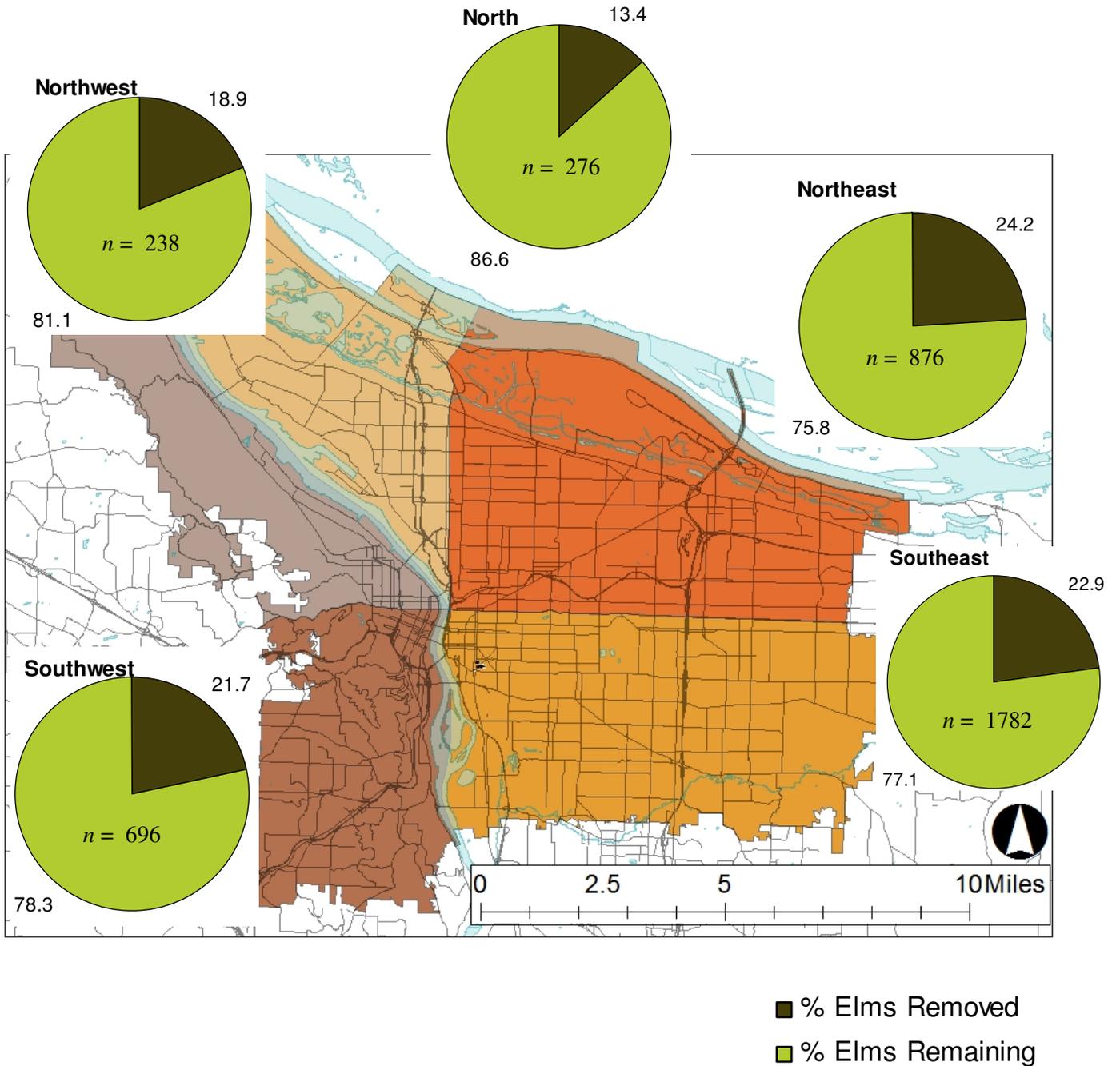


FIGURE 6. ELMS LOST TO DUTCH ELM DISEASE BY DBH SIZE CLASS IN INCHES (1990-2013)



**FIGURE 7. TOTAL PERCENTAGE OF ELMS REMOVED IN EACH QUADRANT OF THE CITY SINCE 1977\***



\*Total number of elms in each neighborhood taken from initial inventory of 3972 elms. Numbers are approximate as elm inventory updates are needed.

## Tables

**TABLE 1. LOCATION OF ELMS REMOVED DUE TO DUTCH ELM DISEASE IN PORTLAND IN 2013**

Location	Neighborhood	Property Type	# of Elms
<b>Northwest</b>			
704 NW 21st Ave.	NW District	ROW	2
			<b>Total NW (2)</b>
<b>Northeast</b>			
1428 NE Schuyler	Irvington	ROW	2
6017 NE Cleveland Ave.	Piedmont	ROW	1
			<b>Total NE (3)</b>
<b>Southwest</b>			
3500 SW Bridlemile Ln.	Bridlemile	ROW	1
8816 SW 8th	Collins View	ROW	1
SW Park Ave. & SW Jackson	Downtown	PP&R	1
ODOT: R246527 west of SW Park Ave.	Downtown	private	3
2000 SW 1st	South Auditorium	private	1
0300 SW Taylors Ferry Road	Unclaimed Multnomah County	private	1
			<b>Total SW (8)</b>
<b>Southeast</b>			
1535 SE Alder St.	Buckman	ROW	1
705 SE 155 <sup>th</sup> Ave.	Centennial	ROW	1
3328 SE Lambert St.	Eastmoreland	ROW	1
2107 SE Hemlock Ave.	Hosford-Abernethy (Ladd's)	ROW	1
2115 SE Ladd Ave.	Hosford-Abernethy (Ladd's)	ROW	1
2121 SE Ladd Ave.	Hosford-Abernethy (Ladd's)	ROW	1
2129 SE Ladd Ave.	Hosford-Abernethy (Ladd's)	ROW	1
2303 SE Ladd Ave.	Hosford-Abernethy (Ladd's)	ROW	1
2421 SE Orange Ave.	Hosford-Abernethy (Ladd's)	ROW	2
4700 SE 88th Ave, Lents Park	Lents	PP&R	2
1713 SE 52 <sup>nd</sup> Ave.	Mt. Tabor	private	2
2276 SE 41 <sup>st</sup> Ave.	Richmond	private	2
METRO (Springwater Corridor)	Sellwood	private	5
3060 SE Stark St.	Sunnyside	private	1
6532 SE 20 <sup>th</sup> Ave.	Westmoreland	ROW	2
			<b>Total SE (24)</b>
			<b>Grand Total: 37</b>

**TABLE 2. LOCATION AND NUMBER OF ELMS TREATED WITH ARBOTECT FUNGICIDE IN 2013 BY URBAN FORESTRY**

<b>Location</b>	<b># Elms</b>
Central Library	15
North Park Block #6 (Flanders – Glisan)	12
South Park Block #3 (Hall - Harrison)	13
Couch Park	11
South Park Block #4	13
South Park Block #5	16
Overlook Park	1
South Park Block #9	16
Laurelhurst Park	12
North Portland Library	4
Eastmoreland Golf Course	15
North Park Block #4 (Davis – Everett)	9
<b>Total</b>	<b>137</b>

**TABLE 3. LOCATION AND NUMBER OF ELMS TREATED WITH FUNGICIDE IN 2013 BY SAVE OUR ELMS (SOE), AFFILIATES, AND VOLUNTEERS**

<b>Location</b>	<b># Elms Inoculated</b>	<b>Method</b>
Ladd's Addition	24	Arbotect (Thiabendazole)
Eastmoreland	68	Alamo (Propiconazole)
Laurelhurst	15	Alamo (Propiconazole)
Grant Park, Beaumont, Wilshire, Irvington	53	Alamo (Propiconazole)
Richmond Elementary	10	Alamo (Propiconazole)
<b>Total</b>	<b>170</b>	

**TABLE 4. NUMBER OF ELMS REMOVED DUE TO DED PER NEIGHBORHOOD BETWEEN 1977 AND 2013**

<b>DED</b>	<b>Neighborhood</b>
94	Eastmoreland
67	Hosford-Abernethy
57	Downtown
57	Sellwood-Moreland Improvement League
56	Mt. Tabor
41	Laurelhurst
37	Creston-Kenilworth
34	Irvington
30	Northwest District
29	Collins View
22	South Portland
17	Wilkes
16	Overlook
16	Rose City Park
15	Buckman
15	MC Unclaimed #11
14	Alameda
13	Forest Park
13	Piedmont
12	King
12	MC Unclaimed #5
12	Richmond
11	Brooklyn Action Corps
11	Kenton
10	Goose Hollow
9	Sunnyside
8	Beaumont-Wilshire
8	Cully
8	Grant Park
8	Lents
8	Woodstock
7	Centennial

<b>DED</b>	<b>Neighborhood</b>
7	North Tabor
7	Sabin
6	Madison South
6	Multnomah
6	Southwest Hills
5	Montavilla
4	Argay
4	Powellhurst-Gilbert
3	Concordia
3	Eastmoreland/Reed
3	Hollywood
3	Old Town/Chinatown
3	University Park
2	Boise
2	Brentwood-Darlington
2	Hillsdale
2	Kerns
2	Pearl
2	Roseway
2	St. Johns
2	Sumner
1	Arbor Lodge
1	Bridlemile
1	Eastmoreland/Ardenwald-Johnson Creek
1	Eliot
1	Humboldt
1	Roseway/Madison South
1	Russell
1	South Tabor
1	Sullivan's Gulch
1	Woodlawn
<b>853</b>	<b>Total*</b>

\*Total number of elms lost in each neighborhood is approximate as elm inventory updates are needed.

