A Review of the Literature
• Supporting a Rationale for Mpingo Conservation •
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(Note: The following essay is a plea created for a grant proposal for the conservation of the African Blackwood tree supported by information compiled from a review of the extant modern literature regarding the mpingo and its related conservation issues. A bibliography at the end of the essay references the citations in the body of the text.)

"The case of *Dalbergia melanoxylon* is a classic example of a species which although of local, national and international value and importance is being totally neglected in terms of conservation….(it) is in fact the most highly valued traded timber in the world and is of cultural, ecological and economic significance where it grows. This is particularly true for Kenya, Tanzania and Mozambique, where the species is important at local, national and international scales. The combination of these facts imply that the trade and use of *Dalbergia melanoxylon* are not likely to stop, and without the implementation of carefully designed management plans the exploitation may continue until it is no longer economically viable, which may, unfortunately correspond with extinction." (Sharman, pg. 12)

This statement is a summation of the problems facing African blackwood. When acquainting oneself with its history and importance one is faced with several questions: Why is it not being protected in its native habitat? Why have those who use the wood not mounted a tree planting campaign to assure its continued survival? Why has there been so little research on habitat, germination and propagation requirements? Why are there no satisfactory inventories of yearly wood extraction?

The answers to such questions are not simple and are rooted in our present day economic and social ills. Here we will attempt to elucidate some of the problems involved in saving mpingo and point to efforts that are being undertaken in an attempt to address the problem of its survival.

Conservation Efforts

In the mid-1980's the Tanzanian government, concerned about its diminishing stands of blackwood requested help from the United Nations Environment Programme (UNEP). In 1987 and 1988 UNEP sent missions to Tanzania but there has been no follow-up and the results of the mission were never published. The World Wide Fund for Nature (WWF) showed interest in the late 1980's and the Finnish Turku-Mtwara Friendship Association has conducted research in the Mtwara Region. "One notable element of the above investigations is the lack of any further on-the-ground activities." (Platt, 1)

The only known current project for replanting mpingo in Tanzania is a 3-acre plot managed by the Kilombero Valley Teak Company. However, most of the trees are teak; mpingo is a subsidiary interest. In the late 1980's the Wildlife Conservation Society of Tanzania started an

mpingo replanting effort but it has now ended. Several experimental plots were established in the early 1970's by research botanists but were abandoned in the early 1980's with no follow up. (Platt, p. 9)

Fauna and Flora International, the world's longest established international wildlife conservation body, has launched several efforts to focus attention on the species. In 1994 it assisted the governments of Kenya and Germany in preparing a proposal to present to CITES (Convention on International Trade in Endangered Species), a monitoring agency which regulates trade in vulnerable and endangered wildlife. The proposal was subsequently withdrawn but enough concern was raised that the government of Mozambique invited an international group of conservationists, academic experts and representatives of the music and woodworking industries to meet the following year in Maputo to prepare a regional conservation and management strategy for mpingo. The meeting was held in November 1995. An initiative was drawn up but lack of funding has prevented its implementation.

FFI also founded Soundwood, an organization which focuses conservation efforts on threatened species that are used in the making of instruments. An ongoing initiative, The Cambridge Mpingo Project (renamed to Mpingo Conservation Project in March 2004), was begun in 1996 as a 10-year research program conducted by Cambridge students to undertake botanical, economic and cultural surveys regarding mpingo in targeted regions of Tanzania.

In addition it has funded three blackwood studies, a brief in-country investigation by Irene Platt and Steve Evison, and two Master's theses. One of these, "Investigation into the Sustainable Management of a Tropical Timber Tree Species Using Dalbergia Melanoxylon as a Case Study" by Hazel Sharman is probably the most knowledgeable collection of information about the tree that is now available. Another, "Tree! What Tree? An Ecological Economic Approach to Producing a Sustainable Mpingo Trade" by David Beale discusses economic factors influencing the trade in mpingo.

As can be seen, most of the efforts at this point are in the area of research, although Soundwood is having some success in influencing manufacturers to use less vulnerable wood sources for their instruments. Notably, Boosey and Hawkes, a leading clarinet maker, has just announced a line of "green" clarinets and oboes, made from mpingo sawdust, resin and carbon fiber. Following are selected topics discussing the complex array of issues that influence the conservation of mpingo.

Fragile ecosystem

For the past several decades both Europe and North America have enacted programs to stabilize their wood extraction amounts. According to the *State of the World's Forests 1999 (SOFO)* report, between 1980 and 1995 their forestland coverage increased by 20 M hectares. For the tropical zone, however, the figures are not so encouraging. In the same span of time the tropics have suffered a net loss of 200 M hectares — a painful result of the policies of developed countries to look for raw materials and resources beyond their own national boundaries.

Many of these tropical species live in rainforest environments with consistent amounts of rainfall, but the African blackwood inhabits the semi-arid woodlands of the east African savannah. Rainfall is often marginal and periods of drought not unusual. Land areas such as these are environmentally fragile, their ongoing vitality dependent on a delicate balance being maintained between the plant, animal and human populations which inhabit them.

Mpingo has adapted well to this marginal existence, although its long growing period is an outcome of its adaptation to harsh conditions. As a legume, it is a pioneer species with nitrogen fixing properties. It can take root in adverse sites, in shallow and rocky soil where agriculture would be impossible. There it performs the function of being a soil stabilizer and enricher. The first 5 to 8 years of its life is spent establishing an adequate root system to insure survival during periods of drought. It does not grow in dense stands but is a solitary species, its members distributed over large areas.

The particular problems of dry forest species like blackwood are only beginning to draw concern from environmentalists. Because of the inherent scarcity of natural resources in such areas the vegetation and wildlife are of particular importance to the local population. Their villages and towns will often be surrounded by a large zone denuded of vegetation.

Referring to these problems *SOFO* (pg. 24) comments: "Greater international emphasis on fragile ecosystems and on social and environmental aspects of the forest sector has resulted in an elevated awareness of the importance of trees outside forests (e.g. trees in agricultural lands, those scattered in the rural landscape and those located in urban and peri-urban environments). These resources have often been overlooked." The program we are establishing will directly utilize these suggestions for reclaiming fragile ecosystems by planting scattered trees in agricultural, rural and urban environments.

Protection

In Tanzania the felling of a blackwood tree requires an official permit for which there is a fee. This is a governmental effort to limit harvesting by imposing a tax and also a rudimentary means of recording usage. "Unfortunately, it is unlikely that such a legal requirement has any effect on the quantity of *Dalbergia melanoxylon* harvested annually. For example in Kibabha, Tanzania, during an interview with the District Forest Officer, he reported that no licenses had been issued for *Dalbergia melanoxylon* in his district that year 1994/1995, but that there was plenty of evidence of the extraction…in both gazetted, private and common lands in the area." (Sharman, p. 23)

The area of Tanzania is twice that of California—much of it great expanses of sparsely inhabited land. The logistics of supervision and control of such a wide area by a country with so few monetary resources are nearly insuperable. One suggested solution to the problem is to establish community-based forest management programs. These would involve a multi-use assessment of the various resources of a given forest or woodland. Agriculturists, pastoralists, herders, townspeople and the woodcarving communities would co-ordinate activities with the goal of sustainable harvesting of not only the saleable forest products, but all products that are traditionally utilized. The local communities then have a stake in supervising and wisely

managing their woodlands because of the ongoing benefits they derive. This is, in fact, becoming a world-wide trend in forestry management. (*SOFO*, p. 16-19)

The programs of the ABCP are oriented towards this kind of local involvement. The people of Moshi and Arusha are participating in the replanting effort and being taught the principals of conservation. In this way we hope to develop a model for community-based planning for blackwood conservation.

Genetic Erosion

"At present there are no known plantations for *Dalbergia melanoxylon* where extraction occurs, therefore the timber trade is currently derived exclusively from natural forests or private lands." (Sharman, p. 47) Beale discusses the implications of continued logging. He calculates that roughly 40,000 mpingo trees are felled in a year. In a process known as "high grading" only the most mature and straightest (most marketable) trees are removed from the ecosystem. "This could leave the ecosystem ecologically out of balance with the regenerative ability of the remaining Mpingo population much reduced, due to a lack of reproductively active trees.…Any imbalance is not being helped by the total lack of replanting of mpingo in Tanzania by those involved in the exploitation of the species.…The slow growth rate of this species in the wild means that reliance on only the natural reproductive capacity of mpingo to replace those trees extracted is causing the future viability of the species as a commercial stock to be put into question." This "pattern of exploitation …could signal the beginning of a downward spiral of increasing costs and a declining mpingo stock which could lead towards commercial extinction." (Beale, p. 6)

Sharman comments further on genetic erosion: "Whilst it may not be biologically or ecologically threatened, it may well be commercially threatened. The constant removal of individuals with the same characteristics will be extremely harmful to the population structure, possibly resulting in genetic erosion. The end result may be a constant decline in the population until it is commercially extinct, leaving, if any, a population structure which may not be able to reproduce and that if it can, will reproduce individuals without those characteristics so highly prized by the trade and human society and a population weak and vulnerable to natural disaster and environmental change. There is a definite need for the implementation of an effective and applicable management strategy. What must be recognised is that utilisation of Dalbergia melanoxylon is not going to stop whether legally or illegally, but this utilisation should at the very least be managed and monitored. What must be addressed is how scientific knowledge can be mobilised most effectively to ensure the persistence and protection of the trade, and species itself." (Sharman, p. 68-9)

Tanzanian Economics

One of the largest difficulties in the way of sustainable management is the monetary problem of the Tanzanian government. Its balance of payment deficit amounts to US $1 B. Blackwood is the third highest foreign exchange earner of Tanzanian forestry, bringing in an estimated $1.5 M annually from exports alone, money desperately needed to service its debt. (Beale, p. 44) Additional revenue is attracted by the art of the Makonde carvers, which is purchased by an ever

increasing tourist trade, as well as museums and collectors throughout the world. In Tanzania per capita income is one of the lowest in the world while its goods are more expensive than most other African states. Mpingo is an important item in the fiscal budget and there is great hesitation to limit its use.

Since the instrument industry has already harvested one wood (Caribbean cocuswood in the early 1900's) to extinction it seems reasonable that steps should be taken to limit their access to the remaining stands of mpingo in Africa and embark on a program of replanting and sustainable management of the species. Beale suggests that African countries form a cartel to manage and distribute the wood. By raising its price to consumers they could raise income for forestry management of the tree. Likewise he suggests that western consumers and instrument manufacturers should demand the wood come only from sustainable sources, to insure its continuing supply.

Agricultural Expansion

The African population grows at the rate of 3% a year. Ninety percent of its citizens are agriculturists, and many of them practice a slash and burn technique. The clearing of land is reducing large acreages of plant and animal habitat. Although mature mpingo is fire-resistant, the young trees are not, and easily succumb to the often out-of-control agricultural fires. A notable problem with existing stands of mpingo, mentioned in several research studies, is the absence of both mature trees and very young ones. Mature trees have been harvested and young ones are not being regenerated properly, a problem of great concern for the continuance of the population. In our replanting efforts we are raising mpingo in a sheltered environment so that it can develop its natural resistance to fire before it is exposed to harsh natural conditions. Hopefully this will in establishing a young tree population which will survive to maturity.

Conclusion

"To meet the needs for wood and non-wood products and at the same time fulfill demands for environmental and social services from forests is the challenge now facing the forest sector. Efforts to find an acceptable balance between production and protection and between use and conservation drive much of the debate surrounding the forest sector today." (SOFO, p. 34)

Certainly the long term survival of African blackwood can only be insured by a multi-faceted approach, involving research, education, conservation, improved milling techniques, replanting, community involvement and an international commitment to sustainable harvesting. The approach of the ABCP is a beginning step, but a necessary part of the larger, more inclusive picture. Because so few steps are presently being undertaken, we think it is an important one, not only to insure a future source of wood for human use but to contribute to the biological diversity of the planet as an holistic ecosystem.

The world is only now beginning to realize the delicate interrelationship between all ecological systems. The products of the natural environment have their own inherent importance within the natural world. If humankind, by its intelligence, chooses to use these products, then by the same

intelligence, it can devise plans to insure that the natural balance is maintained. This is the challenge of the industrial world.

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Mpingo Fact Sheet

- *Miombo** woodlands containing Mpingo and other species once covered vast areas of the African savannah from Ethiopia to South Africa.
- Populations of Mpingo suitable for commercial harvesting are now found mainly in Mozambique and Tanzania.
- Known locally in Tanzania in the KiSwahili language as the *Mpingo* tree.
- International musical instrument trade brings in $1.5M to local Tanzanian economy (ca. 1992).

- A thorny member of the rosewood family whose roots support a specialized bacteria which increases soil fertility.
- Miombo woodlands including mpingo as one of its mixed species serve as a barrier to spreading desertification.
- The leaves of mpingo serve as fodder for migrating wildlife.
- Becoming increasingly known as “The Tree of Music” for its qualities as a material for woodwind instruments.
- Premier wood in the world for Ornamental Turning.
- Estimated 3 million trees exist today, according to "The Tree of Music" film.
- One typical mill on the southern coast of Tanzania processes 600 trees per month.
- 60 years are required to produce commercially viable trees.
- Of the current population, only about 20%, or 600,000 trees, are suitable for harvesting.
- At the current extraction rate of 20-30,000 trees per year, the harvestable population diminishes at a rate of 5% per year.
- Human-caused burning kills younger trees which are not yet resistant to the effects of fire and causes defects in growing trees.
- Replanting and controlling fires are the first steps in replenishing the mpingo.

* "The Miombo Woodlands system is taken to include all those Southern and Central African ecosystems which occur under a hot, subhumid, seasonally-wet climate on soils derived from acid crystalline geologies. The components of this system include woodlands on well-drained soils, and hydromorphic grasslands (called dambos) in drainage lines. Miombo occupy about 5 million square km, and support about 100 million people with food, fuel, building materials, medicines and water." This definition is taken from the Miombo Network. In depth information about the Miombo ecosystem is available on the International Geosphere-Biosphere Programme (IGBP) Report 41 page of the Miombo Network website.

** Source for most of the information on this page is the 1992 BBC Television Documentary "The Tree of Music" aired on US PBS television stations on the *Nature* series. All of the numbers for tree populations and use are estimates, as no firm inventories of Mpingo populations exist and the extraction rate is also uncertain because much illegal felling goes unreported in the local forestry statistics which are derived from the selling of licenses to cut mpingo, a protected species in Tanzania.