

TAPE GRASS, *VALLISNERIA AMERICANA* RESTORATION IN SW FLORIDA USING EXCLOSURE CAGES TO CONTROL HERBIVORY & PROMOTE SEED PRODUCTION



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North Florida Springs & Rivers



Ecosystem Services of *Vallisneria*

1. Habitat for fishes, crabs, shrimp, crayfish, bivalves, epiphytes, and numerous aquatic insects.
2. Forage for endangered manatees, freshwater turtles, waterfowl, fish, crayfish, and snails
3. Stabilizes sediments, attenuates wave action, improves water clarity, and removes nutrients
4. Considered a "Valued Ecosystem Component" (VEC) for Everglades Restoration and MFLs.
5. Living shoreline habitat that responds quickly when conditions are restored & may serve as a performance measure for CERP projects.

ABSTRACT

Water quality degradation, algae blooms, drought conditions, water management practices, invasive species, and excessive herbivory have all contributed to the decimation of native submerged aquatic vegetation (SAV) coverage in aquatic ecosystems. For example, over two thousand acres of the freshwater tape grass (or eel grass), *Vallisneria americana* in the C-43 and upper Caloosahatchee Estuary have been lost since 2001. Tape grass is considered as a valued ecosystem component (VEC) for Everglades Restoration but has been nearly eliminated from many freshwater ecosystems from north Florida springs to the Caloosahatchee River and Lake Trafford. SAV recovery under ideal conditions is currently regulated in many areas by excessive herbivory. Herbivores include turtles, manatees, waterfowl, grass carp, crayfish and other invertebrates including the invasive non-native apple snail, *Pomacea maculata* (syn. *insularum*). Herbivore exclusion cage designs have been tested in the Caloosahatchee River since 2002 with mixed results. Herbivore exclusions have also been used to protect *V. americana* plantings in the Crystal River, Florida and in the Chesapeake Bay. Several designs of exclusion cages have been tested for protecting planted *V. americana* from herbivores. Low profile cages (30 cm) were used to successfully establish plots of tape grass but flower production was not possible due to grazing. In 2011 *V. americana* was replanted upstream of structure S-79 in order to establish a potential seed source for future populations in the upper estuary. Higher profile cages (1.0 meter) constructed of PVC and plastic mesh and anchored with bricks and rebar were deployed to allow for vertical growth and seed production. Flowering and seed pod production was successful in both small (1m²) and large exclusions (2m x 6 m) cages. Wave action from C-43 vessel traffic caused damage that required routine maintenance that became cost prohibitive. Exclusion cages were successful for producing an upstream seed source of *Vallisneria americana* for the Caloosahatchee Estuary, C-43 and Lake Trafford. We propose using a sturdier cage for withstanding wave action and manatees, along with regular maintenance to remove non-native snails and epiphytes as needed. Control of the invasive exotic apple snail, *P. maculata* is an immediate concern for recovery of SAV in the Greater Everglades Ecosystem.

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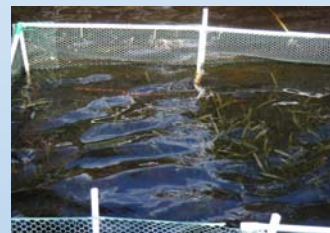
Factors controlling growth and distribution in South Florida

1. Salinity levels and duration of exposure (Doering et al. 1999, 2002)
2. Water clarity, light attenuation, color (Bortone and Turpin 2000)
3. Sediment type, nutrient concentrations, and genetic strains (Gettys and Haller 2011)
4. Excessive herbivory (Ceilley and Bortone 2003, Ceilley 2009, Hauxwell et al. 2004, Moore et al. 2010, Ceilley and Everham 2013)

Vallisneria americana range map for US and Canada



Acknowledgements: Funding for these restoration and research projects was provided by the South Florida Water Management District, Lee County and the West Coast Inland Navigation District between 2002-2015. Special thanks to Peter Doering, Beth Orlando, Teresa Coley, Steve Bortone, and the late Chris Koepfer for their support and encouragement in restoring this critical habitat type in S. Florida.



Summary

- Growth and survival at all large exclusion sites was good and plants colonized a large percentage of the bottom of the exclusions ranging from 70-98% cover.
- The large cages successfully protected tape grass from over-grazing after six months and density of plants ranged from 16.5 to 129 plants/m².
- No plants survived outside cages due to obvious grazing on runners and blades by turtles, exotic apple snails and manatees
- We documented staminate and pistillate flowers and seed pods using exclusion cages. Seed production appears to be greatest in winter months based on our observations in the C-43 and Lake Trafford.



Conclusions

- Herbivory is controlling factor both upstream and downstream of Franklin Lock (S-79) in the Caloosahatchee River & other waters in SW Florida
- *Vallisneria* plants outside the cages were grazed & short (2-3cm) & No flowering or seed pods documented since 2000 in Caloosahatchee Estuary
- Using mesh exclusions to protect the plants from herbivory was critical to restoration success due to massive losses of *Vallisneria* beds in recent years to poor water quality and droughts
- Exclusion cages allowed for successful flowering and seed production in the Caloosahatchee River.
- Genetic strains of *Vallisneria americana* are being tested for tolerance for water quality, sediment type, and salinity for restoration project applications.



Vallisneria restoration at Lake Trafford CERP project (above) using exclusion cages (below).



Without Cages



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EXCLOSURE CAGES TO CONTROL HERBIVORY & PROMOTE SEED PRODUCTION



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Eel grass, tape grass
Vallisneria spiralis
Photo by Vic Hamann
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With Cages



Without Cages



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