

Quantifying the Economic Benefit of More Water for Agriculture: Expanding Irrigated Lands

INTRODUCTION

Where, when, and how much? These are the three critical questions for OCR when considering options for making more water available for agriculture. An important starting point is to quantify the economic benefits of making additional water available. This analysis discusses how to do this in the context of issuing new water right.

ESTIMATING WATER VALUES

In order to assign values to water for alternative uses it is convenient to think in terms of \$/acre-foot. From an economic perspective, the value of water is the additional revenue net of production costs that accrue to the farmer from being able to use another acre-foot of water. The two numbers needed for this calculation are estimates of the profit per acre, which is often taken from enterprise budgets, and water use per acre. Of course, both of these numbers are crop and location specific. Dividing the prior by the latter gives an estimate of water value.

$$\$/\text{acre-foot} = (\text{profit}/\text{acre})/(\text{acre-feet}/\text{acre})$$

$$\text{Example: } (\$300/\text{acre})/(4 \text{ aft}/\text{acre}) = \$75/\text{acre-foot}$$

This is a single year value. To calculate the total value from using the water in perpetuity apply the present value formula

$$\text{Total Value} = (\text{single year value})/(\text{discount rate})$$

A common assumption for the discount rate is 4%.

$$\text{Example: } \$75/0.04 = \$1,875/\text{acre-foot}$$

AVERAGE VS. MARGINAL VALUES

Diminishing returns implies that the value of water should decrease the more that is made available for agricultural use. A value that changes with quantity requires estimating values “at the margin”. One reason is that remaining unirrigated land is lower quality than currently irrigated land. However, as long as (1) high quality land remains, (2) increased supply of crops does not depress prices, and (3) crop mix on new irrigated acres is similar to the mix on the existing irrigated acres in the region one can assume that the marginal value of water is equal to the average value for the WRIA.

ANALYSIS

With the discussion of marginal versus average values in mind, there were two parts to the analysis:

- 1. What is the quality of the remaining unirrigated land in the area?**
- 2. Estimate an average water value for each WRIA**

The objective is to create a simple yet reliable tool for assessing the economic benefits of making new irrigation water available for the purpose of expanding irrigated extent by WRIA. Note that no assessment of cost of supplying new water is mentioned. This analysis only provides ½ of a benefit-cost analysis.

Part 1. Land Quality

Quantify the quality of the remaining land based currently not irrigated by WRIA is done by combining data from the WSDA on irrigation and from USGS on soil classifications.

An alternative approach is to rely on local knowledge by eliciting information on whether or not there is interest in getting a new water right if there was a cost associated with the right. This was considered in a survey that was part of another component of the Forecast.

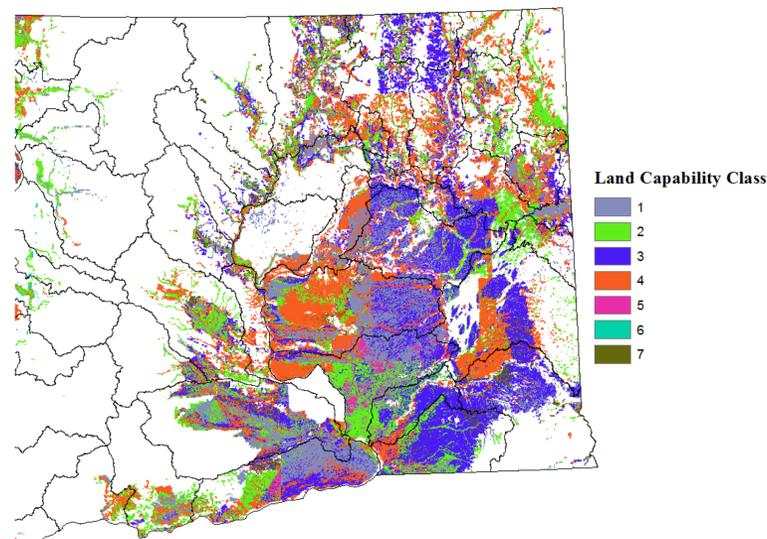


Figure 1. Map of irrigated land capability classes in Eastern Washington (source: USGS). The lower the number the more productive is the soil. Nearly all crops can only be grown on Classes I-IV.

Part 2. Water value by WRIA based on current crop mix.

To estimate an average water value by WRIA the WSDA Cropland Data Layer was combined with assumptions on profit per acre by crop type and water use per acre. The values displayed below are essentially an average water value weighted by the existing irrigated crop mix.

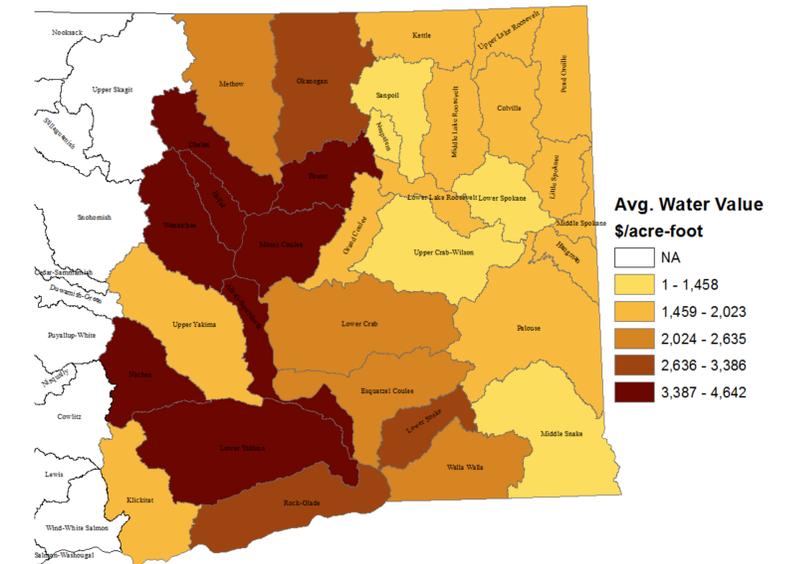


Figure 32. Estimates of the value of additional water for agriculture assuming that (1) there is unirrigated land of similar quality to currently irrigated land and (2) the crop mix on the newly irrigated land is similar to existing irrigated crop mix. These represent the total value of water, or the present value of water available in perpetuity.

CONCLUSIONS

While most regions in Eastern Washington have fully allocated water resources there are opportunities to issue new water rights in some locations. The first step to determining the economic benefits of issuing new rights is to have an estimate of the value of new water made if available that is location specific. This analysis demonstrates how to arrive at an estimate for all WRIsAs in Eastern Washington.

