

PLANT Conservation

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Grassroots Conservation on the Great American Prairie

CPC Botanists help restore native plants in wide open spaces

The great American prairie is a place of mythical proportions. A vast, undulating sweep of land, it lives in the American imagination as the setting for pioneer trails, cowboys and Indians, and sunsets that stretch as far as the eye can see. It's our home on the range where buffalo roam, munching on amber waves of grain; the place where that ribbon of highway winds between the endless skyway and a golden valley. But it's also a sensitive ecosystem that's being pushed to the brink. Today, only five percent of original tallgrass prairie remains. And, conservationists point out, it's a place where the previous impacts of ranching and large-scale agriculture have resulted in a plethora of problems for flora and fauna alike.

CPC institutions and their partners are working to save some of these imperiled prairie plants – and in many cases, they're doing it with the cooperation and help of landowners who value conservation in land management.

Coming Clean

Can a former weapons factory contaminated with toxic chemicals become a haven for imperiled native plants? At Rocky Mountain Arsenal National Wildlife Refuge, just miles from downtown Denver, a former wasteland is blossoming into a much-needed haven for native prairie plants.

Grasses and wildflowers once dominated the rolling plains here, with

shrubs and trees lining the waterways. Settlements, agriculture, and, beginning in the 1940s, a long-standing chemical-weapons and pesticide factory seriously altered that landscape. The flora and fauna of the prairie were definitely *not* on the agenda.

By the 1960s, area residents were complaining about contamination of the local water supply. By the late 1980s the factory had been closed down, groundwater treatment plants established, and the EPA stepped in to designate the area a Superfund toxic clean-up zone. Under the Refuge Act of 1992, the former arsenal is set to become one of 504 national wildlife refuges once clean-up is complete. The prairie is about to get a second chance.

Tulip Gentian (*Eustoma grandiflorum*), a native prairie wildflower, has dwindled in numbers as more and more stream edges and wet meadow habitats are destroyed by agriculture and development. "The major problem for the *Eustoma* is a lack of habitat," explains **Tom Grant of Denver Botanic Gardens.**

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photo by Michelle DePrenger-Levin

Above, Tulip Gentian (*Eustoma grandiflorum*), a dwindling prairie wildflower. Below, research assistant Michelle DePrenger-Levin and research intern Bethany DeMarco collect vegetation data at a Denver restoration site.



photo by Thomas Grant

Director's Letter:

Hot summer days. When it's too hot to be outside, I seek AC and a good book. Ralph Waldo Emerson wrote: "Do not go where the path may lead, go instead where there is no path, and leave a trail." Easier said than done, but it really does fit the story of CPC. We've created an effective program to help conserve our native flora, and we figured it out as we went along. This issue of the newsletter really shows how far we've come!



Kathryn Kennedy

The latest addition to our "Along the Road to Recovery" provides a peek at the revisions to seed collecting protocols coming with our new book next year. We take a look at restoration work guided by good science that is helping answer important questions, focusing on flora of the prairies and the habitats of Florida. Our profile of Kay Havens

and her work at the Chicago Botanic Garden shows that passionate and innovative staff at our institutions really can advance conservation locally and nationally.

Our Friends make all of this happen. We see modest growth in our numbers, so we know you are helping spread the word. Thanks to each and every one of you, we are making a difference. Visitors using our website have grown from the hundreds to approximately 10,000 per month this year, and our partnerships with agencies have never been stronger.

But our trailblazing days are not over. There are multiple scientific challenges in growing and restoring these species in the wild. This Fall at our annual meeting we'll take a hard look at how well we are providing for the highest priority imperiled species. We know there are still many vulnerable species, and we don't want anything to fall through the cracks.

Plus, the ripple effect of the economy over the last several years is hitting home at many of our institutions, par-

ticularly those supported through state budgets. We felt we had to show you how those budget cuts are hitting our vital conservation programs. Clearly CPC must continue to grow, providing more support to restoration programs, and working to improve funding.

What could be crazier than for our affluent society to allow the loss of the plant resources that have the potential to solve so many problems? In the next issue we'll look at federal agency budgets for the coming year.

That process at the federal level is going on right now though. If you want to check the status of proposed federal agency budgets online and weigh in yourself, check <http://thomas.loc.gov/home/approp/app04.html> and click to Department of the Interior to track most endangered species funding, administered through the Fish and Wildlife Service.

In the meantime, enjoy these last lazy days of summer!

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A network of more than 30 botanical gardens and arboreta, the Center's mission is to conserve and restore the rare native plants of the United States.

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Seed Collecting: More than Meets the Eye

Imagine you've just discovered a small, struggling population of an imperiled native plant growing in the wild. You're ecstatic at your discovery, of course. These plants are so rare they were even considered extinct at one point! Now you have a chance to preserve the plants *ex situ* and work towards restoring the plant throughout its historic range. Immediately, you kneel down in the soil and start scraping the seeds into your pocket to take back to the lab – right?

Think again! Seed collecting is a key component of plant conservation, and even this early step in restoration must follow careful scientific guidelines to ensure the success of the project and to guard against extinction. First of all, collecting seed as opposed to other plant material might not even be the right choice.

You may have found a wild populations that is doing so poorly that it no longer produces healthy seed; or, perhaps the seeds from this taxon are known to die when subjected to the freezing and desiccation typically required for storage.

These situations might call for cuttings, or perhaps using tiny amounts of plant tissue in tissue culture. In rare cases, transplanting whole plants may be considered appropriate, but only as a last resort to save a population from imminent destruction.

In general, though, taking seeds is the best option, for many reasons. Transplanting can be hard on a plant, and survival rates may well be lower than survivorship in plants propagated in the greenhouse from collected seeds. Seed collections are more cost-effective and don't require regular maintenance. Plus, seeds do the best job of suspending genetic resources, minimizing the genetic shift that nearly invariably happens in cultivation as life in the greenhouse shifts the standards for survivorship and reproduction.

Conventional wisdom has long held that collecting seed, if done with care, is less harmful to existing populations

than taking plant parts or, worst of all, whole plants. Nevertheless, the potential impact of seed collection on population health is still a major concern, especially when working with dwindling numbers of rare natives.

This question has recently been addressed in a rigorous scientific manner for the first time by **Eric Menges** (CPC Scientific Advisory Council), **Ed Guerrant** (Conservation Director, **Berry Botanic Garden**) and Samara Hamzé. Their chapter on the effect of seed collection on extinction risk in perennial plants will appear in CPC's upcoming book, *Ex Situ Plant Conservation*.

The authors used computer modeling based on real-world data to analyze possible collection schedules. "Among other conclusions, we found that it is generally better to collect small amounts more frequently than it is to collect large quantities, even infrequently," says Guerrant.

It's in the genes

So you've decided to collect seed, and you have some ideas on how to avoid serious damage to the population in the wild. But you want to make sure that your seeds are genetically representative of all the traits built into the plant's DNA. How many seeds do you need to collect? From which plants? And when should you go out in the field to gather them?

The new CPC book, due out in February 2004, will provide some updated answers to these questions. Guerrant, joined by co-editors **Kayri Havens** of **Chicago Botanic Garden** and **Mike Maunder** of **Fairchild Tropical Garden**, along with Peggy Fiedler, provides revised sampling guidelines for conservation collections.

The revised guidelines build on the earlier CPC genetic sampling guidelines, which have found wide use globally, and continue the discussion of maximizing genetic representation in seed collections.

These second-generation guidelines place a greater emphasis on the context surrounding the collection. Now,



photo by Andrea Raven

Seeds from Bradshaw's parsley (Lomatium bradshawii) are collected into small envelopes by botanists at Berry Botanic Garden.

botanists are encouraged to consider the range of purposes for which a seed collection might later be put to use, including restorations, right from the start. For example, many fewer seeds are needed to develop germination and cultivation protocols than to propagate plants for a restoration planting.

"Plant conservation is like a three-legged stool," explains **Dr. Kathryn Kennedy**, CPC director. "You have to have all three before the chair can stand. You're working on several fronts at the same time: understanding the species biology; habitat protection and management; and conserving the genetic resources for future restoration." What does this mean for seed collecting? It's not as simple as it seems.

"Along the Road to Recovery" is a CPC series highlighting the steps to recovery for imperiled plant species. For an overview of the road to recovery, see the Winter 2003 issue of Plant Conservation, available on the CPC Web site at www.centerforplantconservation.org.

Prairie Conservation

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“The damming of rivers and channelization of streams has changed the hydrologic system, and the *Eustoma* depends on seasonal streams.” Now, only a few populations are left in the Denver area.

After collecting seeds and conducting propagation and germination studies, Grant and his team introduced cultivated tulip gentian plants to an experimental plot along the northern edge of Parkfield Wetlands in the outskirts of the former arsenal. The experiment tested the importance of soil moisture and found the greatest survivorship in the areas that were seasonally wet or saturated soils, but not flooded. There, 80 percent of the juvenile plants survived the five-month summer growing season.

The success of this initial experiment is now leading to a second reintroduction, which could continue next year if funding from Shell is renewed. This time, researchers will also be monitoring fruit production and recruitment, as well as planning to add other elements of the prairie to the mix. “Our idea is to add parts of the ecosystem back in,” Grant says. The research team hopes to continue restoration work by adding other species, including **Alkali yellowtops** (*Flaveria campestris*) and the federally endangered **Colorado butterfly plant** (*Gaura neomexicana* ssp. *coloradensis*).

Unlikely Allies

In more northern prairies, at least one National Collection plant may actually be getting a boost from the return of agricultural practices. The federally threatened **prairie bush clover** (*Lespedeza leptostachya*), an herbaceous perennial, is known from only 36 sites in Minnesota, Wisconsin, Iowa and Illinois. So when a population at the Nachusa Grasslands in western Illinois dipped drastically after the Nature Conservancy stopped cattle grazing on the historic ranch site, researchers took notice. A similar precipitous drop had been seen after the removal of cattle from a population in Minnesota.

“Buffalo would have provided the

equivalent,” explains **Pati Vitt**, Conservation Scientist at **Chicago Botanic Garden’s Institute for Plant Conservation**. “The prairie bush clover benefits from reduced competition from grasses, because that’s primarily what the cattle remove, and an increase in the percent bare ground due to disturbance by the hooves.”

With a total of 60 experimental plots, each a meter square centered on a single prairie bush clover plant, Vitt and colleagues allowed a single cow to graze



photo by Pati Vitt

Above: *Eastern Prairie Fringed Orchid* (*Platanthera leucophaea*) may be hurt by pesticides applied to nearby potatoes.

half of the plots to remove 20 percent of the vegetation cover. A year later they compared the grazed and ungrazed plots, and found that many more juvenile individuals had been produced in the grazed plots.

But other agricultural practices may well be hurting another favorite imperiled native in the region. Vitt is working to learn more about the **Eastern and Western prairie fringed orchids** (*Platanthera leucophaea* and *Platanthera praeclara*, respectively), elegant, showy wildflowers that once dotted the tallgrass prairies. Now on the federally threatened list, these species are being monitored and hand pollinated to increase fruit and seed set.

But Vitt was worried that the extra

pollination might push the plants to over-extend themselves, using up so much of their energy in producing offspring that too little is left to support growth in the next season.

“I was concerned that the cost of increased reproduction would lead to a demographic cost – that is, a decrease in plant size and subsequent reproductive output, and potentially mortality,” Vitt explains. She began her work with a population of the Eastern orchids in Illinois.

In fact, Vitt’s experiments revealed just the opposite of her fears – and may help us learn more about the natural history of this floral treasure. “In the third year, after two years of hand pollination, the plants that were hand pollinated are bigger and have more flowers and higher survival rates than those with any other treatment, including natural pollination.

“Since this orchid has a short life span of only five to seven years, and since the pollinator, the hawk moth, was once common, it’s possible that the plant has the ability to ‘up-regulate’ the photosynthetic apparatus to handle the additional embryo load,” Vitt hypothesizes.

“This year, we are starting to repeat the experiment with the Western species. The hawk moth is closely related to tomato hornworms, which prey on agricultural species like potatoes. Since many of the populations of the Western species are surrounded by potatoes, it’s very likely the pollinator is being impacted by agriculture.

“In the Western species, fruit set is very low, at 12 percent. In the Eastern species, it’s at 30 percent. Given my findings, that should be more about 60 percent for the Eastern species. Now, I’m working to see if we’ll find the same in the Western species.”

And so, like the Colorado butterfly plant and prairie bush clover, prairie fringed orchids may become pieces of the puzzle in the fragmented habitat of the great American prairie. As we restore these natural treasures, we’re making progress towards restoring some of the greatest wild places of the American landscape.

Guzundheit! on the coastal prairie

It's allergy season, so why are botanists working to save the plants that make you sneeze? Perhaps because even allergens are an important part of our natural heritage.

Paul Cox of the **San Antonio Botanical Garden** has taken on the itchy task of helping federal agencies restore the imperiled **South Texas Ambrosia** (*Ambrosia cheiranthifolia*), a silvery-green herb in the ragweed family.

This ragweed, however, is not the widespread coarse weed most of us associate with the word. This federally endangered species once grew throughout Texas prairie lands and along the gulf coast, but is now known from only six locations in the wild.

Herbaceous plants like this one may play an important role in the nutrient cycle on the prairie, greening earlier in the spring or remaining edible longer in the fall than prairie grasses and therefore providing essential sustenance for game and other wildlife.

NPR Broadcast and International Agreement Spread CPC Message

In June, CPC signed a memorandum of understanding with three other botanical organizations. The American Association of Botanical Gardens and Arboreta, Botanic Gardens Conservation International, and the Canadian Botanical Conservation Network, along with CPC, confirmed common goals and sharing resources. Yearly meetings will establish annual work plans for areas of joint concentration. For 2003, the organizations have set the goal of developing a web-based resource center for plant conservation education.

And in early August, our own **Kathryn Kennedy**, CPC director, was featured as a guest on National Public Radio's Science Friday.

This national broadcast had originally been recorded in February at the Denver meeting of the American Association for the Advancement of Sci-



Eliot Paine, CPC Board Chairman, signs the MOU.

ence and included a discussion of gene banking for endangered species. **Chris Walters**, a member of the CPC science advisory council and Research Program Leader at the National Center for Genetic Resources Preservation, was also featured in the discussion.

You can access the program at the Science Friday website: http://www.sciencefriday.com/pages/2003/Aug/hour2_080103.html

One Step Ahead for Texas Hill Country Wildflower

The Texas Hill Country's unique ecosystem is a mix of open grassy areas interspersed with woodlands and dense brush.

Now, a coalition of conservation botanists, city, county and federal agents, landowners, nurserymen, and gardeners are taking a pro-active approach to saving a vulnerable wildflower in this special place before it's too late. **Bracted twistflower** (*Streptanthus bracteatus*) is an herbaceous, somewhat succulent waxy annual with beautiful lavender-purple

flowers. This native plant was once scattered throughout south-central Texas, and previous surveys by the Texas Parks and Wildlife Department had located about 20 populations.

But an informal group calling themselves the Friends of *Streptanthus* is realizing that only a handful of those populations can still be found—and many are located on private land slated for development.

"We knew this plant was having some problems, so we need to do something now before it becomes a gigantic blip on radar screen," points out CPC scientist **Flo Oxley** of the **Lady Bird Johnson Wildflower Center**. "The conservation botanists in the area have gotten together and said, 'Let's keep it from getting to the critical point.'"

Volunteers from all walks of life joined the group to search for more populations and to collect seed from a site facing im-

minent destruction. Since all the plants located at the rescue site were growing in the path of the bulldozer, researchers collected as much seed as possible.

Oxley has been banking those seeds with time-honored methods: "We separate the seeds from the fruit and try to get out all the gack, the garbage and the plant material. Then we weigh them and dry them out in a desiccator until they reach a constant weight—that's getting all the water we can, given our crude equipment. Then we put them in an aluminum foil package, seal them up with a iron we bought at a garage sale, and put them in a Kenmore chest freezer at -18 degrees Celsius."

Now the group is hoping to identify sites where the twistflower can be restored.

Want to learn more about the imperiled native plants of the Great American Prairie and the Texas Hill Country? Search the National Collection of Endangered Plants online at www.centerforplantconservation.org.

Volunteers search for bracted twistflower plants.



Photo courtesy of Flo Oxley



Dunes, Keys, and Rocklands: Rare Habitats, Rare Plants *Fairchild Tropical Garden Makes Progress on Restoring Imperiled Flora*

The Miami Rock Ridge is only a few feet high, rising above the coastal marshes of the Atlantic to the east and the swamps of the Everglades to the west. Even so, it's high enough to pass for "high ground" in low-lying South Florida. There, a rich diversity of rare and endemic plant species flourished in the pine rockland habitat. Unfortunately, this habitat has also historically been singled out by humans to build cities, farms, and orchards, and now only 11.4 percent of the original habitat area remains undisturbed.

Imperiled native plants of at-risk Florida habitats like the pine rocklands are getting help from the **Fairchild Tropical Garden**. Historically, the rocklands were subject to naturally occurring fires, and the current lack of fire disturbance means that trees and shrubs are shading out understory species, like the federally endangered **tiny polygala** (*Polygala smallii*). An experiment at a U.S. Coast Guard communications station may be able to demonstrate just how important fire is to the survival of the plant, and whether mechanical removal of trees and bushes can be used as a surrogate.

In 2002, trees and shrubs were thinned in four experimental plots, in what must have been a difficult undertaking — it took an eight-man crew three weeks to thin four 30-by-15 meter plots! **Joyce Maschinski**, conservation

Beach Jacquemontia (*Jacquemontia reclinata*)



photo courtesy of Joyce Maschinski

ecologist at Fairchild, reports that the experiment may be about to enter the next stage: "We've just gotten news from the Coast Guard that they do have permission in place to burn a site. If we can get a burn treatment through, we can compare the results to the mechanical treatment." Researchers will count the total number of polygala plants and the amount of ground they cover, as well as analyze the overall diversity of species that spring up in the wake of bush and tree removal.

"The preliminary results indicate that mechanical thinning treatment plots did have an increased number of species, but it does not look like there's been much change in the abundance or cover of understory plants, as of last year," reports Maschinski. "The county is interested in this information because they get a lot of pressure to do other things besides burning, but most ecological studies indicate fire is not easily replicated."

Conservation botanists at Fairchild also recently completed an experimental reintroduction of the **hoary pea** (*Tephrosia angustissima* var. *Corallicola*), another pine rocklands plant. "What has been unusual about this species is that it was growing in an area that was cultivated for fifty years, and there aren't any existing populations in undisturbed pine rockland habitat any more," Maschinski explains. "We are testing what kind of microsites might be good for it." Using experimental groups of both cuttings and seeds, sites were established at a roadside, a forest, and a sandy, open meadow.

Like the pine rockland habitat, Florida's coastal dunes suffer from de-



photo courtesy of Joyce Maschinski

Field Botanist Adrianna Muir consults with a volunteer during outplanting of the hoary pea.

velopment and fire suppression. There, Fairchild's CPC botanists have conducted three experimental reintroductions of **beach jacquemontia** (*Jacquemontia reclinata*). In one of these experiments, plants were spaced out along a transect starting at the high tide line and moving further inland. Researchers aimed to discover which position afforded the jacquemontia the best survivability. "It turns out the plants that are mid-distance, which is about 16 meters from the high tide line, had the greatest survival," reports Maschinski. "Those closest to the ocean were affected by a hurricane and got buried by sand, and the ones further from the ocean were eaten by what we think were marsh rabbits, because in the taller hammock vegetation further from the shore critters can hide easily." The plants will continue to be monitored.

A whole different set of problems plagues the Florida keys, low-elevation reef islands where rising salinity levels, rising sea levels, and an introduced moth spell trouble for dwindling native flora.

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High-Five in Hawaii

CPC scientists in Hawaii are celebrating the change in management at Waimea Arboretum. As of June 26, the arboretum has become the **Waimea Valley Audubon Center**, pledged to “protect, enhance, and interpret the botanical, ecological, and cultural resources of Waimea Valley,” according to the Audubon Society.

“It’s really a wonderful transition,” says **David Orr**, formerly director of the arboretum. Orr will continue to work with the CPC plants at Waimea, along with **Linda Bard**, nursery manager, under the auspices of Audubon. “A lot of us, including myself, were in a hopeless stew before the transition,” Orr says. “Now the valley is very peaceful, and we’re far more motivated. Plus, we’re getting lots of community volunteers. All in all, this is very positive for the collections of native plants.”

These botanists have been collaborating with another Hawaiian CPC institution to save an extremely vulnerable Hawaiian native that may well be the rarest plant in the world: the **Hawaiian tree cotton (*Kokia Cookii*)**. When the tree cotton was first discovered in the 1860s, its numbers were probably already reduced due to the loss of nectar-feeding birds on the islands. Since then, it has teetered on the brink of extinction in a remarkable story of survival.

Extirpated from the wild in 1918, the species survived in only one cultivated tree by 1934. Over 130 seedlings from that tree were planted on the islands during the next 20 years, but none survived, and the species was thought to be extinct with the death of the cultivated tree in the late 1950s. In 1970 a cultivated survivor was discovered at the site—only to be extinguished by fire eight years later.

Now, CPC botanists at Waimea and at **Lyon Arboretum** are working with a cutting taken from that last survivor to cultivate cloned plants that will be

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Budget Crisis Hits Imperiled Native Flora

These days, you’d be hard pressed to find a non-profit institution that’s *not* worried about finances. But for botanic gardens and arboretum that are supported by state, city, or university funds, things are looking particularly grim. Plus, cuts to the federal Fish and Wildlife Service and other agency budgets would limit the amount of money available to help endangered and threatened native flora. Together, these financial ills spell problems for the imperiled native plants that so desperately need our help.

In the CPC network of participating institutions, **Nebraska Statewide Arboretum** has perhaps been the hardest hit. As a public-private partnership between the University of Nebraska-Lincoln and a private nonprofit corporation, the Arboretum relies on state university funds for half of its financial support. But as the state budget crisis hit hard early this year, university chancellors were faced with difficult decisions and identified both the Arboretum and the Nebraska Forest Service for complete elimination of state funding. Then last month, in what Arboretum director **Jim Locklear** calls an “eleventh hour reprieve,” the state legislature voted to reduce the original cut to the university budget.

The decision reversal was, to say the least, a huge relief. But unfortunately it’s hardly the end of the rainbow. Even within the normal state budget, Arboretum funding had lost 15 to 20 percent over the past three years. “It was a steady erosion,” Locklear says. “Even though we’ve survived this most recent round, we’ve taken some cuts in previous rounds.”

This means a severe shortfall when it comes to plant conservation. As the Arboretum has been forced to retreat to a core program, there’s been no money to fund a position focused solely on plant conservation. That’s especially frustrating to Locklear, who previously served as the arboretum’s CPC conser-



photo by Elizabeth Garcia-Dominguez

*The North Carolina Arboretum maintains the Appalachian avens (*Geum radiatum*) in the National Collection, but lacks funds for restoration projects.*

vation officer and did much of the work to build up the *ex situ* samples of plants held by Nebraska in the National Collection. “As director, I’ve had to look overall at our institutional priorities and make those decisions, which has been painful because conservation has been a huge part of who I am,” he says. “We just don’t have the capacity to be engaged like we should be and we want to be.”

Similar problems plague the **North Carolina Arboretum**. There, management decided to institute a parking fee to compensate for funding cuts due to a statewide budget crisis. But conservation programs are getting little relief, and the single conservation position has been frozen since the last conservation officer left nearly two years ago. “We’ve had to pull in to the limits of our property,” explains **Alison Arnold**, the Arboretum’s Director of Horticulture. “So we’re just in a maintenance mode — we’re not going out and collecting new seed, or propagating plants for restoration. We all have it in our hearts; we’re passionate about it; but we haven’t found the funding for it.”

Institutions funded by municipalities, like the gardens in **Honolulu** and **San**

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Meet the Network: Dr. Kayri Havens, Chicago Botanic Garden

After learning of Kayri Havens' long list of impressive projects, I expected this CPC botanist to be at least a little stressed or strained. But after talking with her, I realized that Kay knows how to find fun and laughter even in her busy schedule. I guess she's following the very advice she gives the students in her conservation courses: "I tell them to follow their passions," she says, "to have a job where you get to do what you love." A leader in *ex situ* plant conservation, Kay collaborated with Ed Guerrant of Berry Botanic Garden and Michael Maunder of Fairchild Tropical Garden to edit the next CPC book, which will hit the stands in February, 2004. In the meantime, here's a peek into the life of one very busy conservation botanist:

Name: Dr. Kayri Havens

Position: Director, Institute for Plant Conservation at Chicago Botanic Garden

Where are you from? I've been a Midwesterner all my life. I grew up in Chicago, went to school in Illinois and Indiana, and spent three years at the Missouri Botanical Garden before com-

Kay collects samples of dune thistle (*Cirsium pitcheri*) at Indiana Dunes.



photo by T. Antonio

ing here to Chicago.

Educational background? Bachelor's and master's degrees in botany from Southern Illinois University; PhD in Biology from Indiana University

What got you started in plant conservation? I was always a plant-lover, from gardening and houseplants when I was little all the way through.

While I was pursuing my degrees, I always envisioned doing something outside of academia, working with a conservation organization, and that was unusual, especially to be choosing a non-academic tract. My three years at Missouri Botanical Garden really opened my eyes to what botanic gardens can do for plant conservation.

In 2002, the Institute for Plant Conservation at Chicago Botanic Garden was publicly launched. What changes did that bring? We were part of the research department, but then we became a separate institute. That allowed us to formalize our partnership with Loyola University, and we began teaching college-accredited courses. They are typically six-week short courses that are taught here at the garden as part of our plant conservation certificate program. There are eight courses in all, and they're focused on how we can take theoretical information and apply it. We also offer two different internship programs, one in partnership with the Bureau of Land Management. This is our second year with the BLM project, so our first cohort of about 25 students have now finished their positions, and four of them were hired on by BLM.

Why is education so important for conservation botany? I think we all feel it's important to reach the next generation of plant conservation biologists by getting involved in teaching at a variety of levels. In the federal agencies there's a fairly well-documented shortage of plant conservation biologists, so



photo by William Biderbost

Dr. Kayri Havens.

we're helping them bring in people who have that background in plant conservation.

What are some of your most interesting research projects right now? In partnership with Mike Maunder at Fairchild, we're studying genetic diversity in *Brighamia insignis*. It's an endangered Hawaii endemic with only 15 or 20 individuals left in the wild, so there may be more genetic diversity in the individuals that have been maintained in cultivation by botanic gardens, because many of those were collected before the population got so small in the wild. We wrote to botanic gardens all over the world, and obtained about fifteen samples. All we need is a one-square inch piece of leaf because we're using a DNA fingerprinting technique called ISSR – Inter simple sequence repeat. The leaf is fixed in a desiccant silica gel, and then we extract out the DNA and amplify it with a machine called a thermocycler. It's kind of like a Xerox machine for DNA! We've analyzed the samples, and we have found a fair amount of diversity. Now we'll compare that to the DNA in the wild population, and if the diversity is not as high, we could work with the Fish and Wildlife Service in Hawaii to determine if it's appropriate to augment existing populations or to set up a separate population based on the plants in the botanic gardens.

I've also been studying genetic diversity in *Cirsium pitcheri*, a threatened dune thistle of the Great Lakes. We're

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Reasons To Celebrate in Hawaii

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outplanted to the wild as an experimental stage of a restoration project. These clones, highly inbred, no longer produce viable seeds, so micropropagationist **Nellie Sugii of Lyon** has turned to tissue culture techniques to produce seedlings from immature embryos. The tree's flamboyant red and yellow flowers are a favorite in Hawaiian botanical gardens.



Kokia Cookei in bloom.

photo courtesy of Waimea Arboretum Foundation

Another endangered Hawaiian native, the **loulu palm (*Pritchardia schattaueri*)**, is getting a boost from Hawaii Youth Conservation Corp volunteers, U.S. Fish and Wildlife Service, and CPC botanists at the **Amy B.H. Greenwell Ethnobotanical Garden**.

Budget Crisis

Continued from page 7

Antonio, are also feeling the crunch. "At the last annual meeting we were the poster child of despondency," reports San Antonio's **Paul Cox**. "We've had our CPC internship open for three years." Due to citywide belt-tightening, all garden positions must now be filled through a laborious approval process that leads to long delays, Cox adds. In a word, "We're still limping along in a world of hurt."

Many other institutions have been touched by financial hard times, with

Florida Habitats

Continued from page 6

Until last year, **Florida semaphore cactus (*Opuntia corallicola*)**, a keys native, was known from only a single small population of twelve individuals in very poor health. Luckily, a second population of 600 individuals has recently been discovered on another key. Now researchers are using DNA fingerprinting to discover to what extent the two populations are related,

"There's only a single population left, with thirteen individuals," explains **Peter Van Dyke**, the garden's manager. With the help of members of the Hawaii Native Palm Society, seeds were collected from those thirteen trees and grown in the greenhouse for about a year. Now the plants are big enough to fill gallon-sized containers, and about 300 have been outplanted in three

sites around the island. "The idea is to get between eight and ten restored populations," Van Dyke says.

Want to see some of Hawaii's beautiful native flora – without leaving the mainland? Head for the United States Botanic Garden in

funding reductions from city, state, or private sources. At CPC, we're trying to overcome these low times by supporting plant conservation work in as many ways as we can. We are seeking and passing on new sources of funding and partnerships, and advocating for imperiled flora at the national level.

More than ever, we couldn't do it without our Friends, whose support continues to provide valuable resources to imperiled flora. Your voice is important: let your local and state leaders know that you care about your region's at-risk natural treasures!

and how many individuals are present in the new population. This research could guide future reintroduction efforts, helping scientists decide whether to use propagules from both known locations together, or separately.

"Habitats throughout Florida are being developed," Maschinski says. "Less and less remain. What we're trying to do is work with plants from several habitats, both in the greenhouse and out in the field."

Washington DC, where 60 rare and imperiled island plants will take up residence this fall. The exhibit, organized by the Kaua'i Native Plant Society and titled "Our Nation's Crown Jewels," will be open daily from August 28 to November 23. Several CPC participating institutions in Hawaii have contributed specimens to awe East-Coasters and capital visitors.

Meet the Network

Continued from page 8

involved in a restoration project of the *Cirsium* at Illinois Beach State Park, and we've been looking both at DNA variation and quantitative trait variation. That involves growing lots of individuals from several populations and comparing things like leaf length and stem height. That helps us determine for future restorations how far away we should go to collect seeds, and from how many populations, in order to assure genetic diversity in the restored population.

Hardest part of your job: Juggling all the projects, and making sure they all get completed on time.

How do you stay sane and get it all done? I have great colleagues who help a tremendous amount. We have a wonderful team of people who all chip in to get the job done.

What inspires you? Definitely going out and seeing intact natural areas is very inspirational—and the hope that we can maintain areas like that for future generations.

What her co-workers say about her: "Kay is a quiet visionary. She's not one of those intensely passionate, talkative, out-there kinds of people, but what she has managed to do in terms of implementing and growing a conservation program at a botanic garden in such a short time has been spectacular. She's incredibly supportive and she's very efficient. She understands both the academic rigors but also the nuts and bolts, on-the-ground conservation work that's necessary to really implement conservation strategies." – **Dr. Pati Vitt**, Conservation Scientist

Imperiled Flora in Your Backyard

Nearly every state and U.S. territory has plants in the national collection waiting for full or partial sponsorship. Without sponsorship, these plants may not get the care and research they need to preserve options for restoration. Many of these natural treasures are dangerously close to extinction. You can

help by contributing to a plant's sponsorship in the CPC National Collection.

Want to learn more about plants in the national collection that still need sponsorship? Browse our partial list below, or log on to www.centerforplantconservation.org to search by name, family, or state range.

Alabama

Alabama anglepod (*Matelea alabamensis*)

Arizona

Santa Rita yellowshow (*Amoreuxia gonzalezii*)

Arkansas

Stern's Medlar (*Mespilus canescens*)

California

San Bruno Mountain manzanita (*Arctostaphylos imbricata*)

Colorado

Colorado Gentian (*Frasera coloradensis*)

Delaware

Swamp-pink *Helonias bullata*



photo by Steve Shirah

Florida

Beautiful pawpaw (*Deeringothamnus pulchellus*)

Georgia

Wild olive (*Forestiera segregata* var. *pinetorum*)

Hawaii

Mann's gardenia (*Gardenia mannii*)

Iowa

Christ's Indian paintbrush (*Castilleja christii*)

Illinois

Sand dune thistle (*Cirsium pitcheri*)

Indiana

Glade mallow (*Napaea dioica*)

Iowa

Bull's coraldrops / kittentails (*Besseyia bullii*)

Kansas

Prairie flame-flower (*Talinum rugospermum*)

Kentucky

Whorled horse-balm (*Collinsonia verticillata*)

Louisiana

Louisiana quillwort (*Isoetes louisianensis*)

Maine

Estuarine monkey-flower (*Mimulus ringens* var.

colophilus)

Maryland

Piedmont bishop-weed (*Ptilimnium nodosum*)

Massachusetts

Barbed-bristle bulrush (*Scirpus ancistrochaetus*)

Michigan

American fern (*Phyllitis scolopendrium* var. *scolopendrium*)

Minnesota

Leedy's roseroot (*Sedum integrifolium* ssp. *leedyi*)

Mississippi

Honeysuckle azalea (*Rhododendron austrinum*)

Missouri

Pygmy sword plant (*Echinodorus parvulus*)

Montana

Sapphire rockcress (*Arabis fecunda*)

Nebraska

Blowout penstemon (*Penstemon haydenii*)

Nevada

Silver Lake buckwheat (*Eriogonum argophyllum*)



photo by Marj Boyer

New Hampshire

Boykin's lobelia (*Lobelia boykinii*)

New Jersey

Awned meadowbeauty (*Rhexia aristosa*)



photo by Joyce Maschinski

New Mexico

Sacramento prickly-poppy (*Argemone pleiacantha* ssp. *Pinnatisecta*)

New York

Southern arrowwood (*Viburnum dentatum* var. *venosum*)

North Carolina

Carolina spleenwort fern (*Asplenium heteroresiliens*)

North Dakota

Dakota wild buckwheat

(*Eriogonum visheri*)

Ohio

Canby's mountain-lover (*Paxistima canbyi*)

Oklahoma

Ouachita Mountain goldenrod (*Solidago ouachitensis*)

Oregon

Willamette Valley daisy (*Erigeron decumbens* var. *decumbens*)

Pennsylvania

Long-hairy field chickweed (*Cerastium arvense* var. *villosissimum*)

Puerto Rico

Palma de Manaca (*Calyptronoma rivalis*)

Rhode Island

New England boneset (*Eupatorium leucolepis* var. *novae-angliae*)



photo by W. S. Justice

South Carolina

White-wicky (*Kalmia cuneata*)

South Dakota

Barr's milkvetch (*Astragalus barrii*)

Tennessee

Tennessee milkvetch (*Astragalus tennesseensis*)

Texas

Chisos hedgehog cactus (*Echinocereus*



photo by Michael Gardner

chisoensis var. *chisoensis*)

Utah

Navajo sedge (*Carex specuicola*)

Vermont

Green Mountain maidenhair fern (*Adiantum viridimontanum*)

Virgin Islands

St. Thomas prickly-ash (*Zanthoxylum thomasianum*)

Virginia

Roan Mountain sedge (*Carex roanensis*)

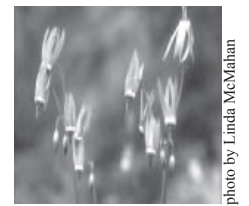


photo by Linda McMahon

Washington

Frigid shooting star (*Dodecatheon austrofrigidum*)

West Virginia

Shale-barren rockcress (*Arabis serotina*)

Wisconsin

Jacob's ladder (*Polemonium occidentale* var. *lacustre*)

Wyoming

Porter's sagebrush (*Artemisia porteri*)
Sunflower Family

How you can help the Center for Plant Conservation recover native plants

There are many ways to help the Center for Plant Conservation continue to recover America's vanishing flora. Every gift counts and is important to us.

Unrestricted Giving: These are gifts that CPC can use at their discretion. Funds are used where there is the greatest need.

Honorary and Memorial Opportunities: You can choose to make your gift in honor or memory of a friend or loved one.

Stock Gifts: As your financial advisor can confirm, there are advantages to giving appreciated stock directly.

Gift Friendships: CPC Friendships make great gifts! A way to say you care, a gift "Friendship" can be sent for any occasion.

Plant Sponsorships: Plant sponsorships provide the needed funding to do the "hands on" work for plants in the National Collection

Our Friends and Donors are the backbone of our native plant conservation

efforts, providing the help we need to run a national plant conservation organization. The Center for Plant Conservation accepts gifts in the form of cash, check, credit card, or transfer of securities.

For more information, please contact:

Center for Plant Conservation
P.O. Box 299
St. Louis, MO 63166-0299
(314) 577-9450
or e-mail cpc@mobot.org

Plant Sponsorship Tribute Gifts: a Lasting Promise

Stumped on what to give someone special to mark an important moment? For any gardener or nature-lover in your life, there *is* a gift that's unique, lasting, and meaningful: sponsorship of a plant in the CPC National Collection of Endangered Plants in honor of this wonderful person.

In fact, sponsoring a CPC plant is a lovely way to mark any number of occasions: birthdays, graduations, weddings, retirements, holidays, or your own charitable giving. And, memorial sponsorships can help leave a lasting legacy.

The National Collection is a bank of seeds, cuttings and other plant material from more than 600 of the country's most imperiled native plants. Botanists at CPC participating institutions gather and catalogue these plant materials according to strict standards developed by CPC's scientific advisory council.

The materials are then stored and maintained in protective custody at the participating institution, preserving our options for restoration. National Collection material is used to study the life

cycle and germination requirements of these rare treasures, and plants propagated from the collection are used by botanists and researchers for private, state, and federal plant and habitat restoration projects.

Your gift will endow a fund that provides secure, regular payments to the institution caring for the in-need plant you specify.

For example, your sponsorship could help botanists collect seed in the field to improve and expand collections for greater security, provide periodic testing for continued germination viability, or conduct research like studying the DNA of the plant materials in their care to ensure that the full genetic diversity of the species is represented.

We'd be happy to direct your donation to the plants in most critical condition, or you can browse our list to choose a species from a plant family or geographic region that holds special meaning for you or the recipient.

Fully sponsoring a plant is a significant contribution, but even if you're not able to donate at that level we welcome your gift to help finish funding for a

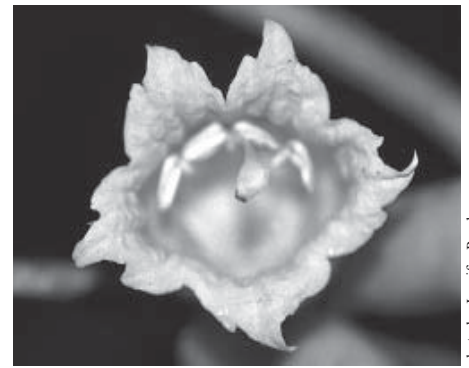


photo by Jennifer Possley

Your donation could help the endangered Higuero de Sierra (Crescentia portoricensis), a Puerto Rico native.

plant close to full sponsorship, or to start a fund for an unsponsored plant. In either case, you'll be able to track the progress of "your" plant as CPC botanists work towards restoration in the wild.

Why not sponsor a plant to commemorate the birth of a new baby to your family or circle of friends? You'll be welcoming the little newcomer with a promise and commitment to keep our nation's natural treasures safe for him or her – and for generations to come.

Give the gift that keeps on growing!

The Center for Plant Conservation's efforts are made possible by the **Friends of CPC**. All Friends receive a complimentary subscription to *Plant Conservation*, the CPC newsletter. Plus, Friends will receive our new **Friends benefits**, with distinctive botanical illustrations of the imperiled plants that your gifts support. The

benefits feature artwork by botanical illustrator Bobbi Angell.

Please use the form below either to renew your support or enroll as a new Friend. **Your gift will contribute in an important way to the vital work of saving America's most imperiled plants.**

- \$35 Friends 4 notecards
- \$75 Family Friendsabove and 3 magnets
- \$150 Sustaining Friends ..above and canvas lunch bag
- \$250 Benefactorsabove and 15" boat bag
- \$500 Preserving Donors*
- \$1,000 Conserving Donors*
- \$5,000 President's Circle Donors*

**These Donors will receive periodic informational updates about the progress of the Center.*

- This is a gift membership for a new Friend. (Please list name, address and phone number of recipient on the form at right.)

Please send this completed form and payment in enclosed envelope, or mail this form to: Center for Plant Conservation, P.O. Box 299, St. Louis, MO 63166

- Enclosed is my check for \$ _____ made payable to the Center for Plant Conservation.

Please charge my: VISA Mastercard

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Name on card _____

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(Dr., Mr., Mrs., Ms., Miss, Anonymous)

Friend's name (if needed) _____

(Dr., Mr., Mrs., Ms., Miss, Anonymous)

Address _____

City _____ State _____

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Plant Profile: Barbed-Bristle Bulrush

Like many wetlands plants, the barbed-bristle bulrush (*Scirpus ancistrochaetus*) is threatened by loss of habitat, water contamination, and changes to hydrologic systems caused by damming or canalization.

This leafy member of the sedge family gets its name from the curved, pointed barbs found at the end of bristles capping chocolate-brown florets. During the late summer, these drooping flower heads give way to dry, one-seeded fruits about a millimeter long.

But finding a barbed-bush bulrush in the wild is a tall order these days. With a range that stretches from the Connecticut River Valley of New Hampshire and Massachusetts south to the interior of Pennsylvania, Maryland, Virginia and West Virginia, the barbed-bristle bulrush is only known to exist in about 60 populations with

no more than a few dozen stems at most sites.

This federally endangered plant grows in standing water up to 40 cm deep, along the edges of sinkhole ponds, beaver ponds, sandplain depressions, backwater ponds in river floodplains, or boggy marshes. It seems to prefer a substrate of sandstone or sand, as well as fluctuating water levels.

The New England Wild Flower Society monitors populations in New England and has successfully germinated both fresh and dried seeds in the greenhouse. The barbed-bristle bulrush can be seen growing in the New England Wild Flower Society's Garden.



photo by William Larkin

Barbed-bristle bulrush is currently not sponsored. To sponsor or partially sponsor this plant, please contact CPC at (314) 577-9450, or cpc@mobot.org.

Address Service Requested

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