# REPORT FROM THE FIELD
## JUN '20

By
Michael Powell
With
Marsha Neill, Bob Waidner & Patti Waidner

**PAST SEASON SUMMARY**

Even though it is likely that some have already seen this, I'm starting this posting with an aerial image of this springs' wildflower displays in the western Antelope Valley; just in case some readers haven't seen it. Besides, it gives me another opportunity to enjoy this awesomely beautiful photograph.

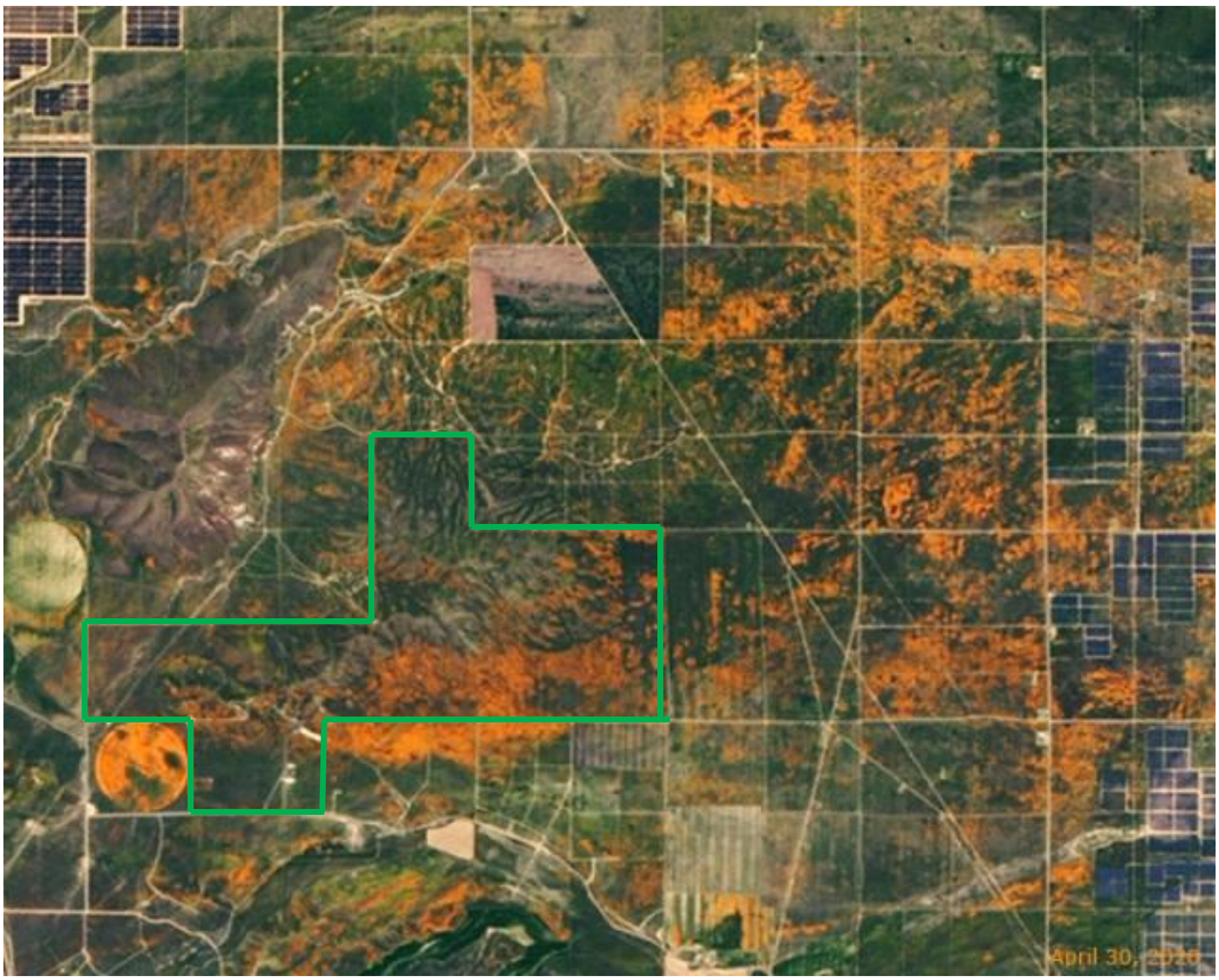

**FIGURE 1: AERIAL VIEW OF THE AREA SURROUNDING THE CALIFORNIA AV POPPY RESERVE**

The Poppy Reserve itself is outlined in green showing this spring's best poppy colors were actually outside the Reserve's boundaries. Marsha is one of the lucky, lucky few who, having permission to empty the researchers' rain gauges, visited the Reserve after it was closed to visitation. She has reported she thought this spring's poppy displays were some of the best she has ever seen. This would indicate that, as amazing as the color is in this image, there has been some degradation of the actual color.

Although the scale is somewhat different, I thought you might like to see a similar aerial view taken last year for comparison, Figure 2. The 2019 view was obtained by CNN on 30 Mar. '19. In the next several Figures, the rainfall and daily temperatures are compared for this spring season's preceding winter and last year spring season's preceding winter. The Figures show there were remarkable similarities in the weather conditions and yet there were significant differences in the quality of localized poppy color. At the same time, if you look closely, you can see some consistency in where the poppy displays occurred; raising the question does this consistency happen every year?

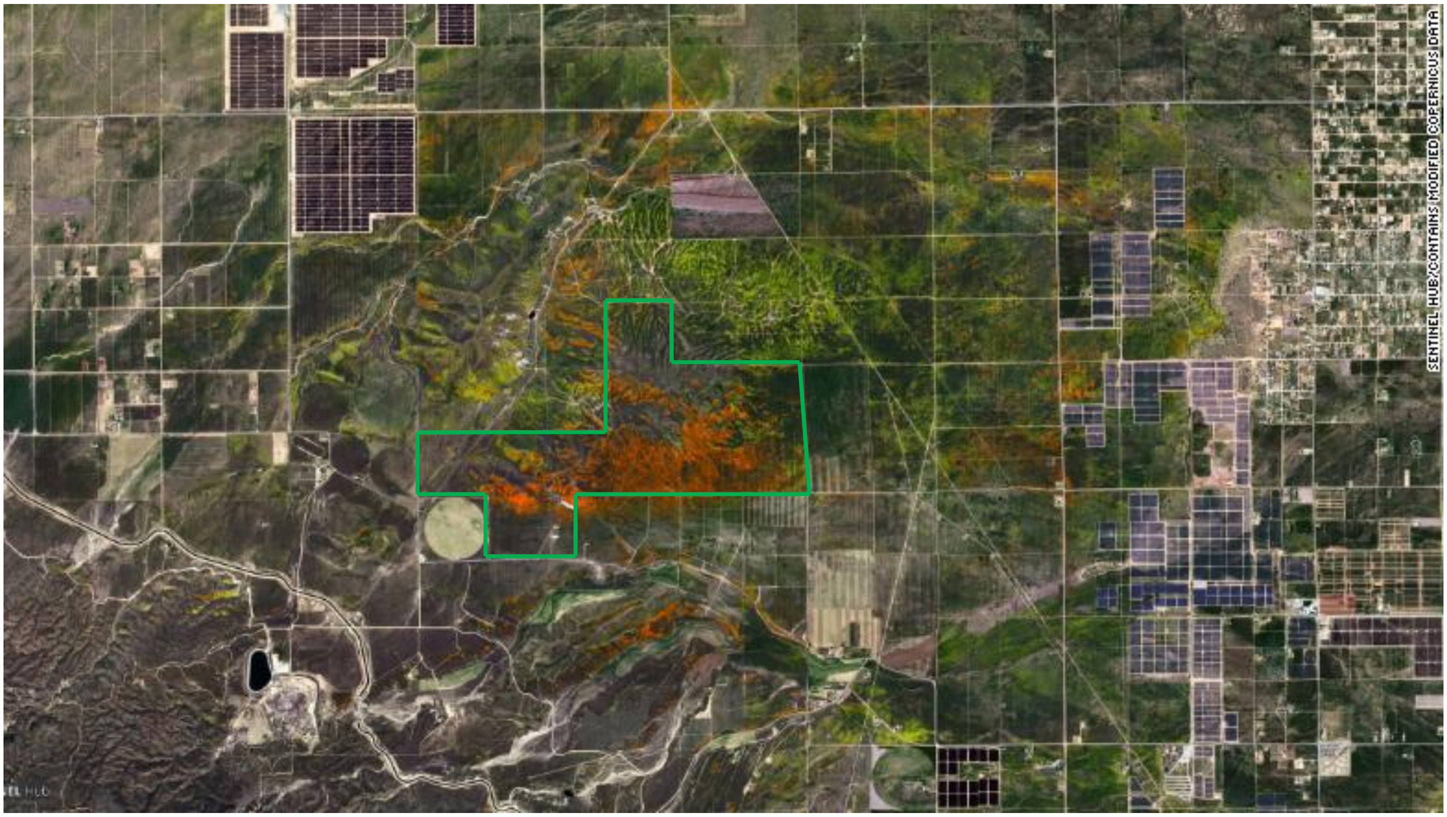


**FIGURE 2: SPRING 2019 AERIAL VIEW OF THE AREA SURROUNDING THE CALIFORNIA AV POPPY RESERVE**

Somewhere deep in my research files is an equivalent aerial image taken at the peak of the 2003's poppy color. When I find this image, I'll revisit this topic and we'll have a judge-off to see what year really had the best poppy displays. In the mean time, if you have a personal favorite year, let me know and I'll try to find aerial images for that year as well and, if I can, we'll add it to the competition.

During a presentation I gave at the end of February, I stated that, even though dense growth of young poppy plants had been observed earlier in the winter throughout the Reserve, I believed this spring's poppy displays would be good but, due to the extended time between rainstorms, the window of possibility for outstanding displays had closed. Shows how little I really know and how Mother Nature still rules.

Figure 3 shows the seasonal accumulated rainfalls for this past seasonal year and the previous year. The two years have amazingly similar total accumulated rainfall patterns except the previous year had a final mid-May rainstorm which could still occur this year as well. The previous year had an extended period through much of December 2018 with no rainstorms. With the outstanding season last spring, clearly that three or four week period of drought had little adverse impact on the young, growing poppy plants that had already germinated after the early December rainstorm. This was consistent with the researchers' previous observations indicating young poppy plants can tolerate dry periods of three to four weeks with little mortality but the young plants start to fade if they experience longer drought periods. It was these previous observations that led me to conclude that this spring would likely have high poppy plant mortality resulting from the two and a half plus months of almost drought this past winter from late December to almost mid-March. This period had only a few, very weak rainstorms; the strongest deposited only 0.13 inches of rain in mid-January. Even though the drought was a little later in the growing season so the plants' root systems were likely a little more developed, and deeper, and the Reserve already had had a total of six inches of rain so the soil was quite moist, I still did not believe that was enough for so many poppy plants surviving. I was proven wrong, again.

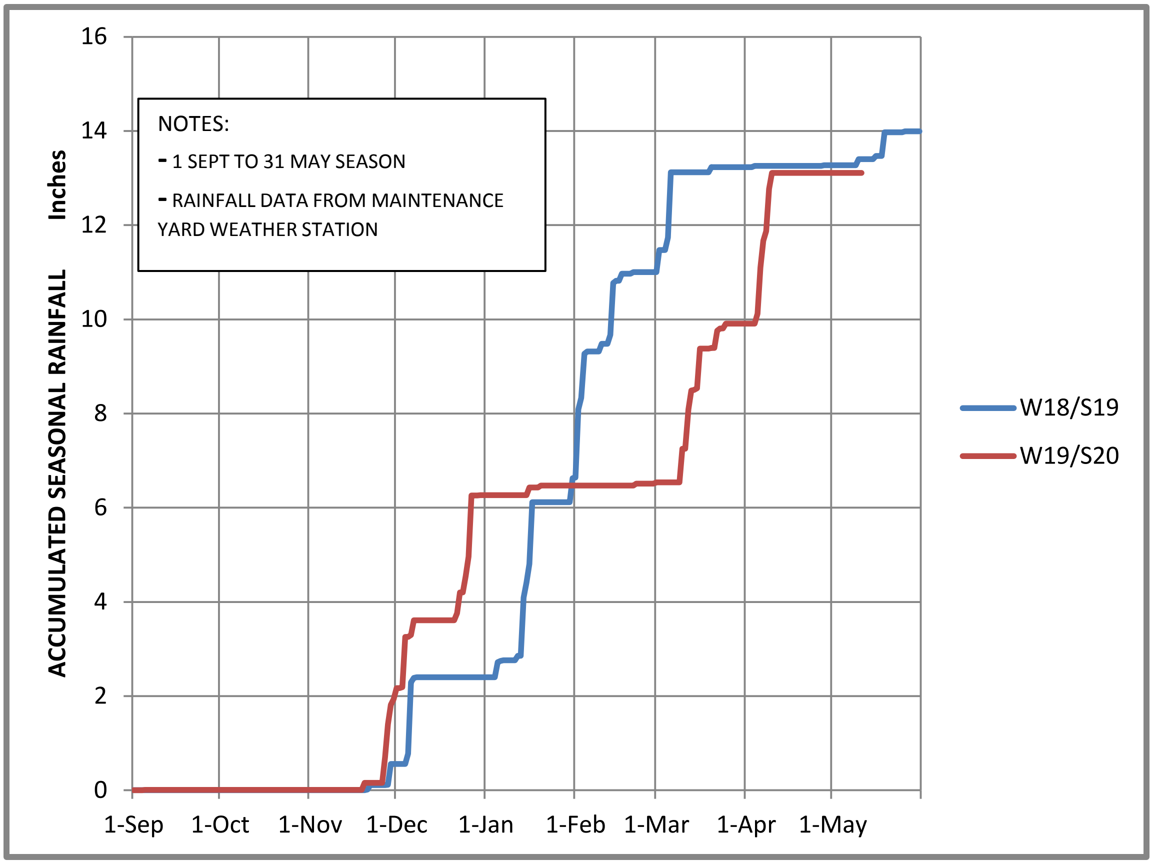


**FIGURE 3: POPPY RESERVE ACCUMULATED RAINFALL FOR W18/S19 AND W19/S20 SEASONS**

## 2019 SUMMER'S EXTENDED POPPY SEASON

Poppy plant survival was not the only surprise of this concluding poppy season. Even though this past winter/spring's rainy season was the fifth wettest in the last twenty four years and much of that rain came in March and April of this year, this spring's wildflower season came to a surprisingly early and rapid end. The aerial image in Figure 1 was obtained at the end of April '20. By the end of the first week in May, the season was over with the poppy displays already gone. In contrast, poppy plants survived well into July and August of last summer.

Before tackling one of the primary focuses of the researchers' efforts over the last year (resolving the apparent differences in the Ripley and Poppy Reserve recorded air temperatures), I want to add my bit to a topic Mary Wilson discussed in her October 2019 article on this website under the link to "Field Observation Archives".

The topic is the 2019 spring wildflower season's surprisingly extended poppy blooming period. Mary noticed it as did I. Just from personal memory, the latest I had previously seen poppy blossoms was July 2003; another outstanding and late poppy season. In early July that year, there were still a few, barely surviving poppy plants still blooming but their blossoms were few and very small. Therefore, I was shocked to find wide spread poppy blossoms during my mid-July visit to the Reserve last year. Additionally, large, healthy looking blossoms covered the mostly healthy looking poppy plants and most of the blossoms hadn't even started to loss their orange coloration; only a few of the blooms appeared to have the yellow petal tips, Figure 4. I take the transition to the pale yellow petals as a sign of plant stress from drying soil. Although I did find poppy blossoms at other locations on the Reserve, there appeared to be more numerous blossoms and healthier poppy plants on the Reserve's southern flats around the Maintenance Yard and west of the entrance road.

**FIGURE 4: BLOOMING POPPY PLANT ON 18 JULY '19 NEAR MAINTENANCE YARD**

As healthy as the poppy blossoms and plants were in the middle of July, the poppy season was finally over by the third week in August '19; my next visit to the Reserve. Mary has shared some data with me that she collected. On 26 July '19, she counted 34 poppy plants with blossoms in the vicinity of the Dorothy Bolt bench on the east side of the North Poppy Loop trail. On 7 Aug. '19, she found only five poppy plants with blossoms and, when I visited the same area on 22 Aug. '19, I found no poppy blossoms. The rather rapid demise of the poppy plants raises the question did anything happen during the intervening month that led to the demise of the remaining poppy plants.

Because the poppy season was unusually extended into July in both 2003 and 2019, how similar were the weather patterns and how do they compare to this spring? Did the weather patterns contribute to the late blooming season? Figure 5 shows the rainfall patterns for the three years.

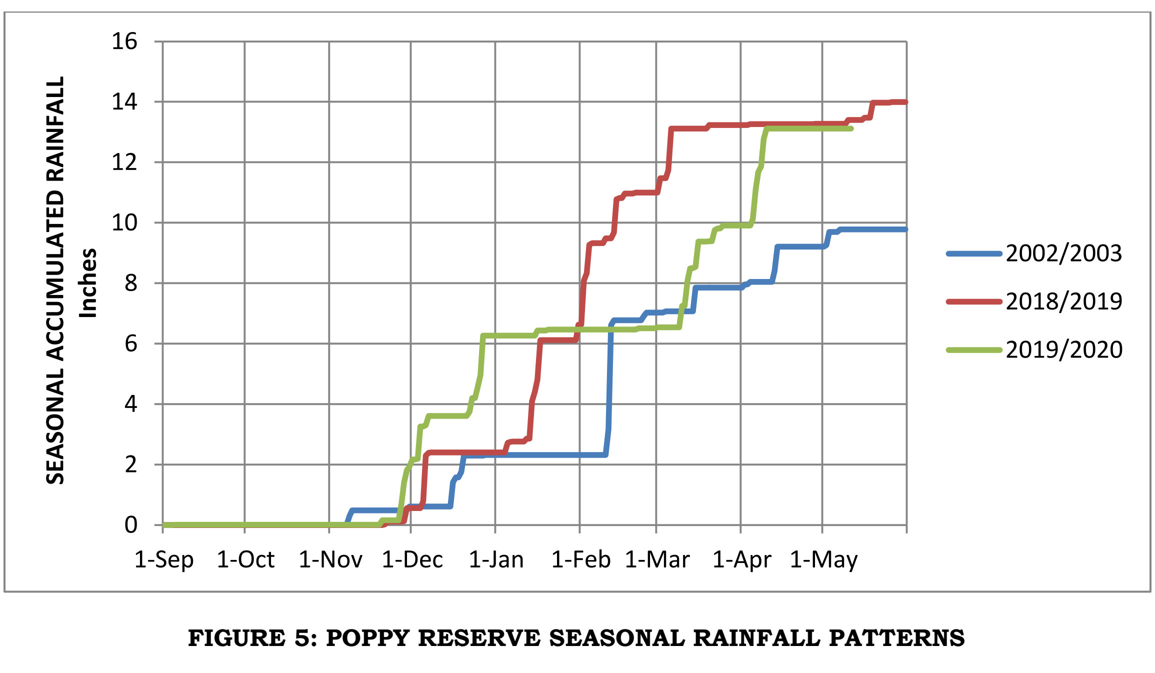


**FIGURE 5: POPPY RESERVE SEASONAL RAINFALL PATTERNS**

Up until early/mid February, the rainfall patterns for the three years were remarkably similar. With some minor differences in storm timings, the intensities of the season's first rain storm, first strong storm, and second strong storm were almost identical so the total rainfall at that point in the season was almost the same. From the first of February to early March, the 2018/2019 winter/spring had three major rainstorms with significant rainfall. In contrast, the spring of 2003 had a similar number of storms but each had much less rainfall so the 2003 rainy season ended up with slightly over four inches less rain than the winter/spring of 2018/2019. Actually, 2003's rainfall amount was essentially the average seasonal rainfall for the last 24 years so it doesn't seem that it can be argued that the seasonal total rainfall amount contributed to the late 2003 poppy blossoms. There was a major rainstorm in April of 2003 that added over an inch to the total rainfall compared to the spring of 2019 which had its last major storm in early March. It should be noted that both 2003 and 2020 had almost the same late season May rainfall amount.

When you add this spring's rainfall pattern, the situation doesn't get any clearer. This season's total winter/spring rainfall was equal to last year's and there were major storms in both March and April. Because this spring's poppy season was already over by early May, it seems it can't be argued that the May rainstorms in 2003 and 2019 contributed to their late blooming period. To summarize, it seems unclear if, or how, total seasonal rainfall or rainfall patterns have any influence on the length of the poppy season unless you want to argue that late season major rainstorms are detrimental.

Even though looking at the raw rainfall patterns didn't show any clear reason for the long poppy season last spring, the wide range of dates provided in Mary's article piqued my curiosity enough to take another approach at investigating if the preceding winter/spring's total amount of rainfall impacts the length of the subsequent poppy season. The dates listed in Mary's October '19 article are duplicated in Table 1. Additionally, my equivalent dates and the seasonal total rainfall are also listed in the table. The dates listed are the last dates that poppy blossoms were observed that summer.

| SUMMER | TOTAL SEASONAL RAINFALL Inches | DATE LAST POPPY BLOSSOM OBSERVED | |
|---|---|---|---|
| | | MARY'S DATA | MIKE'S DATA |
| 2005 | 27.1 | 3-Jul | |
| 2006 | 12.6 | 10-Jul | |
| 2007 | 2.8 | 27-Jun | |
| 2008 | 9.9 | 18-Jul | |
| 2009 | 9.7 | 9-May | |
| 2010 | 8.3 | 1-Jul | 17-Jun |
| 2011 | 13.7 | 1-Jul | 29-Jun |
| 2012 | 6.4 | 5-May | 6-Jun |
| 2013 | 1.4 | 3-Apr | 17-Apr |
| 2014 | 4.6 | 21-Jun | 7-Jul |
| 2015 | 6.9 | 24-May | 20-May |
| 2016 | 8.4 | 20-May | 7-Apr |
| 2017 | 10.3 | 14-Jul | 13-Jul |
| 2018 | 4.5 | 23-Apr | 30-Apr |
| 2019 | 14 | 7-Aug | 18-Jul |

**TABLE 1: POPPY BLOOMING PERIOD AT THE CALIFORNIA AV POPPY RESERVE**

There are a number of factors that could explain the differences in Mary's and my dates. The most obvious is that we visited the Poppy Reserve on different days. For example, in 2011, Mary visited the Reserve on 1 July and I had just happened to visit the Reserve two days earlier on 29 June. In any case, neither Mary nor I observed any poppy blossoms during our subsequent visit to the Reserve, be it a few days, a week or an extended time period later. Typically, our visits are less frequent during the warmest months of the summers. In addition to the obvious variation in visit dates, it is possible that we visited different parts of the Reserve and poppies could have survived longer in one part over another. During my 18 July visit to the Reserve last summer, the poppy plants growing near the Reserve's Maintenance Yard appeared much healthier than the plants I saw near the Visitor Center and along the trails so it is possible that they survived longer than the plants near the Visitor Center or elsewhere. Finally, it is easy to miss seeing an isolated poppy blossom especially when they are small and colored pale yellow, typical for the end of the season, so Mary might see a blossom that I might miss even if I visited the same area of the Reserve on the same day.

For all the uncertainty in the date data, the total seasonal rainfall is plotted against the later of the table's two dates in Figure 6. The increasing "best fit" linear trend line shows that the seasonal rainfall does have an effect on how long the poppies bloom but the significant scatter in the plotted data indicates that there are other factors that also have a measurable impact on the poppy blooms. If I have time in the future, I'll investigate other possible factors so watch for further discussion in a future article. For just one example, Figure 5 shows that last winter's rainstorms started very late; poppy seed germination didn't occur until the very end of November. Maybe this late start in the wildflower season partially explains the late blooming of the poppies last summer. Maybe the length of the poppy season correlates better with total seasonal rainfall.

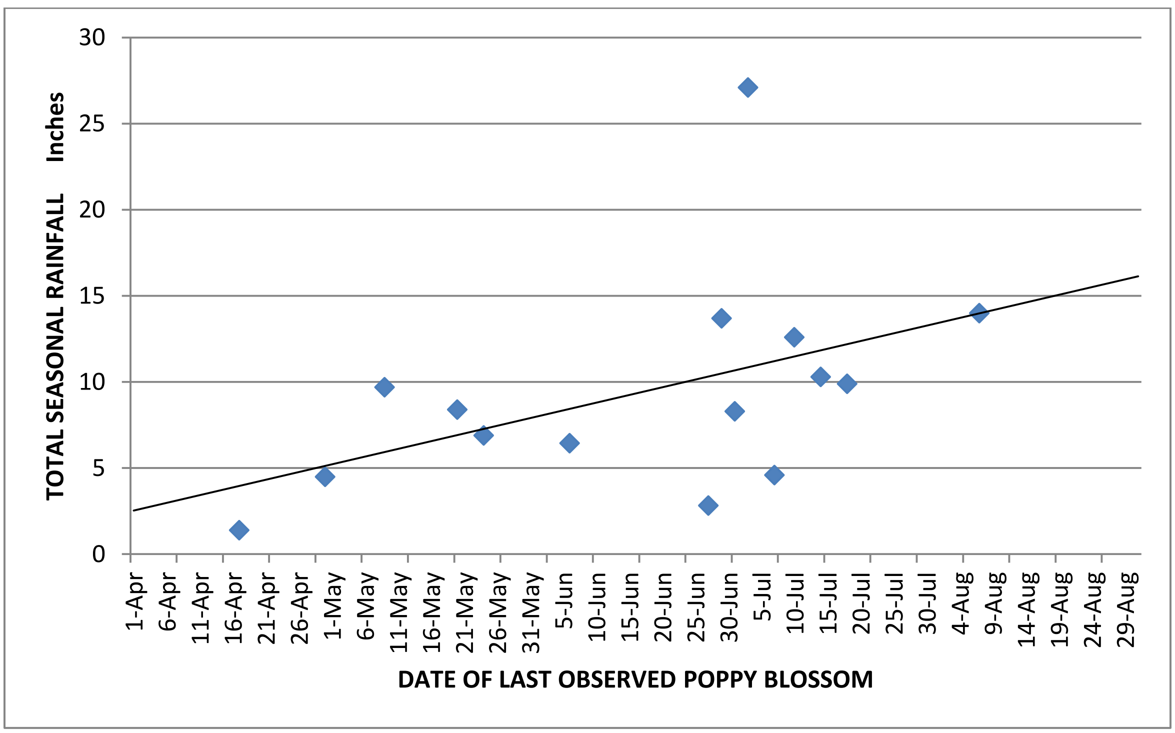


**FIGURE 6: EFFECT OF SEASONAL RAINFALL ON POPPY BLOOMING PERIOD**

With the above discussion concluding that other factors besides seasonal rainfall is impacting the length of the poppy season, let's take a quick look at another obvious candidate, the air temperatures. Because the daily maximum or minimum air temperatures were not being recorded by the Poppy Reserve's weather station in 2002/2003, only the daily maximum and minimum air temperatures for 2018/2019 and 2019/2020 can be compared. The daily maximum temperatures are shown in Figure 7.

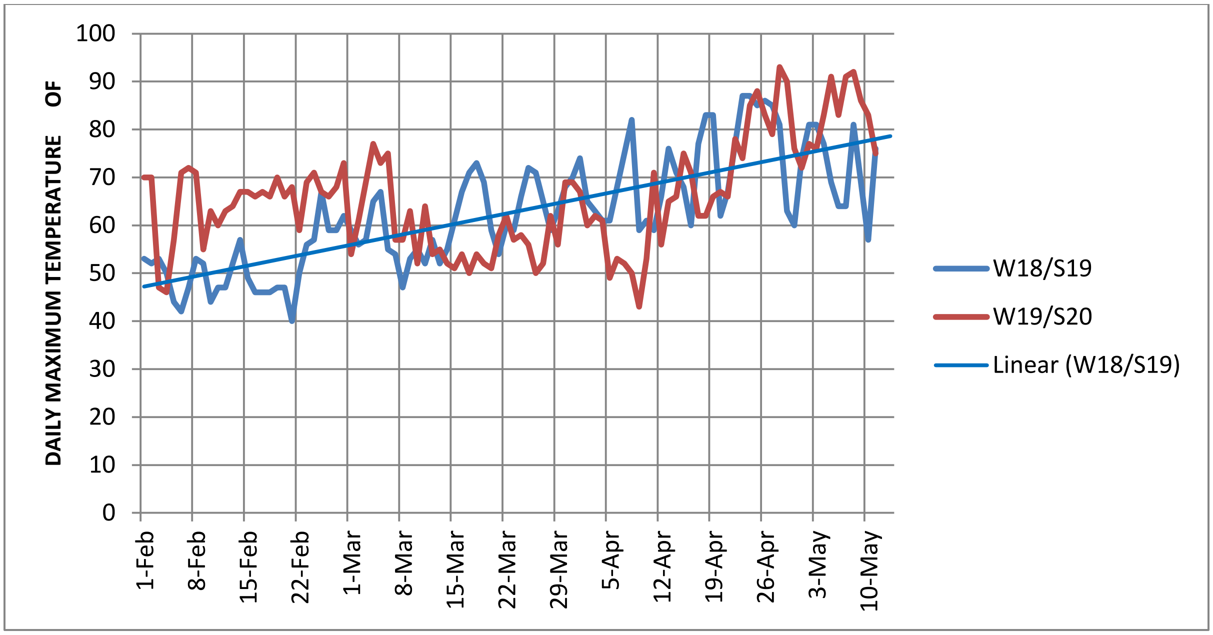


**FIGURE 7: POPPY RESERVE DAILY MAXIMUM TEMPERATURE**

This spring's daily maximum temperature was a little more variable than last spring but it doesn't look excessive. Over the last month of the plot, the average daily maximum air temperature this year was 4 ½ oF warmer than last spring; 72.6 oF vs. 68.2 oF. It is true that, over the last week of the plot, this spring was warmer than last year but the maximum daily temperature still did not get hotter than 92 oF and that is still much cooler than last summer temperatures where the poppy plants survived to the end of July.

The two years' daily minimum temperatures are even more similar as shown in Figure 8. There doesn't appear to be any systemic differences between the two years; just the expected random variations.

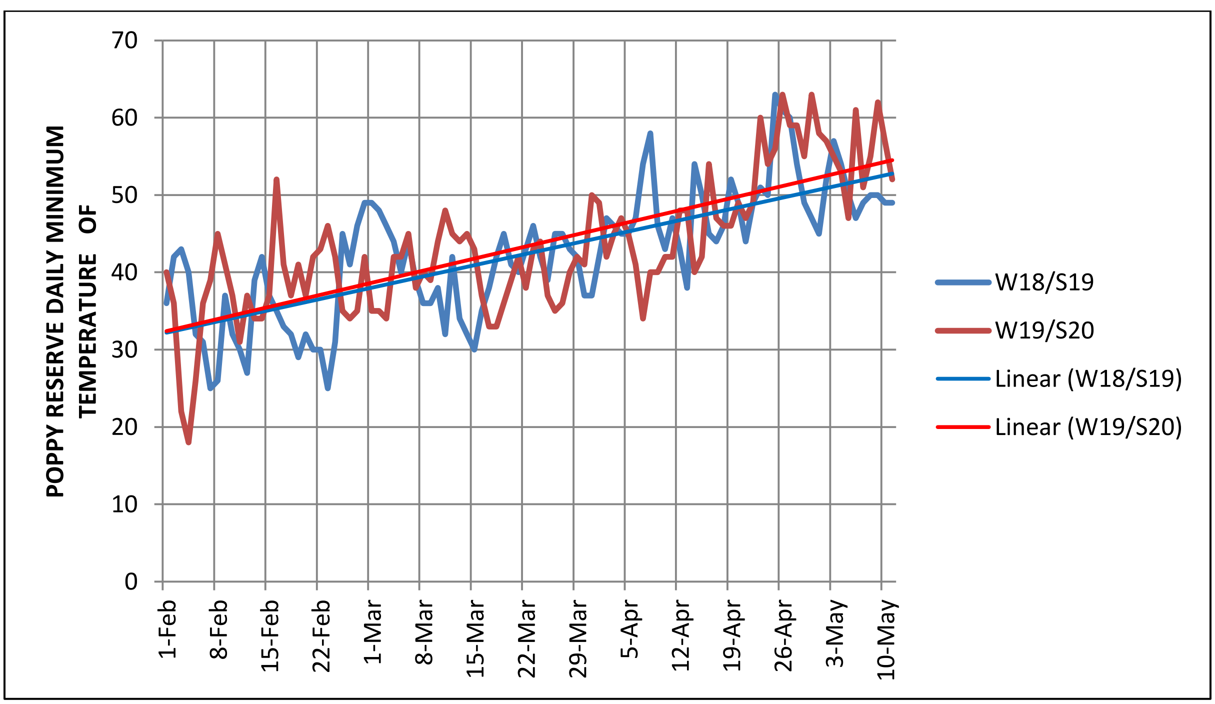


**FIGURE 8: POPPY RESREVE DAILY MINIMUM TEMPERATURE**

Besides the winter/spring temperatures, it is possible that the summer temperatures could have contributed to last year's long poppy season and its eventual rapid demise. Figure 9 shows last summer's temperatures.

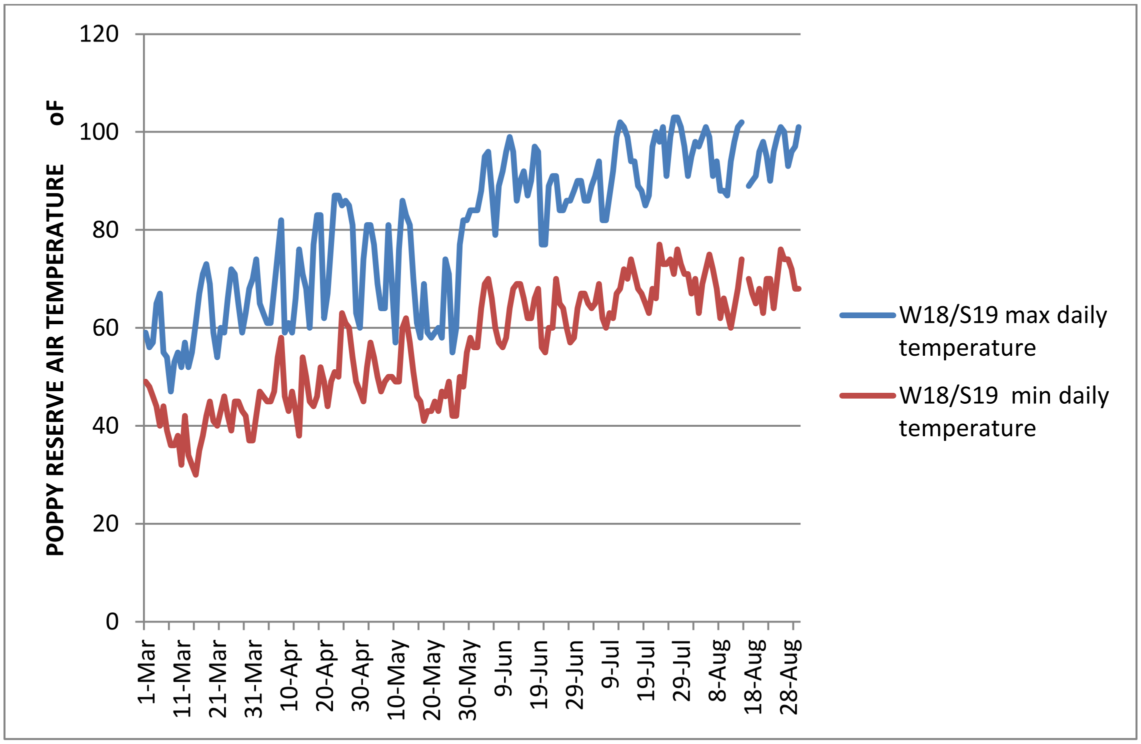


**FIGURE 9: POPPY RESERVE DAILY MAXIMUM AND MINIMUM AIR TEMPERATURES**

There are no obvious extreme temperature variations for the mid-July through late August period that could possibly account for the rapid demise of the blooming poppy plants. With only a few days having a daily maximum temperature over 100 oF, I would say that last summer was pretty mild; at least, through August.

From this quick look, I would again conclude that it is not clear how, or if, air temperatures impact the length of the poppy displays or their rapid endings.

At first blush, you might wonder why the end of the poppy blooming is important enough to be worthy of an extended discussion in this article. I believe it is worthy to note because the poppy's extended blooming season gives the poppies a competitive advantage over the other plant species in the Reserve's vegetative community by continuing to add its seeds to the soil's seed bank long after the other spring blooming species have died. Having more seeds ready to germinate when the next winter's rainstorms come should help the poppies compete against the other plant species for the limited soil moisture and nutrient resources. There is a widely held belief that California poppies can't tolerate heat. If nothing else, last summer certainly proved that myth wrong.

**ARTHUR B. RIPLEY STATE PARK WEATHER DATA**

Through the volunteer efforts of Bob and Patti Waidner, a long time personal poppy research goal of mine is beginning to be achieved. The goal is to record and document the Arthur B. Ripley Desert Woodland State Park's weather conditions. With this documentation, the Ripley climate data can be combined with the already documented Poppy Reserve and Saddleback Butte State Park climate data. This will allow the creation of a map showing climate variation over an almost forty mile west to east line. Using this climate variation combined with the significantly different vegetative communities of the three State parks, researchers can start to tease out the climate conditions that each of the different desert plant species are currently adapted for and then predict how future climate changes will impact the various plant species.

The Ripley effort began almost two years ago now with the establishment of a relatively simple weather station consisting of a manual rain gauge and a two channel temperature recorder allowing both air and soil temperatures to be recorded. Unfortunately, we have had more than our share of start-up problems. First, the rain gauge had to be replaced with a new style of manual rain gauge when several of the Poppy Reserve's rain gauges of the same style cracked and started leaking. These cracking rain gauges had been recently purchased to replace the Reserve's original rain gauges that had started to fail after being in the field for over sixteen years.

Then we discovered the design of the new rain gauges made them very efficient insect traps. If the first convenient opportunity to empty the rain gauges was two or three days following the end of a rainstorm, it was not uncommon to find a pea soup thick broth of collected rain and insects attracted by the smell of water and then trapped within the gauge; primarily the tiny soft winged flowering beetles we commonly find in the poppy blossoms. It was imperative that we quickly find a solution to this problem before we caused a local extinction of these insects. After several iterations, we did work out a screening approach that was effective in keeping out the insects. We were never completely successful because we can still find a few insects, including large insects like bees and flies, in the rain gauges. We have no idea how these insects can get past our tiny pored screens.

Now that we had modified the design of the rain gauges, we had to confirm that the modifications did not affect their accuracy. This required installing one of our screened rain gauges just outside the Poppy Reserve's maintenance yard fence so we could compare our collected rainfalls with the readings from the Reserve's "official" weather station's digital rain gauge located within the maintenance yard. After many rainstorms of different intensities, we were finally confident that we could validly compare Ripley's rainfall data with the Poppy Reserve's. Figure 10 shows the collected comparative data.

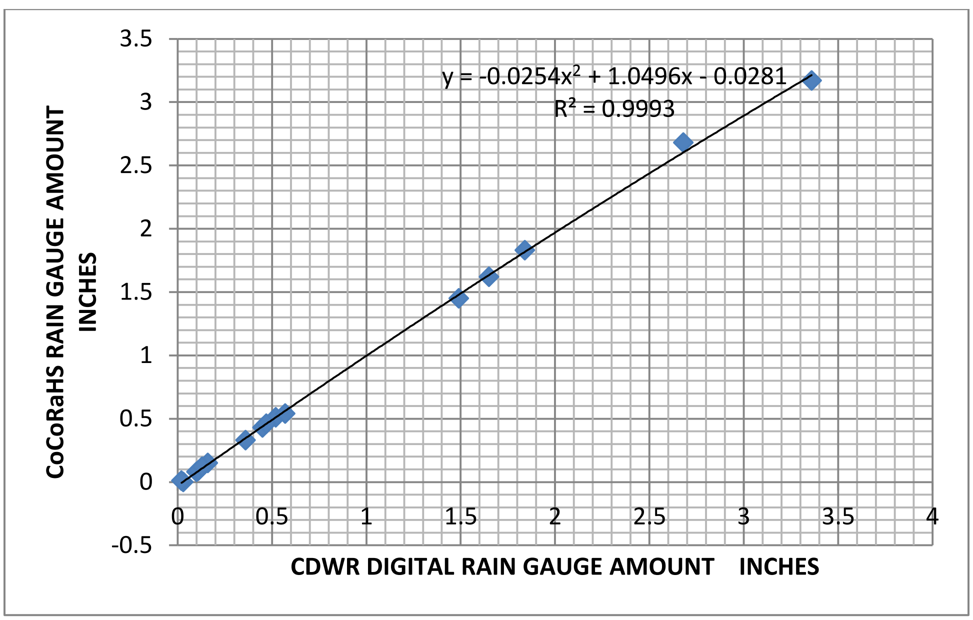


**FIGURE 10: COMPARISON BETWEEN MANUAL RAIN GAUGE AND POPPY RESERVE DIGITAL RAIN GAUGE**

Having sorted out the problems with obtaining valid rainfall comparisons between Ripley and Poppy Reserve Parks, Figure 11 shows those comparisons for the 2018/2019 winter/spring season. Surprisingly, the rainfall patterns for the two State Parks were almost identical. With a steeply decreasing rainfall gradient east of the Poppy Reserve, it was anticipated that Ripley, being further west and closer to the mountains, would have higher rainfalls than the Reserve and this, at least partially, explained Ripley's different vegetative community. The rainfall data for this past winter/spring is still being collected and analyzed. If the consistent seasonal rainfall patterns continue, we'll have to look to other reasons causing the differences in plant species communities between the two parks. Variation in temperatures between the two parks is certainly another possible explanation.

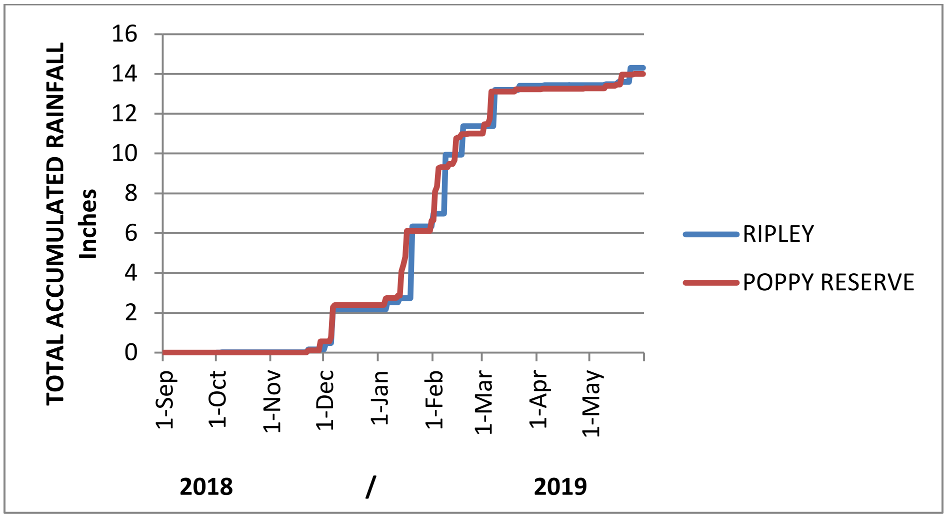


**FIGURE 11: COMPARISON OF SEASONAL RAINFALL PATTERNS BETWEEN ARTHUR B. RIPLEY AND POPPY RESERVE STATE PARKS**

We didn't catch a break with the temperature measurements either. In some ways, it was even worst. Initially, we used a surplus temperature recorder that was originally purchased for one of the Poppy Reserve's mini-weather stations established in 2004 for the Ripley mini-weather station. This recorder has two probes that continuously measures temperature but only records the maximum and minimum temperatures each probe measured within the last twenty four hour period in the recorder's memory. We soon realized that it was near impossible to determine if the temperatures retrieved from the recorder's memory applied to that day or the previous day and, if you can't tell what day the recorded temperatures are for, valid comparisons can't be made between Ripley's and the Poppy Reserve's temperature. We chose to upgrade to a better temperature recorder that continuously recorded the temperatures as well as the time of each recording.

The purchased upgraded temperature recorder also has two probes. One probe is used to measure the air temperature ten inches above the ground and the second probe is buried in the ground to measure soil temperature. The ten inch height was intentionally selected to represent the temperature environment that mature poppy plants experience.

Shortly after the new temperature recorder was installed at Ripley, it began to give erroneous data. After an extended trouble shooting period working with the recorder's manufacturer, it was concluded that the recorder itself was malfunctioning and a replacement recorder was obtained. It looked like we were finally over the problems and could obtain valid comparison data but that turned out to be wrong. Comparing the temperature data for the two parks just didn't look right. After unsuccessfully investigating other possibilities, we were left with the possibility it was a boundary layer effect. When air flows over a surface, there is a zone close to the surface where the air velocity decreases. FYI, at the surface, the air velocity is theoretically zero. When the wind blows over the earth's surface, the boundary layer can be a few feet in height. Besides a velocity boundary layer, there is a related temperature boundary layer.

As mentioned, the air temperatures were being measured at a height of ten inches. The air temperature probe at the Poppy Reserve is estimated to be at a height of approximately seven feet. The Poppy Reserve's weather station is in a locked enclosure within the maintenance yard so the researchers did not have access to directly measure the temperature probe's height. In any case, there is a substantial height difference between the two probes.

To measure the thermal boundary layer's variation in air temperature, two of the surplus maximum/minimum temperature recorders were used to measure the air temperatures at four different heights above the ground varying for only a couple of inches to approximately five feet. These recorders were located again just outside the Poppy Reserve's maintenance yard as close to the enclosed weather station as possible. When the four temperature measurements are plotted, a curve through the four points can be extended to compare with the Reserve's recorded equivalent temperature. This type of plot is shown for three and four dates in Figure 12.

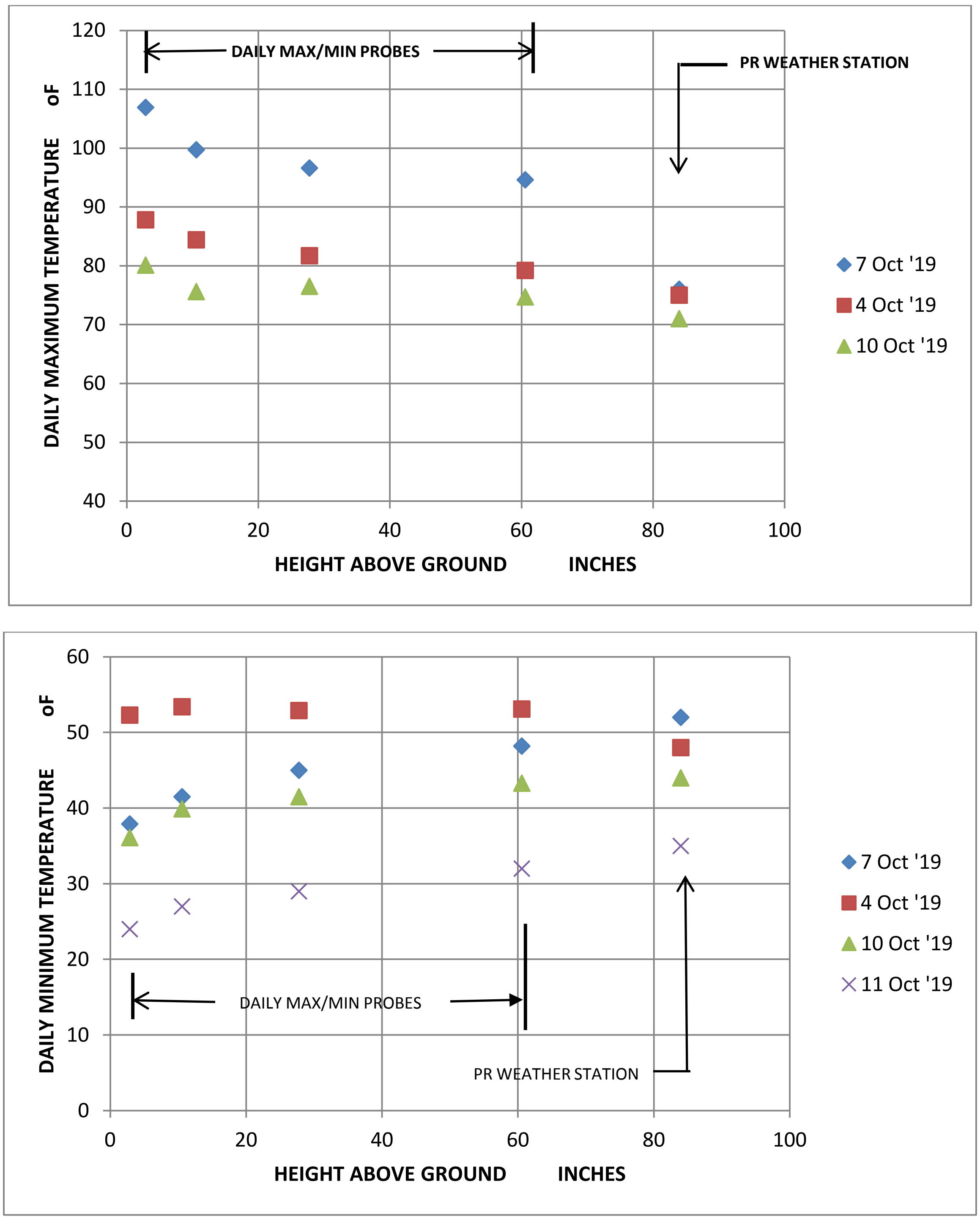


**FIGURE 12: AIR TEMPERATURE GRADIENTS CLOSE TO THE GROUND**

Figure 12 shows that there is approximately a ten degree variation in air temperature between three inches above the ground and 84 inches with about half of that difference occurring by ten inches above the ground.

Although the trends are reversed, the ten degree temperature variation is consistent for both the daily maximum and daily minimum temperatures.

The daytime trend was expected because the ground is heated by solar radiation and some of that excess heat energy is transferred to the air near the ground surface. The nighttime trend was unexpected because the ground cools slower than the air so it should be warmer than the air and, again, some of that excess heat energy would again be transferred to the air close to the ground. Counteracting this effect, colder air is heavier so sinks to the lowest point, i.e. ground level. Apparently, settling of the colder air is the predominate effect for most of the days we are reporting on. The 4 Oct daily minimum temperature data does not seem to agree with the other days' data. If the wind speed is strong enough it mixes the air and smoothes out any temperature gradient. This might account for 4 Oct being different. For all the other days, the Poppy Reserve weather station's recorded wind speed was 5 mph or less at the time of, and for multiple hours before, the daily minimum air temperature. Even for 4 Oct, the wind speed at the time of the daily minimum temperature was low but, until several hours before, the average wind had been 20+ mph. It's possible that there had not been adequate time to re-establish the temperature gradient.

It is also likely that the temperature gradients will change throughout the year. Year round temperature data has been collected and is waiting for analysis. Rather than trying to determine a suitable correction factor that would allow the Ripley air temperature data to be compared with the Poppy Reserve data, the researchers have decided it is easier to simply install our own temperature recorder at the Poppy Reserve. The air temperature sensor for this recorder will also be ten inches above the ground so the two temperatures can be directly compared. We were intending to install the new recorder this spring but the closing of the Reserve has delayed our effort.

This study of the air temperature gradients near the ground has helped solve a long time observational mystery. Even though frost damage has been observed on the Reserve's plants as well as other signs of sub-freezing temperatures, the Reserve's weather station has very infrequently recorded air temperatures below freezing. Now it is known why. It can be freezing at the ground level or plant level and still be substantially above freezing at the seven foot level.

**POPPY RESERVE HISTORICAL STORIES**

In my last posting, I stated that there were several additional stories hidden in the NASA aerial photographs that were included with the that posting but, due to the length of that posting, the stories would be held for a future article. I'll end this article with a couple of those stories. To set the stage for these stories, the two aerial photographs are duplicated in this posting.

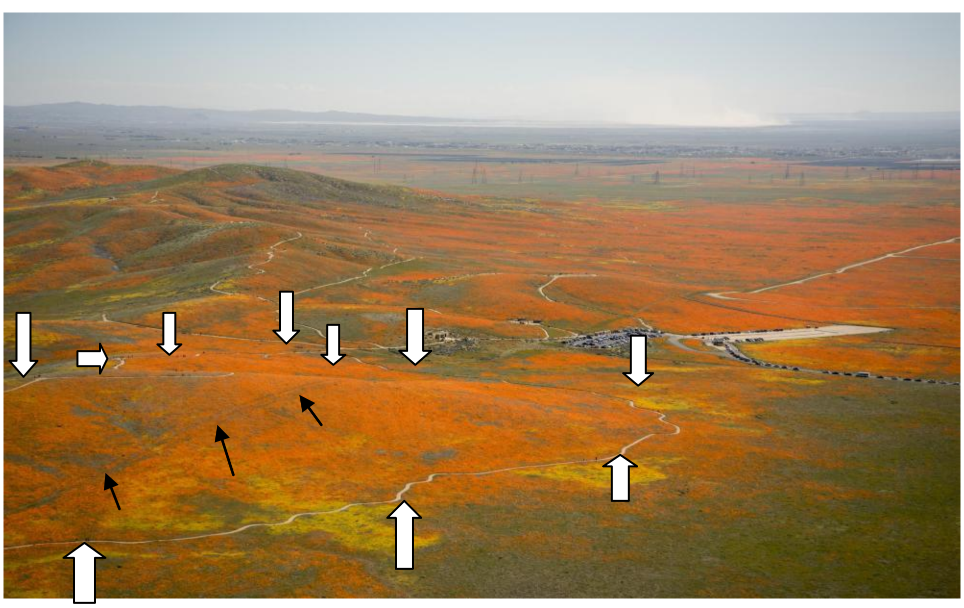

**FIGURE 13: DUPLICATE OF FIGURE 3B FROM JUNE '19 POSTING**

The poppy color in the Figure 13 photograph's foreground is the south facing slope between the Tehachapi Vista Trail and the south loop of the Poppy Trail. The two trails are marked with white arrows. The story begins more than twenty five years ago in the early to mid-1990's. It was then that the California Department of Parks and Recreation ecologist assigned to the local then Sector, now District, office decided that prescribed burns would improve the quality of the poppy displays and began to burn vegetation off different sections of the Poppy Reserve. The last prescribed burn was conducted in 1999 where the entire area between the Tehachapi Trail and the South Loop of the Poppy Trail was completely burned; the same area marked by the white arrows in Figure 13. Based on this single photograph, you might conclude that prescribed burns truly are helpful in improving the poppy displays but that conclusion could be premature.

The next chapter of the story happens in the spring of 2003; the spring I started volunteering at the Reserve. I personally believe that that spring had the best outstanding poppy displays I have seen. It wasn't so much that the display intensity was greater but, in my memory, the displays were much wider spread. Figure 2 shows last spring's best displays were largely limited to the immediate southern slopes on the Reserve. In 2003, the outstanding poppy displays extended onto the flats further south and north. Some of the best displays were even south of Lancaster Road across from the Reserve as well as in the valley between the Poppy Reserve and Fairmont Butte. The one area that was notably missing poppy color that spring was the area burned four years earlier in 1999. A transect plant survey conducted by the volunteer researchers through the burned area documented significantly fewer poppy plants compared to a similar transect survey conducted on the east ridge area of the Reserve.

For the next chapter, it wasn't until the late 2000's that we observed the poppy displays slowly returning to the burnt area. A photograph accompanying an article published in a local newspaper prior to 1999 showed at least the eastern portion of the burnt area had previously had good poppy displays so the lack of poppy plants growing in that area was not historically expected. It appears it took ten or more years for the burnt area to fully recover.

When I pointed out these observations to the most recent local State Parks ecologist, she argued that the observations did not prove the prescribed burns were truly harmful. She was right of course but I would argue that the observations are strong circumstantial evidence that prescribed burns are potentially harmful to the Poppy Reserve's desert grassland ecology and should raise a yellow flag of caution before any future prescribed burns are considered.

Very limited data might indicate that there can be significant differences between the impacts of prescribed burns and natural grassland fires. A former Reserve ranger related that a small area of the Poppy Reserve burnt from a lightning strike caused fire had outstanding poppy displays the following spring. A few years ago, a pyromaniac initiated a small grass fire on the Reserve between Lancaster Road and the Reserve's Maintenance Yard and that area seemed to fully recover within two or three years. Additionally, I drove over to the Fort Tejon State Historic Park one spring to see the reported outstanding poppy displays growing on the hill sides east of Interstate 5 that had burnt the previous summer. The reports were correct. The hills across Interstate 5 were ablaze with outstanding poppy color.

Although it is largely speculation, I can think of two effects that could account for the possible differences in impacts between prescribed burns and natural wildfires. First, prescribe burns are typically conducted during calm wind conditions to help prevent the fire from getting out of control. In contrast, wildfires do get out of control because the wind is really blowing. Under calm wind conditions, a fire moves more slowly and this could result in a greater adverse heating of the soil and the soil's seed bank. Secondly, whereas natural wildfires are more frequent in the late summer and autumn when the vegetation is completely dry, prescribed burns are typically conducted in the spring when the vegetation is still moist; again to help control the burning rate. These differences in vegetation moisture levels will again affect the fire's travel rate and hence the impact on the soil. In addition, the fire will flash the existing soil and vegetation moisture to steam and steam is a known killer of seeds.

The second delayed story is a totally different subject. This story is about the Poppy Reserve's still observable cultural remnants of the early historic settlement of the western Antelope Valley. The smaller black arrows in

Figure 13 highlight the remnant of the old dirt Ave. G.  Figure 14 shows the same Ave. G track continuing down the east facing slope of the same ridge where it crosses the parking lot and continues off to the east.

**FIGURE 14: REMNANT OF THE OLD, HISTORIC AVE. G ROADWAY WEST OF THE PARKING LOT**

If you look carefully on the eastern side of the north loop of the Poppy Loop Trail, the remnants of the old 150th East road can also be found.  I have been told by a Park staff member that restoration efforts were conducted on these roads when the Reserve was first established.  Still being able to clearly see these disturbed roadways over forty years later points out how difficult it is to truly restore disturbed desert environments and how slowly the desert ecology fully recovers.

Although not being aware before seeing it in Figure 15, I believe the black arrows in this figure indicate a simple trail.  The black arrow in the middle of the photograph is marking the location of an old, historic corral on top of the hill.  In either 1980 or 1981, the State Parks Department contracted with Dr. Curtis Clark, then a botany professor at Cal Poly, Pomona and a well known poppy researcher, to conduct a plant survey of the Poppy Reserve and a map contained in his final report made note of this corral.  The apparent trail leads off towards the southwest.  At the western most, southwest corner of the Poppy Reserve is a small grove of two or three non-native trees.  I believe they are locust trees which are fast growing, good for providing shade, and tolerate drought and poor soil conditions.  Because of these trees, I believe it is likely that a homestead was once located at this corner.  The marked trail seems to connect the homestead site and the known corral.

In addition to the several historic roadways located on the Reserve, remnants of historic juniper tree fence posts and tangles of barbed wire have also been located.  Also the locations of several historic dump sites have been located and recorded.  Because the Poppy Reserve is a natural reserve, these dump sites have not been disturbed but it would be really interesting to know what was thrown away and how old these dumps are. One site has pieces of blue and white porcelain plates laying on the surface.

**FIGURE 15: DUPLICATE OF FIGURE 3C FROM JUNE '19 POSTING**

Because the volunteer researchers spend so much time staring at the ground documenting what plant species are growing or blooming as well as being on our knees taking close-up photographs of plants' blossoms or inspecting the details of the blossoms, we are periodically rewarded with finding other cultural remnants like corroded metal cans or glass bottles – once I even found a large caliber, spent bullet simply laying on the ground.

The periodic findings of these cultural reminders of the people who lived in the area long ago - who farmed the land, or grazed herds or simply walked among the spring wildflowers, makes me wonder who they were and how long ago they lived here. This has started me on a quest to learn more about the history of the Antelope Valley (especially the western portion of the Valley around the Poppy Reserve) from the time of the earliest exploration by European explorers and, hopefully, will lead to a second series of articles that can be posted on this website. The first of this second series of articles is focused on who gets credit for being the first European to venture into the Antelope Valley. The answer to this question turns out to be somewhat controversial so watch for the first article to be posted on this website soon.

As always, I encourage everyone to continue to visit the Reserve throughout the year; only this year, it has to be once the "stay at home" restrictions are lifted. During many years, you can see plant species blooming almost year around. These are different plant species that you don't find during the spring season so you can add to your personal plant list. The autumn months have some of the best weather conditions – reasonable temperatures and mild winds. If you visit early enough, even the summer months can be quite nice.

If you have any questions, comments, corrections, want to add a year to the best poppy display year competition, or simply just want to say “hi”, you can contact me at mfpowell@verizon.net.  I always enjoy hearing from any readers.  May all stay safe and healthy.