Wetland & Riparian Habitat

Restoration, Mitigation, and Monitoring Plan

Canyon Rock Quarry, Sonoma County

Sonoma County APNs (portions of) 083-210-020, -019, -018, -017, -001

Prepared for: Carlile-Macy & Benchmark Resources
Prepared by: Charles A. Patterson, Plant Ecologist
February 28, 2025

1.0 Background and Objectives

This Wetland and Riparian Habitat Restoration, Mitigation, and Monitoring Plan ("Plan") has been prepared to address impacts to potential wetland and riparian habitat resources at the Canyon Rock Quarry, specifically in an unnamed intermittent drainage on the western boundary of a large overall quarry (the "Site", see Figure 1). The quarry is an active quarry that is expanding over time as per use permit allowances). Quarrying and grading activities have, over the past decade or so expanded into the affected area (Figure 2), which has had the effect of eliminating approximately 0.11 acre of potential man-made "wetland", and roughly 0.19 acre of "riparian" habitat. The presence of these habitats was first described in the draft Environmental Impact Report for the Quarry's current use permit. The quarry use permit required the operator to avoid disturbance of these habitats, but the Quarry's mine and reclamation plan allowed for grading in the area of the potential wetland and riparian habitats. This discrepancy between the use permit and the mine and reclamation plan was only identified after the disturbance of the riparian and wetland habitats had already occurred. The Quarry operator is working cooperatively with the resource agencies and Sonoma County to address this issue.

Based on the various recent agency reviews, discussions, and associated conditions and directives, Canyon Rock Company, Inc. must propose some form(s) of onsite habitat restoration if feasible. Since the area impacted (the natural drainage feature) is literally (physically) gone, and the current ground surface is significantly below the prior grade, and deep into rock and subsoil, the option of restoring the small drainage and incorporating wetlands and riparian conditions in their original form and location is not possible. Therefore, this Plan identifies selected (potential) options for creating wetland and riparian habitats at the Site, and discusses the opportunities and constraints for such onsite efforts based on current conditions and the approach to restoration grading. In addition, given some of the Site's obvious constraints (it is, after all, adjacent to an active operating quarrying operation and partly within an area proposed for development under the Quarry's current use permit application for an asphalt facility), some discussion is also provided here regarding mitigation that might be pursued that would provide for the restoration and long term protection of wetland and riparian habitats in offsite areas.

Figure 1. Regional Location

Canyon Rock Quarry, Forestville

NORTH ⇧	**Source/Prepared by:** C. Patterson; February, 2025	**Applicant:** Carlile-Macy & Benchmark	**Sonoma County APNs** (portions of) 083-210-020, -019, -018, -017, -001
	Basemap: Google Earth Air Photo **No Scale**		

Onsite Wetland & Riparian Habitat Restoration Plan

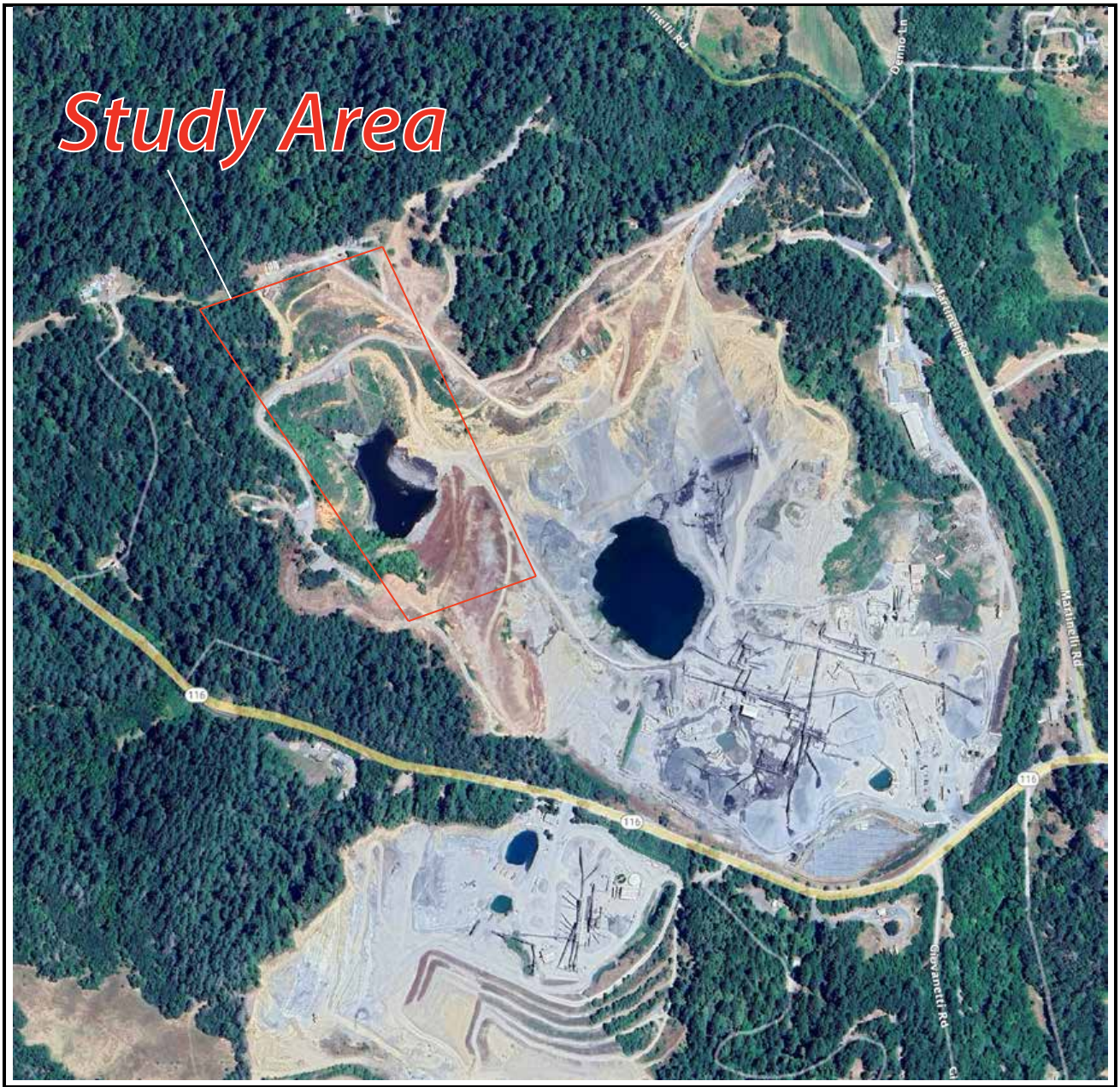

Figure 2. Local Setting

Canyon Rock Quarry, Forestville

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2.0 Impacts To Be Addressed

The affected area (and much of the surrounding landscape) is characterized by moderately steep low ridges and intervening drainage ravines, blanketed by relatively dense mixed evergreen forest vegetation. Most nearby drainages are in the headwaters of Green Valley Creek, and are strictly seasonal or intermittent, and most are heavily wooded with minimal (if any) true riparian growth (e.g., willows, cottonwoods, maples, etc.).

A Forensic Biological Assessment prepared by WRA, Inc. (WRA) provides a forensic analysis of land cover types (including aquatic resources) present in 2005 within the Site. Based on that assessment, the area contained approximately 0.11 acre (4800 square feet) of potential wetland habitat and 0.19 acre (8500 sq. ft.) of riparian habitat (originally nestled within overall forest). The wetland was a small man-made pond (that presumably supported a small community of wetland vegetation) with an earth berm and buried culvert. The riparian habitat was a narrow strip along the bottom of the drainage, composed of willows and blackberry mixed with oaks (buckeye? maple?) and bay trees. An additional 0.09 acre of summer dry ephemeral (or intermittent) channel ("other waters") was also eliminated, but which supported no wetlands or true riparian vegetation, merely upland forest.

Timber harvesting, grading, fill, and excavation activities in the affected area involved complete removal of the existing vegetation (mostly forest) and then downward stripping of layers of the mountain. The small ravine on the northwest corner area was cleared and lowered, leaving a bare excavated basin, with exposed quarry surfaces downslope to the southeast and surrounding forest offsite to the north and west. The old drainage thalweg is completely gone, and the area which contained the wetland and riparian habitats cannot physically be replicated in the same place as it originally occurred. Above (upslope to the west of) the current active quarry edge is typical forest cover.

3.0 Restoration Goals, Approach, and Specific Tasks

3.1 Objectives

The primary goal of this Plan is to identify and provide details for a program of onsite wetland and riparian habitat restoration, and/or complementary mitigation measures that would adequately compensate for the lost wetland and riparian habitats described above. A total area of approximately 0.6 acre is proposed for restoration treatments (see below) to compensate for the 0.39 acre total impact described by WRA.

3.2 Approach

Since the original landscape that contained the impacted habitats is no longer available to 'restore', this Plan has evaluated several potential alternative opportunities to provide such mitigation. Also, while the agency emphasis has been on completing onsite restoration measures, future expansion of the quarry (as planned, generally allowed, and expected) has been taken into consideration (e.g., it would be less than ideal to attempt growing a riparian woodland in an area that very well could be quarried in a few years). Because of the various unique constraints, uncertainties, and limited onsite opportunities here, a phased approach is proposed. This would involve some restorative/mitigating measures to be implemented onsite 'immediately' (characterized by rapid growing, mostly herbaceous vegetation), which would provide an initial resource base relatively quickly (aquatic habitat, wetland/riparian vegetation), to be followed

(potentially) by other complementary (including possible offsite) measures, depending on the degree of success with this Plan's onsite effort, as well as future quarrying.

3.2.1 Onsite Restoration Options

Given the aforementioned impacts and inherent constraints of the Site, the following alternatives for onsite restorative and/or mitigating measures regarding the lost wetland and riparian habitats have been identified, and are discussed briefly below:

1) Construct a similar ephemeral drainage in a new location nearby, roughly replicating the original drainage's attributes.

2) Construct/create similar (wetland and riparian) conditions along the lower section of the new/replacement drainage feature to be built reconnecting this upper watershed area back to a ditch along Highway 116.

3) Construct/create similar (wetland and riparian) conditions along the undisturbed uppermost section of this drainage (above the quarrying in the extreme northwest corner).

4) Create a large (use the whole or major portion of the current pond) seasonal marsh, by backfilling the pond to a level roughly three feet below the eventual spill elevation.

5) Eliminate (backfill) the pond altogether and create/duplicate the small wetland and riparian habitats along a new watercourse to be constructed at the bottom of local terrain, and feeding (as pre-disturbance) away from the quarry and toward Highway 116. This would be attempting to create a completely new similar watercourse (see '1' above), in an alignment as close to the pre-disturbance as allowed by the new landscape.

6) Backfill the upper portion of the pond area, creating two stair-stepped level benches, capturing the incoming runoff from both the main drainage to the pond, plus the small 'valley' cut off by the current large berm, and stalling this water in the two shallow basins created by the bench/lip grading.

3.2.2 Discussion of Restoration Options and Selection of Preferred Effort

Restoring any type of wetland or riparian habitat requires a certain minimum of water, especially outside the typical winter/spring rainy season. Insufficient water (at some depth in the soil/rock substrate), and even the most hardy of native California wetland and riparian species would perish the first summer. Magnifying this issue is the fact that the current ground surface to be used for such restoration is no longer surface (or even sub-) soil, but essentially fractured rock, exacerbating the critical water issue by providing a very coarse, porous substrate in and upon which to try to grow wetland vegetation. Further, while there is a small watershed (roughly 40± acres) that feeds the affected area, runoff is strictly seasonal and rainfall dependent (no significant nearby seep or spring contributions), and in many years, this drainage would be surface dry from May through October (and generally unable to support significant riparian vegetation).

The pre-existing small wetland (0.11 acre) that was eliminated was, in fact, a man-made pond (roughly 60-70 feet in diameter) with a dirt berm, farm road, and culvert pipe, a feature constructed to hold back

water, and not a naturally occurring type of habitat in such a seasonally dry, densely forested headwater drainage. The small area of 'riparian' habitat/vegetation (0.19 acre) was merely a narrow strip of common willows and blackberries along the rocky, forested drainage.

Option 1 above is not realistic, as there are no suitable physical areas where such an endeavor would seem likely to succeed. Such an effort could not physically be completed on the vast majority of the ground in the reclamation area, due to steep slopes and porous soils/rock. The only remotely feasibly version would be **Option 5**, wherein the entire existing pond would get backfilled, and a new watercourse along a new low drainage route would be constructed through the pond's current footprint. Unfortunately, the likelihood of success for any new drainage channel constructed in backfilled coarse earth and rock to support riparian vegetation would seem quite low. Even if summer irrigation was provided in the early year(s), long term survival of phreatophytes in hard-packed subsoil and rock, with extremely (critically) limited natural water over the longer term, would almost certainly be doomed. Because of the physical impracticality of trying to create a new similar drainage course, with attendant habitats, these options (1 and 5) are rejected here, and dismissed from further discussion at this point.

Option 2 would be to attempt revegetation (wetland and riparian) along the lower section of the affected drainage (below the existing pond), in an effort to reconnect this back westward (where its original flow took it) toward Highway 116. Unfortunately, this route for channel reconstruction goes through extensive exposed rock, and has a generally southern exposure, both factors indicating that this route is probably not suitable (not wet enough, long enough into/through summer) to support the types of habitats lost. This new channel will convey significant runoff from the pond area, but will also likely drain very rapidly and very completely once the seasonal rains stop. Again, attempting to grow water-thirsty vegetation on a south facing, exposed rock substrate, without other water sources (seeps/springs, shallow aquifer) seems destined to fail. This option is likewise dismissed on the basis of physical impracticality.

Option 3 would be to attempt to establish the wetland and riparian habitats in the very upper headwater ravine above the current pond. This includes 7-800 feet of headwater channel draining the 20 or so acres upslope. Since this is an existing drainageway (with seasonal flows), it might be possible to clear open some of the dense forest, and establish small pockets of willows and other wetland species. However, at this uppermost position in the watershed, this short section of channel has even less incoming runoff than below, has a steeper gradient (and hence less prone to pool formation), and goes dry sooner in late spring. In a dry year, it is doubtful that willows and such could survive this far up the drainage. Given its marginal wetness, plus the need to clear forest for some sunshine, this option is dismissed as impractical (and is also likely to fail anyway).

Option 4 would be to backfill virtually all of the existing pond, leaving a relatively level surface just slightly (one to two feet) below the basin's spill elevation. This area would flood annually, and could conceivably support as much as a full acre of seasonal marsh or wetland. However, as with the channel efforts, trying to get water to pond (and not percolate into the mountain) over a long distance or wide expanse is extremely challenging, if not impossible. While pursuing this option, and using/dedicating the entire pond, might result in nice seasonal wetland habitat, it seems much more likely that it wouldn't, and sacrificing the entire pond area (up to one acre) for a high-risk effort seems unnecessary and a waste of resources. As described above, a backfilled, graded bed of coarse earth and rock is not likely to stay wet enough for true wetland vegetation.

Option 5 is discussed with '1' above, and is dismissed as being physically impractical. Trying to create a new channel with riparian vegetation on top of rushed rock and coarse earth fill, without a reliable, semi-

perennial source of water would be likely to fail, especially over the long term when additional drought years are certain to occur.

Option 6 would be to backfill the uppermost portion (about 0.6 total) of the pond footprint, creating two level benches (see Figure 3) that stair-step slightly downward into the pond basin, and which capture the incoming runoff from the main drainage, plus the smaller one that will be reconnected to the pond (by removing the tall berm). These benches would be graded relatively flat, with a low (one foot) lip or berm to retain ponding on each bench, and would receive a thin (3 to 8 inches) layer of local clay compacted into each bench to help seal the soil. These benches would be placed at three and five feet below the ultimate pond spill elevation, and would be planted with a variety of native wetland and riparian plants. Since they would be placed where incoming runoff naturally flow, the two constructed benches would be essentially guaranteed at least a relatively reliable water source. With clay lining and low containment berms, the bench areas would almost certainly become and stay ponded each winter, and with average rainfall, the overall pond filling to capacity would ensure full inundation. Natural ponding that currently occurs until sometime in May or June in the main pond should help facilitate the benches getting a good winter and spring soaking. The benches should then remain wet or damp well into, if not through summer, with most species to be planted being tolerant of at least some drying in the late summer and fall.

3.3 Plan Components

The following are tasks to be completed in implementing the chosen option ('6' above):

Task 1) Remove large berm and reconnect the small drainage area in the northeast corner of the Site to the existing pond footprint (consistent with restoration grading approach in the 60% design plans).

Task 2) Backfill roughly 0.6 acre of pond footprint at the upper confluence of the two feeder drainages (see Figure 3).

Task 3) Grade the backfilled area into two broad, nearly level benches (the upper 60-80 feet wide, the lower about 50), including a low (1-2 foot) lip around the 'downstream' edges. These benches should be over-excavated by about one foot to allow for layering of clay (3-8 inches) and a surface layer of soil (5-10 inches) to achieve the desired final surface elevation.

Task 4) Spread a layer of locally derived clay (from the rock crushing operations) over the two benches, and compact. Three inches of clay over the roughly 0.5 acre would require approximately 200 cubic yards. More would be recommended if available.

Task 5) Spread additional local 'topsoil' (5-10 inches) over the clay layer and compact again. While good natural topsoil may not be available, whatever local fine material is available should be used to cover the clay.

Task 6) Plant an arrangement of wetland and riparian plants across the two benches, using cattails, bulrushes, and potentially other deep water aquatics (*Potamogeton, Nuphar, Alisma, Sparganium*) over the main bench areas (and especially the lower one), and planting willows, mule fat (*Baccharis salicifolia*), tall rush (*Juncus effusus*), marsh sedges (*Carex* spp.), and potentially other riparian shrubs (e.g., native blackberry) along the edges, peripheral 'lips', and in the uppermost corners of the incoming feeder channels (to be planted at the spill elevation). Prior to implementation (or even potentially 'final' approval), a detailed planting layout and species palette should be prepared to guide the effort. A detailed grading plan is in preparation and will be (modified if warranted, and) used to portray this restoration

effort. Availability will determine what species would be planted, but generally these would be common, regionally indigenous (and successional 'pioneer') natives. Common willows, rushes, and native blackberry should be available commercially (or could be propagated from local sources easily enough), but many other native wetland species are not easily procured without private collecting. The initial planting palette would emphasize natural pioneer species that thrive in open sun and bare mineral soil. If approved, this restoration effort would proceed with identifying precisely what species (sizes and sources) would be planted, and in what pattern.

The impacted habitats totaled approximately 0.3 acre, which included only about 0.2 acre (8600 square feet, or an area about 90 feet by 90 feet) of 'wetland' (some of which was likely open water), and about 0.1 acre (4300 sq. ft. or an area 65 by 65). It is estimated that by planting bulrushes, cattails, and/or other clump forming aquatics on ten-foot centers, an area of approximately 0.2 acre (2:1 for the impacted 0.1) would require some 90-100 individual plugs/pots/specimens. Spread between two species of native cattails, several bulrushes, and a number of marsh sedges and rushes, a planting plan using 15 to 20 'starts' of the various (4-6) selected species would be planted, largely on the lower bench, but also on the upper. For riparian replacement, 0.1 acre (impact) equates to roughly 57 willow bushes at a mature diameter of 10 feet each. For purposes here (since plantings would be small starts), 100 selected willows (any of several species) and associated semi-riparian shrubs would be planted in the slightly higher areas of and around the upper bench. Some of these may be planted along the new shoreline to be created for the small 'valley' that will be reconnected to the pond. A small depressional area right near the pond spillway may also be suitable for some willow planting, and will be given some such plantings the first year to see if this area is wet enough and could contribute to some new riparian habitat. All plantings should be done in (mid-late) fall, just before the first significant rains.

Task 7) Cover the ground between plantings with a topdressing of wood chips and/or straw to aid is moisture retention and the addition of organic material.

Task 8) Monitor site conditions (at least monthly when wet) through the first winter and spring to ascertain the effectiveness of the treatments, and document the survival (and condition) of the planted materials. Assess the year's results against the stipulated success criteria, and recommend remediations, supplemental planting, and/or other measures as needed and appropriate. Assuming great enough success to continue, annual monitoring should be conducted for the first five years, and/or until the specified performance criteria have been met.

Task 9) Evaluate the first year's results, and (depending on the degree of success) propose/complete any modifications that might improve the results, such as planting additional material for species that did well, or change the placement of certain species (to deeper or shallower), or possibly conduct some physical modifications like creating island/mounds, raising or lowering a surface slightly, re-compacting certain areas, etc.

Task 10) Prepare and submit an annual report by the end of September each of the five initial performance monitoring years, including basic results, vegetation assessments, problems encountered, remediation completed, and recommended additional measures/plantings.

Task 11) Prepare and submit a 'preliminary wetland delineation' upon attainment of the performance criteria, demonstrating the actual extent of "wetlands" conditions that were successfully created.

Task 12) After attainment of the performance criteria (i.e., after the initial 5 year period), longer term monitoring should be continued, although at a reduced level of detail (e.g., annual hydrological baseline: pond filled or not, vegetation surviving or not and where, compile reference photos). Annual inspections by quarry staff should be made to determine and document that the pond fills or doesn't each year, and what the general results are for the revegetation plantings, with the results (field notes, photos) to be maintained in a binder/log book at the quarry for potential future documentation. Significant problems that might arise would be reported to the appropriate agencies.

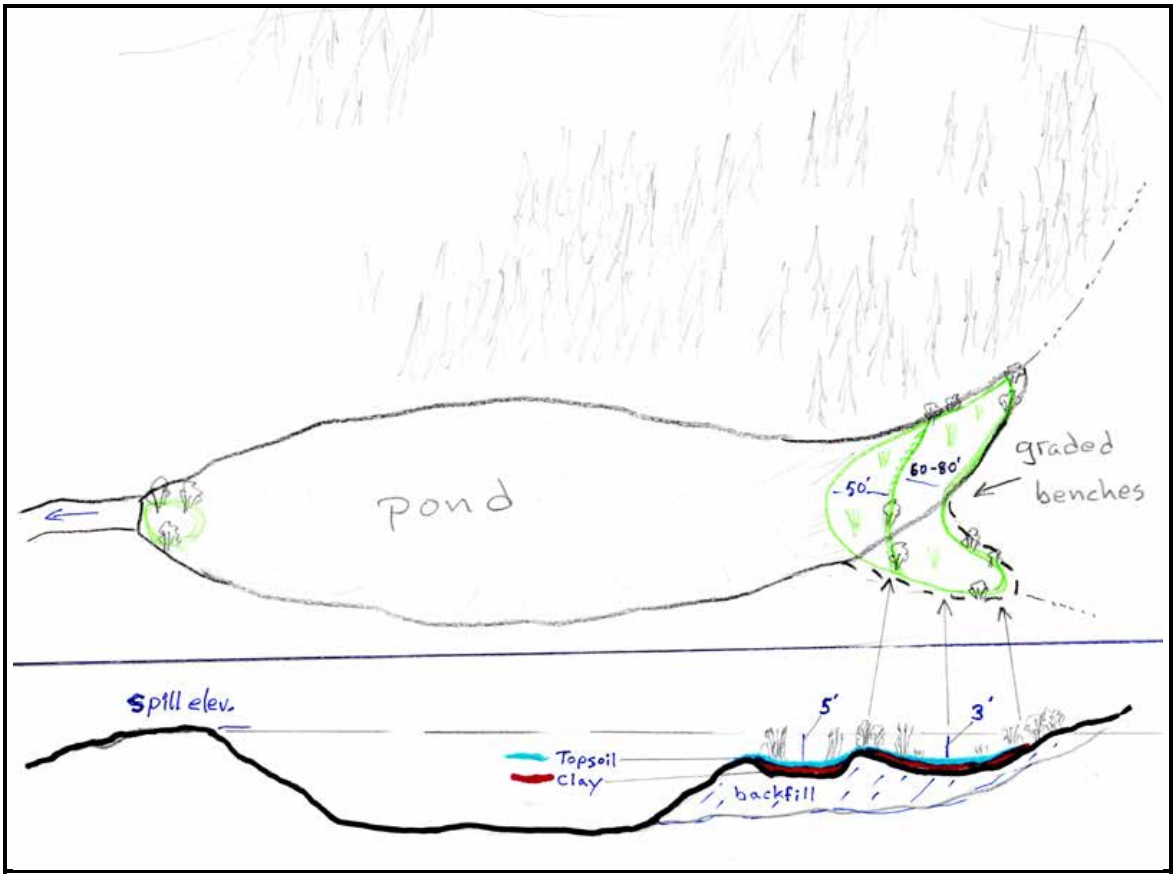

Figure 3. Conceptual Restoration Site Detail

Canyon Rock Quarry, Forestville

NORTH ⇧	**Source/Prepared by:** C. Patterson; February, 2025	**Applicant:** Carlile-Macy & Benchmark	**Sonoma County APNs** (portions of) **083-210-020, -019, -018, -017, -001**
	Basemap: Google Earth Air Photo **No Scale**		

Onsite Wetland & Riparian Habitat Restoration Plan

3.4 Performance Monitoring and Success Criteria

Because the situation in which trying to create new wetland and/or riparian habitat on an open quarried mountainside has a relatively high degree of uncertainty (primarily related to how well runoff can be captured locally and retained into and/or through the summer), the first couple of years will be essentially a test of whether or not this approach will work in this situation. With close to 'normal' rainfall, the pond area, and the constructed benches, should fill and become fully inundated in winter, and the main question is then, for how long into the hot summer months will the ground stay wet, thus dictating the survival of planted materials. The stair-step benching will provide two levels of ponding, and hence, should offer a range of ponding/drawdown conditions for the vegetation to respond to, favorably or not. Because of this uncertainty, it seems folly to try to target certain intermediate success criteria (e.g., Year 1: 20% cover, Year 2: 40%...), and it is only the ultimate target that is specified here, that being the replacement/creation of at least equal acreage of similar wetland and riparian habitats as were impacted. Thus, while approximately one-half acre would be devoted to this effort, the primary success criteria are that:

1) At the end of the initial five year performance monitoring period, 0.2 acre (or more) of (at least seasonal) "wetland" habitat has been successfully created and sustained without any significant remediation in the last three years. Such 'wetland' shall qualify as such according to the standard Corps (1987, 3 parameter) wetland delineation guidelines. This includes compensation for the 0.11 acre of wetland and the 0.09 acre of creekbed.

2) At the end of the performance period, the extent of actual live vegetation in the wetland restoration area needs to be a minimum of 60 percent of the 0.2 acre target, or 0.12 acre of actual live standing tissue (clumps of cattails, bulrushes, etc. aggregated). Because the impacted area was a small pond, with less than 100 percent vegetation cover, the replacement effort here would allow for up to 40 percent of the targeted (treated) 0.2+ acre to be 'open water' (or mud, or herbs, etc.).

3) At the end of the performance period (minimum 5 years, 3 without remediation), the planted riparian shrub cover shall include a minimum of 0.2 acre (compensating for the impacted 0.19 acre) of live shrub cover.

3.5 Additional Mitigation/Compensation

While it is hoped that the effort outlined herein would be reasonably successful, additional mitigation opportunities have been sought in the region, whereby (should the onsite efforts not be fully successful, and/or future quarry expansion proposes to move back into this area), offsite restoration efforts might be warranted (with a higher likelihood of long term success) or even preferred (adding to other existing conservation efforts). Toward this end, there is a small (roughly one acre) triangular piece of land that fronts on Green Valley Creek and which is owned by Canyon Rock. With some restorative clean-up (i.e., remove ivy, Himalaya blackberry, and other exotics, plant more woody natives) and a protective conservation easement, this property could add significant resource value to the quarry's package of long term reclamation and restoration plans.

APPENDIX A

Selected photos of the proposed wetland/riparian restoration area

at the

Canyon Rock Quarry

Forestville, Sonoma County

Plate 1. Looking south across reclamation area, showing existing pond and berm. After removal of the berm and reconnection of the small watershed area (to the left), two level benches would be graded roughly as shown above, at approximately three and five feet below the pond's spill elevation. Canyon Rock Quarry, Forestville; February, 2025.

Plate 2. Looking NNW up the small drainage/watershed area that feeds the existing pond from the northwest (a portion of the area discussed under 'Option 3').

Plate 3. Northwestern arm/inlet for the existing pond; white line shows rough placement of bench to be graded.

Plate 4. Looking SW at area below pond; white line approximates the route for re-channeling the overflow from the pond back toward Highway 116. This area is not especially suitable for attempting wetland or riparian restoration ('Option 2').