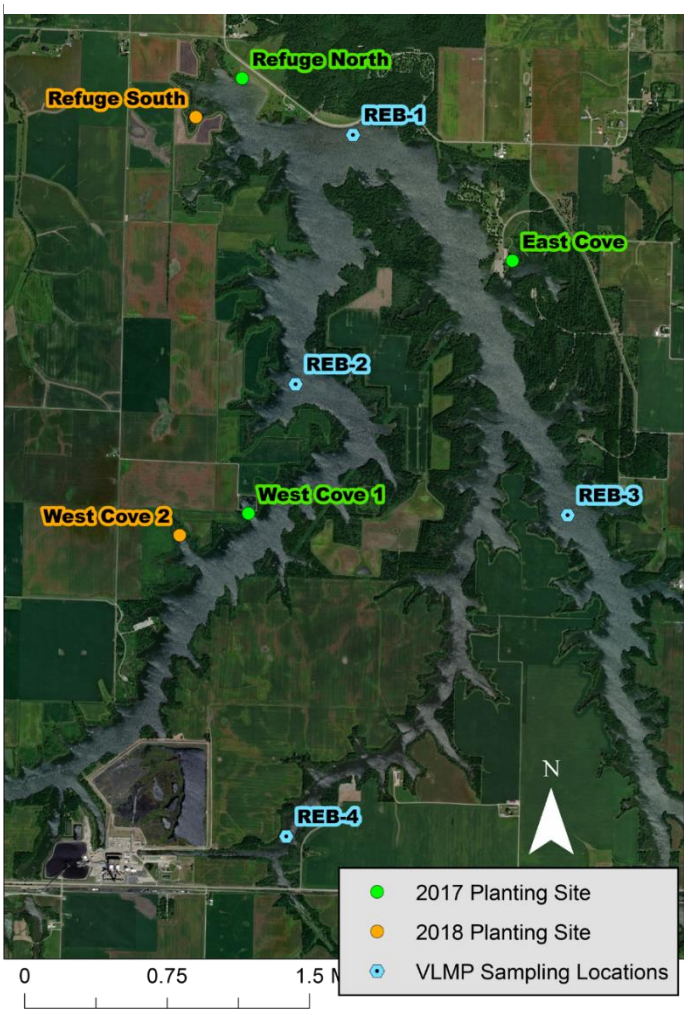
Sangchris Lake Aquatic Vegetation Restoration Project – 2019 Planting Report

In 2019, the Illinois Department of Natural Resources Contaminant Assessment Section completed three years of aquatic vegetation restoration and water quality monitoring at Sangchris Lake in Christian and Sangamon Counties. This project consists of transplanting native aquatic vegetation from local sources into the lake and conducting water quality monitoring throughout the lake. The transplanted aquatic vegetation is placed within protective exclosures to prevent aquatic animals such as turtles and carp from consuming or uprooting the plants. Over time, the plants become established and form founder colonies from which these species can spread throughout the lake through setting seed or by vegetative growth. Once the plant colonies become large and dense enough to overcome the threats posed by other aquatic life, they can begin to provide ecosystem functions that the lake currently lacks. These functions include providing food and habitat for aquatic organisms, nutrient reduction, and erosion control.

Figure 1. Planting Locations



Phase I of the project was completed in 2017. This phase consisted of identifying target species of aquatic vegetation for restoration, suitable locations for restoration (Figure 1), and the efficacy of the selected restoration strategy. Three of the four test species, spatterdock (*Nuphar advena*), white water lily (*Nymphaea odorata*), and American pondweed (*Potamogeton nodosus*), were selected for continued restoration. Water stargrass (*Heteranthera dubia*) was deemed unsuccessful due to low to no survivability.

Phase II, completed in 2018, involved transplanting additional plants into the lake in locations which appeared to offer the most suitable growing conditions (Figure 1). The existing planting locations were expanded to allow the plants there to grow and spread.

In 2019, planting sites were again expanded to allow for more room for the plants to grow while maintaining the exclosure fencing to keep the plants protected. No new plants were collected for transplanting, however, an effort to germinate and plant American lotus (*Nelumbo lutea*) in the existing planting locations was conducted.

The 2019 effort began with an assessment of the plants and exclosure fencing at all 5 locations. The locations and species of surviving plants were recorded, and plans were made for expanding the size of the exclosures where applicable.

East Cove

The East Cove site was originally planted in 2017 and sits in a large protected cove near a boat ramp and campground. The planting area consisted of two large exclosures and one small exclosure. The large exclosures contained large, healthy looking plots of spatterdock and white water lily. The small exclosure was suspected to contain water stargrass, but it was not observed in 2019.

The exclosure fencing was expanded to stretch from the western shoreline around the planting site to the northern shoreline. This would greatly expand the planting area and would utilize the shoreline as a barrier for aquatic herbivores. Unfortunately, extremely high water levels created a pathway for animals to get into the expanded exclosure. Once the water receded, many of the plants, primarily pondweed and white water lily, were destroyed. To better protect them, the fencing was moved to create two large adjoining circles. This configuration allowed additional room for the plants to grow while maintaining stronger protection from wildlife.

Before moving fencing on 6/4/19, the exclosure is full of spatterdock, white water lily, American pondweed, and a number of large American lotus leaves

After flooding at the site receded, only spatterdock remains visible above the water.

Refuge North

The Refuge North Site, also planted in 2017, sits in a large shallow cove within the wildlife refuge in the northeastern area of the lake. This site experienced heavy wind and wave action, as well as very low water in late 2017. Due to these less than ideal conditions, no additional plants were added in 2018.

This site consisted of one large exclosure, with two separate colonies of spatterdock, and two medium exclosures, each with a healthy colony of American pondweed. After examining and securing the fencing with new metal stakes, it was decided that no expansion or modification would be necessary at this location. Ample room existed for the expansion of these plantings within their respective exclosures. Wind and wave action at this site may also make larger exclosures less stable and more likely to collapse.

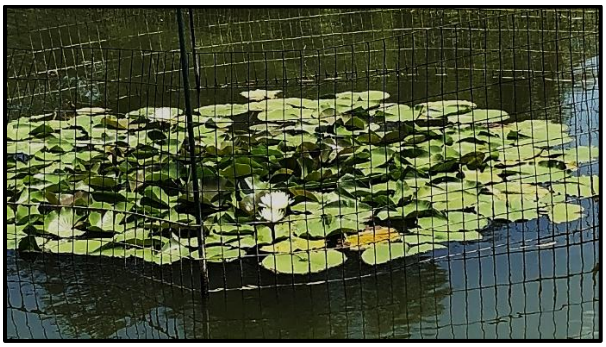
7/2/19 A large colony of American pondweed with several large American Lotus leaves growing in the middle observed on July 2.

Two colonies of spatterdock seem to be holding up well against the wind and wave action in the North Refuge. This species is slow growing so it will take some time to expand and fill this exclosure.

Refuge South

The Refuge South site is located in a well-protected cove at the southwestern end of the wildlife refuge. This site was planted in 2018 and consisted of 11 small exclosures, each containing a colony of white water lily, spatterdock, or American Pondweed. For 2019, the fencing was rearranged at this site so that most of the plants were protected within two large conjoined circular exclosures. Exclosures surrounding two of the existing plots were individually expanded as they were too distant to be joined with other plants in a single large exclosure.

Overall, the plants at this location appear to be doing very well. All three species are growing well and expanding to fill the exclosures. In August, the white water lilies were even flowering, which has been rare at other locations. Unfortunately, in late August one half of the large exclosure was breached and the vegetation within was destroyed. While repairing the fencing and attempting to flush out any animals that might be inside the exclosure, one turtle, likely a red-eared slider, was observed. Hopefully the roots and rhizomes of these plants are still intact, and they will return in the future.



White water lily observed flowering on July 23rd. As long as the plants remain protected from herbivores, they thrive in this calm shallow location.

This dense colony of spatterdock is doing very well and is quickly filling this exclosure, which is approximately 12 feet in diameter.

West Cove North

The West Cove North site was planted in 2017 and is in a small shallow cove with moderate protection off of the western branch of the lake. This site showed limited success in 2017, possibly due to discharge from the adjacent crappie nursery pond which is treated with herbicide. No plants were added to this location in 2018; one small exclosure containing white water lily and one medium exclosure containing American pondweed remained at this location. For 2019, the exclosures were checked and reinforced with new metal stakes. The American pondweed exclosure was downscaled to better fit the size of the colony while still allowing room for expansion.

Although much of the vegetation at this location did not return, this 3-year-old colony of white water lily is still looking great. Hopefully this colony will continue to grow and will eventually spread beyond the exclosure.

The American pondweed grew rapidly in late spring and early summer, filling the exclosure. This species has been observed along the shoreline in several locations in this part of the lake. This colony will provide a source for more plants to grow and spread in the area.

West Cove South

The West Cove South site was added in 2018 and is located in a very well protected, shallow cove in the western branch of the lake. It consisted of 10 small exclosures containing white water lily, spatterdock, or American Pondweed. In 2019, these exclosures were disassembled and rearranged into two large conjoined circles, each containing a mix of all three species.

All of the species appear to be thriving in this location. They are well protected from wind and wave action and no breaches appear to have occurred. One issue at this location is an abundance of the nuisance species brittle naiad (*Najas minor*). This species grows in very dense mats that can grow so thick, making it difficult to access the site. Fortunately, the restoration species have leaves that grow at or above the surface of the water and appear to prohibit the naiad from growing in close proximity. Once these species become established, they may actually reduce the abundance of this bothersome species.

All three species can be seen here, growing well and filling these large exclosures.

The white water lilies grew very large leaves at this location and even had a few flowers in July (Left).

Brittle naiad can be seen here, creating a large dense mass just below the surface of the water (right).

American Lotus

American lotus (*Nelumbo lutea*), is a floating leaved plant native to North America. It has large leaves that can grow up to 17 inches in diameter. This species was once very abundant in Sangchris Lake and still grows occasionally in shallow areas and inside the exclosures put in place for this restoration. In an effort to bolster the abundance and diversity of the American lotus population at Sangchris Lake, lotus seeds were collected, germinated, and transplanted in several locations.

Lotus Seed Preparation

In August of 2018, approximately 200 lotus seeds were collected from a stormwater retention pond near Springfield, Illinois. These seeds were checked for obvious defects, rinsed with water, and kept in a cool, dry location until the spring of 2019.

To begin preparing the lotus seeds for germinations, they were first placed in water. Any seeds observed floating on the surface of the water were discarded. Lotus seeds have very thick outer shells, which can be scarified to hasten the germination process. The seeds are slightly oblong and have a pointy end where they were once attached to the flower and a small concave circle on the opposite side (Figure 2).

To scarify the seeds, the concave end was sanded or filed until the white endosperm, the seeds food source, became visible (Figure 3). Once scarified, the seeds were placed into a glass jar filled with water (Figure 4). The water was changed every few days to prevent bacterial growth. After a few days the seeds began to swell, almost doubling in size, and the outer shell became soft (Figure 5). After a few days, the sprouts began emerging from the seeds. Some of the seeds with less area sanded away took longer to break out of the shell. Once sprouted, the shoots grew rapidly, reaching 1-6 cm in 7 days and up to 10 cm in 10 days (Figures 6 & 7). After 2 weeks, most of the shoots were around 12 cm long. They were then planted just below the soil surface in 1-quart plant pots. The pots were then submerged in water in a 100-gallon Rubbermaid tub. They were allowed to grow in the pots and develop leaves and roots for several weeks before being transplanted into the lake.

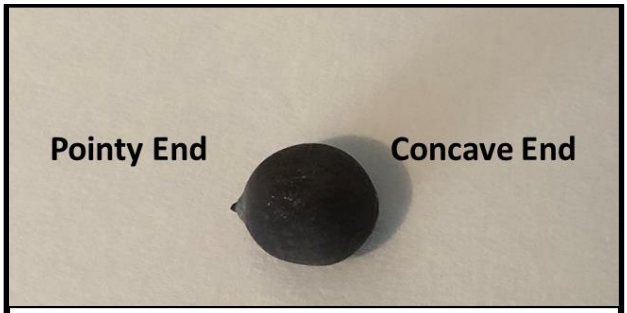


Figure 2. Lotus seed with one pointy and one concave end.

Figure 3. Endosperm visible after sanding away the outer shell.

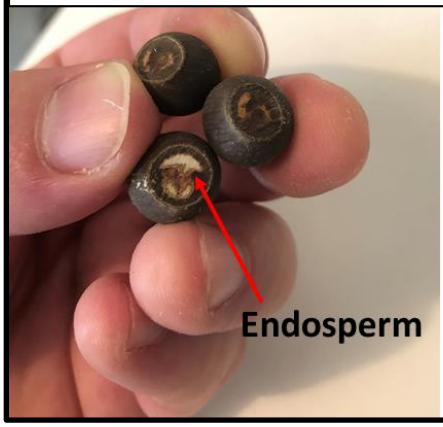


Figure 4. Seeds placed in water on Day 1.

Figure 5. After 4 days, the lotus seed has grown to nearly twice its original size.

Figure 6. Seeds at 7 days.

Figure 7. Seeds at 10 days.

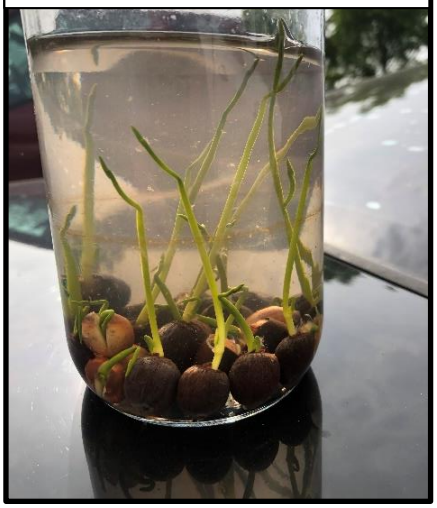


Figure 8. Young lotus plants growing in a 100-gallon Rubbermaid tub young lotus plants

Summary

Overall, each restored species (with the exception of the water stargrass, which did not survive) is doing well within the exclosures, resulting in the expansion of several cages during the 2019 season to give the plants more room to grow. The expanded cages also allowed room to plant American lotus in 2019. Predation continues to be the most likely, although speculative, limiting factor for these reintroduced species. Competition with invasive species (such as brittle naiad) does not seem to be negatively impacting the plantings. Recommendations for future efforts will be developed by IDNR staff and an update of efforts will be provided at https://www2.illinois.gov/dnr/programs/NRDA/Pages/Sangchris-Lake---.aspx and at the park office when available.