

# Effectiveness of aerial herbicide treatment of *Melaleuca* for habitat restoration in the northern Everglades



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## Introduction

*Melaleuca quinquenervia* is an aggressive, exotic invasive tree in the Florida Everglades that displaces native vegetation, often forming dense, closed canopy stands with very little value for native wetland wildlife. Negative impacts of *Melaleuca* can increase with time through increased shading, altered hydrology, and substrate changes from massive litter production. Management of *Melaleuca* typically involves either aerial or ground spraying with herbicides. However, the impacts of management practices on non-target native vegetation and the recovery of native plant communities are not well quantified.

In this study, we are quantifying the recovery trajectory of aerial treated *Melaleuca* heads in major vegetation communities of the northern Everglades.

## Methods

This study is being performed at the A.R.M. Loxahatchee National Wildlife Refuge in Boynton Beach, FL. Nineteen *Melaleuca*-invaded sites were chosen for aerial herbicide application. These represented the major vegetation types at the Refuge: slough, sawgrass marsh, and pocosin.

Initial site characterization was in November 2013 and herbicide was applied in January 2014. Islands were visited shortly after to confirm treatment and initial mortality. The most recent survey took place in March 2015.

Vegetation composition, canopy density, and water depth within each head, as well as landscape features adjacent to each *Melaleuca* head, were assessed prior to and following aerial herbicide treatment (Fig. 1).



Figure 1. Undergraduate DIS student assisting with canopy cover measurements using a densitometer.

## Acknowledgements

We thank everyone at A.R.M. Loxahatchee NWR for their tremendous effort in the field and for providing photographs. Special thanks to everyone from the Benschoter lab who helped in collecting this data. Funding for this project is provided by the US Fish and Wildlife Service.

Pre- and Post-Herbicide Plant Communities

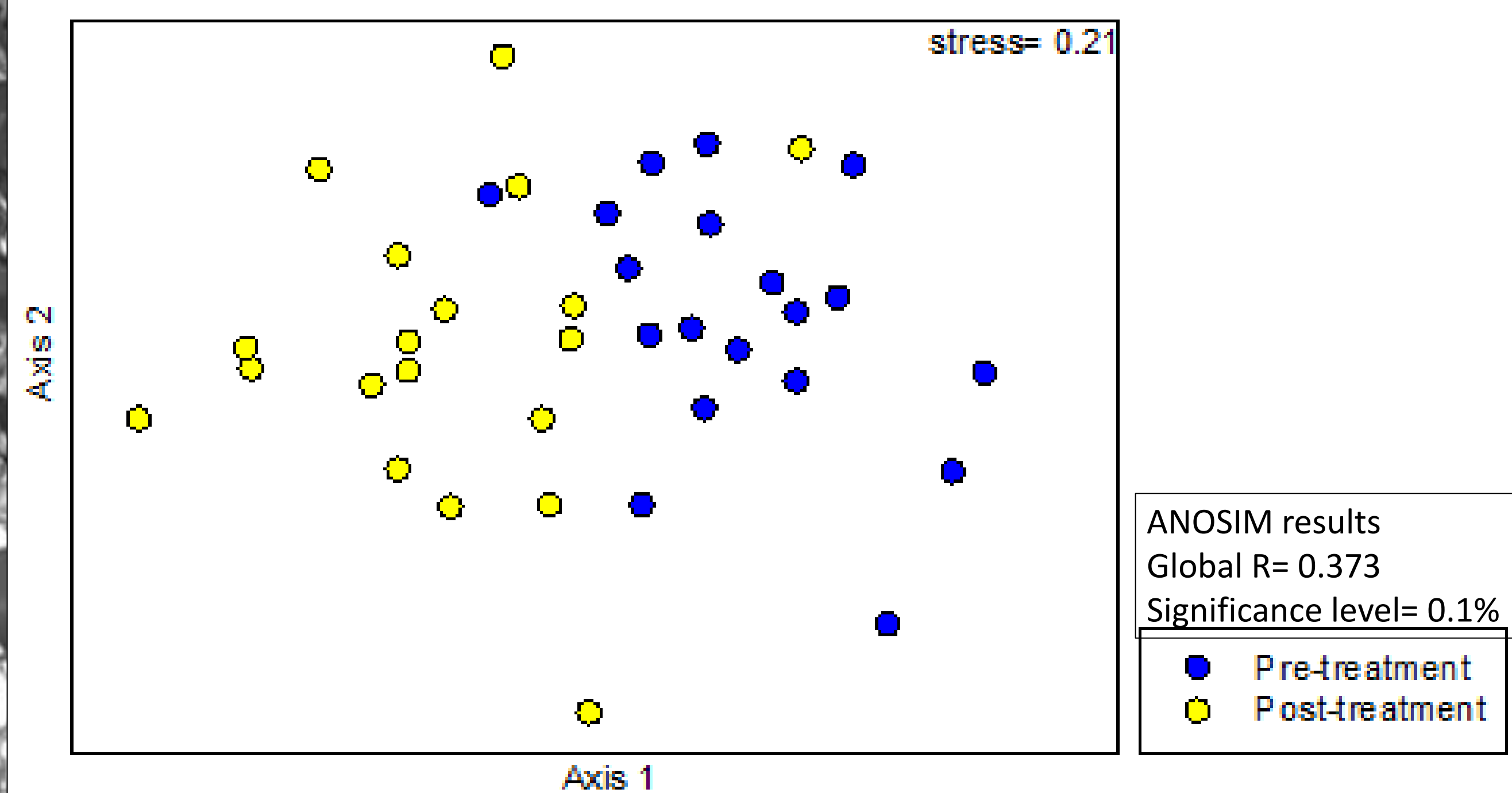


Figure 2. NMDS ordination depicting community composition of islands pre- and post-herbicide treatment (years 2013 and 2015, respectively). The ANOSIM results indicate a significant difference due to the treatment.

## Results

- Pre- and Post-treatment comparison:
  - Based on the ordination and ANOSIM results, there is a significant difference in plant community composition as a result of herbicide treatment (Fig. 2).
  - Immediate effects of the treatment are evident upon referring to ground photographs from the interior of a head (Fig. 3).
  - A paired t-test for percent canopy cover showed a significant difference between the pre- and post-treatment surveys (Fig. 4). T-tests for water level and species richness based on treatment were not significant.



Figure 3. Ground photographs depict *Melaleuca* mortality as viewed from the center of one of the heads. Photographs will continue to be used to aid in monitoring effects.

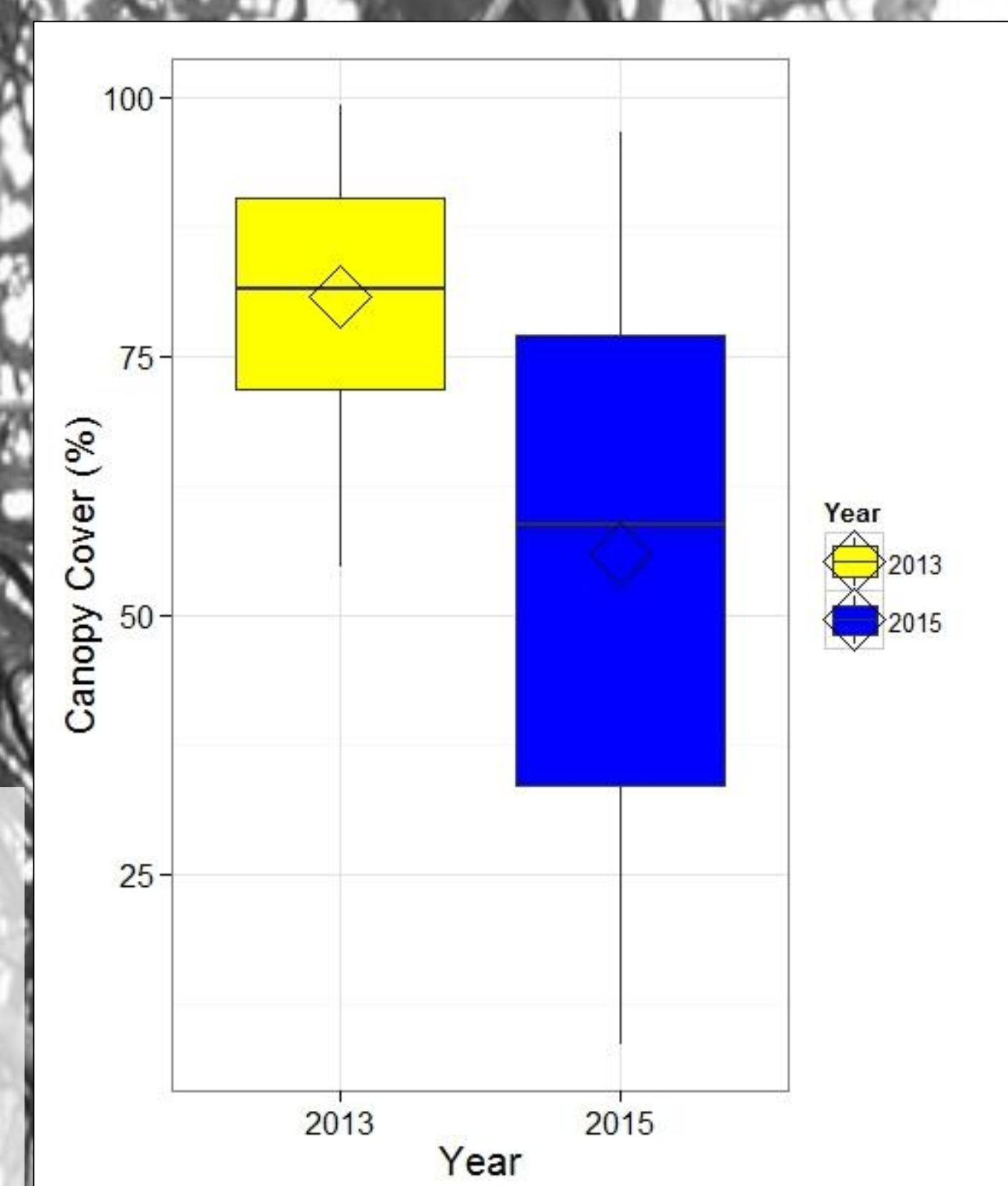


Figure 4. Box plot showing pre- and post-treatment percent canopy cover. T-tests indicated a significant difference ( $t=4.871$ ,  $df=18$ ,  $p<0.001$ ).



Figure 5. *Melaleuca*-invaded island following herbicide application. Adjacent landscape features such as this wet prairie-slough habitat may play a role in the native species recovery and end result of the treatment.

## Common Plant Species

Year	Species
2013	Fern sp., <i>Lygodium microphyllum</i> , <i>Melaleuca quinquenervia</i> , <i>Myrica cerifera</i> , <i>Peltandra virginica</i>
2015	Fern sp., <i>Eupatorium capillifolium</i> , <i>Lygodium microphyllum</i>

## Dominant Plant Species

2013	<i>Cladium jamaicense</i> , <i>Melaleuca quinquenervia</i> , Fern sp., <i>Myrica cerifera</i>
2015	<i>Salvinia minima</i>

Table 1. Top portion indicates plants species found on more than 10 of the invaded islands. The bottom portion indicates plant species found in densities of greater than 70% cover.

## Preliminary Conclusions

Results indicate immediate success using aerial herbicide application, but further monitoring will be necessary to assess long-term effectiveness of native habitat restoration (Fig. 5). Native, although ruderal, vegetation appears to be colonizing islands as a result of canopy openings (Table 1). Personal observations indicate that there is evidence of *Melaleuca* resprouting on several of the islands as well as the presence of *Lygodium microphyllum*.

It is still early in the recovery process, but results from this study will be used to evaluate the recovery of microhabitat conditions and native plant communities following aerial treatment of *Melaleuca*. This information will help develop management guidelines for the use of aerial herbicides in the maintenance of high quality habitat at the Refuge.