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<http://groups.yahoo.com/i?i=eGRgZbmcgAvwGwSNkXJ4pJA-nZE&e=Cbtanager%40aol%2Ecom>

Follow directions, which will be a 2-step process: first you create a name for yourself recognizable by any yahoo group you wish to join. Then you specifically join the Torreya group.

If you have any difficulty, email Lee Barnes directly: lbarnes2@earthlink.net

After you successfully subscribe, you will receive this message:

Hello,

Welcome to the Torreya group at Yahoo! Groups, a free, easy-to-use email group service. Please take a moment to review this message.

To learn more about the Torreya group, please visit <http://groups.yahoo.com/group/Torreya>

To start sending messages to members of this group, simply send email to Torreya@yahoogroups.com

If you do not wish to belong to Torreya, you may unsubscribe by sending an email to Torreya-unsubscribe@yahoogroups.com

To see and modify all of your groups, go to <http://groups.yahoo.com/mygroups>

Regards,

Moderator, Torreya

Torreya-owner@yahoogroups.com

TORREYA EMAILS

Hello,

Welcome to the Torreya group at Yahoo! Groups, a free, easy-to-use email group service. Please take a moment to review this message.

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Torreyia-unsubscribe@yahoogroups.com

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<http://groups.yahoo.com/mygroups>

Regards,

Moderator, Torreyia

Torreyia-owner@yahoogroups.com
Hello Cbtanager@aol.com,

lbarnes2@earthlink.net has invited to join the Torreyia group
hosted by Yahoo! Groups, a free, easy-to-use community service.

By joining Torreyia, you will be able to exchange
messages with other group members, store photos and files,
coordinate events and more.

This invitation will expire in 7 days.

Here's an introductory message from lbarnes2@earthlink.net:

I'm inviting folks to the Torreyia list serve directly since normal torreyia-unsubscribe@yahoogroup.com does not seem to work yet. I've also accessed site by
<http://groups.yahoo.com/group/Torreyia/>. The chase continues... Lee

JOIN NOW, IT'S EASY:

1) Go to the Yahoo! Groups site by clicking on this link:
<http://groups.yahoo.com/i?i=eGRgZbmCgAvwGwSNkXJ4pJA-nZE&e=Cbtanager%40aol%2Ecom>

(If clicking doesn't work, "Cut" and "Paste" the line above into your
Web browser's address bar.)

-OR-

2) REPLY to this email by clicking "Reply" and then "Send"
in your email program

If you do not wish to join the Torreyia group, please
ignore this invitation.

Report abuse:

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friends and family or meet new people who share your interests.
Yahoo! Groups values your privacy. It is a violation of our service
rules for Groups members to abuse this invitation feature. If you feel
this has happened, please notify us:
<http://help.yahoo.com/help/#var:Pref.Yahoo!nt!#/groups/abuse/index.html>

You may also change your email preferences to stop receiving group
invitations in the future. To do so, please go here:
http://groups.yahoo.com/s?tag=DYhU5b1qs7KE_F0n2B--NDPpSO-PochHna6zjnLRYtNucePN0ReeqA7wiMsdenL7VV4jrpCeF16l

Your use of Yahoo! Groups is subject to:

Your use of Yahoo! Groups is subject to:
<http://docs.yahoo.com/info/terms/>

You should get a message to subscribe to Torreyia- it's now available from the yahoo.com home page search engine. Torreyia-subscribe@yahoo.com should also work for others, if not, I'll invite others from past emails. Lee

<DIV> </DIV>

<DIV>LEE R BARNES</DIV>

<DIV>lbarnes2@earthlink.net</DIV>

<DIV>Why Wait? Move to EarthLink.</DIV>

<DIV> </DIV></DIV>

Connie-

after subscribing, you can send email to all subscribed folks at "torreyia@yahoo.com." You can also go to yahoo.com homepage to see your membership and details. I'll forward today's emails but from now on, include torreyia@yahoo.com in your to: list to send copies to the listserv. I've forwarded about 20 back messages so we are developing a public archive/discussion group. We can add attachments as currently set-up but that may lead to virus problems if everybody isn't using "protection."

I can check on new members (as list moderator) so I can tell who subscribes so maybe we need to send out another announcement to all the folks you are emailing. Later, Lee

LEE R BARNES

lbarnes2@earthlink.net

Connie- this is info directly from yahoo.com, so Torreyia-subscribe@yahoo.com should work. Only other thing is you might have to subscribe to yahoo.com first- that's why I'm lee_barnes_98 when I joined other groups. There is an option to send invitational email letter to any email names which you can provide me with- I guess I could go thru each email and do that but that's a pain... try going to yahoo.com and search for torreyia. this should be pretty simple. Later, Lee

Post message: Torreyia@yahoo.com
Subscribe: Torreyia-subscribe@yahoo.com
Unsubscribe: Torreyia-unsubscribe@yahoo.com
List owner: Torreyia-owner@yahoo.com

I'm not sure of the problem with joining Torreyia@yahoo.com. I can get to the site OK, but when I go to yahoo.com, it does not show up in the search- I believe it's hidden down in their ecology section. I'll try to invite you as members and we'll see if that works. Sorry for the problems, I didn't think it would be so difficult- maybe things will work out in a day or two. Lee 828-452-5716

MARCH 4, 2004

Thanks, Connie.

I agree with Mark that this is a complex problem and with Peter that I'm not yet convinced by all your arguments. Perhaps more importantly, I am skeptical that this represents a viable conservation strategy. Even if we understand the habitat needs sufficiently for Torreyia, assisted migration is unlikely to be feasible for the myriad species - rare and common - whose range is likely to shift with climate change. Impacts to the recipient community are also of concern. However, conservation biologists need to start articulating the relevant issues and responses to climate change. I would like to remain on your contact list.

Best,

Doria

dgordon@tnc.org

Doria
dgordon@tnc.org

Stan -

Thank you for your prompt reply. I look forward to hearing from you more fully when you have had a chance to consider this more.

For Torreya,
Connie Barlow

In a message dated 3/3/04 8:41:28 AM, Stan_Simpkins@fws.gov writes:

<< Ms. Barlow, thanks so much for sending me the proposal. I wish to "mull it over" with several other Fish & Wildlife Service Biologists before I get back to you. So for now, please know we are not ignoring your request for comments and will reply at a latter date.

Stan Simpkins
Ecologist, USFWS,
Panama City Field Office
(850) 769-0552 x234
>>

TORREYA

> From: Josh Brown <josh@wildlandsproject.org>
> To: <hermasm@auburn.edu>; <hazeldelcourt@earthlink.net>;
> <Cbтанager@aol.com>; Schwartz, Mark <mwschwartz@ucdavis.edu>
> Cc: <pmartin@geo.arizona.edu>; <lbarnes2@earthlink.net>;
> <hdelcourt@utk.edu>; <balexander@biltmore.com>
> Date: 2/25/2004 1:19:56 PM
> Subject: Re: Q on Calif Torreya for paper on T. taxifolia
>
> Dear All,
>
> I have followed the exchanges about the potential translocation of T
> taxifolia with great interest. I'm intrigued by the proposal to develop a
> group of articles for Wild Earth exploring this controversial
> matter--though
> we'll have to work out the precise question being debated, and don't have
> unlimited space for numerous articles.
>
> As Connie noted, we regularly publish our Wild Earth Forum department: two
> (or sometimes more) articles taking divergent positions on matters of
> philosophical and practical importance to conservation. This would seem to
> fit the bill! Our fall issue, in which we had tentatively slated the T
> tax.
> article, is taking up the theme "connectivity." This debate could add an
> important dimension to this broad theme. I'll look forward to being in
> touch
> as we move forward on this.
>
> best,
> Josh

Connie:

Here is the response from Leigh Brooks, NC, showing her interest in the project and others to contact or add to a distribution list. It is great to see such a positive reponse.

Steve

----- Original Message -----

From: "Leigh Brooks" <leigh_brooks@tnc.org>
To: "Steve Urse" <surse2@earthlink.net>
Sent: Tuesday, February 24, 2004 5:42 PM
Subject: RE: Florida Torreya conservation

> Thanks Steve. I'm very interested. My sister, Another Brooks, is also

> Thanks Steve, I'm very interested. My sister, Anathe Brooks, is also
> interested. I'll forward to her. If you are keeping a distribution list,
> her e-mail is abrooks@umbc.edu. I'll also forward to Greg Seamon here at
> TNC, gseamon@tnc.org.
>
> The next contacts I'll leave for you or Connie to forward if you like.
Stan
> Simpkins is our endangered species contact at USFWS. His e-mail is
> stan_simpkins@fws.gov. Mark Ludlow is the biologist at Torreya State
Park.
> Did you and Connie meet with him? His e-mail is
> Mark.Ludlow@dep.state.fl.us.
> Leigh
>
> -----Original Message-----
> From: Steve Urse [mailto:surse2@earthlink.net]
> Sent: Tuesday, February 24, 2004 1:51 PM
> To: Leigh Brooks; Eleanor43@aol.com
> Subject: Fw: Florida Torreya conservation
>
>
> Hello Leigh and Eleanor:
> I thought you might be interested in the Torreya update from Connie
Barlow,
> who will be writing a paper for Wild Earth magazine along with some other
> people. Who besides Bill Anderson might be interested in this?
>
> Leigh: Connie and I spent over six hours at the state park that Monday
and
> then did not have time to visit you at NC. Thanks for calling back.
> Steve

Hello all - FEBRUARY 29

Mark's most recent email, below, is hugely significant. It gives more details and insights on the wider context than I was aware of. I now see that Wild Earth, Conservation Biology, or both might want to devote a theme issue to the global climate change translocation question, with *T. taxifolia* being the most immediate, and best-case example that many of us have already put thought and/or effort into.

As lead organizer for our first team of communicators (which, from the start, included Hazel Delcourt, Paul Martin, Bill Alexander, and Lee Barnes and has Wild Earth as the intended journal of interest), I plan to call Josh Brown at Wild Earth to see what his thoughts are at this stage. Mark, your recent email is so insightful, well-stated, and energetic that I am wondering whether you might want to play a similar role (with Sharon?) in proposing a theme section for Conservation Biology journal. I am sure the editors at both journals would be happy to collaborate to ensure that this important issue could be covered in ways that have maximum impact. Michael Soule and Reed Noss, for example, have played important roles in the history of both journals.

Typically, articles in Wild Earth (for which I have written often) are geared toward conservation leaders, educators, activists, and the interested public. The focus is on advocacy, pushing well beyond the mainstream of conservation, respect for and deference to natural processes and the need for large wild landscapes, fully biocentric, biodiversity preservation fully for intrinsic value, a crucial communicator and translator of new ideas and efforts in the science of conservation biology, while recognizing that scientific knowledge will never fully grasp the wisdom of wild processes and that "gardening" earth, even with the best scientific knowledge, is no substitute for humility and the setting aside of wildlands and corridors. My (and Paul Martin's) contributions to Wild Earth have been bringing "deep time" awareness into deep ecology philosophically, and conservation biology practically. In Spring 2001, Paul Martin (who, since the 1960s, has been most prominently associated with the "overkill" hypothesis for end-Pleistocene extinctions) and I published companion pieces in Wild Earth: mine was titled "Rewilding for Evolution" and his was "Bring Back the Elephants" (arguing that grazed lands in the west cannot be ecologically understood and properly managed without reflecting on the fact that humans have introduced grazers without bringing back the

"Rewilding for Evolution" and his was "Bring Back the Elephants" (arguing that grazed lands in the west cannot be ecologically understood and properly managed without reflecting on the fact that humans have introduced grazers without bringing back the shrub and tree browsers that had once provided a balance -- most notably, proboscideans -- lost owing to human action: overkill; both can be read in Milkweed Publications 2002 book, "Wild Earth," a book edited by Wild Earth editor Tom Butler).

Paul has a book coming out shortly, U Calif Press, that is a summary of his life work on overkill. My most recent book is "The Ghosts of Evolution," which tracks the impact of a paper that Paul co-wrote with Dan Janzen in 1982 on how fruits and thorns of many plants in the Americas cannot be understood without including the recently extinct megafauna in our considerations of animals with whom those characteristics evolved.

Overall Wild Earth will be especially attentive to how this issue can be handled in a way that does not give the public a sense that translocation is to be done in lieu of corridors; we must be clear why translocation is truly an end-game effort. *T. taxifolia* is simply a case in which it can be compellingly argued that, for one reason or another (anthropogenic fire? overkill loss of tortoises?), post-glacial dispersal to the southern Appalachians was hindered by humans for thousands of years before Europeans arrived in North America -- that is, there is no physical possibility for a functional corridor any longer and humans are ultimately the cause of the tree's current problems. Any article(s) for Wild Earth will also likely need to sacrifice some of the detail and precision that one might otherwise include in a scientific paper in order to be of reasonable size and maximally understood and memorable. So it would be great if some of us could write something for Wild Earth AND be able to reference more detail in a concurrently published or in-press article(s) in Conservation Biology written by another set of authors (perhaps with some overlap).

By the way, Hazel Delcourt's book, "Forests in Peril: Tracking Deciduous Trees from Ice-Age Refuges into the Greenhouse World" is what stimulated this whole effort: she brings a deep-time understanding to the situation of glacial relics in the pocket refuges of the SE U.S. Several years prior to that, Bill Alexander (at the Biltmore Estate Gardens in Asheville) and I, while working on my Ghosts of Evolution book, discovered that we both had independently concluded that *Torreya taxifolia*'s "natural" habitat was not northern Florida at this stage of an interglacial but the southern Appalachians. But it was Hazel's book that provided the deep time theoretical and on-the-ground foundation for arguing in behalf of any such project.

I am going to combine my initial email to Mark and Sharon with Mark's email here into a single email to send to others who have been part of this conversation indirectly, and others I have been told about or know about who should be, as I think the widest net of communicators would be most helpful at this point. (Our ultimate goal, I am sure, is biodiversity thrival on the ground; what sort of papers may contribute to that, and by what groups, is simply the means.) I will be sending that pair of emails with an intro on the history of our communications to the following list. I will encourage anyone who has a substantive response to respond to the original core group plus Mark and Sharon, to ensure that we are all connected. Eventually it should become clear who will be the writers for one or more articles in Wild Earth, who will be the authors for one or more papers in Conservation Biology or another technical publication, and who are primarily resource people.

Here is the list I will send to:

Leigh Brooks (leigh_brooks@tnc.org) and Greg Seamon (gseamon@tnc.org) for The Nature Conservancy *T. taxifolia* conservation effort, plus Leigh's sister who also asked to be on this list: Anathe Brooks (abrooks@umbc.edu) Leigh has seen some of this conversation and is very interested.

Mark Ludlow (Mark.Ludlow@dep.state.fl.us) - new biologist at Torreya State Park.

Stan Simpkins (stan_simpkins@fws.gov), endangered species contact for *Torreya* at USFWS. I don't believe he has been part of any communication on this yet.

Steve Urse (surse2@earthlink.net), my host in Tallahassee who helped me find *Torreya* and Florida Yew in Torreya State Park 2 weeks ago and who brought Leigh Brooks into the conversation.

Bill Anderson (banderson@nettally.com) who has catalogue 80 *T. taxifolia* in Torreya

the conversation.

Bill Anderson (banderson@nettally.com) who has catalogue 80 *T. taxifolia* in Torreya State Park

Ron Determann (rdetermann@atlantabotanicalgarden.org) and Carol Denhoff (cdenhoff@atlantabotanicalgarden.org) who are doing *Torreya taxifolia* conservation at the Atlanta Botanical Garden, and who have nurtured clones of the remaining wild *T. taxifolia* to the point that they are producing seed, and are now growing a new crop of hundreds of seedlings each year, awaiting transplantation. I visited them and their project recently.

Ron Nicholson (now at Smith College, I will track email address) whom Ron Determann recommended as having got the cuttings off the wild *Torreya* and rooted them all. He may know about California *Torreya* too.

Brian Keel (BGKeel@aol.com) who is working on a PhD project proposing "assisted migration" for an orchid, *Habenaria repens* (not endangered), as a model for conservation of terrestrial orchids in SE U.S. as climate changes. As he wrote me, "Assisted migration, as I am developing the concept, is for use in places such as the highly fragmented landscape of the eastern seaboard of the United States, where the creation of corridors may not be possible, or for migrations between oceanic islands or mountain tops." He expressed a wish to be included on *T. taxifolia* communications.

Michael Soule (rewild@tds.net) - because he is such a major player in always developing the leading edge in conservation biology, and I know him.

Dave Foreman (eltigredave@comcast.net) - founder of Wild Earth magazine and a visionary leader in conservation biology from an strong advocacy and wildlands stance, and because I know that he is trying to keep tabs on the most visionary projects now happening.

Peter Wharton (peter.wharton@ubc.ca) - who contacted me recently and who is working on cutting edge issues of plant conservation in China.

Robbin Moran (rmoran@nybg.org) - my prime contact at New York Botanical Garden, who has a strong interest in deep-time matters affecting plants.

Peter del Tredici (ptredici@oeb.harvard.edu) - head of living collection at Arnold Arboretum, and who has done ginkgo research spun off of Janzen & Martin 1982, and with whom I consulted in writing my Ghosts of Evolution book).

Peter White (pswhite@unc.edu) - director of the botanical garden at Chapel Hill NC, and who I also consulted with while writing my Ghosts book, as he was inspired by Janzen&Martin 1982 to see the spines placement on *Aralia spinosa* and American holly as anachronistic.

John MacDougal (John.MacDougal@mobot.org) - my contact on *Torreya* at Missouri Botanical Garden, who says his two *T. taxifolia* planted outdoors there are doing fine.

Okay, that's all for now. Please feel free to communicate to anyone else about this now, being sure to let them know that I am organizing for a Wild Earth paper, and Mark Schwartz (who has recently written about *Torreya taxifolia* for Conservation Biology, Biological Conservation, and J. Torrey Botanical Society) should be contacted if anyone wishes to advise or contribute on a more technical paper.

Together for *Torreya*,
Connie

In a message dated 2/25/04 11:50:09 AM, mwschwartz@ucdavis.edu writes:

<< Hi all,

Following Paul's comments and these, I have been thinking. I would be interested in starting a dialogue, perhaps as a pair of papers or a longer paper in Wild Earth about this issue. I see the following points:

1) Your arguments for the conservation of *T. taxifolia* make sense to me and argue for a translocation effort on its behalf.

longer paper in Wild Earth about this issue. I see the following points:
1) Your arguments for the conservation of *T. taxifolia* make sense to me and argue for a translocation effort on its behalf.

2) With global climate change it is likely that other narrowly endemic species, particularly glacial relics share similar problems, so this could become a large problem by the next century (although I think it flawed, the recent article in Science on what proportion of species may be relegated toward extinction gives an idea of a potential magnitude)

3) *Torreya taxifolia*, by all stretches is not likely to become an invasive weed problem:

a) it has not gone weedy at Biltmore or other So. Appalachian garden locations.

b) It is slow growing, reasonably shade tolerant and dioecious, later maturing and poorly dispersed. All characteristics of things that are not weedy.

c) Seeds are heavily consumed by squirrels.

d) The tree seems to require large gaps to colonize in patches. Thus, the suite of species with which it would compete are reasonably small (*Pinus glabra*, *Taxud floridana* in FL).

4) Nonetheless, the implications of such actions in a general sense are grave.

a) We set a precedent for species introductions on behalf of conservation. This clearly pits opposing conservation concerns against one another (that of species conservation versus community integrity)

b) There are examples of opposition to such actions. A cross-breeding of a functionally sterile population in Illinois (I forgot the species name, Marcy DeMauro did the work) was sabotaged on behalf of conservation. The population was one clone and self sterile. The population was bred with individuals from a different state. Viable offspring were released. Subsequently killed.

5) Conservation biologists lack a formal policy on this and one is needed.

6) Despite developing a policy, however, there is very little control. There is no legal authority, that I know of, that would have jurisdiction to either sanction or prevent any private individual from acquiring seed from Bill Alexander or anyone else who is legitimately selling it (it is commercially available in South Carolina) and then planting it in forest that they owned. (animals may be a different story).

I find this to be a compelling and interesting problem.

Mark

Boy, this will teach me to not spend almost a week in the field in south central Alabama away from e-mail connections! Your recent messages deal with a complex topic worthy of attention. I probably shouldn't jump into the fray without taking the time to ponder all that you have covered to date but I did want to let you know of my interest. I am reasonably sure that I will end up concurring with most, if not all, of what Mark has already stated. This should come as no great surprise since the two of us have discussed similar issues in the past. I'll try to toss in my two cents by tomorrow.

Thanks for the intellectually stimulating exchange!

Sharon

MARCH 1 TORREYA

Sharon -

I absolutely agree that introducing an endangered species outside of its "natural range" is a very serious step to take. However, it is crucial for me to communicate to you that myself and the others in this project are proposing assisted migration of *Torreya*

I absolutely agree that introducing an endangered species outside of its "natural range" is a very serious step to take. However, it is crucial for me to communicate to you that myself and the others in this project are proposing assisted migration of *Torreya taxifolia* only because we have good reason to suspect that *Torreya*'s "natural range" at this point in an interglacial is quite simply not in the pocket refuge habitat(s) where it was forced to migrate when climate cooled dramatically at the beginning of the Pleistocene. I would be very curious to know whether you see any role for deep time considerations in determining "natural range" of any species. Looking into the future, any efforts to establish climate-zone transiting corridors (latitudinal or altitudinal) to ensure that species can make the move on their own in step with future human-induced climate warming would also seem to rest on the assumption that as climate shifts, so too does "natural range." I would be very interested to hear your response on this particular foundational issue.

Thanks for the dialogue,
Connie

In a message dated 3/1/04 9:27:17 AM, hermasm@auburn.edu writes:

<< All,

I do agree with Mark's previous messages. Although I am very interested in creation of *Torreya* populations in a range of botanical garden-like sites, I have reservations about introducing any species into wildlands outside of its range.

It seems like that there are two basic areas for discussion: 1) the potential ecological consequences and precedent-setting results of introducing species outside of their natural ranges and 2) for the specific case of *Torreya*, is there reason to think that such an introduction would produce the desired result of saving the species.

Mark has already addressed the first topic and I concur with his assessment. Some conservation groups have also voiced concerns about moving species out of their native ranges. As Mark pointed out, it is unlikely that *Torreya* will prove to be an invasive species but there are other ways species that are novel to a community could be disruptive, including serving as a host for a pathogen.

Although the commonly accepted scenario is that the abrupt decline of *Torreya* was related to a pathogen (blight), the identification and confirmation of the pathogen remains elusive. A corollary to this scenario is that trees in more northern (cooler) area will be healthier. Although there is no doubt that Biltmore supports the only remaining population however when we looked at the condition of other individuals in the Carolinas, most were dead or dying. In addition, two trees planted in a yard in Liberty County Florida reproduced and appeared to be healthy. However, I believe that recently they were damaged by wind and cut down. It is not clear to me that there is strong evidence for the idea that moving the species north will automatically result in healthy populations.

There are few things that could make me happier than having vigorous *Torreya* scattered across the Apalachicola Bluffs but unfortunately we still lack the information needed to know if that will ever be possible. I am delighted that so many people are thinking about the problem and I look forward to learning more about your ideas.

In answer to the query about work on *Torreya californica* * I think that I may have collected almost all of the limited material published on the species, including information use by Native American but I know of no current studies. In addition, I have not heard of any specific conservation for the species.

I see that I have additional incoming e-mail from some of you! Thanks for including me in the e-mail discussion.

Sharon

Sharon M. Hermann
Department of Biological Sciences
Funchess Hall
Auburn University
Auburn, AL 36849
Office phone: 334-844-3933 >>

Robert Nicholson is conservatory manager at Smith College Botanical Garden

General number of botanic garden = 413-585-2740

**Conservation of
Torreya taxifolia
The Florida Stinking Cedar**

Torreya is a primitive member of the Taxaceae, the yew family. Seven species are known worldwide: four in China, one in Japan and Korea, one in California, and one in Florida and Georgia. *Torreya taxifolia*, the stinking cedar, is a rare and endangered species known only in a restricted area of the Florida panhandle and adjacent Georgia.

The number of mature trees in cultivation outside of Florida may number less than two dozen. At the beginning of the twentieth century, there were wild populations of *Torreya taxifolia* estimated at about 300,000 to 600,000. The estimated number of plants in the original habitat is about 500, which means that 99.3 to 99.6% of the population found at the beginning of the 1900s has died. Where 60 foot trees were formerly found, few individuals over 10 feet are now known. Although research into the cause of this decline is ongoing, *in situ* preservation appears problematic, and management efforts now include the propagation of rooted cuttings from documented wild stands to be grown on *ex situ* populations.

Torreya Rooted Cuttings

For this study, Smith College botanists collected 2622 cuttings from 166 trees at 14 individual sites from throughout the native range of the species in November 1989. The number of cuttings harvested varied with each tree, with the overall health of the specimen determining the maximum harvest of cuttings. Each collection from each genotype was given an accession number at the time of collection, and this number followed the plant through the propagation cycle.

Cuttings were rooted and the young plants potted and grown for two years before being shipped to botanical gardens and biological institutions worldwide for observation and research.

More than 4000 additional cuttings taken in 1997 from the original plant cuttings, representing 150 genotypes, were rooted at the Botanic Garden of Smith College and shipped in November 1998 to the Atlanta Botanical Garden. Given the scale and scope of this project, it seems impractical to assume that humanity is capable of repeating this process with every endangered species of plant. *Ex situ* conservation projects such as the work with *Torreya* may in fact become the best kind of advocacy for *in situ* conservation: the maintenance of where the wild things are.

Many Smith students were involved in propagating, potting on, and shipping *Torreya taxifolia*.

For further reading and experimental details, see Bibiana Garcia Bailo, Rob Nicholson, Ron Determann, and Stephen Sojkowski, "The *ex situ* conservation of stinking cedar," *Public Garden*, July 1998, pp. 9-11.

Research

NOTES FROM BARLOW MEETING AT ATLANTA BOTANICAL GARDEN
FEB 2004

With Ron Determann and Carol Helton Denhof

1989, Ron Nicholson at Arnold Arboretum (now at Smith Botanical Garden) got cuttings off plants in Apalachicola, rooted them all. Sets of these clones then distributed to various botanical gardens, including Atlanta. Some sent to Chapel Hill. 150 genotypes, also got extra off 19 trees in Georgia for Atlanta Botanical Garden. Georgia trees are growing on Army Corps of Engineers land.

I visited the now-7foot tall trees that Nicholson distributed to Atlanta. This "potted orchard" has been producing 500-800 seeds per year. I saw I believe 4 years worth of seedlings grown from those seeds.

Seed-grown trees, especially females, take longer to mature.

Arnold arboretum has found them "not reliably hardy" in winter. May be on edge up there.

Ron thinks Apalachicola problem is that uplands is denuded so altered hydrology. T is not fire resistant. He thinks climate change is a small part of the problem. Thinks introduced disease, a *Phytophthora*, like the one getting the Calif *Torreya*. This is root rot. Very sensitive to root rot. Apalachicola trees start showing the problem in summer droughts. Carol is experimenting with fungicide. Need wetter to do best. Feels Apalachicola is total ecological collapse. Mature trees keeled over from disease, like chestnut. Extensive studies but cannot conclusively claim root rot

Phytophthora, like the one getting the same for yew. This is root rot. Very sensitive to root rot. Apalachicola trees start showing the problem in summer droughts. Carol is experimenting with fungicide. Need wetter to do best. Feels Apalachicola is total ecological collapse. Mature trees keeled over from disease, like chestnut. Extensive studies but cannot conclusively claim root rot, though he thinks it is. Basic problem is not enough water anymore.

Also, deer take a toll on it. No young Taxus yews there either because of deer.

The closest relative of the Florida yew is in Mexico, not the Canadian yew. Florida yew is not very hardy; if planted even at the Biltmore it would have problems.

He told me about Rob Nicholson at Smith. Ask Nicholson about his studies of it in Yosemite.

Atlanta does not want Biltmore seed, as they do not know for sure the origin.

They planted the trees at Torreya State Park lawn, and Carol did more in the wild at the new lands to the north. They also plan to plant some of their trees in Gainesville Georgia, plus Highlands Botanical Garden. The ones planted near Helen Georgia on state property are doing fine; they are not planted in the woods, in the open.

Has seen Calif Torreya with trunks really big, very steep slopes, lots of water. The ones closer to coast, and wetter are healthier, also where cooler at night. When root zone temp gets too hot, rot starts. Disease strikes in Calif in summer.

Want to be part of recovery, need to be integral.

Thinks I am probably right that there were other seed dispersers before squirrels. Seemed to like my tortoise idea.

In Japan and China people eat the nuts?

<http://www.laspilitas.com/plants/679.htm>

Genus: Torreya **Species:** californica **Variety:** **Cultivar:**
Common name(s): California Nutmeg .

An evergreen tree that looks like a miniature Yew or glossy leaved redwood. In a fiberglass shade house where the temperatures are moderate and the humidities are high it grows ok. If you have a redwood doing great this will do great. Moist fast draining soil in part-shade to shade is where it wants to be. The more summer heat it has the more shade it needs. The area it is native to gets about 35-40" of rainfall each year. They do the best where there is a lot of summer humidity but not in rainfall. Cold tolerance is about 25 F., 20 with overhead protection. It will take heat as long as it is in the shade and has a source of moisture. It is too cold and too hot for it here outside.

Torreya californica tolerates part sun, and full shade.
Torreya californica's foliage color is Green , and type is Evergreen .
Torreya californica's flower color is NA .

ommunities for California Nutmeg

[Douglas Fir Forest](#), [Mixed-evergreen Forest](#), [Yellow Pine Forest](#)

Ranges for Torreya californica

pH: 5 to 7

Height: 1 to 20 [m]

Width: 1 to 10 [m]

USDA: 8 to 10

Rainfall: 120 to 790 [cm]

Mixed Evergreen Forest in California

The Mixed Evergreen Forest plant community is found mostly in the northern coastal mountains of California, though extending down to the central coastal mountains. Some of the component species

The Mixed Evergreen Forest plant community is found mostly in the northern coastal mountains of California, though extending down to the central coastal mountains. Some of the component species include Tanbark Oak (*Lithocarpus densiflora*), Madrone (*Arbutus menziesii*), Douglas Fir (*Pseudotsuga menziesii*), California Bay (*Umbellularia californica*), Bigleaf Maple (*Acer macrophyllum*), Canyon Live Oak (*Quercus chrysolepis*), Black Oak (*Quercus kelloggii*), Coast Live Oak (*Quercus agrifolia*) and California Hazelnut (*Corylus californica*). This forest is filled with leafy trees and few conifers. This makes for a softer looking forest. However this forest is not really that soft. There is often a dense understory of brush and a canopy containing several species of oak (It's so dark you have to use a flash to take a digital picture.)

The rainfall in the Mixed Evergreen Forest can vary anywhere from 25 to 65 inches. The temperatures within the Mixed Evergreen Forest are mild although not as mild as the nearby redwood forest. This plant community is like Seattle, wet and drippy many weeks of the year, and days commonly do not warm up. Lows below 20F are very uncommon, highs above 90F are very uncommon. A winter day can have a low of 28F and a high of 40F. A summer day can have a low of 55F and a high of 85F. Humidities are almost always 50-80%.

Many of the components of the Mixed Evergreen Forest are also found in the Yellow Pine Forest as well as the Redwood Forest. The Mixed Evergreen Forest has a wonderful fresh smell given off by the aromatic California Bay (or California Laurel) trees. The dense brush and thick evergreen trees are an excellent habitat for birds. There is an abundance of food for wildlife in the form of various acorns as well as California Bay seeds. See <http://www.laspilitas.com/bird.htm> for more bird information.

A lot of cool plants grow in a Douglas Fir (*Pseudotsuga menziesii*) Forest. The climate is much like the temperate forests of the world, and the plants tolerate regular water that the homeowners insist on using. The winters are rather mild , rarely below 25F, with snow in the colder areas to insulate and protect the plants, and summers regularly get into the 80's.

If you decide to build a Douglas Fir Forest in your garden find a good source of mulch, (shredded redwood or fir bark), put in a low volume overhead sprinkler system. The soil should be slightly acid and raw, please no soil amendments. (The mulch goes on top.) Plant the garden with as many Douglas Fir Forest plant community species as you can find, and one to three Douglas Fir (*Pseudotsuga menziesii*) trees. Water well at first and then water once per week in the summer, with spritzes when it's hot and the rest of the year if it's not raining. The soil should be moist, but not wet and allowed to dry only in fall.

California Yellow Pine Forest

In much of California the Yellow Pine Forest usually has Jeffrey Pine (*Pinus jeffreyi*) or Ponderosa or Yellow Pine (*Pinus ponderosa*), but can sometimes have other middle elevation pines like Coulter Pine (*Pinus coulteri*). In the Sierra Nevada mountains and the north coast ranges this plant community is found at middle elevations, and into northern California it drops down to only around 1200 feet elevation.

California Torreyia (*Torreyia californica* Torrey.)

Identifying Characters: The California distribution of the species, the distinctive olive-like seed cones, the strong aroma of the crushed vegetation and seed cones, and the pair, parallel rows of needles are all highly distinctive.

Similar Species: No similar species in California.

Measurements: The tree is basically conical with widely spreading branches. The height of the tree is between 15 and 70 feet with a basal diameter at breast height of 1.0 to 2.0 feet.

Seed Cones: Seed cone an elliptical fruit between 1.0 and 1.5 inches long, green, sometimes streaked with purple; seed completely contained within the fruit, brown, about two-thirds size of total fruit; seed cone very aromatic.

Needles: Needles in two rows in roughly opposite pairs; length 1.0 to 3.0 inches, flat and slightly curved; tipped with a sharp point; dark green above and green below with two narrow white lines.

Bark: Bark gray-brown, thin, broken into narrow scaly ridges.

Native Range: California Torreyia is rare, but widely distributed in the mountains of central and northern California. In the coastal mountains the species descends almost to the coastline. The eastern limit of its range is along the western slopes of the Sierra Nevada.

Habitat: This species is rare and found mixed with other conifers and is found primarily along mountain streams and in shady canyons.

Notes: The species is sometimes called Stinking Cedar because of its strong aroma. Sometimes also referred to as Nutmeg Cedar because of the shape of the fruit and its smell.

Species summary:

California torreyia, also called California nutmeg, is a shrub on poor sites and a moderate [size](#) tree on better sites along mountain streams and in canyons in the mountains of California.

Range: California: w slope of Sierra Nevada, central Coast Ranges, sea level along coast to 6500 ft in Sierra Nevada.

ange: California: w slope of Sierra Nevada, central Coast Ranges, sea level along coast to 6500 ft in Sierra Nevada.



An aril rather than a cone; similar to a very large olive with a fleshy outer green covering and an inner, yellow-brown, thick walled seed. Takes two years to mature.

Great photos at this site of calif t:

<http://www.cnr.vt.edu/dendro/dendrology/syllabus/tcalifornica.htm>

http://www.fs.fed.us/database/feis/plants/tree/torcal/botanical_and_ecological_characteristics.html

California torreyia is a dioecious native evergreen tree, typically from 16.5 to 90 feet (5–30 m) tall and 8 to 20 inches (20–51 cm) in diameter [16,21]. A record tree growing near Fort Bragg measured 141 feet (43

California torreyia is a dioecious native evergreen tree, typically from 16.5 to 90 feet (5-30 m) tall and 8 to 20 inches (20-51 cm) in diameter [16,21]. A record tree growing near Fort Bragg measured 141 feet (43 m) in height and 14.8 feet (4.5 m) in d.b.h. until cut by timber thieves [17]. The crown is pyramidal to irregular in shape [10,19]. Needles persist for many years. The bark is thin, from 0.3 to 0.5 inch (0.8-1.3 cm) on mature trees [19]. Roots are described as "deep" [14]. The large, heavy seeds are from 1 to 1.4 inches (2.5-3.0 cm) long, enveloped by a drupelike aril [16,21].

RAUNKIAER LIFE FORM :

Phanerophyte

REGENERATION PROCESSES :

Male California torreyia bear their microsporophylls within strobili.

In contrast, the ovules of female trees are not contained within strobili but are solitary [16]. Male strobili begin growth the year prior to flowering, while females trees develop ovules in one growing season [21]. Torreyias are wind pollinated [16]. Male trees must normally be within 75 to 90 feet (23-27 m) of female trees in order to effect pollination [24]. Seed production is erratic. Good seed crops may be followed by crop failure the following year [10]. Seeds mature in 2 years [19]. Being heavy, seeds usually fall near the parent plant; wind dissemination is rare [17]. Seed predation by Stellar's and scrub jay is high [10]. Seeds require a 9- to 12-month stratification period before germination [21]. In one study, seeds stratified for 3 months before planting took an additional 9 months to germinate under greenhouse conditions. Ninety-two percent of seedlings germinated at that time. [15]. Temperature regimes during the stratification period were not noted. Seeds sometimes germinate without stratification but do so slowly [21].

Growth of trees in the understory is slow [10]. Sudworth [24] reported trees from 4 to 8 inches (10-20 cm) in diameter were 60 to 110 years of age, while those from 12 to 18 inches (30-46 cm) in diameter were 170 to 265 years old. The growth rate needs further study, however, as rates of over 1 foot (30 cm) per year have been reported in cultivars [3]. Preliminary data obtained from tree-ring counts of saplings on the El Dorado National Forest shows some trees attained heights of 4.8 feet (1.5 m) in 28 years [10].

California torreyia sprouts from the roots, root crown, and bole following damage to aboveground portions of the tree [3,10,19]. Some torreyias reproduce by layering [21], but the layering capacity of California torreyia is unknown.

SITE CHARACTERISTICS :

California torreyia grows in diverse sites such as streambanks, shaded slopes, hot dry canyons, canyon floors, and lowland flats [3]. Best growth occurs on moist sites. Trees in Colusa County grow in serpentine soil [8].

The climate is mediterranean, characterized by hot, dry summers and cool, wet winters. Summer climate is moderated in the outer Coast Ranges by cool marine air and fog [29].

California torreyia grows at elevations from 3,000 to 7,000 feet (914-2 134 m) [16]

California *torreya* grows at elevations from 3,000 to 7,000 feet (914-2,134 m) [16].

Plant associations: Common overstory associates not listed under Distribution and Occurrence include tanoak (*Lithocarpus densiflora*), Oregon ash (*Fraxinus latifolia*), California bay (*Umbellularia californica*), bigleaf maple (*Acer macrophyllum*), white alder (*Alnus rhombifolia*), and bishop pine (*Pinus muricata*). Understory associates include cascara (*Rhamnus purshiana*), ceanothus (*Ceanothus* spp.), manzanita (*Arctostaphylos* spp.), Pacific rhododendron (*Rhododendron macrophyllum*), California huckleberry (*Vaccinium ovatum*), California red huckleberry (*V. parvifolium*), and Pacific bayberry (*Myrica californica*) [12,28].

SUCCESSIONAL STATUS :

Facultative Seral Species

California *torreya* is very shade tolerant [9] and is found in late seral and climax communities [3]. Following disturbance such as fire or logging, sprouts growing from surviving perennating buds appear in initial communities [10].

SEASONAL DEVELOPMENT :

Stamens and arils are produced from March through May [16,21]. Seeds ripen from August until October and are released from September through November [15,21,27].

California. Rare and local along mountain streams, protected slopes, creek bottoms, and moist canyons of the Coast Range and Sierra Nevada, at 0-2000 m elevation (Hils 1993). See also Thompson *et al.* (1999).

indicate that it can be found in "draws and basins on Mt. Tamalpais in Marin County;" along "the road entering Yosemite Valley from El Portal" (Yosemite National Park); at "the entrance to Boyden Cave in Kings Canyon" (National Park); and "the trail to Crystal Cave and near Clough Cave in Sequoia National Park."

I have only found it in one location so far, on the road towards Giant Forest a few miles beyond the Foothills Visitor Center in Sequoia National Park (36° 32.558' N, 118° 46.912' W). My notes report: "Here I find what is definitely the most prickly conifer I have ever encountered. This is a decent-sized little grove. They're growing amidst evergreen oaks, blue oaks, tanoak, a few small incense-cedars, and an understory with a xeric analogue of ladyfern, shrub oak, and probably poison oak. There's active regeneration, trees and seedlings growing both above and below the highway. Within 100 m of the sample point there are probably 50 stems taller than breast height, the largest being the one that I photographed the bark of, which has a dbh of about 25 cm. These trees are growing on a south- or southeast-facing slope. It seems to be a relatively dry microsite, but the *torreyas* are on locally concave topography. Slopes are 60-70%. We only find fruits on the largest, sun-grown specimen. Seedlings, of which the smallest I can find are about 15 cm tall, basically look the same as the larger plants except that their needles are shorter, about 1.5-2 cm vs. 4 cm on sun foliage in the mature trees."

http://www.usgs.nau.edu/global_change/Sierra.html

Ice-Age Vegetation of Kings Canyon, Sierra Nevada

Principal Investigator:

Kenneth L. Cole, USGS FRESC Colorado Plateau Field Station

Abstract:

A series of [packrat middens](#) were collected between 1000 and 1300 m elevation on a marble roof pendant in the Kings River Gorge just west of Kings Canyon National Park. Plant macrofossils from these middens include the first Late Wisconsin macrofossil records of giant sequoia (*Sequoiadendron giganteum*), and the California ponderosa pine/Jeffrey pine complex (*Pinus ponderosa/jeffreyi*) ([picture of macrofossils](#)). Other important macrofossil records include: western juniper (*Juniperus occidentalis*), incense-cedar (*Calocedrus decurrens*), red fir (*Abies magnifica*), and California *torreya* (*Torreya California*). The Pleistocene vegetation recorded between 45 000

highly endangered tree, *Torreya taxifolia*. Timely discussion is required for upcoming publications in *Wild Earth* (possibly Fall 2004) and other conservation biology publications." but can modify this per anyone's suggestions. I'm the official owner/moderator but I've set it up with open membership but may have to change to private group if spam creeps in...I don't expect that problem since I've moderated wncdowers@yahoo.com for about 4 years.

Please send this out to interested folks- it's easy to join or unsubscribe and you can set it up for immediate or daily email delivery, or just check when you want to- emails will be archived, photos can be included, etc. I will see if I can forward past discussions to the list but that may take a few days. I can add names from others list, but feel it is best for folks to sign-in with their preferences, etc. Happy Trails, Lee 828-452-5716

LEE R BARNES

lbarnes2@earthlink.net

Why Wait? Move to EarthLink.

FROM ROB NICHOLSON AT SMITH BOTANICAL GARDEN, RNICHOLS@email.smith.edu

Dear Ms. Barlow,

Regarding your article :

I received your message and I can be reached at this return e-mail address as well as 413-585-2747.

A good starting point would be an article I wrote for *Natural History* Dec. 1990 (yikes, that long ago!) which details the first collection efforts. About 2200 cuttings from this collection trip, were propagated and grown on at The Arnold Arboretum (where I worked at the time) and subsequently distributed to a number of southern gardens and field stations (I can dig out this list). This collection work was funded by The Center for Plant Conservation (then at Arnold, now at Missouri BG). Atlanta BG was one of those who received cuttings and I suspect had the most success as Ron D. is such a good plantsman and understands how to grow these. Once I relocated to Smith BG, more two propagation cycles with material sent from Atlanta BG (grown from the original cuttings) resulted in still more rooted cuttings, all sent back to Ron D. for distribution, mostly to gardens and field stations in GA. . All told over 4000 cuttings were rooted, all with clonal i.d. numbers that document where the original collection site was.

I have not tracked or censused the original set of 2200 sent out in 1991/1992 as that would be a time consuming undertaking. It would be an interesting study in the variability in care and mortality. One or two people who can grow plants makes a huge difference in a project such as this. The trees at Atlanta BG now set seed and this opens up the possibility of re-stocking the ravines.

I have another article that details the propagation efforts and strategies for replenishing the native stands and I can fax this to you if needed.

Regards, Rob Nicholson

Hello Rob Nicholson -

Thank you for the *Torreya* restoration historical info. I would like to invite you into email informal communications about a new idea for restoring *T. taxifolia*. Five of us have been involved from the start in developing this idea for publication in the Fall 2004 issue of *Wild Earth* (theme is "connectivity"; our facet of that is, "What should happen when connectivity is impossible?"). The five of us are:

CONNIE BARLOW (cbtnanager@aol.com) - independent, author of "The Ghosts of Evolution: Nonsensical Fruit, Missing Partners, and other Ecological Anachronisms" (2001, Basic Books), and a corresponding writer for *Wild Earth* magazine. I broached the idea of *T. taxifolia* translocation to the southern Appalachians in an article published in 61/2 of *Arnoldia* journal.

HAZEL DELCOURT (hazeldelcourt@earthlink.net), Univ Tenn. Knoxville, palynologist.

Author of "Forests in Peril: Tracking Deciduous Trees from Ice Age Refuges into the Greenhouse World" (2002, McDonald & Woodward Publishers)

PAUL MARTIN (pmartin@geo.arizona.edu), emeritus Univ. Arizona, Tucson, Pleistocene

PAUL MARTIN (pmartin@geo.arizona.edu), emeritus Univ. Arizona, Tucson, Pleistocene ecologist, original and major proponent of overkill hypothesis of end-Pleistocene extinctions of megafauna.

BILL ALEXANDER (balexander@biltmore.com), historian at the Biltmore Estate, with 11 mature *T. taxifolia*

LEE BARNES (lbarnes2@earthlink.net), independent, Waynesville NC, who did his PhD on root cloning of *T. tax.*

JOSH BROWN (josh@wildlandsproject.org), editor at Wild Earth with whom we are working.

Recently, MARK SCHWARTZ (mwschwartz@ucdavis.edu), author of many *T. tax* papers has come into the conversation, and has come to share our core-group views in important ways. Mark may be interested in developing this idea (below) into a technical paper, perhaps for Conservation Biology.

THE BASIC PROPOSAL: There is reason to conclude that, at this stage of the current interglacial, the "natural range" of *Torreya taxifolia* is no longer the pocket refuge (Apalachicola) where it survived during glacial peaks of the Pleistocene. The natural range instead would be appropriate habitats within the southern Appalachians. We argue, further, that *T. tax* got left behind in its pocket refuge because of anthropogenic reasons: fires caused by paleoIndians, and possibly loss of tortoise seed dispersers owing to paleoIndian overkill of tortoises. For all these reasons, we propose "assisted migration" (translocation) of enough *T. taxifolia* seeds and/or seedlings into one or more appropriate "wild" habitats (ideally, private lands) within the southern Appalachians, such that the population will be able to maintain and expand naturally, with native squirrels as seed dispersers.

DETAILS OF THE ARGUMENT:

(a) During the glacials, *Torreya taxifolia* was pushed down into pocket refuges of the Gulf Coast, such as the Apalachicola, where it is now exclusively found. (Hazel Delcourt's 2002 book is precisely on this topic: "Forests in Peril: Tracking Deciduous Trees from Ice Age Refuges into the Greenhouse World"). It was Connie's reading of Hazel's book that prompted this idea for collaboration.

(b) Given the warmer climate now and projected into the future, *T. taxifolia*'s "natural range" would really be in the southern Appalachians.

(c) Unlike many other plants of the Apalachicola pocket refuge, *T. taxifolia* has, for 13,000 years, been unsuccessful in sending a population north from the Apalachicola refuge into the southern Appalachians during this interglacial.

(d) The likeliest reason for the disruption in migration was an increase in fire in the intervening terrain, owing to paleoIndian use of fire for game and brush management (based on Paul Martin's own work and his knowledge of current literature on paleoecological effects of aboriginal fire in Australia). Another possible reason is the end-Pleistocene extinction of co-evolved reptilian seed dispersers: large tortoises (based on my own 2001 book, "The Ghosts of Evolution: Nonsensical Fruit, Missing Partners, and Other Ecological Anachronisms").

(e) *T. taxifolia*, unlike *Torreya* in Calif, Japan, and China, was unable to adjust to shifting climate simply by moving up mountains; rather, the severity of its troubles owe to its having to traverse hundreds of miles north across flat, fire-susceptible terrain in order to adjust to climate change and to reach mountain slopes and mountain ravines.

(f) Therefore, one crucial aspect of the effort to save *T. taxifolia* from extinction should include its transplantation into "the wild" in appropriate terrain in the southern Appalachians.

(g) Squirrels can be expected to play a helpful role in local and regional dispersal of seeds outward from areas of transplantation (based on Bill Alexander's experience with squirrels all-too-well planting *T. taxifolia* seeds at the Biltmore Estate in Asheville, NC)

(g) Squirrels can be expected to play a helpful role in local and regional dispersal of seeds outward from areas of transplantation (based on Bill Alexander's experience with squirrels all-too-well planting *T. taxifolia* seeds at the Biltmore Estate in Asheville, NC)

(h) Finally, our project of bringing a "deep time" perspective into conservation biology for the benefit of one imperilled species will become more important for other species as global warming continues. *T. taxifolia* can be viewed as a model for such future work.

NOTE: WE RECENTLY INVITED MARK SCHWARTZ to participate in this dialogue/project, given his authorship of important papers on *T. taxifolia*. His most recent response is very supportive:

Hi all,

Following Paul's comments and these, I have been thinking. I would be interested in starting a dialogue, perhaps as a pair of papers or a longer paper in *Wild Earth* about this issue. I see the following points:

1) Your arguments for the conservation of *T. taxifolia* make sense to me and argue for a translocation effort on its behalf.

2) With global climate change it is likely that other narrowly endemic species, particularly glacial relics share similar problems, so this could become a large problem by the next century (although I think it flawed, the recent article in *Science* on what proportion of species may be relegated toward extinction gives an idea of a potential magnitude)

3) *Torreya taxifolia*, by all stretches is not likely to become an invasive weed problem:

a) it has not gone weedy at Biltmore or other So. Appalachian garden locations.

b) It is slow growing, reasonably shade tolerant and dioecious, later maturing and poorly dispersed. All characteristics of things that are not weedy.

c) Seeds are heavily consumed by squirrels.

d) The tree seems to require large gaps to colonize in patches. Thus, the suite of species with which it would compete are reasonably small (*Pinus glabra*, *Taxus floridana* in FL).

4) Nonetheless, the implications of such actions in a general sense are grave.

a) We set a precedent for species introductions on behalf of conservation. This clearly pits opposing conservation concerns against one another (that of species conservation versus community integrity)

b) There are examples of opposition to such actions. A cross-breeding of a functionally sterile population in Illinois (I forgot the species name, Marcy DeMauro did the work) was sabotaged on behalf of conservation. The population was one clone and self sterile. The population was bred with individuals from a different state. Viable offspring were released. Subsequently killed.

5) Conservation biologists lack a formal policy on this and one is needed.

6) Despite developing a policy, however, there is very little control. There is no legal authority, that I know of, that would have jurisdiction to either sanction or prevent any private individual from acquiring seed from Bill Alexander or anyone else who is legitimately selling it (it is commercially available in South Carolina) and then planting it in forest that they owned. (animals may be a different story).

I find this to be a compelling and interesting problem.

Mark

SEVERAL QUESTIONS FOR ROB NICHOLSON:

SEVERAL QUESTIONS FOR ROB NICHOLSON:

1. What do you think of this proposal?
2. If you find the thesis attractive, do you have any thoughts on how to practically implement this proposal: that is, what would need to be done in order to get *T. taxifolia* successfully established in one or more "wild" habitats in the southern Appalachians?
3. Would you like to participate in our continuing (and widening dialogue) on this issue, which may lead to several publications and (we hope) actual on-the-ground implementation of assisted migration? (Lee Barnes is setting up a list-serve precisely for this discussion, which any of us can opt into. More on that later.)
4. May I distribute your response here to others?

Last month I personally visited the struggling wild *T. taxifolia* along the Apalachicola River, and met with Ron Determan and Carol Denhoff at Atlanta Botanical Garden who have been harvesting seeds for several years now from the clonal stock you initially supplied them with. I also have walked through a grove of *T. californica* occurring naturally in the coastal range of northern Calif and saw evidence of squirrels eating or burying the seed. I have also toured the healthy mature *Torreya* at the Biltmore, with Bill Alexander.

Others who I plan to invite comments from and to participate in list-serve conversation include the following. Please let me know if you think there are others I should add to this list:

Leigh Brooks (leigh_brooks@tnc.org) and Greg Seamon (gseamon@tnc.org) for The Nature Conservancy *T. taxifolia* conservation effort, plus Leigh's sister who also asked to be on this list: Anathe Brooks (abrooks@umbc.edu) Leigh has seen some of this conversation and is very interested.

Mark Ludlow (Mark.Ludlow@dep.state.fl.us) - new biologist at Torreya State Park.

Stan Simpkins (stan_simpkins@fws.gov), endangered species contact for *Torreya* at USFWS. I don't believe he has been part of any communication on this yet.

Steve Urse (surse2@earthlink.net), my host in Tallahassee who helped me find *Torreya* and Florida Yew in Torreya State Park 2 weeks ago and who brought Leigh Brooks into the conversation.

Bill Anderson (banderson@nettally.com) who has catalogue 80 *T. taxifolia* in Torreya State Park

Ron Determann (rdetermann@atlantabotanicalgarden.org) and Carol Denhoff (cdenhoff@atlantabotanicalgarden.org) who are doing *Torreya taxifolia* conservation at the Atlanta Botanical Garden, and who have nurtured clones of the remaining wild *T. taxifolia* to the point that they are producing seed, and are now growing a new crop of hundreds of seedlings each year, awaiting transplantation. I visited them and their project recently.

Rob Nicholson (now at Smith College, rnichols@email.smith.edu) whom Ron Determann recommended as having got the cuttings off the wild *Torreya* and rooted them all. He may know about California *Torreya* too.

Brian Keel (BGKeel@aol.com) who is working on a PhD project proposing "assisted migration" for an orchid, *Habenaria repens* (not endangered), as a model for conservation of terrestrial orchids in SE U.S. as climate changes. As he wrote me, "Assisted migration, as I am developing the concept, is for use in places such as the highly fragmented landscape of the eastern seaboard of the United States, where the creation of corridors may not be possible, or for migrations between oceanic islands or mountain tops." He expressed a wish to be included on *T. taxifolia* communications.

Michael Soule (rewild@tds.net) - because he is such a major player in always developing the leading edge in conservation biology, and I know him

Michael Soule (rewild@tds.net) - because he is such a major player in always developing the leading edge in conservation biology, and I know him.

Dave Foreman (eltigredave@comcast.net) - founder of Wild Earth magazine and a visionary leader in conservation biology from an strong advocacy and wildlands stance, and because I know that he is trying to keep tabs on the most visionary projects now happening.

Peter Wharton (peter.wharton@ubc.ca) - who contacted me recently and who is working on cutting edge issues of plant conservation in China.

Robbin Moran (rmoran@nybg.org) - my prime contact at New York Botanical Garden, who has a strong interest in deep-time matters affecting plants.

Peter del Tredici (ptredici@oeb.harvard.edu) - head of living collection at Arnold Arboretum, and who has done ginkgo research spun off of Janzen & Martin 1982, and with whom I consulted in writing my Ghosts of Evolution book).

Peter White (pswhite@unc.edu) - director of the botanical garden at Chapel Hill NC, and who I also consulted with while writing my Ghosts book, as he was inspired by Janzen&Martin 1982 to see the spines placement on *Aralia spinosa* and American holly as anachronistic.

John MacDougal (John.MacDougal@mobot.org) - my contact on *Torreya* at Missouri Botanical Garden, who says his two *T. taxifolia* planted outdoors there are doing fine.

For *Torreya*,
Connie Barlow

In a message dated 3/2/04 9:20:34 AM, RNICHOLS@email.smith.edu writes:

<< Dear Ms. Barlow,

Regarding your article :

I received your message and I can be reached at this return e-mail address as well as 413-585-2747.

A good starting point would be an article I wrote for Natural History Dec. 1990 (yikes, that long ago!) which details the first collection efforts. About 2200 cuttings from this collection trip, were propagated and grown on at The Arnold Arboretum (where I worked at the time) and subsequently distributed to a number of southern gardens and field stations (I can dig out this list). This collection work was funded by The Center for Plant Conservation (then at Arnold, now at Missouri BG). Atlanta BG was one of those who received cuttings and I suspect had the most success as Ron D. is such a good plantsman and understands how to grow these. Once I relocated to Smith BG, more two propagation cycles with material sent from Atlanta BG (grown from the original cuttings) resulted in still more rooted cuttings, all sent back to Ron D. for distribution, mostly to gardens and field stations in GA. . All told over 4000 cuttings were rooted, all with clonal i.d. numbers that document where the original collection site was.

I have not tracked or censused the original set of 2200 sent out in 1991/1992 as that would be a time consuming undertaking. It would be an interesting study in the variability in care and mortality. One or two people who can grow plants makes a huge difference in a project such as this. The trees at Atlanta BG now set seed and this opens up the possibility of re-stocking the ravines.

I have another article that details the propagation efforts and strategies for replenishing the native stands and I can fax this to you if needed.

Regards, Rob Nicholson >>

SEVERAL QUESTIONS FOR STAN SIMPKINS:

1. What do you think of this proposal?

2. If you find the thesis attractive, do you have any thoughts on how to practically

1. What do you think of this proposal?
2. If you find the thesis attractive, do you have any thoughts on how to practically implement this proposal: that is, what would need to be done in order to get *T. taxifolia* successfully established in one or more "wild" habitats in the southern Appalachians?
3. We would, of course, prefer to work in collaborative harmony with USF&WS, which I presume we would need to do if seedling stock for transplantation came from any of the botanical gardens that were distributed clonal stock from actual trees in the Apalachicola. From my preliminary conversation with Ron Determann, while I visited the "potted orchard" of *T. taxifolia* at Atlanta Botanical Garden, I get the sense that he would be open to considering having some of the stock being raised there used for this new effort, subject to all necessary approvals.
4. Would there be any USF&WS objection to a restoration project that would acquire *T. taxifolia* seed from mature trees now at the Biltmore Estate in Asheville NC (and which no-one is effectively saving and harvesting), and implemented on private lands in that region?
5. Would you like to participate in our continuing (and widening dialogue) on this issue, which may lead to several publications and (we hope) actual on-the-ground implementation of assisted migration? (Lee Barnes is setting up a list-serve precisely for this discussion, which any of us can opt into. More on that later.)
6. May I distribute your response here to others?

SEVERAL QUESTIONS FOR PETER DEL TREDICI:

1. What do you think of this proposal?
2. If you find the thesis attractive, do you have any thoughts on how to practically implement this proposal: that is, what would need to be done in order to get *T. taxifolia* successfully established in one or more "wild" habitats in the southern Appalachians?
3. I understand that Arnold Arboretum is participating in the conservation effort by maintaining clonal stock distributed to various botanical gardens from originals in the Apalachicola. Do you have any experience with *T. taxifolia* growing outdoors on the grounds of Arnold Arboretum?
4. I have heard that the aril around the seed of *T. tax* (a.k.a. stinking cedar) takes on an unpleasant odor after it has been on the ground for a while, much like ginkgo. Do you have any thoughts on who the co-evolved disperser might have been during the Jurassic? And who might have kept *T. tax* dispersed in the Cenozoic? (I have posited a loss of large tortoises by overkill or extirpation as the likely cause that *T. tax* remained stuck in its pocket refuge.
5. Would you like to participate in our continuing (and widening dialogue) on this issue, which may lead to several publications and (we hope) actual on-the-ground implementation of assisted migration? (Lee Barnes is setting up a list-serve precisely for this discussion, which any of us can opt into. More on that later.)
6. May I distribute your response here to others?

SEVERAL QUESTIONS FOR PETER WHITE:

1. What do you think of this proposal?
2. If you find the thesis attractive, do you have any thoughts on how to practically implement this proposal: that is, what would need to be done in order to get *T. taxifolia* successfully established in one or more "wild" habitats in the southern Appalachians?
3. I understand that your botanical garden is participating in the conservation effort by maintaining clonal stock distributed to various botanical gardens from originals in the Apalachicola. Do you have any experience with *T. taxifolia* growing outdoors on the grounds there?

Apalachicola. Do you have any experience with *T. taxifolia* growing outdoors on the grounds there?

4. Would you like to participate in our continuing (and widening dialogue) on this issue, which may lead to several publications and (we hope) actual on-the-ground implementation of assisted migration? (Lee Barnes is setting up a list-serve precisely for this discussion, which any of us can opt into. More on that later.)

6. May I distribute your response here to others?

SEVERAL QUESTIONS FOR ROBBIN MORAN:

1. What do you think of this proposal?

2. If you (or someone else at NYBG) find the thesis attractive, do you have any thoughts on how to practically implement this proposal: that is, what would need to be done in order to get *T. taxifolia* successfully established in one or more "wild" habitats in the southern Appalachians?

3. I understand that NYBG is participating in the conservation effort by maintaining clonal stock distributed to various botanical gardens from originals in the Apalachicola. I wonder if anybody has planted any of the seedling offspring outdoors there yet?

4. Would you like to participate in our continuing (and widening dialogue) on this issue, which may lead to several publications and (we hope) actual on-the-ground implementation of assisted migration? (Lee Barnes is setting up a list-serve precisely for this discussion, which any of us can opt into. More on that later.)

6. May I distribute your response here to others?

SEVERAL QUESTIONS FOR JOHN MACDOUGAL:

1. What do you think of this proposal?

2. If you (or someone else at Missouri) find the thesis attractive, do you have any thoughts on how to practically implement this proposal: that is, what would need to be done in order to get *T. taxifolia* successfully established in one or more "wild" habitats in the southern Appalachians?

3. I understand that Missouri Botanical Garden is participating in the conservation effort by maintaining clonal stock distributed to various botanical gardens from originals in the Apalachicola. My notes show that I had spoken to you about *T. taxifolia* there and that you might have some trees planted outdoors. How are they faring in that climate?

4. Would you like to participate in our continuing (and widening dialogue) on this issue, which may lead to several publications and (we hope) actual on-the-ground implementation of assisted migration? (Lee Barnes is setting up a list-serve precisely for this discussion, which any of us can opt into. More on that later.)

6. May I distribute your response here to others?

March 3

Dear Peter White -

What a fabulous, thought-provoking response! What makes it so great is that, while you overall support the thesis for assisted migration of Florida *Torreya* into the southern Appalachians, and while you would help in its implementation, you make some excellent points on the skeptic side. I am circulating this to our core *Torreya* group, and others who have expressed an interest or who I am hoping to interest in this subject, and will post it on the list-serve when we are sure that the list-serve is up and running (and will let you know how to get on).

P.S. to the others: Peter White is director of the botanical garden at UNC Chapel Hill, and, pertaining to Janzen and Martin 1982, has written on anachronistic spininess in holly and *Aralia spinosa*.

and, pertaining to Janzen and Martin 1982, has written on anachronistic spininess in holly and *Aralia spinosa*.

For Torreya,
Connie Barlow

In a message dated 3/3/04 9:09:14 AM, Peter.White@unc.edu writes:

<< Hi, Connie,

Here are a few responses:

The hypothesis that some species spread poorly from glacial refuges and so, as you say, "got left behind" is a reasonable one. Like others, I have noticed how well *Torreya* grows in cultivation in the mts and its current range seems to not represent its climatic envelope. However, I don't yet believe you are correct about the role of Indian set fires nor over hunting of tortoises. Many fire sensitive species spread northward despite Indian set fires. In any landscape, fire effects are variable. Further, tortoises hardly seem to me (but I am NOT an expert on this) a likely vehicle of movement of the species to the southern Appalachians. I doubt the effectiveness of that. Further, some ant dispersed species are currently far northward into Canada. So, I think, but am willing to listen to reason, that the dispersal story you've developed is not correct. What else could disperse *Torreya*? What disperses it in California? There may be a megafauna and Inidan link, I just don't think you've got it down yet. I'd be happy to be proved wrong. Failure to disperse is not rare in nature--many species, including many other glacial relicts, failed to saturate their climatic envelope, including species of many dispersal types and both positive and negative relations to fire. Given your thought that native squirrels will disperse the species, why didn't they already carry it northward? Other mt loving plants did make it out of the refuges in the coastal plain, despite what you call the burned flat landscape.

I'm not against assisted migration per se--and think it is likely we will be doing this! But it would be nice to have more details on the life history and possible mt competitors that *Torreya* would have, as well as contrasts and similarities with other species in the genus in terms of life history and ecology.

Dan Janzen once refereed to species that survive but without their coevolutionary context (e.g., without dispersers) as "ghost species". They exist, but won't forever (without human help) because some critical species interactions are missing. Without that coevolutionary context (which might include natural enemies that also prevent aspecies form forming monospecific stands), the behavior of the species (increase or decrease) can be less predictable and the act of assisted migration becomes simply gardening.

Torreya seems to grow just fine in Chapel Hill. If we get that far, we could presumably help propagate the plant.

Yes, add me to your list for discussion and list serve.

Yes, please distribute my response to others.

Yes, please distribute my response to others.

Be glad to comment more with others...

Peter >>

Hello Doria -

Thanks for responding - This is Connie Barlow. I will paste in the original email sequence below, and will add you to the names of folks to receive periodic correspondence.

In a message dated 3/3/04 4:10:15 PM, dgordon@tnc.org writes:

<< Hi. I was copied on the correspondence from Peter White which was evidently in response to your thesis and suggested translocation efforts along with some comments from Mark Schwartz. I would be very interested in seeing that information. As you know, The Nature Conservancy's Apalachicola Bluffs and Ravines Preserve supports one of the primary - but declining - populations of *Torreya*.

Thank you,

Doria Gordon

Doria R. Gordon, Ph.D.
Senior Ecologist, The Nature Conservancy
Courtesy Professor of Botany

University of Florida
P.O. Box 118526
Gainesville, FL 32611

(352) 392-5949
(352) 846-1344 FAX
MARCH 3

Good point, Paul!

I personally have seen bear (as well as fox and coyote) turds full of juniper berry seeds in the Gila area of New Mexico. The problem for *Torreya* is that the seed is huge, and apparently very tasty: humans as well as squirrels eat it. And the seed case is about as thin as that on a pinyon nut, so it is easy for molars to chomp. Bears easily chomp acorns to the point of nongermination, and *torreya* nuts are just as big and less well protected than acorns.

Nevertheless, methinks you are wise to suggest we lay a bit low on that one, and always put it in a wider context of argument.

Sure am having fun with this widening email conversation!

For *Torreya*,
Connie

In a message dated 3/3/04 2:28:56 PM, pmartin@geo.arizona.edu writes:

<< Hi Connie,

Just one minor suggestion. When we mention some large potential seed vector I think we don't need to mention any examples, i.e. the giant tortoises. I'm told that bears eat juniper berries near Glenwood, NM (Joe Truett) and any of a variety of extinct mammals might have eaten *torreya*. No?

Just to be cagy, if we mention tortoises or other possible vectors, we should add the adverb "possibly" by

Hey, I'm over 75 and getting cautious. Never mind, a very good case can be made for *Torreya* being constrained by anthropogenic

Hey, I'm over 75 and getting cautious. Never mind, a very good case can be made for Torreyya being constrained by anthropogenic fires.

Happy talks, Paul >>
March 18 w bill Alexander

Connie,
I am glad you had a great day. I have no historic details (other than collecting notes) concerning the planting of the Torreyas or why the particular sites were chosen. I suppose it had a lot to do with the fact that there was a higher canopy from the pine grove which has, in more recent years, been thinned out from loss of trees to storms and pine beetles. I don't think that we have ever seriously considered planting them in other locations due to the possibility of altering the historic design integrity of the landscape.

I have met and talked to Peter White at various meetings in the past, but do not know him very well. I do, however, think that he would be a good person in the leadership role.

Bill

-----Original Message-----

From: Cbtanager@aol.com [mailto:Cbtanager@aol.com]
Sent: Wednesday, March 17, 2004 10:14 AM
To: balexander@biltmore.com
Subject: Re: Connie Barlow visiting Torreyya at Biltmore on Saturday

Bill -

It was a terrific day at the Biltmore. I took a lot of photos of the the grove of Torreyas, which looks very natural. Do you happen to know why the originals were planted on the south-facing side of the ravine, with hemlocks naturally growing on the north side? Also, I wandred uphill a bit from there and saw a couple more. But I wonder, has there been any consideration of planting extra seedlings (or just the seeds) in natural ravines on the vaster grounds of the estate? Looks like a lot of prospects there.

I had a great visit with Hazel Delcourt at Univ Tennessee Knoxville a couple days ago. Will report more on that later. High recommendations for seeing if

Peter White at Chapel Hill Botanical Garden wants to take leadership in this, as the email reply he sent me a few weeks ago was a nice balance of high interest in the idea with some reservations that would work well for experimental work on various natural sites. Do you know Peter?
MARCH 19 from ROB NICHOLSON RNICHOLS@email.smith.edu

Dear Rob -

Excellent! I shall pass your email onto the group. All the detail you mention is extremely helpful. It is great that you have had experience with T. cal in the wild. And thank you for suggesting the specific ways in which you would offer to be involved in this research/restoration effort.

The main SOURCE OF SEEDS would probably be the small grove of T. tax at the BILTMORE ESTATE Asheville. Bill Alexander is Landscape/Forest Historian there, and he and I talked several years ago as, (1) he independently came up with the idea that "native" range at this time in history for T. tax would really be southern Appalachians, and (2) he has been frustrated with a lack of success thus far in attempting to entice conservators to harvest the Torreyya seed production there and put it to good use, as well as the seedlings which squirrels establish sometimes quite distant from the grow and that simply get mowed on lawns or pulled from landscaping beds where they are not

conservators to harvest the *Torreya* seed production there and put it to good use, as well as the seedlings which squirrels establish sometimes quite distant from the grow and that simply get mowed on lawns or pulled from landscaping beds where they are not wanted.

ANOTHER SOURCE OF SEEDS/SEEDLINGS would likely be any of the three(?) botanical gardens where your branch cloning work ended up: Atlanta, Chapel Hill, Missouri(?)

Several weeks ago I visited the T. tax project at Atlanta Botanical Garden and visited the potted orchard of those original clones, plus 3 years worth of seedling orchards also growing well in pots: the offspring of the clones. I can't remember the exact number, but I believe they are now harvesting about 500 seeds per year there and that the germination rate is excellent. [Ron Determann and Carol Denhoff at Atlanta: feel free to clarify by directly emailing Ron, and please cc me and Lee Barnes (lbarnes2@earthlink.net). I send emails out in three separate groups lists, so I will need to send to all if you have something you would like everyone to see. Lee is maintaining the on-line archive at torreya@yahoogroups.com]

If anybody else wishes to respond directly to Ron, go for it. Again, please copy me and Lee Barnes.

Ron: You will need to subscribe yourself onto the *Torreya* group listserve, where you can also peruse the archive of previous emails (all with Lee's name shown for each, as he is the one who took the backlog and put them all up). I will send you a separate email on how to do that.

For *Torreya*,
Connie Barlow

In a message dated 3/19/04 3:34:29 PM, RNICOLS@email.smith.edu writes:

<< Dear Connie,

I would be happy to participate in the on-line forum and possible research effort so will be glad to enter into discussions regarding *Torreya taxifolia* and the proposed reservation.

1. Weed Potential: I have seen three different genera and maybe 12 species of Taxaceae in the wild and consider all to be understory or mid-layer inhabitants of established forests. they seem to compete and reproduce best where disturbance is minimal. (The most open, driest site I have seen is *Torreya californica* in Yosemite).

I occasionally see seedlings of bird dispersed *Taxus media/cuspidata/baccata* (non-natives) sprouting and growing in the woods near my home. These are escapees from suburbia. But since you raised the question of weediness, I recall seeing saplings to 6-8' but nothing older and certainly no mature reproducing trees even though these cultivated non-natives have been in New England for over 100 years. So I am not even sure these escapees can sustain themselves long-term in New England forests, but it may be different further south. I think that potential long distance dispersal of *Torreya* by squirrels is limited but bluejays are known to move acorns around so bird dispersal is at least possible. But on a scale of 1 to 100 I would imagine the weed potential is below 10.

2. A 50 to 100 year outlook is needed on any re-establishment project and it might be interesting to set up comparisons blocks to be planted with say 5' plants, 1' rooted cuttings, untreated seed, and pre-treated seed as a comparison study to see what material has the best long term success and what material has the least impact during planting (this is an issue on the steep sides of the Appalachian Ravines, but may be less so elsewhere). I would suggest and would be willing to do the pre-treatment experiments as germination protocols for *Torreya* in general are still a bit fuzzy. There is a long 18 month embryo after-ripening prior to germination. I suspect lee Barnes has the most experience here.

Chinese researchers have GA 4 and GA 7 (GA 3 inhibits) to stimulate germination of *Taxus* and this would be a very interesting line of research to try with *Torreya*. Again if seed can be procured our garden

Chinese researchers have GA 4 and GA 7 (GA 3 inhibits) to stimulate germination of *Taxus* and this would be a very interesting line of research to try with *Torreya*. Again if seed can be procured our garden would be happy to delve into this. A comparison with *T. californicum* or *T. nucifera* would be nice.

Feel free to share this with others.

regards, Rob Nicholson >>

March 24, 2004

Hello *Torreya* group:

Pasted in below is the very supportive and informative email I received from ROB NICHOLSON, now at Smith College Arboretum, who is the person who cut branches from all the surviving wild *T. tax* along the Apalachicola, cloned them, and sent the sets of clones out to botanical gardens. His work is the source of the *T. tax* potted orchard that is now producing seeds at the Atlanta Botanical Garden, and which I visited a few weeks ago.

MY RESPONSE TO ROB follows his email to me, and after that I am pasting in directions on HOW TO SUBSCRIBE to the *Torreya* list-serve Lee Barnes just created. This listserve electronically archives, sends to all subscribers, and makes available anything sent to it. (When Lee started the listserve, he put up on the website the previous correspondence, so much of it looks like it came from Lee Barnes, but it really is stuff that circulated between me, Hazel Delcourt, Paul Martin, Bill Alexander, Lee Barnes, Mark Schwartz, Josh Brown, etc.) In order to prevent AOL from thinking I am sending spam, I must send any email communications out in 3 batches (as there are already that many people interested!), so if we can all get on the listserve that will make it easier for me.

If you know anyone else who would like to participate or listen in on the conversation, please advise them to contact me first, as I want to keep track of everyone. Thus far, there is not enough traffic to warrant anyone fearing a boatload of *Torreya* listserve emails showing up each morning, but if the conversation expands beyond a comfortable point, Lee Barnes will advise us how to regroup.

Again, this conversation is exploratory and we can already see how much synergy there is in keeping the conversation going. My sense is that we all share (a) a deep concern for *T. tax* to be given the best possible chance to survive and thrive in the wild, and that some of us are also (b) looking for ways to responsibly move ahead on planting/rewilding *T. tax* to the southern Appalachians and (c) are gathering ideas for working in teams to produce articles on this idea for a Fall theme issue in *Wild Earth* magazine and perhaps also for other journals.

March 24, 2004 to John.MacDougal@mobot.org

John -

This is Connie Barlow, who has instigated an email group discussion on possible "assisted migration" of *Torreya taxifolia* to the southern Appalachians. Hazel Delcourt (U Tenn Knoxville), Peter White (Chapel Hill), Rob Nicholson (Smith College, who propagated the *T. tax* clones you have), Ron Determann (*T. tax* propagation project at Atlanta Botanical Garden), Bill Alexander (Biltmore Estate), various Nature Conservancy folk, are among those engaging in this lively discussion. A month or so ago, I asked you several questions. But here are 3 quick new ones:

QUESTION 1: I just found an October 17, 2001 email from you in which you answered a question from me related to this. I just want to check if this is still true. I asked you whether you have any *T. tax* planted outdoors there. YOUR RESPONSE: "We have two, both planted out within a year of each other. Both are doing fine (Zone 8/ Zone 6a)." Is this still true?

QUESTION 2: Are the *T. tax* clones you received from Rob Nicholson when he was at Arnold Arboretum producing any seed yet? I visited the "potted orchard" at Atlanta Botanical Garden, and they are doing magnificently. If you are getting seed, what are you doing with it? Some of us have an interest in beginning experimental plantings on private land into the "wild" in various locations in the southern Appalachians.

QUESTION 3: Would you be interested in joining this email conversation?

You may be interested in these two recent responses by Rob Nicholson and Peter White:

You may be interested in these two recent responses by Rob Nicholson and Peter White:
March 24, 2004 title: Torreyia: 10 questions for discussion

Hello Torreyia Group:

This is Connie Barlow. I am dedicating today to *Torreyia taxifolia*, as I need to catch up with you all with thoughts and conversations that have come my way over the past few weeks, and which only now I am having a chance to assimilate and pass on. Basically, since I last wrote to you in depth, I have visited the *T. taxifolia* propagation effort at Atlanta Botanical Garden (Ron Determann and Carol Denhoff), the thriving grove of *T. taxifolia* at the Biltmore Gardens in Asheville (Bill Alexander), the office of Hazel and Paul Delcourt at University of Tennessee Knoxville (from which I walked off with a lot of useful papers to read and a lot of sobering thoughts), and a potential private preserve for rewilding *T. tax* along the east side of the Cumberland Plateau.

Probably the best way to convey some of the pieces is in the form of 10 QUESTIONS FOR DISCUSSION. (I may have more in a separate email to follow.)

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?

This idea was suggested to me this past weekend by JOHN JOHNSON, while I was visiting 340 acres of private woodland, where he lives, on the east slope of the CUMBERLAND PLATEAU, a few miles north of Whitwell Tennessee, near the Sequatchie River. John is very interested in our *Torreyia* conversation, and I hope he will become a key player on the ground, as well, for these reasons:

(a) John will likely be energetic about advocating and implementing test "REWILDING" of *T. tax* with the owner of the PROPERTY on which he lives, which is deciduous woodland slope with ravines (most of the pines have died from beetle infestation). Hemlock grows wild pretty much only along the creek at the bottom of the canyon that cuts deeply into the east side of the Cumberland Plateau, but hemlock does well when planted by hand in gentle ravines running up the side of the canyon (their property is south-facing).

(b) John is now a field research assistant, working for a graduate student of PETER WHITE on a forest research project pertaining to an exotic tree.

(c) John is active in ecological protection of his bioregion and recently met LEE BARNES, of our *Torreyia* Group, who is one of the leaders of the bioregionalism movement in the KATUAH Bioregion (Smokies/Asheville)

(d) John recently encountered Hazel DELCOURT's book, "Forests In Peril: Tracking Deciduous Trees from Ice-Age Refuges into the Greenhouse World," and almost bought it -- so he was delighted when I lent him my own marked-up copy.

2. WHAT IS THE ECOLOGICAL IMPORTANCE OF *T. TAX* AND ITS POSSIBLE INTERCHANGEABILITY WITH HEMLOCK/TORREYA IN SHADING STREAMS AND SEEPS IN THE SOUTHERN APPALACHIANS?

JOHN JOHNSON'S suggestion immediately struck me as significant. Consider: several of us have pointed out (most recently PETER WHITE) that it will be important to ensure that *T. tax* won't supplant existing southern Appalachian plants before large reintroductions take place into the wild in posited new "native" range. RON NICHOLSON, who clonally propagated *T. tax* genotypes from the remaining Appalachian population, responded to Peter's point, from personal experience with *T. tax* and *T. cal*, that, "on a scale of 1 to 100, I would imagine the weed potential [of *T. tax*] is below 10." MARK SCHWARTZ, author of many papers on *T. tax*, responded similarly: "*T. tax*, by all stretches, is not likely to become an invasive weed problem," and he gave 4 arguments to support that conclusion. So perhaps we can consider that problem largely settled for the moment (though it would have to be fleshed out in any paper) and go on to the next consideration in our discussions:

That is, might *T. tax* might actually be able to play an ECOLOGICALLY IMPORTANT role, filling an ecological "gap" created by an exotic insect, and a gap that might widen anyway as climate shifts, even if the adelgid does not extirpate the HEMLOCK? John JOHNSON mentioned his concern for what will happen to the TEMPERATURE OF CREEKS and seep drainages if the evergreen hemlock is lost in those environments. What do any of you think? Note: JOSH BROWN directed our attention early on to an important paper by Michael Soule et al. 2003. "Ecological Effectiveness: Conservation Goals for

and seep drainages if the evergreen hemlock is lost in those environments. What do any of you think? Note: JOSH BROWN directed our attention early on to an important paper by Michael Soule et al, 2003, "Ecological Effectiveness: Conservation Goals for Interactive Species," Conservation Biology 17:1238-1250, which HAZEL DELCOURT and I have read.

If rewilding is to take place, then:

3. WHAT ABOUT SOUTH V. NORTH FACING SLOPES AND A POSSIBLE COMPLEMENTARITY OF HEMLOCK AND TORREYA? I visited the T. tax GROVE AT THE BILTMORE GARDENS in Asheville about 10 days ago and was impressed by how "wild" the grove was. There are about a dozen elder trees, all planted from seed collected in the Apalachicola in 1939, plus various ages of younger trees seeded by those elders. Some of the elders (and all the younger ones) are growing as middle- and understory in a narrowish ravine with a tiny flow of water in the bottom, in which the slopes are all fairly "wild", not mowed. It is so great to see healthy Torreya, thriving! The canopy of this ravine is mostly old white pine with some hardwoods. The T. tax looks gorgeously healthy. BILL ALEXANDER reports that this grove survived a 5 year drought in the 1980s, and in 1985 survived temperatures of minus 16 degrees F. A few years ago they began spraying adult trees for fungus not specific to Torreya, though the young trees show no sign of any problem. Significantly, the ravine trends E-W. HEMLOCKS are the dominant understory of the north-facing slope (with a bit of rhododendron and holly) and T. tax dominates the SOUTH-FACING - thick in parts! I asked Bill Alexander whether this SEGREGATION OF HEMLOCK AND TORREYA BY NORTH AND SOUTH SLOPES was intended, but there are no historical records as to why T. tax was planted south-facing. He does say that the pine canopy over the little ravine used to be denser, but storms and beetles have thinned them out.

4. IS BIOLOGICAL CONTROL (BREEDING AND TESTING OF AN ASIAN LADYBUG THAT DINES ONLY ON WOOLLY ADELGID) A SERIOUS POSSIBILITY FOR SAVING THE EASTERN HEMLOCK? While I was at Sequatchie Valley Institute, Carol Kimmons, a plant pathologist at U. Tenn Chatanooga, told me about ongoing work to make feasible biological control of the woolly adelgid. Is this a serious possibility? In other words, am I too hastily looking at T. tax as a possible hemlock substitute?

5. SHOULD WE ALSO BE TALKING ABOUT FLORIDA YEW? Speaking of ecological replacement, what about FLORIDA YEW? Florida yew grows only in the Apalachicola. The trees I saw there were all very old, looked in excellent health. Apparently, unlike Torreya, the mature trees are doing fine, but there is little if any replacement. The thought is that deer are nibbling away the young ones. Note: another reason the Sequatchie/Cumberland property might be ideal for rewilding T. tax is that it is in a very backwoods area of traditional hill folk (so we can count on DEER POACHING to give any plantings a good chance). The ATLANTA BOTANICAL GARDEN (Deterrmann and Denhoff) also have seedlings of Florida yew that they are propagating, so potentially there would be a source.

I understand that Florida yew (*Taxus floridana*) is more closely related to the relict populations of yew in the highlands (cloudforest) of Mexico (*Taxus globosa*) than it is to the Canadian yew (*Taxus canadensis*) of the northern Appalachians. IS A YEW "MISSING" from the southern Appalachians? Could the "Florida" yew be that yew? Should we even be discussing yew?

6. DID TORREYA ARRIVE IN NORTHERN FLORIDA WELL BEFORE ONSET OF GLACIALS? HAZEL DELCOURT gave me an old copy of PAUL MARTIN'S CLASSIC 1957, "The Pleistocene History of Temperate Biotas in Mexico and Eastern North America," Ecology 38: 468-480. In that paper, Paul elegantly uses taxonomic affinities of lungless salamanders in the Appalachians v. Mexican highlands to answer a botanical question that had seemed intractable: Did moist-loving flora that presumably evolved in the Appalachians arrive in Mexico (via a continuous band of moist forest along the Gulf coastal plain from Florida thru Texas into Mexico) during the Pleistocene glacials and then become disjunct? Or did the spread and disjunction occur much earlier, with plants "arriving" in highland Mexico from their presumed source in the Appalachians by the mid-Cenozoic and then becoming disjunct (Texas gap) during the arid Pliocene? Paul uses salamander affinities to conclude the latter: that the flora arrived in Mexico by mid-Cenozoic and then became DISJUNCT WELL BEFORE THE PLEISTOCENE.

So: Does this mean that T. tax arrived in the Apalachicola prior to the Pleistocene too, rather than having been forced down during the glacials? NOTE: I will be visiting with Paul Martin in about 2 weeks; my business travels just happen to be putting me in easy proximity to visit over the course of 3 months: the Apalachicola, Atlanta Botanical

too, rather than having been forced down during the glacials? NOTE: I will be visiting with Paul Martin in about 2 weeks; my business travels just happen to be putting me in easy proximity to visit, over the course of 3 months: the Apalachicola, Atlanta Botanical Garden, the Biltmore, Lee Barnes (south of the Smokies), Hazel Delcourt in Knoxville, the Cumberland land prospect and John Johnson along the Sequatchie Valley, and Paul Martin in Tucson!

7. DID T. TAX EVER MAKE IT BACK TO THE S. APPALACHIANS DURING PREVIOUS INTERGLACIALS? There is no question that the onset of the glacials extirpated *Torreya taxifolia* from its possible range in the southern Appalachians and either drove it into the Apalachicola at that time or simply made pre-existing southern pockets the only remaining habitats. The question then becomes this: Once the southern Appalachian populations were lost, does it seem that *Torreya* was unable to move back north from the Apalachicola "refuge" during ANY previous interglacial? Remember: Only in eastern North America is there no altitudinal relief for the *Torreya* species from its glacial refuge; in contrast, in California and Asia, there were mountains nearby. Another useful point of information: I recall that Earth enters a glacial episode slowly, so there is a lot of time for plants to move south, but that Earth traditionally comes out of a glacial swiftly, so there is less time to move back north.

Although PAUL MARTIN'S 1957 paper did not delve into when *Torreya taxifolia* arrived at its "pocket refuge" of the Apalachicola in Florida, the paper (and the discussion I had with Hazel and Paul DELCOURT last week in their office at U. Tenn. Knoxville) opens up the question as to WHETHER T. TAX EVER MADE IT BACK TO S. APPALACHIANS DURING PREVIOUS INTERGLACIALS (each about 10,000 years in duration). I had presumed that it had, but after speaking with the Delcourts, I am chastened. There is no empirical evidence that *T. taxifolia* existed in the southern Appalachians during previous interglacials. In other words, once North America entered the Pleistocene 2.5 mya, *T. tax* was doomed to be a relict species in pocket refuges along the Gulf coast, vulnerable to extinction if any interglacial warmed too much -- owing to lack of access to an altitudinal means of quickly dispersing into cooler conditions. This then brings up the next question:

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? That is, if *T. taxifolia* never made it back north in previous interglacials, then it doesn't really matter that paleoindians might have made the return journey even less feasible during the current interglacial. What matters now is that the industrial era has already moved greenhouse warming to a level higher than any previous interglacial, and that a threshold for *T. tax* was apparently reached several 40 or 50 years ago when summer heat and drought stressed *T. tax* in the Apalachicola (but not at the Biltmore in North Carolina) to the point that various fungal diseases took their toll.

This is an important question: For, if there is consensus that *T. tax* did not make it back to the southern Appalachians in previous interglacials, then my own work on the loss of tortoises as dispersal agents (as published in my 2001 book, "The Ghosts of Evolution," and in a 2002 issue of *Arnoldia* magazine) and PAUL MARTIN'S and HAZEL DELCOURT'S expertise on ecological effects of Paleoindian use of fire need not enter into the argument, virtually at all. Rather, the focus becomes a matter of how this interglacial differs from previous interglacials temperature-wise, and the role of the INDUSTRIAL human in exacerbating that effect in the very near future (and, for *T. tax*, already by mid-20th century). Note: The Delcourts' book, "Prehistoric Native Americans and Ecological Change" will be published in May 2004 (Hazel gave me an advance copy).

Paul Martin has a retrospective on his own 55 years of work coming out this fall, I believe, U. Calif Press.

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? My discussion last week, for several hours, with Hazel and Paul DELCOURT at their office in Knoxville was intellectually exhilarating, but emotionally depressing. I walked in there just wanting to help rewild *Torreya*, using what I like to call "deep-time eyes." Alas! Hazel, whose 2002 book, "Forests In Peril: Tracking Deciduous Trees from Ice-Age Refuges into the Greenhouse World" (which draws upon her 3 decades of work on this topic), opened my eyes to the scale and speed of forest upset that global warming is and will increasingly cause. Yikes! Wildlands corridors may be fine for mobile animals, but trees simply cannot move fast enough, and the generation times for trees are much longer than are those for animals. Already, HAZEL discerns that the Evergreen Magnolia-Beech climax forest, which used to be widespread south of the Appalachians yet barely

but trees simply cannot move fast enough, and the generation times for trees are much longer than are those for animals. Already, HAZEL discerns that the Evergreen Magnolia-Beech climax forest, which used to be widespread south of the Appalachians yet barely exists anymore, would do quite well in the southern Appalachians right now. Climate warming is already that advanced. (Significantly, I was in such a forest in February when I was viewing the diseased T. tax on the eastern slope of the Apalachicola River.) See Hazel R. Delcourt, 1977, "Presettlement Magnolia-Beech Climax of the Gulf Coastal Plain: Quantitative Evidence from the Apalachicola River Bluffs, North-Central Florida," Ecology 58: 1085-1093.

A few days after I spoke with Hazel, I found myself on a wooded slope of the east side of the Cumberland Plateau, at Sequatchie Valley Institute, seeing a woodland losing its pine to beetle infestation, its hemlock to warming, while a (planted) evergreen southern magnolia was thriving by the house - and the owners talked of getting more!

9. IS THE CORRIDOR CONCEPT OF NATURAL MIGRATION INADEQUATE FOR THE PLANTS IN OUR DECIDUOUS FORESTS? Hazel DELCOURT also said we should be looking not just at *Torreya* in the Apalachicola but also at the southern BEECH. The genes of the beech that still survives that far south may be the very genes that will allow the beech to survive in Michigan in 100 years! Preserve this essential genetic diversity! Hazel would thus suggest wholesale experimentation with rewilding into the southern Appalachians of genotypes of beech and southern magnolia drawn from the Apalachicola, as well as endangered yew and *Torreya*. She and Paul DELCOURT showed me climate model estimations (by others) that would force shifts in suitable habitat of beech for the next 100 years that were absolutely appalling: it may be that the southern-most suitable range for beech will soon be found in southern Canada, and that the northern suitable range will extend up alongside James Bay.

No bluejay can assist migration of a whole species that far and that quickly; and our once-grand traveler, the Passenger Pigeon, is gone. What would Aldo Leopold be saying in our time? Will the generation of children alive today be forced to plot and implement the continental movement of our grand eastern forests? Will the younger among us in this conversation right now be part of that effort? Should we be starting the first real discussions and tests of forest-scale assisted migrations now? And is the concept of wildlands corridors for natural migration of biodiversity simply too animal-centric?

Corridors may work just fine for helping wide-ranging jaguars and wolves and grizzlies return to previous habitats and track changes in climate, but can corridors do much of anything useful for slow-maturing plants?

This realm of thought is very depressing for me, because I am a wildlands advocate and would vastly prefer us to simply make preserves big enough and corridors connected enough for nature to do what it needs to do without our meddling. The Fall issue of *Wild Earth* is on the theme of corridors, so what sorts of contributions might be generated from this group, from our discussion of *T. taxifolia* and all the ancillary thoughts that go along with that?

I look forward to hearing from many of you -- and please join the listserve so that I don't have to play the role of switchboard!

For *Torreya* (and, alas!, a whole lot more),
Connie Barlow
RESPONSES TO 10 QUESTIONS, March 26

Leigh -

I agree! After I assemble all the comments from this round, I will get them out to all so that we can all consider what everyone is saying, and have the discussion continue.

Somehow it is all less daunting knowing that I personally don't have to figure everything out. There is a community of expertise and dedication and I am hopeful that good things will emerge beyond the capacity of any one of us to envision right now.

For *Torreya*,
Connie

In a message dated 3/24/04 5:30:42 PM, leigh_brooks@tnc.org writes:

<< Connie,

Thanks for sharing all those exhilarating ideas. I look forward to hearing people's thoughts on how to preserve biodiversity in light of climate change. When I started thinking about the implications, I felt overwhelmed and helpless. It helps to know others are concerned and putting on their

people's thoughts on how to preserve biodiversity in light of climate change. When I started thinking about the implications, I felt overwhelmed and helpless. It helps to know others are concerned and putting on their thinking caps.

Leigh Brooks

The Nature Conservancy, Northwest Florida Program

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Bristol, FL 32321-0393

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RESPONSE FROM PETER WHITE:

I wanted just to take up ONE point here:

I argue strongly that no two species are ever identical and we should not sell this idea based on the idea of replaceability. There may be some reasonably similar functions (for example, evergreen shade for streams) but there will be a whole host of differences, too.

We should never argue that species are equivalent or replaceable--among other things, it makes it look like when just go out and plant new trees and species to replace old ones and that all environmental disasters (e.g., the hemlock woolly adelgid) can just be writ out of the system. I don't believe red maple is a replacment for sugar maple, that Fraser magnolia is a replacement for umbrella magnolia...that oaks are replacements for chestnut. There are some similarities for some functions, but I believe this is going down the wrong path.

I don't belive this either as a philosophical statement or a biological one.

I'll read the rest of the email and comment later on other issues.

RESPONSE FROM SHARON HERMANN:

I concur with Peter's comments. I don't see this as a useful path to consider.

Sharon

Sharon M. Hermann

Department of Biological Sciences

Funchess Hall

Auburn University

Auburn, AL 36849

Office phone: 334-844-3933

SECOND RESPONSE FROM PETER WHITE:

In a message dated 3/24/04 9:32:05 PM, peter.white@unc.edu writes:

<< So, here is one more thought:

There seem to be two rationales for growing *Torreya* in the to the north of its current location, one simple and one complex. I am attracted by the simple rationale and troubled by the complex one.

The simple rationale goes like this: It's not doing well in Florida; it seems to do well in cultivation in NC. Let's save this species by planting it in botanical gardens (we have a collection in Chapel Hill) and seeing if we can establish it in self-reproducing populations in the wild. This is essentially a biodiveristy and Noah's Ark rationale. We don't have to claim it was once here. We don't have to claim that Indians prevented its northward migration. We just want to do it because this species (and, for better or for worse, it is a charismatic species) will have a better chance. Throw in the next 100

don't have to claim it was once here. We don't have to claim that Indians prevented its northward migration. We just want to do it because this species (and, for better or for worse, it is a charismatic species) will have a better chance. Throw in the next 100 years of climate change and this rationale seems even more appealing. There are a lot of things we don't know. We don't know if it will outcompete native species (though we doubt it will). We don't know if there are dispersers that will assist it. We don't know if its pathogens are present or will spread with it. But, what the heck, we'll give it a shot. We don't need to put it everywhere, we just need to put it in a few places and monitor it because our real goal is that the species survives, not that it fills all potential habitat.

The complex rationale goes like this: That there is some historical precedence to convince us that it SHOULD be here--that in ONCE was here (in NC or the So. Appalachians) and that it was only people that have prevented it getting here. Corrolaries of this argument are that it plays an essential role in this ecosystem or that it overlaps in role with hemlock and will help the forest recover from hemlock loss. In that sense, this rationale suggests we are just assisting what should have happened naturally and that, once *Torreya* is moved, it will regain its rightful position and role. We are assisting--but the aim of our assistance is, paradoxically, to create the natural situation (cf. White and Bratton, 1980, *After Preservation: the philosophical and practical problems of change. Biological Conservaiton*). This is where the verb "wilding" seems to imply that we are assisting with a recovery towards wildness. In the email of today I see this desire to establish the naturalness, historic precedence, or ecosystem completeness.

Personally, I don't believe the complex rationale is the essential argument. If *Torreya* were doing well in Florida and if we didn't face climate change, I would not care to artificially expand its range northward. I like the idea that history matters and creates narrow endemics with small ranges. I think that glaciation created a very interesting signature in narrow endemism in the SE (I gave a paper at the Ecological meetings laster summer in Savannah on endemism in the SE in plant and animal groups--see ppt posted through my UNC web page: go to <http://www.bio.unc.edu/faculty/peet/lab/PEL/publications.htm> and look under ESA talks for White, McKnight, and Walker). There are even some interesting ecological spin offs when species don't saturate their potential range. One of the strictest definitions of native vs. exotic is that you should not move a fish above a waterfall it cannot cross on its own. This might seem silly but some mt streams have waterfalls and the streams above the waterfalls are missing fish--but that creates a refuge from predation for prey species. Vernal pools here at the botanical garden are good for salamander reproduction--BUT in wet years, fish swim into the pools and eat the eggs and larvae. It turns out that wet years connect the ponds and dry years leave them isolated. Wet years are good for fish, dry years for salamanders. I am pretty far from *Torreya* at this point, but my general point is that small range siize, lack of saturation of available habitat, and barriers to dispersal are not inherently bad--they are one of the interesting products of evolution on our variable planet, creating geogrpahic turnover of species and local uniqueness. I could wax eloquently about the good, bad, and indifferent processes that created a narrow endemic situation like *Torreya*. But the bottom line is that, were it not for *Torreya*'s poor outlook in Florida and if it were not for the rapid climate change caused by people, I'd be happy to let it thrive in a narrow range. Even to move it northward, to me, does not have the goal of saturating the potential range or restoring some ideal state. It has the goal of preventing the extinction of the species.

So this makes me sound like a person motivated only by biodiversity and saving species, rather than wildness. I like both--for example, I like the idea that Great Smoky Mts National Park would NOT be the site of *Torreya* introduction. I would love to see Park restoration occur for other species. For example, the Park just got back some elk--I guess that's ok, but don't forget we lack mountain lions and wolves and I'd rather have those with the elk. Leopold wrote that "deer live iin mortal fear of the wolf, but the mountain lives in mortal feer of its deer" and elk overgrazing does occur on other national parks. So, I don't mind putting mt lions, wolves, and elk back in the Smokies. They were all there within a few 100 years. But by and large I like wildness to dominate

mountain lives in mortal fear of its deer" and elk overgrazing does occur on other national parks. So, I don't mind putting mt lions, wolves, and elk back in the Smokies. They were all there within a few 100 years. But by and large I like wildness to dominate the park, even a wildness that is affected by air pollution and climate change (well, obviously I'd like to reverse those, but the fact of those doesn't make me want to move *Torreya* into the park).

Peter >>

Peter -

Bravo! It is great to read the argument happening right inside your head, pro and con. Thank you for letting the rest of us have access to your internal conversation. Your email sets an example for all of us: let's regard this email discussion as a kind of "conversation cafe," where we can freely exchange ideas, however tentative or ill-formed, and also as individuals know that we are not held to anything that we might have earlier said. We can all evolve our views as we go.

For *Torreya*,
Connie

RESPONSE FROM RON DETERMANN:

Please note. The Atlanta Botanical Garden is currently working on the coordinated trial recovery of the species in the wild consistent with the recovery plan and initial indications are even encouraging (two years of data only). This will be a very long term project and who knows may fail after many years. In addition we are interested in safeguarding the species with as much known genetic variance (as many indexed individuals as possible of KNOWN origin) in cultivated settings only! Even far away from original distribution location, such as cooler climates. Climate changes however are not the real reason for its decline, pathogens are. We do not see the need to integrate the species into natural areas of any kind other than the original. Ecologically this species cannot replace any other....

Ron -

Thank you for your forthright statement. This is great! I like having a full debate on this, with people coming in from all angles. We shall see how this flows. Ultimately, we may be able to fashion from this discussion different sets of people gravitating to at least two distinctive positions, and then publishing both sides in the fall issue of *Wild Earth*. Maybe like Supreme Court decisions, with a Yes and a No, and individuals then weighing in with their own nuances to each.

For *Torreya*,
Connie

FROM PAUL MARTIN:

Paul -

Yours is indeed a brain to pick! Thanks for including all the detail and speculations. I'm getting in some very interesting responses. Will assemble them all next week and send them out en masse to everyone.

For *Torreya*,
Connie

In a message dated 3/24/04 6:35:54 PM, pmartin@geo.arizona.edu writes:

<<
Hi Connie,

Wow. You (we) may have thought the *Torreya* project would involve grabbing only a few black hairs, but now I see its in fact the tail of a bear.

involve grabbing only a few black hairs, but now I see its in fact the tail of a bear.

The basic idea still seems sound. There are reasonable reasons for thinking that *Torreya* should be farther north than it is naturally. From what you say, it seems that the tree does best when it has been planted artificially to the north and higher in elevation than along the Apalachicola.

Why did it not move north fast enough? Just possibly for the same reason that Critchfield's spruce is extinct, i. e. by anthropogenic fires of spring at the end of the last glacial at a time when the climate was warming rapidly.

Now, the global warming model gives, or will give, license to those who promote experimental plantings of all eastern deciduous forest trees north of their present domain. This will be a radical step for some plant people, but there seems no way to ignore the need for experiments in the face of uncertainty. The next decade of global temps may well pull some big surprises, and not all for the worse..

We might, for example, see the southern Appalachians experience a rise in mean annual temp and a reduction in range, Summers would not be much warmer than at present and winters decidedly warmer (only enough frost to kill tank bromeliads one year out of 50, with no damage to trees, i.e. the climate of Rancho del Cielo in Tamaulipan cloud forest.) At 4000 feet the place has a species of beech, of fir (*Abies*), hard maple, an evergreen magnolia, some tropical montane species we don't have, including six species of oaks all different from ours, red bud, and a taxon of sweet gum different from ours, trees 100 feet tall with a tight crown (before lumbering began).

We could do worse than end up with habitat in the Smokies for Tamaulipan cloud forest, thanks to global warming .

Are we playing god in all this? I guess so. Its the only game left, unless the Kyoto Treaty is resurrected from the dead.. Carefully conserving what is where it is vaporizes if the bioclimate shifts massively.

Best,

Paul >>

March end of from DAVID JARZEN

Dear Connie;

I am now officially on the Yahoo *Torreya* group. My messages are getting through.

Yes, I was student of Dr. Alan Graham, but for my MA degree from Kent State University. (1969) I do not have reprints available, but could make a copy if you would like one?

Graham has since retired (a couple of years ago) and is now a Research Associate at the Missouri Botanical Gardens, St. Louis. A very knowledgeable man indeed!

More later. I liked your open questions about *Torreya*. I'm thinking.

David

David