Restoring Two Mile Pond
Santa Fe River Watershed
Santa Fe, NM

A White Paper Prepared by the Santa Fe Canyon Preservation Association in conjunction with the Canyon Neighborhood Association

1. Introduction

This report has been prepared by the Santa Fe Canyon Preservation Association (SFCPA) in conjunction with the Canyon Neighborhood Association (CNA) (collectively, the "Canyon Partners") to identify and evaluate concepts to restore Two Mile Pond in the Santa Fe River Canyon in Santa Fe, New Mexico.[1] The intent is not to promote a particular restoration method, but to stimulate discussion of the importance of Two Mile Pond as a community and regional asset. The Canyon Partners recognize numerous stakeholders share an interest in Two Mile Pond and the watershed. Any restoration effort will require a cooperative approach among many water users and landowners.

The concepts presented herein would augment this unique waterbody's ability to support the features and functions Two Mile Pond previously offered after the main dam was breached in 1994, but before Two Mile Pond was completely drained in 2023. These include, but are not limited to:

- Enhancing the quality of riverine and wetland complexes;
- Offsetting the impact of climate change and stabilizing water supplies;
- Creating open water habitat for the benefit of native and migratory flora and fauna in Santa Fe Canyon; and
- Providing learning, eco-tourism and recreational opportunities for the entire Santa Fe community.

Overall costs depend on the scale and method of restoration, as well as the level of cooperation among the participants. Initial costs are estimated to range from negligible to approximately $800,000. Ongoing operating and maintenance costs related to periodic maintenance will be required and are yet to be determined based on further study of sediment management alternatives. All concepts assume funds would be made available through a public-private partnership, and responsibility for long term operation would be held by the City of Santa Fe Parks and Open Space Division.

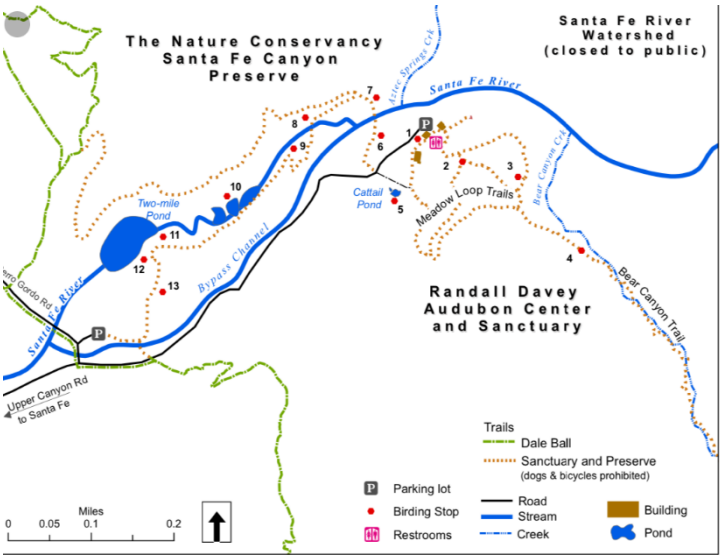
The Canyon Partners hope the following discussion and information cited will inform and engage stakeholders and the City of Santa Fe in a discussion about the value of Two Mile Pond and its potential to once again become a key piece of the Santa Fe Canyon landscape.

---

[1] SFPCA was formed to preserve and improve the natural and historic environment of the Santa Fe Canyon, its river and surrounding areas and to assist and cooperate with the City and County of Santa Fe and other governmental authorities and private associations in carrying out this mission. CNA was founded over four decades ago to preserve the eastside canyon neighborhood's historic attributes and to maintain the architectural and natural resources of the Santa Fe Canyon environs.

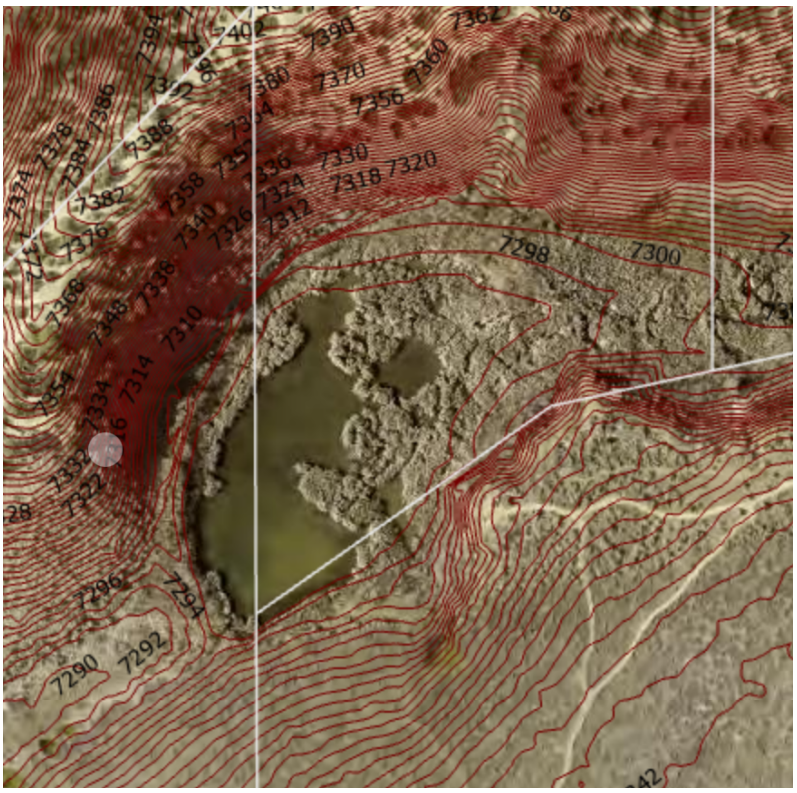
2. A Brief History of Two Mile Pond

The Santa Fe River is 46 miles long with its headwaters in the Sangre de Cristo mountain range. Historically, its flows were perennial, and are now largely classified as intermittent. The Santa Fe River watershed is approximately 285 square miles, and all the surface water within the area flows to, and is a part of, the river system. Within this watershed sits Two Mile Pond; a small body of water near the intersection of Cerro Gordo and Upper Canyon Road in Santa Fe, New Mexico.

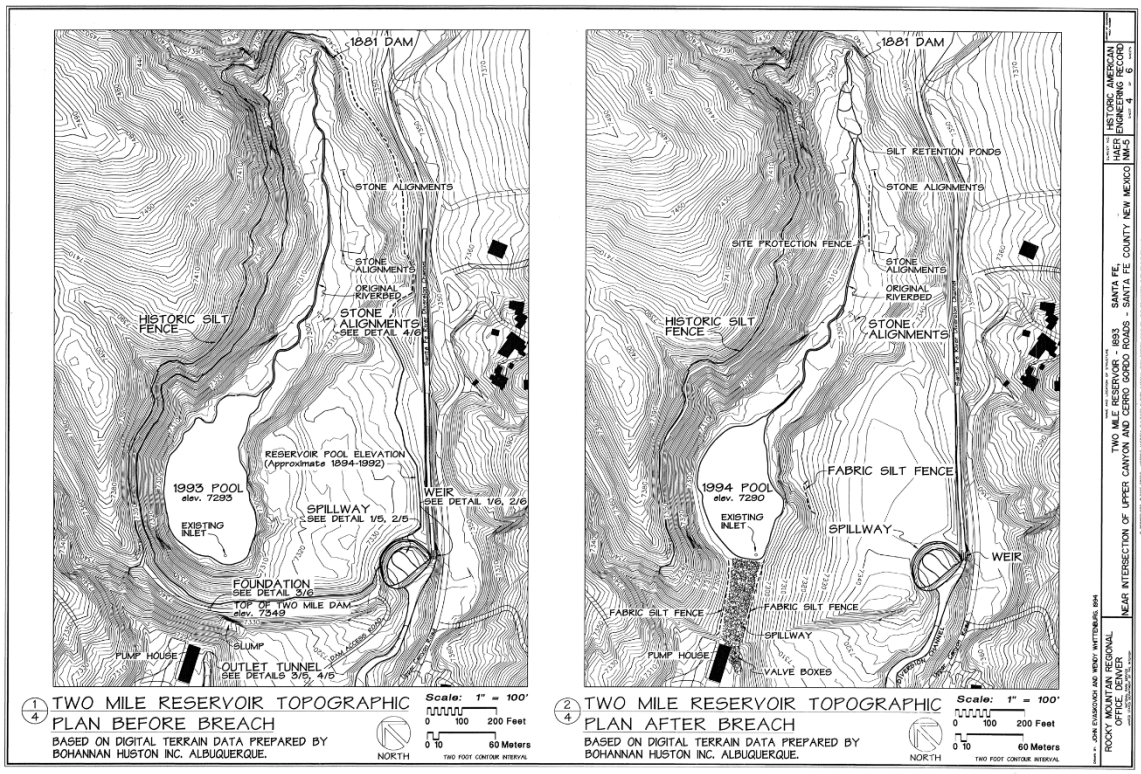


Two Mile Pond represents the remains of a larger reservoir formed by Two Mile Dam, initially constructed in 1893 to store up to 387 acre feet of water from the Santa Fe River for use downstream. Two Mile Dam was one of the largest embankment dams in New Mexico, and was the largest dam constructed at the time in the State. Used for both irrigation and potable water supply, the dam was a primary catalyst for the urbanization of Santa Fe.

According to the Santa Fe County Assessor's tax parcel information, approximately 10% of the Two Mile Pond's surface area along its southern edge is located on land owned by The Nature Conservancy ("TNC"). Approximately 60% of Two Mile Pond is on land owned by the federal government as part of the Santa Fe National Forest. The remaining roughly 30% of Two Mile Pond's surface area (including the outlet pipe and trailhead parking) is on City land.



Two Mile Dam was breached in 1994 after the discovery of a critical fault and the dam's designation as a flood hazard. At that time, most of the dam was removed, though a small pond remained and structural remnants of the dam remain in place today. Other than groundwater and seepage from the Old Stone Dam upstream of Two Mile Pond, Two Mile Pond lacks a permanent water supply.



Moreover, Santa Fe River water has periodically been directed away from the Santa Fe River's natural channel, which flows through Two Mile Pond, and into an artificial "Bypass Channel" originally constructed in 1904 to protect Two Mile Dam from flood threats. This has the effect of rerouting the River around the former reservoir and Two Mile Pond, leaving it without a permanent, reliable surface water supply. Nevertheless, a tiny version of Two Mile Pond has always persisted.

In 2012 the City of Santa Fe adopted Ordinance 2012-10 establishing the Santa Fe River target flows for the Living River Initiative. The City committed to bypass 1,000 acre feet annually of water to the Santa Fe River in normal and wet years. These flows originate above McClure Reservoir and are released to the Santa Fe River at the base of Nichols Dam. From 2012 until it was drained in 2023, Two Mile Pond was augmented by this "Living River" water thanks to a coordinated effort by TNC and others.

Specifically in 2012, TNC, which owns most of the land under the former Two Mile Reservoir location below the Old Stone Dam, installed a diversion channel (colloquially known as the "Restoration Channel"). Funds for the restoration project were granted to the Santa Fe Watershed Association by the New Mexico Environment Department. The project was managed by TNC in the Santa Fe Canyon Preserve. The project permitted some Living River Initiative water to flow back into Two Mile Pond from the Bypass Channel.

Despite receiving initial support, approval and permitting, in 2018, the Office of the State Engineer (OSE) ordered TNC to cease surface water diversions into Two Mile Pond. In 2021, the OSE ruled the diversion had been placed illegally and that consumptive water use required to offset evaporative losses from Two Mile Pond had not been provided. The diversion was removed as required by the OSE. Because the diversion was the principal source of water for Two Mile Pond, it shrank even further and became stagnant.

When the dam was breached in 1994, a slotted outlet pipe was left intact, which controlled water elevations. However, due to lack of maintenance, the pipe became obstructed, and Two Mile Pond filled in with sediment. This caused the water level in the pond to rise several feet. In 2023, the City uncovered the slotted outlet pipe and cleaned it, which caused the water level to drop by another two and a half feet over the next several days. Additional modifications caused the water level to drop about another foot.

In response to concerns about Two Mile Pond's status, the City of Santa Fe held public meetings to gather feedback regarding management of the Two Mile Pond area for habitat preservation, recreational activities, and educational opportunities. In response, hydrologic and biologic study of the area is ongoing. The purpose of the study is to inform policy decisions regarding the management of the Two Mile Pond complex in the future. This includes determining the volume of water to be directed through the area and evaluating whether Two Mile Pond will be retained. As discussed next, the Canyon Partners believe Two Mile Pond is an essential community resource that should be maintained and improved.

3. Two Mile Pond as a Community Asset

Prior to the loss of inflow, Two Mile Pond provided habitat for numerous birds, including: Warbling vireo, yellow-breasted chat, black-headed grosbeak, American robin, migrant ducks, resident American Coot, Pied- billed Grebe, swallows, White-throated Swift, Song Sparrow, Red-winged Blackbird, Great-tailed and Common Grackle, Belted Kingfisher, and Spotted Sandpiper. Wildflowers were abundant, especially in the spring. Cottonwood and willow trees dominated and provided a shady canopy. Beaver lodges, remnants of the old dam, and traces of the original route of the Santa Fe River were apparent.

These features provided substantial educational and recreational opportunities including a trail around Two Mile Pond with interpretive signs and abundant wildflowers and birdlife. The Nature Conservancy today manages 525 acres around Two Mile Pond on Upper Canyon Road. More than 30,000 visitors and 5,000 students hike the preserve annually. A recently completed ADA compliant path was recently completed to improve access for all.

Wetlands are often inviting places for popular recreational activities including hiking, fishing, bird watching, photography and hunting. More than 82 million Americans took part in these activities in 2001, spending more than $108 billion on these pursuits. Two Mile Pond remains in the hearts of Santa Fe residents and visitors alike, despite its diminished state.

4. Current Status of Two Mile Pond and the Wetland Complex[2]

[2] When discussing Two Mile Pond, we refer to the open water portion and immediate shoreline. When used herein, the Two Mile Pond Complex includes the pond and associated wetland habitats.

Two Mile Pond has lost most of its open water surface area. The area previously occupied by Two Mile Pond is rapidly transitioning to a wetland complex, and the amount of open water is minimal (less than one acre). Water that does remain in Two Mile Pond is generally stagnant and creates a potential breeding ground for undesirable insects like mosquitoes.

The riparian corridor that emerged within the channel formerly inundated by Two Mile Dam has remained relatively stable. The riparian area stretches from the base of Old Stone Dam to the outflow of Two Mile Pond. There has been significant tree growth around Old Stone Dam at the upper end of the complex since 2005. Soil moisture levels in the area vary. According to City studies, stream flow at the Two-Mile Pond Complex originates from groundwater discharge at Old Stone Dam, ranging from 0.16 to 0.40 cfs with an average of 0.24 cfs in the first quarter of 2024. This is the sole source of reliable water supplies to the Two Mile Pond Complex.

Since Santa Fe River water is no longer regularly directed through Two Mile Pond, the hydrology of Two Mile Pond is changing. When surface water flow and volume decrease, adverse consequences typically result, including:

- Altered water levels and vegetation composition along with encroachment of upland species
- Water temperature increases and enhanced stratification due to air temperature increases and longer hydraulic residence times
- Enhanced algal production and lowered dissolved oxygen concentrations
- Increased evaporation and water loss

These changes can affect the species that rely on Two Mile Pond's habitats, including birds, fish, amphibians, and aquatic plants. They also limit the value of recreational experiences by eliminating one of the most unique elements of the Santa Fe River Canyon.

The Canyon Partners are not the only ones to note the extraordinary value of Two Mile Pond and the related wetland complex. According to Santa Fe County's Wetland Action Plan Update (2023): "The most important, ongoing stressors of wetlands and riparian areas in Santa Fe County include … wetland isolation; degradation of habitat quality; and hydrological changes … ; dwindling water sources; exposure to high temperatures (leading to increased water loss from evaporation); … and encroachment by and proliferation of invasive plants." Restoration concepts such as those proposed by the Canyon Partners here can help offset these threats by allowing critical waters to "retain more snow over a longer period in the mountains; counter evaporative water losses; help spread, infiltrate, and store water in the soil; and cumulatively moderate local micro-climates and their effect on the water balance in the landscape."

The Wetland Action Plan Update specifically identifies water loss as a present threat to the Two Mile Pond Complex and recommends securing surface and groundwater

flow into the complex. The Canyon Partners believe the concepts set forth herein are consistent with all elements of the County's "Goal #3: Wetland restoration and protection projects that maintain or increase the acreage of functioning wetlands in Santa Fe County (no net loss)" as identified in the Update.

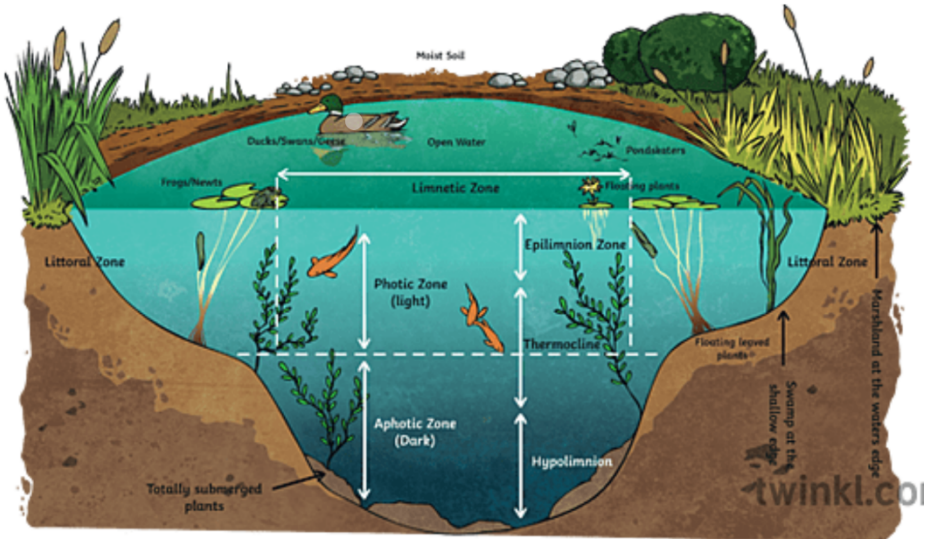
Indeed, the Wetland Action Plan Update marks the following as high priority for the Two Mile Pond Complex:

- Water security guarantee,
- beaver and bird habitat;
- protection of downstream values; and
- ecological and engineering analysis

Finally, it should be noted that the Two Mile Pond complex is particularly vulnerable in light of the Supreme Court's recent decision in *Sackett v. EPA*, 598 US 651 (2023), which eliminated federal Clean Water Act protections for wetlands that lack a continuous surface connection to a navigable waterway. Restoration of a more permanent surface connection between Two Mile Pond and the Santa Fe River could help to ensure the complex is fully protected.

5. Potential Benefits of Restoring Two Mile Pond

Small ponds hold significant wildlife habitat value, serving as crucial breeding and feeding grounds for a variety of species, particularly amphibians, insects, and birds. They provide essential water sources for drinking and bathing, attracting diverse wildlife like frogs, insects, and small mammals due to the availability of food and shelter within their shallow edges and aquatic plant life. As many as one-half of all North American bird species nest or feed in ponds and wetlands.



They also significantly reduce sediment and pollution levels by acting as natural filters, capturing pollutants like sediment, nutrients, and chemicals from runoff water as it flows through them, allowing these particles to settle to the bottom before the water exits, thus cleaning the water body downstream.

They play a crucial role in flood management by arresting peak flow events during heavy rainfall. By slowing down the release of rainwater, ponds attenuate sudden surges that can overwhelm drainage systems downstream. This controlled discharge acts as a buffer, mitigating the risks associated with intense weather events.

Small ponds can improve water supply by acting as a local reservoir, capturing rainwater runoff and providing a readily available source of water for irrigation, especially in areas with inconsistent rainfall, thereby helping to supplement existing water supplies and reduce strain on municipal systems. Ponds also improve water supplies by recharging groundwater, which keeps more water in the system for longer, providing greater quantities for use in the watershed and allowing seepage into streams later into the summer.

The values offered by a waterbody like Two Mile Pond take on even greater significance in small western watersheds where water supplies are limited, drought is a frequent occurrence, and the effects of climate change are intensifying. For example, in 2015, the U.S. Bureau of Reclamation, the City of Santa Fe, and Santa Fe County collaborated on the *Santa Fe Basin Study: Adaptations to Projected Changes in Water Supply and Demand*. That study projected a water supply shortfall in the Basin on the order of 5,155 – 9,323 acre feet on average due to a combination of population growth, climate change, and water supply shortages. Such gaps in the water supply (the difference between supply and demand) will compromise the City's ability to continue providing water service to the projected population of approximately 125,000 people by 2050. In response to these projections, the Basin Study sets forth a series of recommendations to mitigate the impact of the projected future scenarios. Among the recommendations contained in the Basin Study is to "[m]aintain flow in the Santa Fe River to induce infiltration into the aquifer for use in dry years." The concepts contained herein would do exactly that.

Finally, Two Mile Pond is a unique resource in the Santa Fe Region because it is publicly accessible. Most of the Upper Santa Fe River watershed is closed to the public. There is no other place open to public access where students and other individuals may view and study a pond and the wildlife it attracts.

6. Restoration potential and feasibility evaluation of concepts

The Canyon Partners considered two concepts to restore Two Mile Pond to its pre-2023 status. These concepts include restoring Living River water flows to Two Mile Pond (i.e. the "Water Supply" concept) and restoring open water by increasing the depth and

surface area of Two Mile Pond (the "Mechanical Restoration" concept). Even greater value is likely achieved by combining both concepts.

Despite their worldwide prevalence, only recently has there been a scientific definition of ponds, as distinguished from wetlands, lakes and other waterbodies.[3] As defined there, and as used in this section "[p]onds are small and shallow waterbodies with a maximum surface area of 5 ha, a maximum depth of 5 m, and < 30% coverage of emergent vegetation. Ponds will have light penetration to the sediments if water clarity permits and can be permanent or temporary and natural or human-made." The concepts below are intended to ensure Two Mile Pond meets this definition.

a. Concept 1: Restored Water Supply

In 2012 the City of Santa Fe announced it would dedicate as much as 1,000 acre-feet per year to the Living River Initiative to support the Santa Fe River's riparian corridor. The Living River supports a healthy plant community and wildlife habitat, recharges the City Wells, and adds the beauty of free-flowing water to the parklands along the Santa Fe River. The City recently (summer 2024) stated its willingness to once again direct Living Rivers water through Two Mile Pond if related issues are addressed to the City's satisfaction.

The Restored Water Supply Concept involves permanently restoring the flow of Living River water to Two Mile Pond and closing the outlet at the base of Two Mile Pond to hold water at post 1994 and pre-2023 levels. This would provide a consistent flow of surface water into Two Mile Pond and maintain water elevations similar to that observed prior to the City's decision to clean out the outlet at the base of Two Mile Pond. Some or all of the City's Living River water could be redirected to flow through Two Mile Pond, rather than through the Bypass Channel. This would have the added benefit of restoring the natural channel of the Santa Fe River, which is presently constrained to an artificial waterway originally intended only to carry periodic floodwaters around Two Mile Dam.

This concept would require, among other things:

- Resolving OSE's concerns and mitigating any adverse impacts on downstream water users, including the local acequias (Cerro Gordo and Madre among others).
- Obtaining the City's agreement to:
    - Redirect Living Rivers water to Two Mile Pond; and
    - To the extent storage in Two Mile Pond is not grandfathered, move a portion of its storage rights back to Two Mile Pond from Nicholls and/or McClure reservoir.

[3] Richardson, et al., Nature, Scientific Reports, *A functional definition to distinguish ponds from lakes and wetlands* (2022)

- Obtaining The Nature Conservancy's agreement to manage flow through Two Mile Pond.
- Ensuring the surface level of Two Mile Pond is not raised to such a degree that its maintenance endangers property downstream.

If the City were agreeable, initial costs could be minimal, as the water diversion works are already in place. And, while some have expressed concern that increasing Two Mile Pond's surface area would increase losses due to evaporation and transmission by up to 8 acre-feet annually, this equates to an instantaneous flow rate of just 0.011 cfs. The mean annual flow rate of the River near Santa Fe from 2001 – 2007, in comparison, was 5.7 cfs. The impact is negligible in context. Further, the downstream Acequias Cerro Gordo and Madre previously expressed concern over diversion into Two Mile Pond, however, with the completion of work at Nichols Dam, Acequia water and Living River waters will be separately measured. This should resolve any conflict about which water is being diverted for use as contemplated here.

b. Concept 2: Mechanical Restoration

If no additional water supplies can be directed to Two Mile Pond, then inflows will remain limited. Further, if the City is unwilling to close the outlet works at the base of Two Mile Pond, water levels will not increase. Under such circumstances, open water elements could only be restored through mechanical means such as dredging, which could deepen and expand Two Mile Pond.

Dredging is the process of removing accumulated sediment, muck, and debris from the bottom of a waterbody to maintain its depth and water quality. Dredging involves several steps, starting with mobilizing the dredge to the worksite, extraction of the sediment, and disposal. Factors like sediment type, water depth, and project scale influence the choice of dredging techniques and equipment. Dredging can play a crucial role in environmental conservation and restoration, particularly for habitat restoration. By removing excess debris, dredging helps restore desirable habitats and ecosystems.

This concept would require, among other things:

- Obtaining the landowners' agreement to allow dredging of Two Mile Pond.
- Locating a suitable, nearby location to deposit dredge waste.

- Obtaining any required authorization from the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act.
- Resolving potential OSE concerns about increased storage capacity and evaporation losses from additional open water.
- Obtaining the City's commitment to direct the Parks and Open Space Division to maintain Two Mile Pond over time.

Exhibit A attached depicts a possible restoration concept. Based on review of historical satellite imagery, it appears that from 1994 until 2023, Two Mile Pond rarely exceeded two acres of open water surface area. This concept involves restoring the full two acres of open water habitat (blue line), by excavating to a depth of 8-12 feet, using at least a 1:5 slope to discourage rodent burrowing and avoid emergent vegetation from re-establishing in the open water portion. Additional upstream channel sinuosity (green line) would be created as part of the process.

Initial costs of dredging, assuming disposal is made within a reasonable distance, are presently on the order of $20 - 25 per cubic yard of material. Using this general figure, one can estimate costs depending on the size and depth of the desired excavation. For example, dredging a 2-acre area 10 ft deep would generate approximately 32,000 cubic yards of material. Given the assumed cost per cubic yard, this results in a cost of roughly $800,000. However, the actual cost likely would be less based on the slope used in the excavation.

Once dredged, Two-Mile Pond will need to be maintained. One of the most critical elements affecting how frequently maintenance dredging is required is the rate at which sediments return and fill in the excavated area. Factors like river flow, runoff from surrounding land, and watershed forestry management, can affect the rate of sediment buildup. The frequency of dredging and the desired condition will affect the cost of maintenance dredging.

One option to reduce the frequency of dredging and to preserve the integrity of Two-Mile Pond would be to install a sedimentation basin upstream of the pond. Such facilities are used to arrest the process of sedimentation downstream by slowing sediment laden water, allowing the sediment to drop out of suspension before water continues downstream. This would reduce the overall volume of sediment entering Two Mile Pond each year. These maintenance issues and related costs are subject to further study.

c. Combined Solution

Likely the most beneficial alternative is to restore reliable water supplies *and* to engage in limited mechanical restoration. This would involve combining the concepts above to quickly expand Two Mile Pond's open water surface area to two acres via dredging and to dedicate a water supply that would sustain the Two-Mile Pond Complex over the long term. The success of Mechanical Restoration alone relies on the

maintenance of existing groundwater levels and continued seepage from the Old Stone Dam. The addition of Living River water secure water supplies for Two Mile Pond and would maximize the value of any restoration effort. This should be a project in the Parks and not the Water Department, and legal issues should be handled by outside counsel.