Water Measuring Methods

Irrigation Best Management Practices depend upon conservation of water and the key to conservation is accurate water measurement. (NEH 9, Chapter 1)

Water is measured in a variety of ways. Measuring equipment commonly used include, weirs, flumes, submerged orifices, current meters, acoustic meters, and various other open channel and closed conduit devices. Generally water measurement is reported in different units, mainly depending upon type of irrigation and local custom. In the United States, it is commonly reported, in gallons per minute (gpm), millions of gallons per day (mgd), cubic feet per second (cfs), acre inches (ac-in), and acre feet (af).

Flow Meter (Propeller) mounted on steel pipe. (Mike Standefer, Portales, NM)

QT=DA

Q – Flow rate in cubic feet per second

T – Time in hours

D – Depth in inches

A – Area in acres

E.G. – 10 cubic feet per second flowing for 12 hours will cover 40 acres to a depth of 3 inches.

Without measurement, there can be no management.

Measuring Irrigation Water

Using the Float Test

1. Multiplying the Average Speed of the Stream flow by the Cross-sectional Area.
    1. Select a straight run in the stream
    2. Make several measurements of the depth of a cross-section to get an average depth
    3. Measure the width of the steam. If the width is not uniform for the run of stream selected take several widths and compute the average.
    4. Figure the cross-sectional area of the stream. Example: The stream is 4 ft. wide with an average depth of 6 in.

$$\frac{4 \text{ ft.} \times 6 \text{ in.}}{12 \text{ in./ft.}} = 2 \text{ ft.}^2$$

2. Determine the Average Speed of the Stream Flow
    1. Mark and measure a length of run to be checked (Such as 100 ft.)
    2. Drop a float (cork or other suitable object) into the stream at the upper end of the marked section of run
    3. Record the time it takes the object to make it to the end of the marked run
    4. Determine flow rate. Example: The float takes 2.1 minutes to travel 100 ft.

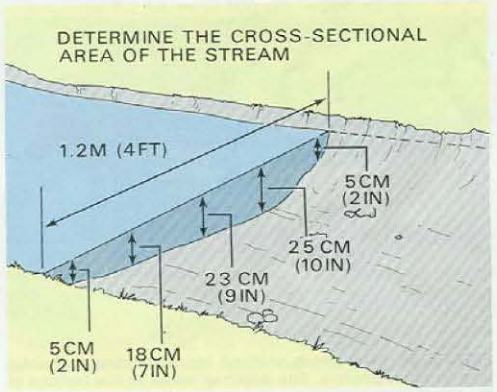
$$\frac{100 \text{ ft.}}{2.1 \text{ min.}} = 47.6 \text{ ft/min}$$

3. Estimate the Amount of Water Flowing in the Stream.
    1. Multiply the cross-sectional area of the stream from step 1 x the average speed of the stream flow from step 2.

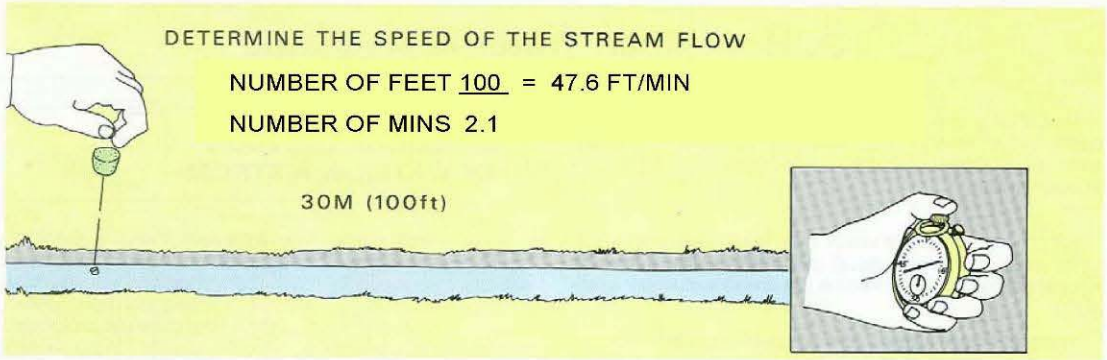
$$2 \text{ ft.}2 \times 47.6 \text{ ft/min} = 95 \text{ ft.}3/\text{min.} \times \frac{1 \text{ min.}}{60 \text{ sec.}} = 1.58 \text{ cfs}$$

    2. Multiply the flow by the roughness factor (0.8 x the indicated flow speed of the stream)

$$0.8 \times 1.58 \text{ cfs} = 1.27 \text{ cfs}$$



. Measurements to be made for determining the cross-sectional area of a stream.



. Checking and computing the stream flow.

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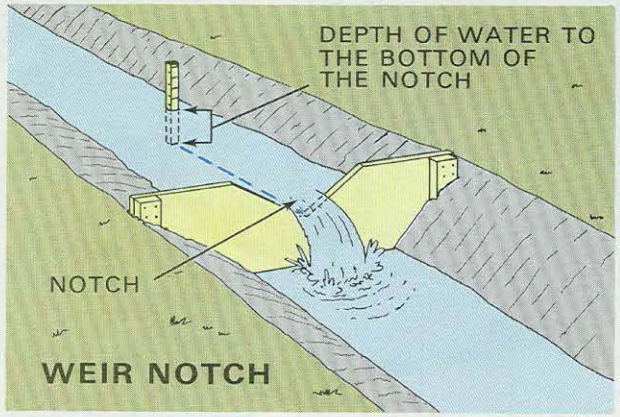
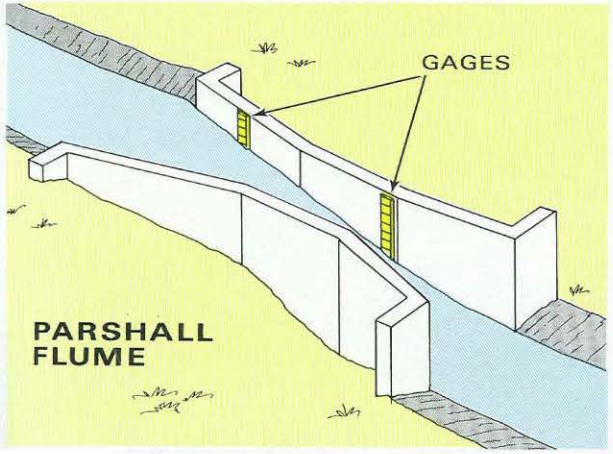
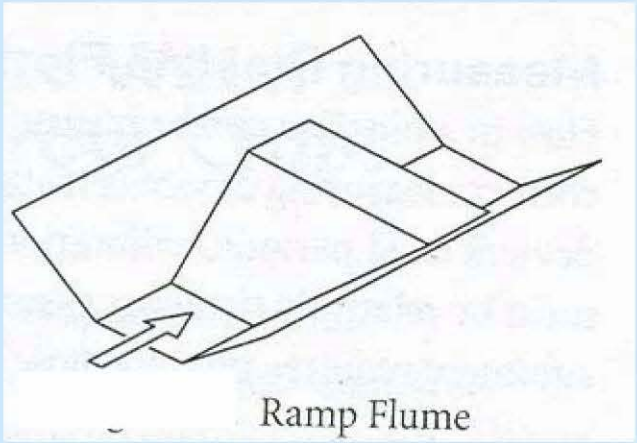


Weir notch method for measuring the water flow in open ditches. The depth of water to the bottom of the notch is measured up-stream from the notch by a gage. Then the quantity of flow is determined from a table of values prepared for this type of Weir notch.



. When using a Parshall flume, the depth of the water is measured at 2 points in the flume by gages. Then the quantity of water flow is determined from a table of values prepared for that particular flume.



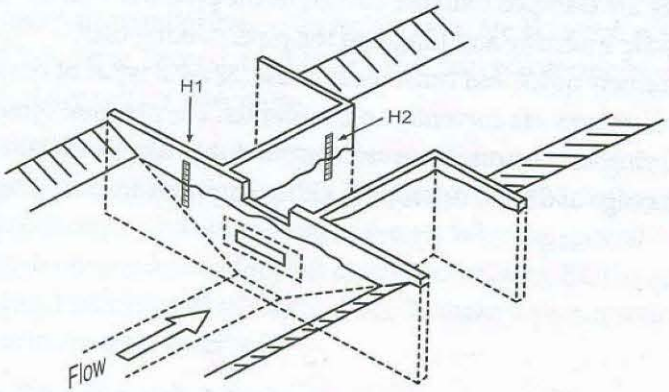


Figure 14. Submerged Orifice