The Loss Of An Old Friend.

The story of what happened to the male *Phytolacca dioica x weberbauri* in the Palomar College Arboretum.

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Introduction

In December of 2013 the Palomar College Grounds Department was faced with a painful and unfortunate decision. They were forced to remove a large and beautiful specimen of *Phytolacca dioica x weberbaueri*, because it had become so infected with an unknown root pathogen, that there was no doubt, in the coming years it was in danger of toppling over. Sadly the specimen had been in decline for at least two years and was the largest "tree" on campus.



This image taken from Wayne's Word, shows the tree as it was in 2006.

Incorrectly referred to as a tree, Phytolacca, or Ombu as they are called in their native lands, are not true trees at all. They are actually giant herbs. Our specimen was a hybrid between *Phytolacca dioica and P. weberbaueri*. Massive plants themselves, they are native to the **Pampas** (Plains) of South America. Similar species are found in mild temperate and subtropical regions throughout the world. With most species being small annuals, there is even a native North American species called Pokeweed, or *Phytolacca americana*. Wayne Armstrong has a great article pertaining to this on his site:

http://waynesword.palomar.edu/ecoph24.htm

As best anyone knows, this hybrid species has never been seen in the wild and was the result of an incidental and accidental fertilization between the two species at the Huntington Botanical gardens in San Marino California over 40 years ago. The Huntington has one female *P. dioica* and one male *P. weberbaueri* very close to each other. Bees or wind transfer the pollen and the result is a hybrid. (*Peers comm*) A few seedlings were donated to the college by the Huntington in the early 1970s for planting in the Arboretum. Robert James Kelly, who was a very active promoter, founder and advocate of the Arboretum, was the person who is said to have chosen the planting location for this plant.

Collectively, the plants in this genus do not develop lignified (hardened) wood composed of multiple layers of old dead cells "tightly adhered to each other" in the same manner that true trees do. Instead, the limbs and trunk act like giant water tanks, with relatively large spaces between each layer. Ultimately these layers provide an area for the water to accumulate. One might think this adaptation to be a great advantage for surviving drought; however the rains fall on the Pampas nearly year round and the adaptation may in fact have allowed these "Pseudo-Trees", to survive the occasional grass fires that ravage the lands from which the parents of our tree originated. In the wild P. dioica and P. weberbaueri can receive 20-47" of rain annually. Yet, in cultivation they have indeed proved to be resilient to drought conditions, surviving on only 15-20" inches of rainfall annually. Some have argued the plants can even survive on quite a bit less water, possibly as low as 8-15 inches annually. (Peers-Comm)



An Oak branch on the left and a branch of nearly the same dimensions from the P. dioica X weberbaurii. After some decomposition, side by side they show the vast difference in dead wood structure.

As you saw in the images above, when a branch dies it dehydrates and becomes reminiscent of a cylindrical mass of multiple layers of very thin shredded cardboard.

In addition to the water storage potential, the plants have a remarkable and unique advantage for healing damaged tissues by possessing what scientists refer to as **"Successive Cambia"**. In short this basically means that each ring has the potential to generate caulis (wound covering/healing) tissues. Thus wounds heal both from the outside and inside. This is fairly unique for plants especially for anything that attains the size and dimensions of a large tree. On nearly every other plant on the planet, this healing occurs only from the outer most edge of a cut branch. Again, this could also have been an adaptation that allowed the plants to survive the frequent grass fires that ravage the Pampas.



A *Phytolacca dioica x weberbauri* branch showing its ability to develop caulis tissue from multiple rings at the site of removed limb, indicating the possible presence of multiple cambium layers. This is an extremely rare adaptation among plants.

Lastly, the growth rate of these plants is remarkable. Not nearly as fast as Giant Kelp or Bamboo, (which can exceed rates of 2-3 feet per day in ideal conditions) but rapid none the less. We have seen sucker growth on a healthy tree rise 20-40 feet into the canopy of older established trees within 6-10 months. That would equate to 4 feet per month or 12 inches per week and 1.7 inches of growth per day. This is absolutely remarkable growth from a plant whose most common relatives rarely get more than 4-8 inches in diameter and perhaps 6-10 feet tall at best. One can only surmise that this too is a possible regenerative adaptation that allowed the plants to quickly recover from fire.

In the case of the hybrid, total eventual height is much greater than the two parent species, maxing out at approximately 80-100 feet tall. It is plausible that the genetics of its large parents were passed on and caused what is known in science as **"Hybrid Vigor"**, which often results in larger, faster growing progeny.

Over the years three of these magnificent hybrid "Pseudo-Trees" were planted in the Arboretum. Three *Phytolacca dioica* specimens, were also present in the Arboretum collection. Sadly, one of the hybrids and one of the *P. dioica* had succumbed

to a mysterious root pathogen by 2008. Another *P. dioica* had to be removed because it had toppled over in a winter storm. Years of squirrel activity had undermined the massive root system and was the primary cause of the tree toppling over. Until recently there was one Male *P. dioica* and two hybrids: One female which is still growing at the East entrance to the Arboretum and the male who was removed in December 2013.

The Downward Spiral

As mentioned earlier it is assumed that a root pathogen caused the demise of the recent loss and that it was the same pathogen that infected and destroyed the others in years past. Frustratingly the symptoms are hard to identify at first. It is possible that the infection travels into wounded tissues either from damaged surface roots or from large pruning wounds in the canopy. At this point there is no way to be certain, due to the lack of evidence. However, based on the quick decay and collapse of roots, it is likely a safe assumption that the roots are affected first.

The true species as well as the hybrids often go semi deciduous in the winter months, with the greatest leaf drop during the coldest of winters. However in at least the case of the most recent loss, the plant did not re-leaf in the spring as it usually would have. It was not until late summer/early fall that a large root, roughly 12-18 inches in diameter was seen damaged and apparently infected by an unknown root pathogen. At this point, a closer look at the canopy was done.



This image shows the *Phytolacca dioica* that was removed in the late 2000's due its rotted collapsing roots. This was identical to what was seen in the male hybrid in 2012.



The male *Phytolacca dioica x weberbauri* in the spring of 2012.



Large wounds like the one seen in the image above were prevalent in the canopy. This damage occurred due to massive heavy limbs, breaking and tearing away, thanks to gravity's never-ending downward pull.



Strange colorless areas in the leafs, were seen in the sucker growth, near the base of the plant. These lesions were almost reminiscent of a virus like Tobacco Mosaic Virus.



Slight discoloration was seen in branch tissues, often seemingly starting at the lenticels or respiring tissues of the branch.



A cross section of the internal tissues showed that the damage was not limited to the surface tissues, but had spread multiple layers into the branch.

The decay causing organism had spread so rapidly that there was concerns about whether treating the plant would be successful. Initially, we had opted to try and inject the hybrid with chemicals to help it fight off the disease. The problem here is that without knowing what to treat for and the already severe progression of the disease prevented us from knowing what to treat with, or that a treatment would be effective at all. Typically, when a plants' vascular (water moving) tissues are so badly damaged there is little that can be done to heal them. Even if we had injected the plant it was very doubtful any chemical would have transferred through the cells to prevent further decay. We sent samples to the San Diego County Ag Department in 2012, but they only found secondary infectious agents. This means that the cell destruction and tissue decay had progressed such that non plant killing organisms, like some species of fungi and bacteria had already begun to feed on the dead and dying.



As the infection spread throughout the plant tissues large sections of branches and stems began to discolor and soften.



Eventually entire branches and stems became completely brown and began to ooze or bleed a dark brown/black viscous fluid.

As a result we opted not to treat the plant and leave the plant to its natural defenses. A frustrating decision to say the least! Ultimately this pathogen had caused such severe root damage that "<u>Our</u> **Friend**" was no longer capable of safely supporting itself. By October of 2013 we knew in time eventually, even this mighty tree-like plant would succumb to the forces of nature and fall down. To prevent any unfortunate damage to the surrounding specimens and by-standers the plant had to be removed. Sadly, these plants are weak and prone to this mysterious root rotting pathogen and we have lost four of these plants over the years, all but one to what we assume is the same pathogen. San Diego Botanic Gardens has lost a few over the years ago, had fallen and destroyed all the under growth. The Wild Animal Park also has had to remove some of these plants over the years.



Large collapsing depressions in the stump reveal how severely aggressive the decaying organism is.



This image shows the north side of the stump, sending home the totality of the decay.



Another image of the same type of decay seen above, on the opposite side of the plant.

Over the last two years I have discovered many possible culprits, which have been positively identified. Most recently, I came across an article that indicated the possibility of the pathogen being a species of bacteria, most likely an *Erwinia sp*. Another article indicated *Phytophthora nicotianae* a common and destructive water mold as a possible cause. (*A. Belisaro, M. Maccaroni, and L. Corazza, 2003*) During the removal of the tree in December, we discovered some fungi. Samples were collected and taken to the San Diego County Ag Department for identification. The Department later indicated that these were decaying or decomposing fungi and not pathogenic species.



As yet unidentified Fungus on branch.



As yet unidentified fungus on roots. Possibly an Armillaria sp.

Many have noticed that the stump is now sending out new healthy looking shoots. Unfortunately every plant that has lost its masses to this pathogen has done the same. In years past we tried to let the new growth grow out in the hopes it might make a comeback. Hoping that it might develop into a new massive healthy "tree".... Every time being gravely disappointed that is has not.



The stump as seen in March 2014

Sadly, whatever pathogen this is, it is viciously aggressive and it is has already staked its claim on the life of this Old Friend of Ours.

Resolution

The good news is our Female still has seeds and we can save those in our seed bank for later planting. Right now, she is dropping her leafs for the year and preparing to flush new growth just as she does every year. No one knows how long these trees live and being a hybrid they may not live long. These plants grow so fast, they are hard to keep up with and with the small crew we have available to maintain the whole campus, having only one or two is a blessing. In the future, we will plant another to replace the one lost in December and hopefully by then we will know what the pathogen was and be ready to treat for it should it rear its ugly head again.



The Female Tree with her non edible seed baring fruits.

Thoughts For the Future

Since the "tree" was removed a few students, staff faculty and community members have asked why this spectacular plant was destroyed.

"Was it to accommodate the New Child Care Center?? I hope not! If so that is ridiculous, and unacceptable!!!"

Obviously, after reading this we all now know that the answer is no. It was removed because it was dying and becoming a safety hazard. The decision to do so was not an easy one!

It is great to see that people care though!!! This is a perfect example of why the Arboretum, the gardens on campus and the renovation of the Arboretum are so important. The community does have an interest and it is important for us all to learn about and be concerned with environmental projects and issues.

In a world where monetary or material wealth seems to be the primary motivator for human

progress, often the things that are destroyed are those that have no voice. Greed; the great empire builder does not have time, or heart for anything or anyone who stands in the path of its quest for progress. It motivates blindly through time, leaving a wake of destruction in its path. Humanity; like no other time in recorded history, has been a species so destructive to the very thing it depends upon for survival.

We are just now beginning to see the fruits of our labor, and sadly those fruit are bitter and with little nourishment. Only in the last 20-30 years have we begun to see how truly destructive our selfish actions have been to a planet who nurtured us for so long. A planet that may be growing too weak to care for us any longer. The earth itself is akin to a giant recycling plant. New things are born from the old, even the crust of the earth geologists tell us is recycled. Today, "we" recycle and we are now beginning to take active roles in conserving our natural resources. Even the planets spectacular and beautiful bio diversity is becoming a common topic of discussion in our daily lives.

Yes, these efforts are bold and new by modern standards, but many cultures around the world have been doing these things and so much more for generations. They knew if we did not make the stability of the environment a social responsibility they would eventually have nothing to sustain themselves. A slightly narcissistic view perhaps? To care for something only because you depend upon it... Perhaps; but this quandary of a paradigm is a reality. Is this all too little too late though? I suppose progress will tell.

It is important to remember that our world is a system, one that can and does adapt like a super computer; constantly working to keep complex equations accurate, ensuring everything runs to the betterment of the whole, despite the occasional glitch. Occasionally rebooting

Today, like no other generation before us, we have more means and methods at our disposal than ever before. We can chose to truly learn about what is left and preserve it. Or we can continue down the path of those before us.....

The story of this Tree-Like plant at Palomar College, is not unique among trees, nor is it truly a special one. It is one though that parallels what humanity faces each day, as we struggle with finding the balance between progress and protecting the environment. Even if it is an artificial environment, manmade crafted and planted by man's own hands. Rest assured as "progress continues on campus there are many knowledgeable caring individuals who are working to preserve habitat, gardens and specimens on this uniquely planted campus, for the future generations who will visit and attend this equally spectacular community college.

Palomar Community College District,

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Please feel free to contact me if you have any questions, or would like to get involved with the Arboretum and or any of the other great gardens on Campus.

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The Arboretum web page is a great place to start learning about the fantastic plants on campus and the natural world around us.

http://www.palomar.edu/arboretum/

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