

Quantifiable Objective Refinement

Rainbow River



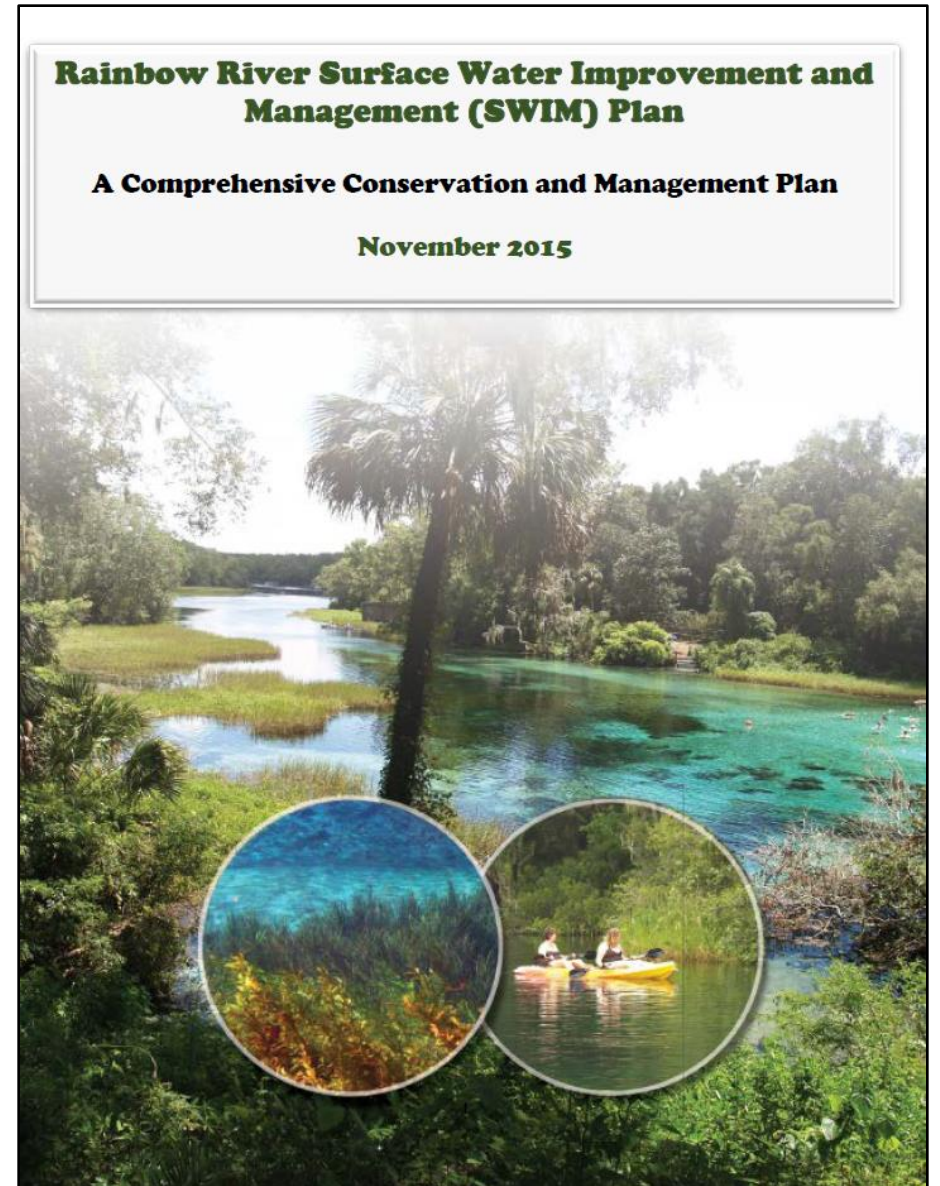
Madison Trowbridge, Ph.D.

Springs Scientist

Natural Systems and Restoration

SWIM Plans

- Surface Water Improvement & Management (SWIM) Plans
 - Issues & Drivers
 - Management actions
 - Quantifiable objectives
 - Projects and Initiatives



Quantifiable Objectives



Rainbow: Current Quantifiable Objectives

| Water Quality | Target |
|---|--------------------------|
| Water clarity in the river | >100 feet ¹ |
| Nitrate concentration in the springs and river | <0.35 mg/L ² |
| Water Quantity | |
| Minimum flows for the springs and river system | TBD in 2016 ³ |
| Natural Systems | |
| Coverage of desirable submerged aquatic vegetation in the river | >65% ⁴ |
| Coverage of invasive aquatic vegetation (hydrilla/filamentous algae) in the river | <10% ⁴ |

¹ Based on Anastasiou 2006 and average river-wide data presented in Table 3

² FDEP 2013 – Nutrient TMDL for Rainbow Springs Group and Rainbow Springs Group Run

³ SWFWMD 2015 Minimum Flows and Levels Priority List and Schedule

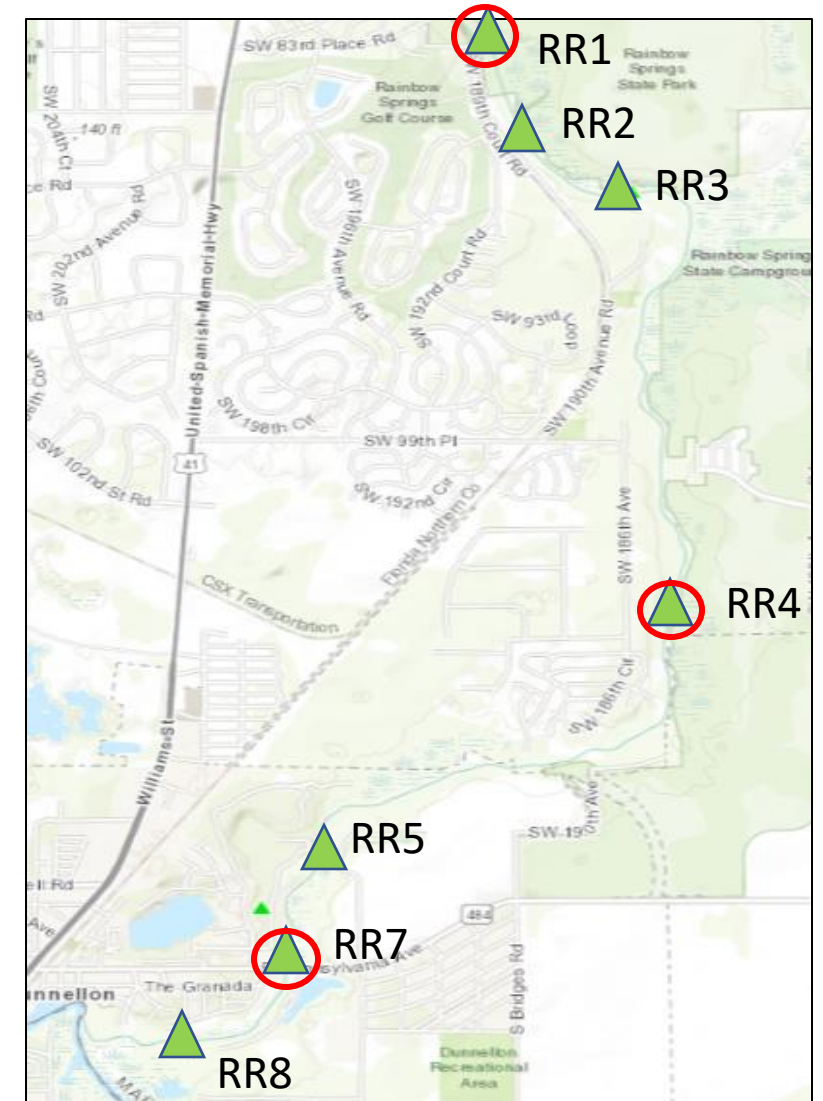
⁴ Based on data presented in Table 4 from the 2011 Rainbow River vegetation evaluation (Atkins and DCWI 2012)

Rainbow: Refinement Discussion

- Minimum flows as >95% natural flow
- Define Quantifiable Objectives as different river portions
 - Water clarity – indicator status
 - Submerged aquatic vegetation

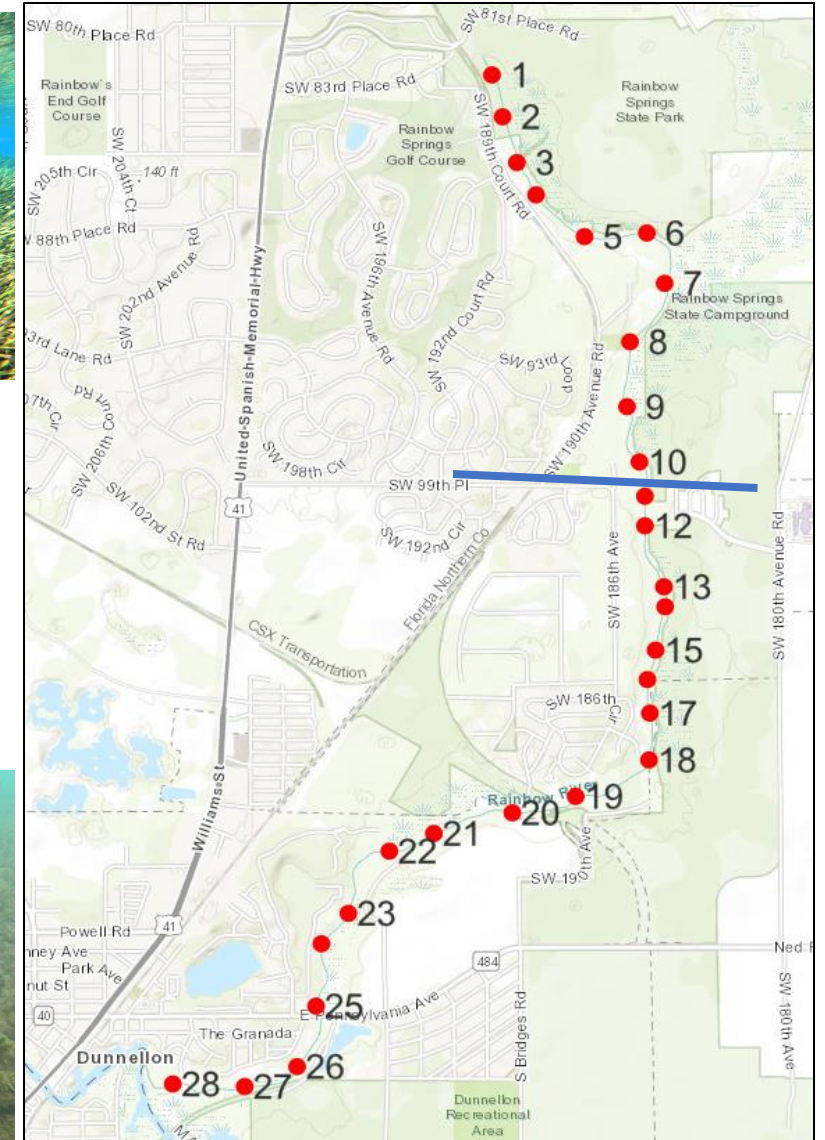
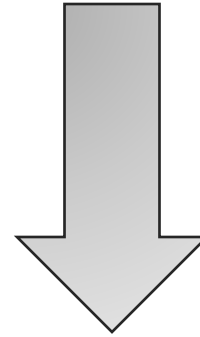
Rainbow: Refinement Discussion

- **Presenting Quantifiable Objectives as different river portions**
 - **Water clarity**



Rainbow: Refinement Discussion

- Presenting Quantifiable Objectives as different river portions
 - Natural systems (submerged aquatic vegetation)



Rainbow Refinements Summary

Indicators

| Water clarity | Threshold |
|----------------------------|-----------|
| Near the headspring | 194 ft |
| Middle portion of river | 47 ft |
| Lower portion of the river | 26 ft |

Quantifiable Objectives

| Water quality | Target |
|---|--------------------|
| Nitrate concentration in the springs and river | < 0.35 mg/L |
| Water quantity | |
| Minimum flows for the springs and river | > 95% natural flow |
| Natural systems | |
| Desirable submerged aquatic vegetation in the upper and lower portions of the river | > 65% |
| Invasive aquatic vegetation in the upper and lower portions of the river | < 10% |

Action item

Approve quantifiable objective refinements to replace those currently in the SWIM Plans.

- **Redefine water clarity as an indicator**
- **Update minimum flows target as adopted**
- **Define water clarity evaluated as headspring, middle, and lower portions**
- **Define desirable and invasive submerged aquatic vegetation evaluated as upper and lower portions**

Questions or comments?

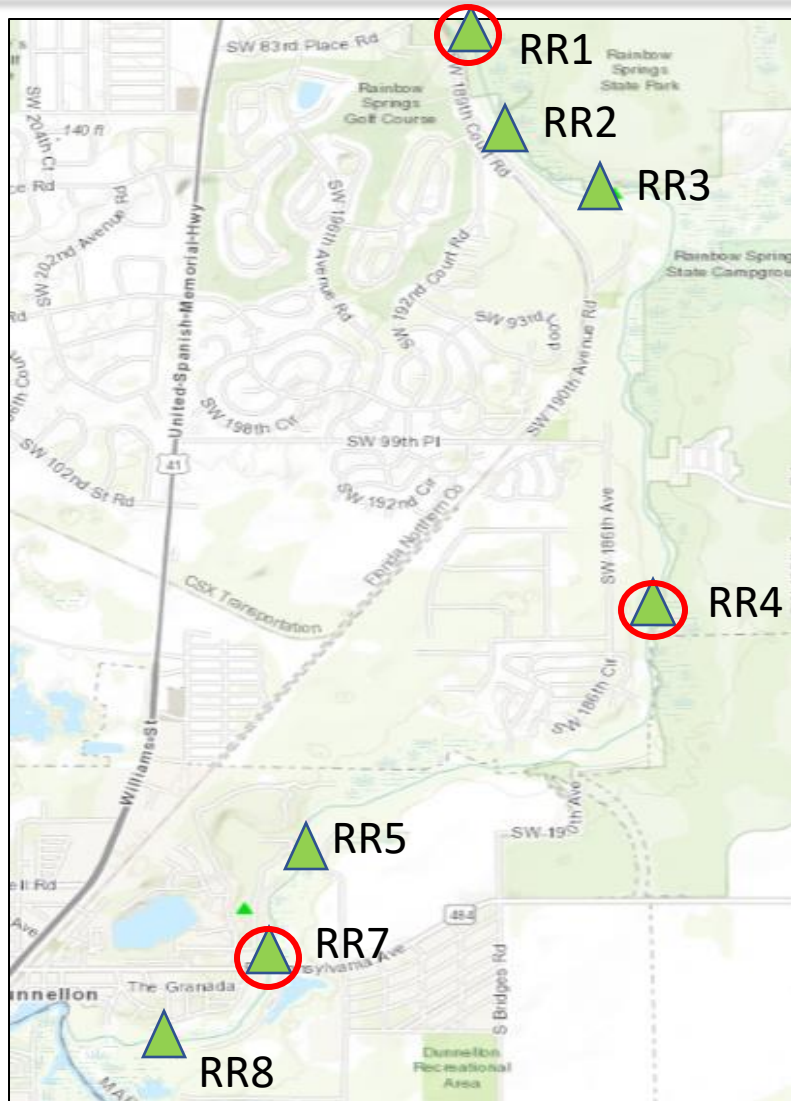
Madison Trowbridge, Ph.D.

Springs Scientist

Natural Systems & Restoration

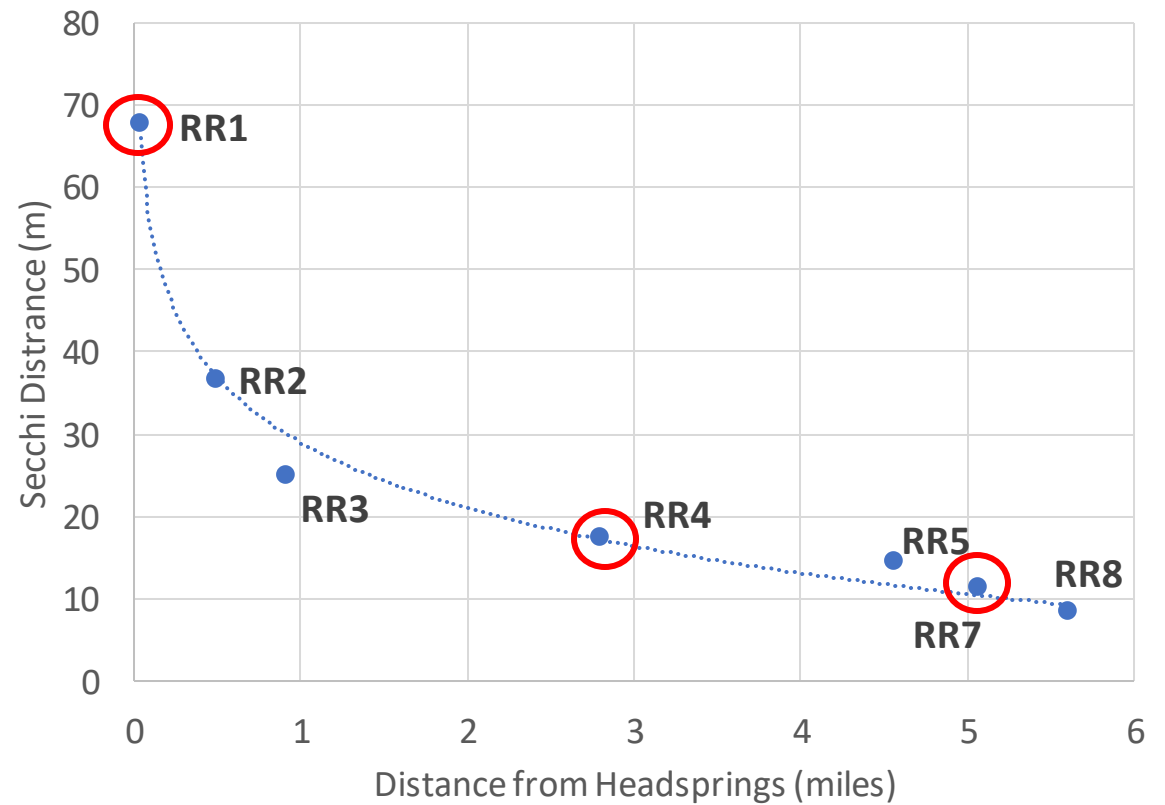
Madison.Trowbridge@swfwmd.state.fl.us

Q0: Rainbow Discussions



Rainbow River Secchi vs Distance

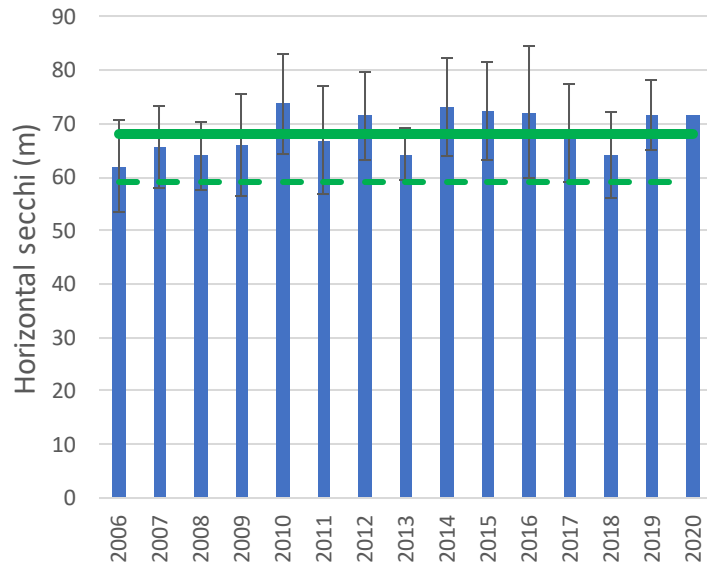
$$y = -11.46\ln(x) + 29.003$$
$$R^2 = 0.9844$$



Q0: Rainbow Discussions

HEADSPRING PORTION

Annual Clarity Average: RR1

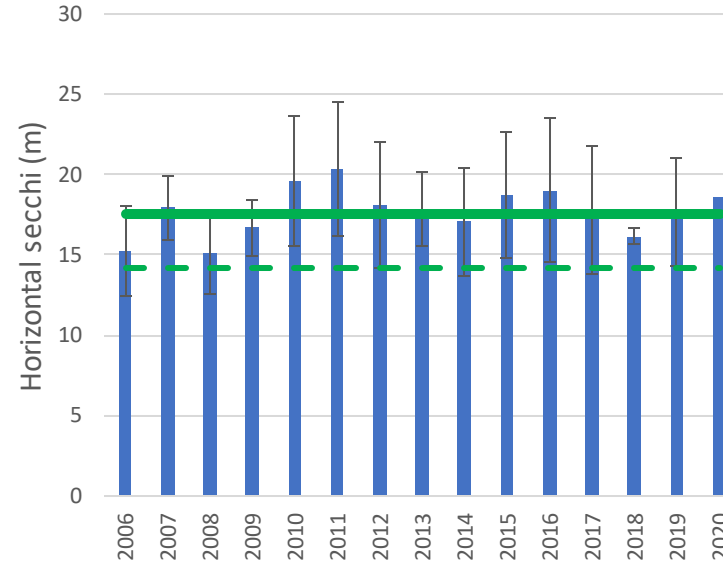


AVG: 68 m
(223 ft)
STD: 9 m
(29 ft)



MIDDLE PORTION

Annual Clarity Average: RR4

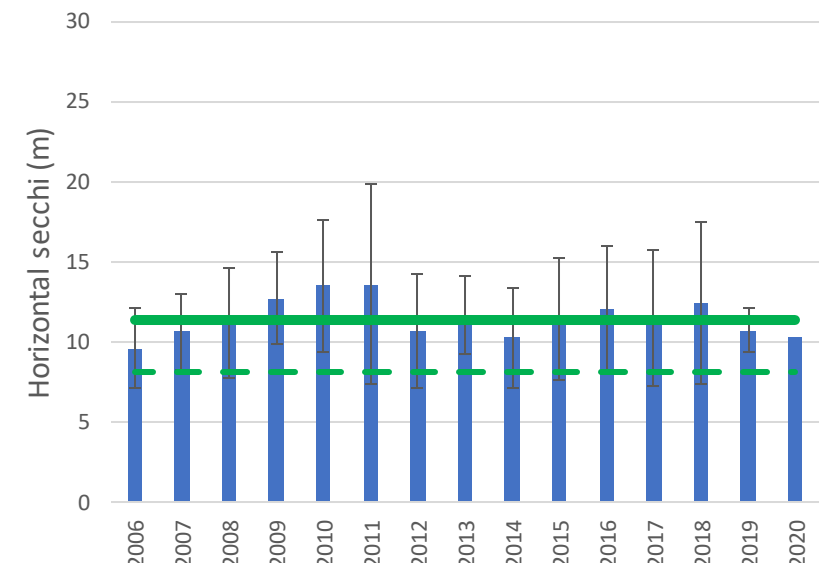


AVG: 18 m
(58 ft)
STD: 3 m
(11 ft)



LOWER PORTION

Annual Clarity Average: RR7



AVG: 11 m
(37 ft)
STD: 3 m
(11 ft)



Q0: Rainbow Discussions

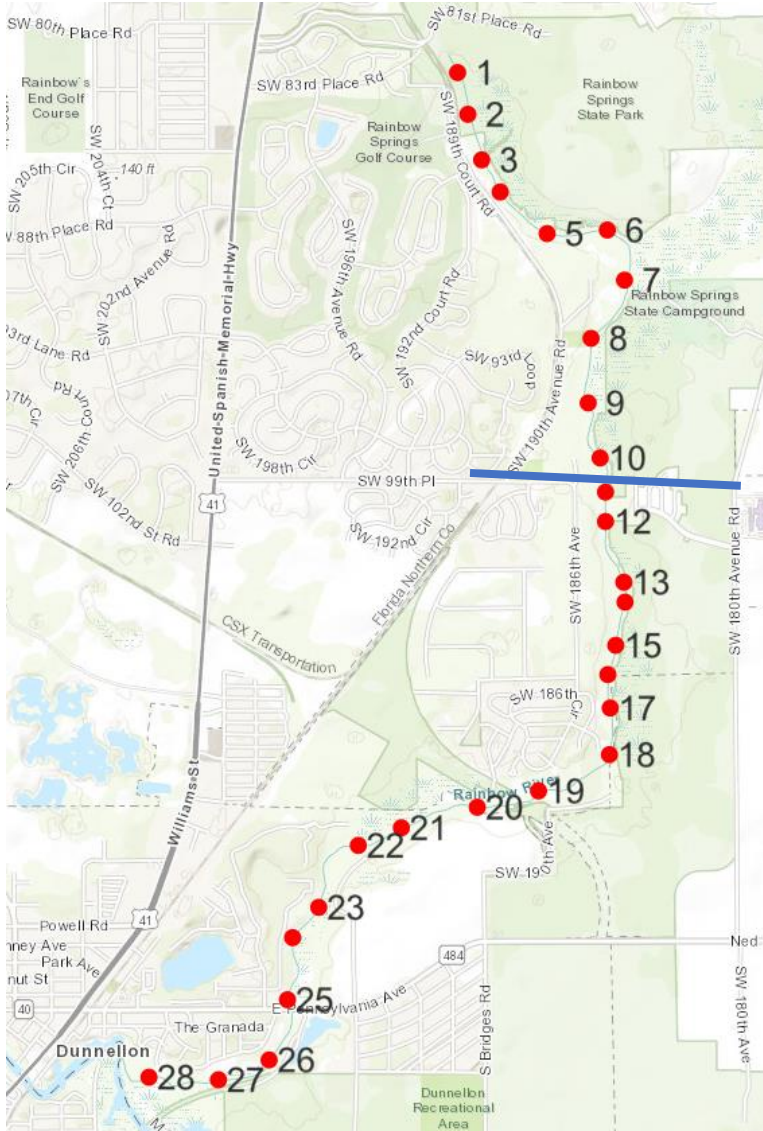
Targets:

Invasive: <10%

Desirable: >65%

 = *meeting*

👉 = *not meeting*



| Transect | Avg Total SAV Cover (%) | Invasive SAV | Desirable SAV |
|----------|-------------------------|--------------|---------------|
| 1 | 73 | 18 | 57 |
| 2 | 58 | 0 | 75 |
| 3 | 68 | 0 | 89 |
| 4 | 94 | 1 | 125 |
| 5 | 53 | 4 | 58 |
| 6 | 41 | 2 | 42 |
| 7 | 50 | 21 | 51 |
| 8 | 86 | 9 | 87 |
| 9 | 74 | 17 | 73 |
| 10 | 90 | 1 | 112 |
| 11 | 85 | 15 | 87 |
| 12 | 81 | 30 | 96 |
| 13 | 85 | 16 | 96 |
| 14 | 92 | 31 | 82 |
| 15 | 86 | 18 | 79 |
| 16 | 53 | 35 | 30 |
| 17 | 80 | 74 | 77 |
| 18 | 26 | 20 | 19 |
| 19 | 82 | 17 | 86 |
| 20 | 99 | 44 | 97 |
| 21 | 58 | 63 | 39 |
| 22 | 77 | 37 | 66 |
| 23 | 47 | 32 | 21 |
| 24 | 93 | 18 | 88 |
| 25 | 82 | 56 | 52 |
| 26 | 63 | 115 | 12 |
| 27 | 58 | 113 | 0 |
| 28 | 96 | 168 | 8 |

Option 1: upper

 **Invasive: 7%**

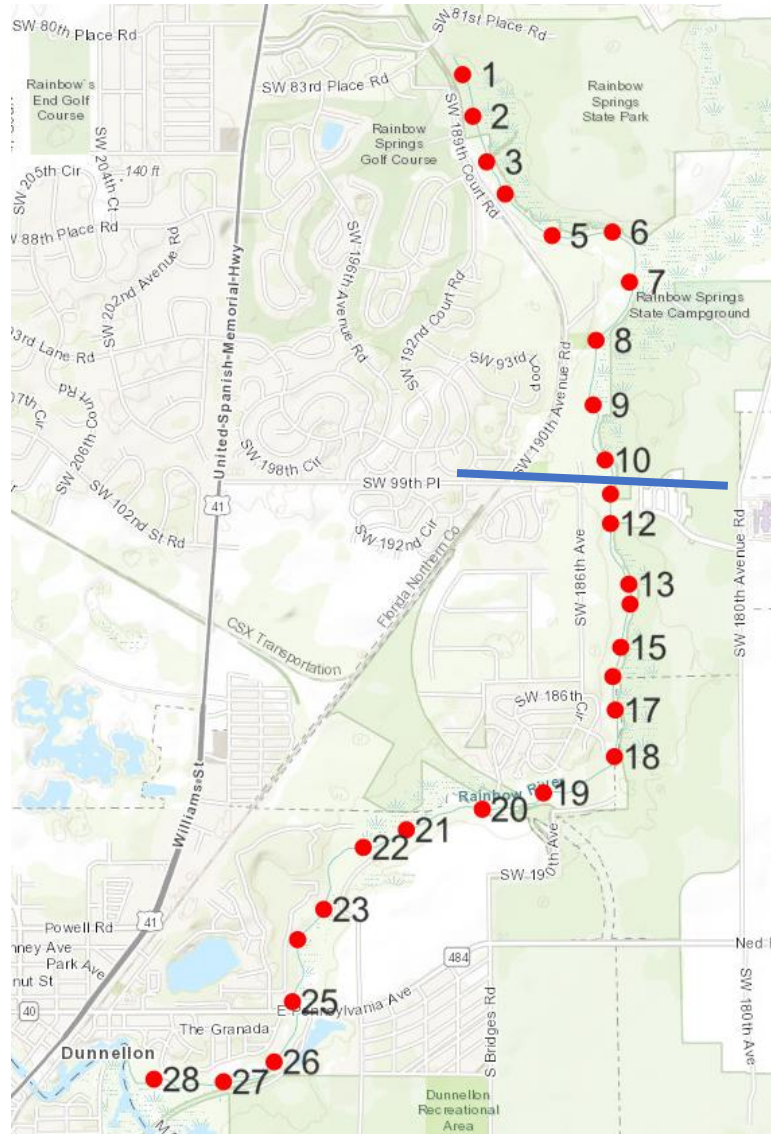
 **Desirable: 77%**

Option 1: lower

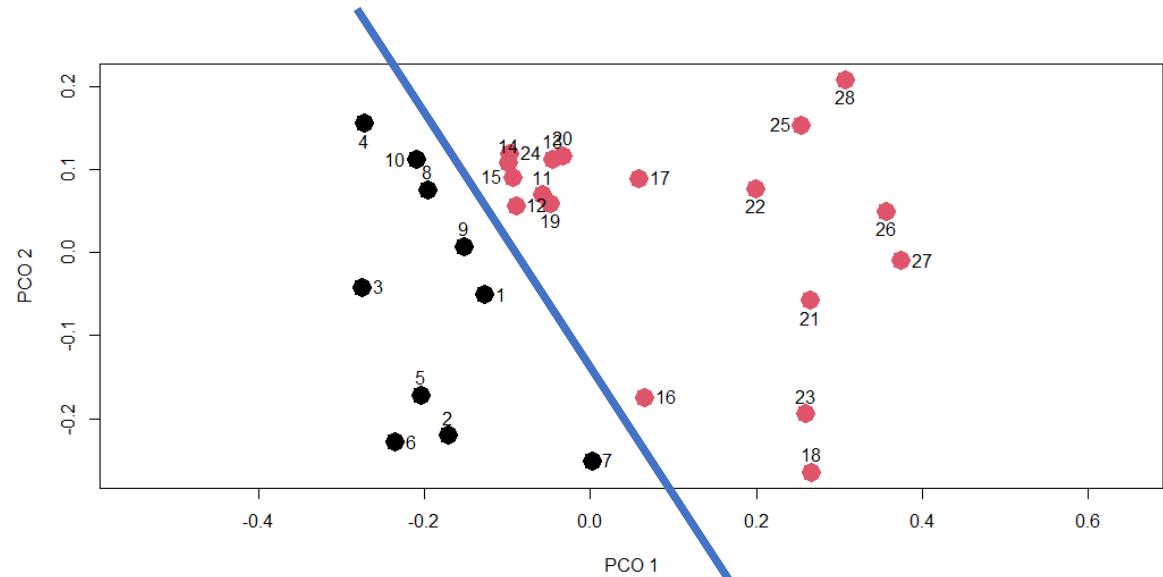
 Invasive: 50%

 **Desirable: 58%**

Q0: Rainbow Discussions



| Transect | Avg Total SAV Cover (%) | Invasive SAV | Desirable SAV |
|----------|-------------------------|--------------|---------------|
| 1 | 73 | 18 | 57 |
| 2 | 58 | 0 | 75 |
| 3 | 68 | 0 | 89 |
| 4 | 94 | 1 | 125 |
| 5 | 53 | 4 | 58 |
| 6 | 41 | 2 | 42 |
| 7 | 50 | 21 | 51 |
| 8 | 86 | 9 | 87 |
| 9 | 74 | 17 | 73 |
| 10 | 90 | 1 | 112 |
| 11 | 85 | 15 | 87 |
| 12 | 81 | 30 | 96 |
| 13 | 85 | 16 | 96 |
| 14 | 92 | 31 | 82 |
| 15 | 86 | 18 | 79 |
| 16 | 53 | 35 | 30 |
| 17 | 80 | 74 | 77 |
| 18 | 26 | 20 | 19 |
| 19 | 82 | 17 | 86 |
| 20 | 99 | 44 | 97 |
| 21 | 58 | 63 | 39 |
| 22 | 77 | 37 | 66 |
| 23 | 47 | 32 | 21 |
| 24 | 93 | 18 | 88 |
| 25 | 82 | 56 | 52 |
| 26 | 63 | 115 | 12 |
| 27 | 58 | 113 | 0 |
| 28 | 96 | 168 | 8 |



Invasive: 7%



Desirable: 77%



Invasive: 50%



Desirable: 58%