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THE

AMERICAN CONIFER SOCIETY CENTRAL REGION

CONIFERITE

SPECIAL EDITION:

AN INTRODUCTION TO THE AMAZING WORLD OF CONIFERS

AMERICAN CONIFER SOCIETY

Enter the Cone Zone!

Dear Fellow Gardener,

You know what a conifer is. Some people might call it an evergreen, a pine tree or even a Christmas tree, but almost everyone has some general knowledge of and experience with the Pinophyta division of the plant kingdom.

But what in the world is a "coniferite?" It's not in the dictionary, and if you Google it the main hit will be either the newsletter you're now reading, or some reference to the American Conifer Society.

"What?" you say, "a society for conifers?"

Yes indeed. Welcome to the cone zone!

Simply put, a coniferite is a gardener who really likes conifers, and the American Conifer Society (ACS) is an organization for coniferites.

If you're starting to think there's more to conifers than the evergreen/Christmas tree image, you're absolutely right.

Few people are aware of the thousands of plants available in the conifer category. While collectors might want dozens or hundreds of them, even the average gardener can make good use of several. There are places for a few even in the landscapes of non-gardeners, who too often settle for run-of-the-mill varieties simply because they don't know about the many exciting and unusual options available, or where to find them.

With the wide range of shapes, sizes, colors, textures, and growing conditions, there is a conifer to fit almost every situation. Once you become aware of these possibilities (which we'll share with you in the following pages) you're in danger of contracting ACS — Addicted Conifer Syndrome! You'll become a coniferite.

I hope you do, of course. This Special Edition of The Coniferite is designed to plant that seed. If it doesn't, I hope it at least informs and entertains you. There is plenty of both information and entertainment in the world of conifers, and in this publication.

Enjoy it. Then visit our website at conifersociety.org and join ACS for even more.

Happy gardening!

Jerry Belanger, Editor
coniferite@gmail.com

P.S. Please note that this Special Edition was funded by anonymous donors, not by ACS dues or fundraisers, to encourage the use of unusual conifers and to celebrate the Central Region's 25th anniversary. Our regular 4-page newsletters, concerned more with ongoing events than feature articles, will continue to be issued quarterly.

What's inside?

On the cover: Male strobili (pollen cones) on *Pinus parviflora* 'Bergman' (Japanese white pine).
—Dennis Groh photo

What every good gardener should know about conifers

As a gardener, you know how important it is to have at least some basic information about a new plant you introduce to your garden: sun or shade, how much water, pH, etc.

Your pleasure and satisfaction can be increased by learning even more. What is its native range, and what are the growing conditions there? What are some suggested uses, companion plants, potential pests and other problems? You might be interested in related varieties. Coniferites enjoy talking about all of these.

It's not *necessary* to know that conifers can be found in the fossil record as far back as 300 million years ago, but knowing how ancient they are makes them even more interesting.

Conifers are much older than flowering plants. They are *gymnosperms,* meaning "naked seed" — plants whose seeds are not enclosed in an ovary. Flowering plants are *angiosperms* — plants with seeds enclosed in a carpel or "fruit."

"Conifer" is a compound of the Latin words *conus* and *ferre* meaning "one that bears a cone, or conical fruit."

The majority of conifers have woody cones with scales that spread open, letting the seeds fall out to be spread by the wind. In some (firs and cedars), seeds are released when the cone disintegrates, while in still others large nut-like seeds require birds or animals for dispersal. Mature cones can remain on the tree for a long time: with some fire-adapted pines, 60-80 years!

Then there are families, including yews and junipers, whose seed coverings resemble berries rather than woody cones. The soft, colored cone scales (called *arils*, except in junipers where the term berry-like is used) are eaten, and the seeds are dispersed, by birds. Note that while juniper berries are used to flavor gin and certain foods, all parts of the yew, including the seed inside the red arils, are highly poisonous to mammals.

What are conifers?

Conifers are woody plants (trees, shrubs or groundcovers) with leaves in the form of needles or small scales that hug the twigs. The needle-like leaves can be solitary or grouped into bundles called *fascicles*. These needles can be quite thin and stiff or somewhat flattened.

Most conifers are evergreen, and the terms "conifer" and "evergreen" are often used interchangeably. However, many broadleaf evergreen plants are not conifers (such as rhododendron, azalea, holly, and boxwood) and a few conifers are deciduous (e.g., *Larix* (larch), *Pseudolarix* (false larch), *Metasequoia (*dawn redwood) and *Taxodium* (baldcypress/pondcypress).

Conifers do not have true flowers or fruit. The seed or ovulate cone is the female reproductive structure of conifers, and is also called a *megastrobilus.* The pollen-bearing cone, or catkin, is the male reproductive structure. It is usually smaller than the megastrobilus, not woody, and is called a *microstrobilus*. Both types of cone are made up of scales that bear either ovules (female) or pollen-producing sacs (male). When the ovules are fertilized following transfer of pollen from the male cones, they develop into seeds carried in the seed cones.

When male and female cones are found on the same individual plant the species is said to be *monoecious*. When male and female cones are restricted to separate plants the species is said to be *dioecious* (e.g., *Taxus, Juniperus, Cephalotaxus*).

Fossils tell us this method of reproduction has evolved over 300 million years. The male cones produce pollen in huge amounts. Upon ripening it's expelled as very small and light particles which can float for hundreds of miles. However, most settle out a short distance from the parent tree. Timing is critical, as the female cones are only receptive for a few weeks.

The gymnosperm group includes a leaf-bearing deciduous tree, ginkgo biloba. While not a true conifer it's a close relative.

Conifers are the dominant natural species in many parts of the world where growing conditions are difficult for flowering plants. Conifers can be found growing naturally and abundantly on all continents except Antarctica. While conifers make up less than one percent of all plant species, they deserve special attention for their great diversity, adapt-

Please turn to next page

The entrance to the Harper Collection of Rare and Dwarf Conifers in Tipton, Michigan, is an excellent demonstration of the mantra that conifers provide tremendous choices in size, shape, color and texture.

ability, and value. Conifers comprise over 30% of the world's forests and are a major source of softwood lumber, paper products, and specialty chemicals. The 630 species of conifers known to date represent some of the smallest, (mountain rimu, *Dacrydium laxifolium)*, tallest (redwood, *Sequoia sempervirens*), largest circumference (Montezuma baldcypress, *Taxodium mucronatum*), largest (giant sequoia, *Sequoiadendron giganteum*), and oldest (Great Basin bristlecone pine, *Pinus longaeva*) living plants. In the United States, eight of the top ten largest National Champion Trees are conifers.

You probably wouldn't want one of those next to your house. Let's consider some smaller options, namely, dwarfs.

Dwarf and miniature conifers have many uses in the garden.

What are dwarf conifers?

By definition, a dwarf is anything that fails to attain the size and stature of a normal parent as it matures. Therefore, the term "dwarf" only has meaning in relationship to the size of the parent. Most people think of a dwarf as being very small, like Snow White's seven small friends, but that isn't always the case. For example, a mature dwarf redwood might be "only" 100 feet tall. It's a dwarf because its parent is three hundred feet tall. Few of us would be happy if we planted a dwarf redwood next to our home and it grew to 100 feet.

Perhaps a more understandable concept is the term "slow-growing conifers." This implies that no matter how old, the plants will still continue to grow. They will not reach some ultimate size and stop. The American Conifer Society has adopted as a relative guide the following size categories for conifers: (Note: actual size may vary due to cultural, climatic and regional factors.)

Category	Growth/year	at 10 years
Miniature	**Less than 1"**	**Less than 1'**
Dwarf	**1" – 6"**	**1' – 6'**
Intermediate	**6" – 12"**	**6' – 15'**
Large	**12"+**	**15'+**

Landscape use

The importance of evergreens in the landscape becomes very obvious when deciduous plants go dormant in winter. Then, evergreens become the focal point and provide critical wildlife shelter.

Since they have a definite form and are prominent year-round, the selection and placement of evergreens are important design factors because they provide structure, color, and can help define spaces or "rooms" in a landscape.

Conifers are the best of the four-season evergreens because of their wide variation in sizes, shapes, colors, and textures. Conifers can act as backdrops for the bright spring, summer, and fall colors and winter snowfall. They can be combined with landscape lighting in summer or winter for spectacular effects. The needle or scale-like texture of conifers is an excellent contrast to broad leaves.

Dwarf conifers are especially valuable landscape plants because they offer all the four-season benefits of conifers in a scale suitable to modern homes and yards.

Dwarf conifers are generally trouble-free and low maintenance. These combined features cannot be obtained by using any other plants.

While most conifers need full sun, a few conifer genera can tolerate shade e.g., *Tsuga* (hemlocks), *Taxus* (yews), *Cephalotaxus* (Japanese plum yew), *Thujopsis* (hiba arborvitae), *Microbiota* (Russian arborvitae), and certain *Thuja* (arborvitae).

Colors

Dwarf conifers are available in a wide spectrum of green shades, but cultivars exist which are blue, yellow, gold, and gray. In addition, there are variegated versions with stripes, spots, and patches featuring white, cream, and yellow. On certain conifers, e.g., spruces, firs and pines, the underside of the needle can display contrasting colored stomata of white, silver, or blue. These multicolored needles can be quite attractive.

In spring, lighter shades of new growth contrast against the older darker foliage and is very attractive. This contrast offers a splash of new color before other plant color is naturally available in the landscape.

Certain dwarf conifers have colorful cones (pink, red, blue, or purple) as they first emerge. Later, the cones on certain firs can develop an attractive resin coating. A few dwarf conifers have interesting seasonal color change (yellow, bronze, gold, and plum) or especially colorful and attractive bark.

Forms/Textures

The most interesting aspect of dwarf conifers could be the incredible variety of natural shapes and textures available, which generally require no pruning to maintain. These include upright (narrow or wide), globe, bun, vase, mound, conical, weeping, oval, horizontal, ground hugging and irregular.

In addition to the wide variety of natural shapes, conifers can also be culturally altered and pruned or trained into many formal or imaginative shapes including high grafts onto standards. However, once pruned to specific shapes, they definitely no longer qualify as low maintenance.

Leaf shape and density, branch structure, and to some extent the light reflectivity of the plant's bark and leaves, de-

termine the texture of a woody plant.

All this diversity provides the designer with great flexibility. Planning the exterior landscape design can be as challenging and fulfilling as planning the interior decoration of a home. To take full advantage of all these opportunities, the designer will have to invest some time in mastering the subject of dwarf conifers.

Miniature conifers in tuffa troughs.

Definition of a dwarf conifer

A dwarf conifer is a slower growing selection of a genetic mutation of a normal conifer. Dwarf conifers generally do not reproduce true from seed, and are usually produced asexually by rooting cuttings or by bud grafting onto compatible rootstocks. There is great debate over the optimum rootstocks for grafting.

Commercial introduction

Ideally, dwarf conifers are grown for several years and carefully evaluated before they are introduced commercially. Thorough dwarf conifer evaluations require examinations of growth rate over both time and differing growing environments. This effort is necessary to verify the genetic mutation is stable and will not revert back to more normal species growth rates when propagated.

Any new commercial dwarf conifer introduction should demonstrate some significant difference or improvement over existing plant cultivars. The individual introducing a new dwarf conifer must select and register an acceptable and unique cultivar name so it can be properly identified. Since dwarf conifer growth is slow and the supply of propagation material is limited, the introduction of new dwarf conifers is a costly and time-consuming process.

Origins of new dwarf conifers:

I. Bud mutation

A. Limited bud mutation

Branch sporting, or limited bud mutation, can produce a genetically stable shoot which is different from the rest of the plant. When the new genetic material is large enough, it can be propagated and evaluated.

B. Witch's brooms

A number of conifers, in particular pines, spruces and firs, can naturally and randomly develop an unusual congested growth. The root cause is not well understood and hypotheses include parasitic or pathological effects and changes in genetic code caused by concentrated reflected light or magnetism. Whatever the cause, this growth is commonly referred to as a "witch's broom," a term thought to originate in folklore as people blamed the touch of a flying witch's broom as the cause.

A broom is a congested, tight, and gnarled bundle of shorter needles and branches in otherwise healthy and normal plant growth, Once this growth is found, often very high on large conifers, propagation material has to be carefully removed. Preferably, without harming the broom because until it is propagated it's the only source of the unique genetic plant material in the world!

However, determined collectors have been known to gamble and take the whole broom at once, sometimes using a rifle to bring down an entire branch holding the broom. Not all brooms are successfully propagated or produce desirable plants.

II. Seed

A. Normal seed mutation

During normal seed production, rare chance variations can occur which produce conifers that differ in size, shape, color, or growth rate.

B. Environmental selection

Certain stressful mountain environments have provided, through natural selection, a limited number of natural dwarfs that maintain their dwarf character when planted in more favorable growing conditions. Many that grow as dwarfs in challenging environments will revert to normal growth rates when planted in more favorable growing conditions.

C. Witch's broom seedlings

Of special interest is the extremely rare instance when witch's brooms or their offspring produce dwarf cones. Current belief is these broom cones are female only (remember, most conifers produce both male and female cones) and must get pollen from male cones of the same species. Therefore, each wind-pollinated seed could theoretically have a different "father" with unique genetic make-up and different growth characteristics. When these seedlings are planted, about 50% show dwarf characteristics and 50% show growth rates more typical of normal species. ■

Pinus echinata (shortleaf pine)

Tsuga canadensis 'Everitt Golden'

Abies koreana 'Horstman's Silberlocke'

Abies concolor (white fir)

One of the attractions of conifers is their cones, which come in a wide array of colors, shapes and sizes, as can be seen here and on our back cover.

Gardeners can find many uses for dwarf and miniature conifers. They work well in rock gardens, fairy gardens, railroad gardens, and even containers.

Care and feeding of the dwarf conifer

by **Dennis Groh**
Dearborn Heights, Michigan

Dwarf conifers' needs are simple and their rewards great. They will thrive in most well-drained soils, and once properly spaced and established, require very little attention.

Cleanliness

Dwarf conifers can be very tight, dense plants and can collect and hold both their own needles (which many conifers lose during the summer months) and winter debris like paper and leaves. These need to be removed to allow proper amounts of sunlight and air circulation to promote general plant health. Hand cleaning, in combination with a strong water stream from a hose in spring, is very beneficial. If this is not done, dwarf conifers can decline in both appearance and health.

Mulch

Conifers like organic mulches such as wood chips, shredded bark, pine needles, buckwheat hulls, and shredded leaves. Avoid sawdust, grass clippings or peat moss because they can become compacted when dry and act to repel water. (I prefer no-float cypress mulch.)

Watering

It is critical to provide adequate water until a freshly planted conifer establishes its new root system. Check the soil next to the plant for moisture every other day for a month. Water thoroughly if the soil is dry an inch below the surface. After this, check weekly for another two months and water as required. After three months the plant should be fairly well established and watering is less critical (except during periods of drought when the plant will require extra water). Conifers may benefit from a heavy watering late in the fall before the ground freezes. This allows the roots to take up extra water, which can help increase the plant's resistance to needle dry out, which can occur during winter conditions.

Spraying: Always follow the instructions and cautions provided on the product label!

CAUTION: Oil-based sprays can dissolve the wax coating which naturally occurs on conifer needles. Blue conifers may appear green once this light reflective coating is removed. Don't use oil sprays after the 4th of July because a needle's wax coating is part of a conifer's defense to minimize winter injury from loss of water through its needles.

On certain conifers the late fall use of antidessicants, such as Wilt-Pruf spray, may be beneficial (refer to product label). Antidessicants are typically coating materials which cover the openings on plant tissue to prevent transpiration or loss of water. This type of product would be best applied in late fall as the plant starts into its dormant period.

Careful use of a systemic insecticide and miticide (as recommended by your agricultural extension service) can help control insect pests such as pine sawfly and spider mites on certain susceptible plants. Dishwashing soap has also proven to be a useful environmentally friendly method to control spider mites.

Fertilizing

Fertilization is generally not needed if proper planting procedure has been followed. Dwarf conifers are quite content to exist in areas of low fertility. Too much fertilizer can cause greater than desired growth. If fertilization should be required on established plants, it should be of the slow-acting organic type and used in small amounts. The optimum time for fertilization is early spring. Do not apply any fertilizer after the 4th of July. This practice allows new growth to properly harden off before winter.

In alkaline soils typical of the Midwest, the iron is not dissolved and is therefore not readily available to the conifer root system. Annual application of iron chelates may help maintain good color for conifers which prefer low pH (acidic) soils. Soil amendments with magnesium sulfate (short term) and sulfur (long term) may be required for certain pine species.

Snow and Ice

Heavy wet snow or an ice storm can damage most woody plants, but some conifers are very susceptible.

Arborvitae must be kept to a single leader or tied to avoid splitting open under these conditions. ■

Some tips on pruning

In a nutshell: avoid it if you can

Excerpted from *A Brief Look at Garden Conifers* by JC Harper

While dwarf conifers never stop growing, they grow very slowly and need little or no pruning. The only pruning would be to maintain health and shape. This would mean the removal of a dead or diseased branch, or a poorly placed branch.

Another reason for pruning would be the removal of a branch which looks like it may have reverted back to a non-dwarf growth more typical of the species. If not removed promptly, vigorous growing shoots can overwhelm a dwarf plant.

The natural growth pattern of a conifer, whether normal or dwarf, is a large part of its charm. When its charm gets out of hand because it is too large for its available space, then either the wrong plant was originally selected or proper pruning was not maintained. When this occurs, the choices are pruning, moving, or removing. Removal is often the easiest solution.

Some conifers can be severely pruned but others won't tolerate it. Severe pruning will destroy the natural charm, although certain conifers can recover over time.

Careful size selection of your garden conifers is the most important consideration. Utilizing the information available on conifer form and growth-rate categories, the gardener should be able to select plants that can be planted and expected to grow within the space available without substantial intervention for periods of up to fifty years.

***Taxus* (yews) and *Tsuga* (hemlocks):** This group is the easiest to prune. Both have abundant buds on both old and new wood that can develop into twigs when the cut is above the bud. This characteristic tolerates heavy shearing and allows them to be used as hedges. Their needles tolerate some shade and grow well on the insides of the plant. Pruning just before new spring growth allows the pruning cuts to be covered with new growth, avoiding the "just sheared" look.

Full-size trees can be beautiful, but they don't fit all landscapes. Dwarf conifers can take their place.

***Abies* (firs), *Cedrus* (cedars), *Picea* (spruce), and *Pseudotsuga* (Douglas-firs):** These plants have easily identifiable buds along the current season's growth and sometimes along the stems of the previous year's growth. Size can be controlled at any time by pruning back to a bud or a live twig. For a formal shape, they can be pruned or sheared when the current season's growth is soft. Their needles are also somewhat shade tolerant, so pruning or shearing has the potential of creating a dense plant.

***Pinus* (pines):** When pruning pines, one must be aware of their lack of buds along the stem. Buds are only located at the tip of the current season's growth. Thus, pruning at most times of the year must be done carefully or shape will be lost. The best time to prune pines is in the spring when growth is soft. The new growth (which is called a candle because of its appearance) can be cut or pinched before the needles are fully elongated. New growth buds will develop from needle fascicles below the cut. Spring pruning or "candling" will produce a compact plant. Using careful early spring pruning annually, the gardener could almost maintain the current size of a pine tree indefinitely.

***Juniperus* (junipers), *Thuja* (arborvitaes), and *Chamaecyparis* (false-cypress):** This group is very difficult to prune. Buds are present only where there are green scales. A branch cut back to a non-scaled region will not form new foliage. Thus cutting or shearing to the brown inner part results in an unsightly scar, which may not be covered for many years (if ever). The reason the interior of these plants is naked or brown is because the foliage is intolerant of shade and dies. If these plants are to be sheared at all, it should be done with great care and only when they are growing in the spring. These plants in effect have only a thin outer "shell" of green growth hiding a barren interior of twigs and limbs with no foliage and no potential for development of buds. Care must be taken not to break through this thin "shell" during pruning.

NOTE: More comprehensive pruning information is available in the Frequently Asked Questions (FAQ) section on the Conifer Society website (http://www.conifersociety.org)

The world's oldest tree is a conifer

The Great Basin bristlecone pine *(Pinus longaeva)* remains the most ancient documented tree. At least 17 of the Great Basin bristlecone pines growing in the White Mountains of eastern California exceed 4,000 years of age. The oldest, named Methuselah, is estimated to be 4,600 years old. Methuselah was a mere seedling when the Egyptian pyramids were being built, 2,500 years before the birth of Christ.

These hardy species of pine trees have adapted to some of the harshest living conditions on the planet — extremely dry, ferociously fast winds, very little rainfall, and very alkaline, sandy soil. The brutal environment in which they live is one of the main reasons they have been able to survive over the millennia. Lack of competition from other trees, shrubs, and vines that just can't make it in such a tough place helps the bristlecone pine adapt to the rigors of its home soil without interference from other species.

The harsh climate also eliminates many damaging insects.

Some of the oldest and longest lived of the trees are isolated, solitary sentinels perched in the spots most exposed to the fierce, desiccating winds. Many plant species are unable to live in a place that is continuously assaulted by winds that rob them of life-sustaining moisture.

Conifer pioneer profile: Jean Iseli

The man behind that familiar Iseli label

It would be difficult to wander through the tree and shrub offerings of any respectable garden center without encountering the distinctive triangular label of the Iseli Nursery. Maybe you saw their trademark, "Where the beauty of nature meets the artistry of man," and wondered exactly what that meant.

The man behind all this — and one of the original promoters of dwarf and unusual conifers as well as being one of the founders of the American Conifer Society — was Jean Iseli.

Jean (pronounced "John") was born in Switzerland, but his parents moved to the U.S. when he was a child, operating a plant nursery in Oregon. Jean, however, wasn't very interested in the nursery business: he studied math, and art. Drafted into the army in 1959, he was stationed in the Washington, D.C. area, working with mathematics and the beginnings of the computer. After his discharge he stayed in the area as a computer programmer for government contractors involved with ARPANET, the origins of the internet. He dabbled in painting, ran an art gallery, and briefly taught college mathematics, until his brother André told him about a nursery opportunity in Boring, Oregon, and convinced him to become a partner.

André was the money-man and Jean was the plantsman. He wanted a small nursery growing choice plants, but soon caught the dwarf conifer bug from other growers in the area. No one was producing them commercially because they were too labor-intensive and they took too long to be saleable, so they weren't profitable. Jean Iseli had a different idea: he believed there was a market for unusual, slow-growing and dwarf conifers, and he set out to create it.

Many stories indicate how shy he was — until he learned that you had some rare and unusual dwarf conifers.

He was also somewhat eccentric. He told Bob Fincham, who wrote *Gone But Not Forgotten,* that he used to lecture his math students while sitting in the lotus position on a desk in the front of the room. Another contemporary claimed that he often taught while wearing a toga. It is generally agreed that he loathed shoes, choosing sandals instead.

Jean Iseli, co-founder of Iseli Nursery in Boring, Oregon, with an *Acer palmatum griseum* (paperbark maple). Inset: the familiar trianglar Iseli label.— *Don Howse photo*

One of his most famous exploits involved a Japanese maple, which he admired almost as much as conifers.

Another grower in that nursery-rich area of Oregon had a spectacular dissected red leaf Japanese maple *(Acer palmatum)* named 'Red Filigree Lace' that Jean coveted. He was told, "You can't afford it," but after some intense negotiation it was his... for $10,000. The transaction was even more astounding than the plant, since the price was unheard of and ridiculous.

Jean's idea, however, was to use the tree as a key to access new contacts for more rare and unusual specimens. As related by Ridge Goodwin, Iseli's first sales rep:

"The following spring small packages started to arrive at the homes of plant collectors in the East, accompanied by a letter that began: 'Permit me to introduce myself; my name is Jean Iseli from Boring, Oregon. Please accept my gift to you of a new Japanese maple cultivar, 'Red Filagree Lace.' ' The letter went on to inform the recipient that the sender was an Oregon nurseryman and plant collector himself and, by the way, was wondering what plants the collector might have in his collection?"

When Jean Iseli died suddenly in 1986 at the age of 52 he was already a legend: obviously, much more could be told about him.

But even with this brief introduction, the next time you encounter that distinctive triangular Iseli label, think of Jean, and you'll appreciate "the beauty of nature meeting the artistry of man" even more.

Iseli Nursery in Boring, Oregon, a major producer of dwarf conifers, is where "the beauty of nature meets the artistry of man." — *Jd Belanger photo*

Bewitched by BROOMS

ACS (Addicted Conifer Syndrome) wouldn't be nearly as addictive without witch's brooms. It certainly wouldn't be as interesting or as much fun. It's the cultivars that spice things up and for the most part, "cultivar" means brooms. Coniferites love witch's brooms, yet much about them is still unknown.

by **Jerry Belanger, Editor**

Right: This broom—the darker, denser growth—is on a *Picea abies* in the Mount Airy Forest in Cincinnati, Ohio. —*David Speth photo*

One of the best sources of information on witch's brooms I've found — certainly one of the most interesting — is a small pamphlet titled *Arnoldia, A continuation of the Bulletin of Popular Information of the Arnold Arboretum, Harvard University,* dated June 23, 1967. I discovered it on a book-collecting adventure long before ever hearing of the American Conifer Society, and of course it was written some 15 years before ACS was founded. The author was Alfred J. Fordham, one of the great pioneers of the conifer world.

He begins with an etymology lesson, informing us that "witch's broom" translates directly from the German *hexenbesen,* and that both parts of the German compound word are found in English: *hex,* in the sense of bewitching, and *besom,* a bundle of twigs bound together "to form the age-old do-it-yourself sweeping implement still used by people in rural Europe." He speculates that it would be natural for medieval Europeans to call peculiar tree growths "witch's brooms" because they were familiar with brooms made of bundles of twigs, and they were inclined to relate anything mysterious and unexplainable to witchcraft.

Medieval superstitions

Fordham claims that witch's brooms were associated with many medieval superstitions and they played an important role in folklore, although he couldn't find any examples in English. However, Dr. Richard S. Merian, professor emeritus in the Harvard Business School, "kindly volunteered to search the German literature at Harvard's Widener Library and found the following:

"The German word *hexenbesen* is now used to define only witch's brooms and mistletoe, but in the past it was applied to other woody growths as well. It was once one of several words used to describe such abnormalities — they were also called witch's nests *(hexennester)*, mares' nests *(mahrnester)*, and thunderbrooms *(donnerbesen)*. Witches not only caused these formations: they also used them as nests and resting places during their travels. They were also used by elves, hobgoblins, and other evil and repressive spirits. Among them were the mares *(mahre)* who were thought to sit on the chests of sleeping persons and bring on bad dreams — the origin of our word 'nightmare.'

Other unusual growths

"We cannot be sure that all the tales apply solely to witch's brooms as we know them, for some other unusual growths may have been involved. A special use of the witch's broom, of course, was for the witch to mount it and ride through the air. The ancient belief in witch's brooms and thunderbrooms ascribed magical protective and healing powers to them. They protected against sickness and lightning and, curiously enough, against witchcraft itself."

According to Fordham, modern scientific literature (as of 1967) abounds with references concerning the investigation of witch's brooms. "They have been found on many species of woody and non-woody plants, and have been shown to result from the stimuli of feeding mites and insects and parasites such as fungi, bacteria, viruses, and one of the higher plants — dwarf mistletoe *(Arceuthobium pusillum)*."

Brooms of genetic origin

However, despite this abundance of literature on brooms in general, he could find few references to brooms that appear in the absence of any causal organisms, presumably through mutations or "bud sports." The brooms of genetic origin were what interested him. He spent most of his life in plant propagation research, all of it at the Arnold Arboretum, Jamaica Plain, Massachusetts (which, dating from 1886, is considered the second-oldest conifer collection in the U.S.).

In his 1967 paper he noted that his extensive research in encyclopedias and technical publications invariably attributed witch's brooms to causal organisms. He questioned that. He described several broom-hunting excursions (noting that brooms are relatively common when one has developed an eye for spotting them), observing that two brooms were never found on a single tree, in only one instance was a second broom found within 100 feet of the first, and usually they are many miles apart. "This, and the fact that they are free of excessive dead parts would tend to support the belief that they are not caused by organisms." If

his thesis proved true, he suggested, a new term to define such brooms might be needed.

A white pine bud sport

He explained how a witch's broom on an eastern white pine developed from a single bud. In spring, the cluster of buds at the tips of the previous year's growth develop into new shoots called candles. The central bud develops into a terminal or leading shoot, while those surrounding it develop into lateral or side shoots. And of course this happens year after year, leading to an increase in the tree's height, breadth and density.

In the example at hand, a new set of six branches arose along with a terminal shoot. One of the lateral buds underwent changes that gave rise to the broom. The broom developed into a dense, multi-branched globose mass, 26 inches wide and 23 inches tall, with a basal stem 1-$^{7}/_{8}$ inches thick. Its needles were less than an inch long, compared to the more normal 2-½ to 3-¾ inches.

This mass shaded out the other five lateral branches, and all that remained were the barely discernable scars. The terminal shoot had enough light to continue growing, but only to about pencil-thickness.

No indication of causal agents

He had similar descriptions (and pictures) of other examples of brooms arising from single buds, with no indications of any causal agents. In one case, a broom on a pitch pine *(Pinus rigida)* was about four feet off the ground in the remains of a whorl of branches. And while the host and other trees in the area reflected the sandy impoverished Cape Cod soil they were growing in, the broom was dark green and appeared to be healthy and vigorous. This broom had been under observation for six years.

Wild dwarf seedlings

There is a particularly interesting account of dwarf seedlings in the wild resulting from a white pine broom. What appears to be two trees is actually one, which divides into two parts about four feet from the ground. One is a broom, about ten feet tall and ten feet wide. Its clean growth shows no sign of causal agents. This tree was located at the edge of a strip that was cleared through the woods to accommodate high-tension electric lines. This unnatural opening allowed many seeds of the broom to survive, and there were many dwarf trees in the area. Through the years, he counted as many as 250, some a quarter of a mile away. Seeds collected from the broom and germinated at the Arnold Arboretum showed 48% dwarfism.

Fordham carefully described the cones and seeds of this tree. The cones of the broom were generally smaller than normal, but with much more variation in size. The number of scales on the cones also varied dramatically. The scales on 23 broom cones ranged from 20 to 50, while normal cones yielded 68 to 80. There was no relationship between cone length and scale number: the shortest had 25 scales while the longest had only 21.

German theory in 1933

Fordham was able to find two references supporting his theory of genetic mutation rather than causal agents, both appearing in 1933, and both in Germany. But not until the 1960s did witch's brooms and their progeny attract much interest in the United States, leading to increased vegetative propagation. ■

Which would you rather look at?

Hostas after an early frost

Conifers after an early frost

Calm down, hostaholics, we love hostas too! But it's hard not to notice that the touted "winter interest" of conifers has something going for it.

How to succeed with dwarf conifers

by **Dennis Groh**

• Invest time and effort to understand which conifer cultivar(s) to purchase.

• Attend classes taught by qualified instructors knowledgeable in conifers.

• Study publications on the recommended conifer reading list (page 25).

• Visit conifer collections listed on p. 33.

• Join the American Conifer Society (conifersociety.org).

• Surf conifer Internet sites (e.g., http://www.conifersociety.org).

• Before purchasing, understand the plant, its needs, and conditions where you will plant it.

• Verify USDA cold hardiness and AHS heat hardiness (or do you have an appropriate microclimate?).

• Sun or shade? (Consider both winter and summer exposure and reflections off buildings).

• Soils: Drainage? (Test, as most conifers need good drainage), pH? (most prefer acidic, a few basic).

• Wet or dry? (be sensitive to downspout and sprinkler head locations).

• Based on the growth rate, estimate its required space at various time intervals (10 years, 20 years, etc.).

• Use the Latin genus, specific epithet and the correct cultivar name when purchasing.

• *Caution: Remember, all puppies and conifers look cute when small!*

• To correctly specify a plant, you must use the binominal (two-part) international plant classification system. The common name for a plant may change from region to region, but classification names are globally constant.

• Buy only from reputable sources who list the genus, specific epithet and cultivar names.

• *Caution:* Not everyone, even in garden centers, is truly knowledgeable about slow-growing conifers.

• Properly prepare the ground and carefully plant the conifer.

Remember, conifers are low-maintenance — if they are wisely chosen and properly sited and planted.

Recalling Euell Gibbons:

Have you ever eaten a pine tree? Some parts are edible!

Humans have been enjoying the fruits of the conifer—pine nuts— since the paleolithic period, and we continue to do so today.

In Italian cuisine, *pignoli* are an essential ingredient in pesto. The pignoli cookie is made of almond flour and topped with pine nuts. In Spain, small marzipan balls are covered with pine nuts, then painted with egg and lightly cooked. The *salade landaise* of Southern France features pine nuts. In Middle East cuisine you'll find pine nuts in kibbeh, sambusek, and best of all, baklava. Around the world, these delicacies are added to fish, meat, salads, vegetables, and breads.

American Indians have made use of pine nuts for generations, and they're becoming popular as a snack food, as evidenced by their availability at Farm & Fleet, a Midwestern chain better known for tires than for gourmet foods.

Enough salivating! *The Coniferite* is better known for trees than for gourmet foods, so let's get back on track.

For starters, while pine nuts are nuts to the cook, to the botanist they're seeds. Technically, "Being gymnosperms, they lack a carpel (fruit) outside."

Most people probably associate pine nuts with pinyon pines, mainly the Colorado pinyon *(Pinus edulis)*, Single-leaf pinyon *(Pinus monophylla)* and Mexican pinyon *(Pinus cembroides)*. These are the most common in the United States. They're usually harvested by American Indians, sometimes under treaties guaranteeing them that traditional right.

But this is the 21st century, so guess what? Most of the pine nuts on the market today come from China.

About 20 species of pine have seeds large enough to be worth harvesting. None are cultivated. People go out and gather them in the wild. In Asia, the main source is the Korean pine *(Pinus koraiensis).* In Europe it's the stone pine *(Pinus pinea)*. Seeds of the Korean pine are stubbier than those of the stone pine; the European variety has greater length compared to girth.

The seed of the pinyon pine takes 18 months to reach maturity — if growing conditions are favorable. This depends to a great degree on elevation, the ideal being 7,000 feet. This pretty much leaves out the ACS Central Region.

However, the Society of Ontario Nut Growers (SONG) (and Ontario is in the Central Region) suggests that the most suitable species for Ontario's climate would be the Korean and Siberian or Swiss stone pines. They'll grow wherever red and white pines are native. The SONG website notes that no cultivars of pines have been selected for nut production, and it can take 10 years for a Korean pine to begin setting filled cones.

Might growing pine trees for their nuts become a viable industry? The nuts, depending on species, contain between 10-34% protein, and are a source of dietary fiber. In a hungry world, selective breeding might well be applied to these trees.

According to Wikipedia, the United States has lost millions of hectares of productive pinyon pines due to land conversion, and Chinese production has been lost due to destructive harvesting techniques (such as breaking off whole branches to harvest the cones).

In addition, there are quality issues with wild-gathered seeds. While unshelled nuts have a long shelf life if kept dry and chilled (near freezing), shelled nuts deteriorate rapidly. As a result, commercial nuts can have poor flavor, or even be rancid by the time they're purchased. Freezing preserves the flavor.

Then there is the problem of "pine mouth," a relatively new phenomenon not yet fully understood, involving a bitter, metallic taste. There is some speculation that it's related to nuts imported from China.

You might not want to become a pine nut farmer, but if you have some Korean or stone pines in your collection, you might want to pay a little more attention to their cones. Who knows, you might have your pine tree, and eat it too! ■

Conifer lore:

The story behind the dwarf Alberta spruce

Most people who are interested in conifers have heard the story of how Alfred Rehder and John G. Jack took a stroll while waiting for a train, and discovered the *Picea glauca* 'Conica.' The year was 1904. The location was near Lake Laggan, Alberta, Canada. The two strollers, who speculated that a tree with a witch's broom had dropped seeds that had sprouted, just happened to be staff members of the Arnold Arboretum, in Boston, Massachusetts. Naturally (it's natural if you are, or know, a broomer in today's conifer world) they dug one up and took it home with them. Apparently they could get away with that in 1904: don't try it today.

The tree, of course, was the now-ubiquitous dwarf Alberta spruce.

While John Jack shows up in much of our research into conifer pioneers and the Arnold Arboretum, Alfred Rehder is the more famous of the pair. One reason is that he became known to thousands of students for his *Manual of Cultivated Trees and Shrubs,* first published in 1927, and updated in 1940. This 930-page tome easily outshone the previous benchmark by another Arnold star, C. S. Sargent — who hired the visiting German as a student-worker for $1 per day in 1898. Naturally, there is much more to the story, since his "visit" lasted until his death, in 1949.

However, what many coniferites are not aware of is in that 1940 edition Rehder was the first to use a "plant hardiness zone" map based on plant tolerance to minimum winter temperatures. His map only had eight zones; nevertheless, it was the precursor to the 12-zone USDA map we use today, which came 30 years later.

Now, maybe you can appreciate Alfred Rehder for coming up with the idea of plant hardiness zones, and forgive him for helping to introduce the dwarf Alberta spruce.

How scientists determine cold hardiness

Proclaiming a plant to be "hardy to Zone 3" is less haphazard than you might think

Spring has sprung and your favorite conifers made it through the winter. You can breathe a sigh of relief, right?

Not so fast! Spring can be the most dangerous time of the year for some plants, including conifers. The popular notion that plant hardiness refers only to the most frigid days of winter isn't true, according to a blog from ACS member Bert Cregg of Michigan State University.

How is cold hardiness determined? Not by planting a tree at the University of Minnesota Arboretum (or anywhere else) and then waiting to see if it lives or dies. It's a lot more complicated, and interesting, than that.

"Cold hardiness is essentially how much cold a plant can withstand before it suffers damage," Cregg said, and this can be measured quite precisely and scientifically. The simplest method involves putting a group of plants in a freezer, lowering the temperature a few set degrees at a time (commonly 3° C), removing and thawing some of the plants at each step and examining them for damage.

LT50: Deadly temperature for 50%

Higher temperatures don't affect the plants, but as the temperature drops, some damage occurs. At some point, all the plants will be damaged. When this information is plotted on a graph showing the percentage of damaged plants at each temperature level, the scientist can identify an "LT50", a lethal threshold where 50 percent of the plants are damaged.

Note that up to half are not damaged at this point, which helps explain why some plants survive temperatures they're not "supposed" to.

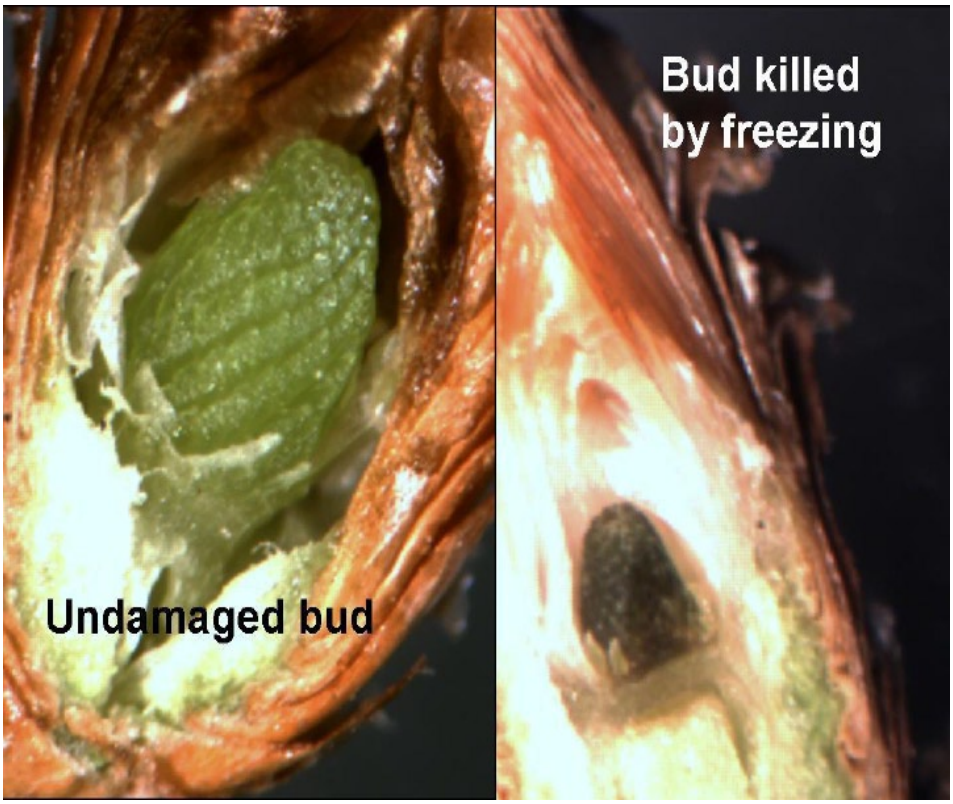
A somewhat more complicated method is called Freeze-Induced Electrolyte Leakage (FIEL) which tests, not an entire plant or shoot, but just a small portion of plant tissue: a segment of a conifer needle will suffice. Plants can stand ice between their cells, but not within their cells (intra-cellular). Intra-cellular ice disrupts the cell membranes, releasing cell contents into a solution. This can be measured with a standard conductivity meter and again, the LT50 can be plotted.

Then it gets complicated.

In fall, it takes conifers several weeks to become acclimated to cold temperatures. In one study ponderosa pine, Douglas-fir and Englemann spruce all had an LT50 of between -5°C and -10°C for about a month before dropping (to about -23° for the pine, -40° for the spruces). In other words, a sudden cold snap in early autumn might damage trees at temperatures far above their hardiness rating.

But in spring, as days lengthen and temperatures rise, the trees undergo de-acclimation, meaning they become susceptible to damage at increasingly higher temperatures. What's significant is that de-acclimation occurs much faster than acclimation and "typically," Cregg pointed out, "our most common winter injury problems occur during the de-acclimation phase as temps warm and hardiness is lost."

(Thanks to Steve Penticoff for passing this on and to Dr. Bert Cregg for permission to use the material. For the original article see https://sharepoint.cahnrs.wsu.edu/blogs/urbanhort/archive/2012/03/12/the-cold-truth.aspx)



Did you know...?

Fun facts about conifers and other interesting things

Dwarf conifer planting strategies

Conifers can be used effectively with many other plants. Care must be given to the color combinations. Pink, purple and orange go well with blue conifers. Grey conifers can accent red. Yellow conifers and yellow flowers do well but you need to be careful with other colors and experiment to your own taste. Green conifers are easy to use and show off white very well.

Conifers look good from all sides and are shown off best in raised island beds.

Consider one of these two planting strategies:

1. Plant small-sized conifers close together and move several times or decide which must be removed as they grow to specimen size.

2. Space plants with ample room between them (using growth rate information to estimate future size) and fill in with other non-conifer companion plantings. Use thyme (wooly thyme, etc.), sedum, heaths, heathers, Japanese Blood or Hakone grass, low-growing perennials and annuals for this purpose.

Honestly now, wouldn't this property look much better with a *dwarf* conifer? (It would probably be safer, too.)

Remember, so much of a conifer's garden value is in the form and outline which can be lost by poor spacing.

The ancient, adaptable bristlecone pine

Probably the most important adaptation of the bristlecone pine is its ability to let its own tissues die back when it suffers damage from fire or drought, and maintain its crown on just a small portion of living bark. Even when the usually brief summers in the White Mountains are unusually cold, the bristlecones can use reserves stored up from previous summers to help them survive the long, harsh winters.

On one 4300-year-old bristlecone pine 90% of the tree is dead, but the remainder is kept alive by a 10-inch strip of bark. And this tree still produces viable seeds.

The trees are age-dated by taking small cylinders of wood from the trunks with a special boring tool. Then the annual growth rings can be counted with a dissecting microscope.

Comparing the thickness of the annual growth gives an idea of the climatic conditions as well. With the age-dating of living trees and the even more ancient dead ones, the bristlecone pine wood preserves a climatic record of about 9000 years. Since size of tree is no indication of age, it is possible that still older trees will be discovered.

Why we "spruce up"

Sorry, coniferites, but "sprucing-up" has nothing to do with your beloved *Picea* trees. It does not refer to sweeping with spruce brooms.

Spruce is a variant of *Pruce,* which refers to the state of Prussia. In the 14th century, anything that came from Prussia was said to be "spruce." In other words, what we would call "Prussian leather" was called "spruce leather."

Spruce leather jerkins — that is, jerkins made of fine and expensive leather imported from Prussia — were much sought after by the Tudor and Stuart noblemen dandies. By the end of the 16th century, "spruce" had changed from an adjective describing goods from Prussia, to a verb meaning "to make trim and neat."

Of course, leather wasn't all that came from Prussia. Among others, there was an interesting conifer in the genus *Picea*... which we know as the spruce tree.

Slow-growing conifers are speed demons, compared to these!

While we sometimes facetiously refer to slow-growing miniature conifers as "living stones," there is a plant that even educated people once thought actually was stone: the lichen. "Spontaneously, inorganic stone becomes living plant!" marveled a Dr. Homschuch in 1819.

It might appear that way, especially since it can take 50 years for a lichen to attain the size of a shirt button and hundreds or thousands to become the size of a dinner plate.

But the truth is, lichen is a collaboration between fungi and algae. Fungi produce acids that dissolve rocks. The algae converts the minerals thus freed into food for both. Lichen existed long before the evolution of vascular plants, including conifers, and contributed much to the formation of fertile soil that could support higher plants.

Care to collect some? There are more than 20,000 species, 400 in Antarctica alone, where little else will grow... not even conifers.

Some conifer miscellany:

Conifers are one of the oldest groups of woody plants, with fossil records dating back 300 million years. Conifers are second only to food crops in terms of their economic importance. They provide raw material for lumber, paper, cardboard and chemicals. Conifers comprise about 30% of the world's forests. However, conifer-only forests are rare south of 40 degrees north latitude and very rare in the Southern Hemisphere where mixed conifer-angiosperm forests are the rule.

The Coniferite is a quarterly 4-page newsletter sent only to Central Region members of the American Conifer Society. This Special Edition is designed to increase the appreciation of conifers throughout the wider gardening community. To that end, if you'd like additional copies for your garden club, plant society, garden center, or other educational use, please contact us at coniferite@gmail.com for information. Thank you for promoting conifers!

Coaxing out the "Essence of Tree"

The "essence of tree," along with asymmetry and balance, occurs naturally in many beautiful old white pines. Skillful pruning brings these qualities to younger trees, although the Chicago Botanical Garden bonsai at the bottom is more than 1,000 years old.

Tree huggers, including conifer connoisseurs, come in many flavors. Some are plant collectors. Others are attracted to botany and related sciences, while still others lean more towards art (and remember, art is in the eye of the beholder). One branch combines art and science with Japanese history and culture in a form called *niwaki.* Yes, it's similar to *bonsai,*but... well, let's take a closer look.

***Niwaki: Pruning, Training and Shaping Trees the Japanese Way,* by Jake Hobson, Timber Press**

As with many coniferites, Jake Hobson's interest began innocently enough. After graduating from the Slade School of Art in London (note that he had studied sculpture), he toured Japan on a travel award. He was so taken with Japanese culture, especially the gardens, that he went back for an entire year as an English teacher. During that time he realized that the attraction was the garden trees, or *niwaki.* This led to a stint working, and learning, in a Japanese nursery, after which he returned to England, spending six years at Architectural Plants, an "exotics" nursery founded by Angus White. White had been importing niwaki from Japan. They were not cheap. With the help of Hobson and others who had actual experience in Japan, Architectural Plants started producing "homegrown" niwaki.

All of that provided the basis for this book.

Niwaki is perhaps most easily described to a Westerner as "large *bonsai." Bonsai* of course is a stylized and miniaturized caricature of the wildly shaped conifers growing on windy coastal or mountainous sites, perhaps dwarfed by clinging to a rocky ledge, or by the grazing of wild animals, as well as harsh climatic conditions. The main difference is that *bonsai* grows in a pot, while *niwaki* grows in the ground.

A good niwaki is a beautiful, manicured sculpture involving a living tree. On his web site Angus White says it "doesn't display the kind of symmetry that we're used to in Europe, but of something closely allied — *balance*. A well-executed niwaki is highly asymmetric and beautifully balanced at the same time."

In his book, Jake Hobson put it this way: "Observations, memories, emotions and thousands of years of cultural and practical tradition inform Japanese gardeners and nursery workers as they cultivate their garden trees, coaxing out those features believed to signify 'the essence of tree': gnarled trunks, outstretched branches, rounded canopies."

He also notes that although a broad awareness of the cultural and spiritual influences of Japanese gardens and trees provides a better understanding with which to appreciate them, "what is most important of all, from a Western point of view, is an open mind and a willingness to look."

Most of this is lost on the average American. Thus, a few large rocks on a bed of raked gravel, perhaps a stone lantern and a koi pond, are all it takes to make a "Japanese garden."

However, far worse (for our current discussion) is the bastardization of niwaki resulting in such frou-frou as "poodle" and pom-pom pruning. Topiary does have its place, perhaps: at least it's an ancient and recognized art form, even if it is a travesty. (Alexander Pope all but killed it off as a fashion with his 1713 mocking satire, "Verdant Sculpture", but it survived, and returned.) Nevertheless, there is a fine line between art and kitsch. The key words are asymmetry, balance, and *essence of tree.*

Technically, training and pruning to achieve this level of art is not unlike shearing Christmas trees or pruning apple trees or even landscape evergreens: the pruner must have a purpose, and an ideal in mind, and a working knowledge of the tree's growth habits, including its regenerative ability.

However, add to this the artistry, including the sensitivity involved in discerning the essence of tree, and this clearly takes conifer gardening to an entirely new level. — *J.B.*

" Plant what pleases you most – getting older helps you make up your mind." – John Vrablic

A man and his garden

Photos by John Jacob Vrablic

One of America's premier conifer gardens can be found on an otherwise average half-acre lot in the unpretentious town of Rossford (population 6,293) in the Toledo area of northwestern Ohio.

It began in 1986 when John Vrablic, a 40-year-old railroad engineer, was "fixing up the folks' place big-time." That included putting in a little ornamental garden with some deciduous trees, "all the wrong stuff and nothing of that is left now."

Someone advised him to check out Hidden Lake Gardens in Michigan where he just happened to meet Chub Harper who introduced him to the American Conifer Society and some sources of dwarf and miniature conifers.

"Now I have 580 conifers in all sizes plus plenty of deciduous plant material. Nothing crowded, but they don't look their best without a helping hand. This year I used about 720 bags of crushed pine needles from Georgia just for top dressing. It takes a while to weed, prune and groom and put the soft needles down one handful at a time, but I like it. I have gradually been cutting back the last few years, not as much energy and all the pain and misery that goes with the days of our lives, but the fire in me burns brighter than ever. I am thankful for the best hobby I ever had and just want to take good care of what I have as long as I can and I don't worry about it."

" I still buy small conifers that I can't live without, mostly at Gee Farms and sometimes mail order. I just want beautiful views outside year-round. What blocks out too much light I take out. If it doesn't earn its keep it has to go. I have no irrigation, I only water if I have to and that is almost never. I never hear any complaints from neighbors, but the wind blows all their leaves in my yard all winter long and I never run out of something to do but I try to do what I can and take a lot of breaks and don't overdo it or it's just not any fun. I always promote conifers but we are still in the minority: too many golfers."

A wonderful sense of artistry and the deft hand of an expert plantsman have transformed an otherwise ordinary city lot into a spectacular example of what can be accomplished with conifers.

While any garden is more impressive when seen live, a virtual tour has several advantages over a personal tour. Gardens change, year by year, season by season, day by day, and often with each passing hour. While a personal tour is a snapshot of one moment in time, John's pictures show the garden in different seasons, and over several years. Cones, colors and new growth are important in a conifer garden, this one has them in abundance, and John's excellent photographs have captured them for us.

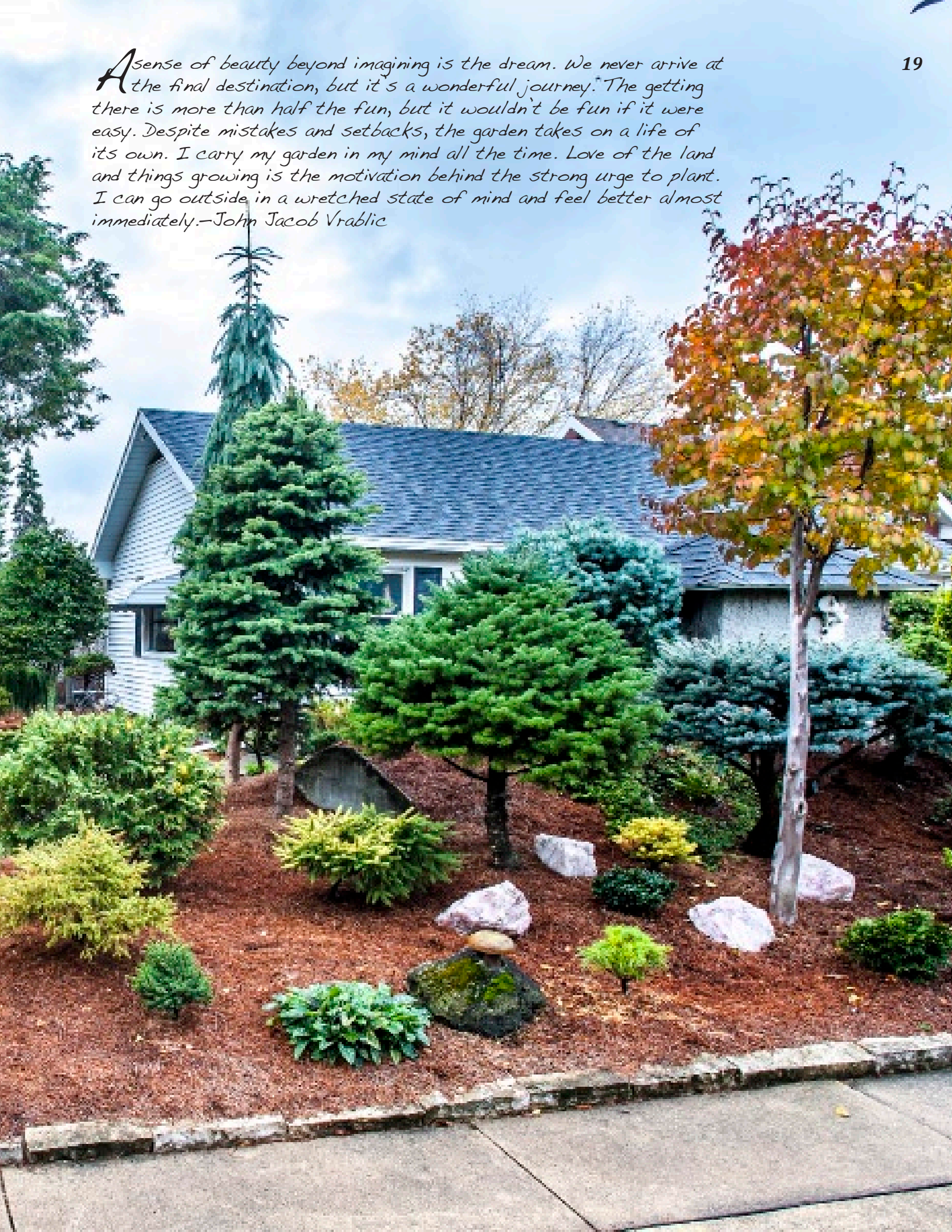
To see more, visit www.rossfordgarden.com

This garden is truly amazing. There is no wasted space, but nothing is crowded. The juxtaposition of colors, textures, shapes and sizes is superb. The variety is astounding, the curves inviting, the artifacts interesting, the rocks highly unusual, the culture impeccable. (Once, a $1,000 reward for finding the first weed during a garden tour went unclaimed.)

It's a collection, in that only those who know what they're looking at can truly appreciate its scope; only a gardener will fully comprehend the effort and care that obviously went into it; but anyone with a soul can't help but be moved by the sheer beauty of it all.

All the colors- shapes- textures- and diverse patterns which change every step I take are a phenomenal treat. – John Jacob Vrablic

A sense of beauty beyond imagining is the dream. We never arrive at the final destination, but it's a wonderful journey. The getting there is more than half the fun, but it wouldn't be fun if it were easy. Despite mistakes and setbacks, the garden takes on a life of its own. I carry my garden in my mind all the time. Love of the land and things growing is the motivation behind the strong urge to plant. I can go outside in a wretched state of mind and feel better almost immediately.—John Jacob Vrablic



The impressive trunk of a *Metasequoia glyptostroboides* in Longwood Gardens, Kennett Square, Pennsylvania. The first seeds of the dawn redwood were planted in America in 1948, so this tree is less than 75 years old.

The fascinating story of the dawn redwood

If the equivalent of finding a living dinosaur isn't enough to excite you, there's a lot more to the tree's story

Text by Jerome Belanger; Photos by Dennis Groh

Many visitors to my garden are awed, intrigued, or perhaps simply amused by some of my "weird" plants: the insanely twisted Harry Lauder's walking stick *(Corylus avellana contorta),* the loopy *Pinus banksiana* 'Uncle Fogey', the unusual gold bands on an aptly-named dragon's eye pine *(Pinus densiflora* 'Oculus Draconis'*)* or the spectral silver needles of an *Abies koreana* 'Horstmann's Silberlocke'. By comparison, the *Metasequoia glyptostroboides*, although quite attractive, doesn't appear to be very unusual — until you hear its story.

If you have the time. The story is long.

Many people are aware of the condensed version, but there's much more than that. It's rooted in a primitive isolated village in a remote area of central China, quickly spreads to Japan and both the East and West coasts of the United States, involves hazardous expeditions in bandit-infested mountains, bitter rivalries between scientific colleagues, a Chinese version of Bigfoot, paleobotanical detective work, civil war, international intrigue, a glimpse of historical global climate change and at least one killing.

Also of interest, the tree is deciduous: it's an "evergreen," but the needles turn color and fall off in autumn.

Oh, and one more thing: it supposedly became extinct about 1.5 million years ago.

Fossil remains of the tree's ancestors tell us it was widespread around the world more than 100 million years ago. It was so common in eastern Oregon that in 2005 it became the official state fossil. It survived the extinction of the dinosaurs, but then apparently became extinct itself.

We call it the dawn redwood.

Scientific classification

Kingdom:	***Plantae***
Division:	***Pinophyta***
Class:	***Pinopsida***
Order:	***Pinales***
Family:	***Cupressaceae***
Subfamily:	***Sequoioideae***
Genus:	***Metasequoia***
Species:	***M. glyptostroboides***

Binomial name

Metasequoia glyptostroboides

Hu and W.C.Cheng, 1948

If this were a movie it would start in Japan, in 1941, where paleobotanist Dr. Shigeru Miki was studying fossils of *Sequoia* (redwood) and *Taxodiaceae* (bald cypress). Many of those ancient fossils had a peculiar abnormality, namely, opposing leaves or needles, rather than the expected alternate arrangement, and they were longer than normal. These phyllotaxic (a fancy word for the arrangement of leaves on a stem) characteristics had long concerned paleobotanists: they simply didn't fit the pattern of modern forms of *Sequoia.* After extensive examination Dr. Miki decided that these taxodiaceae, meaning members of a conifer family including *Sequoia* and *Taxodiaceae* were neither of those. They represented a "new" genus, in the sense that until then it had gone unnoticed. It certainly wasn't new, for some of the fossils were hundreds of millions of years old. Miki named it *Metasequoia*, meaning "like" or "akin to" a *Sequoia,* and published his findings. But readership was limited: in 1941, Japan was at war.

By one fanciful but doubtful account, the threat of a full-scale Japanese invasion of mainland China prompted wealthy aristocrats to commission surveys of the sparsely inhabited interior, a primitive wilderness where they might relocate. For whatever reason, in 1941 forester Toh Kan (sometimes Gan Duo) was in a remote village in central China —Modaoxi or Modaoqi or Mo- ao-chi. (The use of pinyin, the romanization of standard Chinese used in many of the names in this story, sometimes makes it difficult for a researcher to follow the thread.) There he discov-

ered a most unusual tree.

Of course, this was like "discovering" America when at least eight million people already lived there: the villagers obviously knew of the tree, and others like it, but forester (later dendrology professor) Kan was unable to identify it. A small shrine was built next to one particularly large specimen which was thought to house gods, but aside from that, it wasn't considered unusual. The locals called it shui-shan, or "water-fir." It's not clear what Kan did about the find, but we do know (from some of the more than 1,000 papers about the tree published in the past 60+ years) that most of his contemporaries did not consider him the true discoverer because he followed none of the usual scientific protocols. By one account, when he saw the tree no specimens were collected because all the leaves had fallen off, but he asked Yang Lung Tsing, principal of an agricultural school in the region, to collect herbarium specimens for him.

According to Jinshuang Ma, the leading contemporary researcher of this tree, years later, after the news of the discovery of a new genus had spread to the National Central University at Chongqing, Toh Kan, by then a professor of Forest Management at the National Central University, told W. C. Cheng that he had seen the tree in the winter of 1941 and later collected some material but never preserved or identified it.

Most accounts now credit Zhan Wang, not Toh Kan, with the discovery.

Zhan Wang's biography reads like an adventure story by itself. As a poor youth in a remote mountain province he learned much about plant identification, primarily for medicinal purposes, but ran away from home, changed his name (from Yishi to Zhan or Chan) and by 1936 graduated from the Forestry Department of the Agriculture College in Beijing (Peking) University where he became an assistant professor. A year later, the university was evacuated to escape air bombing during the war with Japan. It wasn't the only time he dodged bombs. He and his family suffered severe persecution during the Cultural Revolution: his only son committed suicide.

He was appointed Forest Administrator of the newly founded Forest Survey Department in 1943, the time of a famine that killed 2-3 million peasants

This close-up is of a newer cultivar of *Metasequoia glyptostroboides.* Note how the leaves are opposing rather than alternate as in true sequoias.

(the details are yet another fascinating story) and the civil war being fought by Chiang Kai-shek and Mao Zedong. The job included forest surveys in rugged, remote, sparsely populated areas. Some accounts of this activity are particularly colorful: some say the trip was triggered by stories that the untamed Shennongjia district of central China harbored the "Wild Man," a legendary humanoid primate, like a Yeti. Zhan's report clearly rejected this hypothesis, but, meanwhile, concluded that the area was very rich in species and more complex than any other part of China. (In 2016 it was listed as a 1,256 sq. mi. World Heritage site.)

According to a brief but authoritative biography written by former students after his death in 2000, "on his way to Shennongjia Zhan was infected with malaria and had to stop in Wanxian County." It so happened that the principal of the local agricultural school was none other than Yang Lung Tsing, who also just happened to be an undergraduate classmate of Zhan. Yang wondered if Zhan could help identify a large, unusual tree in Modaoxi, obviously the one described by T. Kan. The story grabbed Zhan's attention, and he detoured his field route to Modaoxi, arriving in the late evening on July 20, 1943.

Upon examination, Zhan found that the tree was similar to Chinese swamp cypress or shui song *(Glyptostrobus pensilis),* a species widely distributed throughout southern China. However, its leaves, twigs and scales of the cones were all opposite and the cones were larger and had long stipules. Undoubtedly, the tree was not *G. pensilis* but what was it? Zhan made a note *"Glyptostrobus pensilis?"* on the specimen in the field, to remind his assistants that the tree was not *Glyptostrobus pensilis*. According to the student account, this was the first time a living *Metasequoia* was scientifically examined.

That account added, "Be aware that almost all the *Metasequoia*-related publications outside China (e.g., Spongberg, 1990) did not know Yi (1948) but only referred to the story by Hu (1948), which diminished the role of Zhan by involving T. Kan and Chung-lung Wu."

These details were found in Zhan's field journal. Later, Zhan attempted to characterize and identify the species, but the lack of references at his disposal prevented further investigation.

***Metasequoia glyptostroboides* 'Ogon' (also known in the trade as 'Gold Rush').**

However, in 1945, Zhan and the Central Forestry Experiment Institute's director showed the specimen to Cheng Wan Chun (Wanjun Zheng), a dendrology professor from the National Central University. Prof. Cheng, a conifer specialist, agreed that the specimen was different from *Glyptostrobus pensilis.* He took the specimen for further study, although it was of little help. Hsueh Chi-ju wrote later, "the specimen Mr. Wang collected had no male inflorescences and since the cones had been picked up from the ground, we didn't know how the cones

Fall color: *Calocedrus decurrens* 'Pioneer Sentry' (center) is a narrow upright form of incense cedar. *Taxodium distichum* 'Pendens' (bald cypress) is on right. At left is *Metasequoia glyptostroboides* 'Ogon' (dawn redwood cultivar also known in the trade as 'Gold Rush') .

grew on the branches. In addition, we had no information on whether it was deciduous or evergreen, on its flowering season, or on its ecological characteristics and distribution." More research was needed.

Accordingly, in 1946 Prof. Cheng sent Hsueh Chi-ju, (Jiru Xue), his graduate student, to collect additional specimens. With Zhan's directions to Modaoxi, Hsueh made two trips, in February and May.

He set forth alone on a perilous trip, at one point walking 72 adventure-filled miles, and collected the precious seeds. Years later, Hsueh wrote a modest but moving account of his solitary journey, threading foot-wide paths through narrow mountain passes on the border between Sichuan and Hubei provinces, known for its treacherous trails, infrequent visitors, ruthless robbers and murderers who beset hapless travelers. "Since we had no funds and everyone was quite hard up, I could only go to the place on my own, carrying a few pieces of simple baggage and specimen-clips." At one point he went through the forest at night, to avoid bandits: after all, there were no travelers to rob at night! Written when he was a self-described old man, he cited several acts of perhaps brash courage to show that he had once been young and strong.

He managed to find the tree, "...located at the edge of the southern end of a small street. In the twilight nothing was discernible except the withered and yellowed appearance of the whole tree. My excitement cooled. 'Am I to bring back just some dried branches?' I asked myself.

"The tree was gigantic; no one could have climbed it. As I had no specific tools, I could only throw stones at it. When the branches fell from the tree I found, to my great surprise, that there were many yellow male cones and some female cones [containing seeds] on the leafless branches. I jumped with joy and excitement!"

With the new specimens, Cheng tentatively named the tree *Chieniodendron sinense*. In the fall of 1946, Cheng sent the new specimens to Hu Hsen Hsu (Xiansu Hu), the director of the Fan Memorial Institute of Biology in Beijing, to double-check the new genus.

Hu's role was pivotal. He had been educated in America, earning his bachelor's degree at UCLA-Berkeley in 1916 and his ScD at Harvard in 1925. Consequently, he was acquainted with Berkeley paleobotanist Dr. Ralph Chaney, and the director of Harvard's Arnold Arboretum, Dr. E.D. Merrill. A significant side-note here is that Dr. Merrill was considered the foremost contributor to the taxonomy of plants of the Asia-Pacific region, having spent 22 years in the Philippines and describing approximately 3,000 new plant species, and Dr. Chaney... well, more about him in a moment.

Somehow, despite the war between their two nations, Hu had read Miki's paper. Chronologist Jinshuang Ma points out that not every Chinese botanist would have had access to recent international research, let alone that of botanists of an enemy country, but Hu was well-connected: he had studied in America, and his Beijing institute had received American funding before Pearl Harbor. In any event, he immediately realized that the living tree was identical to Miki's fossil *Metasequoia*. The discovery of the living fossil was then published (Hu & Cheng, 1948), adding the species name *glyptostroboides* to the *Metasequoia* in recognition of its similarity to *Glyptostrobus pensilis,* the water pine. Significantly, the paper made no mention of Wang.

Hu asked Merrill for $250 to mount an expedition to gather more samples, and seeds. (Merrill's explanation of the Arnold Arboretum's Chinese exploration fund, provided by Harrison W. Smith of Tahiti, himself a Harvard graduate, is yet another fascinating offshoot of this story.) Merrill considered that a bargain. In a letter to Henry Hicks, a Long Island nurseryman, he said, "In general, for what it would cost to send one man from here and cover his salary and travel expense I could maintain a dozen expeditions in China, and from each one of the dozen would receive as our share on a 50-50 split about as much material as the one man sent from here!"

Learned scientists debated the name of the new tree (including a nomen nudum, or invalid botanical name) and squabbled over its discovery. How wry then, that the common name was conjured out of thin air, in an office 6,536 miles away from the tree, by two men who knew next to nothing about trees of any kind: two newspaper men. It's a dawn redwood, and don't argue with a man who buys ink by the barrel.

In June, 1947, Chaney sent Hu $25 for seed collection. Merrill's $250 arrived in July. An August expedition returned with two kilograms of seed from different trees.

Rivalries surrounding the discovery and introduction of *Metasequoia glyptostroboides* erupted on both sides of the Pacific Ocean, and to some degree, continue today. It's amusing to note how various arboreta and organizations lay claim to being the first, or close to first, to "bring back a prehistoric relic."

As part of the deal involving the $250 grant, seeds were sent to Merrill, arriving on Jan. 5, 1948. (Cheng also sent seeds to Missouri Botanical Garden, Denmark, Amsterdam and India.) Some were planted at the Arnold Arboretum in Boston almost immediately. They germinated in less than a month. "Following long-established Arnold Arboretum practice," Merrill wrote, "packets of seeds have been widely distributed to institutions in the United States and Europe. It is, of course, not known whether this remarkable species will prove to be hardy under the rather difficult climatic conditions characteristic of the Boston area. With excellent germination records it is now certain that we shall be able to establish this ancient but now nearly extinct type in various parts of the United States and elsewhere, if not in the Northeast, then in the South or on the West Coast."

According to one probably apocryphal story, when Berkley paleobotanist Dr. Ralph Chaney got a package from China (on Jan. 9, 1948) and opened it to find cones and needles of the mysterious tree, he fainted, supposedly in the presence of Dr. Milton Silverman, science writer for the *San Francisco Chronicle,* who was in Chaney's office on another matter. Be that as it may, he determined to see these trees for himself. Two months later he was in China, thanks to funding from the Save the Redwoods League.

By that time it was accepted that the new find was a living specimen of the fossils Miki had named *Metasequoia*. Chaney told Silverman that "if this is confirmed, it will be ranked as the greatest botanical discovery of the century." Naturally, Silverman talked the *Chronicle* into sending him along, which became a key factor in the story. (Silverman's doctorate was in pharmacology, but he was first and foremost a journalist.) For one thing, although *Metasequoia glyptostroboides* was not yet the official name (and it would have been tough to use in newspaper headlines), Silverman and an editor gave it a name calculated to have more popular appeal: dawn redwood. It caught on.

But what really lit the fire were Silverman's accounts of the perilous journey to China in March, 1948. China was involved in the communist revolution. The trek involved many colorful hardships, including the killing of a bandit. Chaney and Silverman together lost 64 pounds. Comparing finding the dawn redwood to finding a live dinosaur, as Chaney did, made great headlines and captured the public imagination. Silverman's articles went far beyond San Francisco.

With this publicity, Chaney's role became glorified out of proportion to the truth. He did return with some seeds and seedlings, but the April 5, 1948 *San Francisco Chronicle* reported that "Dr. Ralph Chaney brought the tree back to America after a 250,000,000-year absence." (Recall that Dr. Merrill's seeds were already sprouting at the Arnold.) That's when Dr. Chaney was quoted as saying, "Finding a living dawn redwood is at least as remarkable as discovering a living dinosaur." He was even hailed as the "discoverer."

A dawn redwood in Wisconsin

But an editor's headline on the first of the series—"100,000,000-Year-Old Race of Redwoods: Science Makes a Spectacular Discovery"—created a whopping misperception. The wording led the public to believe that Chaney had discovered the tree. Chaney never made that claim himself. But the press coverage and resulting visibility sparked what Silverman called "a seven-year transcontinental barrage of misunderstandings, denunciations, attacks, vilification, innuendos, libel, slander, and outright lies"—much of it "ridiculously petty"—between the Harvard University botanist E. D. Merrill and Chaney over who first introduced *Metasequoia* seeds into this country, among other matters.

This did not make Dr. Merrill happy. "Credit is credit in any man's language," Merrill grumbled later. "Chaney had nothing to do with it; the Arnold Arboretum of Harvard University deserved all the credit."

Meanwhile, a similar rivalry was going on in China. Zhan Wang became a beloved professor and although he was quite modest about his role in the discovery, his adoring students felt he had been slighted, with Hu and Cheng getting all the credit. This was partly due to the power and class differences between Hu and Cheng on one hand, and Wang on the other. The first two had studied in the U.S. and France, and were prominent, well-established scholars, while Wang came from a remote village in Manchuria and was, in one description, "an ordinary teacher."

After his death in 2000, former students published an article in the journal *Taxon* in his defense:

"Discovery of *Metasequoia glyptostroboides* was perhaps one of the most significant events in natural history, evolution and paleontology in the twentieth century. News about the specimen caused a tremendous sensation within the botanical community and the general public. No other plant species has held such attention among scientists

This *Metasequoia* is a youngster. It could grow to be 200 feet tall.

and the public since the 1940s. At present, more than three hundred research papers related to this species have been published" (and 1,000 papers in toto: Ma & al., 2000; www.metasequoia.org). "Yet, Zhan's contribution in discovering the tree was completely ignored in the very first publication about the species (Hu & Cheng, 1948), even though it was recognized in later publications."

The student account continued, "Although his role in the history of *Metasequoia glyptostroboides* was distorted in many ways, Zhan never complained. He did not even tell us that there was an original publication by Yi (1948) regarding the discovery of *Metasequoia.* Zhan believed that discussing the past discovery of a new species is not as important as investigating how a living fossil species will survive in the future. He encouraged his students to focus on the species' protection and its habitat."

One of the world's leading and most revered experts on conifers begs to differ with some aspects of this scenario. In *A Natural History of Conifers* (2008) Aljos Farjon asserts that "in 1947 Cheng distributed seeds freely, and in 1948 American scientists were able to visit the location. No impenetrable wilderness here, just villages and rice fields among which some old trees survived."

Chinese accounts do say the area became more developed in recent years, but it wasn't during the period in question. Farjon, himself a world traveler in pursuit of conifers, seems not to have read Hsieh's account, and to discount or ignore reports about Chaney's 10-day journey covering 220 miles, during which their guards shot a bandit and a porter nearly fell to his death, to say nothing of that 64-lb. weight loss.

Comparing the *Metasequia glyptostroboides* with "a lot of nonsense" written about the Wollemi pine, another ancient tree, discovered in Wollemi National Park northwest of Sydney, Australia in September, 1994, Farjon notes that this also was touted as "equivalent to discovering a living dinosaur" and rails at the hype surrounding its promotion. He concedes that the dawn redwood was similarly reported by the world press, "but with less hype. Botanists and gardeners did not try to make fortunes" (as was the case with the Wollemi), "they just distributed the seeds."

They did a fine job of it. An article in the January 19, 2016 *Landscape Architecture Magazine* said, "Its discovery captivated the world, especially the American public, and made possible the myriad dawn redwoods we see today in cities, parks, and campuses on nearly every continent. *Metasequoia* dots cemeteries in Cambridge, Massachusetts, and Louisville, Kentucky. A million dawn redwoods line either side of a 30-mile-long avenue in the city of Pizhou, in Jiangsu Province. They can be seen in Chile, Japan, England, and Zimbabwe. The tree's easy cultivation in temperate climates around the globe contrasts with its increasing rarity in wild form in China, where its habitat is in decline."

Jinshuang Ma entered the fray around 2000, and brought some credibility to the muddle. He is a U.S. citizen with a PhD in plant taxonomy who was born and educated in China and taught there, and has been a researcher at Brooklyn Botanic Garden and at Harvard. Since 2000 he has been working on separating *Metasequoia* fact from fiction.

While most of the original players are dead, he has interviewed many secondaries, including descendants. His exhaustive literature research has found scientific inconsistencies and distortions, both in China and abroad. Many of the scientific records were lost during the many years of turmoil: the war with Japan, the Chinese civil war, the flight of Chiang Kai-shek's government to Taiwan, and the communist takeover. Most of what remained was lost during the Cultural Revolution. He founded the website www.metasequoia.org, devoted to everything *Metasequoia,* including directions on how to reach the original type tree in Modaoxi, which is now called Moudao.

Much of his effort has been directed at preserving the role of Wang Zhan, including one caper that would give any mystery writer fodder for a novel. In 2002 he uncovered what many had insisted didn't even exist: Wang's specimens. They were in an abandoned herbarium that had been without resources for 20 years: Jiangsu Forestry Academy, Nanjing (formerly the National Bureau of Forest Research, where Wang was employed) (Ma and Shao, 2003).

"It was very hard for me to get in the room. The academy didn't want me to see it," Ma recalls. He published the finding of Wang's specimen (in *Taxonomy,* August 2003, with Shao Guofan as his co-author) complete with photos. Despite—or because of—its negligence of the herbarium, "they (the academy) hated that I published the specimen because they thought they should have published it themselves." The specimens meant noth-

ing to them, he says. "We can't tell them what to do. More important are title and power," says Ma, than collegial sharing among scientists. "There are many things like this in China," he laments.

Meanwhile, Chaney's few articles, appearing mostly in scientific journals, seem to have focused on the role of climate. As for the Sequoia's range through the ages, he noted that "We find that it appeared at high latitudes in the Cretaceous period" 65-100 million years ago (mya), "was widely distributed there in the Eocene" (38-54 mya), "had moved south and was abundant in the United States and northern China in the Oligocene" (24-38 mya), "was more scattered in distribution during the Miocene" (5-24 mya), "and disappeared from the fossil record on both sides of the Pacific before or during the Pliocene period" (2-5 mya). "Why has it survived only in central China after living so widely around the world in other ages?"

He added, "Observations on the existing climate in the area now occupied by dawn redwoods will enable us to make some long-range weather predictions in reverse regarding the rains and winds of Manchuria and Oregon in the days when *Metasequoia* lived there and left behind its leaves and cones to be preserved as fossils."

And if climate was so important, would the tree grow elsewhere? If not, its extinction was assured: the Modaoxi natives were feeding the leaves to their cattle and using the wood in construction, and new seedlings were rare. His concern about losing the tree — this time for real, and forever —led him to plead with Chinese officials to protect the survivors.

However, the tree not only grew in North America and Europe: it flourished up to zone 5—and some nurserymen now claim zone 4—shooting up as much as three feet per year under ideal conditions. People were fascinated not only by its background story, but by its beauty. Millions were planted, in arboreta, on campuses, by churches, in private yards and gardens.

While most of the newly-planted trees were descended from the originals at Arnold, which incidentally, in the 1980s led to inbreeding weaknesses until new blood was introduced in the 1990s, Chaney did bring back seeds and four seedlings from his 1948 expedition. Anticipating problems with customs in Hawaii, he contacted a former student then working with the Department of Agriculture in Washington, to grease the skids. Unfortunately, word did not reach the inspector at Plant and Economic Quarantine in Honolulu, who proceeded to confiscate the seedlings for incineration.

Not surprisingly, Chaney demurred, protesting that the trees were priceless. According to Silverman, the ensuing argument increased in volume and violence until a nearly hysterical Chaney was shouting "millions of years, tens of millions of years, hundreds of millions of years!"

The jolted inspector composed himself and asked, "Are they more than 150 years old?"

The *Metasequoia* seedlings were officially admitted into the United States as "antiques." ■

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Recommended reading

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These first-year cuttings have been removed from the rooting chamber to their individual pots.

How to propagate conifers with cuttings

It's easier than you might imagine, saves money, and makes the hobby all the more gratifying

by **Tangula Unruh, North Dakota**

If you are like me, you started out with perennials, constantly having to divide, deadhead and feel like you should be trying out for a body-building competition after wrestling with all the overgrown plants and sometimes weeds. Not to mention avoiding inviting your friends in August since your perennial gardens are beginning to look tired.

I got started in conifers after attending a seminar presented by Gary Whittenbaugh in Grand Forks, ND. I heard this during that seminar: why should someone grow conifers?

1. No deadheading
2. No spring or fall clean up
3. Year-around beauty

I was sold! Once Gary heard that my passion lies with rooting plants or planting up seeds, he fed my obsession with many cuttings, not to mention the numerous hours we spend talking about conifers, which plants do well in my northern frigid temperatures and what conifers do well from cuttings, etc. I feel so fortunate to have such a wonderful friend and mentor.

Now, have you spent all your cash with your spring purchases and need more conifers? Did you know there are some conifers that are easy to multiply by taking cuttings and allowing them to root? Let's venture into the world of rooting conifer cuttings.

Conifers that readily root by cuttings:

Abies - koreana and balsamea cultivars
Cedrus
Chamaecyparis
Cryptomeria
Juniperus
Picea - some will root fairly easily
Podocarpus
Taxus
Tsuga
Thuja

Cuttings should be taken from healthy plants as these will root better than those from sick or stressed plants.

When and how to take cuttings

Plants have an internal chemistry that changes with the seasons. Therefore, taking the cuttings at the correct time of year is most conducive to rooting that particular plant. As a

general rule, conifer cuttings root best when taken after the first few hard frosts of fall when the plants are in dormancy. The dormancy factor is satisfied by cold temperature (35 degrees Fahrenheit down into freezing temperatures) for at least 6 weeks. I've had the highest successful percentage rooting when the conifer cuttings were taken from December through February.

When taking cuttings I like to use this season's growth as it is easier and faster to root than old wood in most cases. Basically you are taking a tip cutting two-to-three inches in length. It is entirely possible to use the old wood or past season's growth but the amount of time it takes to produce roots with these old wood cuttings is a bit longer.

Conifer cuttings root best when taken after the first few hard frosts of fall.

Remove the leaves from the bottom third of a 2-3" tip cutting, then cut the end at a severe angle, exposing as much of the cambium layer as possible.

Dip the cutting into a rooting hormone and place it into a premade hole in a soilless medium in the rooting chamber.

Preparing the rooting chamber

A greenhouse is not necessary for successful propagation. I use large clear/opaque totes as my rooting chamber. Maintaining high humidity around the cutting is critical and I find totes work perfectly and are inexpensive. I fill the tote with a soiless medium of 1:1 peat moss and perlite to a depth of about 3" to 4". If you choose to use something other than peat moss and perlite, make certain whatever medium you are using is sterilized. You will be leaving these conifer cuttings in this rooting chamber for a long time (ideally 12 months) and you do not want to introduce any pathogens which will result in mold, eventually killing your cuttings.

Once you have your soiless medium in the rooting chamber, you need to add enough water to the mix to make it damp, *not* soggy wet. Too much water and your cuttings will rot, too little water and your cuttings will dry out. I think one of the biggest keys to my success is that I use rainwater or pond water instead of tap water.

Preparing the cutting

I take my cutting, make a cut below a leaf and remove leaves from the bottom third of the cutting if possible (any foliage that comes in contact with the growing medium could rot). Then snip the end of the cut stem at a very severe angle, exposing as much of the cambium layer as possible.

I then dip my entire cutting, leaves and prepared stems, into a rooting hormone and place them into a premade hole in the soilless medium in my tote. I always take a pencil and create a hole in the pre-moistened soiless medium, as I do not want to displace any of the rooting hormone. If you are into labeling your plants in your gardens don't forget to label your cuttings. Trust me: if you put it off until later you *will* most likely forget the name.

I have used several different rooting hormones; Clonex, Rootech Cloning Gel, Olivia's Cloning Rooting Hormone... However, I have had the most success with Dip n' Grow and Dyna Gro K-L-N. If I use the gel I cannot dip the entire cutting piece in the rooting hormone. I never use the powder rooting hormones as I have never had much success with them.

Be careful with the rooting chemicals. I just dip the cuttings and place them in pre-moistened mix. Do not allow them to sit in the rooting chemicals as it will burn the tissue.

Putting it all together

Now that we have all our cuttings tucked nicely into our rooting chamber, with the lid fit tightly in place, we need bottom heat. The temperature of your medium is very important for callusing and root stimulation. I use heat mats and I also have a few waterbed heaters (Not sure if the electricians approve of waterbed heaters but they are inexpensive). Place your rooting chamber on these mats and heat to 70-72°F. Remember, we want Warm Feet and Cool Heads. I will leave my rooting chamber on these mats until March or April when the temperatures start increasing. I do have the rooting chamber in an eastern sun exposure in my house or in my greenhouse.

I peek into the containers to ensure things are looking good. I watch for mold and dry soil. I usually have to mist the plants/soil's surface with fungicide laced water about once every other week and more often if I see any signs of mold or the soil is too dry. When I mist, I mist with rain water or pond water instead of tap water.

Plese turn to the next page

Aftercare

Once I take the rooting chamber off of the heat mats I move the totes under my benches in the greenhouse. For the past few years I have been stacking all my totes outside on the north side of the greenhouse or down in my basement and mostly forget about them, only peeking periodically to ensure they are not drying out, until November or December when things in my life slow down. That is when I will pot them up. I am finding the longer I keep them in the totes, the better root systems they have. Once they are off the heat mats it is best to keep them in a shaded area and out of direct sunlight.

Some of the plants take a bit longer to root and definitely need a full year or two to root. Once you begin experimenting with cuttings you will be able to tell. You will see with these slow rooters, that they will have a large bulbous bump and no roots or a slight start of a white thick root. When you see this, you will know this specific conifer needs more rooting time.

Please note: before re-using these totes (rooting chambers), wash them out very well with bleach water. This is imperative. I lost an entire batch of cuttings from using my totes over and over without cleaning them up with bleach.

I usually keep up-potting my conifer cuttings until I get them potted into gallon containers. At this point I will plant them out in my gardens.

Growing conifers from cuttings is a rewarding experience and seeing the fruits of your labor come to life makes this hobby all the more gratifying. You can also expand your varieties by trading your newly rooted plants with fellow conifer enthusiasts. ■

Devastated forests:

Billions of trees are dead, and "it can only get worse"

Tree lovers, read it and weep: some experts claim that hundreds of different pests are devastating Canadian and American forests from coast to coast, causing billions of dollars a year in damage in addition to the loss of biodiversity. Some of the killer bugs are from other ecosystems, brought to places (through world trade and global travel) where they have no natural enemies to keep them under control. Others are moving into new territory due to the warming climate, or they're attacking trees weakened by prolonged drought.

Because total control is impossible, it can only get worse. Those experts say some tree species are already nearing extinction.

This article began as the result of a forwarded article on the hemlock wooly adelgid and the horrendous destruction it has wreaked over vast areas of the eastern U.S. but in the process of fact-checking and further investigation, it quickly became apparent that, heartbreaking as the loss of these magnificent old trees might be, it's only a part of a much larger problem.

One of the first, and still one of the most famous invasions virtually wiped out American chestnuts. In some places (such as Appalachia) one in every four hardwoods was a chestnut, many 100 feet tall and often straight and branch-free for 50 feet, with a dbh (diameter at breast height) of 4-5 feet. Around 1904 *Endothia parasitica* was introduced into the U.S. from Japanese nursery stock. Within 40 years nearly four billion American chestnut trees were dead.

Dutch elm disease arrived around 1928, with a shipment of logs from the Netherlands, destined for use as veneer in the Ohio furniture industry. Quarantine and sanitation largely confined its spread to within 150 miles of New York City, but those measures were relaxed after 1941, pressured by the demands of World War II. The disease almost completely destroyed the famous elms of "Elm City," New Haven, Conn. It reached Detroit by 1950, Chicago by 1960, Ontario in 1967, Minneapolis by 1970, Manitoba in 1975 and Saskatchewan in 1981. Of the estimated 77 million elms in North America in 1930, more than 75% had been lost by 1989.

The largest surviving urban elm forest in North America is said to be in Winnipeg, Manitoba, where around 200,000 remain — probably double the number of those in Amsterdam, the "Elm City of Europe." But not without cost. Winnipeg spends about $3 million a year on chemical warfare — and still loses 1,500-4,000 trees per year.

A newer threat is emerald ash borer (EAB), detected in Canton, Michigan in 2002, presumably introduced from abroad in shipping materials in the 1990s. EAB has killed tens of millions of ash trees thus far, and seriously threatens the other 8.7 billion throughout North America. The economic impact of the EAB is projected to reach $12.7 billion by 2020, but as with other species, that's the tip of the iceberg. The loss of *Fraxinus* from an ecosystem can have broad repercussions on invasive plants, changes in soil nutrients, and effects on wildlife that feed on ash, as well as quality of life and other considerations.

The Asian longhorned beetle *(Aniplophora glabris)* is a very destructive wood-boring beetle that prefers maples, but also infests alders, birches, elms, horse chestnuts, poplars and willows. There is no effective control.

Not all forest pests that are causing concern are imported from overseas: some natives that are relatively benign in their traditional range cause trouble when they show up elsewhere. The walnut twig beetle (WTB) is native to the U.S. Southwest and Mexico, where it lives on the Arizona walnut without causing major damage. However, it has been found as far away as Pennsylvania, where it kills eastern black walnuts *(Juglans nigra)* within three years. Large numbers of the pest can be moved in raw wood for firewood or lumber: two logs, 5-6 inches in diameter and 18 inches long, were found to contain more than 23,000 beetles.

What about conifers?

There are more than 600 species of bark beetles (family Scolytidae) in the U.S. and Canada: more than 200 in California alone. Of these, 20 are considered invasive. Ten have been discovered only since 2002.

Closer to home, we have something of a twist: a native fungus that affects mostly non-native trees. Brown spot needle blight is caused by the fungus *Mycosphaerella dearnessii* (syn. *Scirrhia acicola*). In the Great Lakes region, *Pinus ponderosa* and *P. sylvestris* are severely affected. Formerly an economic problem

How to measure average wind speed — with a fir tree

Are you one of those artistic people who finds the asymmetrical shape of a wind-blown conifer enchantingly beautiful? Or perhaps you see such trees as a testament to the connectivity of all of nature, perhaps a marriage of botany and meteorology. Bonsai enthusiasts not only marvel at the individuality of storm-shaped trees, but attempt to replicate them in their own creations.

Few of these people are aware that there's a method of classifying the extent of a tree's deformity, much less that it was designed to evaluate a site's potential for wind electric generators.

It's the Griggs-Putnam Index, based on the permanent deformation of fir trees, specifically, due to wind. It's also accurate for Douglas-fir (*Pseudotsuga menziesii*, technically not a fir) and Ponderosa pine, although it won't work with all conifers because some are inherently stiffer than others.

The index was developed to aid a survey of wind power potential in New England, resulting in the installation of the world's first megawatt-size turbine on Grandpa's Knob in Vermont in 1941.

R. F. Griggs was a botanist who collaborated with P. C. Putnam, who designed the 1.25 MW turbine manufactured by the S. Morgan Smith Company. It was the largest wind turbine in the world until 1979.

To use the scale, survey a set of five trees in open terrain. (It won't work for trees in a forest or other sheltered area.) Observe the degree of "flagging" over at least half of the tree's height. Then use the chart to determine the approximate average wind speed in that location.

There are, of course, other ways to measure wind, including the familiar Beaufort Scale and the now ubiquitous anemometer. But none of these can capture the elegance and sheer beauty of a wind-swept fir tree.

The Griggs-Putnam Index of Deformity

Index	Top View of Tree	Side View of Tree	Description	Average Wind Speed
0			No Deformity	No Significant Wind
1			Brushing and Slight Flagging	11-14 kph 7-9 mph 3-4 m/s
2			Slight Flagging	14-18 kph 9-11 mph 4-5 m/s
3			Moderate Flagging	18-21 kph 11-13 mph 5-6 m/s
4			Complete Flagging	21-26 kph 13-16 mph 6-7 m/s
5			Partial Throwing	24-29 kph 15-18 mph 7-8 m/s
6			Complete Throwing	26-34 kph 16-21 mph 8-9 m/s
7			Carpeting	35+ kph 22+ mph 10+ m/s

The mountain pine beetle alone has wiped out more than 88 million acres of timber

(Continued from previous page)

confined to longleaf pine, it's increasingly causing losses to Christmas tree plantations, as well as ornamental plantings, in the mid- and north-central states. The fungus attacks 28 species of pine over a broad geographic area but it's not commonly found in jack pine, eastern white pine or red pine *(P. banksiana, P. strobus and P. resinosa).*

The European pine shoot moth *(Rhyacionia buoliana)* was first observed in this country in 1913. It's a serious pest of mugo and red pines, but also damages Scots, Austrian, and Japanese black pines. This is not to be confused with the pine shoot beetle, *Tomicus piniperda,* a native throughout Europe, northwestern Africa and northern Asia. The first known occurrence in North America was on a Christmas tree farm near Cleveland, Ohio, in July, 1992. It has spread to 11 states and two Canadian provinces. Quarantines in both countries regulate the movement of pine logs, bark, nursery stock and Christmas trees from infested to uninfested areas. One of the most destructive shoot-feeding species in northern Europe, its primary host plant is Scots pine, but also affected are Austrian pine *(P. nigra)*, maritime pine *(P. pinaster),* eastern white pine, red pine, jack pine *(P. strobus, P. resinosa, P. banksiana)* and others. It's rarely found on spruce or larch.

According to the US Forest Service, hemlock wooly adelgid, *(Adelges tsugae)*, was first described in western North America in 1924. The current and much more serious outbreak originated near Richmond, Virginia, in 1951. HWA is now established in 18 eastern states from Massachusetts to Georgia. Molecular genetics indicate that there are several distinct populations in Asia and the western U.S. According to genetic analysis, the HWA populations now devastating the east originated in southern Japan. They cause little damage in their natural range, since natural enemies and perhaps tree resistance have evolved along with the insect. But in some areas in the U.S. 95% of the hemlocks, some 500 years old, have already died.

Arguably one of the most dramatic and widespread conifer devastations has been caused by the native mountain pine beetle, *Dendroctonus ponderosae.* Its normal role has been to attack old or weakened trees, thus aiding development of a younger forest. This pattern was changed in the mid-1990s when unusually hot, dry summers and mild winters altered the climate and ecology of the region. In addition, the beetles' proliferation was helped by a longer breeding season.

By 2013 the MPB had effectively wiped out 88 million acres of timber. ■

"I am at home among trees." — J.R.R. Tolkien, The Fellowship of the Ring

Left: Bickelhaupt Arboretum in Clinton, Iowa. Right: University of Iowa ACS Reference Garden

Have you visited an ACS Reference Garden lately?

Eight public gardens in the Central Region show the public the beauty and diversity of conifers and how they can be used in home landscapes

David Speth & Martha Smith,
CR Reference Garden Coordinator

The American Conifer Society developed a Reference Garden program in 2008 to recognize public gardens having noteworthy conifer collections and to provide opportunities to educate the public about the diversity and use of conifers in home landscapes. The ACS provides grants to assist in developing gardens highlighting the beauty, diversity and utility of conifers, and through our members, has provided expertise, assistance, and plant donations.

Implementation of the program has been delegated to the society's regions. Our Central Region elected Martha Smith as Reference Garden Coordinator and established guidelines with specific criteria necessary for a garden to be recognized as a Reference Garden. Thus far we have designated eight public gardens as Reference Gardens. The Central Region is committed to supporting these gardens and you are encouraged to visit them, perhaps volunteer where appropriate, and hopefully find a source of inspiration in developing your conifer projects.

We also hope that the Reference Gardens will help spread the word about the ACS and use of conifers to gardeners who are not yet members of the society.

These are the current Central Region Reference Gardens:

Iowa: Bickelhaupt Arboretum, Clinton, is a 14-acre outdoor museum of select, labeled trees, shrubs, groundcovers, perennials and annual flowers. The Bickelhaupt Arboretum was developed by Robert and Frances Bickelhaupt in 1970. The Heartland Collection of Garden Conifers is the arboretum's largest and most well-known collection. It was instigated by the late Chub Harper of Moline, Ill. The initial planning, bed layout, and plant selection were done during the summer and fall of 1990. There is a nice selection of older time-tested cultivars as well as some exciting newer ones. The collection has many one-of-a-kind plants that originate from witchs' brooms.

In January 2015, the Bickelhaupt Arboretum was signed over to Clinton Community College to insure the continuity of the legacy of Robert and Frances Bickelhaupt. *For more information see http://bickelhaupt.org/*

Iowa: University of Iowa Dancer's Garden & Eckstein Medical Research Building Garden are located in Iowa City. Inspired by ACS members Dennis Hermsen, Ed Rinderspacher, and Pam Maurer among others, the university began the development of several conifer-based gardens on campus in 2004. Two of the largest gardens – The Dancer's Garden and the Eckstein Medical Research Building Garden – were nominated and designated as Reference Gardens.

The Dancer's Garden is a tiered installation using limestone rock. The garden is comprised of 16 genera (four of which are deciduous), comprising 31 species, and 46 cultivars. Tucked in amongst the

Green Bay Botanical Garden

Above left: Longnecker Horticultural Gardens in Madison, Wisconsin; right, Hidden Lake Gardens. Tipton, Michigan.

plantings is a waterfall.

The Eckstein Medical Research Building Garden consists of raised beds featuring 17 genera (four of which are deciduous), 36 species and 40 cultivars.

Because of the success of these gardens, the university has added conifers throughout the campus: they are now approaching 80 different species. The gardens were recognized as an ACS Reference Garden in 2014.

Michigan: Hidden Lake Gardens is located in Tipton. Hidden Lake Gardens was donated to Michigan State University in 1945 by Harry A. Fee. In 1981, Chub Harper donated more than 350 specimens, which became the Harper Collection of Dwarf & Rare Conifers. Since then the collection has expanded to include over 500 specimens. In 2010 the garden was designated as an ACS Reference Garden. Plants from the collection are propagated by the garden staff. Many are sold to individuals to support the collection and to insure their future by being included in other collections. *For more information see: http://hiddenlakegardens.msu.edu/*

Missouri: Powell Gardens, located in Kingsville, was established in 1988, inspired by the involvement and generosity of American Conifer Society Past President Marvin Snyder. The conifer gardens have grown to include 22 genera and 81 species. Plant donations were obtained from Rich Eyre of Rich's Foxwillow Pines and Iseli Nursery. The Powell Gardens was acknowledged as an ACS Reference Garden in 2012 and was profiled in the Winter 2013 issue of *Conifer Quarterly. For additional information see: http://www.powellgardens.org/*

Ohio: Stanley M. Rowe Arboretum is located in Indian Hill. The Arboretum was founded by Stanley M. Rowe, Sr. and his wife Dorothy in 1926. Today, the arboretum, which was opened in 1987, consists of a nine-acre portion of the original site. Sections originating in the early to mid-1930s were designated for conifers with one section planted as a dwarf conifer collection.

The arboretum also contains collections of lilacs, crabapples, deciduous trees and shrubs. A decision was made to revise the collections policy to focus on conifers. It is estimated that there are over 1,300 different conifers and evergreens on display. More recently Dr. Clark West collections, including a 3rd generation seedling assortment from *Thuja occidentalis* 'Filiformis' and a group of *Thuja occidentalis* 'Rosenthalii' 3rd generation seedlings were planted. The arboretum was designated as an ACS Reference Garden in 2009. *For more information see: http://www.ci.indian-hill.oh.us/departments/rowe.html*

Wisconsin: University of Wisconsin-Madison Arboretum, Longenecker Horticultural Gardens is located in Madison. The garden's conifer collection began in 1939 with the planting of a large grove of white pine. Additional taxa were added in the late 1950s and early 1960s. Currently the collection holds over 560 taxa. Specimens are grouped according to genus with collections of pine, fir, juniper, spruce, yew, hemlock, larch, Douglas fir, and ginkgo.

From 1966 through 2015, ACS member Professor Ed Hasselkus served as garden curator and was responsible for the dynamic expansion of the gardens. The garden was designated an ACS Reference Garden in 2015. *For more information see: https://arboretum.wisc.edu/visit/*

Wisconsin: Green Bay Botanical Garden is located in Green Bay. The garden's Arendt Conifer Garden features more than 325 dwarf conifers representing 275 taxa. Over 3,250 complementary colored foliage and flowering perennials and shrubs accent the conifers. The garden highlights the use of unique forms of conifers and how they can be incorporated into home gardens. The conifer garden was designed in 2012 by ACS member Greg Meissner, and most of the initial conifer collection was supplied by ACS member Gene Arendt. The Botanical Garden was designated as an ACS Reference Garden in 2015. *For more information see: http://www.gbbg.org/*

Ohio: The Dawes Arboretum in Newark was established in 1929 by Beman Dawes and his wife Bertie. Around 1917, Dawes purchased 140 acres in Licking Township. He felt that the farm was well situated for an arboretum, being located practically in the center of the state with diversified soils and good climate for hardy trees. The farm served as a retreat from the family's residence in Columbus, as well as a place to pursue their horticultural interests.

It was Beman Dawes' aim to inspire people to plant trees. He planted trees, striving to obtain specimens from all over the world that would survive in central Ohio.

By the time the Dawes Arboretum was founded over 50,000 trees had been

Please turn to the next page

Where to buy dwarf and unusual conifers

We asked some topnotch coniferites where they get trees. Here are their recommendations:

ILLINOIS

Heartland Garden
Randy Dykstra
910 Middle Rd.
Fulton, IL 61252
Phone: 815-589-2004
Call for appointment.

J Carlson Growers Inc
Jon Carlson
8938 Newburg Road
Rockford, IL 61108
Phone: 815-332-5610
www.jcarlsongrowers.com

Rich's Foxwillow Pines Nursery
Richard and Susan Eyre
11618 McConnell Road
Woodstock, IL 60098
Phone: 815-338-7442
www.richsfoxwillowpines.com

INDIANA

Rosie's Garden Center
Ryan Hughes
10402 N. College Ave
Indianapolis, IN 46280
Phone: 317-844-6157

IOWA

Evergreen Gardens
Pam Maurer
6036 George Washington Carver
Ames, IA 50010
Phone: 515-232-7633
Mobile: 515-460-3056
www.evergreen-gardens.com

(Dawes Arboretum cont'd. from p. 31)

planted and the grounds had doubled in size to 293 acres. Beman and Bertie Dawes created the arboretum as a private foundation "To encourage the planting of forest and ornamental trees ... to give pleasure to the public and education to the youth."

Today, The Dawes Arboretum displays nearly 5,000 different types of woody plants. Active records are kept on more than 30,000 individual plants on more than 2,000 acres.

Dawes became an ACS Reference Garden in 2016. For more information see http://dawesarb.org

Hermsen Nursery
Dennis & Nancy Hermsen
11463 Jamesmeier Road
Farley, IA 52046
Phone: 563-744-3991
Call for appointment.

Lasting Beauty Landscaping
Jeff & Lora Rathje
P. O. Box 22
McCausland, IA 52758-0022
Phone: 563-225-2670
Call for appointment.

Quilted Gardens & Nursery
1895 East Army Post Road
Des Moines, IA 50320-1817
Phone: 515-288-6768
www.quiltedgardens.com

KANSAS

Family Tree Nursery
Mark Titzman
8424 Farley Street
Overland Park, KS 66212
Phone: 913-642-6503
www.familytreenursery.com

MICHIGAN

Blue Horizon Nursery and Gardens
9721 59th St,
Grand Junction, MI 49056
Phone: 269-998-8165
www.bluehorizonnursery.com

Gee Farms Nursery & Landscaping
Gary & Kaye Gee
14928 Bunkerhill Rd.
Stockbridge, MI 49285
Phone: 517-769-6772 or
1-800-860-BUSH
www.geefarms.com

Ray Wiegand's Nursery
47747 Romeo Plank Rd
Macomb, MI 48044
Phone: 586-286-3655
www.wiegandsnursery.com

MISSOURI

Frisella Nursery, Babette Briagas
550 Hwy F
Defiance, MO 63341
Phone: 636-798-2555
www.frisellanursery.com

Greenscape Gardens and Gifts
Jennifer Schamber
2832 Barrett Station Road
Manchester, MO 63021
Phone: 314-821-2440
www.greenscapegardens.com

Timberwinds Nursery, Mike Curran
54 Clarkson Road
Ellisville, MO 63011
Phone: 636-227-0095
www.timberwindsnursery.com

OHIO

Brotzman's Nursery
6899 Chapel Rd.
Madison, OH 44057
Phone: 440 482 3361
www.brotzmansnursery.com

Dannaher Nursery
12200 Vans Valley Rd.
Galena, OH 43021
Phone: 740 965 3789
www.dannaherlandscaping.com

ONTARIO

Vineland Nursery
Jim Lounsbery
4540 Martin Road
Beamsville, ON Canada
Phone: 905-562-4836
www.vinlandnurseries.com

Whistling Gardens Ltd
Darren Heimbecker
698 Concession 3
Wilsonville, ON Canada
Phone: 519-443-5773
www.whistlinggardens.ca

OREGON

Conifer Kingdom
6450 Brush Creek Dr. NE (Box 1581)
Silverton, OR 97381
Phone: 503-874-4123
www.coniferkingdom.com

Stanley & Sons Nursery
11740 SE Orient Drive
Boring, OR 97009
Office 503-663-4391
Fax 503-663-6672
conifer@teleport.com

WISCONSIN

Stonewall Nursery
Peter Moersch
763 US Highway 14
Oregon, WI 53575
Phone: (608) 835-8590
www.stonewallnursery.com

Van Zeeland Nursery
Steve Van Ryzin
1715 East Main Street
Little Chute, WI 54104
Phone: 920-788-1051
www.vanzeelandnursery.com

Some midwestern public conifer collections worth visiting:

You can learn a lot from books, magazines and the Internet, but one of the best ways to learn more about conifers is by seeing them growing. Pay attention to those in your own area of similar soil and climate, how they are used, and whether they are thriving. (Even poor examples can be instructive.)

Watch for conifer-gazing opportunities on day trips and vacations. Many of the gardens we recommend are worthy destinations in themselves.

Enjoy the adventure!

Bernheim Forest Arboretum and Nature Center, Clermont, KY
Bickelhaupt Arboretum, Clinton, IA **(2)**
Chicago Botanic Garden, Glencoe, IL **(3)**
Dawes Arboretum, Newark, OH
Dubuque Arboretum and Botanical Gardens, Dubuque, IA **(1)**
Green Bay Botanical Garden, Green Bay, WI
Hidden Lake Gardens, Tipton, MI
Iowa Arboretum, Madrid, IA
Minnesota Landscape Arboretum, Chanhassen, MN **(5)**
Missouri Botanical Garden, St. Louis, MO
Morton Arboretum, Lisle, IL **(4)**
Mt. Airy Arboretum, Cincinnati, OH
Powell Gardens, Kingsville, MO
Rowe Arboretum, Indian Hill, OH
Royal Botanical Gardens, Hamilton, Ontario, Canada
Secrest Arboretum, Wooster, OH
University of Iowa, Dancer's Garden & Eckstein Medical Research Building Garden, Iowa City
University of Tennessee Arboretum, Oak Ridge, TN
University of Wisconsin, Longenecker Garden, Madison, WI
Whistling Gardens, Wilsonville, ON Canada

Answers to back cover cone quiz:

1. *Pinus nigra,* Austrian pine
2. *Picea abies* 'Pusch' cones
3. *Abies squamata* (flaky bark fir) new cone
4. *Picea abies* 'Virgata,' Snake Branch spruce
5. Female cones *Abies concolor* 'Candicans'
6. *Picea abies* 'Reflexa' spring cones
7. *Psuedotsuga menziesii* (Douglas-fir) immature cones
8. *Abies koreana,* Korean fir
9. *Pinus contorta* var. latifolia 'Taylor's Sunburst' showing the bright yellow new growth with red imature female seed cones. This will last for about one month and then the needles turn to green.
10. *Abies koreana,* Korean fir
11. New cone on *Cedrus libani* 'Glauca Pendula'
12. *Pinus echinata* (shortleaf pine) cone

(NOTE: Members of the American Conifer Society can arrange to visit other members' private conifer collections.)

Some people like conifers so much they decorate their homes with pictures of them, but not many go as far as Chris Daeger did, as seen here.

Conifers can make a fashion statement. This beautifully intricate jacket is proudly worn by Susan Eyre, of Rich's Foxwillow Pines Nursery.

Do red cedar trees bear fruit?

No, but they do contract cedar-apple rust, as seen in this photo.

The rust is a fungal disease that requires two hosts—or victims. It affects both cedars and apples (including crabapples), but with different effects and at different times of the year. The rust galls on cedars explode into the colorful display seen here after a warm rain in April or May, but they don't damage the tree. Rust spores infecting apple trees can cause early defoliation or spotted fruit.

— Chris Daeger photo

What ardent coniferite would think of using plain old rectanglar ice cubes when conifer-shaped ones are available?

Conifers are valued for their "winter interest"

Right: conifers in winter
Below: hostas in winter

Not many members of the plant kingdom offer as much year-round interest and beauty as conifers. Their majesty sparkles with a pristine coat of snow.

Left: These berry-like fleshy cones are on a *Juniperus chinensis* 'Trautman.' They are used, fresh or dried, to flavor casseroles, meats, fruitcake and gin. "Gin" is short for the French *genièvre* or the Dutch *jenever,* both of which mean "juniper."

Why join ACS? For the meetings!

Annual meetings, regional and national, provide educational seminars, tours of private gardens, as well as opportunities to acquire extremely rare and unusual conifers in auctions, and conifer camaraderie!

*And that's only **one** of the benefits of an ACS membership.*

Our purpose: to promote the use of conifers in the garden and landscape and to educate the public about their care and conservation.

Our mission is to:

- promote the development, propagation and conservation of conifers
- encourage the appreciation and use of conifers in the landscape
- educate the public and professionals about conifers
- spread the joy, knowledge and diversity of conifers across the world!

Collectors' Conifer of the Year Program offers members an opportunity to select a rare cultivar shipped direct from growers. Proceeds benefit the ACS Scholarship fund.

Nursery Discount Program: Members receive 10% discounts at participating nurseries, as well as the privilege of shopping at a select number of wholesale nurseries and growers who do not sell directly to the public.

Our magazine, *Conifer Quarterly*

Reference Gardens are public gardens with significant conifer collections who partner with the Society to further our mission.

Scholarships are awarded for the study, development, preservation, promotion and appreciation of conifers with emphasis on the dwarf and unusual conifers in landscapes and gardens available to the public.

Join now!

www.conifersociety.org

Not all cones are pine cones!

Test your cone IQ

How many species can you identify?

(Answers on page 33.)