Lingua Botanica

The National Newsletter for FS Botanists & Plant Ecologists

Never hesitate when you can act. Ann DeBolt, a BLM botanist in Idaho, started the Idaho Native Plant Society native plant sale several years ago with plants thinned from her and a friend's garden. Now INPS makes over a thousand dollars a year from its native plant sale to fund conservation and education programs. Seeing cogon grass encroach on sensitive plant habitat from off-Forest sites frustrated Lorraine Miller, of the Ocala National Forest in central Florida. She made a few calls, then a few more, and before she knew it she had forged an alliance of state and private landowners to fight the invasion. Grants from the National Fish and Wildlife Foundation and Monsanto Chemical, and a Regional Forester's Collaborative Stewardship Award later, and Lorraine's Cogon Campaign is a regular part of life in her community. Karl Urban used to get up early to doodle wildflower pictures before going to work at Blue Mountain Community College. At the time, they were nothing more than a pleasant creative outlet. Years later, after he become the Umatilla National Forest Botanist, they became the centerpiece of a new Forest Service program called *Celebrating Wildflowers*. I hear too many stories about botanists that are absolutely swamped with surveys, paperwork, meetings; botanists that have no time for "extras." Not to sound unsympathetic, but that's the nature of our jobs. Its up to YOU to take the initiative and do something more, to start something that will make the world better for botany, even if it's just in your little corner of the botany world. Take a timber beast on a wildflower walk, plant a garden with your kids and their friends, give a talk at the senior center, participate in your local native plant society chapter, plant purple coneflowers at the local elementary school, write an article for your local newspaper, put a wildflower poster up in your break-room, or put together a slide show for your next District safety meeting. Many or you are already doing stuff like this, and that's great. Now we need do some more. Evangelize, proselytize, go out and help everyone to see the light of botany. - the editor.

In this Issue

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Useful URLs

Cleveland National Forest Threatened, Endangered, and Sensitive Plant Gallery:
http://www.r5.fs.fed.us/cleveland/res/t&eplants.htm

Continuing Education for Natural Resources Professionals: The 2003 schedule of learning opportunities is now available. Classes are open to Forest Service employees **and others**. Check out the Continuing Ed. website today!
http://www.fs.fed.us/biology/education/

Plants Collected by Lewis and Clark: an excellent site full of history, images, and collection details from the intrepid Corps of Discovery.
http://www.inform.umd.edu/EdRes/Colleges/LFSC/life_sciences/.plant_biology/L&C/L&Cpublic.html

Early Botany from the Vatican Library: "No scientific subject, perhaps, produced a larger, a more curious, or a more splendidly illustrated literature than the world of plants." This page contains images from some of the earliest works on botany held in the Vatican Library.
http://www.ibiblio.org/expo/vatican.exhibit/exhibit/g-nature/Botany.html

The Tree Circus: Pleaching gone MAD!
http://www.arborsmith.com/treecircus.html
http://www.bonfantegardens.com/trees/trees.html

Gluttonous Trees: Still more freak-show trees!
http://www.primeau.qc.ca/Arbgourm_intrA.html

The BIG BIG Botany Story Issue

An upcoming issue of *Lingua Botanica* will be dedicated to your stories about botany, about botanizing, about your motivation to become a botanist, and about the wonders you've encountered and successes you've enjoyed. Stories are one of the most important ways that we transfer knowledge and understanding, and they are the best way to explain to others the pleasure and awe we share for plants.

I hope to have enough input from you, the readers of *Lingua Botanica* to make the Spring 2003 issue the Big Big Botany Story Issue.

You need not be a Forest Service botanist to contribute. If you've had an enlightening or transformative or just funny experience related to botany, we want to hear about it. You don't have to be an eloquent writer to participate, just be honest.

Keep it clean (this is a family publication), pseudonyms are acceptable if you prefer, make sure anyone mentioned in your story is okay with what you say about them (don't embarrass anyone), and your stories may be used in other FS publications. There is no minimum size, but try to keep your tales to less than two pages.

Submit your stories to the editor wowen@fs.fed.us

Bryophyte Conservation

Janice Glime, Michigan Technological University
This is a draft document posted on Bryo-net, 21 August 2002

While invasive species may be cause for concern, more often, we need to be concerned about the loss of bryophytes from the ecosystem. Massive destruction is accomplished in the same ways as it is for other creatures of the planet. Progress in the form of roads, cities, agriculture, industry, and forestry remove not only the mosses but the habitats they require. Harvesting takes an additional toll. We are just beginning to ask ourselves how patch size and distance affect the ability of bryophytes to re-invade after their removal. In the Pacific Northwest, protection of the spotted owl protects our old growth forests, but it does not yet protect the bryophytes from harvest, both by folks with permits and by poachers.

Peck and McCune (1997), concerned over the massive removal of mosses from these national forests for commercial use, asked "What's out there, and how fast does it grow?" In answer to this question, they found that 120-3050 kg/ha, dry weight, was available (defined as that growing less than 2m from the ground and easily removable). Harvested mats in their sampling (280 mats) included 23 species of bryophytes, as well as lichens and vascular plants. Although the harvesters were not deliberately collecting listed species, five of the accompanying taxa were Record of Decision Strategy listed species.

Peck and McCune feel their estimates of biomass production are rather rough, probably underestimating the actual productivity because of the assumption that growth begins on new stems immediately, failure to account for losses due to decay, and regrowth after disturbance. Nevertheless, they are good approximations of biomass potential over a period of time from the initiation of a new branch. Using tree and branch age as their yardstick, they suggest that early production is highest, averaging 5.1 g m-2 y-1 during the first 15 years, slowing to 2.9 g m-2 y-1 for the next 25 years, and leveling off at a loss of 0.5 g m-2 y-1 after that. Hence, harvesting has severe implications for old-growth forests. It would appear that the massive sheets that are desirable for horticulture, and hence for the harvesters, would not regenerate completely for 40 years. In the meantime, the absence of bryophytes would most likely affect the way nutrients cycle through the forest ecosystem, particularly those nutrients arriving to the soil through stem flow.

Laws for Protection

The years of protection for bryophytes number in decades, with most U.S. states still lacking any protection lists, and the rest being uncertain which to protect. In Europe, the Red List has become common in many countries, and the same approach has been adopted in Japan. The International Association of Bryologists is leading the way toward a global plan, with bryologists around the world providing the manpower needed to accomplish the tasks at hand (Hallingbck & Tan 1996). Many kinds of efforts are needed. For example, to further the efforts of locating collections and understanding distributions, Frahm (1996) has contributed a Directory of Bryophyte Collecting. Although the guidelines are a good start toward protecting threatened species, they are not without their problems. Hallinbck (1998a) expressed concern over difficulties in

applying the terminology. How should we apply "area occupancy" or be certain of "length of generation"? And how does one define an "individual" in a bryophyte? He bemoans the absence of criteria related to reproductive capability and dispersal ability, factorscrucial to the continued success of a species.

Problems in Conserving

Numerous problems face us in trying to conserve bryophytes. Bisang and Hedens (2000) summed it up in their paper titled "How do we select bryophyte species for conservation, and how should we conserve them?" They present the considerations necessary for the maximum protection of species:

1. The rationale is based on saving taxa from human-induced extinction.

2. Values such as aesthetic, ethical, basic research, economic, rarity, and ecological are insufficient when faced with economic constraints.

3. Preservation should use a worldwide or continental approach, with national preservation considering the global distribution of a taxon. "Individual countries have a high responsibility for taxa that are identified as phylogenetically representative and are rare or threatened on a global scale, irrespective of their frequency within the national boundaries."

4. We need to understand the biology of the selected taxa to determine their "status, ecological requirements, and potential threats."

5. We need to understand the population dynamics and sensitivities in each life cycle stage before we can predict the responses of the taxon to the changing conditions of our environment.

6. Because of funding limitations, we may need to focus our efforts on a few species and use what we learn, along with evidence from other studies, to guide us in predicting the needs of those we can't study.

7. Phylogenetic methods can be used to choose the maximum genetic variation, particularly in a monophyletic group.

8. We can increase the effectiveness, at least where funding for exploratory work and policing is limited, by protecting sites that are species-rich.

9. Cooperation between scientists, conservation agencies, and government is essential to the most effective program for preservation.

10. A fundamental change in human attitudes is necessary for all programs that attempt to preserve biological diversity at the expense of our social and economic pleasures of the past.

Selection Criteria

First, we need to identify those bryophytes in danger of extirpation or extinction. But that means we need to understand the flora and know what is common and what is rare. Again, the British have good vice county maps of the bryophyte flora, but nowhere else in the world is the flora so well documented on such a fine scale. Thus, it appears our first task is to define what we mean by rare.

Assessment of Magnitude of the Problem

Just how many of our bryophytes are endangered? Pollution, agriculture, and urbanization are the major threats throughout most of the world, with forestry presenting a threat to species restricted to old-growth. In Bulgaria, 201 taxa (30%) appear to be threatened, while 112 are rare and 35 are insufficiently known, but most likely many are at least threatened, with 21 achieving endangered status (Ganeva 1998). In Sweden, there are slightly more than 1000 species, of which 24% are red-listed. In Finland, 15% of the taxa are threatened, 20 species have disappeared, 18 endangered, 35 considered vulnerable, and another 109 that need to be monitored to determine the safety of their status (Piippo & Urbanski 1998). In Hungary, a similar number of 20% (120 taxa) are endangered (Orban 1992). In Switzerland, 39% of the taxa fall into the endangered category (Urmi et al. 1992)! In Czechoslovakia, there is documentation of 14 liverworts, 1 Anthocerotophyta, and 12 mosses that have become extinct, 24 liverworts and 36 mosses endangered, and 11 liverworts and 29 mosses in the Red Data Book, with nearly 1/3 of the bryophytes in that country either extinct or threatened (Vna 1992a, b). In Alberta, Canada, Vitt and Belland (1997) estimate that 25% of the flora is rare. In the Kumaun Himalaya, Pant and coworkers (1992) listed four thalloid liverwort taxa, all monotypic endemics that are nearly extinct. Yet we are unable to make estimates for vast parts of the world. What has been lost with the cutting of rain forests in South America? What has been lost and what remains in the over-populated China, where the barriers of language do not permit most of us to access much of the older literature?

Habitat vs Species Protection

Once we understand the flora, and know what is indeed rare for a region or country, we need to find the specific localities for individual taxa. Then we need bryologists who are willing to become politically involved in order to get our rare taxa protected. Fortunately, that seems to be getting easier, at least in the U.S., because one can usually discuss such taxa with the regional Forest Service and accomplish the task. But that protects the plants only in the state or national forests, not in other locations where they may be lingering.

Now just suppose that the bryophytes of choice have indeed become protected. How many people will be able to recognize them in order to spare them? Oops! I didn't mean to collect a protected species! No fine in the world can protect against the prevailing ignorance of bryophyte taxonomy, and the endangered species is the least likely to be recognized, just because of its rarity. Hence, most botanists, both bryologists and tracheophyte folks, are looking for ways to identify habitats that need to be protected, rather than trying to accomplish the nearly impossible task of protecting the species alone.

In an attempt to define rarity in at least some parts of North America, Forest Service personnel and bryologists are cooperating on projects to "survey and manage" in western North America (Harpel 2002). Using 141 sites in a variable landscape in the Okanogan Highlands of Washington state (part of the dry rainshadow east of the Rockies), Heinlen divided the 209 taxa into categories of rare, frequent, and common (Heinlen & Vitt 2002). For this purpose, she selected the arbitrary delimiters of 1-2 collections for rare, up to 13 for frequent, and greater than that as common. The emerging pattern from this and other studies is that rare taxa occur in rare habitats - those that are unique or restricted on the landscape. Furthermore, these rare species are more common in restricted mesohabitats such as streams, cliffs, and fens than in broadscale ones such as forested or non-forested uplands. She suggests using mesohabitats such as these to cast a coarse filter for selecting habitats to conserve.

It seems that one indicator of rare species, at least in some North American wetlands, is the state of species diversity. Bedford and coworkers (1999), in compiling a large set of data and literature from across North America, concluded that the rare and uncommon species of bryophytes are almost always associated with species-rich communities, although the converse might not be so frequently true.

Indicator and Surrogate Taxa

Hallingbck (1991) suggested that the presence of indicator species could be a useful way to approach locating suitable habitats for conservation. This concept was used much earlier in Britain, with 30 taxa of lichens that were faithful to ancient woodlands, thus indicating the continuity of the forest (Rose 1976). Using these 30 taxa, Rose developed a Revised index of Ecological Continuity (RIEC) to indicate the probability that the woodland is old. A similar index could be developed for bryophytes, but our present state of knowledge is not sufficient to permit it. We need to know what are the constant species in the old woodlands that do not appear in younger ones, to develop the list and determine the level of species to be expected in the average old forest. We aren't there yet. And for most of the eastern U.S. it may not be possible. There is very little forested land that is more than 200 years old, making it impossible to determine what could have been. The use of indicator taxa is a more promising alternative.

Hallingbck argued that the presence of such indicator taxa would indicate the presence of other demanding species that are difficult to find or identify. He thus proposed woodland bryophytes that indicate important conservation locations. These selections are based on their occurrence mainly in sites where endangered bryophytes occur, a restriction to substrates and niches that are rarely found in today's forests, and poor colonizing ability, being restricted to sites with a long woodland continuity (old-growth forest). Hallingbck and Weibull (1996) carried this concept further by selecting 13 epiphytic bryophyte taxa that would indicate forests with high conservation value. Their presence indicates the continuity of old deciduous trees, and thus the likelihood of finding additional taxa restricted to old-growth forests. They presented the species in a pyramid of four levels, indicating their conservation value, with the rarest at the top, and contend that this method of using indicator species stimulates the field workers to find more species while being able to complete the survey rather quickly. It surely would be

more efficient that looking at every moss on every rock and soil patch in every location surveyed.

Hedens and Lfroth (1992) suggested criteria for selecting indicator species for wetland habitats with high conservation value. The selected species should be restricted to habitats that are likely to house other rare species, have species rich floras, or be decreasing in number or area. Taxa should be conspecific and easy to learn and recognize.

One natural phenomenon in support of this approach is that habitats that have one rare plant typically have a group of rare or endangered species. Finding one is a good indication one should look for others. Hence, a similar approach to using epiphytic indicator species is the use of tracheophyte "surrogates" to indicate potential bryophyte diversity (Pharo et al. 1999). Since bryophytes are less well known than tracheophytes, particularly to most Forest Service personnel who are usually responsible for such surveys, this would present a more workable and practical approach. In Australia, Pharo and coworkers found that there was a strong positive correlation between fern and bryophyte richness. Factors such as time since fire, tracheophyte cover, and topographic position were good indicators of both fern and bryophyte richness. However, among the other tracheophyte groups, only overstory cover was significantly correlated with bryophyte richness. One encouraging factor was that species turnover was similar among the tracheophyte groups and bryophytes, suggesting that for total diversity, high tracheophyte diversity would suggest high bryophyte diversity. The time since the last fire seems to be the best predictor of both tracheophyte and bryophyte diversity, with a patchwork of fire and logging intervals providing the highest diversity overall.

Although it appears to be somewhat unreliable in Australia, except where ferns abound, the tracheophyte surrogate diversity might be a worthwhile approach to explore in other parts of the world. Nevertheless, the use of tracheophytes as predictors of bryophyte richness or rare species seems to have its limitations and may not be a reliable approach. Johnson and Jonsell (1999), working in Sweden, found that while total species richness correlated with several habitat characteristics, especially substrate types and forestry impact, the richness of the species regularly used did not correlate with the habitat factors, and the richness correlation among different groups of organisms was scale dependent. Whereas lichens and vascular plants formed nested subset patterns, with taxa at poorer sites being a subset of those at richer sites, bryophytes did not. Furthermore, richness in one taxonomic group did not necessarily predict richness in another. They recommended instead that monitoring and inventories should be based on a set of factors that are important for different groups of organisms, and any use of indicator species should rely not on one but on several groups of species. Nevertheless, we still need to answer the question of whether the high diversity of tracheophytes is a good indicator of rare and threatened taxa.

Which "Key Habitats"?

If indicator species among the more conspicuous and better-known tracheophytes is not a reliable approach, then perhaps the use of key habitats is. This approach uses various indications that a particular habitat is likely to be rich in taxa because of certain features of the landscape and the presence of other endangered taxa. Using the habitat approach in southern Sweden, Gustafsson (2002) found that in 35 "woodland key

habitats" 22% of the red-listed tracheophytes, bryophytes, and lichens were represented. Bryophytes were more common than were the tracheophytes. These woodland key habitats had more red-listed species, more species in high categories of threat, and significantly more records per hectare of endangered and threatened taxa than unprotected production forests.

If indeed the habitat approach is the best way to protect endangered taxa, then what are the most likely candidates for such protection? In Sweden (Hallingbck 1998b) and Czechoslavakia (Vna 1992a), it appears that old-growth forests and lowlands are the "safe sites" for the most endangered bryophytes, while regulation of water flow has reduced diversity in the rapids of North Sweden (Hallingbck 1998b). In Norway spruce forests (Picea abies), fallen timber (logs) provides an important substrate not available in managed forests; 8 red-listed cryptogams (lichens and bryophytes) were found here, especially on logs in late stages of decay (Kruys et al. 1999). In Poland, where air pollution can be a serious threat, it is mostly epiphytes, epiliths, and aquatic bryophytes that are impacted, hence requiring habitats that are free from pollution (Jedrzejko 1997).

The importance of swamps, mires, bogs, and fens depends on where you are in the world. In Sweden, where swamp forests are extremely rare, preservation of this habitat is very important to the national bryophyte diversity (Ohlson et al. 1997). The 195 bryophyte taxa found there represent 33% of the entire bryophyte flora of Sweden. Nevertheless, as in many other studies, the presence of dead wood was the most important variable in explaining the biodiversity. Interestingly, in Finland, it is rotten leaves that provide substrate for the most threatened liverwort taxa (Piippo & Urbanski 1998)!

Ironically, changes in agricultural practices have endangered some taxa that depended on the numerous and predictable disturbances once afforded there. In Sweden, many plants, including bryophytes, are rapidly decreasing as a result of the loss of continuity of this once widespread agricultural landscape (Svensson & Ingelg 1990). Among the vascular plants, this could be as high as 75%; among the bryophytes, the figure is unknown.

What is it like to be rare?

Vitt and Belland (1997) approached the question of rarity by examining the characteristics of the mosses that are rare, at least in Alberta, Canada. They found that being pleurocarpous, long-lived perennials with competitive strategies coincided with being less represented in the flora than other combinations of characters. It also appears that members of Bryales, Dicranales, and Funariales endows one with over-representation among the rare, while Hypnales, Orthotrichales, and Sphagnales are under-represented among the rare. Having a boreal distribution seems to be a recipe for disaster, since 42% of the rare taxa in that province are boreal in distribution. But most importantly for conservation of habitats, 74% of the Alberta rare species occurrences are in such restricted mesohabitats as cliffs and alpine areas, supporting the later findings of Heinlen and Vitt (2002).

It is interesting that in addition to species of restricted mesohabitats, fugitive species may be among the most endangered. They require a means of getting from place to place by having neighboring habitat patches, since they cannot stay long at one place. Herben and Sderstrm (1992) showed that at least in their testing, increased isolation

between habitat patches was the most serious consequence of habitat fragmentation, particularly for fugitive taxa. Decreases in area, fewer localities, and increased distance between habitats are the most likely conditions to result in a decreased persistence of species.

Conclusions

With these specific examples of species, habitats, and characteristics, what then can we conclude about an ergonomic approach to bryophyte conservation? Certainly conservation based on individual species is in a large part intractable. Using a more manageable habitat approach, old growth forests seem to be in need of conservation everywhere. Mesohabitats that provide restricted substrata, light, temperature, or humidity conditions, such as clean streams, waterfalls, caves, and cliffs, need protection, and certainly indicator species or surrogate taxa can help us to identify these. Bogs, fens, mires, and swamp forests may need protection on a local/national scale, but with 20% of the world's carbon in peatlands, this may not be true on a global scale if only the conservation of taxa is being considered. The protection of agricultural lands is controvertible, with fugitives and shuttle species being difficult to protect by any currently practiced management strategy.

Why I Like Mosses: Part Two

David Wagner, Northwest Botanical Institute

Last month I explained the first half of why I love mosses: how they manage to get through dry spells. This month I'll explain how mosses deal with wet periods. Both add up to the original statement: I like mosses because of what they do as much as what they are.

That mosses like wet weather is well understood by most Oregonians. This is the time of the year when mosses are most prominent; this is the time of the year when mosses grow the most and fastest; this is the RAINY SEASON!

Last month I explained that mosses on the branches of trees dry out during drought periods because they are not parasitic on the trees. The branch mosses cannot get moisture from the host trees. Neither can mosses get essential nutrients from the host trees. The essential elements are to mosses as vitamins are to us: not a lot needed but that little needed is absolutely necessary for life. Some essential elements are easy to get, like carbon from carbon dioxide in the atmosphere. Many others are quite scarce in the in the environment, especially metals which need to be absorbed as ions of dissolved metallic salts.

Mosses must obtain all the elements necessary for growth from the only source available: the air around them. A certain amount is blown in as dust during dry weather and made available when the dust is wetted by the rain so it can be absorbed by the moss tissues. But the nutrient elements present in dust are just as likely to be washed away by the rain as absorbed by the plant tissue. Furthermore, there's not likely to be an adequate supply of essential elements in dust and it's hardly evenly distributed over the tree branches. So where in air do mosses get their essential elements? From the rain! The rain that comes from the air around them!

Rain water does not have a lot of dissolved elements in it but it always has a little. What is special about mosses is that their cell walls have a special affinity for the dissolved elements. They are able to pick out what they need and hang on to it. Moss cells use a process called ion exchange to get the rare elements in ionic form. Moss cells literally scavenge essential elements from the most dilute of solutions, even rain water. Any nutrients that come from dust present on mosses and wetted by the rain is also snapped up before it can wash away. In this way mosses get what they need, just enough to grow slowly. Slow growing seems to be just fine for mosses.

This ability to scavenge elements from dilute solutions is much better developed in mosses than in flowering plants. That is why mosses do so well in your lawn during the winter. That's why mosses grow on your roof and not grasses. The winter rains wash away all the nutrients that grasses need to grow, but provide plenty for the lawn mosses to thrive. The special ability to scavenge elements is used against mosses in the Moss Kill formulations people use to eliminate mosses from lawns and roofs. The Moss Kill compounds are simply salts of metals like zinc and copper. Zinc and copper are actually essential elements for mosses. The special ion exchange capacity of moss cell walls pulls out the copper and zinc they need from rainwater. When there is an excess of these metals, too much is pulled into moss cells. Too much copper or zinc in moss cells poisons them. Even slightly elevated levels of zinc and copper, harmless to most flowering plants, is toxic to mosses.

The use of copper and zinc to poison mosses demonstrates that the ion exchange capacity of mosses is well known and put to economic advantage. Surprisingly, hardly anybody mentions that this special ability of mosses might be extremely important to one of our most prominent ecosystems. I refer to the rain forests found along the Pacific Coast from northern California to Alaska.

The rain forests of the Pacific Coast are characterized by the abundance of mosses festooning the branches of every tree and shrub as well as carpeting every open square foot of forest floor. The mosses are what tell you this is a rain forest. So, are the mosses just there for decoration? Are they there just to take advantage of the situation, because they can grow in rainy forests better than in the inland forests? I think most ecologists have been satisfied to accept this explanation. What they are overlooking is that mosses are an essential element of the rain forests, that the rain forests would not be the forests they are without the mosses.

It's the rain, remember? Rain which washes away the dissolved nutrients in the soil, away from the roots of the trees and flowers. It is the moss component of the ecosystem that captures the essential elements from the rain water and fixes them into biological compounds available for all plants of the ecosystem. That's my theory, anyway. It needs to be proven but good ecologists have verified it is a good idea worth study. Mosses are responsible for the nutrient health of our rain forest ecosystems.

And that is why I love mosses.

The rare *Bartramia stricta*

Sisyphus, in Greek mythology, king of Corinth, the son of Aeolus, king of Thessaly.

Mark Mousseaux, BLM, Oregon

Sisyphus saw the god Zeus carry off the beautiful maiden Aegina and told her father what he had witnessed. Enraged with Sisyphus, Zeus condemned him to Tartarus, where he was compelled for eternity to roll to the top of a steep hill a stone that always rolled down again.

This has nothing to do with us directly nor even necessarily metaphorically of course, and yet as an agency Botanist I sometimes have that image in my mind. Not the motive, but the image of forever rolling a stone to the top of a hill without every experiencing satisfaction of completing the act.

This is NOT how I think of our work, and I hope that you don't feel this either. But there is a seductively martyristic quality to certain jobs in the natural resource profession, including being a Botanist or a Biologist. Because we are a removed a step from direct public interface, as public servants this may be even more so, because we work harder to justify the importance of the work we do within the agency. This could be my projection, but I don't think so.

As a program lead for Botany I hold in my philosophy the value of health, and of balance within the full potential of a person, a family, the work place, and the community at large. That is to say a person is more than their output; true health is multifaceted: the connection and development of the emotional, physical, mental, behavioral, and even spiritual. In order to nurture and develop positive, supportive work environments, in order to support the health in any system we address: we must model that health. We must live it.

If the words that fall out of our mouth are about how much there is to do, how great a work load is on our plates, how we lose sleep/weekend/eve time over getting (or not getting) work done...we are not emulating health. We are not walking the talk. We are not expressing and living the health I/we want to support in our selves and peers. We must build resilience in ourselves if we hope to build/support resilience in our work place/system - to build resilience in our co-workers, and in our families too.

There are times when concentrated work effort is healthy, motivating, and required. I throw myself into challenges often that I believe will result in a reasonable/meaningful contribution. It is when the 'overwork' ethic becomes out of balance with my other human needs that I am hypocritical and 'out of tune'. I have realized that there have been several times over the last year that this is true.

I know how I'm doing by this acid test: Am I feeling drained or impassioned? Am I excited to come to work most mornings? Do I feel defensive or optimistic with regards to my work? Do I look forward to play time on the weekends with my family, or do I just want to hang and eat???

I feel have worked relatively hard since I came here almost 2 years ago now, I had a lot to learn. I have learned first hand that there is a seductive quality to this…the system rewards this 'work ethic.' It can feed my sense of self, and becomes a part of my identity. "Oh, you work so hard!" "Good job!" It feels good to hear; the admiration and sympathy

of others is enticing. If, when others ask about my weekend, and my answer is short and I go on about work, I am reinforced for that, and it is cause for concern.

I say this in this long-winded fashion because I see it reflected in many of you. Some of you have been doing this job for a long time; some of you are new. Regardless, this job is constantly changing, and the reaction and learning curve that goes with it requires extra hours/ attention. You have my praise for your enthusiasm and willingness to invest, but please monitor yourself so as not to allow yourself to get caught into allowing the extra devotion to work to become a chronic state. It will be if you allow it to be. If you allow it to be, you are not modeling the very message I'm trying to convey. The more successfully you allow work to crowd the other parts of your life that define **you** and require attention, the more you are getting in your own way.

Yes, there will always be tasks uncompleted, there will always be more you could have done, there will always be data/EA/NEPA deadlines looming, another acre to survey. And they will always hold value: the work you do is important. It does make a difference in the natural resource profession. You make a difference. And yet, the work can never be as important as you. Please learn to leave it behind at the end of the day. Trust you gave it your best with the time you had, you can feel proud of what you worked toward accomplishing today. If anything, work to work smarter, not always harder. We can come up with new ways and new solutions. It will make a difference…but not if your ego gets tied up into thinking you're on your own and it's up to you alone. We have to trust each other, our peers, and this system that we work in.

Try letting something go on purpose!! Just once!! Delete the 200 messages in your email without reading half of them for once! See what happens! I want you to experience the realization that others picked up the pieces, compensations were made, and the important things will come back and demand your attention. You'll be surprised what doesn't come back. The system does offer flexibility, no natural resource issue, or rare plant species will be lost because of you missing that meeting/deadline/chance for approval. Let me know when you do, if you need support to, how you gathered your resources, and what happened as a consequence.

When we can't spend some time in relationships with another at work, when we are afraid our work ethic is questioned if we speak of other aspects of our life, etc. then trust decreases as we become self protective. If we each perceive we work harder than our peers, and are busy trying to convince others of how hard we work: we are aligning with the most corrosive ingredient in any system - fear. You cannot align with this and do the work that needs to be done to manage our natural resources.

It is my hope you go out and do good work. It is my belief that you do this by giving yourself and those around you permission to be whole people: professional and personal. Reflect on the health you bring out in others, the health you live, the health we witness in natural systems, and watch for invitations to become a part of that which perpetuates stress in self and systems.

I admire each and every one of you, for your passion, your 'individualness'. Help me discover ways to keep this alive throughout our experience together! If you read all the way to this point, Thanks! I'm impressed! I needed to say this. Now go hit the field, breath some fresh air, and find a reason to laugh or…

Poached Lupine Seeds Seized

Manti-LaSal National Forest Law Enforcement Officers seized 1,200 pounds of illegally harvested native lupine seed and cited the individuals for not having permits to harvest the seed. This activity has become a very profitable source of income for the local communities. – USDA Forest Service Law Enforcement and Investigations Weekly Report, August 18-24 2002

Plant Thieves Plunder America's Parks

E/The Environmental Magazine, 6 September 2002

Park biologist Mike Owen had been on the job only two months when he got a startling phone call. It was the park manager. Come to the parking lot, he said. What happened next would inspire a book and, coming this fall, a movie starring Nicholas Cage. Owen headed to the main parking lot of southern Florida's Fakahatchee Strand State Park, which harbors the nation's largest concentration of wild orchids.

He quickly noticed the bags filled with orchids, which had been plucked from his park by the lanky guy now standing near a flatbed truck. Park manager Mike Petty had stopped the nonplussed thief and his three companions as they emerged from the woods carrying their bounty.

Within the pillowcases and garbage bags were such rarities as the ghost orchid, which thief John Laroche hoped to propagate. "I wanted to make a dollar but I really want the plants to be saved from extinction," he told author Susan Orlean, as recounted in her book, *The Orchid Thief*.

"I had never seen some of these species [before]. I never heard of some of them," recalls Owen. "We never had the chance to see that many species in one place." Ninety-four plants, he counted. Nearly all died. "I know of about three or four that still survive," Owen says nearly a decade later. "And I moved them back the *next day.* Put 'em right back in the swamp."

Plant pilfering is a persistent, if little-known, problem at a wide range of public places: public parks, botanical gardens, national forests, and acreage managed by the Bureau of Land Management (BLM). Most troubling: at least some national parks are also targets. The 10 Most Endangered National Parks list published by the National Parks Conservation Association (NPCA) includes some that incidentally attract poachers, including Mojave National Preserve (barrel cactus), Big Cypress National Preserve (saw palmetto berries) and Great Smoky Mountains National Park (ginseng).

While tallying the main internal threats to national parks, the General Accounting Office in 1996 listed: commercial development and private in-holdings, invasive plants and animals overtaking natives, and illegal activities, particularly poaching of plants and animals.

"I think it's more widespread than even I understand at this point," says Randy Rasmussen, acting regional director for NPCA's southwest regional office. "People are stealing the resources that some national parks were created to protect."

Some floral bouquets, typically in Europe but also in the United States, are adorned with salal branches picked from Washington's Olympic National Park. Another

target there is moss, used to make tiny trees for model railroads. A bust two years ago nabbed six men for stripping more than 450 bags of moss from a quarter-mile wide swath of forest on each side of the road. Chief Ranger Curt Sauer pulls out slides used as evidence in criminal cases. "See this tree?" he asks, pointing to a brown mass. "It should be green all the way up [from moss]. That was three people in about two hours."

Mushroom picking is prohibited at Oregon's Crater Lake National Park, yet fungifiles seem undaunted there and at Olympic park. Park managers told congressional investigators that the "multimillion-dollar, largely unregulated industry could damage forest ecosystems."

Elsewhere, a thin floral-industry greenery called galax is plucked from scenic Blue Ridge Parkway, which connects Shenandoah and Great Smoky Mountains national parks. "They're catching them down there on a regular basis," Dennis Burnett, the National Park Service's (NPS) law enforcement administrator, says of galax thieves. NPS has made news by marking galax with a powdered marker and by using an environmentally safe dye on the roots of ginseng in the Smokies — all to prove they belong to the parks. "Most of this is for commercial purposes," Burnett says of the thefts. "Plants are in trouble anytime there's a dollar to be made," he says. But whim and desire also spur their share of thefts.

When Everglades National Park built its Mahogany Hammock Trail, rangers noticed within two months that every rare tropical "hand fern" within arm's reach had been swiped from the three trees that bore them. Key Largo Hammocks State Botanical Site in southern Florida nurtured the nation's largest West Indian mahogany tree — that is, until someone lopped off its top. Investigators concluded the thief wanted the orchid, and perhaps bromeliads, that graced its upper branches but not its valuable wood. It was left to rot.

At Mounts Botanical Garden in West Palm Beach, Carolyn Saft has told participants in her potting class that orchids not only have eyes, but legs.

"Staff cannot watch everything. The threat of thefts means that some interesting plants are never displayed to the public," agrees Charles Hubbach, longtime director of plant collections at Fairchild Tropical Garden in Coral Gables, Florida. There, visitors have snagged new plants and clipped small cuttings. More commonly, they've stolen seeds, even seeds "bagged and tagged on the plant."

"Casual thieves who steal a cutting or seeds may allow them to die," Hubbach laments. Occasionally, he adds, rare plants "are taken by knowledgeable people. They are either stolen to be hidden away in a private collection or for sale to a knowledgeable enthusiast. Some plant collectors are so obsessive that they can rationalize almost anything."

Botanist Daniel F. Austin knows about obsession. He never reveals exact locations of his rare plant finds when publishing professional articles. He suspects thieves have followed him during treks into the forbidding swamp; sometimes, he would discover a rare plant, then, a week or two later, it was gone. "They see your truck or your car parked in a particular place. They say, "Hmmm, I know this guy," says Austin, professor emeritus of Florida Atlantic University.

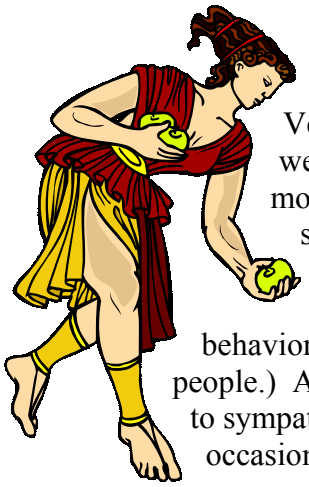
A common excuse park biologist Jim Duquesnel hears from thieves is that they didn't think the land belonged to anyone. "My comeback is, 'Do you really think there's land in the U.S. that somebody doesn't own?' If you don't know whose land it is, don't

assume it's nobody's," Duquesnel says. He protects Key Largo Hammocks State Botanical Site, where an Alabaman once chainsawed his way to the nation's largest crabwood tree. "He was a woodworker, and he needed crabwood for a project," Duquesnel says. "He got arrested."

Biologist Mike Owen and orchid thief John Laroche will be portrayed in the film adaptation, inspired by Orlean's bestseller. Will the film become the rallying cry for lowly plants like Free Willy for performing orcas or Chicken Run for factory-farmed fowl? Don't count on it. Nicholas Cage plays a sexually frustrated screenwriter struggling to adapt *The Orchid Thief* for the big screen. So even a film about the best-known caper of the past decade doesn't take the subject head-on.

Green Mythology

Tom Fischer, Horticulture Magazine, May/June 2002



If you've read any ancient Roman history, you're probably familiar with the chief Roman gods and goddesses – Jupiter, Venus, Mars, Juno, and the rest. Like their Greek counterparts, they were always getting themselves into interesting amatory scrapes and molding the destinies of heroes and nations. But the Romans also had scores of minor deities who were concerned with extremely specific aspects of daily life. Some of the most curious are the gods and goddesses of gardening and agriculture. (Despite their warlike behavior, the Romans considered themselves an essentially agrarian people.) Although most of us today aren't polytheistically inclined, it's easy to sympathize with those ancient Romans who felt the need to send out an occasional plea for horticultural help.

Some of the more specialized Roman deities of the fields and gardens:

Insitor	god of seed sowing
Lactanus	god of crop vitality and growth
Libera	goddess of vine cultivation
Mellonia	goddess of beekeeping
Messor	god of mowing
	(*Messor* is the genus of harvester ants)
Patelana	goddess who protects young shoots
Promitor	god of fruition and the coming-to-readiness of crops
Puta	goddess of pruning
Robigus	god who protects crops from rust and mildew
Sarritor	god of hoeing and weeding
Segetia	goddess of sprouting seeds
Seia	goddess who protects stored seeds and seeds in the ground
Spiniensis	god who presides over the uprooting of briar patches and thorn bushes
Sterculius	god of manure

Fossil Shows Bird's Last Meal

Pioneer among plant eaters' found in China

Marsha Walton, 24 July 2002, CNN Sci-Tech

A turkey-sized bird that lived more than 100 million years ago is now giving paleontologists some important clues about how animals lived and evolved.

The fossil of this new species, *Jeholornis prima*, was found last year in the Liaoning area of northeast China. It's not just the bones of this big bird that scientists find revealing, but its diet. The fossil shows in great detail more than 50 seeds in the bird's stomach. This is the first direct evidence of seed eating in a bird, believed to be a new adaptation for birds of the Mesozoic era.

Although the seeds haven't been identified specifically, they give researchers a better insight to ancient birds' diets

"The bird is approximately the size of a turkey, the whole skeleton is about 75 centimeters (30 inches) long, but with feathers in the tail, it could probably be close to one meter," said Zhonghe Zhou, of the Chinese Academy of Sciences. His findings are described in this week's issue of the British journal *Nature*.

Scientists found the fossil in an area once covered with volcanoes and tropical lakes, where feathered dinosaurs, primitive birds and other mammals have also been unearthed. *Jeholornis* is slightly larger than *Archaeopteryx*, the earliest known bird that lived 145 million years ago.

The Cretaceous period, the third and last period of the Mesozoic era, is known for the development of flowering plants, and the disappearance of the dinosaurs.

Powerful flight

Scientists said the skeletal structure shows that this bird was capable of powerful flight, but was also built to sit in trees. Those discoveries provide a further relationship between birds and some theropods, the carnivorous dinosaurs of the Jurassic and Cretaceous periods that walked on two legs and had small, grasping forelimbs.

Because the seeds found in the stomach were intact, researchers say the birds may have eaten them whole, rather than breaking them up into smaller pieces. The seeds would have been "stored" in a crop, or pouch-like area, to be digested later in the gizzard.

"The other birds we know of at this time were probably meat eaters, fish, or insect eaters, based on their teeth," said Thomas Holtz Jr., a paleobiologist at the University of Maryland.

"This guy was sort of a pioneer, giving us the oldest evidence so far that birds ate plants," said Holtz.

Dinosaur link?

Each seed was about a centimeter long. While the seeds are similar in size to the gingko plant, common in that region of China, there is not enough evidence to determine what plant the seeds came from.

Jeholornis was also different from other birds of the period because of a very long tail. Paleontologists say this skeletal tail provides evidence linking birds with dromaeosaurids, dinosaurs that were small, fast, bipedal, and closely related to birds.

"This fossil really increases our understanding of the diversity of early birds," said Holtz. And the region in China where it was found is considered a treasure chest for fossils.

"It gives us an excellent picture of ecology, not only of birds and other dinosaurs, but also mammals, lizards, plants, and potentially insects," said Holtz.

Benefit of Trees Misjudged

Andrew Bridges, Associated Press, 7 August 2002

Los Angeles - Scientists have overestimated the potential of trees and shrubs to soak up carbon dioxide from the atmosphere, according to a new study.

The reassessment casts doubt on whether planting trees is always a positive step in the fight against global warming (news - web sites), as President Bush (news - web sites) and others have suggested.

In the study, published in Thursday's issue of the journal Nature, Duke University scientists say trees and shrubs growing in areas of abundant rainfall are less effective storehouses for carbon than native grasslands they have steadily replaced across much of the western United States.

Vegetation stores carbon that otherwise might trap heat in the atmosphere, driving up temperatures and leading to climate change. Previous studies have ignored what was going on below ground, said Robert Jackson lead author of the study and an associate professor of biology at Duke University.

In wet locations, replacing grass with shrubs and trees actually can lead to a decrease in the amount of carbon locked up in organic matter mixed in the soil, Jackson said. The amount can be enough to offset any gains achieved above ground.

"The study suggests that we need to look very closely at what's below ground before we add up just what's stored above ground in tree trunks," Jackson said.

Scientists studied six pairs of adjacent western grasslands. In one of each pair, trees and shrubs had cropped up sometime in the last 100 years.

In the drier sites, the invasive growth led to an increase in the amount of carbon locked up in the soil. In wetter areas, however, the opposite was the case, Jackson said. It is not clear what caused the change.

"Grasses are deceptively productive," Jackson said. "You don't see where all the carbon goes so there is a misconception that woody species store more carbon. That's just not always the case."

Previously, studies estimated that U.S. shrublands contain about 440 million tons of carbon. The number may be closer to 280 million tons, Jackson said.

That result suggests shrublands, by absorbing carbon from the atmosphere, do less to balance emissions from the burning of fossil fuels than previously thought, Jackson said.

"It would not surprise me at all if they were absolutely spot-on right," said Steve Pacala, a Princeton University professor ecology, who wasn't involved in the study.

However, he said he didn't consider the study definitive, given uncertainties in its measurements of the carbon contained in woody roots.

The study helps dispel the notion that humans can plant their way out of global warming, said Daniel Becker, director of the Sierra Club (news - websites) global warming and energy program.

"We are going to need to tackle the industrial sources of emissions head-on rather than just plant a bunch of trees," Becker said.

As part of his administration's strategy for curtailing carbon dioxide emissions, Bush has proposed tax incentives for farmers who plant trees.

When a Crop Becomes King

Michael Pollan, 19 July 2002

Cornwall Bridge, Conn. - Here in southern New England the corn is already waist high and growing so avidly you can almost hear the creak of stalk and leaf as the plants stretch toward the sun. The ears of sweet corn are just starting to show up on local farm stands, inaugurating one of the ceremonies of an American summer. These days the nation's nearly 80 million-acre field of corn rolls across the countryside like a second great lawn, but this wholesome, all-American image obscures a decidedly moredubious reality.

Like the tulip, the apple and the potato, *Zea mays* (the botanical name for both sweet and feed corn) has evolved with humans over the past 10,000 years or so in the great dance of species we call domestication. The plant gratifies human needs, in exchange for which humans expand the plant's habitat, moving its genes all over the world and remaking the land (clearing trees, plowing the ground, protecting it from its enemies) so it might thrive.

Corn, by making itself tasty and nutritious, got itself noticed by Christopher Columbus, who helped expand its range from the New World to Europe and beyond. Today corn is the world's most widely planted cereal crop. But nowhere have humans done quite as much to advance the interests of this plant as in North America, where *Zea mays* has insinuated itself into our landscape, our food system – and our federal budget.

One need look no further than the $190 billion farm bill President Bush signed last month to wonder whose interests are really being served here. Under the 10-year program, taxpayers will pay farmers $4 billion a year to grow ever more corn, this despite the fact that we struggle to get rid of the surplus the plant already produces. The average bushel of corn (56 pounds) sells for about $2 today; it costs farmers more than $3 to grow it. But rather than design a program that would encourage farmers to plant less corn - which would have the benefit of lifting the price farmers receive for it - Congress has decided instead to subsidize corn by the bushel, thereby insuring that *Zea mays* dominion over its 125,000-square mile American habitat will go unchallenged.

At first blush this subsidy might look like a handout for farmers, but really it's a form of welfare for the plant itself - and for all those economic interests that profit from its overproduction: the processors, factory farms, and the soft drink and snack makers that rely on cheap corn. For *Zea mays* has triumphed by making itself indispensable not to farmers (whom it is swiftly and surely bankrupting) but to the Archer Daniels Midlands, Tysons and Coca-Colas of the world.

Our entire food supply has undergone a process of "cornification" in recent years, without our even noticing it. That's because, unlike in Mexico, where a corn-based diet has been the norm for centuries, in the United States most of the corn we consume is invisible, having been heavily processed or passed through food animals before it reaches us. Most of the animals we eat (chickens, pigs and cows) today subsist on a diet of corn, regardless of whether it is good for them. In the case of beef cattle, which evolved to eat grass, a corn diet wreaks havoc on their digestive system, making it necessary to feed them antibiotics to stave off illness and infection. Even farm-raised salmon are being bred to tolerate corn - not a food their evolution has prepared them for. Why feed fish corn? Because it's the cheapest thing you can feed any animal, thanks to federal subsidies. But even with more than half of the 10 billion bushels of corn produced annually being fed to animals, there is plenty left over. So companies like A.D.M., Cargill and ConAgra have figured ingenious new ways to dispose of it, turning it into everything from ethanol to Vitamin C and biodegradable plastics.

By far the best strategy for keeping *Zea mays* in business has been the development of high-fructose corn syrup, which has all but pushed sugar aside. Since the 1980's, most soft drink manufacturers have switched from sugar to corn sweeteners, as have most snack makers. Nearly 10 percent of the calories Americans consume now come from corn sweeteners; the figure is 20 percent for many children. Add to that all the corn-based animal protein (corn-fed beef, chicken and pork) and the corn qua corn (chips, muffins, sweet corn) and you have a plant that has become one of nature's greatest success stories, by turning us (along with several other equally unwitting species) into an expanding race of corn eaters.

So why begrudge corn its phenomenal success? Isn't this the way domestication is supposed to work?

The problem in corn's case is that we're sacrificing the health of both our bodies and the environment by growing and eating so much of it. Though we're only beginning to understand what our cornified food system is doing to our health, there's cause for concern. It's probably no coincidence that the wholesale switch to corn sweeteners in the 1980's marks the beginning of the epidemic of obesity and Type 2 diabetes in this country. Sweetness became so cheap that soft drink makers, rather than lower their prices, super-sized their serving portions and marketing budgets. Thousands of new sweetened snack foods hit the market, and the amount of fructose in our diets soared.

This would be bad enough for the American waistline, but there's also preliminary research suggesting that high-fructose corn syrup is metabolized differently than other sugars, making it potentially more harmful. A recent study at the University of Minnesota found that a diet high in fructose (as compared to glucose) elevates triglyceride levels in men shortly after eating, a phenomenon that has been linked to an increased risk of obesity and heart disease. Little is known about the health effects of eating animals that have themselves eaten so much corn, but in the case of cattle, researchers have found that corn-fed beef is higher in saturated fats than grass-fed beef.

We know a lot more about what 80 million acres of corn is doing to the health of our environment: serious and lasting damage. Modern corn hybrids are the greediest of plants, demanding more nitrogen fertilizer than any other crop. Corn requires more pesticide than any other food crop. Runoff from these chemicals finds its way into the groundwater and, in the Midwestern corn belt, into the Mississippi River, which carries it

to the Gulf of Mexico, where it has already killed off marine life in a 12,000 square mile area.

To produce the chemicals we apply to our cornfields takes vast amounts of oil and natural gas. (Nitrogen fertilizer is made from natural gas, pesticides from oil.) America's corn crop might look like a sustainable, solar-powered system for producing food, but it is actually a huge, inefficient, polluting machine that guzzles fossil fuel – a half a gallon of it for every bushel.

So it seems corn has indeed become king. We have given it more of our land than any other plant, an area more than twice the size of New York State. To keep it well fed and safe from predators we douse it with chemicals that poison our water and deepen our dependence on foreign oil. And then in order to dispose of all the corn this cracked system has produced, we eat it as fast as we can in as many ways as we can - turning the fat of the land into, well, fat. One has to wonder whether corn hasn't at last succeeded in domesticating us.

Plant Population Estimated

BBC News Online, 2 July 2002

There may be far more flowering plants on Earth than was thought. A new calculation, by leading botanist Dr David Bramwell, suggests there could be about 422,000 species of angiosperm.

Conservationists say the estimate underlines the urgent need to complete a global inventory of plant diversity. Much of the planet's botanical wealth is concentrated in parts of the world where species-rich tropical and Mediterranean habitats are under greatest pressure.

"By increasing the total number of species, we also increase the number that are threatened," Dr Bramwell, the director of the Jardin Canario "Viera y Clavijo" on Gran Canaria, Spain, told BBC News Online.

He believes more than a fifth of species may now be endangered.

The new estimate is for plants known to science, and does not include speculative numbers of species yet to be discovered.

Wide range

Angiosperms are flowering plants that produce seeds enclosed in fruit. The flowers allow animals, particularly insects, to transport pollen between the plants.

Although they are thought to have evolved relatively recently - about 125 million years ago - they are the dominant plants on the planet.

Dr Bramwell made his estimate (421,968) by adding together the number of plants in each region of the world, concentrating on plants only known from one country or island, and allowing for overlap of floras from one country to another.

"What I have done is take a baseline flora - the largest flora in each region - and then count the number of endemics from the other countries that are definitely not in that baseline. The main point is that my system eliminates a lot of the duplication that occurred in previous estimates."

The figure arrived at is substantially higher than previous estimates that ranged from 231,000 to 320,000 species. However, it fits well with another recent estimate by Dr Raphael Govaerts, from the Royal Botanic Gardens, Kew, UK.

Dr Govaerts used a different method of counting and produced a figure of 422,127.

More resources

The latest estimate has been published in Plant Talk, an international periodical on the conservation of the world's plants.

Those working in the field say the number greatly boosts the argument that more resources should be allocated to the classification and conservation of plant diversity.

Under the international Convention on Biological Diversity, a Global Strategy for Plant Conservation is being worked on. One of its targets is to list all the plants of the world.

"At least now we have an idea of the size of the problem," Dr Bramwell said. "But we need also to get an idea of the conservation status of each plant.

"Conservation isn't only biology, it's politics as well - obviously. We need to make the politicians aware of the size of the problem; to see how much of the world's biodiversity can be saved."

Potentilla robbinsiana Delisted!

The U.S. Fish and Wildlife Service delisted *Potentilla robbinsiana* (Robbins' cinquefoil) on 27 August 2002. This species is endemic to Forest Service land on the White Mountain National Forest. The Service determination was based on available data indicating that this species has recovered. The main population of the species currently has more than 14,000 plants, and the 2 transplant populations have reached or surpassed minimum viable population size. A monitoring program will continue for the next five years. The species was listed in 1980, and for years the Forest Service, FWS, Appalachian Mountain Club, New England Wild Flower Society, New Hampshire's Natural Heritage Program and others have been implementing tasks of the Recovery Plan, which was approved in 1983. Congratulations to present and past White Mountain NF employees and their partners and cooperators who have contributed to this accomplishment! A continued monitoring program will continue for five years.
http://news.fws.gov/newsreleases/r5/C3314775-90A8-4608-9A5159013020D017.html

The PLANTS National Database now has County distributions for vascular plants for all states except Ohio, Mississippi, Maryland, Texas and Alaska. Thanks in part to Deb Hayes FS who has spearheaded some of these data purchases for the agency. If you haven't tried this before try looking up a species on their web site, then when looking at the state distribution maps, click on a state (that has county info) and check it out. – John Haglund (NRIS-TERRA)

Wales Welcomes Back one of World's Rarest Plants

Maev Kennedy, The Guardian, 6 August 2002

The Snowdonia Hawkweed (*Hieracium snowdoniense*), one of the rarest plants in the world, has been rediscovered growing on a mountain slope in Wales, decades after botanists feared it had become extinct.

"We were literally capering about for joy on the mountain ledges like lunatics when we found it," Tim Rich, head of vascular plants at the National Museums and Galleries of Wales, said yesterday.

The plant was last reported seen in 1953, and was believed to have been nibbled to death by sheep. "I was worried that this species might have become extinct, a Welsh dodo," he added.

Mr Rich has a list of endangered plants which he is trying to track down, collect seed from, and breed at the National Botanic Garden of Wales, including a pink flowering bramble not seen in Gloucestershire for 30 years. The hawkweed, however, the only Welsh plant on his list, was the most precious to him.

The little perennial, with brilliant yellow flowers, was first identified by the Caernarfon born botanist John Griffith in the 1880s, and declared a species in its own right in 1955. By then it had already disappeared and no trace had been seen since, despite several safaris for it.

The oddest thing about the rediscovery is that the plant has turned up exactly where it ought to be - on the mountain slopes near Bethesda in the north of Wales, where it was first identified, and last reported seen.

Scott Hand, of the Countryside Council for Wales, searched the slope only two years ago, and found nothing. He returned with Mr. Rich and a team to comb the mountainside in one last try before admitting the plant was probably gone for ever.

Records show that with the recent problems of lowland farming, and subsidies to hill farmers, sheep stocking levels are now far higher than they were in the early 20th century. In the sparse coarse vegetation of the high slopes, the hawkweed is apparently irresistible to them, although it must have survived each year just long enough to set seed. It is not the most spectacular plant in the natural world but, Mr. Rich said yesterday, "to me at least it is very beautiful".

The sheep have been taken off the mountain to allow the plant species to recover, and Mr. Rich is hoping that none strays back before Thursday, when the team returns to gather and save seed.

UC Researchers Confirm Coast Redwood and Douglas Fir as Hosts for Sudden Oak Death Pathogen

California Oak Mortality Task Force, 4 September 2002

Douglas fir branch tip affected by Sudden Oak Death Pathogen
Photo UC Berkeley/UC Davis

Two of California's most highly prized trees – coast redwood and Douglas fir – are susceptible to *Phytophthora ramorum*, the pathogen that causes Sudden Oak Death, University of California researchers have confirmed. Over the past seven years, Sudden Oak Death, a highly contagious fungus-like disease, has killed tens of thousands of oaks and tanoaks along the northern coast of the state.

Researchers from UC Berkeley and UC Davis have isolated living cultures of *P. ramorum* from the branches and needles of coast redwood and Douglas fir saplings that had shown symptoms of infection. The researchers first announced the discovery of *P. ramorum* DNA in the trees earlier this year, but couldn't confirm that the pathogen was causing infection until living cultures were successfully grown from the field samples.

It is not yet clear how seriously the disease will impact California's coast redwood and Douglas fir trees, which are ecologically and economically vital to the state, particularly to the timber, nursery, landscape and construction industries.

The infected redwood saplings were found at Jack London State Park in Sonoma County and Henry Cowell State Park in Santa Cruz County. The infected Douglas firs were found at another site in Sonoma County.

The researchers also conducted DNA tests on diseased sprouts growing from the base of mature redwood trees in Marin, Alameda and Monterey counties. The presence of the pathogen in the sampled trees has been strongly suggested by repeated positive DNA identification.

These new test results will be published online in October in the journal *Plant Disease*.

The number of identified species susceptible to the Sudden Oak Death pathogen has steadily grown since the disease was first reported in Marin County in 1995. With the addition of coast redwood and Douglas fir, there are now 17 known species worldwide susceptible to

P. ramorum. Sixteen of them are found in California, including madrone, bay laurel and buckeye. One additional host species, viburnum, has been found only in Europe.

"It seems that some species are able to tolerate the pathogen better than others," said David Rizzo, associate professor of plant pathology at UC Davis. The research was a collaboration between the laboratories of Rizzo and Matteo Garbelotto, adjunct assistant professor of ecosystem science and a cooperative extension specialist at UC Berkeley's College of Natural Resources.

"We see a whole range of symptoms in the field, from nasty cankers on the trunks of oaks to minor spots on the leaves of the buckeye," said Rizzo.

It is unclear what the new findings mean for the health of redwoods and Douglas firs in the long run, said the researchers. “Since we have not seen evidence of disease symptoms or death from the pathogen in large, mature redwood or Douglas fir, we cannot say what the effects of the infection will be long-term,” said Garbelotto.

Garbelotto noted that symptoms have been detected only on the needles and very small branches of redwoods. “What was somewhat surprising is that, for redwoods, we found the pathogen in all the places we checked,” he said. “In contrast, infected Douglas fir saplings were found at only one site — in Sonoma County — but they seemed to show a stronger reaction to infection. The Douglas fir saplings were right under heavily infected bay laurel trees. We don’t know if there was something unique about that site that made the Douglas fir more susceptible to infection than in other areas.”

In addition to checking diseased trees in the field, the researchers conducted a battery of lab tests to see how *P. ramorum* would affect healthy trees and to confirm that the pathogen was the cause of the symptoms observed in the field.

In one test, they exposed 20 redwood seedling stems to the pathogen and compared them to unexposed seedlings. After six weeks, the pathogen-exposed seedlings exhibited lesions from infection, unlike their unexposed counterparts. Branches on many of the infected seedlings became yellowed and discolored, while branches on the control seedlings retained their green color.

The same series of tests were conducted for Douglas fir seedlings, which generally developed larger lesions than their redwood counterparts after exposure to the pathogen. Like the redwoods, Douglas firs that were exposed to *P. ramorum* developed lesions from infection.

“We essentially confirmed in the lab what we observed out in the field,” said Rizzo.

The UC researchers say it is unclear what caused the dieback of a mature redwood tree in Mill Valley, widely reported earlier this year as having been infected by *P. ramorum*. Although the tree stump tested positive for *P. ramorum* using DNA tests, Rizzo and Garbelotto found that the tree appeared to have been plagued by three other fungal infections.

“The tree had already been cut down to a stump by the time we conducted the tests, so we don’t know if *P. ramorum* came in after the tree was cut or if the pathogen had infected the tree when it was still alive,” said Rizzo. “It is impossible to say what ultimately was wrong with that particular redwood tree.”

The discovery of *P. ramorum* in the redwood — one of California’s most treasured symbols — hits a sensitive chord for many in the state. The majestic trees can reach heights of more than 350 feet and live to be 600 to 2,000 years old.

“It may take years before we can start answering questions about the ecological impacts of the disease on coast redwood and Douglas fir,” said Rizzo. The researchers emphasize the need for further study, noting that they have only been studying the biology of *P. ramorum* in redwoods and Douglas firs for several months.

This research was funded by the USDA Forest Service Pacific Southwest Research Station, the USDA Forest Service Forest Health Management and the Gordon and Betty Moore Foundation.

Conservation Bias

According to a report published in the Summer 2002 edition of *Conservation in Practice* by J. Alan Clark (University of Washington) and Robert M May (University of Oxford), there is a definite bias in conservation research. World-wide, 79% of all species are invertebrates, 18% are plants, and 3% are vertebrates. However, in looking at 2,700 reviews, contributed papers, and short notes published over the last 15 years, Clark and May found that 69% of articles report studies on vertebrates, 20% on plants, and 11% study invertebrates.

The bias is even further skewed toward charismatic species if you consider the types of vertebrates and invertebrates studied. 28% of all vertebrates are birds or mammals, yet 79% of conservation literature (and 71% of ecological literature) published address these species. 48% of all vertebrates are fish, yet fish are the subject of only 8% of all conservation literature. Similarly, only 15% of insects are butterflies or moths, yet 48% of the insect conservation literature addresses these species.

The authors do not report whether there are biases for or against certain groups of plants. Do we favor orchids over sedges? Is corolla size a determinant of interest?

Conservation in Practice, http://www.conservationbiology.org/InPractice/

Bees Need Place to Call Home

Jonathan Brinkman, The Oregonian, 17 July 2002

You'd think a well-groomed flower garden would be heaven for bees, with colorful blooms in neat beds full of nectar and pollen for the industrious insects.

Not necessarily. Bees need places to nest, and manicured flower gardens don't always provide them.

The absence of bees matters, because they're the most important of the pollinators, the insects and other animals that carry pollen from one flower to another. Most plants won't produce seeds unless pollen is brought to their flowers.

Having enough pollinators is vital, because about 75 percent of the crops grown for food, fiber, spice or medicine throughout the world depend on pollination by insects or animals such as hummingbirds and bats. In addition, about 25 percent of all birds eat fruit or seeds, produced after a flower is pollinated, as a key part of their diet.

The Xerces Society, a Portland-based group dedicated to saving invertebrates -- animals without a backbone, such as insects, spiders and snails -- has made providing homes for bees a top priority.

The society's bee home campaign, part of its overall effort to help invertebrates, involves building bee nests in parks, golf courses and other bee-friendly places. The society also works to spread the word about the importance of bee habitat and to help homeowners create bee nests in their gardens.

The honeybee, with its brown- and black-striped abdomen, is only one of about 4,000 bee species in the United States, including 45 species of bumblebees. Most bees are solitary nesters, unlike honeybees, which live in colonies called hives. The parasitic mites that have devastated honeybee populations do not affect bumblebees or solitary bees. About 20,000 species of bees have been identified and catalogued throughout the

world, ranging in length from less than one-eighth inch to more than 1 inch. Many have iridescent bodies that glimmer green or blue.

Some of their common names reflect the way they build nests: plasterer bees, leafcutter bees, mason bees, digger bees, carpenter bees. Others are named after particular traits, such as the cuckoo bee that lay its eggs in the nests of other bee species, or the sweat bees that like to drink salty perspiration.

Unlike honeybees, most other bees don't sting.

"They're as lovely as butterflies," said Scott Hoffman Black, executive director of The Xerces Society. "You just have to look closer."

But beauty is not the reason the society makes bees a priority. Although data are scarce, native bee numbers appear to be dropping. Entomologists who survey bees in urban and suburban areas say counts are down.

"There is a real problem with the paucity of the data, but something is going on," Black said. "Native bees are in trouble."

Bees are effective pollinators because they visit flowers to gather food to feed their young -- not just to feed themselves, as most insects do. That means bees visit dozens or even hundreds of flowers on a foraging trip, carrying pollen from one flower to another.

The vast majority are solitary bees. They build individual nests and don't nestin a colony. Each female solitary bee lays one or more eggs in each nest she builds. She also stashes pollen and nectar in each nest for the bee larvae to eat when they hatch.

Solitary bees nest in three main types of homes: One group digs into the ground; its members need dry earth not covered by a lawn or bark mulch. Another group nests in the hollow stems of plants, such as reeds. A third nests in holes in wood, often colonizing the holes dug by other insects in dead trees.

Bumblebees, with their distinctive fuzzy appearance, are social. They nest in colonies, favoring enclosed places such as the hollows of trees or abandoned rodent burrows.

Development destroys those habitats, and they do not tend to be a part of neatly manicured gardens. Scientists think it is the lack of bee homes, not the lack of flowers, that explains why the number and diversity of bees are low in urban and suburban areas.

Matthew Shepherd, The Xerces Society's pollination program director, is the group's resident bee expert. He can identify most local bees at a glance.

Shepherd regularly visits pockets of wild areas in Portland, Beaverton and other urban sites, such as small parks or roadsides, to count bees. In urban areas, he generally finds only a quarter of the species that he finds in large undeveloped areas, such as western Washington County.

What's missing for bees in developed areas? Homes.

"People are increasingly recognizing that nesting habitat is the most important limiting factor for bees," Shepherd said. "You can put in all the flowers you like in your garden, but if you don't have nesting habitat you won't have many bees."

Building homes for solitary bees can be as simple as clearing a patch of ground, putting a bundle of hollow twigs on a fence or drilling holes in a block of wood. One indication that nesting sites are in short supply is the popularity of nest sites.

"We find that if we put out nesting boxes, they are filled almost immediately," said Mace Vaughan, staff entomologist. "That indicates there's a need."

Sustainable Forestry Initiative Adopts NatureServe Assessments of Conservation Status

NatureServe Press Release, 22 July 2002

Arlington, Virginia The sustainable forestry certification standard that is adhered to by most major timber companies has adopted the use of NatureServe conservation status assessments as the official standard for the protection of forests of exceptional conservation value. The new Sustainable Forestry Initiative (SFI) standards, adopted as of July 1, will affect the management of some 60 million acres of forest lands in the United States and Canada.

The Sustainable Forestry Board, which oversees the SFI certification standards, approved the new standards on June 28. These standards must be followed by all SFI participants, including nearly all major timber companies in the United States and many in Canada. In order to receive SFI certification, the companies will develop and implement plans to protect sites on their forestlands that contain viable occurrences of imperiled plants, animals, and ecological communities.

"NatureServe welcomes the opportunity to work through the Sustainable Forestry Initiative to provide timber companies with critical information about biodiversity," said Mark Schaefer, NatureServe's president and CEO. "Imperiled species and important habitats are found on timber industry lands throughout North America. Through this strengthening of the SFI standard, the timber industry has taken an important step towards their conservation."

"For nearly a year, the Sustainable Forestry Board has been collaborating with scientists, foresters, the conservation community, private landowners and the forest products industry to improve the SFI standard in order to enhance the identification and protection of forests with exceptional conservation value," said Mr. Colin Moseley, Chairman of the SFB and Chairman of Simpson Investment Company. "For participants in the SFI program, these new enhancements represent a significant step forward in the protection of imperiled forests."

In the terminology of NatureServe's conservation status rankings, the species and communities to be protected are those ranked by NatureServe as G1 (critically imperiled) or G2 (imperiled). The rankings are based on nearly three decades of biological field inventories by hundreds of scientists in the network of U.S. natural heritage programs and Canadian conservation data centers (CDCs), combined with analysis of information from other scientific sources. The natural heritage programs and CDCs are the leading source of information on the exact locations and conditions of rare and threatened species and ecological communities. "Our conservation status assessments cover more than 50,000 species and communities in the U.S. and Canada," notes NatureServe's Vice President for Science, ecologist Dennis Grossman. "For example, we currently track about 17,000 native plant species alone, and more than 2,500 of these are ranked as G1 or G2." NatureServe's database is relied upon by conservation groups and government agencies as well as industry, and widely recognized as the most comprehensive and authoritative of its kind.

Information from NatureServe and natural heritage programs is referenced in the new SFI standards under the objective related to conserving biological diversity. Specifically, an indicator of compliance with SFI standard 4.1.4 is: "Plans in place to

protect species or communities that are vulnerable at the global, national, or regional level based upon conservation status ranking systems (e.g., NatureServe, Natural Heritage Network, etc.)."

An indicator of compliance with standard 4.1.6 is: "Collection of information on critically imperiled and imperiled species and communities and other biodiversity-related data through forest inventory processes, mapping or participation in external programs such as NatureServe, state or provincial heritage programs, or other credible systems."

Currently more than 115 forest product companies adhere to SFI certification standards. The Sustainable Forestry Board itself, which oversees the SFI standards, is an independent body comprised of SFI program participants, conservation and environmental leaders, and forestry community representatives.

Eugene Odum – The Father of Modern Ecology

Phil Williams, 11 August 2002, University of Georgia Public Affairs

Athens, Georgia – Eugene P. Odum, 88, director emeritus of the University of Georgia Institute of Ecology and recognized worldwide as "the father of modern ecology," died Saturday at his Athens home.

Odum was born September 17, 1913. He grew up in Chapel Hill, North Carolina, where his father, Howard W. Odum, was a professor of sociology. Odum's brother, named Howard after their father, was born in 1920 and was to become a noted ecologist as well.

Odum showed a deep interest in birds as a teenager in Chapel Hill and with a friend named Coit Coker began a column called "Bird Life in Chapel Hill" in the local newspaper in the spring of 1931. When Odum graduated from high school in 1929, his class presented him with a comb because his wind-blown hair was never neat.

He received his bachelor's and master's from the University of North Carolina in and spent one formative summer as at the Allegheny School of Natural History. His first faculty post was in the department of biology at Western Reserve University in Cleveland, Ohio. In 1937, he entered the University of Illinois to work on his doctoral degree.

After graduation, he took a job as a resident naturalist for the Hyuck Preserve in upstate New York. He also married Martha Ann Huff, to whom he was married until her death in 1995. While at the Hyuck Preserve, Odum began research on birds and their habitats, research that would led him to a greater understanding of how entire ecosystems work.

The more Odum thought about ecosystems, the more he was convinced that there should a way to study how one part affects another. Yet this was in a day when there were no computers. Only crude tools were available to understand how biological and physical systems interacted. And yet, with the single-minded determination that became the hallmark of his method, Odum set about creating a discipline that took a revolutionary view of how ecosystems worked.

In the fall of 1940, Odum took a full-time job as an instructor of zoology at the University of Georgia. He was the only ecologist in a department of five faculty members, none of whom thought much about his ideas of studying entire ecosystems.

Before he could develop his ideas further, World War II exploded. Odum spent three years helping teach science to nurses, pharmacy-mates and pre-medical personnel. He even found time to coach the UGA tennis team.

In 1951, the Atomic Energy Commission made a decision that would have a profound effect on Odum's career and the future of ecology. The AEC had earlier built the Savannah River Site on land in South Carolina just across the line from Georgia. To see if the site had any effect on nearby plants and animals, it proposed an ecological laboratory.

The AEC selected a proposal developed by Odum as a basis for what would become the Savannah River Ecology Laboratory. Suddenly Odum found himself with one of the largest self-contained environmental laboratories on earth - some 300 square miles or property off limits to the public.

He helped set up research projects at the site, but one thing was still lacking for the consistent study of ecosystem ecology: a textbook. There had been many books on the ecology of parts of the natural world for years but there was no single book that examined the entire ecosystem, starting from the top down.

His book, Fundamentals of Ecology, was, for an astonishing 10 years, the only textbook available worldwide on ecosystem ecology. It was translated into many languages and was crucial in the training of an entire generation of ecologists. Odum argued that ecology was not a subdivision of biology or anything else. Instead, he said it should be an integrated discipline that brings all of the sciences together instead of breaking them apart.

Odum was also deeply involved in the establishment of and staffing of the UGA Marine Institute on Georgia's Sapelo Island, which has continued its mission of marine research for more than 40 years.

All of Odum's varied pursuits came together when the University's Institute of Ecology was founded in 1960, with Odum as its first director. It immediately made a name for itself, training a generation of scientists committed to Odum's holistic method of looking at the world around us.

In addition to Fundamentals of Ecology, Odum published more than a dozen other books.

Numerous honors came Odum's way during his long professional life. He was elected to the National Academy of Science and was named an honorary member of the British Ecological Society. With his brother, Howard W. Odum, he received the $80,000 international "Institut de la Vie" prize from the French government. He also received the Tyler Ecology Award and a check for $150,000, presented by then-President Jimmy Carter in ceremonies at the White House.

In 1987, Eugene and Howard Odum won the Craaford Prize given by the Royal Swedish Academy - comparable to the Nobel Prize, which is not awarded in ecology. Eugene Odum's share of the money, $125,000 went to set up a private foundation for the promotion of research and education in ecology.

Odum retired from the University of Georgia in 1984 but he never stopped coming to work every day and published his last book in 1998, *Ecological Vignettes*. He was also the subject of a documentary film that aired a number of times on Georgia Public Television and which has been used in ecology classes on campus.

National Botany Program Highlights

What's going on with botany in the Washington Office?

- National Fish and Wildlife Foundation grant proposal reviews.
- Making the Inventory and Monitoring Planning Program safe for botanists
- CITES issues, especially ginseng harvests on National Forests
- Lobbying for our NRIS rare plants protocol

Federal Botany Jobs

Check for these and other jobs of interest to botanists at http://usajobs.opm.gov/.
Remember, botanists make excellent rangers, planners, staff officers, and Forest Supervisors.
There are currently (19 September 2002) seventeen open Forest Service line officer positions

BOTANIST	$45,285 - 58,867	GS-0430-11/11	May 26, 2003
NAVY FIELD OFFICES			SW-INV-0430
Open to Everyone	Full Time,Permanent		
Southwestern States, US; WESTERN & PACIFIC ST, US			
BOTANIST	$30,597 - 37,428	GS-0430-07/09	Oct 3, 2002
USDA, FOREST SERVICE			R514NP-148DP-02
Open to Everyone	Part Time,Permanent		
MOUNT SHASTA, CA			
BOTANIST	$24,701 - 30,597	GS-0430-05/07	Sep 27, 2002
US ARMY CORPS OF ENGINEERS			NC-DEU-02-373
Open to Everyone	Full Time,Permanent		
NEW ORLEANS, LA			
BOTANIST	$24,701 - 30,597	GS-0430-05/07	Sep 27, 2002
US ARMY CORPS OF ENGINEERS			NC-DEU-02-374
Open to Everyone	Full Time,Permanent		
NEW ORLEANS, LA; MEMPHIS , TN			
BOTANIST	$39,698 - 74,835	GS-0430-09/12	Sep 23, 2002
US Army Corps of Engineers			FSU201742
Open to Everyone	Full Time,Permanent		
New York, NY			
BOTANIST	$37,428 - 45,285	GS-0430-09/11	Oct 10, 2002
INTERIOR, U.S. Fish and Wildlife Service			DS-2-08-144054-BM
Open to Everyone	Full Time,Permanent		
ALAMO, TX			
BOTANIST (PLANNING SPECIALIST)	$37,428 - 58,867	GS-0430-09/11	Oct 3, 2002
USDA, FOREST SERVICE			R514NP-088DP-02A
Open to Everyone	Full Time,Permanent		
Hayfork, CA			

Banner Plant: *Schistostega pennata* protonema

Each month, a different plant graces the banner of *Lingua Botanica*.
This month's image courtesy of the National Park Service, Olympic National Park
Natural history information is courtesy of Alma Hanson, Payette National Forest.

Schistostega pennata is a small (4-7 mm) distinctive moss that grows in dark recesses on damp soil, rock or wood. Its common name, "goblins gold", "cave moss" or "luminous moss" comes from the reflective character of lens-shaped filaments or (protonema) that causes the plant to glow a golden-green when exposed to light. Though it has a wide geographic distribution, it is very rare, and was only recently discovered in Idaho. The species is track by many Natural Heritage Programs and is listed under the Survey and Manage Standards and Guidelines within the range of the northern spotted owl and is included in the list of species covered by the viability assessment and management of species associated with late-successional and old-growth forests in the Pacific Northwest (Thomas et al. 1993) Look for *Schistostega* in the dark and damp overhangs of upturned rootwads on fallen trees and in caves or crevices.

Afterword: Celebrate American Flowers!

The 2002 Floral Flag (in Lompoc, California) is 740 feet wide and 390 feet high and maintains the proper Flag dimensions as described in Executive Order #10834. This Flag is 6.65 acres and is the first Floral Flag to be planted with 5 pointed Stars comprised of White Larkspur. Each Star is 24 feet in diameter; Each Stripe is 30 feet wide. This Flag is estimated to contain more than 400,000 Larkspur plants with 4-5 flower stems each for a total of more than 2 million flowers. – Photo by Bill Morson

The opinions expressed in *Lingua Botanica* are not necessarily those of the USDA Forest Service or the editor. The USDA prohibits discrimination in all its programs and activities. Pass your copy of *Lingua Botanica* around to all your friends. Contributing submissions are always welcome.

I didn't know the names of the flowers, now my garden is gone – Alan Ginsberg

To subscribe to the *Lingua Botanica*, just send an email to Wayne Owen at <wowen@fs.fed.us>.

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