

Appendix H

2020 UCRB Crop Map

UCRB\_IrrCrops\_2020\_20210615.shp is the 2020 map of irrigated crops within the UCRB (Upper Colorado River Basin) that was produced as a part of the Upper Colorado River Commission's Phase 3, Year 4 Project. This map will be used to 1) identify irrigated agricultural areas within the 2020 SSEBop and METRIC ETa maps of the UCRB, and 2) to provide location-specific irrigated crop acreages for input to the Penman-Monteith and modified Blaney-Criddle crop coefficient models.

### **State-by-State Data Processing**

The crop maps and other information used to generate the 2020 UCRB crop map came from the following sources. Due to the change of schedule between 2019 and 2020 for updating the UCRB Phase 3 project, no states were able to generate new irrigated crop layers in time to be included in the 2020 UCRB crop map. The general assumption was that crop types and irrigation status has not changed significantly since the 2019 growing season, however, it's recommended that an adjustment be made to the corresponding state office's schedule so that updated crop maps can be used in future maps. A brief description of the datasets used to create the UCRB irrigated crop map, and the processing performed on them is provided below.

#### **Wyoming**

The most recent digital irrigated crop layer generated by Wyoming State Engineer's Office (WYSEO) of the Upper Green River Basin in Wyoming represents the 2019 growing season. However, WYSEO requested that the 2018 irrigated crop layer be used instead of the 2019 layer, due to 2018 conditions being similar to 2020. The 2018 map was a product of pixel-by-pixel classification of Landsat imagery, and was provided in raster format. All pixels identified as irrigated were assumed to be grass unless they were sprinkler-irrigated – in which case they were assumed to be alfalfa. WYSEO also provided a separate shapefile identifying sprinkler-irrigated lands (circa 2017). The 'sprinkler' shapefile was rasterized to the same 30-meter grid as the Landsat-based irrigation status classification and used to identify the pixels from the irrigation status map whose crop type would be changed from 'Grass' to 'Alfalfa'. The rasterized irrigated crop map was then converted to a polygon shapefile. A visual comparison with the 2020 Cropland Data Layer (CDL) was performed and no significant changes were identified.

#### **Utah**

The most recent digital irrigated crop layer generated the Utah Department of Water Resources (UTDWR) represents the 2019 growing season. A visual comparison with the 2020 CDL was performed and no significant changes were identified. UTDWR provided a shapefile of the 2019 'Water Related Land Use' (WRLU) map and the general assumption was that crop types and irrigation status has not changed significantly over this time. A visual comparison with the 2020 CDL was performed and no significant changes were identified. The WRLU map identifies lakes, rivers, riparian areas, and other land cover categories not related to irrigated agriculture. Irrigated and subirrigated lands were identified and extracted from the WRLU map with the following logic.

```
"State" = 'UT' AND "Basin" IN ( 'Southeast Colorado River', 'Uintah', 'West Colorado River') AND  
"Landuse" = 'Agricultural' AND "LU_Group" IN ( 'Active IR', 'SubIRR')
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## **Colorado**

The most recent digital irrigated crop layer (2015) generated by the Colorado Water Conservation Board was incorporated into the 2019 UCRB irrigated lands map. All mapped polygons are identified as irrigated in 2015, and the general assumption was that crop types and irrigation status did not change significantly over time. However, two kinds of edits were done to make the 2015 map more current. First, fields shown to have extremely low vegetative cover as evidenced by average seasonal (4/1/19 – 10/31/19) maximum Landsat NDVI (from surface reflectance) values less than or equal to 0.3 were recoded as 'Not Irrigated' for 2019. Second, 21 new agricultural fields totaling 1610 acres were added to the map, most of which were center pivots in the Towaoc area in southwest Colorado. Crop type attributes for these new polygons came from the 2019 Cropland Data Layer (CDL). A similar approach was applied using the 2020 CDL, however, no significant changes were identified between the 2019 UCRB and 2020 UCRB irrigated lands map for Colorado.

## **New Mexico**

2019 Irrigated crop maps for New Mexico came from three sources: the New Mexico Interstate Stream Commission (NMISC), the Navajo Nation Department of Water Resources (NNDWR), and Reclamation (USBR).

### *Non-Tribal Lands*

The 2019 NMISC map covers all non-tribal irrigated agriculture along the Animas, La Plata, and San Juan Rivers (approximately 14,200 acres). The map identifies both irrigated and not irrigated polygons. Six of the mapped land cover classes (315 polygons comprising 1501 acres) have ambiguous crop type labels that contain both irrigated and non-irrigated lands (i.e., 'Fallow', 'Inaccessible', 'Native Veg', 'Other Crop', 'Plowed', and 'Unclassified'). Irrigation status and crop type was estimated for these polygons using ancillary datasets such as high-resolution imagery, multidate satellite imagery, maximum and mean seasonal (4/1/19 – 10/31/19) NDVI imagery, the 2019 Cropland Data Layer, and the 2018 crop classification.

### *Tribal Lands Along the San Juan River*

The 2019 NNDWR map covers about 7600 acres of irrigated agriculture within the Navajo Nation along the San Juan River. The map contains both irrigated and non-irrigated land cover classes which are unambiguously labeled.

### *Navajo Indian Irrigation Project*

The Navajo Irrigation Project encompasses the majority of irrigated lands within New Mexico's portion of the UCRB (approximately 66,000 acres). The Bureau of Indian Affairs (BIA) maintains a GIS database of irrigated lands within the Navajo Indian Irrigation Project (NIIP). In the past, BIA shared a tabular database of 2017 and 2018 irrigated acreage by NIIP irrigation block that Reclamation used in combination with the respective year Cropland Data Layer (CDL). During production of the 2019 crop map BIA was unable to share the block data with Reclamation due to privacy concerns. Reclamation updated the NIIP crop map using publicly available data, such as the CDL, seasonal NDVI, maximum NDVI, and multidate satellite imagery from the USGS Global Visualization Viewer to assign the most appropriate crop type. During this 2020 update BIA was again able to share a tabular database for 2019 and 2020 NIIP crop data by irrigation block. Comparing these data to the updates performed in 2019 displayed only minor differences in total crop acreage, despite some variation in year to year crop type. Reclamation was unable to distinguish where these small changes occurred without more detailed spatial information, so the 2019 map data was not changed and remains the same for 2020.

