

# **Dallas Floodway Extension Wetlands**

## ***A proposal for establishment of native aquatic vegetation***

Mike Smart and Gary Dick

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### **General Design Concept**

This proposal is being submitted as a general guideline for establishment of native aquatic plants in the Dallas Floodway Extension (DFE) wetlands over a two-year period. The primary purpose of the wetland creation project is to enhance waterfowl and other wildlife habitat in a floodwater conveyance. Because the depth (7 ft.) to achieve the necessary hydraulic capacity the conveyance requires will not allow for establishment of diverse aquatic plant communities most beneficial to waterfowl and wildlife, shallow water areas will be added adjacent to the flood conveyance channel. These areas will be designed, planted, and managed to promote the development of highly desirable waterfowl and wildlife habitat

Water levels in some or all of the wetlands will be managed according to a practice commonly referred to as "moist soil management". In this management scheme, water levels are lowered during the summer growing period (summer pool), exposing large areas of soil and promoting the growth of terrestrial and wetland plants. Following plant community development and seed production, water levels are raised during the fall and winter (winter pool), allowing waterfowl access and feeding. This management technique can be improved upon by maintaining a permanent pool of water in a portion of the wetland. This practice allows for establishment of additional wetland and aquatic species that provide valuable winter food sources for waterfowl. Many submersed and emergent aquatic plants provide cover and food for other wildlife, fish and invertebrates in addition to serving as food sources for waterfowl. The additional habitat diversity provided by the permanent pool greatly enhances the value of the wetland.

Following excavation and construction, establishment of native plants will be undertaken. Both emergent and submersed plant species will be planted. All species planted provide food for wintering waterfowl and other wildlife.

Protective devices are necessary to successfully establish desirable native aquatic vegetation in Texas. Although this is a new construction project -- much of our experience has been obtained in older (>10 years) reservoirs -- it is likely that feeding activities of aquatic (carp, turtles, nutria) or terrestrial animals (deer, rabbits, loose cattle, wild hogs) will impede plant establishment. If desirable plant establishment is delayed, the habitat quality of the wetland will be greatly diminished. In addition, a delay in native plant establishment provides an opportunity for undesirable, weedy species such as cattails to invade.

Therefore, we propose inclusion of protective exclosures for many of the plants. This will ensure that at least protected individuals will have the opportunity to grow and begin to spread. If the use of protection proves to be unnecessary, funding and efforts can be shifted towards plants alone in subsequent establishment efforts.

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### Depth Profile Planting Zones

The following is a description of a cross-section of each floodway pond (Figure 1). During excavation to these specifications, topsoil should be reserved in order to replace 6" over Zones A-D. Note that grading should be done to a depth 6" below those specified below in order to allow for replacement of topsoil.

**Zone A:** a *transition from upland to wetland* should be graded on a 4:1 slope to a depth of 1 ft, and will be of variable width. This zone serves as the transition from upland habitat to moist soil habitat. It is flooded during winter pool and exposed during summer pool. Topsoil seed banks and moist soil management will be used to promote growth of vegetation in this zone.

**Zone B:** a *moist soil wetland* should be graded to achieve a 1½ -ft deep shelf of variable width (dependent upon contours and configuration of the wetland cell). This zone serves as the moist soil habitat management area. It is flooded during winter pool and exposed during summer pool.

**Zone C:** a *transitional emergent wetland zone* should be graded on a 4:1 slope to a depth of 3.0 ft. This zone serves as the transition from the moist soil wetland to the aquatic zone. It will be the primary zone for emergent wetland plants. It is permanently flooded.

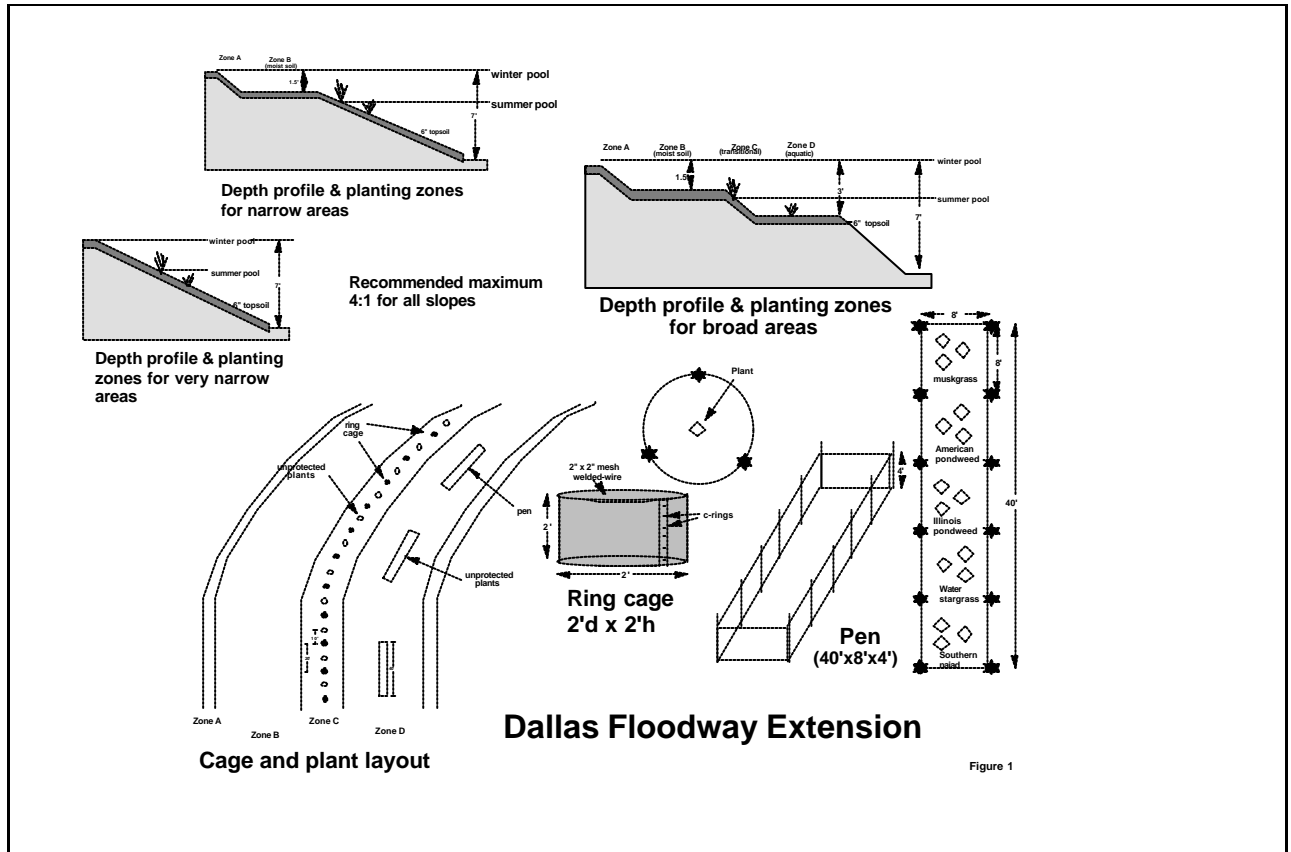
**Zone D:** an *aquatic plant zone* should be graded to achieve a 3.0-ft deep shelf of variable width (dependent upon contours and configuration of the wetland cell). This zone serves as the submersed plant zone. It is permanently flooded.

The above zones will vary in width depending on cell configuration. In the narrowest areas (28 ft from bank to 7-ft depth), the shelves at 1½ - and 3-ft will be omitted, and the zones will continuously grade into each other on a 4:1 slope. For cells (or portions of cells) that allow for a wider shallow water area, a moist soil management zone will be excavated at a depth of 1½ ft below winter pool. The minimum width for this zone will be the minimum that can be easily achieved with the excavation equipment being used. This minimum is expected to be on the order of 12 ft. For cells (or portions of cells) that allow it, an additional shelf will be excavated to a depth of 3 ft below winter pool. Minimum width of this shelf will likewise be established based on the operating dimensions or characteristics of the equipment being used. No slope shall exceed 4:1. If cell configuration does not allow for the inclusion of shelves, a lesser slope down to a depth of 3 ft should be employed.

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**Figure 1. Depth profiles, planting zones, pen and cage construction, and planting schematic for the proposed Dallas Floodway Extension wetlands.**

### Protective Enclosure Design

Two types of protective enclosures will be constructed (Figure 1 and Appendix A). Materials and construction will be provided by private contractors. Site locations of constructed enclosures will be assigned by Lewisville Aquatic Ecosystem Research Facility (LAERF) personnel. LAERF personnel will also inspect enclosures following construction.

**Ring cages** are 2-ft diameter x 2-ft tall, open-ended cylinders constructed from 2" x 2" mesh, PVC-coated, welded-wire. Ring cages will be anchored to the substrate using pieces of rebar. These cages are designed to protect emergent plant species in shallow water (0 to 18" deep). Construction specifications are given in Appendix A.

**Pens** are 40-ft long x 8-ft wide x 4-ft tall enclosures constructed from t-posts and 2" x 4" mesh, PVC-coated welded-wire and t-posts set at 8 ft centers. These pens are designed

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to protect submersed and floating-leaved plants in water 18 to 36” deep. Construction specifications are given in Appendix A.

### Cage and Planting Schematic

**Zone C, Year I:** Ring cages will be installed every 20 feet along the perimeter of the shallowest portion (top of slope) of this zone, roughly at (summer pool) depths of 0-6 inches. Following flooding to summer pool, each ring cage will be planted with an emergent plant species. In order to ascertain the need for protection in each wetland cell, unprotected plants of the same species will be planted on ten-foot centers with the ring cages. Table 1 provides the numbers of cages and plants per DFE wetland cell.

**Table 1. Proposed numbers of protected plants (with ring cage) and unprotected plants (without ring cage) in DFE wetland cells planted during Year I.**

Cell	Protected plants	Unprotected plants	Total plants
D	224	224	448
E	160	160	320
F	480	480	960
G	432	432	864
<b>Total</b>	<b>1296</b>	<b>1296</b>	<b>2592</b>

All plants will be mature transplants with well-developed root balls, grown in 4 to 6 inch pots at the LAERF. Plant installation (Appendix B) will be provided by contractors, with specific planting sites assigned by LAERF personnel. Plant species will include:

- |                                                    |                                           |
|----------------------------------------------------|-------------------------------------------|
| Flatstem spikerush, <i>Eleocharis macrostachya</i> | Arrowhead, <i>Sagittaria latifolia</i>    |
| Squarestem spikerush, <i>E. quadrangulata</i>      | Tall burhead, <i>Echinodorus berteroi</i> |
| Slender spikerush, <i>E. acicularis</i>            | Pickerelweed, <i>Pontederia cordata</i>   |
| Bulltongue, <i>Sagittaria graminea</i>             | Water hyssop, <i>Bacopa monnieri</i>      |
| Softstem bulrush, <i>Scirpus validus</i>           | Bullsedge, <i>Carex lasiocarpa</i>        |
| Waterpepper, <i>Polygonum hydropiperoides</i>      |                                           |

**Zone C, Year II:** In the event establishment of unprotected plants is hampered by herbivory during the Year I growing season, ring cages will be installed at sites previously planted but not protected. Each ring cage will be planted with the emergent plant species lost in Year I. In the event establishment of unprotected plants is not hampered by herbivory during the Year I growing season, additional unprotected plants will be installed to increase the rate of overall establishment in each wetland cell. Table 2 provides the numbers of protected or unprotected plants per DFE wetland cell required during Year II.

**Table 2. Proposed numbers of protected plants (with ring cage) or unprotected plants (without ring cage) in DFE wetland cells planted during Year II.**

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Cell	Protected or unprotected plants
D	224
E	160
F	480
G	432
<b>Total</b>	<b>1296</b>

**Zone D, Year I:** Pens will be installed at sites selected by LAERF personnel, at (summer pool) depths of approximately 18". Following initial flooding to winter pool, each pen will be planted with groups of three individuals of five submersed plant species. Unprotected colonies of the same species will be planted in similar groupings at selected sites. Water will then be raised to summer pool over a four-week period to allow planting of ring cages. Table 3 provides the numbers of protected and unprotected submersed plants per DFE wetland cell required during Year I.

**Table 3. Proposed numbers of protected colonies (with pens) and unprotected colonies (without pens) in DFE wetland cells planted during Year I.**

Cell	Protected plantings	Unprotected plantings	Total colonies	Total plants (15 per colony)
D	12	13	25	375
E	6	6	12	180
F	15	15	30	450
G	9	8	17	255
<b>Total</b>	<b>42</b>	<b>42</b>	<b>84</b>	<b>1260</b>

All plants will be mature transplants with well-developed root balls, grown in 4-inch pots at the LAERF. Plant installation (Appendix B) will be provided by contractors, with specific planting sites assigned by LAERF personnel. Plant species will include:

- American pondweed, *Potamogeton nodosus*
- Illinois pondweed, *P. illinoensis*
- Muskgrass, *Chara spp.*
- Southern naiad, *Najas guadalupensis*
- Water stargrass, *Heteranthera dubia*

**Zone D, Year II:** In the event establishment of unprotected plant colonies is hampered by herbivory during the Year I growing season, pens will be installed at sites previously planted but not protected. Each pen will be planted with the submersed species lost in Year I. In the event establishment of unprotected plant colonies is not hampered by herbivory during the Year I growing season, additional unprotected colonies will be installed to increase the rate of overall establishment in each wetland cell. Table 4 provides the numbers of protected or unprotected plants per DFE wetland cell required during Year II.

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**Table 4. Proposed numbers of protected colonies (with pens) or unprotected colonies (without pens) in DFE wetland cells planted during Year II.**

Cell	Protected or unprotected colonies	Total plants (15 per colony)
D	13	195
E	6	90
F	15	225
G	8	120
<b>Total</b>	<b>42</b>	<b>630</b>

### **Moist Soil Management**

In order to develop waterfowl and other wildlife habitat in the DFE wetland cells, the system should be operated under a moist soil management regimen. Research conducted by Texas A&M water management specialists suggests the most productive moist soil management techniques for North Texas involves incomplete drawdowns conducted twice yearly (spring and fall). This technique provides a permanent pool of water (Zones C and D, Figure 1) in which submersed, floating-leaved, and many emergent species can survive as well as maximizing seed production by grasses, sedges and forbs in the moist soil areas (Zones A and B, Figure 1).

Higher species diversity in moist soil management areas is more beneficial to waterfowl and other wildlife. Greater diversity is maintained by scheduled drawdowns and mowing, both of which promote annual species (as opposed to perennial species) growth. Mowing will also prevent establishment of woody species (trees and shrubs) in the DFE managed areas.

In all likelihood, topsoil at the DFE excavation site possesses a seed bank that includes desirable grasses and forbs. Barnyard grasses (*Echinochloa* spp.), smartweeds (*Polygonum* spp.), panic grasses (*Panicum* spp.), and numerous sedges are common in North Texas seed banks. To ensure establishment of terrestrial and wetland species in Zones A and B, we will introduce seeds (in sediments) of North Texas annuals (terrestrial and wetland) including the genera *Amaranthus*, *Aster*, *Carex*, *Cyperus*, *Echinochloa*, *Eleocharis*, *Euphorbia*, *Panicum*, *Phyla*, *Polygonum*, *Sagittaria*, and *Setaria* during Year I.

### **Scheduled operations for DFE wetlands**

- 1) Early March** --- water should be lowered 1½ feet from winter pool, exposing Zones A and B but leaving zones C and D flooded (summer pool). Drawdowns should be conducted over a two-week period. This will promote germination of terrestrial and wetland annuals (Spring) in the moist soil areas.

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- 2) **Mid-August** --- Zones A and B should be mowed. This allows time for spring annuals to have produced seed, promotes germination of fall annuals, and inhibits woody and some weedy perennial species from establishing in the moist soil management area.
- 3) **Mid-August** --- water should be raised 1½ feet to full winter pool immediately following mowing and left at full pool for two days.
- 4) **Mid-August** --- water should be lowered 1½ feet to summer pool two days after flooding, exposing Zones A and B but leaving zones C and D flooded. Drawdowns should be conducted over a two-week period. This operation (3 and 4) will saturate soils and promote germination of fall annuals. During drought conditions, this operation (3 and 4) may be required earlier in the year, and at multiple times.
- 5) **Mid-October** --- water should be raised 1½ feet to winter pool. This water level will provide access to migratory waterfowl seeking spring and fall seeds, invertebrates, and submersed plants during the fall and winter months.
- 6) **Early March** --- see 1).

### Monitoring

LAERF personnel will monitor the site during the construction phase (Year I and II), with visits made twice monthly during the growing season of each year. Winter visits will be made to observe waterfowl usage of the wetland cells. Evaluations of plant establishment and any need for implementation of scheduled or “as needed” operations (see below) or repairs to enclosures will be made at these times. GPS mapping will be conducted at the beginning and end of growing seasons during both years in order to facilitate assessments of plant establishment in the wetland cells.

Water quality will be monitored at each outflow (including source outflows) on a once-monthly basis. Parameters measured will include temperature, pH, conductivity, dissolved oxygen, and turbidity, and samples will be analyzed for alkalinity, total phosphorus, dissolved phosphorus, ammonia nitrogen, nitrate nitrogen, total nitrogen, chlorophyll *a*, and total suspended solids. These analyses will provide data needed for full evaluation of the wetland cell ecological condition.

An interim report will be provided following the Year I growing season, and a final report provided following the Year II growing season.

Following the two-year construction phase, site monitoring will be the responsibility of DFE operators.

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### “As-needed” operations for DFE wetlands

- 1) **Pen and cage maintenance** --- enclosures should be maintained for at least two years following establishment of plants. LAERF personnel will monitor enclosure integrity during the construction phase, and report problems in need of repair.
- 2) **Periodic flooding** --- occasional short-term flooding of Zone B may be required to prevent drought damage to developing moist soil populations. LAERF personnel will monitor moist soil management areas during the construction phase, and report periodic flooding requirements.
- 3) **Herbicide applications** --- if undesirable species begin to invade the DFE wetlands, appropriate herbicides should be applied as soon as possible. Notable problematic species in North Texas may include cattails (*Typha* spp.), black willow (*Salix nigra*), ragweed (*Ambrosia* spp.), Bermuda grass (*Cynodon dactylon*), cocklebur (*Xanthium* spp.) and others. In some cases, mowing may be used in place of herbicide application. LAERF personnel will monitor the wetland cells and report any need for herbicide applications and/or mowing during the construction phase.
- 4) **Carp and large herbivore control** --- because water cannot be drawn down to levels required to remove carp or other large herbivores, periodic gillnetting may be required to reduce carp populations. LAERF personnel will report any need for herbivore control during the construction phase.
- 5) **Crayfish control** --- water level fluctuations under this moist soil management plan may promote development of dense crayfish populations. Juvenile largemouth bass (*Micropterus salmoides*) should be stocked at a rate of 100 per acre (permanent pool) to prevent overpopulation of crayfish and its negative impact on aquatic plant communities. To sustain the bass population, juvenile bluegill (*Lepomis macrochirus*) should be stocked at a rate of 1000 per acre.

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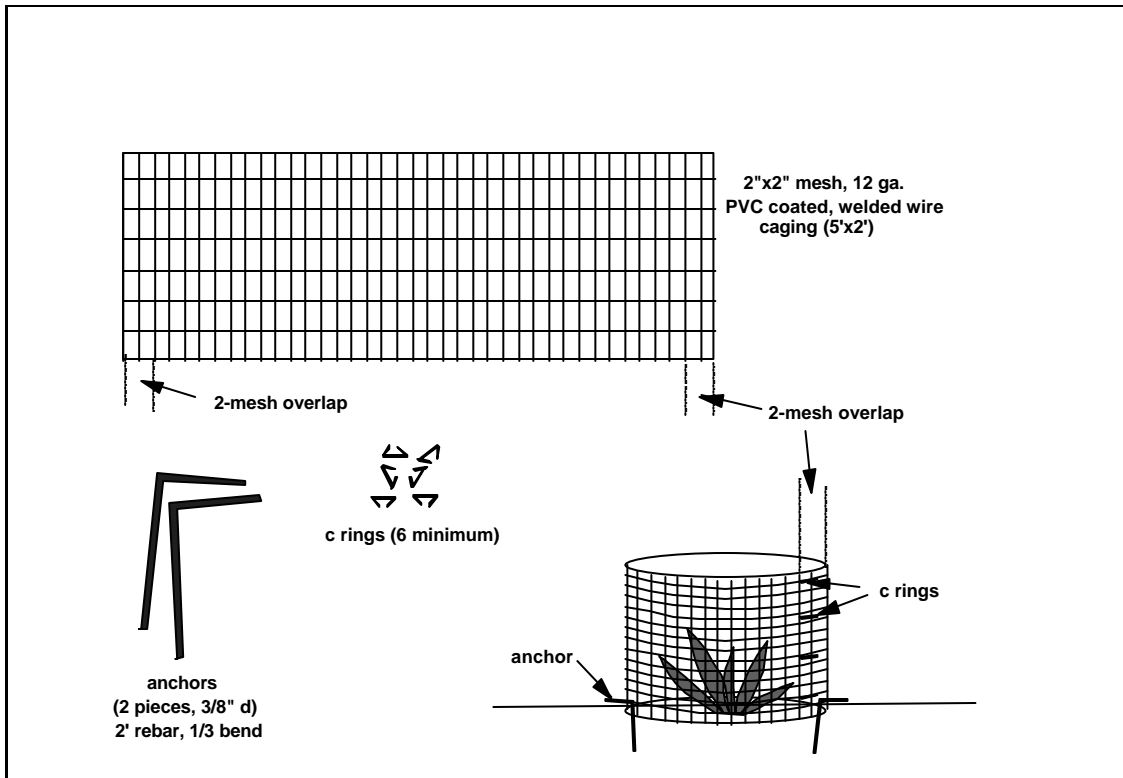
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### **Appendix A.**

#### **Ring Cage Construction (Figure 2)**

**Ring cages** are 2-ft diameter x 2-ft tall, open-ended cylinders constructed from 12 gauge 2"x2" mesh, vinyl-coated, welded wire. 2-ft x 5-ft pieces of wire will be formed into 2-ft diameter cylinders by overlapping two meshes on each end and attaching with a minimum of six c-rings.

Installation sites for each ring cage will be marked with survey flags (color coded to match plant species). Ring cages will be anchored to the substrate with two 2-ft long pieces of 3/8" diameter rebar bent at right angles.



**Figure 2. Ring cage materials and construction.**

Planting: plants should be installed as directed in Appendix B. One plant will be installed in the center of each ring cage. Plant species for each ring cage will be assigned by LAERF personnel and indicated by color-coded survey flags.

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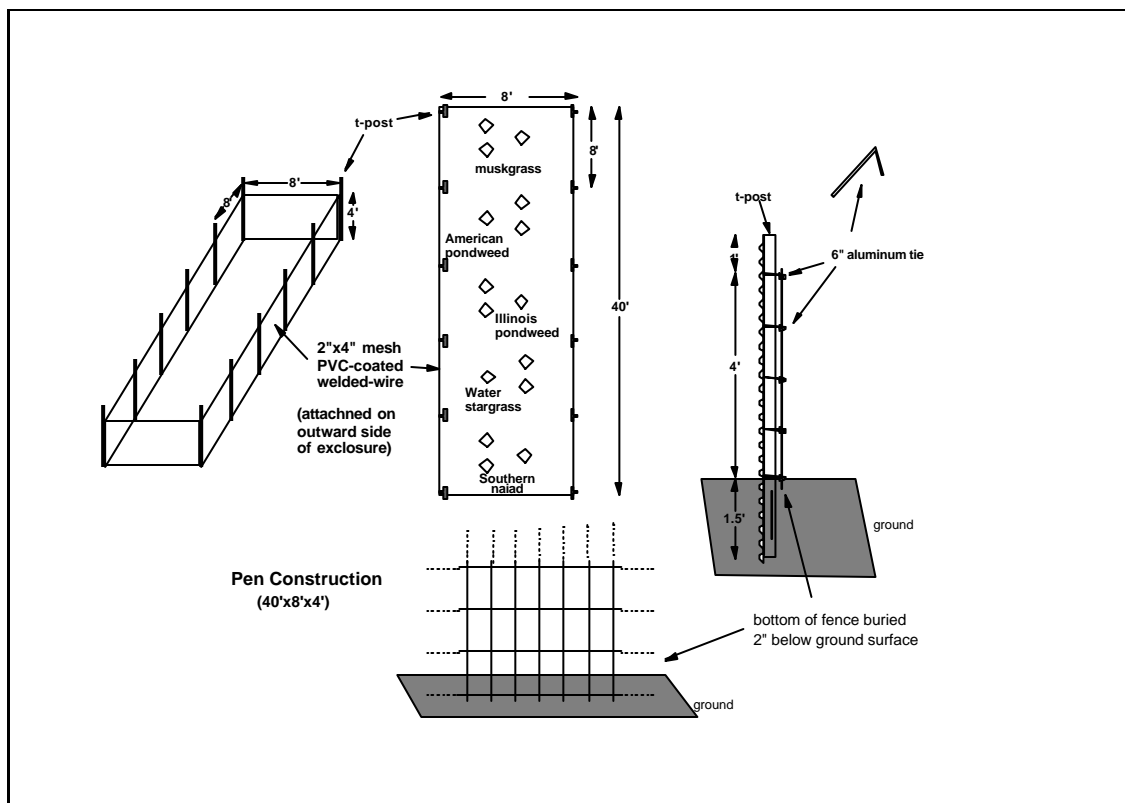
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### Pen Construction (Figure 3)

**Pens** are 40-ft x 8-ft x 4-ft tall enclosures constructed from medium grade, 6 ½ ft t-posts (#125) and 2"x 4" mesh, PVC-coated welded-wire. T-posts should be set 18" deep at 8 ft centers. Welded-wire will then be attached outward side of the t-posts using 6" aluminum fence ties (every 10" minimum). The bottom two inches (one half mesh) of the welded-wire will be buried in the ground the entire perimeter of the pen.

Installation sites for each pen will be marked with survey flags.



**Figure 3. Pen construction and planting specifications.**

Planting: plants should be installed as directed in Appendix B. Three plants of six species will be installed in each pen, with specific sites assigned by LAERF personnel and indicated by color-coded survey flags.

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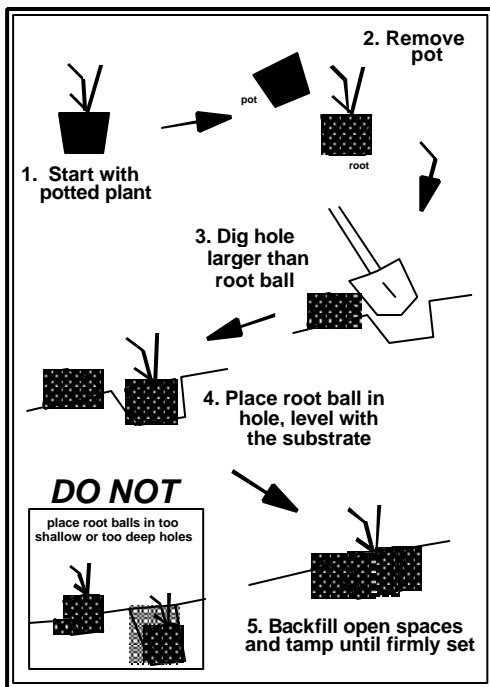
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### Appendix B.

#### Planting Instructions

Plants should be installed by the contractor as diagrammed in Figure 4. Specific locations for plants will be assigned with survey flags color-coded to species by LAERF personnel.



**Figure 4. Planting instructions for submersed and emergent plant species.**