

Socio-Economic Impacts of Controlling *Melaleuca* in South Florida

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Melaleuca quinquenervia, commonly referred to as melaleuca, was introduced to Florida in the late 1800s and has flourished in the state since its introduction. In the late 1980s and early 1990s efforts to eradicate/control melaleuca began in earnest. Public agencies in Florida have spent an estimated \$25 million on control efforts from 1989 to 1999 and have succeeded in reducing the area it covers by about 100,000 acres (Pratt and Ferriter 2001). However, private landholders have been less aggressive in its removal, and this has allowed melaleuca to spread in many areas and resulted in no net loss of the acreage covered. The Areawide Management Evaluation of Melaleuca (TAME Melaleuca) project was created in 2001 specifically to address the problems and unique situations associated with melaleuca control, and to further promote effective control measures. The work presented here is part of the TAME project's efforts to assess the current status of melaleuca management in the state.

Balciunas and Center (1991) conducted a benefit-cost analysis of melaleuca control as part of their study on the prospects and dilemmas that could arise if biological control was used in the fight against this invasive tree. Under the assumption that melaleuca was allowed to spread unchecked, they determined that by the year 2010 economic damages could

amount to \$1.76 billion. In contrast to this and other prior research that has been largely prospective, we sought to characterize the current state of melaleuca management in South Florida and to determine the benefits and costs of controlling melaleuca for the year 2003. The main objective of this analysis was to assign monetary values to the benefits gained in areas invaded by melaleuca that have been successfully treated, and the costs associated with that treatment.

To document the current status of melaleuca and associated management practices, surveys were developed and mailed to professional land managers and residents in the 10 southernmost counties of Florida during the summer of 2004. The surveys for the professional managers were sent to individuals whose management areas were classified as park/preserve or agricultural. Information gathered included general descriptive information pertaining to the management unit and specific information on melaleuca control treatments. The response rates for park/preserve and agricultural managers were 32% and 22%, respectively.

As shown in Tables 1-1 and 1-2, the responses from park/preserve managers revealed that 619,317 acres of melaleuca inhabited their management areas, while they treated a total of 84,740 acres during 2003. Park managers indicated the largest

area of infestation occurred on park/preserve lands and lakefronts (553,763 and 39,509 acres respectively). Managers also indicated that stump treatment was used most frequently on park/preserve land (46,562 acres.) Because control strategies may not be completely effective, a 90% rate of effective removal was applied to the treatment areas reported by park/preserve managers to yield the estimated area of melaleuca killed as 76,265 acres. Based upon the survey results, the total costs associated with these control methods were reported as \$10.9 million. The park/preserve managers felt that melaleuca impaired the ecological function and recreational use of the land they managed by an average of 23%.

Agricultural managers indicated that a total of 12,271 acres of melaleuca occupied their land and that they treated an estimated 10,868 acres. Managers indicated that the largest areas of infestation occurred on lands classified as pasture/range land (10,441 acres). The most frequently used method of treatment was mechanical removal (7,279). When the previously mentioned effective rate of treatment is applied, it is estimated that 9,781 acres of melaleuca were killed in 2003. Survey results indicated that agricultural managers spent an estimated cost of \$1,180,000 during 2003. It should be noted that the raw data from agricultural managers represented a sample of the population and were subsequently expanded to reflect that population. The population was 11,500 and the sample size was 2,000. The population size was divided by the sample size and yielded an expansion factor of 5.75. This calculation assumed that the sample data gathered was representative of the population. Finally, the agricultural managers

Table 1-1. Infested Area of Melaleuca Categorized by Land Use, 2003.

Land Use Classification	Park Managers (Ac.)	Ag. Managers (Ac.)	Total (Ac.)
Park	553,763	0	553,763
Lakefront	39,509	0	39,509
Mitigation	13,897	6	13,903
Range	690	10,441	11,131
Other	8,633	748	9,381
Right of Way	2,718	69	2,787
Fruit	63	558	621
Crop	43	374	417
Forest	0	46	46
Nursery	1	29	30
Total	619,317	12,271	631,588

Table 1-2. Various Control Methods Used to Treat Melaleuca in South Florida, 2003.

Method	Park Managers (Ac.)	Ag. Managers (Ac.)	Total (Ac.)
Felling + Herbicide (stump treat.)	46,562	2,277	48,839
Foliar/Soil Herbicides	15,802	1,064	16,866
Mechanical	4,592	7,279	11,871
Hack and Squirt	11,454	230	11,684
Biological Control	6,310	18	6,328
Biological + Other	4,242	0	4,242
Other Control	20	0	20
Total*	84,740	10,868	95,608

*Total area excludes biological plus other control methods to avoid double counting.

reported that the agricultural productivity, market value, and ecological function of their land had been reduced by an average of 24 percent, 11 percent, and 22 percent, respectively.

The benefits that applied to the areas of land reported by park/preserve managers were ecosystem benefits, recreational values, and the benefits gained from avoidance of increased fire damages, and were \$13,142,718, \$703,313, and \$178,213, respectively for a total of \$14,024,244. The benefits of restored ecological function, agricultural productivity, agricultural market value, and avoidance of fire damages applied to melaleuca treatment areas as reported by agricultural managers were in the amounts of \$236,866, \$2,146,228, \$6,675,569, and \$178,213, respectively, and yielded a total of \$9.24 million. Since there were two categories of managers being considered, the overall avoidance of fire damages \$356,426 was divided between the two categories to yield \$178,213 for each managerial category. Total benefits were estimated to be

\$23,261,120 (Table 1-3).

The costs were derived from the residential and professional survey data along with the TAME Melaleuca program costs, which include the costs associated with this research, and as shown in Table 1-4, were estimated to be \$13.2 million.

Based upon the results of the surveys it was quite apparent that the vast majority of melaleuca control was still taking place on public land in South Florida. This phenomenon is most likely because a legal mandate requires public agencies to remove invasive plants from their management areas. It may be necessary for the legislature to make the current laws addressing the general public more stringent so as to induce a greater number of private land managers and homeowners to implement melaleuca controls on their properties. While making tighter laws is a step in the right direction, it will also be necessary for the lawmakers to assign specific penalties for those in violation of the law and require a uniform enforcement of the laws and penalties. This would require increased presence by

the enforcement agencies and would certainly require a greater amount of time and effort from those agencies. A requirement similar to those of some municipalities that call for new construction sites to have melaleuca trees removed from the property before a certificate of occupancy can be issued may be a useful tool in inducing melaleuca removal.

The English/Spanish language residential survey was directed at gathering information related to the awareness and perceptions of melaleuca by the residents. Specifically, the content of the survey was designed to gather an introductory assessment of residential experience with and knowledge of melaleuca, an assessment of attitudes towards melaleuca and treatment methods, as well as cost data, willingness-to-pay information, and demographic data. Residents (as opposed to park/preserve and agricultural managers) had the lowest survey response rate at 20 percent and the majority of residents surveyed (96%) indicated that they did not have melaleuca on their property. It was estimated that the residents of South Florida spent approximately \$246,750 on melaleuca control/removal in 2003.

A majority of residents who responded to the survey questions aimed at determining their awareness of melaleuca indicated that they knew that melaleuca was not native to Florida and that they knew non-native plants could be harmful (71% and 89%, respectively). However, when the residents were later asked to indicate if melaleuca affected their

Table 1-3. Total Benefits of Melaleuca Control in 2003.

Benefit	Value (\$)
Agricultural productivity	2,146,228
Agricultural land market value	6,675,569
Ecological function	13,379,584
Recreational value	703,313
Avoidance of fire damages	356,426
Total	23,261,120

Table 1-4. Cost Data for Melaleuca Control in 2003.

Group	Costs (\$)
Park managers	10,866,113
Agricultural managers	1,180,000
Residents	246,750
TAME Melaleuca	915,000
Total	13,207,863

enjoyment of the outdoors, 77% of those who responded to the question indicated that it did not. When residents were asked to indicate if they felt that melaleuca negatively affected their property value, 95% of those responding to the question indicated that they felt it did not. There seemed to be a gap between what people know about melaleuca and how that knowledge affected their desire to take the actions necessary to control it. According to the survey data, the main sources that provided information on melaleuca for residents were newspapers and local/national news (59% and 47% of residents who responded to the question, respectively). Policy makers, environmental action groups, and public agencies should target these outlets to help educate the public about melaleuca and why they should control it.

It is important to keep in mind that this analysis did not consider benefits that may have accrued to private homeowners in South Florida and would only serve to increase the benefit figure. Given the resulting benefit-cost ratio of 1.76, it can be said that current policies requiring melaleuca control provided a benefit to society for the year 2003. It is interesting to note that due to the compound effect of having multiple values tied to their land (i.e.-the values gained from the ecological functions, the actual production of agricultural commodities, as well as the market value of the land) this analysis indicated that agricultural lands have a higher benefit-cost ratio than park/preserve lands for treating melaleuca (7.83 vs. 1.29). Even without considering the benefits accruing to agricultural land market values, the ratio is still greater for agricultural lands than park/preserve lands (2.17 vs. 1.29). Therefore, it is recommended that policy-makers and public agencies continue to at least maintain the current levels of funding and control efforts for melaleuca reduction. Not only should they continue to maintain the current levels of funding, but they should also consider increasing funds to help specifically target agricultural managers to persuade them to control melaleuca on their property. This would help solve the problem of having melaleuca spread on private lands while it is being controlled on public lands, and would also help avoid

cross contamination from the infested areas to the areas under control. In view of the positive benefit-cost ratio determined in this study, it is recommended that policies requiring the removal of melaleuca remain in effect until the benefits no longer outweigh the costs.

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