Dutch Elm Disease
Ann Brooks Gould, Ph.D., Specialist in Plant Pathology

Dutch elm disease is one of several vascular wilt diseases that affect shade trees in New Jersey landscapes. This group of diseases, which includes Verticillium wilt of maple and Mimosa wilt, are caused by pathogens that reside in the xylem (water-conducting tissue) of plants and disrupt the uptake of water and minerals. The primary characteristic of wilt diseases is, as you would expect, wilting due to water stress. This stress occurs when xylem vessels are blocked by the pathogen (disease agent) or by the host itself as it attempts to halt the movement of the pathogen through the transpiration stream.

The American elm (Ulmus americana) was once a very important shade tree in cities and parks throughout North America. Because of its graceful, overhanging canopy (or vase shape) and fast growing characteristics, American elm was densely planted along roadsides and was also used in windbreaks and hedgerows. In the 1920s, a new vascular wilt pathogen, Ophiostoma ulmi, was introduced from Europe in elm logs used for making furniture. The Dutch scientist Christine Johanna Buisman subsequently identified Dutch elm disease of American elm in Ohio in 1930. Since then, the disease has spread up and down the Eastern seaboard and west to California, destroying an estimated 40 million trees. A highly destructive related species of the fungus, Ophiostoma novo-ulmi, is responsible for the more recent outbreaks of this disease.

Symptoms
In New Jersey, Dutch elm disease is most apparent on affected American elms during June to August. The first symptom of the disease is wilting (called flagging) of leaves on individual branches throughout the canopy. These leaves rapidly turn yellow, then brown, and then curl and drop from the tree. Affected branches die shortly after. Rapid mortality (within one season) occurs in trees that become infected with the pathogen in early spring. Trees infected later in the summer may often take several years to die.

Disease spread
Dutch elm disease is transmitted (or vectored) from tree to tree by insects or through root grafts. Beetles that vector the disease include the Native elm bark beetle and the smaller European bark beetle. The insects are attracted to dead or dying elm wood, where they lay eggs in tunnels (called galleries) just beneath the bark. As new beetles emerge, they may carry spores of the pathogen on their bodies, and will trans-
Dutch elm disease management

❖ Avoid monoculture
❖ Diligently inspect trees
❖ Prompt removal of diseased limbs up to 10 ft behind yellowed foliage
❖ Remove dead or dying elms promptly
❖ Burn or chip and compost all diseased wood
❖ Trench to prevent root graft transmission
❖ Breeding for resistance

Resistance

Native American elms vary in their susceptibility to Dutch elm disease. The most susceptible elm is the American elm (Ulmus americana), whereas other elms such as winged elm, slippery elm, rock elm, and cedar elm vary from susceptible to somewhat tolerant. Within species, individual trees or cultivars may vary in susceptibility. Siberian and Chinese elms are less susceptible to Dutch elm disease. In breeding efforts in the United States, American elms have been hybridized with elms of Asian and European origin; these hybrids, which include Accolade, Regal, Urban, Homestead, and Pioneer, have the popular vase shape as well as resistance to Dutch elm disease. Although many of these hybrids are planted in urban landscapes, gaps remain in what is known of the tolerance of these elms to other plant pathogens (cankers, leaf spot, and elm yellows) and insects that feed on foliage or in twigs and trunks, as well as anatomical and architectural features that minimize breakage during periods of high winds or snow and ice storms.

While a number of American elm selections with a moderate level of tolerance to Dutch elm disease have been introduced into the horticultural trade, the growth habits of earlier selections limited their demand, availability, and planting. ‘Princeton’ is a selection of U. americana discovered around 1920 in New Jersey. The outstanding horticultural characteristics of Princeton include the classic vase-shaped form, large leathery leaves, and tolerance to Dutch elm disease. For many years, this selection was the only cultivated variety of Ulmus americana available. Today, many of the Princeton elm trees planted in the early 1930s are still alive. Princeton is also reported to have some resistance to elm leaf beetle feeding.

The “American Liberty” elms are a group of six clones of U. americana (including Independence, Valley Forge, and New Harmony) selected from a breeding program at the University of Wisconsin by Eugene Smalley and Ray Guries. Although all six clones are reported to be resistant to Dutch elm disease, they vary in horticultural characteristics and tolerance to diseases and insects.

Today the elms of the urban landscapes have parentage from not only North America (U. americana, U. rubra, and U. thomasii), but also from Asia (U. parvifolia, U. pumila, U. japonica, and U. wilsoniana) and Europe (U. glabra and U. carpinifolia). Use of U. wilsoniana or U. japonica in the development of disease-resistant elm cultivars imparts the added advantage of resistance to elm leaf beetle. All selections of American elm must be propagated from softwood cuttings; they cannot simply be grafted onto American elm seedlings, as infection of the Dutch elm disease pathogen could occur through the roots.

Native American elms vary in their susceptibility to Dutch elm disease. The most susceptible elm is the American elm (Ulmus americana), whereas other elms such as winged elm, slippery elm, rock elm, and cedar elm vary from susceptible to somewhat tolerant. Within species, individual trees or cultivars may vary in susceptibility. Siberian and Chinese elms are less susceptible to Dutch elm disease. In breeding efforts in the United States, American elms have been hybridized with elms of Asian and European origin; these hybrids, which include Accolade, Regal, Urban, Homestead, and Pioneer, have the popular vase shape as well as resistance to Dutch elm disease. Although many of these hybrids are planted in urban landscapes, gaps remain in what is known of the tolerance of these elms to other plant pathogens (cankers, leaf spot, and elm yellows) and insects that feed on foliage or in twigs and trunks, as well as anatomical and architectural features that minimize breakage during periods of high winds or snow and ice storms.

While a number of American elm selections with a moderate level of tolerance to Dutch elm disease have been introduced into the horticultural trade, the growth habits of earlier selections limited their demand, availability, and planting. ‘Princeton’ is a selection of U. americana discovered around 1920 in New Jersey. The outstanding horticultural characteristics of Princeton include the classic vase-shaped form, large leathery leaves, and tolerance to Dutch elm disease. For many years, this selection was the only cultivated variety of Ulmus americana available. Today, many of the Princeton elm trees planted in the early 1930s are still alive. Princeton is also reported to have some resistance to elm leaf beetle feeding.

The “American Liberty” elms are a group of six clones of U. americana (including Independence, Valley Forge, and New Harmony) selected from a breeding program at the University of Wisconsin by Eugene Smalley and Ray Guries. Although all six clones are reported to be resistant to Dutch elm disease, they vary in horticultural characteristics and tolerance to diseases and insects.

Today the elms of the urban landscapes have parentage from not only North America (U. americana, U. rubra, and U. thomasii), but also from Asia (U. parvifolia, U. pumila, U. japonica, and U. wilsoniana) and Europe (U. glabra and U. carpinifolia). Use of U. wilsoniana or U. japonica in the development of disease-resistant elm cultivars imparts the added advantage of resistance to elm leaf beetle. All selections of American elm must be propagated from softwood cuttings; they cannot simply be grafted onto American elm seedlings, as infection of the Dutch elm disease pathogen could occur through the roots.

Native American elms vary in their susceptibility to Dutch elm disease. The most susceptible elm is the American elm (Ulmus americana), whereas other elms such as winged elm, slippery elm, rock elm, and cedar elm vary from susceptible to somewhat tolerant. Within species, individual trees or cultivars may vary in susceptibility. Siberian and Chinese elms are less susceptible to Dutch elm disease. In breeding efforts in the United States, American elms have been hybridized with elms of Asian and European origin; these hybrids, which include Accolade, Regal, Urban, Homestead, and Pioneer, have the popular vase shape as well as resistance to Dutch elm disease. Although many of these hybrids are planted in urban landscapes, gaps remain in what is known of the tolerance of these elms to other plant pathogens (cankers, leaf spot, and elm yellows) and insects that feed on foliage or in twigs and trunks, as well as anatomical and architectural features that minimize breakage during periods of high winds or snow and ice storms.

While a number of American elm selections with a moderate level of tolerance to Dutch elm disease have been introduced into the horticultural trade, the growth habits of earlier selections limited their demand, availability, and planting. ‘Princeton’ is a selection of U. americana discovered around 1920 in New Jersey. The outstanding horticultural characteristics of Princeton include the classic vase-shaped form, large leathery leaves, and tolerance to Dutch elm disease. For many years, this selection was the only cultivated variety of Ulmus americana available. Today, many of the Princeton elm trees planted in the early 1930s are still alive. Princeton is also reported to have some resistance to elm leaf beetle feeding.

The “American Liberty” elms are a group of six clones of U. americana (including Independence, Valley Forge, and New Harmony) selected from a breeding program at the University of Wisconsin by Eugene Smalley and Ray Guries. Although all six clones are reported to be resistant to Dutch elm disease, they vary in horticultural characteristics and tolerance to diseases and insects.

Today the elms of the urban landscapes have parentage from not only North America (U. americana, U. rubra, and U. thomasii), but also from Asia (U. parvifolia, U. pumila, U. japonica, and U. wilsoniana) and Europe (U. glabra and U. carpinifolia). Use of U. wilsoniana or U. japonica in the development of disease-resistant elm cultivars imparts the added advantage of resistance to elm leaf beetle. All selections of American elm must be propagated from softwood cuttings; they cannot simply be grafted onto American elm seedlings, as infection of the Dutch elm disease pathogen could occur through the roots.
Diseases of Turfgrass

Bruce B. Clarke, Ph.D., Specialist in Turfgrass Pathology

General

Anthracnose, dollar spot, copper spot, and fairy ring are all active on susceptible turf at this time. The cooler weather diseases red thread, stripe smut, and leaf spot are starting to decrease in severity with a return to warmer summer weather.

Dollar Spot

This disease, caused by the fungus Sclerotinia homoeocarpa, continues to be very prevalent on landscape and golf course turf in the tri-state region. The warm weather in May and frequent rainfall over the past few weeks have created extremely favorable conditions for dollar spot. Outbreaks were first reported back in late April and the disease continues to intensity. To prevent this disease from causing severe damage to susceptible turf again in 2012, maintain adequate nitrogen fertility, water in the early morning hours to reduce the leaf wetness period, reduce thatch, avoid the sole use of any fungicide for prolonged periods of time (to limit the possibility of fungicide resistance), and apply Banner, Bayleton, Chipco 26GT, chlorothalonil, ConSyst, Eagle, Emerald, Headway, mancozeb, Rubigan, Spectro, Tartan, thiophanate-methyl, Tournay, Trinity, Triton, Velista, or vinclozolin per manufacturer’s recommendations. Repeat fungicide applications as needed through late-October and reduce plant stress to limit disease development. Insignia and Disarm will also suppress dollar spot, but should not be used as the sole means of disease control due to the potential for fungicide resistance.

Fairy Ring

Fairy ring disease, caused by a group of fungi known as Basidiomycetes, is visible on golf greens and home lawns at this time. Symptoms may appear as continuous or interrupted rings of dark-green turf. Mushrooms, which are often associated with fairy rings, usually develop in the spring and the fall. In severe cases, the thatch in affected patches becomes hydrophobic and the rings may become necrotic. Although fungicides are not effective against all of the fungi that cause fairy rings, Bayleton, Headway, Heritage, Insignia, and ProStar have provided good control in many university tests. Endorse and Tournay are also now registered for the suppression and short term control of this disease. For best results, maintain adequate soil moisture and nitrogen fertility to mask symptom expression. Spike affected turf prior to irrigation or the application of fungicides to enhance water movement into the soil profile. The use of surfactants on affected areas will increase water penetration and may also improve fungicide efficacy and symptom suppression.

Rutgers NJAES Turf Blog

James A. Murphy, Ph.D., Turf Management

We have developed a turf blog to post brief updates on matters related to turf (i.e., home lawns, municipal and school grounds, sports fields, golf courses, sod farms, etc.). Visit the blog at http://turfblog.rutgers.edu.

The blog is new and does not contain a lot of information yet, but recent postings include anthracnose basal rot, seedling crabgrass and red thread.

Slime Mold

Although slime mold is not actually a disease, inquiries have been received about the appearance of yellowish tan to grayish-black colored clumps on turf, flower-beds and home gardens. In many cases, this material has been reported to occur virtually overnight on plant stems, grass blades, soil mounds or other vertical objects and is easily removed with light pressure. Leaf tissue underneath these clumps is usually green and healthy. Upon close examination, these mysterious structures are actually clumps of the common slime mold fungus Fuligo. Fuligo is not injurious to plants and will soon disappear on its own. However, it can be easily dispersed with a rake or steady stream of water. No fungicides are labeled or recommended for slime molds on turf.

Turf Field Days

Mark your calendars now for this year’s Rutgers Turfgrass Research Field Days!

The Golf and Fine Turf Field Day will be held on Tuesday, July 31st at the Hort Farm II, 102 Ryders Lane, North Brunswick NJ. Registration will begin at 7:30 am. An optional pesticide recertification core session will be given from 8 - 8:30 am and field tours will run from 9 am to 1 pm. Lunch will be provided from 1 - 2 pm. After the field day, Basic Training for the Professional Fertilizer Applicator Certification Exam will be presented at no charge from 2:00 - 3:00 pm for the first 80 registrants.

The Lawn, Landscape & Sports Turf Field Day and Trade Show will be held on Wednesday, August 1st at the Adelphia Plant Science Facility, 594 Halls Mill Road, Freehold NJ. Registration & Trade Show opens at 7:30 am and field tours and equipment demonstrations will run from 9 am – 1 pm. Lunch will be provided from 1 - 2 pm and an optional pesticide recertification core session will be given from 2-2:30 pm.

Pesticide recertification credits will be awarded for NJ, NY, CT, DE, MD and PA. To register on-line (or to print the registration form) and for additional information about the field days go to www.njturfgrass.org. The early registration discount for both field days ends on July 13th.
Turf

Summer is quickly approaching and the golf turf samples will be ramping up with the temperature. The theme this week is yellowing and thinning annual bluegrass. One of the submitters suggested the decline of their turf began on May 21. I went to the website weather underground (www.wunderground.com) and punched in the date 5/21 and the zip code of the golf course in question. The weather during the week the grass started to decline was described using the following adjectives: cool temperatures, fog, overcast, mostly cloudy, rain, mist, and drizzle. It is hard to grow grass in a cloud! Each week since early-May has had 3 or 4 days that meet the cloud criteria. The extended periods of overcast skies, light rain and drizzle are catching up to the grass. If the course is getting heavy play or is highly managed, then the grass never has a chance to recover from the day to day stresses of golf. I am afraid it will be all down hill from here for some of these guys. Anthracnose is already moving into some of these greens and we are starting to see the first pythium root rot on grass in super-saturated soils or in crummy soils.

Last issue we discussed fungicide resistance and dollar spot. Interestingly enough, all the samples we had failed the testing protocols. All of them were resistant to one or all of the following chemical classes: MBC (MBC = methyl benzimidazole carbamate = Frac code 1), the DMI materials (DMI = demethylation inhibitor = Frac code 3) and the dicarboximides (Frac code 2). Tough deal for these superintendents, because once the MBC and dicarboximides are lost, then they are gone for good as dollar spot controls. The DMI materials may return to effectiveness, but need to be avoided for some time, which severely limits their use for other problems.

In other news, samples diagnosed brown ring patch are still trickling in. Annual bluegrass weevils are also starting to roll into the lab in a big way.

Ornamentals

Anthracnose samples from shade trees continue to be submitted from residential landscapes. We had samples of maple, sycamore, and oak this week. We also had a couple of privit samples diagnosed with Cercospora leaf spot and privit rust mite infestations. Scale insects were also very common this week; cottony cushion scale was identified on holly, cottony azalea scale was found on azalea, and maskell scale were all over a black pine sample. Last but not least, two samples of powdery mildew on plane tree made us happy.
Sunflowers and Other Daisy Family Relatives that Look Like Them
Clare Liptak, Retired Somerset County Agricultural Agent

The smaller sunflowers and the daisy-like flowers that look like them confuse me to the point that I can't identify them. This is my attempt to get them straight in my mind.

All these plants have 2 types of flowers: the ray flowers around the outside of the central disc each have one large petal -- these are the flowers that attract the pollinators; the flowers crowded together in the center disc produce most of the seeds. All the plants need full sun, or do best in full sun and moist, well-drained soil. If the soil is too wet, or fertile, or the site too shady, the plants will need staking. Divide clumps within 2 or 3 years.

The biggest sunflowers, like Russian Mammoth, are no problem for me; these annuals have the Latin name Helianthus annuus. Most have yellow outer, or ray flowers and big, coarse, rough leaves arranged in an opposite pattern on the stem. They're more site tolerant than the other plants mentioned here. They flower from late summer into fall and deadheading prolongs the blooms display.

The short-lived false sunflower, Heliotheca helianthoidees var. scabra (or simply H. scabra), also called ox-eye, or woodland sunflower, blooms in midsummer. It forms a clump and is shorter than H. annuus. The blooms have more pale-yellow ray flowers than brownish yellow disk flowers so it looks more like a zinnia.

Some smaller sunflowers have ray flowers that are darker at the base like the perennial blanket flower, Gaillardia x grandiflora. This hybrid has flowers that are 3 to 4 inches across, yellow at the tips of the ray petals and maroon at their base. The blanket flower we usually see is a tetraploid hybrid, vigorous and easy to grow. The flowers in the disc are usually burgundy.

Most Helianthus ssp. are native to North America. It has the unattractive name sneezeweed because it blooms at the same time as ragweed. While it resembles the true sunflower, the basal leaves are alternate rather than opposite like Helianthus sp.

The petals of the orange or yellow ray flowers are fan-shaped with 3 to 7 lobes, and they’re usually directed downward.

Coreopsis verticillata and grandiflora are two species (out of at least 100) of tickseed that do well in our landscapes, blooming from mid-summer to fall. Coreopsis spp. have alternate leaves; the yellow ray flowers sometimes have a red base. The disk flowers surround a flattened center disc. One identifying characteristic is the presence of 2 layers of leaf-like, yellowish or green bracts under each flower head. C. verticillata has thread-like foliage and C. grandiflora leaves are elliptical. C. grandiflora ray petals are often lobed or toothed at the tip.

Coneflowers such as Echinacea purpurea have alternate leaves, purple ray flowers and a raised disc (called a cone) of brown flowers.

Rudbeckia ssp. usually have alternate leaves. The blooms have yellow ray flowers with a dark brown or black cone. The annual Rudbeckia hirta is the well-known black-eyed Susan, but it’s also called Gloriosa daisy. The petals of the ray flowers of R. hirta can have a reddish base. The perennial Rudbeckia ssp. have raised brown or black cones but no red blotches on the yellow or gold petals. A commonly used cultivar is R. ‘Goldsturm’ about 2 feet high flowering from midsummer until mid-fall. ‘Goldsturm’ reseeds itself, but the offspring don’t flower quite as freely and are not as compact as the parent.

References:
Clare Liptak is an IPM scout, horticulturist, and Certified Tree Expert #208. clare.liptak@gmail.com.
Weekly Weather Summary
Keith Arnesen, Ph.D., Agricultural Meteorologist

Temperatures averaged below normal, averaging 64 degrees north, 66 degrees central and 67 degrees south. Extremes were 92 degrees at Hammonton and Downstown on the 11th, and 44 degrees at Charlotteburg on the 6th. Weekly rainfall averaged 0.43 inches north, 0.93 inches central, and 0.38 inches south. The heaviest 24 hour total reported was 0.82 inches at Freehold on the 7th to 8th. Estimated soil moisture, in percent of field capacity, this past week averaged 93 percent north, 90 percent central, and 74 percent south. Four inch soil temperatures averaged 62 degrees north, 65 degrees central and 65 degrees south.

<table>
<thead>
<tr>
<th>WEATHER STATIONS</th>
<th>RA INFALL WEEK</th>
<th>TOTAL</th>
<th>DEP</th>
<th>TEMPERATURE MAX</th>
<th>MIN</th>
<th>AVG</th>
<th>DEP</th>
<th>GDD BASE50</th>
<th>MON %FC</th>
</tr>
</thead>
<tbody>
<tr>
<td>BELVIDERE BRIDGE</td>
<td>.16</td>
<td>11.15</td>
<td>-1.65</td>
<td>85</td>
<td>45</td>
<td>64</td>
<td>-3</td>
<td>741</td>
<td>227</td>
</tr>
<tr>
<td>CANOE BROOK</td>
<td>missing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHARLOTTEBURG</td>
<td>1.05</td>
<td>11.08</td>
<td>-2.85</td>
<td>85</td>
<td>44</td>
<td>63</td>
<td>-1</td>
<td>744</td>
<td>393</td>
</tr>
<tr>
<td>FLEMINGTON</td>
<td>.40</td>
<td>11.18</td>
<td>-2.09</td>
<td>89</td>
<td>46</td>
<td>65</td>
<td>-2</td>
<td>840</td>
<td>342</td>
</tr>
<tr>
<td>NEWTON</td>
<td>.11</td>
<td>8.84</td>
<td>-3.62</td>
<td>84</td>
<td>47</td>
<td>63</td>
<td>-2</td>
<td>779</td>
<td>374</td>
</tr>
<tr>
<td>FREEHOLD</td>
<td>1.58</td>
<td>10.81</td>
<td>-2.34</td>
<td>86</td>
<td>47</td>
<td>67</td>
<td>-1</td>
<td>900</td>
<td>326</td>
</tr>
<tr>
<td>LONG BRANCH</td>
<td>.75</td>
<td>15.39</td>
<td>1.99</td>
<td>83</td>
<td>50</td>
<td>65</td>
<td>-3</td>
<td>742</td>
<td>224</td>
</tr>
<tr>
<td>NEW BRUNSWICK</td>
<td>1.32</td>
<td>11.79</td>
<td>-1.12</td>
<td>89</td>
<td>48</td>
<td>67</td>
<td>-2</td>
<td>913</td>
<td>298</td>
</tr>
<tr>
<td>TOMS RIVER</td>
<td>missing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRENTON</td>
<td>.07</td>
<td>10.49</td>
<td>-1.43</td>
<td>90</td>
<td>48</td>
<td>66</td>
<td>4</td>
<td>1047</td>
<td>393</td>
</tr>
<tr>
<td>CAPE MAY COURT HOUSE</td>
<td>.43</td>
<td>8.19</td>
<td>-3.37</td>
<td>88</td>
<td>46</td>
<td>65</td>
<td>-3</td>
<td>686</td>
<td>103</td>
</tr>
<tr>
<td>DOWNTOWN</td>
<td>.44</td>
<td>7.60</td>
<td>-4.23</td>
<td>92</td>
<td>45</td>
<td>67</td>
<td>-3</td>
<td>932</td>
<td>254</td>
</tr>
<tr>
<td>HAMMONTON</td>
<td>.05</td>
<td>9.67</td>
<td>-2.68</td>
<td>92</td>
<td>47</td>
<td>67</td>
<td>-3</td>
<td>967</td>
<td>319</td>
</tr>
<tr>
<td>POMONA</td>
<td>.59</td>
<td>9.82</td>
<td>-1.50</td>
<td>88</td>
<td>50</td>
<td>67</td>
<td>-1</td>
<td>919</td>
<td>350</td>
</tr>
<tr>
<td>SEABROOK</td>
<td>missing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SOUTH HARRISON</td>
<td>.57</td>
<td>8.62</td>
<td>-3.83</td>
<td>92</td>
<td>50</td>
<td>68</td>
<td>NA</td>
<td>1038</td>
<td>NA</td>
</tr>
</tbody>
</table>

WES KLINE -- GDD BASE 40 PINEY HOLLOW LAST WEEK 224 Ending 5/28/12 THIS WEEK 216 (Ending 6/4/12) TOTAL UNITS BASE 40 FOR FEBRUARY=55
The Permaculture 8-Day Design Certificate Course
Offered over Two Long Weekends:
July 19-22 and August 9-12, 2012

Co-Sponsored by NOFA-NJ & The Permaculture Project at Duke Farms, Hillsborough, NJ

Permaculture has expanded its purview to include economic and social structures that support the evolution and development of more permanent communities, such as co-housing and eco-villages.

As such, Permaculture design concepts are applicable to urban as well as rural settings, and are appropriate for single households as well as whole farms and villages. From households to bioregional planning, Permaculture is about whole systems, not about separate components. Because each element in a landscape or the built environment affects every other element at a site, a complete, comprehensive assessment is tantamount to develop healthy, productive, energy efficient relationships between elements for the benefit of everyone and everything involved in day to day operations and life. By paying attention to all details: topography, climate, water, wind, sun, activity nodes and corridors, buildings, machinery and tools, the waste stream, plants and animals, it enables us to make best use of what is already on the ground, and what we intend to put there. With a dynamic interaction of elements in process, and an assessment of both spatial and temporal attributes, organized around sound ecological principles, we can maximize yields and balance the landscape.

Dates and Details:
July 19-22 & August 9-12

This course is very intensive and will run from 8 am—6 pm each day. The course will be delivered at Duke Farms in Hillsborough, NJ and the hands-on design project will be part of the Community Garden at Duke Farms. The first four days will focus more on the planning components and the second four days will include some implementation at the Permaculture Display Garden at Duke Farms. For more information about the course content, please visit www.permacultureproject.com.

Wayne Weiseman is certified by The Permaculture Institute of Australia as an instructor of the Permaculture Design Certificate Course. He is also certified by the American Institute of Architecture to teach continuing education in Permaculture to licensed architects and landscape architects. Wayne has taught and featured internationally for many years. Wayne is the Director of The Permaculture Project LLC, a full service, international consulting and educational business promoting the ideas of eco-agriculture, renewable energy resources and eco-construction methods.

The cost of the course is $1,300 per person, $1,200 for NOFA-NJ members. Discounts are offered for early registration and for multiple family member/farm registrations. For more information about lodging, meals and services and to register for this course, go online to: http://www.nofanj.org/programs_permaculture.htm or you can call the NOFA-NJ office at 908-371-1111.
Pesticide User Responsibility: Use pesticides safely and follow instructions on labels. The pesticide user is responsible for proper use, storage and disposal, residues on crops, and damage caused by drift. For specific labels, special local-needs label 24(c) registration, or section 18 exemption, contact RCE in your County.

Use of Trade Names: No discrimination or endorsement is intended in the use of trade names in this publication. In some instances a compound may be sold under different trade names and may vary as to label clearances.

Reproduction of Articles: RCE invites reproduction of individual articles, source cited with complete article name, author name, followed by Rutgers Cooperative Extension, Plant & Pest Advisory Newsletter.

For back issues, visit our web site at: www.rce.rutgers.edu/pubs/plantandpestadvisory