## AMENDED LEMHI SETTLEMENT WORKING GROUP MEETING AGENDA

**JULY 14, 2020**

**1:30 PM to 5:30 PM**

Idaho Department of Fish and Game Conference Room  
99 Highway 93  
Salmon, Idaho

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Presenter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:30 – 1:45 PM</td>
<td>Introduction</td>
<td>Clive Strong</td>
</tr>
<tr>
<td>1:45 – 2:30 PM</td>
<td>Hydrogeology of the Upper Lemhi Basin</td>
<td>Ryan McCutcheon</td>
</tr>
<tr>
<td>2:30 – 3:00 PM</td>
<td>Recharge</td>
<td>Wesley Hipke</td>
</tr>
<tr>
<td>3:00 – 3:30 PM</td>
<td>Water Right Development &amp; Administration</td>
<td>Mat Weaver</td>
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<td>Clive Strong</td>
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<tr>
<td>3:30 – 4:00 PM</td>
<td>Upper Lemhi Basin Fishery Biological Goals</td>
<td>Tom Curet</td>
</tr>
<tr>
<td>4:00 – 4:30 PM</td>
<td>Lemhi River Basin Model</td>
<td>Carter Borden</td>
</tr>
<tr>
<td>4:30 – 5:30 PM</td>
<td>Reconciling Competing Water Supply Needs</td>
<td>Group Discussion</td>
</tr>
<tr>
<td>5:30 PM</td>
<td>Set Next Meeting Date and Adjourn</td>
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</tbody>
</table>
Hydrogeology of the Upper Lemhi Basin

Presented by Ryan McCutcheon, Hydrogeologist

07/14/2020
• Purpose
• Background
  – Geology
  – Hydrology
  – Hydrogeology
• Previous Studies
  – Groundwater levels and flow direction
  – Groundwater flow rate
  – Groundwater impact on streamflow
• Unanswered questions
• Future work?
To inform water management decisions

- Need to characterize trends in
  - Streamflow
  - Groundwater levels
  - Water quality

- Need to predict the impacts of changes to
  - Climate
  - Land Use
  - Irrigation Practices
• Water-bearing units in unconsolidated sediment
  – Near streams: Gravel, sand, silt
  – Basin flanks: Sand, silt, clay
  – Terraces: Bouldery gravel
- Almost all groundwater discharges into the Lemhi River at the “narrows”
- The narrows divides the upper and lower basins
Hydrology

- 27 stream gauges with daily mean data
- [https://research.idwr.idaho.gov/apps/hydrologic/aquainfo/Home/Data#!/](https://research.idwr.idaho.gov/apps/hydrologic/aquainfo/Home/Data#!/)
- Eighteenmile (1), Big Timber (2), Big Eightmile (2)
- Little Timber and Mill (modeled)
• 25 continuously monitored wells with hourly data
• 18 wells with bi-weekly discrete measurements
• https://maps.idwr.idaho.gov/arcgis/GroundwaterLevels/
Groundwater Levels (Spinazola, 1998, USBR)

- Groundwater flow direction is perpendicular to the water table contours
• Donato, 1998
  – Thickness and 3D shape of the alluvial deposits on the basin floor is poorly defined.

• Spinazola, 1998 (USBR)
  – From 1995-1998, water levels in approximately 30 wells increased significantly (e.g., 5-25 ft) and remained elevated during the irrigation season.
  – Water levels in nearly as many wells fluctuated much less significantly.
- High variability of groundwater levels
- High levels in the winter, low in the summer.
• Low variability of groundwater levels
• Low levels in the winter, high in the summer.
• Very high variability of groundwater levels
• Low levels in the winter, high in the summer.
Figure J-2. Examples of the relationship between surface water diversions and groundwater head.
Groundwater flow rate (Haws et al., 1977)

- Rhodamine dye was applied to three irrigation ditches in July, 1976.
- No direct surface route to Lemhi River.
- Monitored the river in Lemhi, ID and Salmon, ID until October.
Groundwater flow rate (Haws et al., 1977)

- Dye appeared in the Lemhi River after two days and peaked at six weeks.
- Very high percentage of dye detected in the river in both Lemhi and Salmon.
- Unknown tracer deployment location for dye detected in the river.
Groundwater flow rate (Spinazola 1998, USBR)

- Average linear groundwater flow velocity of 27 ft/d
- High variability of groundwater flow rates across the basin
Lemhi River Basin Model
Time to Peak Response

Groundwater Flow Rate
(Days to Lemhi River)
Groundwater impact on streamflow (Boggs 2014, CH2MILL)

Seepage Run on the Lemhi River

August 2014 Seepage Run
- Gain
- Loss
- Lemhi_Reaches
- USGS Stream Gages

Arbitrary boundary between upper and lower Lemhi River Basin
Groundwater impact on streamflow (Boggs 2014, CH2M Hill)

Seepage Run on the Lemhi River

Arbitrary boundary between upper and lower Lemhi River Basin

October 2014 Seepage Run
- Gain
- Loss
- Lemhi Reaches
- USGS Stream Gages
Previous Studies

2014 Results

- 8/2014
- 10/2014

Gain or Loss (Δ), as Percentage of Total Flow

Discharge, in Cubic Feet Per Second (cfs)

Distance Downstream from Leadore, in River Miles

Reach 1
Reach 2
Reach 3
Reach 4
Reach 5
Reach 6
Reach 7
Reach 8
Reach 9
Reach 10
Reach 11
Reach 12
Reach 13
Reach 14

Lemhi Gage

Reach

0 10 20 30 40 50 60

95%
90%
85%
80%
75%
70%
65%
60%
55%
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
-5%
-10%
-15%
-20%
-25%
Lemhi River near Lemhi 2008-2018

- 2009 Ten Year High
- 2013 Ten Year Low
- Ten Year Average (2008-2018)
• **Groundwater Impact on Streamflow Discussion**
  
  - Streamflow gains and losses are partially governed by the slope of the aquifer between the adjacent aquifer and the river.
  - The water table slopes more steeply downhill toward the river in August than in October at locations downstream of Leadore.
    - Water table is raised by mountain front recharge, applied irrigation recharge, and ditch seepage during the summer.
    - When irrigation stops, groundwater levels drop, and the slope of the water table between the river and adjacent aquifer decreases.
  - Management actions that increase the amount of groundwater recharge at POUs with longer residence times (> 30 days) will result in increased streamflows during the critical late-summer/early fall time period.
• **Groundwater impact on Streamflow Discussion**
  - If, at a given POU, the majority of stream discharge due to irrigation recharge occurs within 30 days of application (May/June), then river flows during the late-summer and fall low-flow period do not benefit much from recharge at those POUs.
  - However, if at a given POU, the discharge is distributed over a longer time period, then stream discharge due to recharge that occurs early in the season contributes a significant amount of water to streamflow during the critical late-summer period.
  - Management actions that increase the amount of groundwater recharge at POUs with longer residence times will result in increased streamflows during the critical late-summer/early fall time period.
Previous Studies

• Groundwater Impact on Streamflow – Lemhi Tributaries (2007-2010)
  – Big Springs
  – Big Timber Creek
  – Bohannon Creek
  – Canyon Creek
  – Eighteenmile Creek
  – Hawley Creek
  – Jake’s Canyon Creek
  – Kenney Creek
  – Lee Creek
  – Little Eightmile Creek
  – Little Springs
  – Texas Creek
  – Valley Creek
Future Work

- Where and when do spring runoff and irrigation-induced groundwater recharge contribute to streamflow?
  - Tracer analyses
  - Collect improved aquifer properties data
  - Coupled groundwater and surface water model

- What are the hydrologic impacts of conversion from flood to sprinkler irrigation?
  - Analyze aerial imagery for changes to irrigation practices
  - Assess the groundwater impacts of changes to irrigation methods by comparing well water levels and streamflow before and after the changes.

- Run scenarios in the Lemhi River Basin Model to predict the streamflow impacts of changes to water rights and irrigation.
Questions?
Groundwater impact on streamflow
(Boggs 2014, CH2MHiIl)

- Mountain-front recharge (regional) -
- Applied irrigation water (local) --
- Irrigation ditch conveyance losses (local) has not been calculated
Idaho Water & Managed Recharge

Lemhi Water Supply Meeting

Wesley Hipke
IWRB Recharge Program Manager

July 14, 2020
High Level Overview of Managed Recharge

• Managed Recharge Basics
• Starting a Managed Recharge Project
• Getting Water to Recharge
• Developing Recharge Sites
• Monitoring Associated with Managed Recharge
• Key Elements to a Recharge Program
Recharge Terms

• Natural Recharge
  Rain and snow infiltrating into ground water aquifers

• Incidental Recharge
  Unintentional placement of water into an aquifer resulting from normal water deliveries for irrigation or other uses (canal losses)

• Managed Recharge
  Intentional placement of water into a groundwater aquifer
Reasons for Doing Managed Recharge

• Aquifer Replenishment
• Aquifer Storage / Recovery
• Improve Water Quality / Soil Treatment of Water
• Increase Natural Discharge from an Aquifer
• Prevent Intrusion of “poor” Water Quality
Components of Managed Recharge

- **Problem being Addressed**
  - Volume / Location

- **Source of Water**

- **Method of Recharge**
  - Basins / Canals
  - Wells
  - Other

- **Recharge Location**
  - Suitable Conditions
  - Delivery

- **Monitoring / Data**
Developing a Managed Recharge Program

• Clear Understanding of the Problem
  • What’s the End Result?
  • How Long?

• Stakeholder Agreement

• Monitoring
  • Flows
  • Groundwater
  • Water Quality

• Funding
  • Infrastructure / Maintenance
  • Water
  • Monitoring

• Adaptive Management
Idaho Managed Recharge – Source of Water

Recharge Water Right  (Idaho Code § 42-234)

• “It is the policy of the state of Idaho to promote and encourage the optimum development and augmentation of the water resources of this state.”
• Defined Source for Defined Purpose
• Prior Appropriations – First in Time, First in Right

Incidental Recharge ≠ Managed Recharge  (Idaho Code § 42-234.5)

• “…incidental recharge may not be used as the basis for claim of a separate or expanded water right.”

Transfer / Rental of Current Water Rights
Developing Managed Recharge Sites

Water Availability:
• Volume – How much water do you want to move?
• Timing – When is the water available?

Method / Location:
• Hydrogeology –
  • Will the water go into the ground?
  • Will it go where it is needed / wanted?
• Infrastructure Needs
• Land Ownership / Easements / Agreements
Managed Recharge Monitoring / Data Requirements

Surface Flow – Quantify actual Recharge:
• Into and out of Recharge Area

Groundwater Levels – Impacts on the Aquifer / Results:
• Before, During, and After Recharge

Water Quality – Protect the Aquifer and the Recharge Site:
• Source Water – During Recharge
• Groundwater - Before, During and After Recharge
Managed Recharge Water Quality Requirements

Water Quality – Protect the Aquifer and the Recharge Site

- Basins “Off-Canal” - IDEQ
  - Approved Groundwater Quality Monitoring Program
    - Water Quality Standards (Idaho Code § 58-01.02)
    - Groundwater Quality Rule (Idaho Code § 58-01.11)
    - Land Application of Recharge Water (Idaho Code § 58-01.16.600)

- Injection Wells - IDWR
  - Requires Injection Well Permit (Idaho Code § 42-3901)
IWRB ESPA Water Quality Monitoring

What is sampled?

- Surface Water
  - Headgate
- Groundwater
  - Dedicated Monitoring Wells
  - Domestic Wells

Cost

- Getting Samples?
- Lab Cost per Sample:
  - Bacteria $20
  - Common Ions $13 - $20 ea
  - Herbicides $162
  - Semi-volatile $182
Developing a Successful Managed Recharge Program

Key Elements:

✓ What Problem are You Solving?

✓ Funding
  • Infrastructure / Maintenance Cost
  • Water / Conveyance Cost
  • Monitoring / Analysis Cost

✓ Agreement – Who’s on Board

✓ Data – Before, During, & After
Adaptive Management

An ongoing natural resources management process of planning, doing, assessing, learning and adapting, while also applying what was learned to the next iteration of the natural resources management process.

- Adjusting to have the optimal impact on the problem
- Unforeseen consequences
- Changing conditions
Questions
<table>
<thead>
<tr>
<th>Sampled Analytes</th>
<th>Avg 130 analytes per sample</th>
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</thead>
<tbody>
<tr>
<td><strong>ESPA</strong></td>
<td>Bacteria</td>
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<tr>
<td><strong>Sampled Analytes</strong></td>
<td>Metals</td>
</tr>
<tr>
<td><strong>Sampled Analytes</strong></td>
<td>Common Ions</td>
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<tr>
<td><strong>Sampled Analytes</strong></td>
<td>Herbicides / Pesticides</td>
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<td><strong>Sampled Analytes</strong></td>
<td>VOCs / SVOCs</td>
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<tr>
<td><strong>Sampled Analytes</strong></td>
<td>Field Parameters</td>
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<tr>
<td><strong>Sampled Analytes</strong></td>
<td>Temp</td>
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<tr>
<td><strong>Sampled Analytes</strong></td>
<td>DO</td>
</tr>
<tr>
<td><strong>Sampled Analytes</strong></td>
<td>Specific Conductivity</td>
</tr>
<tr>
<td><strong>Sampled Analytes</strong></td>
<td>pH</td>
</tr>
</tbody>
</table>
NOW, THEREFORE, BE IT RESOLVED...the Senate and the House of Representatives concurring therein, that we direct the Idaho Water Resources Board, with Technical Support from the Idaho Department of Water Resources, to work expeditiously with local water users to develop a comprehensive settlement that resolves current tensions and conflict... ."

Senate Concurrent Resolution 137, 2020.
Lemhi: Historic WR Development

Lemhi: Summary of WR Development by Appropriated Diversion Q (cfs)

A = ~1,926 cfs
B = ~2,235 cfs
1. Post-2000 WR Records by Type (182 Lic., Per., & App.)

- Applications: 106
- Permits: 25
- Licenses: 51

2. Post-2000 WRs – Sources

- Combined Div. Q = 309 cfs
- Streams & Rivers: 87%
- Groundwater: 3%
- Wastewater: 6%
- Springs: 4%

3. % of Total Diversions (309 cfs) by Source

- Streams & Rivers: 87%
- Groundwater: 3%
- Wastewater: 6%
- Springs: 4%

4. Percent of Total Records (182 Lic., Per., & App.)

- Com.: 32.4%
- Dom.: 14.3%
- Non-Consumptive: 6.6%
- Irr.: 35.7%
- Misc.: 2.2%

5. % of Total Diversions (309 cfs)

- Com.: 2.2%
- Dom.: 8.8%
- Non-Consumptive: 14.3%
- Irr.: 9.1%
- Misc.: 1.8%

Take Aways:
- 182 Records
- $\Sigma Q = 309$ cfs
- 87% Streams (269 cfs)
- 36% of Records for Irr.
- 275 cfs (89%) for Irr.
Lemhi: Post-2000 Licensed and Permitted WRs

Lemhi Water Rights and Permit
Points of Diversions
Priority Date After 01/01/2000

City
- LEADORE
- SALMON

Water Right
POD - Active

Water Permit
POD - Active

The Narrows
L-6 Diversion

Hydrography
Non-GP Creek

Water District
- 74A
- 74B
- 74C
- 74D
- 74E
- 74F
- 74G
- 74H
- 74I
- 74J
- 74K
- 74L
- 74M
- 74N
- 74O
- 74P
- 74Q
- 74R
- 74S
- 74T
- 74U
- 74V
- 74W
- 74X
- 74Y
- 74Z

Map showing water rights and permit points of diversions in the Lemhi area with priority dates after 01/01/2000.
- 25 active applications
- Primarily Irr.
- Combined Diversion
- $Q = 227$ cfs
- 175 cfs for irrigation application 74-16030
Lemhi: Post-2000 Irrigation Water Right Records

1. Percent of Total Records (182 Lic., Per., & App.)
- Licenses: 32.4%
- Permits: 6.6%
- Applications: 14.3%
- Com.: 35.7%
- Dom.: 2.2%
- Non-Consumptive Irr.: 8.8%
- Stock.: 2.2%

2. % of Total Diversions (309 cfs)
- Irr.: 9.1%
- Misc.: 1.8%
- Stock.: 9.1%
- Com.: 89.1%

Take Aways:
- 182 Total Records
- 65 Records (36%) Irr.
- 309 cfs Total Diversions
- 275 cfs (89%) for Irr.
Lemhi: Post-2000 Irrigation WR Records

Lemhi Water Right, Permit, and Application
Irrigation Points of Diversions
Priority Date After 01/01/2000

City
- LEADORE
- SALMON

Application
- POD - Active

Water Right
- POD - Active

Water Permit
- POD - Active

The Narrows
- POD - Active

L-6 Diversion
- POD - Active

Hydrography
- Non-GP Creek

Water District
- 74A
- 74B
- 74C
- 74D
- 74G
- 74H
- 74M
- 74N
- 74O
- 74P
- 74Q
- 74R

City
- LEADORE
- SALMON

Water District
- 74A
- 74B
- 74C
- 74D
- 74G
- 74H
- 74M
- 74N
- 74O
- 74P
- 74Q
- 74R

Water District
- 74A
- 74B
- 74C
- 74D
- 74G
- 74H
- 74M
- 74N
- 74O
- 74P
- 74Q
- 74R
Federal Reserved Water Rights Salmon Wild and Scenic River Partial Decree - Subordination

Federal WRs (75-13316 & 75-11941) Subordinated to the following:

- All WR claims filed in the SRBA to the extent ultimately decreed
- All pending applications, permits, and licenses on file with IDWR as of the effective date of the stipulation (Effective date of the stipulation September 3, 2003)
- All domestic uses as defined and set forth in I.C. § 42-111(a) and (b)
- All de minimus stockwater uses as defined and set forth in I.C. § 42-1401A(11)
- All qualifying future municipal water rights (excludes individual services >2.0 cfs)
- Water rights other that those described above (i.e., future development)
  - Shoup Gage Q’s <1,280 cfs: 150 cfs (including not more than 5k acres of irrigation)
  - Shoup Gage Q’s ≥1,280 cfs: additional 225 cfs (including an additional 10k acres of irrigation)

Decree can be downloaded at: https://idwr.idaho.gov/water-rights/wild-and-scenic-rivers/
### Wild and Scenic Summary Report

<table>
<thead>
<tr>
<th>Wild &amp; Scenic River</th>
<th>Future Use Subordination Account -- Acres</th>
<th>Acres Used</th>
<th>Acres Remaining</th>
<th>Future Use Subordination Account -- Rate</th>
<th>Rate Used</th>
<th>Rate Remaining</th>
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<tr>
<td>Lochsa River</td>
<td>500</td>
<td>60.6</td>
<td>439.4</td>
<td>40</td>
<td>1.31</td>
<td>38.69</td>
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<td>Middle Fork Clearwater River</td>
<td>500</td>
<td>10.5</td>
<td>489.5</td>
<td>40</td>
<td>0.61</td>
<td>39.39</td>
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<td>Middle Fork Salmon River</td>
<td>2000</td>
<td>2</td>
<td>1998</td>
<td>60</td>
<td>0.04</td>
<td>59.96</td>
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<tr>
<td>Rapid River</td>
<td>300</td>
<td>0</td>
<td>300</td>
<td>10</td>
<td>32</td>
<td>-22</td>
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<tr>
<td>Salmon River</td>
<td>5000</td>
<td>4116.7</td>
<td>883.3</td>
<td>150</td>
<td>97.54</td>
<td>52.46</td>
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<td>Selway River</td>
<td>500</td>
<td>0</td>
<td>500</td>
<td>40</td>
<td>0</td>
<td>40</td>
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<tr>
<td>St. Joe River</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>5</td>
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**IDWR WR Wild and Scenic Webpage:**

- Published Documents, Research, Maps, and IDWR Contacts
- Download Decrees, Spreadsheets of WR Records, and Summary Tables (see above)
Federal Reserved Water Rights Salmon Wild and Scenic River Partial Decree – 150 cfs Reservation

1. Salmon R. Wild and Scenic River WR - <1,280 cfs Future WR Reservation

2. Salmon River Wild and Scenic WR - 150 cfs Reservation Break Down by Upper Salmon River Basins

- 0.5%
- 12.8%
- 10.2%
- 10.1%
- 7.3%
- 59.2%

Reservation = 150 cfs
Current Debited $\Sigma Q = 97.54$ cfs
Remaining Q = 52.46 cfs (35%)
Federal Reserved Water Rights Salmon Wild and Scenic River Partial Decree – 5,000 ac. Reservation

1. Salmon R. Wild and Scenic River WR - <1,280 cfs
Future WR Reservation

2. Salmon River Wild and Scenic WR - 5,000 Acre Reservation Break Down by Upper Salmon River Basins

Reservation = 5,000 acres
Current Debited ∑Ac. = 4,117 ac.
Remaining Acres = 883 acres (18%)
Questions and Comments.
(www.idwr.idaho.gov)
What are the impacts of:
- Changes in diversion operations?
- Channel reconnects?
- Flood to sprinkler conversion?
- Rainfall patterns?
LRBM Diversions

Consumption

Infiltration

Fast Return

Diverted Water

Q

T

Construction
Crop Consumption Method

- Ref ET (UI Kimberly)
- Calculations depend on:
  - Irrigated area
  - Crops grown
  - Irrigation method
  - Daily reference ET rate
  - Ditch loss (not used)
Groundwater Return

Flow (cfs)

- Return Flow
- Diverted Water
- Seepage

Dates: 4/16/2001 to 8/16/2003
Hawley Creek Scenario

Limit: 10 cfs

Limit: 4 cfs

Limit: 4 cfs
LRBM Outputs
Discharge

Hawley Creek Average Flows: July

<table>
<thead>
<tr>
<th>Location</th>
<th>Discharge (ft³/s)</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>20</td>
</tr>
<tr>
<td>B</td>
<td>25</td>
</tr>
<tr>
<td>C</td>
<td>30</td>
</tr>
<tr>
<td>D</td>
<td>35</td>
</tr>
</tbody>
</table>

- Baseline
- No Diversion
- Change in Discharge
LRBM Outputs
Discharge Statistics

<table>
<thead>
<tr>
<th>Month</th>
<th>u/s-Max.</th>
<th>u/s-20%</th>
<th>u/s-50%</th>
<th>u/s-80%</th>
<th>u/s-Min.</th>
<th>SS-50%</th>
<th>Diverted Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>May</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Jun</td>
<td>▲</td>
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<td>Jul</td>
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<td>Sep</td>
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</tr>
</tbody>
</table>

Monthly Discharge (ft³/s)
LRBM Uses

- “Plumbing”
- Stream Flows
- Diversion Records
- Simulates changes in:
  - Diversion Volume
  - Diversion Location
  - Irrigation Method
  - Crop Type, Area
  - Ditch Capacity
- Consumptive Use
- Climate Projections
- Socio-Economic, Ecological

Application Limitations

- Not physically based
- Diversion averaged over POU
- Groundwater flow is not explicitly calculated
LRBM Applications

1. Cumulative Impact of USBWP Projects (OSC, USBWP)
2. Federal Diversions (USFS, NOAA)
3. Big Timber Cr (LRLT)
4. Habitat Modeling (UI)
5. IRA (OSC, IDFG, Biomark)
6. Project Evaluation (USBWP)
7. Borden Dissertation (UI)
8. Big Timber Creek
# BTC Tool: Water Rights Table

## BTC Diversion Information

From Amy Cassel

### About

#### Water Right List

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>Diversion Name</th>
<th>Right ID</th>
<th>Priority Date</th>
<th>WR RATE (CFS)</th>
<th>MAX FOR THIS DIVERSION (CFS)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BIG TIMBER CREEK</strong></td>
<td>BT1</td>
<td>74-31</td>
<td>6/1/1884</td>
<td>1.40</td>
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### BTC Tool: Diversion Inputs

**BTC Bird Analysis**

**Inflow Time Series**

**About**

**Time Series**

**Diversion**

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**Graphing**

**BTC Inputs**

**BTC Profile**

**PHABSIM**

**Delivery Sum**

**Div List**

**LRBM Q Data**

**LRBM WU Delivery**

**LRBM WU Deficit**

---

**Input Time Series**

**Catchment Inflow Time Series**

- Big Timber Inflow
- Basin Creek Inflow
- Little Timber Creek Inflow
BTC Compliance

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**BTC Tool: Diversion Scenarios**

- **BT-12: Baseline**
- **Upper BTC Gage Compliance**

Legend:
- **Blue** (solid line): Upper BTC Q/in
- **Red (dashed)**: Lower Threshold
- **Red (dotted)**: Upper Threshold
- **Red (dashed-dotted)**: Upper Compliance
BTC Tool: Water Delivery

BTC Bird Analysis
Water User Delivery/Deficit

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Baseline Delivery

Scenario Delivery

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Graphing BT-12
BTC Application

• **Common platform/data set** for understanding stream-irrigation network (plumbing), flows, water rights, irrigation types/consumption, ditch capacity
  
  – **Water is diverted at Point A (POU) where, when, how much does it pop up in the stream network (B).**

• **Available Water:** Quantify tributary discharge at Lemhi River confluence

• **Scenario Analysis:** Evaluate proposed WR given flow criteria

• **Cumulative impacts** from multiple proposed WR, irrigation method change

• **Ecological Impact:** Connect stream flow with fish habitat models
LRBM Improvement

Update Data/Local Expertise:
- Model network verification “Plumbing”
- Estimates of return flow location
- Diversion operations
- Crops grown
- Irrigation method, Area

Testing the System
- Impacts of return flow timing, quantities
- Change crop type, irrigation method, area
- Estimate impact for different diversion operations impact flows.
- Outputs
QUESTIONS
Crop Consumption

**Big Bear Creek**

- May
- Jun
- Jul
- Aug
- Sep
- Oct

**Big Eightmile-15**

- May
- Jun
- Jul
- Aug
- Sep
- Oct