Economic performance standards for forested wetland compensatory mitigation sites in Virginia include:

- >990 woody stems/ha (400 stems/acre)
- >10% increase in height/year

The woody stem density standard can be accomplished through:

- Natural tree colonization from surrounding forests
- Introduction of planted trees

Wetland compensation sites are not meeting ecological performance standards mainly as a result of:

- Poor survival of planted woody vegetation
- Poor quality nursery stock
- Improper species selection
- Improper stocktype selection
- Improper planting techniques

Previous studies suggest that species and stocktype should be matched to hydrologic conditions.

The purpose of this study in part, is to determine the appropriate species and stocktype combinations for use in wetland compensation sites and other afforestation or reforestation projects.

### Hypotheses

Within each cell, gallon stocktypes and primary successional species will have greater probabilities of survival and height growth rates when compared to other stocktypes and secondary successional species. Bare root stocktypes will be the least expensive stocktype to ensure meeting the required stem density.

### Survival Data Analysis

- **Survival**
  - There was significant three-way interaction among cell, species, and stocktype (p=0.0089), suggesting that the species and stocktype did not have similar probabilities of survival among each cell.
  - Gallon stocktypes frequently had greater survival than other stocktypes and all species had similar survival probabilities within each cell (Figure 2).

- **Probability of survival beyond two growing seasons**
  - (Lowercase letters represent no significant difference among stocktypes, uppercase letters represent significant difference among species, p<0.05)

### Growth Data Analysis

- **Percent change in height per year**
  - (Uppercase letters represent no significant difference among stocktypes, lowercase letters represent a significant difference among species, p<0.05)

### Economic Analysis

- **Initial density**
  - (Percent change in height per year)

- **Overall density**
  - (Percent change in height per year)

### Methods

- **Three Nursery Stocktypes**
  - Bare root
  - Gallon
  - Tubeling

- **Survival Data Analysis**
  - Measured April, August, October (2009-2010)

- **Growth Data Analysis**
  - Calculated percent change in height per year
  - Two-way ANOVA within each cell and scribing

- **Future Dissertation Work**
  - To determine how the following variables influence the net primary production of planted trees:
    - Distance to forest edge
    - Hydrology
    - Morphology
    - Photosynthetic Rate
    - Leaf area index
    - Photosynthetic Efficiency

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### Literature Cited

- Two Year Survival and Growth of Seven Wetland Tree Species in Three Hydropotically Distinct Habitats

- Herman W. Hudson III and James E. Perry

- Virginia Institute of Marine Science, College of William & Mary, Gloucester Point, VA

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**Table 1.** Economic comparison of species and stocktypes. The initial density required is the number of trees needed to reach the >990 stems/ha ecological performance standard based on survival for each combination. Represents soil removed prior to shipping. Highlighted cells are lowest values.