



SALMON PROTECTION AND WATERSHED NETWORK

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Roy's Pools Modification Repair Project

Background- A degraded dam located on San Geronimo Creek in Marin County was creating an obstacle to migrating salmon attempting to reach their spawning habitat upstream. Even though there is an adjacent fish ladder that has been in place for decades, the dam's apron had become degraded causing fish to attempt to jump over the dam in vain. Repair of the site began in 1996 and was completed in 1999 through the collaborative effort of several agencies, organizations and community members. The site now consists of a series of three jump pools with the existing adjacent fish ladder. Adult salmon and steelhead can be seen jumping through the pools each winter.

Downstream Juvenile Migration Problem Created: However, while an upstream migration impediment for salmonids was repaired, a downstream migration problem was created. Each spring, flow decreases to the point where all flow ends up cascading through the fish ladder and none through the pools. Also, the pools leak, particularly the lowest pool, trapping juvenile salmonids all spring/summer until rains begin the following wet season. This fish, including smolts, are thus trapped in pools with decreased depth and food supply, increased temperatures and excessive algae growth.



Excess sunlight exposure, due to a lack of shade cover causes increased water temperatures as well as algae and duckweed infestations which result in higher than normal mortality of juvenile salmonids.

Specifically, the following problems have existed at the site since 1999:

- Water flow ceases to cascade through the pools in spring resulting in
 - > all pools trapping juvenile salmonids - approximately 300-600 salmonids become trapped each season.
 - > lack of upstream food source delivery
 - > prevention of migrating smolt that would otherwise continue ocean bound migration

- All pools leak to varying degrees with the bottom pool level greatly diminished. (SPAWN crews have relocated over 200 salmonids from the lowest pool over the last 4 years.)

- Excess sunlight exposure of pools has led to:
 - > Water temperatures on the surface of pools exceeding sub-lethal limits for salmonids.
 - > Large quantities of filamentous algae and duckweed blooms inundating nearly all space in pools, reducing salmonid's ability to feed at surface. Decay of this material also results in anoxic conditions which can become lethal to salmonids and other species. (Each summer SPAWN crews remove 100-200 pounds of algae from the pools before the algae decays to prevent such conditions.)
 - > Exotic bullfrogs from nearby ponds take up residence in pools each summer likely a result of warm, slow or no flow water conditions.



Reuven Walder

This coho salmon was one of the first to jump through the newly restored Roy's Pools in 1999.

Alternative Solutions: A meeting was convened of key agency and organizations on 6/25/02 to discuss recommendations for repair. Repair options from this meeting and subsequent discussions and analyses are listed below.

- 1). Re-vegetate the south end of the site in effort to keep pool temperatures cool and to inhibit growth of algae*.
(* SPAWN has secured funding to re-vegetate the south side and will be completed in Winter 2003/04.)
- 2). Allow safe and easy passage of salmonids through pools and prevent or significantly minimize their stranding in summer

Safe passage possibilities include:

A) Install Openings in all 3 pools and Install Partial Diversion: Create an ~4 inch opening for juvenile salmonid passage located on the steel girders of all 3 pools below the existing summer water levels AND construct a movable (slot type) partial weir that would be installed each spring on the fish ladder allowing flow to continue through the fish ladder while diverting a portion of water through the pools.

Advantages: This alternative is low cost and relatively easy to implement and it will lower the water level in the pools and potentially reduce leakage; allow flow to pass through the pools and allow salmonids - particularly smolt, to pass through without becoming trapped. This alternative will mimic natural seasonal creek flow conditions as much as possible. It also provides flow through the fish ladder to support the salmonids that commonly inhabit this structure.

Disadvantages: This configuration requires yearly maintenance to potentially remove sediment from the openings and to install and remove the partial weir each year.

B) Seal Bottom Pool, Install Openings in Upper Two and Install Partial Diversion: Attempt to repair leaks in bottom pool only with gunnite and create a V-notch on the spillway and then construct an ~4 inch opening for juvenile salmonid passage midway down steel girders on the upper and middle pools to lower water levels, provide easy flow connectivity and reduce leakage AND construct a movable (slot type) partial weir that would be installed each spring on the fish ladder allowing flow to continue through the fish ladder while diverting a portion of water through the pools.

Advantages: This will lower the water level in the upper 2 pools and potentially reduce leakage; allow flow to pass through the pools and allow salmonids - particularly smolt, to pass through without becoming trapped in the pools while also allowing some to pass through the ladder to support salmonids that inhabit this structure.

Disadvantages: There is no guarantee that the sealant will successfully make the pools watertight and it may be quite costly to implement. This configuration also requires yearly maintenance to potentially remove sediment from the openings of the upper 2 pools and to install and remove the partial weir each year. Summer low flow may not be sufficient enough to maintain water levels high enough to allow continuous overflow from the bottom pool, and thus the out-migrant problem would not be solved.

C) Seal all 3 Pools and Install Partial Diversion: Repair leaks in all pools with gunnite, create a V-notch on spillways AND construct a movable (slot type) partial weir that would be installed each spring on the fish ladder allowing flow to continue through the fish ladder while diverting a portion of water through the pools.

Advantages: This will allow flow to cascade over the spillways of all 3 pools and potentially allow salmonids - particularly smolt, to pass through without becoming trapped in the pools.

Disadvantages: The implementation of this project is likely quite costly and there is no guarantee that the sealant will successfully make the pools watertight. Yearly maintenance to install and remove the partial weir is required. Summer low flow may not be sufficient enough to maintain water levels high enough to allow continuous overflow from the bottom pool, and thus the out-migrant problem would not be solved.

D) Install Salmon Screen Diversion and Install Partial Weir: Install partial weir that would be installed each spring on the fish ladder allowing flow to continue through the fish ladder while diverting a portion of water through the pools plus install a mesh screen to divert downstream migrants through the fish ladder.

Advantages: This alternative is quite inexpensive. It will potentially divert the majority of salmonids through the adjacent fish ladder and reduce the number of salmonids that would become trapped in the pools.

Disadvantages: Salmonids will still potentially become trapped in the pools prior to the installation of the salmon screen and will not be able to move downstream. Summer low flow may not be sufficient enough to maintain water levels high enough to allow continuous overflow from the bottom pool, and thus the out-migrant problem for any salmonids trapped in pools prior to installation of the screen would not be solved. This may be labor intensive. Late season storms may blow out the fish screen thus requiring the structure to be removed prior to such events.

E) Install Passageway Between Pools and Ladder: Construct passageway between each jump pool and the adjacent fish ladder that would maintain hydrologic connectivity and a passage way for out-migrating species.

Advantages: This will potentially allow salmonids to freely pass between the pools and the ladder allowing safe passage.

Disadvantages: The cost of this alternative is unknown but may be expensive and the problem of leakage in the pools is not addressed. Nor is it known whether the installation of passage ways at each pool will be utilized particularly since the pools would still leak, and resulting decreased water levels would prevent hydrologic connectivity.

F) Seal Lowest Pool and Divert Fish Ladder Flow into Lowest Pool: Seal the lowest pool AND divert flow from lowest ladder into lowest pool.

Advantages: This alternative will potentially allow salmonids trapped in the lowest pool to escape while allowing flow to pass through the ladder and may be inexpensive.

Disadvantages: The problem of fish being stranded in the upper 2 pools still exists.

G) Status quo: Wait to see if leaks seal themselves through capture of sediment.

Advantages: This option is maintenance free and requires no permits.

Disadvantages: There is no guarantee that the problem will solve itself since the project was completed nearly four years ago and the problem still exists.

An analysis of alternatives are outlined on the next page.