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Measuring Flow

IN

SMALL STREAMS

MARVIN SHEARER
Extension Irrigation Specialist



Federal Cooperative Extension Service
Oregon State College
Corvallis

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Why Measure Stream Flow?

Small streams flowing year around provide a good source of water for irrigation. The quantity of water flowing and the area of land that it can serve should be known before pumps and expensive irrigation equipment are purchased.

How Is Stream Flow Measured?

The simplest way to measure small stream flow is with a weir.

A weir is a bulkhead placed across a stream so that all of the water in the stream flows through a notch which has been constructed on the top edge of the bulkhead. This notch is usually faced on the upstream side with light-weight sheet metal to give accurate measurement.

By measuring the difference in height (H) between the weir crest and the surface of the water at a reference point 3 feet upstream from the weir and applying this reading to a weir table the amount of water flowing over the weir is determined.

When Should Stream Flow Be Measured?

Stream flow should be measured at weekly intervals throughout the growing season of the crop which is to be irrigated. Pastures require irrigation all summer while some row crops require irrigation only through July or August.

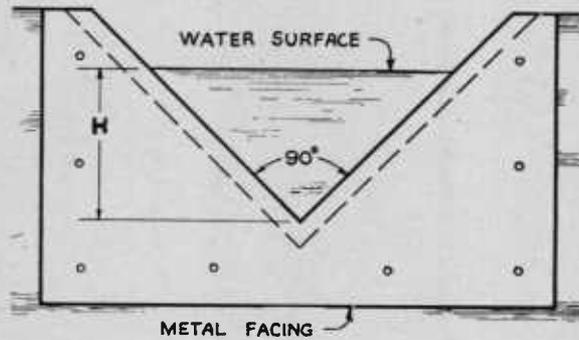
How Much Water Is Required Per Acre?

Water requirements vary with different crops and with different areas. Stream flow varies from one year to the next. Plan safely. It is suggested that a continuous stream flow of 7 gallons per minute be allowed for each acre of pasture and 10 gallons per minute be allowed for each acre of row crop.

Construction of Weir

► The 90° V-Notch weir should be used for very small streams which will not exceed a flow of 100 gallons per minute.

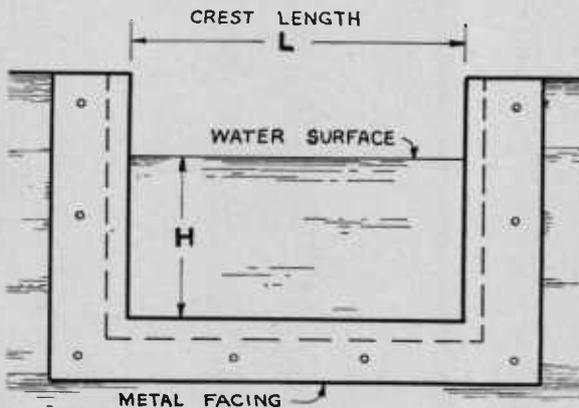
The bulkhead is made of 1-inch material and should be large enough to reach across the stream. The notch should be 9 to 12 inches deep.



A 90° V-Notch Weir

► The rectangular weir should be used for stream flows from 47 gallons per minute up.

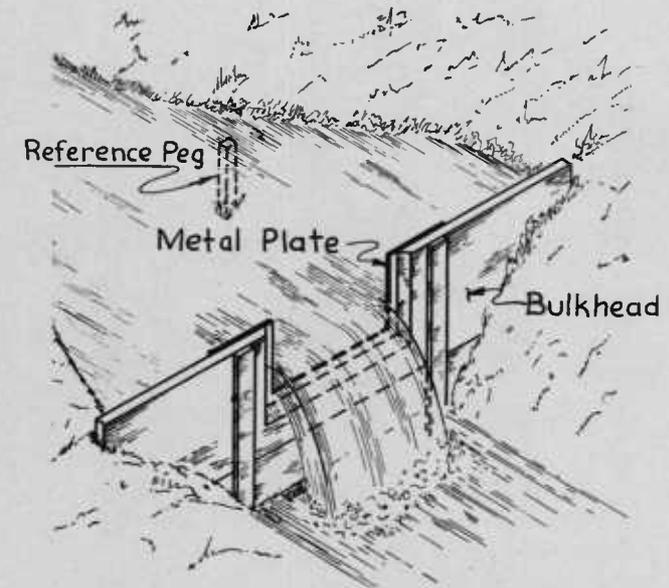
The bulkhead is made of 1-inch material and should be large enough to reach across the stream. A crest length (L) of 1'0" is suggested for flows of 47 gallons per minute to 486 gallons per minute. A crest length (L) of 2'0" is suggested for flows from 95 gallons per minute to 990 gallons per minute. The notch should be 9 to 12 inches deep for both crest lengths.



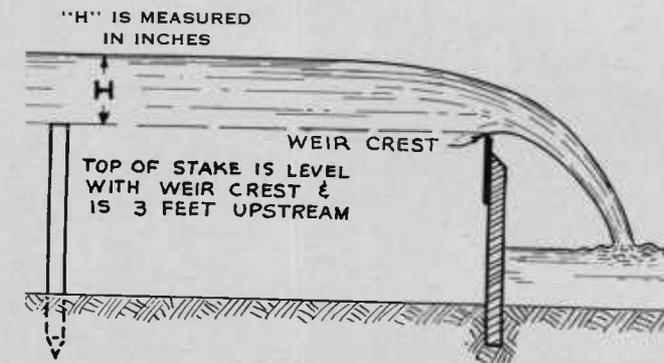
A Rectangular Weir

Installation of Weir

The weir must be placed perpendicular to the flow of water, level and plumb with the metal facing on the upstream side.



Properly installed rectangular weir and reference peg



A reference peg is driven into the creek bottom about 3 feet upstream from the weir. Measurements are made with a common ruler.

Measurement of Flow

The measurement ("H") is taken from the top of the peg to water level (see drawing under Installation). The reading applied to Table 1 will show the quantity of water flowing over the weir.



Measuring "H" over a rectangular weir.

Suggestions

- ▶ A carpenter's level can be used to level and plumb weir and place reference peg at desired level.
- ▶ Water should touch no part of weir after leaving crest until it strikes the downstream water.
- ▶ Make certain that *all* water goes over the weir.
- ▶ If several 1-inch boards are used to form the bulkhead, the cracks should be sealed to prevent leakage.
- ▶ Locate the weir where the stream is wide enough to make the water comparatively "still" above the weir.

Table 1. WEIR FLOW TABLE

"H"	90° V-notch weir	Rectangular weir	
		1'0" crest length	2'0" crest length
<i>Inches</i>	<i>gpm</i>	<i>gpm</i>	<i>gpm</i>
1 3/16	3.6	46	95
1 5/16	4.6	54	110
1 7/16	5.7	62	125
1 9/16	6.8	70	140
1 11/16	8.1	77	157
1 13/16	9.5	86	173
1 15/16	11.2	95	190
2 1/16	13.1	103	208
2 3/16	15.2	112	227
2 1/4	17.5	122	246
2 3/8	19.9	131	265
2 1/2	22.5	140	284
2 5/8	25.3	151	305
2 3/4	28.3	161	325
2 7/8	31.6	171	346
3	35.1	182	368
3 1/8	38.8	193	389
3 1/4	42.8	203	411
3 3/8	47.0	215	434
3 1/2	51.4	226	459
3 5/8	56.0	237	482
3 3/4	60.8	249	504
3 13/16	65.8	261	531
3 15/16	71.1	273	554
4 1/16	76.7	285	576
4 3/16	82.6	297	603
4 5/16	88.8	310	630
4 7/16	95	323	653
4 9/16	101	335	680
4 11/16	108	348	707
4 13/16	115	362	734
4 15/16	122	375	761
5 1/16	130	388	788
5 3/16	137	402	815
5 1/4	145	416	846
5 3/8	154	430	873
5 1/2	162	444	900
5 5/8	171	459	932
5 3/4	181	473	959
5 7/8	190	486	990

Table 2. SUGGESTED ACREAGE THAT CAN BE SERVED

Minimum flow	Pasture	Row crops
	<i>Acres</i>	<i>Acres</i>
7 gpm	1	½
14 gpm	2	1
28 gpm	4	3
56 gpm	8	5
112 gpm	16	11
224 gpm	32	22
448 gpm	64	45
896 gpm	128	90