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The Azalean

Journal of the Azalea Society of America

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Azalea Society of America
1000 Moody Bridge Road
Cleveland, SC 29635

President's Letter

Robert (Buddy) Lee — Independence, Louisiana

The Azalea Society of America will soon have another local chapter. Thanks to Carlton LeMond and other dedicated Alabama members, this new chapter is off to a great start. Their "ground breaking" meeting was held in Birmingham this past July and was well attended. Officers were elected, by-laws completed, and plans for future meetings were scheduled. If everything goes to schedule, the Alabamese Chapter will be chartered at the national convention in Michigan this coming May 2005.

Speaking of the convention, it looks like everything is on track for another outstanding meeting—next year in Holland, Michigan. I recently spoke to John Migas, convention coordinator, and he and his convention committee are polishing up the final details of this convention. Look for the convention information in the winter edition of ***The Azalean.*** Sounds like a great line-up of speakers and tours that I'm sure you will not want to miss.

There are a lot of exciting things going on with our Society. The Azalea City Program and the ASA Archives Project are off to a fantastic start. You will be hearing and reading more about these new programs in the near future. Also, the on-line azalea discussion group has been very busy recently with many interesting azalea-related topics. If you have not signed on to the azalea group, I would highly recommend it. There are numerous ways that you can become involved in our Society, so come on and join in on the excitement.

In Memory
Col. Elvin Murray Sheffield
(1920-2004)

William C. Miller III — Bethesda, Maryland

It is my sad duty to report the death of Col. Elvin Murray Sheffield, 84, on September 24, 2004. Murray suffered a massive heart attack while cleaning up damage sustained from Hurricane Ivan. A retired career Air Force officer, Murray served in World War II, Korea, and Viet Nam. A Thirty Second Degree Mason and a Shriner, Murray was a member of the ASA board of directors from 1997 to 2001, and managed the back issue program for ***The Azalean*** for many years. Murray and his wife Inez took great pride in their incredibly beautiful four-acre azalea garden with 4,000 azaleas of 250 varieties at their home in Wetumpka, Alabama. At-large members of the ASA, they were regular attendees at ASA national meetings, and Inez remarked in a personal note that he "loved the Azalea Society and the tours."

Azalea Society of America

The Azalea Society of America, organized December 9, 1977 and incorporated in the District of Columbia, is an educa-tional and scientific non-profit association devoted to the culture, propagation and appreciation of azaleas Subgenera *Tsutsusi* and *Pentanthera* of the genus *Rhododendron* in the Heath family *(Ericaceae).*

Chapters

Brookside Gardens
(chartered Aug. 1979)
Dr. Charles Evans, *Pres.*

Ben Morrison
(chartered May 1980)
Carol Segree, *Pres.*

Northern Virginia
(chartered May 1980)
Barry Sperling, *Pres.*

Louisiana
(chartered June 1981)
James Campbell, *Pres.*

Tri-State
(chartered Oct. 1981)
Robin Hahn, *Pres.*

Dallas Chapter
(chartered May 1989)
Eugene Westlake, *Vice-Pres.*

Oconee Chapter
(chartered Nov. 1991)
Allison Fuqua, *Pres.*

Vaseyi Chapter
(chartered June 2001)
Ed Collins, *Pres.*

Lake Michigan Chapter
(chartered May 2003)
John Migas, *Pres.Pro-tem*

Regular membership is open to all interested parties for an annual amount of $25.00; life-membership for an individual is $500.00. Members receive ***The Azalean*** and are eligible for participation in all activities of the Society including those of the chapter with which the member affiliates. For information and a membership application, write to the Membership Committee, Azalea Society of America, 1000 Moody Bridge Road, Cleveland, SC 29635.

The Azalean

Journal of the Azalea Society of America

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Opinions and views expressed in ***The Azalean*** are those of the contributors or the Editor, not necessarily those of the Society, and are presented to foster a wider appreciation and knowledge of azaleas. Advertisements are presented as a service to our readers and do not imply endorsement by the Azalea Society of America. Advertising and other contributions to ***The Azalean*** are used exclusively to help defray the costs of publishing ***The Azalean.***

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On the Cover

'Mystery' is one of the Loblolly Bay hybrids from Bay Country, introduced by Lee Amann of Bozeman, Maryland. It was photographed in the West Chester, Pennsylvania, garden of ASA member Bill Steele. All Loblolly Bay hybrids are likely to be seedlings of Glenn Dale hybrids 'Buccaneer', 'Dayspring', 'Geisha', 'Glacier', and 'Merlin' (Galle, revised edition p.173). The flower is 2-1/2" across, with narrow 1/2"-wide petals, and early midseason blooms on a plant that reaches 3' to 4'. It is hardy to Zone 6. *(Photo by Bob Hobbs)*

A Bay Country Welcome—Ben Morrison Chapter Hosts the ASA 2004 National Meeting and Convention

Debra Hughes — Lusby, Maryland

Take 111 people keenly interested in azaleas. Add some nice weather, pretty near peak azaleas (hailstorms notwithstanding), informative speakers, wonderful public gardens, generous and gracious private garden hosts, a "blow-your-socks-off" plant sale and auction, a flower show, a propagator's roundtable, a delicious banquet with Maryland crab cakes, and, of course, the "Pot Heads."

That appeared to be the recipe for success for the "Best Bloomin' Azaleas in Bay Country," the 2004 Azalea Society of America National Meeting and Convention, held May 6-9 in Bowie, Maryland. The Ben Morrison Chapter, this year's host, was pleased that so many people were able to enjoy what Bay Country has to offer. Attendees included all the ASA officers/directors; in addition, eight of the nine ASA chapters were well represented (missing was Tri-state), as was the At-large membership.

Photograph of Convention attendees at evening presentation by Bill Miller *(Photo by Bill Miller)*

Many attendees, including host chapter members themselves, discovered for the first time what area actually comprises "Bay Country," thanks to an informative talk by Bob Hobbs, who provided an overview of "Azaleas in Bay Country." Other speakers included Courtland Lee, whose vast knowledge of the history of the "Glenn Dale Azaleas—Plants for All Seasons" was complemented by William C. Miller III, who gave his Saturday evening keynote speech on Ben Morrison and his azaleas (see page 54 of this issue). Sandra Austin discussed color in the azalea garden and explained how color attributes create diverse variations depending on light, texture, and time. She also outlined how colors work together in families and combinations.

Bill Miller, keynote speaker at banquet. *(Photo by Charlie Evans)*

Ethel M. Dutky shared her knowledge in "Azalea Diseases," noting that the window of opportunity to treat for petal blight is at the first sign of a brown blotch on an azalea petal; after that, it is too late *(see page 64 of this issue)*. Dr. Michael J. Raupp provided a less toxic alternative, "Integrated Pest Management (IPM) for Azalea Gardens." He argued that the worst culture is monoculture. The best is biological control of insect pests; that is, having a landscape varied enough to attract insects that eat other insects *(see page 61 of this issue)*. Deer in the garden, however, are another matter. In "Azaleas Can Be Very EnDeering," Jonathan S. Kays provided myriad ways to minimize deer damage to ornamental shrubs, from high fences, electrical fences, and dogs, to applications of commercial deer repellents; but, somehow, hungry deer always seem to find a way to eat—and, unfortunately, destroy—even the best-protected garden. *[The Hobbs, Lee, Austin, and Kays papers will be published in the Winter 2004 issue of* ***The Azalean****, Ed.]*

The four tours—US National Arboretum, Baltimore, Annapolis, and Southern Maryland—each offered a special overview of the azaleas in Bay Country and all were equally enjoyed by attendees.

Convention attendees (l to r) Bill Miller, Bob Hobbs, Don Voss, and Bill Bode deep in conversation on Southern Maryland Garden Tour. *(Photo by Charlie Evans)*

The Saturday evening banquet and the Society's annual business meeting were both well attended. The "Best ***Azalean*** Article Award" was presented to ASA President Buddy Lee for his article "Azaleaphile Margie Jenkins" [25(4): 84-85, 87]. He immediately donated the honorarium to the ASA's Azalea Research Fund project. Also highlighted was the Azalea City program, established earlier this year to find, recognize, and certify municipalities that promote and display

Sue and George Switzer and Bill and Phyllis Meyers at the Switzer Garden. *(Photo by Bob Hobbs)*

azaleas. The results of the election of 2004-2006 board of directors were announced during the business meeting: Bob Hobbs, Ronald Hooper, and Tom Milner joined the board for the Sunday board meeting. The amendment to the By-Laws described in the Winter 2003 issue of ***The Azalean*** was approved by the members present.

Convention banquet. *(Photo by Charlie Evans)*

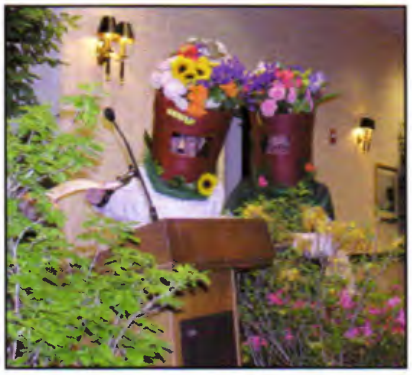
Hundreds, if not thousands, of azaleas and companion plants were carried or wheeled out on hotel carts during the ongoing plant sale. Thanks to chapter members Charles and Wanda Hanners, Gray Carter, and to Courtland Lee and Don Hyatt for donating plants to the plant sale and to Buddy Lee for donating the Saturday banquet table favors. The lively auction, presided over by Don Hyatt, included native azaleas and many stunning varieties donated by the Hanners and Harry Weiskittel. In the flower show, which was presented by the Potomac Valley Chapter of the American Rhododendron Society and coordinated by Don Hyatt, awards were swept by Bill Bedwell of Dinwiddie, Virgina. Bob Hobbs of North Beach, Maryland, won the photography competition.

ASA President Buddy Lee. *(Photo by Charlie Evans)*

Throughout the convention, diversion—and great gifts—were provided by the "Pot Heads," two enormous (anonymous) walking flowerpots. Alas, their entry into the flower show, *"R. fakus,"*—obtained (but not stolen) from the garden of Michaels (as in the crafts store)—did not fool the judges and garnered no awards.

Don Hyatt, plant auctioneer. *(Photo by Charlie Evans)*

The Azalea and Rhododendron Flower Show. *(Photo by Bob Hobbs)*



The "Pot Heads" visited the evening convention venues frequently, to the delight of all. *(Photo by Bill Miller)*

Sunday morning's propagator's roundtable, moderated by Ed Collins, attracted serious growers of azaleas: J. Jackson provided a handout on "Growing Azaleas from Seed," Allen Cantrell presented "Alternative Methods for Propagating Native Azaleas," and Aaron Cook presented "Propagation of Native Azaleas from Cuttings."

Finally, special thanks to all of the Ben Morrison Chapter members who participated in the planning and execution of the 2004 convention (including Carol Segree, chair, and Bob McWhorter, president) and to Don Hyatt for the Web site. What camaraderie!

The ASA 2005 National Meeting and Convention will be hosted by the Lake Michigan Chapter in Holland, Michigan, May 19-22. Many of the featured events of the convention were described by chapter president John Migas in a brief talk at the banquet. See you all there! For more details, visit the chapter's Web site: http://www.azaleas-lake-michigan.org/events.cfm.

Lake Michigan Chapter President John Migas invites all to attend the 2005 convention in Holland, Michigan. *(Photo by Charlie Evans)*

Debra Hughes *and her husband, Peter, joined the Ben Morrison Chapter after moving to southern Maryland and say they are lucky to have fallen in with a great group of people far more knowledgeable about azaleas than they could ever hope to be. The 2004 convention in Bowie, Maryland, was their first ASA convention, for which Debra handled publicity.*

Ben Morrison and His Azaleas

William C. Miller III — Bethesda, Maryland

The Glenn Dale, Belgian-Glenn Dale, and Back Acres azaleas that we enjoy today are attributable to the vision and personal industry of one man, Benjamin Yoe Morrison. Born

Ben Morrison photographed on May 3, 1954, during the dedication of the Morrison Garden at the US National Arboretum. *(Original USDA photo by Matthews)*

on September 25, 1891, in Atlanta, Georgia, the eldest child of Isabel and Lisle Morrison, Ben Morrison graduated from Central High School in Washington, DC, in 1909 where even at this early age his artistic ability and attention to detail were evident. The personal reference in his senior yearbook reads: "Benjamin is a Georgia cracker, a regular hot-headed Confederate from Atlanta, Georgia. You wouldn't think it to look at him but it is the truth. He is the best man in the class for grabbing E's, and he gets them because of his conscientious work. He has always been quiet, but he gets there just the same."

Morrison attended the University of California at Berkeley and graduated *Phi Beta Kappa* with a BS in Agriculture *cum laude* in 1913. He continued his studies at Harvard and received a Masters of Landscape Architecture in 1915. While it is noteworthy that Morrison's interest in azaleas developed prior to the commencement of the formal Glenn Dale project, as a trained horticulturist and a landscape architect who traveled to Japan in 1916 under a Sheldon Fellowship from Harvard, he could not have missed being impressed by the azalea component of springtime in Japan. During World War I, he served first in the US Army Medical Corps and later in the Sanitation Corps.

A Career Begins, Ends, and Resumes

In 1920, when he took a job as a Landscape Gardener (Scientific Assistant in Landscape Gardening) with the Bureau of Plant Industry of the United States Department of Agriculture, one of his activities was to conduct trials and tests of ornamental plants used in connection with landscape gardening. While the focus for this activity seems to have been chiefly roses and peonies, this placed Morrison in an organization that received all kinds of plant material from all over the world. Working for an agency whose mission was plant exploration and introduction, there was very little in the way of plant material to which he did not have access. Given all that, it would seem, however, that Morrison developed his azalea expertise on the side at his home in Takoma Park, Maryland, a northern Victorian suburb just across the District Line.

The Plant Introduction Station at Glenn Dale, Maryland, some 16 miles northeast of Washington, DC, was established in 1920 by P. H. Dorsett on 70 acres of the Darrow and Woodworm farms. Dorsett was a noted plant explorer, after whom Dr. Eugene Hollowell named the popular fall blooming *Rhododendron kaempferi* 'Dorsett'. The Plant Introduction Station at Glenn Dale, often referred to as Bell Station and now a Plant Quarantine Laboratory, was the receipt and entry point for a lot of interesting plant material from government plant explorers and foreign growers. To put this in perspective, the establishment of the station was two years after E. H. Wilson acquired "Wilson's Fifty" for the Arnold Arboretum.

In 1922, Ben Morrison considered pursuing a different career, resigned his position, and went to New York to study music. An excellent pianist with a "solo grade" voice, he told friends that music brought him much pleasure. For whatever reason, it did not work out, and he was reinstated in 1924 as an Assistant Landscape Architect. In fairly short order, he progressed through various transfers and promotions from Junior Horticulturist and Assistant Horticulturist in 1924 to Associate Horticulturist in 1926.

The bill establishing the US National Arboretum was signed by President Coolidge in 1927, Dr. Frederick V. Coville was appointed Acting Director in 1929, and Mr. Oliver Freeman was appointed Field Superintendent one year later.

Azalea Breeding Program Begins

In a document entitled "Report of Azalea Breeding July 1, 1928," that was found in the files at the Glenn Dale Station, Morrison mentioned that his personal collection included 'Indica Alba', 'Indica Rosea', 'Indica Magnifica', and various small-flowered forms that he concluded were hardier forms of the "Kurume azaleas." He was impressed with the hardiness of "Kampfer's azalea" [sic] and chose it as the seed parent for his first cross, *R. kaempferi* x 'Indica Alba', seedlings of which bloomed for him for the first time in 1928.

Morrison's formal plan was to develop a race of large-flowered azaleas, resembling the Indian hybrids of Southern

gardens, which would be well suited for landscape use in the Washington, DC, area. His approach was as simple as it was classic and involved crossing hardy species and garden forms of the period with the more tender but larger-flowering forms. In retrospect and noting that not all of the Glenn Dale hybrids have 3" or 4" flowers, one concludes that his "large-flower" goal sustained a modification as the project progressed.

His notes indicate that additional crosses, reciprocal crosses, and back crosses utilizing *R. kaempferi,* various Kurume hybrids, *R. mollis, R. simsii, R. poukhanense,* and his initial *kaempferi* x 'Indica Alba' hybrids were performed prior to the government project. Given his opportunities, his experience, and what we have learned about his characteristic attention to detail, it is not surprising that he would begin to develop a familiarity that would enable him to recognize parental characteristics in subsequent progeny.

In the introduction to Monograph 20, Morrison states that the official project was "set into motion on a serious scale" in 1929. Coincidently, this was the same year that R. Kent Beattie introduced his Kurume hybrids from Japan. Parenthetically, included with the Kurumes was the Satsuki hybrid that became George Harding's 'Oh My'. By this time Morrison had achieved the title of Senior Horticulturist and had been given the responsibility for the four field stations in Glenn Dale, Maryland; Miami, Florida; Chico, California; and Savannah, Georgia.

In an article for the University of Washington's *Arboretum Bulletin,* Morrison succinctly outlined his basic approach: "As a routine procedure, therefore, pollination was carried out very largely under glass, using potted specimens, grown under cool to cold conditions. The resulting seedlings were well cared for inside for two winters. All were planted out-of-doors in thick oak woodland with a slightly sloping terrain, in well-prepared soil that has always supported native ericaceous plants. Good care extended to watering for the first summer. After that time nature took over, and as was to be expected, there were many deaths, although not as many as we had been prepared to face." So, it was in 1930 that they began planting azalea seedlings in the "woods" at Glenn Dale. The hybridizing continued.

In 1937, Ben Morrison made his first selections for further study. With the death of Dr. Coville that same year, Ben Morrison was named Acting Director of the US National Arboretum, "without compensation and in addition to his other responsibilities." One can imagine how the administrative demands upon his time were ever increasing.

The years 1938 and 1939 saw the acquisition of the Chugai Satsuki introductions. 'Adzuma-no-hana' and 'Shinnyo-no-tsuki' were later used in the breeding program.

The selection process continued in 1939, 1940, and 1941, which brought the total selections to 830. With the advent of World War II, however, all work with azaleas ground to a halt and Glenn Dale's and Morrison's attention turned to supporting the war effort. In fact, from October 1, 1943 to March 29, 1944 Ben Morrison was "transferred," reassigned, or loaned to the Office of Foreign Agricultural Relations, Latin American Division, in Bogota, Colombia, for the purpose of "making observations" on the *Cinchona* developments in Guatemala, Costa Rica, and Colombia, to determine how to best "collaborate in the production of complementary crops" (chiefly other sources of quinine).

Glenn Dale 'Morning Star' shown with two sports. *(Photo by Bill Miller)*

Glenn Dale Azalea Distributions

In 1942 and despite the change of mission necessitated by the war, the first of eight official distributions of Glenn Dale hybrids occurred. Because of the change in mission, the Glenn Dale greenhouses and cold frames were cleared, and all remaining rooted azalea cuttings and potted plants were transferred to the US National Arboretum where they were put in cold frames or lined out in nursery beds. If it wasn't already there, I'm sure some of the plant material found its way to Morrison's home in Takoma Park.

After the war, Glenn Dale endeavored to pick up where it had left off. In memos for the record in 1946 and 1948, Ben Morrison documented that he was providing the station with azalea cuttings from his collection at home because it was easier to find them in his home garden than to hunt for them in the azalea plantings at Glenn Dale, which had suffered from a lack of care.

Morrison resumed the selection process in 1946 and continued to make selections until 1951. Post-war selections numbered 312, which brought the total number to 1,142.

After the war, much of Morrison's focus turned to the Arboretum. In 1947, an 8-acre tract of the southern face of Mount Hamilton was planted with Morrison's selected azaleas and work was begun for an "azalea display

Belgian-Glenn Dale 'Pink Ice', one of five introductions from 16 finalists from 96 selections from 1200 seedlings. *(Photo by Bob Stewart)*

garden" that was to later be dedicated in his honor. In 1947 he also began the work that was to become known as the Belgian-Glenn Dale hybrids. For some reason he waited three years before he sought permission to undertake the project. It is fortunate that his proposal was approved, since he had plants in hand.

In 1948, John Creech came to the Glenn Dale Station. The azalea distribution process resumed and continued through 1954. Over the life of the official distribution process, it should be noted that 54 gardens, nurseries, and individuals in 19 states and the District of Columbia received shipments, though not all participated equally or were in the program from beginning to end. There were 12 recipients in 1942 and a high of 33 in 1950. Overlook Nurseries in Mobile, Alabama (Sawada); Golden Gate Park in San Francisco, California; Fruitland Nurseries in Augusta, Georgia; Kingsville Nurseries in Kingsville, Maryland (Hohman); Tingle Nursery Company in Pittsville, Maryland; Swarthmore College in Swarthmore, Pennsylvania (Wister); and the University of Washington Arboretum, in Seattle, Washington, were the only participants who received plant material every year. The final thought on the matter of the distribution of the Glenn Dale hybrid azaleas rests with the recognition that there was also an unofficial distribution process; that is, an unknown number of individuals, nurseries, and organizations (e.g., Milo Perkins) received plants now and then. This unofficial distribution may well account for the survival and existence of some of the Glenn Dale hybrids that were never formally distributed (e.g., 'Fenelon').

Plans for Retirement

It is evident that Morrison had been considering retirement for a number of years. In an April 18, 1949, memorandum to Robert M. Salter, Chief of the Bureau, he offered to withdraw his request for retirement to enter upon a new job. Morrison proposed that he be permitted to: 1) give up his responsibilities for the Division of Plant Exploration and Introduction; 2) focus full time on the Arboretum, the propagation and placement of the Glenn Dale Azaleas, planning the plantings for the Plant Industry Station; and, 3) be granted such leave without pay as might be requested. Morrison was acutely sensitive about what he perceived to be outside interference with regard to the Arboretum and made his displeasure known on more than one occasion with talk of retirement. My favorite remark along these lines is: "the democratic processes have so broadened the decisions that they lack all character." Morrison's proposal was approved, and effective July 1, 1949 he was assigned to the Arboretum full time.

Morrison's last several years prior to retirement had numerous periods of "leave without pay," which were invested in "personal business," both locally and in Pass Christian, Mississippi, where he eventually relocated, established a small nursery, pursued his interest in studying and hybridizing azaleas and eventually introduced the Back Acres hybrids, named after the family home of his friend, Ivan Anderson. Morrison's interest had turned to developing doubles and flowers with white eyes and colored borders, a logical extension of the Glenn Dale work. He also had become very interested in the Satsuki hybrids and had come to appreciate their potential impact on developing new and later-blooming cultivars.

Back Acres 'Margaret Douglas', a fine example of the colored border/lighter center combination that characterizes many of the Back Acres hybrids. *(Photo by Bob Stewart)*

In April of 1951, Ben Morrison was named Director of the National Arboretum after having served in an "acting" capacity for 14 years. Ironically, in November of that same year, he retired from federal service as a GS-14 Horticulturist, only to be rehired under a temporary, 12-month appointment as a GS-13 Horticulturist consultant. Among other things, this arrangement permitted an orderly search for his successor. Dr. Henry T. Skinner was appointed the Director of the National Arboretum in September of 1952, and he benefited greatly from Morrison's counsel. It is unclear when Morrison actually moved to Pass Christian, Mississippi, full time. It was a gradual process over a number of years and involved many of the already mentioned periods of "unpaid leave."


Azalea notables at the dedication of the Morrison Garden (left to right): Leamon Tingle; Andrew Adams, Sr.; H. H. Hume; David Leach; Albert Close; John Wister; and B. Y. Morrison. *(USDA photo by Matthews)*

By March 1953, the editing of the Monograph 20 manuscript had been completed and the finished product was issued in October. On May 3, 1954, before a large audience of friends and associates, the azalea clonal garden at the Arboretum was dedicated in Morrison's honor.

Morrison's Legacy

One might be tempted to think that the story of the 454 Glenn Dale hybrids, the 16 Belgian-Glenn Dale hybrids, and the 53 Back Acres hybrids ends with the publication of Monograph 20, the conclusion of the formal distribution process, Morrison's death in 1966, or even the passage of sufficient time, but that is certainly not realistic. Morrison was a prolific writer, and much of his personal correspondence and many of his drawings provide additional insight into the behavior and performance of his azaleas. Because new chapters are being written as succeeding generations of hobbyists and professionals alike rediscover the variety of color, shape, and size that characterizes Morrison's azaleas, his legacy will continue as long as there is an appreciation for beauty.

William C. Miller III** is **a** recipient of the Society's Distinguished Service Award and the Brookside Gardens Chapter's Frederic P. Lee Commendation. He is a past president of the Brookside Gardens Chapter, a former vice president of the Society, **a** past member of the ASA board of directors, co-chairman of the ASA's membership committee and chairman of the public information committee, a long-time ASA member, and a frequent contributor to **The Azalean.

Digital Pictures in The Azalean and on the Web

Bob Stelloh — Henderson, North Carolina

It's All About Resolutions

No, not New Year's—for digital images, resolution is the number of pixels in the image. The more pixels, the higher the resolution. The higher the resolution, the bigger the print you can make, either on your own inkjet printer or in ***The Azalean.***

What's a *pixel?* It's short for picture element, and when you're talking about digital cameras it's one of the many light-sensing dots on the tiny thing the camera uses instead of film. That thing is called the *sensor,* or sometimes a *CCD* or a *CCD sensor.* It's deep inside the camera, you never see it, and it is usually about a 1/2" square. When you take a picture, the camera first records the amount of light hitting a filter for each of three colors (red, green, blue) for each pixel on the sensor. Then the camera copies that information from the sensor to its *storage device.* That's the little rectangular card you can remove from the camera with your pictures recorded on it. Your computer then makes sense out of that information to:

- turn it into a picture on the screen; or
- send it to your printer, whose computer can turn it into an inkjet print; or
- send it to your friends as an attachment to an e-mail; or
- send it to our editor, whose computer can turn it into a picture in ***The Azalean.***

The resolution of a digital camera is described in *megapixels,* or how many millions of pixels its sensor has. More megapixels equals larger pictures. The size of an image (measured by width x height in pixels) for four popular digital camera sizes is:

Camera Size	Image Size
2-megapixels	1600 x 1200 pixels
3-megapixels	2048 x 1536 pixels
4-megapixels	2272 x 1704 pixels
5-megapixels	2590 x 1920 pixels

For comparison, the resolution of a 35-millimeter slide ranges from 6 megapixels to 14 megapixels, depending on the film and the quality of the slide processing.

So How Big Is My Picture?

One of the more confusing things about a digital image is that the size of the picture you see depends on the resolution *and* on how close together the pixels are when you are looking at it. The pixels in a digital image can be spread apart or squeezed together to fit any given physical image size, without changing the number of pixels in the image. If you squeeze them tightly together you get a small high-quality print. If you spread them further apart you get a large low-quality print. See Photo 1, a 1" x 1" print at 288 pixels per inch, and Photo 2, a 4" x 4" print at 72 pixels per inch, which shows how the image degrades. They are printed from the same 83000-pixel image-the only difference is the physical size of the image.

While you can specify the physical size of the image, how big it actually appears to be also depends on the device used to show it, such as the computer screen or a printer.

Computer screens normally have 72 pixels per inch—but they have their own resolution issues. So, how big the image will appear to be on the screen depends on the size of the

screen as well as the screen resolution. Ideal screen resolutions, which you can specify on some computers, are:

Screen Resolution (pixels)	Screen Size (diagonal inches)
640 x 480	15
800 x 600	17
1024 x 768	20
1280 x 1024	21
1600 x 1200	21

Ideal means text and images will appear to be *life-size,* or about the same size as the original. Text and images will appear to be larger and somewhat blocky using a smaller screen resolution, while text and images will appear smaller and may be harder to see using a larger screen resolution.

Web browsers normally show an image at 72 pixels per inch, so Photos 1 and 2 are displayed at the same size. You can see this at http://www.pbase.com/azaleasociety/compression. While printer standards vary, they average out to be 300 pixels per inch. An inkjet printer needs about 300 pixels per inch for the highest quality, so a 1600 x 1200 pixel (2-megapixel) image can produce a high quality 4" x 5" print (1600/300 = 5.3, 1200/300 = 4.0).

Offset printing uses half-tone screens measured in *lines per inch,* which increases as the quality of the printing increases. Newspapers typically use an 85-lines-per-inch screen, which is low quality. ***The Azalean*** uses a 175-lines-per-inch screen, which is very high quality. For an offset-printed image to look its best, the pixels per inch of the digital image should be between 1.5 and 2.0 times the lines per inch of the offset screen. For ***The Azalean,*** that translates into a range of 175 x 1.5 = 262.5 pixels per inch to 175 x 2.0 = 350 pixels per inch. Using 300 pixels per inch leads to a good rule of thumb: **If it looks good on an inkjet printer at a particular physical size, such as 4" x 6", it will probably look good in *The Azalean* at about that same size.**

Photo 1 (top). High quality print of 'Airy Fairy' at 288 dpi.

Photo 2. Poor quality print of 'Airy Fairy' at 72 dpi.

Is Bigger Better?

On the minus side, more pixels mean more:

- time needed to store the picture on your camera's storage device;
- space taken up on your camera's storage device;
- time needed to move the picture from the storage device to your computer;
- space taken up by the picture on your computer hard drive;
- time needed to send it to a friend, especially on a dial-up connection;
- time needed to display the picture on your computer screen;
- time and effort needed to scroll around the picture to see all of it; and
- time needed to edit the picture in PhotoShop or other image programs.

On the plus side, more pixels mean you can print a bigger picture.

More pixels only mean you can print bigger pictures, not that the pictures are higher quality. The quality of the picture is determined by the quality of the lens, not the number of pixels. The quality of a picture taken with a 1-megapixel camera can be identical to a picture taken with a 5-megapixel camera. The difference is that you can print a high-quality picture from a 5-megapixel camera about two times larger than a picture from a 1-megapixel camera.

To deal with all those minus points, most digital cameras offer choices for storing your images. Professional photographers can store their images as very large TIFF (Tagged Image File Format) or so-called RAW files (unique to each camera manufacturer, and usually 1/3 the size of a TIFF), which save all the information exactly as recorded by the camera. They can then manipulate the information just as they manipulated film negatives and prints. Most of us don't need that degree of control, and will instead let the camera save the images to its storage device as JPEG (pronounced 'jay - peg', short for Joint Photographic Experts Group) files. These include the effects of any camera settings in use when the picture was taken, such as saturation or filters, and are *compressed files* that contain fewer pixels than the camera sensor has.

JPEG compression is used almost universally

because it:

- produces small files;
- exploits known limitations of the human eye (we notice small changes in brightness much more than small color changes);
- lets the user choose the degree of compression;
- preserves all the colors; and
- is efficient in terms of computer use.

But—it throws away some of the information during compression, called *lossy compression*. That means a compressed image will never be quite as good as it was before it was compressed, although you usually can't see the difference.

Most cameras let you choose the resolution of the image to save. They also let you choose how much JPEG compression to use; or, how much information you are willing to lose, with names for the settings such as:

Good, Better, Best
Normal, Fine, Superfine
Economy, Normal, Fine

The names on the left produce smaller files (around 1/16 of the original size) than the names on the right, which produce files from one-half to one-quarter of the original size.

There Is No Free Lunch

The smaller the image you save and the more the image is compressed, the more images you can save onto your camera storage device-but, the lower the quality of the resulting image. A good way to decide what camera settings to use is to answer the question *what will I do with the images?* If you want to send them to a friend to see, or to show them on the Web, the smallest size and the lowest quality your camera offers is good enough. If you want to publish them in ***The Azalean,*** or make large inkjet prints, you'll want the largest possible images saved at the highest quality setting. If you want to do both, then you'll want to use the largest images and the highest quality setting in the camera, and adjust the images later for use on the Web.

Now What?

Once you've captured your image on your camera storage device, and you've gotten it into your computer, you can use an image-editing program to do things to it. You can change the colors and saturation (usually a bad idea), you can crop it, you can rotate it, you can make it crisper and sharper (usually a good idea when done in moderation), and you can change its size. That last one is important, because it lets you tailor the same image to best serve different uses. Since some image-editing programs adjust the image size to fit the screen, don't trust that to be the real image size; instead, look around and find the numbers that tell you the image size in pixels or in inches at 72 pixels per inch. Remember that JPEG files use lossy compression? Because they do, you have two important rules to remember when you edit JPEG files:

1. **Never, ever save a JPEG file back into itself.** Each time you do, you will lose more quality. Keep the file that came from your camera as the master, and use it as your source document only. Any time you open it and do something to it, save the result as a different file. Just opening and closing a JPEG file without saving it has no effect on the quality.
2. If you are going to do a number of things to an image (such as rotating it, cropping it, sharpening it and changing its size), open the master, do all of those things one after the other, and then save the result as a different file. **Do not do one of those operations, save it, open that result and do another one, save it, etc., because each time you save it, you will lose some more image quality.**

Photo 3 shows enlarged portions of an image side-by-side to show the effects of lossy compression. The left hand side is the original from the camera, while its mirror image on the right hand side has been opened and saved back into itself a total of 10 times (no, you would never do that, but it is hard to show a slight degradation of image quality). You can also see this image on the Web at http://www.pbase.com/azaleasociety/compression .

Images for the Web

To prepare a picture to be shown on the Web, **make it smaller.** Most

Photo 3. Compression Quality Loss: left-hand side is the original image from the camera; the right-hand (and mirror image) has been opened and saved 10 times.

image-editing programs have a way to do this, although exactly how to do it varies from program to program. If your program lets you change the pixels per inch, set that to be 72 pixels per inch if it isn't already. Or, if your program only lets you change the physical image size, set the size so that when the browser shows the image at 72 pixels per inch it will be small enough to see the whole picture without scrolling. A good target size to suit most monitors is 640 x 480 pixels, or about 9" x 7". For example, if your image is saved at 300 pixels per inch, re-size it to be no more than 2.2" x 1.7". When the browser shows that tiny 300-pixel-per-inch image at 72 pixels per inch, it will appear at about 9" x 7". The arithmetic is 300/72 = 4.17, and 9/4.17 = 2.2, and 7/3.17 = 1.7. Some editing programs simplify this with an *information window* that shows the dimensions of the image in inches or pixels, the pixels per inch, the file size in KB (kilobytes), the amount of compression, etc.

The last step in making the image smaller is saving it as a JPEG file. Some programs let you specify the quality of the compressed image as a percentage, some as a ratio, some let you choose from a Good/Better/Best range, and some let you specify the saved file size. Also, some programs preview the appearance at various quality settings, and some preview the resulting file size. From a practical standpoint, do whatever it takes to make it less than 90KB, because that will make no quality difference on the Web, and a file size of 90KB or less reduces all the size-related problems mentioned above. For displaying on the Web, a file larger than 90KB merely wastes time and space. That's especially important when someone receives the file over a dial-up connection. Divide the file size in KB by 6 to see its approximate transmission time in seconds using a 56KB modem. For example, a 90KB file takes 90/6 = 15 seconds to receive, while a 1MB file takes 1000/6 = 167 seconds = 2.75 minutes. Since both of those files will appear the same on computer screens, have pity on the recipients and go to the effort to shrink the file size.

Images for *The Azalean*

To prepare an image to be printed in ***The Azalean*, keep it as big as possible.** First, set your camera to its largest image size and its highest quality JPEG setting before you take the picture. Next, if you aren't going to edit the image, send a digital copy of the original just as it came from your camera. Send it as an attachment to an e-mail if you have a fast connection and your Internet service provider allows large files; otherwise, send it on a CD. If you do edit the image, save it at one of the higher quality settings and send that. A quirk of JPEG, however, is that saving at 100% results in a larger file than you started with, with no improvement in quality—a setting of 80% or 90% is a good choice. The largest image size in inches in ***The Azalean*** will be your image resolution divided by 300. See the sidebar for a table of camera resolutions and printed image sizes.

Sources and Further Reading Image editing programs

Windows

IrfanView multilingual viewer/editor/converter, freeware, Microsoft® Windows® 9x/ME/NT/2000/ XP/2003, http://www.irfanview.com/

Paint Shop Pro 8 image editor and manipulator, $84 download or $94 boxed, Microsoft® Windows® 98/98SE, NT4 SP6, 2000 SP4, ME, XP, http://www.jasc.com/

LView Pro viewer/editor/converter/graphics package, $39 to $70, Microsoft® Windows® XP/Me/98/95, http://www.lview.com/index800.htm

Macintosh

GraphicConverter viewer/editor/ converter, $30 download or $35 CD. Current version is 5.1.1, Mac OS 8, 9, X, http://www.lemkesoft.de/

File format descriptions

http://www.wfu.edu/~matthews/misc/graphics/formats/formats.html

RAW file format description

http://photography.about.com/library/weekly/aa061603a.htm

Image print size table

http://www.nikonians.org/html/ resources/guides/resolution_and_ prints/resolution_and_print_size_ 2.html

Bob Stelloh, *our treasurer, is an avid azalea enthusiast and former software engineer. He currently has responsi-bility for the azaleas e-mail list and the ASA Web site, and, along with our secretary John Brown, is actively involved in finding and documenting native stands of* R. vaseyi—*see* http://www.pbase.com/bstelloh/vaseyi. *He also maintains the new and little-known ASA picture site at* http://www.pbase.com/azaleasociety . *Please take a look and contact Bob for information about adding your pictures there.*

Image Print Sizes

This table shows the recommended size of printed image in ***The Azalean***. For other images sizes, divide the image size by 300 to see the recommended print size.

Image size (pixels)	Megapixels	Print size (inches)
640 x 480	0.3	2.1 x 1.6
1,024 x 768	0.8	3.4 x 2.5
1,280 x 960	1.2	4.2 x 3.2
1,504 x 1,000	1.5	5.0 x 3.3
1,632 x 1,224	2.0	5.4 x 4.1
2,000 x 1,312	2.6	6.7 x 4.4
2,240 x 1,488	3.3	7.5 x 5.0
2,275 x 1,520	3.5	7.6 x 5.1
2,272 x 1,704	3.9	7.6 x 5.7
2,590 x 1,920	5.0	8.6 x 6.4
3,008 x 2,000	6.0	10.0 x 6.7

Azalea Research

What's New in Integrated Pest Management for Azaleas?—Biological Control Update

Dr. Michael Raupp and Paula Shrewsbury

Insect Pest Management

Several methods of pest control are available to managers and growers of azaleas and landscape plants to help them reduce damage from insect and mite pests. Traditionally, great reliance has been placed on the use of chemical pesticides. Recently, however, social and economic factors have made this approach less attractive, with the result that interest has increased in the development and implementation of different approaches. The integration of multiple methods of pest control accompanied by regular monitoring, decision-making, and evaluation is commonly referred to as Integrated Pest Management (IPM). One of the most promising alternatives to the use of conventional insecticides is **biological control.** Biological control can be defined as the use of predators, parasites (or parasitoids), and pathogens to reduce pest populations below damaging levels. *Predators* are animals that find and kill a series of prey to complete their growth and development. A ladybird beetle that kills aphids each day to feed itself is a good example. Many insects, spiders, and mites are predaceous in both immature and adult stages. *Parasitoids* are generally species that complete their growth and development on or in a single host. Consequently, parasites are usually smaller than their hosts. Many parasitoids require hosts only for immature stages of development. *Pathogens* are agents that cause disease such as fungi, bacteria, and viruses.

The goals of biological control are to lower pest densities to innocuous levels and keep them there. Biological control practices must be sustained over an extended period of time. This contrasts with the notion of eradication that implies the complete elimination of all pests at a site. Eradication is rarely achieved by any method of pest control, including the use of pesticides. Furthermore, pest control through eradication is unstable even when it can be achieved because pests from other locations often rapidly re-colonize the landscape. In the absence of natural enemies, pests quickly increase and reach damaging levels.

Biological control is achieved in three general ways:

1) **Conservation**—Existing natural enemies may be protected through management practices that favor their survival and reproduction.
2) **Augmentation**—If existing natural enemies are too scarce or appear too late to prevent damage, extra parasites or predators, purchased from a commercial insectary or collected elsewhere, can be released at the site. Augmentation may also rely on the application of a formulated biological control agent such as nematodes. Formulation is sometimes considered a separate category of biological control.
3) **Importation**—If a pest is an introduced species that lacks effective natural enemies, new biological control agents may be introduced from other locations.

There is no new progress to report concerning the importation of biological control agents for pests of azaleas at the time of this writing. Therefore, in this brief review only progress in conservation and augmentation will be discussed in reference to azaleas.

Conservation

With respect to azaleas, two approaches have proven effective in conserving natural enemies in residential landscapes. The first approach relies on the relationship between habitat complexity and natural enemy abundance and activity. Several studies have established a link between the vegetational texture of a landscape; that is, the number of species and their representation as trees, shrubs, bedding plants, and ground covers, and the number and activity of predators and parasitoids in the landscape. In general, landscapes with many kinds of plants and amounts of shade, and several strata of plants (overstory trees, understory trees, shrubs, bedding plants, and ground covers) are home to more natural enemies than landscapes comprised of few types and strata of plants with high levels of light exposure. Diverse landscapes provide vital resources for natural enemies, such as a diverse array of food including prey like azalea lace bugs and nectar and pollen for those natural enemies that require both plants and animals to eat. Perhaps favorable regimes of temperature, humidity, incident light, and refuges from their own predators favor natural enemies in complex landscapes. The lesson here is to diversify your landscape to the greatest extent possible with plants that flower and occupy different strata. Plant different species of trees that will mature to be large or small, and mix shrubs, bed-

Lace bug damage. *(Photo by Mike Raupp)*

ding plants, and ground covers into the design.

The second approach for conserving natural enemies is to select insecticides with short periods of residual activity. We all know that even under the best of circumstances pest populations may become intolerable and insecticides may be the only option for saving the aesthetic value or life of a plant. We have found that insecticides with long periods of residual activity such as organophosphates often reduce the abundance of predators and parasitoids in landscapes. Contact materials such as insecticidal oil and soap have short periods of residual activity and may help conserve natural enemies in landscapes. For pests such as azalea lace bug, we recommend the use of short residual, contact insecticides whenever it is feasible. Some newer insecticides such as those containing the active ingredient imidacloprid can be applied to the soil. The insecticide is taken into the azalea through the roots and distributed throughout the plant systemically. Imidacloprid provides spectacular and long-lasting control of several species of lace bugs on shrubs. The use of systemic insecticides applied through the soil is an attractive alternative to the application of wet sprays to the leaves of shrubs because it reduces the exposure of natural enemies that might be found on the plant at the time of application.

Augmentation

Augmentation can be practiced in two general ways, inoculation and inundation. Inoculation means releasing a relatively small number of natural enemies in an area where pests are present in the hope that they will become established, reproduce, increase in number, and provide continuing control. Inoculative releases may be made periodically. The application of milky spore bacteria to control Japanese beetle grubs in turf is an example of an inoculative release. Inundation means that large numbers of natural enemies are released with a goal of rapid reductions of pest populations. In this case, the natural enemy is used like a biotic insecticide and the expectation is not necessarily one of persistence of the natural enemy in the habitat. The application of thousands of entomopathogenic nematodes to the trunk of a rhododendron to kill the larvae of rhododendron borer is an example of an inundative release.

One promising approach to managing lace bugs on azaleas is the augmentative release of green lacewing larvae. Green lacewing larvae are voracious predators of many types of pests including lace bugs. In a nursery setting we found that commercially purchased green lacewing larvae released at the rate of 10 larvae per plant provided almost 90% control of azalea lace bug.

We have also used augmentative releases of deadly nematodes to manage another common landscape pest—the black vine weevil. In this case we applied the nematode *Heterorhabditis bacteriophora* to containers of the perennials *Bergenia, Heuchera,* and *Epimedium.* In all three studies the nematodes provided levels of control comparable or superior to those found with conventional insecticides. The promising results of these trials on small herbaceous perennials await confirmation for woody plants such as azaleas in landscapes.

Success or failure of augmentation will depend on many things. You must know the identity of your pest and determine if it is in a life stage susceptible to control by biological control agents. For example, small nymphs of lace bugs may be vulnerable to attack by larvae of lacewings purchased commercially. Lace bug eggs and adults are relatively invulnerable to lacewing larvae. Releases timed for control of lace bug nymphs may succeed while releases timed to the presence of adults may fail. Your attempts to manage pests will be most successful if you release your natural enemies when the pest population is comprised of vulnerable stages.

This is an azalea lace bug being attacked by a green lacewing larva. *(Photo by Miles Lepping)*

Once you have identified the target pest and sampled to determine its life stage, select and purchase an

appropriate biological control agent. Today, more than 100 kinds of biological control agents are available on the market. This selection increases the possibilities for control. However, not every pest has a biological control agent. At present there is no effective biological control agent for Japanese beetle adults. By contrast, for some pests such as aphids you will have many possible candidates to select from, including predators such as lady beetles and lacewings, parasitoids such as tiny wasps, and fungal pathogens. Boring caterpillars such as iris, dogwood, sycamore, banded-ash clearwing, and peach tree borer have been controlled with nematodes in the family *Steinernematidae,* whereas beetle larvae including grubs of black vine weevil and oriental beetle appear more susceptible to attack by nematodes in the family *Heterorhabditidae.* Learn which agent is right for the target pest and choose the right one.

This is damage from a black vine weevil.
(Photo by John Davidson)

There are several reference books that can assist in your selection of natural enemies. A few of these are listed below. An excellent aid in the selection process is the catalog of suppliers of biological control agents developed by the California Environmental Protection Agency. It can be perused and obtained electronically at www.cdpr.ca.gov/docs/ipminov/bensuppl.htm. This reference lists common target pest such as aphids, scales, and spider mites, and suggests several potential biological control agents for each. Contact information including corporate names, addresses, phone and fax numbers, e-mails and Web addresses is provided. Most suppliers will provide information concerning the storage, handling, and release of control agents.

We offer the following advice when selecting suppliers of biological control agents. Dependability rather than price should be your primary consideration. Augmentative biological control will generally be more expensive than the application of conventional insecticides. This is a given. If you are committed to releasing biological control agents, then be sure that the agent you order arrives when you need it and in good condition. We have experienced problems with agents arriving late or dead, sometimes both. Suppliers occasionally ship species different from those listed in the catalog. All of these problems complicate the situation and reduce the chances of successful biological control. Shop around, find reliable suppliers, and stick with them.

General References on Biological Control in Landscapes and Urban Forests

Flint, M.L. and S.H. Dreistadt. 1998. *Natural Enemies Handbook: The Illustrated Guide to Biological Pest Control.* Berkeley, California: University of California.

McCullough, D.C., S.A. Katovich, D.L. Mahr, D.D. Neumann, C.S. Sadof, and M.J. Raupp. 1999. *Biological Control of Insect Pests in Forested Ecosystems: A Manual for Foresters, Christmas Tree Growers and Landscapers.* East Lansing, Michigan: Michigan State University Extension Bulletin E-2679.

Raupp, M.J., R.G. Van Driesche, and J.A. Davidson. 1992. *Biological Control of Insect and Mite Pests of Woody Landscape Plants: Concepts, Agents, and Methods.* Riverdale, Maryland: Maryland Cooperative Extension Service, Production and Distribution.

***Dr. Michael J. Raupp** is a Professor of Entomology in the Department of Entomology at the University of Maryland, College Park, Maryland. He holds advanced degrees from Rutgers University and the University of Maryland. His research interests focus on the mechanisms of plant resistance and biological control of insect pests of ornamental plants.*

Raupp has more than 100 publications and has delivered over 100 invitational seminars or symposium presentations on these topics. He has received five regional or national awards for excellence, including the US Secretary of Agriculture's Award for Environmental Protection. His work has been featured in Good Housekeeping, Fine Gardening, *and* Organic Gardening *magazines, and he has appeared on National Public Radio and CNN. He works closely with arborists and citizens to develop effective and environmentally acceptable methods of pest control.*

A black vine weevil adult and larva.
(Photo by John Davidson)

Azalea Diseases

Ms. Ethel Dutky and Dr. Nina Shishkoff

Azaleas are durable, reliable shrubs for the mid-Atlantic landscape. However, sometimes problems appear. The first step in solving the problem is a correct diagnosis. This can involve some detective work.

Phytophthora ramorum, a New Disease

The fungus *Phytophthora ramorum* has been identified as the cause of foliar blight, shoot blight, and cankers on a wide variety of plants. A common name for the fungus is "Sudden Oak Death" or "SOD," based on the damage caused to oaks in coastal California forests. Other species of the *Phytophthora* fungus cause disease of azalea and rhododendron in nursery production and landscapes, and some produce foliar symptoms that can be confused with this new disease. You will need expert laboratory help to diagnose *P. ramorum.* Consult your local state department of agriculture for guidance in selecting samples for testing.

We plant pathologists would prefer to call this disease "Ramorum blight" rather than "SOD," but the press prefers to use SOD in stories about detections of the disease. This disease was observed on nursery plants (rhododendrons, viburnums, and some others) in Europe in 1993 and on oaks in California in 1995. The populations of the *P. ramorum* fungus in Europe and California differ. It is not clear if these populations represent separate introductions of the fungus from unknown points of origin. The disease has spread throughout the countries of the European Union on nursery stock. *P. ramorum* has now been found at 339 sites in England and Wales alone. It is being seen causing cankers on trees (oaks, beech) in parks and forests in England and Wales. In the United States the disease was restricted in distribution to the California coastal forest ecosystem until recently. In 2003 the fungus got into several large wholesale nurseries in California. Camellias, viburnums, and lilacs potentially infected with *P. ramorum* were shipped to nurseries and directly to home gardeners in about 35 states during the period from March 2003 through June 2004.

P. ramorum causes damage by infecting foliage, shoots, and the trunks of some trees (oaks, beech). It has been detected on the roots of potted azaleas, but is not considered to cause root disease. The new *Phytophthora, P. ramorum,* causes leaf spot and shoot blight on azalea and rhododendron (see Photo 1). It has a very wide host range, which is very unusual for *Phytophthora,* since most species of *Phytophthora* studied have a narrow host range. *P. ramorum* usually does not kill the infected plant. Instead it produces leaf spots, small twig cankers, and blight of shoot tips. The fungus produces many microscopic spores on the infected foliage and blighted shoots. These spores can be carried on wind or splashing rain to lodge in the bark of oaks, infecting the main trunk, and eventually killing the oak. It usually takes several years to cause wilt and death except for very small seedling oaks. The symptoms seen on azalea are brown leaf spots and die-back of young shoots.

If you suspect that you may have azaleas showing odd leaf spot/shoot blight symptoms, and want them tested for *P. ramorum,* you should contact your local state department of agriculture. Only plants purchased during the March 2003-June 2004 period are considered at increased risk for this disease. Several laboratory tests are required to identify this fungus. It cannot be quickly identified through microscopic examination. [For the most current information on SOD in Maryland, home gardeners should contact the Home and Garden Information Center (1-800-342-2507) or visit their Web site (www.agnr.umd.edu/users/hgic).]

Flower Diseases

The major disease of azalea flowers is *Ovulinia* petal blight caused by the fungus *Ovulinia azaleae.* The first symptom seen following infection is a small tan spot. This spot enlarges to turn the entire petal into a slimy mass. The blighted petals may cling to the plant (and look messy) well into late June (see Photo 2). They weather off the plant, the over-wintering structure of the *Ovulinia* fungus (a lens-shaped dark sclerotium) falls to the ground (see Photo 3). The following spring these sclerotia produce little mushrooms (apothecia) that forcibly eject infective spores into the air.

Because the first infections each spring come from air-borne inoculum, even when you control all the *Ovulinia* on your property, you will probably see it again each year. This disease is easily prevented with one fungicide application. Apply a systemic fungicide (e.g., Strike, BannerMaxx, Heritage, Compass) to the plant when flower buds show color. The fungicide will enter the petal tissue and prevent infection for three to four weeks.

Root Diseases

The most important root disease in landscapes is *Phytophthora* root rot. Over a dozen species of the *Phytophthora* fungus attack azaleas and other ornamental shrubs and trees. The symptoms range from sudden death within the first few years after planting to a slower decline over three to five years. To diagnose, look for the dark chocolate brown discoloration in shoot cambium. In nursery

production this disease is prevented using cultural and chemical methods. Fungicides are routinely applied to prevent *Phytophthora* diseases in nursery production and to ensure that the plant reaches the consumer with a healthy vigorous root system.

Photo 1. *Phytophthora ramorum* on Rhododendron *'Nova Zembla'*. *Photo by Nina Shishkoff)*

Phytophthora is a "water mold." Under wet conditions it produces many microscopic swimming spores called zoospores. These can seek out and infect plant roots, shoots, and foliage.

In the landscape we advise cultural methods to prevent losses from *Phytophthora.* Azaleas have a shallow, fibrous root system. Add organic amendments to the soil to increase organic matter content and to improve internal soil drainage characteristics. Your goal is a soil that retains moisture, but drains well and does not remain saturated for extended periods. Some azaleas are resistant to *Phytophthora* root rot. These resistant varieties should be used when re-planting a site where you have lost plants to *Phytophthora.*

Photo 2. When the azalea petal blight fungus *(Ovulinia azaleae)* infects flowers, the petals become brown and slimy. *(Photo by Ethel Dutky)*

Photo 3. The petal blight fungus forms these black lens-shaped structures called sclerotia in blighted petals. In early spring these sclerotia can produce mushrooms that forcibly eject microscopic spores into the air to cause the first infections of new flowers in the spring. *(Photo by Ethel Dutky)*

Cankers and Die-backs

When most of the plant looks fine but a section is blighted, there are several suspects. Tight growing azaleas (such as the 'Gumpo' varieties) are susceptible to *Rhizoctonia* web blight. The symptoms seen are browning of patches of foliage. Look closely for the fungal sign, the fine tan webbing of *Rhizoctonia solani* (see Photo 4). This fungus can also cause blight of cuttings during rooting. *Rhizoctonia* can infect foliage

Photo 4. The fungus *Rhizoctonia solani* can blight cuttings in the greenhouse. Note the tan web-like mycelium growing across the media. In the landscape, *Rhizoctonia* causes foliar and shoot blight in hot, humid summer weather. *(Photo by Ethel Dutky)*

and make a little inconspicuous spot. *Rhizoctonia* diseases thrive in warm, moist conditions. Fungicides may be applied to prevent *Rhizoctonia* web blight on highly susceptible varieties. **Resort to fungicides only when you know you have this in your planting.** Some effective fungicides include: Contrast, BannerMaxx, Systhane, Heritage, Compass, Medallion, Daconil Ultrex, and others.

A different picture can be seen when selected large branches die during the summer and fall. Look for evidence of canker (abnormal looking areas on the bark). Old azaleas often lose large stems from *Phomopsis* canker. In Dutky's lab she isolates to identify the fungus. The symptoms of *Phomopsis* are similar to *Botryosphaeria* canker, but the two fungi look different in culture. Phomopsis usually produces a pie-shaped wedge of brown discoloration in the shoot (see Photo 5).

Photo 5. Cankers caused by *Phomopsis* are common in old landscape azaleas. This pie-shaped wedge of discoloration seen when the wilting shoot is cut, is diagnostic for Phomopsis on azalea. *(Photo by Ethel Dutky)*

The control is the same for all shoot canker diseases. Prune out the dead shoots back to healthy wood. Try to identify and correct cultural problems (drought is the most common one that predisposes azaleas to cankers) and correct them to encourage vigorous growth.

Don't be fooled by borers. They make symptoms that look just like a canker, but if you look for it, you can find the holes—tunnels in the shoot and "sawdust" coming out when they are active. Dr. Mike Raupp explained how to deal with borers (see accompanying IPM article on page 61).

Shoot Galls

Azaleas and rhododendrons can be affected by the disorder called "Tissue Proliferation." These large galls on the crown were long thought to be caused by the crown gall bacterium, but are now known to be of abiotic origin. Some symptomatic plants perform well in the landscape,

but others are brittle at the galled area and fail to thrive. Some even snap off at the crown. Tissue proliferation galls can be distinguished from bacterial crown gall because they sometimes make little green shoots. This disorder appears to be most common in plants that originated from tissue culture.

Exobasidium Leaf and Petal Gall

This is a very conspicuous disease that is not damaging to the plants. It is seen on native azaleas in the woodland. Several species of the *Exobasidium* fungus can infect ericaceous plants. The galls on *Rhododendron periclymenoides* [formerly *R. nudiflorum*] are called "Pinkster apples" and are edible. This fungus can remain on the plant either as a systemic infection or as spores on bud scales. Infection requires moist conditions, and only young developing leaf or petal tissues are infected to form galls. These galls should be picked off before they develop the white bloom. This white material is composed of a layer of infective spores, and it is these spores that make next year's infections. We never advise chemical control for this disease. If you are offended by it, then hand-pick the galls promptly. Remove them from the landscape; don't just drop them on the ground (see photo 6).

Photo 6. Pick off the galls caused by *Exobasidium* fungus before they produce the glacous white bloom on the surface. *(Photo by Ethel Dutky)*

Powdery Mildew, Rusts, and Other Diseases on Foliage

Azalea foliage can be marred by a variety of leaf spot fungi. The two most conspicuous ones are the rusts and the powdery mildews (see Photo 7). Other fungi may cause spotting and blight of azalea foliage *(Rhizoctonia, Colletotrichum, Cercospora, Phyllosticta)*, but are seldom important in the landscape. However, we may find that more attention must be paid to leaf spots on azaleas and rhododendrons because of the possible introduction of the fungus *Phytophthora ramorum*.

A reference to help you diagnose Azalea Diseases:

Compendium of Rhododendron and Azalea Diseases. 1986. APS Press $49.00. To order by phone 1-800-328-7560 or online at www.shopapspress.org.

Photo 7. This rust (fungus *Pucciniastrurn myrtilli)* produces conspicuous symptoms and signs on the lower leaf surface of this decidious azalea. *(Photo by Ethel Dutky)*

Animal-Caused Damage

Finally, a few words about non-disease-related azalea damage.—White-tailed deer like to eat the shoots, leaves, and flower buds of azaleas in the winter. If deer have eaten all the flower buds in the winter, flower display will be reduced. Bird netting placed over the planting will protect from deer.

Another cause of decline, wilt, and death symptoms can be small rodents eating the roots during the winter. Look for holes and shallow tunnels around your azaleas. The best control for these pesky rodents (usually pine vole or meadow vole) is to adopt a nice cat. Visit your local animal shelter to find your new pet. If you don't like cats, encourage snakes to reside in your garden. We don't think poison baits are a good idea in home landscapes, but may be used in field production.

Ethel M. Dutky *is the director of the plant diseases diagnostic laboratory in the Department of Entomology, University of Maryland, College Park, Maryland. Her teaching responsibilities include training Master Gardener volunteers, growers, landscape maintenance workers, and arborists to identify and control plant diseases. She is also on a team that designs and trials IPM programs for ornamental plant production and maintenance, which stress intensive crop monitoring and use of the least toxic tool to prevent or control problems.Dutky has consulted for USAID in Africa and South America, setting up and evaluating regional plant diagnostic laboratories and training staff. She is a co-author of* Pests and Diseases of Herbaceous Perennials *(1999) as well as many articles and, with Stanton Gill and David Clement, a CD-format professional series adjunct to the* Horticopia Electronic Horticulture Encyclopedia on Pests and Diseases of Herbaceous Perennials. *She has also contributed many images of plant disease to books and CD collections. Contact her at* edutky@umd.edu *or 301-405-1611*

Dr. Nina Shishkoff *has a BA in botany from the University of Michigan and a Ph.D. in mycology from Cornell University. She is currently working on research on* Phytophthora ramorum, *the organism that causes "Sudden Oak Death," as a research plant pathologist with the USDA Agriculture Research Service, Foreign Diseases and Weed Science Research Unit, at Fort Detrick, Maryland 21702-5023. Contact her at* nshishkoff@fdwsr.ars.usda.gov *or 301-619-2877.*

Society News

Highlights of the Board of Directors Meetings and Annual Meeting in Bowie, Maryland

John Brown — Secretary

At meetings held May 6 and 9, 2004, the board authorized the Azalea City Program, under the direction of past-president Joe Schild, to recognize municipalities which promote an appreciation of azaleas through tours, festivals, and public attention. See Joe for details, which are also listed on the www.azaleas.org Web site and in the following article in this issue.

The board has selected North Carolina State University as the repository for the Society Archives. That project is underway. See article in ***The Azalean*** [26(2): 42] for more information.

Barry Sperling has been selected to head the Membership Committee. He will be working with Tom Milner and Ron Hooper. A committee reported on a review of the work of the editor. Other items held over for further discussion were potential new chapters and the status of the Dallas Chapter.

At the May 6 meeting president Buddy Lee thanked Don Voss and Margie Jenkins for their service, since they were leaving the board.

It was announced at the May 8 annual meeting that Tom Milner, Ron Hooper, and Bob Hobbs had been elected to the board for three-year terms. The By-laws change to add the Society's secretary to the executive committee was accepted by the membership. Then Buddy Lee was awarded the Best Article in ***The Azalean,*** and Lake Michigan Chapter president John Migas presented preliminary information on Holland, Michigan, the location of the 2005 ASA convention (May 19-22, 2005) and the local Tulip Festival, inviting all to attend. After the meeting, William C. Miller III gave the keynote speech "Ben Morrison and His Azaleas."

Azalea City Program—Help Needed

Joseph E. Schild, Jr. — Chairman

Yes, the Azalea City program committee needs your help in locating and contacting municipalities that deserve the recognition of the Azalea Society of America for their continuing efforts in promoting azaleas as worthy landscape shrubs within their boundaries. This may be through celebrations, official proclamations, garden tours, and the use of azaleas in the public and private landscape.

As members of chapters or at large, each of you perhaps knows of a city that fits the above description and may be able to assist them in completing an application. As you may know, all the information is posted to the ASA Web site for easy access and downloading. If, however, the town you live in does not know about it, then you are our ambassador and can assist them or supply the appropriate municipal officials with contact information to make the opportunity available to them.

If any member does not have online connection to access the ASA Web site, please contact me by telephone or mail, and I will make sure you or the city contact person receives all the necessary forms and guidelines. A number of news releases have been sent out to various publications, but the personal contact of members most certainly carries more weight and influence.

The committee is pleased to announce the awarding of the first recognition as an "ASA Azalea City" to Nacogdoches, Texas. They supplied the committee with overwhelming proof of an excellent and on-going program in the municipality for celebrating and using azaleas in the public and private landscape. We hope this will lead many more municipalities to follow in their path to excellence.

You may reach me at the numbers or addresses below:

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The following 40 members joined the Society since July 21, 2004.

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