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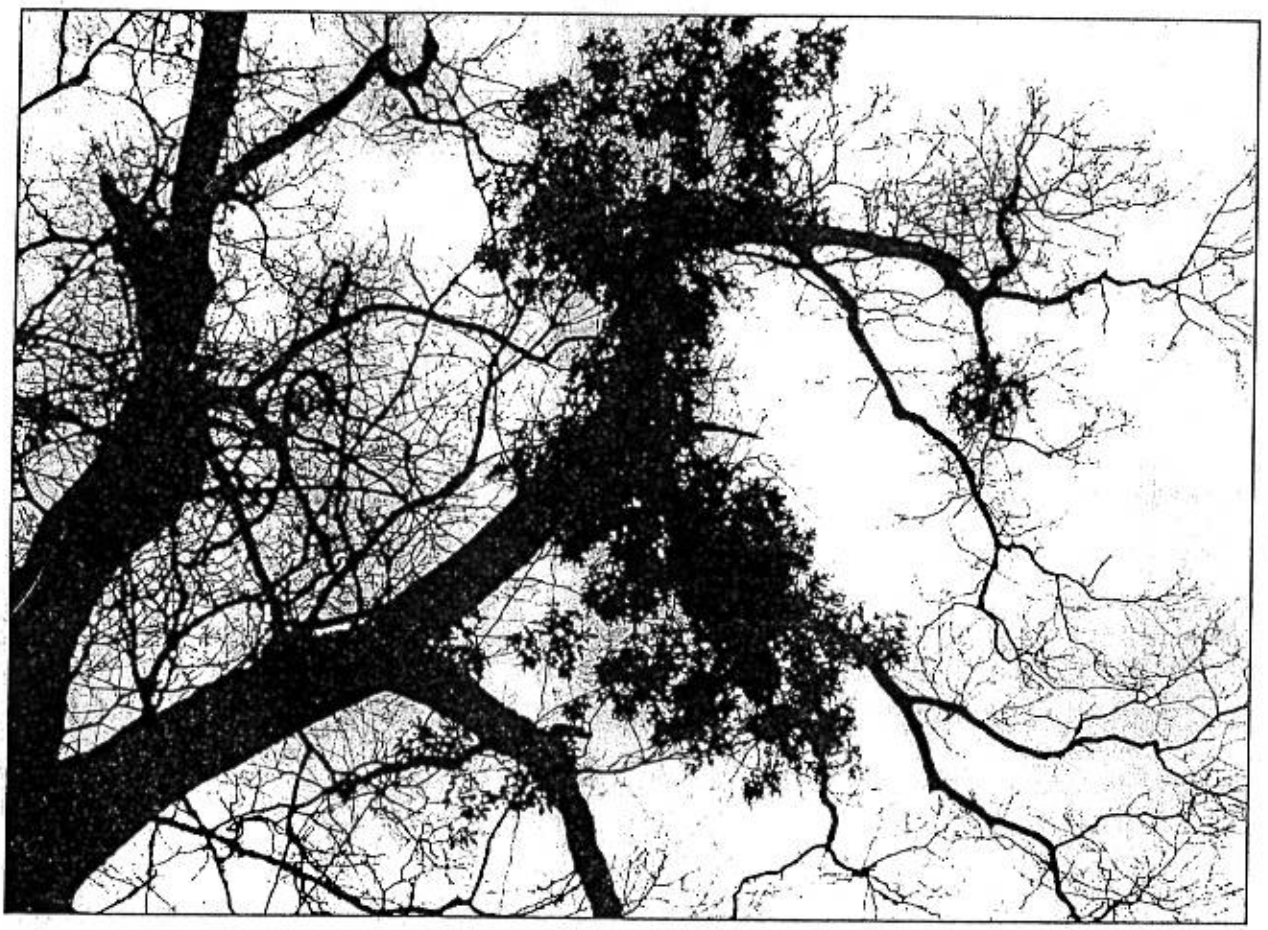

# Black Oak Decline on New York's Long Island, 1990–1996

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oak seedlings may be outcompeted by other tree species. In residential areas and managed parks, where natural regeneration is frequently suppressed by landowners, planting is normally the only means of regeneration. However, black oaks are not often planted in urban areas; other species such as red oak (*Quercus rubra*) or pin oak (*Q. palustris*) have become much more popular landscape trees.

## Parasitic Organisms

### Gall Wasps

The gall wasps (non-stinging) found in the swollen twigs of affected black oaks are from the cynipid family of the Hymenoptera. This family of insects generally has a complex life cycle that may include two generations a year—one consisting of all females (asexual) and the other consisting of males and females (sexual). The tiny insects spend most of their lives as larvae, the immature, maggot-like life stage.

The majority (99 percent) of gall wasps identified in this study were *Bassettia ceropteroides* (figure 2). This species has not been thoroughly studied, so little is known about its host preference, life

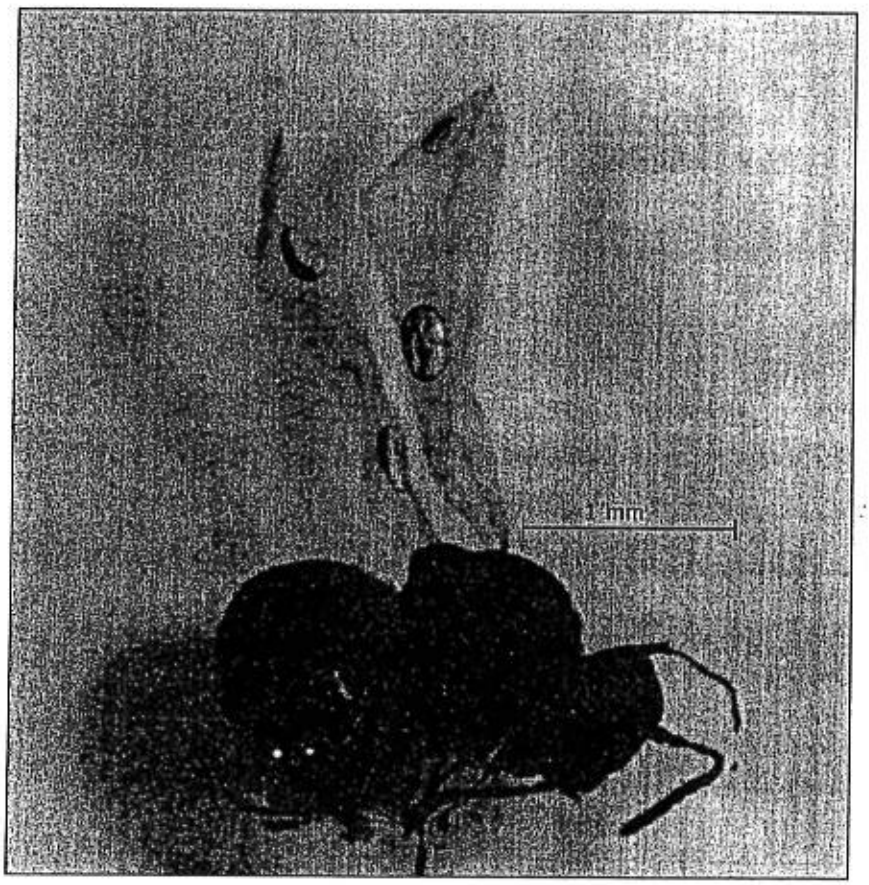


Figure 2. *Bassettia ceropteroides* was the most common species of cynipid wasp removed from black oak twigs. Approximate size is 1/8 inch (3 millimeters). (Photo by C. Pike)

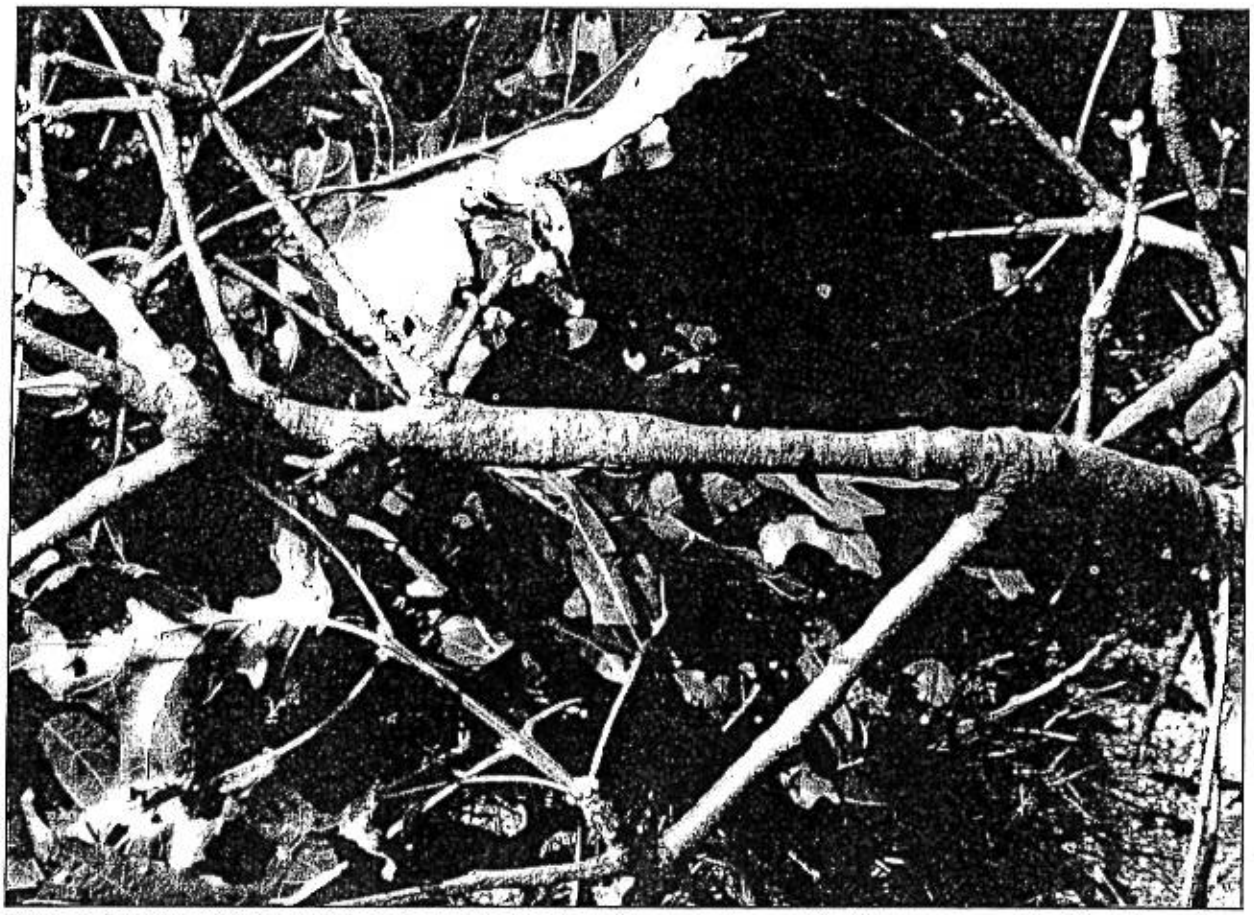

Figure 3. Branches with heavy infestations may appear swollen several years after the wasps completed their life cycles. (Photo by C. Pike)

by *Botrysophaeria*; however, no direct association between *Botryosphaeria* and gall wasps has been made. Other abiotic factors, such as drought stress, are known to increase the susceptibility of oaks to *Botryosphaeria* infection. While this fungus can cause significant damage to stressed trees, it is seldom a problem in healthy trees.

## Study Methods

A visual survey of black oak trees was conducted across Long Island's Nassau and Suffolk Counties in 1994 to assess the extent and severity of decline symptoms. The survey included trees in three ecotypes: residential areas (210 trees in 21 plots), managed parks (53 trees in 6 parks), and forested areas (135 trees in 13 areas). Other oak species were examined as well. Trees in residential areas were located along secondary and neighborhood streets and in the yards of private residences. Management of these trees typically included regular watering or fertilization or both during the growing season, as well as potential stress from herbicide use, disturbed and

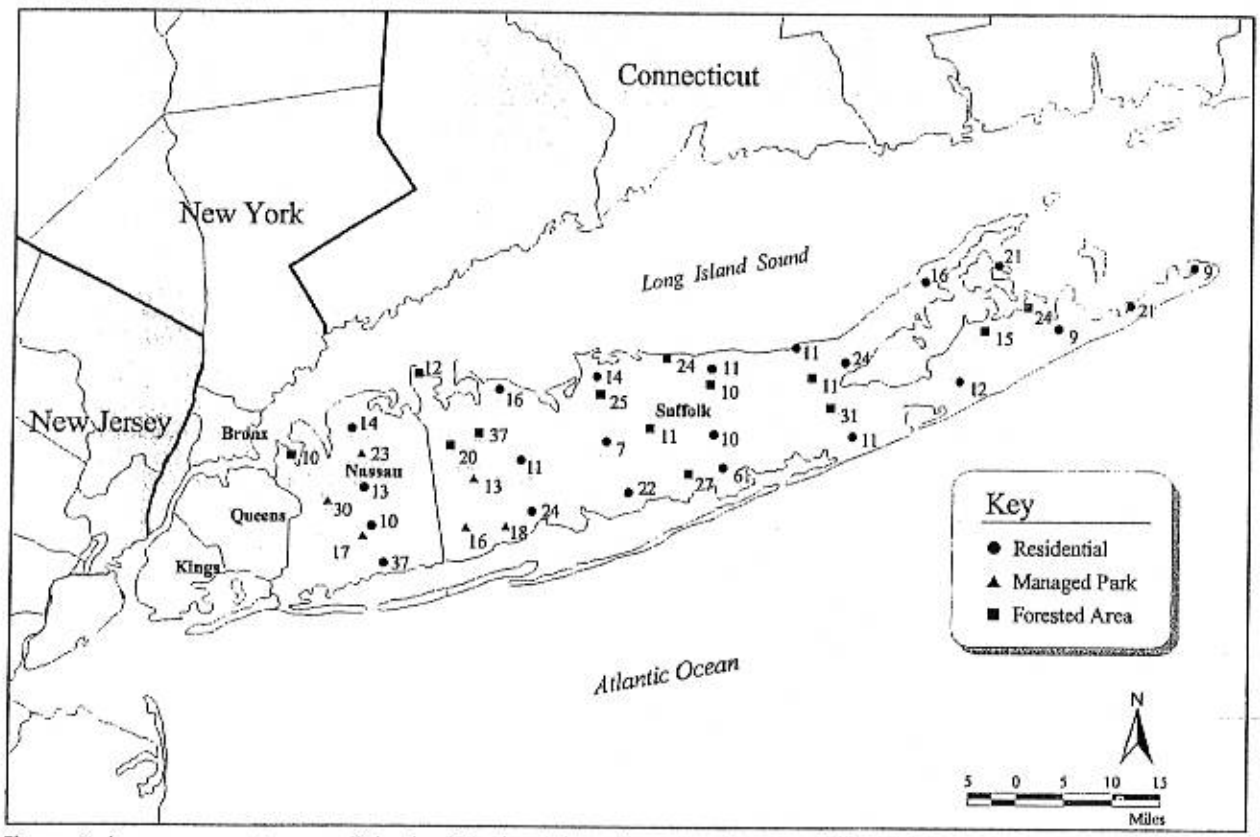

Figure 4. Average percent crown dieback of black oak in each survey plot ranged from 7 to 37 percent.

dieback correlate with the major soil associations of Long Island,areas but no cause-and-effect relationship between particular soil properties and the decline syndrome can be assumed.

The decline syndrome was confined to black oak trees. While galls, cankers, and dieback were observed on other species of oaks, the combination of these symptoms was found only on black oaks. All size and age classes of black oak were affected, but no significant correlations between them and decline severity were found. The extent of the decline varied greatly within a given area—some oaks were severely affected (figure 5), while others, sometimes directly adjacent to declining trees, showed few or no symptoms (figure 6). These findings suggest that susceptibility to decline is governed by a combination of individual tree site factors and genetic predisposition.

Analysis of growth rates from increment cores indicated that trees having severe dieback in 1995 also had slower growth many years prior to the decline than did trees with less dieback (figure 7). Growth rates of severely affected trees in residential areas were noticeably slower from 1989 to 1995. These trees may have been predisposed long before the emergence of this syndrome. It is unlikely that gall wasps targeted these trees, but weakened trees were

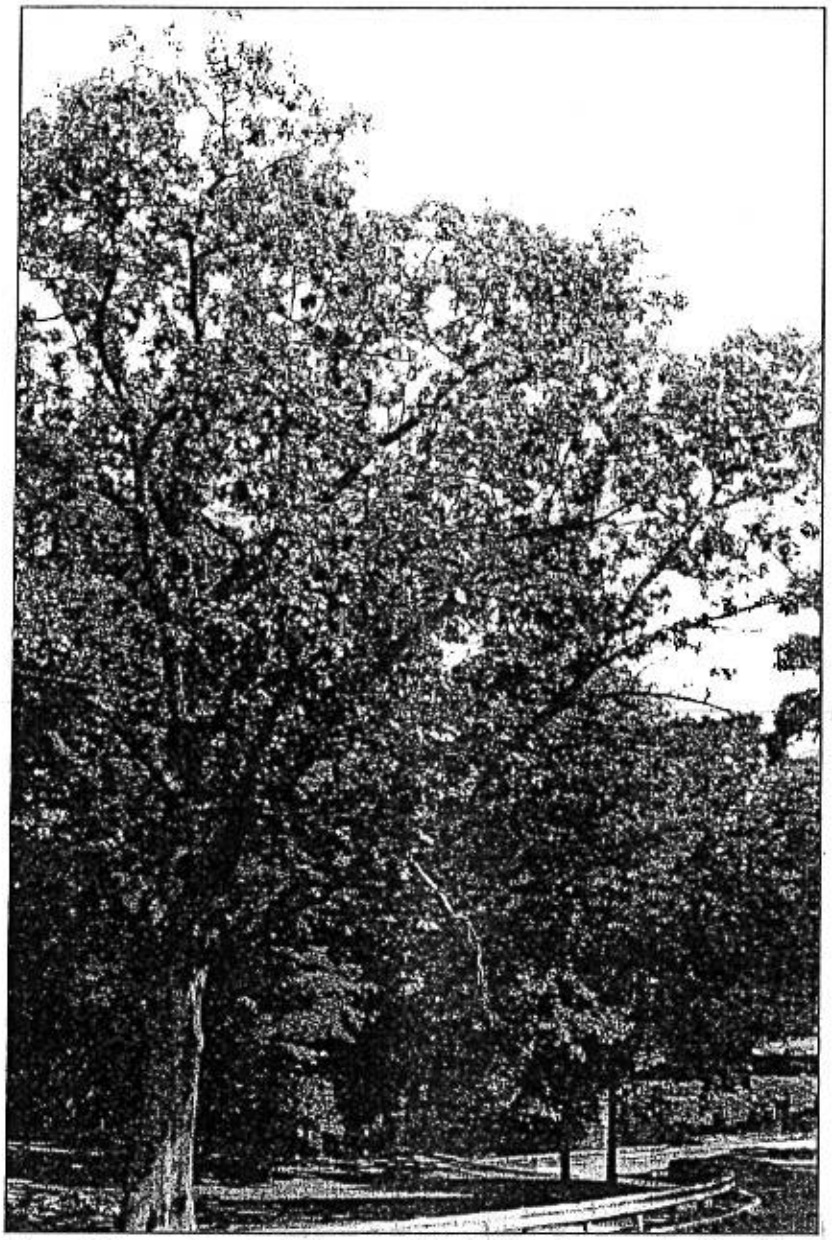

Figure 6. Trees with only slight crown dieback otherwise appear healthy. (Photo by C. Pike)

Increment cores also revealed reduced incremental growth due to widespread gypsy moth defoliation on black oak in 1980–1981 and droughty conditions during the late 1980's (figure 7). Both of these factors, as well as several severe windstorms during the 1980's and early 1990's, may have contributed to the development of the decline.

Gall wasp populations reached higher levels in residential areas than in forested areas, as determined by twig dissections (figure 8). It was not possible to accurately discern wasp chambers in twigs predating 1990. It appears that by 1990 the gall wasp population had reached

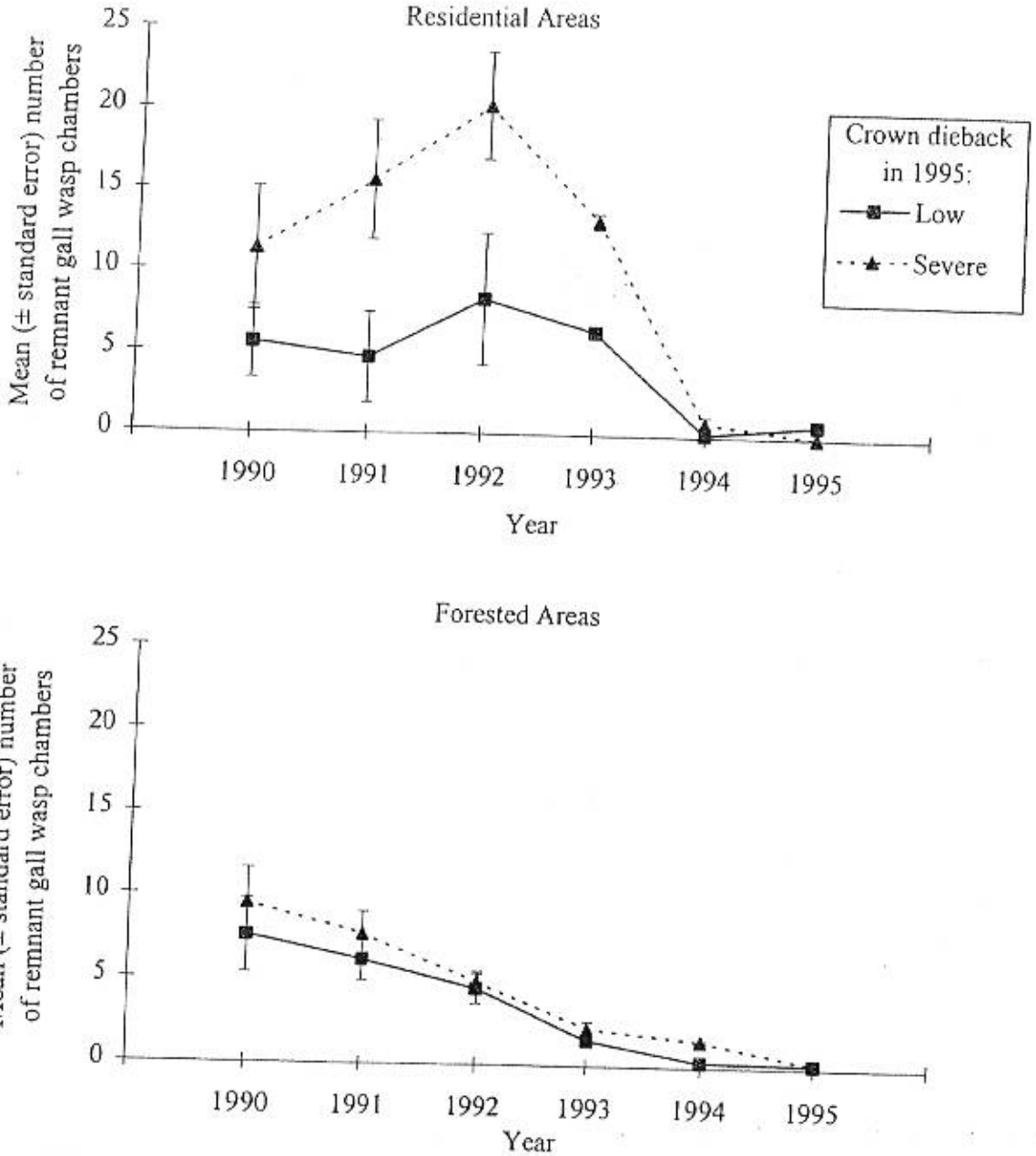


Figure 8. Mean number of gall wasp chambers in each year's growth of black oak twigs on Long Island, 1990–1995, in residential and forested areas, from trees recorded as having low or severe crown dieback in 1995. The average number of gall wasps excised from each year's growth decreased gradually in forested areas (lower graph) but sharply increased then decreased in residential areas (upper graph) from 1990 to 1995.

2. Gall wasps are more successful in residential areas because host trees are more vigorous, which benefits the wasps. It should be noted, however, that in this study, vigorous trees suffered less dieback despite having high wasp populations.
3. Estimates of decline in forested areas may be conservative. It was difficult to assess the extent of symptoms in many forests where black oak is not a common species.

population of black oak across the island is probably good, considering that the weakest trees were most affected by the syndrome and many were removed by subsequent cutting. Subtle changes in species composition in all ecotypes where black oaks were impacted may have occurred.

Based on these findings, Long Island's black oak decline syndrome appeared in the late 1980's and had diminished across the Island by 1996. This cycle is not unexpected. Additional cycles of black oak decline associated with gall wasps may emerge in the future and follow similar patterns of damage and recovery. There is no evidence to suggest or identify any particular human-caused factor leading to this syndrome.

## Management Recommendations

Arborists and others involved in the care and management of trees on Long Island responded in various ways to the syndrome and to requests for help from their clients—private and public property owners and managers. Practitioners tried intensive irrigation and fertilization, insecticidal sprays and injections, soil aeration, and removal of the galls by pruning. In some cases trees were cut and removed either because large dead limbs appeared to pose a threat to public safety and property or because the trees had become unsightly or died. While some operators reported occasional success at improving tree health, no documented evidence exists to support the use of these actions to control or manage this syndrome or the associated insects and disease.

As often as not, trees recovered without treatment as the syndrome diminished naturally. Healthy trees with vigorous growth were less susceptible to decline; therefore, maintaining tree vigor may be the best management strategy. Slow growth of trees before the onset of dieback appears to be the best indicator of future decline severity.

Galling insects are generally well protected from insecticidal sprays and tree injections. In fact, the gall itself consists of modified tree cells that protect the insect from toxic plant chemicals as well as from the external environment. Aerial application of insecticides might be effective if extraordinarily well timed with the emergence and flight of adult wasps. Research at the University of Maryland-College Park found that careful monitoring could identify the time of adult wasp flight in the spring. A spray protocol was not developed from the data, however, because the disappearance of the syndrome and gall wasp populations by 1996 precluded such studies.

Integrated management of this decline syndrome is best accomplished through the maintenance of tree health and vigor, and