



Tools of the Trade

In each issue of *Arboricultural Consultant* a new topic related to the practice of arboricultural consulting is examined. The topic is discussed through the proposal of questions followed by responses from ASCA members.

The topic for the Spring 2003 issue, **Tools of the Trade**, poses scenarios using tools and equipment that a consulting arborist may use in a variety of situations through his or her practice. Following are the questions which were posed to members and responses to those questions.

Q1 I need to retain some samples of roots damaged by excavation for a possible court case which may be a year or more in the future.

How should these samples be stored to keep them in usable condition?

A1

Joe Benassini

It depends on why the samples are being retained. For example, if a sample is being retained for tree ring analysis related to a time line of events or to demonstrate the mechanics of a failure, dry storage may be acceptable. If the sample is being preserved to demonstrate an active pattern of decay, herbicide damage, or the presence of environmentally toxic materials within the tissue, any of which may dissipate over time, a more specialized method of storage might be necessary. I do not have specialized knowledge about such storage, so I would consult with the forestry department of a local university or a forensic specialist. In all cases, storage should be secure, and a chain of custody should be documented.

Russ Carlson, RCA #354

The answer will depend on the purpose of the root samples, what they are trying to demonstrate and the size and condition of the samples taken. First, photograph the roots at the time they are collected. Make more photographs at your office, if necessary, to document all the features you need for the case.

For storage, consider freezing the samples. This will preserve most physical characteristics and appearance. However, the ephemeral tissues such as root hairs, mycorrhizae and fine root tips, may not survive intact. Once the roots are thawed, you will probably not be able to re-freeze them without significant damage.

A preservative may maintain some of the features you want to preserve. Alcohol or formalin (formaldehyde) might be considered. Drying the roots is an option to keep them from further decay or invasion by molds. Again, some of the fine tissues may not remain intact well enough for later identification. If you need microscopic examination, make fresh slides and mounts of the tissues when they are fresh. Be sure you properly label all samples that are retained, with dates, identification, etc.

John Lichter, RCA #375

One could dry the roots and then freeze them to slow the rate of decay. Apparently Plant Pathologists at the University of California at Davis keep root samples in a 80 degree below zero freezer. Don't forget to take copious pictures as well.

Chris Nurczyk

When I have to store damaged plant parts, I generally dry them out and save them in a cool dry place. I have considered freezing them but am concerned about freezing causing further damage to the tissues.

Marty Shaw

It may not be possible to keep a sample in the exact condition that it was found. Since many root samples contain moisture, drying the sample will cause checking and distortion - much like O. J's bloody glove. Keeping samples frozen may also have undesired effects and distortions in the wood. . Since moisture can also promote decay, leaving the sample in moist environment may result in further degradation. The method used to preserve a sample must be compatible with what is to be preserved. If a defect is to be preserved then perhaps the sample would be preserved immersed in cold water or some wood preserving liquid. If decay fungi are to be preserved, then the sample may be frozen perhaps. In all cases, efforts should be made to photograph and document the condition of the sample before it is stored.

Don Zimar

Not my field of expertise, I would contact one of the researchers on this one.

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Q2 I have been asked to determine why a tree fell over in the wind-storm. The top of the tree appeared healthy, but I discovered that the roots were dead and just beginning to decay. Is there any way of determining accurately how long a root has been dead? Can the stage of invasion by fungi be assessed by a plant pathologist to tell me something more?

A2

Russ Carlson, RCA #354

The question here is “when did a part of the root die?” You can only address the parts that you actually examine or test. A progressive disease may take several years to kill the root from tip back to trunk.

Fungal progression depends on the tree species and vigor, the fungus, and environmental conditions. Predicting decay or disease advance is still mostly just an estimate. Sampling the roots and base of the tree might provide information that will narrow the range, even to within a year or less. This will entail a careful dissection of the wood and following annual ring patterns. Since decay actually destroys the tissues, it may not provide a fully accurate date, if the bark or some increments are missing. Annual ring production in some species is not a reliable indicator of root age.

Scott Cullen, RCA #348

I can think of two ways to determine how long a root has been dead. One would use dendrochronology to establish a known time sequence in the annual rings in the root. This may require a known event like a fire which damaged the tree or cross referencing with the rings in a large group of trees to pin down events like droughts or insect defoliations. With a known year in the cross section you may be able to count forward to the year the tree died. A second method would look at the extent and nature of decay to estimate the number of years the decay process has been active on this species of root in its setting. This would require good local knowledge and comparisons to decay of known duration. I have heard of university researchers who have worked on this but never been able to identify and contact any.

John Lichter, RCA #375

Determining how long a root has been dead at this point in time would be difficult, if not impossible. I discussed this question with Tom Smith, Forest Pathologist with the California Department of Forestry. He was not aware of any accurate means of determining how long a root has been dead by looking at pathogens present, stage of invasion, or any other means. First off, it can be difficult to identify an initial pathogen, injury or environmental stress affecting the root. Additionally, several species of fungi may have been responsible for the death and/or decay of the root and many other saprophytic fungi/bacteria/etc. may be present at the time of inspection, which do not have anything to do with the condition of the root, yet make isolation of causal agents problematic. Finally, the rate of decay can vary tremendously due to environmental conditions (i.e. soil moisture), host and fungal attributes, and other factors. In *Fungal Strategies of Wood Decay in Trees*, Schwarze, et al. indicate that determining the speed of develop-

ment of decay fungi is difficult because of the numerous factors influencing the degradation capacity of the fungus, which include species specific tree mechanisms for compartmentalizing decay (assuming a certain level of host vigor) and species specific fungal mechanisms for overcoming these “defenses.”

Chris Nurczyk

This is a difficult question to answer as the evidence is so subjective and has so many variables. If the actual causal fungus is known to infect tissues at a certain average rate, you do have something to go on. But even this is subject to the resistance level of the host, field conditions, etc. - we are dealing with living systems and ‘The Harvard Law’ (“under the best controlled conditions, an organism does what it darn well wants to”). This is best answered by indicating the individual consultant’s field experience in exploring root damage and the evidence, expressed as a professional opinion in a conclusion. As for help by a plant pathologist, they may be able to help in certain circumstances - but only if they are familiar with the species, pathogens, and patterns of infection in your local area. They will generally be expressing a professional opinion as well.

Marty Shaw

I think the real question here is “What caused the decay infection?”. Decay fungi must have a port of entry. If there are multiple events that could provide ports of entry for the decay organisms, then it becomes a matter of, “What is the most likely cause?”. It is unlikely that anyone could determine precisely how long a root has been decaying since there are a myriad of factors that contribute to the speed of decay in tree roots.

Don Zimar

Again, I would contact someone way more qualified than me.

Q3 I have taken photographs of some “normal” tree leaves to compare to photographs of tree leaves with chemical injury. The colors in the photographs are not exact representations of the colors of the real leaves. How can I capture or index the actual colors?

A3

Joe Benassini

If you are using a digital format, save the originals as they were taken. Using the tools available in most digital photo-editor software, you may be able to define colors using the tools menu. Document the original and altered settings. Both sets of photos should be presented, with a detailed explanation of how and why the photos were edited.

If you are using a 35mm format, the same may apply, using various filtering lenses to enhance colors. Again, document how and why the filters were used.

In both cases, it is important that the photos are not enhanced to represent more than what, in your opinion, exists in the field.

Russ Carlson, RCA #354

I use color charts for on site comparisons where accurate color checking is needed. Munsell color charts are available for foliage, providing a range of typical (and atypical) foliage colors. The color comparison can be used to accurately record the visible color of the leaf. I obtained a simple, inexpensive set of charts several years ago from Artistic Arborists. Including the chart in some of your photographs might help to show the comparisons. Also, photographs of the leaves side-by-side might help, if that is possible.

Digital colorimeters are also now available that will accurately read the color. These are more precise than charts, but much more costly. Remember that photography will not always record accurate colors, due

to differences in film emulsions, digital color corrections, exposure and lighting, and other factors.

Chris Nurczyk

In these cases, I generally locate a healthy plant of the same species on the same day and photograph it with the same camera and film with similar exposures, ‘bracketing’ each exposure with one or two settings and comparing the results to present a reasonable approximation of the actual color contrast I observed in the field. All film affects color by favoring certain shades, as does exposure.

Marty Shaw

It is the damage that is being documented. Damaged and undamaged herbarium samples can be taken and preserved for later comparison. Also, images taken of damaged and undamaged plant material can be taken using the same camera settings for side by side comparison.

Don Zimar

Color photographs are not reliable for capturing colors. They fade and change with time. Color slides are much better, but still degrade with time. I am not certain with digital quality. There are many variables associated with photography, mostly related to the knowledge, skill, and experience of the photographer. This would be an excellent topic for a presentation at the next ASCA meeting - a professional still photographer giving a primer on issues for Arborists would be delightful.

Q4 I use both a 35mm and a digital camera in my work.

Is the court system generally accepting both formats if I include this media into my reports or offer as evidence in a case?

A4

Joe Benassini

In my experience, I have submitted both 35mm and digital photos without challenge. Forensic Imaging Courses, offered by various institutions, typically offer classes which include training in both formats.

Russ Carlson, RCA #354

The principal requirements to admit a photograph into evidence are relevance and authentication. The most important is authentication. Unless the photograph is admitted by stipulation of the parties, the party introducing the photograph into evidence must be prepared to present testimony that the photograph is accurate and correct. In most cases, the testimony doesn't have to be from the photographer- any witness can testify that a photograph accurately portrays a familiar scene. If authenticity is challenged, the judge must make the decision to admit it or not. This is not dissimilar to other types of evidence in that respect. The trier of fact (judge/jury) has the burden of deciding if the testimony is reliable. Since photography was first introduced into the courtroom authenticity has been challenged. The difference now is that digital images can be easily manipulated by almost anyone, and leave little or no evidence of tampering. Even film images can be digitized and recreated after modification. If you are concerned or your client-attorney instructs you, create file copies of the original digital images that cannot be changed,

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Defensible Appraisal

In my capacity as a consultant, I have for several years employed the Trunk Formula Method (TFM) only in rare cases. It is my impression however, based on questions I receive and the reports of others that cross my desk, that many other appraisers, particularly consultants who are relatively new to appraisal, use TFM exclusively and feel TFM is why the Guide is written. In this article I would like to caution appraisers to think through the possible challenges that may develop regarding any appraisal.

If you are to be successful defending an appraisal, you will need to be prepared to answer, hopefully in simple terms, questions that arise regarding how and why you employed the method and its protocols. The vast majority of the questions asked the CTLA committee members regard TFM, and many of these questions are being asked by folks who have years of experience in the appraisal process. The volume of questions received regarding TFM suggests to me that many appraisers are not fully prepared to explain TFM if challenged. It has been my unfortunate experience that many of these questions can *and will* appear at the most uncomfortable times, like when you're sitting in the witness box. Defending the reasoning you employed in using the retail cost and a 90% condition factor, when the opposing expert used the wholesale cost and a 75% condition factor can quickly become lengthy and challenging. Even if you're perfectly capable of explaining all of the intricacies of TFM the judge will probably fall asleep.

While TFM may be the only method applicable in certain circumstances, *please* consider it as only one tool in your toolbox. My most used method of appraisal? Easy - Cost of Cure! With a little creative but *reasonable* thinking, the concept of developing a value by restoring the approximate level of benefit enjoyed by a property owner prior to an event can be simple and defensible. If I offer a total value to first, cleanup and repair an affected site, then restore within reason the approximate level of benefit previously enjoyed by the owner (this is of course the creative part, but trust me, it *can be done* in many cases), and finally, offer a cost to provide after care, I have a simple and defensible appraisal. The process is easily explained to a layperson and the values are hard numbers offered by local contractors to supply material and perform services.

Any appraisal method *selected by you* must be defensible *by you*. The most defensible appraisals will be those that are as simple as possible, reasonable in scope, and are based on methods you fully understand and are comfortable employing. I have developed numerous Cost of Cure estimates for clients, and on completion, I have always been confident of my ability to thoroughly defend those appraisals. Is Cost of Cure always applicable and defensible? Nope; but we're trying to have the perfect appraisal method ready for Edition 13!

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such as on CD-ROM. Also, record any modifications you make such as brightness, contrast or minor color corrections. These are usually accepted modifications. If you make substantial changes to the content ('digital pruning') be sure you document the process, and be sure you keep a copy of the original for comparison. This type of manipulation will seldom be used in a litigation case, except perhaps as a demonstration exhibit. Refer to the Federal Rules of Evidence, ARTICLE X. CONTENTS OF WRITINGS, RECORDINGS, AND PHOTOGRAPHS. Most state's rules will follow this, but check your state to be sure.

Chris Nurczyk

Digital cameras are wonderful and easy to use for non-court work. But digital images are so easily manipulated, and this ability is so readily understood by most people (they can do it at home on their computer) that I doubt that digital images could stand up to good photos in court. This is to say nothing of computer generated images themselves. We actually have a crisis of belief in accuracy of images in media by the general public in recent times because of this. With a photo you can produce a negative as proof of the original image, but a digital image has no such equivalent that I am aware of.

Marty Shaw

The courts are treating photographic evidence from either source in like manner.

Don Zimar

Have never had either challenged in court. If using digital, most courts will want prints provided to enter as evidence and distribute to litigants.

Q5 Is there a guide or handbook of generally accepted forensic procedures that is applicable to an analysis of tree failures or other cases?

A5

Russ Carlson, RCA #354

One of the best sources I have found in preparing for a litigation case is The Comprehensive Forensic Services Manual, Steven Babitsky, JD, James Mangraviti, Jr., JD, and Christopher Todd, JD, 2000 SEAK, Inc. Available from seak.com or www.amazon.com/exec/obidos/ASIN/1892904071/treetechconsulti.

Chris Nurczyk

No.

Don Zimar

Not that I have heard of, but I am very interested if someone else has.