

International Oaks

The Journal of the International Oak Society



Issue No. 23
Spring 2012

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Some of the oaks and oak people you will meet in these pages



The 'New Madrid' stock tree at Pavia Nursery in Belgium - Nurseryman Dirk Benoit and Guy Sternberg (Inset - spring color in May) - see page 49 photos by Guy Sternberg



Arborist author Ryan Russell working high in the New Madrid Oak ortet tree in Missouri - see page 49 - photo by Ryan Russell



Daniel Burford with *Quercus arkansana* - see page 16 photo by Larry Burford. Jr.



Henri de Brem with *Quercus rysophylla* - see page 55 photo by Béatrice Chassé



Shawn Haddock with a *Quercus baloot* he collected in Pakistan - see page 27 photo by Guy Sternberg

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The International Oak Society

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The International Oak Society is a nonprofit organization dedicated to encouraging the study and cultivation of oaks (genus *Quercus*). Begun in 1985 to facilitate seed exchange, the Society has grown into a worldwide group bringing together oak lovers from nearly 30 countries on six continents. Being a member you will:

- receive a yearly membership directory, an invaluable network of contacts
- receive *International Oaks* (journal) and *Oak News and Notes* (newsletter)
- receive special offers on books, publications and oak-related items
- be able to participate in the triennial conferences and seed exchanges
- be able to participate in many oak-related events all over the world such as the Oak Open Days
- have open access to the IOS website

For more information on becoming a member,
check out the **International Oak Society website:**

<http://www.internationaloaksociety.org>

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Cover photos:

Habit and detail of *Quercus havardii*, the Havard shin oak, growing on pure sand near Monahans, Texas (see article on page 75)
photo and inset©David Richardson

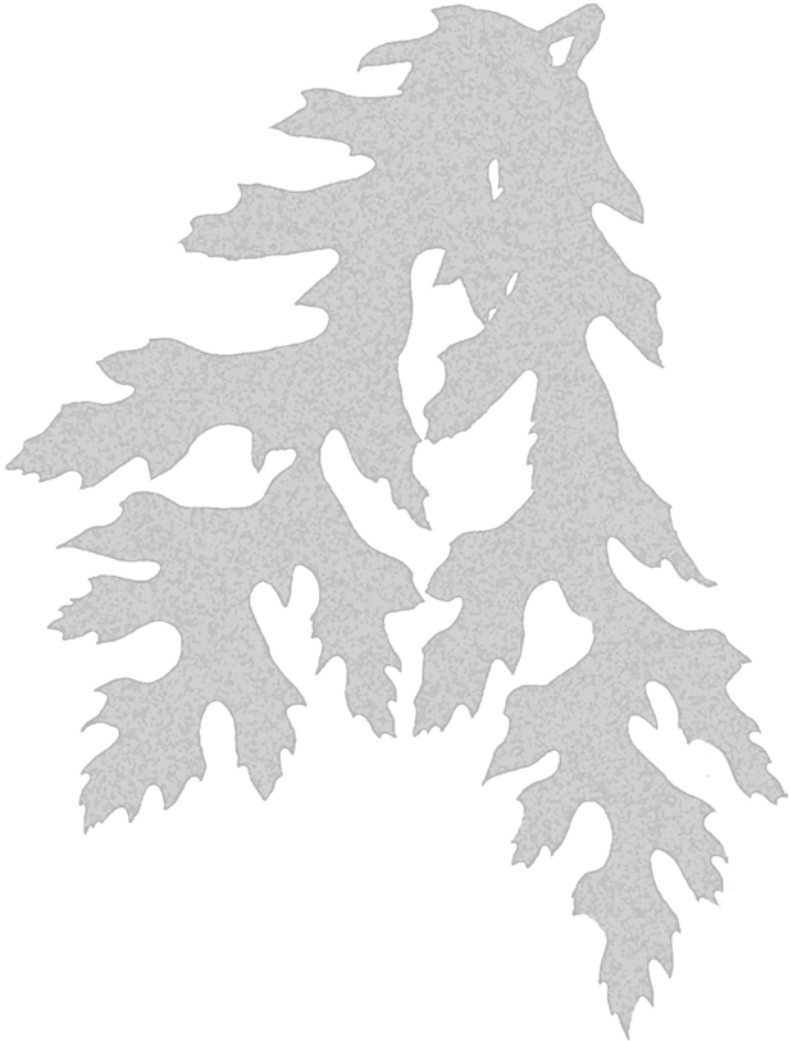
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Editorial

Béatrice Chassé, *President*
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Of acorns, labels and change

As I stroll through my nursery, marveling at *Q. urbanii* Trel., *Q. resinosa* Liebm., *Q. carmenensis* C.H. Mull. and countless others, I am overwhelmed by the beauty and vigor of these baby trees and the realization that there is so much to be discovered, to be learned, about oaks. Collecting in Mexico is of course the perfect place to grasp the abundance of mysteries offered by the genus and consequently how important it is to support collecting and research efforts.

The year 2011 was a spectacular acorn year here at the Arboretum des Pouyouleix in terms of number of fruiting species grown from seed collected all over the world. Being rather strict about only planting trees grown from wild-collected seed we will not grow these acorns but their presence is a beautiful sight and proof again of the incredible adaptability of oaks.

In *Paternity and Pollination in Oaks: Answers Blowin' in the Wind* (*International Oaks*, Issue N°. 22) Mary V. Ashley demonstrates – as has been corroborated by other studies – that even in the wild, in the midst of a “pure” stand (difficult to find in the best situations) pollination can indeed come from afar. And so, it is not necessarily the trees next to the tree that you are plucking acorns from that have pollinated the flowers. No one who has taken the time to grasp specific differences and nomenclatural complications should despair about their (in)ability to identify oaks: the babies that grow from a correctly identified species can still hold surprises. The corollary to this is of course that everyone who is planting oaks should be wary about labels and spend more time looking at their trees!

Similarly, one must not despair or have malevolent feelings about those who undertake taxonomic revisions and name changes: it is impossible for botanists to examine all of the populations of a species at once (unless its distribution is extremely restricted, as is the case for example with *Q. deliquescens* C.H. Muller). A very good recent example of this is the new species *Q. delgadoana* Valencia, Nixon and Kelly (see the NEWS section at internationaloaksociety.org). What was thought to be from north to south one species, *Q. eugeniifolia* Liebm., was studied more closely to reveal sufficiently significant differences between populations to warrant the creation of a new name for some of them.

The science of genetics is not an oracle: there is unfortunately nothing in the DNA of *Q. fulva* Liebm. that screams up through a microscope, “Hey! I’m *Q. fulva*.” Much as a morphologist will decide that petiole length between 0.4 cm and 1 cm indicates one species and petiole length between 1 cm and 1.4 cm another, so geneticists must decide what delimiting markers they will use to interpret who is what. In both cases these decisions are not arbitrary but they are based on our understanding at a given moment in time in the context of a specific theory.

Ever since Darwin, and the theory that biological evolution was a slow and steady process, the significance that was given to the “gaps” in the fossil record

was that the various forces involved in fossilization and other forms of preservation of organic material were not always present, or at best, faulty. With the theory that proposed evolution as a process of punctuated equilibrium formulated by Stephen Jay Gould and Niles Eldridge, the gaps no longer signified “something missing” – they signify stasis. As our understanding changes and our theories are modified, the significance of facts changes (although not necessarily in that order).

Change, not stability, is, after all, the essential ingredient of any evolution.

This issue of *International Oaks* is the last one to have Guy Sternberg as Editor. He has held this position since Issue N° 16 (2004) and his involvement in these editorial activities reaches further back. He has devoted a lot of time and effort to producing our journals and his editorial footprint will remain in these published documents. Having worked in scientific publishing for nearly 20 years, I know that the difficulties and challenges he has encountered have not been easy. His retirement from the Board will give others the opportunity to imprint their talent and commitment to *International Oaks*.

The International Oak Society is a unique dendrology society because of the uniqueness of the genus *Quercus*. There is none other that holds as much scientific, esthetic, cultural, popular, historic and economic significance. The editorial responsibilities that are to be taken on for *International Oaks* must reflect this if we are to achieve our general goal of furthering knowledge and appreciation of this genus.



Reflections upon Oak-Happy Days - The International Oak Society to 2012

*Past Presidents Allen Coombes, Eike Jablonski,
Ron Lance, and Guy Sternberg*



Past Presidents Allen Coombes (4), Eike Jablonski (3), Ron Lance (2),
and Guy Sternberg (1) photo©Guy Sternberg

Who are we, where did we start, where are we going, and what has happened to us along the way? We asked our past presidents for their thoughts, memories, and projections. Here is what they said!

Allen Coombes, Fourth President

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The year 1994, which featured both the First International Oak Conference and the birth of the International Oak Society, was in several ways, a turning point in my life. At that time I had worked at Hillier Gardens for 9 years, and immersed myself in the diverse collections, but hesitated to take the plunge into the genus *Quercus*. My attendance at the 1994 conference was not planned but was as a result of meeting Bill Hess earlier that year. In 1989 Hillier Gardens received seed from the Morton of *Q. shumardii* var. *acerifolia* (now *Q. acerifolia*) and it must have been shortly afterwards that I saw the paper by Stoyrnoff and Hess in which

this was given specific status. At the time I was more interested in horticultural taxonomy and it was at a conference in Seattle on this subject that I first met Bill, talking about *Q. acerifolia*, and he informed of the coming conference at the Morton.

Thinking back to that first meeting makes me realise just how much things have changed. Both those meetings in 1994 were arranged without the use of the internet or email. Today it is difficult to imagine how we could manage without them. The meeting was attended by the keen oak collectors and growers of the day, many of whom are still with us. I remember meeting Susan Cooper, Guy Sternberg, Mark Coggeshall and Kevin Nixon for the first time as well as many others. From the Hillier collection I brought a small shoot of an oak that Harold Hillier collected on his only visit to Mexico, and from Kevin's talk on Mexican oaks I recognised it from one of his photos as *Q. hypoxantha*. Kevin kindly confirmed this and he and Guy invited me to join their trip to collect in Mexico the following year.

Without that invitation I almost certainly would not be where I am today. Maricela Rodriguez, who became my wife in 2001, visited Hillier Gardens with the Kew botanic garden management course in the summer of 1995 and we arranged to meet later that year in Mexico.

The oak enthusiasts that attended the first meeting, as well as later ones, are hungry for two things: acorns and information. In those days there were not large numbers of oaks available to collectors. Oaks were collected, sometimes, along with other plants and people took the luck of the draw. This is one thing that the Society has changed dramatically. Inspired by the enthusiasm of those I met, for more than 10 years, and with the help of generous sponsors, I targeted the oak-rich areas of the world, from the US and Mexico, to China and Taiwan. Many other members have done the same in the last 15 years, to such effect that Grimshaw and Bayton in *New Trees* (which devotes 69 pages to oaks) state that "It is almost impossible to keep up with the flow of oaks into cultivation." Grimshaw also adds "Of all the trees in this book, *Q. rysophylla* is the one that made the greatest impression on me." I can still remember the seedlings of the first introduction to Britain at Hillier Nurseries.

If there is one aspect on which the Society has had at least as much effect it is on the information available on oaks. In 1994 there was little information generally available, unless you happened to be the lucky owner of Trelease or Camus. I remember trying to identify the *Q. rysophylla* at Hillier Gardens without luck. I even took one of Harold Hillier's seedlings to Kew (the source of the tree there) and tried to match it with material in the herbarium. As it was not represented there, Nigel Taylor visited to collect a specimen and kindly named it from the illustration in Trelease. Most oak enthusiasts would now recognise this magnificent tree, which is even available commercially.

Today the story is very different. Apart from *New Trees*, which documents recent introductions, all oak lovers must know, if not possess, the magnificent *Guide illustré des Chênes* by Antoine le Hardy de Beaulieu and Thierry Lamant. With its splendid photographs, many taken during conference tours or at members' collections, this unrivalled work will stand as the ultimate publication on the genus for many years. Many oak collections have benefited from the renewed interest in the genus. One in particular features in *The Oaks of Chevithorne Barton*, by Michael Heathcoat Amory, founder and owner of this, one of the largest oak

collections in the world, now documented in a book of more than 200 beautifully illustrated pages.

Of course, the web has also had a profound effect on making information on oaks available. Apart from the website of the International Oak Society at <http://www.internationaloaksociety.org/home> two additional sites, the Oak Names Checklist at <http://www.oaknames.org/> and the Oaks of Chevithorne Barton at <http://www.oaksofchevithornebarton.com/> are discussed in the article *The Tale of Two Sites* in this issue.

I think everyone will agree that we have come a very long way since those early days, and that this is largely the result of inspired people inspiring others. In 1994 it would have been difficult to imagine where we would be today, just as today it is difficult to imagine where we will be in 20 years from now. We do know that the aims of the Society will remain the same, to bring together oak enthusiasts from around the world. There will always be oaks to collect and names to debate. The membership may not be enormous but we know they are keen and that is what counts for now and the future.

The retirement of Guy Sternberg as editor of *International Oaks* and as a board member (with others perhaps not far away) signifies a change of era. We should recognise that all our achievements to date have come about under Guy's leadership or at least guidance and inspiration, but we have a strong and experienced team in place to guide the society through whatever challenges it may face in the future.

Eike Jablonski, Third President

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In the beginning of the 1990s, three students of dendrology and horticulture (Erik Schulte, Ulrich Wuerth, and myself) became aware of the richness of the genus *Quercus*, when mapping the Hanover Botanic Garden in Germany. The garden cultivated at that time 27 different species of that genus. Impressed with this fact, we started to dig more deeply. In our scientific university library, we came across one name frequently: Dick van Hoey Smith. After making contact, we got an invitation from Trompenburg, invited by Dick to stay in his house and learn more about the oaks. Late spring 1992, we found ourselves in paradise: in the midst of the famous Arboretum Trompenburg! Dick and his wife Riet invited us to stay, and we had a two day intensive lesson about oaks and all dendrology. At the end, we were given a large, grey publication: "The" Journal of the International Oak Society, No. 1! I became a member immediately. That time, in 1992, I got a letter back from Nigel M. Wright and his wife Lisa: they were happy to inscribe me as International Oak Society (IOS) European member No. 18! I was so very proud.

This was the serious start to my work with oaks, first at university and later in my job as lecturer for dendrology and horticulture (specialty ornamental woody plants) in Luxembourg. I made a lot of friends in joining all the early events which have been arranged. Soon I organized my own tour to Germany (Kassel and Berlin) and a tiny piece of Poland (Muskau). Trips with oak people to China, Turkey, several places in the U.S.A., Spain, and Portugal, to name but a few, have strengthened

my friendships with IOS members and my personal work with oaks. This all was reinforced when attending the International Oak Conferences, sometimes as a contributor as well. These early days of the IOS were somewhat adventurous in times, but always they have been accompanied with deep personal friendships. Many oak introductions into Central Europe (Germany, Holland, Belgium, Poland, and Austria) could have been made due to these contacts and travels.

The IOS developed in these early years many important features which make it so important in the scientific and horticultural world today. The description of new taxa in oaks, either species or cultivars, is a very important role for the IOS which must continue if we are to remain the leading authority for oaks in the world. The recognition of outstanding work connected with oaks, and thus the creation of two different awards, is another important feature.

I had the privilege to serve in the IOS as a member of the board and our third president for several years, always together with a group of fantastic people. This time was (and still continues to be) very intensive in the sense of working together on various oak issues as a team, and I was taught many important things by my fellow colleagues.

Now, after 20 years, we cannot lie down and look back upon these things which we have reached thus far. We need to focus again and again on things like environmental impacts upon oak stands; we have to continue our work as oak registrar within the ICRA; we must keep an eye on the complex of new diseases and other harms to oaks, and also on entire oak habitats. But scientific work is not the only focus. We must keep the membership informed about all this, but we also have to keep in mind that we are a community of different people who share the love of oaks in common and reach out to every member. We need to continue the seed exchanges, the personal exchange of ideas and knowledge, and the many events we make, sharing our experience with oaks in the wild and in the garden. We need to interest younger people in many countries for all of this, to keep our membership mixed and diverse. We need to continue to be an open society for all those diverse people who love oaks. Thus, we need to listen to the needs and wishes of our membership, like we did all these years so successfully.

I hope that the International Oak Society will prosper in the future as it has in the first two decades of its existence. Wishing all the best to the IOS!

Ron Lance, Second President

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There is no particular time in my life when an interest in oaks uniquely usurped my interest in other types of trees. On the other hand, oaks were a highly significant part of my dendrological renaissance after a forestry course in high school. As my familiarity with local trees grew, along with the realization of my immense lack of familiarity with all trees, oaks became one of my favorite focal points among throngs of hickories, magnolias, maples and birches. It was not long before I was collecting and planting them, then finding employment that entailed connections with such. About 20 years later, the International Oak Society entered my perspective.

It was 1993, I think, and I was satisfactorily established as Nursery Manager at The North Carolina Arboretum. A modest but intriguing publication came to my desk, introducing a fledgling International Oak Society. The black-and-white drawings and short articles about oaks and oak-related matters suggested that I might find fun and friends among this group of people. There were, incidentally, not a lot of people in the IOS at that time. When I attended the First IOS conference at the Morton Arboretum in 1994, the organizational meeting that followed was a tightly-fitted assemblage of friendly people in a less than roomy meeting room. Still, the atmosphere was frisky with talk of oak and things an oak society member could do next. I drove all the way back to Asheville, North Carolina that last night of the conference without fatigue, fueled by oak stimulant. There were also oak trees and acorns in the vehicle, silent passengers with stories that were up to me to tell, if I could find an audience at the Arboretum. If not, I'd try to make one.

As subsequent years accumulated, oaks grew vigorously in my nursery, landscapes, and notions. I became a solicitor for oak planting at my place of work and broadened collections of oaks at home. Adding exotic oaks was the natural course of events, encouraged by a few IOS members who liked sharing acorns as much as I did. By 1997, at the Second Triennial Oak Conference in California, I was anxious for treks to see California oaks, and got them. A more memorable tree trip I had not encountered before. Overly excited perhaps, I wanted to share in the showing of oaks, and suggested the next conference be at my place of employment in the year 2000.

I had not been a Conference Chair before, but the IOS is full of helpful folks, and I had fellow Arboretum staff members who did nearly anything I asked of them. Maybe because it had to do with oaks, trees that no one seems to dislike, it was made easier. Collecting acorns, growing seedlings for the plant sale, arranging the tours, hotels and food, selecting speakers, planning the schedule, all this and more consumed a sizable chunk of my life and energy, particularly in those last months before the conference. In retrospect, it remains one of the most fulfilling periods in my working life.

Elected the second President of IOS at the Business Meeting of the 2000 Conference, I then began a new personal era in the Society. The first 6 years of involvement had been an introduction to the IOS and its oaky people, a time of making friends and solidifying contacts. The next 6 years spent working in officer status of the IOS board amid the gears of the administrative machine was a bit different. The responsibility was neither burdensome nor frustrating, yet it had a few challenges that make those years memorable. The Oak Tour in Spain in 2001, organized by Francisco Vasquez, was a particular delight. The 2003 Conference in England was my last function as President of the IOS, and I am still unsure who was more entertained there, me by all the uniqueness of the opportunity, or fellow participants who stifled chuckles during the culture clash. It is not expected by many heretofore farm boys from Southern Appalachia that they one day would be attending and speaking at formal dinners in England. Nevertheless, the conference had great segments for everyone.

At the end of my following post as Secretary in 2006, after another excellent Oak Conference in Texas, I remained on the IOS Board but felt a bit relieved to return to the bench and off the main playing field. Lots of things were going on in my life and my growing of oaks had taken a hiatus. Still, by the time the 2009

Conference in Mexico arrived, I was eager to attend. A trip to see Mexican oaks in the mountains of that country had been on my wish-list for a long time.

Now, it is nearly time for another IOS Conference, 18 years since the first one. I find it hard to grasp the reality of my near 20-year affiliation with the IOS. This has lasted longer than any one job or marriage that I've had. In contemplation, perhaps it is the oaks that provide the binding that lasts. These trees are inspirational in many ways, and have the potential to outlast all of us, whether we marvel at them or not. No matter the human temporarily claiming to own the land upon which oaks may grow, the trees make do in spite of us. To me, the best part of all these IOS years has been its organized opportunities that allow quercophiles as well as broader-interest dendrologists to gather, scheme, and visit oaks in their natural realms; also to allow us to adopt a few and call them our own (for a while). I hope that venture, and the IOS, can continue.

Guy Sternberg, First President

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This group of oak friends was born in the 1980s as a way to facilitate the exchange of a few seeds across international borders. The steps taken by Steven Roesch to do this catalyzed a movement far beyond the expectations of any of us who were with him at the beginning. We are now about to hold our seventh triennial members' meeting; we have an impressive web site; we conduct scientific tours around the globe; we hold conferences and member meetings in oak-rich, accessible areas; we have become the ICRA oak names registrar; and even this journal and the newsletter are moving into their third decade. We have hundreds of members on several continents, and we are the go-to place worldwide for anyone interested in oaks. As my country-boy friend down the road would say, "Who'da thunk it?"

This progress is the result of the dedication and imagination of many people. Oaks (surely the most important tree genus on the planet!) bring together many people with divergent yet overlapping interests and a very broad spectrum of capabilities. In this respect, oak people are like the oaks themselves.

Our gallery this year (starting on page 112) features some Oak Society images from my file that might no longer exist anywhere else. They depict a history that will be recalled fondly by some of you and revealed to the rest of you in a way that is intended to recharge your batteries and give the IOS a boost into the future. It all began, officially, with a conference in 1994 that we hoped might attract several dozen people. That quickly outgrew its intent when the room capacity of 170 people registered well in advance and more came to stand outside in the hallway with the hope of listening in. A few of you still remember that day, and you might have shared with me the overwhelming sensation that we had a tiger by the tail!

Then that evening, shortly after the Iraq/Kuwait "Mother of all Battles", we conducted what we called the "Mother of all Seed Exchanges." We had anticipated that some of the participants would bring a few seeds to share. When everything was set out, we had five large library tables piled high with labelled acorns, with more on the floor below, and every conference since then has carried

on this tradition. I have a special fondness for the trees I grew from those seeds I took home from that first event.

The next day, those who could stay overnight reconvened for our first organizational meeting. Topics were solicited in advance and served as a loose agenda, with the ultimate goal of forming an organizing committee to incorporate and become “official” in every way. All of this was accomplished with telephone calls and written notes (often in longhand) sent by ordinary mail. E-mail was not a factor back then, and things such as smart phones, Skype, interactive web sites, video conferences, and webinars were yet to be invented.

Those who participated in the first American tour in New Mexico will remember it forever, and we gladly endured some Spartan conditions in order to help our less wealthy participants meet expenses and to see as much as possible in the allotted time. When the campsite flooded, we all crammed into a couple of inexpensive motel rooms, literally camping all over the floor; when the vehicles got stuck on washed-out wilderness trails, we all moved boulders, changed tires, and pushed together; when the Gila River rose after a violent hail storm, we held onto logs and waded across together, holding one another up as we pushed through the floating ice. There were no fancy hotels, no leisurely breakfasts, and no political welcoming speeches that week!

I still have the historic registration book from our first meeting (it’s too large to publish here) giving the signatures of all who made it happen. I might bring it to our conference this fall so you can try to find the names of people you recognize. It is part of our archive—the record of our conception—and if you know any of the people signed in there (or if you are one of them) please be sure to give (or accept) all the credit due.

What lies ahead for us?

What about our future? We continue to evolve, but we must remember our roots and our base. We are not an organization restricted to expert taxonomists and wealthy elite who can speak fluent botanical Latin and travel anywhere at will. We must keep our message and our activities targeted to all of those whom we serve—ourselves.

So then, who are we? From the beginning we always have been about one-half North Americans, one-third Europeans, and the remainder from all corners of the Earth. We are a diverse blend of people with interests varying as much as the oaks we study. We should reflect that ratio in our conference locations, our publications, and everything else we do, while taking extra care to welcome and be meaningful to those who are not in the majority; our diversity, too, must be respected. Following, then, are some thoughts for your consideration at the triennial members’ meeting later this year. You may agree with some and not with others, but come prepared to discuss them or give your proxy to someone who shares your views. Let’s grow together.

The volunteer Board of Directors and committees exist to serve the members, and in return, the members should do their best to assist the Board. We are an open society as Eike has noted, and I hope there will be increasing interaction among all interested members and their Board. Having general member meetings

once every three years is no longer sufficient to provide the guidance and help the Board needs in our fast-paced world, but we realize that most of us cannot afford to convene more often. Society members should be proactive in seeking out Board members and expressing their ideas, and/or they should volunteer to become more directly involved.

Following the same line of reasoning, Board meetings should be as transparent and inclusive as possible, and Board discussions should be accessible to any member who is interested. This is how we started, and this is how we can build a working team and groom future Board members and committee leadership. Board actions must be decided by the Board of Directors only (this is why they are elected) or we could never get anything done, but those actions should be subject to influence and oversight from every member who has something to contribute.

I also suggest including in every newsletter not only a summary of Board actions, but also proposed agendas for future deliberation so that members may contribute their ideas in advance—award nominations, budget priorities, member recruitment, conference and tour locations, policies and procedures, volunteering for committees, whatever. Many members will not visit the web site regularly, and some do not even have convenient Internet access; yet we cannot afford the space to place extensive Board discussions in our print publications. I think abbreviated summaries are a good compromise, and anyone who wants more detail can follow up at that point. We need to give all members an opening to get more involved, develop a vested interest, and hopefully become prospective future leaders and Board members.

Let's keep our events affordable, attractive, and accessible to as many members as possible, and provide engaging reports and proceedings for those who are unable to participate in person. We are an egalitarian group where wealth, knowledge, and status should not matter, and parity should drive our decisions. For example, future conference expenses need to be cut back in our uncertain economy. Our first conferences were simple, inexpensive affairs that did not include extravagant banquets with chamber music and liveried waiters. The first one (1994) had 20 exhibitors whose booth fees paid all transportation costs for the foreign speakers and furnished simple, inexpensive refreshments during conference breaks. There were no conference-hall rental fees (the space was donated by the Morton Arboretum), no fancy dress codes requiring extra baggage for travel, and no expensive evening programs or live music; yet nearly 200 people attended, and 35 of them stayed on to hold our first organizational meeting. I believe an inexpensive, accessible conference that focuses upon oaks more than upon dinner-jacket receptions will attract the most members (and their money, and their seeds, and their participation), especially now, as everyone struggles to stay fiscally solvent. We can pass along some of the savings to participants, and keep the rest to help maintain our treasury. This will also help to avoid setting an intimidating standard for the conference hosts who follow.

Tours are a different matter, by nature involving very few people and disproportionately comprising those most capable of travel. If tour participants occasionally wish to have a more grand experience they should be free to do so. We should still offer more budget-priced tours, however, for those more interested in oaks than in luxury.

Publications should appeal to the full cross section of members and should be user friendly. The most frequent feedback I have had as journal editor over the

past decade has been to continue to strive for accuracy, simplicity, and diversity, maintaining a broad range of content to provide something for taxonomists and gardeners alike. Full color is an option that we cannot afford unless we find supplemental funding, but it was very popular when we used it and it should be considered again if such funding becomes available. The newsletter should remain concise, current, and readable, with an on-line option to speed delivery and save cost. It always should include organizational news such as Board reports and events. The web site should be as comprehensive as possible, yet simple to navigate, and it should be usable by members who do not have broadband connections. Of course, all of this is easy to suggest but requires a huge commitment of volunteer effort to accomplish.

This leads to my final appeal. I know, perhaps more than anyone else, how much work it has taken to keep this organization intact and moving forward. We currently have some outstanding, dedicated Board members, and some of us fight tooth and claw over what we believe is right for IOS because we care very much about this organization and its mission. This autumn, several excellent people will join me in retiring from the Board, and we have recruited what I believe will be an outstanding “freshman class” to replace us. But transition never ends, and we always must be thinking about the more distant future. This means that you (yes, YOU!), if you are not already involved, should give consideration to participating more, in whatever way you are able.

Here is your incentive: Many of my very best friendships, worldwide, have come from this group. Many of the special places I have seen, with the help of other individual members or via our tours, are places I never would have found (or even known about) without the IOS. Many of my most interesting arboretum visitors from exotic places around the globe come because they are IOS members. Most of the best things I have learned from other people about oaks came from our conference speakers, our publications, and my conversations with knowledgeable members. Our quercetum at Starhill Forest has grown into the most comprehensive NAPCC-certified oak reference collection in North America with the help of countless IOS members. Thus, the more active you become, in whatever way you can contribute, the more rewarding will be your own experience. It certainly worked for me!

A diverse mix of impressive authors have prepared some very special papers for this volume. I hope you will find the combination to be as interesting and motivating as has ever been published here. I especially appreciate the thoughtful essays our past presidents have contributed to this retrospective section of our journal. It is our way of saying goodbye (now, or soon enough) and good luck. Now the future is up to you.

An Oak Named after My State

Larry Burford Jr.

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Hello! Let me introduce myself. My Name is Larry Burford, from Taylor, Arkansas. I live in southwest Arkansas, just a mile from the Louisiana state line, so I live in the swamps and thickets that most people associate with Louisiana, not Arkansas. We have snakes, alligators, wild hogs, ticks, red bugs, and fire ants, to name just a few of the unpleasant things that lurk in our woods, along with the more pleasant things—the native trees.

I am a native of Arkansas: just an average American man who loves the world he lives in. I am not a botanist or a biologist and I don't have a college degree of any kind. Sometimes people ask me if I would do anything differently if I could live my life over again. I would have to say "Probably not!" Everything has worked out well for me; I have a good job, a nice country home, and a beautiful family—could anyone ask for more?

Where I differ, perhaps, from some other people is that all my life I have had a love for the outdoors. This extends beyond an interest in hunting, fishing and camping to a real curiosity about all of the plants and trees that are found in the





Quercus arkansana Bodcau Bayou with Guy Sternberg photo©Larry Burford, Jr.

woods in my part of the United States. When I was only five or six years old I can remember filling my pockets with acorns and feeling that I had found some sort of treasure. It was about this time in my life that I planted my first acorns. I was visiting my great grandmother in northeastern Arkansas, and while I was there I gathered some acorns from a huge white oak (*Quercus alba* L.) tree in her yard. I brought them home to southwest Arkansas and planted them. From one of the acorns that I collected that day I now have a 40-year old white oak growing beside the pond on my property. Every time I see the tree it connects me to my great grandparents and their home place where I collected those first acorns. It's a very special tree to me.

As I grew older I joined the Future Farmers of America and the forestry team at my high school. I couldn't have cared less about the pulp-wood and saw-log parts in our forestry competition; what I loved was tree identification. When I

joined the team, I received and still have my copy of a book called *The Trees of Arkansas* by Dwight M. Moore. It was published by the Arkansas Forestry Commission in 1973. This little book kindled a fire that is still alive in me all these years later. I began to comb the woods, searching for every kind of tree that I found listed in the book. There were several that really interested me; actually, they were the ones that I had not been able to find in my area!

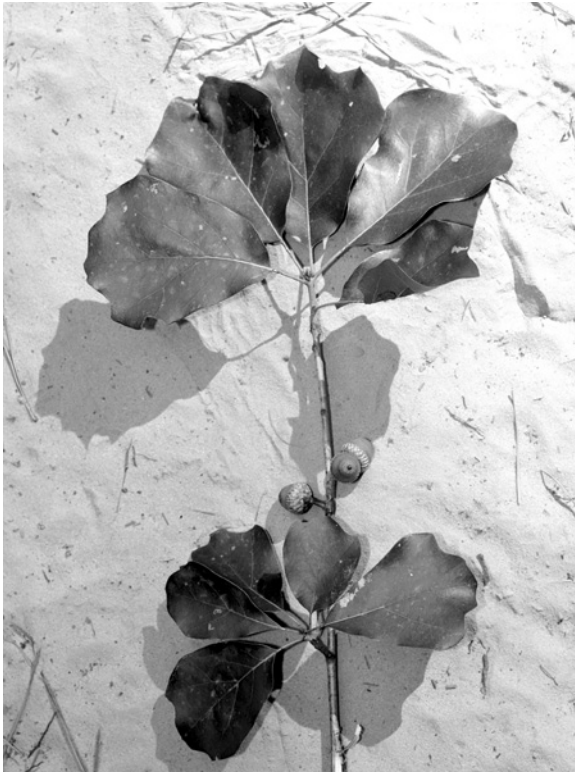
When I was in my early 30s I somehow learned about a new organization called the International Oak Society and that it had a seed exchange program for its members. The first person I wrote to was Guy Sternberg. Since that time Guy and I have remained in touch and I regard him as a very good friend. He has visited me here in Arkansas on several occasions and he is always welcome here. I exchanged seeds with many people from around the world and, thanks to them, I have planted many exotic trees on my property. The last time I counted, I had about 150 different species of trees and shrubs on the ten acres (~3 hectares) around my home.

However, one tree continued to elude me in my search for native Arkansas trees: this was *Quercus arkansana* Sarg. This tree is so rare that it is listed in the Global Tree Specialist Group Red List as globally vulnerable for extinction. I looked for years, but I was never able to locate the elusive Arkansas oak anywhere that I hunted, hiked, or visited. Of course, I could have gotten seed from someone else, or ordered a seedling from a mail-order rare-plant nursery, but I wanted seed from a tree growing naturally in my area.

Eventually, just by luck, I found a grove of huge specimens of the Arkansas oak only twelve miles from my house! I found these trees when I was actually out looking for *Castanea ozarkensis* Ashe, the Ozark chinquapin. The oak trees are actually located just across the state line in Louisiana, not Arkansas. That particular day, I was on Bodcaw Bayou about a mile west of Sarepta, Louisiana, where I was searching the high sandy banks for chinquapin trees. I found a few small chinquapins that day, the first time ever. This caused me to walk farther south along the bayou looking for more chinquapins. I hadn't walked far when I noticed some strange looking oaks growing along the bank. From a distance I could not figure out what they were. As I approached the trees it hit me that these must be ARKANSAS OAKS! And so they were. I waited until autumn and went back to take photographs and gather acorns. From that first collection I now have a nice thirty-foot tall *Quercus arkansana* growing in my back yard.

One of the first people I contacted to tell of my find was Guy Sternberg. I collected seed and sent them to Guy and several other IOS members, so I imagine there are now several more trees scattered around the US and Europe that came from "my" grove of trees. A few years back Guy brought a group of IOS members by my place and I took them on a tour of the area. The grove of Arkansas oaks was one of the places I took the group. I have never enjoyed meeting a group of people more than those that Guy brought with him that day. I did my best to show them as much as possible in one day, and I feel that everyone enjoyed themselves; I know I did!

Quercus arkansana apparently hybridizes with *Quercus falcata* Michx., and several small trees have been found that have traits of both of these species where they occur together in Arkansas; this fact is apparently not widely known. I have



Arkansas Oak on sandy soil

photo©Larry Burford, Jr.

collected some F2 seeds from this hybrid and several IOS members have had an opportunity to test them.

The summer of 2011 was the hottest and driest in recorded history here in southwest Arkansas and northwest Louisiana. We had over fifty days of more than 100 degrees Fahrenheit (38° C), with several days above 110 degrees (43° C). Most of the summer days that didn't have highs above 100° were in the high nineties. These conditions were disastrous for crops, as well as for other plants of all kinds. Acorn production was very low, with most acorns aborting because of the extreme heat and drought. I checked my grove of Arkansas oaks on 16 October 2011 and found that three of the trees had died due to the stressful summer. Luckily, the two largest trees on the site have survived, as have most of the smaller trees.

The location where my Arkansas oaks grow is on a high sandy hill beside a stream; the trees are well above areas that flood. The surrounding forest has *Quercus alba* (white oak), *Quercus falcata* (red oak), *Quercus nigra* L. (water oak), and *Quercus phellos* L. (willow oak), along with *Liquidambar styraciflua* L. (sweetgum), *Pinus taeda* L. (loblolly pine), and *Nyssa sylvatica* Marsh. (black

gum). As the land slopes down to the stream there are *Taxodium distichum* (L.) Rich. (bald cypress) and *Quercus lyrata* Walt. (overcup oak). We are on the border between U.S. Department of Agriculture Plant Hardiness Zones 7 and 8, but some of the seedlings from acorns that I have collected and distributed have survived under Zone 5 conditions.

It has been a thrill for me to find and grow such a rare tree that was originally discovered in my home state (Fulton Arkansas, in Hempstead County) and to share it with others. These are the moments that inspire people to teach their children about nature and become members of organizations such as the International Oak Society!



Author with Arkansas Oak at Burford Arboretum photo©Larry Burford, Jr.

A Tree Tale: *Quercus semecarpifolia* Sm. in Cornwall

Béatrice Chassé

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In June 2011, Charles Snyers and I visited Tregrehan Garden with its current master, Tom Hudson. A very knowledgeable plantsman in a long-line of family members who have left their mark in Tregrehan Garden, he has continued this tradition and since 1987 has made the 20-acre woodland garden his passion and responsibility. Tom was born and raised in New Zealand and has traveled extensively there and in other exotic and wonderful places, collecting and learning.

When Tom tells the story of his champion *Quercus semecarpifolia* Sm., it starts with a letter found in an old trunk in the attic one day...

“My dear Carlyon,

*It is so hot down here that I find it impossible to write decently. I only came down from the hills yesterday... I am writing to tell you that I have sent you a box containing some seeds of *Quercus semecarpifolia* in charcoal ... the acorns may have all germinated on the way as they germinate here almost as soon as they fall to the ground but I hope that some of them, if they have germinated, will reach you alive. This species of oak covers the highest hills in Yarmsa & grows at elevations above the spruce & mixed with the silver fir, so should do well with you. It is very hardy grows very slowly & makes a fine tall straight stem if grown in close canopy.”¹*

And so our tale also begins in these lines written on the first of July, 1894, by Gilbert Rogers, a Cornish forester working as an instructor at the Indian Forestry School in Dehra Dun, NW Provinces, to Jovey Carlyon whose family had been established at Tregrehan House since 1565.

Out of those “...seeds of *Quercus semecarpifolia* in charcoal...” sent by Mr. Rogers, grew a tree that today measures more than 25 m and, though we had no instrument to measure this precisely, we guessed easily more than 2 m in circumference at breast height. It is a magnificent tree standing proudly on its 118 years, the main stem devoid of branches a good half the way up and scattered with epicormic shoots from top to bottom. It is no wonder that coppicing produces luxuriant growth. About 15 years ago, from one of these juvenile shoots, Tom successfully grew a tree that is planted in another area of the garden and today measures about 8 m. The propagation facilities at Tregrehan House are remarkable and, not any less so, Tom’s propagation skills. He successfully roots oak cuttings (and many other rare plants) quite regularly.

Certainly one of the most magnificent of the *Quercus* section Asian oaks, *Q. semecarpifolia* displays brilliantly yellow catkins that can measure up to 12 cm long and that accompany very nicely the golden underside of the leaves. This distinctive color is lost on older leaves that become hairless and while young



Epicormic growth on *Quercus semecarpifolia*. (Inset) The toothed leaves characteristic of juvenile and vigorous growth. photo©Charles Snyers



Young tree with protective structures

photo©Charles Snyers



Tom Hudson taking cuttings from *Quercus lamellosa* Sm. photo©Charles Snyers



Part of the formal garden at Tregrehan House photo©Charles Snyers

leaves or those on coppice shoots have teeth, older branches have entire-margined leaves (hence the name “*semecarpifolia*” which means half-*Carpinus*-leaved). The manner in which the leaves are all assembled in tight, upright rosettes – whether in tree or shrub form – reminds me of *Quercus inopina* Ashe.

Quercus semecarpifolia is a high-altitude oak (2100m to 3800m) ranging up to the timberline in the Himalayan region and forming the climax community on the southern aspect; it is considered to be one of the oldest plants of the region. It is also one of the most over-exploited species and fails to regenerate adequately both in disturbed and undisturbed habitats.

Q. semecarpifolia can grow to 30 m tall, but it grows quite often as a scrubby oak in its natural habitat. According to Frank Kingdon Ward, “In Sichuan, trees of up to 30 m have been recorded, but in Tibet it remains a low growing plant, typically 2-3m.”².

This species was described by James Edward Smith in 1814. Mr. Smith, aside from being a well-known botanist of his day, had the great fortune of acquiring Linnaeus’ library of over 3000 volumes for the modest sum of £1000 after Sir Joseph Banks declined the offer that had been made by Linnaeus’ widow. He then went on to create the first Linnean Society of which he was to become the first President. “I should sow acorns in light mould and water them heavily every day, as they are accustomed out here to a soil saturated with water as soon as they fall from the trees. They will stand, and in fact prefer, a great deal of shade” continues Mr. Rogers in his 1894 letter to Mr. Carlyon. It is an interesting observation that I have not found echoed anywhere else.

There is another very old *Q. semecarpifolia* in the United Kingdom growing in Hampshire, planted by J.S. Gamble (Director of the Indian Forestry School in Dehra Dun) who received acorns from Chakatra in the northwest Himalayas in 1900. Mme Aimée Camus would later name an oak to honor Mr. Gamble : *Q. gambleana* (now referred to as *Quercus oxyodon* var. *tomentosa* M. Deng & Z.K. Zhou).

The Tregrehan woodland garden (www.tregrehan.org) is an enchanting place. As one passes through the more formal plantings to enter the woodland it is a bit like being Alice (in Wonderland) except that the odd creatures that one encounters are not the Cheshire Cat or the Mad Hatter but rather *Quercus tatakaensis* Tomiya, *Quercus pannosa* Hand.-Mazz., *Quercus lamellosa* Sm. and countless other very rare individuals indeed. Happily, unlike Alice, who couldn’t have any token souvenirs from Wonderland, we left Tregrehan with several little pots of treasure.

Notes

¹ Many thanks to Tom Hudson for permission to reproduce this extract.

² Ward, Frank Kingdon, *Riddle of the Tsangpo Gorges*, 1926.

A Tale of Two Sites

Allen Coombes

Chairman, Taxonomic Committee, International Oak Society
San Vicente de Paul 8709, Col. Tres Cruces, Puebla, Puebla 72595, Mexico

While oak enthusiasts are hungry for acorns, there is something else that they need – information. We do not have to go too far back to find a time that this was not easy to come by. Unless you had access to a good library or were lucky owners of a “Camus” or “Trelease” there were few ways of finding information about obscure species. How times have changed.

As far as the International Oak Society is concerned, the provision of information about the genus to a wide audience on a large scale started when Piers Trehane became International Registrar for the genus *Quercus* on our behalf. Already with considerable skills and experience in the field of nomenclature, Piers started work on a database that has become a unique source of reference for us all. His website, the *Oak Names Checklist* at www.oaknames.org provides us with an online searchable database of oak names based on the epithet (thus, you may search for the species or cultivar epithet, not the whole name). Piers was particularly keen to document cultivars, as these were often the most difficult names to find information on, or even to know if they are published. The site is enhanced with scans of living material of many oak species provided by Jan De Langhe, as well as photographs of herbarium specimens including many Standard Specimens for new cultivars.

This is an ideal place to check the correct author, distribution and the spelling of oak names. (Is it *Q. eduardii*, or *Q. eduardi*?) Although the former looks correct it was named after Edward Palmer who collected the type specimen. His name was Latinised to Eduardus and hence the epithet is *eduardi*. In addition to this, it provides lists of oaks that grow in particular countries or even in regions within countries. If you are planning a collecting trip, oaknames.org can tell you what you might expect to find. The site also tells you where you can find a description of each species, details of its conservation status and a list some collections that are growing it.

Although Piers is no longer with us, we are still looking out for new names to add. A recent change was the addition of the recently published *Q. delgadoana* S. Valencia, Nixon & L.M. Kelly, a species that has been grown as *Q. eugeniifolia* since its introduction to cultivation in 1995.

The second online source of oak information that I would like to mention is the quite different oaksofchevithornebarton.com which complements Michael Heathcoat Amory's *The Oaks of Chevithorne Barton* (Adelphi, 2009). This site is dedicated to the plants growing in Michael's oak collection at Chevithorne Barton in Devon, England, which is a National Plant Collection. Information can be accessed about species descriptions, the origins of accessions, and the locations of individual plants within the garden and their size, often with measurements spanning several years. The site is brought to life with the beautiful photographs

by James MacEwen, who has ensured that as many as possible different oaks in the collection are featured, even if they are small seedlings in the nursery. The site is regularly updated from a database developed by Will Blackwell, ensuring that information on new plants is quickly available.



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Welcome to the OAK NAME CHECKLIST

Compiled by Piers Trehane for the International Oak Society,
International Cultivar Registration Authority (ICRA) for the genus *Quercus*.

The 2011 edition of the database is freely available for checking the status of oak names. Over the past year the general layout of the site been changed to improve navigation and there are many new features. Click on the "What's New" button above to find out more. Descriptive and historical information on oak cultivars will continue to be added over the year. Please revisit these pages from time to time to keep up to date with the data. The compiler would be glad to hear of any omissions and errors: please use the feedback button at the top of a page to contact him.

Are you interested in oaks? Why not become a member of the *International Oak Society*? For further details click on the icon below



These pages © Piers Trehane, 2007-2011

International Cultivar Registrar for the **International Oak Society**, the International Cultivar Registration Authority (ICRA) for the genus *Quercus*.

Site launched 24th May, 2007, major revisions 27th June, 2007, 26th June, 2008, 24th April, 2009, 16th September, 2009, and 23rd August, 2010

The data from these webpages are free for anyone to use as long as such use is not for commercial purposes. Should you wish to cite this database, please use the following citation: "Trehane, P. (2007 onwards), The Oak Names Checklist. Published on the internet <http://www.oaknames.org>. [accessed *]" (insert the year and date of your accession according to your own date format protocol).

Oaks in a Difficult Climate – Arboretum de la Bergerette

Shaun Haddock

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For upwards of twenty years I have been planting oaks at the Arboretum de la Bergerette in southwest France, during which time at least 200 species of oak have already been trialed outdoors, and approaching 50 more species await planting. The trees have come from many sources, including notably the first introductions to Europe of several species from Mexico (where they seem able to manufacture oaks at will), commenced in 1995 by Allen Coombes. There are also many collections of my own, often from IOS tours; from IOS seed exchanges; from Ron Lance; and more recently, additions from Beatrice Chassé and Thierry Lamant.

La Bergerette lies at a north latitude of just under 44°, which is that of central Oregon, USA, and Florence (Firenze) in Italy – thus in mid-June the fierce sun is at the same height here as at the equator. Rainfall averages around 600mm per year, usually with a dry period during the hot season which, as in 2003, can be of extreme severity (situated halfway between the Mediterranean and the Atlantic, it is no surprise that both tree rings and weather records show an oscillation between harsh «Mediterranean» and more moderate «Atlantic» summers on an eight to ten year cycle). The heat is often coupled with our «poor man’s Mistral», the Vent d’Autan, which can blast up from the Mediterranean at 40°C («like a hairdryer», as I used to describe it, until someone uncharitably replied «How would you know?»).

This provides «destruction testing» particularly for the trees planted on the dryer and more open plateau at the top of the property, where, to give the drought context, even in a «normal» summer trees like *Gymnocladus dioica* (L.) K. Koch, *Catalpa speciosa* (Warder ex Barney) Engelm. and *Toona sinensis* (A. Juss.) M. Roem. will defoliate without extra water, whilst *Lagerstroemia* L. and *Albizia julibrissin* Durazz. will abort their flowers and shrivel. From the plateau, there is a soil moisture gradient on northeast and northwest-facing slopes down to two intersecting valleys, which in places remain moist in summer. Winter temperatures vary enormously, but almost every year there is at least one night when the temperature plunges to -7°C. Although this is colder than usual winter minima (ignoring the last two winters!) in the UK, it is positively offset by the good ripening of young wood in the summer heat.

Soils vary, but tend to be neutral, clay-based and thus poorly drained, and often with pebbles.

Michael Heathcoat Amory’s splendid book *Oaks of Chevithorne Barton*, apart from its scientific interest and photographic beauty, assists as a very useful guide for that frequently asked question, “Which oaks do I plant if I have room for only a few?” in temperate climates typified by northern Europe. Whilst space in the Journal precludes discussion of every oak growing at La Bergerette (many of which, incidentally, come from the same sources as Michael’s trees), I felt it might

be useful to try to give similar guidance for the more difficult (for trees) climate of southern Europe (and perhaps a future climate-changed northern Europe!), both in terms of ease of cultivation and of ornamental value. I think that we oak collectors contain in varying proportions the “stamp collector” and the plant lover: the latter is possibly the stronger trait in me, as I would rather see a common oak growing well than a rarity looking bilious (the ideal being, of course, a rare oak doing well!), so my comments will relate equally to well-known species.

It is a truism to say that it only takes one extreme event to kill a tree, and any plantings made before December 2001 have endured the cold winter of that year (down to around -11°C or lower, with two weeks below 0°C), the extreme drought of 2003, and more recently, in January 2009, the catastrophic Hurricane Klaus. I thus append the planting date to the tree names below.

A word here on cultivation – most of my oaks were planted small, sometimes at only 10 centimetres in height, from deep pots with air-pruning bases, so that the roots were in balance with the top growth (but this rule I confess to have broken where hardiness was not assured). For many years I successfully used black plastic as a mulch to aid establishment, but recently I have become involved in an escalating arms race with the mammals with which I share the property: voles and moles have taken to burrowing under the plastic, both uprooting the plants and, by bulging the plastic, throwing vital rainwater to the edge rather than to the tree at the centre. This has almost precluded planting such small trees, and also I now use organic mulch in order to see more easily what is going on – however more weed control is thus required (I am not ashamed to use Glyphosate).

Every young plant requires protection against rabbits, for which I use a cylinder of chicken wire, usually wrapped with horticultural fleece for at least the first year to give shelter from wind and direct sun (providing also a useful, albeit unattractive, visual marker for those most in need of watering during establishment). Proprietary tree guards would do the same thing. With the change to organic mulch the rabbits evolved a new technique of digging under the wire from the side and uprooting the plants – so now a flat plate of mesh is also required to surround the plants at soil level. So don't get me started on (choose your own expletive) rabbits! Once the tree is growing out of the top of the rabbit guard, a taller wider cylinder of stronger wire grid is needed against the Roe deer, and for tender subjects this can also be covered with fleece for winter protection in their early years.

Finally, this year has seen a spectacular and disfiguring increase on both white and red oaks of a leaf-miner which causes the entire upper surface of affected leaves to peel off. It has tentatively been identified by Wisley as the larval stage of the moth *Acrocercops brongniardella*. I await next year with trepidation – I would neither wish nor would it be possible to spray against these on the scale required.

In discussing the oaks, as drought is the most limiting factor here I shall start on the plateau, the driest area, and work downhill. My intention has been where possible to plant trees where they would be most likely to survive on the moisture gradient, but as the valleys are also frost pockets, a few trees find themselves in overly dry soil due to presumed lack of hardiness, notably the Himalayan *Quercus leucotrichophora* A. Camus (Nov 1995 and May 1996, 3.6 and 4.7 metres in 2008). A beautiful tree with its dark serrated leaves sporting almost white undersides, it can certainly take the heat, as a large tree grows on the



Quercus rysophylla

photo©Shaun Haddock

French Riviera at La Serre de la Madonne, Menton (almost on the Italian border), but probably benefits there from subsurface water. Here it survives but looks sad without additional irrigation.

Of five examples of a second Himalayan oak, the extremely spiny *Q. baloot* Griff. (Sep 1996), collected from two different altitudes, none have done well here, even one irrigated plant, so it is hard to know how to make this species happy. However, a third species, *Q. floribunda* Lindl. ex A. Camus (May 1995), has seemingly grown best on the plateau (there are two others elsewhere), making a conical tree of 6 metres by autumn 2008 (the last time the trees were

professionally measured). All three of these species I was lucky enough to collect in the mid nineties in the Swat valley, northwest Pakistan. Although if I used a guide he would always tote a Kalashnikov, the (human) population at that time were extremely friendly and hospitable with the marked exception of the young boys in the religious schools. These I suppose grew up to spearhead the valley's recent takeover by the Taliban, triggering a subsequent counter-attack by the Pakistani army – sadly the area is off limits to Westerners for the foreseeable future.

Two plants of *Q. ithaburensis* Decne. (Mar 2003) grow very slowly, and two of their lovely tactile grey-felted-leaved subspecies *macrolepis* Hedge & Yalt. (Nov 2003), from seed collected after the IOS tour in Turkey, have outgrown them. This latter (sometimes, as encouraged in the Oak Names database, found labelled as a separate species, *Q. macrolepis* Kotschy) is a must-have for those with space (up to 25 x 25 metres eventually). Perhaps in part in reaction to the hot summers here, these wild-collected plants are every bit as ornamental as the cultivar 'Hemelrijk Silver' (but then I would say that, as my grafted plant of the latter promptly died). Sadly, although the ornamental acorn-cups have formed, they abort during the summer long before attaining their potentially enormous size of up to 9.5 centimetres (yes, really!) across the extended cup scales.

Another Cerris-section oak, *Q. libani* G. Olivier (Nov 1992), grew steadily for years (to over 6 metres in 2008) in soil made dust-dry by an enormous fastigiata *Populus nigra* L., which finally blew down in the 2009 hurricane (a life-affirming event for *Q. libani*, less so for the *Q. ilicifolia* Wangenh., now regrowing, whose misfortune was to be in the poplar's path). The closely related and more visually interesting *Q. trojana* Webb would I am sure tolerate drought just as well, but my plants are all further down the hill, where the leaves on trees from two provenances in Turkey (Oct 2002) all temper to a beautiful grey in the heat (*Q. libani* stays green). Younger plants from an Italian provenance have smaller, rounder, greener leaves with more pronounced venation.

Prone to mildew, a group of three *Q. infectoria* subsp. *veneris* (A. Kern.) Meikle (Nov 1997) from Cyprus have nevertheless made attractive grey-green-leaved trees, and others further downhill have grown even faster. However, the beautiful Golden Oak of Cyprus, *Q. alnifolia* Poech (May 1999), makes headway only very slowly. Coming from the Troodos Mountains, it would probably benefit from irrigation here. Other shrubs include *Q. coccifera* L. (May 1999) and its subspecies. *rivasmartinezii* J.H. Capelo & J.C. Costa from Portugal (Jan 2002, the largest just over 2 metres), both growing densely but slowly. A more interesting-looking plant is *Q. aucheri* Jaub. & Spach (Nov 2003), with greyer leaves and a more sparse habit showing off pale stems.

On the tour after the California IOS conference in 1997 I was entranced by the blue oak savannahs we saw, with widely-spaced *Q. douglasii* Hook & Arn. above golden grass (this species, according to Peattie (1953), in popular tradition "shies from water like a mad dog!"). I had already planted three of them in Nov 1996, and I hastened to add thirteen more from the seed I collected. Well, the grass goes golden as it should, but the largest blue oak had reached only 2.5 metres by 2008. Perhaps this will be a project rather for the next generation? These oaks can also be subject to mildew.



Quercus affinis

photo©Shaun Haddock

Another blue-leaved Californian, a *Q. engelmannii* Greene was planted on the plateau in Nov 1993. To say that it grows would be something of an overstatement; it has been retrenching over the last few years (a *Q. chrysolepis* Liebm. in the same area was cut right back in the 2003 drought also). A visiting enthusiast thus remarked that Mediterranean oaks seem to do much better here than Californians, but, as a statement, that would need qualifying. *Q. agrifolia* Née (Nov 1992, 6.2 metres in 2008) and *Q. wislizeni* A. DC. (May 1996, 7.3 metres in 2008) have done well enough only just over the lip of the plateau, but, significantly, in part shade. Equally a healthy young *Q. engelmannii* (May 1999) much further down the slope has made over 3.5 metres, next to a *Q. kelloggii* Newb. (Jun 2000) of over 5 metres in 2008. This latter tree has been one that I have had the most difficulty in establishing, having planted half a dozen or more, but finally the sole survivor is growing well.

But back to the plateau: the Californian shrub oaks *Q. berberidifolia* Liebm. and several *Q. pacifica* Nixon & C.H. Mull (Nov 1997) have made sizeable bushes (one of the latter 3.2 metres high by 4.9 m wide in 2008) which fruit every year. Nearby two dwarf oaks, Chinese *Q. monimotricha* Hand.-Mazz. (Sep 2000) and suckering *Q. lusitanica* Lam. (Mar 2003) provide drought-proof ground cover. *Q. durata* Jepson (May 1996) plods on extremely slowly, not at its happiest here. Meanwhile, *Q. john-tuckeri* Nixon & C.H. Mull. (May 1999) makes a rangy but bomb-proof grey-leaved shrub.

To move away from California, the slow-growing red-listed *Q. hinckleyi* C.H. Mull. (May 1999) from Texas thrives and fruits (but unfortunately with pollen from the native *Q. pubescens* Willd.), and shows beautiful pink new growths against its tiny grey-blue evergreen leaves – a must-have if you can find it. One of the most ornamental oaks of all is represented here only by young plants: *Q. hypoleucoides* A. Camus. The narrow evergreen leaves with the occasional asymmetric lobe to add interest are white underneath; the plants have (so far) grown vigorously, and the young growth is purple. What more could one ask? (Even the leaf-miners agree). There is an array of other shrubby species from California and southern USA which are as yet young and need to prove themselves.

Five more Americans on the plateau deserve a mention, firstly *Q. grisea* Liebm. (Jun 2000), from a Mike Melendrez collection, has grown into a characterful rugged-looking small tree, and strangely it has grown taller (4.2 metres in 2008) than one planted in March 1999 on the moister hillside next to a *Q. arizonica* Sarg. for comparison. *Q. grisea* I think makes a more interesting tree, with smaller leaves and a more irregular outline. *Q. myrtifolia* Willd. (Nov 1999) has defied drought to make an attractive evergreen shrub of 2.5 metres. I received seed at an IOS seed exchange labelled *Q. prinoides* Willd. (planted May 1999), but when it shot upwards with a clean straight trunk I started to have doubts. Guy Sternberg has now identified it as *Q. muehlenbergii* Engelm., but what is extraordinary is that, in soil already parched, it has continued to make strong growth (4.2 metres in 2008) in close root competition with two larger trees, a *Pinus radiata* D. Don and a *Q. pubescens*.

Perhaps not surprisingly, several *Q. virginiana* Mill. planted nearby were wiped out in 2003, and only one of two survivors has since made any headway. Lastly, out of an avenue of 24 *Q. rubra* L. (in normal climates an easy and biddable oak) planted in March 1991, those where I had allowed *Prunus spinosa* L. to grow around them were killed in the 2003 drought, those standing alone survived (I have taken this lesson on board!). Again this year (2011) in extreme autumn drought the leaves on more than half these trees are brown at the end of September – given another life I would plant *Q. coccinea* Münchh. or *Q. velutina* Lam. instead, but they were not easily available in those (unimaginable) pre-IO days.

Moving over the rim of the plateau, one is made pleasantly aware that most of the deciduous North American oaks are almost as drought-tolerant as the native *Q. pubescens* and *Q. petraea* (Matt.) Liebl. here. A clutch of them were planted just over the edge of the plateau in November 1995, including *Q. ellipsoidalis* E.J. Hill, *Q. imbricaria* Michx., *Q. coccinea*, *Q. marilandica* Münchh., *Q. velutina* and *Q. shumardii* Buckl., most of which had reached 8 metres by 2008 – *Q. coccinea*



Quercus acutifolia

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a little more, *Q. marilandica* a little less. *Q. stellata* Wangenh. (now just over 4 metres) and *Q. margaretta* (Ashe) Small, planted at the same level in Nov 2003, equally defy drought. If the season proves exceptionally dry the first two start to shed leaves in a controlled manner starting with the oldest, followed in time by *Q. velutina*, but I have never seen the other three suffer even in 2003, although *Q. shumardii* benefits here from midday shade.

Q. velutina is one of my favourite oaks, with its large pendulous glossy leaves giving great visual interest and life to the tree. By chance it is planted next to *Q. marilandica* (another great favourite, with visitors also), with which it often hybridises in the wild giving *Q. ×bushii* Sarg. Sadly, many of the trees of *Q. “marilandica”* one sees on sale and in collections in Europe are probably a first or second generation of this or another hybrid, with extra lobing on the “duck’s foot” leaves. The plant here, thankfully, is true, and produces a yellowish indumentum

which, like velvet, produces hologram-like effects with change of light.

Further down the hill *Q. palustris* Münchh. has formed a classically-shaped example with lower branches angling to the ground, but, despite its position with (slightly) more moisture, one day in August 2003 all the leaves simultaneously turned greyish and shrivelled, whilst continuing to hang on the tree. This is normally a fatal sign, but, with the autumn rains, a few buds burst green, and the following spring, to my great relief, the tree leafed out normally. This species, though most unsuitable for such a dry climate, is the most commonly planted oak in the Cape region of South Africa (perhaps with the exception of *Q. robur* L.) – I would imagine a case of historical accident of introduction.

At the same level as *Q. palustris*, the most extreme *Q. macrocarpa* Michx. I have (Nov 1992, 7.2 metres in 2008), with deep elm-like fluting on even the young bark, also starts to shed leaves in severe drought. Other species of the eastern USA red and white deciduous oaks grow successfully farther down the valley side, with only *Q. bicolor* Willd., *Q. phellos* L. (Nov 1993, a beautiful tree 10.4 metres tall in 2008), *Q. texana* Buckl. (syn. *Q. nuttallii* E.J. Palmer) and *Q. lyrata* Walter (this particular specimen now suspected of being *Q. macrocarpa*) being mollycoddled in the valley bottom.

Just below the first-mentioned group of eastern USA oaks, and thus still in a dry environment, there were some unexpected results amongst the Mexican and Tex-Mex species. Untroubled by cold or drought since its planting in October 1996, the Mexican oak formerly known as *Q. eugeniifolia* Liebm. (now *Q. delgadoana* S. Valencia, Nixon & L.M. Kelly if from Mexican provenance, as here) had reached 8 metres by 2008 despite knowing neither frost nor drought in its cloud-forest home – thus a splendid oak for Europe, with unlobed laurel-like evergreen leaves. Less successful were *Q. acherdophylla* Trel., *Q. canbyi* Trel. and *Q. polymorpha* Schltld. & Cham., all of which, though not killed, were cut back in 2003 and thus cannot be recommended for extremely dry areas (*Q. acherdophylla* never fully recovered, a young replacement grows fast but is watered in dry spells).

Q. canbyi is one of the most rapid-growing oaks of all when young – one from a collection by Thierry Lamant planted at the same time as several Mexicans in November 2008 has outstripped all the latter by far to reach over 4 metres already, but again with “emergency” watering. In the same area one of my favourite oaks, *Q. affinis* Scheidw., planted in November 1996, was killed outright in 2003. An older brother planted in the valley (Nov 1993) survived in the moister conditions, and at 10.5 metres in 2008 is apparently one of several species here which are the tallest in France. I love the glossy dark good health of the small leaves, and the tree here has made a narrow cone bizarrely mirroring the shape of a *Chamaecyparis* next to it.

But back to the hillside and another columnar tree: neat-foliaged *Q. crassipes* Bonpl. (May 1999) has grown steadily with midday shade, reaching 6 metres by 2008, untroubled by the climate. Just below, a *Q. suber* L. (Nov 1991), of course well adapted to drought, makes steady progress (10 metres in 2008), and would survive on the plateau. This specimen has grey leaves (conjuring up visions, as with *Q. douglasii*, of parched savannahs, this time in Spain) but green forms exist, and in either the bark makes an entertaining feature. Highly variable in leaf size



Quercus dolicholepis

photo©Shaun Haddock



Quercus obtusata

photo©Shaun Haddock

and colour of underside, *Q. ilex* L. fits into the discussion here – easy to transplant, drought tolerant, even capable of being clipped, this species is the workhorse oak of southern Europe.

Q. laceyi Small gets a good press everywhere except here, where it fails to do what it says on the packet. Both on the plateau (Jun 2000) and on the hillside (Dec

1998) it leafs out erratically, and sometimes the first flush of growth dies back completely (and this not due to frost). They usually manage to pull themselves together by the end of the season, and the older plant had reached over 4 metres by 2008, an open tree with flaking bark. Maybe, like some but not all other white oaks, it falls prey to whatever maladies are transmitted on the breeze from the natives here (and it is another frequent victim of mildew).

In this same area grows an oak on steroids, a wonder-oak labelled as *Q. graciliformis* C.H. Mull. (Dec 1998), from seed collected by Guy Sternberg from a tree later seen by participants at the 2006 fifth IOS conference in Dallas at the Texas A + M University campus. However, as *Trees of North America* gives the height of this species as 8 metres, and this specimen in ten years had reached 12.5 metres (Oct 2008), and appears to have more pronounced lobes than the type, a little hybrid vigour might be suspected. But, cold-proof, drought-proof and hurricane-proof, I wish I had more of them. There is an obvious affinity between this oak, *Q. canbyi* and the mysterious “Langtry Oak”, with their rapid growth and similar foliage (indeed, in *Guide Illustré des Chênes*, these three species and *Q. cupreata* Trel. & C.H. Mull. are seen as forming a continuum).

Also growing well in the same area are several other Mexicans, including three related trees: one *Q. acutifolia* Née (Jun 2000) and two collected from its natural hybrid nearby with *Q. mexicana* Bonpl. (Mar 1999), all around 8 metres in 2008. The latter two may have been backcrosses with *Q. acutifolia* pollen, as the leaves of the three are difficult to tell apart (although the habit differs). *Q. obtusata* Bonpl. (Nov 1996, 6.2 m in 2008) and *Q. subspatulata* Trel. (May 1999, also 6.2 m, 2008) unobtrusively get on with their business, as does shrubby suckering *Q. microphylla* Née (Jul 1999), which seems to have topped out vertically at under 3 metres. However, nearby is a gap where probably the only Mexican *Q. peduncularis* Née in France used to be (Oct 2004). Having withstood the regular -7°C for several winters, -8°C during the winter of 2009/10 proved just too much for it.

Conversely, *Q. conspersa* Benth. (May 1999 and Nov 2003), which tended to lose young growth in most winters, sailed through the 09/10 winter without damage. What fickle creatures oaks can be! Other Mexicans which had even shorter careers with an unhappy ending include *Q. lancifolia* Schldl. & Cham., *Q. planipocula* Trel., *Q. salicifolia* Née, *Q. sartorii* Liebm. under collector’s number PCH 350 (which turned out to be something else of limited hardiness – some young true *Q. sartorii* are now growing well), and *Q. uxoris* McVaugh.

Nearby a Chinese native intrudes between the Mexicans – *Q. franchetii* Skan. (Dec 1998). It has grown well, an open tree wider than high (5.7 x 6.4 metres in 2008) and clothed to the ground with leaves like a more rounded *Q. leucotrichophora* with similar pale undersides. Several other Mexicans planted in November 2008 grow in the area, and have thus survived the 09/10 winter, the most ornamental of which are *Q. castanea* Née and silvery *Q. crispipilis* Trel., the latter needing water to re-erect its leading shoot this dry summer.

In our descent, we are now about one third of the way down the hillside. Given that areas receiving 1000mm of rain a year are considered dry in Japan, no Japanese oaks are planted on the plateau, but nevertheless it has been a pleasant surprise to find how drought-tolerant several have proved to be at this level. In



Quercus franchetii

photo©Shaun Haddock

particular the related cerris-section species *Quercus acutissima* Carruth. and *Q. variabilis* Blume, both with a wide far-Eastern distribution, have continued to grow rapidly through the driest of years; the latter, with the pale leaf undersides flashing in the breeze and bark eventually becoming corky (in some clones with attractive dark green young wood first), would receive my strong recommendation. The former often, but not invariably, takes on an ungainly shape, but one here (Nov 1991) provides the tallest of the oaks I have planted (13.7 metres in 2008).

At the opposite end of the size spectrum is the drought-proof evergreen *Q. phillyreoides* A. Gray, growing slowly but surely here into a neat and extremely dense wide-spreading bush, holds onto its leaves in the deepest shade and thus can make an excellent hedge (but I have seen this species in moister Japan as a tree).

To return for a while to the USA, evergreen *Q. nigra* L., the water oak, grows both at this level and in the valley (both Nov 1993). The valley tree is certainly larger (12.4 as opposed to 9.7 metres in 2008), but the upper tree has shown no sign of drought stress. However, on the downside both trees here have proved to be fragile, and often drop branches (*Platanus occidentalis* L. is another notorious widow-maker here, though apparently not elsewhere; and according to Peattie, *Q. douglasii* will be so too should the trees ever get large enough). Next door is a *Q. oglethorpensis* W.H. Duncan (May 1996, 4.7 m in 2008), which attractively throws out whorls of horizontal branches in the manner of a tree *Cornus* or, indeed, of *Q. emoryi* Torrey (Oct 2004, 3.5 m 2008). This latter species is one of the few red oaks with edible acorns; tales from Peattie of settlers burnt with their wagons at Apache Pass “of ghastly memory”, where this is the dominant tree,

make me shudder as I pass my plants.

Still at the same level grows the handsome cerris-section *Q. castaneifolia* C.A. Mey. (Nov 1992, 11.4 m 2008), a fast and neatly-shaped pyramidal tree which, when young, strangely displayed the “elephant bark” so remarked on when occurring on some Mexican species.

Several far-eastern Cyclobalanopsis oaks such as *Q. glauca* Thunb. (May 1999) and *Q. hondae* Makino (Jun 2000) have hung onto life through dry years further down the hill, but refuse to increase in size without extra water, *Q. myrsinifolia* Blume being the tougher exception. Otherwise Chinese oaks are not overly well represented here other than by their Japanese forms – I have already mentioned the tiny *Q. monimotricha* inching its way on the plateau and *Q. franchetii* in “Mexico”, but *Q. dolicholepis* A. Camus (July 1999, 4.4 m 2008) has made a splendid dense small tree with its round dark evergreen leaves retained well into its interior.

Q. longispica (Hand.-Mazz.) A. Camus, one of Roy Lancaster’s favourite oaks, took a while to get up steam after faltering in 2003, but is now launching its beautiful leaves with their golden undersides into the air on several stems. Both these trees are highly recommended – I had it in my mind that the latter was a shrub until I saw the photo of an enormous specimen in the equally enormous tome *Guide Illustré des Chênes*. *Q. griffithii* Hook. f. & Thomson ex Miq. (Nov 1999) similarly took a while to get going. Some more recent Chinese and Taiwanese plantings (Allen Coombes again!) are still too young to be assessed.

Other Cyclobalanopsis, such as *Q. oxyodon* Miq. and *Q. lamellosa* Small, have been tried too far up the hillside and disappeared without trace – I must try again risking the frosts below. Though not far-eastern, *Q. pontica* K. Koch is another species I have been unable to make happy in this dry climate (*i.e.* I have killed several).

Descending further to halfway down the hill, several of the wonderful *Q. rysophylla* Weath. weigh in, with their large glossy rugose and highly un-oak-like evergreen leaves. The largest (Nov 1997) was 11.6 metres by 2008 – over a metre a year! On Allen Coombes’ recommendation, several were planted together in search of that Holy Grail – true seed. A crop two years ago seemed to come true, and they are fruiting again this year. Another specimen in a dryer location grows less densely, but appears otherwise happy. Nearby grows a favourite, from seed received as *Q. georgiana* M.A. Curtis. It has been suggested that my plant is merely another *Q. nigra*, but unlike that species this is deciduous. It takes the same form as “classic” *Q. palustris*, with upper branches ascending and the lower ones sloping to the ground, but with its smaller leaves has a finer texture.

At this same level grow several “toughies”: *Q. buckleyi* Nixon & Dorr. (Oct 2001); another *Q. floribunda* (Oct 2001); *Q. geminata* Small (May 1997, which shows some twig dieback from time to time); and *Q. gravesii* Sudw. (Nov 1997: both this and *Q. buckleyi*, with their smaller leaves, display a more lively texture than most “reds”). However, three plants of the supposedly resilient *Q. rugosa* Née (Nov 1997) have been unsuccessful; the largest reaching only 2.4 metres after 11 years, the smallest being dead. I must try again in a different situation.

Spanish and Turkish oaks have been planted at a level slightly below the trees just mentioned where the slope flattens out a little, and understandably



Quercus graciliformis

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show no sign of drought stress. Particular favourites are the *Q. trojana* already covered, of which my own collections with the IOS have narrower leaves than a specimen given by the Karaca arboretum, giving a more lacy look to the plants. Several Japanese *Q. serrata* Murray survive at this level, and in wetter years can give good autumn colour. *Q. alba* L. is said not to grow well in western Europe, but here shows no problems, colouring a deep autumnal red even in dry years. Another “white”, *Q. montana* Willd. is a neat tough plant, and grows fast in the early stages. However, I struggle to make the California White Oak, *Q. lobata* Née (Mar 1999, only 2.7 m in 2008), content here, perhaps due to poor soil. A

youngster recently planted in a different area was killed by insect defoliation – the Fates don't appear to smile on this species. Further along *Q. falcata* Michx. grows well enough, also providing elephant bark (which then splits into flat grey plates) and autumn colour.

To a Quercophile, the most spectacular trees in the Melbourne botanic garden, Australia, are several *Q. canariensis* Willd. planted around 120 years ago – branching to the ground and making enormous cathedrals of substantial grey-green leaves. I say this in envy, as several trees here, some of Spanish and some of unknown provenance (the latter including my largest, planted May 1997, 4.8 m in 2008), have yet to make any sort of statement. I refuse to waste unrequited love on this species.

Now to hurricane Klaus. I have already mentioned the vulnerability of *Q. nigra*: in addition two white oaks were affected, but in contradictory ways. A compact plant of *Q. stellata* (Mar 1999) had slowly attained 3 metres by 2008 in an open position. It was completely snapped just above the base by Klaus. By way of contrast, a *Q. bicolor* (Nov 1993, 8.7 m in 2008) I am fond of grows in the valley. For the first week after the storm I was kept fully occupied along with Anke Mattern's professional team from Germany and a 26 ton tracked digger in re-erecting and cabling shelterbelt pines on the plateau (of which nearly all survived). When I finally visited the valley, there was no sign whatsoever of this oak! Eventually realisation dawned – with its tip bent to the ground it was completely concealed by a fallen 14 metre Leyland cypress. On cutting the cypress away, the oak returned half upright of its own accord – the root plate had not moved and neither had the trunk cracked. It was cabled fully erect again with the help of a tractor, the side branches returned to their normal positions (like a big “bendy toy”, they stayed exactly where they were put), and the tree has since carried on growing as if nothing had happened! But otherwise, apart from some trees tilted (and subsequently re-erected), the oaks fared remarkably well, unlike the pines and eucalyptus. I should add that Klaus struck after a (rare) week of heavy rain, which gave the roots no hold in the sodden ground. Thankfully, deciduous trees were bare, which certainly avoided more severe damage, but made the snapping of the *Q. stellata*, albeit somewhat marcescent, all the more surprising.

I must now draw to a close to escape an editorial bullet, although there are still oaks clamouring for discussion. But finally, I very much hope to be able to welcome all those of you who are able to join the IOS post-conference tour when it visits La Bergerette in October 2012.

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Growing Mexican Oaks in Devon, UK

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The Start

I have been collecting oaks for the last 27 years at my home in Devon in South West England where we have less sunshine than in the eastern counties, but rather higher rainfall. In winter we tend to have one or two cold spells, interspersed with warm periods. We have our fair share of snow and frost, and sometimes damaging, sub-arctic winds. But we knew oaks grow well on our soil, because the dominant hedgerow tree in our part of Devon is *Quercus robur* L.

The Chevithorne Collection

The collection, which currently consists of about 400 different taxa, is far from complete and about 95 of the taxa are still at the greenhouse and polytunnel phase. Most of these will be planted out over the next 1 – 3 years. About one quarter of the collection consists of oaks which come from Mexico. There are three categories: Oaks that only grow in Mexico, oaks that grow in both Mexico and the US, and oaks that grow in Mexico and in the other countries of Central America. This paper encompasses all three categories.

The First Batch of 26 Mexican Oaks

When the collection started at the end of the 1980s there were few Mexican oaks easily available. We planted our first Mexican oak in 1989, *Q. durifolia* Seemen ex Loes., an upright angular tree which is now just under 10m in height. Quite early on we backed expeditions to Mexico whose main purpose was to find the acorns of a wider range of Mexican oaks. These collection trips have continued on a regular basis and have been getting bigger and more professionally organised.

By the end of the 90s we had acquired 26 Mexican species. They varied from easily recognisable oaks like *Q. rysophylla* Weath. and *Q. sartorii* Liebm. to more exotic ones, (e.g. *Q. crassifolia* Bonpl. and *Q. lancifolia* Schltldl. & Cham.), to small bushy oaks like *Q. berberidifolia* Liebm., *Q. grisea* Liebm. and *Q. intricata* Trel. (this was planted in 1992 and is an attractive small bush only 1.6m high). Only two oaks, *Q. uxoris* McVaugh and *Q. insignis* M. Martens & Galeotti, consistently failed to get through an English winter and consequently we keep them in the greenhouse in winter. We made no special provisions for the other Mexican oaks and they were therefore widely distributed throughout all the main areas of the Arboretum. A small number of endangered and/or delicate oaks are wrapped in netting during the winter. The primary objective is to reduce wind chill which is a major problem during prolonged cold spells. We only do this with some of the smaller trees in the hope that if you can get them through their first few winters, the bark will get thicker and they are more likely to survive.

MEXICAN OAKS AT CHEVITHORNE BARTON

This is a list of Mexican oaks which joined the Chevithorne collection from 1989 to 1999 and from 2000 to 2009. All of these oaks have been planted out and been through at least one winter out of doors. These are the first oaks of each species. During the 20 years, we have planted more of these species. In some cases we have up to 6 different specimens. The estimated height is of the tallest tree of each species which is in the collection now. The fourth column designates which oaks are Red, White and Intermediate. The fifth column shows which are Hardy, Half-Hardy and Delicate.

FIRST BATCH

From 1989 to 1999

Name of Oak	Common Name	Estimated Height (m) in 2011	Red, White or Intermediate	Hardy, Half-Hardy or Delicate
Quercus acherodophylla		15.0	R	H
Quercus acutifolia		8.0	R	HH
Quercus affinis		13.0	R	H
Quercus agrifolia	Coast live oak	9.0	R	H
Quercus berberidifolia	California scrub oak	0.8	W	H
Quercus chrysolepis	Canyon live oak	10.0	Int	H
Quercus crassifolia		13.0	R	H
Quercus crassipes		10.0	R	H
Quercus dumosa	Nuttall's scrub oak	3.0	W	H
Quercus durifolia		9.5	R	H
Quercus engelmannii	Engelmann oak	5.5	W	HH
Quercus germana		2.6	W	HH
Quercus insignis **		3.0	W	D
Quercus intricata	Coahuila scrub oak	1.6	W	HH
Quercus laceyi	Lacey oak	1.0	W	H
Quercus lancifolia		1.2	R	D
Quercus mexicana		10.5	R	HH
Quercus planipocula		2.6	R	D
Quercus polymorpha	Netleaf white oak	2.5	W	D
Quercus rysophylla × Q. sartorii *		15.0	R	H
Quercus sartorii		10.0	R	H
Quercus subspathulata		0.3	W	D
Quercus tomentella	Island live oak	1.5	Int	D
Quercus uxoris **		3.0	R	D
Quercus vaseyana		1.1	W	HH
Quercus wislizeni	Interior live oak	9.0	R	H

* This was called rysophylla until the name was changed in 2011

** Now kept in GH every winter

R = 14; W = 10; Int = 2; TOTAL = 26
H = 13; HH = 6; D = 7; TOTAL = 26

SECOND BATCH

From 2000 to 2009

Name of Oak	Common Name	Estimated Height (m) in 2011	Red, White or Intermediate	Hardy, Half-Hardy or Delicate
Quercus acerifolia		2.0	R	H
Quercus agrifolia var. oxyadenia		1.0	R	H
Quercus arizonica	Arizona white oak	1.0	W	D
Quercus canbyi		5.0	R	H
Quercus candicans		2.2	R	HH
Quercus castanea		7.0	W	HH
Quercus conspersa		8.0	R	H
Quercus cornelius-mulleri	Muller's oak	0.8	W	HH
Quercus crispipilis		6.0	R	HH
Quercus delgadoana		9.5	R	HH
Quercus ×dysophylla		1.7	R	H
Quercus emoryi	Emory's oak	3.3	R	H
Quercus fusiformis	Texas live oak	2.0	W	H
Quercus glabrescens		7.0	W	H
Quercus gravesii	Chisos red oak	2.5	R	H
Quercus greggii		0.4	W	H
Quercus grisea	Grey oak	1.2	W	H
Quercus hinckleyi	Hinckley's oak	0.3	W	D
Quercus hintoniorum		0.8	R	H
Quercus laeta		0.7	W	H
Quercus laurina		10.0	R	HH
Quercus miquiluanensis		1.5	R	H
Quercus muenlenbergii	Chinquapin oak	4.7	W	H
Quercus potosina		0.3	W	D
Quercus pungens	Sandpaper oak	0.7	W	HH
Quercus rugosa	Netleaf oak	2.0	W	D
Quercus sinuata	Durand's white oak	0.7	W	HH

R = 13; W = 14; Int = 0; TOTAL = 27
H = 15; HH = 8; D = 4; TOTAL = 27

Red, White and Intermediate oaks	Total	Hardy		Half-Hardy		Delicate	
		Count	%	Count	%	Count	%
Red	27	18	67%	6	22%	3	11%
White	24	9	38%	8	33%	7	29%
Intermediate	2	1	50%	0	0%	1	50%
	<u>53</u>	<u>28</u>		<u>14</u>		<u>11</u>	

The Second Batch of 27 Mexican Oaks

The next decade from 2000 to 2009 saw a steady increase in interest in Mexican oaks and we were sent or acquired many new packets of acorns. Often they were duplications of species already at Chevithorne, but they usually came from different Mexican states and it gave us a chance to try them in different parts of the Arboretum. Our policy is to have two of each species, where possible, and in a few cases we have up to six of particularly unusual species. By 2009 we had another 27 species of Mexican oaks planted out, which had survived at least one winter outside.

The Table

I have kept detailed records of these 53 oaks – divided into 2 batches. The table lists the oaks involved and summarises the data.

In the table the third column gives the estimated height of the tallest of each species at Chevithorne. I have done this because in a few cases the first specimen either died or did not grow properly. The fourth column indicates whether a species is a red, white or intermediate (golden) oak, and the fifth column gives my estimate of the hardiness of each species.

Findings of Note

A. Fast Growers

Fourteen of the 27 red oaks have grown to a minimum of 8m. The really fast growers are *Q. crassifolia*, *Q. affinis* Scheidw. and *Q. acherdophylla* Trel., all of whom have grown to at least 13m. The two tallest trees were the two *Q. candicans* Née which were cut back by the winter of 2010/11. The figures are even more remarkable because, looking at our new website, there are 27 individual specimens of the 14 red oaks mentioned above, which have grown to at least 8m in height. The 14 white oaks which are judged to be hardy range from small bushes to 7m in height. The two biggest are *Q. castanea* Née and *Q. glabrescens* Benth., both 7m in height and a good shape, and they include some smaller species (I like particularly *Q. laceyi* and *Q. greggii*), many of which could be grown in small gardens and on sites where a big tree would be inappropriate. Of the two intermediate oaks, *Q. chrysolepis* Liebm. has grown to 10m and *Q. tomentella* Engelm. has only grown to 1.4m in height.

B. Hardiness

I have divided the 53 oaks into three categories: Hardy, Half Hardy and Delicate:

1. **Hardy.** Twenty-eight of the 53 are judged to be “hardy”. These range from *Q. affinis*, *Q. acherdophylla*, *Q. wislizeni* A. DC., *Q. laurina* Bonpl. and *Q. sartorii*, which have never, in up to 20 years, suffered any weather damage, to others which can be slightly affected by the cold winters. It should be borne in mind that all these Mexican oaks seem to crave strong sunlight and most of them appreciate being protected from the wind.

2. Half Hardy. This applies to 14 of the 53 and encompasses species where some specimens of a particular species do well and others fail. It includes 4 of the fast growing red oaks which were caught by the exceptionally cold weather in November/December 2010 (when the sap was still up). The bark at the bottom of these trees split, frost got into the trunks and these trees apparently died. This included our champion *Q. candicans*, which had grown to 18m in about 12 years. Of the 4 trees that had apparently died, 3 have sprouted again from the base in July of 2011. Particularly vigorous growth has appeared at the base of one of the *Q. candicans*, where the shoots are now 2.5m high. It should make a reasonable tree again in time as it seems that the large root system is still intact. One of our *Q. acutifolia* Née, 8m high, suffered equally damaging frostbite to its bark, but so far is flourishing.
3. Delicate. This has been applied to 10 of the 53 oaks. This category includes all the other oaks which were badly affected by the 2010/2011 winter, and includes the two oaks kept in the greenhouse over the winter.

A Warning

It must be recognised that our experience at Chevithorne on hardiness is based on a very small sample (1-6 specimens of any one species), and a particular specimen can be affected by where it is planted, for example, under the canopy of a big tree.

Our conclusions can be nothing more than a pointer, and many more of these Mexican oaks will have to be grown in different parts of the UK before we can be more definite on which ones are hardy.

C. A Hybrid

Another aspect is that with so many oaks from all over the northern hemisphere in our arboretum, one might expect some interesting transcontinental hybrids. We have only identified one so far, which was observed by James MacEwan. This is a hybrid between *Q. glabrescens* from Mexico and *Q. robur* from Europe. Both parents are white oaks. It displays some signs of hybrid vigour.

D. Pachydermatous Bark

We have found that a number of the bigger Mexican oaks are developing very interesting bark. This takes a form, usually at the base of the trunk, which can best be described as pachydermatous, *i.e.*, similar to an elephant's trunk. It is usually confined to the bottom two to four metres of the tree, and each species has subtle differences. Four oaks which demonstrate this are *Q. mexicana* Bonpl., *Q. laurina*, *Q. conspersa* Benth. and *Q. acutifolia*. These four oaks are planted together in the area north of the Tapir Orchard so that the minor variations between them can be observed. They are red oaks and usually fast growing. It is also worth mentioning that our two semi-mature trees of *Q. crassifolia* have a corky bark up to about 3m and then the trunk changes suddenly to a conventional bark. There are other oaks, which are not mature enough to have fully developed pachydermatous bark, but seem to be heading that way. I can visualise collections in the future consisting entirely of oaks with unusual bark.



Quercus candicans before the freeze

photo©James MacEwen

The Past

A few Mexican oaks are known to have been grown in England for about 200 years -- for example, *Q. chrysolepis* was introduced to England by Charles Sargent in 1877, *Q. gambelii* Nutt. in 1894, and *Q. muehlenbergii* Engelm. in 1822. We know the remarkable *Q. crassifolia* at Kew is probably 100 years old.

Until recently, few arboreta seem to have specialised in collecting Mexican oaks on a larger scale. One of the first to do so, to my knowledge, was Bob Berry, who established the Hackfalls Arboretum in New Zealand and was, I think, the main pioneer in collecting large numbers of these oaks to grow outside Mexico. He acquired his first Mexican oak in 1975 but really got going as a participant in the IDS tour of Mexico in 1981. He then made several further trips in the 1980s. In the benign climate of New Zealand he now has an astonishing array of



Damage as a result of the freeze

photo©James MacEwen

almost mature Mexican oaks, which gives us the clearest indication of what the Chevithorne Arboretum might look like in 10-20 years' time.

The Hillier Gardens at Romsey in Hampshire has also planted a number of these oaks which stretch back to when Harold Hillier himself went to Mexico. They have many semi-mature trees including a record-breaking *Q. rysophylla*.

Finally, Mr Garin, who runs the Jardin Botanico de Iturraran near San Sebastian in Northern Spain, has collected extensively in Mexico and the countries of Central America and has a comprehensive collection of oaks from this region.



Quercus affinis

photo©James MacEwen

He seems to have been collecting over roughly the same period as us, and has about the same number of Mexican oaks, but interestingly only about 70% of his species are the same as ours.

The Present

In the last two or three years there has been an even more concentrated interest in collecting acorns from Mexico. This is not surprising as it is thought that there are up to 200 species in Mexico, including some which have not yet been identified. We have two oaks that have been renamed this year. These are *Q. delgadoana* S. Valencia, Nixon & L.M. Kelly, and *Q. rysophylla* × *Q. sartorii*, and there are several others which need identification, including one or two which could be new species.

It is not a coincidence that this increase in collecting coincides with Allen Coombes' move to Mexico, and he, Béatrice Chassé, and others have introduced a mass of new Mexican species. One has to admire their tenacity and bravery because a lot of the collecting is in remote places. Much of Béatrice's last expedition, which was so productive, was in North West Mexico near the border with California. This is widely considered to be one of the most dangerous places in North America. Obviously it is too early to tell how these species will deal with the English climate. Germination rates have been fairly good and many of them will be ready to be planted out in the next two or three years. It is difficult to distinguish, at this early stage, which ones will stand out, but there are three which already have exceptionally large leaves and a high growth rate. They are *Q. corrugata* Hook., *Q. oocarpa* Liebm. and *Q. skinneri* Benth. These trees come from a comparatively low altitude so may be marginal in our climate, but if we can establish them, they will be even more dramatic-looking than some of the recent introductions like *Q. rysophylla*, *Q. affinis* and *Q. conspersa*. We have another 51 species of Mexican oaks at Chevithorne. A few are already planted out and the rest are seedlings or small plants which are in the greenhouse or polytunnel. In total over the last 23 years we have had the acorns or seedlings of about 125 Mexican oaks at Chevithorne. Around 20 of them have failed for various reasons. Ten of them failed to germinate and another ten died, mostly at the seedling stage. One, *Q. sapotifolia* Liebm., came to us in 1997 and always struggled with our climate; it was finally killed last winter. I hope and expect to be able to report that in a few years' time a further batch of Mexican oaks will have adapted to the English climate.



Quercus acherdophylla

photo©James MacEwen

The Future

In summary it might be reasonable to suggest that over the next 20 years a large number of these Mexican oaks will find their way into collections and gardens in this country and large parts of Europe, and into the better collections in the southern hemisphere (for example, in Argentina and Australia). In fact this process has already started as we have given spare Mexican seedlings to around 50 oak enthusiasts who will be trying to grow them from the North of Scotland to the South of France and, of course, other collectors will be doing the same thing. These oaks are so varied, and many of them are turning into such interesting trees, that they may well alter the general perception of oaks. Those of us who have been involved in the dramatic expansion of introductions of Mexican oaks have been very fortunate

My Book and Website

I published a book in 2009 called *The Oaks of Chevithorne Barton*, published by Adelphi Publishers. Our new website is www.oaksofchevithornebarton.com



Quercus.acutifolia

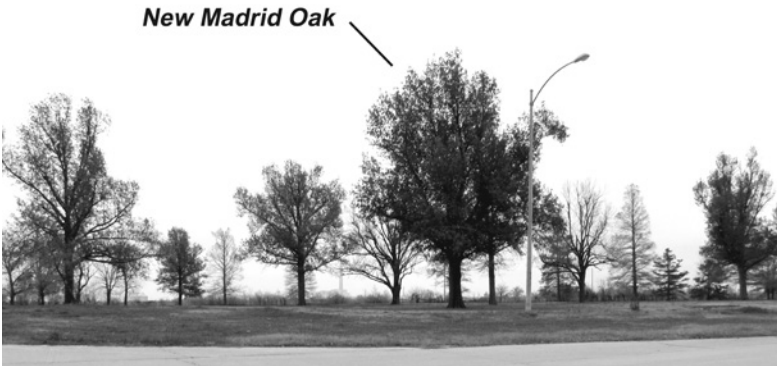
photo©James MacEwen

The Unique Nuttall Oak Tree at New Madrid, Missouri

Ryan Russell,
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In the fall of 1999, past president and outgoing journal editor Guy Sternberg stumbled upon a nice, mature Nuttall oak (*Q. texana* Buckley, syn. *Q. nuttallii* Palmer) at a rest stop along I-55 in Southern Missouri. While nothing jumped out at Guy that would make him think this tree would be anything special, he decided to pick a few acorns to test at his central Illinois arboretum. In the past, he had experienced little luck growing this species since central Illinois is well outside of the Nuttall oak's native range. Despite previous failures (and perhaps lacking self-control!), Guy picked up a few acorns to try the following spring. A little more hunting around the rest stop turned up another Nuttall oak in the northern portion of the parking area. During a second visit Guy collected a few acorns from this tree as well.

Hoping for nothing more than one seedling tough enough to survive the winters at Starhill Forest Arboretum, Guy soon found that some of his new seedlings were indeed something special. As expected, the group of acorns from the second Nuttall oak to the north flushed a vibrant green as is typical of the species. However, the seedlings from the first tree were flushing a consistent vibrant reddish wine color. Guy grew these seedlings over the next few winters and, to his surprise, they did not seem bothered by the harsh winters. When nearly all of his other attempts to grow this species were doomed during the winters, these seedlings stood their ground and, true to Nuttall oak's form, they grew rapidly. Not only did these seedlings survive the winters, each spring Guy was greeted by bright red flushes of growth that lasted well into May. Perhaps the most unique aspect is that every seedling exhibits these characteristics.



The New Madrid Oak and surrounding trees

photo©Guy Sternberg

Guy and others have made subsequent trips to collect acorns from this tree and, every time, the seedlings display these unusual features. Those who came to the US and joined the grand caravan from Illinois to Texas in 2006 for the Fifth Oak Conference stopped there to gather some of the abundant seed, so I expect that there are some nice seedlings now growing in other parts of the world. Belgian Nurseryman Dirk Benoit grows the tree for European markets and has a nice stock plant established from seed sent to him years ago by Guy.



The well-branched crown of the New Madrid Oak

photo©Ryan Russell

I have grown many seedlings from this tree in central Missouri, and I have experienced the same results. In 2008, Guy registered the name ‘New Madrid’ after the city and county where this unique tree was discovered. After some deliberation, the selection has been classified as *Quercus texana* Buckley New Madrid Group because it breeds true, but perhaps not identical to the parent, from seed. It was originally published as a cultivar (*Quercus texana* ‘New Madrid’ Jablonski 2007) but has since been designated as a Group due to possible variations which might



Author Ryan Russell with the New Madrid Oak

photo©Ryan Russell

be expected in color, habit, and other features. Although some plants are grafted, they are not selections and so should not be regarded as cultivars.

What makes this tree seemingly impervious to the common oak traits such as self-sterility and hybridization remains unknown (at least to this author). The parent (ortet) tree does not exhibit characteristics unusual to the species, and to date it has not been clonally propagated. I plan to graft several this spring just to be sure a few copies are around in case anything happens to the ortet.

Recently it came to my attention that the ortet was in danger of removal. My father, Dennis Russell, who is employed at the University of Missouri in the



Author working in the tree

photo©Ryan Russell

College of Natural Resources, occasionally works at the University's Delta Center Farm located near the ortet. He was informed that the Missouri Department of Transportation (MoDOT) had decided to remove the buildings at the rest stop where the ortet is found. The tree is located within 100 feet of the main building. At that same time my dad told me that the trees in that area had been hit by a heavy ice storm in 2009, and that the tree I was interested in may not be in very good shape, if it was even still there.

I spent the next few weeks trying to locate the tree, contacting MoDOT personnel to get information. I was informed of the tree's location and the fact that MoDOT did plan to level the site. I contacted Bree McMurray, MoDOT's Endangered Species Coordinator, in August 2010. McMurray works with endangered animals, bats being her specialty, and I had a tough time explaining why this tree was special. Terms like hardiness, ortet, cultivar and aesthetics did not seem to be working. Since Nuttall oak is not rare or endangered in Missouri, my efforts alone were insufficient. I called upon the help of several IOS members as well as a couple of well-known garden writers. MoDOT personnel received emails and letters from around the globe in support of saving the tree. I finally had their attention!

I was contacted by McMurray, wanting information on how to proceed. She had spoken with her superiors as well as the architect on the job and they agreed to meet with me at the site to go over the particulars. In March 2011, I drove down to the site to meet with McMurray. We had a very productive meeting in which MoDOT agreed to protect an area about two times larger than the drip line. Bree



Trimming ice damage high in the crown

photo©Ryan Russell

also asked me which other trees should be saved, to which I of course replied “All of them!” The other species at the site include Bald Cypress (*Taxodium distichum* [L.] Rich.), Pin Oak (*Q. palustris* Muenchh.) Green Ash (*Fraxinus pennsylvanica* Marsh.), White Ash (*F. americana* L.), and a few others.

I was not able to follow the job closely throughout the demolition phase because the ortet is a 4.5- hour drive from my house, but I had several people helping me monitor the project. MoDOT kept to their promise to protect the tree up to the drip line, and the tree came through the construction relatively unscathed. Someone stubbed off a few low hanging limbs, but no real harm was done. The work was completed in early spring 2011.

In the fall of 2011, my wife and I made the long drive to New Madrid County Missouri to prune and inspect the ortet. By this time, the tree had been through a terrible ice-storm, poor post-storm pruning, construction, and another hot and very dry Missouri summer. Upon initial inspection, I noticed that in three spots on the root flare, pieces of the bark had been ripped off. I assume this was a result of machinery damage during the mowing season. Since the tree had not been pruned since the ice-storm, it had large amounts of adventitious water-sprout growth, and just setting my climbing line into the tree took fifteen minutes. After fighting my way through the thick jungle of sprouts, I began to notice that the ortet has very nice structure. There were no bad unions or included bark and the tree overall had good balance. My job was to try to restore the tree to its former glory.

In places where the larger limbs had broken in the storm, someone had cut them where they could most easily be reached. There were many internodal cuts which resulted in some dieback. I am glad that those limbs were not cut off completely, however. I carefully selected new growth that will become the new leads. However, a few of these limbs were damaged so severely that I removed them altogether. The tree does have a mild (thus far) case of obscure scale, and I am trying to negotiate a plan with MoDOT to treat it this spring.

Unfortunately, I was not able to prune the entire tree this time due to the long drive and the short days, but I managed to get all of the major concerns addressed. I plan to return next fall to finish the pruning (oaks in eastern North America should not be pruned during the growing season due to the threat of a fatal fungus infection called Oak Wilt). I noticed that only a few limbs had acorns. The lower limbs on the south side of the tree were dripping with acorns. Perhaps prevailing spring winds are the culprit? I did manage to stuff my climbing bag full of acorns before I returned to the ground.

I am glad that this great oak was saved from removal, and that an entity as large as MoDOT was willing to listen to a few concerned people. I would like to thank the IOS members that sent messages to MoDOT in support of this tree. I do not believe saving this tree would have been possible without your support. I would also like to thank Guy Sternberg for finding and introducing this plant (and its offspring) to us as well as dedicating his time and efforts to this journal and to the IOS in general.

Anyone interested in more information about this tree or the ‘New Madrid’ seed group can contact me with questions. If anyone would like to express their gratitude to the Missouri Department of Transportation for their cooperation during this project, they can contact me and I will pass the message along.

Normandy Bound

Destination: the Quercetum du Hanouard

August, 2011

Béatrice Chassé

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Who's invading whom?

From our point of departure in the Dordogne (a department of the Aquitaine region) to our destination in the Seine Maritime (a department of the Haute Normandie region) there are 587 kms to be traveled, crossing over two regions, the Limousin and the Centre.

From the city of Orléans, passing through Chartres and then on to Rouen, what the words “invasive plants” should be used to designate, but are not, becomes dramatically clear. Nothing but one plant as far as the eye can see for countless miles and what seems like an eternity. The *tableau* is completed by armies of gigantic fossil fuel-eating machines, high-voltage cables and pylons and mile-long watering apparatus spewing rainbows in the midday sun.

This is of course not a situation endemic to France. Every (agricultural) country in the world has places that are, like this one, so uniformly ugly and so ugly in their uniformity. Can anyone today really believe that this is a solution to anything?

Near Rouen, on the route that we have taken, we cross in different places the valley of the river Seine, which is 777 km long and extremely sinuous, flowing from a place called Source-Seine, through Paris and on to the Havre where it meets that part of the Atlantic Ocean called the English channel (but not in French, of course!).

Our destination is north west of Rouen, about a third of the way between the Havre and Dieppe, to a town called Sassetot le Mauconduit where we have selected lodgings for the evening at the Château de Sissi – not because it is a château (although that might have been sufficient) but because it is situated in a park of 11 hectares planted with trees some of which are over 300 years old.

A change of scenery

It would be hard to say exactly where, but at a certain point along the road (after Rouen certainly) one is struck by the majestic presence of patches of *Fagus sylvatica* L. and the realization that *Quercus robur* L., though a nice tree certainly, just doesn't measure up to this beauty and grandeur. The most beautiful beech forests left in France today are in this region (Haute Normandie).

Obviously, beech is also abundantly planted in parks in this part of the world and the magnificent specimens that we find at the Château de Sissi, probably



Quercus canbyi and truck protector

photo©Béatrice Chassé

planted over 200 years ago, do honor to the species. Here also we find planted: *Q. robur* and *Populus tremula* L. both with circumferences of more than 3m; beech and copper beech of incredible dimensions; *Acer pseudoplatanus* L., *Castanea sativa* Mill., *Cedrus deodara* Roxb. Ex (D. Don) G. Don, *Tilia cordata* Mill., and one very unhappy *Quercus rubra* L., struggling to find its way to the light. Two *Araucaria araucana* (Molina) K. Koch right at the driveway entrance are rather unfortunate recent additions to the grounds. The next time we come, we must bring a chain saw.



Quercus graciliformis

photo©Béatrice Chassé



Quercus durifolia

photo©Béatrice Chassé



Quercus rysophylla and *Quercus sartorii*

photo©Béatrice Chassé

The most spectacular trees to be found in the park are two *Liriodendron tulipifera* L., planted more than 300 years ago. One, with a single trunk of more than 4 m in circumference and the other with a double trunk, each of easily between 4-5 m in circumference. From the single-stemmed tree, a weeping branch, touching the ground shows striking examples of what Francis Hallé calls “traumatic reiterated units” (unités réitérées traumatiques) in his hypothesis about “root wood” (bois racinaire)¹.

As the sun goes down shedding that particular light that is characteristic of places close to coast lines of the Atlantic and after a wonderful meal spent recalling images of the enormous trees we have just seen, visions of our arboretum and how fantastic it will look in 200 years or so accompany us to sleep.

The Quercetum du Hanouard

After an early-morning stroll along the sea, we set off for the small town of Le Hanouard, the location of Henri de Brem’s arboretum. A long-standing member of the International Oak Society, Henri once remarked that he finally understood what sudden oak death was after a committee of oak experts came to visit his arboretum. This bitter-sweet reflection, followed by his credo “*I have great confidence in doubt.*”, gives a measure of the man: fine-tuned humor distilled through masses of knowledge in numerous subjects, all wrapped up in an infectious smile and a provocative gaze.

Originally from the Vendée (the southern-most department of the region called the Pays de la Loire), Henri de Brem acquired this property nearly 40 years ago. And he started planting.



Quercus acuta with fencing

photo©Béatrice Chassé

With between 800 to 1000 mm average annual rain-fall, the oceanic climate of the Haute Normandie delivers winter temperatures at an average of about +5°C with every now and then some below zero temperatures (as much as -10° C). Summer heat is not extreme, with averages between 17 and 20° C and a few days up to 30° C.

The property comprises 6 hectares of – as nearly everywhere in Normandy – extremely fertile, rich soil made of clay, sand and humus sitting on top of limestone. Faithful to a Norman tradition, the property is a “clos mesure”: a house and surrounding grounds enclosed by beech trees planted every meter and a half, “...for wind protection,” explains Henri, adding with a touch of malicious humor, “but really because in Normandy countrymen like to be hidden away, every neighbor being a potential enemy.”



Quercus lanata

photo©Béatrice Chassé

The arboretum is divided into three areas: “la cour”, “l’enclos” and “le bastion”, radiating around the house. The oak collection comprises a little over 100 taxa, with just a few cultivars and as many hybrids. The Quercetum du Hanouard holds one of the 4 “Collection Agréée” labels delivered by the CCVS (Conservatoire des Collections Végétales Spécialisées).

A stroll through Mexico²

The elegant silhouette of what is probably the French champion *Q. canbyi* Trel. greets us as we start off for the first part of the visit. It is probably one of the best introductions from Mexico (in the UK, 1979, by Sir Harold Hillier), with brilliant green leaves, pretty young-leaf color and a seemingly endless adaptability to different soils and climates. Here in Normandy, it has reached a height of about 9 meters and was planted 7 years ago.

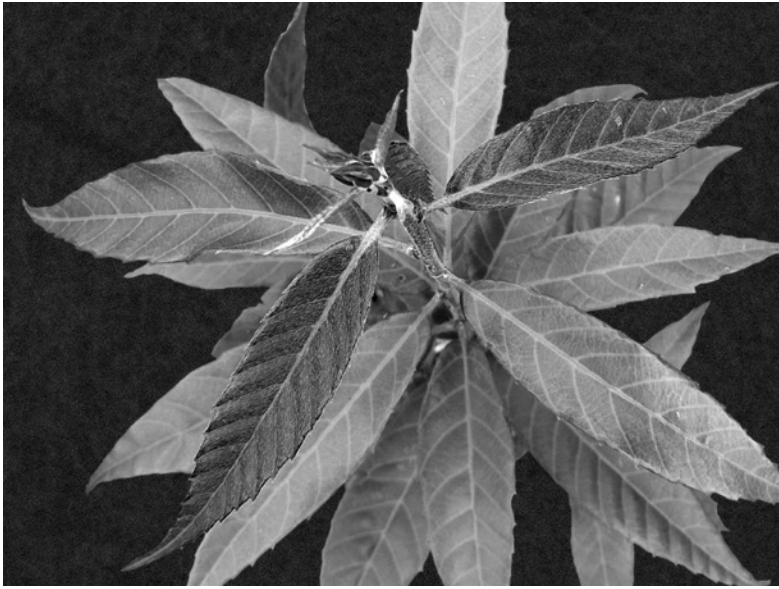


Quercus gilva

photo©Béatrice Chassé

Not far, a similar species, *Q. graciliformis* C.H. Mull. (introduced to Europe only in 1996) is proudly displaying the coppery-red of new young leaves certainly the result of the much needed recent rain fall after a year of terrible drought. Some authors suggest that this species should be considered an ecotype or geographical variant of *Q. canbyi*. Although the distinction between a maximum of 4 lobes for the latter and 5 for the former seems a bit tenuous, the difference in acorn maturation time (one year for *Q. canbyi* and two for *Q. graciliformis*) is perhaps more significant. But, this too can be a function of the environment. As always with oaks, the plot thickens...

Indubitably one of the stars of the collection – and one of the first oaks planted by Henri thirty years ago – is a *Q. durifolia* Seem. complete with acorns. This for me is one of those Mexican species from the Sierra Madre Occidentale that rivals in elegance with the sub-genus *Cyclobalanopsis* oaks. Henri's is one of the first



Quercus oxyodon

photo©Béatrice Chassé

to have been planted in France (just a few years after its presumed introduction to Europe in 1979).

Visiting our arboretum one day a few years ago with a botanist friend, my excited “*I will now show you the most beautiful tree in the world*” as we approached a *Q. rysophylla* Weath. was answered by his very calm, “*It usually is, wherever it is grown.*” Henri’s *Q. rysophylla* is no exception – growing next to a *Q. sartorii* Liebm. that wouldn’t fare too badly in a beauty contest either. Both of these species are from the Sierra Madre Orientale. These two trees, as many others here, are exempt of any leaf damage, disease or other signs of ill being. The Quercetum du Hanouard seems to be a stress-free environment for many of its inhabitants.

Q. crispipilis Trel. from the state of Chiapas and from Guatemala is rare in cultivation and in nature: it is in the highest risk category of the IUCN red list. Growing here in Normandy it has attained respectable size and appears to have suffered a bit from the severe drought of 2011.

Growing not far is a tree that Henri received labeled as *Q. conspersa* Benth. but it is decidedly much more like *Q. glabrescens* Benth. Amongst other characteristics distinguishing the two, *Q. conspersa* should have a majority of leaves with an entire margin, and this is not the case.

In between the trees, Henri explains his love of the genus: “*Their size, their silhouette and leaves, and, of course, their psychology. Most of all, their comforting optimistic vitality as evidenced in their good habit of producing new growth several times during the season, in brilliant colors varying from white to yellow, rose, brown and of course, green.*”



Quercus acutissima and truck protector

photo©Béatrice Chassé

From Asia and America

Part of the Quercetum is mowed by a neighbor's cows. This is of course good use of the land (and a way of reducing potential enemies?) but it means that the trees need very serious protection – as can be seen with this specimen of *Q. acuta* Thunb. Found in nursery catalogues (where they more often than not turn out to be *Q. glauca* Thunb.) this is a rare tree in cultivation in France. This *Q. acuta* with a yellowish pubescence that can be easily removed from the underside of the leaf

and very long, yellow petiole (sometimes exceeding 4 cm) seems to be the real thing. There were no very, very young leaves that presumably would have helped in identification.

There are six other oaks here of the subgenus *Cyclobalanopsis*: *Q. oxyodon* Miquel³, *Q. liboensis* Z.K. Zhou⁴, *Q. myrsinifolia* Blume, *Q. glauca* Thunb., *Q. lanata* Smith. and *Q. gilva* Blume.

Nearly all of the purported *Q. lanata* that I have seen in cultivation are *Q. leucotrichophora* A. Camus. In the *Flora of China* these two taxa have been grouped (but as usual, not everyone agrees on this). I would think that this very velvety, thick white tomentum on the young leaves and shoots of this specimen here in the Quercetum du Hanouard is sufficiently characteristic to confirm that this is *Q. lanata*. According to Henri de Brem, the representatives that he has of the two aforementioned species do not behave the same way – notably with regard to hardness.

Henri's *Q. gilva* measured 50 cm when it was planted three years ago. It is a splendid little tree that has now reached a height of 2.5m, defiantly pointing very yellow new growth towards the sunny blue sky with which we were blessed during the entire visit. The *Q. liboensis* is growing more slowly but is very healthy and vigorous, also with new growth. A less vigorous *Q. oxyodon* (from seeds collected by Jean Merret in Burma in 2005) has been cut back several times.

The oaks from Asia of section *Quercus* include *Q. dentata* Thunb., *Q. fabrei* Hance, *Q. acutissima* Carr., and *Q. castaneifolia* C.A. Mey.

Growing together with the magnificent *Q. dentata* are a fine specimen of *Q. phellos* and an equally beautiful *Q. velutina*. From North America also, we find *Q. montana* Willd., and *Q. bicolor* Willd., showing health and vigor.

With, as always, a touch of humor and a good dose of honest unpretentiousness, Henri explains what he has learned from planting. “*I have come to realize that I have planted almost always in the wrong place and that when it becomes necessary to chop down a dying tree or one that is taking up too much room, the esthetic result is always gratifying. Contrary to decisions that we make based on our judgment, no error is possible when they are based on chance. The open spaces thus created are so attractive that I have come to believe that it is exactly where there is enough room that one should never plant!*”

From dry, poor soil to wet and rich and loving it

This is why Francisco Garin, oak specialist and Director of the Jardín Botánico de Iurraran (Spain) insists, “*Tenemos que intentar todo*” (We must try everything). There are of course limits to this philosophy, but in a large majority of cases, you never know what the response to the environment will be – especially with oaks.

And so it is that all of the European and North American oaks growing in the Quercetum du Hanouard which you would expect to be miserable in wet and rainy Normandy: *Q. pungens*, *Q. ithaburensis*, *Q. macrolepis*, *Q. suber*, *Q. pacifica* (unfortunately damaged by snow this past Winter), *Q. geminata*, and *Q. faginea*, are unquestionably healthy, happy trees.

Once asked what made oaks so special, Kevin Nixon, after a good long



Quercus geminata and electric fence

photo©Béatrice Chassé

think, replied, “*Nothing... oaks never overspecialized, they never found a niche. They are so successful exactly because there is no reason that they are. Restricted distribution only happens when there is just one reason for a creature’s success.*”⁵

Not just oaks

Our day was agreeably interrupted by a very nice lunch which we enjoyed with Anne-Marie de Brem and conversation that started from a beautiful branch

with acorns lying in my plate of *Quercus guesswhat* to continue briefly on to Henri's multiple other interests as varied as 10th-13th Century Chinese porcelain and first editions of French authors of the 19th and 20th Centuries. A little bit of genetics, Latin and botany popped up into the conversation every now and then. And also the story of why he started an arboretum: when he was ten years old and a "louveteau" (the French equivalent of a cub scout), he won a first prize for his herbarium. He made the solemn pledge, as was required of him, to continue his efforts. Which he did...thirty years later at age forty.

The name Quercetum du Hanouard is misleading: there are not just oaks here. *Sassafras tzumu* (Hemsl.) Hemsl., *Austrocedrus chilensis* (D. Don) Pichi-Serm. & Bizzarri, *Cunninghamia konishii* Hayata, *Castanopsis cuspidata* Schottky (all French champion trees); *Fagus japonica* Maxim. (fruiting for the first time) and many other species of this genus; *Picrasma quassioides* Benn., *Trochodendron aralioides* Siebold & Zucc. and still others, make this Norman destination a true dendrologic experience.

There is also a part of the Quercetum that Henri calls his "forêt en mouvement" a play on words with Gilles Clément's "jardin en mouvement". As time goes by, things change and instead of destroying this movement, the gardener (the forester?) intervenes every now and then just to slightly push things in one or more of the directions proposed by this natural change. Time will tell...

In farewell, we left a small box of young trees containing *Q. sebifera* Trel., *Q. viminea* Trel., *Q. greggii* Trel., *Q. sideroxyta* Humb. & Bonpl., *Q. deliquescens* C.H. Mull., *Q. invaginata* Trel. and three pines - who have all indeed found a new, good home.

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- ¹ Hallé, Francis., 2005, *Plaidoyer pour l'arbre*, Actes Sud, Paris. pp 36-37. Author's translation.
- ² This is poetic license: the Quercetum du Hanouard is not organized geographically. As it is impossible to mention every tree, the choice is also poetic license.
- ³ Since the 2006 revision of *Cyclobalanopsis* by Madame Min Deng, this taxon has been split into three varieties: *Q. oxyodon* var *oxyodon*, *Q. oxyodon* var. *hypargyrea* M. Deng & Z.K. Zhou and *Q. oxyodon* var. *tomentosa* M. Deng & Z.K. Zhou. There are divergent opinions about this.
- ⁴ For some authors, this taxon is considered to be *Q. glauca* var. *gracilis* A. Camus. For others, not.
- ⁵ Logan, William Bryant. *Oak: the frame of civilization*, W.W. Norton and Company, 2005. pp. 16-17.

Largest Known *Quercus garryana* Clone Discovered on a Steep Slope at the Boundary of Larrabee State Park, Washington, USA

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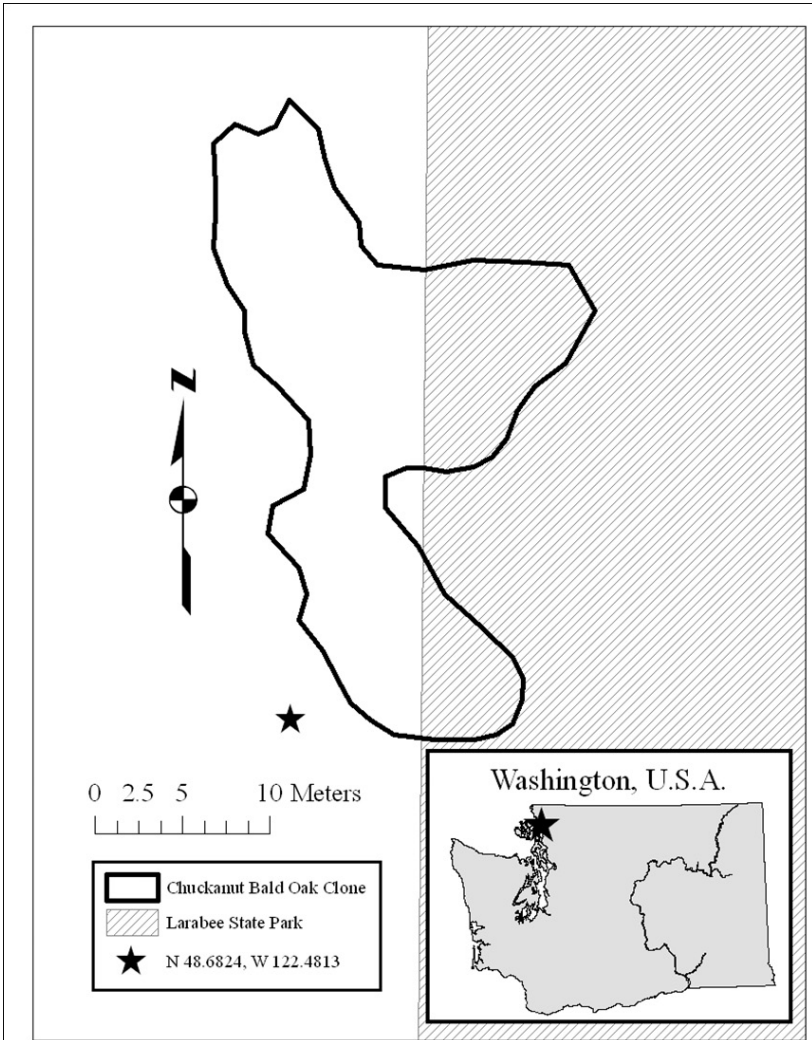
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Abstract

The occurrence of clonal growth in deciduous trees is fairly common, particularly for regeneration after stem damage. Within the genus *Quercus* there are many species that have been described as possessing the ability to reproduce vegetatively, but the discovery of large clones is limited. Here we describe the largest known clone of *Quercus garryana* Douglas ex Hook. produced by extensive suckering. The *Q. garryana* clone described is located on a steep, west-facing slope at the boundary of Larrabee State Park, Washington, USA. Twenty-eight twig samples within the stand were collected and processed for genetic analysis. The samples were analyzed using seven nuclear microsatellites, and the results showed that all individual samples were genetically identical. The combined canopy of this clone covers an estimated 383m² and is ~37m long (N – S) and ~20m wide (W – E) at its largest dimensions. In this case, we propose that the mechanism of continual cloning is a result of the perception of fallen stems due to gravitational pull on a steep slope. It is not yet known if this stand of *Q. garryana* is one of many large clones or unique, but it highlights the need for research into the mechanisms driving clonal growth to understand rates of vegetative biomass accumulation and possible trade-offs between sexual and asexual reproduction in woody plants.

Introduction

Some tree species that reproduce vegetatively through clonal growth produce very large clones, including the largest recorded organisms on Earth. For example, the ‘Pando’ clone of quaking aspen (*Populus tremuloides* Michx.) holds the record for the single largest organism at over 40 ha (100 acres) and an estimated 6 million kg (13.2 million lb) (Grant *et al.* 1992, Grant 1993, DeWoody *et al.* 2008). Other tree species, however, reproduce vegetatively by basal sprouting and root suckering when disturbed (Koop 1987, Jeník 1994, Jensen and Anderson 1995). Clonal clusters of deciduous trees often represent a few genetically identical trunks produced after stem damage from logging, coppicing, fire, wind, flooding, or browsing by herbivores (Roy 1955, Barsoum *et al.* 2004, Valbuena-Carabaña *et al.* 2008). Clonal formation of oak ramets is thought to be more akin to stump



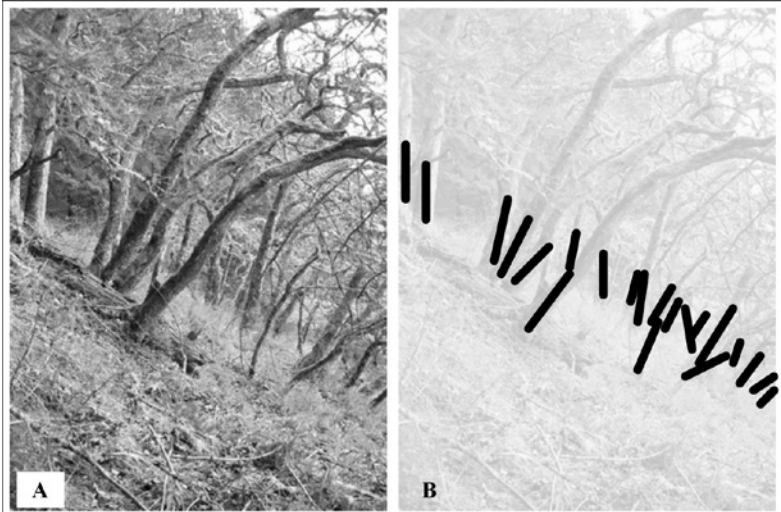
Outline of *Quercus garryana* clone at western boundary of Larrabee State Park, Washington, USA. The star indicates GPS coordinate taken to mark the edge of the clone. Also shown is an inset map of the State of Washington, with the clone GPS coordinate depicted in the northwestern corner of the state.

sprouting or suckering after stem damage than as continuous underground spreading by genets as observed with aspen (Tiedemann *et al.* 1987, Guerin 1993, Sugihara *et al.* 1987, Ainsworth *et al.* 2003, Valbuena-Carabaña *et al.* 2008). Even for oak species that are known to be the most prolific clonal growers, clones



Leafless oak stems at top and right of figure

photo©Derrick Parker



A partial view of the *Quercus garryana* clone sample site and surrounding vegetation (A), and the same image with 21 of the largest visible *Q. garryana* ramets highlighted for improved visualization of oak stems in the stand (B).

photo©Derrick Parker

are typically small with coverage areas less than 100m² (Montalvo *et al.* 1997, Alfonso-Corrado *et al.* 2004), though at least one species, *Quercus havardii* Rydb., has a documented individual estimated at 7,000m² (Mayes *et al.* 1998).

Quercus garryana Douglas ex Hook. (Garry oak or Oregon white oak) can grow as a large, broad-crowned, single-trunked tree, but it is also known as a stump-sprouting and cluster-forming oak species adapted to regular low-intensity fire regimes (Sudworth 1908, Roy 1955, Sugihara *et al.* 1987, Engber *et al.* 2011). In this paper, we describe a large clone of *Q. garryana* that occurs on a steep west-facing slope at the boundary of Larrabee State Park, Washington, USA. Using genetic techniques described in Marsico *et al.* (2009), we were able to identify the ramets of this clone as being genetically identical. The clone described here is the largest known (in canopy area) clone of *Q. garryana*. Determining if this clone is unique or if large clones are commonplace in *Q. garryana* is important to understanding drivers of growth form, rates of growth, and potential trade-offs in sexual and asexual reproduction.

Methods

The *Q. garryana* clone described is located on Chuckanut Bald along the western boundary and near the northern end of Larrabee State Park in Washington, USA (Fig. 1; Duemmel 2004). The site is located on a steep west-facing hillside (Fig. 2) overlooking Bellingham Bay and Lummi Island and is located on the eastern edge of a bald surrounded primarily by coniferous forest at an elevation of 292m. Twenty-eight twig samples were collected from throughout the stand on 5 April 2007, and they were dried individually in plastic bags on silica gel. Details of genomic DNA extraction, primer optimization, PCR, and fragment analysis can be found in Marsico *et al.* (2009). Briefly, Marsico *et al.* (2009) utilized seven nuclear microsatellite markers (quru-GA-0C19, quru-AC-0G12, quru-GA-0M05, quru-GA-1G13, quru-GA-1M17, ssQpZAG 36, ssQpZAG 9) to investigate population genetic structure across the northern half of the *Q. garryana* species range. In sampling 334 individuals at 22 sites from southern Oregon, USA, to British Columbia, Canada, only three pairs of identical individuals were found using these markers (Marsico *et al.* 2009). This indicates that these nuclear microsatellites are sensitive to slight genotypic variation within oak populations, making them appropriate for identifying genetically identical plants.

GPS coordinates were projected in ArcMap 9.3 (Esri, Redlands, CA) using the NAD 1983 reference system for Washington State Plane North and overlaid with a Larrabee State Park Boundary layer (WDNR 2007). A USGS 7.5 Orthoimage (USGS 2011) was georeferenced and compared with field notes to create a digitized Chuckanut Bald oak clone canopy coverage (Fig. 1). Using the ArcMap geometry calculator, the area was calculated for the oak clone canopy coverage. The USGS 7.5 minute Bellingham South Quadrangle was used to calculate percent slope by dividing the change in elevation by the change in horizontal distance. The degree of slope was calculated using the arctangent of change in elevation divided by change in horizontal distance over an area containing the clone.



Young shoots emerge from the root collar and stem base of older stems, showing the continued clonal growth in this stand. photo©Derrick Parker

Results and Discussion

Our genetic analysis of microsatellite markers showed that the individual twigs sampled at Chuckanut Bald had identical genotypes (Table 1). Of the 28 samples collected, 21 provided complete and identical genotypes with the markers. The other seven samples were consistent with the 21 complete samples,

but they did not amplify PCR product at one or two of the genetic markers. Small sprouts from the larger trunk bases, root collars, and lateral root systems were observed (Fig. 3), along with many larger stems comprising the stand (Fig. 4). The clone covers an area approximately 37m long and 20m wide at the longest and widest points, with a total estimated canopy area of 383m² (Fig. 1).

The large, continuously expanding *Q. garryana* clone we identified appears to be the largest recorded naturally occurring clone of this species. Interestingly, the clone seems to be continually spreading and producing new shoots in response to a disturbance perceived by the larger stems in the stand. Even though the most common mechanisms leading to clonal oak stands are fire, logging, coppicing, and/or over-grazing (Roy 1955, Sugihara *et al.* 1987, Montalvo *et al.* 1997, Bakker *et al.* 2001), this site has no indication of these events recently, though new sprouts were discovered in 2007 and appear to be produced annually. We propose that this stand of *Q. garryana* continues to expand due to the perception of fallen trunks caused by the gravitational pull down the steep slope (*i.e.*, 36% grade or 19.8°; see Fig. 2). This clonal mechanism has been observed for trees that have partially or completely fallen over and remain alive (Koop 1987, Jeník 1994), though it has not previously been documented for *Q. garryana* at this scale of regeneration. Therefore, due to specific environmental conditions—the steep slope, in this case—the Chuckanut Bald *Q. garryana* clone may be unique, though certainly these oaks also grow on very steep slopes in other locations. Alternatively, it is possible that large *Q. garryana* clones are relatively common but have simply not been recognized. *Quercus garryana* is known to have high allelic diversity within its populations (Marsico *et al.* 2009), but even in species known for clonal growth, genetic diversity at the population level remains high (Mayes *et al.* 1998, Alfonso-Corrado *et al.* 2004), making population genetic diversity a poor predictor of clone formation. Therefore, it is reasonable to speculate that large clonal stands of *Q. garryana* may simply have been overlooked. Further study of large clones is important to elucidate strategies of energy investment in clonal plants because trees stimulated to grow in large clones may accumulate biomass more rapidly and partition resources differently than non-clonal organisms (Mock *et al.* 2008).

Table 1. Shared nuclear microsatellite genotype of 28 *Quercus garryana* stems at Chuckanut Bald, Larrabee State Park, Washington, USA. Genetic data obtained using seven nuclear microsatellite markers following Marsico *et al.* (2009)

Nuclear microsatellites	0C19	0G12	0M05	1G13	1M17	ZAG 36	ZAG 9
<i>Q. garryana</i> Chuckanut	223	208	194	178	113	210	252
Bald clonal genotype	229	217	206	178	117	214	252

Acknowledgements

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University of Notre Dame allowed use of equipment for sample preparation and microsatellite analysis. This work was supported by the Office of Science (BER), US Department of Energy Grant DEFG02-05ER. Derrick Parker took all photos used as figures in the manuscript.

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Oaks of the Texas Big Country

(cover image)

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A large portion of west central Texas is known as the “Big Country.” A little over one hundred years ago this area was the home of Comanche Indians, hide hunters, and buffalo. Today these vast stretches are filled with wind farms as far as the eye can see. Seven species of oak and their hybrids occur in this area. This part of Texas is easily viewed from I-20, the interstate highway running roughly from Abilene in the east as far as Big Spring in the west. One of the major topographic features just south of Interstate Highway 20 is the Callahan Divide. This is the northernmost extension of the region known as the Edwards Plateau. The Callahan Divide is a plateau with rather rugged topography, shallow to deep ravines, and calcareous soils in the northern half. The draws and ravines are wooded, while the hilltops have topography which varies from grassland, to savanna, to woodland. North of this plateau is the Rolling Plains region consisting of low, undulating hills with shallow draws; the soils are predominantly red clay or sandy. There are vast areas in this region filled with mesquite (*Prosopis glandulosa* Torr.) and prickly pear (*Opuntia* spp.).

This is the eastern edge of the range of *Quercus havardii* Rydb. (see cover illustration) and *Quercus mohriana* Buckley ex Rydb., while at the same time the



Quercus mohriana

photo©David Richardson

western edge of the range of *Quercus buckleyi* Nixon & Dorr, *Quercus marilandica* Münchh., *Quercus sinuata* var. *breviloba* (Torr.) C.H. Muller, *Quercus stellata* Wangenh. and *Quercus fusiformis* Small. There are some rare occurrences of *Q. buckleyi* and *Q. fusiformis* farther west, but for the most part their continuous distribution ends here. Some other important trees such as *Ulmus americana* L., *Cercis canadensis* var. *texensis* (S. Watson) M. Hopkins and *Populus deltoides* Marsh begin to peter out here as rainfall diminishes to around 500 mm (20 in.) per year. *Juniperus ashei* Buchholz and *Juniperus pinchotii* Sudw. occur here and farther west into the Trans-Pecos region. With the exception of *C. canadensis* var. *texensis*, *Juniperus* spp., and *Quercus* spp., *U. americana* and *P. deltoides* occur only near the larger creeks.

Near the town of Colorado City, hybrids between *Q. havardii* and *Q. stellata* are numerous. The larger trees grow to about 5 m (16+ feet). These hybrids result from the earlier range of *Q. stellata*, which in ages past occurred farther west. The hybrids occur as a kind of ground cover of 1 m (3+ feet) tall plants, dominating the region of red sandy soils. Most years these plants are loaded with large ripe acorns near mid to late August. Leaf shapes, color, and texture are variable, ranging from dark to blue green, depending on the clone. Many of the hybrids have leaves that are either cruciform like those of *Q. stellata*, or pronounced tendencies in that direction. It is difficult to say whether all of what grows here is of hybrid origin, since this area is transitional to stands of pure *Q. havardii* still farther west near the town of Monahans. Pure *Q. havardii* is the dominant plant in Monahans Sandhills State Park. This dwarf oak easily holds the sand dunes together with roots that grow nearly 13 m deep (42+ feet; 90% or more of the biomass of *Q. havardii* is underground). Some of these clones live as long as 1000 years, although the above-ground stems of the plant are replaced every fifteen years or so. By contrast, the above-ground stems of *Q. havardii* × *Q. stellata* live around 80 years.

The other western oak that occurs in the Big Country is *Quercus mohriana*.



Quercus stellata

photo©David Richardson

This oak is associated with calcareous soils; it is one of the most widespread oaks farther west in the Trans-Pecos region. In the Big Country these oaks grow on rocky hillsides on the northern edge of the Edwards Plateau. In habitat, *Q. mohriana* usually is no taller than 5 m (16+ feet). The leaf color ranges from olive green to grayish blue. This oak is very distinctive and stands out from most of the surrounding vegetation. This is certainly an oak that should be considered for landscaping purposes where drought tolerance is sought. In this area *Q. mohriana* occurs with *Q. buckleyi* and *Q. sinuata* var. *breviloba* along with *C. canadensis* var. *texensis*, *J. ashi*, *J. pinchoti* Sudw., *Juglans microcarpa* Berl, and *Ungnadia speciosa* Endl. In transitional areas between soil types, *Q. mohriana* hybridizes with *Q. havardii* and *Q. stellata*.

In the hills just southeast of Sweetwater, approaching the Dallas-Fort Worth metro area, *Quercus sinuata* var. *breviloba* is another oak that occurs



Quercus sinuata var. *breviloba*

photo©Guy Sternberg



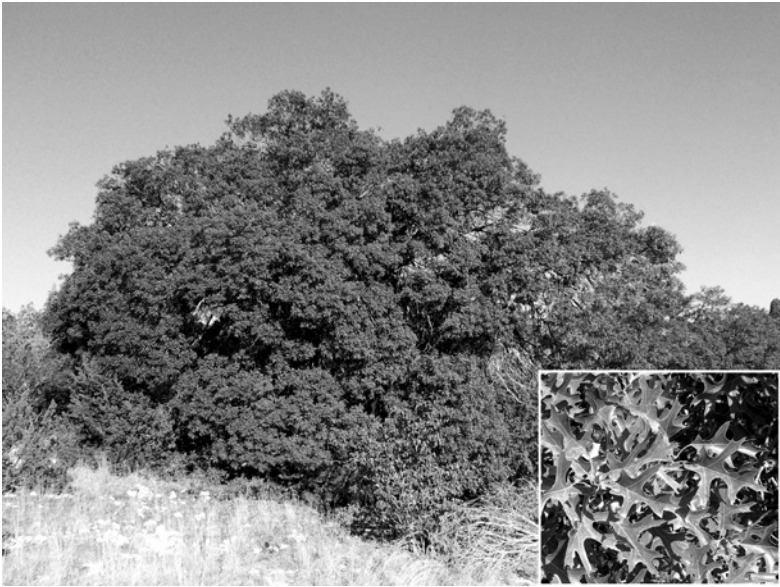
Quercus marilandica

photo©David Richardson



Quercus havardii x stellata

photo©David Richardson



Quercus buckleyi

photo©David Richardson



Quercus fusiformis

photo©David Richardson

on rocky calcareous soils. Most people know this as the “Bigelow Oak.” It has some disjunct populations in a few places farther north in Oklahoma and it also occurs in the southern part of the Edwards Plateau region as well. *Q. sinuata* var. *breviloba* usually reaches about 7 m (just under 23 feet) in height, but it can get taller if growing near draws where more moisture is available. Many of the hillside trees have gnarled trunks and branches which make them look like ancient relics battered by time. The bark is very scaly, which has prompted the name “scaly-bark oak.” This oak commonly grows with *J. ashei* and *Q. buckleyi*. This is



Quercus havardii (see also front cover)

photo©David Richardson

another useful tree for drought tolerance and alkaline soil conditions. Bigelow oak sometimes hybridizes with *Q. stellata* and in a few cases forms hybrid swarms.

In roughly the same habitat as *Q. sinuata* var. *breviloba* is the small red oak *Q. buckleyi* which is known to many as the “Texas Red Oak.” These trees grow to about 11m (36+ feet) on rocky alkaline soils. There is some variation between individuals in leaf shape and bark color and texture. These trees receive between 500 mm to 900 mm (20 to 36 inches) of precipitation, consonant with the west to east range of the species. Texas red oak is highly ornamental and gives some of the best and most reliable fall color in the state; the color varies from burgundy to fire-engine red. In the eastern part of its range, Texas red oak hybridizes with *Quercus shumardii* Buckley forming the hybrid *Quercus ×sternbergii* publ. in prep. These hybrids show variable leaf shapes and forms and usually give great fall color as well. The hybrid population passes through the center of Dallas County and continues farther south all the way to San Antonio. These hybrids perform well on soils which vary from slightly acidic to alkaline. Texas red oak is planted in many commercial and residential developments in Austin, Dallas-Fort Worth, and San Antonio. This tree is also popular in some of the cities in the American Southwest such as Albuquerque, New Mexico and Phoenix, Arizona.

The other red oak that grows in the Big Country near Abilene is *Quercus marilandica*, also known as “blackjack oak.” Blackjack oaks grow in the red sandy soils of the Rolling Plains region. In most cases these trees grow to about 4 m (13+ feet). This is the western form of this tree and it occurs with *Q. stellata*, mesquite (*Prosopis glandulosa* Torr.) and juniper species. The soils in this area are slightly acidic. On occasion *Q. marilandica* and *Q. buckleyi* hybridize both here and in the southern part of the Edwards Plateau. This wide-ranging oak is known for occurring on rather dry sites where available moisture is low. This is a tree that is not usually thought of as a landscape tree but I have observed a few that were definitely planted by someone. In some cases this tree gives beautiful golden fall color. In the Western Cross timbers region (the area west of the Dallas-Fort

Worth metroplex), *Q. marilandica* is one of the major components of the native vegetation, along with *Q. stellata*.

One of the most numerous and wide-ranging oaks in Texas is the “post oak,” *Q. stellata*. This species occurs in all Texas regions except the High Plains and the Trans-Pecos. In the Big Country the post oak begins to play out near the town of Sweetwater. It grows in sandy areas near draws that hold some moisture. Post oaks in this region grow to about 10 m (32+feet). There are some unusual xeric forms of this tree that appear to be true and not the result of hybridization. Not far from these trees there are definite hybrids with *Q. mohriana*. Some of these hybrids are rather attractive and make small trees to 5 m (16+ feet). The post oak is another oak that is not usually used in home or commercial landscapes due to its slower growth and difficulty in transplanting. Most post oaks that are found in urban settings are a part of the natural landscape that has been preserved. In this area of Texas there must have been a rather large amount of pollen exchange, judging from the large number of hybrids that occur near Colorado City just west of Sweetwater. These hybrids are rather confusing, taxonomically speaking, due to their great morphological variation. Many of these hybrids having similar growth habits as *Q. havardii*.

The last of the seven oaks in the Big Country is *Q. fusiformis*, the “escarpment live oak.” *Q. fusiformis* occurs on alkaline to slightly acidic, well-drained soils. Like *Q. stellata*, the escarpment live oak is one of the most numerous and wide-ranging oaks in Texas. *Q. fusiformis* is one of the major landscape trees in Texas and the cities and towns in the southwestern United States. In the natural landscape, these trees grow alone or in clonal clusters called mottes, some reaching up to 15 m (50 feet). The trees are evergreen, with older leaves being replaced in April. In most cases, the trees that occur in mottes are really a single tree with multiple trunks. Some trees take on a reddish or burgundy tint in late winter and early spring. Escarpment live oaks rarely hybridize, but a few hybrids with *Q. stellata* have been found in the Western Cross Timbers region between Fort Worth and Abilene.

The oaks in this portion of Texas have held up well in the exceptional droughts of recent years. As would be expected, acorn production has been low, but it has not been completely absent. Wildfires are another grave threat to oaks and other trees in this portion of the state. Fires were particularly destructive and widespread during the summer of 2011. In view of the species variation, rampant hybridization, and their successful meeting of ecological challenges, the oaks in the Big Country deserve protection and further study.

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Nonprofit Organization Preserves National Champion Oak Cross-Section

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California's Central Valley is a great place to grow oak trees. The deep alluvial soils and generous Mediterranean climate allow riparian oaks to grow to astonishing proportions. These oaks are the backbone of California's fading riparian forest, providing critical habitat for wildlife and important sustenance for native human populations.

Since the discovery of gold and subsequent population explosion in California's Sacramento Valley, ongoing impacts and severe changes have been made to our native oak woodlands. A complex series of levees and other flood control structures were built around Sacramento to protect the growing cities and increase farmland while more recent urban sprawl have brought urban development deep within remnant oak savannahs. These actions, coupled with ongoing population growth pressures, have fragmented and isolated native oak woodlands throughout the valley.

Just north of downtown Sacramento along the Sacramento River, a \$360 million levee project is underway. Improvements to more than 18 miles of levees have resulted in the removal or relocation of more than 4,200 native trees, with the majority of them being native valley oaks (*Quercus lobata* Née). In this lower part of the Sacramento river system, just before entering the Sacramento river delta, levees were originally built as close to the main river channel as possible. This action helps move floodwaters quickly through the system but eliminates the natural river movements that are important to create and sustain riparian forests. In many places, the river elevation in the rainy winter months is several feet higher than the landside soil elevation with nothing but the levee protecting agricultural and residential properties which back directly up against levee walls. Within the small corridor on the river side of the levee and on the levee structure itself lie the last remnants of Sacramento's once great riparian forest. Estimates vary, but it is believed that less than 5% of California's riparian forest remains.

Among the thousands of oaks within the footprint of the Natomas Levee Project, a very special oak stood on a little mound less than 50 feet (15 m) from the base of the levee. This oak tree witnessed the building of the original levee, but would not be spared by the current reconstruction. The tree had been noticed by a local arborist and was submitted to the National Register of Big Trees overseen by American Forests during the earlier stages of the levee improvements.

For the Register, trees are measured and rated by trunk diameter, canopy spread and height to determine the largest of each species in the nation. Though the tree was reported to have been confirmed as the national champion and was scheduled to be evaluated by the Big Tree Register representatives, the tree was



The tree and Ray Tretheway, Sacramento Tree Foundation Executive Director
photo©Zarah Wyly

removed on Monday, 2 May 2011, before the evaluation could occur.

Several months before the removal of the Sacramento River Champion Oak, notification of this special tree and requests to save it began pouring in to the Sacramento Tree Foundation (Tree Foundation). As a nonprofit organization dedicated to building the best urban forest in the nation, the Tree Foundation is frequently approached when controversial tree issues arise. After reviewing the situation and talking with the Sacramento Area Flood Control Agency (SAFCA),



In the background behind the tree, Interstate 5 can be seen as it crosses the Sacramento River just north of downtown Sacramento CA. photo©Matt Buland

the organization managing the levee project, the Tree Foundation found itself in a heartbreaking situation with no potential actions possible for preserving this very special tree. As almost an afterthought, Tree Foundation staff asked for a slice of this tree to be preserved during the removal process so that it could be shared with the community and used to educate people about how long it takes to establish magnificent trees and how quickly they can be erased from the landscape.

On the morning of Tuesday, 3 May 2011, SAFCA called to tell us that the deed had been done. The short call was to inform us that a slice of the tree had been cut and carefully stored for us and we had better “come and get it.” Without being sure of what we would find, I jumped in a Tree Foundation truck with our Executive Director Ray Trethewey and headed off to see what we would find.

The site looked completely different without the tree. For weeks, the project crew had been clearing the site around the tree, moving debris, a tree stump almost as large as the then-still-standing tree, several barns, a house, and all sorts of the type of junk that accumulates around agricultural properties. When we arrived on site, the only thing remaining was our slice of tree trunk and some large trunk quarters that had been left behind. The rest of the tree, including all 102 feet of trunk and the complete canopy of limbs, was gone.

Archaeologists on site had thoughtfully covered the tree trunk to keep it out of the sun and were quite interested in our rescue operation. Members from the nearby Shingle Springs Band of Miwok Indians were on site as archeological monitors, and were at first concerned by our intent to take a piece of this

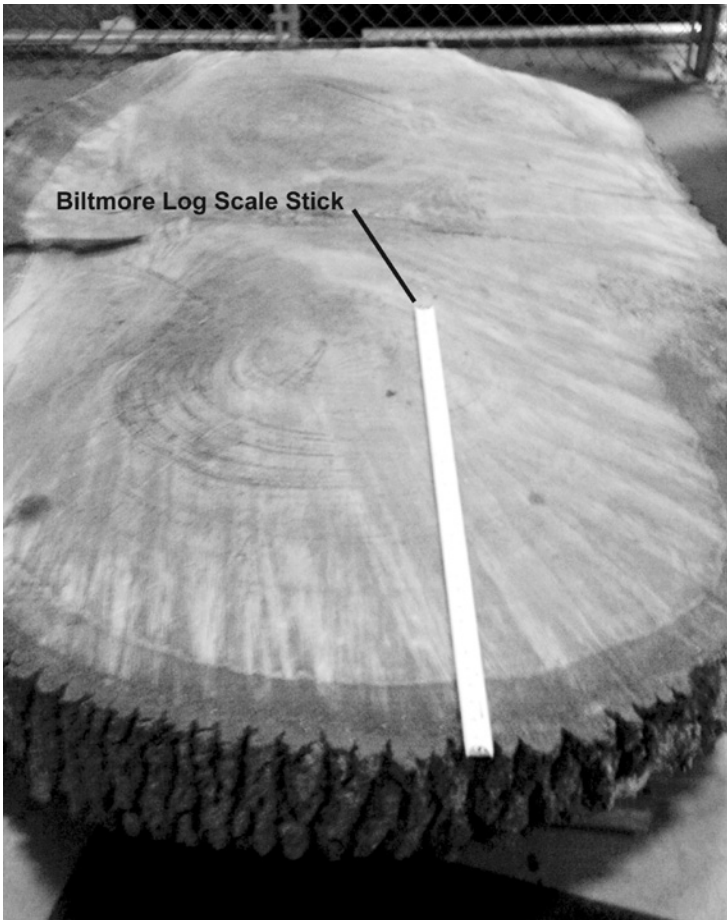
magnificent tree. The gentlemen we spoke with were visibly heartbroken by the loss of so large a tree and spoke eloquently about how trees of this size are family members and what a tragedy it is to see them destroyed. After explaining our intent to preserve the spirit of the tree by using it to educate the community, we were given assistance in loading the slab.

At over seven feet (2.1 m) long, 4 ½ feet (1.4 m) across and 12-18 inches (30-45 cm) thick, this was way more chunk of tree than we had expected. The Tree Foundation doesn't possess a vehicle large enough to move the tree slice, so we quickly went to a local construction materials store to rent one of their trucks by the hour. This turned out to be the very best way possible to move our prize, as we realized upon inspection that a significant area of included bark was visible in the center of the slab. We were very afraid that this inherent weakness might cause the slab to crack in half while being lifted and transported. Luckily, the trucks available for rent have fold-down sides to allow for easy loading. The tree slab just barely fit. Our thanks go out to the kind construction worker who offered to help us get the slab into the truck with his forklift. Without this assistance, we never would have been able to safely lift and load the slab. We estimate that the original wet weight of the slab was well over 1,200 pounds.

After the trials of loading the piece were complete, we realized we didn't have any idea how we were going to unload it once we returned to the office. We don't own a forklift and we weren't prepared to get one that day. Once again, the kindness of others prevailed. Joni Ramirez, our Mature Trees Program Manager, set off into our business park to see if she couldn't find some help. She happened to find a gentleman sitting on his forklift taking a break, just around the corner from our office. He generously gave up the rest of his lunch break to drive over to our office and unload the unwieldy chunk of tree into the back of our office. Momentary panic set in when we realized it wouldn't fit through the standard



A man on his lunch break from a nearby lumber company warehouse helps us unload the slab and install it safely in our office. photo©Zarah Wyly



The tree cookie the next day. Biltmore stick for reference. photo©Zarah Wylie

double doors. Luckily, our forklift driver was a pro and managed to swing it in sideways so it just barely fit. We placed the slab on wooden skids and then began the process of figuring out just what we had gotten ourselves into.

Many people were contacted while trying to figure out how to preserve our tree slice, by now fondly dubbed our “Tree Cookie” by staff and interns. Our main concerns were drying the wood without the whole piece falling apart and balancing the slow wood drying process with the mold and fungus growth this process encourages. The best advice we were given was to immediately soak the whole tree cookie in glycerin.

We contemplated how to do this effectively, and considered bringing in a children’s pool big enough to bathe it in. In the end we decided the only feasible course of action would be to coat the top surface thickly with glycerin and cover



Tree Cookie, after one week in (3 June 2011)

photo©Zarah Wyly

the surface, thus forcing moisture out the bottom of the slice and hopefully drawing the glycerin in. We were able to find an industrial glycerin supplier who would sell to our organization and promptly ordered five gallons to start with. The first treatment of the tree slice began on May 26 2011, 23 days after the tree was cut down.

Treatment of our tree cookie began with a daily coating of glycerin and water. We started using a 50/50 treatment but then rapidly switched to a mixture of 90% glycerin to 10 % water. This seemed to allow for easy application and was thick enough not to run off the top but liquid enough to be absorbed. After treatment, we let the coating sit for several hours before covering the whole piece with a tarp. Due to our climate, our office building is constantly air conditioned in the late spring and summer months and air moisture levels are quite low. Leaving the tree cookie uncovered would have dried it out too quickly, while covering it constantly kept it too moist. About a week into the process, after a long weekend covered, we noticed a fine white mold over a significant portion of the tree cookie. We treated it with a 10% Chlorine bleach solution and have continued to spot treat areas when mold appears. This seemed to work well, and only minor applications of bleach solution have been needed since.

About three weeks into the process, we began to notice that our tree cookie was giving off a different odor. The first few days it smelled like fresh cut lumber, but as the glycerin treatments continued on a daily basis the scent shifted to a sweet baked-goods smell. Tree cookie indeed! The odor was also likened by some of the staff to brewing beer or fresh leather. The scent only lingered for a few weeks and was not unpleasant. By the second week in June we had used the first 5



The tree cookie after six months (22 November 2011)

photo©Zarah Wyly

gallons of glycerin and another 5 gallons was put on order. By this time our grand experiment had cost us approximately \$325.

Throughout the rest of June and July we treated the tree cookie two times per week and left it covered most of the time. By this point small fissures began to form, radiating from the center of the tree cookie and creating the largest gaps in the areas where the wood is softest. By looking closely we could see where the glycerin had been absorbed into the cells, keeping them plump. The easiest time to see the individual tree rings was right after a glycerin treatment so we used push pins and strained our eyes to determine a rough age of the tree. From our best estimate, this magnificent tree was between 175 and 190 years old when it met its early demise in the name of levee integrity and public convenience.

We ran out of glycerin the second time in early September. Since then we have been monitoring the tree cookie on a weekly basis, treating minor mold issues (and a rather disturbing cricket infestation) and waiting to see what will happen. A few areas have begun to check significantly, with the largest cracks appearing in the thinnest portions of the slice. Overall, we are pleased with how the drying process is progressing and believe that the glycerin treatment made a

significant difference in the integrity of the tree cookie as it dries.

We expect another six to 12 months of slow drying before we can finally preserve the piece. Though we still aren't sure exactly how or when we will be able to mount and present this amazing piece of local history, each person who looks upon this physical reminder of how quickly we can erase 200 years of quiet determination leaves with a greater respect for the big trees that lurk in our cities, urban forests and wild lands.

We hope this enormous physical reminder will foster an ongoing ethic of tree preservation in our community. In this small way, the champion that never quite received its recognition will live on in the City of Trees forever.



The slice has started to check, but not as badly as expected given 6 months of preparation and drying time. photo©Zarah Wyly

The Challenges of Ex Situ Conservation for Threatened Oaks

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Introduction

Numerous challenges face individuals and institutions working to conserve threatened oak species. These challenges range from a fundamental lack of information on which species are threatened (and resulting inability to prioritize conservation activities) to growing threats that are difficult to predict and mitigate. Other challenges include widespread hybridization that may or may not be natural and which blurs the lines of which species and individuals require conservation action. These challenges all impact the survival of plants in the wild, presenting a need to ensure that off-site (i.e., *ex situ*) collections are created as a safety net against extinction for threatened species.

Unfortunately, attempting to build *ex situ* collections of oaks presents yet another challenge, as oak seeds are not able to be banked for long-term conservation. Curation of living collections are the only form of *ex situ* conservation currently being carried out for threatened oaks, but for most species these *ex situ* collections do not provide a sufficient safety net against extinction. Other forms of *ex situ* conservation, including in vitro propagation and cryopreservation, are exceptionally challenging for most oak species due to the presence of tannins. Together, these challenges present opportunities for individual and collaborative work to secure threatened species of oaks before they are lost. Here, we discuss the specific challenges faced by oaks in more detail, and present results of a recent project attempting to surmount these challenges, particularly with respect to building *ex situ* collections with high conservation value for four threatened oaks native to the United States.

Conservation challenge 1: Inadequate data

The Global Tree Specialist Group recently attempted to assess the conservation status of all known oak taxa using IUCN's internationally-accepted criteria (Red List version 3.1), and found that only 175 out of 500 taxa had enough information to be fully evaluated (Oldfield and Eastwood, 2007). Of these, 56 taxa (32%) were assigned a Critically Endangered, Endangered, or Vulnerable status, with their continued survival in the wild threatened by a range of factors including habitat



In vitro propagated shoot of *Quercus georgiana*

photo©Valerie Pence

destruction and degradation, invasive species, and unsustainable harvesting. The remaining c. 333 known taxa were either evaluated and found to be data deficient (33) or not evaluated (c. 300) because not enough information was available to begin the process. A clear conservation priority for these remaining 333 taxa is to gather enough data to allow full evaluation, which can then guide strategic conservation action.

Conservation challenge 2: Unpredictable and accelerating threats

For the 56 taxa known to be threatened with extinction in the wild, conservation action is needed to ensure plants are maintained in vigorous populations in their native habitat (i.e., *in situ* conservation) to support long-term survival and evolution. Unfortunately, the continued survival of oak species is increasingly at risk due to a combination of stresses relating to climate change and pathogens



Embryogenic culture of *Quercus arkansana*, with various stages of developing somatic embryos. photo©Valerie Pence

like Sudden Oak Death (*Phytophthora ramorum* S. Werres & A.W.A.M. deCock). Rapidly changing climates shift habitat and species distributions, so protected areas that support rare species *in situ* today may no longer be suitable for those species in the future (Hawkins, Sharrock, and Havens, 2008). And invasive pests and pathogens can unpredictably drive threatened as well as common species toward extinction (a great example comes from North American ash species and the introduction of Emerald Ash Borer in the United States). These stresses mean that *in situ* conservation and restoration must be accelerated to help species cope with multiple unpredictable threats, working to ensure populations are robust enough to allow species to migrate and/or adapt via evolution to avoid extinction. These stresses also mean that *in situ* conservation is a necessary but increasingly inadequate approach to ensure long-term conservation of oak diversity.

Conservation challenge 3: Hybridization

Hybridization among oak species has been widely documented in both common and rare species. Hybridization has been shown to produce plants that successfully grow to adulthood and themselves reproduce (Penaloza-Ramirez *et al.*, 2010), but it may also lead to poor seedling performance that prevents plants from reaching adulthood (Curtu, Gailing, and Finkeldey, 2009). This poses challenges not only in identifying species and populations to protect, but also in determining appropriate management actions. Hybridization is listed as one of the threats to continued survival of a number of threatened oak species that are Red Listed as Critically Endangered (Oldfield and Eastwood, 2007).



Somatic embryo of *Quercus arkansana* with small but thickened cotyledons and radicle growth. photo©Valerie Pence

Conservation challenge 4: Recalcitrant seeds and high tannins

To complement *in situ* efforts, the creation of genetically diverse, representative, and secure off-site (i.e., *ex situ*) collections is needed to secure plant species diversity before it is lost. This is clearly spelled out in the Global Strategy for Plant Conservation (CBD, 2010), which sets the goal that 75% of the world's threatened species will be curated in secure *ex situ* collections by 2020. For species with 'orthodox' seeds (able to be dried and stored at low temperatures for many years and still remain viable), *ex situ* collections of stored seeds can

provide the greatest direct conservation value at the lowest cost. Unfortunately, seed banking is not an option for oaks because they have ‘recalcitrant’ seeds (not able to be dried and stored). Instead, *ex situ* collection options for oaks and other ‘exceptional’ species that don’t produce bankable seed include *in vitro* or cryopreservation, as well as the curation of living collections. These collections must be well-designed and curated in order to provide high conservation value, and are more expensive to maintain than seed banks.

Currently, most *ex situ* collections of oaks are held as living collections. Botanic Gardens Conservation International (BGCI) recently conducted a survey of threatened oak species in living collections (BGCI, 2009) that identified 3,796 oak records from 198 institutions in 39 countries. Fewer than half (26) of the 56 Red Listed oak taxa were identified among these collections. Further evaluation of records for these 26 taxa found in collections showed that the provenance for 82% of them was either unknown or of horticultural origin. This is a concern, as wild-collected material provides highest conservation value (e.g., ability to be used to directly support restoration or reintroduction of the species), but only if it is well-documented and curated. In addition, many of the 26 taxa were only curated at one institution, sometimes as only one or a few plants. These collections may hold conservation value because they support research and education on the species, but they are not an adequate insurance policy against extinction. For this, the development of well-documented, wild-collected *ex situ* collections that capture significant genetic diversity of the species and are replicated at numerous locations not susceptible to Sudden Oak Death are needed. Many living collections today do not meet these standards due to genetic issues such as having too little genetic diversity, of potential hybrid origin, being of unknown provenance, or being located in areas of high Sudden Oak Death threat.

Very few *ex situ* collections of oaks are found in *in vitro* or cryopreserved collections today, largely because protocols have not been developed for most species. The high tannin content of oak tissues can pose challenges for *in vitro* work, but several species have been successfully propagated through shoot cultures or somatic embryogenesis (Pijut, Lawson, and Michler, 2011). Generally, seedling or juvenile tissues are most responsive, but *in vitro* propagation from mature tissues in a few species has been demonstrated (e.g. Vieitez *et al.*, 1994; Valladares *et al.*, 2006). Cryopreservation techniques have also been developed for a few species using zygotic embryo axes or somatic embryos (Gonzalez-Benito *et al.*, 2002; Pritchard, 2007; Fernandes *et al.*, 2008; Sanchez *et al.*, 2008). Freezing zygotic embryo axes relies upon using seeds, which are not always reliably produced by oak trees (e.g., mastings years and other potential delays in successful seed production due to disease outbreaks, natural or human-caused disasters, or other climatic stresses).

Additionally, the tendency of oaks to hybridize means that use of seed to develop *ex situ* collections may be counterproductive, using resources to conserve plants *in vitro*, via cryopreservation, or in living collections that are hybrids which are not representative of the species and which may stand little chance of surviving in the wild (Curtu, Gailing, and Finkeldey, 2009). Cryopreserving zygotic embryo axes requires growth *in vitro* for post-thaw recovery, while freezing somatic embryos relies on first establishing *in vitro* cultures of these tissues. Thus, these

reports demonstrate both the need and the potential for utilizing in vitro methods for *ex situ* conservation of oak. The critical conservation status of many oak species highlights the need for research to develop successful propagation and cryopreservation protocols from adult tissue and, following that, a need for work to build secure, genetically diverse and representative collections of the most threatened oak species.

A recent project on four threatened species in the United States demonstrates the type of work needed to advance *ex situ* conservation of oak species. We outline progress on this project to-date, in the hope that the process and results will be helpful in developing more effective oak *ex situ* collections in the coming years for all threatened oak species.

Methods

Study Species

Four oak species in the southeastern United States found to be threatened following the global Red List assessment (Oldfield and Eastwood, 2007) were selected for this project. This included the critically endangered *Quercus boyntonii* Beadle, the endangered *Quercus georgiana* M.A. Curtis and *Quercus acerifolia* (E.J. Palmer) Stoyonoff & Hess, and the vulnerable *Quercus arkansana* Sarg (Table 1). Prior to this project, it was not clear how many living collections of these species were curated within the United States, or how secure and genetically diverse they are.

It is not known how susceptible these four species are to Sudden Oak Death (SOD). SOD has killed many oak trees in parts of California, and a strict quarantine process has been implemented to attempt to halt its spread. While these efforts have been mostly successful, SOD has been found in nurseries and detected in waterways in Georgia and Alabama (and many other states) and the distribution of these four oak species coincides with the areas of greatest risk for SOD in the US outside of the current outbreak in California (Kliejunas, 2010).

Identifying living collections

To identify living collections for our four study species in the United States, we used BGCI's PlantSearch database. PlantSearch is the only global database of species maintained in the living collections of botanic gardens and other botanical institutions around the world (BGCI, 2011). We then contacted individual gardens that report cultivating each species in PlantSearch for additional detail about the number of plants maintained in their collections, and their provenance. These details were used to determine the potential conservation and research application of collections for each species, and to identify plants to support micropropagation research trials.

Following this data-collection, we asked gardens maintaining documented, wild-collected living collections of each study species to provide cuttings from their plants for use in micropropagation research trials. To our knowledge this was the first attempt to micropropagate any of these species.

Institutions providing cuttings were asked to collect at least 6 inches of new growth from each parent plant in the spring of 2011 following this protocol:

1. Take cuttings in early morning when the tree is well-watered to ensure shoots and leaves contain as much moisture as possible when they are shipped.
2. Identify one or more branches of new growth for a total of at least 6 inches of plant material per plant.
3. Use sterilized pruning shears to cut the stem of selected branches about 2 inches below the new growth at a 45 degree angle.
4. Place cuttings directly into plastic bags with moist paper towels. Cuttings from one tree can go together into one bag; place cuttings from different trees in separate bags.
5. If possible, repeat steps 2-4 for old growth material. Old and new growth cuttings can be placed in the same bag for each tree.
6. Seal plastic bag and write identifying information using permanent marking pen.
7. Ship material overnight to the Center for Conservation and Research of Endangered Wildlife (CREW) at the Cincinnati Zoo and Botanical Garden.

In total, cuttings from ten plants for each species were collected and sent to CREW for micropropagation research trials.

Micropropagation research trials

Upon arrival at CREW, samples were evaluated for the developmental stage of the buds/leaves. Twigs with emerged leaves were immediately surface-sterilized in a 1:10 dilution of commercial bleach (diluted concentration approximately 0.5% chlorine) with 0.05% Tween 20 (a surfactant) for 10-15 minutes with stirring, followed by rinsing with sterile, purified water. Following sterilization they were placed into culture following protocols below. Twigs without emerged leaves were trimmed at the base, placed into water purified by reverse osmosis and maintained on the lab bench under ambient light and temperature. They were checked daily and when buds began to leaf out, buds and young leaves were removed, surface-sterilized as above, and placed into culture following protocols below. In a few cases, buds did not leaf out and these collections were not cultured.

To establish micropropagation trials, all media were gelled with 0.25% Gelzan (Caisson Laboratories, Inc.), unless agar is indicated in the protocols below, in which case a concentration of 0.8% agar (Sigma Chemical Co.) was used. For this research, two approaches were used: 1) *Bud culture* using young buds left intact on short pieces of stem to stimulate axillary shoot growth; and 2) *Leaf culture* using young leaves excised from buds to stimulate somatic embryogenesis.

Bud culture. Buds were cultured on six media: two concentrations of benzylaminopurine (BAP) – 0.89 and 4.44 μM with three salt formulations: 1) Gresshoff and Doy (GD) (1972); 2) Woody Plant (WP) (Lloyd and McCown, 1980); and 3) Murashige and Skoog (MS) (1962), all containing 3% sucrose, Gamborg's organics (Gamborg, Miller, and Ojima, 1968), and 100 mg/L of the fungicide, benlate (benomyl; methyl 1-butylcarbomoyl)-2benzimidazolecarbamate; Sigma Chemical Co.). Culture tubes (25 mm x 150 mm) were used with translucent polypropylene closures, approximately 15 ml of medium/tube, with one bud per tube. One drop, approximately 0.05 ml, of a solution of filter sterilized antibiotics (5 mg/ml cefotaxime and 0.25 mg/ml vancomycin) was added to each tube before

incubating. Cultures were incubated at 26°C, with 20-30 $\mu\text{mol}/\text{m}^2/\text{sec}$ photosynthetically active radiation (PAR) under CoolWhite fluorescent lights, 16:8 hr light:dark photoperiod. Buds were transferred every 3-4 weeks onto the same media (lacking benlate and antibiotics) until the fourth transfer, when all were transferred to WP medium with 0.89 μM BAP and agar, and subcultured on that medium thereafter.

Leaf culture. Young leaves were cultured using three procedures reported in the literature for somatic embryogenesis in other species of *Quercus* (described below). All leaves were cultured in 60 x 15 mm disposable petri plates, with approximately 15 ml of medium/plate and 3-6 leaves per plate. Leaves were cultured whole and the initial length of each leaf was measured, with sizes ranging from 0.3 to 1.2 cm. Leaf cultures were incubated in the conditions described for buds, except that in some cases, as indicated, leaf cultures were incubated in the dark. Benlate and antibiotics were added, as for bud cultures, to the first medium of all three procedures and omitted thereafter.

Procedure 1. Using a modification of the procedure of Hernandez *et al.* (2003) for *Q. suber* L. leaf pieces were cultured on MS medium with half-strength macronutrients plus 1% sucrose, 100 mg/L benlate, and 0.25% Gelzan for 7-14 days in the dark at 26°C, and then transferred to a medium with Schenk and Hildebrandt (1972) macronutrients, MS micronutrients, 3% sucrose and 0.25% Gelzan with 10 μM BAP and 50 μM naphthaleneacetic acid (NAA) for 30 days in the dark. Although leaves expanded on these media, very little callus and no somatic embryos were observed from these tissues, and they were not cultured further.

Procedure 2. Using a modification of the procedure of Toribio (2004) for *Q. robur* L., young leaves were cultured on MS medium with 500 mg/L casein hydrolysate (CH), 3% sucrose, 100 mg/L benlate, 0.25% Gelzan, plus 2.5 μM BAP and 20 μM NAA in the dark for 42 days. They were then transferred to fresh medium without benlate and with growth regulator levels reduced to 0.5 μM BAP and 0.5 μM NAA and maintained in light, as for buds, for 30 days. Embryos and embryogenic cultures were then transferred to MS medium plus 500 mg/L CH, 3% sucrose, 0.25% Gelzan, and no growth regulators, in culture tubes, as for buds.

Procedure 3. Using a modification of the procedure of Pinto *et al.* (2002) for *Q. suber* L. leaves were cultured on MS medium with 3% sucrose, 100 mg/L benlate, 0.25% Gelzan, plus 4.5 μM 2,4-dichlorophenoxyacetic acid (2,4-D) and 9 μM zeatin riboside (ZR) for 3 weeks in the dark. They were then transferred to the same medium except with the growth regulators decreased to 0.45 μM 2,4-D and 2.25 μM ZR and cultured in the light for 8 weeks. Embryos and embryogenic cultures were then transferred to culture tubes with MS medium plus 3% sucrose and no growth regulators. In addition to leaves, immature staminate and pistillate flowers were cultured with this procedure when they were available.

Results

Living Collections. We identified a baseline of 18 *Quercus acerifolia*, 9 *Q. arkansana*, 22 *Q. boyntonii*, and 20 *Q. georgiana* plants in curated living collections in the United States. These are not sufficiently genetically diverse, secure *ex situ* conservation collections for any of these species. However, the species that had the strongest collection for conservation was the most threatened

species; *Q. boyntonii*. This is because it had the greatest number of wild-collected plants with full provenance known (91% of the 22 plants identified, curated at 8 gardens). The species with the weakest collections for conservation was *Quercus arkansana*, which had only 10 identified plants in living collections at 5 gardens. Of these, only one plant was wild-collected and of fully known provenance. This limits the research and conservation application of *Q. arkansana* collections, and for this species, collections of unknown or horticultural provenance had to be used for the tissue culture trials.

Bud Cultures. Table 3 summarizes the results from the bud cultures that were initiated from these *Quercus* species. Among the four species, 0 to 9.5% of uncontaminated buds initiated shoot propagating cultures, with an overall rate of 1.4% (5 of 350 buds initiating shoot cultures). However, of these 5 buds, 3 were initially grown on WP medium with 0.89 μM BAP and one other on GD medium with 0.89 μM BAP. In addition, half of the remaining buds that were alive after 6 months but not producing shoots, were initially cultured on this medium. Thus, of the 94 buds that were cultured on WP medium with 0.89 μM BAP, the culture initiation rate was 3%, and this medium was used for all later transfers and maintenance of these shoots.

Of the 569 buds (i.e., explants) cultured, there was an overall contamination rate (predominantly fungal) of 38.5%, but rates ranged from about 9 to 84 % depending on the source material (Table 3). *Quercus acerifolia* explants showed the highest rates of contamination, but of the 12 genotypes cultured of this species, contamination rates were highly variable, ranging from 0 - 100%. Shoot propagating cultures were successfully initiated from three of the four species tested (Figure 1).

Leaf Cultures. Table 4 summarizes the results from culturing immature leaves from the four *Quercus* species on three media protocols, directed at stimulating somatic embryogenesis. With Procedure 1, leaf tissue enlarged more than with the other two protocols, and this enlargement occurred on the first medium lacking growth regulators. When tissues were moved to medium with growth regulators, some pieces produced callus, although somatic embryos were not seen using this protocol. Most explants in Procedure 2 produced callus, and by 5-6 weeks, embryos were observed in one line of *Q. georgiana* and what appeared to be pro-embryos in lines of the other three species. After transfer to medium with reduced hormones, embryos became more apparent, and embryos from *Q. boyntonii* and *Q. georgiana* were moved to medium with no hormones for further growth (Figure 2). Leaf tissues in Procedure 3 also developed somatic embryos by 5-6 weeks, with embryos from *Q. arkansana* and *Q. georgiana* developing further. In both Procedures 2 and 3, some embryos enlarged on media lacking growth regulators and germination of the radicle was observed in some cases. In both protocols, some cotyledons became swollen and yellowish-orange in color, suggesting accumulation of pigments characteristic of acorn development. Overall, while cultured leaves in these experiments ranged from 0.3 - 1.2 cm in length, those that developed somatic embryos ranged from 0.3 - 0.8 cm in length. Somatic embryos also developed from some tissues of immature staminate flowers using Procedure 3 (data not shown).

Discussion

Exceptional species such as oaks that do not produce storable seeds pose significant challenges for developing *ex situ* collections, which provide a true safety net against extinction. It is not clear how many species fall into this ‘exceptional’ category, but it certainly includes species like oaks with recalcitrant seeds, as well as species that do not reliably produce viable seeds. Work to achieve the Global Strategy for Plant Conservation and ensure 75% of the world’s threatened plant species are held in secure *ex situ* collections (CBD, 2010) must take exceptional species into consideration and develop methods to develop effective *ex situ* collections. For species like oaks, it will be necessary to not only more effectively coordinate and curate living collections for conservation, but also to develop effective methods for micropropagation and cryopreservation.

In using four threatened oak species as a model for developing *ex situ* collections for exceptional species, we see that there is potential to grow the conservation and research value of living collections in the United States by focusing on building more robust, collaborative collections that are wild-collected, of known provenance, and genetically diverse (e.g., multiple individuals from multiple wild populations grown in multiple locations). Current living collections can provide some conservation and research value as-is (for example, we identified 20 of 22 identified *Q. boyntonii* trees at 8 institutions from known wild-collected sources). However, this is not the case for all four species; only 1 of 10 identified trees of *Q. arkansana* at 5 institutions was known from a wild-collected source. For all four of these species, and no doubt most ‘exceptional’ species currently found in living collections, there is a need and an opportunity to develop collections that provide much more conservation value with the same resources by phasing trees in cultivation from unknown or horticultural provenance to fully known, wild-collected material.

As the conservation value of individual collections is grown, it will be important to ensure these collections and expertise are connected, available to conservation practitioners and researchers, and ultimately able to be used to support research and conservation application. While it is not known exactly how many plants are needed in living collections to effectively capture genetic diversity in wild populations, a graduate student in the Longwood Graduate Program at the University of Delaware is currently working on one aspect of this for *Q. georgiana*, and similar research has been conducted on other exceptional species like palms (Namoff *et al.*, 2010).

Our results ultimately illustrate the importance of expanding our *ex situ* conservation options for oaks, particularly for micropropagation and ultimately cryopreservation. Without this it will be difficult and cost-prohibitive to capture and conserve the genetic diversity needed to support potential reintroduction efforts should anything happen to wild populations. Fortunately, these results demonstrate that micropropagation procedures can be developed for at least three of the four species targeted in this study. *Q. arkansana*, *Q. boyntonii*, and *Q. georgiana* all show potential for both shoot micropropagation and somatic embryogenesis. *Q. acerifolia* did not respond, but also was more developmentally advanced than material of the other species when it was cultured. Leaves of *Q. acerifolia* were expanded to 2-3 cm in length, whereas, with the other three

species, only leaves 0.8 cm and smaller were responsive in the somatic embryo procedures. It is possible that younger tissues of *Q. acerifolia* might be more responsive, and this should be examined in the future.

These results have also identified procedures that should be useful in optimizing methods for these species in the future. One of six media tested for bud culture and two procedures for somatic embryogenesis gave the best responses and could be modified in the future to improve results. Although propagating cultures were established for three of these species, the rates of establishment were low and not every genotype responded. Reports of work with other *Quercus* species have also indicated low rates of culture initiation, particularly with material taken from mature trees (Vieitez *et al.*, 1994). However, our studies have suggested the importance of the developmental stage of explant tissue and have highlighted media that appear to be more effective than others in stimulating *in vitro* growth. Further work with these species can focus on optimizing those two factors, with the likely increase in the number of responsive genotypes and species.

In order to fully implement micropropagation and cryopreservation as tools for the *ex situ* conservation of these species, procedures for rooting *in vitro*-propagated shoots, for converting embryos to plantlets *in vitro*, and acclimatizing plants to soil will need to be developed. Methods reported for other *Quercus* species can be used to guide this work (Martinez *et al.*, 2008; Vengadesan and Pijut, 2009; Vieitez *et al.*, 2009; Pintos, Manzanera, and Bueno, 2010). For long-term germplasm storage, cryopreservation in *Quercus* has been reported for embryogenic cultures using vitrification methods (Martinez, Ballester, and Vieitez, 2003; Valladares *et al.*, 2004). Apices from *in vitro* shoots have been successfully cryopreserved in other tree species (e.g. *Betula pendula*, *Robinia pseudoacacia*) using slow cooling and vitrification methods, suggesting their potential for *Quercus* species (Ryynanen, 1996; Verleysen *et al.*, 2005). With a coordinated utilization of these tools, multiple genotypes could be stored long-term as a resource for *Quercus* conservation in the future. As a group of species for which traditional seed banking is not an option, *Quercus* can serve as a model for the use *in vitro* and cryogenic techniques as alternative methods for *ex situ* conservation.



Quercus boyntonii at the Hinds Road Glade, Gadsden, Alabama
photo©Guy Sternberg

Table 1. Information on study species, status in the wild, distribution, conservation ranks, and habitat descriptions.

Species name	Common name	Status in wild	States	Nature-Serve	RedList	Habitat
<i>Quercus acerifolia</i>	Mapleleaf Oak	6 populations, only a few 100's of individuals each.	Arkansas	G1	Endangered	Open woods, ledges and cliff edges, and the rocky edges of plateaus.
<i>Quercus arkansana</i>	Arkansas Oak	Over 200 (most healthy populations are in FL).	Alabama, Arkansas, Florida, Georgia, Louisiana, Texas	G3	Vulnerable	Sandy or sandy clay uplands or upper ravine slopes near heads of streams in deciduous woods.
<i>Quercus boyntonii</i>	Boynton's Sand Post Oak	Only few populations in one county in Alabama, likely extirpated in Texas. Once considered extinct.	Alabama, Texas	G1	Critically Endangered	Shrub layer of pine-oak forests on deep sandy soils in creek bottoms. Possibly also shallower soils of upland prairies.
<i>Quercus georgiana</i>	Georgia Oak	Scattered in Alabama, more populations in 14 counties in Georgia.	Alabama, Georgia	G3	Endangered	Granite outcrops; dry slopes over granite

Table 2. Number of institutions in the United States holding living collections of the four study species identified using the GardenSearch database: includes number of identified plants that are wild collected with full provenance known, wild collected with full provenance unknown, as well as identified plants of unknown or horticultural origin are shown.

Species	No. institutions	No. wild collected plants		No. plants unknown or horticultural	TOTAL PLANTS IDENTIFIED
		full provenance known	full provenance unknown		
<i>Q. acerifolia</i>	5	10 (56%)	1 (6%)	7 (39%)	18
<i>Q. arkansana</i>	5	1 (10%)	6 (60%)	3 (30%)	10
<i>Q. boyntonii</i>	8	20 (91%)	2 (9%)	0	22
<i>Q. georgiana</i>	12	4 (20%)	15 (75%)	1 (5%)	20

Table 3. Contamination and number of shoot propagating cultures initiated from buds of four *Quercus* species after 7 months in vitro

Species	Total genotypes cultured	No. of buds	% contaminated	No. of clean buds	No. of shoot cultures initiated	% all buds producing shoot cultures	% clean buds producing shoot cultures
<i>Q. georgiana</i>	8	192	8.9	175	2	1.0	1.1
<i>Q. arkansana</i>	9	163	24.5	123	1	0.6	0.8
<i>Q. boyntonii</i>	7	25	16.0	21	2	8.0	9.5
<i>Q. acerifolia</i>	12	189	83.6	31	0	0	0
Total	36	569	38.5	350	5	0.9	1.4

Table 4. Somatic embryogenesis (SE) from young leaves cultured on three different media sequences, given as number and percent (in parentheses) of lines initiating SE cultures.

Species	Total genotypes cultured	<u>Procedure 1</u>			<u>Procedure 2</u>			<u>Procedure 3</u>			<u>Totals</u>	
		No. of Leaves Cultured	No. (%) of lines initiating SE lines	No. of Leaves Cultured	No. (%) of lines initiating SE lines	No. of Leaves Cultured	No. (%) of lines initiating SE lines	No. of Leaves Cultured	No. (%) of lines initiating SE lines	Total leaves cultured per species	Total no. (%) of lines initiating SE lines	
<i>Q. georgiana</i>	2	37	0 (0)	36	2 (6)	33	3 (9)	106	5 (5)			
<i>Q. arkansana</i>	7	66	0 (0)	64	0 (0)	68	1 (1)	198	1 (0.5)			
<i>Q. boyntonii</i>	4	18	0 (0)	16	1 (6)	17	0 (0)	51	1 (2)			
<i>Q. acerifolia</i>	11	34	0 (0)	37	0 (0)	33	0 (0)	104	0 (0)			
Totals	24	155	0 (0)	153	3 (2)	151	4 (3)	459	7 (2)			

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Quercus acerifolia at Brown Spring, Magazine Mountain, Arkansas
photo©Guy Sternberg

***Quercus* ‘Piers Trehane’ - A New Oak Cultivar**

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A new cultivar of oak, *Quercus* ‘Piers Trehane’, a putative hybrid of *Quercus emoryi* TORR. × *Quercus hypoleuroides* A. CAMUS (section *Lobatae*), is described.

The cultivar described here is accompanied by a herbarium specimen, which is deposited as the Standard Specimen in the Sir Harold Hillier Herbarium (HILL) at the Sir Harold Hillier Gardens, the official herbarium of the International Oak Society. The holdings of that herbarium, as well as the living collections, can be consulted online using the search facility from the Garden’s homepage at www.hilliergardens.org.uk.

***Quercus* ‘Piers Trehane’** (Sect. *Lobatae*; figures 1 & 2). New cultivar name. Tree or multi-stemmed shrub, up to 12.5 m. Twigs brownish green, pubescent. Terminal buds dark reddish brown. Leaves: petiole 5 - 7 mm, pubescent. Leaf blade obovate to broadly elliptic, 45-80 mm × 19-30 mm, base rounded or obtuse, rarely slightly subcordate, margins entire with one apical awn, apex obtuse to acute, surface abaxially densely tawny- to cream white tomentose (the tomentum rubs off easily, while in *Q. hypoleuroides* it is firmly attached), adaxially glossy dark green with few hairs along the midrib, young leaves in spring noticeably reddish and male inflorescences are red before they open. Acorns occasionally appear, but fall before ripening.

Original plant at Sir Harold Hillier Gardens and Arboretum planted in 1968 (accession No. 1976.1579), source of seed not known but probably from cultivated material. The original plant has reached 12.3 m height and 41.3 cm DBH in 2010. It is a putative hybrid of *Quercus emoryi* Torr. × *Quercus hypoleuroides* A. Camus.

Standard Specimen: Sir Harold Hillier Herbarium (HILL), collector Con Lightbody, No. 1, collection date August 1995, specimen No. 416 (sterile/vegetative), collected at Sir Harold Hillier Gardens from a cultivated plant, living accession No. 1976.1579.

Additional specimen seen:

1. Sir Harold Hillier Herbarium (HILL), collector Dorothy Holley, No. 227, collection date 12 May 1999, specimen No. 2865 (flowering), collected at Sir Harold Hillier Gardens from a cultivated plant, living accession No. 1976.1579.

A herbarium sheet showing the putative hybrid *Quercus emoryi*. × *Quercus hypoleuroides* from Arizona State University Vascular Plant Herbarium (Catalog Number ASU 154940), collected on Jan. 1, 1987, at USA: Arizona, Cochise County, by J.R.Zimmerman 8719-C shows a plant different from *Q.* ‘Piers Trehane’, with a spinose leaf margin.

Distributed as a graft, the hybrid *Quercus* ‘Piers Trehane’ is found in several collections: A specimen in Michael Heathcoat Amory’s collection at Chevithorne Barton, Devon, planted in 1990, was 5.5 m high in 2011 (Accession



Quercus 'Piers Trehane' at the quercetum of Chevithorne Barton, Devon, United Kingdom
photo©James MacEwen

No. 032.1990A). At Chevithorne Barton, *Quercus* 'Piers Trehane' grows more vigorously than either of its parents. A specimen at Lord Heseltine's collection in Northamptonshire was 3.6 m HIGH in 2011.

Quercus 'Piers Trehane' is in cultivation in a Belgian nursery specializing in oaks. The cultivar shows possible incompatibility when grafted on *Quercus palustris* MÜNCHH. rootstock, according to nurseryman DIRK BENOIT (pers. comm. 2011). The grafts are weak and less vigorous than similar grafts of oaks section *Lobatae*. BENOIT will try to use other rootstocks such as *Quercus shumardii* BUCKLEY in the future.

Quercus 'Piers Trehane' is named to honor PIERS TREHANE (1950 - 2011), a British horticulturist and plantsman, and for many years the ICRA registrar of oaks for the International Oak Society (IOS). Piers also built the IOS-affiliated web-site www.oaknames.org, which contributes greatly to the knowledge of oaks

and the recognition of the IOS as oak registration authority in the scientific world (figure 3). Piers had been a member of the IOS since its inaugural meeting in 1994, and participated in IOS triennial conferences as recently as 2009.

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<http://www.oaksofchevithornebarton.com/> (consulted Dec. 10, 2011)



Standard Specimen of *Quercus* 'Piers Trehane' filed at the Harold Hillier herbarium, the official repository for oak cultivars. Scanned image courtesy of Hillier Herbarium. See also inside back cover.

A Gallery of our History

Guy Sternberg, Journal Editor

Starhill Forest Arboretum, Petersburg, Illinois USA

Where did we come from? Most members may not know about the humble beginnings of this organization. Others will remember, to varying degrees, the sequence of triennial conferences and other activities that have led to the present. Perhaps the recollections expressed in this journal issue by the four prior presidents unwrapped a faint memory or two for you. But a picture is worth a thousand words.

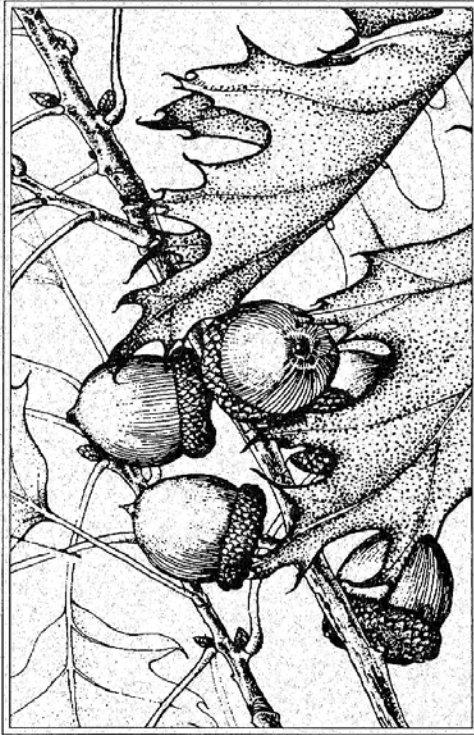
Our popular photo gallery section in previous issues has covered oaks from North America, Europe, and Asia, along with a view of historic oak illustrations. This time, we are taking a different direction. We are a worldwide organization of oak people, and the people part is just as important as the oak part. As my final journal gallery, I have decided to forego the traditional oak illustrations and focus instead upon something retrospective that I hope will generate emotional responses from every member. There may be tears for those you see and remember here who are no longer with us. There could be some amusement at how some of us have changed over the decades. There should be ample respect for the efforts involved in overcoming uncertainty to create the premier oak organization on the planet, with hundreds of members from nearly every continent. There definitely should be overwhelming awe for the level of expertise represented within our membership roster, and for the quality and diversity of information offered by them and by our other authors and conference speakers. Finally, I believe there will be admiration for the trees now growing in so many countries that began with our seed exchanges, and excited anticipation for what is yet to follow.

Hopefully, there also will be a renewal of vigor and energy as we launch into our third decade and our seventh triennial conference this fall. This is my farewell offering to you, as I pass the journal editorship to a successor who will bring some of that new vigor and energy to this publication.

I have met many of my very best friends here. I've seen places I could never have visited, or even known about, on my own. I have learned so much from so many outstanding people, some of whom are the world's foremost authorities on their subjects. I've grown our Quercetum at Starhill Forest into one of the most comprehensive living collections in North America. I have grown old with you, and I have thoroughly enjoyed every bit of the hard work it has taken to get to this point. I urge every member to look at the glimpses of history on the following pages, and then consider participating more actively in our journal, newsletter, seed exchanges, web site content, on-line oak discussion group, oak tours, member recruitment, conferences, board of directors, or committees. Do something that will engage your successors to be inspired. Find your niche -- a place to become an even more effective part of this grand ride.

And look closely at the photos -- everyone is always smiling!

TODAY'S PROGRAM



The First International Oak Conference

OCTOBER 17, 1994



Our First Oak Conference
(We knew there would be more!)



GOOD MORNING & WELCOME to The First International Oak Conference
 PRESENTED BY *The Morton Arboretum* & THE INTERNATIONAL OAK SOCIETY

AGENDA	
7:45 a.m., Registration & Coffee	10:00 a.m., Break
8:00 a.m. Welcome Gerard Donnelly, Director, <i>The Morton Arboretum</i>	10:10 a.m. Oaks of Central and Eastern Europe - Occurrence, Ecology, Forestry, and Amenity Values Seliian Radu, <i>Arboretum Simeria, Romania</i>
8:35 a.m. Announcements Morning Moderator, Kris Buchell, Director of Plant Collections, <i>The Morton Arboretum</i>	10:35 a.m. Oaks of Turkey and the Mideast - Occurrence, Ecology, Forestry, and Amenity Values Aytekin Ertaş, <i>University of Istanbul, Turkey</i>
8:40 a.m. Keynote Address: The Re-Oaking of America George Ware, <i>Research Fellow, The Morton Arboretum</i>	1:10 p.m. Identifying Oaks - Practical Oak Taxonomy Kevin Nixon, L. H. Bailey, <i>Herbarium, Cornell University, Ithaca, New York</i> (<i>Quercus</i> co-author, <i>Flora of North America</i>)
9:00 a.m. Oak Images from Temperate North America - An Introduction to the Genus Guy Sternberg, <i>Starhill Forest, Petersburg, Illinois</i>	1:35 p.m. Identifying Oaks - The Hybrid Problem Richard Jensen, <i>Department of Biology, St. Mary's College, Director, Greene-Niwaaland Herbarium, Notre Dame University, (Quercus co-author, <i>Flora of North America</i>)</i>
9:35 a.m. Hardy Oaks from the American Southwest Michael Meléndez, <i>Trees that Please, Los Linnas, New Mexico</i>	2:00 p.m. Horticulture and Aesthetics of Hybrid Oaks Ken Asmus, <i>Okos Nursery, Kalamazoo, Michigan</i>
	2:25 p.m. Dynamics of Selected Eastern North American Oaks Curt Hanson, <i>Chronic Gardens, Gates Mills, Ohio</i>
	2:50 p.m., Break
	3:00 p.m. Understanding APHIS - Simplified Acorn Import and Export Ken Kruse, <i>USDA/APHIS Plant Protection/Quarantine, Rosemont, Illinois</i>
	3:25 p.m. Oak Propagation Techniques Mark Coggeshall, <i>Valonia State Nursery, Valonia, Indiana</i>
	3:50 p.m. Growing Oaks on the Great Plains John Pair, <i>Kansas State University, Wichita, Kansas</i>
	4:15 p.m. Maintaining and Restoring Oak Groves - Community and State Efforts with <i>Quercus garryana</i> Michael Reichenbach, <i>Arboreal Enterprises, West Linn, Oregon</i>
	4:40 p.m. Summary - George Ware, <i>Research Fellow, The Morton Arboretum</i>
	5:00 p.m., Announcements and Adjournment

The program from our first Oak Conference, 1994
 170 registered, and more filled the hallway - 35 stayed on to found the IOS



UPDATE
UPDATE
UPDATE
UPDATE
UPDATE

In addition to the program printed in Issue #4,
 please keep in mind that there will be more activities....

Monday Night, 10/17/94 -- Social Mixer & Dinner

Featuring "The Mother of all Seed Exchanges!" and Display of
 Oak Seed and Reference Material - I.O.S. Coordinators : Steven
 Roesch and Mike Spravka

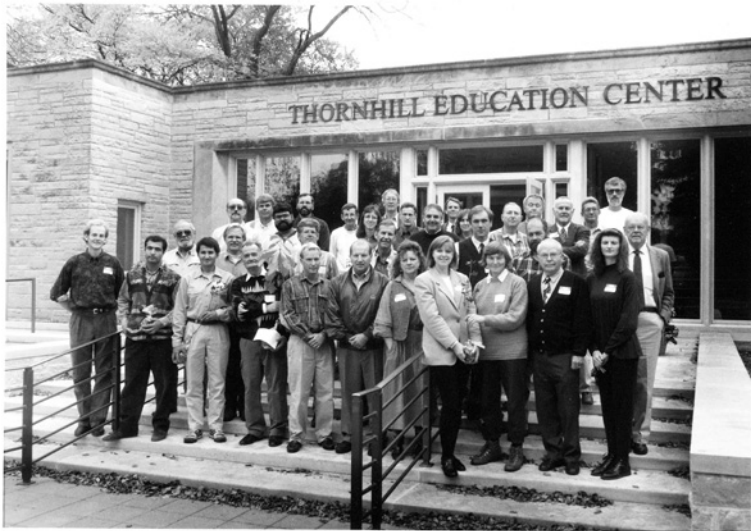
Tuesday, 10/18/94 -- I.O.S. Business Meeting

Moderator - Guy Sternberg

- Group Photos for Journal and Archives - by Morton Arboretum Staff
- Organizational Structure, Bylaws - Ken Asmus, Curt Hanson
- Non-Profit Legal Status - Lisa & M. Nigel Wright
- Heritage Oak Registry and Data Base - Mike Chesebrough
- Seed Exchange Coordination - Steven Roesch
- Oak Reference Information Network - Lisa & M. Nigel Wright
- Suggestions from the Floor
- Elect Officers, Select Planning Committee for Next Conference
- Final Announcements and Closure
- Committee Meetings, Networking (until 5:00 PM)

Also attending will be **Mark Pitman of Kew Gardens, London, England** who
 will be making a special presentation at the members meeting on October 18th.

Our First Seed Exchange and Business Meeting



**PARTICIPANTS IN THE INAUGURAL MEETING OF THE
INTERNATIONAL OAK SOCIETY**

18 OCTOBER 1994, THE MORTON ARBORETUM, LISLE, ILLINOIS USA

FRONT ROW, LEFT TO RIGHT:

Nigel Wright (Pennsylvania), Aytekin Ertas (Turkey), Michael Melendrez (New Mexico), Stelian Radu (Romania), Damian Beardi (New York), Michael Beardi (New York), Mary Ann Dillon (Michigan), Amy Larson (California), Susan Cooper (England), George Ware (Illinois), Lisa Wright (Pennsylvania);

SECOND ROW, LEFT TO RIGHT:

Tom Burluson (New Mexico), Ken Asmus (Michigan), Peter van der Linden (Illinois), John Pair (Kansas), Jamie Friend (England), Ron Lance (North Carolina), E. H. Peter Ahrens (New York);

THIRD ROW, LEFT TO RIGHT:

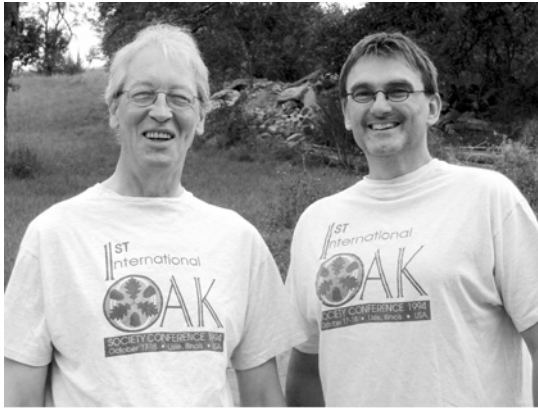
David Johnson (Ohio), Rocco Damato (Illinois), Tamara Trites (Ohio), John Gammon (England), William Hess (Illinois), Harry Bailey (Georgia);

FOURTH ROW, LEFT TO RIGHT:

Durell Nelson (Illinois), Greg Morgenson (North Dakota), Mark Coggeshall (Indiana), Mark Pitman (England), Sue Shapiro (Wisconsin), Jim King (Illinois), Lawrence Slavicek (Illinois);

FIFTH ROW, LEFT TO RIGHT:

Piers Trehane (England), Allen Coombes (England), Guy Sternberg (Illinois).



Piers Trehane, founder of the Oak Names Database, and Eike Jablonski, our third president, shown in Luxembourg in August 2008 wearing their t-shirts from the First International Oak Conference (photo courtesy of Eike Jablonski)



FIELD TRIP 19 OCTOBER 1994

- PETERSBURG BANK --
Quercus robur hybrid
- OAK HILL CEMETERY --
Quercus alba
Liriodendron tulipifera
Rutledge Grave
- NEW SALEM VILLAGE --
Quercus lyrata
Lincoln's Store
- WASHINGTON PARK --
Quercus xbebbiana
Quercus alba "Late Nut"
Thomas Rees Carillon
- COTTON HILL --
Quercus xdeami (National Champion)
Quercus mulhenbergii
- OAK RIDGE CEMETERY --
Quercus xruncinata
Quercus bicolor x mulhenbergii
Quercus velutina
Oak Tree Nursery
Quercus xexacta
Quercus xleana
Quercus rubra
Quercus stellata
Quercus lyrata x bicolor
Quercus alba pinnatifida
Abraham Lincoln's Tomb
- STARHILL FOREST --
NATIVE STANDS:
Quercus alba
Quercus macrocarpa
Quercus imbricaria
Quercus rubra
Quercus velutina
Oak Collection

**The First IOS Field Trip
Lincoln's Tomb Trees, 19 October 1994**

Front Row:

Michael Melendrez (New Mexico), Allen Coombes (UK), Aytekin Ertas (Turkey), Susan Cooper (UK), Jamie Friend (UK)

Back Row:

Bill Hess (Illinois), Stelian Radu (Romania), Mark Pitman (UK), Tom Burleson (New Mexico), Mark Coggeshall (Indiana), John Gammon (UK), Lisa Wright (Pennsylvania), Guy Sternberg (Illinois), Nigel Wright (Pennsylvania)



To All Members of the International Oak Society

4th September, 1995

Jermyns Lane Ampfield Near Romsey
Hampshire SO51 0QA
Facsimile 01794 368027
Telephone 01794 368787

Dear

Oak Open Day 28th October, 1995

On behalf of the Sir Harold Hillier Gardens and Arboretum and the International Oak Society I would like to invite you, as a member, to the Oak Open Day to be held on Saturday 28th October, 1995 at the Sir Harold Hillier Gardens and Arboretum, home of the National Collection of Oaks.

Entrance to the Gardens on the 28th October will be free to members from 10.30am (please remember to bring your membership card). I will be leading a tour of the oak collection from the main car park at 11am. This will include a tour of our Propagation Unit to see the methods we use for the germination and growing on of oaks. Members are very welcome to bring guests who will be asked to pay the normal group admission price, i.e. £3.50.

A special buffet lunch has been arranged in Jermyn's House (cost £6.50), or alternatively members can obtain light refreshments from the Jermyn's House Restaurant. After lunch members will have an opportunity at an informal meeting to discuss any queries they may have on the Society and talk about oaks.

I do hope you will be able to join me on 28th October. If so, please complete the enclosed form indicating whether or not you require lunch and the number of guests accompanying you. Please note the charge of £6.50 for the buffet lunch is to be paid on the day, although numbers are required in advance.


I look forward to hearing from you.

Yours sincerely,

Allen J. Coombes,
Botanist.

European representative on the Board of Directors, and Vice President of the International Oak Society.

Bernard Payne, Directing Officer
Peter C B Robertson County Secretary
The Hillier Arboretum is a Registered Charity (Reg No. 274737)

 Hampshire County Council

Invitation to the first Oak Open Day, 1995



Second IOS Members Meeting - California 1997

KNEELING, LEFT TO RIGHT:

Ron Lance (North Carolina), Larry Slavicek (Illinois), Hugh Angus (United Kingdom), Diana Gardener (Oregon), Nigel Wright (Pennsylvania), Dan Keiser (Minnesota), Zhekun Zhou (China), Doug McCreary (California), James Trager (Missouri);

STANDING, LEFT TO RIGHT:

Bill Hess (Illinois), Dick Sage (California), Rick Standiford (California), Peter van der Linden (Illinois), Mike Reichenbach (Oregon), Jean Smith (California), Amy Larson (California), Shawn Haddock (United Kingdom), Consuelo Bonfil (Mexico), Larry Schmidt (California), Allen Coombes (United Kingdom), Robert Berry (New Zealand), Maricela Rodriguez (Mexico), Matt Strong (Kansas), Dick van Hoey Smith (Holland), Rei Rasmussen (Oregon), Peter LaHarrague (Argentina), Ed Holm (California), Mark Coggeshall (Indiana), Wayne Erickson (British Columbia), Riet van Hoey Smith (Holland), Guy Sternberg (Illinois).



INTOAKS

The Newsletter of the International Oak Society

Volume No. 1

Summer 1997

Issue No. 1

ABOUT THIS NEWSLETTER

The purpose of *INTOAKS*, the newsletter of the International Oak Society, is to distribute information to its members regarding Society business, items of interest, seed exchange, events and happenings in addition to the information contained in the *Journal*.

We envision publishing the following items in the newsletter:

- Seed Exchange
- Calendar of Events
- Conference Opportunities
- Reports from Treasurer
- Membership Update
- General Announcements
- Member Advertising

We would like to know what additional items or modifications to the above list you want to see in *INTOAKS*. Please send your ideas to: International Oak Society, Journal Office, P.O. Box 310, Pen Argyl, PA 18072-0310, USA.

We also need your help to spread the word about the International Oak Society. Many members have already mentioned our group in other publications in the U.S., England, Germany and France. Some of these publications are very prestigious and we are delighted to get our message out to their readers.

If you are sponsoring a meeting or field trip on oaks in your area of the world, please drop us a line or e-mail us. We'll publish your meeting beforehand and give a summary afterwards if you wish. Just let us know.

For our newsletter, we welcome and need unsolicited letters, opinions or short articles written in a more informal manner than what we publish in the *Journal*. Don't be bashful. Send them to the Journal Office.

We plan to distribute *INTOAKS* biannually, in summer and early winter.

INTOAKS

The Newsletter of the International Oak Society
P.O. Box 310
Pen Argyl, PA 18072-0310
USA

President: Guy Sternberg
Vice President: Allen Coombes
Secretary: M. Nigel Wright
Treasurer: Peter van der Linden

Editors: M. Nigel and Lisa Wright

Send submissions to the above address.
Telephone: 610-588-1037
Facsimile: 610-599-0968
E-Mail: nigel1765@aol.com

FROM OUR PRESIDENT

Hello and welcome to the Society's first newsletter. The initial item which I need to bring to your attention is the enclosed ballot. We have identified the candidates to serve on the Board of Directors from 1997 to 2000. PLEASE complete and return the ballot within the deadline date. WE NEED YOUR VOTE!!!

During our first organizational meeting in October of 1994, an Interim Board of Directors was elected to complete our incorporation as a not-for-profit organization and to conduct the initial business affairs of the International Oak Society. Many of you were not yet members at that time, and most of you probably have not met this Board, so let me introduce them to you.

My name is Guy Sternberg and I maintain the North American Plant Preservation Council oak collection at Starhill Forest in Illinois, USA. I was one of several original members of our organization when it was started about a decade ago by Steven Roesch as an international acorn exchange. I organized the First International Oak Conference, held at The Morton Arboretum, and have done some of the work behind the scenes to help establish the organization. I serve as our President.

Allen Coombes is the botanist for the Sir Harold Hillier Botanic Gardens and Arboretum in Hampshire, England (home of England's national oak collection). Allen is our designated coordinator for

European affairs and is our chief scientific consultant for the *Journal* on matters of taxonomy and nomenclature. He has been instrumental in expanding our membership outside the USA and in helping to organize a regional chapter in England. Allen serves as Vice President.

M. Nigel Wright, also one of the original members of the Society, owns Windrose Nursery in Pennsylvania, USA. Windrose grows many oak species, and is one of the most diverse mail-order nurseries in America. Nigel and his wife Lisa publish our *Journal* and newsletter and serve as coordinators of the Society's growing worldwide membership. Together they have devoted an unbelievable amount of volunteer time and effort to the member services you enjoy. Nigel is our Secretary.

Peter van der Linden is the Curator of Plant Collections for The Morton Arboretum in Illinois, USA. The Morton has one of the finest temperate zone oak collections in the Western hemisphere. Peter and his institution provided the magnificent venue for our first conference in 1994, and were instrumental in its success. He has taken on the critical responsibility of managing the financial affairs and budget preparation for the International Oak Society as its Treasurer.

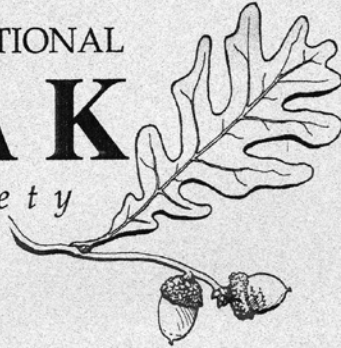
Amy Larson recently served as the Executive Director of the California Oak Foundation (USA) and is a member of our Board. Amy's enthusiasm, energy and experience serves us well -- she is our Conference Coordinator for 1997. The California Oak Foundation will be co-hosting the upcoming conference in October, in cooperation with the Huntington Botanic Garden and Museum in San Marino, California, USA. Amy and her committee are working very hard to put this conference together, and she would like to see every one of you there!

As we approach this second triennial conference and business meeting, it is time to bring new ideas and fresh energy to our organization. We need to establish committees in order to pursue our proposed activities on many fronts. All members should feel that this organization belongs to each of you, not just to the Board of Directors. Please try to attend the meeting in California, if possible, and volunteer if you can contribute as a committee member or a director candidate. The organization, devoted to the greatest genus of plants in the world, needs your help!

Our first newsletter, initially called "Into Oaks" and shortened to IntoOaks (as a contraction of "International Oaks"), published in 1997 via a photocopy machine by our editor Nigel Wright

MARCH 1992

JOURNAL
of the
INTERNATIONAL
OAK
society



INTERNATIONAL
OAK
society



Steven Roesch, Founder & Seed Distributor
14780 Kingway Drive, New Berlin, WI.
53151, U.S.A.

Susan Cooper, Co-Founder
Churchfields House, Cradley, Nr. Malvern,
Worcester, WR13 5LJ, England

Guy Sternberg, Co-Organizer
Starhill Forest Arboretum, Route 1, Peters-
burg, IL 62675, U.S.A.

M. Nigel Wright, Journal Editor
1093 Ackermanville Road, Pen Argyl, PA.
18072, U.S.A.

ISSUE NO. 1, MARCH, 1992

AN INTRODUCTION FROM THE EDITOR

As editor, I would like to welcome all our readers to this first publication of the International Oak Society Journal. Given adequate time and opportunity, I anticipate that many more are to follow.

Most of the articles included are of an introductory nature, to ease our way into the horticultural arena before getting involved with exact specifics and scientific debate. Since this is an international organization, I have tried to include a diversity of material that might circumpact the continuity of the whole. But I feel strongly that the articles are stimulating and worthy of bringing together in this first issue. It was also important to get this journal published so that more people could get involved and contribute their knowledge on the wonderful genus *Quercus*.

The I.O.S. evolved out of a very informal correspondence and seed exchange between Steven Roesch in America and Susan Cooper in England. As they exchanged miscellaneous seeds, their requests centered around oak species in particular, namely oaks, and thus began the I.O.S. Mr. Roesch took it upon himself to contact people around the world who were interested in oaks and to set up a network of seeds. When I got involved in the I.O.S. I saw the need for centralization and some kind of literature that could unite its members. I sent letters to addresses that Steven Roesch had given me, asking for help and contributions to what was at first suggested as the I.O.S. Journal.

On future publications, we hope to spotlight at least on oak species and try to involve ourselves more thoroughly into the science of propagating and growing oaks. We would also like to promote our seed exchange and encourage our readers to write to each other and explore the numerous species of oaks available.

Cover and Introduction from our first Journal,
published in 1992 with a photocopied machine
(Republished as a commemorative edition in 1999)



Field Trip - 2000 Conference
Majestic Oak (*Q. virginiana*) - Savannah Georgia



The First IOS Award
Presented by President Guy Sternberg
to Dick van Hoey Smith (with wife Riet at left)
Third Triennial Meeting, North Carolina 2000



Third Members Meeting, IOS
North Carolina 2000



The First Full-Conference Group Photo
2000 - Asheville, North Carolina



The First IOS American Tour - New Mexico 2001



The Second IOS Award
Given in Absentia to Stelian Radu, Deva, Romania
Third Triennial Meeting, 2000



The First IOS European Tour - Spain 2001



**Fourth Triennial International Oak Conference
Hampshire, United Kingdom, 2003**



**The Fifth Triennial Oak Conference
Dallas, Texas 2006**



**Sixth International Oak Conference
Puebla, Mexico 2009**



7th International Oak Society Conference Bordeaux, France 29 September – 2 October 2012

The 7th International Oak Society Triennial Conference will be held in Bordeaux, France at l'Espace Agora du Haut Carré at the University of Bordeaux's campus Bordeaux 1. Conference participants will enjoy a short trolley ride in the morning through the breathtakingly beautiful center of Bordeaux directly from their hotel to the Espace Agora du Haut Carré.

Program Summary

Saturday 29 September

Welcome cocktail, Conference registration at the Agora Haut Carré (16.00h-19.00h); evening free in Bordeaux.

Sunday 30 September

6 morning sessions, lunch, afternoon field trip to INRA, Pierroton, for demonstrations of genetic sequencing of oaks and to visit the propagation and other experimental facilities; evening free in Bordeaux

Sessions

Antoine Kremer (INRA, BIOGECO, France)

Past and Future Evolutionary Responses of Oaks to Environmental Change

Francis Hallé (France)

Subject to be determined

Stelian Radu (Forest Research Station & Arboretum Simeria, Romania)

Romania's Oak Forests: Past and Future

Eike Jablonski (LTA Arboretum, Luxemburg)

The Oaks of Cyprus

Deng Min (Shanghai Chenshan Plant Science Research Center, China)

Taxonomy and Systematics of Quercus Subgenus Cyclobalanopsis

Andrew Hipp (Morton Arboretum, USA)

Oak Phylogenies for Oak Enthusiasts

Monday 1 October

Six morning sessions, lunch, afternoon field trip into the wonderful world of casks, cork and wine, gala dinner *au château*

Sessions

Philippe de Spoelberch (Arboretum Wespelaar, Belgium)

Oak Portraits in the Wild and in Arboreta

Pierre Sourzat (Station Trufficole Cahors-le-Montat, France)

Oaks and Truffles

Flaviu Ropescu (Forest Research Station & Arboretum Simeria, Romania)

Postglacial Evolution of Oaks in the Balkan Peninsula

Chantal Armagnac (Author, France)

Homage to Gascon Oaks

Emily Griswold (UC Davis Arboretum, USA)

Bringing Scientific Oak Collections to Life for Garden Visitors

Alexis Ducouso (INRA, BIOGECO, France)

Endangered Oak Resources in Europe and around the Mediterranean Basin

Tuesday 2 October

8 morning sessions, lunch, business meeting, seed exchange

Sessions

Francisco M. Vázquez Pardo (Arboretum de la Orden, Spain)

Anatomical and Micro-morphological Characters in Mediterranean Oaks

Dominique Mansion (Author, France)

Oak pollards

Michael Melendrez (Soil Secrets Worldwide LLC, USA)

Understanding the Soil Food Web

Hervé Le Bouler (Ministry of Agriculture, France)

Botanic Collections : A Tool for Selecting Species Adapted to Climate Change

Guy Sternberg (Starhill Forest Arboretum, USA)

Pruning Oaks 1 : Training the Young

Guy Meilleur (Better Tree Care, USA)

Pruning Oaks 2 : Preserving the Grandeur

Eike Jablonski (LTA Arboretum, Luxemburg)

New Oak Cultivars

Thierry Lamant (INRA, France)

Interesting Quercus ilex Populations in France

Conference registration fee: €200 (includes transportation during the conference, entrance fees and guides, lunch, coffee breaks and gala dinner).

Pre-Conference Tour

26 September to 29 September 2012

Tuesday 25 September

Participants must arrive in Paris in the evening, as the Tour will commence very early the following morning.

Wednesday 26 September

We will meet at the Jardin des Plantes, in front of the Paleontology Gallery of the Muséum National d'Histoire Naturelle to visit historic oak specimens, some over two centuries old. We will have lunch at the Arboretum de Chèvreloup, near Versailles, followed by a visit of their National Collection of North American oaks. We will continue southward where hotel and dinner await us in the city of Angers.

Thursday 27 September

We will first visit the Arboretum Gaston Allard in Angers, an old garden with a few national champion oaks (*Q. phellos*, *Q. ×schochiana*). We will have lunch in Angers and continue our travels on to the national forest of Bercé. The first planted trees date back to the 17th Century and France's tallest *Q. petraea* grows there. We will end the day on an easterly route that will take us to Orléans for dinner and hotel.

Friday 28 September

During the morning we will visit the well-known Arboretum National des Barres created during the First Empire. Several European introductions, for example, *Q. baronii* and *Q. glauca* var. *gracilis* and the original tree of *Q. 'Hickelii'*, are just some of the interesting trees to be seen. We will have lunch and then visit the Arboretum des Grandes Bruyères at Ingrandes, where Brigitte and Bernard de la Rochefoucauld, recently awarded a Collection Agréée label for their North Eastern American oaks, will welcome us. We will have dinner and lodgings in Orléans.

Saturday 29 September

We must arrive in Bordeaux around lunch time and therefore will spend much of this morning driving. If time permits, we may be able to stop at one point along the way.

Pre-Conference Tour registration fee : €560-€800 (includes 4 days, 4 nights, all meals, transportation, guides and entrance fees).

Post-Conference Tour

3 October to 7 October 2012

Wednesday 3 October

Departure from Bordeaux for the Centre de Graoux and a guided tour of the riparian forest of the Leyre river. From there, we move further south to the Ecomusée de Marquèze where we will have lunch after a guided tour of the *airial* (traditional gascon agro forestry). The remainder of the day will see us hiking through the area surrounding the Réserve Naturelle Nationale du Courant d'Huchet to discover its curious oak (and other) flora. A short ride from there will take us to Saint Pée sur Néville where we will lodge and enjoy a typical French Basque meal.

Thursday 4 October

Michel Duhart at the Arboretum de Chocha in Ustritz will be waiting for us bright and early for a visit of his oak collection (French National Collection of Mexican Oak Taxa) followed by lunch. From there, we will have a guided visit of the Fôret Communale de Sare with its ancestral pollarded oak population. We will have dinner in Sare and then be on our way to Zarauz on the Spanish coast where our hotel awaits us.

Friday 5 October

We will spend the morning visiting the magnificent Jardín Botánico de Iturraran (with over 400 botanic taxa of the genus *Quercus*) accompanied by Francisco Garin. We will have lunch in a small village nearby and then be headed back north in the direction of Montauban to Labourgade where we will have dinner and rooms at the Château de Terrides.

Saturday 6 October

From our Château, we will proceed to St. Sardos to the Arboretum de La Bergerette where Shaun Haddock will be waiting to greet us and guide us through this interesting collection that received a Collection Agréée label in 2008. We will have lunch there and then proceed still further north to Brantôme to our hotel and dinner.

Sunday 7 October

Our morning will be spent visiting l'Arboretum des Pouyouleix in St. Jory de Chalais. This young oak collection, created in 2003 by Béatrice Chassé and Gérard Lionet, comprises just over 300 botanic taxa. We will have lunch at the Arboretum. Our final stop will take us to St. Saud, a short ride, to visit the small arboretum of Mr. Laurent Lauthier and to enjoy a final, farewell drink in the magnificent courtyard of an authentic *périgourdine* farm.

Post-Conference Tour registration fee : €580-€700 (includes 5 days, 4 nights, all meals, transportation, guides and entrance fees).

For information, registration, assistance

internationaloaksociety.org

arboretum.pouyouleix@wanadoo.fr (Béatrice Chassé)

shaun.haddock@orange.fr (Shaun Haddock)

thierry.lamant@orleans.inra.fr (Thierry Lamant)

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trees	water	energy	solid waste	greenhouse gases
5.4 fully grown	2259 gallons	2.2 Million BTUs	143 pounds	501 pounds

Calculations based on research by Environmental Defense Fund and other members of the Paper Task Force.

www.newleafpaper.com



Quercus 'Piers Trehane'



1 cm

Image from a plant at the Sir Harold Hillier Gardens (UK)
©Jan De Langhe, Ghent University Botanical Garden, 2009

7TH INTERNATIONAL OAK SOCIETY CONFÉRENCE 2012 BORDEAUX-FRANCE 29 sep - 02 oct

Pre-Conference Tour 26 sep-29 sep
(starts in Paris - ends in Bordeaux)

Conference 29 sep-02 oct
(Bordeaux)

Post-Conference Tour 03 oct - 07 oct
(starts in Bordeaux - ends near Périgueux)
transfer to airport of your choice will be arranged

Hosted by Antoine Kremer (INRA), the 7th International Oak Society Conference will take place in the Agora Haut Carré (University of Bordeaux Conference Center).

The Pre-Conference Tour ends in Bordeaux early in the afternoon on 29 september (participants must arrive on 25 september in Paris).

A welcome cocktail as well as conference registration are scheduled for 29 september (early evening) and the Conference begins the following morning.

With speakers from Algeria, Belgium, China, France, Germany, Romania, Spain and the United States of America, the presentations cover a vast range of *Quercus* subjects.

Program details and costs will be announced shortly.

