

Estimating irrigation withdrawals

Susan S. Hutson
U.S. Geological Survey
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Problems in estimating IR wu

- ❑ Unknown number of irrigated acres
 - ❑ Single or multiple cropping practice
 - ❑ Source of water, surface-, ground-, reclaimed waste water
 - ❑ Application rates for irrigation system
 - ❑ Additional irrigation uses, such as frost protection or harvesting
 - ❑ Permitted amounts and use amounts
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Methods for estimating irrigation withdrawals

- Metering
 - Metering of a statistically determined sample
 - Application of coefficients for crops or irrigation systems
 - Reported data required through permitting
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Metering irrigation water withdrawals

- ❑ Rarely are all ground-water wells and surface-water intakes metered.
 - ❑ Extent of the metering determined by the need for the data in decision-making.
 - ❑ Meters are either in-line meters or non-invasive flow meters
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Metering irrigation water withdrawals

- Water meters—properly selected and maintained—can be the most accurate and easiest method for measuring water flow.
 - Improve water-use efficiency
 - Determine pumping plant efficiency to allow water to be supplied as inexpensively as possible
 - Detect potential well, pump or irrigation system problems
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Metering irrigation withdrawals

Units of measurement

- ❑ 1 acre-inch = volume of water that would cover an acre one inch deep
 - ❑ 1 acre foot = volume of water that would cover an acre one foot deep
 - ❑ 1 cubic foot = volume of water that would fill a container by one foot long and one foot deep
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Metering water withdrawals

Flow rates

- 1 gpm = the rate of flow necessary to fill a gallon container in one minute
 - 1 cfs = the rate of flow in an area of 1 square foot, and moving at a velocity of one foot per second
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Metering water withdrawals

Inline flow meters

- Impeller meters
 - Operate continuously
 - Direct flow read-outs
 - Positive displacement meters
 - Small irrigation systems
 - Operates with a timer
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Metering irrigation water use USGS metering study

Comparison of two approaches for
determining ground-water discharge
and pumpage in the Lower Arkansas
River basin, Colorado, 1997-98

by *Russell G. Dash, Brent M. Troutman,
and Patrick Edelmann*

Water Resources Investigations Report
99-4221

Water Resources Investigations Report 99-4221

Results

- Totalizing flowmeter measurements
 - Inline meter

 - Portable flowmeter measurements
 - Power conversion calculations and computations of pumpage
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Irrigation water use
Statistical sampling--Benchmark farm study

A Field and statistical modeling study to
estimate irrigation water use at
benchmark farm study sites in
southwestern Georgia, 1995-1996

by *Julia L. Fanning, Gregory E. Schwarz,
and William C. Lewis*

Water-Resources Investigations Report
00-4292

Irrigation water use—Indirect method

Pump capacity & # applications

Variables: number of applications, hours per application, pump capacity

applic * hrs * conversion factor =mgd

$$4 * 12 \text{ h} * \left(\frac{1,200 \text{ g}}{\text{m}} * \frac{60 \text{ m}}{\text{h}} \right) / 10^6 \text{ gal} = .009 \text{ mgd}$$

Irrigation water use—indirect method

Crop Consumptive Irrigation Requirement CCIR

□ Variables: Acreage, CCIR

applic * acreage * CCIR * conversion to mgd / 365

$4 * 40 * \frac{0.90 \text{ acres/ft}}{\text{acre}} * \frac{0.3259 \text{ mil gals}}{365} = 0.129 \text{ mgd}$

Estimating irrigation water use

Soil classification, region, crop type

Variables: crop type, acreage, # applic, soil classification, location

Applic * rate of applic * acreage *
conversion factor to mgd / 365 = mgd

$$4 * \frac{0.298 \text{ acre-ft}}{\text{acre}} * 40 \text{ acres} * \frac{0.3259 \text{ million gallons}}{\text{acre-foot}} / 365 = 0.043 \text{ mgd}$$

Non-crop irrigation Golf courses

Variables: number of holes

Unknown: number of acres

Approach: generalize the # acreage

Fairways

Greens

Tees

Irrigation water use

Golf course requirement

Greens

- ~2 acres
- 4 in/wk growing season 1.5 in/wk non-growing

Fairways

- ~40 to 50 acres
- 1.25 to 1.5 in/wk

Tees

- 3.5 to 4.0 acres
 - 1.25 to 1.5 in/wk
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Irrigation water use Permit reporting

- Water allocation or water withdrawal?
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