# Control of *Cayratia japonica*, Bushkiller, in an Urban Habitat in Charlotte, NC

*by James Matthews Ph.D., Gary Marshall and Michael Hodges*

*Figure 1. Leaves and flowers of* Cayratia japonica. *Note the center leaflet is stalked.*

The highly invasive *Cayratia japonica* (Thunb.) Gagnep. (Vitaceae) [Bushkiller] is a severe pest in the tropical areas of the southern United States, Texas, Louisiana, Mississippi, Alabama and in North Carolina (Hansen and Goertzen (2006), Krings and Richardson (2006). The first North Carolina population was discovered in Winston-Salem (2005), as reported by Krings and Richardson (2006). In June 2007 a population was discovered in Charlotte, North Carolina by John T. Soule during a stream restoration project in which Habitat Assessment and Restoration Professionals (HARP) was the botanical contractor. Very quickly, with the aid of local publicity, five other populations were documented (J.T. Soule *et al.* (2008). The largest of the six populations occurred in Charlotte in an urban habitat where it dominated the lower parts of the trees and shrubs on a slope above the stream and invaded the lawns, fences and gardens of five residential lots (Figure 1 close up of leaves and flowers; Figure 2 overgrown habitat).

Upon hearing of this new population, a Master's graduate student, Amanda M. West, in the Crop Science Department at North Carolina State University in Raleigh, contacted HARP asking to use the Charlotte population for a series of test plots for research on chemical control. HARP assisted Ms. West in setting up control plots in the summer of 2007. A local invasive species committee, Council on Locally Invasive Plants and Pests (CLIPP) operating under the Mecklenburg County Soil and Water Conservation District, expressed interest in investigating ways to control the species but decided to await the results of the research by Ms. West. In the summer of 2008 the results of the various trials were supplied to HARP by Ms. West as she completed her thesis research. Her thesis was submitted in 2009. A report of the research was published in 2011 in *Invasive Plant Science and Management* (A.M. West *et al*. 2011). The data reported were from one season of treatments (2007) with an analysis of the long-term regrowth results during the 2008 growing season. In her thesis (2009) and in the 2011 report it was noted "that multiple-season treatments may be required at well-established bushkiller infestation sites." The special projects subcommittee of CLIPP focused on extending Ms. West's studies.

West's studies (West *et al*, 2011) in the field showed no long-term control by glyphosate, triclopyr, tryclopyr + 2,4-D, and triclopyr + aminopyralid. Better long-term control was achieved by imazapyr, sulfometuron, and sulfometuron + metsulfuron, particularly the latter which was marketed under the name Oust Extra™ (DuPont™). Figure 3 shows the results of the treatment with Oust Extra at the end of the 2008 growing season. Note the two logs at the base of the slope in both Figures 2 and 3. In addition to the slope, five residences at the top of the slope were strongly affected by the growth of the bushkiller, which overgrew the gardens, fences, became the dominant plant in hedgerows and grew into the cultivated trees in the lawns.

CLIPP received written permission from the property owners to do whatever seemed feasible to reduce the impact of the species. We have worked since 2008 until the summer of 2011 when we feel confident that we now have a better understanding of the biology of the species in the Piedmont region and have the infestation almost under control. We noted that spraying with Oust Extra™ in September 2008 gave a reduction of about 60% in vigor in the spring of 2009, but there was significant regrowth of new shoots.

The initial 2008 treatment of the area along the slope and floodplain was 60 gallons (8 oz./100 gallons/acre). Treatments were repeated in 2009 the last of April and monthly thereafter until frost. Since the species is tropical, new shoots appear all during the growing season. Working in the temperate Piedmont gave us an opportunity to plan during the dormant season and treat the stems in the spring before they reached high into the trees the next year. Not having a temperate climate in the Gulf coast means that the plant may not stop growing all year, which requires additional planning for treat-

ment. Although treatment with Oust Extra™ gave the best results, it required several years to reduce the sprouting and vigor of the regrowth. New sprouts occurred at random from the underground stems all during the season.

As Amanda West (West 2009) completed the 2007 treatment season, she obtained a new chemical not yet on the market, DPX-KJM44, being tested by DuPont. The preliminary results showed this chemical provided the best control 10 months after treatment. Our examination of her plots the next spring showed the best over-winter reduction in growth and vigor resulted from the treatment with DPX-KJM44. We contacted the DuPont VMF representative in Raleigh, North Carolina, G. Neil Loyd to ask about the new herbicide and found it was in a pre-release to the public condition, to be labeled as DuPont™ Streamline® (MAT 28 + Escort®) [Aminocyclopyrachlor + Metsulfuron]. We arranged for a demonstration of the new herbicide on July 22, 2010. The results of the trial on one lawn and woods ecotone were excellent and a limited amount of Streamline® (150 gm.) was made available for testing in Charlotte. All of the residential areas (lawns and fence infestations) were treated with 15 gallons of herbicide (50 gm./5 gallons of water) on August 5. There had been no regrowth in the areas treated on July 22 by August 5. Based on these results, DuPont, through Neil Loyd, provided several pounds of Streamline® to Michael Hodges, a representative of Crop Production Services, Timberland Division of Monroe, North Carolina, to support the continued activity. A final treatment of the entire area of untreated woodland was performed on October 21, 2010, using five gallons of herbicide. Michael Hodges has overseen the application activity in Charlotte and in Davidson and Forsyth counties.

Streamline® has been applied at 7 oz. per acre, in 20 gallons of water per acre with a nonionic surfactant. Several surfactants were tested. The most effective results were obtained with LI-700, an acidifying, penetrating, soy-oil derived nonionic surfactant that enhances penetration by temporarily relaxing the wax structure on the leaf surface. LI-700 was added at a rate of one-fourth oz. per gallon of spray mix. LI-700 was supplied by Loveland Products, Inc., Greeley, Colorado, through Crop Production Services, Timberland Division, Monroe, North Carolina.

In 2011, the first application of the growing season was on April 25 when five gallons were applied over the entire area. As is typical of areas with heavy infestations, new sprouts appear during the growing season and not in the same area as the previously treated sprouts. On June 2, twelve gallons were applied to the regrowth; on June 24, five gallons were applied; on July 22, two and one-half gallons were applied; on August 23, one and one-half gallons were applied. The last application for 2011 was on October 21, again using one and one-half gallons. The decrease in number of gallons indicates that the infestation is becoming less aggressive (less new sprouts) as the underground food supply is reduced.

Control of a bushkiller infestation will require continual treatment over several years, depending on the degree of infestation. The longer an area has been infested, the more massive the underground storage/meristem system and the longer it will take to eventually kill the underground meristems and deplete the nutrition. Streamline® appears to act in a limited area on underground parts and although it does eliminate local underground areas of growth, sprouting occurs away from the previously treated area. We have noted that regrowth in areas is unpredictable and the entire area has to be examined/treated initially every 10 to 14 days, then three to four weeks. As the control develops (lack of new sprouts), monitoring can be extended to six to eight

*Figure 2. Bushkiller population at the time of discovery in June 2007. Note the two logs, with the bushkiller covering the vegetation on the bank and up 25 ft. into the canopy.*

*Figure 3. Reduction of the bushkiller growth after herbicide application during the 2008 growing season. Compare the vegetation in relation to the two logs in Figure 2.*

weeks. However, periodic treatment over the growing season is necessary. Waiting late into the season before treating allows the plants to grow and store food, which seems to prolong the problem of control of new sprouts.

In areas where control is just beginning and where the vines have become attached to the shrubs and trees, we have found that gently pulling on the vines will break the tendrils, allowing the vines to be piled on the ground and sprayed. This spray procedure reduces the amount of spray needed, as the entire plant receives a concentrated dose of herbicide. This technique also reduces the chance of overspray on to desirable species.

In an experimental treatment for an area without desirable woody species, the typical mixture of Streamline® and LI-700 was supplemented with 3 oz. per gallon of Tailspin,™ containing Fluroxypyr 5.6% and Triclopyr 16.1%. Tailspin™ is labeled for broadleaf control in cool season turf, industrial and non-crop areas. This combination of chemicals stopped re-sprouting better than a mixture containing only Streamline.® However, it should not be used near desirable woody species.

We wish to acknowledge the cooperation of the CLIPP Subcommittee, particularly Jack McNeary and Tom Martin who assisted in some of the early site work. We also wish to thank Neil Loyd, District Sales Manager for DuPont, Raleigh, North Carolina, for providing materials for the project.

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