**Title**
Reducing Runoff from Irrigated Lands: Storing Runoff from Winter Rains



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# Storing Runoff from Winter Rains

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The California State Water Code requires anyone discharging waste that could affect the waters of the state to obtain a permit or coverage under a waiver. Agricultural runoff, whether from irrigation or rainfall, that leaves a property has been determined to likely contain waste (sediment, nutrients, chemicals, etc.).

Compliance under the Irrigated Lands Conditional Waiver is available to agricultural landowners who have runoff from their property caused by irrigation practices or winter rainfall. Since the regulations apply only to water leaving a property, some growers have suggested that they will keep all runoff water on their own property to avoid being impacted by the Irrigated Lands Conditional Waiver. This may be feasible for irrigation runoff since tailwater return systems can be used, but it is more problematic for runoff from winter rains.

The major difficulty in preventing runoff from winter rains is the large volume of water that must be dealt with. The California Water Code does not specify how frequently runoff must occur before the discharge must comply. Even if discharge occurs only during a very infrequent storm event (e.g., a 100-year storm, a rainfall event that has only a 1 percent chance of occurring in any year), the discharges may still need to comply.

How much water is involved? Rainfall varies greatly within the Central Valley of California and along the Central Coast. Table 1 shows the amount of rainfall during a 2-year 24-hour storm, a 25-year 24-hour storm, and during a 100-year 24-hour storm for selected locations in California. By definition, a 2-year storm would occur, on average, every 2 years; a 100-year storm would occur, on average, every 100 years. A 2-year 24-hour storm would therefore be the rainfall event one could expect during a 24-hour period on the average of every 2 years. In table 1, the rainfall (in inches) has been converted into gallons and cubic feet of runoff per acre of land. Not all of this rainfall would run off since some will soak into the soil, but a large portion of it could, especially during the less frequent (25-year and 100-year) storms.

For example, table 1 shows that in Redding a tremendous volume of storage would be required to store all the runoff from even the 2-year 24-hour storm: nearly 90,000 gallons per acre, or 0.28 acre-feet per acre of precipitation. This means that for a 40-acre field, a 2-year 24-hour storm would produce over 3,600,000 gallons (over 11 acre-feet) of water, much of which could run off.

A 100-year storm in Redding, falling on a 40-acre parcel, would produce over 6,700,000 gallons (over 20 acre-feet) of water! A pond nearly 1.5 acres in size and 10 feet deep could be required to store the runoff from just this one storm if two-thirds of the precipitation ran off. Even in a lower-rainfall area like Bakersfield, a 2-year storm could still produce over a million gallons of precipitation per 40-acre field, and a 100-year storm would produce precipitation of over 2 million gallons per 40-acre field.

Trying to store all winter rainfall on a property to avoid being a discharger regulated under the California Water Code is not practical. It is feasible, and often desired, to retain irrigation runoff on-site, but it is not feasible to do the same with winter rainfall runoff.

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**Table 1.** Estimated precipitation of 2-year, 25-year, and 100-year 24-hour storms for various locations in California

| Location | 2-year 24-hour storm | | | 25-year 24-hour storm | | | 100-year 24-hour storm | | |
|---|---|---|---|---|---|---|---|---|---|
| | (in) | (gal/ac) | (ft³/ac) | (in) | (gal/ac) | (ft³/ac) | (in) | (gal/ac) | (ft³/ac) |
| Bakersfield | 1.0 | 26,340 | 3,520 | 1.7 | 46,160 | 6,170 | 2.0 | 54,030 | 7,230 |
| Fresno | 1.4 | 38,830 | 5,190 | 2.4 | 65,170 | 8,710 | 2.9 | 77,930 | 10,420 |
| Lakeport | 3.0 | 81,450 | 10,890 | 5.0 | 135,760 | 18,150 | 6.6 | 179,500 | 23,990 |
| Monterey | 1.6 | 43,445 | 5,810 | 3.0 | 81,460 | 10,890 | 4.0 | 108,610 | 14,520 |
| Redding | 3.3 | 90,690 | 12,124 | 4.0 | 108,600 | 14,520 | 6.2 | 167,800 | 22,430 |
| Sacramento | 2.1 | 55,935 | 7,480 | 3.4 | 92,320 | 12,340 | 4.1 | 111,050 | 14,845 |
| San Luis Obispo | 3.3 | 89,600 | 11,980 | 5.8 | 157,485 | 21,055 | 7.0 | 190,065 | 25,410 |
| Santa Barbara | 3.0 | 81,460 | 10,890 | 6.0 | 162,915 | 21,780 | 8.0 | 217,220 | 29,040 |
| Stockton | 1.6 | 43,985 | 5,880 | 2.7 | 73,310 | 9,800 | 3.3 | 89,880 | 12,020 |
| Williams | 2.0 | 54,300 | 7,260 | 3.3 | 89,600 | 11,980 | 3.9 | 107,250 | 14,340 |

*Note:* For metric conversions, 1 in = 2.54 cm; 1 gal/ac = 9.36 l/ha; 1 $ft^3$/ac = 0.07 $m^3$/ha.

## FOR FURTHER INFORMATION

*Precipitation Frequency Atlas of the Western United States* (NOAA Atlas 2, 1973. See also the NOAA National Weather Service Web site, http://hdsc.nws.noaa.gov/hdsc/pfds/.

*Understanding Your Orchard's Water Requirements* (ANR Publication 8212), 2007.

*Measuring Irrigation Flows in a Pipeline* (ANR Publication 8213), 2007.

*Causes and Management of Runoff from Surface Irrigation in Orchards* (ANR Publication 8214), 2007.

*Managing Existing Sprinkler Irrigation Systems* (ANR Publication 8215), 2007.

*Soil Intake Rates and Application Rates in Sprinkler-Irrigated Orchards* (ANR Publication 8216), 2007.

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