INTRODUCTION
Lake Okeechobee, located in southern Florida, encompasses approximately 1,700 km² and is a vital part of the Lake Okeechobee and Everglades ecosystem. Major cyanobacterial blooms have been documented in Lake Okeechobee since the 1970s and have continued to plague the ecosystem. Similarly, hydrialla, water hyacinth, and water lettuce have been documented in the lake and continue to threaten the ecosystem by their rapid growth. This study examines invasive aquatic vegetation occurrence through the use of the Normalized Difference Vegetation Index (NDVI) calculated on MOD09 surface reflectance imagery. Occurrence during 2008 was analyzed using the Time Series Product Tool (TSPT), a MATLAB-based program developed at John C. Stennis Space Center. This project tracked spatial and temporal variability of cyanobacterial blooms, and overgrowth of water lettuce, water hyacinth, and hydrialla. In addition, this study presents an application of Moderate Resolution Imaging Spectroradiometer (MODIS) data to assist in water quality management.

METHODS
Acquired MOD09 daily surface reflectance imagery from 1 May 2008 to 1 October 2008. Processed raw images using TPST, which performed the following operations:
- Projection: all images set to UTM WGS84 Zone 17N
- NDVI: calculated NDVI on each image
- Clear: removed pixels with cloud cover and shadow
- Maxvza: removed pixels with view zenith angle ≥ 50°
- Fuse: combined MOD09QK (original surface reflectance) and MOD09GA (includes observation data and geolocation statistics) data
- Outlier: removed NDVI values outside of set thresholds
- Time: replaced missing pixel values using temporal interpolation
- Stacked processed images into a single image with 116 layers in ERDAS IMAGINE®
- Color-coded each layer to show areas of suspected aquatic vegetation, which included NDVI values ≥ 0.2 and < 1, with all other values suspected to be water
- Used a STACK MAX model to show total maximum NDVI values for all five months and for each month individually
- Compared visual results with U.S. Army Corps of Engineers spray treatment data

RESULTS

Maximum NDVI Values by Month

<table>
<thead>
<tr>
<th>Month</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
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<tbody>
<tr>
<td>May 2008</td>
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<td>June 2008</td>
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<td>September 2008</td>
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CONCLUSIONS
- NDVI values can be calculated from MODIS-derived products and applied to aquatic vegetation
- Spatial and temporal change can be deduced from time analysis assessment
- Individual images should be correlated against meteorological and nutrient level in-situ data; however, current data is limited
- Temporal analyses of NDVI values could be conducted to assess impacts of sugarcane harvesting (to the south) and cattle farming (to the north) on nutrient levels in the lake
- The time period could be broadened to gain an understanding of long-term NDVI changes associated with land use change

REFERENCES