

ECOLOGICAL STUDIES OF WILLOW (*SALIX CAROLINIANA*):
MONTHLY STATUS REPORT #4



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Ecological Studies of Willow (*Salix caroliniana*): Monthly Status Report #4
Covering the time period from April 1-30, 2009

This status report summarizes progress made on the Ecological Studies of Willow project through April 30, 2009, with reference to the tasks and timeline outlined in the Scope of Work and presented in Table 1 below.

Table 1. Timeline of tasks to be accomplished in Year 1 and later. Tasks initiated and underway in this reporting month are highlighted in blue.

YEAR 1

| Quarter | Months | Tasks accomplished |
|-----------------|-----------------|--|
| 1 st | Oct – Dec, 2008 | Initiate and complete Task 1 (<i>Finalize research plan</i>) |
| 2 nd | Jan – Mar, 2009 | Initiate Task 2.1 (<i>Germination & early survival and growth experiments</i>) Initiate Task 2.4 (<i>Life history</i>) |
| 3 rd | Apr – Jun, 2009 | Continue Task 2.1 (<i>Germination experiment</i>) Initiate Task 2.2 (<i>Willow transplantation</i>) Initiate Task 2.3 (<i>Fire response</i>) Continue Task 2.4 (<i>Life history</i>) |
| 4 th | Jul – Sep, 2009 | Continue Task 2.4 (<i>Life history</i>) Complete Tasks 2.1 & 2.2 (<i>Germination experiment & Willow transplantation</i>) Complete Task 3.1 (<i>Data analysis and final report, Year1</i>) |

YEAR 2

| Quarter | Months | Tasks accomplished |
|-----------------|-----------------|--|
| 1 st | Oct – Dec, 2009 | Continue Task 2.3 (<i>Fire response</i>) Continue Task 2.4 (<i>Life history</i>) |
| 2 nd | Jan – Mar, 2010 | Continue Task 2.3 (<i>Fire response</i>) Continue Task 2.4 (<i>Life history</i>) Initiate Task 2.5 (<i>Spatial analysis of willow distribution</i>) |
| 3 rd | Apr – Jun, 2010 | Initiate Task 2.2 (2nd iteration, <i>Willow transplantation</i>) Continue Task 2.3 (<i>Fire response</i>) Continue Task 2.4 (<i>Life history</i>) Continue Task 2.5 (<i>Spatial analysis of willow distribution</i>) |
| 4 th | Jul – Sep, 2010 | Complete Task 2.2 (2nd iteration, <i>Willow transplantation</i>) Continue Task 2.3 (<i>Fire response</i>) Continue Task 2.4 (<i>Life history</i>) Continue Task 2.5 (<i>Spatial analysis of willow distribution</i>) Complete Task 3.2 (<i>Data analysis and final report, Year2</i>) |

Progress on Task 1 – Finalizing the Research Plan

In collaboration with District personnel, the UCF team identified field sites for the competition experiment (Fig. 1).

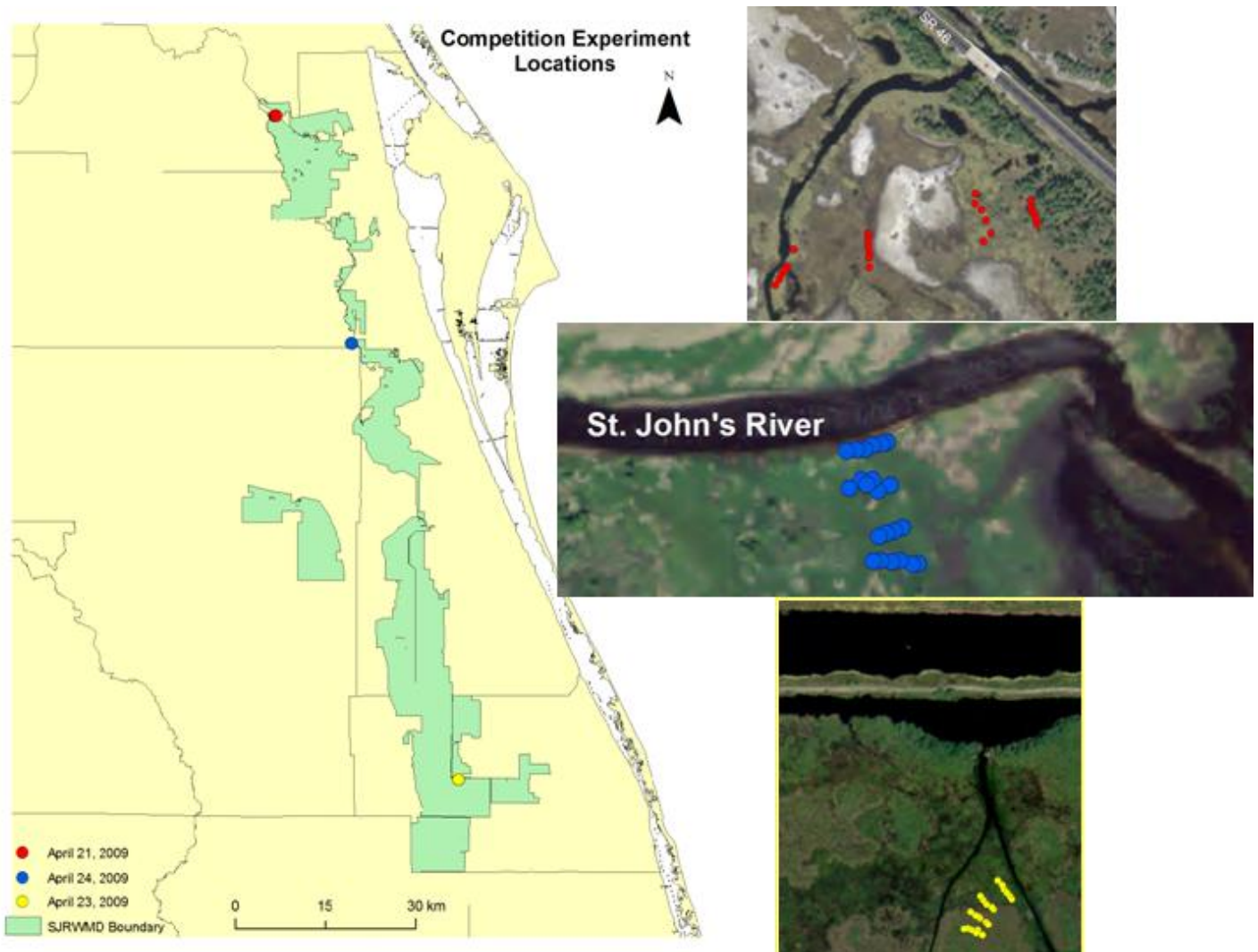


Figure 1. Locations of the north (red), central (blue) and southern (yellow) blocks of the willow competition experiment. Seedlings and cuttings were planted in four locations along an elevation/microhabitat gradient: along a river, stream or airboat trail; at the wetland/upland or shrub ecotone; and at two intermediate locations between these two extremes. Within a block, willow cuttings and seedlings were planted in an open area; within 15 cm of a grass/forb; or within 15 cm of a non-willow shrub. Each circle on the map identifies one of these six treatments, which are repeated four times along the gradient (the four parallel lines of circles).

Progress on Task 2.1 – Germination and Early Survival and Growth Experiments

The UCF team completed the 2nd growth chamber experiment, which evaluated the six soil types used in the greenhouse experiment. Thirty green seeds were sown into each pot, with water delivered by capillary action. This watering protocol yielded the highest seedling survival

in the previous germination experiment. The experiment ended on April 30 and we are still entering and proofreading the data. Initial results will be in the next monthly report.

The greenhouse was completed and plants moved into it to acclimate (cover photo). Both greenhouse experiments were initiated on May 14 & 15; results will be summarized in the next report.

Progress on Task 2.2 – Willow Transplantation A. Competition Experiment – On April 21-24, we established three replicates of a field experiment to evaluate responses of willow seedlings and cuttings to competition with grasses/forbs and non-willow shrubs (Fig. 1). The experimental design and analysis are presented below (Fig. 2). Graduate students from Dr. Quintana-Ascencio’s restoration ecology class planted the northernmost block (Fig. 3), which is located within Seminole Ranch Conservation Area. We will monitor plants monthly during this experiment.

3 x 4 x 2 x 3 factorial = 72 experimental units

Treatments are all possible combinations of

3 ecological neighborhoods: open, grass/forb, or non-willow shrub x

4 positions: river bank, 33% up floodplain, 67% up floodplain or at forest/floodplain ecotone x

2 life-history stages: seedlings (10 per pot) or cutting x

3 replicates: transects south of SR 46 (Cabbage Slough), northwest of Lake Poinsett, and in Blue Cypress Marsh Conservation Area .

| Source | df | Critical F |
|------------------------------|----|--------------------|
| Competitive neighborhood (C) | 2 | $F_{2,4} = 6.94$ |
| Position (P) | 3 | $F_{3,6} = 4.76$ |
| Life-history stage (S) | 1 | $F_{1,2} = 18.5$ |
| Replicate (R; random effect) | 2 | $F_{2,12} = 3.89$ |
| C x P | 6 | $F_{6,12} = 3.00$ |
| C x S | 2 | $F_{2,4} = 6.94$ |
| C x R | 4 | $F_{4,12} = 3.26$ |
| P x S | 3 | $F_{2,6} = 5.14$ |
| P x R | 6 | $F_{6,12} = 3.00$ |
| S x R | 2 | $F_{2,12} = 3.89$ |
| C x P x S | 6 | $F_{6,12} = 3.00$ |
| C x P x R | 12 | $F_{12,12} = 2.69$ |
| C x S x R | 4 | $F_{4,12} = 3.26$ |
| P x S x R | 6 | $F_{6,12} = 3.00$ |
| Residual error | 12 | |
| Total | 71 | |

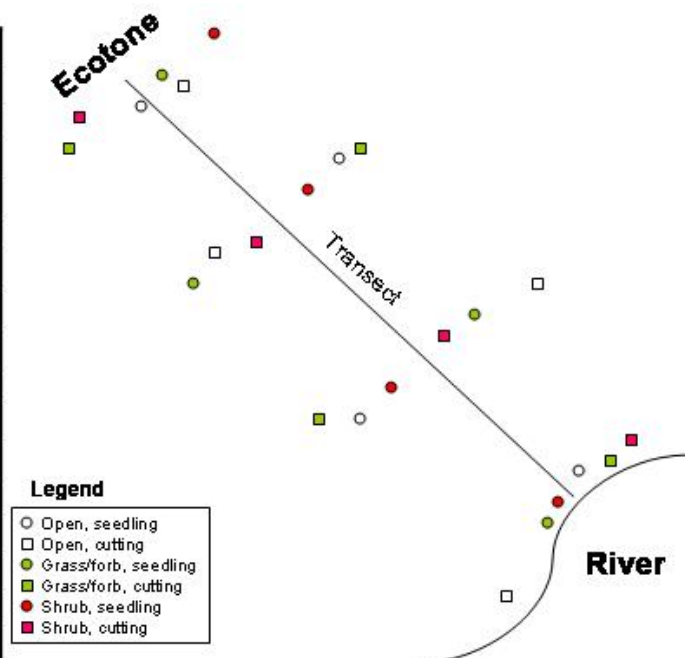


Figure 2. Skeleton ANOVA table (left) and diagram of one block of the willow competition experiment.



Figure 3. (Top) Dr. Quintana-Ascencio and graduate students in his restoration ecology course at the marsh/upland ecotone of the willow competition experiment, northern block. Willow seedlings and cuttings were planted in open areas; adjacent to forbs & grasses; or non-willow shrubs & palm trees. The high water mark from Tropical Storm Fay is marked by the dark tree trunks. **(Bottom)** UCF graduate student Beth Stephens recording GPS coordinates of plants in the central block.

B. Hydrology Experiment – District personnel helped us create four islands for the hydrology experiment (Fig. 4), which began on April 11. Briefly, both seedlings and cuttings were transplanted onto islands at four different heights; at marsh level and 16.7, 33.5 and 50 cm above marsh level. Each of these treatments was repeated on the north, east, south & west sides of each island (Fig. 5). We will monitor plants monthly during this experiment.



Figure 4. (Top) District personnel used heavy equipment to pile submerged marsh soil into artificial islands, which were shaped using the white frame (foreground). **(Bottom)** Dr. Quintana-Ascencio and two members of the Biology Graduate Student Association shaping willow islands.



Figure 5. One of the four replicate willow islands. Colored flags mark seedlings and cuttings from different populations. When we checked the islands in early May, the tops had dried out and were cracking, and while all plants were alive, those perched at or near the top had grown much more slowly than those near marsh level. We will collect the first data from this experiment next week.

Progress on Task 2.4 - Life History

Our attention during this period was focused on the germination experiment, the two field experiments and acclimating cuttings and seedlings to the new greenhouse. We will begin gathering life history data again next month, from sites near the field experiments.

Progress on Task 2.5 – Spatial Analysis of Willow Distribution.

We concentrated on the field experiments and therefore did not modify the spatial model.

Summary of Activity

During this reporting period, the UCF team logged more than 17 person-days initiating the hydrology and competition experiments (Table 1). Twenty person-days is equivalent to a full-time position. Copies of our data notebooks and spreadsheets will be sent by mail.

Table 1. Dates of field trips and other major activities during this reporting period. Not included in this list are routine activities such as watering plants and monitoring those in the growth chamber and greenhouse.

| Date | Personnel Involved | Purpose |
|----------|--------------------------------------|---|
| 02 April | SJRWMD staff/UCF Team | Constructed islands for hydrology experiment |
| 11 April | UCF Team & graduate students | Transplanted seedlings and cuttings onto willow “islands” |
| 21 April | UCF Team & Restoration Ecology class | Planted northernmost block of competition experiment |
| 23 April | SJRWMD staff/UCF Team | Identified sites for competition experiment; planted southernmost block |
| 24 April | UCF Team | Planted central block of competition experiment |
| 30 April | UCF Team | Completed 2 nd germination experiment |

UCF Team – John Fauth, Pedro Quintana-Ascencio, Luz Castro-Morales