January 18, 2019
Middle Colorado Water Council
Alan Martellaro, Div Engineer
WATER DIVISION 5 – AB LINE
SHOSHONE POWER PLANT

Colorado River nr Dotsero and Shoshone Power Plant
SHOSHONE RIGHTS

- Shoshone Power Plant
  - Senior right 1250cfs; 1902 approp date, 1905 priority
  - Junior right 158cfs; 1929 approp date, 1940 priority
  - Earliest Call June 17th
  - River above considered over-appropriated Mid June through Mid April of following year.
  - Historically with low flows in the winter operator repaired one of the two generating units in January
GRAND VALLEY OPERATIONS

Colorado River nr Cameo to Colorado River at Palisade gages
## Cameo Demand

<table>
<thead>
<tr>
<th>User</th>
<th>Amount, cfs</th>
<th>Use</th>
<th>Adj date</th>
<th>Approp date</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>GVIC</td>
<td>520.81</td>
<td>Irrigation</td>
<td>7/22/1912</td>
<td>8/22/1882</td>
<td></td>
</tr>
<tr>
<td>GVIC</td>
<td>119.47</td>
<td>Irrigation</td>
<td>7/25/1941</td>
<td>4/26/1914</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total = 640.28</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMID</td>
<td>10.2</td>
<td>Irrigation</td>
<td>7/22/1912</td>
<td>10/01/1900</td>
<td></td>
</tr>
<tr>
<td>OMID</td>
<td>450</td>
<td>Irrigation</td>
<td>7/22/1912</td>
<td>10/25/1907</td>
<td></td>
</tr>
<tr>
<td>OMID</td>
<td>400/800</td>
<td>Power</td>
<td>7/25/1941</td>
<td>02/27/1908</td>
<td>400 summer, 800 winter, 310 peak irrig</td>
</tr>
<tr>
<td></td>
<td>Total = 860.2/800</td>
<td></td>
<td></td>
<td></td>
<td>Peak Irrigation demand = 770</td>
</tr>
<tr>
<td>PID</td>
<td>80</td>
<td>irrigation</td>
<td>7/22/1912</td>
<td>10/01/1889</td>
<td></td>
</tr>
<tr>
<td>MCID</td>
<td>40</td>
<td>irrigation</td>
<td>7/22/1912</td>
<td>7/06/1903</td>
<td></td>
</tr>
<tr>
<td>GVWUA</td>
<td>730</td>
<td>Irrigation</td>
<td>7/22/1912</td>
<td>02/27/1908</td>
<td></td>
</tr>
<tr>
<td>PID</td>
<td>23.5</td>
<td>Irrigation</td>
<td>7/25/1941</td>
<td>06/01/1918</td>
<td>Subject to space available</td>
</tr>
<tr>
<td></td>
<td>Total = 850</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grand Total</td>
<td>2260</td>
<td></td>
<td></td>
<td></td>
<td>640+770+850</td>
</tr>
</tbody>
</table>
Colorado River mainstem annual call days

- **Shoshone call days**
- **Cameo call days**

The chart shows the number of call days per year from 1995 to 2018 for the Colorado River mainstem. The data is categorized into call days for Shoshone and Cameo, with each year represented by a bar.
FIRST DAY MAINSTEM CALL FOLLOWING SNOWMELT RUNOFF

Shoshone/Cameo
First call day following runoff

- 2015
- 2010
- 2005
- 2000
- 1995

9-Jun 24-Jun 9-Jul 24-Jul 8-Aug 23-Aug 7-Sep 22-Sep 7-Oct 22-Oct
1937 Authorizing Legislation for CBT

GMR 154,685 AF
  + 52KAF replacement for CBT
  + Compensatory storage in 100KAF power pool

GMR and CBT are 1935 water rights

100KAF power pool released for west slope irrigation and domestic users at no cost limited to:
  + 1250cfs at Shoshone
  + April 15- October 15
  + If not required for these purposes is available for oil shale and industrial users.
Result of 1977 drought 100KAF power pool could not indefinitely provide for all future irrigation and domestic needs

Defined 100KAF power pool as:
- 66KAF for HUP
- 5KAF for Silt Project
- 20KAF for contract pool

Removed 1250cfs and Apr15-Oct15 limits
Decreed October 1, 1996
  + A simple exchange of 640cfs

Stipulation limited the 2260cfs demand to a 1950cfs call, i.e. 310cfs OMID power would check at full irrigation demand

HUP beneficiaries not curtailed as long as:
  + Check structure is operable
  + GMR HUP stores 66KAF
  + Shoshone Power Plant operates as historic
Intent of HUP surplus is for endangered fish

HUP Operating Criteria – attached to stipulation
  + Managing entities – USBR, GVIC, GVWUA, OMID, DWR, CWCB, and USFWS
  + Purpose
    × Protect HUP beneficiaries
    × Define when a surplus in HUP exists
  + Rule curve – maintain HUP within drawdown band

Weekly HUP meetings
WEEKLY HUP MEETINGS DATA SHEET

<table>
<thead>
<tr>
<th>HUP Flow Sheet</th>
<th>August 29, 2018</th>
<th>1-877-785-6122 7961779</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Colorado River &amp; Tributary flows (cfs)</strong></td>
<td>Remarks</td>
<td></td>
</tr>
<tr>
<td>Colorado River &amp; Tributary flows (cfs)</td>
<td>Remarks</td>
<td></td>
</tr>
<tr>
<td>Colorado River @ Catamount</td>
<td>1760</td>
<td>Natural Flow = 1760 – (25×223+20)(0.95) – 134(0.95) – (463+20)(0.95) = 919 cfs</td>
</tr>
<tr>
<td>Roaring Fork @ Glenwood</td>
<td>Gage Down</td>
<td></td>
</tr>
<tr>
<td>Colorado River @ Catamount</td>
<td>2080</td>
<td>Natural Flow = 2080 – (25×223+20)(0.95) – (6566)(0.925) – (463+20)(0.95) = 1283 cfs</td>
</tr>
<tr>
<td>Plateau Creek @ Cameo</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Colorado River @ Palisade</td>
<td>750</td>
<td></td>
</tr>
<tr>
<td><strong>River Call Status</strong></td>
<td>Shoshone Sr. 20477.1899</td>
<td>Grand Valley Project 22729 21241</td>
</tr>
</tbody>
</table>

**Reservoirs**

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Decred Capacity (acft)</th>
<th>Inflow (cfs)</th>
<th>Remaining or Total Content (acft)</th>
<th>Total Outflow (cfs)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Granby Res</td>
<td>543,758</td>
<td>5,412</td>
<td>481,744</td>
<td>90</td>
<td>Adams Tunnel = 441 cfs</td>
</tr>
<tr>
<td>5,412 E. Slope pool</td>
<td>5,412</td>
<td>2,407</td>
<td>2,407</td>
<td>20</td>
<td>Direct Delivery to GVIC</td>
</tr>
<tr>
<td>Grand County IA</td>
<td>1,000</td>
<td>662</td>
<td>662</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Williams Fork Res.</td>
<td>93,637</td>
<td>83,453</td>
<td>83,453</td>
<td>100</td>
<td>Moriah Tunnel = 47 cfs, 28 from Meadow Cr.</td>
</tr>
<tr>
<td>Upper Blue Res.</td>
<td>3,140</td>
<td>1,679</td>
<td>1,679</td>
<td>100</td>
<td>Con Hooper Tunnel = 0 cfs</td>
</tr>
<tr>
<td>Dillon Res.</td>
<td>252,678</td>
<td>224,885</td>
<td>224,885</td>
<td>895</td>
<td>Roberts Tunnel = 300 cfs</td>
</tr>
<tr>
<td>Green Mtn. Res.</td>
<td>154,645</td>
<td>97,570</td>
<td>97,570</td>
<td>895</td>
<td>Direct Del. GVIC/GVP = 63/400 = 463 cfs</td>
</tr>
<tr>
<td>HUP</td>
<td>66,000</td>
<td>23,203</td>
<td>23,203</td>
<td>650</td>
<td>HUP Repl. = 53/134 cfs</td>
</tr>
<tr>
<td>Contract/Silt</td>
<td>20,000</td>
<td>13,154/3,366</td>
<td>13,154/3,366</td>
<td>R20 – 28</td>
<td>Silt = 20 cfs</td>
</tr>
<tr>
<td>Contract</td>
<td>52,000</td>
<td>66</td>
<td>66</td>
<td>75</td>
<td></td>
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<tr>
<td>Wellford Res.</td>
<td>65,953</td>
<td>41,010</td>
<td>41,010</td>
<td>271</td>
<td>Contract Release = 4 cfs Wetlands = 0 cfs</td>
</tr>
<tr>
<td>West Slope Fish</td>
<td>6,000</td>
<td>2,173</td>
<td>2,173</td>
<td>25</td>
<td>West Slope Pool Release = 223 cfs</td>
</tr>
<tr>
<td>DWB Pool</td>
<td>24,000</td>
<td>24,000</td>
<td>24,000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Radee Res.</td>
<td>102,369</td>
<td>79,800</td>
<td>79,800</td>
<td>176</td>
<td>Seed from Rocky Fork = 178 Total</td>
</tr>
<tr>
<td>Contracts</td>
<td></td>
<td></td>
<td></td>
<td>66</td>
<td></td>
</tr>
<tr>
<td>5k Turn</td>
<td>5,000</td>
<td>5,000</td>
<td>5,000</td>
<td>0</td>
<td>Boustead Tunnel = 0 cfs</td>
</tr>
<tr>
<td>5k Slope pool</td>
<td>5,412</td>
<td>3,680</td>
<td>3,680</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>SL (47 years)</td>
<td>5,000</td>
<td>5,000</td>
<td>5,000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Ute WCD</td>
<td>6,000</td>
<td>6,000</td>
<td>6,000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2K Granby insurance</td>
<td>2,000</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Grand Valley Diversions (cfs)**

<table>
<thead>
<tr>
<th>Entity / Facility</th>
<th>Decreed Capacity</th>
<th>Flow</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>GVIC</td>
<td>520/119 cfs</td>
<td>625</td>
<td>Fish Passage – Off Fish Screen – Not Operational</td>
</tr>
<tr>
<td>Gov't High Line Canal</td>
<td>160 cfs</td>
<td>145</td>
<td>Fish Passage – Off Fish Screen – Operational</td>
</tr>
<tr>
<td>Palisade Pipeline</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OMID Power Canal</td>
<td>860 cfs</td>
<td>759</td>
<td></td>
</tr>
<tr>
<td>to irrigation</td>
<td>160 +10 cfs</td>
<td>149</td>
<td></td>
</tr>
<tr>
<td>Returns from Irr. pumping</td>
<td>290 cfs</td>
<td>610</td>
<td></td>
</tr>
<tr>
<td>Returns from Power Plant</td>
<td>390/90 cfs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amt. Checked</td>
<td>640 cfs</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>15 MR Target</td>
<td>810</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
HUP RULE CURVE

2017 GREEN MOUNTAIN RESERVOIR HUP OPERATIONS

- HUP Storage Volume
- Dry Year Lower Band
- Dry Year Upper Band
2018 GREEN MOUNTAIN RESERVOIR HUP OPERATIONS

- HUP Storage Volume
- Dry Year Lower Band
- Dry Year Upper Band

HUP RULE CURVE

HUP STORAGE VOLUME (Acre-Feet)

SHOSHONE CALL REDUCTION

+ Denver Water agreement with Xcel Energy signed 2006.
+ Runs through 2032
+ Relaxes call to one turbine or 704cfs
+ Limit – cannot cause Cameo demand up to 1950cfs to not be met
+ Implemented under certain defined water shortage conditions
+ Denver pays for lost power caused by all upstream depletions, not just Denver’s.
SHOSHONE OUTAGE PROTOCOL

1. The agreement was signed in 2016 and continues for 40 years

2. Concerns leading to agreement, If Shoshone Power Plant shutdowns for any reason;
   a. Call cannot be exercised
   b. Curtailed right resume diversions, causing flows to drop
   c. Recreation, fish, and others have come to rely on the operation of the Shoshone Power Plant
   d. Many water rights and augmentation plans have been developed with Shoshone as the controlling right.

3. Intent of Protocol
   a. keep the flow regime as historically influenced by the Senior Shoshone Call
   b. mitigate the impacts of any Shoshone Outage.
SHOSHONE OUTAGE PROTOCOL

- “Shoshone Outage” is whenever the Senio Shoshone Call cannot be fully exercised.
- Non-parties may continue to divert under their priorities.
- Whenever an outage occurs parties will operate as if the “Senior Shoshone Call” is in place up to 1250 cfs
- Winter Season:
  a. Parties will operate their water resources as if the Shoshone Senior Call were on for up to 900 cfs,
  b. Except for a cumulative total of 17 days during January and February of each Winter Season, in consideration for historic maintenance at the power plant.
1. Agreement was finally signed this year, and continues for a 40 year term.
2. Operated protocol informally prior to 2016 as if fully executed.
3. The Shoshone Power Plant experienced an outage in October 2016, when the protocol was operated as a formal agreement.
Colorado River at Palisade

- historic minimum
- 2018 with deliveries
- "2018 without deliveries"

Discharge, cfs
CROS - ENHANCE PEAK

- Bypass storable inflow at participating reservoirs
- Each operator considers current conditions, to participate, re-operation can’t impact current year yield of reservoir
- Goals is to Enhance Peak in 15 mile reach for 10 days
- Limits as measured at Cameo:
  + Minimum flow = 12,500cfs
  + Maximum flow = 24,500cfs
CROS - ENHANCE PEAK

Spring 2017 CROS Operations

Discharge, cfs


Gaged Flow, with CROS ops
without CROS ops

Division of Water Resources
Department of Natural Resources
Endangered Fish recovery program

In lieu of Flow requirements that will prevent future development, except for a carve out, the Recovery Program, has accepted

- CWCB ISF
- Fish ladders and screens
- CROS
- Summer flow augmentation and fish pools, including the 10825 water

Requires reasonable progress USFWS
FISH POOLS

- 10825 for existing east/west slope depletions
  + Granby 5412AF
  + Ruedi 5412AF

- Ruedi Reservoir
  + 5KAF + 5KAF in 4 out of 5 years

- Wolford Mtn Res
  + 6KAF

- Green Mtn Res. – HUP surplus, 0 to 66KAF

- Total = 21,825AF/26,825AF + HUP surplus + credit for Palisade Pipeline bypass
LATE SUMMER FLOW AUGMENTATION 2014

Recovery Program Flow Enhancement

- USFWS Target Flow
- ColPalCO with Fish deliveries = gaged flow
- ColPalCo without Fish deliveries
LATE SUMMER FLOW AUGMENTATION 2017

Recovery Program Flow Enhancement

discharge, cfs

USFWS Target Flow
ColPalCO with Fish deliveries = gaged flow
ColPalCo without Fish deliveries
LATE SUMMER FLOW AUGMENTATION 2018

Recovery Program Flow Enhancement

- USFWS Target Flow
- ColPalCO with Fish deliveries = gaged flow
- ColPalCO without Fish deliveries

Discharge, cfs

Date: 6/27/2018 - 10/31/2018

OTHER WATER THAT MAY BE IN RIVER

- Grand County Windy Gap storage in Granby
  - 1000AF
  - Released to Grand Valley Irrigators
  - Timed to benefit Grand County Stream Management Plan and Grand County RICD’s
- Ute WCD 6000-9000AF of Ruedi contract water to endangered fish
- Ute WCD 3000AF of Ruedi for direct delivery to GV irrigators
- ExxonMobil 3000AF to endangered fish
- Smaller contractors in Ruedi allowing contracts to be used for endangered fish or meet irrigation demand
Fish Pool and HUP releases can cause flows at Dotsero to exceed the Shoshone Power rights
+ Juniors to Shoshone yet senior to GVIC exist
+ Allowing them in priority defeats purpose of releases
+ CRS37-87-103 protects the purpose of the reservoir release – formerly called the paper pipeline.
+ Delivery to a future water right such as the Glenwood RICD may be an alternative
SHEPHERDING RELEASES TO 15 MILE REACH

- Some of the storage rights are decreed for fish or piscatorial purposes, which can be delivered directly to 15 Mile Reach.

- Those that are not:
  - Some are released at risk of being picked up in transit and at risk of not being stored in following year.
  - GMR and Granby are decreed for power
    - Released to Palisade Power Plant
    - Released to Muni/Rec contract
TRANSMOUNTAIN DIVERSIONS

All Division 5 TMDs

Annual acre-feet

|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|