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Management Recommendations for Jacoby Creek Land Trust's Off-Channel Pond Site at the Kotke Ranch and Nature Preserve

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Executive Summary

Now more than ever there is a need for conservation easements within California because of ongoing degradation, urbanization, clear cutting and loss of habitat to ecosystems due to wildfires. The Jacoby Creek Land Trust (JCLT) is in need of a restoration and conservation plan regarding constructed off-channel ponds along Jacoby Creek. One of the ponds is flourishing and supporting different types of fishes during their migration. The other pond, our project location, is struggling to meet the JCLT's project objectives. The pond is overgrown with European grasses due to the surrounding grazing land and has yet to see the pond's potential. There has been little to no maintenance in regards to this area, thus there is work to be done.

The JCLT recently received a five-year grant to restore the off-channel pond and the adjacent riparian habitat. Within this report, we focus solely on the off-channel location. We recommend ways to address various problems in the site by providing the Land Trust with a management plan to help them meet their goals for the off-channel pond to serve a multitude of functions. These recommendations include brief flash grazing of the site, accessibility to the public for recreational use, habitat enhancement, and addition of pollinator-friendly vegetation.

Project Goals

Included in this report, we recommend the following:

- Additional and enhancement of native vegetation to help with:
    - Attraction of pollinators
    - Bank stabilization
    - Inundation tolerant plants ; which refers to plants that are able survive if it undergoes flooding
- Fencing repair recommendations where current old fence is failing
- Addition of a recreational trial for public use

Background

Historical Land Use

The Jacoby Creek watershed is located in Humboldt County (Figure 1), a region of California that was drastically affected by European settlement and the subsequent land conversions. This area of California is a part of unceded Wiyot territory (Figure 2) that was taken from them through colonization. As a result of colonization, much of the land was altered to support farming, homesteading, and logging (Jacinto, 1999). Settlers logged much of the forested areas of Humboldt County and converted wetland habitats to agricultural land through draining and filling (Murray & Wunner, 1980). These large-scale alterations had adverse effects on the structure and function of the present ecosystems (Wunner, 1988). Logging in the area caused higher levels of sedimentation in the waterways (Murray & Wunner, 1980), harming the quality of habitat for salmonid species. Logging also removed habitat for many different avian species and overall reduced biodiversity in this watershed (Wunner, 1988). Due to loss of floodplain and wetland habitats, there is a reduction of biodiversity (Wunner, 1988). The loss of floodplains and

wetlands, along with simplified, unchanging channel geomorphology, is also responsible for increased flooding in the area (Wunner, 1988). It is crucial to understand the history of this area in order to begin grappling with the present problems within this site.

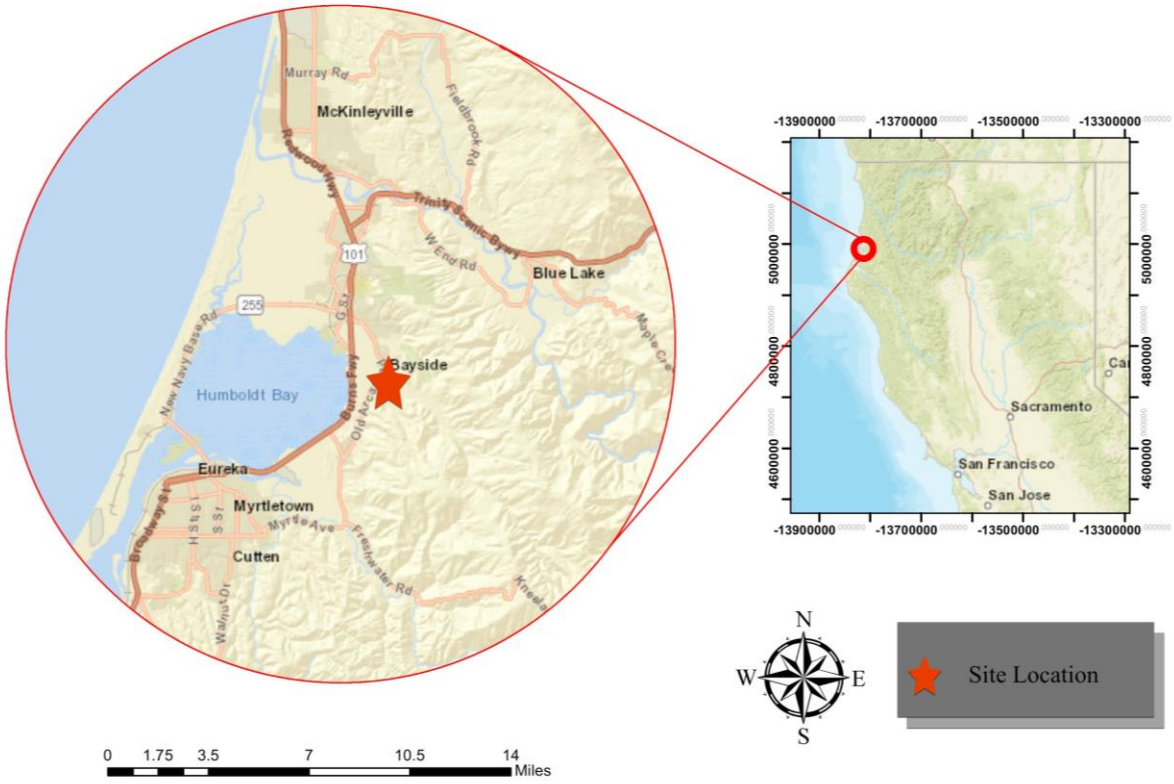

Figure 1: Map showing the location of Jacoby Creek within Humboldt County in California. Map by Marcos Sosa, 2020, ArcMap.

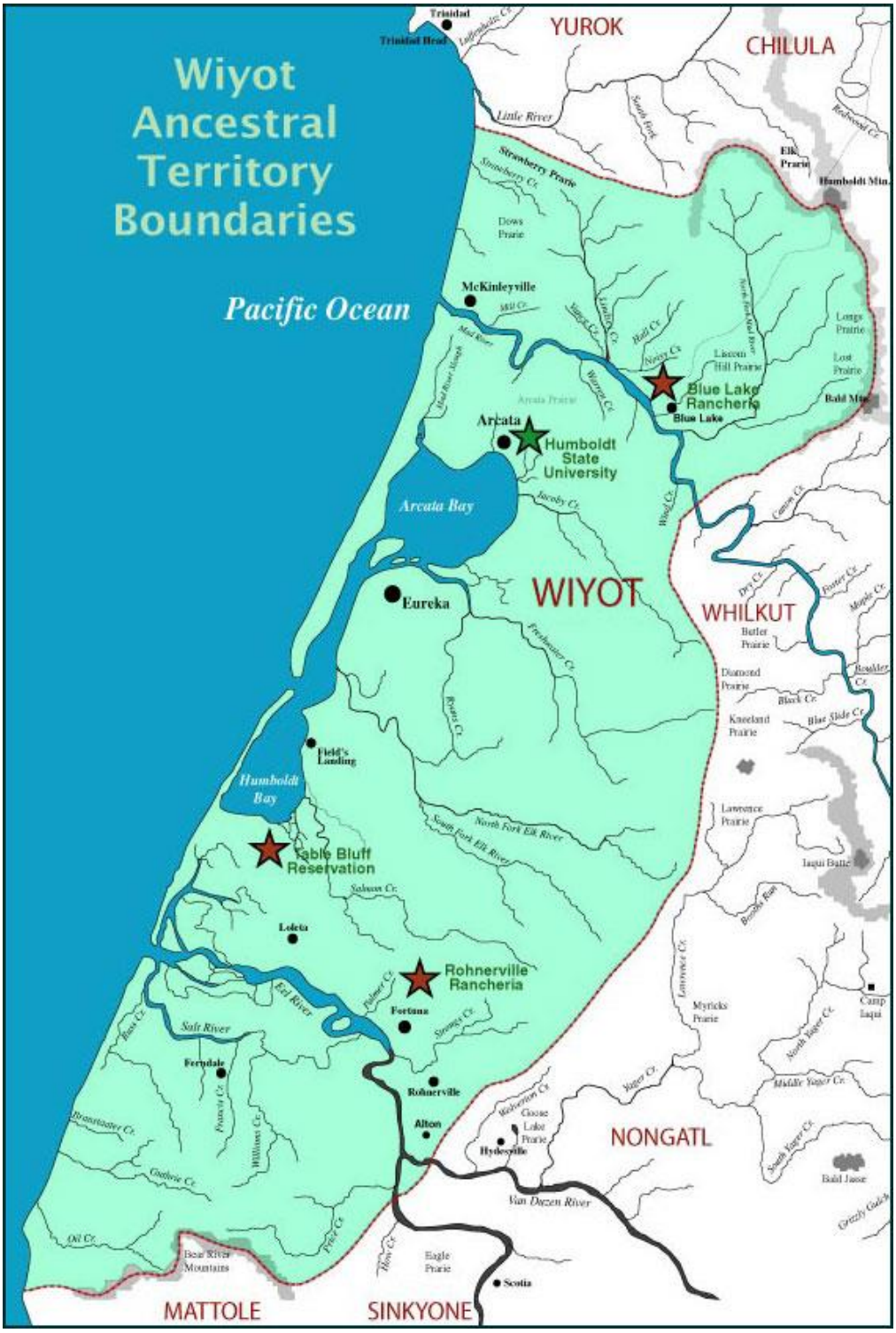

Figure 2: Map of Ancestral Wiyot Territory (Humboldt State University Department of Native American Studies, n.d.).

Jacoby Creek Land Trust

The Jacoby Creek Land Trust (JCLT) is a non-profit 501(c)(3) organization established in 1992 that works to conserve the ecological, recreational, cultural, agricultural, and historical values present in the Jacoby Creek watershed (Figure 3) (Jacoby Creek Land Trust, n.d.). The JCLT protects around 126 acres of land within the watershed through conservation easements (Jacoby Creek Land Trust, n.d.). They also provide educational workshops and activities to the community that seek to promote interest in science among young folks, and to further protect and benefit native ecology and healthy ecosystems (Jacoby Creek Land Trust, n.d.). Promoting conservation values throughout the community is very important to the folks at JCLT, so they host various educational and recreational events at Kokte Ranch and Nature Preserve, one of the recreation sites (Jacoby Creek Land Trust, n.d.).

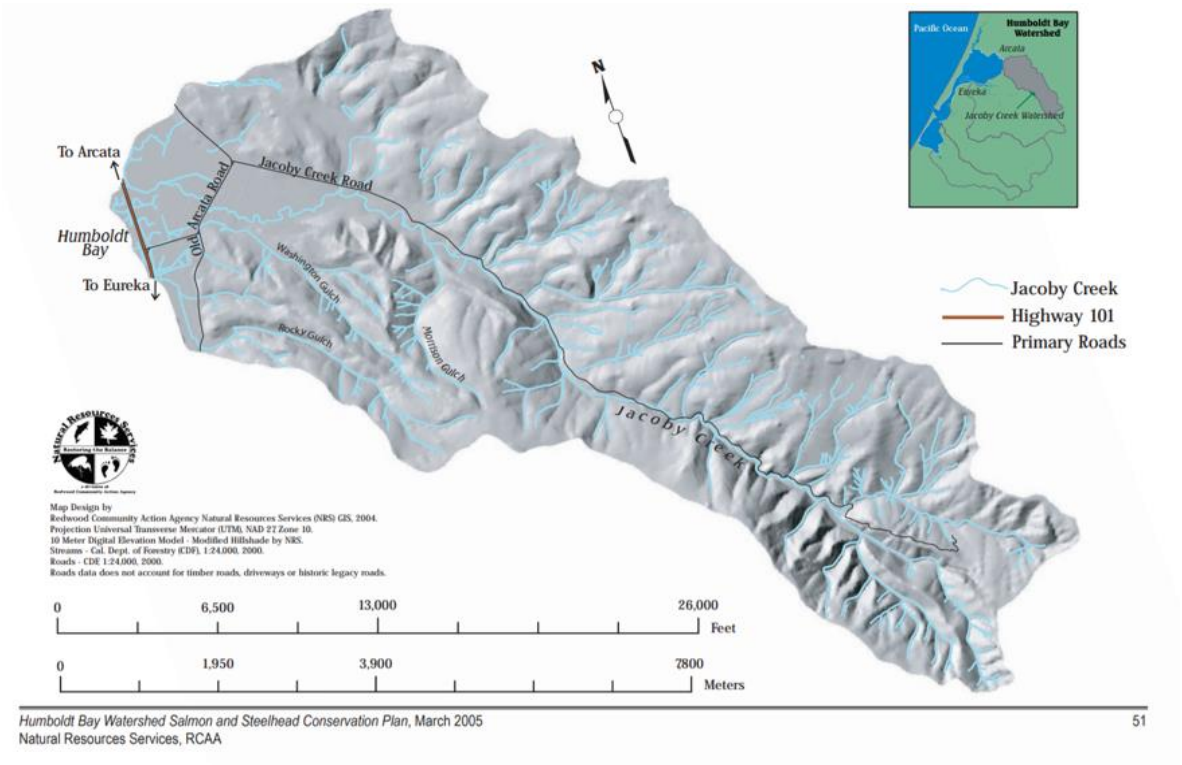

Figure 3: Map of the Jacoby Creek watershed (RCAA, 2005).

Kokte Ranch and Nature Preserve

Kokte Ranch and Nature Preserve is located on Old Arcata Road in Bayside, California. It has a total area of 63 acres and is home to the offices of the Jacoby Creek Land Trust (JCLT). Previously, this land was a dairy farm, but then converted to a preservation site. Currently, 50 acres are dedicated for pasture land to raise grass-fed beef, that the JCLT rents out for fundraising efforts to support community-based agriculture sustainability efforts (Jacoby Creek Land Trust, n.d.). Caudal Fin Farm is also located on the site and grows local organic produce and flowers to over 200 families locally (Jacoby Creek Land Trust, n.d.). Also located at Kokte Ranch, is the Humboldt Wildlife Care Center / Bird Ally X, rehabilitates over 1,200 injured animals annually and takes in orphaned animals to help with their recovery until they are able to be released back into the wild (Bird Ally X).

Off-Channel Ponds at Kokte Ranch and Nature Preserve

There are also two constructed off-channel ponds at this site that are seasonally connected to Jacoby Creek. One off-channel pond is currently overgrown with pasture grass (our project site, Figure 4) but the other pond provides habitat for steelhead (*Oncorhynchus mykiss*), Chinook (*Oncorhynchus tshawytscha*), and Coho (*Oncorhynchus kisutch*) salmon during the winter months (Jacoby Creek Land Trust, n.d.). Lastly, the JCLT has restored half a mile of riparian area alongside the Jacoby Creek and provides public access to the nature trail.

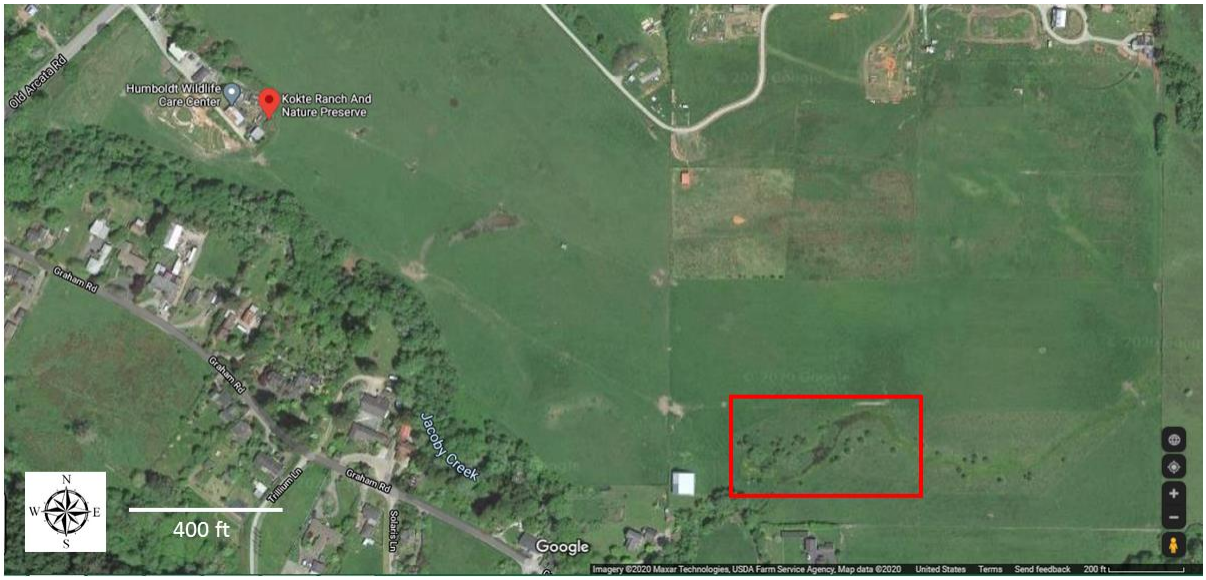

Figure 4: Location of the lower off-channel pond within Kokte Ranch and Nature Preserve. Lower off-channel pond is highlighted by the red box, while the upper off-channel pond is located just east of there. (Map by Auston Tague, 2020, Google Maps).

Site Description

Off-channel Pond Site

Our project site is the off-channel pond located on Kokte Ranch and Nature Preserve along the north side of Jacoby Creek approximately 700 meters southeast of Old Arcata Road (Figure 4). This portion of the Jacoby Creek valley is primarily open agricultural land surrounded by forested hills. Grazing pastures surround the off-channel pond site (US Fish and Wildlife, n.d.). The pond is situated on a 10-acre parcel designated by the Jacoby Creek Land Trust and the California Department of Fish and Wildlife for wetland and riparian habitat restoration (US Fish and Wildlife, n.d.). Connectivity of the off-channel pond to Jacoby Creek is

seasonal and only occurs during periods of higher stream flow, providing temporary refuge for juvenile salmonids and amphibians (US Fish and Wildlife, n.d.).

The pond area is characterized by a gradient of plant communities ranging from aquatic species to upland trees and shrubs. These communities form relatively distinct zones in their proximity to the saturated pond area and were given corresponding titles ranging from Zone 1 to Zone 4 (Figure 5). The upland zone (Zone 1) is dominated by annual European grasses that spread from the surrounding pastures as a result of re-seeding performed by ranchers (US Fish and Wildlife, n.d.). The upland Zone 1 also features a variety of small trees and willows (*Salix* sp.*)* scattered throughout the pond area, although the willows have had little success with establishment due to deer browse. The *Ranunculus/Trifolium* zone (Zone 2) contains numerous flowering herbaceous plants, many of which have migrated from the surrounding pastures. Some of these species are native, while others have been introduced through re-seeding as mentioned earlier. The sedge zone (Zone 3) lies on the very edge of the pond, containing semi-aquatic and moisture-tolerant plants which form a sort of ring around the pond and delineate the boundary of the inundated area. The pond area (Zone 4) is an oxbow-shaped depression that was constructed in 2015 to provide seasonal refuge to juvenile salmonids and other aquatic creatures when Jacoby Creek reaches the flood stage (US Fish and Wildlife, n.d.). The pond area was planted with aquatic species that flourish when the pond contains water (CalFlora, 2020).

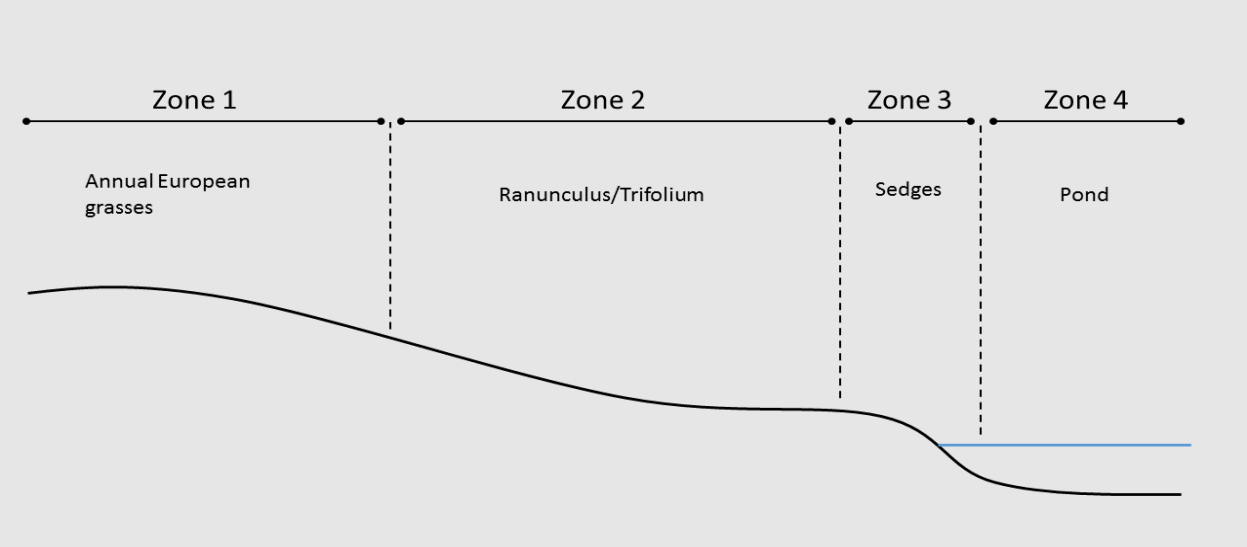

Figure 5: Distribution of ecological zones surrounding the off-channel pond based on plant communities. Figure by Auston Tague, 2020, Microsoft PowerPoint.

Environmental Conditions

Although being located within the Pacific North Coast, the environmental conditions differ from what is considered typical. The mean annual air temperature is around 55 - 55 degrees Fahrenheit (Web Soil Survey, 2020). There is recorded occasional flooding within this site, and this flooding peaks during the annual King Tides (Van Kirk, 2015). This area normally receives a total of 35-80 inches of mean annual precipitation (Web Soil Survey). The current soil type within the site is a mix of clayey and loamy, leaning towards the clayey part (Web Soil Survey). Classified under the Web Survey Soil as silt loam for 43 acres of the property and silty clay loam for 22 acres remaining. It is very poorly drained, mainly due to the amount of compaction it receives due to the periodic flash grazing (Web Soil Survey). For the 43 acres of the property, it is prime farmland if it is maintained, i.e. irrigated and drained properly (Jacoby Creek Land Trust, n.d.).

Methods

Biological Inventory

Four ecological zones (Figure 5) were identified around the pond using qualitative observations of differing plant communities along the sloped gradient the pond banks provided. These zones were numbered one through four beginning with the upland area and ending with the pond itself.

In order to create adequate planting recommendations we completed quantitative biological inventory of the plants in and directly adjacent to the pond. A 36-meter transect line was placed from the upland zone on the south bank of the pond to the upland zone on the north bank of the pond on October 24, 2020 (Figure 6). The width of each zone was measured and divided into numbered quadrat positions. Each zone was assigned a randomly generated position where a $1m^2$ quadrat was placed. The bottom left corner of the quadrat was placed along the east side of the transect line at the designated position for each zone. Both banks of the pond were surveyed due to different mixes of vegetation. Zones on the south side of the pond were given an *A* designation, while zones on the north side of the pond were given a *B* designation (Figure 7). A total of seven zones were surveyed for percentage cover of present species, with the pond zone only being surveyed once due to dry conditions.

Figure 6: Placement of the transect line across the off-channel pond. Map by Auston Tague, 2020, Google Maps.

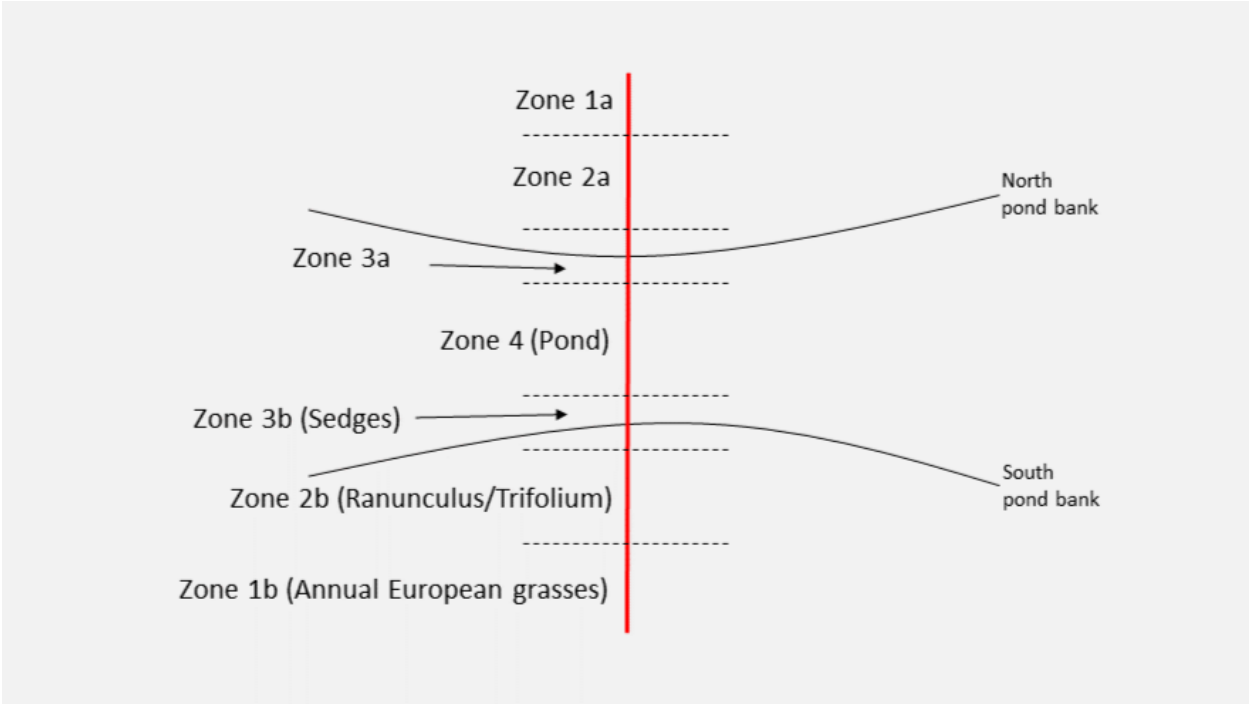

Figure 7: Delineation of ecological zones on north and south pond banks. Figure by Auston Tague, 2020, Microsoft PowerPoint.

Other flowering plants were also identified within the project area using the iNaturalist app with verification via remote experts. An existing iNaturalist project titled *Biological Inventory of the Jacoby Creek Watershed* helped in identifying certain species. These observations are logged as part of an ongoing identification project.

Mapping

In order to provide adequate management recommendations for the off-channel pond site, we mapped the pond's footprint and a suggested trail location. We visited the site prior to the start of the rainy season on October 11 and October 24, 2020. The seasonal pond was dry during our visits, but a waterline at the bank of the pond allowed us to determine the typical diameter of the pond. The bank of the pond fell in between zones two and three, so we marked the pond's footprint where zones two and three met using a Garmin GPSMap 64SX handheld unit. From there, we delineated the pond boundary by walking the circumference of the pond along the bank and marking averaged waypoints at intervals of fifteen paces. The final waypoint recorded for the pond's footprint was taken roughly at the same location of the initial waypoint.

Mapping the trail involved similar methods as those described for mapping the pond's footprint. We used the previously determined zones to identify an optimal trail location. We placed the trail in zone one, the annual European grass community. Starting at the entrance gate of the off-channel pond site, we walked near the pond footprint along the higher points of the swale, averaging waypoints after fifteen paces. After reaching the north-easternmost point of the pond, the trail stops because the swale drops deeper and this region of the site will likely be inundated with water during the rainy season. From here, we crossed the pond to the south-easternmost point of the swale and walked back through zone one to the entrance gate, averaging

waypoints for every fifteen paces. This will allow users to access both sides of the pond regardless of the season, without harming the floral and faunal communities within the site.

Management Recommendations

Fencing Recommendations

Aging fences surrounding the off-channel pond have contributed to degradation of plants and compaction of soil near the banks (US Fish and Wildlife, n.d.). Adjacent land-owners will seasonally use the pond site area for cattle flash grazing, and it is paramount that the pond be protected during this time. Cattle grazing is a nonpoint source of pollution responsible for reductions in water quality (Agouridis, 2005). Furthermore, the presence of cattle can reduce plant health and productivity due to increased compaction and addition of manure. Including electrical fencing along the trail next to the pond will help protect the sensitive areas of the site from compaction and a reduction in water quality and health (Vidon et al., 2008).

The electrical fence will be turned off from late September through early May, when the site is open for visitor use and closed for flash grazing. From late May through early September the electrical fence will be turned on to exclude cattle from sensitive site areas during flash grazing. Flash grazing will occur during these months because the least amount of rainfall occurs during this time (Eureka WFO Woodley Island, n.d.). Flash grazing should occur during dry months to mitigate negative impacts to water quality and health (Agouridis, 2005).

Replacement of posts, fencing material, and installation of gates will significantly increase protection to sensitive plants and pollinators, as well as facilitate the occasional flash grazing within the pond area. Existing fence posts and standing fences can be used as a template

for replacement. Estimates from the US Fish and Wildlife Service place costs around $3,400 for the off-channel pond (US Fish and Wildlife, n.d.).

Deer fencing should also be used around existing willow stakes that are currently struggling to establish themselves due to constant deer browse. The fencing will protect them from herbivory and allow them to flourish (Pellerin, 2010). We selected willow stakes to be fenced based on their current success, solely via field observation. Willow stakes that are recommended for protection are two to four feet tall with multiple leaves growing out of them, surrounding an established community of plants that are favored by deer. Selected willow stakes were near vegetation that could attract deer, like high protein crops (Pellerin, 2010) or surrounded by other willow stakes. These seemed to be the most valuable individuals when it came to ensuring the establishment of willows on the site, yet these individuals could still be susceptible to deer. Fencing will allow the establishment and proper growth of the stakes without deer impacting their resistance.

Trail and Interpretation Elements

Creating accessible green space that the community can use for recreational and educational purposes is essential to the JCLT. With these goals in mind, we suggest adding a trail following the pond through zone one (Figure 8). This trail location will allow users to access the pond site regardless of seasonal inundation, since it rests on the higher edges of the swale. Furthermore, the location of this trail helps protect the native plants that we recommend be added to the site from being trampled or otherwise distributed by folks enjoying the area (D'antonio & Monz, 2016).

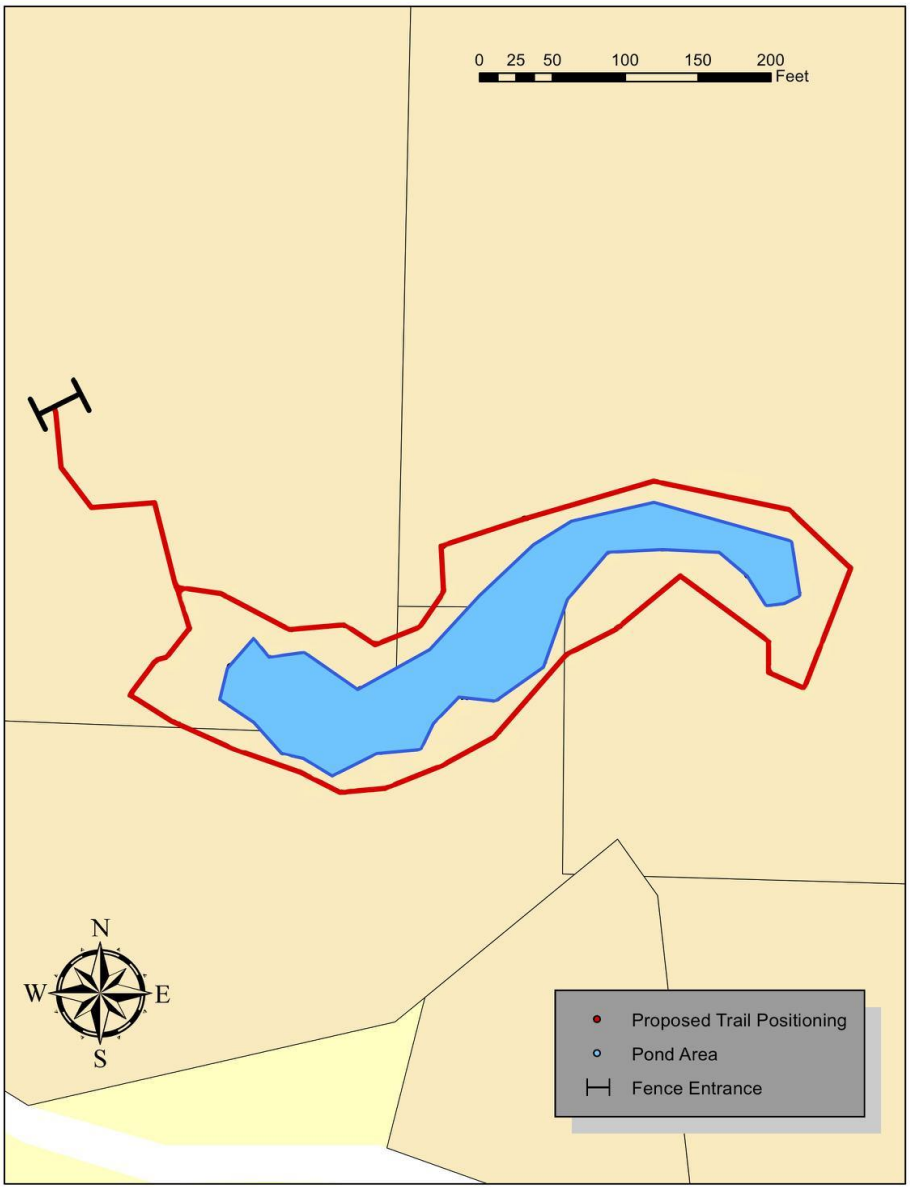

Figure 8: Map of the Off-Channel Pond Site including recommended trail additions. May by Marcos Sosa and Maeve Flynn, 2020, ArcMap.

We also recommend that an interpretive sign be included along the trail adjacent to the pond on the south side where it meets with the riparian channel. The sign will include some of the plant and animal species present at the site, as well as explain some of the restoration work

and restorative objectives of supporting pollinators and juvenile salmonids. We included this element because the JCLT strives to be both a recreational and educational resource for the community at large (Jacoby Creek Land Trust, n.d.). Through the creation of a trail that includes educational features, this site can serve as ecological habitat, recreational space, and an outdoor classroom.

Planting Plan

Zone 1

Since this site is surrounded by active grazing fields, we do not recommend efforts to eradicate the mix of annual European grasses that dominate this region because these species can readily recolonize the area after removal. On both sides of the pond, this zone contains mostly European annual grasses (Figures 9 and 10). The adjacent landowners reseed their fields for cattle grazing annually, so any eradication efforts would ultimately be futile. Instead, efforts should be made to contain the annual grass mix to this area through annual short term flash grazing events. Flash grazing should occur during the summer dry season, from late May through early September (EUREKA WFO WOODLEY ISLAND, n.d.). An electrical wire will restrict the cattle to this area and protect the other zones present at the site from grazing impacts.

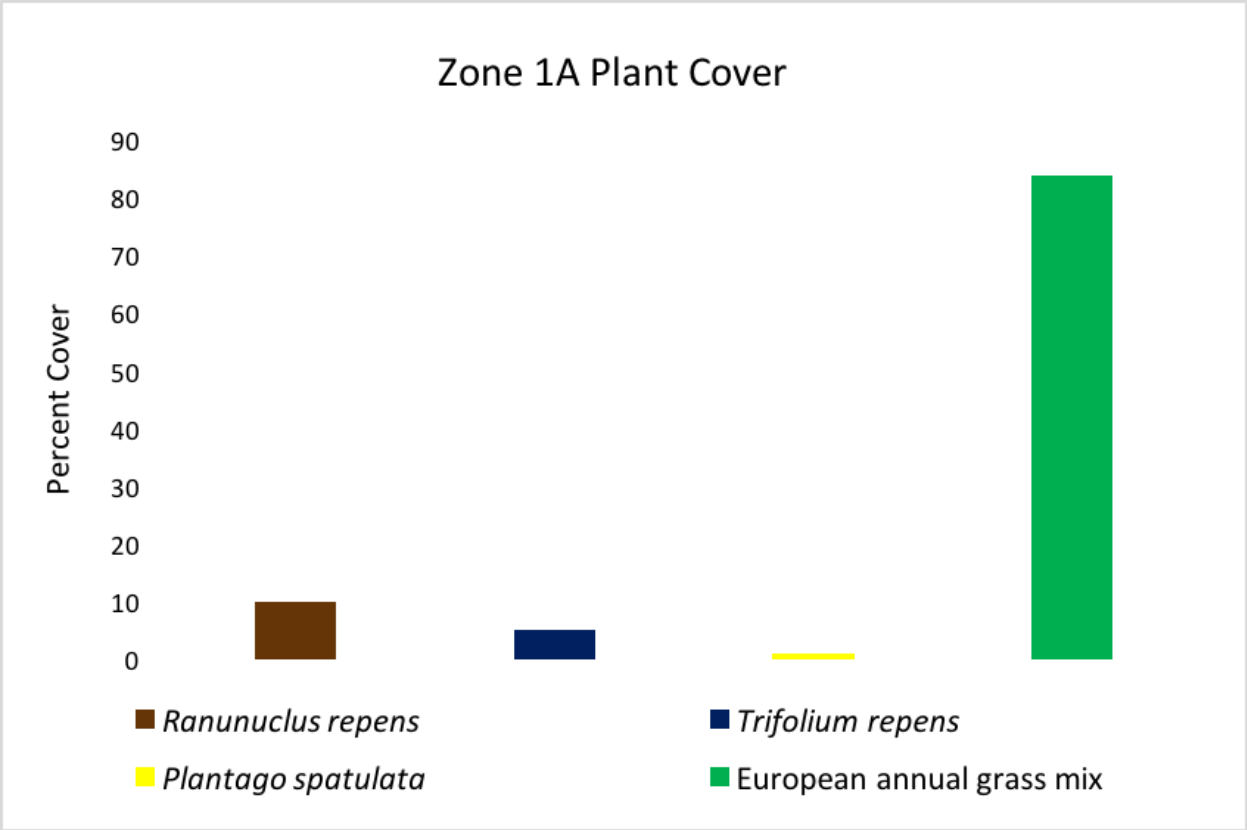

Figure 9: Bar graph showing percent coverage of species in the most upland plant community on the south side of the pond. Data collected in October 2020.

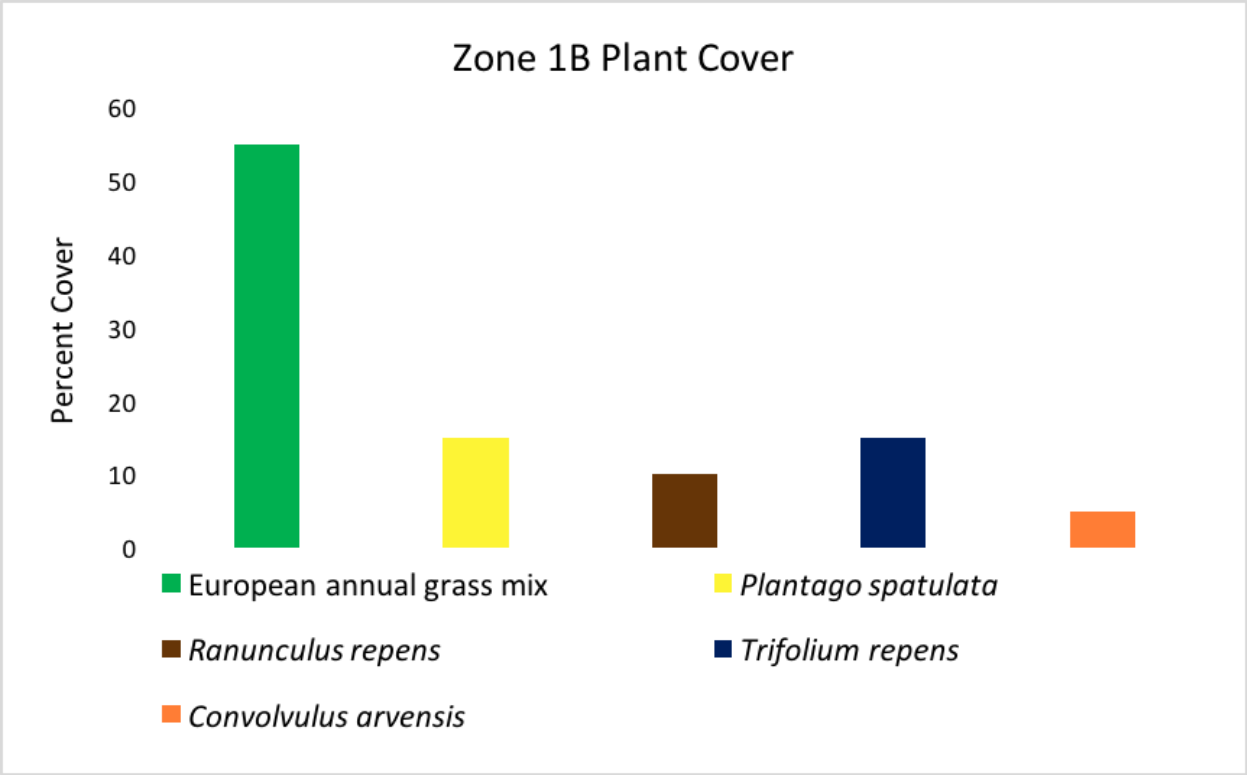

Figure 10: Bar graph depicting percentage of plant species present within the most upland zone on the south bank of the pond. Data collected in October 2020.

Zone 2

Moving towards the pond area, one can start to see the transition from European grasses to more vegetation that play an ecological role. This zone is particularly dominated by *Ranunculus* and *Trifolium* present (Figures 11 and 12). Our recommendation for this zone is to plant native vegetation that will attract pollinators. Through our recommendations, we will take into consideration vegetation that can also benefit other aspects besides pollination. These include bank stabilization, having perennial vegetation, drought tolerant and are low maintenance. Since the site is made up of poorly drained soil due to heavy trampling by cattle, this will be a factor in deciding the vegetation proposed. With all these in mind, here are some of recommendations for planting at the site: common yarrow (*Achillea millefolium)*, blueblossom

ceanothus (*Ceanothus thyrsiflorus)*, and yellow eyed grass (*Sisyrinchium californicum*). The yellow eyed grass is flood tolerant, which will allow it to survive when the off-channel pond gets inundated in the winter (CalFlora, 2020). Yellow eyed grass is also known to tolerate cold weather and do well in poorly drained soils, it also is deer-resistant (Stahlheber, 2016). The Blueblossom Ceanothus is a good pollinator and is known for its drought tolerant behavior, it also supports bees and butterflies with its colorful flowers (CalFlora, 2020). According to CalFlora, the genus *Ceanothus* provides host to "Spring Azure, Echo Blue, Pacuvius Duskywing, California Tortoiseshell, Pale Swallowtail, and Hedgerow Hairstreak butterflies." Alongside supporting a magnitude of pollinators, *Ceanothus* is also a good plant for bank stabilization (CalFlora, 2020).

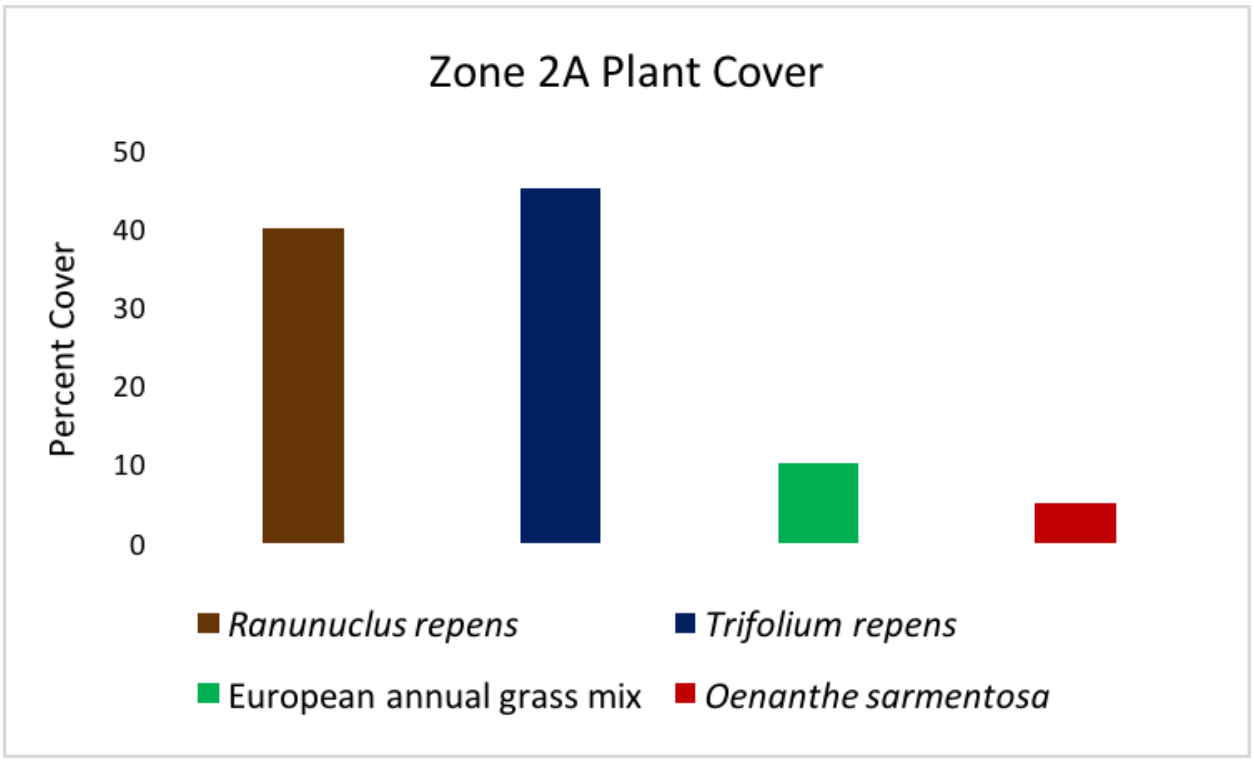

Figure 11: Bar graph representing plant species found in Zone 2 on the northern side of the pond.

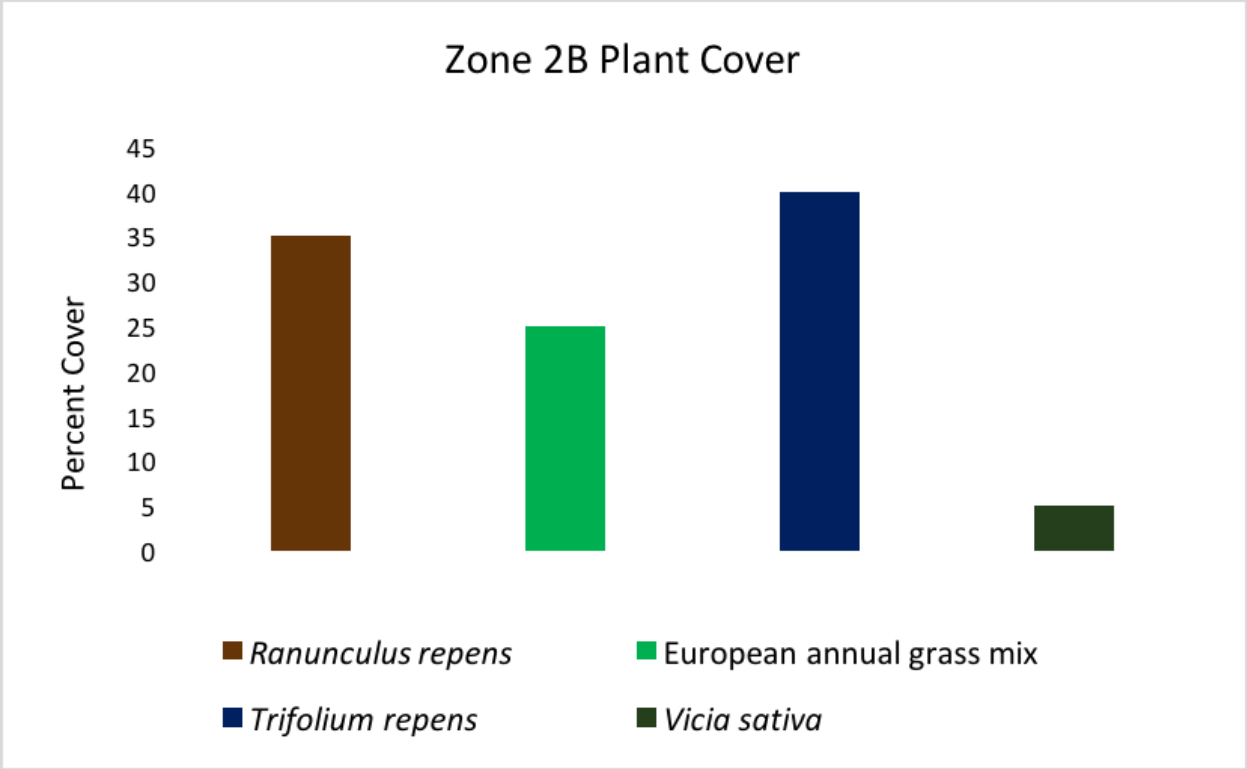

Figure 12: Bar graph including percentage of plant species cover within Zone 2 on the south side of the pond.

Zone 3

The sedge zone immediately surrounding the pond is well established and contains many flowering plants such as Pennyroyal (*Mentha pulegium)* and Knotweed (*Persicaria sp.*). Common vegetation like Water Parsley (*Oenanthe sarmentosa*) grows around the entire pond (Figures 13 and 14) and provides excellent flowers for pollinators from May through July (CalFlora, 2020). This zone may also be suitable for willows which provide early flowers for pollinators as soon as February and March (CalFlora, 2020). Previously unsuccessful willow stakes may benefit from deer fencing to protect young foliage. Wild ungulate grazing from deer and elk has been shown to decrease planting survival by 30 percent and can increase mortality by five times in newly planted stakes (Averett, 2017). To obtain a fast and more even early

establishment of willows, we recommend the use of vertically planted cuttings with a length of at least 20 cm. If cuttings are planted horizontally, they should not be planted deeper than 5 cm (Edelfeldt, 2015).

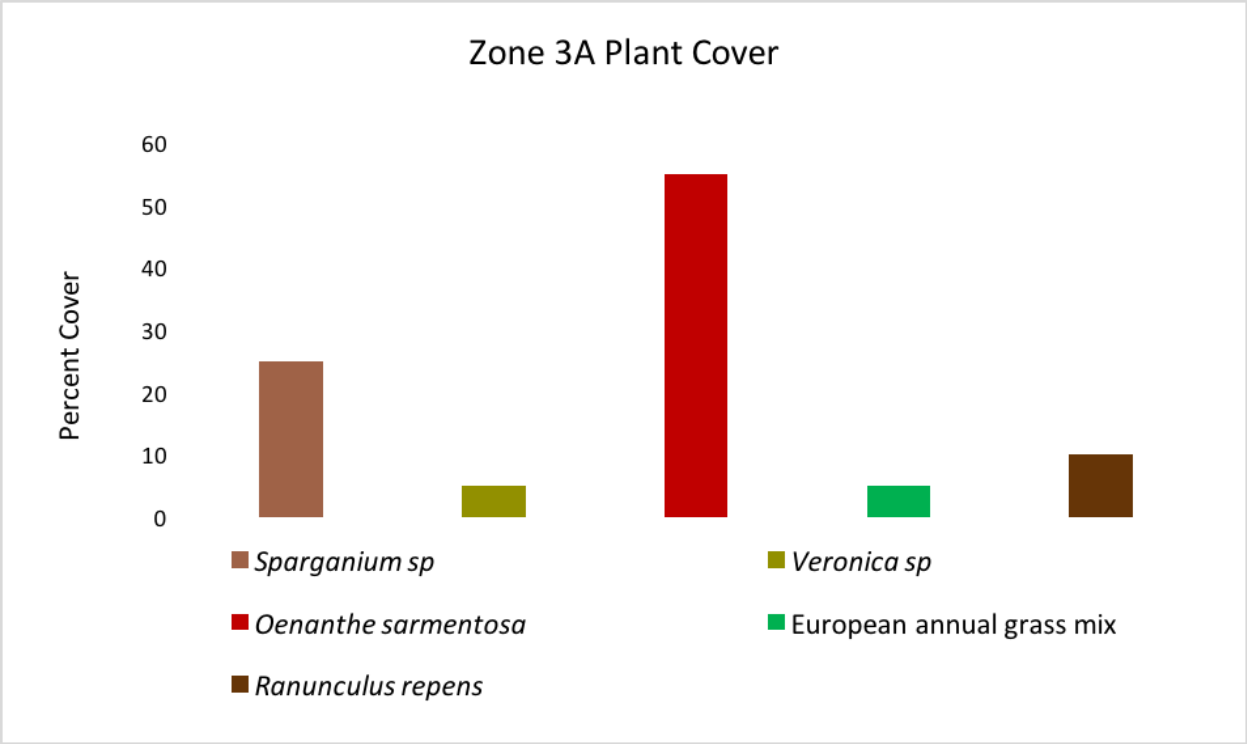

Figure 13: Bar graph listing plant species present along Zone 3, the bank of the north side of the pond.

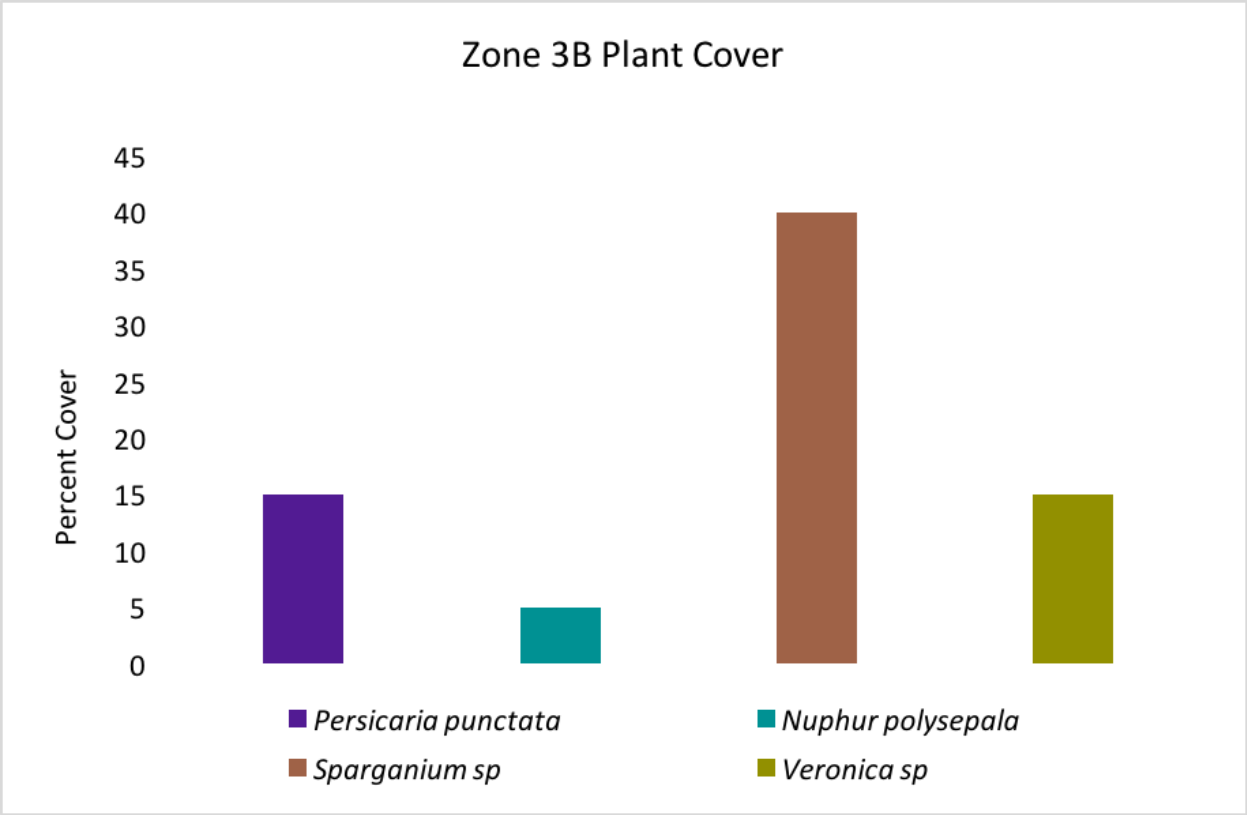

Figure 14: Bar graph listing plant species present along Zone 3, the bank of the north side of the pond.

Zone 4

The pond zone currently contains *Azolla filiculoides* (Water fern) and *Nuphar polysepala* (Western yellow pond-lily), which flowers from April through September (Wiersema 2012), and *Persicaria punctata* (Dotted smartweed) (Figure 14), which flowers from June through November (Costea 2012). We recommend planting *Callitriche marginata*, (California water starwort), since it flowers from February to March (CalFlora, 2020). One goal of this site is to provide food for pollinators throughout the year, and adding this plant to the pond area will help achieve this goal. After planting *C. marginata*, within the pond site alone things will flower from February through November (CalFlora, n.d.).

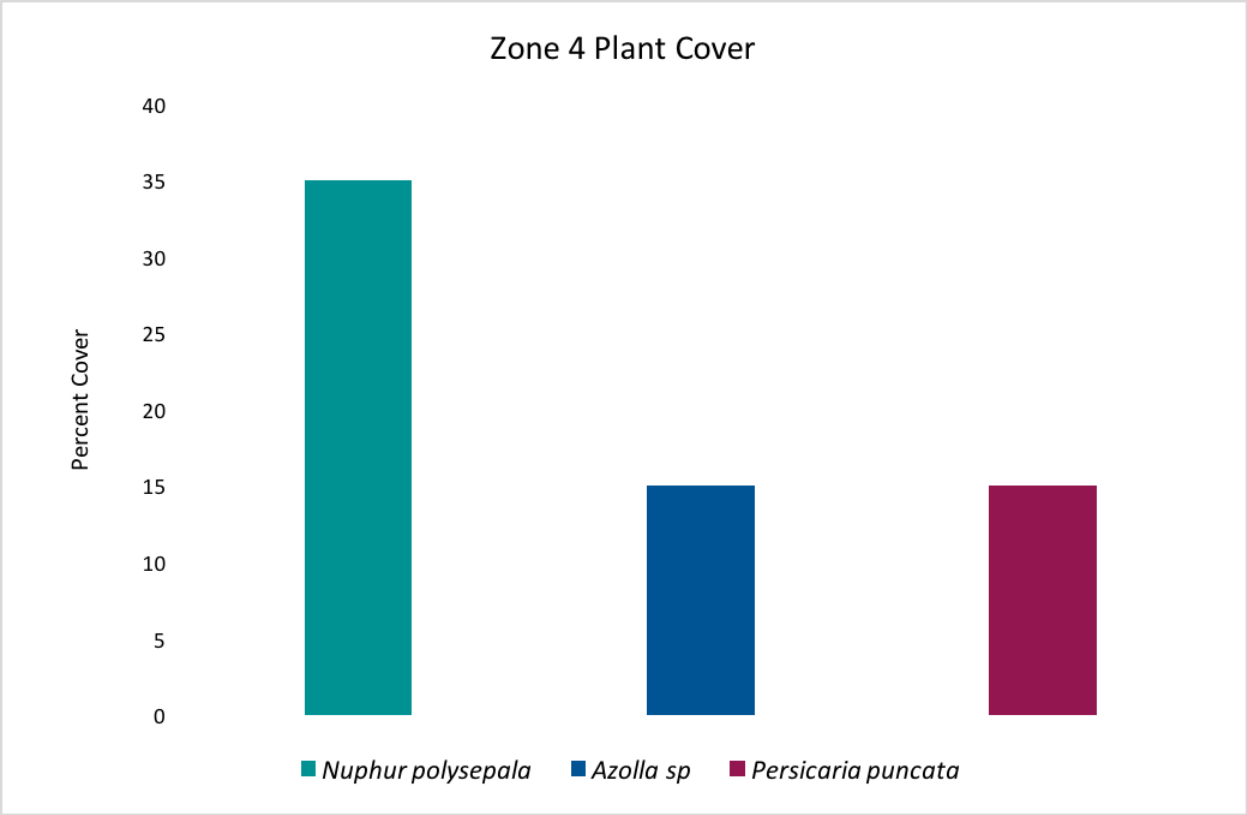

Figure 15: Bar graph showing plant communities present in the pond area.

Another important goal related to the pond itself is that it will serve as a supportive habit for juvenile salmonids including *Oncorhynchus kisutch* (Coho salmon) and *Oncorhynchus tshawytscha* (Chinook salmon) (Gerwein, 2017). Since this is an ephemeral pond that becomes seasonally inundated, it is important that juvenile salmonids have ample access to food. Higher presence of vegetation in this habitat will allow for more secondary production and healthier, larger salmonids (Jeffres et al., 2008).

Monitoring Plan

For our monitoring plan we will recommend that the JCLT regularly check on the site once the native vegetation is planted. There is a need for careful observation after planting is

done because the first few weeks are essential for establishment and proper growth (Zirbel, 2020). Plants need to be attained and sought after to ensure everything is appropriate for their residency (Jones, 2006). This will require frequent site visits that consist of checking for growth, water availability, weak or struggling plant individuals, drought, competition or the emergence of weeds. It is important to note early on if there are factors that impede the proper growth and establishment of the planted vegetation. The need for early detection is vital in order to combat and provide the vegetation with adequate necessities. The plan will consist of at least weekly monitoring from the first day the planting is finished up to 4-5 weeks afterwards. Each monitoring day will include providing water if vegetation needs it, removal of young weeds, and the proper space for individuals. We also recommend that the vegetation is planted in the fall prior to a rain event in order to reduce the need for watering (Milena, 2020).

Conclusion

The combination of planting plans, trail addition, fencing improvements and post-implementation monitoring will further improve conservation efforts regarding the ecological value of the off-channel pond area along Jacoby Creek. The nature preserve already serves as both a recreational space for the community, as well as a functioning ecological habitat for many species of fauna and flora; implementing the recommendations in this report will further improve the off channel pond site to support even more native species. This contributes to the JCLT's efforts of creating self-sustaining habitats throughout the Jacoby Creek Watershed while also increasing access to natural spaces for the community.

Acknowledgements

We would like to thank everyone who contributed to this project and helped make this undertaking possible. Our community partner, Stephanie Mietz, and the JCLT board members: Cheryl Dillingham, Sean Rowe, Chuck Powell, Colin Mateer, Mark Fritzke, Dustin Brooks, Ben Goulart, Donna Luckey, Emilia Berol, and Kyle Sipes all helped provide insight and direction. Additionally, Sue Moore, who runs the garden at Jacoby Creek Elementary School assisted in brainstorming ideas and outlining goals. We also want to thank the Environmental Science and Management Department Faculty at Humboldt State University, especially Alison O'Dowd, our professor, who provided advice and guidance throughout the entire project. Thank you to the Humboldt State University Forestry Stockroom, which provided necessary equipment for our data collection.

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