High Soil Salinity Threatens Key Tree Cactus in the Florida Keys

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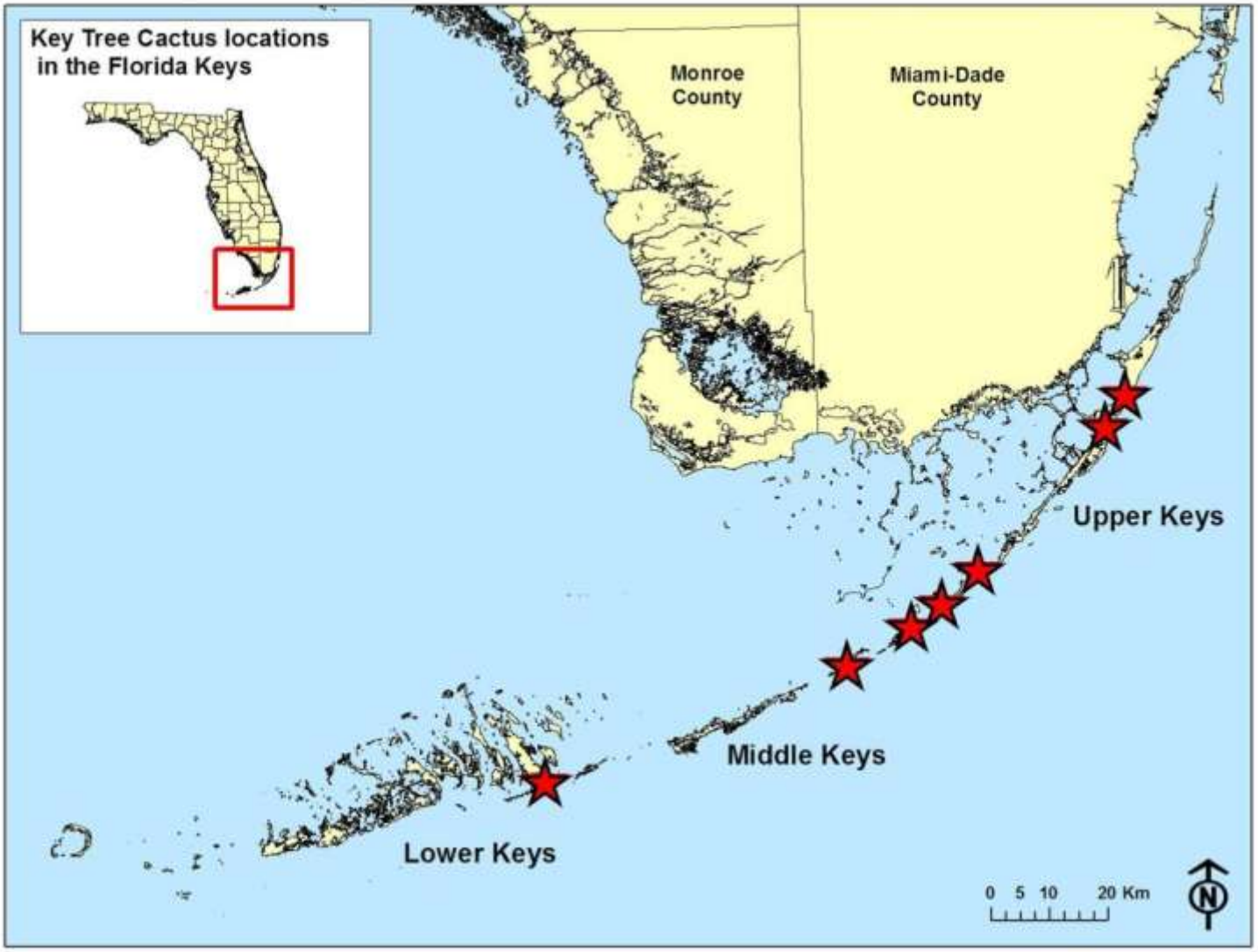
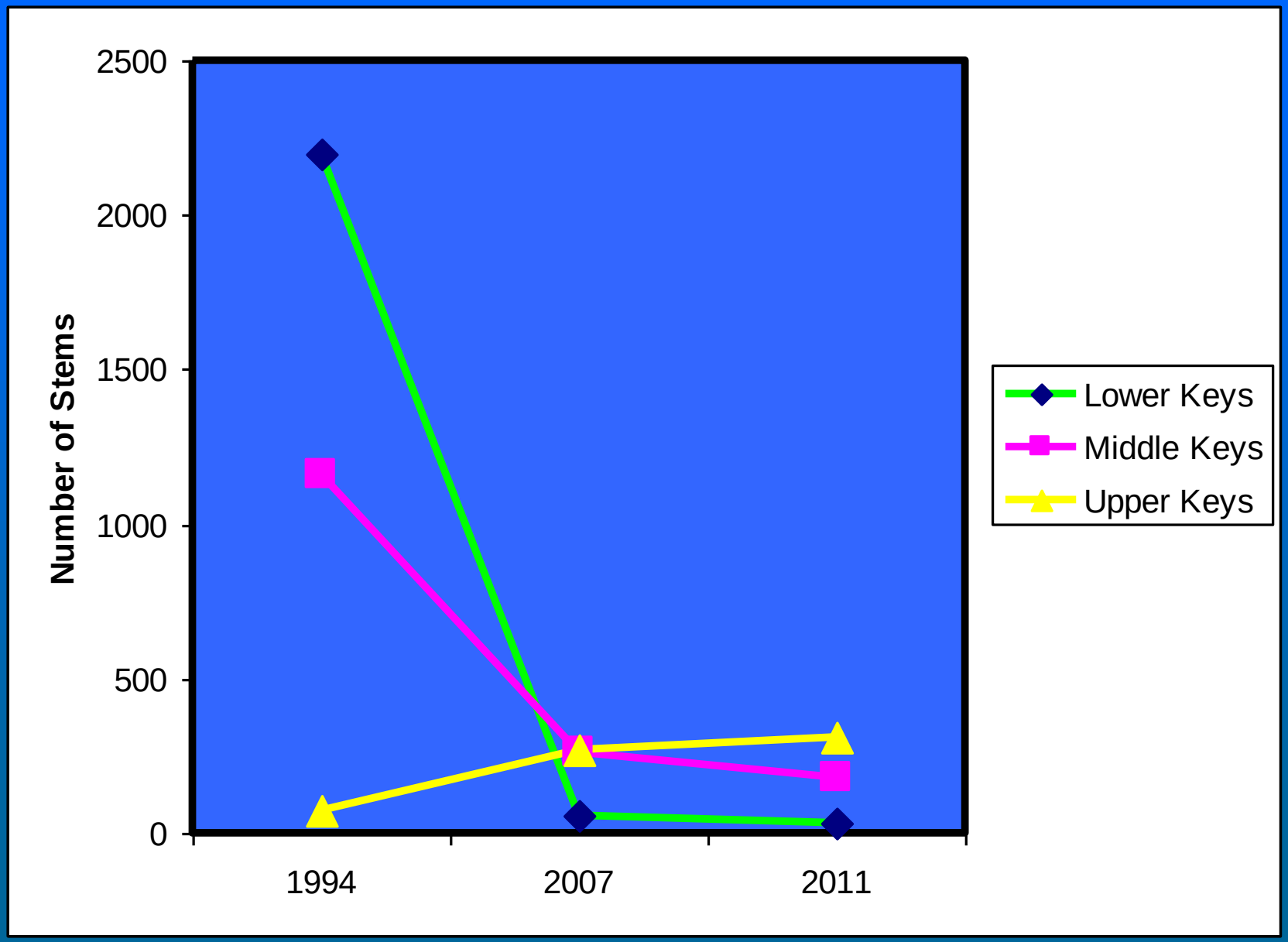
FAIRCHILD TROPICAL BOTANIC GARDEN

U.S. Endangered Key Tree Cactus (*Pilosocereus robinii*) Populations

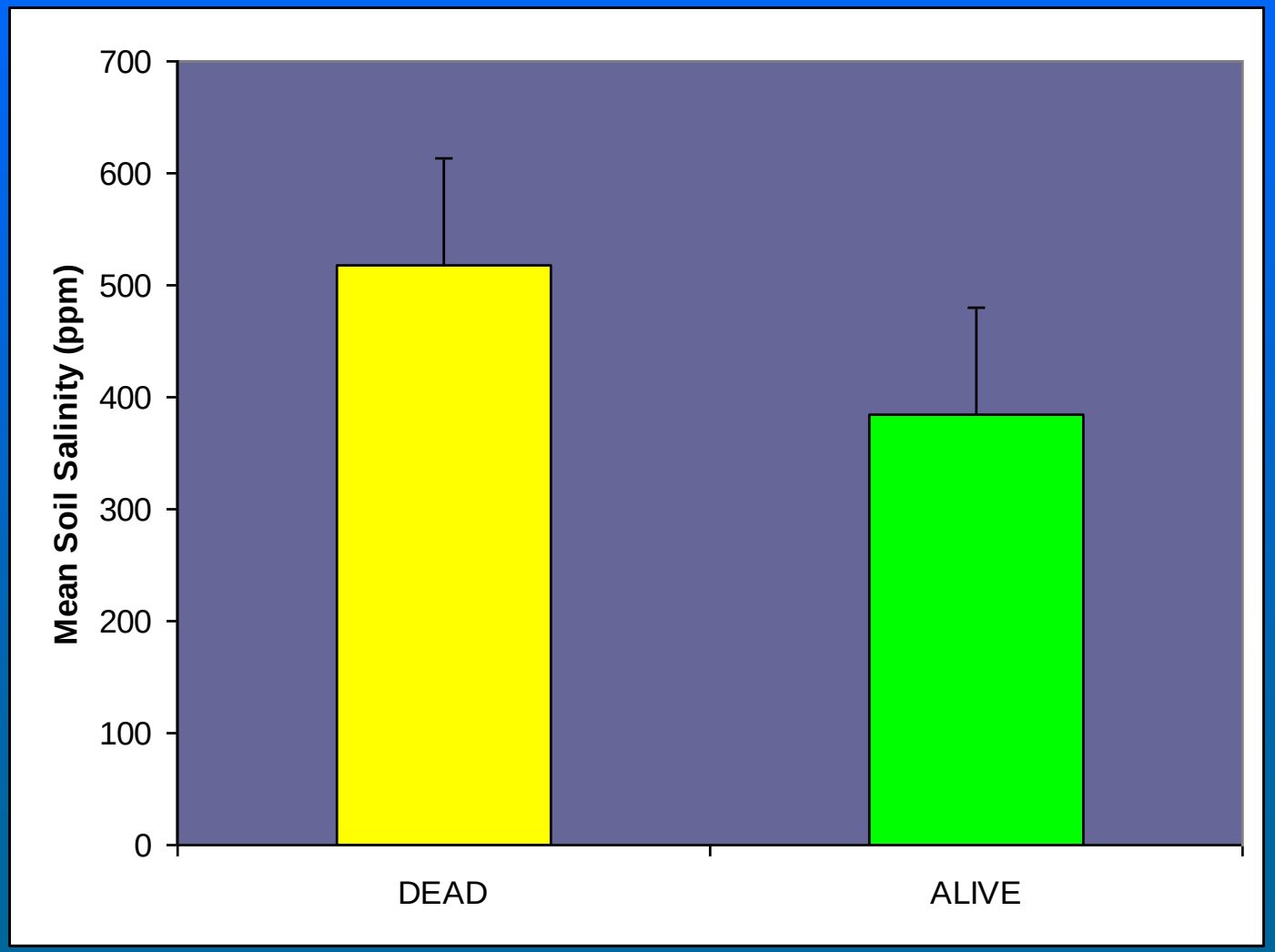


Lower Matecumbe Key, Fla. Dec. 1916. Carrying plants of cactus (Cephalocereus keyensis) out of hammock. Photo by J.K.Small

Key Tree Cactus Survey Results



In 2007, In Lower Keys Soil Salinity was Greater Around Dead Plants



Thanks to funding from USFWS and FDACS

Steps for species conservation:

1. Make collections for long-term storage ex situ at FTBG and DBG.
2. Rescue populations if necessary.
3. Testing Salinity Tolerance.
4. Genetics studies planned.
5. Identify potential reintroduction sites.
6. Spread the risk by reintroducing plants to the wild (increasing total numbers of plants and populations).

Testing Salinity Tolerance of Key Tree Cactus

Seedlings germinated in 2008 from 2 maternal lines

Maternal 1 – cultivated source
Maternal 2 - BPK

What do Salinity Measures Mean?

40 mM Na = Soils considered saline; Plants experience osmotic stress

100 mM Na = level at which salt sensitive species cannot complete life cycle

0 94 390 670 1800ppm 11,000 ppm

X = 11g Na in 1000 ml water

Live Dead in 2007

Five Salinity Levels

1. 0 mM NaCl =control plants received only RO water with no detectable Na

2. 2 mM NaCl = low soil Na concentrations detected at one proposed reintroduction site

3. 15 mM NaCl = Na soil concentration detected at BPKE, where *P. robinii* had low mortality between 1994 and 2007

4. 40 mM NaCl = the threshold for osmotic stress in salt-sensitive plants and comparable to Na concentrations measured at BPKW

5. 80 mM NaCl = 2X threshold stress Na concentrations

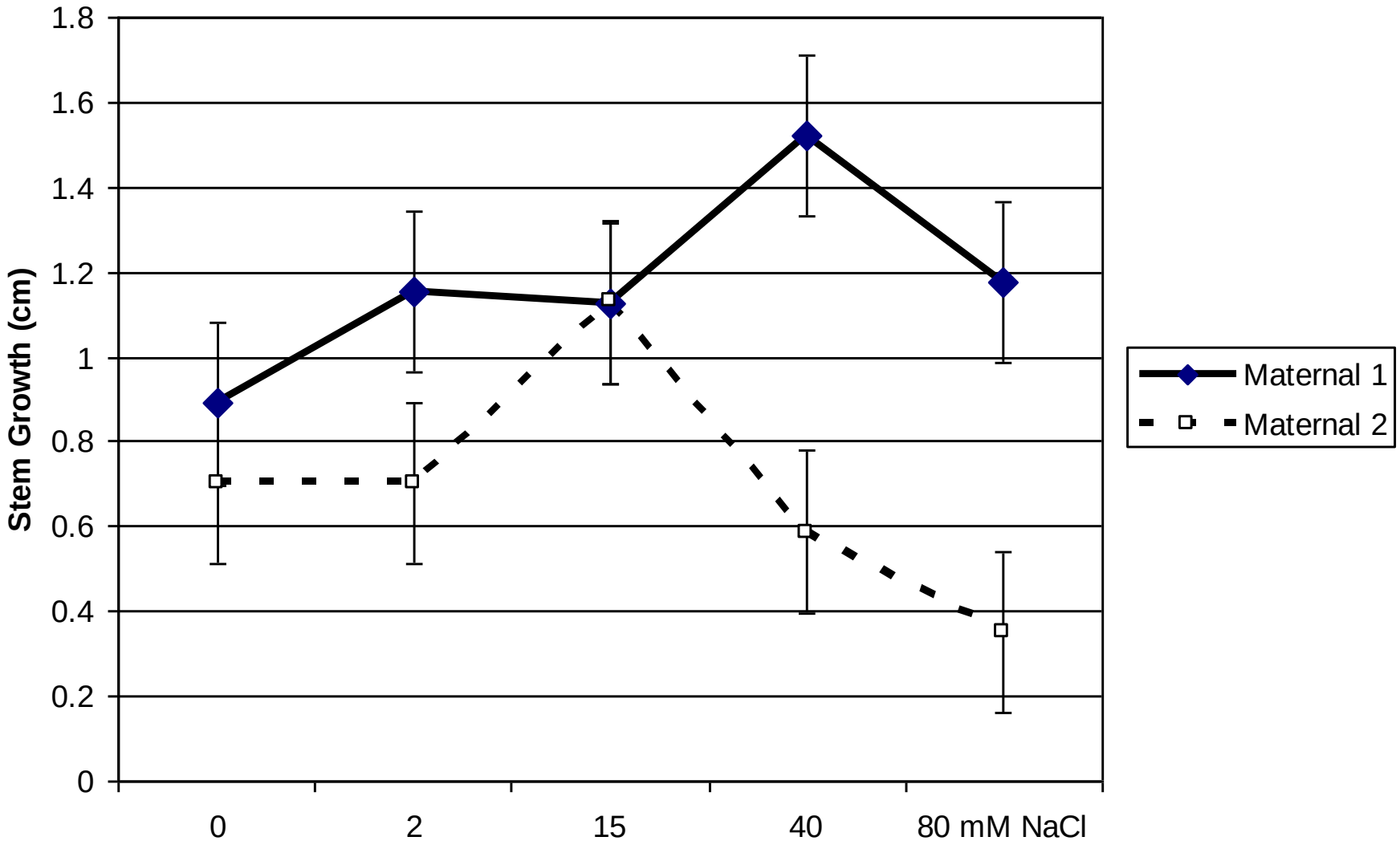
Setting Up the Experiment

Initial and 7 week Growth Measurements

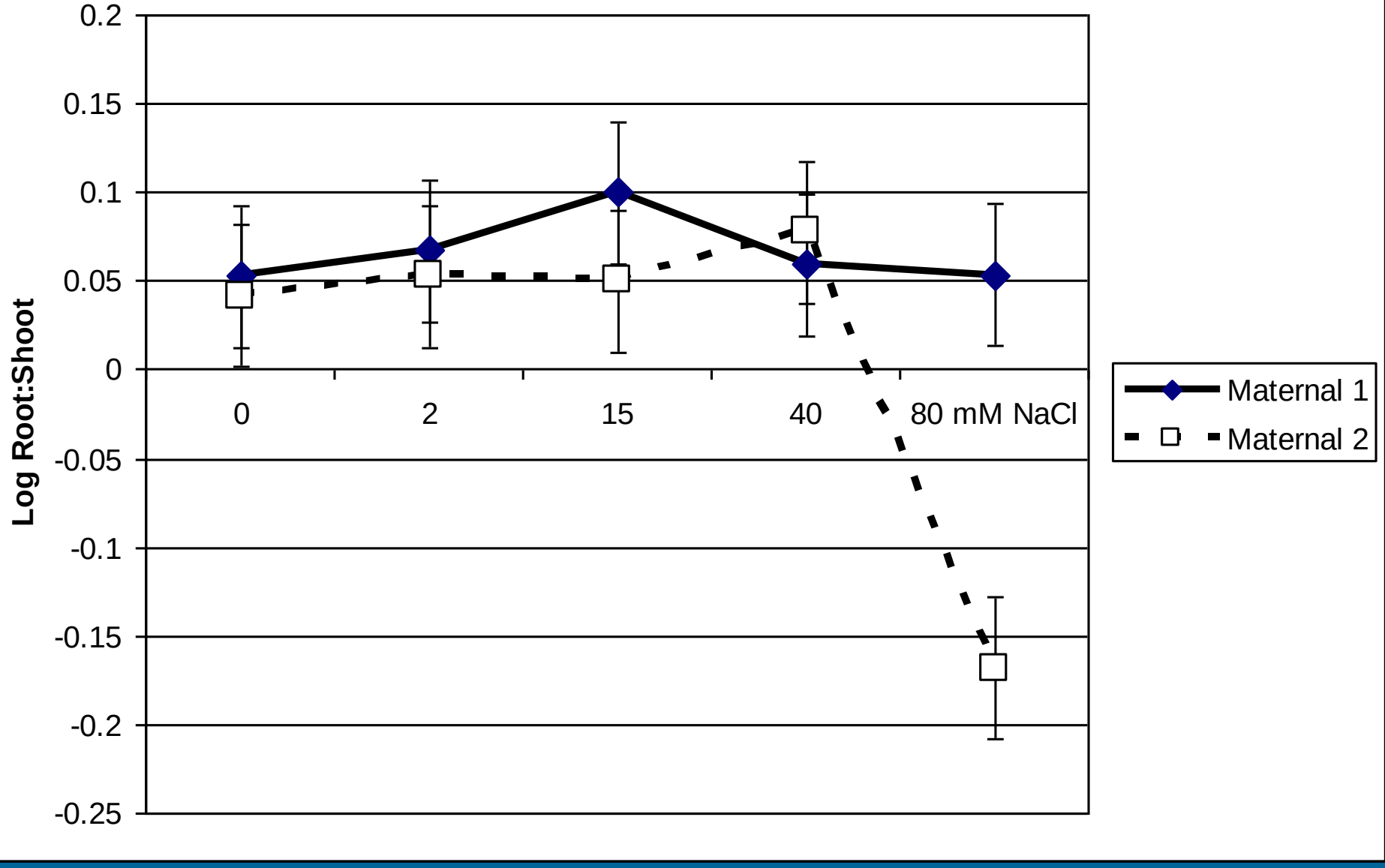
Stem Weight and Length

Dry Root Weight

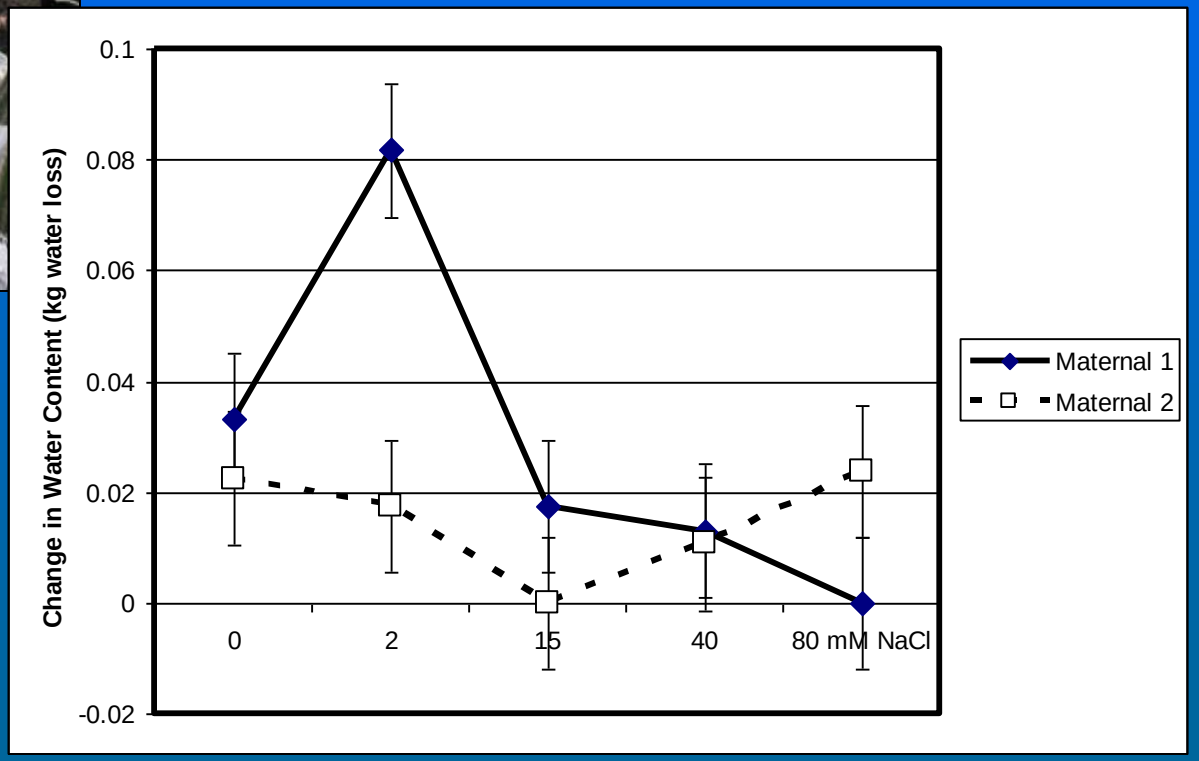
Stem Growth


Stem Growth (cm)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
2
15
40
80 mM NaCl
Maternal 1
Maternal 2

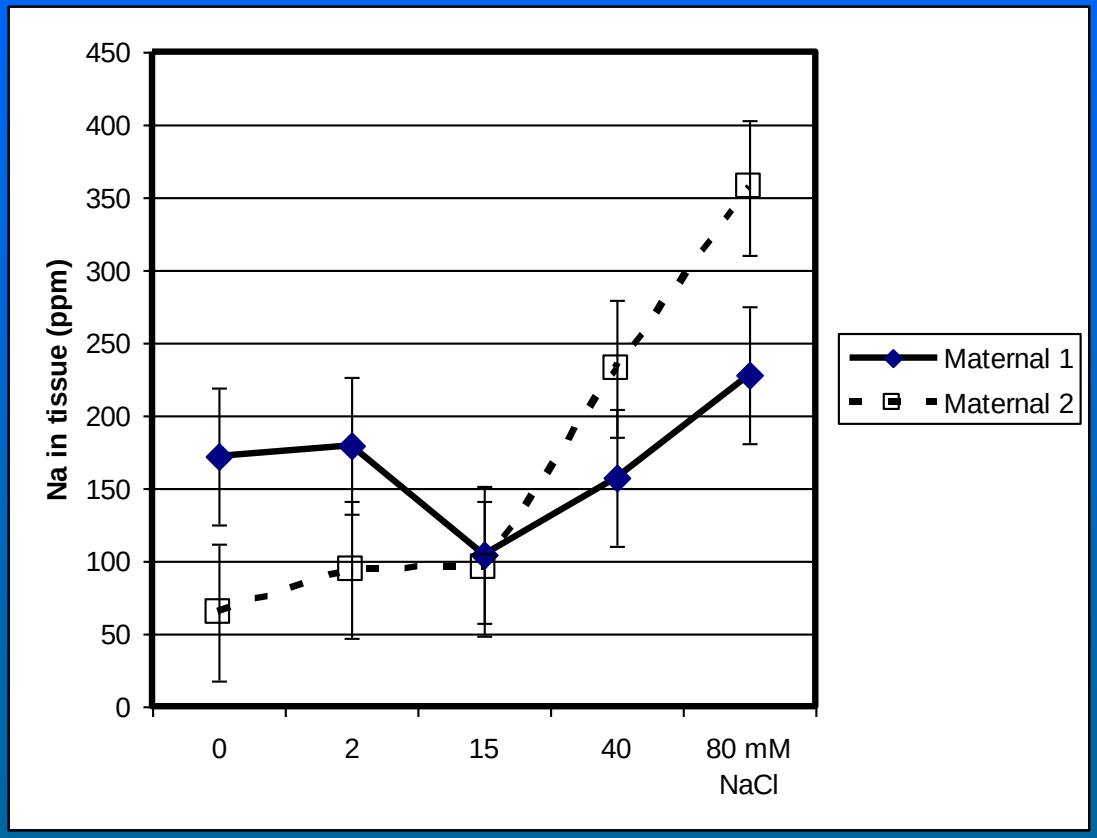
Root:Shoot Ratio



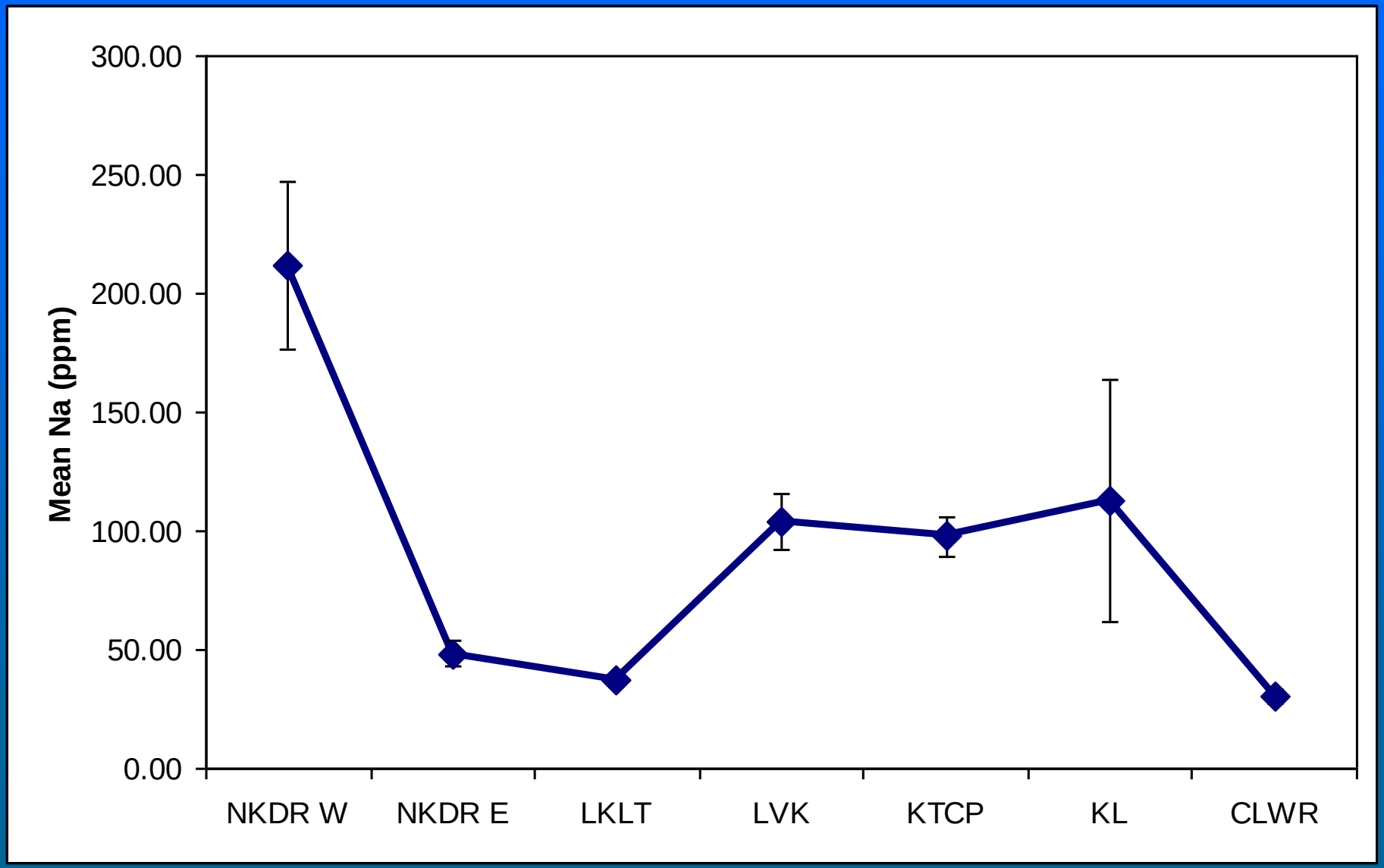
Transpiration Rate



Levels of Sodum in Plant Tissue



Sodium Concentration in Florida Keys Soils Collected Winter 2011



Conclusions

- There was variation in salt tolerance across maternal lines of Key tree cactus. BPK collection was very salt sensitive.
- At least one reintroduction site (CLWR) had salinity levels well within the tolerance of both maternal lines that were tested.
- BPKW salinity levels were significantly greater than other sites even 4 yrs post storm-surge event.
- Reintroductions with some salt-tolerant genotypes would be beneficial.
- A second source of mortality may have been inundation. Trials are underway.

Thanks to the South Florida Conservation Team and to funding agencies U.S. Fish and Wildlife Service and Florida Dept of Agriculture and Consumer Services