UNIVERSITY OF MARYLAND EXTENSION

Browning White Oaks in 2019

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extension.umd.edu/ipm Fall 2019

University of Maryland Extension CMREC, HGIC, and the UMD Plant Diagnostic Lab have received numerous reports of sudden discoloration of foliage and death of white oak (*Quercus alba*) trees throughout the Mid-Atlantic region in August through October of 2019. We have visited sites with symptomatic trees, examined samples submitted to the UMD lab, and spoken with several arborists, landscapers, state and local forestry officials and landowners, in pursuit of information that might reveal a specific cause. While our investigation is still in progress, here are some factors that these individual cases all have in common:

1. Affected trees are older trees, approximately 40 – 80 years old or older. Younger trees in the same areas are not affected.
2. The onset of symptoms is fast – foliage that appeared healthy in spring and summer, became brown in color in August, often within 2-4 weeks. Most of the brown leaves remain attached to twigs of affected trees.
3. Although other oak species have been showing twig dieback and decline symptoms for several years, it is primarily white oaks that have this sudden browning of the canopy.
4. Symptomatic white oaks are often in urban and suburban landscapes, but trees in forests and in large landscaped areas with unrestricted root zones are also affected
5. In some cases, affected trees have large trunk wounds, previous root damage from compaction or construction, and show previous branch dieback, but many trees do not have any visible obvious symptoms of injury or major decline prior to browning of the foliage.
6. A variety of pests and diseases that are usually considered to be opportunistic invaders of stressed trees (such as ambrosia beetles, Armillaria root rot and Hypoxylon canker) are often observed in symptomatic trees. Sawdust-like frass at the base of the tree or on the bark of the lower trunk indicates the invasion of ambrosia beetles.

Fig. 1. White oaks with brown foliage, September 2019
Photo: David Clement

Overall assessment:

We have not found a single factor that is responsible for this problem. At this point, our best assessment is that the phenomenon is most likely an accelerated version of what is commonly called “tree decline”. Symptoms of typical tree decline include loss of vigor, early fall color, and dieback in twigs and branches. These symptoms usually progress over several years, and are usually related to root problems

(soil compaction, root or trunk damage from construction activities, and environmental extremes like drought or excessive rainfall). As the root system becomes unable to fully support the moisture needs of the tree, twig dieback occurs. Poor pruning, resulting in cavities, and repeated defoliation from insect pests or foliar diseases will add additional stress and continue the decline saga. Opportunistic insect pests like two-lined chestnut borer, ambrosia beetles and diseases like Hypoxylon canker and fungal root rots can aggressively invade weakened trees, resulting in severe decline and eventual tree death. Again, it usually takes several years from initial symptoms to death of affected trees.

Fig. 2 Fine sawdust-like frass (arrows) from ambrosia beetles at base of white oak with brown foliage Photo: David Clement

We believe that weather extremes in 2018 and 2019 have accelerated this decline scenario in white oaks (Table 1). In 2018, our area received excessive rainfall – up to more than 70 inches in some areas, resulting in flooding and saturated soils. Such conditions are very damaging to fine roots of trees like white oaks, and can favor the development of root rot diseases caused by water mold pathogens like Phytophthora. We had similar moist conditions in early 2019, and numerous isolated storms that dropped 2+inches of rain, resulting again in localized flooding. The summer of 2019 then turned quite hot and dry, with a record number of days above 90°F and very dry weather in August and September. We speculate that this sudden hot and dry weather caused rapid water loss from the foliage of these trees and the impaired root systems were not adequate to provide enough moisture under dry conditions. The presence of secondary invaders, like ambrosia beetles, cankers and root rot, contributed as well. The rapid browning and death of affected trees is the result of this "perfect storm" of factors.

We still have unanswered questions – what type of ambrosia beetles are present? How many affected trees show secondary insect pests and opportunistic pathogens? Will healthy-appearing trees be threatened by these organisms in browning oaks nearby? Will trees with brown foliage this year develop new growth next year? We will continue investigating and working with colleagues from other agencies and other states in our region to find answers.

What can you do? White oaks would benefit from irrigation during this time of drought. Trees that enter winter dormancy under drought stress are more likely to show additional decline symptoms next year. Deep but infrequent watering to the root zone will help to reduce drought stress.

Table 1: Precipitation Recorded at BWI Airport for 2018* and 2019:

MONTH	2018	2019
January	1.00	3.15
February	5.30	3.64
March	2.25	4.14
April	3.20	1.46
May	8.17	5.51
June	4.77	2.95
July	16.73	3.85
August	3.84	0.39
September	9.19	0.16**
October	6.69	6.21
November	8.14	1.10
December	6.54	3.57
Total for Year	**71.82**	**36.13**

Data Source: National Weather Service

*Wettest year on record for BWI (also for Reagan National at 66.28" and Dulles at 66.74")
** Second driest September on record for BWI (also second driest September for Dulles at 0.41" and fourth driest September for Reagan National at 0.25")

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October 2019