The Institute for Conservation Advocacy, Research and Education (ICARE)
Presents the
Suscol Creek Collaborative Partnership Restoration Project
2005 Final Report

Introduction

This is the third year of the Suscol project. Part I of this year's report summarizes the work and analysis for the year. It was an unusual year. Precipitation was higher than normal and, as a result, many parts of the stream flowed continuously throughout the year. Steelhead numbers were also significantly higher than those previously surveyed. New this year, we found that steelhead of all ages were primarily located in the largest pools in the study area during the winter. In this report we also summarize the macro-invertebrate samples that have been collected in the study area of Suscol Creek from 2000-2005.

In part II of this report we provide a historical analysis of the Suscol basin over the last couple of centuries. It describes the changes in land management in the basin over time. This information helps characterize the long-term trajectory of ecological health for the Suscol basin.

Physical Setting (2005)

The 2005 water year has about 15% higher than the long-term average precipitation (Excell Precip- Figure 1-Chart 1). The precipitation for the year was 29.4 inches at the State Hospital in Napa. The long-term average precipitation from 1917-to the present is 24.9 inches at that location.

Precipitation was significantly higher in December than the long-term average by about 4.5 inches. Rainfall during December 2004 was slightly less than 8 inches. The second period that had higher than average precipitation was May and June. May's average was about 1.5 inches greater than the average while June's was about 3/4 of an inch greater than the average.

The average temperature for the water year was 60.72, slightly higher than the long-term average of 58.5 (Excell Temp-Figure 2-Chart 1). February, March, and July averaged a couple of degrees higher than the long-term monthly averages.

Stream Flow and Temperature

The most significant observation during the year was that much of the stream channel in the study area maintained continuous flow during the entire summer-fall period (see temperature chart). This was particularly true of the stream channel above the bridge. Observations in previous years were that much of the stream network above the bridge is reduced to isolated pools with a small amount of subsurface flow moving down slope. But in 2005, the additional rainfall received during the year was substantial enough to maintain continuous flow. This suggests that either the shallow soil/ hill slope aquifer is able to maintain the flow during the year or that the deep bedrock aquifer responds quickly to additional recharge. At this point, we suspect it is the former.

The observations in 2005 concerning precipitation are important because they establish the amount of water necessary to maintain continuous flow in the majority of the stream system during the year. This is one of the bench marks that are important for evaluating the current conditions and detecting long term changes of the stream system.

In the lower half of the study area below the bridge, there is a substantial reach that is dry for most of the summer. This reach is dry and would be expected to be dry in the majority of years. Water in this reach is flowing subsurface and may be recharging the groundwater aquifer in that reach. Continuous flow is observed below a bedrock nick point that brings the water back to the surface. There was continuous flow in the reach from that point down to the highway bridge.

On October 16, 2005 we collected stream flow measurements at three locations in the study area: at the upstream boundary, 50 m above the bridge, and the lower dam site. At the upstream site the flow was 35 liters/ minute. At the bridge site it was 12 liters/ minute. And at the lower site it was 20 liters/ minute. The highest stream flow was observed at the upstream boundary. By the middle site, the flows were reduced to approximately 35% of the flow at the upstream site. The flow at the lower site was 167% of the flow at the middle site.

Combining the stream flow observations with the maps of the areas of permanent flow suggest the following scenario: At a point approximately parallel with the pond, stream flow begins recharging an aquifer. It is not clear if this is the aquifer supplying the pond or not. We do not know how many aquifers exist in the strata in that area. It appears that the center of the recharge area is west of the house on the south side of the creek. We do not know how extensive an aquifer is being recharged by stream flow. What is clear is that approximately 42% of the water observed at the upper site on October 16th was recharging an aquifer before leaving the study area.

We had difficulties with the stage height recorders at both locations during the year and we only obtained a partial record. Fortunately, this was a high water year so stream flow remained during the summer and fall season. Our October spot measurements of stream flow were all that were necessary to establish where the recharge was occurring. We worked out a new arrangement to seal the probes from moisture so they should perform better next year.

Salmonid Surveys

During 2005, two salmonid surveys were conducted in the study area. The first was the annual early summer count. A second survey was conducted after the first major storm of the year. The first survey is part of the long-term monitoring program, while the goal of the second one was to determine the abundance and distribution of salmonids in the study area during the late fall-winter period.

The first survey was conducted on June 4th and 5th by Josh Malan and Charley Dewberry. The total number of fish observed during the survey were 577 Steelhead 0's, 49 Steelhead 1+, and 23 Steelhead 2+ (Table 1). In addition, 101 centrarchids were observed in the survey. The number of Steelhead 0's was four times as great as the number observed in 2004. One pool north of the house on the south side of the creek below the bridge had 70 steelhead 0's. The combined number of Steelhead 1+ and 2+ were approximately three times the number observed in 2004. These are significant increases in all age groups. The survival rates for these fish going into the winter period should have been high because of the higher than average stream flow observed through the summer and fall period.

The number of centrarchids in the reach was approximately the same as it was in the previous year. At this point we do not know for sure if these fish came in during the year or resided in the stream over the year. They were not significantly larger than those the previous year, which suggests that they came in during the year.

The second survey was conducted on December 9th and 10th after the first major storm of the year. The goal of this survey was to determine the number and distribution of salmonids and centrarchids in the study area during the winter. The number of fish observed during the survey was 16 Steelhead 0's, 24 Steelhead 1+, and 16 Steelhead 2+. No adult steelhead were observed during the survey. These are very low number compared with those observed at the beginning of summer. All observed fish were in the largest pools in the study area. Only a couple of Steelhead 1+ were found in pools of small or moderate size.

These results are not a complete surprise. The number of age 2+ steel head observed in December were about 70% of those observed in June. This is a good survival rate, especially considering subsequent comments. The number of Age 1+ steelhead observed in December were approximately 50% of those observed in June. Again this is a reasonable survival rate for 1+ steelhead. The number of Age 0 steelhead was only 3% of those observed in June. This is a very low survival rate.

However, conditions in the pools made observation of many of the fish difficult. After the storm, visibility was approximately 10 feet which is very good. During the summer survey visibility is about 3 feet. However, the downstream 1/2 of most pools was loaded with leaves from 9 to 20 inches deep. Generally, age 2+ steelhead were in the open while age 0 fish were often observed adjacent or in the leaves. Age 0 steelhead are also often hidden between or under rock in the bottom of the pools during the winter. Under these conditions, it is often the case that only a fraction of the age 0 fish are observed under these conditions.

Leaf litter and Macro-invertebrates

A large amount of leaf litter is common in late fall/winter in many forested, western United States streams. The amount of leaf litter observed in the pools in Suscol Creek was approximately equal to what would be observed in a Pacific Northwest forested stream. This is a higher amount of leaf little than I would have initially expected, given the species and density of trees in the riparian zone. Without question, this leaf littler plays an important role in the production of salmonids in Suscol Creek. It is not uncommon for leaf litter to make up 90% of the organic matter driving headwater streams like Suscol Creek.

However, more of this leaf litter remains in the Suscol Creek system than is found in Oregon forested streams because of the lower precipitation through the winter. As a result, this leaf litter is probably the most important source of organic matter driving the stream ecosystem in the study area. It is probably the dominant food of the macro-invertebrates that are the food for the salmonids.

Another of the important roles of the riparian zone is to provide downed trees and limbs that provide sticky-wickets to catch and hold the leaf litter being transported during storms. The riparian zone, within the study area of Suscol Creek, is dominated by a mature oak- alder riparian zone with a considerable amount of downed wood in the stream channel and valley floor. Therefore, it has a high capacity to hold the leaf litter.

Between 2000 and 2005 a total of five macro-invertebrate samples have been collected on Suscol Creek (see Table M.) The sample in 2000 was collected downstream of the study area while the other samples were collected within the study area. The samples from 2002 and 2004 are very consistent with each other for most community measures. The 2005 sample was lower in all metrics. It is not clear why the 2005 sample was lower than the other samples from the study area. The 2005 sample was collected at the top of the study area near the upper fence line. In 2004 this area was dry during the summer months. The lower metrics are explainable if this upper reach of stream has intermittent flow in many years, while the downstream sites have permanent flow. However, we need to monitor the stream network through at least another dry year to determine if that suggestion is true.

Even with the spread of taxa richness found in the Suscol samples, the community measures for the Suscol Creek samples are above average and more stable than the same metrics for most other Napa sites. This suggests that conditions are above average in the Suscol Creek basin. The greatest risk to the aquatic communities is long-term depletion of the ground water into the creek.

The 2000 sample, was slightly lower in total taxa than the 2002 and 2004 samples and no intolerant taxa were found in the 2000 sample. This shift in community measures occurs rapidly downstream of the study area. This sample site was located approximately a 100 m downstream of the study area. The riparian vegetation is no longer mature oak and alder.

Rather, it consists of young willows and sedge grasses. This sample highlights the sensitivity of macro-invertebrates to their environment by comparing it to the other year's samples. This sample was lower in all community metrics from samples from the study area in 2002 and 2004.

Recommendations

- Continue to manage the water levels in the pond such that the pond has minimum water stored as the fall/ winter storm season is entered. If pumping is necessary to fill the pond in the early spring.
- Provide a wire mesh cage over the outflow of the pond to minimize the movement of centrarchids out of the pond.
- Continue to remove blackberries from the riparian zone and continue to reestablish native riparian vegetation.

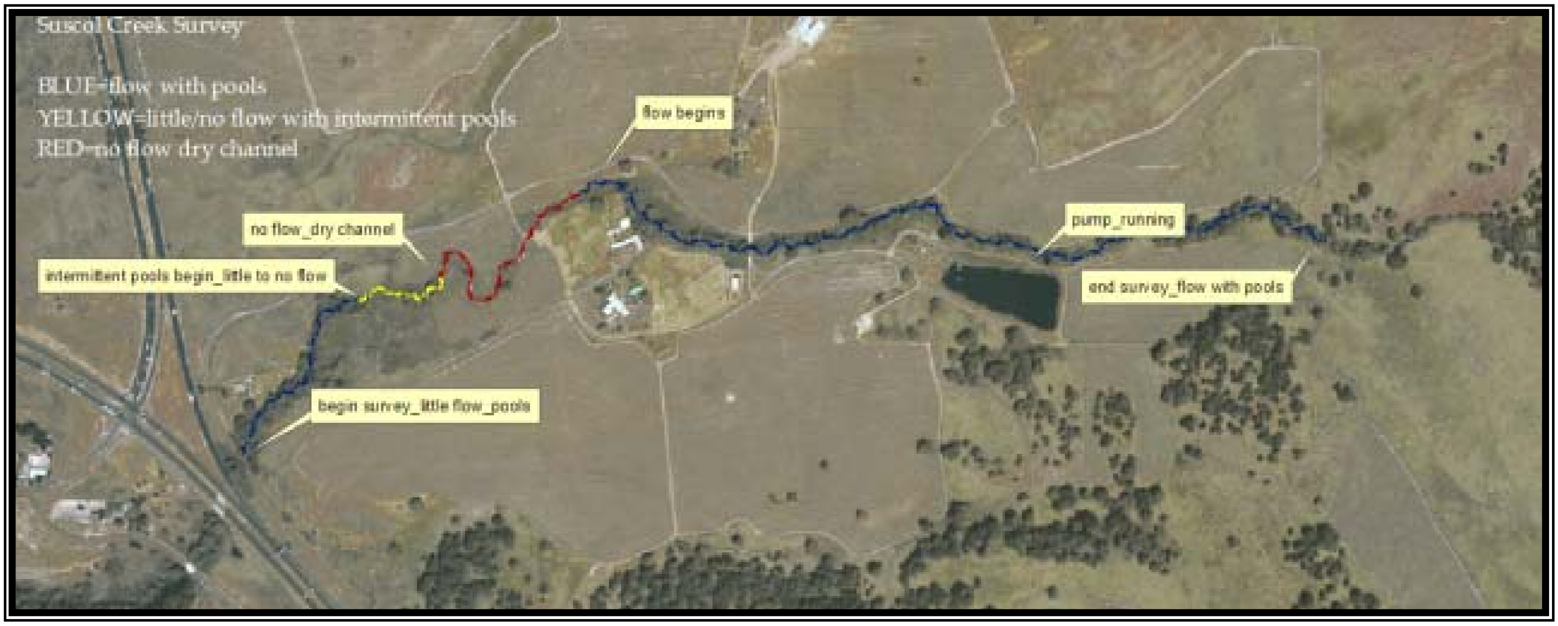
Focus of Work for Next Year

We propose continuing the annual June snorkel count but discontinuing the winter count. The June count is our benchmark for salmon production for the study reach. We now also know that most of the steelhead of all ages are in the large pools during the winter and the age 0 fish are largely underrepresented because they are hiding in the leaves at the bottom of the pools.

We are also proposing to continue the flow measurements and measuring the dynamics of the permanently flowing stream channels. These measurements will help understand the relationship of precipitation, recharge, and water withdrawal from the aquifers to stream flow.

We are also proposing adding macro-invertebrate emergent trapping for the coming year. We will place 3 small traps in the stream that allow us to capture all the insects that are hatching under the trap. These captured insects will allow us to get a complete species list, time of emergence, and number of each species produced during the year. This information is of use for a number of reasons. First, collecting these adult insects is necessary to identify what species are present in Suscol Creek. There are only a few streams in California where this information had been collected. It is in these surveys that accurate species lists and new species are usually identified. Suscol Creek is a good location for this sampling because it has a mature, healthy, riparian zone. Second, emergence trapping can be conducted at a later date to determine changes within the macro-invertebrate communities. Third, emergence trapping can be used to calculate an estimate of the macro-invertebrate annual production. This information when combined with an estimate of steelhead production will help us determine how limiting food resources many be for the steelhead.

Suscol Creek Surveys



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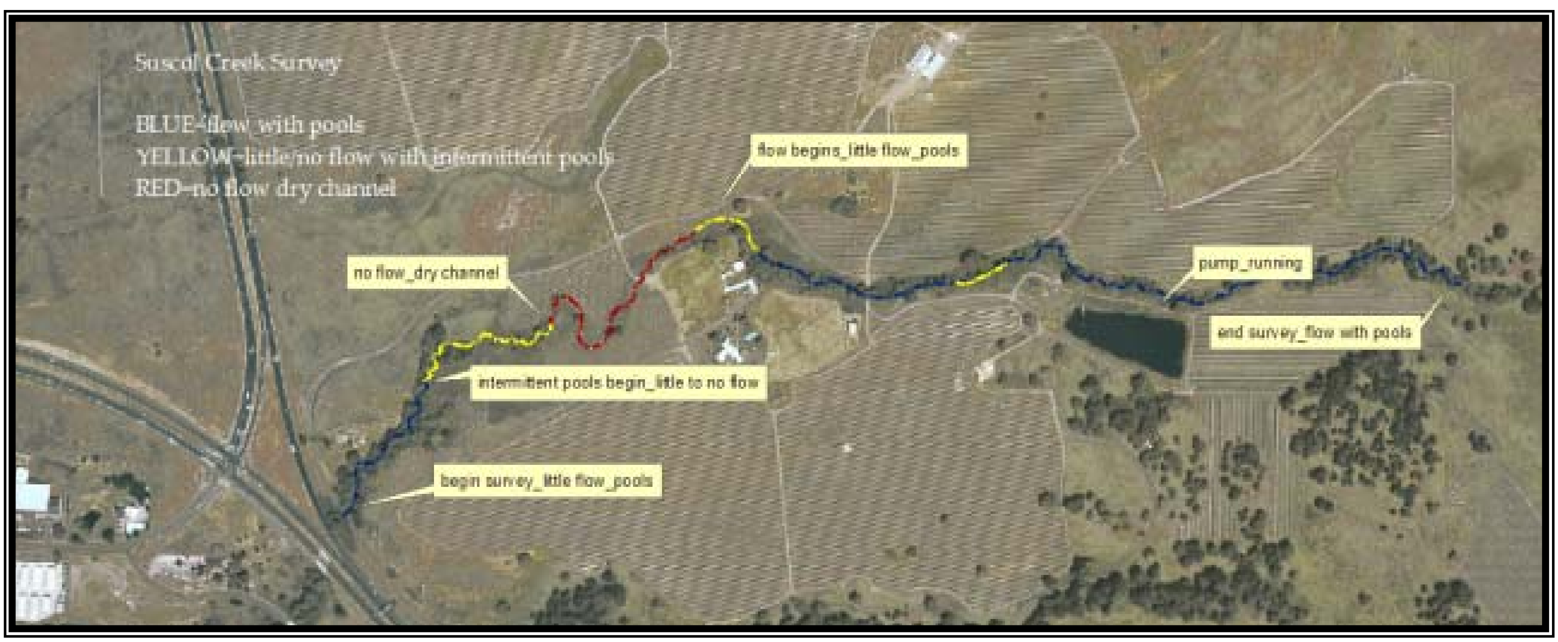

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Long Term Stream Temperature Data