PROPOSAL

Title: BRANCHING OUT: Focusing on Feature Articles

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Abstract: BRANCHING OUT: *An IPM Newsletter for Trees and Shrubs* has been published (10 issues per year) since 1994. Each issue has a 1-2 page feature article describing either a single pest or pathogen or a closely related group with detailed illustrations. The forum allows authors to explain the conceptual bases behind IPM strategies as well as the strategies themselves. The product of our efforts here is a consolidation of the feature articles into a single booklet, with suitable rearrangement of topics to provide a logical framework (either via host, symptom, or pest/pathogen group) for reference by practitioners. Management options from some of the older features have been updated and some new articles have been written to fill obvious gaps. All black and white photos or line drawings have been replaced with color pictures.

Background and Justification: For the past 16 years, the P.I and a team of contributing staff members have published **BRANCHING OUT:** *An IPM Newsletter for Trees and Shrubs* for an audience of tree care professionals, nurserymen, Christmas tree growers, Cooperative Extension educators and turf managers that numbers about 2000 per year. **BRANCHING OUT** was recognized by the NYS Associate of County Agents as the best new extension publication when it first appeared, and it has since received numerous accolades from readers. The P.I. received the Richard W. Harris Author's Award from the International Society of Arboriculture in 2007, following nomination by the New York State Arborists Association primarily for his efforts on the newsletter. And the P.I. and his assistant together won the 2009 Excellence in IPM award for their continued publication of **BRANCHING OUT**.

In addition to sections with a scouting report (with field observations less than 4 days old), a growing degree day monitor, and "miscellaneous news", each issue has a 1-2 page feature article. The feature, complete with color illustrations, describes in some detail either an individual pest/pathogen, a group of closely related (by symptoms or hosts) pests/pathogens, plant problems caused by non-infectious agents, or some other important issue. The feature articles are different from traditional industry or academic generated fact sheets in that writers do more than illustrate pests/pathogens and detail life cycles; they use the opportunity to develop IPM concepts that justify recommended management strategies. Emphasis is on least toxic alternatives to "traditional" chemical controls and, more often than not, recommendations urge plant health care professionals not to intervene at all, but rather to allow pest outbreaks that our experience tells us are temporary, to pass. So far, 160 unique feature articles have been prepared. If printed as is, they would total about 240 pages.

Procedures:
We propose to consolidate and organize the 160 feature articles published in BRANCHING OUT into a booklet that will enable plant health care professionals, educators, Master Gardeners, etc. to have ready access to up-to-date tree and shrub pest management information. In some cases, the articles will be used *verbatim*, but in others there will be need to update information on host and geographic ranges and management strategies and to upgrade illustrations. Many feature articles deal with pests and pathogens that have similar symptoms (e.g. conifer twig problems, witches' brooms, leaf scorch) but for purposes of this booklet, an alternative organizational scheme that leads IPM practitioners more directly to relevant information will be employed. The booklet will also have a table of contents and an extensive index to direct readers to important information quickly and easily. About 1/3 of the feature articles in the early years of Branching Out were not illustrated in color because we couldn't afford what was, at the time, such luxury. Those illustrations will be replaced for this effort and everything will be in color unless we decide that a line drawing provides a better way to illustrate a particular point. We would also plan to make the booklet available electronically, either on a dedicated web site with links to it from the current Branching Out site, the Insect and Plant Disease Diagnostic Lab web sites and the NYS-IPM website. For the future, the electronic site would allow for easy revision, additions, and links to YouTube videos like the one we recently prepared to guide arborists in selection of suspect oak wilt samplesWe expect to complete the project by June 1, 2010.

Note: Reproduction and distribution (and sales?) of the final product are not part of the scope of this proposal but will be at the discretion of appropriate staff associated with the NYS-IPM program.

Results and discussion:
Branching Out features contain information on a wide array of the most important pest management issues that plant health care professionals are likely to face in any given year. Practitioners will use the resource to hone their diagnostic skills and to put a conceptual framework behind whatever management strategy they are proposing to implement. They will also have a bit of an historic record of some unusual outbreaks or epidemics inasmuch as those also would have been worthy of extended treatment in a feature article. In its electronic form, the compilation can also be excerpted as needed to be used as an educational resource for Cornell Cooperative Extension staff, industry clients, and students. Together, the collection provides end-users with ready answers to vexing questions and enables them to make informed decisions about pest management strategies. To ensure that the final version gets wide exposure, we propose to offer it as an add-on to the 2011 Branching Out subscription package, thus getting it into the hands of at least 1000 of the leading educators and practitioners in New York State, including arborists, Christmas tree growers, NYS Turf Association members and others throughout the Northeast who are involved in managing landscape vegetation. Excerpts from the manual follow.

BRANCHING OUT

An Integrated Pest Management

NEWSLETTER
For Trees and Shrubs

1994–2009

A Collection of Feature Articles Spanning 16 Years

Table of Contents

1

Pine Needle Scale

Pine needle scales are some of the most serious pests of ornamental pines. For many years, pest managers thought that only one species of insect caused the characteristic signs and symptoms of an infestation. However, in recent years we have learned that there are actually two species of insects involved. They are *Chionaspis pinifoliae* and *C. heterophyllae*. Because they cannot be separated in the field and are biologically similar in so many other ways, they are treated as one species here.

Pine needle scale on Scots pine.

Hosts

In the Northeast, pine needle scales are most commonly found on two- and three-needled pines such as mugo, Scots, red, and Austrian pines. White, Norway, and Colorado blue spruces are also occasionally attacked, but damage to these species rarely warrants attention.

Symptoms and Signs

The most obvious signs of attack by pine needle scales are the readily discernable white covers (tests) of female scales. The covers are oystershell-shaped and about ⅛ inch long. Covers on males are of similar shape and color, but they are ¼ to ⅓ as large as the females.

In May and July, pry back the female scale covers to determine if the red eggs or crawlers are present. Crawlers are very tiny (less than 1/16 inch long), but they are bright red and relatively easily seen when they are active. When the crawlers have settled down and are feeding, they are translucent and yellow.

Newly hatched pine needle scale crawlers

Trees with light infestations can tolerate such and may show no overt symptoms other than the occasional scale, itself. However, with heavier infestations (ie. several scales per needle), feeding from this insect causes the needles to turn yellow and then brown. From a distance, the foliage may look white to gray. The affected branches or entire trees may die.

Life History

This native, armored scale has two generations per year. The eggs overwinter underneath the female scale covers. In May, the eggs hatch. The red nymphs emerge and either crawl to other nearby branches or are dispersed by the wind to other trees. Once they find a suitable host, female crawlers settle in one place where they feed and continue to develop. Male crawlers, on the other hand, feed briefly and then go through a maturation process leading to their development into minute, winged adults. These males then fly around in search of females. Following mating, the males die. The females bear up to 100 eggs.

Settled pine needle scale crawlers showing color change before producing white waxy covering

The second generation of crawlers emerges in July. The adults from this generation also reproduce. The females lay their eggs in late summer, and the eggs remain under the scale covers until the following spring.

Management

In late May (298–448 GDD_{50}) and July (1290–1917 GDD_{50}), examine previously infested trees with a hand lens to observe the crawlers. These bright red crawlers can also be detected by tapping selected branches over a piece of white paper and viewing the crawlers that drop down.

At these times, look also for the presence of wasp parasites and predators, such as lady beetles. If the beneficial insects are present and holding the populations in check, no further action will be needed. If no beneficials are present or if the scale populations are high enough to cause yellowing, treat with a registered pesticide. In addition, a dormant treatment can be made in April.

If all else fails, severely infested trees should be removed and destroyed during the winter season to prevent spread of the insect to other trees.

Close view pine needle scale.

Pests of General Interest

2

***Corythuca* sp.**

Symptoms—Examine the foliage of deciduous plants such as sycamore, hawthorn, birch, willow, cotoneaster, quince, and pyracantha. Feeding by Corthuca lace bugs results in stippled foliage. The stipples eventually coalesce. The leaves turn yellow then brown. Dieback may occur, and heavily infested shrubs may die.

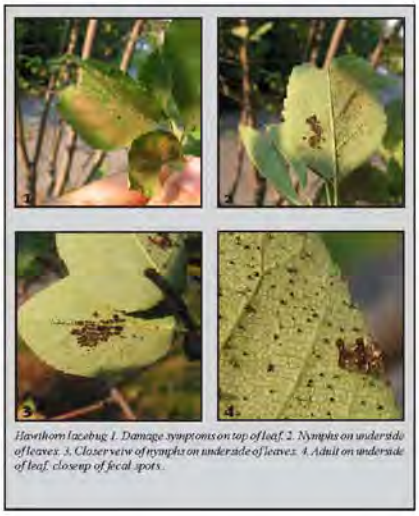
Signs—Look on the undersides of leaves for the immature and adult lace bugs. The nymphs are black with long spines. The adults have lace-like wings and are 1/8 inch long. Their bodies are white to tan with brown or black markings. Brownish-black fecal spots are also seen on the undersides of the leaves.

Look on the undersides of leaves for the immature and adult lace bugs.

Life History—The adults overwinter near their hosts. In spring, the eggs are laid in small groups on lower surfaces of leaves. The nymphs emerge and then feed. The adults mate, and the female inserts her eggs into the leaf tissue. This second generation feed, mature and eventually overwinter until the following spring.

Managment—The natural enemies are mostly predators but they are rarely abundant enough to make an impact on the pest populations. An insecticide application may be required to reduce the populations to acceptable levels. Several insecticides are registered for use and should be applied in mid-July (1266–1544 GDD_{50}).

When planting cotoneaster or pyracantha, consider using resistant species. Schultz, from Virginia Tech, tested the preference of hawthorn lace bugs for five cultivars of cotoneaster and pyracantha. The lace bugs least preferred *Cotoneaster horizontalis* and *Pyracantha atalantioides* cv. Aurea. *C dammeri* cv. Royal Beauty and *P. koidzumii* cv. Ingleside Crimson were most preferred. Schultz tested an additional four cotoneaster species for resistance. In that research, he found that significantly fewer nymphs completed development on foliage of *C. lacteus*, possibly because of the pubescence on underside of the leaves.



Hawthorn lacebug 1. Damage symptoms on top of leaf. 2. Nymphs on underside of leaves. 3. Closer veiw of nymphs on underside of leaves. 4. Adult on underside of leaf, closeup of fecal spots.

Oak lacebug adults. Insert is enlargement of oak lacebug adult.

Sycamore lacebug adult

Pine Needle Diseases

For growers and managers of conifers, spring is the time to keep a watchful eye for needle diseases which are essentially symptomless through all of the previous season and become apparent during the early part of the growing season. Some needle diseases on pine to watch for include:

Canavirgella Needle Disease of Eastern White Pine
This disease is caused by the fungus *Canavirgella banfieldii*, a relatively newly described fungus that causes damage previously attributed to ozone injury, salt spray, and winter drying. Luckily, less than 1% of the white pine trees in most areas appear to be susceptible to the disease, but symptomatic roadside and forest trees are conspicuous in spring.

Only the current year's needles on susceptible trees are infected by the fungus. Infection takes place in June – July and by August the

foliage turns a reddish color. A key symptom of the disease is that needle bases stay green and often only one or two needles in a fascicle are infected. The best indicator of Canavirgella is development of a long gray to black stripe (actually a spore bearing structure) on the dorsal side of the needle. Unfortunately, needles are cast soon after the stripe becomes noticeable, so you have to be ever vigilant to see it. Since relatively few trees are afflicted, fungicide control programs will not likely be developed to help combat the problem.

Dothistroma (Red Band) Needle Blight
Although capable of killing pines, Dothistroma needle blight, caused by the fungus *Mycosphaerella pini* (=*Dothistoma septospora*) is best known as a pathogen which retards growth. The pathogen is known to attack over 30 species of pines, but in the northeastern United States, Austrian pine is the most susceptible. Younger trees

are more susceptible to the fungus, and severe infections can kill small trees in as little as one year. The disease is conspicuous now because last year's needles have reddish brown tips that contrast with the green bases and with uninfected foliage in the crown. Infection is usually worse within two meters of the ground.

Although commercial recommendations are to treat with a registered fungicide beginning at budbreak with two more applications at 10 to 14 day intervals, research by our colleagues indicates that the budbreak fungicide application might not yield results that are worth the investment. In fact, the tangible benefit is more likely to be the prevention of infection by the Diplodia tip blight pathogen, *Sphaeropsis sapinea*, and that only when fungicides registered for both pathogens are used. In cases where Dothistroma is the only issue, it's probably just as well to postpone that first fungicide application until mid-May with a second application two - three weeks later. Dothistroma management will be a perennial issue for the lives of whatever trees are affected, and a thorough cost-benefit analysis should precede any major investment.

4

3. Fir-Fern Rust
Host: All true fir (*Abies spp.*)

Signs or Symptoms: Infected needles begin to turn yellow or brown in July or August. Tiny white tongue-like fruiting bodies erupt from the underside of infected needles and split open to disperse white spores.

Causal Organism: *Uredinopsis* sp. and *Milesina* spp.

Overwintering Stage: Most species – as dormant spores on fern debris from the previous fall. A few species are perennial in infected fir needles and twigs.

Alternate Host: Ferns

Infection Period: Current season's needles are infected in early spring when new growth emerges. Windblown spores come from the fungus on nearby dead ferns from the previous year.

Management: Use registered fungicides to prevent infection of fir, or mow and/or use herbicides to control nearby ferns.

4. Weir's Cushion Rust
Host: Blue Spruce

Signs or Symptoms: Previous year's infected needles begin to yellow the following spring. Bright yellow waxy blisters develop on these discolored needles and break open to release spores that infect the newly emerging growth. Later in the growing season, infected previous year needles are shed.

Causal Organism: *Chrysomyxa weirii*

Over-Wintering Stage: Over-winters in spruce needles infected the previous year.

Alternate Host: None, this rust is autoaecious, and can continually re-infect spruce. This feature makes it especially threatening to its hosts.

Infection Period: Current season's needles infected in early spring when new growth emerges and is infected by windblown spores.

Management: Use fungicides to prevent infection of spruce.

5. Yellow Witches' Broom Rust of Fir
Host: Balsam fir

Signs or Symptoms: Trees infected by this fungus may develop a proliferation of shoot growth known as a witches' broom. A witches' broom consists of a very dense (and often discolored) mass of stunted shoots growing from a common point of origin. Small yellow rust pustules appear on needles within the broom and produce spores that infect the alternate host. When spore dispersal is complete, infected needles turn brown, die and drop, leaving a bare spot where the broom is located on the tree.

Causal Organism: *Melampsora caryophyllacearum*

Over-Wintering Stage: Dormant spores on weed hosts (esp. chickweed) and in broomed twigs.

Alternate Host: Chickweed

Infection Period: Current season's needles are infected in spring when new growth emerges and is infected by windblown spores from infected chickweed.

Management: Cut out obvious brooms back to point of origin and control the alternate host via mowing or herbicides.

5

Commonly Observed Beneficial Insects

We often see beneficial insects while we are scouting for pests. Conserving these natural enemies in the landscape by using selective insecticides or insecticides in a selective manner is an important part of an IPM program. Spot applications and low toxicity, short-residual materials like soaps and oils will help conserve these beneficials. Natural enemies can play an important role in pest management. Best results are obtained when conscientious monitoring of both the pest and its biocontrols are undertaken to determine if damaging levels have been reached and if other IPM tactics are needed. Be sure to look for beneficials while scouting and especially before spraying.

Lacewings

Lacewing nymph (left) and lacewing egg (center) © Branching Out

Green lacewing adult © Joseph Berger, Bugwood.org

Assassin Bug

Assassin bug nymph © Susan Ellis, Bugwood.org

Assassin bug adult © Branching Out

Lady Beetles

Twice stabbed lady beetle adult © Branching Out

Multicolored Asian lady beetle larva and eggs © Branching Out

Damsel Bug

Damsel bug nymph (left) and adult (right) © Whitney Cranshaw, Colorado State University, Bugwood.org

Minute Pirate Bug

Minute Pirate Bug adult (left) and Nymph (right) © Bradley Higbee, Paramount Farming, Bugwood.org

Flower Flies

Flower fly adult © Susan Ellis, Bugwood.org

Flower fly egg, greatly enlarged (center) and larva (right) © Branching Out

Soldier Beetle

Adult soldier beetle © Branching Out

Adult soldier beetle © Jim Occi, BugPics, Bugwood.org

Ground Beetles

Adult ground beetle © Branching Out

Adult ground beetle © A. Steven Munson, USDA Forest Service, Bugwood.org

Spined Soldier Bug

Spined soldier bug adult © Gerald J. Lenhard, Bugwood.org

Spined soldier bug nymph © Russ Ottens, University of Georgia, Bugwood.org