Graham-Mebane Lake 5-Year Aquatic Habitat Enhancement Plan

2023-2027

Inland Fisheries Division

Updated: May 10, 2023

Objectives

The purpose of this 5-year plan is to enhance habitat for the fisheries of Graham-Mebane Lake, to improve angler satisfaction, and stimulate the public to participate in habitat improvement efforts. To meet these objectives the North Carolina Wildlife Resources Commission (Commission) proposes to seek angler input on habitat enhancement measures, establish native aquatic vegetation at a minimum of 40 sites within the lake, add six new artificial habitat sites, and fell 10-15 shoreline trees to give anglers more opportunities during the short-term.

Need

Human-made reservoirs often have limited natural habitat such as aquatic vegetation or woody debris. Over time, reservoirs lose aquatic habitat through increased sedimentation and decomposition of the limited large woody debris. Graham-Mebane Lake's watershed is rapidly urbanizing causing additional sediment and water quality issues. Deploying natural and artificial habitat and establishing native aquatic plant communities in the lake will be vital to the long-continuing success of the aging reservoir's fisheries.

Expected Results and Benefits

This plan will identify possible sites for both native vegetation establishment as well as artificial and natural structures using bathymetry, lake zoning, residential considerations, and existing vegetation. With proper time and effort, the planted aquatic vegetation will continue to grow and expand to new areas within the lake. Native aquatic vegetation is beneficial to the ecosystem because it provides important habitat for juvenile and adult sportfish and other wildlife. Vegetation can also improve water quality, reduce rates of shoreline erosion from boat wakes, and help slow the spread of nuisance aquatic plants. This project will also give anglers an opportunity to provide direct input to biologists on beneficial sites for habitat enhancement and improve the Commission's public relations with anglers by seeking their input.

Background

Graham-Mebane Lake is an expanded 256-ha impoundment in central Alamance County, NC. The lake is fed by four tributaries, Quaker, Stagg, Mill, and Back creeks. The lake is a water supply reservoir for the residents of the Cities of Graham and Mebane, NC. These cities and their suburbs are rapidly urbanizing. 2020 U.S. Census data indicate that the immediate area increased by more than 9,000 people over 10 years. The county has increased by more than twenty thousand residents during the same time frame (US Census Bureau 2021). Due to the increasing population and higher demands on the entire water system, the old lake formerly known as Quaker Creek Reservoir was expanded in 1994. This addition added 200-ha of impounded surface water to the system.

There is one public boat access for the lake. The city of Graham also operates a fishing pier and kayak rental service at this reservoir. The lake's shoreline is relatively undeveloped with several personal residences near the lake but not onshore. Homeowners have increased sedimentation at the lake by clearing trees from lands close to the banks of the reservoir allowing stormwater to directly run into the lake. Increased development within this watershed and reduced shoreline buffers will undoubtably lead to increased nutrient loading over time and nuisance algal occurrences. Pond Services Inc. (Sanford NC) currently manages algae and nuisance plants for this reservoir.

<u>Existing Conditions</u>

Fisheries. — Graham-Mebane Lake contains a few fish species of interest to anglers including Largemouth Bass, *Micropterus salmoides,* sunfish, *Lepomis* spp., catfish, *Ictalurid* spp., and Black Crappie, *Pomoxis nigromaculatus*. Striped Bass Hybrids ('Bodie Bass'), *Morone chrysops* x *Morone saxatilis,* have been captured within the lake, however, these are likely washdowns from local, privately owned, ponds.

The Commission monitors changes in population characteristics of sport fish every five to seven years. Current Commission monitoring efforts continue to document a near trophy-class Largemouth Bass fishery compared to other Piedmont reservoirs. Relative weights and frequency of large bass can be compared to some of the best bass lakes in the state of NC. Anglers often catch bass more than seven pounds. The average weight in the 2018 survey was 2.7 pounds and seven percent were greater than 21 inches long. The current Black Crappie fishery is comprised of a large percentage of smaller fish that display average growth and condition for a lake of this size. (Lincoln and Mycko 2018)

Natural Aquatic Habitat. — The reservoir currently contains 10-20 isolated pockets of emergent species such as lizards' tail (*Saururus cernuus*), pickerelweed (*Pontederia cordata*), smartweed (*Polygonum sp.*), and rushes (*Juncus sp.*). Submerged aquatic plants and macro-algae have been observed in the past, but current turbidity conditions are not favorable to water clarity needed for robust populations of submerged plants to exist. For abiotic habitat, this reservoir contains several natural boulder formations and man-made riprap around bridge crossings. Local

beavers have created lodges and fallen trees that fish can use. Personal correspondences with local anglers indicate that man-made "brush piles" have also been placed into the lake at a few specific locations.

Native aquatic vegetation is beneficial to the ecosystem because it provides important habitat for juvenile and adult sportfish and other wildlife. Vegetation also acts as a food source for aquatic organisms and waterfowl (Dibble et al. 1996). Colonies of native vegetation helps prevent the spread of nuisance aquatic plants (Smart et al. 1994). It can also be beneficial to water supply systems and recreational users because it improves water quality and clarity (James and Barko 1990). It reduces rates of shoreline erosion and reservoir sedimentation (James and Barko 1995).

Other forms of fish habitats, natural and artificial, can provide opportunities for fish to carry out certain habitat related tasks and will likely improve angler catch rates. Fish can use artificial structures for resting, feeding, and migration while vegetation serves as spawning habitat for adults and nursery habitat for young fish. The artificial habitat structures can provide areas for algae attachment and aquatic insect colonization which is beneficial for planktivorous fish such as shad species. Complex structures provide better refuge for small fish, while less complex cover in nesting areas is an effective habitat for spawning activities. In addition, habitat structures can attract and congregate fish (Bohnsack et al. 1997, Basset 1994) which can also improve angler catch rates. Graham-Mebane Lake has very little existing habitat structure. There are no flooded timber stands and very little woody habitat due to shoreline development. There are currently five existing artificial habitat sites (Table 1).

Approach

Proposed Habitat Enhancements

This plan's approach for improving habitat is made up of four components: 1) public involvement, 2) native aquatic vegetation, 3) artificial habitat structures, and 4) natural cover (felled shoreline trees). This plan includes a detailed timeline outlining project activities for the next five years. While this project will seek input from public, the plan will be steered by the Commission and the City of Graham's Recreation and Parks Department who will meet annually to update the plan. Commission staff will work with the City of Graham to develop and implement this plan. Design, construction, and placement of all aquatic habitat will be approved by the Commission and the City of Graham.

All proposed habitat work will be completed in areas in the reservoir where oxygen levels are adequate for fish to use year-round, characterized as the Habitat Enhancement Zone (HEZ) (Clark-Kolaks 2016). In Graham-Mebane, during summer months, fish can likely use areas which are in less than three meters of water.

Public Involvement

Incorporating volunteers from local fishing clubs to help enhance aquatic habitat is essential to the mission of this project. The Commission will seek community input by providing an interactive map which will also be displayed at in-person events (see timeline) and seen in the marina during business hours. This effort will seek comments on where to place artificial and natural structures as well as where to initiate native vegetation efforts. This map will also be a way for stakeholders and members of the public to provide feedback on the project and to sign up to become a volunteer.

Native Aquatic Vegetation

Establishing native aquatic vegetation in reservoirs is a multi-year effort. Successful revegetation often requires a community effort and is typically completed in three phases (planning/installation-modification-monitoring). Phase One involves identifying potential revegetation sites, developing a list of desired plant species, mapping existing emergent and rooted-floating leaf vegetation in the lake, and planting a variety of plant species within and outside of protective fenced exclosures. Forty-seven proposed revegetation sites (Figure 1; Table 2) were selected based on consultations with Pond Services Inc., their proximity to adjacent homeowners, location within the reservoir (coves, creek arms, and other protected areas) soil characteristics, water depth, and potential for fish habitat. The proposed plant species for each site (Table 2) are based on substrate type, topography, water depth appropriate for each species, the plant's desiccation tolerance, existing plants within the reservoir, and susceptibility to herbivory (Table 3). The number and location of sites are subject to change as input is received from the community and project coordinators. The revegetation work will focus on establishing submergent, rooted floating leaf and emergent plants (Table 3; Appendix B). Proposed plant species identified for each site (Table 2) are based on substrate type, topography, water depth appropriate for each species, the plant's desiccation tolerance, existing plants within the reservoir, and susceptibility to herbivory (Table 3).

Wildlife herbivory will be a large factor in the success of the earliest stages of the project. Water Willow is not as susceptible to herbivory and thus can be planted outside protective fenced exclosures. Monitoring during Phase One will help to determine the level of grazing pressure present in the lake and which species will likely result in the successful establishment of founder colonies. Once the correct suite of species is determined, then the project can move to phase 2.

Phase Two involves monitoring and modifying the size and number of revegetation sites based on what was learned during Phase One. This should result in the successful establishment of founder colonies. These colonies can spread in the reservoir through vegetative growth, seed production, and fragmentation (Smart et al. 1996, 1998). This information will then be used to determine how to proceed for Phase three, which will likely occur well after the timeframe of this 5-year plan.

Phases three will include annual Fall monitoring of established vegetation with the main goal of non-intervention in mind. At this point, maintenance and site modification for increased natural spread and seed production will be the bulk of the activities. Successful spread and seed production at >65% of sites will be the threshold to advance the project into completion. Once this threshold has been met, plan administrators will discuss the best way to finalize the project and summarize the data.

Artificial Habitat

Artificial habitat locations will be based on the following factors: 1) the extent of the Habitat Enhancement Zone, 2) guidance for deploying fish attractors in City of Graham Reservoirs 3) shoreline zoning/neighboring landowners, and 4) public input. Most attractors will be placed in a minimum of 10 feet of water (based on a 5 ft tall habitat structure with a potential drought pool of 5ft drop in lake surface elevation).

During the first five years, the existing artificial habitat sites will be re-furbished as needed and six new sites will be created based in part on public input. These sites will incorporate complex artificial habitats designed to provide refuge for prey fish and cover for larger predators. The four main types of structures being proposed are a modified Georgia Cube, poly trees, spider blocks and Mossbacks (Appendix A). All fish attractor sites will also be identified with GPS coordinates that are available to download from the Commission's website (https://www.ncpaws.org/ncwrcmaps/fishattractors).

Felled Shoreline Trees. — Felled shoreline trees can provide excellent fish habitat and congregate adult and juvenile Bluegill, black bass, and Black Crappie (Basset 1994). Trees are readily available, environmentally friendly, require minimum amounts labor, and are less costly than artificial habitats. Felled trees provide a diversity of interstitial space that can be used in a variety of ways by many species. They also provide the natural surface area for periphyton and invertebrates which act as a food supply for fish. Trees should be felled in areas with sufficient shoreline depth (>8 feet) and cabled to their stump to ensure the trunk will not float off and cause a boating hazard. Commission staff will identify potential trees to cut and cable to the shoreline during the 2022 whole lake survey.

Special Considerations

Nuisance Plant Species Prevention – Commission biologists will utilize protocols designed to reduce the transport and spread of invasive or nuisance plants and animals (NCWRC 2017).

Boater Safety – Exclosures will be constructed in near-shore areas that are unlikely to be utilized by most boat traffic. High visual yellow fence guards will be placed atop of the exclosures (Figure 2). Exclosures will be marked with signs supplied by the Commission notifying reservoir users that the fencing and plants are for improving aquatic habitat. Graham-Mebane Lake is not open to the public at night, thus boater safety issues between dusk and dawn is non-issues at this reservoir.

Proposed Timeline

Year 0 – 2022

- Commission biologists will complete a survey of existing emergent and floating-rooted vegetation along the entire shoreline, assess existing artificial habitats, assess bathymetry and other natural rock/permanent features
- Developed a draft 5-year habitat enhancement plan for Graham-Mebane Lake

Year 1 – 2023

- Create and announce the angler survey via social media and/or email
- Plant a 45-pot water willow test site near the old dam and mark with a noticeable sign to begin stimulating angler conversations & interest in the project
- Construction of 20 vegetation sites - including 3 “research sites”
- Planting of 18 water willow sites
- Attend family fishing events to educate the public about the project
- Annual assessments of existing founder colony sties

Year 2 - 2024

- Construction of 20 new fenced founder colony sites.
- Planting of 20 water willow sites
- Assess vegetation in founder colonies

Year 3 – 2025

- Planting of 18 water willow sites
- Maintenance of existing founder colony sites
- Assess vegetation within founder colonies

Year 4 – 2026

- Annual assessments of existing founder colony sites
- Planting or replacing 20 water willow sites
- Maintenance of existing 40 founder colony sites
- Assess vegetation in founder colonies

Year 5 – 2027

- Maintenance of existing founder colony sites
- Planting or replacing 5-10 water willow sites
- Annual assessments of existing founder colony sites
- Full lake assessment of 5-year vegetative spread and adequacy of planted area to meet future goals

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TABLE 1. — GPS coordinates for current fish attractor sites.

ID	Latitude	Longitude	Type
GMFA1	36.10984	-79.30898	PVC Trees
GMFA2	36.11431	-79.322747	Mossback
GMFA3	36.114587	-79.322619	Mossback
GMFA4	36.10363	-79.32878	PVC Trees
GMFA5	36.1087	-79.32423	PVC Trees

TABLE 2. — Proposed revegetation sites in Graham-Mebane Lake NC.

Map No.	Anticipated Year of Initiation	GPS ID	Location	Lat	Long	Vegetation	Fenced Exclosure (Y/N)
1	2023	GMWW	Main Lake	36.105573	-79.326698	Water willow	No
2	2023	GM23-01	Mill Creek	36.117036	-79.295508	White water lily, spatterdock, pondweed, pickerelweed	Yes
3	2023	GM23-02	Mill Creek	36.116691	-79.29468	White water lily, spatterdock, pondweed, pickerelweed	Yes
4	2023	GM23-03	Stagg Creek	36.138035	-79.293108	White water lily, spatterdock, pondweed, pickerelweed	Yes
5	2023	GM23-04	Quaker Creek	36.109922	-79.327569	Spatterdock	Yes
6	2023	GM23-05	Stagg Creek	36.131095	-79.297959	Spatterdock, Pondweed	Yes
7	2023	GM23-06	Quaker Creek	36.127339	-79.316062	Water lily	Yes
8	2023	GM23-07	Quaker Creek	36.128181	-79.317103	Spatterdock, White Water Lily	Yes
9	2023	GM23-08	Main Lake	36.103285	-79.317825	Eelgrass	Yes
10	2023	GM23-09	Bason Rd Bridge	36.107281	-79.33225	White water lily, spatterdock, pondweed, pickerelweed	Yes

11	2023	GMWW23-02	Quaker Creek	36.122603	-79.318187	Water willow	No
12	2023	GMWW23-03	Quaker Creek	36.119918	-79.318354	Water willow	No
13	2023	GMWW23-04	Main Lake	36.109926	-79.31561	Water willow	No
14	2023	GMWW23-05	Main Lake	36.109729	-79.31342	Water willow	No
15	2023	GMWW23-06	Main Lake	36.106453	-79.322451	Water willow	No
16	2023	GMWW23-07	Stagg Creek	36.128268	-79.298291	Water willow	No
17	2023	GM23-10	Quaker Creek	36.111197	-79.332238	White water lily, spatterdock, pondweed, pickerelweed	Yes
18	2023	GM23-11	Quaker Creek	36.110503	-79.330223	White water lily, spatterdock, pondweed, pickerelweed	Yes
19	2023	GM23-12	Quaker Creek	36.113296	-79.331034	White water lily, spatterdock, pondweed, pickerelweed	Yes
20	2023	GM23-13	Quaker Creek	36.11281	-79.330481	White water lily, spatterdock, pondweed, pickerelweed	Yes
21	2023	GM23-14	Quaker Creek	36.112582	-79.330432	White water lily, spatterdock, pondweed, pickerelweed	Yes

22	2023	GM23-15	Quaker Creek	36.112433	-79.33037	White water lily, spatterdock, pondweed, pickerelweed	Yes
23	2023	GM23-16	Quaker Creek	36.112185	-79.330383	White water lily, spatterdock, pondweed, pickerelweed	Yes
24	2023	GM23-17	Quaker Creek	36.111798	-79.330616	White water lily, spatterdock, pondweed, pickerelweed	Yes
25	2023	GM23-18	Quaker Creek	36.112989	-79.32994	White water lily, spatterdock, pondweed, pickerelweed	Yes
26	2023	GM23-19	Main Lake	36.102262	-79.331028	White water lily, spatterdock, pondweed, pickerelweed	Yes
27	2023	GM23-20	Main Lake	36.101281	-79.325288	White water lily, spatterdock, pondweed, pickerelweed	Yes
28	2024	GM24-01	Mill Creek	36.11081	-79.308312	White water lily, spatterdock, pondweed, pickerelweed	Yes
29	2024	GM24-02	Mill Creek	36.117624	-79.300458	White water lily, spatterdock, pondweed, pickerelweed	Yes
30	2024	GM24-03	Stagg Creek	36.126508	-79.302297	White water lily, spatterdock, pondweed, pickerelweed	Yes
31	2024	GM24-04	Stagg Creek	36.134408	-79.296412	White water lily, spatterdock, pondweed, pickerelweed	Yes
32	2024	GM24-05	Stagg Creek	36.134703	-79.295545	White water lily, spatterdock, pondweed, pickerelweed	Yes

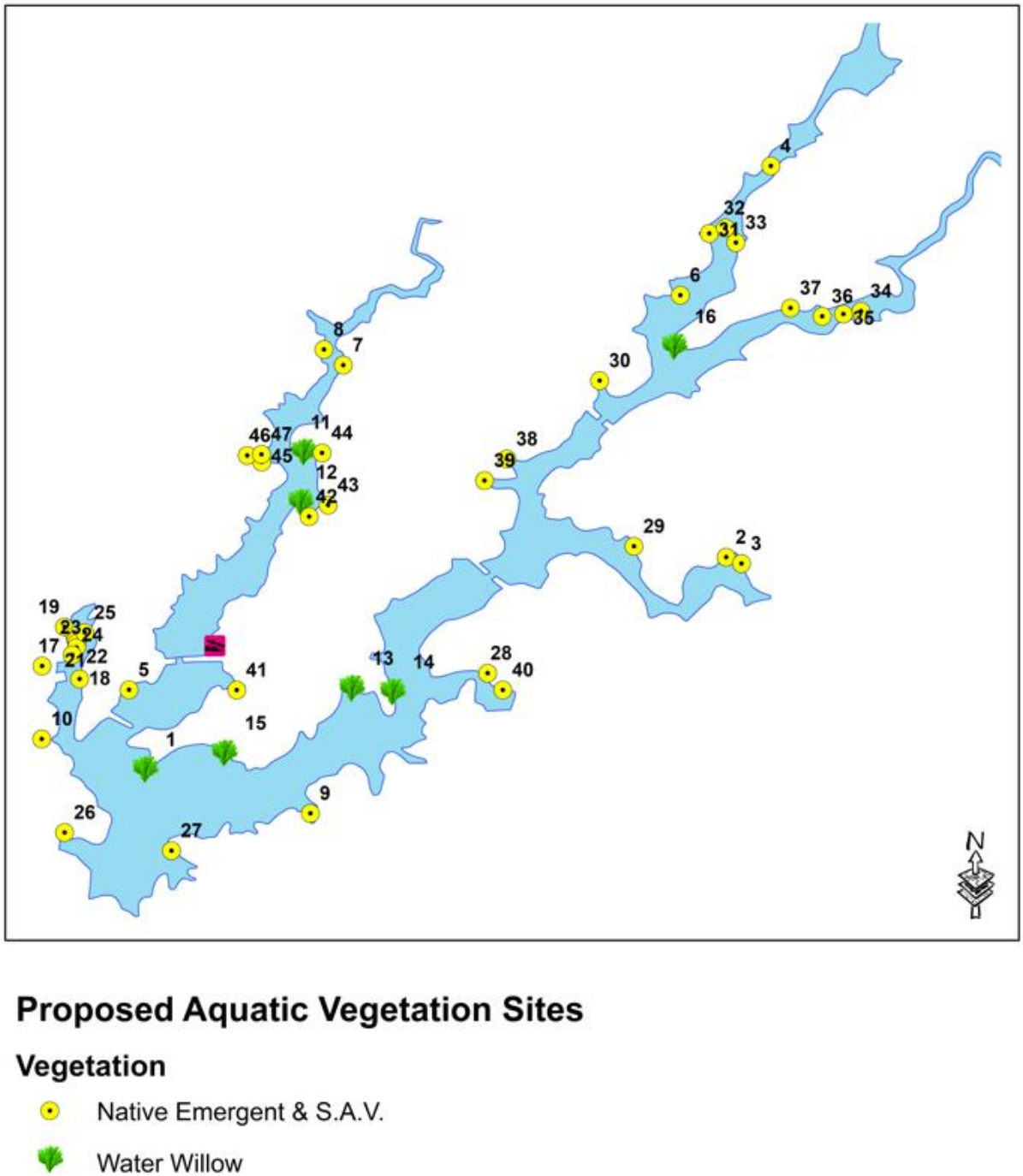
33	2024	GM24-06	Stagg Creek	36.133919	-79.29498	White water lily, spatterdock, pondweed, pickerelweed	Yes
34	2024	GM24-07	Stagg Creek	36.130237	-79.28827	White water lily, spatterdock, pondweed, pickerelweed	Yes
35	2024	GM24-08	Stagg Creek	36.130081	-79.289212	White water lily, spatterdock, pondweed, pickerelweed	Yes
36	2024	GM24-09	Stagg Creek	36.12996	-79.290346	White water lily, spatterdock, pondweed, pickerelweed	Yes
37	2024	GM24-10	Stagg Creek	36.13041	-79.292048	White water lily, spatterdock, pondweed, pickerelweed	Yes
38	2024	GM24-11	Stagg Creek	36.122307	-79.307284	White water lily, spatterdock, pondweed, pickerelweed	Yes
39	2024	GM24-12	Stagg Creek	36.12115	-79.308482	White water lily, spatterdock, pondweed, pickerelweed	Yes
40	2024	GM24-13	Main Lake	36.109908	-79.307496	White water lily, spatterdock, pondweed, pickerelweed	Yes
41	2024	GM24-14	Quaker Creek	36.109904	-79.321786	White water lily, spatterdock, pondweed, pickerelweed	Yes
42	2024	GM24-15	Quaker Creek	36.119212	-79.317899	White water lily, spatterdock, pondweed, pickerelweed	Yes
43	2024	GM24-16	Quaker Creek	36.119828	-79.316874	White water lily, spatterdock, pondweed, pickerelweed	Yes

44	2024	GM24-17	Quaker Creek	36.12263	-79.317202	White water lily, spatterdock, pondweed, pickerelweed	Yes
45	2024	GM24-18	Quaker Creek	36.122143	-79.320436	White water lily, spatterdock, pondweed, pickerelweed	Yes
46	2024	GM24-19	Quaker Creek	36.122491	-79.321216	White water lily, spatterdock, pondweed, pickerelweed	Yes
47	2024	GM24-20	Quaker Creek	36.122557	-79.320459	White water lily, spatterdock, pondweed, pickerelweed	Yes

TABLE 3. – Proposed aquatic plant species list and their biological characteristics.

Species Name	Common Name	Plant Type	Substrate	Planting Depth (cm)	Max. Depth (m)	Desiccation Tolerant	Susceptible to Herbivory	Individual Spacing (m)
Justicia americana	Water Willow	Emergent	Rock or gravel	0 - 91	1.2	Yes	Low	0.9
Pontederia cordata	Pickerelweed	Emergent	Sand to muck	0 - 91	1.2	Moderate	Moderate	0.9
Nuphar advena [N. lutea]	Spatterdock	Floating Rooted	Sand to muck	50 - 91	1.8	Yes	Low	1.8 - 2.7
Nymphaea odorata	White Water Lily	Floating Rooted	Sand to muck	50 - 91	1.8	Yes	Low	1.8 - 2.7
Cephalanthus occidentalis	Buttonbush	Shrub	Sand to muck	0 - 15	0.6	Yes	Low	0.9 - 2.7
Potamogeton nodosus	American Pondweed	Submergent	Sand to muck	30 - 122	3	Yes	High	0.9
Vallisneria americana	Eelgrass	Submergent	Sand to muck	30 - 122	3	No	High	0.9
Ceratophyllum demersum	Coontail	Submergent	Sand to gravel	30-122	3	No	High	0.9

Figure 1 – Map of all potential exclosure locations (N=47) and first year water willow sites. Subsequent water willow locations will be chosen based on success of first year sites. See Table 2 for descriptions of map numbers.



Figue 3. Typical fenced exclosure site with high-viz. yellow boater markings.

Appendix A – Potential Artificial habitats

Polytree

Spider Block

Mossbacks

Modified GA-DNR Cube

Felled Shoreline Trees

Quad Polytree

Appendix B – Proposed Native Aquatic Plants

Source: Webb, M. A., J. Richard A. Ott, C. C. Bonds, R. M. Smart, G. O. Dick and L. Dodd. 2012. Propagation and establishment of native aquatic plants in reservoirs. Texas Parks and Wildlife Department, Inland Fisheries Division, Management Data Series.

Water Willow

Scientific name	*Justicia americana*
Common names	Water willow, American water-willow
Growth form	Rhizomatous emergent forb.
Reproduction	Produces new shoots along rhizomes. Also reproduces by fragmentation and seed.
Perennation	Herbaceous perennial; overwinters as dormant rhizomes.
Range	Eastern U.S.
Use	Valuable for fish habitat and erosion control.

<u>Field Planting</u>

Propagule	Mature potted transplants.
Season	Early spring to midsummer.
Substrate	Sand to muck.
Depth	Moist soil to 91cm.
Comments	Highly tolerant of drought and herbivory; will tolerate depths of 1.2m once established.

Pickerelweed

Scientific name	*Pontederia cordata*
Common name	Pickerelweed, pickerel plant
Growth form	Rhizomatous emergent forb.
Reproduction	Produces new shoots along rhizomes; also reproduces sexually by seed.
Perennation	Herbaceous perennial; overwinters as dormant rhizomes.
Range	Eastern U.S.
Use	Valuable for fish habitat and waterfowl food.

<u>Field Planting</u>

Propagule	Mature potted transplants.
Season	Early spring to late summer.
Substrate	Sand to muck.
Depth	Moist soil to 91cm.
Comments	Moderately tolerant of desiccation; susceptible to herbivory by waterfowl and nutria; will tolerate depths of 1.2m once established.

White Water Lily

Scientific name	*Nymphaea odorata*
Common names	White water lily, fragrant water lily
Growth form	Rooted floating-leaved; leaves produced at apical tips of branching rhizomes.
Reproduction	Produces new shoots along rhizomes; also reproduces by seed.
Perennation	Herbaceous perennial; overwinters as dormant rhizomes and/or tubers.
Range	Throughout the U.S.
Use	Valuable for fish habitat and waterfowl food. Floating leaves are adapted for shallow, turbid waters.

<u>Field Planting</u>

Propagule	Mature potted transplants.
Season	Late spring to midsummer.
Substrate	Sand to muck.
Depth	50 – 91cm.
Comments	Tolerant of desiccation; susceptible to herbivory by beavers and nutria; will tolerate depths of 1.8m once established.

Spatterdock

Scientific name	*Nuphar advena* [*N. lutea*]
Common names	Spatterdock, yellow pond lily, cow lily
Growth form	Rooted floating-leaved; leaves produced at apical tips of branching rhizomes.
Reproduction	Produces new shoots along rhizomes; also reproduces by seed.
Perennation	Herbaceous perennial; overwinters as dormant rhizomes.
Range	Eastern U.S.
Use	Valuable for fish habitat. Floating leaves are adapted for shallow, turbid waters.

<u>Field Planting</u>

Propagule	Mature potted transplants.
Season	Late spring to midsummer.
Substrate	Sand to muck.
Depth	50 – 91cm.
Comments	Tolerant of desiccation once established; susceptible to herbivory by turtles and nutria; will tolerate depths of 1.8m once established.

American Pondweed

Scientific name	*Potamogeton nodosus*
Common name	American pondweed
Growth form	Rooted submersed; produces submersed and floating leaves.
Reproduction	Produces new shoots along stolons; also reproduces by fragmentation and seed.
Perennation	Herbaceous perennial; overwinters as dormant winter buds.
Range	Throughout the U.S.
Use	Valuable for fish habitat and waterfowl food; floating leaves are adapted for shallow, turbid waters.
<u>Field Planting</u>	
Propagule	Mature potted transplants.
Season	Spring to late summer.
Substrate	Sand to muck.
Depth	30 – 122cm.
Comments	Tolerant of desiccation; susceptible to herbivory by carp, turtles and waterfowl; will tolerate depths of 3.0m once established.

Eelgrass

Scientific name	*Vallisneria americana*
Common names	Wild celery, eelgrass, tapegrass, ribbon grass, Vallisneria
Growth form	Rooted submersed; rosette form with a basal meristem and ribbon-like leaves.
Reproduction	Produces daughter plants along stolons; sexual reproduction by seed.
Perennation	Evergreen (southern ecotype) or winter bud forming (northern ecotype) perennial.
Range	Throughout the U.S. (absent from parts of the Midwest).
Use	Valuable for fish habitat and waterfowl food. In the south, evergreen habit allows planting over an extended period.
<u>Field Planting</u>	
Propagule	Mature potted transplants.
Season	Early spring to early fall (southern ecotype); early to late summer (northern ecotype).
Substrate	Sand to muck.
Depth	30 – 122cm.
Comments	Transplants must be planted deep enough to cover the root mass and anchor the plant, but care must be taken not to bury the basal rosettes. Not resistant to desiccation; highly susceptible to herbivory by carp, turtles and waterfowl; will tolerate water up to 3.0m deep once established.

Coontail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Scientific name	*Ceratophyllum demersum*
Common names	hornwort, rigid hornwort, coon's tail
Growth form	Rooted submersed, branching stems with whorled, flat, leaves in an opposite pattern.
Reproduction	Fragmentation; sexual reproduction by seed.
Perennation	Evergreen
Range	All of North America and Northern portions of Mexico
Use	Valuable for fish habitat and exceptional waterfowl food.

<u>Field Planting</u>

Propagule	Mature potted transplants.
Season	Early spring to early fall
Substrate	Sand to gravel; not muck.
Depth	30 – 122cm.
Comments	Transplants must be planted deep enough to cover the root mass and anchor the plant, but care must be taken not to bury the basal rosettes. Not resistant to desiccation; highly susceptible to herbivory by carp, turtles and waterfowl; will tolerate water up to 3.0m deep once established. Easily confused with *Hydrilla verticillata*.