Estimated Depletion Reduction Calculation Methodology

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Colorado River Authority of Utah
Lily Bosworth

Management and Technical Consulting for Agricultural Resilience and Demand Management Pilot Program
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1. Introduction

The Colorado River Authority of Utah (the Authority), in accordance with the Authority's 2022 Colorado River Management Plan (Authority 2022), is implementing an intrastate Utah Demand Management Pilot Program (DMPP) to begin during irrigation season 2025. The purpose of the DMPP is to identify opportunities and challenges associated with developing a full-scale, long-term agricultural demand management program in Utah. Specifically, the DMPP will seek to implement projects that achieve water conservation through reduced depletion of water. Coordinating with the Utah Division of Water Rights to distribute and account for the reduced depletion through a change application process on the subject water right(s) will help the Authority test demand management and maintain 1922 Colorado River Compact compliance.

In March 2024, the Authority hired Jacobs Engineering Group Inc. (Jacobs) and their subconsultant partners to assist in developing, administering, designing, and implementing the DMPP. This report summarizes the depletion reduction calculation methodologies used by Jacobs and their subconsultants for each project type included in the DMPP (which are fallowing, irrigation system conversion, and storage forbearance) and specifies the assumptions and data sources used to support depletion reduction estimates for the DMPP's first project cycle to begin with irrigation season 2025.

2. Data Sources

Table 2-1 summarizes data sources used to calculate depletion reduction estimates for the DMPP's first project cycle. These data sources directly support calculations and methods described in this report. Additional references are provided throughout this report.

Table 2-1. Summary of Key Data Sources Used in Depletion Reduction Calculations

Data Source	Usage	Reference	Additional Notes
eeMETRIC (version 0.20.26)	All ET estimates discussed in this report are actual ET estimates from OpenET's eeMETRIC model, rather than potential ET estimates. Monthly eeMETRIC data is used to derive ET inputs used in Equations 1, 2, and 3. The forms of ET used in this report are: ▪ Growing season[a]: ET ▪ Nongrowing season[a]: ET_{win} ▪ Monthly: ET_{mon}	OpenET (2024)	OpenET provides satellite-based estimates of the total amount of water that is transferred from the land surface to the atmosphere through the process of evapotranspiration. The gridded monthly results from the eeMETRIC model are used to determine actual ET in this methodology consistent with UCRC (2022).
SSURGO	SSURGO data are used in Equation 2, Equation **3**, and Equation **4**.	NRCS (2024)	AWS for soil depth 0 to 59 inches
Literature	The equation to calculate annual depletion in inches (Equation 1) is from Hill (1989). Annual depletion (inches) is calculated as evapotranspiration (during growing season), minus nongrowing season SM_{co} at start of irrigation season, minus P_{eff} (growing season).	Hill (1989)	--
Literature	Equation 2 uses crop rooting depths (RZ) to calculate SM_{co}.	Crop rooting depths based on Jacobs (2024) in the Colorado River Basin and assumptions based on CCC (2024), Sertse et al. (2019), Dharmasri et al. (1993), Allen et al. (2015), St. John et al. (2017), Pleasant (2023), and Franzen et al. (2005).	--

Data Source	Usage	Reference	Additional Notes
DMPP applicants	Field boundaries	None	Field boundaries were self-reported by applicants and digitized based off maps included in DMPP applications.
NASA DAYMET	Precipitation data are used in Equation 1, Equation **2**, and Equation **3**. ▪ Effective precipitation; an estimate of the portion of precipitation that supports plant growth during the irrigation season: P_{eff} ▪ Monthly precipitation: P_{mon} ▪ Winter/nongrowing season precipitation: P_{win}	DAYMET (2024)	DAYMET provides localized, monthly precipitation. The gridded monthly results are used to derive P_{eff}, P_{mon}, P_{win}.

[a]Growing season is April 1 to October 31, and the nongrowing season is November 1 to March 31.

AWS = Available water storage

DAYMET = Data Daily Surface Weather and Climatological Summaries

DDMP = Utah Demand Management Pilot Program

eeMETRIC = Google Earth Engine Implementation of the Mapping Evapotranspiration at High Resolution with Internalized Calibration

ET = evapotranspiration (actual)

ET_{win} = non-growing season evapotranspiration (actual)

ET_{mon} = monthly evapotranspiration (actual)

NASA = National Aeronautics and Space Administration

NRCS = Natural Resource Conservation Service

P_{mon} = monthly precipitation

P_{win} = non-growing season precipitation

P_{eff} = effective precipitation

SM_{co} = carry-over soil moisture

SSURGO = Soil Survey Geographic Database

3. Methodology

3.1 Establishing Baseline (Historical) Depletion

For the purpose of the DMPP, depletion is the net removal of water from either the water source or the hydrologic system. In theory, depletion from irrigation is the difference in consumptive water use between the irrigated condition and what would have occurred in the non-irrigated condition (Barker pers. comm. 2025). Equation 1 provides the annual depletion calculation, consistent with Hill (1989), that helps to establish a historical (7-year) depletion depth (based on water years 2016 through 2023) from which an estimate of depletion reduction can be developed. For fields that participated in SCPP during the historical period, the 7-year period was 2016 to 2022. For all other fields, the 7-year period was 2017 to 2023.

The Google Earth Engine implementation of the Mapping Evapotranspiration at high Resolution with Internalized Calibration (eeMETRIC) model (OpenET 2024) helps to determine actual evapotranspiration (ET) in this methodology, consistent with the *Consumptive Use Measurement in the Upper Colorado River Basin* (Resolution of the Upper Colorado River Commission; UCRC 2022). All ET estimates discussed in this report and used in the equations (ET, ET_{mon}, and ET_{win}) are actual ET estimates from OpenET's eeMETRIC model, rather than potential ET estimates. ET of the growing season is the summation of April through October monthly ET values, where monthly ET values are mean values within each field boundary utilizing gridded ET data. Carry-over soil moisture (SM_{co}) and effective precipitation (P_{eff}) are computed as shown in **Equation 2** and **Equation 3**, respectively.

$$\text{Depletion (inches)} = ET - SM_{co} - P_{eff} \qquad \textbf{Equation 1}$$

Where:

ET	=	growing season[1] OpenET eeMETRIC ET_{act} (inches) (OpenET 2024)
P_{eff}	=	growing season effective precipitation (inches)
SM_{co}	=	winter/nongrowing season carry-over soil moisture at start of irrigation season (inches)

For each field, the annual depletion depth (inches) was converted to a volume in acre-feet by converting inches to feet and multiplying the depth by the field size in acres; the resulting water year depletions were joined with the field boundary to create a field-scale depletion model, identifying the historical depletion volume (based on water years 2016 through 2023) for each field included in DMPP applications. The median historical depletion volume in the seven-year baseline period is assigned to each field included in the DMPP applications.

SM_{co} for each field was calculated using winter/nongrowing season ET data (OpenET 2024), daily surface weather and climatological summaries (DAYMET) precipitation data (DAYMET 2024), the available water storage (AWS) for soil depth 0 to 59 inches (0 to 150 centimeters) (NRCS 2024), and crop rooting depths (provided in Table 3-1). Winter precipitation and ET values are calculated as the sum of the monthly precipitation and ET values for the non-growing season. Mean values within each field boundary are pulled from monthly precipitation and ET datasets to represent single monthly values per field. When multiple crops were grown in a single season, the average rooting depths of the different crops were used. Historical crop types for the seven-year baseline period were identified by applicants. If crop types were not identified, the field was assumed to grow alfalfa for the entirety of the study period. This assumption

[1] For all equations, the growing season is April 1 through October 31, and the winter/nongrowing season is November 1 through March 31.

was based on the high volume of alfalfa growth in the study area. Equation 2 provides the SM_{co} calculation, consistent with Hill (1989). Available water capacity (AWC) was computed as the ratio of the AWS and maximum soil depth of 59 inches (NRCS 2024).

$$SM_{co} = minimum(0.67 * (P_{win} - 1.25 * ET_{win}), 0.75 * RZ * AWC) \quad \textbf{Equation 2}$$

Where:

SM_{co} = winter/nongrowing season carry-over soil moisture at start of irrigation season (inches)
P_{win} = winter/nongrowing season precipitation (inches)
ET_{win} = winter/nongrowing season ET (inches)
RZ = crop rooting depth (inches)
AWC = soil available water capacity (inch per inch)

Table 3-1. Crop Rooting Depths

Crop	Rooting Depth (inches)
Alfalfa	54
Apples	42
Apricots	42
Barley	36
Beans	24
Berries	36
Canola	36
Cherries	42
Corn	36
Durum wheat	36
Field crop unspecified	36
Flaxseed	35
Grain/seeds unspecified	36
Grapes	36
Grass hay	24
Horticulture	24
Idle pasture	39
Melon	60
Mustard	47
Oats	36
Onion	30
Orchard unspecified	42
Pasture	39
Peaches	42
Potato	30
Pumpkins	60
Rye	36
Safflower	60

Crop	Rooting Depth (inches)
Sorghum	36
Soybeans	24
Spring wheat	36
Squash	24
Sugar beets	48
Sunflower	48
Triticale	36
Turfgrass ag	24
Vegetables	24
Watermelons	60
Winter wheat	36

[a]Crop rooting depths are based on Jacobs (2024) and assumptions based on the CCC (2024), Sertse et al. (2019), Dharmasri et al. (1993), Allen et al. (2015), St. John et al. (2017), Pleasant (2023), and Franzen et al. (2005).

P_{eff} is an estimate of the portion of precipitation that supports plant growth during the irrigation season. P_{eff} was calculated monthly using methodology shown in Equation 3, consistent with the United States Department of Agriculture (USDA 1970). Total monthly precipitation was obtained from DAYMET (2024), and total monthly crop evapotranspiration was assumed to be ET obtained from OpenET (2024). Mean of the precipitation and ET grid cell values whose cell centers lie within each field boundary are used in Equation 3, P_{mon} and ET_{mon} respectively, to calculate monthly effective precipitation at the field scale. The summation of growing season computed P_{eff} from Equation 3 was used to calculate depletion using Equation 1.

$$P_{eff} = SF(0.70917P_{mon}^{0.82416} - 0.11556)(10^{0.02426ET_{mon}})$$ **Equation 3**

Where:

P_{eff} = monthly effective precipitation (inches)
SF = soil water storage factor
P_{mon} = monthly precipitation (inches)
ET_{mon} = monthly crop evapotranspiration (inches)

The soil water storage factor is defined by Equation 4, consistent with USDA (1970), which states the following: "the term D was generally calculated as 40 to 60 percent of the available soil water capacity in the crop root zone, depending on the irrigation management practices used." Original **Equation 3** and **Equation 5** were developed before sprinkler irrigation was common. For surface irrigation, best practice then—and in many cases now—is to deplete the soil to about 50 percent AWS and then refill to field capacity. This practice, however, is not reasonable for most sprinkler systems, especially center pivots, where water application typically occurs before water depletion from the soil reaches 50 percent AWS. A value of 40 percent of AWS strikes a balance between surface and sprinkler irrigation management practices and was used in this methodology (Barker pers. comm. 2025). SSURGO AWS data (NRCS 2024) were obtained to support quantification of usable water storage (D in Equation 4) and was summarized as an area-weighted average within each DMPP applicant field boundary. Thus, the soil water storage factor was calculated at the field scale.

$$SF = 0.531747 + 0.295164D - 0.057697D^2 + 0.003804D^3$$ **Equation 4**

Where:

SF = soil water storage factor
D = usable soil water storage (inches)

3.2 Estimating Depletion Reduction Opportunity

The depletion reduction opportunity estimation methods for each DMPP project type (fallowing, irrigation system conversion, and storage forbearance) are described in the following subsections.

3.2.1 Fallowing

The depletion reduction opportunity for full-season (April 1 – October 31) fallowing of an applicant field was assumed consistent with the median estimated depletion volume for the subject field over the last 7 years; 7 years was chosen as a reasonable period to capture both wet and dry hydrologic conditions in the DMPP area. Due to lack of available data for 2024, a 7 -year baseline period was established for the 2017 -through -2023 period of record. For applicants who fallowed their field(s) during this period as part of the System Conservation Pilot Program (SCPP), all non-SCPP participation years within an adjusted baseline period of 2016 through 2022 were used. The median value from this 7 -year period was used to represent “typical” conditions for a given field. Median values are commonly used by the Natural Resources Conservation Service when dealing with hydrologic data to limit the bias of rare yet abnormal weather phenomena (USDA 2025).

For partial season fallowing, a similar approach was used, but carryover soil moisture was only incorporated in the depletion estimate if it was not depleted prior to the start of the fallowing period. Additionally, only the depletions for months with planned fallowing activities were considered to estimate depletion reduction. For example, if an applicant intended to fallow their field from July through October, the depletion estimate would likely simplify to July through October ET less July through October effective precipitation, as carryover soil moisture was oftentimes exceeded by the ET for the months of April through June. Thus, winter carryover soil moisture would be consumed by the crop prior to the start of the fallowing period. Sample depletion reduction opportunity estimates for both full and partial season fallowing cases of a single field are provided in Appendix A.

3.2.2 Irrigation System Conversion

Irrigation system conversion depletion reduction calculation methods are still in development. No irrigation system conversion project applications were received for DMPP in 2025.

3.2.3 Storage Forbearance

The depletion reduction volume associated with reservoir storage forbearance applications[2] was estimated using the same method used by SCPP (UCRC 2024). The estimated volume of water released from storage (acre-feet) was multiplied by a combined efficiency factor to account for both conveyance losses and irrigation losses (Equation 5). Conveyance and irrigation efficiency factors were both estimated at 80 percent (and a 20 -percent loss was assumed for each), with a combined efficiency factor of 64 percent (Bosworth pers. comm. 2025).

Depletion reduction (acre-feet) = **Equation 5**

$$Reservoir\ release\ volume\ (acre - feet) * \text{ conveyance efficiency } * \text{ irrigation efficiency}$$

[2] Evaluations of the recommended depletion reduction methodology are ongoing for those applications involving both fallowing and storage forbearance projects. Sufficient information is not yet available to support those estimates.

Where:

Conveyance efficiency	=	80 percent (Bosworth pers. comm. 2025a)
Irrigation efficiency	=	80 percent (Bosworth pers. comm. 2025a)

4. Discussion

This report summarizes the data sources, assumptions, and methodology used to obtain depletion reduction estimates associated with the DMPP. The DMPP methodology varies from the methodology used by SCPP in several ways (Table 4-1).

Table 4-1. Differences in Depletion Reduction Estimation Methodologies Used by SCPP and DMPP

SCPP	DMPP
SCPP used an eight-year baseline period of 2016 through 2023 (Bosworth pers. comm 2025b).	The DMPP used a seven-year baseline period (2016 to 2022 for fields which participated in SCPP in the baseline period, and 2017 to 2023 for all other fields) based on professional judgment, considered to be a reasonable period to capture both wet and dry hydrologic conditions, and aligned with the latest SCPP report available at the time the analysis began (UCRC 2024).
Consumptive use from precipitation was estimated at a nearby non-irrigated area of the same general area and similar properties (e.g., a reference field). Thus, the depletion of the applicant field was estimated as the consumptive use of the applicant field less the consumptive use of the reference field.	Consumptive use from precipitation was calculated at the applicant field from effective precipitation and winter carryover soil moisture.
The baseline depletion reduction opportunity was calculated as the average value over the baseline period.	The baseline depletion reduction estimate was calculated as the median of the baseline period. Median values are commonly used by the Natural Resources Conservation Service when dealing with hydrologic data to limit the bias of rare yet abnormal weather phenomena (USDA 2025).
For split season fallowing alternatives, fields that were to be irrigated before the start of the fallow period, water stored in the soil zone due to irrigation before the start of fallowing was estimated, as the crop would continue consuming that water during the fallow period. The estimated consumptive use from the soil storage was subtracted from the total CCU (UCRC 2024).	For split-season fallowing alternatives, only remaining winter carry-over soil moisture was subtracted from the depletion reduction opportunity estimate, based on commencement of fallowing practices (early season or late season) and a comparison of ET values against carry-over soil moisture.

Jacobs, in coordination with the Authority, plans to continuously improve upon the methods described in this report. They are currently working with the OpenET team to investigate instances where fields with a smallest dimension of less than 100-200 meters may be suffering from a low ET bias due to influence from adjacent non-irrigated fields [the LANDSAT thermal pixel is about 90 meters in width; therefore, fields with narrow edges could contain ET values biased by non-irrigated areas (Melton pers. comm. 2025). Additional analysis is also planned to determine if mean or median depletion values obtained from the seven-year historical lookback period would better represent a baseline depletion value for the fallowing projects chosen by the Authority. These changes may be contemplated and summarized in future versions of this report.

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Appendix A
Example Field Calculation

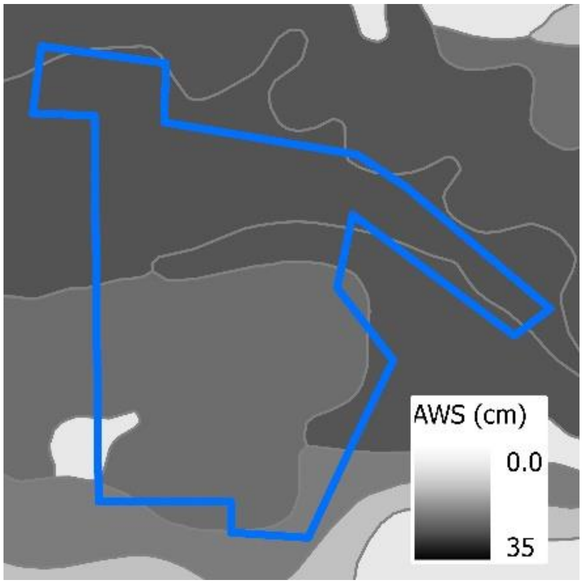
A.1 Example Field Calculation

This attachment outlines the calculation of full-season and split-season fallowing for the example field shown on Figure A-1. The methodology followed is outlined in the *Estimated Depletion Reduction Calculation Methodology Technical Memorandum*. The example field has a total irrigated area of approximately 90 acres. The calculation steps are as follows:

Figure A-1. Example Field

1. The available water storage (AWS) in the first 59 inches (150 centimeters) of soil is obtained from the Natural Resources Conservation Service (NRCS 2024) Web Soil Survey. Using ArcPy tools in python, the area-weighted average AWS is added as an attribute to the field boundary layer. The area-weighted average AWS in the first 59 inches (150 centimeters) of soil for the example field is 9 inches (24 centimeters), as shown on Figure A-2 and in Table A-1 where 2,138 acre-centimeters / 90 acres = 24 centimeters.

Figure A-2. Available Soil Water Storage



Source: NRCS (2024)

Table A-1. Available Water Storage for Example Field

AWS (centimeters)	Area (acres)	AWS x Area (acre-centimeters)
22	42	930
21	3	59
26	34	886
6	1	5
26	10	258
TOTAL	**90**	**2,138**

2. Usable soil water storage (D) was taken as 40 percent of the AWS. Therefore, D of the example field was 4 inches (40 percent of 9 inches, rounded to the nearest inch).

3. The soil water storage factor (SF) was then calculated based on Equation A1:

$$SF = 0.531747 + 0.295164*4 - 0.057697* 4^2 + 0.003804*4^3 = 1 \qquad \textbf{Equation A1}$$

4. The spatial mean of OpenET's eeMETRIC actual evapotranspiration (ET) and DAYMET precipitation data within each field boundary is obtained for each monthly timestep using zonal statistics in ArcPy. For July 2020, the example field received 0.2 inch of precipitation. Evapotranspiration (ET) from the example field for July 2020 was 5.3 inches. ET and precipitation summaries for the example field are presented in Table A-2 and Table A-3, respectively.

Table A-2. Evapotranspiration for Example Field (inches) (2017 to 2023)

Month	2017	2018	2019	2020	2021	2022	2023
November[a]	0.7	0.5	0.8	0.7	0.3	1.2	0.3
December[a]	0.2	0.4	0.1	0.3	0.2	0.7	0.0

Month	2017	2018	2019	2020	2021	2022	2023
January	0.0	0.3	0.2	0.0	0.3	0.1	0.0
February	0.1	0.3	0.3	0.5	0.1	0.3	0.2
March	0.5	0.5	0.5	0.5	0.2	1.0	0.8
April	1.7	1.9	3.0	1.9	0.9	1.6	2.1
May	2.5	3.1	4.4	5.1	2.2	3.0	3.8
June	5.2	1.9	5.1	5.7	4.2	3.2	5.4
July	3.3	2.5	4.3	5.3	3.3	2.3	6.7
August	3.6	1.8	3.5	3.9	3.8	2.8	5.7
September	2.9	1.9	2.7	2.3	3.7	3.1	3.5
October	1.5	0.9	1.5	1.7	2.7	2.4	1.9
ET_{win}[b]	**1.5**	**2.1**	**1.9**	**2.0**	**1.0**	**3.2**	**1.5**
ET[c]	**20.6**	**14.0**	**24.5**	**25.9**	**20.9**	**18.4**	**29.0**

Source: OpenET (2024).

[a]November and December values shown are for previous calendar year.

[b] Sum of ET from November 1 to March 31 (winter).

[c] Sum of ET from April 1 to October 31.

Table A-3. Precipitation for Example Field (inches)

Month	2017	2018	2019	2020	2021	2022	2023
November[a]	0.3	0.1	0.8	1.7	0.7	0.2	0.2
December[a]	1.1	0.1	0.3	1.6	0.5	1.6	0.9
January	2.2	0.7	1.2	0.2	0.5	0.0	2.2
February	0.5	0.3	1.6	0.4	0.4	0.9	0.2
March	1.5	0.5	2.0	1.6	0.6	0.6	1.7
April	0.2	0.8	0.7	0.1	0.8	0.2	0.0
May	0.3	0.8	2.2	0.0	0.1	0.1	0.7
June	0.3	0.5	0.3	0.9	0.6	0.7	0.8
July	1.4	0.7	0.3	0.2	1.5	0.1	0.6
August	0.9	1.0	0.2	0.0	2.0	0.9	2.1
September	1.3	0.0	0.4	0.0	0.8	2.1	0.3
October	0.0	3.4	0.1	0.0	2.0	0.4	0.3
P_{win}[b]	**5.6**	**1.6**	**5.6**	**5.6**	**2.8**	**3.3**	**5.1**

Source: DAYMET (2024)

[a] November and December values shown are for previous calendar year.

[b] Sum of precipitation from November 1 to March 31 (winter).

5. Effective precipitation (P_{eff}) was calculated for every month of the growing season in the baseline period based on Equation A2, where SF of the example field equals 1 (from step 3 above):

$$P_{eff} = 1 * (0.70917 P_{mon}^{0.82416} - 0.11556)(10^{0.02426 ET_c})$$ **Equation A2**

For July 2020, the calculation results were as follows:

$$P_{eff} = 1 * (0.70917 * 0.2^{0.82416} - 0.11556)(10^{0.02426*5.3}) = 0.1 \text{ inch}$$

Monthly P_{eff} estimates are shown in Table A-4.

Table A-4. Effective Precipitation for Example Field

Month	2017	2018	2019	2020	2021	2022	2023
November[a]	0.2	0.0	0.5	1.1	0.4	0.1	0.0
December[a]	0.7	0.0	0.2	1.0	0.3	1.0	0.6
January	1.3	0.4	0.8	0.1	0.3	0.0	1.3
February	0.3	0.2	0.9	0.2	0.2	0.5	0.0
March	0.9	0.3	1.2	1.0	0.4	0.4	1.0
April	0.1	0.5	0.5	0.0	0.5	0.1	0.0
May	0.1	0.6	1.6	0.0	0.0	0.0	0.5
June	0.2	0.3	0.2	0.7	0.4	0.5	0.7
July	1.0	0.5	0.2	0.1	1.1	0.0	0.5
August	0.6	0.7	0.1	0.0	1.5	0.7	1.7
September	0.9	0.0	0.2	0.0	0.6	1.5	0.2
October	0.0	2.0	0.0	0.0	1.3	0.3	0.1
P_{eff}[b]	**3.0**	**4.5**	**2.9**	**0.8**	**5.5**	**3.1**	**3.6**

[a] November and December values shown are for previous calendar year.

[b] Sum of effective precipitation from April 1 to October 31.

6. Winter SM_{co} was calculated according to Equation A3. The example field is a grass and alfalfa mix; therefore, the root zone depth for the entire field was assumed to be the average of the grass hay (24 inches) and alfalfa (54 inches) crop rooting depths, which equates to a rooting depth of 39 inches (Table A-2). Because the crop composition of the example field does not vary from 2017 through 2023, a single root depth value is used; however, root depth can vary by year if the crop composition varies between irrigation seasons. Available water capacity (AWC) is equal to the AWS in the first 59 inches of soil (0.16 inch per inch for the example field). Winter (November through March) precipitation and ET_{win} values are summarized in Table A-3 and Table A-2, respectively. For 2020 at the example field, the resulting carry-over soil moisture (SM_{co}) is as follows:

$$SM_{co} = minimum\left(0.67 * (5.6\ inches - 1.25 * 2.0\ \text{inches}), 0.75 * 39\ inches * 0.16\frac{inch}{inch}\right) = minimum\ (2.1, 4.6) = 2.1\ \text{inches.} \qquad \textbf{Equation A3}$$

The resulting annual winter SM_{co} values for the example field are in Table A-5.

Table A-5. Winter Carry-Over Soil Moisture for Example Field

Year	SM_{co} (inches)
2017	2.5
2018	0.0
2019	2.4
2020	2.1
2021	1.0
2022	0.0
2023	1.4

7. Annual depletion was calculated at the field-scale based on Equation A1. To convert depletion from a depth to a volume, the depletion estimates were multiplied by the field area, which totaled 90 acres for the example field. Annual depletion estimates for the example field are shown in Table A-6. The depletion reduction opportunity under the full-season fallowing alternative for this field was 114 acre-feet, which is the median value from the 7 -year baseline period shown in Table A-6.

   The approach for calculating the depletion reduction opportunity of a split-season fallow closely followed the full-season fallow approach discussed previously with one key difference: depletion was calculated monthly. For this difference, winter SM_{co} was depleted starting in April (shown in Table A-7). After cumulative irrigation-season ET exceeds the sum of the cumulative irrigation-season P_{eff} and winter SM_{co}, monthly depletion is equal to ET minus P_{eff} only, and winter SM_{co} is removed from the calculation.

Table A-6. Depletion Estimates for Example Field

Year	ET (inches)	SM_{co} (inches)	P_{eff} (inches)	Depletion (inches)	Depletion (feet)	Depletion (acre-feet)
2017	20.6	2.5	3.0	15.2	1.3	113.4
2018	14.0	0.0	4.5	9.5	0.8	71.0
2019	24.5	2.4	2.9	19.2	1.6	144.0
2020	25.9	2.1	0.8	23.0	1.9	172.1
2021	20.9	1.0	5.5	14.4	1.2	107.7
2022	18.4	0.0	3.1	15.3	1.3	114.4[a]
2023	29.0	1.4	3.6	24.0	2.0	179.5

[a] In this example, 2022 corresponded to the median depletion-value in the seven-year baseline period. So, the depletion reduction opportunity for this field under the full-season fallowing alternative was approximately 114 acre-feet.

Table A-7. Monthly Depletion Calculation for Example Field for Year 2020

Month	Starting SM_{co} (inches)	Ending SM_{co} (inches)	P_{eff} (inches)	ET (inches)	Depletion (inches)
April	2.1	0.2	0.0	1.9	0.0
May	0.2	0.0	0.0	5.1	4.9
June	0.0	0.0	0.7	5.7	5.0
July	0.0	0.0	0.1	5.3	5.2
August	0.0	0.0	0.0	3.9	3.9
September	0.0	0.0	0.0	2.3	2.3
October	0.0	0.0	0.0	1.7	1.7

If the applicant desired to fallow their field before August, then their depletion reduction opportunity for the year 2020 would be equal to the sum of their April through July depletion estimates, or 113 acre-feet (15.1 inches). If the applicant desired to fallow their field following the end of July, then their depletion reduction opportunity for the year 2020 would be equal to the sum of their August through October depletion estimates, or 59 acre-feet (7.9 inches). Similar to the full-season fallowing alternative, the median depletion estimate in a baseline period of 7 years was used to determine the overall split-season depletion reduction opportunity.

A.2 References

Daily Surface Weather and Climatological Summaries (DAYMET). 2024. Precipitation data for study area. National Aeronautics and Space Administration, Oak Ridge National Laboratory, Distributed Active Archive Center. Accessed August 2024. https://daac.ornl.gov/cgi-bin/dataset_lister.pl?p=32.

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