NH Department of Natural & Cultural Resources
Division of Forests & Lands
Forest Health Program

Annual Newsletter 2019

Oak Wilt
Hemlock Woolly Adelgid
Emerald Ash Borer

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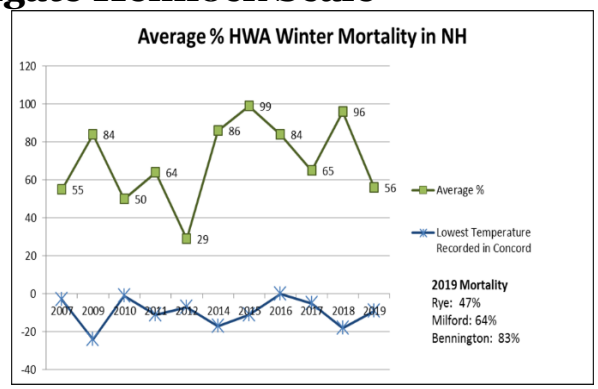
FIELD SURVEYS

By: Jen Weimer

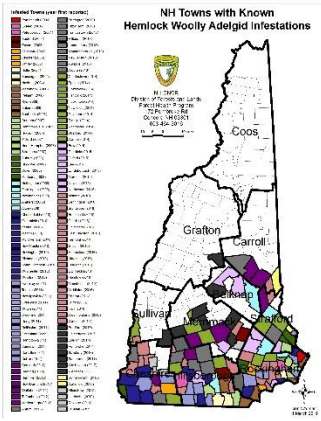
Hemlock Woolly Adelgid and Elongate Hemlock Scale

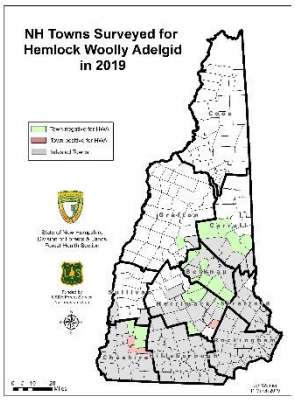


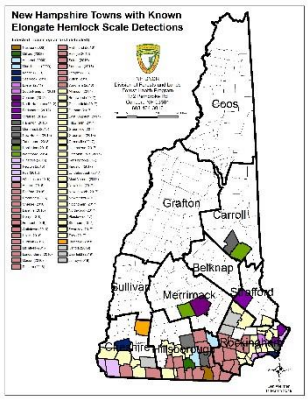
Hemlock Woolly Adelgid (HWA) surveys for 2019 were done in 23 towns that border infested areas in NH. Towns surveyed included Marlow, Stoddard, Sullivan, Nelson, Harrisville, Roxbury, Dunbarton, Allenstown, Pittsfield, Barnstead, Gilmanton, Belmont, Tilton, Laconia, Effingham, New Hampton, Center Harbor, Northfield, Canterbury, Boscawen, Sandwich, Tamworth, and Ossipee. Infestations were found in Sullivan, Harrisville, Roxbury, and Allenstown. Winter mortality surveys were done for HWA at 3 sites with an average mortality of 56% which was down from prior years. In addition, larval sampling was done this past spring at 2 sites on the seacoast where *Laricobius nigrinus* (Ln) had been previously released for HWA biocontrol. Molecular analysis done by Virginia Tech shows that Ln is now established at one of those sites in Seabrook, where beetles had been released in 2007. Prior to this only 1 adult beetle had been recovered (in 2009). Since no other adult Ln beetles have been recovered to date in NH through beat sheet sampling, we plan to expand larval surveys to all prior release

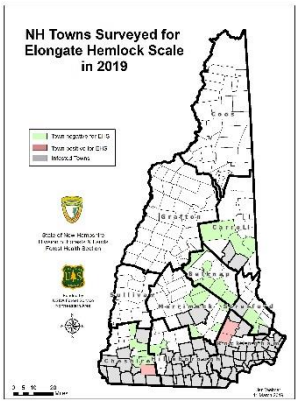
sites next spring. Additionally 500 Ln beetles were released in November at our field insectary in Durham. This was our fourth release at this site where hope to collect beetles in the future and relocate to other areas in the state with HWA infestations.

Elongate Hemlock Scale surveys for 2019 were done in conjunction with HWA surveys. Towns surveyed included the towns surveyed for HWA and the towns of Dublin, Jaffrey, Candia, Madbury, Lee, Barrington, Marlborough, Bennington, Hancock, and Deerfield. New infestations were detected in Jaffrey, Candia, and Deerfield.





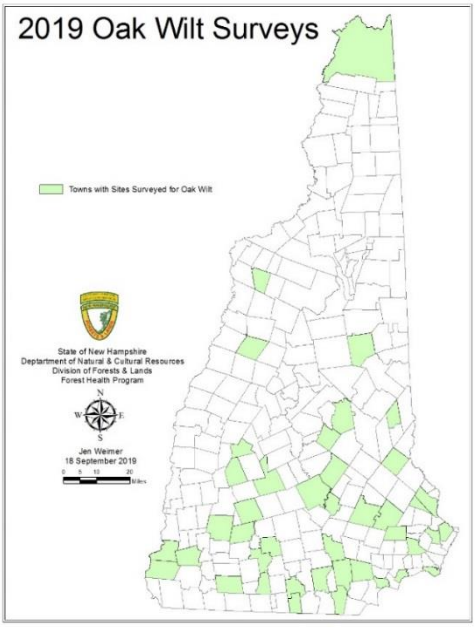




Click on maps to enlarge

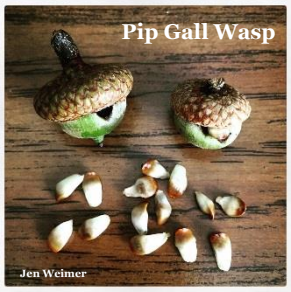
Spruce Budworm and Southern Pine Beetle

Trap catches for Spruce Budworm in NH continue to remain at endemic levels. You can find out more info and view an interactive map of the current outbreak in Canada on the Maine SBW Task Force webpage. This was our fifth year trapping for Southern Pine Beetle in response to the recent northern spread of the beetle and we did not detect any in our traps again this year.



Oak Wilt

Surveys for oak wilt were done at high-risk sites around the state this summer. Sites included state parks (16), firewood dealers (19), and second homes (2) owned by residents of towns with known infestations in New York. We also had a large response (60 calls) to the press release that went out in August and visited many homes (24) with suspect trees. While all of our surveys were negative for oak wilt there was a lot going on with oak this year. Of note was mortality from prior defoliation of gypsy moth, early acorn drop from pip gall wasp, defoliation from oak shothole leafminer, anthracnose, branch dieback from bot canker, and oak twig pruner. See this years' feature creature for more info on oak wilt and other oak pests.

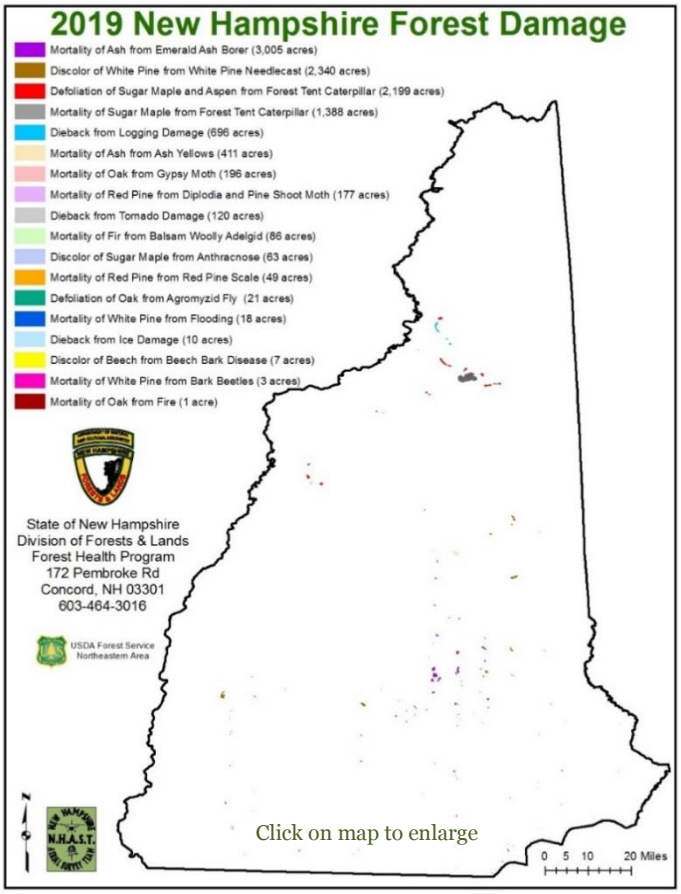


Larvae from the pip gall wasp develop in tooth-like galls within acorns causing early acorn drop. It also causes sap to drip from the trees leaving a sticky residue on anything it falls on. Outbreaks are rare but occurred region wide in 2019.

The adults of this small native fly in the family Agromyzidae are active in the spring when buds are just opening. They feed on red and white oak newly developing leaves which creates tiny circular holes in leaf tissue looking a bit like Swiss cheese.

Aerial Survey Highlights for 2018

By: Jen Weimer



We mapped over 10,000 acres of damage in this year's aerial survey. Mortality from emerald ash borer is becoming more noticeable throughout its range in southern NH, where we mapped 3,000 acres of damage. White pine needlecast diseases were also prevalent around the state again with 2,340 acres mapped. Forest tent caterpillar defoliated 2,199 acres in the White Mountains, but this was much less than previous years and damage was light. We also mapped 1,388 acres of sugar maple mortality from prior years of severe defoliation.

Other notable damage this year occurred from ash yellows (411 acres), gypsy moth (196 acres of mortality from prior years of defoliation), and mortality of red pine from diplodia tip blight, pine shoot moth, and red pine scale (226 acres). Additional damage mapped included; dieback from old tornado damage (120 acres), mortality of balsam fir from balsam woolly adelgid (86 acres), discolor of sugar maple from anthracnose (63 acres), defoliation of oak from oak shothole leafminer (21 acres), mortality of white pine from flooding (18 acres), dieback from ice damage (10 acres), discolor of beech from beech bark disease (7 acres), mortality of white pine from lightning and bark beetles (3 acres), and mortality of oak from fire (1 acre). Damage polygons can be viewed on the map above or check out an online web map (including maps from the past 5 years) for more detail.

EAB UPDATE

By: Bill Davidson

Infestations of emerald ash borer have been detected in 24 towns so far in 2019, which is currently tied with last year as the most new towns in a single year. However, with visual surveys still ongoing, it is likely that a few more towns will be added before year's end. Among these towns were Croydon and Rindge, the first detections in Sullivan and Cheshire Counties respectively. Currently, nine of New Hampshire's ten counties have active ash borer infestations, with Coos County serving as the lone uninfested county. Detections this year were made predominantly via visual surveys and trapping, however, several infestations were brought to light as the result of suspect trees being reported by the public. As the core of the EAB affected area continues to expand, public reporting will become more critical in detecting new outbreaks in a timely manner. Suspect trees should be reported to www.nhbugs.org, where you can also find information on symptoms of infested trees.

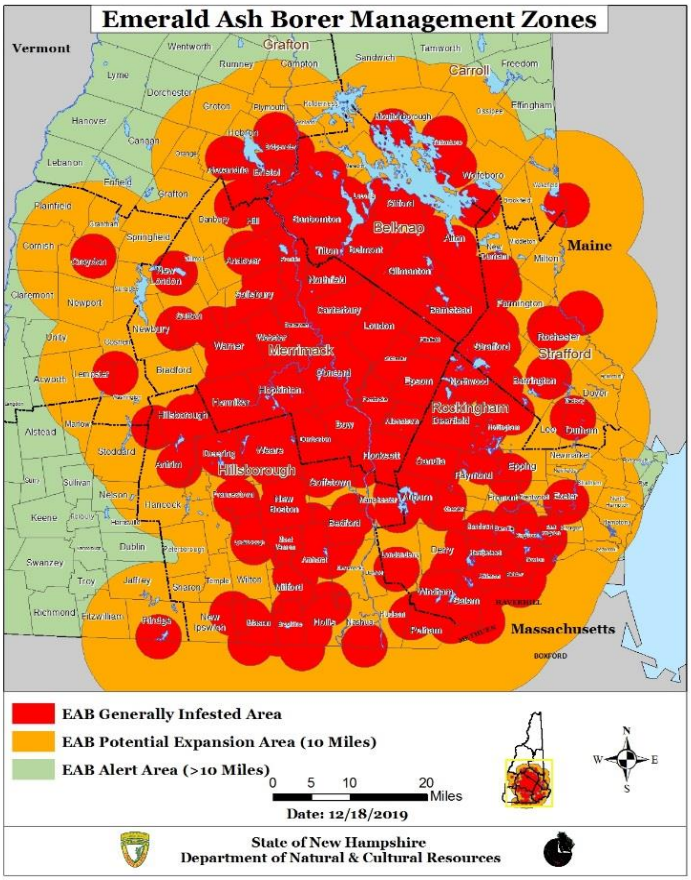
New Towns in 2019

Town	County	Date added
Newton	Rockingham	January
Chester	Rockingham	January
Nottingham	Rockingham	January
Barrington	Rockingham	January
Farmington	Strafford	January
Rochester	Strafford	January
Francestown	Hillsborough	May
Croydon	Grafton	May
Exeter	Rockingham	July
Durham	Rockingham	August
Sandown	Rockingham	August
Danville	Rockingham	August
New Ipswich	Hillsborough	August
Greenville	Hillsborough	August
Rindge	Cheshire	August
Windsor	Hillsborough	August
Washington	Sullivan	August
Sutton	Sullivan	August
New London	Merrimack	September
Nashua	Hillsborough	October
Londonderry	Rockingham	November
Raymond	Rockingham	November
Epping	Rockingham	November
Antrim	Hillsborough	November

This year, biological controls for emerald ash borer were released at eight locations in five counties, bringing the total number of sites were biological control has been conducted in New Hampshire to 21. The best method to evaluate if the released wasps are becoming established is to go back to the release sites and try to find them several years after releases have stopped. We have reliably recaptured the parasitic wasp *Tetrastichus planipennisi* from forests surrounding release sites, and in some instances have captures this wasp several miles from the nearest release site, which indicates that this species is becoming well established in the environment. *Oobius agrili*, another of the parasitic, has been more elusive. Up until this year we had only recovered a few individuals, but earlier this year at a release site in Hopkinton over 50 EAB eggs were collected that had been parasitized by this wasp, representing a parasitization rate of over 50%. The third species used in the program, *Spathius galinae*, has only been

released for the past two years, but researchers at UNH have already had some success in recapturing them from their release sites. More work is needed to better understand how these insects move across the landscape once they become established at a site. This past year, in an effort to evaluate their spread, infested trees ranging from 2-5 miles from release sites were felled from throughout the Concord area to be checked for presence of parasitic wasps. This initial regional survey was unsuccessful at determining spread of parasitic wasps and therefore will be reattempted in 2020.

In addition to the standard biological control procedure, four of the highest quality release sites were selected for use in an ongoing integrated pest management (IPM) treatment regime. At these four sites, 12-15 of the most vigorous ash were selected for treatment with emamectin benzoate (a trunk injected systemic insecticide), which will provide those trees with complete protection from emerald ash borer. Protected trees will serve as a valuable source of continuous seed production, which will pave the way for ash regeneration once the main wave of EAB moves through. Treated trees also provide residual benefit to the surrounding forest by killing adult ash borers that feed upon their leaves. An overall lower population of emerald ash borer in the forest will slow mortality of untreated trees, buying more time for parasitoids released as part of the biological control program to successfully establish self-sustaining populations.



Click on map to enlarge

FEATURE ARTICLE

By: Kyle Lombard

Tree Restoration and Conservation in NH

This past summer Anne Krantz wrote an article for the UNH Cooperative Extension Big Tree program that highlighted the butternut tree in New Hampshire and its serious decline across the landscape due to butternut canker disease. Anne's article referred to a Forest Health Program project from the 1990's, designed to locate apparently resistant butternuts in the wild and propagate potentially resistant native trees in an orchard. Once again, folks who thought they knew of a healthy butternut trees were asked to contact us and share the locations. The public response to the article reinforced several findings from the original project. First, people love their butternut trees. There seems to be a deep cultural significance to the species for folks that grew up on farms or in rural areas; cracking open nuts from a butternut tree in the yard holds special meaning. Second, there are no longer any healthy native butternuts in mature size classes in NH. Of the dozen trees we looked at, only one was healthy and it was a "buartnut" tree. A cross between a butternut and a Japanese walnut. The cross looks and acts almost identical to butternut and it's highly resistant to butternut canker disease but it' not native.

Butternut is not alone in facing challenges, and there are many tree restoration and conservation programs across the eastern states. People are working on American chestnut genetics, elm genetics, beech bark disease resistance, hemlock resistance to adelgid mortality, and white pine immunity to blister rust. Generally, restoration programs are designed to study and modify tree genetics and produce new varieties that can be placed back in the ecosystem to recapture some of the services provided by a species lost to invasive insects or disease. On the other hand, conservation projects seek to find apparently tolerant populations of trees in our forest and manage to encourage and promote these rare but native populations.

A case in point for conservation is the white ash tree. Researching genetics to try to create an ash variety that is resistant to Emerald Ash Borer (EAB) feeding is a noble exercise. But practically, we need to educate landowners and managers about modifying forest management behaviors to recognize tolerant stands and promote those native trees that have the best chance of survival. Planning for a future that includes a mix of biocontrol agents, pesticide options and changing forest species compositions, means promoting silviculture that encourages ash regeneration or small diameter ash trees while limiting the amount of basal area in large diameter ash trees unless those larger stems are treated with pesticides for long-term seed source protection. There appears to be something unique about young ash trees (versus larger, older trees) when it comes to tolerance to EAB. Whether it is the result of elevated terpene production, bark

thickness, bark texture, lack of cambium volume, or a bit of each, small vigorous ash trees seem to survive much longer than large, older, thick barked trees. Our objective should be to protect young stands while reducing the stocking of big trees - which have the capacity to carry huge outbreaks and exponentially more beetles than small trees.

There is a place for both restoration and conservation in New Hampshire, but with few resources to spend, focusing on conservation efforts over introducing hybrids or genetically modified species into the forest may be the most practical path.

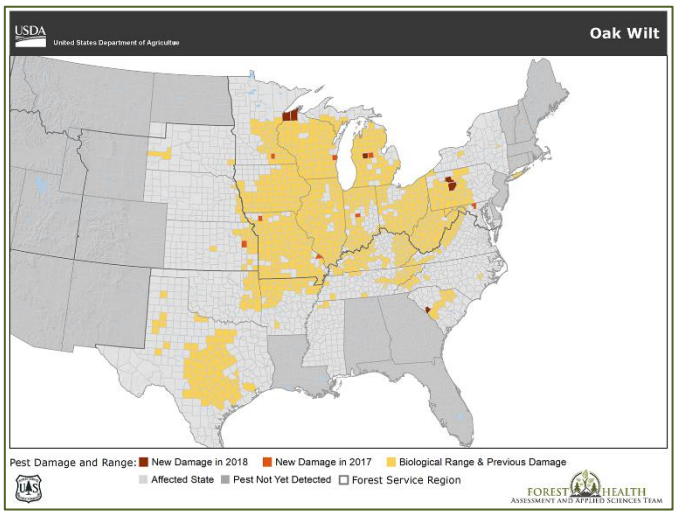
Grafted Butternut

FEATURE CREATURE

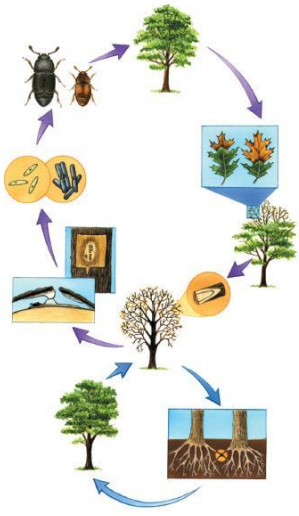
By: Jen Weimer

Oak Wilt *(Bretziella fagacearum)*

Oak Wilt is a vascular wilt disease of oaks caused by the fungus *Bretziella* (previously *Ceratocystis*) *fagacearum*. Hosts include all species of oak, with red oak being the most susceptible. Infected trees can die within six weeks of infestation. The disease was first described in Wisconsin in the 1940s but its origin is still unknown and is considered by some to be exotic. The current known range of oak wilt is from New York through the Midwest and south to Texas. Surveys for oak wilt in NH were initiated in the 1950's using fire tower lookouts and were done again this past summer at high-risk areas within the state (see field surveys). Recent detections in New York on Long Island and near Albany have raised the alert level for New England states.



Symptoms of the disease appear in July with red oak (including scarlet, pin, and black) leaves browning and shedding from the top of the tree downward within a few weeks of infestation. White oaks (including bur and scrub oak) that form tyloses die more slowly and branch dieback is more sporadic, occurring over several years. Trees wilt and die as their water carrying vessels become plugged as a response to the invading fungus. After the tree dies, sweet smelling fungal mats coated with spores are produced in the tree and force the bark to crack open. These mats, sometimes called pressure pads, attract sap feeding nitidulid beetles which can spread the spores to healthy trees through fresh wounds. Spore mats are most common on red oak species and are not typically seen on white oaks. The disease is also spread locally through root grafts. Root grafting is more common in sandy soils and can lead to new infections of healthy trees up to 100 feet or more from an infected tree.



Oak Wilt Disease Cycle
USDA How To Identify, Prevent, and Control Oak Wilt

Control of oak wilt is difficult and involves removal of infected trees, breaking root grafts between infected and health trees with vibratory plows, or the use of herbicides to slow the spread of the fungus into the roots. Vibratory plows with a 5-foot blade are the preferred method of disrupting root grafts in sandy or loamy soils. This method would likely be difficult in the northeast and stump extraction may be a more practical method in NH. This method involves removing infected trees as well as a buffer of healthy trees and uprooting the stumps during the dormant season. The use of herbicides is also being used in some areas to kill infected trees more quickly and prevent the spread of the fungus into the roots.

There are no known effective chemical treatments for oak wilt and prevention methods should be followed in areas at risk for the disease. Prevention measures such as pruning in the winter and avoiding injury to healthy trees is key to avoiding this deadly disease. In areas where oak wilt is present and damage to trees are unavoidable, it is advised to use tree paint on fresh wounds occurring in the spring or summer months when beetles are active. Infected trees that are removed should be debarked or chipped. Firewood should also be considered a risk for spread and should not be moved or stored near healthy trees.

There are several look-a-like symptoms that can easily be confused with oak wilt including; drought, bacterial leaf scorch, botryosphaeria canker, tubakia leaf spot, sudden oak death, oak leaf skeletonizers, oak shothole leafminer and anthracnose among others. None of these however will cause rapid wilt and complete leaf drop in early summer.

What to look for:

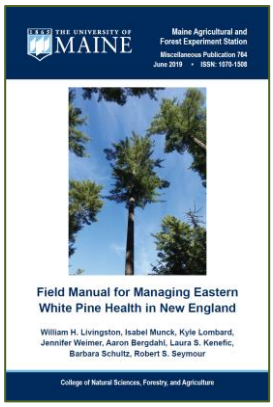
- Brown coloration on leaves starting at the outer edge and progressing inward toward the mid-vein of the leaf.
- Branch dieback starting at the top of the tree's canopy and progressing downward.
- Leaves suddenly wilting in the summer and falling.
- Sweet smelling fungal spore mats under the bark.

If you suspect you have seen signs of oak wilt please note location, take photos of the symptoms including the leaves and the entire tree, and upload to nhbugs.org or email jennifer.weimer@dncr.nh.gov.

Office Notes

The NH Forest Health Program office and lab is located at the Caroline A. Fox Research and Demonstration Forest in Hillsboro. Our small staff monitors the condition of New Hampshire's 4.8 million acres of forest. You can help by contacting us if you observe any forest damage. Photos can be uploaded at NHBugs.org or you can contact us for a site visit. You can also follow us on social media to keep up to date on forest health issues. So far this year we have 931 followers on Facebook, 664 followers on Twitter, and 1,019 followers on Instagram. Thanks for being so social with us! In addition we email quarterly updates in March, June, and September. If you're not already on the mailing list you can sign up on our website or Facebook page.

NEW Publication: Field Manual for Managing Eastern White Pine Health in New England. The manual provides readers guidance for identifying and evaluating important health problems of eastern white pine in New England, including white pine weevil, blister rust, bast scale, and needle damage, *Caliciopsis* canker, and red rot or red-ring rot. The manual also outlines silvicultural practices that can reduce risks of health problems and improve productivity and quality of eastern white pine at various stages of stand management. In addition to being a resource for forest managers, the field manual can help woodland owners understand the risks to eastern white pine health and help justify the use of forest management.



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