December 3 to list:

Hello Torreya folks!

This is Connie Barlow after a long absence.

1. WILD EARTH FORUM:

Attached is a pdf format of the text of the PRO-ASSISTED MIGRATION essay by me and Paul Martin, which will appear in the connectivity issue of WILD EARTH magazine, coming out this month (which will likely be the final issue of Wild Earth), along with the ANTI piece written by Mark Schwartz.

2. TORREYA GUARDIANS WEBSITE:

I finally got up a WEBSITE: WWW.TORREYAGUARDIANS.ORG. Check it out! The rudiments are there now. I needed to get it up by the time Wild Earth went to press because in the Wild Earth essay, we solicit private landowners to offer their natural forested lands for Torreya test plantings, and we also solicit volunteers (especially teachers who can assign monitoring to students through the years) to volunteer in assisted migration of T. tax. And we direct them to the website to learn more about the effort and who to contact (me and Lee Barnes).

3. THINGS TO LOOK FOR ON THE WEBSITE:

A. STANDARDS FOR ASSISTED MIGRATION. In the Wild Earth Forum, there was no room to include the proposed "Standards for Assisted Migration" that we worked on as a group, so I've got a draft up on the website. As I am the webmaster, I can make changes in an instant, so let's still consider that draft in process.

B. LIST OF NAMES ON LIST OF "TORREYA GUARDIANS". Everybody please click on the "Who Are Torreya Guardians?" page and see if you do or do not want your name listed, and how I've got it listed (some as "advisors" from particular botanical gardens, Nature Conservancy "liaisons", academic advisors, etc. As of now, the only names that are hotlinked to ready email correspondence are my own as volunteer webmaster, and Lee Barnes as volunteer coordinator of "Private Lands Initiative." Let me know if you want on, off, want to be hotlinked, how you want to be listed, etc.

C. EFFORTS TO SAVE. Note that on this page of the website, I briefly describe the cuttings/cloning project and results, and try to link pages of the participating botanical gardens.

D. REWILDING NOW! I tried to ensure that this page conveys that only a subset of "Torreya Guardians" support assisted migration, so that even Mark Schwartz will feel like I wants to be associated with this

website.

E. WILD EARTH FORUM IN PDF. Eventually, after Wild Earth is published, I will get the pro (and with Schwartz approval, anti) papers up on the website in pdf.

F. RECRUITING LANDOWNERS PAGE. Bill Alexander at the Biltmore told me that the hurricane season, coupled with an off-year for fruit production, meant that there was no fruit to harvest this fall. So efforts to harvest T. tax seed at the Biltmore and to begin the assisted migration process will begin autumn 2005. So plenty of time to discuss, recruit land-owners, help with easy protocols for citizen naturalists to follow, recruit leagues of students for monitoring, etc.

G. IMPROVING THE WEB PAGES. Lots of work still to be done to make the web pages more useful, and to hotlink to elsewhere on the web. LET ME KNOW OF ANY SUGGESTIONS.

H. SOLICITING DIGITAL PHOTOS. Notice how I have the website photo-rich, and easily viewable even with dial-up access. Those of you who have never seen the grove at the Biltmore can now see it on this website, and those who would like to see how diseased resprouts look in Florida can see that too. I would love to be able to post some photos of groves in California, and anything from the cuttings/cloning project. Please do not send me by email hi-resolution digitals, as it will take me forever to download on my dial-up. Email me in advance so I can request low-res/size or ask you to burn into a CD to mail to me.

I. OTHER PLANT GUARDIAN WEBSITES? Perhaps this will set a trend for ease of communication, and other guardian websites for other plant species will spring up. You will notice on the "Recruiting landowners" page that I end with some photos of Florida yew and speculate that perhaps it might too benefit from assisted migration -- but that would be a whole different (linked) website!

J. ARCHIVAL CORRESPONDENCE? At some point in the future I would like to think about getting some of our archival email correspondence up on this site (with permission of each contributor), and also making it possible to add important new communications. Threaded discussion is beyond my capabilities right now.

K. PLEASE CONSIDER THIS OUR/YOUR WEBSITE! AND HELP ME MAKE IT BETTER!

Together for Torreya,
Connie Barlow

"Why conservationists should not assist migration for Torreya taxifolia."

Mark Schwartz
Department of Environmental Science and Policy
University of California.

July 9, 2004 DRAFT–Please do not cite.

In 1988 I began a long-term study of the Florida Torreya (Torreya taxifolia). I have followed natural populations across the distribution now for more than 15 years and have, from the start, been focused on conservation efforts for this critically endangered coniferous tree. Rob Nicholson and I collected the material from approximately 150 trees that now constitute our ex situ plant material. My studies have been focused on determining whether there is genetic differentiation across the distribution, understanding the magnitude of the population decline, understanding disease factors and predicting the likelihood that the species will recover. Over the course of my studies, I have published 9 peer reviewed research publications on the species.

During this period there have been occasional efforts to transplant the species northward on behalf of conservation. One justification for northward introduction may be that the population has suffered from disease within its current distribution and thus a northward movement may allow it to escape its pathogens. This justification is somewhat weak as current individuals do not appear to be overly susceptible to any particular disease. Further, since the disease agent responsible for the original decline is a matter of conjecture, it is not clear what Florida torreya would be escaping from, and where this would be. Another rationale for northward introduction is that the species likely existed further north at some time in the past, although not during the current 10,000 year interglacial, and that it is more suite to a cooler climate. Range expansion efforts have begun with the assumption that the reason that the species declined to near extinction is at least partially because the species is trapped in a current distribution that is too far south, too warm, and that the species is now unable to disperse further north, where it is more climatically suited. Thus, the reasoning goes, if we assist migration northward, the species is likely to thrive, thereby assuring the persistence of one of this continent's most distinctive conifers. Based on my reading, research and personal experience I am convinced of the merit of this latter argument; Florida torreya is a glacial relic, is quite likely on the edge of its climatic tolerance and would likely thrive in a cooler climate. I am more skeptical of the disease escape arguments as we are, at present, unclear of the culprit and thus not assured of any success in that regard.

Population level global warming research provides predictions of rates of tree species range shifts driven by predicted future climate change and estimates the ability of tree species to migrate to occupy potential new distributions (Iverson et al. 2003). One of the findings is that species with narrow distributions, such as the Florida torreya, are often projected to have future distributions that are wholly disjunct from their current distributions. In other words, global warming can put species in jeopardy as a consequence of disassociating the current distribution of a species from what we currently understand to be its envelope of appropriate climate (Schwartz 1992). If species are limited by climate and fail to migrate, they can go extinct (Hannah et al. 2002, Midgley et al. 2003). Florida torreya, being perceived as a glacial relict, may be the most plausible case of such an outcome that we have in North America. In addition, we are likely to witness more potential cases in the future as climate warms, habitats are fragmented and existing corridors are insufficient to allow species to move northward at a sufficiently rapid rate (Thomas et al. 2004). Unfortunately, these arguments rely on very important assumptions that are not well-justified. We usually do not have empirical data from which to judge whether narrowly distributed species are, as assumed, limited by climate and not other environmental factors (e.g., soils, disturbance regimes, etc).

In the end, I remain opposed to assisted migration in Florida torreya and other cases. Briefly, I believe that assisted migration must be a management option of last resort. My reasoning is simple and based not on the biology of the target species, in this case Florida torreya, but based on conservation concerns of the recipient ecosystem. Humanity has a long record of tinkering with natural ecosystems. Largely these have been successful from the perspective of the human endeavor (e.g., agriculture). This tinkering, however, creates a series of ancillary non-target biological winners and losers. It has been argued that the numeric majority of species introduced have had little effect on ecosystem structure, and most introductions do not cause undue ecological damage (Mack et al. 2000). Nevertheless, those few cases where introduced populations rapidly expand and threaten to endanger other species or damage ecosystems and ecosystem functions cost the US billions of dollars each year (US Congress. 1993, Pimentel et al. 2000). As a consequence, I believe that conservationists should be very reticent about introducing species to novel environments as a conservation measure. Societal recognition of the appropriate reticence toward species introductions has been slow, but is emerging (Mack et al. 2000). If we are to now advocate species introductions on behalf of conservation, conservationists must have clear guidance as to when this action is warranted and when it is not. It is not an action to be taken lightly.

Assisted migration implies that we would not recognize the target species as native to the newly introduced locale. Local

conservationists must then reconcile themselves as recipients of this novel species in their midst. In most cases we use historical records to establish a baseline forest community toward which we manage our current forests. Certainly, we do not want to return to a static, historic view of forests and manage our natural lands as museum pieces, but then again we would like to retain an historical basis for the range of variability in composition of plant communities that are representative of the habitats we are trying to conserve (Landres et al. 1999). Without a baseline we have no target. Without a target every kind of management, including those that lose species from the repertoire of native species, is arguably a success. I fear such success. Intentional introduction of species outside their current distributions in an effort to conserve them detracts from and trivializes this baseline and threatens to discount standards for conservation. From a visceral point of view, one can argue that Florida torreya has no place in any vision of the conservation management of southern Appalachian cove forests.

As a consequence, assisted migration should, and will, result in rancor among conservationists. An anecdote regarding the lakeside daisy (Hymenoxys acaulis var. glabra) serves to illustrate this point (Demauro 1994). This species declined to such low numbers in Illinois (~30 individuals) that cross-fertilization within the Illinois population resulted in no fertile seeds. The breeding system of lakeside daisy includes self-incompatibility alleles that prevent close inbreeding. By the 1980's the entire Illinois population consisted of the same breeding type. Managers sought to recovery this population by planting individuals from a different, non-local, genotype. It happened that the source population for the new alleles was Indiana. Local conservationists were angered that non-native genes were being introduced to "their population" and ripped up the test plants. This was simply a case of introducing new alleles so that a population that existed locally as a native species with an historical record of presence could persist.
The apocryphal story of lakeside daisy aside, species escaping out of control in an issue of concern with assisted migration. The likelihood of Florida torreya expanding out of control is minimal. Florida torreya is a slow growing, shade-tolerant, dioecious tree that requires relatively large canopy gaps for successful recruitment. The species does not spread clonally and the relatively few seeds that trees produce are a favorite food of squirrels. This species carries all of the attributes of a species that will not spread and become a noxious weed. Nevertheless, assisted migration sets a precedent that I feel is risky. Will control assurances and monitoring of problems be followed for future species that are deemed to be in need of assisted migration? I fear not. Thus, I feel that it is critical that we take a hard look at what criteria are to be used to justify assisted migration and develop guidelines for appropriate assisted migration in order to preserve biological diversity.

I share Peter White's dedication to favoring the preservation of biodiversity over the preservation of historical examples of what we perceive as natural communities. But, I think that conservationists must be reticent to advocate ecological tinkering. I would advocate assisted migration for plants only when there is a clearly imminent extinction risk. Some would believe the Florida torreya to be such a case. There are probably fewer than 1000 individuals extant in the current distribution and the numbers are dwindling (Schwartz et al. 2000a). At last count, there is a single known individual that is producing seeds in the wild (personal observation). Aside from this one individual and the approximately 8 seeds it has produced, there has been no observed seedling recruitment for at least 20, and probably 40 years. The situation, indeed, seems critical. Nevertheless, our population modeling suggests the species retains a very high probability of remaining extant for the next 50 years (Schwartz et al. 2000b). Further, there are no current disease symptoms that suggest that an augmentation of the population within its native distribution would not succeed. The germplasm currently housed in botanical gardens of the southeast could be used to augment natural populations. Local population augmentation of Florida torreya has not been adequately explored. All local options for conservation must be exhausted prior to assisted migration. Florida torreya fails this simple criterion.

The reality of the situation, however, bears mentioning. The ownership and movement of plants are very loosely regulated. Anyone who wants to plant Florida torreya wherever they want can, in reality, do so. The species is commercially available in South Carolina. Anyone is free to venture to a dealer, buy the plant, and introduce it to their property. This is perfectly legal. Thus, assisted migration, if it is to be used sparingly and only in conditions where the need is dire, then it is up to the conservation community to begin to now specify and advertise a consensus view on when this may be appropriate. In fact, Florida torreya has already been moved northward in a test planting in northern Georgia. Florida torreya is a native plant of Georgia. There are approximately 30 trees within the native distribution growing in Georgia, all within 200 meters of the Florida state line. Planting the species in northern Georgia, as a species native to the state is somewhat of a stretch; this is a northward expansion of more than 10 times the distribution breadth of the species in its native range. Current efforts suggest moving the species northward further still, across state lines. This is the sort of effort that should begin with a dialogue with conservation organizations from the recipient location. In some cases, the result will be no assisted migration and extinction of species in the wild. Nevertheless, with an ex situ population and time on our hands before we lose the native population, now is the time to fully explore local solutions, that is local population enhancement, before rash action.

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Hello Torreya Group -

This is Connie Barlow. By now you all should have received Mark Schwartz's draft of an anti-assisted-migration essay for the Torreya Forum scheduled for publication in Wild Earth magazine.

It appears that the writing of a solidly pro-assisted-migration essay may have fallen to me. We shall see. Nevertheless, to get things rolling, I could use a little help from the group. Mark, in his draft essay writes:

"As a consequence, I believe that conservationists should be very reticent about introducing species to novel environments as a conservation measure. Societal recognition of the appropriate reticence toward species introductions has been slow, but is emerging (Mack et al. 2000). If we are to now advocate species introductions on behalf of conservation, conservationists must have clear guidance as to when this action is warranted and when it is not. It is not an action to be taken lightly."

I think we all heartily agree on that. So I propose for the advocacy piece (which logically would follow Mark's anti-piece in the Wild Earth Forum, as it truly is a response to his piece, and I would want his essay to remain on-point in its current form) that I/we write a set of criteria for ensuring that such actions would have "clear guidance" and would not "be taken lightly."

Below I propose a set of 11 STANDARDS by which the merits of assisted migration would be evaluated for PLANTS (somebody else would have to work up such a list for fish, cave creatures, etc.) . And, of course, in the pro-essay I would then show how Torreya taxifolia ranks a solid YES for all 11. I look forward to hearing improvements in this list from any of this group, before I send a draft essay to Josh Brown at Wild Earth. And let me know if any of you think you might want to be active enough, and are compatibly on track with the viewpoint, such that you might want to be listed a co-authors in whatever final draft I/we come up with for the Pro piece. Or, if you want to be listed at the end of this piece as forming a founding group of "Plant Guardians" for Torreya taxifolia (see below).

But first, attention to a few terms that I use or introduce within the 11 standards:

* ASSISTED MIGRATION - (I will look to Brian Keel to provide an official definition for this term.)

* CURRENT RANGE - where the plant is found "in the wild" right now.
*
* TARGET RANGE - the chosen destination(s) for "assisted migration."

* HISTORICALLY NATIVE RANGE - where the plant was found within the written or other records of human history.

* NEAR-TIME NATIVE RANGE - immediately before or within the time of the likely human-induced "extinctions of the massive" (Paul Martin's term) on various continents, that is beginning about 40,000 years ago in Australia, about 13,000 years ago in North America. (Note: Paul Martin uses the term near-time, and has published a contributed chapter in a book titled "Extinctions in Near-Time.")

* DEEP-TIME NATIVE RANGE - any time prior to near-time. For Torreya taxifolia, this would include the previous (Sangamon) interglacial period, as well as the Cretaceous evidence of Torreya in the southern Appalachians. (Paul Martin, myself, and many others have long used this term in pretty much this way.)

* PLANT GUARDIANS - A network of individuals who have jointly and publicly stepped forward to advocate and act in behalf of a particular plant, including the possible need for assisted migration. The group may or may not include credentialed botanists, horticulturalists, or other scientists. (Any ideas for a better name for such a group?)
*

PROPOSED STANDARDS FOR DECIDING WHETHER A PLANT (SPECIES, SUBSPECIES, OR ISOLATED POPULATION) WARRANTS ASSISTED MIGRATION

Note: The intention here is to come up with a set of guidelines that conservationists could generally and widely support. Any plant that clearly meets all the thresholds would be ideally suited for assisted migration, and should be able to garner substantial support without causing a rift in the conservation community.

1. The plant is highly THREATENED or ENDANGERED in the wild in its current range.
2. Dispersal is NOT BY WIND, BIRD, OR FLOOD WATERS.
3. The plant has no ability to spread by ROOT RUNNERS.
4. There is no real concern that the plant would become NOXIOUS to other organisms (especially rare or threatened organisms) in the target range, especially given the oversight and precautions established in an implementation plan.
5. A reasonable argument can be made that ECOLOGICAL CHANGE (habitat disruption, introduction of exotics, loss of vital partners, shift in fire regime, etc.) and/or CLIMATE CHANGE is a major cause of its threatened status in its current range.
6. A reasonable argument can be made that the NEAR-TIME RANGE or DEEP-

TIME RANGE of the plant encompassed the target range or at least the kinds of life communities now found in the target range.
7. There is reasonable evidence (e.g., specimens are thriving in botanical gardens or on private lands representative of the target range) that THE PROBLEMS OF CLIMATE OR ECOLOGICAL CHANGE COULD BE LESSENED OR OVERCOME by assisted migration.
8. CORRIDORS adequate for unassisted and timely movement do not currently exist and are not actively being promoted. In the case of plants, unassisted migration through an "adequate" corridor may nevertheless fail to meet the "timely" specification, if advance at a natural and unassisted pace is deemed too slow for population survival or thrival.
9. A GROUP OF PEOPLE ("Plant Guardians") HAS VOLUNTEERED to pursue implementation of assisted migration (or tests preliminary to assisted migration) on PRIVATE LANDS. This group may or may not include recognized botanists or horticulturalists.
10. The group of Plant Guardians has established a means (e.g., a website) by which their plans and results can be PUBLICLY POSTED and through which interested parties can communicate advice, concerns, and offers to assist.
11. The SCIENTIFIC COMMUNITY shows no evidence of taking the initiative and achieving the funding to actively pursue testing and implementation of assisted migration for the plant in question.

MY PERSONAL BIASES ON THE PRO SIDE

1. FOR REWILDING: I have contributed to Wild Earth magazine on the concept of "rewilding" (my 1999 essay, "Rewilding for Evolution," which was a companion piece to Paul Martin's essay in the same issue titled "Bring Back the Elephant!" [meaning, to North America]) Thus, my interest in Torreya taxifolia is not just to keep the species "preserved" in botanical gardens, or through careful management, replantings, fungal spraying, etc. in or near its current range. I want T. tax to not just survive but thrive, and to do so eventually on its own in the wild, without becoming noxious, within suitable target range, and as an integrated member of the full life community. Thus, I want to work toward "rewilding T. tax." "Potted orchards" in widely separated botanical gardens to preserve the full genotypic expression of T. tax in triplicate (as in the case of Torreya taxifolia) may be an excellent step toward this end, but it is not an end in itself.

2. THE ROLE OF NATURALISTS. My other strong personal bias is advocacy for the role of naturalists, academically or otherwise trained, of which I am one. I believe that in the time to come, amateurs as naturalists, who have taken the step to network and communicate as publicly recognized Plant Guardians (or by another name), will become crucial to the survival and thrival of plant biodiversity. Such a role can also provide a core "meaning to life" for many people who otherwise feel disempowered to deal with all the bad news happening environmentally, especially future generations of young folk. Each of

us CAN make a difference, by getting to know fully and intimately with mind and heart just one single species, within the whole frame of the natural world that we love, and then taking action in behalf of that one species.

After all, when I met with Hazel Delcourt this spring she told me that T. tax as the beneficiary of assisted migration was not enough - that virtually every genotypically distinct population of Apalachicola plants disjunct with its species or sibling species in the Appalachians should be targeted for possible reintroduction northward as global warming proceeds - indeed, well in advance of global warming, as it takes so long for forests to establish. In her mind, there is a possibility that a hundred years from now, it will be the genotypes from beeches now limited to pocket refuges in the southeast that will allow beech forests to maintain anywhere south of Canada! Scarey stuff!

Also, I have personally known several prominent scientists who affirm that they are first and foremost naturalists, and then scientists. (Here I am thinking of Edward O. Wilson and Dan Janzen, and probably also Paul Martin. Certainly Aldo Leopold.) There is an important role still for observational skills, inquiry, problem-solving, integrated judgment calls, and passion beyond the strict boundaries of empirical work. And that need will surely increase as the scope of botanical conservation problems increases, while scientific training and funding do not.

Your for Torreya,
Connie Barlow

In a message dated 7/11/04 9:44:54 PM, pmartin@geo.arizona.edu writes:

<< Hi Mark Schwartz,

I gave your draft a quick read. I would not have been able to do that if
it were not written so well - it is reader friendly. You covered ground
totally new to me and you have certainly given deep thought to the Torreya
transplant issue.

My approach is based on the bias that extinctions of large animals in near
time have seriously torqued our ideas of and comprehension of natural nature. Connie covers many of my favorite biases in her book, The Ghosts
of Evolution. which I'm sure you know, . I suppose there are no ways in
which Torreya might have been dispersed by hairy mastodons.

My other question has to do with fire. I think Jackson and Weng missed the boat when they concluded that their new fossil species, Critchfield's spruce, was a victim of near time climatic change. They did not consider what Clovis age people might have done with fire, an idea Dave Burney and Guy Robinson of Fordham believe they can pick out of the New York State pollen records after mastodon extinction. Did fires of spring eliminate the spruce and also blight Torreya?

I should admit early on that I have never seen Torreya either in nature or captivity. Its good to know that transplants exist. I trust you don't view them as pestiferous like Japanese honeysuckle. I did field work years ago in the cloud forest at Rancho del Cielo in the Gomez Farias region.of southern Tamaulipas. Its botanical significance was first appreciated by Byron Harrell who spread the word to Jack Sharp and Royal Shanks of the University of Tennessee. With Taxus, Abies, Pinus and Podocarpus in proximity and endemic Chamaedora palms I can't help but wonder if the mountains of Mexico might also be appropriate habitat for Torreya.

Steve Jackson tells me that the Chihuahua spruce is a closer relative of Critchfield's spruce than he once thought and that it grows with some cloud forest deciduous species in Nuevo Leon, north of Rancho del Cielo.

I'll stop before wandering any more. Suppose Torrey transplants were tried in some private cove habitat. Might we learn important new information?

Best wishes,

Paul S. Martin.

At 03:29 PM 7/9/2004 -0700, you wrote:
>Hi Gang;
>
>OK, here is my first draft. No punches pulled, I think. This really
>outlines the arguments that I set forth earlier.

>
>I am happy to hear comments, good and bad, for revision.
>
>Mark >>

Josh -

Do you want to suggest something to Peter White directly? Would be great to have him involved in some way. Connie

In a message dated 7/11/04 5:10:50 PM, peter.white@unc.edu writes:

<< Connie and Mark:

What to do? Whereas, I could develop the "biodiversity" argument that was contained in our various exchanges of emails, it doesn't differ much
from Mark's "con" article and I don't think it will produce the contrast
or debate that the Journal was expecting. Moving species around is risky and a resort that is accepted after it is proved to be essential.
The issue becomes empirical: does the evidence suggest it is time to move Torreya into the wild north of its present distribution? Where should we move it?

In contrast to my earlier email, others have advanced more extreme arguments which I objected to at the time:

Historic precedence. To me this is unimportant. I would not undertake
the assisted migration for this goal per se.
Overcoming human caused barriers (fire, extinction of animals after the
ice age). I never believed these arguments were true.
Provision of an ecological role to replace hemlock. I wrote that no two
species were ever identical, despite some superficial similarities.

What are my "biodiversity grounds" to move a species? If it was the last resort because of threat to wild populations. How far would I move
it? As small a distance as feasible into a well-chosen habitat with site protection and conservation-driven management. This is the biodiversity argument rather than an argument based on historic precedence, restoration of a pre-human impact situation, or naturalness. It would be aimed at securing future survival of Torreya only. Indeed, we grow Torreya in Chapel Hill for that exact reason. Mark has participated in the ex situ collections that our Garden and other gardens hold. So we have bet hedging--we have these off site

collections, as well as horticultural use of the plant. To shift to a wholesale movement northward would mean that we have good evidence of the impending doom of natural populations.

For me the pro argument hinges on the degree of threat in the wild. This is, in the end, an empirical issue. Mark, who has been closer to this situation than any other biologist, says, empricially, we aren't there yet. That's good enough for me!

Even for species that have to be moved because of impending loss in the
wild, there are additional empirical issues, some of which Mark has discussed in his article. Just because something needs to be moved out of its wild habitat is not a blank check for moving it anywhere.

One solution might be for there to be a single article--Mark could add to his article a consideration of what evidence would be needed for movement and how that movement ought to be carried out. An interesting
subplot here is the degree of climatic warming relative to the physiological envelope of species. We don't know enough about either of
these and in the next 50-100 years conversations will be at war with themselves about whether and how to move species northward.

Peter

Cbtanager@aol.com wrote:

>Hello Torreya folks -
>
>This is Connie Barlow. Attached is an MS Word draft by Mark Schwartz to pair
>with a paper Peter White is writing, both for the Fall issue of Wild Earth
>journal. Mark's is the con statement: "Why Conservationists Should Not Assist
>Migration for Torreya taxifolia." Mark had only a partial list of Torreya
>folks, so I am here sending it to the rest of you, with his cover letter below.
>(Josh: I am sending this to all the folks on the Torreya list I sent you.)
>Good to see this debate put into paper for a wider circle of folks to begin
>reflecting on!
>
>Hi Gang;
>
>OK, here is my first draft. No punches pulled, I think. This really

>outlines the arguments that I set forth earlier.
>
>I am happy to hear comments, good and bad, for revision.
>
>Mark mwschwartz@ucdavis.edu >>

July 19 abrooks@pop900.gsfc.nasa.gov

Dear Connie,

So far I have been a passive reader in the Torreya discussion group, because of my full work schedule. Alas, I won't have the time I would have liked to participate, as I am about to move abroad. I shall provide some comments of Mark Schwartz' paper, your planned paper, and my brief bio before it literally becomes impossible. If any of the members of this group are attending the Society for Conservation Biology meeting this month (hosted by CERC, where I used to work), I'd like to meet them. I plan to raise the issue of assisted migration if any opportunity arises.

Who I am:

BROOKS, L. ANATHEA – Currently Assistant Director of the NASA Goddard Earth Science and Technology Center. Has MS in Conservation Biology (U
Maryland) with thesis on endangered fungi. Has been interested in Torreya taxifolia since learning of it as an undergraduate at UC Berkeley. Has published on the interface of natural science, ethics, and policy. Broad interests in ecology, climate change, symbiosis, conservation and history. Plans to visit locations of Chinese Torreya species. Got the naturalist bug as a child-even worked at natural history museum as curatorial assistant all through high school. Sister
of Leigh Brooks.

Comments and reflections on "Why conservationists should not assist migration for Torreya taxifolia" by Mark Schwartz

On the whole, this is succinct, covers the main points, and is well written.

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I consider the discussion of a pathogenic decline of Tt in its current location to be a red herring. Having read probably every published and
grey literature study, there is no evidence of any pathogenic organism attacking Tt. I would delete these sentences. I agree that TT is a glacial relict which would probably thrive in a cooler climate. The ecological term is "relict", whereas a "relic" is housed in a church

shrine.

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How much empirical data is enough? The Ecological Society of America strongly suggests using other tools in addition to empirical data, such as population modeling, in conservation science. It certainly is worth considering the soil type, slope and aspect at the site of any new populations, should we agree to assist in their creation.

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This is full of philosophical issues that I would like to see someone treat more thoroughly. Should we remain outside observers and simply watch this species die out, studying how it does so? Isn't it paradoxical that an endangered species from one location is an exotic in another? Can science tell us which is the exotic and which is the native species? With the advent of climate change, and the discontinuity of habitat due to our sprawling urban growth, does human kind have a moral responsibility to assist species to migrate? If so, what criteria do we use to select those who can board the Conservation Arc? After hearing Iverson talk about the potential distribution range of tree species, and everything I've heard at NASA about the likelihood of major climate modifications, we need to have this discussion without delay.

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The lakeside daisy is a good example. What would conservationists say to using a GMO (genetically modified organism) technology to save a species with low genetic diversity?

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I "third" the idea of preserving biodiversity rather than historical examples of assemblages. It may not yet have made its way to the popular version of ecology, but strict communities are no longer a useful concept. I do not think that a PVA showing species survival for 50 years is reason for comfort. How much more genetic diversity would be lost at the end of 50 years? I consider the Apalachicola bluffs to be a "refugee camp" for Tt and other species such as Croomia pauciflora and Taxus floridiana. Why put more individuals in the refugee camp when it barely meets the requirements for the species to survive? If one is species-centric in one's thinking, then moving a portion of the gene pool to a more suitable habitat is logical. Looking at the habitats of other Torreya species, or other members of the yew family may give us an idea of the suitable habitat for Tt.

Comments on Connie Barlow's notes towards an argument in favor of assisted migration July 18 draft.

I do not like the definition of Historically Native Range because it is misleading. Perhaps reword: "the range of confirmed specimen locations as evidenced by written or other human records." In any case, in geologic terms the thin sliver of time humans wrote about is next to meaningless. I would look at historical records in conjunction with Holocene fossil evidence.

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I agree that we don't want a world of "ex situ" conservation gardens and captive populations in zoos. Good luck!

L. Anathea Brooks
Conservation Ecologist

Ecology isn't rocket science -- it's much harder.

SENT TO JOSH, PETER WHITE, MARK SCHWARTZ, PAUL MARTIN, STAN SIMPKINS:

Josh -

Wow. check this out powerful email by Anathea Brooks (pasted in below). You/we should keep track of her! Notice three things in particular:

1. She is planning to visit the Torreya species in China!!!! I don't know anybody who has done that!

2. She is less than neutral about putting any more effort into the in-situ effort to recover Torreya in Florida. And she is very articulate about it!

3. She is very pro having a publicly available site for into exchange and posting implementation plans. I think I want to have one set up for Torreya (a website) by the time the fall issue goes to press, so that we can list it in there. Do you know of an organization that might want to host such a page? Because of how easy hotlinks work, there is no need to have one umbrella organization willing to do a myriad of separate plant websites or pages - Torreya taxifolia Guardians, etc. But it seems that this could be a historic case for use of the web, group mind, exclusive of any paper-copy "real" organization (v. The American Chestnut Association), so somebody might really want to do it. Otherwise, I am a seasoned web master and will simply fork over the $15 per year to grab a web address with Torreya in it, and start the site myself!

Together for Torreya,
Connie

P.S. Stan Simpkins, in charge of T. tax for USFWS, is very keen on staying in communication on all this, so he finds these email exchanges very valuable.

In a message dated 7/19/04 9:58:55 AM, abrooks@pop900.gsfc.nasa.gov writes:

Connie, thanks so much!
I want to make sure that I supply you with an accurate and complete answer
to your question. Therefore, please give me a week to get back to you.
And this time I WILL respond! If you do not here from me by the middle of
next week, please send me another e-mail or give me a call at (850) 769-0552 x234.

stan simpkins

	Cbtanager@aol.com	To: Stan_Simpkins@fws.gov
		cc:
	07/20/2004 09:38 AM	Subject: Re: Torreya - Mark Schwartz draft paper

Stan -

I am glad you are still with us. I will paste in below the excellent anti-statement written by Mark Schwartz. Since then, I've also heard from Paul Martin (who will co a pro statement with me), Peter White (who sees both sides), and very strong pro comments from someone who has been passively watching the list but who has a lot to add to the conversation: Anathea Brooks. I will paste in her response onto this same email, right after Mark Schwartz's draft piece. Notice that Anathea plans to visit Torreya species in China! I don't think any of the rest of us have ever had that chance, so it will be important to

stay in touch with her. (Eventually I will send her piece out to the whole

gang, after I wait to collect a few more responses.)

One quick QUESTION FOR YOU: If someone were to chooose to collect T. tax seeds this fall from the grove of thriving trees at the Biltmore Gardens in

Asheville (Bill Alexander there will surely say yes, as he has been despairing having to mow the seedlings planted by squirrels in the lawn!), and if these were then planted solely on privately owned land up in the Appalachians or Cumberland Plateau, would there be no need for permits or other communication with

your office or any other federal agency?

Together for Torreya,
Connie Barlow

In a message dated 7/19/04 10:57:01 AM, Stan_Simpkins@fws.gov writes:

<<
hello Connie,

Have your heard from anyone else on the Mark's draft?
Here in my office, we were not able to open the file that you attached..
Could you please resend? Or, if easier, my fax number is (850) 763-2177.

Although we have provided no input at this time, please continue to keep us
in the loop.
Thanks for all your efforts!

stan simpkins
USFWS, Ecologist
Panama City Field Office >>

I RESENT THE SCHWARTZ DRAFT.

JULY 22, 2004

Hello Torreya Group:

This is Connie Barlow. Below I will paste in the responses I have received thus far to (1) Mark Schwartz's draft essay to serve as the "Anti Assisted Migration for Torreya" position for the Forum in Wild Earth, and (2) the "11 standards" for assisted migration that I also sent to the whole list. But first, here are my thoughts on what will happen next.

At this particular moment, my druthers now are to:

1. ANTI-ASSISTED MIGRATION ESSAY BY MARK SCHWARTZ - I think Mark's draft is terrific, and others agree. He does a superb job of setting forth the facts and interpretations in a way that I feel can serve as foundation for the pro position too. I have forwarded Mark all the comments I received on it, so now Josh Brown at Wild Earth will be working with him on producing a final version.

2. PRO-ASSISTED MIGRATION ESSAY BY CONNIE BARLOW & PAUL MARTIN - Paul Martin and I will coauthor a "Pro" piece for the Wild Earth Forum. Because Mark Schwartz does such a great and balanced job of stating

the arguments (to which I would easily conclude "yes" instead of his "no"), Paul and I don't have to cover the same ground about whether Torreya will likely be invasive, etc. Mark does a good job with that. Rather, Paul and I will tell our version of the story of Torreya from a NEAR-TIME perspective, as Paul and I personally find the Near Time arguments compelling to our case, and we'd like to introduce more near-time thinking into conservation biology. To contemplate assisted migration for future global warming, one absolutely needs to be grounded in a sense of how climate change in the last 18,000 years has already impacted the plants, and the various ways the plants have responded (or not). (In a separate email mailing, I will send you all a rough draft of a section from Paul's forthcoming book on Overkill, in which he powerfully presents a near-time story that links the threads of Torreya, Critchfield Spruce, and Franklinia in America, and Wollemia in Australia.)

3. SIDEBAR "STANDARDS FOR ASSESSING ASSISTED MIGRATION PROPOSALS." I will update the standards list, based on suggestions from you all, send the revised form out to the website once again, all with the aim of having this list (probably in the format of questions) included as a sidebar in the Wild Earth Forum.

4. POSSIBLE SIDEBAR (Hazel Delcourt) - Last fall Hazel Delcourt wrote an introductory essay on this issue with the intent of it being worked on by a bunch of us for eventual publication in Wild Earth. Now that we have the Forum, I and Josh Brown will see if some parts of the long essay can be used as a short sidebar of background material.

5. CREATE A WEBSITE (and announce its existence in the Wild Earth Forum) -
Nudged by the very positive responses by David Jarzen and by Anathea Brooks, I plan to go ahead and spend the $15 to purchase ownership of a website domain name, something like "www.TorreyaGuardians.org". I already am webmaster of my own business site (www.TheGreatStory.org), and I know how easy it is to put up the rudiments of a new site, and make it possible for anybody to send an email to the webmaster. This way, people will be able to find us via Google, and the website address can be published in the Fall issue of Wild Earth. Subject to the approval of various authors, I will at a leisurely pace begin to put up the substantive historical email conversation we have had on this issue, so that anybody can track the arguments. And, importantly, will post who and what is moving forward with IMPLEMENTATON. Note: If anybody out there also knows how to be a webmaster and sees an opportunity to create your own life purpose by volunteering to do this, or to earn some school credit or passage to Heaven, then let me know. I will gladly hand it over to you!

6. BEGIN IMPLEMENTATION! Basically, my personal inclination now is to post the key pro and con arguments on the website, ensure that the Forum for this fall issue of Wild Earth is as good as it can be, and

then just get busy networking with others to move forward with actually beginning the assisted migration of T. tax. into private forest lands that can be carefully monitored in the years and decades to come . All implementation proposals and plans will be reported in advance and discussed on the website. Personally I look forward to heading out to the Biltmore in Asheville this fall, with the approval and timing advice of Bill Alexander there, and to have others in the region join me in actually gathering seeds. We will have to compete with the squirrels, though!

This is a historic shift from the way endangered species have been dealt with in the past. But plants aren't wolves or condors, and T. tax is not tamarisk. And, as we all have experienced in this Torreya group, the web is a fabulous way to build community and co-evolve important ideas and actions. I am deeply attracted to the prospect of using the web to build a community of volunteers and experts, all for the sole purpose of helping Torreya taxifolia (and, perhaps, California Torreya if interest develops there) in whatever ways we deem suitable, and who all talk with one another and mix it up, outside of any established institution, and with no need to become a bona fide organization - and with no need for officers, paperwork, or funding! I anticipate other groups of folks in the future creating their own plant-specific websites, and us all hotlinking into one another.

I anticipate young folk finding an outlet for deeply satisfying activism. Instead of being immobilized by the world's vast scope of environmental stresses and a sense that only experts and those with money or votes or experience can make a difference, they choose to self-educate and work in behalf of just one species of a time. I envision conservation-minded teachers (grade schools as well as college) in the southern Appalachians and Cumberland Plateau volunteering their own implementation plans, and supervising hordes of students in planting, nurturing, and monitoring the plants year by year, decade by decade, and earning school credit by doing so and learning how to write well by posting their results and conclusions!

NOTE TO STAN SIMPKINS at USFWS : I look forward to receiving your answer to the question I emailed you: "If someone were to choose to collect T. tax seeds this fall from the grove of thriving trees at the Biltmore Gardens in Asheville, and if these seeds were then planted solely on privately owned forested land in the southern Appalachians and/or Cumberland Plateau, would there be any need for permits or other communication with your office or any other federal agency?"

In a message dated 7/22/04 2:03:44 PM, Stan_Simpkins@fws.gov writes:

<< Hi Connie, in response to your question below:

It is my understanding that there is no federal nexus for this project.
Therefore for plants, no permits are required. However, if the seeds (or
plants) are being transported across state lines, AND some financial transactions are taking place (including barter) then an interstate commerce permit would be needed. In the absence of financial transactions,
then again, no permits would be required.

I would ask however, that you keep me "in the loop" concerning this project.

Thank you for your interest and efforts. If you have any questions, please
feel free to give me a call.

stan simpkins
USFWS Ecologist
Panama City Field Office
1601 Balboa Ave.
Panama City, Florida 32405
(850) 769-0552 x234 >>

NOTE TO DAVID JARZEN - Excellent that you have some Torreya taxifolia pollen. If you have a chance and have the curiosity, I would be interested to hear from you whether you can distinguish Torreya pollen from Taxodium, Taxus, Cupressus?

NOTE TO ANATHEA BROOKS: Please keep me/us posted on your visit to Torreya in the Chinese wild! I will be very curious to hear whether (as with the sibling balsam fir that chose to go up in altitude rather than latitude and thus speciated, and is now in trouble, on the highest peaks of the Smokies), whether the genus in Asia also shows that it adjusted to climatic warming by moving upslope as well as north -- that is, do you find widely disjunct populations of the same species, or very close sibling species that might have speciated since the last high glacial?

FROM PAUL MARTIN:
In a message dated 7/11/04 9:44:54 PM, pmartin@geo.arizona.edu writes:

<< Hi Mark Schwartz,

I gave your draft a quick read. I would not have been able to do that if
it were not written so well - it is reader friendly. You covered ground

totally new to me and you have certainly given deep thought to the Torreya
transplant issue.

My approach is based on the bias that extinctions of large animals in near
time have seriously torqued our ideas of and comprehension of natural
nature. Connie covers many of my favorite biases in her book, The Ghosts
of Evolution. which I'm sure you know, . I suppose there are no ways in
which Torreya might have been dispersed by hairy mastodons.

My other question has to do with fire. I think Jackson and Weng missed the
boat when they concluded that their new fossil species, Critchfield's
spruce, was a victim of near time climatic change. They did not consider
what Clovis age people might have done with fire, an idea Dave Burney and
Guy Robinson of Fordham believe they can pick out of the New York State
pollen records after mastodon extinction. Did fires of spring eliminate
the spruce and also blight Torreya?

I should admit early on that I have never seen Torreya either in nature or
captivity. Its good to know that transplants exist. I trust you don't
view them as pestiferous like Japanese honeysuckle. I did field work years
ago in the cloud forest at Rancho del Cielo in the Gomez Farias region.of
southern Tamaulipas. Its botanical significance was first appreciated by
Byron Harrell who spread the word to Jack Sharp and Royal Shanks of the
University of Tennessee. With Taxus, Abies, Pinus and Podocarpus in
proximity and endemic Chamaedora palms I can't help but wonder if the
mountains of Mexico might also be appropriate habitat for Torreya.

Steve Jackson tells me that the Chihuahua spruce is a closer relative of
Critchfield's spruce than he once thought and that it grows with some cloud
forest deciduous species in Nuevo Leon, north of Rancho del Cielo.

I'll stop before wandering any more. Suppose Torrey transplants were
tried

in some private cove habitat. Might we learn important new information?

Best wishes,
Paul S. Martin

_____

FROM PETER WHITE:
In a message dated 7/11/04 5:10:50 PM, peter.white@unc.edu writes:

<< Connie and Mark:

What to do? Whereas, I could develop the "biodiversity" argument that was contained in our various exchanges of emails, it doesn't differ much from Mark's "con" article and I don't think it will produce the contrast or debate that the Journal was expecting. Moving species around is risky and a resort that is accepted after it is proved to be essential. The issue becomes empirical: does the evidence suggest it is time to move Torreya into the wild north of its present distribution? Where should we move it?

In contrast to my earlier email, others have advanced more extreme arguments which I objected to at the time:

Historic precedence. To me this is unimportant. I would not undertake the assisted migration for this goal per se. Overcoming human caused barriers (fire, extinction of animals after the ice age). I never believed these arguments were true. Provision of an ecological role to replace hemlock. I wrote that no two species were ever identical, despite some superficial similarities.

What are my "biodiversity grounds" to move a species? If it was the last resort because of threat to wild populations. How far would I move it? As small a distance as feasible into a well-chosen habitat with site protection and conservation-driven management. This is the biodiversity argument rather than an argument based on historic precedence, restoration of a pre-human impact situation, or naturalness. It would be aimed at securing future survival of Torreya only. Indeed, we grow Torreya in Chapel Hill for that exact reason. Mark has participated in the ex situ collections that our Garden and other gardens hold. So we have bet hedging--we have these off site collections, as well as horticultural use of the plant. To shift to a wholesale movement northward would mean that we have good evidence of the impending doom of natural populations.

For me the pro argument hinges on the degree of threat in the wild. This is, in the end, an empirical issue. Mark, who has been closer to this situation than any other biologist, says, empricially, we aren't there yet. That's good enough for me!

Even for species that have to be moved because of impending loss in the wild, there are additional empirical issues, some of which Mark has discussed in his article. Just because something needs to be moved out of its wild habitat is not a blank check for moving it anywhere.

One solution might be for there to be a single article--Mark could add to his article a consideration of what evidence would be needed for movement and how that movement ought to be carried out. An interesting subplot here is the degree of climatic warming relative to the physiological envelope of species. We don't know enough about either of these and in the next 50-100 years conversations will be at war with themselves about whether and how to move species northward.

Peter

ANOTHER FROM PETER WHITE:

In a message dated 7/17/04 5:38:22 PM, Peter.White@unc.edu writes:

<< Hi, Connie,

This continues to be interesting. I like your general notion of establishing criteria for assisted migration. If I had written the "pro" piece it would be similar--that is conditions under which we SHOULD do assisted migration. By only ambivalence is whether it is time yet to move Torreya. As I wrote before this becomes an empirical question--is the assisted movement needed for Torreya because it is otherwise going to go extinct? Mark thinks, not yet. But even Mark (and I) have distributed Torreya to gardens outside its natural range as a hedge against extinction. Odd that I agree with Mark and, in a sense, with you (though you will see some comments below on your specific criteria). While I could have written a set of criteria that showed I was "pro" assisted migration when it was needed, I would've been quite wishywashy at this pt on Torreya and you will be a much more effective counterpoint to Mark's article.

Some comments on your 11 principles and other comments (many of which will sound familiar to you):

Why is it important the plant not be spread by wind, water, or birds? Perhaps what you mean is that those species don't need assistance--but given habitat fragmenation and lack of corridors (and if climate change is rapid) they might need assisted migration. Ditto, if the bird species they depend on has delcined (the passenger pigeon is already gone). But the real issue is the rate of natural dispersal vs. the rate of environmental change. Even if the species disperses by natural means, it might not be able to keep up with change.

Runners: I think that you are trying to avoid the weedy species with this criterion? But runner species do differ in aggressiveness. For

instance, Linnaea borealis, Euonymus obovatus, and Pachysandra procumbens are all "runner" species that are not aggressive. And many many plants are perennial by underground rhizomes (as opposed to above ground). So, to me the issue is risk assessment of invasive and agressive behavior and not being a runner species.

Scientists doing nothing. Well, I think that we ought to purposefully blur the line between scientists and non-scientists and that some scientists might want to be guardians in your sense. Also the demands of rigorous science are such (and the funding available low enough) that I doubt that science ill ever do the job of large scale assisted migration...they might inform or inspire it or do the experimental effort that tests the idea...but I don't think conservation managers should expect scientists to be the most important movers.

CLIMATE CHANGE: To me this is the real rub in the whole matter. Torreya is just one case. In the next 50-100 years (beyond most of our lifespans, I am afraid), conservationists will increasingly debate what to do. The degree of change and impeding loss will be a trigger that will push folks over the edge to assisted migration, so it would be very good to point out that, to avoid a bunch of "folks running around like chickens with their heads cut off", the climate change driver will be a key variable. I hope if that degree of change is drastic, that folks will be grabbing what they can and moving it into deep cold strorage (for later use) or trying to get it established northward. I am a
pluralist in the sense, that I wouldn't also mind having some "canaries in cages"--places we do not manipulate in order to better understand the natural changes (a kind of control).

I hope you will include the biodiversity argurment based on rate of climate change and degree of impending loss. As I've argued before, I wouldn't require deep time or recent ecological range if I thought that moving it north were the only way for it to survive.

SO, let me say a few things about range:
--New climates may not be equivalent to past climates in all details, so climatic fit is important only in so far as the species will do well. It doesn't matter that it was there geographically in the past or that the climate existed before.

--Climatic envelops may be so far out of joint that the species can be moved to a place that it never would have been before.

--Current distribution does not guarantee that we know the species optimum performance conditions. Some species may actually do better with warming in the same places they are growing now.

Peter S. White email: pswhite@unc.edu
Department of Biology -- Campus Box 3280

University of North Carolina at Chapel Hill

_____

FROM MARK SCHWARTZ:
In a message dated 7/17/04 2:32:49 PM, mwschwartz@ucdavis.edu writes:

<< Connie;

Good going sticking to the pro piece. You can do me a favor on it. Please, please, please say that you endorse the idea of doing all that we can for in situ conservation. I know that we have not given this as good a shot as we can. I am simply not in a position where I can oversee, coordinate or run an in situ program. I am hoping that this may
help stimulate some additional in situ efforts, regardless of the assisted migration issue.

Your arguments seem good. I think rule # 2 may be a bit too restrictive
to be general. It seems like there certainly will be species imperiled by global warming and not doing anything because they have such a dispersal syndrome would be overly conservative. Perhaps these could be
stated as "risk factors" (along with root spreading) and that the more risk factors a species carries, the more desperate the need must be and
the more vigilant the rewilders should be. Just a thought.

Best wishes,
Mark >>

_____

FROM ANATHEA BROOKS
July 19 abrooks@pop900.gsfc.nasa.gov

Dear Connie,

So far I have been a passive reader in the Torreya discussion group, because of my full work schedule. Alas, I won't have the time I would have liked to participate, as I am about to move abroad. I shall provide some comments of Mark Schwartz' paper, your planned paper, and my brief bio before it literally becomes impossible. If any of the members of this group are attending the Society for Conservation Biology meeting this month (hosted by CERC, where I used to work), I'd like to meet them. I plan to raise the issue of assisted migration if any opportunity arises.

Who I am:

BROOKS, L. ANATHEA - Currently Assistant Director of the NASA Goddard Earth Science and Technology Center. Has MS in Conservation Biology (U
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How much empirical data is enough? The Ecological Society of America strongly suggests using other tools in addition to empirical data, such as population modeling, in conservation science. It certainly is worth considering the soil type, slope and aspect at the site of any new populations, should we agree to assist in their creation.

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I "third" the idea of preserving biodiversity rather than historical examples of assemblages. It may not yet have made its way to the popular version of ecology, but strict communities are no longer a useful concept. I do not think that a PVA showing species survival for 50 years is reason for comfort. How much more genetic diversity would be lost at the end of 50 years? I consider the Apalachicola bluffs to be a "refugee camp" for Tt and other species such as Croomia pauciflora and Taxus floridiana. Why put more individuals in the refugee camp when it barely meets the requirements for the species to survive? If one is species-centric in one's thinking, then moving a portion of the gene pool to a more suitable habitat is logical. Looking at the habitats of other Torreya species, or other members of the yew family may give us an idea of the suitable habitat for Tt.

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I agree that we don't want a world of "ex situ" conservation gardens and captive populations in zoos. Good luck!

L. Anathea Brooks
Conservation Ecologist

Ecology isn't rocket science -- it's much harder.
_____

FROM DAVID JARZEN:
 In a message dated 7/21/04 2:21:36 PM, dmj@flmnh.ufl.edu writes:

<< Dear Connie;

What marvelous work you are doing toward assisting Torreya in its need to
"get back home". I fully agree with you (and others) that we need to move
ahead on this project, and to get articles out to the public for their general information. Your proposal for an item Wild Earth seems appropriate
and timely.

I probably can not add significantly to the paper, so co-authorship is unlikely, however I truly would like to be listed at the end of the paper
as a "Plant Guardian for Torreya
taxifolia", I will supply whatever support you think I may be able to offer.

I have collected the pollen of T. tax. from preserved herbarium voucher
sheets from the Philadelphia Academy of Natural Sciences. Don't need to
use this for anything right now, but when questions of the occurrence of T.
tax. pollen in the fossil record are asked, we will have pollen for light
and scanning microscopy use. I would suspect that Paul Martin also has a
collection of the pollen.

Thank you Connie for the leg work, the research, the thoughts and the proposals you are assembling for all of us. Keep going!

All the very best,

David Jarzen>>

DRAFT SECTION BY PAUL MARTIN TO APPEAR IN HIS BOOK

Hi Connie, I'm trying to attach a few pages of draft from my book to show where Australian and American plant extinctions appear to be going. This is unedited for the Torreya project but what I'm thinking. Please let me know soon if it is wide of the mark. Best, Paul

In particular, the midden analysis added considerable support to a key argument in favor of the overkill theory. As the list of tree and shrub species known from middens accumulated, it became blatantly obvious that plants, unlike large terrestrial animals, had not experienced a wave of extinctions in the late Quaternary (Betancourt and others 1990). The packrat midden record from work done in the Desert Lab and on the main campus by Owen Davis and his team yielded nothing in the way of extinctions. In this regard the near time fossil record of plants in arid regions is similar to that of beetles (Coope 1995). With rare exceptions, such as scarab (dung) beetles which depend on megafauna, whatever forced extinctions of large animals in America and Eurasia spared virtually all other beetles and vascular plants, as we will see. As shown by major range changes in near time, both plants and beetles are sensitive to climatic change, but neither group suffered appreciable near time extinction. Presumably, then, neither plants of arid America nor beetles other than scarabs were vulnerable to whatever caused the extinctions of two-thirds of North America's large mammals. I thought this supported my view, which raised considerable dust in certain circles, that climate change had nothing to do with near time extinctions.

Then ecologists Steve Jackson and Chengyu Weng (1999) raised more dust. They described a new species of an extinct spruce, Picea critchfieldii*, whose distinctive long cones are found commonly in Tunica Bayou on the east side of the Mississippi River in Louisiana. They also

occur in Tennessee. It was fossils of spruce or spruce pollen at low elevations in the southern states, far south of the normal range of spruce
at present that Ed Deevey reported in attacking the popular view of field
ecologists in the 1950s (my major professor Charles Walker was one) that
there had been little change in climate outside the ice margin during glacial times. The famous plant community ecologist E Lucy Braun, an expert on the eastern deciduous forest, concluded that forest trees, spruce
included, had not been obliged to move south appreciably during times of
glacial ice advance.

From fossil records ecologist Ed Deevey of Yale and Herb Wright of the
University of Minnesota and their students began to show otherwise. The
discovery of spruce cones in deposits of Mississippi loess was of great
interest for paleoclimatic reasons. Palynologists began drawing vegetation
maps of the last glacial maximum and its aftermath. Lucy Braun and the
Ohio naturalists had not got their history right. Was it my turn next? Could an extinction of a spruce tree around the time of the YD (and
the arrival of Clovis hunters) reveal something the ice core records had
missed, a truly lethal warm up at the end of the last glaciation that eliminated a spruce tree before it could return north to cool country? The description of a new species of fossil spruce from the late Pleistocene
challenged the view that the plant world totally escaped extinction in near
time, as the overkill model implied. Extinction of Critchfield's spruce by
"overchop" certainly seemed out of the question. Prehistoric Clovis hunt[ers would not be able to cut down trees [[comprable to]] in the way I
proposed they or their ancestors speared and killede mammoths.
Picea critchfieldii Jackson and Weng, named for the conifer expert, William
Critchfield, is characterized by a cone of unusual size. Its late Quaternary fossils, especially cones, are found in Louisiana and Tennessee.
Jackson and Weng have attributed its extinction to late glacial climatic
change and those who believe that some climatic impact accounts for

megafaunal extinction (Grayson 2001) soon rubbed my nose in this new exception to my long-standing claim that no North American trees, shrubs, or herbs ("megaflora") are known to have accompanied the late Quaternary mammoths and other megafauna to their doom.

To be sure the extinction of just one species of tree, presumably coeval with large animal extinction, hardly seemed to be a major strike against the overkill model. Past climate changes, as plotted from the Greenland ice cores (Alley 2000), did not indicate any unusually sudden or extremely severe change when prehistoric large mammals, now joined by a species of spruce tree, lost their footing in the environmental kaleidoscope of the late Quaternary in North America. The ice core record shows remarkable swings from cold to extremely cold and a glance down section reveals many repetitions of these swings, some accompanied by flocks of ice bergs from Hudson's Bay. The ice core record extends over [over] hundreds of thousands of years. No ice core interpreters, to my knowledge, have picked out the Younger Dryas signal in the ice core record and expostulated: "Eureka!" "Here we have that terrible cold snap that did in the megafauna of the Americas!" But what else besides a climatic crisis of some sort as promoted by Jackson and Weng 1999 could account for the loss of Critchfield's spruce?

But wait! Is it certain that Clovis people could have had nothing to do with the extinction of a coniferous tree? Obviously the new spruce species had survived many previous climatic changes. Along with mammoths and mastodons might Critchfield's spruce itself have been the victim of human activity? Of course no one had considered such an outlandish possibility. Nevertheless it should not surprise us if on occasion the overkill vortex drew in a plant species. After sleeping on this problem, clarified by Steve Jackson's visits and sharpened by consulting books on wildfire by Steve Pyne, I thought I saw an answer. Steve Jackson and

Chengyu Weng had said nothing about the anthropogenic possibilities. For example, when subjected to climatic stress, including drought, in an episode of late glacial climatic change, a species of limited range such as Critchfield's spruce would have been especially vulnerable to a new regime of vernal fires. Summer, not spring, is the normal season for thunder-storms which can ignite the forest. Out-of-season ignitions, the anthropogenic fires of spring, would not be expected until human arrival (Kay and Simmons 2002). The mammoth hunters may have used fire and fire drives to harass elephants and other potential prey (see G. Haynes 2003) or simply to burn the woods, like Thoreau in Concord, for the thrill of it. . Recent fossil pollen work by Guy Robinson (2003) in eastern New York State, where mastodon and stag-moose extinction preceded the disappearance of the spores of a dung fungus, ended in a sharp rise in particulate charcoal. Human-caused fires in the spring season when natural ignitions by lightening, presumably in a dry year, would favor fire-tolerant trees and shrubs and flash through the dry needles and twigs of more flammable trees; such as spruce. This is one way to account the post extinction burst in charcoal seen in Robinson's pollen diagrams.

Could there be other victims of anthropogenic fires? A relic conifer, Torreya, barely survives in a natural population only on the banks of the Apalachicola River in northern Florida (Barlow 2000), suggesting a history similar to that of Critchfield's spruce. Torreya is all but extinct in nature. Had the tree not been transplanted to the north to the Biltmore Estate in Wilmington, North Carolina, where it is thriving, it might well be doomed. Another endemic, Franklinia, also described from Florida by the early naturalist and plant collector, John Bartram, is now extinct in the wild. It thrives in cultivation in the mid-Atlantic states. I would add Torreya and Franklinia to the list with Critchfield's spruce and implicate

human disturbance of the habitat by the one powerful method available to Clovis hunters, wildfire, as an alternative to the climate-change model. Australia provides another example of the potential of anthropogenic fires to force plant extinctions. In Australia, where humans have been setting fires for tens of thousands of years, much longer than in the Western Hemisphere, extinctions of southern hemisphere conifers that occurred around 40,000 years ago are attributed to human ignitions (Kershaw in Martin and Klein 1984).

I first met Peter Kershaw in New Zealand at an INQUA (International Quaternary Association) Congress. He and his colleagues write: "In relation to megafauna, this environmental reconstruction for Australia makes it unlikely that either climate or habitat change was the primary cause of Late Pleistocene extinction. Consequently, we consider that the most likely explanation is direct killing by people, a conclusion supported by the evidence for the demise of megafauna in the late Holocene of New Zealand" (Kershaw and others 2000). Direct killing need not all be by clubs or spears. It may also involve wildfire.

According to Woodford (2000), anthropogenic fires are suspected of playing a large part in the virtual extinction of a described new genus of Australian conifer, the Wollemi pine (Wollemia nobilis). Recently discovered in Wollemi National Park northwest of Sydney, the tree barely survives in two tiny populations totaling less than 50 individuals. Fossil records based on their distinctive pollen type indicate that ancestors of Wollemi pines shrank in range two to three million years ago. The surviving trees narrowly escaped fire storms and their own extinction in the shelter of deep canyons tucked into the mountains northwest of Sydney (Woodford 2000). Propagation of seed stock has been achieved and seedling trees are being widely distributed.

Peter Kershaw studied the fossil pollen record at Lynch's Crater in the Atherton Tablelands of eastern Queensland, a patch of rainforest. His

record reveals extinction of late Quaternary conifers, the genus Dacrydium,
two species of Nothofagus, Phyllocladus and a major reduction in the pollen
record of Araucaria (Kershaw in Martin and Klein 1984). Kershaw suspected
that firestorms ignited by the first Australians played a major role in
both reducing habitat for certain rainforest trees and in expanding the
range of fire-adapted sclerophyll woodlands of eucalyptus. One result was
extirpations and extinctions of rainforest trees.

July 25 from Brian Keel

Hello Connie,
Here are my comments on some of the 10 questions you sent to the Torreya Group. I would have sent them directly to the listserve but I do not have the listserve address. Please forward to the listserve and send me its address.

Thanks.
Brian

Torreya Group
Here are answers to some of the 10 questions from Connie Barlow.
I am a new member of the Torreya Group so please disregard any of my comments that are irrelevant or answer questions that have already been answered.

Brian Keel

1. MIGHT TORREYA TAXIFOLIA HELP TAKE THE ECOLOGICAL PLACE OF EASTERN HEMLOCK, IF THE LATTER IS WIDELY EXTIRPATED FROM THE SOUTHERN APPALACHIANS BY THE WOOLLY ADELGID AND/OR CLIMATE WARMING?

I assume that by the southern Appalachians is meant the northwest Georgia, Tennessee and North Carolina area. Trying to introduce Torrya into this area may be difficult if the plantings near the Biltmore Estate are experiencing mortality from pathogens, and especially if the pathogens are the same that are top killing the Torreya in Florida. Any pathogen that can survive the lowest temperatures experienced in the vicinity of the Biltmore Estate will most likely be present from that part of the country south. Under these circumstances maintaining long term population viability in this part of the country may be difficult.

As far as Torreya taking the ecological place of hemlock is concerned,

hemlock grows to a considerably larger size than Torreya. Hemlock can be a dominant in the forest community (dominant position of its crown in the forest canopy) and for Torreya to take the place of hemlock in an overdstory position will not be possible. However, Torreya might take the ecological place of hemlock in the understory in a forest environment. Torreya is shade tolerant but I suspect that like most, if not all, shade tolerant trees including hemlock, will grow well in full sunlight (shade tolerance does not imply a liking for shade but rather a tolerance or ability to survive in the shade), although Torreya may do very well in the shade. Torreya may be like most eastern shade tolerant conifers in that it may have difficulty competing with hardwoods on good sites because the hardwoods are more efficient users of minerals and nutrients and can attain more rapid growth on good sites. The shade tolerant conifers are able to persist in the shade of the hardwoods but do not grow very fast in these locations. Micro-site selection for planting Torreya will be critical not only for survival but also for the attainment and maintenance of rapid enough growth to be worth the effort of planting for the ecological purpose for which it is needed. A vigorous tree tends to be more resistant to environmental stressors, insects pests and diseases. For the past seven years I have been the reforestation forester on Green Mountain National Forest in Vermont and have first hand experience with planting shade tolerant softwood trees, including hemlock, on sites with varying degrees of shade, nutrient capitol and hardwood competition. In general I have found that for best growth and survival it is advantageous to give the softwoods as much sun as possible and then deal with hardwood competition as necessary. With the planting of Torreya this may or may not be the best strategy.

I suspect a predator or pathogen of the hemlock woolly adelgid will eventually be found, although many hemlock will have died by then. I don't believe hemlock will be totally lost from the eastern forests as a result of the adelgid, however with the intentional or unintentional movement of all sorts of organisms by humans we can not ever say that any plant, animal or other organism in the United States will never be threatened in the future by an alien species; hemlock could, in the future, again be threatened by some other organism. I agree with the comments of Ron Nicholson and Mark Schwartz as mentioned in Connie Barlow's comments following her question # 2 that there is little chance of Torreya becoming an invasive in any location in which it is planted, therefore, the planting of Torreya would probably do more good than harm by adding more diversity to the eastern forests.

The biggest problem I see for planting Torreya anywhere are the pathogens. Do the pathogens killing Torreya require an alternate host or do they use other trees as primary hosts? Can the pathogens be transmitted to other species not now threatened by the pathogens if Torreya is migrated north? Any propagules (seeds or cuttings) need to be surface sterilized before they are moved north for the greatest threat to the migration of Torreya is the pathogens. Again I must ask

the question, can the pathogens effecting Torreya, infect and kill other species? If it has not been done already, before Torreya is moved anywhere, a plant pathologist familiar with the pathogens of Torreya needs to be consulted.

Hemlock grows as far north as southern Ontario, New Brunswick, Nova Scotia and northeastern Minnesota. What is the northern limit of Torreya, in other words, is it known what the minimum temperature is that Torreya can withstand?

5. SHOULD WE ALSO BE TALKING ABOUT FLORIDA YEW?

Does the Florida yew have site requirements similar to Torreya, are the two species forest associates? Torreya is able to withstand temperatures in the neighborhood of minus 16 degrees F. What is the minimum temperature the Florida Yew can withstand? Is there evidence that the Florida yew ever grew anywhere else other than the Apalachicola? If the two species can be combined in a planting project (both migrated together) it might be cost effective rather than working with each species separately.

8. IS THE MODERN HUMAN EFFECT ON GREENHOUSE GASES A BIGGER CAUSE OF T.TAX ENDANGERMENT THAN HAVE BEEN THE PALEOINDIAN EFFECTS THAT ELIMINATED SOME SEED DISPERSERS (TORTOISES, though squirrels still remain) AND/OR PALEOINDIAN ESCALATION OF WILDFIRES?

The combination of pathogens and global environmental change could very well become a greater threat to Torreya than the effects of the paleoindians. Torreya survived the paleoindians elimination of its seed disperses, surviving until now in a few isolated sites and would probably continue to survive at those sites for the foreseeable future as long as the habitat was not destroyed except for the pathogens and climate change. But now that Torreya is being hit by pathogens and the climate is changing Torreya my not survive for very long.

9. IS IT POSSIBLE TO DISCUSS T. TAX AND ADVOCATE "ASSISTED MIGRATION" OF THIS ONE SPECIES WITHOUT TALKING ABOUT THE POSSIBLE NEED FOR WHOLESCALE MOVEMENT, BY HUMANS, OF FOREST ECOSYSTEMS AS THE CLIMATE RAMPS UP?

The best information indicates that plant communities will not migrate, and have not migrated in the past, as intact groups of species, and that plant communities in the future may not resemble the communities of the past or present (Davis 1983, Kullman 2002). Species will migrate, more or less, on their own because individual species will respond differently to climate change (Davis 1989). The wholesale movement of ecosystems will most likely not be humanly

possible. The best approach to the climate change/plant migration problem may be to work with those individual species such as Torreya, or specific communities of species that require unique habitats, such as wetland plants, and assist their migration. The biggest challenges will be in how far and how fast to migrate a particular species or community of plants to track the changing climate, and to select the new population sites. Each species or group of associated species will need to be taken on a case-by-case basis. For my doctoral dissertation I am working on these specific problems.

Davis, M. B. 1983. Quaternary history of deciduous forests of eastern North America and Europe. Ann. Missouri Bot. Gard. 70:550-563.

Davis, M. B. 1989. Lags in vegetation response to greenhouse warming. Climate Change 15:75-82

Kullman, L. 2002. Rapid recent range-margin rise of tree and shrub species in the Swedish Scandes. Journal of Ecology 90:68-77.

10. IS THE CORRIDOR CONCEPT OF NATURAL MIGRATION INADEQUATE FOR THE PLANTS IN OUR DECIDUOUS FORESTS?

In highly fragmented areas of the globe such as the eastern seaboard of the United States corridors may not be possible to construct. Corridors also allow the movement of alien invasive species. Farther inland along the backbone of the Appalachian Mountains such as along the Appalachian Trail a corridor might be possible. This might work for Torreya once it is migrated into the southern Appalachians.

In conclusion I see the threat of pathogens to Torreya a greater threat than climate change at the present time. I am familiar with the process of producing a blight resistant American chestnut (I worked with The American Chestnut Foundation to establish a small research plantation on Green Mountain National Forest; the plantation is a very small part of the work being done to bring back the chestnut) so I am familiar with the cost in time and money to restore a tree to the eastern forests. The American chestnut is a charismatic tree and its restoration will have great economical benefits; unfortunately Torreya does not fit either of these categories. Unless the pathogen problem is solved (and not being familiar with the work being done with Torreya I don't know how close to solving the pathogen problem is) successful assisted migration of Torreya and the ecological benefit of Torreya to the forest environment will be severely compromised.

RESPONSE TO BRIAN KEEL FROM CONNIE BARLOW

Brian -

Thanks for taking the time to respond to my earlier email to all. I hadn't realized that you knew so much about Torreya specifically. Great! Only 3 people signed up on the listserve, so I send emails in clumps to about the 30 folks in this group individually. That's why i wait till I have a group to send and then paste them all into a single email. Also, I was unaware of your work in reforestation. Below is the only biography I have of you, which I constructed from previous emails. could you please flesh it out?

Very useful ruminations you gave on hemlock, and what shade tolerance means in trees practically. Your questtion on what is the northern limit of Torreya is a good one. I am not sure whether Arnold Arboretum has no outdoor T. tax because of experience that it would not survive outdoors there, or whether they simply assumed that "Florida torreya" could not possibly grow that far north. I am not sure, frankly, whether anyone has ever tried to grow it outdoors north of Asheville.

For Torreya,
Connie Barlow

AL TRAVERSE WILL PLANT T. TAX, PENNSYLVANIA

Al -

I've got you on the list of willing private planters of T. tax. And thank you for all the ruminations!

Connie

On 10/13/04 8:34 PM, "Al Traverse" <atraverse@earthlink.net> wrote:

> Dear Connie and Paul:
>
> Thanks for sending me the information re Torreya taxifolia, which I have
> seen in botanical gardens [including at Biltmore], but about which I knew
> relatively little before.
>
> My reaction about the plant itself is that if it has gone in the wild, in my
> lifetime, to near extinction from hundreds of thousands of specimens, global
> warming is hardly likely to have been the cause. Much more probable is
> acute sensitivity to (in a broad sense) pollutants-the causes of
> "Waldsterben" in Europe and of sickly trees all over the Adirondacks, for
> example-acid rain, perhaps also some particular compound to which T.

tax. is
> sensitive-or even an animal or fungal agent which attacks this
> conifer -perhaps because weakened by other factors.
>
> Having said that, as to my reaction to "assisted migration": I am
VERY
> interested in preventing the extinction of ANY tree (shrub, vine,
> herb.....). I find it very heartening that Franklinia is definitely
not
> extinct and even exists in hundreds of places far from its native
habitat.
> (At the Holden Arboretum near Cleveland, for example-they have some
> dandies.) Unfortunately on my private arboretum numerous attempts
to get a
> specimen of F. a. to survive have so far been unsuccessful-probably
means
> that the taxon is not very tough-certainly doesn't grow like a weed.
I have
> dozens of other taxa that for either environmental or meteorological
reasons
> are out of their element but are doing just fine [Cryptomeria,
Taxodium,
> Paulownia, Passiflora, to name just a few]. It reminds me a little
of
> Diospyros virginiana, which I have going, but have had big trouble
> propagating from seed. It's no wonder it has been unable to
repopulate
> itself when PA stopped cutting all trees for charcoal a hundred and
twenty
> years ago.
>
> So, yes, I would very much like to try some T. tax. plants and will
give
> them good attention in several of my various environments-
streamside, forest
> edge, swamp edge, hillside, etc.
>
> However, as to "assisted migration" as such: This seems to me [I'm
sorry]
> to be very quixotic. "Waldsterben," which on close examination
means not
> what the word says but the selective death of certain species, is a
part of
> nature. The world forest problem is the ELIMINATION OF FOREST LAND,
not the
> changing composition of the forests, caused by pollutants and
warming.
>
> I belong to the American Chestnut Foundation because what they are
doing is

> interesting, and I love all species of Castanea. However, I believe that
> encouraging the probable natural development of resistant American
> chestnuts-resistant to the blight, that is, would be preferable to what they
> are doing: back-crossing to C. mollis, to produce a resistant hybrid with
> most characters allegedly like C. dentata but with C. mollis resistance to
> the blight. Natural recovery from some sort of pest or disease apparently
> happened to Tsuga canadensis some 5000 yrs. ago, because its pollen
> disappeared utterly from the pollen record for a long time, and then
> gradually reappeared.
>
> We own property in the Adirondacks, where Acer spp. are replacing Fagus and
> Betula at an alarming rate, as the latter die from "Waldsterben." as the
> German foresters would say. The acid rain is very bad up there-our lake is
> the most acid lake in N. Amer. In the German forests being attacked, maples
> and other broad-leaved trees are replacing conifers, so that the Black
> Forest will no longer be Schwarz. The forests are not dying, except where
> replaced by shopping malls, factories and golf courses. Their composition
> is changing. That doesn't bother me at all, whereas the replacement of
> forests by non-forest does. In the Adirondacks the lichens and bryophytes
> are being hit by pollutants too. There will still be lichens and mosses up
> there-different species. I am only greatly moved by all of this when it
> means that the poisoning is getting to the point where all life is
> endangered. The changing composition of the biosphere per se does not
> greatly exercise me. If your efforts help to secure the survival of T. rex.
> as a species, that is marvelous, and I am all for it. Whether it ever
> becomes established again as a significant element of American forests
> anywhere doesn't move me very much. I am not opposed to such a notion, but
> it doesn't seem very important.
>

> The biggest biological problem in the world is none of the above,
but human
> over-population, and nobody except the marvelous Chinese ever
mentions it.
> In fact, for religious reasons, the American government will not
cooperate
> in its foreign policy with family-planning, or birthrate reduction
programs,
> even in the most over-populated places.
>
> I greatly appreciated the opportunity this has afforded me to think
about
> these matters. Don't leave me behind the door when the Torreya
plants are
> handed out.   I'll plant one of them near my Cephalotaxus, so that
he will
> feel at home.
>
> All the best. Al
>
> Alfred Traverse
> Alphabet Arboretum
> RD2, Box 390
> Huntingdon, PA 16652
> USA
>
> [Ph. 814-643-1958;
> Penn State e-mail: traverse@ems.psu.edu]

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Lee -

Thanks for the update. I apologize for being so long to reply. Bill Alexander left me a long phone message on the same. I have been keeping track of those who I know wish to plant T. tax on private lands, and I will send you that list when next I can spend a few days doing nothing but T. tax (I need to create the www.torreyaguardians.org website, for which I have already purchased the domain name). Fall issue of Wild Earth is delayed. Will let the whole list know when it comes out.

Have you got any folks in the Asheville/Waynesville area that might want to plant T. tax, so that those seedlings need not go to waste? The folks I have are SE Cumberland Plateau, western Tenn, southeastern Ohio, and somewhere in Pennsylvania. I imagine that when the Wild Earth piece is published (with its solicitation of private land owners at the end), we will get a lot more.

Since you are the Torreya growing specialist and live in the Asheville

area, would you like me to refer everyone to you who wants to participate in plantings, and then you can coordinate the actual gathering and dispersal of seed next fall? Or do you want me to do the coordination? When I create the website I will create an internal hotlink that will allow folks to send an email of interest directly to whoever is in charge of the seed dispersal end of things. It would be great if you would take it on. Let me know.

Together in the Great Work
Connie

On 10/13/04 4:19 PM, "LEE R BARNES" <lbarnes2@earthlink.net> wrote:
Connie-
    I spoke with Bill Alexander yesterday- he has been out of town and backed up at work. He says that there was only a small seed crop this year in mid-September and these were scattered by tropical storms- his staff has been extremely busy cleaning up so they didn't catch the seeds this year. He did offer 10-12 seedlings but felt they could not be easily mailed but might go to local sources who can offer long term stewardship. Did you have specific requests for the seeds, etc. Also, has the Wild Earth articles on Torreya come out yet? I hope all goes well with you'all! Happy Trails, Lee 828-452-5716

LEE R BARNES
lbarnes2@earthlink.net

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