

THE MYSTERIOUS DECLINE OF SCREWBEAN MESQUITE ALONG THE LOWER COLORADO RIVER

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*Abstract: In May 2005 we noticed that screwbean mesquite (*Prosopis pubescens*) growing along the lower Colorado River were apparently declining in vigor. By September 2007 77% of screwbean individuals from Bullhead City, Arizona to Yuma, Arizona were seriously diseased. The epidemiology of the situation is not understood. A concomitant reduction in wildlife, especially birds, would parallel a large loss of screwbean mesquite habitats. Biologists and those agencies involved with managing and protecting wildlife along the lower Colorado River should give this problem immediate serious attention. Screwbean should not be used in revegetation (mitigation) projects for the foreseeable future.*

INTRODUCTION

In May 2005 we noticed that mature screwbean mesquite (*Prosopis pubescens*) growing along the Colorado River southeast of Blythe, California (Goose Flats) were dying. As the 2005 growing season progressed we noted additional trees declining in general vigor.

Typically screwbean decline somewhat in lushness from the beginning to the end of a long, hot, and dry growing season. What I am reporting transcends any of the normal alterations of vigor. This is something new, at least on the scale described, and it is serious.

By spring 2006 it was apparent that the situation was worsening; significantly more screwbean were yellowish in color and some were dead or near death. At that point we began making formal counts that involved simply tallying the number of trees that were affected. It may mark the initiation of a major development involving riparian habitats along the lower Colorado River. This new impact on an already highly degraded riparian zone will have a large negative impact on the beleaguered wildlife in the area. We hope that this report will stimulate serious investigation into the epidemiology, pathology, and other aspects surrounding this situation.

METHODS

We estimated the extent of damage by simply counting normal and affected trees in areas populated with relatively significant numbers of screwbean. Counts were made at 7 localities from Bullhead City to Yuma (Fig. 1.). The first formal count was in September 2006 at Goose Flats nears Blythe, California with additional counts being made from June through September 2007. Counts, made along transects, include trees lateral to the transect at distances no further than I can identify individual trees both as to species and degree of affliction—a distance of 30 m or so. Each tree is recorded as being in one of two categories: (1) apparently unaffected or lightly affected, (2) obviously affected. The most obvious affected tree is dead. To avoid counting dead trees that may have been present prior to, say 2005, and therefore the cause of death perhaps being due to something other than this new malady, we conduct surveys in areas familiar to us where we no that screwbean are generally robust; trees that died prior to 2005 occur in small numbers (<1%). Beyond that, recently dead trees usually have seed lying around and under their canopy. For example a tree producing large amounts of seed in 2006 might be dead in 2007, but pods produced the preceding year are still abundant under the tree. Pods have long since disappeared from under long dead trees. When there is doubt about when the tree died it is omitted from the count. A majority of limbs are dead on many trees or there is a significant number of small dead branches, while on other limbs the leaves are sparse and yellow.

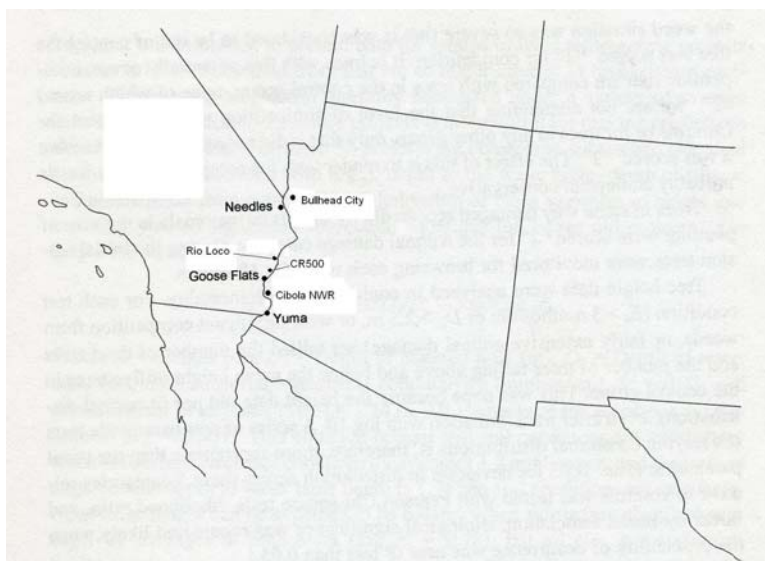


Figure 1. Locations where counts of affected and unaffected screwbean mesquite in 2006 and 2007 were made.

RESULTS

During the 2005 and 2006 seasons I was present almost daily where the screwbean malady was spreading. This gave me the opportunity to observe development of this disease. Newly infected trees typically declined in health rapidly, going from barely infected (a few yellowish limbs) to trees with mostly dead limbs within three months. I also observed that once the first affected trees were observed the malady spread rapidly affecting nearly all trees in the area within two growing seasons.

Seriously affected trees and relatively unaffected trees can be seen in Fig. 2. When affected trees contain mistletoe, the mistletoe dies as the tree dies (Fig. 3). Pod production typically decreases to little or none within a year. In the spring screwbean often have a yellowish color due to copious presence of yellow flowers. However, if the yellowish color, such as that seen in Fig 4, is due to a yellowing of the usual green leaves, it is a clear sign of an infected tree—seemingly such trees are doomed. We have observed no reversals. Total loss of leaves, perhaps indicating death of limbs follows closely on the heels of the spreading leaf discoloration. Occasionally one or a small number of limbs will remain green over the first season after symptoms are detected. The health of some limbs are somehow maintained into the subsequent growing season, but inexorably the entire tree is overcome.

Screwbean planted in 2004 on a revegetation site that was embedded in a general area where screwbean were abundant remained at least superficially healthy and displayed robust growth through 2006. In fall 2006 less than 1% of 4000 screwbean were noticeably affected (Fig. 5). They showed vigorous growth in spring 2007 and an estimate indicated that four percent were affected by the end of June. However by the end of July noticeably affected trees accounted for one-third of the total and by the end of August virtually none were unaffected.

In October 2007 virtually all screwbean were significantly affected in Yuma and in areas adjacent to and on the Cibola National Wildlife Refuge (Fig. 6). Further north the proportion of affected screwbean was 60% in fall 2006 but this had increased to more than 85% by mid-June and had spread to virtually 100% by early September 2007 although no formal count was made at that time. A count seemed unnecessary because the impact was so obvious to even casual observation. At localities located to the north of Goose Flats the proportion of affected trees was observed to be less than at points south. For example only a few km north of Goose Flats only about 45% were obviously affected and 40 km further north, at Rio Loco, 78% were affected in September 2007. On the Havasu National Wildlife Refuge just over 40% appeared obviously affected in July, but 30 days later that proportion had grown to just over 50% (Fig. 6). In September 2007 about 78% of 225 screwbean adjacent the Colorado River near Bullhead City had been significantly affected.

Among 1593 screwbean included in the last survey at each locality roughly 77% were clearly afflicted with some strange malady that seems to eventually kill trees showing the early symptoms described above (Fig. 6).

DISCUSSION

What is the cause of this malady? There are several possibilities. Perhaps foremost among them is that it is some microbiological agent (virus, bacterium, fungus, etc.). But how is it being transmitted? Did it ride in on the wind? Was it brought in on some alien plant recently introduced to the area? Was it brought in more directly by man for example with an insect introduced to control salt cedar (*Tamarix ramosissima*)?

Intentional delivery of alien biological control agents involves risks to native flora and fauna as well as to agriculture. Sadly, there is serious talk about doing just that in some quarters where concern for native vegetation and wildlife are nonexistent. Historically, flights from reality in order to control pests include many infamous examples of ecological disasters, as famously documented by Rachel Carson (1962). We cannot exclude some misguided effort to control salt cedar being involved.

If screwbean are the unintended victims of some misguided plan to control saltcedar involving a combination of biological agents the observations of damage, so obvious on screwbean, should be apparent on other salt cedar. We can say that many salt cedar appear to be less than robust in the areas where screwbean are afflicted with this new malady, but whether this is related to the decline of screwbean is uncertain.

But couldn't the decline in screwbean health be related to the weather? Indeed, perhaps our current extended period of dry conditions has exacerbated the situation. As stated earlier, some of the initial observations on screwbean decline were in an area where soil moisture levels were quite adequate and soil salinity levels were well within the tolerance levels of screwbean (Anderson, et al 2004). On one four-year old revegetation project, planted screwbean are now showing declines similar to those in adjacent vegetation; the planted trees have been irrigated throughout the 2007 growing season. Beyond that, some of the planted trees were planted where soil moisture levels were satisfactory and in addition they, too, were being irrigated. All of these trees are now showing the same symptoms to the same extent as the screwbean growing naturally in the area.

What is the eventual outcome for screwbean? Unless there is sudden reversal of the trend that has been developing since at least 2005, screwbean appear to be headed for drastic reduction and, perhaps, extinction in the lower Colorado River Valley. Any drastic reduction in the numbers of screwbean mesquite without replacement would have a huge negative impact on wildlife, especially birds.

Screwbean mesquite habitats account for about 17% of the riparian vegetation in the lower Colorado River (Yunker and Andersen 1986), ranking second only to salt cedar. Although cottonwood/willow habitats are more valuable to wildlife, especially birds, it is now a relatively scarce habitat and is home for only about 8% of the current avifauna with salt cedar accounting for 45% and screwbean an additional 25% of the summer avifauna (calculations from data in Anderson, et al 2004, adjusted for abundance of each habitat type). These calculations suggest the magnitude of the impact of a drastic reduction in the screwbean habitats. Of course, with the loss of screwbean from the screwbean habitats these areas will not become bare ground.

Other plant species are well represented within what is defined as a screwbean habitat, especially arrowweed and salt cedar (see e.g. Anderson et al 2004). These species would no doubt expand. In my experience arrowweed expands into in these kinds of habitats faster than salt cedar, so I expect to see an increase in the amount of arrowweed. Most of the negatively impacted bird species will still be represented in former screwbean habitats albeit in reduced numbers for a while. In the long run, however, arrowweed supports less wildlife than any of the other major habitat types (Anderson and Ohmart 1984, 1986, Anderson et al 2004).

The frontispiece shows a screwbean mesquite habitat in 2004 in the upper photograph compared to one as it looked in 2007. I am not aware of a single healthy looking stand of screwbean anywhere from Davis Dam to Yuma as of October 2007.

Planting screwbean mesquite should be avoided for mitigation projects in the foreseeable future and it is ill-advised to plant them for any revegetation project.

LITERATURE CITED

- Anderson, B. W., P. E. Russell, and R. D. Ohmart. 2004. Riparian revegetation. Avvar Books. Blythe, California.
- Anderson, B. W. and R. D. Ohmart. 1984. Vegetation management study for wildlife enhancement along the lower Colorado River. U. S. Bureau of Reclamation. Lower Colorado Region. Boulder City, NV.
- Carson, R. 1962. Silent spring. Houghton Mifflin Co. Boston.
- Ohmart, R. D., B. W. Anderson, and W. C. Hunter. 1988. The ecology of the lower Colorado River from Davis Dam to the Mexico-United States International Boundary. A community profile. U. S. Fish and Wildlife Service Biological Report 85 (7.19).
- Yunker, G. L. and C. W. Andersen. 1986. Mapping methods and vegetation changes along the lower Colorado River between Davis Dam and the border with Mexico. Final Report. U. S. Bureau of Reclamation, Lower Colorado Region. Boulder City, Nevada.



Fig. 2. In both of these photographs the screwbean mesquite on the left appear more or less normal while those on the right are seriously affected. These photographs were taken in June 2006; by the September 2007 the screwbean on the left had an appearance similar to those on the right.



Figure. 3. Screwbean mesquite is often a home for mistletoe (*Phoradendron californicum*). This parasite provides fruit for frugivorous species. Since the mistletoe also dies as the tree dies, frugivorous birds will be negatively impacted. This particular tree produced 18 kilograms of pods in 2006, but no pods in 2007.



Figure. 4. Once screwbean show the tell tale yellow leaf color (photograph) they typically degrade rapidly over two-three months.



Figure 5. Screwbean planted for revegetation projects typically do not become afflicted in the earliest years. The photograph shows screwbean in June of their third growing season in 2006. By August of 2007 they had an appearance similar to afflicted trees in Figs. 2-4.

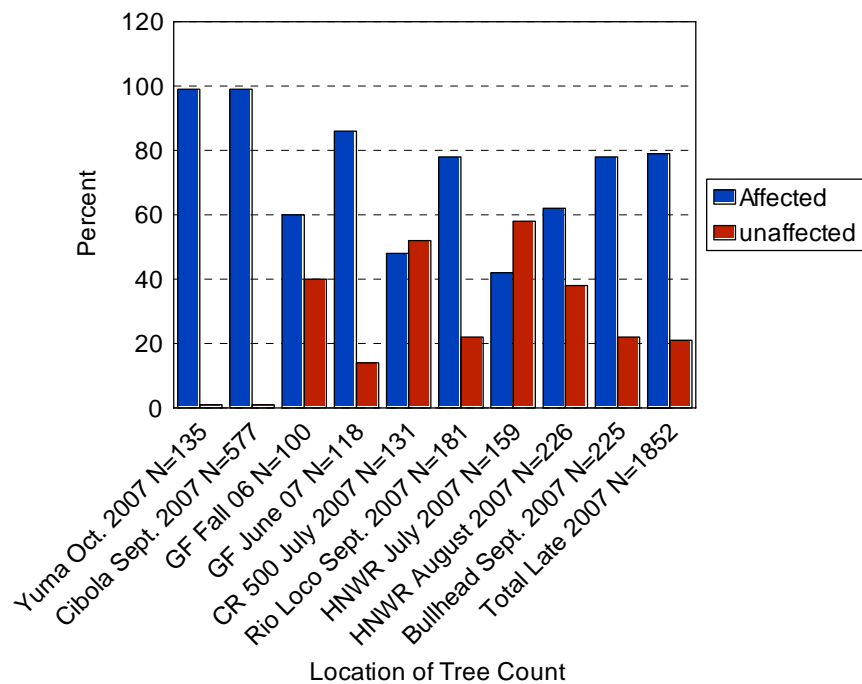


Figure 6. Proportion of affected and unaffected trees on 9 occasions at 7 different locations along the lower Colorado River. GF refers to goose flats; CR 500 is the name of a development project east of Blythe, California, and HNWR refers to the Havasu National Wildlife Refuge. Rio Loco is located about 40 km north of Blythe. See Fig. 1.