

CONSERVATION OF WATER AND FERTILIZER USING PULSE IRRIGATION

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Pulse watering is a concept that was developed by Jan and Peter Groot who operate El Modeno Gardens in Orange County, California. The Groots developed this concept in response to environmental problems created by their excessive nitrate runoff. Water is applied for multiple short cycles that are spaced about an hour apart instead of in one long cycle. The hour pause between cycles gives the water time to soak into the medium before more water is added.

Irrigation at Lancaster Farms is totally automated, which made it very easy for us to try this new concept. We water early in the morning so that we can be finished before crews start their workday. In our old method of irrigation, a four-station program was designed to water each station for 60 min. beginning at 3:00 a.m. At 7:00 a.m. the irrigation was completed for the day. Now we program each of the four stations for 15 min. beginning at 3:30 a.m. The cycle is repeated at 4:45 a.m. and 6:00 a.m. Our daily watering is still completed by 7:00 a.m. All stations have an hour pause time between each 15-minute watering pulse, and our overall irrigation time is reduced by 30 min. We now apply 0.2 in. of water per day to everything.

This appears to be a lot of trouble; therefore, let us look at the advantages: As you can see from Figure 1, we used to apply 60 min. of water per day. Usually one afternoon a week we had to apply an additional 60 minutes of water. This resulted in each area receiving a total of 480 minutes of irrigation weekly. Now we apply water for 45 minutes per day, and no supplemental afternoon cycles are necessary. Plants are irrigated 315 minutes per week, which reduces our water usage by 33%.

We grow mostly 3-gal. hollies, azaleas, and junipers on a 2-year cycle. The first year we use only a liquid fertilizer program. During the second year, this is supplemented with 18-6-12 Osmocote to finish growing the material.

We are using the Virginia Tech. liquid fertilizer program developed by Dr. Robert Wright. We run pour-through samples weekly and adjust our liquid feed accordingly. Under our old irrigation methods the formulation (initially, 10-4-6) had to be changed as many as five times due to the leaching of the nitrogen from the media. For the last two years we have been able to keep

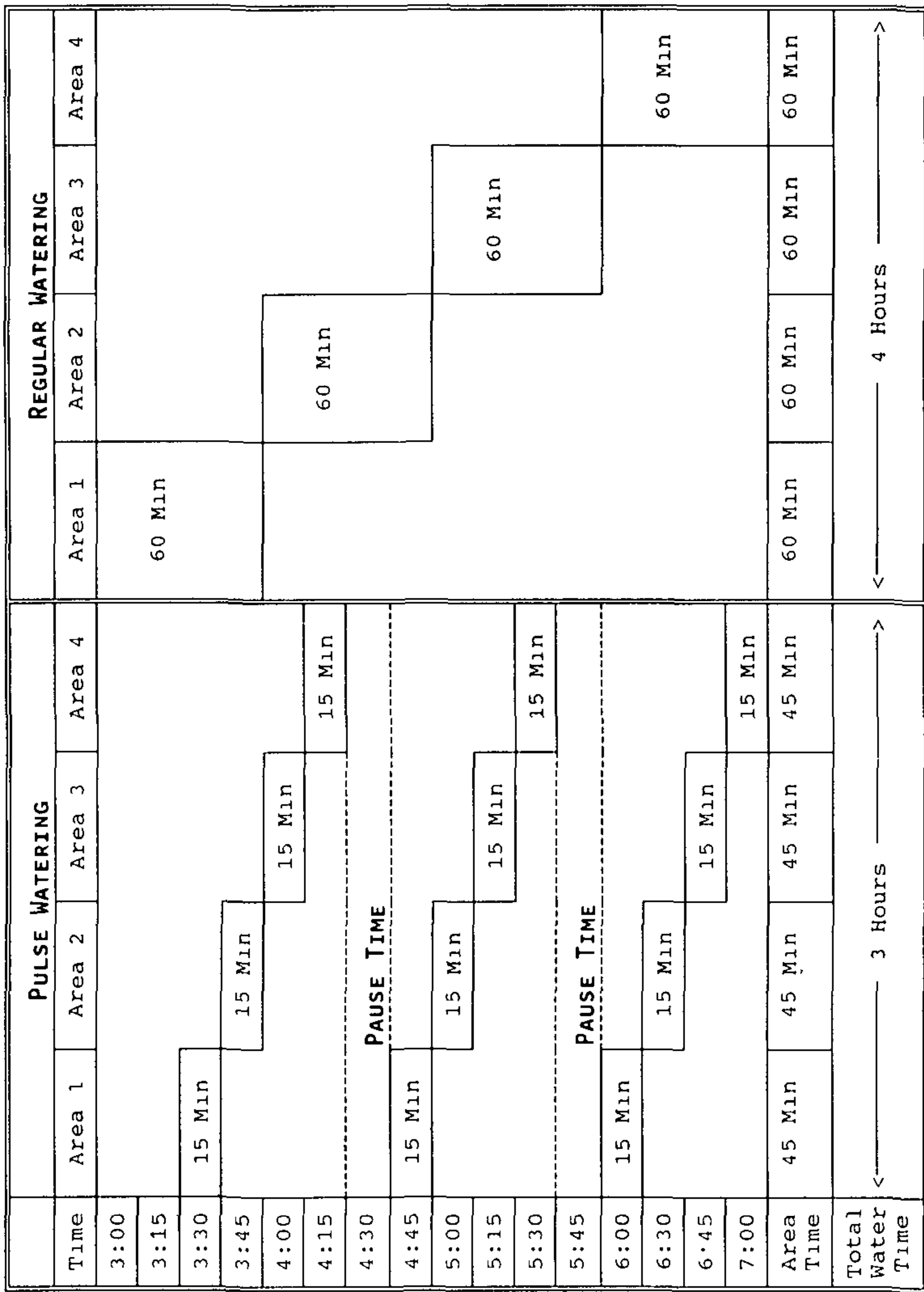


Figure 1. Comparison of timing using pulse watering vs regular watering

the 10-4-6 formulation throughout the growing season. Before pulse watering we were injecting the liquid fertilizer at a constant rate of 80 ppm nitrogen throughout the 60-min. watering cycle. We now inject the fertilizer at 60 ppm nitrogen only during the last two 15-min. pulses. We maintained the same plant growth and nutrient levels in the containers and cut our liquid fertilizer bill in half. We saved \$50,000 on liquid fertilizer the first year and cut our Osmocote cost by 20%.

Because of our limited water supply, we collect and recycle approximately 80% of our runoff. By the end of the summer, some of our holding ponds have had Solubridge readings as high as 0.65. Since we have reduced the fertilizer in our runoff, the water quality is much better. The highest Solubridge reading since pulse irrigation has been 0.38.

Pulse irrigation also makes it much easier to quickly build up nutrient levels in a container. This is particularly important in the latter part of the growing season when slow-release fertilizers sometimes run out and it's otherwise necessary to top dress with more fertilizer. It is also important in rebuilding fertilizer levels after heavy rains.

In order to set up a pulse watering program, you must have an automated irrigation system. You also need an irrigation controller that is dual programmable with at least three independent starts on each program. There are many controllers that have these capabilities. At Lancaster Farms we use an IRRI-TROL DIAL AB.

Pulse watering does have a few disadvantages to be considered. Any weak points in your irrigation system will become apparent very quickly. We conducted a series of tests using rain gauges and found most of our irrigation system applied water uniformly with an efficiency of approximately 75%. However, in one area where different nozzles and spacings were used, water quantities were very uneven. We tried three different irrigation heads and orifice sizes before we found a combination that was suitable for that area. You cannot expect a uniform nursery crop without uniform watering patterns.

Pulse watering would also be almost impossible if you cannot water at night. Field crews could not work around the pulse irrigation system as easily as the longer watering periods. Pulse irrigation method also will probably reduce the life of pump motors since they will have many more start-ups on a daily basis.

At Lancaster Farms, we are convinced that the advantages of pulse watering far outweigh the disadvantages. Not only are we reducing the cost of our fertilizer but we are making our recycling more manageable by lowering fertilizer runoff and reducing water consumption. All nurseries will be facing stiff government regulations and mandatory monitoring in the future. By using an

integrated program of recycling, pulse irrigation, and chlorination, Lancaster Farms hopes to be able to meet all environmental regulations.

REFERENCES

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