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To: Florida Wildflower Foundation

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Phlox *Floridana* and Other Wildflowers in Florida Today

Will Florida Phlox Survive?

This fragile, sandy peninsula, overpopulated and losing native plants and animals at an alarming rate, struggles today against an unprecedented decline. Surrounded by water, pressures from all directions force unparalleled migrations and extinctions. With air, water and soil polluted to extremes the question looms - Do we have the capacity to put on the brakes and change direction? Do we still value our connection with Nature enough to have the connection define what it is to be an American? In Florida we have changed our moniker from *La Florida - land of flowers* to "the Sunshine State." Perhaps the expectation is that sunshine will last. 1., 2.

Daisy: What kind of a garden do you come from?

Alice: Oh, I don't come from any garden.

Daisy: Do you suppose she's a wildflower?

Alice in Wonderland, by Lewis Carroll 3.

An Overview

It is, in some sense, normal to become extinct. Plants and animals have been experiencing environmental changes from the beginning of time. Modern America, though, is not kind to wildflowers. In Florida, population growth has been the biggest, most constant economic engine until 2008. At its peak, from 2001 through 2006, Florida gained 200,000 residents a year. 4., 5., 6. The question at hand is whether what is left of Florida's plant diversity can continue? And what is our devotion to preserving the resolute few that remain? 7., 8.

The magnificence of *La Florida* is long gone. "The land of flowers" today is a far cry from the land explored in the mid-16th century. Planting a few seeds in highly visible areas for show, in celebration of the 500th year since "discovery" is hardly going to restore the floral grandeur that was. 9., 10., 11., 12.

Early explorers noted the vast beauty of this land. Lacking photographs, we rely on the manuscripts from early explorers and botanists. It is hard to get a sense for such history. Our appreciation has been deepened by narratives such as *Silent Spring* 13. and *The Everglades: River of Grass*, 14., and immeasurably enhanced by photography, as reflected in recent PBS documentaries 15. There is an illusion to the vastness shown in aerial photographs and film when planes fly over the wilderness preserves, or the famous Everglades. We see the skin on the earth, the trees, the unending grasslands. We are comforted by the immenseness of it all. But closer to ground, things look different - there is less of everything - from mammals and birds to wildflowers and other native, under-story plants. 16., 17.

Until we see the forests dying, as large areas of pines are doing in the Appalachians, we will be comforted by the blanket of green that we see - the illusion that all is well. 18., 19., 20., 21.

If we continue to disrupt the chain of life by selective eradication, as we are doing with mosquitoes for example, we will see nature interrupted with unforeseen ripple effects, and unintended consequences. Our unending war with mosquitoes results in the loss of a multitude of pollinators, including bees and butterflies, many of which help to create the blanket of flowers that once made Florida a spectacularly beautiful place to be. 22., 23., 24., 25., 26.

Since the early 1960s when Rachel Carson's *Silent Spring* was published the public has known about the devastating effects of human habitation on air, land, and water. The Department of Environmental Protection was organized in response to the dangerous excesses and the public outcry. But what have we accomplished in the meantime? 27.

Fifty years later, have we been lulled, or dulled, into thinking that things are better for us, and for plants and animals? ²⁸. Or are we just scrubbing the surface of unsightly filth while the insidious effects of modern culture continue unabated in changing these communities on earth for ever? We cannot see the pesticides and herbicides in the air around us. We cannot see the changes in the acidity of the soil and water. ^{29.}, ^{30.} We cannot see the soil depleted through generations of use of phosphate fertilizers. We cannot see the radiation in the air from the power lines that provide electricity. We cannot see the uranium added to the fertilizer that is now part of the soil, in the food chain and showing up in the human body. ^{31.} We can neither see, nor understand the effects of magnetic fields created by the multitude of electronic devices we use to make our daily lives comfortable. But we can see the pressures of monoculture all around us - from immaculately groomed lawns to federal and state highways - from the crops we grow for food to the horticultural industry. The unnatural - the artificial - the manipulated appearance has become the rule. Nature in its wonderful diversity is becoming the exception. ^{32.}, ^{33.}, ^{34.}

Florida has laid claim to be the location of the Garden of Eden, even the Fountain of Youth. Are we going to be the place that develops into a magnificent artificial environment, devoid of pests, sterile of weeds? No butterflies - no birds - no weeds - no wildflowers. ^{35.}

The story of man being expelled from the Garden of Eden may actually help us understand why we must cut, clear, and clean all vegetation to resemble a short-napped carpet. For many people it is as simple as an underlying fear of snakes whenever Nature is engaged. ^{36.}

Phlox *floridana*, Florida Phlox, is a good symbol of wildflower survival. It is an example of a plant under the stressful conditions Florida wildflowers must endure in modern life. Phlox (pronounced "flocks" and meaning 'flame' in Latin) is a genus of 67 species of flowering plants. With the exception of the annual Drummond Phlox, it is perennial with a wide variety of colors and plant forms - from the tall Garden Phlox to the creeping mat-like *stolonifera*. Particular species will grow in full sun to full shade. This plant family has a distribution over most of North America and is found in Europe and Asia. Historically significant, the heart of love songs and courtship, "Sweet William" was also brought to America by early settlers from the British Isles.

Florida Phlox is no transplant, though. At one time Phlox *floridana* was indigenous no where else in North America. ^{37.} Today its southernmost habitat is in the central part of the state, around Brooksville. It is found in small colonies throughout the northern part of the state and is under migratory pressures as it drifts toward Georgia and Alabama. Phlox *floridana* - must this "flame" be extinguished before the course is changed in Florida? Will wildflowers join the Loggerhead turtles, Grouper, manatees, bats, and bees struggling to survive in Florida? No need to look back to the 1960's when the environmental movement began. In the last 10 years Florida has experienced accelerating losses of plants

and animals everywhere. This loss is primarily due to loss of habitat. 38., 39.

Florida Today

State and local governments seem determined to allow developers to consume every acre of land and gallon of water at any price to support an economy based on growth. 40., 41., 42. Florida is an example of the “build it and they will come” mentality gone wrong. 43. More than \$68 billion dollars a year are brought to Florida by domestic and international travelers. Nature-based recreation and tourism create hundreds of thousands of jobs to take care of those visitors. Recent fluctuations in the number of visitors shows that dependence on travelers is not a secure source of revenue in modern day Florida. 44., 45. Whether an economic downturn or the disruption from hurricanes, shark attacks, red tide, or crime perpetuated on tourists, visitors can and do sometimes go somewhere else. 46., 47.

Tourism is pressed to replace agriculture as the largest economic indicator, but one thing is for sure: growth is sacred. 48., 49. Growth in population and all it represents is embraced by leadership at all levels to satisfy our insatiable need for more of everything: fun, food, homes, shopping malls, cars, and places to go. 50., 51., 52., 53., 54., 55. The rapacious greed that is loose in Florida is frightening. Wildflowers certainly seem ripe for extinction - the collateral damage of unbridled growth. 56., 57., 58.

After years of being on the bottom of the list nationwide for dollars spent on education, public servant pay scales, and infant health - the engine of growth in Florida is sputtering. Florida is losing population for the first time since 1948. In 2008, more than 58,000 people left the state. 59., 60., 61., 62. This in itself is not a positive for natural resources left in Florida. Water scarcity is prevalent in South Florida, tax bases are shrinking, insurance is exorbitant, air quality is poor in dense metropolitan areas, sewage treatment and industrial waste and auto emissions have already affected air, soil and water. 63., 64. Environmentalists point to a continued risk to home values and strained natural resources. 65.

Despite plummeting housing and real-estate values, Florida is experiencing a radical, remarkable, and irrational number of requests to build new homes and develop commercial property. 66., 67. Florida’s principal economic engine is still turned toward population growth. 68.

Wildflower Diversity and Habitat assessment

Plant diversity and habitat conditions appear to be linked. Healthy habitats support a natural diversity in the plant communities but damaged habitats - whether through development or pollution - are easy targets for encroaching plants. Invasive species do not overpower indigenous species easily. Natural competition in plant communities keeps the balance in place. Agriculture and

Silva culture, during seasonal or periodic harvesting, show impacts from unwanted exotics and other plants establishing themselves at alarming speed. Hurricanes and horticulture share responsibility for transporting species from different hemispheres to attach footholds in new ecosystems.

Some botanists today do not consider any plant as “native” unless it was listed on the manuscripts sent to Spain in the 16th century. ⁶⁹ Everything else is regarded as an invader to the ecosystem. Today there is an established plant hierarchy of desirables and undesirables, nuisances and invasives, and natives and nonnative. And many of them are targeted for eradication as though there was something evil about them. Are wildflowers short-listed for extinction because they are “wild?”

Wildflower diversity reflects the unusual and varied ecological systems in Florida. The main land mass differentiations in Florida can be described as wetlands and the uplands. Wetlands are made up of the Freshwater Marsh, Salt Marsh, Wet Prairie Hardwood Swamp, Cypress Swamp, Mangrove Swamp and Bay Swamp. The Uplands are divided into Hammock, Dry Prairie, Pine Flatwoods, Pine Rockland, Scrub, Sandhill, and Coastal Strand. ⁷⁰

Delicate systems such as the Mangrove Swamp are home to soil covered with water where the ecosystem mixes fresh water with salt water. Such systems are highly vulnerable to human habitat pollution. The prevalent warnings of red tide and unhealthy bacteria levels are common from the Big Bend to South Florida beaches. Inundated with water, this ecosystem is usually surrounded by the Coastal Prairie which evolves from hurricane damage to the nearby swamps. ⁷¹

The Everglades is an example of the Marl Prairie, where Sawgrass dominates the system. Tropical Hardwood Hammocks and Cypress Domes dot the prairies.

As elevation increases, the Pinelands appear. Little of the original forest cover is left. While more than 50 percent of the world’s forest cover is gone today, in Florida efforts are underway to reestablish the once reigning Longleaf Pine savannahs. ⁷²

As an example of arrogance, or a myopic focus, toward plants, Longleaf Pine restoration was initially largely unsuccessful because of the need for the missing understory plants. ⁷³ When grasses and herbaceous plants typical to the natural plant community were added in amongst the pines, the projects were more healthy and sustainable. Fire is also necessary for Pinelands health, similar to the destruction caused by hurricanes that helps create the coastal prairies. It is interesting that the forces of nature that were severe economic destruction are the same elements necessary for healthy ecosystems - in Florida these forces are fire and hurricanes. ^{74, 75}

Long before the interest in Longleaf restoration began, Slash Pines were the tree of choice for generations in Florida. Desirable for producing turpentine and highly resistant to termite damage, Slash pine crops were encouraged for pulp for the paper industry as well and were harvested earlier than lumber or telephone pole grades. Naturally resistant to fire, slash pines enjoyed prominence throughout north Florida.

Managed forests everywhere experience regular applications of herbicides and pesticides for the “health” of vast monocultures. Whether the stands of pine are weakened by monoculture alone, pines as well as palms and citrus groves are being ravaged by insects, fungus and bacteria that are increasingly resistant to eradication efforts. ^{76., 77.}

Recently, the Florida Department of Agriculture and Consumer Services discontinued an eradication program attempting to contain citrus canker. Frequent hurricane activity simply made containment unachievable regardless of the legislated destruction of private citrus groves throughout Florida. ^{78.}

Human populations suppress fire and build in areas vulnerable to hurricanes, while altering delicate ecosystems with roads, sewage, air and water pollution. From the Mangrove to the Sandhill, man stamps nature in Florida with a footprint that doesn't wash away easily. Each system, rich in varying characteristics of plant and animal life, has experienced huge losses of diversity.

What is left receives annual applications of pesticides and herbicides to control pests and undesirable vegetative competition in an effort to support monoculture. Tinctures of waste treatment and landfills are added to the water wonderland.

Recent budget cuts cause outpouring of concern about local mosquito control activities all over the state. These activities are largely funded by grants from the Department of Agriculture and Consumer Services. Concern about West Nile virus and encephalitis as well as ridding residents of annoying insects is a flash point eliciting fear. Fear of disease has targeted mosquitos even though they are an integral part of the food chain for birds, bats and fish. Historically, local governments have been trying to rid communities of mosquitoes for more than 90 years - beginning with Indian River County in 1922. Some programs date back prior to statehood in Central Florida. Mosquitoes are still with us, more than ever. ^{79., 80.}

An overview of habitats in Florida would not be complete without attention to the influence of exotics and invasives. More than four thousand plants are listed in Florida's rich biodiversity. Over one-third of them were introduced and are not considered native. Florida has the worst condition of any state on the continental US. Only Hawaii has a greater invasive plant infestation. ^{81.}

Originally, the most destructive invasives were actually purposely introduced for what seemed like a good reason at the time. Taking a few of these plants as examples will illustrate similar problems with the others on the state and federal invasive plant lists.

The Melaleuca tree (*Melaleuca quinquenervia*) from Australia has become established in south Florida. It is restricted geographically only due to its intolerance to cold weather. Having a high tolerance for fire, it is taking over many habitats, from coast to coast, including Sawgrass marshes and wetlands and is considered by many environmentalists as the biggest threat to the Everglades. ^{82.}

The Brazilian pepper (*Schinus terebinthifolius*), from South America was introduced through the horticultural industry as an ornamental and is also invading south Florida. It will crowd out all natives, including sawgrass, and stands as a self-appointed monoculture. It shows signs of being toxic to other plants. It will ruin natural feeding areas for water birds and is threatening the endangered gopher tortoise habitat in the Everglades. ^{83.}

Bahia grass, the dominant grass on roadsides, is threatening native grasses throughout Florida. Introduced from South America, its aggressive, drought-resistant growth justifies burgeoning roadside management budgets as it requires frequent mowing for safety concerns. ^{84.}

In the top 10 of the worst plants world wide is Cogongrass. Introduced in Alabama in 1912, probably as a ground cover or soil stabilizer, today it is found throughout Florida. *Imperata cylindrica* competes and displaces native species, is resistant to herbicide applications, is not conducive to management by fire and is extremely costly to attempt to eradicate. It has taken over more acreage than kudzu. ^{85.}

Chinsegut Wildlife Environmental Area Big Pine Tract is home to a large colony of Phlox *floridana*. An employee was confronted when herbicide was applied within the colony, in the summer of 2008. With disdain he scoffed at such concern and stated, "Do you know how bad the problem is with invasives at Chinsegut?" After arguing that the native colony of Phlox *floridana* is at least as important as an invasive, he responded, "Invasives always trump natives." ^{86., 87., 88., 89., 90., 91.}

Hydrilla removal commands the largest part of the budget for management activities at Wakulla Springs State Park. While water hyacinths are controlled with herbicides, hydrilla is not and requires expensive equipment to remove the submerged roots that are clogging the beautiful spring. Since hydrilla feeds in the acidifying, nitrogen-rich effluence from the sewage waste treatment spray fields in Tallahassee, it seems doubtful that mechanical or chemical means deter this monster of change. The question that arises is whether herbicides should be used on water hyacinths at all? ^{92., 93.}

Jonathan Swift, in his article *Demons in Eden: The Paradox of Plant Diversity*, ^{94.} suggests a delay of 50 to 80 years is common for a newly introduced plant to become out of control and invasive - such has been the case with Paperbark,

Cogongrass, Japanese Honeysuckle, Brazilian pepper, Nandina and Ardisia and the list goes on. They were all purposely introduced into a new environment with good intentions. 95., 96., 97.

And so it is, everywhere, in land management policies. Private individuals, local, state and federal employees bolster their budgets with funds to buy expensive herbicides and apply them at will to a variety of unwanted plants - from dandelion to dollar weed, from Cogongrass to Brazilian pepper. Little regard exists for nearby plants and the soil itself which absorbs the poisons as well. 98. There is no justification for such eradication programs when the costs to natives are so high and health and safety for plants and humans for generations to come is imperilled by attitudes of *floridana* be damned - just get the job done.

Almost all government agencies responsible for public lands are using chemicals to control unwanted invasives. Garlon-4 is a prevalent herbicide in use today by most stewards. 99. The label on the product stipulates it not be used on highly permeable soils. Nothing is more permeable than Florida sand, except Florida water.

Florida today appears as a patchwork effort to undo many ills originally conceived as improvements when attempted over the last 500 years. From clear cutting the *Torreya*, to slicing the land mass in two for boat traffic, nothing can eclipse the absurdities inflicted on the delicate fragile plant habitats.

One final blow to the diversity issue stands at the door to the horticultural industry. The industry maintains a commercial interest in plants on the federal and state invasive species lists and many can be found at garden centers for the public to purchase. Further, a wide variety of houseplants sold are poisonous. This puts children and pets in harms way. Several commercialized native plants are known to be carcinogenic and capable of inducing anaphylactic shock. Florida's Friendly Yard program also encourages plants that are discouraged by other programs. While many native and endangered species that are not conducive to commercialization are not generally found in this venue, invasive plants are available. 100., 101.

II. Wildflower Sustainability and Development trends in Florida

The Florida Federation of Garden Clubs has had an active part in promoting and preserving Florida's environment. For many decades, men and women all over Florida have been motivated to beautify and protect what is left of the natural Florida. The garden clubs were also an integral part of the development of the Florida Wildflower Foundation. The Foundation grew out of efforts and funds generated with the wildflower specialty license tag for cars. Currently, the Foundation is involved in education, planting and research of Florida native wildflowers and supports projects state-wide with grants. 102.

Also, there is an established organizational presence in Florida to commercially promote and protect native plants. A professional group known as the Association of Florida Native Nurseries, founded in 1985, it has become the largest native nursery association in the nation. Similarly, the national organization of the Native Plant Society has an active Florida branch that has a political and educational presence state wide. While the horticultural and landscape industry seeks to capitalize on the availability of native plants commercially, the inherent difficulties with establishing wild plants into urban and suburban environments makes this problematic. ¹⁰³.

Today an inner city plan for establishing natives in an intentional landscape includes the work of a dozer scraping all the top soil away, modifying the terrain for water flow, applying herbicide to the soil to remove invasives and planting a pretty show. The problem remains that not many native plants will adapt to soil treated with herbicide. There are some plants that will survive herbicidal applications, but very few native wildflower seeds will ever germinate or grow in it.

The State of Florida adopted an official state wildflower in 1991 through the efforts of the Florida Federation of Garden Clubs and state agencies. ¹⁰⁴. Over a dozen varieties of *Coreopsis*, also known as tickseed, were established throughout the state and made a fitting representative for wildflowers in Florida.

The roadside beautification program was born by accident in 1963. ¹⁰⁵. Sod purchased from a farmer for a highway project near Tallahassee contained red clover. The next spring the red blossoms made a stunning spectacle that delighted the public. Enjoying the popular support, the Florida Department of Transportation began planting flowers. ¹⁰⁶.

The plantings were whimsical. If there was money in the budget and an atmosphere of appreciation, then seeds were purchased and planted and then mowed.

The manicured-look has an interesting history. Manicured America began after soldiers returned from World War II. Housing and community developments sported a patch of green for every yard. The sales pitch was on and has been fine-tuned ever since. While “keeping up with the Jones” became ingrained, it wasn’t until the Viet Nam war was ending that chemical companies began promoting the offspring of Agent Orange - an herbicide in the hands of homeowners and an eradication campaign aimed at dandelion and dollar weed. With automobiles and inexpensive construction supporting the spread of suburbia, it would seem that dandelion could ruin the reputation of a neighborhood alone, but not for long. Soon every other grass and broad leaf plant in existence would degrade the epitome of the lush lawn - monoculture had seeped into home life as well as agriculture.

The visual impact of England’s war with plants may have had a strong influence

on America as well. Huge vistas devoid of any undergrowth were the scene of manor houses and countryside. England had a much longer history of cultivation than America by the 1800s and 1900s. Every tree, twig, and brush had been scavenged for heating and building and animal containment. Many native plants were purposely eliminated. No wonder Americans thought English estates with their gorgeous grounds were clean and beautiful and worth emulating. The well cared for look of the landed gentry in Britain and Europe certainly had a psychological imprint on the American psyche.

Publications through educational institutions were created to continue support of the well-managed look. *Weeds of Southern Turfgrasses*

was produced for the management of golf courses, lawns, roadsides, recreational areas and commercial sod production. ^{107.}

First published in 1992, by the University of Florida, it has gone through several reprints for the purpose of “identifying problem weed species and understanding their life cycles.” Dupont, Monsanto, Dow and others contributed to the production costs of this eradication publication. Grasses and broadleaf plants are targeted, including Blue-eyed grass, Blanket flower (Gaillardia), Pink Purslane, Bushy Aster, Bushy Bluestem, Chicory, Venuslookingglass, Cranesbill, Evening Primrose, Daisy Fleabane, Dandelion, Field Pansy, Field Violet, Johnny Jump-ups, Oxalis, Spreading Dayflower, Spring Starflower, Violets, Yellowtop and Yellow Woodsorrel - 190 species in all. Today, many of these plants are in demand by commercial interests looking to plant native wildflowers into landscapes.

Adopting the “golf course look” spread to roadsides as well. Huge budgets exist to keep roadways looking clean - meaning mowed down with nothing else but grass to see. Dry grasses can be easily ignited by the hot undercarriage of automobiles as they pull onto the shoulder areas for emergencies. In some areas tall grasses are feared as offering cover for wildlife that will startle motorists and cause accidents. Mowing transportation infrastructures is a major cost to federal, state and local roadways and a major cause of shrinking plant diversity losses statewide. ^{108.}

Keep the shoulders clear and safe: it justified high labor costs, and as equipment and chemicals became more and more expensive, the cost was justified with concerns for safety. The hidden costs were runoff pollution in water, air, and soil, the wholesale slaughter of wildlife, land removed from private ownership and an erosion to the tax base.

Can't anything good be said? Well, yes. The transportation infrastructure, while being the greatest single threat to statewide plant diversity, helped sustain the bubble necessary to support the expanding economy of Florida. People are actually leaving Florida for the first time in a half century. ^{109.} Even 56 years ago the interruption was just a blip on the growth indicator after WWII. Florida has been in growth mode forever it seems. And with that growth came wildflower

habitat destruction - the destruction of nature as it existed - the consumption of resources as though there would always be enough.

As important as it is to focus this information on Florida, this force of change is being felt in every corner of America. In Florida we must measure our frailty with our uniqueness - our wonderful diversity with our burgeoning population - our affinity for air, water and sand and our need for a cohesive infrastructure. ¹¹⁰. Where is our vision for the *Land of Flowers* - are we going toward plastic or silk - or do we still want the real thing? Would astro turf actually be a solution to the problem of habitat loss and environmental pollution and the safety of management policies?

For 60 or more years the public's attitude has been imprinted with the golf-course-look along roadways. Indeed, if comments by county commissioners were solicited, a stark conflict emerges between public safety and natural beauty, with concerns for the former overriding any aesthetic valuation of the latter in roadside management policy.

During efforts to secure permission to collect plant material on county roads in Liberty County, commissioners became hostile at the thought of new, highly desirable wildflowers being identified for research and conservation. Commissioners said that mowing wildflowers down was preferable to the safety issues that arise when deer and turkey wander on the roadsides to forage on the delectable plants. Horror stories were repeated about speeding teenagers colliding with deer and a fatal crash occurring - fatal for the driver as well as the deer. ^{111., 112.}

Craig Wilson, a reporter for USA Today, states, "The National Highway Traffic Safety Administration says there are about 1.5 million car accidents with deer each year, resulting in about 150 human fatalities and more than 10,000 personal injuries. There are now as many as 100 deer per square mile, especially in eastern metropolitan areas." While Bristol, in Liberty County, Florida, would not be considered an eastern metropolitan area, it is deep in the heart of the Apalachicola National Forest and local drivers experience many interactions with bears and deer. ^{113., 114.}

Another issue surfaced as well. Liberty County in particular but not alone, has a significant portion of land removed from its tax base under the stewardship of the Federal Government. The US Government can and does allow public forest land to be managed at a loss. Inadequate contributions are made to local governments to offset the loss of tax base and grievances over restricted access and conservation regulations are quickly ignited when plant enthusiasts look to identify new plant species for concern and protection.

Liberty County has justification for its antagonism toward federal policies but the resulting attitudes and behaviors to vulnerable plant species remain. The plants

can't speak for themselves. They may be trying to migrate out of hostile environments, but more often, they are simply destroyed by aggressive efforts to minimize them and "clean things up." Valuable plants on roadways in Liberty County need to be considered for rescue.

Ironically, Torreya State Park in Liberty County is home to richly diverse flora and fauna. The park boasts one thousand different plants, some of which are found nowhere else in the world. It is a truly unique place and well protected from everything except fungus it seems. The famed Torreya trees, nearing extinction from logging, now under protection, are succumbing to a fungus. ¹¹⁵.

Private conservation efforts seeking cooperation from wildlife preserves are met with disapproval. The Nature Conservancy declined to approve collection requests to relocate rare plant material from Liberty County to Madison County. The rationale given was not wanting to move genetic material from one county to another even though commercialization was not the intent. ¹¹⁶. Given that every big storm that moves through the Panhandle moves genetic material, the disinclination to support private endeavors is either absurd, or patently self-serving. Conservation in this scenario seems more like protecting turf than plants.

The discussion of targeted eradication should also include an overview of areas described as of "zones of influence," the area directly adjacent to the land receiving the herbicidal treatments, and technically the air-borne drift area as well. Thus, land subjected to runoff during rain and areas open to air-borne molecules also effectively receive the herbicidal "treatment."

This picture of habitat alteration, whether by mowing or herbicidal treatments includes all managed lands, all agricultural lands, all developed lands, all golf courses, lawns, roadsides, recreational areas and commercial sod production as well as the purchasers of the commercial sod - the affected areas in Florida are vast. What is left? What is "untouched?" It is conceivable that the only untouched lands left are abandoned private properties. If the zone of influence is taken into account perhaps no unaffected areas are left in Florida. After 50 years of spreading herbicides and nearly 100 years of spraying pesticides, have we had enough yet? ^{117., 118., 119.}

Agriculture

Environmental correspondent Alex Kirby states "the world is losing plant species at a rate which threatens its ability to grow enough food." He adds "widespread loss of species is attacking the foundations of agricultural productivity." ^{120., 121.}

The USDA Agricultural Research Service has published research indicating the effects of spraying herbicides on undesirable invasives can have some unwanted side effects on desirable native forbes in the same area. Even 16 years after the

initial spraying, “although the herbicide would have dissipated within a few years, it seemed to cause a long-term plant community shift.” 122.

Research in South America is documenting the effects of the herbicide glyphosate on the fetuses of amphibians. Glyphosate is used in the cultivation of Monsanto’s genetically modified soya, which now covers some 18 million hectares, about half of Argentina’s arable land. Dr. Andrés Carrasco, an Argentinian embryologist, said the doses of herbicide used in the Buenos Aires study were ‘much lower than the levels used in the fumigations.’ Indeed, as some weeds have become resistant to glyphosate, many farmers are greatly increasing the concentration of the herbicide.” 123.

Dr. John Tuxill, author of *Nature’s Cornucopia: Our Stake in Plant Diversity*, observes “widespread loss of species and varieties is attacking the foundations of agricultural productivity. The genetic diversity of cultivated plants is essential to breeding more productive and disease-resistant crop varieties.” In our educated arrogance, if we are only relying on cultivated genetic diversity, we are leaving ourselves vulnerable to losing the original biodiversity that is itself the source for the engineered crops. Such diversity is simply artificial and has no track record for the survival of the species - human and plant. Tuxill goes on to say “Biotechnology is no solution. We are increasingly skillful at moving genes around, but only nature can create them.” 124.

Environmental effects on air, water, soil

“America loses more than one million acres of fertile farmland every year to sprawling cities and endless suburbs. Each year two billion tons of fertile, irreplaceable topsoil are lost forever to erosion and it often ends up in our rivers and streams, degrading water quality with fertilizers and pesticides and damaging critical fish and wildlife habitat.” 125., 126.

Product residues are showing up in communities throughout Florida. 127. From pharmaceuticals to shampoo, cleaning products and septic system residues to name a few, are found in waterways throughout Florida and the nation. The uncertainty is the risk to humans. If the residues are harmful to humans - What about plants? Are they harmful to plants, invertebrates, birds, and mammals? What is the impact of being absorbed from the bottom to the top of the food chain? 128., 129.

The US Geological Survey found 80% of samples taken contain residues. “A century ago, most metropolitan areas treated nearby waterways as public sewers, but until they were black with stinking filth that spread cholera and typhoid, few cared,” cited Associated Press reporters Jeff Donn, Martha Mendoza and Justin Pritchard in an article, *No standards to limit pharmaceuticals in water, and Pharmaceuticals turning up in drinking water*. 130. Though U.S. waterways coast to coast are contaminated with residues of prescription and

over-the-counter drugs, there's no national strategy to deal with them. The EPA's position is "there needs to be more searching, more analysis." ^{131., 132.}

Testing, whether for traces of uranium, pharmaceutical residue, or water contaminants is problematic. Inherent in the testing procedure is the difficulty of getting the same result twice. The sample in the soil or water is in a constant state of change. The procedures vary in timing after the sample is taken before the testing is done. Even if, in the ideal situation, these factors were constant, there is the potential for human error as well. It is reasonable that a level of scepticism is involved with trusting published test results. The National Park Service has a disclaimer attached to testing results for uranium and other environmental toxins for these very reasons.

While Tallahassee's spray field sewage treatment plant is harming the health of Wakulla Springs, it also prevents pharmaceutical products in wastewater from getting into the region's water supply, scientists say, according to Bruce Ritchie, reporter with the Tallahassee Democrat. ^{133.} But the nitrogen from the waste treatment plant is feeding the growth of "weeds and algae that has choked the state park swimming area in recent years," according to Brian Katz, a research hydrologist with the U.S. Geological Survey in Tallahassee. ^{134.} While pharmaceuticals are not found in the water supply from the Florida Aquifer, the drugs were being trapped in the soil and taken up by bacteria and plants before they seep into the groundwater, says Katz. "And while researchers do not yet understand the exact risks from decades of persistent exposure to random combinations of low levels of pharmaceuticals, recent studies - which have gone virtually unnoticed by the general public - have found alarming effects on human cells and wildlife." ^{135.}

Consultants from pharmaceutical companies respond, "Based on what we now know, we find there's little or no risk from pharmaceuticals in the environment to human health." ^{136., 137.} Countering that opinion, Mary Buzby, Director of Environmental Technology for drug maker Merck & Co. Inc., said: "There's no doubt about it, pharmaceuticals are being detected in the environment and there is genuine concern that these compounds, in the small concentrations that they're at, could be causing impacts to human health or to aquatic organisms." ^{138.}

AP reporter, Christopher Leonard wrote: "In September of 2009, Monsanto Co., the world's biggest seed maker, announced plans to lay off more than 2,000 workers. After Roundup's patent expired in 2000, a flood of competitors entered the market. Monsanto was caught off guard this year when a flood of generic Roundup products flooded the global market and gutted prices. Its shares tumbled because of the surprisingly weak Roundup sales." ^{139.} Competition is changing the game, but not the results.

Along with Garlon-4 and Roundup, Atrazine has been used for decades to protect crops, golf courses and manicured lawns. ^{140.} It is now a commonly found

contaminant in American drinking water supplies. A *New York Times* article stated, "Now, new research suggests that Atrazine may be dangerous at lower concentrations than previously thought. Recent studies suggest that, even at concentrations meeting current federal standards, the chemical may be associated with birth defects, low birth weights and menstrual problems." ¹⁴¹. The article revealed that "40 % of the nation's community water systems violated the Safe Drinking Water Act at least once last year," according to a *New York Times* analysis of EPA data, "and dozens of chemicals have been detected at unsafe levels in drinking water." ¹⁴².

Water is a significant concern to human population health, but what about plant populations? ¹⁴³. Water permeates oxygen and soils. The osmosis effect of movement at the molecular level is where a higher concentration will move in an effort to disburse into a lower concentration. If humans experience fertility problems and propagation difficulties regarding these chemicals, it is logical to assume plants will experience disruptions to germination and cross-fertilization. ¹⁴⁴. Increasing warnings are occurring, notifying swimmers of bacteria levels and red tide at popular beaches on the Gulf coast. ¹⁴⁵, ¹⁴⁶.

Water suppliers for Miami, Orlando and Jacksonville were listed but not tested for pharmaceuticals in drinking water supplies in the recent study tracking 62 major water providers. ¹⁴⁷. Test results vary widely. Some water systems said tests had been negative, but the Associated Press found independent research showing otherwise, "But people aren't the only ones who consume that water. There is more and more evidence that some animals that live in or drink from streams and lakes are seriously affected." ¹⁴⁸. Coupled with aerial spraying, it is an obvious conclusion that water becomes the carrier for multiple pollutants.

Air quality concerns for an increasing number of residents in the Big Bend are alarming health care providers. "It's very under appreciated how dangerous air pollution is", said Dr. Ron Staff, protesting plans for the Port St. Joe biomass plant. " ¹⁴⁹. There is a pattern of industrial complexes that degrade communities and put particle pollution in the air." Communities need to know when control burns and aerial herbicide and pesticide applications occur as a matter of public health. ¹⁵⁰, ¹⁵¹.

Phosphate fertilizers have been used for decades. More recently a uranium by-product from the production of energy has been added to the fertilizer. Fertilizers made from phosphate rocks contain higher amounts of uranium than natural soils. Some rocks and minerals in underground and open pit mines also contain uranium in a more concentrated form. After these rocks are mined, uranium is extracted and chemically converted into uranium dioxide or other "usable" forms. Some plants can have 80 times the concentration of uranium found in the soil, and root foods like potatoes and radishes show adsorption onto crops. ¹⁵².

Consider again the lowly *Phlox floridana*. How will it withstand the developmental

and agricultural changes such as adding uranium to fertilizers and asphalt, increasing radiation through magnetic fields around electric power system and the acidifying of soil and water by human populations. These conditions will not necessarily be overcome by a plant like *P. floridana*. 153., 154.

While searching for the Phlox species locally, a visit was made to Buckeye Cellulose, in Taylor County. The visit was during late Spring but no wildflowers were seen blooming. In some areas the soil was so poor that it would no longer grow pines. The land, considered economically sterile, was being offered as a site for the controversial coal plant. The mined-out soil, whether from repeated mono-crops, or repeated herbicide and pesticide applications was home to a limited plant community. Nothing was blooming. Bare sand was all around. 155.

What is also noticeable, in North Florida, is that fewer species of flowers bloom in the Spring. 156. This change is verified by residents who moved to the Panhandle 20 years ago and enjoyed a multitude of blooms in the drainage ditches along sparsely traveled roads. 157.

While the effects of aerial spraying and sewage treatment seepage could account for some changes, the climate modifications could also be affecting plant cycles. "The alarm clock that all the plants and animals are listening to is running too fast," Stanford University biologist Terry Root noted. "The changes could push some species to extinction. More than 30 scientists told The Associated Press how global warming is affecting plants and animals at springtime across the country, in nearly every state. Noticeable from space, satellites measuring when land turns green found that spring 'green-up' is arriving eight hours earlier every year on average since 1982 north of the Mason-Dixon line." 157.

As far as climate changes go, losses of plant life also cause concern for air quality and carbon storage. The Lady Bird Johnson Wildflower Center describes the impact of plants on carbon storage: "Plants capture carbon dioxide through photosynthesis and store it below ground. This organic carbon 'sequestered' in the soil is a vital part of the carbon cycle and represents a carbon store that is twice as large as what is in the atmosphere. If we manage the soil and vegetation to maximize carbon sequestration, we can have a positive impact on greenhouse gas emissions and climate change. Some ecosystems are very effective at storing carbon below ground. For example, wetlands are excellent carbon stores as the saturated conditions do not allow breakdowns of dead plant material. Similarly, grassland soils contain much carbon, because grasses put more biomass below ground than above - this material binds up in soil and can be stored there for hundreds of years. Conserving and restoring these landscapes is clearly a high priority task. If we fail to design and manage our landscapes carefully, it can negatively affect global climate change." 158.

III. Current land management policies

State parks

An editorial in the Tallahassee Democrat commented, “ Lawmakers cut maintenance for Florida’s 160 state parks by more than 80 percent in the Spring of 2009. That means parks will go without, or see fewer, repairs of facilities, roads and safety features. There also will be little work done to remove barriers to accessibility and restore resources such as water quality at Wakulla Springs, plant trees and protect natural and cultural jewels.” 159.

St Marks Wildlife Refuge Association is enjoying the excited public response to the whooping crane relocation program. It is a rich experience for area residents to follow the seasonal activities of the migrations of the cranes and a unique opportunity for the Refuge. St. Marks has generated a lot of public support and like many public areas in Florida, it has regular attendance at annual wildflower and butterfly programs. 160., 161.

Another preserved gem is “an undeveloped barrier island just offshore from the mouth of the Apalachicola River, in the Gulf of Mexico, St. Vincent National Wildlife Refuge.” 162. Sadly, it is not immune to the modern problem of battling exotics and invasives. “The refuge is managed to preserve, in as natural a state as possible, its highly varied plant and animal communities. Ten separate habitat types have been identified: tidal marsh; freshwater lakes and streams; dunes dominated by live oak/mixed hardwood understory; scrub oaks; relatively pure stands of cabbage palm; and four different slash pine communities, each with its own unique understory species. St. Vincent is an important stop-off point in the Gulf of Mexico region for neo-tropical migratory birds. The island is a haven for endangered and threatened species, including bald eagles, sea turtles, indigo snakes, and gopher tortoises. Wood storks use the refuge during their migration. In addition, the refuge serves as a breeding area for endangered red wolves.” 162. What makes St. Vincent different is the difficulty of getting there and the need for an appointment to visit the area. It has escaped the inevitable footprints of many visitors but not the invasion of unwanted plants.

Florida is enriched with many of these distinct environments. Without budgets to continue programs and management, all of Florida’s parks will be looking at ways to maximize offerings to the public on limited funds. Having to restrict access could prove to be the gentlest way to let the lands rejuvenate. Management activities will remain problematic.

Water Management Districts

The best description of current education attempts by water management districts was an article by Faith Eldse describing North Florida Water Management District educational model that is presented to middle-school students. 163., 164. The model shows effectively how pollution runoff affects Florida’s wetlands and all water resources in the state. The spillover effect harms mammals, birds, fish, reptiles, invertebrates, and plants - it might as well be said

that pollution harms all life. What is clear from these management and education efforts is that Florida is deluged with the cumulative effects of life-style choices by millions of people for generations. The cleanup and behavior modification is enormous. But the glimmer of hope lies with the children. Typically they reject most of their parents ideologies as they grow through adolescence and adopt contrary ideas. While we hope that they retain the best we have to offer, in this case, educating the young seems the only way to deter continued degrading activities and thought patterns.

The Northwest Florida Water Management District is currently implementing the results of a study of storm water treatment affecting Wakulla Springs. Saving this natural jewel will require cooperation from citizens, developers, contractors, landowners, and municipal leadership. No doubt conservative points of view will rebel at the thought of restricted abilities to maximize individual profit potential. The progress made in the coming years to protect the quality of Wakulla Springs water will define the ability of Floridians to put the good of the community and the state above narrow self interests. If it is voted to plunder and consume at the rates Floridians are used to, then there is no hope. ^{165.}

Water management Districts efforts seem appropriate and necessary but are somewhat like the little boy's thumb stuck in the dyke. It is not known how or how long it will take to undo the dumping on the earth. We must simply acknowledge that this is a step in the right direction. ^{166., 167.}

State roadways

The Florida Native Plant Society views development of a transportation-related infrastructure as a frequent cause of habitat destruction and what most threatens Florida's native plant diversity. ^{168.} It is difficult to reconcile the transportation needs of Florida's population growth with habitat loss. While there are not enough funds for the Department of Transportation to keep up the maintenance of asphalt and bridges - the roads and bridges are there to they carry visitors and residents - they are the ribbon that ties us to oil, fortunes and futures. ^{169.}

What happened between the 60s and the 90s in Florida on roadsides was little more than trial and error policy development. Even though flower seeds were planted, and many were not native flower seeds, the intent was never to create sustainable areas. It was not until recently that FDOT purchased and planted Florida native wildflower seeds, because until recently, Florida native wildflower seeds were not available. To date, purchases of native seed from the wildflower seed co-op is subject to a state bid system that awards the purchase to the low bidder. As recent as the last five years, FDOT wildflower seed purchases went to out-of-state vendors who underbid the young, struggling wildflower seed industry in Florida. ^{170.}

Today, roadside management policies are in a state of change. Largely driven by

an economy in dire trouble, Florida roadway stewards are attempting to reduce the frequency of mowing. This will have the additional benefit of allowing wildflowers a chance to survive. A sustainable maintenance plan has not been popular with transportation employees or the public. Small pockets of environmentally friendly communities are beginning to protest the regular destruction of the roadside wildflower habitat and that may bolster change - but it only takes a day, a mower and an employee determined to "get it right" to undo several seasons of establishing the delight of plant diversity on the roadsides. 171.

"Wakulla County has signed on for a pilot project to grow more wildflowers along the roadside by mowing the grass less frequently. If more counties follow suit, Florida could be a carpet of wildflowers by 2013 when the state celebrates the 500th anniversary of the arrival of explorer Ponce de Leon who named us *La Florida* or "flowered land," wrote Gerald Ensley with the Tallahassee Democrat. 172.

The Wakulla County project will be along the 12 miles of U.S. 98 from Newport to Medart. The project originated from residents: In May, DOT-contracted mowers did their usual mowing along that stretch just as wildflowers were in full bloom. It caused an outcry from citizens to county and state officials, spurred by the irony that it was State Wildflower Week in Florida.

Jeff Caster, a Florida Department of Transportation landscape architect, held a meeting with residents and told them about a program that could prevent such carnage in the future. In recent years, the DOT has worked with several counties to reduce mowings and encourage wildflowers. Wildflowers bloom in spring and fall. The DOT mows most roadsides and medians five to seven times a year. But when the number of mowings (as well as the area mowed) is reduced to two or three times a year –such as in early spring and late summer –wildflowers can bloom, drop seed and propagate the next year in the medians and roadsides.

Reducing mowing has been embraced in rural Suwannee, Columbia and Madison counties as well as populous Volusia County (Daytona Beach), which started an annual wildflower festival. Other counties, such as Gadsden County, have inquired about the program.

"We're pushing hard for increased awareness," said Caster. "We want wildflowers to be an iconic symbol of Florida, just like manatees, panthers and palm trees."

Another developing project of interest is the St. Johns River to the Sea Loop trail. Nearly 20 showy native wildflower sites are planned for development and naturally occurring along the trail. Some habitats on U.S. Highway A1A were home to an already naturally diverse colony of wildflowers. This is one of several opportunities state-wide to bring agencies and groups together to develop a sustainable environment for public appreciation. 173.

Federal lands

Over 84 million acres are held in public lands nationally. Over one million acres of federal lands are in Florida. ¹⁷⁴. The government is responsible for a myriad of problems but the negative is outweighed by sequestering the lands from private ownership which inevitably leads to development and economic exploitation along with destruction in some cases. But economic exploitation is unavoidable, even in the park, as visitors are enticed, roadways paved, amenities enhanced. There is a delicate balance between too few and too many visitors.

Federal lands experience pollution and climate changes, too. ¹⁷⁵. They manage the forests with herbicides and pesticides, will clear cut timber and manage the crops at a loss. They will restrict public access and will refuse to permit commercial interests as a matter of policy. Some commercial uses have been allowed - such as worm grubbing - and permits will be allowed for acceptable activities.

While wildflowers are considered important to the natural environment, they do not command a high priority. In ecotourism, prevalent on federal lands, wildflowers provide food, nectar and cover for pollinators and other species. They also attract beneficial insects and reduce erosion. They have a place but they are not "managed" like the forests. Wildflowers are compromised by herbicides and lack pollinators from pesticide applications.

IV. Plant collection policies and access

Look but don't touch! If you are a private collector prepare to be bogged down with delays and paperwork. If you are working with a governmental agency or educational institution, you will have a ready acceptance. Many private landowners are pleased to allow collectors to gather plants on their property but prior permission is absolutely necessary. This is the most favorable recourse for private citizens.

Most protective legislation makes it a violation to purposely pick, uproot or destroy any wild plant and to sell any live or dead wild plant on the plant list. We are often reminded that ignorance is no excuse - you simply have to know the plant and any protections it receives. There is a repeated admonition not to collect wildflowers along the roadside. The most frequent justification is that some property is private and there are the hazards of traffic.

Federal agencies require alliance with an educational institution. They will categorically deny a request from anyone with a commercial interest. If the request comes from a not-for-profit organization it might be considered. If the request comes from a sole proprietor or private citizen it is considered suspect and if not denied outright, will be delayed through stone-walling techniques reminiscent of bureaucracy.

A private citizen will encounter a far different experience gaining permission to

collect plant material than will a government employee or a member of an educational institution. Hearing of the difficulties, in getting access to *Phlox floridana* plants, professionals several times suggested, with a wink, to take plants - with or without permission. That attitude ignored entirely the requirement to document the permission to collect source material.

On state roadways you must literally “know someone” to get access. Without the intervention of Jeff Caster, landscape architect with District III, in the FDOT, and Florida Wildflower Foundation officer, no permission would have been received for state roadway collection of *Phlox floridana* in Florida. Concerns for the ripple effect of having many requests spawned from acquiescing just once, coupled with fears for the safety of the collector along the roadside became insurmountable. One cooperative FDOT employee set up a meeting to view the habitat in question, arrives with four additional employees to observe the collection activity.

State police have trespass and safety policies in place to deal with anyone courageous enough to try to rescue a roadside plant. ¹⁷⁶.

Conservation areas have similar policies throughout Florida. The Institute for Regional conservation policies include:

- Registration to use the online site to apply for permission;
- Physical access to all conservation areas in South Florida is controlled;
- Permits must be obtained before any research can be initiated;

Federal, state, and local laws expressly forbid the collecting of plants or plant specimens in conservation areas without a permit. ¹⁷⁷.

Contradictory attitudes by state agencies none the less regard plants as in peril if left in the hands of private landowners. One might ask if commercialization is any worse for plant species than repeated applications of herbicides and pesticides, as well as the benign introduction of foreign plants for erosion control.

Local county road management

The management practices of the Madison County Roads and Bridges Department highlight what happens in rural counties. Madison County maintains about 673 miles of county roads that are both paved and dirt. A two-man mower-crew can cover the two sides of the 260 miles of paved roadways about every six weeks. ¹⁷⁸.

Citizens frequently complain that it is not often enough. On the dirt roads crews will clear brush and fences if needed, as well as mow. They maintain areas around the airport and landfill sites as well. Herbicides are applied as needed around road signs, stop signs and fence lines. The County uses 40 gallons of a generic Roundup concentrate per year. Mowing labor costs approximately \$8,500 a year. ¹⁷⁹.

Madison is viewed as progressive in roadside management through established policies and efficiency. They also have cooperated with a growing number of landowners who choose to grow wildflowers on the road front footage of their properties. The Road Department will mow, or requires the landowner to mow, an eight-foot border along the asphalt for safety reasons, but they will leave the additional area under the maintenance of the landowner. This single cooperative policy is allowing for roadside beautification throughout the county.

In rural areas, County Roads are maintained separately from State Roads. The FDOT maintains the paved state roads in the county. Their right-of-way is a larger set-back from the road's edge. They have their own schedule of spraying and mowing. Policies vary from District to District and while easy access to officials at the county level is the norm, it becomes increasingly difficult for landowners who want reduced maintenance on their road-front property to receive cooperation.

Area utility companies also get involved with maintenance along county roads given the significant percentage of electric power lines located along roadways. Utilities will bring in equipment and herbicides to keep power lines and poles clear of brush and trees. Their policies refer to outage-response-time as the primary reasons to spray and clear. In the past few years the combination of FDOT and Tri-County Electric have left large swaths of roadside sprayed with herbicide. No effort is made to inform the public about the spraying schedule because the companies insist no threat to human and animal health is posed. 180.

As recently as 2008, Tri-County Electric, in Madison, Jefferson and Taylor Counties began a campaign to consult landowners who prefer not to have the right-of-way sprayed or cut by the utilities. The expectation is that the landowner will take responsibility for the upkeep and contact will be made before the utility does maintenance on its own. This is a new program and warrants oversight by utility customers and landowners.

Private lands

Governmental agencies routinely consider biodiversity threatened if the land is privately held. Landowners simply have the right to develop their property or leave it in conservation. The profit motive seen all over Florida is in play with private lands. But preservation of a region's flora is no more safeguarded with the agencies than with the public. Management policies as well as self-interested decisions are doing severe or serious harm to plant communities. Public lands are simply removed from real estate transactions.

Cities and towns

Whether urban or rural, municipalities engage in repeated maintenance of

postage stamp-sized plots of grass. It seems medians everywhere are maintained by weed-eaters and mowers, operating in dangerous proximity to automobiles. Some native wildflowers, plants and shrubs would do well in medians but it is a hostile environment.

Zoning policies in more urban areas actually specify grass or sod to be placed between curbs and sidewalks. The tolerance for noise and pollution to accomplish the maintenance has reached a level of the absurd.

VI Summary:

All chemical plant control methods should be eliminated from land management policies state-wide immediately. No conditions justify continued poisoning of the air, water, soil and indigenous life in Florida today. Manual and mechanical controls should be developed to substitute for chemical solutions. The cost/benefit of continuing with past policies cannot be reconciled in any budget that includes consideration of the health and welfare of humans, plants and animals.

In many cases invasives are either edible or have potential as bio-fuels. Cogongrass, cattail and kudzu are edible and at the very least many undesirable invasive plants should be harvested, pelletized, and shipped to emerging nations to feed cows, chickens, and pigs. This is an alternative way to increase food supplies in the 21st century.

For Phlox *floridana* the situation is critical. *Floridana* appears weak, without vibrance or dense colonies. It has few bloom stems and fewer ripe seed capsules for propagation by seed. It looks and acts like a species in decline. ¹⁸¹. There are a number of habitat stressors that could be diminishing the species - from soil and water acidity to air pollution - from an intolerance of uranium to carbon monoxide. ¹⁸².

Instead of questioning the genetic purity of species growing in close proximity, ask why Phlox *floridana* has different physical characteristics, in different regions in Florida. When plant identification is as difficult as it is with Phlox *floridana*, what is the benefit of the identification process when disagreement among experts is not uncommon? ^{183., 184.} Why is *floridana's* cousin, *P. pilosa* able to command a robust and indomitable presence where it grows, while *floridana* shows a decline in fertility? Why does *floridana* exhibit totally different growth characteristics in central Florida than in the Panhandle colonies? What regional variation is acceptable? Is it politically expedient to let Phlox *floridana* expire without the benefit of endangered species status? Are the Sandhill plant communities doomed simply because that is where Floridians demand to build and travel? Have we over-developed Florida already?

The world is too much with us, late and soon,
Getting and spending, we lay waste our powers:
Little we see in Nature that is ours;
We have given our hearts away, a sordid boon!
This sea that bares her bosom to the moon;
The winds that will be howling at all hours,
And are up-gathere'd now like sleeping flowers;
For this, for everything, we are out of tune;...

William Wordsworth 185.

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177. The Institute for Regional conservation, www.regionalconservation.org
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180. Note: Personal conversations with employees of Tri-County Electric Cooperative over 8 years in effort to stop periodic herbicidal spraying on Right/of/Way on private property.
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spring was from the Brooksville area), and all three had picogram DNA amounts in the normal range for diploid *P. pilosa*. Does this mean this population couldn't be introgressing with *P. floridana* (as the idea of mixed characteristics would suggest)? Not necessarily. We have good evidence that *P. floridana* is tetraploid and that *P. pilosa* in the area is diploid, so these shouldn't interbreed; but these populations haven't been studied extensively. My lab has found with intensive study that some Phlox species exhibit variation in cytotypes (some narrow endemics even occur in diploid, tetraploid and hexaploid populations [!]), and we certainly know that *P. pilosa* exhibits some tetraploidy elsewhere. So we really can't bank too much on a small amount of data--it is entirely possible that there is unappreciated cytotype variation in these natural populations. I have previously thought the peninsular Phlox material warranted more study, and this may just point to the potential for more detailed population level studies in the future. So, your work helps to highlight the need for further work. There's no doubt that these species are taxonomically challenging and genetically interesting, and more work needs to be done. All of this said, it sounds like your findings have demonstrated they don't have great potential for roadside reintroduction, which is too bad, but perhaps further highlights the conservation concerns.

I would be very interested in your report if you get a chance to send it (I'm sure you're swamped right now just getting everything done). I do think that you've probably found some really interesting populations, and this furthers our information on the species."

Ferguson, C.

182. Botany/plant pathology vs. plant fertility and affects of environmental pollutants. There is a great deal of news coverage and research topics regarding the effects of environmental pollutants on human and animal fertility. There is not so much information being circulated regarding compromised plant fertility issues, except as it relates to the food chain of other life forms. The decline of Phlox floridana may be an indication of this plant's inability to withstand habitat alterations of air, water, soil, and plant community underway in Florida today.

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