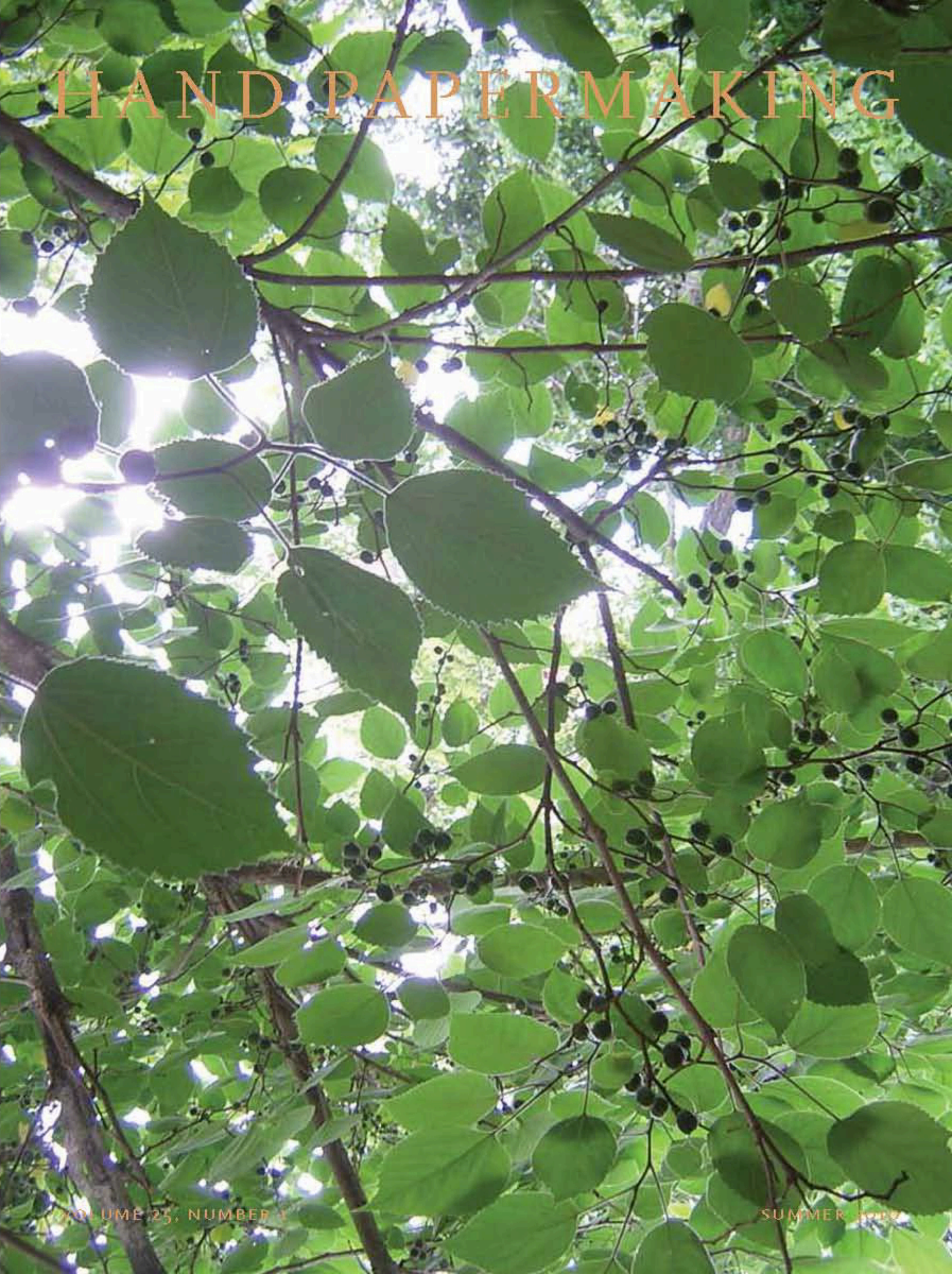
HAND PAPERMAKING



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HAND PAPERMAKING

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FRONT COVER: *Mulberry plant growing outside the book and paper studio at Penland School of Crafts in North Carolina. August 2009. Photo by and courtesy of Amy Richard.*

BACK COVER: *Patterson Clark,* White Mulberry, June 18, *2009, 17 x 11 inches, artist-made invasive white mulberry (*Morus alba*) paper, ink, and block. Photo by and courtesy of the artist.*

Letter from the Editor

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When we open up the fiber cabinet to select the raw material(s) for a paper project at hand, we scan our options, weighing the aesthetic qualities and working properties that each fiber can lend to the pulp we would like to prepare. Sometimes our considerations are financially based. Throughout history, papermakers have gladly employed materials discarded by other industries as a way to obtain readily available fiber and to minimize costs. Adding to the economic argument, we recognize that recycling is a beneficial and necessary practice to conserve our planet's resources. Papermakers are also seeing a potential role in the control of "invasive" plants by processing the nonnative fibers into pulp. Like the invasives themselves, papermakers too are opportunistic. To draw on the papermaking–culinary arts connection, we are always on the lookout for interesting and novel ingredients to cook up new, distinctive, innovative papers.

In this issue, we will investigate new fiber sources in the field, look at how and why we seek to turn today's cast-off materials into handmade paper, and benefit from the experience and expertise of papermakers who employ nontraditional fibers in their work. We begin with Gin Petty who outlines her favorite Kentucky invasive plants for papermaking. Mary Tasillo shares her experience with urban guerrilla weeding for an ambitious paper/print project in Philadelphia. Julie Johnson describes how to use invasive plants responsibly, and contributes two paper samples that compare the qualities offered by Japanese knotweed harvested at different times. Amy Richard examines the use of Florida's wild kozo, one of the state's Category 2 invasive plants. Peter Thomas introduces Arch Shred, a 100-percent-recycled fiber source for papermaking. Steve Miller takes us through the processing of banana stalks from annual garden trimmings, accompanied by a sample of Alabama banana paper produced by MFA students at the University of Alabama. Barbara Beisinghoff discusses her use of nettles fiber in her artwork. And Eugénie Barron introduces artist Duke Riley who used invasive phragmites fiber to create paper related to an extraordinary public art performance in New York City. In reviews, Helen Frederick tells us about Joan Hall's recent exhibition at George Mason University, and Dan R. Goddard gives us his take on "Engaged and Fragmented," a group exhibition presented at the Southwest School of Art & Craft.

As always, I appreciate hearing your feedback, comments, and suggestions. Please let us know if you are working with unusual fibers and would like to share your experience. In conjunction with this issue, we are devoting a section of our website to "Fiber R&D."

Many thanks for your continued support and readership.

Mina Takahashi

A Papermaker's Dilemma: Examining the Use of Invasive Plants

AMY RICHARD

*Paper mulberry (*Broussonetia papyrifera *or kozo) can be found growing in abandoned lots and disturbed lands in northeast central Florida. This photograph, taken in September 2009, shows a perfect example of how the plant crowds out native species like the wax myrtle (pictured in the center), eventually creating a monoculture. All photos by and courtesy of the author, taken in Gainesville, Florida.*

For many papermakers, a chance to harvest locally grown kozo (*Broussonetia papyrifera* (Vent.) or paper mulberry) for the purpose of making Japanese paper is an exciting prospect.

A few years ago, after discovering a large stand of these plants growing within just a few miles of my home in north central Florida, I became determined to try my hand at the age-old Japanese papermaking process, beginning with harvesting the raw material. I was enchanted with the sense of accomplishment found in a stack of freshly cut branches; the earthy aroma of the sticks as they steamed over a fire; the satisfaction of scraping away black bark from the silky inner bast fibers in one smooth motion; the feel of the crisp finished paper; and the warmth of its lovely golden hue. Before long, I developed the ability to spot kozo plants, with their telltale mitten-shaped leaves, alongside roadways while driving at high speed. Abandoned lots and utility right-of-ways, which seemed to be full of these plants, were duly noted for potential harvest sites each winter.

Like a youngster with unlimited access to a cookie jar, I tried to ignore the nagging doubts that began to grow when I realized that this same shrubby tree species, cultivated and highly prized in Japan, is weedy and invasive in many natural areas throughout Florida. "Problem solved," one might think; artists can harvest the material for their own use and help the environment at the same time.

If only it were that simple. As coordinator of the Florida Invasive Plant Education Initiative, I am surrounded by an abundance of information on the risks associated with harvesting and using invasive plants.[1] Kozo is one of 130 plant species considered invasive in Florida.[2] In 2004–2005, over $37 million were spent controlling invasive plant species in the state's aquatic, wetland, and terrestrial habitats.[3] While the big dollar figure is alarming, it is the hundreds of photographs that have come across my desk that worry me the most—images of invasive species gone wild, covering forests, lakes, rivers, or wetlands, choking out native flora and fauna and threatening Florida's biodiversity. Trips to field sites, where a single species has created a monoculture as far as the eye can see, have left a lasting impression.

Paper mulberry plants have highly variable leaves ranging in size from 3 to 10 inches long. A combination of leaf shapes may be found on one plant or they may all be the same. Smaller leaves tend to be egg-shaped with pointed tips and serrated edges (margins). This tree is growing just outside the book and paper studio at Penland School of Crafts in North Carolina. August 2009.

Larger paper mulberry leaves tend to be heart or mitten shaped, some are deeply notched with three large or two smaller lobes near the base of the leaf. Soft hairs on the stems and leaf undersides are other distinguishing characteristics. November 2009.

It can be a prickly subject, which is why my intent is not to preach but to present a yellow blinking light: a warning signal for us to reduce speed and take a closer look before proceeding. As one scientist warns, "For invasive species, the stakes are higher than for most other forms of pollution because once a species is established and has begun to spread, the introduction is irreversible."[4]

Unlike many agricultural and/or horticultural plants, some nonnative species are able to flourish outside of cultivation.[5] Because these plants are beyond their native range, their natural enemies (e.g., bacteria, fungi, insects, herbivores) are not present, giving them a huge advantage and allowing them to cover or shade out native plants and/or drive away native wildlife that have evolved within an ecosystem.[6] Once the presence of a nonnative species results in economic or environmental harm to human, animal, or plant health, it is defined as invasive.[7] Throughout the United States, invasive species (including animals) are causing environmental damage and losses totaling an estimated $137 billion per year.[8]

Like many of the invasive plants that we are trying to control today, kozo was introduced into the United States with the best of intentions. One source dates its introduction in Virginia as early as the 1830s as a potential papermaking fiber, back when the number of American paper mills was growing and sources for cotton rag were dwindling.[9] Since then, it has become naturalized—reproducing on its own outside of cultivation—in many neighboring states. In numerous instances, this is the first step towards becoming invasive. In Florida, kozo plants were reported as early as 1903.[10] It is now documented in every corner of the state.[11]

The degree of kozo's invasiveness depends on region, climate, and soils. The USDA Plants Database documents the occurrence of *B. papyrifera* in at least 29 states in the United States, but that does not mean that the plant has been assessed in every state.[12] To date, it is considered invasive in natural areas in at least 11 of the 29 states: Florida, the District of Columbia, Georgia, Louisiana, Maryland, North Carolina, Oklahoma, Pennsylvania, South Carolina, Tennessee, and Virginia. Also, it is reported to be invasive in more than a dozen other countries.[13]

Numerous state and federal publications agree on the negative environmental impacts of paper mulberry:

- It exhibits aggressive growth, quickly invading open habitats such as forest and field edges or disturbed lands, displacing and out-competing native vegetation;
- It negatively impacts wildlife dependent on native vegetation for forage, nesting, and cover; [14]
- Its fruits can be spread significant distances by wildlife, enabling it to spread deeply within undisturbed areas;
- Once established, paper mulberry spreads from its root system, forming dense thickets, which are often 30 feet across.[15]

In addition to producing thousands of seeds, mature paper mulberry trees, growing to heights of more than 30 feet, spread vegetatively by sending up vertical shoots or "suckers" from underground stems (rhizomes) that reach as far as 30 feet from the parent plant. This shallow web-like system prevents other plants from growing in the understory and results in a monoculture of paper mulberry. In every location where I have found it, this root system was present and seemed to extend even farther.

With all of this said, *B. papyrifera* is, at the present, considered to be somewhat less egregious when compared with other invasive species in Florida. According to the IFAS Assessment, used by the University of Florida, Institute of Food and Agricultural Sciences (IFAS) to evaluate invasiveness in the state, paper mulberry "may be recommended with caution" and "managed [as] to prevent escape."[16] Florida's Exotic Pest Plant Council (FLEPPC)

Even this small shrubby-sized paper mulberry plant produces many fruits and consequently, seeds. Mature trees produce many more seeds in addition to spreading by horizontal underground stems (rhizomes) that sprout new plants or "suckers" as far as 30 feet from the parent plant. This tree is growing outside the book and paper studio at Penland School of Crafts in North Carolina. Small suckers were observed by the author at least 40 feet from this tree. August 2009.

Paper mulberry trunks are also quite variable. Some are pale brown or silvery gray in color. Others sport tiger stripes, shown here. Notice the absence of any ground vegetation, a product of its dense leaf canopy shading out the understory and its shallow web of underground roots preventing other plants from growing. November 2009.

ranks paper mulberry as a Category II species, "an invasive exotic that has increased in abundance or frequency but has not yet altered Florida plant communities to the extent shown by Category I species (i.e., positively invasive)." They follow up by stating, "This species may become ranked as Category I, if ecological damage is demonstrated."[17]

B. papyrifera has not shown up *yet* on the Florida noxious weed list so it is not "officially" a problem to harvest it from existing stands.[18] However, at least one individual in the plant management arena is now considering recommending that kozo join the list.[19] If you are contemplating the use of kozo or another plant found somewhere other than on your own property, research may be warranted. Most states have laws limiting or restricting the transport or possession of certain plants; some require a permit, others are prohibited altogether (i.e., illegal to possess or transport). Your state's noxious weed list is a good place to start.

Noxious weed lists and laws were created because harvesting known invasive plants can help to spread the plant, especially if seeds or fruit are present. Collecting material in the winter when the plant is dormant or before it produces seed or fruit can help reduce the risk. When harvesting an invasive or even a potentially invasive plant, it is also recommended that any extra material be collected and disposed of properly, especially material with attached seeds or spores, or plant parts capable of vegetative reproduction.[20] Some land managers have been known to use tarps or tight-meshed ground cloths for this purpose. Proper disposal involves burning, freezing, or putting all materials in household trash that is destined for the landfill, far away from a compost pile. As well, viable parts of invasive plant species should never be discarded with yard waste that may be provided as mulch to other homeowners.

For kozo specifically, the Japanese tradition of harvesting branches in the winter seems to work although I have adopted the practice of collecting and burning extra material in the backyard fire pit as additional insurance.

When I first learned "Florida kozo" was invasive, I spent considerable time wondering if there was any way to safely cultivate it. Professor Ken Langeland, an invasive plant expert at the University of Florida, confirmed my suspicions with one word: "Don't." In his opinion, kozo is one of the worst landscape weeds he has seen.[21] Like me, he battles to control the endless suckers that sprout up all over his yard, new plants attached to underground rhizomes, all of which lead to a parent tree in a neighbor's yard. Without removing the parent tree and all existing suckers, it is a futile effort.

His professional insight and my own personal experience with this plant further increase those twinges of guilt I experience when harvesting branches from local naturalized stands. If I care about the natural diversity of the habitats around my home, shouldn't I be willing to permanently remove these plants, especially in areas where they are clearly a problem?

While I have volunteered to remove other invasive plant species, I have not quite reached the point of treating a thriving stand of paper mulberry saplings with herbicides (i.e., the only viable way to control large infestations). But I'm close. After seeing some

"Florida kozo" saplings continue to sprout just steps from the author's studio and 40 feet from a parent tree that was blown down during one of the many hurricanes that visited Florida in 2004. January 2010.

A mature "parent" paper mulberry tree located two lots over from the author's house continues to introduce new plants to the neighborhood, in every direction. February 2010.

of the local kozo populations, I have become increasingly uncomfortable with harvesting branches without also trying to remove the plant. Even though I am keen on access to such a wonderful fiber, I am also quite fond of Florida's beautiful and unique natural areas, wild places that could be threatened by a monoculture of paper mulberry.

Many of us, including me, are uncomfortable with the use of chemicals in the natural environment. However, as I have learned from working at the Center for Aquatic and Invasive Plants, the research behind the use of herbicides is much more thorough than in years past and regulations are far tougher. Working with a host of plant managers who are knowledgeable and dedicated to environmental safety has also increased my comfort level.[22]

For many plant infestations, herbicides have proven to be the only economical and ecological means of control, especially for plants like hydrilla, an aquatic species that can re-sprout from a tiny fragment fallen off a boat trailer and grow an inch or more a day.[23] The same is true for upland plants like the air potato vine, which can grow up to eight inches in a day.[24] There is really no way to effectively control these situations without herbicides. As well, other methods like the use of mechanical harvesters have their own problems, such as high mortality rates of fish and turtles killed in the machinery as it scoops up aquatic plant material.[25] For this reason, virtually every governmental agency and many conservation organizations support or use herbicides as part of their toolbox for managing invasive vegetation.

When working with found plants, I have learned that it is always a good idea to consult with the experts and there are plenty who are ready to share their knowledge and expertise. They can be found by contacting local or state environmental agencies or university cooperative extension services. Many states or regions have native plant societies and pest plant councils that are comprised of plant management professionals.

To ease my own conflict with using invasive plants, I will continue to use "best management practices," and seek partnerships with land managers in the area to coordinate my harvest along with their control efforts. And (sigh), I will also be exploring the cultivation and use of other *non-invasive* fibers such as flax or Dahlia...or perhaps, our native red mulberry.

NOTES

1. University of Florida/Institute of Food and Agricultural Sciences, Center for Aquatic and Invasive Plants, http://plants.ifas.ufl.edu.

2. Florida Exotic Pest Plant Council, Florida Exotic Pest Plant Council Invasive Plant Lists, http://www.fleppc.org/list/list.htm (accessed February 24, 2010).

3. Kenneth A. Langeland, UF/IFAS Center for Aquatic and Invasive Plants, personal comment to author, February 8, 2010. This figure includes both research and management costs.

"Globose" or ball-shaped paper-mulberry fruits surround a single female inflorescence with a few remaining flowers still attached. Courtesy of UF/IFAS CAIP.

4. David M. Lodge and Kristin Shrader-Frechette, "Non-indigenous Species: Ecological Explanation, Environmental Ethics, and Public Policy," Conservation Biology *vol. 17, no. 1 (February 2003): 31–37.*

5. Nonnative describes any species that is present in a region outside its original, historic range due to intentional or unintentional introduction; also referred to as non-indigenous or exotic. The term nonnative does NOT necessarily mean it is invasive. In Florida, the majority of an estimated 1,300 nonnative plant species are not causing problems. Some are beneficial. For more information, see Vic Ramey, "Non-Native Invasive Plants: An Introduction," from the Plant Management in Florida Waters website, http://plants.ifas.ufl.edu/guide/invplant.html#stewardship (accessed January 30, 2010).

6. "Native" describes any species occurring naturally in a geographic region; also referred to as indigenous. In the United States, plants are generally considered native if they were here before the arrival of Europeans (i.e., Columbus). Source: Richard P. Wunderlin, © 2006 Institute for Systematic Botany, as quoted in the Plant Management in Florida Waters website, http://plants.ifas.ufl.edu/guide/invplant.html (accessed February 23, 2010).

7. Invasive Species Definition Clarification and Guidance White Paper, Submitted by the Definitions Subcommittee of the Invasive Species Advisory Committee (ISAC), for the National Invasive Species Council (April, 2006). The document, available online, offers a great deal of information: http://www.invasivespecies.gov/global/ISAC/ISAC_documents/ISAC%20Definititions%20White%20Paper%20%20-%20FINAL%20VERSION.pdf (accessed February 24, 2010).

8. David Pimentel et al., "Environmental and Economic Costs of Nonindigenous Species in the United States," BioScience *vol. 50, no. 1 (January 2000): 53–65.*

9. Edmund Fulling, "Botanical Aspects of the Paper-Pulp and Tanning Industries in the United States—An Economic and Historical Survey," American Journal of Botany *vol. 43, no. 8 (Oct. 1956): 621–634.*

10. John Small, Flora of the Southeastern United States *(New York: published by the author, 1903), 362.*

11. Eric Morgan and William Overholt, Wildland Weeds: Paper Mulberry, Broussonetia papyrifera, *University of Florida/IFAS Publication ENY-702 (Gainesville: Entomology and Nematology Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, March 2004). Also available online at http://edis.ifas.ufl.edu/in498 (accessed February 24, 2010).*

12. See profile of paper mulberry on the USDA Plants Database, http://plants.usda.gov/java/profile?symbol=BRPA4; and on the Invasive Plant Atlas of the United States, http://www.invasive.org/weedus/subject.html?sub=5208 (both accessed February 24, 2010).

13. J.M. Swearingen, "Paper Mulberry," Alien Plant Working Group Least Wanted, on the Plant Conservation Alliance's website, http://www.nps.gov/plants/alien/fact/brpa1.htm (accessed February 24, 2010).

14. Lorraine Miller, Paper Mulberry, Broussonetia papyrifera, Invasive Plant Species, *National Forests in Florida Protection Report R8-PR 46 (USDA Forest Service, Southern Region, 2000).*

15. Eric Morgan and William Overholt, Wildland Weeds: Paper Mulberry, Broussonetia papyrifera. *See endnote 11.*

16. The University of Florida's IFAS Assessment project was created to provide recommendations concerning the use of nonnative plants in Florida. For more information, see http://plants.ifas.ufl.edu/assessment/ (accessed December 10, 2009).

17. Florida Exotic Pest Plant Council (FLEPPC) is a non-governmental organization comprised of plant management experts from around the state. One of their self-assigned tasks is to assist land-managers by setting priorities for invasive plant control programs through the maintenance and continuous review of the Invasive Plant Species, a biennial list supported by current ecological observations in the field plus information in several statewide plant databases and herbaria, http://www.fleppc.org/list/list.htm (accessed January 20, 2010). Information specifically on kozo's classification in other states can be found from a number of resources, starting with these websites: http://plants.ifas.ufl.edu/node/634, http://www.naeppc.org/, and http://www.eddmaps.org/species/ (all accessed February 24, 2010).

18. The Florida noxious weed list is available on the website of Florida Department of Agriculture and Consumer Services, Division of Plant Industry, http://www.doacs.state.fl.us/pi/enpp/botany/noxweed.html (accessed February 10, 2010).

19. Ken Langeland, UF/IFAS Center for Aquatic and Invasive Plants, personal comment to author, February 8, 2010.

20. Ken Langeland, Help Protect Florida's Natural Areas from Non-Native Invasive Plants *Circular 1204 (Gainesville: Agronomy Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, first published March 1998, revised February 2009). Also available online at http://edis.ifas.ufl.edu/ag108 (accessed February 24, 2010).*

21. Ken Langeland, UF/IFAS Center for Aquatic and Invasive Plants, personal comment to author, February 2010.

22. For an interesting video presentation on the safety of herbicides, see Carole Lembi, "Why Aquatic Herbicides Affect Aquatic Plants and Not You!" on the website of the Department of Botany and Plant Pathology, Purdue University, http://www.btny.purdue.edu/Aquatic/aquaticherb.html (accessed February 4, 2010).

23. Gerda Van Dijk et al., "Growth of Hygrophila and Hydrilla In Flowing Water," Journal of Aquatic Plant Management *24 (1986): 85–87.*

24.Greg MacDonald, Jay Ferrell, Brent Sellers, Ken Langeland, Tina Duperron-Bond, and Eileen Ketterer-Guest, Invasive Species Management Plans for Florida, *Circular 1529 (University of Florida, IFAS Extension, 2008). Also available online at http://plants.ifas.ufl.edu/node/133 (accessed February 7, 2010).*

25. Travis Booms, "Vertebrates Removed by Mechanical Weed Harvesting in Lake Keesus, Wisconsin," Journal of Aquatic Plant Management *37 (1999): 34–36. See also William Haller et al., "Fish Harvest Resulting from Mechanical Control of Hydrilla,"* Transactions of the American Fisheries Society *109 (1980): 517–520.*