RANCHERS AND SCIENTISTS HELPING RODENTS MITIGATE DROUGHT – THE STORY OF BRINGING BEAVER BACK TO BIRCH CREEK

Jay Wilde
1. Jay & the Birch Creek Watershed History
2. The hydrology problem
3. The evolution of grazing practices
4. Some hydrology experiments
5. What about beaver?
6. The BDA-assisted beaver restoration experiment
BIRCH CREEK, ID
THE BIRCH CREEK WATERSHED
1. Jay & the Birch Creek Watershed History

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WHERE DID THE WATER GO?
ONE OF THE SYMPTOMS

June 14, 2007
Water has quit running
HOW LONG INTO SUMMER DOES IT FLOW?

Preliminary Analysis from Nick Bouwes
June 18, 2007 - DIURNAL DIFFERENCES

8:30 AM Stream flow is getting low

8:19 PM Flow has ceased by late afternoon or early evening.
Water is flowing again
Flow has stopped again
Lotsa water in the morning......
and no water running in the early evening.

So......What’s goin’ on here?
EVAPOTRANSPIRATION

- Water is drawn from the water table via the root systems of the trees and other vegetation into their foliage and then transpired into the atmosphere.
RIPARIAN AREAS

• The riparian area on the national forest is dense and populated with phreataphyte type vegetation.
Precipitation is blocked from reaching the ground directly and entering the water table. Much is either evaporated or, in the case of snow, sublimated back to the atmosphere.
INTERCEPTION

- Trees can slow or block precipitation from reaching the ground and entering the water table.
The red line is SWE. The black line is total precip (data only available for 30 years) Green line is the average SWE for 1936-2009. Blue lines are the average SWE for each decade.
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## Line Intercept Results...

**Plant Density* Wyethia amplexicaulis**

<table>
<thead>
<tr>
<th>Transect</th>
<th>Year 1</th>
<th>Percentage 1</th>
<th>Year 2</th>
<th>Percentage 2</th>
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<tr>
<td>Transect 2</td>
<td>2010</td>
<td>25.4%</td>
<td>2016</td>
<td>8.0%</td>
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<tr>
<td>Transect 3</td>
<td>2010</td>
<td>38.1%</td>
<td>2016</td>
<td>11.5%</td>
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<tr>
<td>Transect 4</td>
<td>2010</td>
<td>64.4%</td>
<td>2016</td>
<td>29.0%</td>
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</tbody>
</table>
PRE 1965 GRAZING MANAGEMENT

- Grazing from May 15 – Oct 15
- Season-long grazing
- About 333 permits
WHAT THAT REALLY MEANT…
• USFS cuts from 333 to 182 permits
• Grazing from June 16 to Aug 15
• Season-long grazing
TRY SOMETHING NEW

POST 2005 GRAZING MANAGEMENT

- After taking over as President of Grazing Association for Mink Creek Allotment in 2003, proposed an experiment in 2009 with USFS
STARTING EARLY JUNE NOW...

- June 4 – 7
- Doc Flat 1 Pasture
HIGH-INTENSITY, SHORT DURATION

POST 2005 GRAZING MANAGEMENT

- June 7 – 25
- Doc Flat 2 Pasture
THREE ROTATIONS DURING JUNE ALONE

- June 25 – July 1
- Basil Pasture
EARLY JULY... MOVED JUST OUT OF BIRCH

POST 2005 GRAZING MANAGEMENT

- July 1-20
- Peterson Hollow/ School House Pasture
LAST PART OF JULY BACK IN BIRCH

POST 2005 GRAZING MANAGEMENT

- July 20-Aug 1
- Graham Hollow/ Horse Basin Pasture
• August
• South Fork Dry Creek & Crib Spring/Upper Birch Pastures
2 WEEKS, MOVE DOWN THROUGH VB

- Sep 1 - 15
- Lower Birch Creek Pasture
BY, SEPT 15, BACK ON DIAMOND BACK W

- Sep 15 - Late Nov
- Off USFS
COME THANKSGIVING...

POST 2005 GRAZING MANAGEMENT

• Jay takes cows back to Glenns Ferry for winter
PRE EXPERIMENTAL, ROTATIONAL GRAZING 2001

Closer to season-long grazing...

Another MIMS site
Over a decade of lighter, late season use as cows move down stream
Same grazing, but another twist...
BIRCH CREEK HISTORY

(1822-1825) First European fur trappers show up in Cache Valley

(1825-1840) Beaver heavily trapped

Preston settled while intensive logging and grazing begins in watershed

(1925) Dwight Wilde buys ranch - During this period USFS permitted 800 cattle from May 15 to Sept 1.

(1903) Logan Forest Reserve created in response to over grazing, over logging and 'streams drying up'

(1933) Dwight Wilde buys ranch - During this period USFS permitted 800 cattle from May 15 to Sept 1.

(1966) USFS changes grazing permits (800 → 283; May 15 to Sept 1 → June 16 to Aug 1)

Beavers successfully reintroduced

Jay Wilde returns to Birch Creek & buys Diamond W Ranch

Jay Wilde's mom reports that Birch Creek is 'drying up'

Jay Wilde graduates high school & leaves Birch Creek

(2005) Experimental rotational grazing on USFS allotments
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8. Wrap-up
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BIRCH CK. TIMELINE OF BEAVER...

(1822-1825) First European fur trappers show up in Cache Valley
(1822 - Rocky Mountain Fur Company, 1824 Peter Sken Ogden, 1825 Jim Bridger)

1800  1825  1850  1875  1900  1925

Beaver temporarily extirpated?

Preston settled while intensive logging and grazing begins in watershed

1950  1975  2000

Jay returns to Birch Creek for 2-3 years

Jay's Cottonwood removal Experiment

Jay translocates 6 nuisance beaver to Birch Creek in 2008 & 7 in 2009. None stayed or survived.

Jay Wilde graduates high school & leaves Birch Creek

Last known beaver dam (photo); only dam left is @ USFS boundary

Casey Wilde remembers swimming in old beaver pond in Squirrel Hollow

BDA Pilot Installed

Jay remembers 3-4 beaver 'complexes', primarily with just one really big dam each

5 beavers successfully reintroduced in 2015 and 4 in 2016.

ANABRANCH SOLUTIONS
DEPARTMENT OF WATERSHED SCIENCES
Utah State University
THE LAST DAM... & RIPARIAN RECOVERY

1989

2017
1992 vs. 2016

Last Known Dam in 1989
On USFS / Diamond Back W Ranch Boundary

Legend
- Last known natural beaver dam (1989)

Google Earth

Last Known Dam in 1989
On USFS / Diamond Back W Ranch Boundary

Legend
- Last known natural beaver dam (1989)

Google Earth
IN 2008 & 2009, JAY BROUGHT BEAVER BACK
Jay's 2008 & 2009 Translocations
Six in 2008 & Seven in 2009 - All released into Mill Hollow of Birch Creek.

2 Source Beaver 2008

2008 Beaver

2008 & 2009 - Beaver Translocation Release Sites

2009 - 7 Nuisance Beaver from Station Creek Trib.
NO GO…

- Released all 13 into Mill Hollow (tributary to Birch Creek)
- Some sign of chew, no dam building
- Whether they left, died of predation or other causes is unknown
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WILLING USFS PARTNERS

- All actions require permits, Brett helped cut through red tape
BRAT IN BIRCH CREEK - GOOD HABITAT

Existing conditions
• Capacity of 90 dams
• 23 dams per mile

vs. Historic Estimate
• Capacity of 125 dams
• 32 dams per mile
BIRCH CREEK, ID - RESTORING PERENNIAL FLOW

Restoration Goal

• Restore perennial flow (or make less intermittent)

Setting

• Abundant forage for beaver
• Shallow water depth – high risk of predation
• Previously unsuccessful beaver translocation

Strategy

• Build BDAs to provide immediate habitat/refuge for beaver
BASIC HYPOTHESIS: BEAVER SHOULD DO BETTER IF RELEASED INTO PONDS w/ DEEP WATER
BUILD PILOT TO TEST IDEAS

- November 2014
- Two complexes separated by 0.5 mile
- Each complex had one primary dam and one secondary dam
PILOT CONSTRUCTION

Build BDAs without beaver… see if we can: hold back water, keep it from freezing over winter, and hold up to spring runoff.
2015 - BUILD ENOUGH BDAs TO GIVE BEAVER CHOICES (PRIOR TO RELEASE)

- Sept 2015
- Build 5 more complexes all on mainstem of Birch
- 15 more BDAs built (total now 19)
- Each complex had one primary dam and 1-4 secondary dams
- 3-4 days construction
2015 RELEASE

- IDFG provides 5 nuisance beaver from Slug Creek, ID
- Released in lower pilot BDAs on Birch Creek
Beaver Release

Beavers... a keystone species
BUILT SOME MORE AS PART OF A NRCS WORKSHOP

SGI/NRCS 2016 Workshop Participants working building a BDA:
2016 – BDAs BUILT BY STUDENTS

- NRCS Workshop built next phase
- Built 1 more complex on Birch Creek (3 BDAs w/ posts)
- Moved into Mill Hollow, built 4 BDAs (3 originally postless)
- Total by 2016 of 25 BDAs
USFS + IDFG + USU + 3 GENERATIONS OF RANCHERS + NRCS CLASS

No big budget science or monitoring... but a lot of collective learning with good will and volunteer efforts.
NOT ALL BDAs NEED POSTS
2016 MOVED RELEASE INTO MILL HOLLOW
ROUGH TIME LINE... BIRCH CREEK

- 1970s – Beaver Dams Present... last beaver extirpated from system
- 1990s – Jay move’s back to family ranch, discovers creek now drying up (& no beaver)
- 2008 & 2009 – 2 Reintroduction attempts (13 nuisance beaver), none stayed (or survived?)
- Oct-Nov, 2014 – Jay shows interest in BDAs, we build pilot (4 BDAs – 2 complexes)
- Sep, 2015 – We build 15 more BDAs (6 complexes total)
- Oct, 2015- Reintroduce 5 beaver (4 adults; 1 kit)
- Sep, 2016 – NRCS Course & USFS maintain 3 BDAs, & build 3 new BDAs on mainstem, and experiment with 4 postless BDAs on 1st order tributary
- Oct, 2016 – 4 more beaver introduced
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THEY DON’T ALWAYS USE OUR BDAs AS INTENDED

- Beaver utilized 15 of 19 BDAs in 2015
- Maintenance and dam building on 2 of 5 complexes in 2015
- Successful translocation
- Continued beaver activity

BDA flooded by natural beaver dam built downstream
BEAVER TAKE OVER MAINTENANCE OF BDAs... IDEALLY

This example took 2 years for them to start working on... Others ranged from 2 days to 2 months.
IN ADDITION TO MAINTENANCE...

• Since introduction in November 2015 (5 beaver), beaver have built 49 of their own dams in same area

• Some expanded our complexes, others built entirely new complexes
EXPANDED BEYOND BDAs INTO MEADOW

- Starting in spring 2016, they built 1-2 complexes in meadow with 8-9 dams

Late 2016

Mid Summer 2016

2001
BEAVER’S IDEA... NOT OURS: RESTORING PERENNIAL FLOW

Valley Bottom
Old Wetted Extent

New Dam Crest

3 BDA complexes used initially...
IN LESS THAN TWO YEARS...

- 9 beaver have taken up shop, and transformed the place
- Used 22 of 26 of our BDAs
- Built another 49 dams
- Only one blow out (they repaired) from high flows of 2017
- Now at over 70 dams
EVIDENCE OF KITS?

We don’t know exactly how many beaver are there now.
AN NRCS CLASS, SOME POSTLESS BDAs
+ 4 BEAVER & 1.5 MONTHS =
A POSTLESS EXAMPLE...

- September 2016 – NRCS Class builds 4 postless BDAs
- October 2016 – 4 more beaver introduced
- By November, they remodeled...

Photo from April 2017 (8 months later)
SHIFTING TO LATER ALREADY?

Preliminary Analysis from Nick Bouwes
SOME FAILURES... SOME DISCOVERIES

- Can beaver ruin perfectly good hydrology experiments?
- ‘Do beaver make snow cave lodges?’
ACKNOWLEDGING ‘WE’...

2014 Pilot & 2015 Implementation:

**USFS:**
- Brad Higginson
- Dell Transtum
- Kevin Parker
- Dennis Deurhen
- Lee Mabey
- Brett Roper

**IDFG:**
- Mike Suter (trapper contractor)
- Raleigh Scott

**APHIS:**
- Gary Rushane

**USU**
- Konrad Hafen
- Elijah Portugal
- Scott Shahverdian
- Steve Bennett
- Connor Penrod

**Volunteers:**
- Bill Bradbury
- Mitch Butterfield
- Nate Norman
- Cadel & Luke Wheaton
- Casey & Emily Wilde
- Doris Bennett

2015 & 2016 Beaver Workshop Participants (USFS & NRCS)
If you come to know and work a patch of land...........
You’ll find you don’t own it..... IT OWNS YOU

From the book THE PRARIE KEEPERs by Marcey Houle
And quoting Cressie Green
QUESTIONS?
SOME ESTIMATES?

• Could beaver dams compete with a declining a snowpack?

• From Hafen (2017), it depends on size of system

• Per dam average estimates:
  - Pond Storage:
    • 55 ± 9 m³ per pond
  - Additional GW Storage:
    • 125 ± 30 m³ per pond
  - Total Transient Storage Increase per pond:
    • 180 ± 39 m³ per pond
    • 0.14 ± 0.03 acre-feet per pond
WHAT CAN WE STORE?

For entire Bear River Watershed (as a function of % beaver dam capacity):

<table>
<thead>
<tr>
<th></th>
<th>5%</th>
<th>25%</th>
<th>50%</th>
<th>100%</th>
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<tbody>
<tr>
<td>Surface Water Storage (million m³)</td>
<td>0.08</td>
<td>0.44</td>
<td>1.00</td>
<td>1.88</td>
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<tr>
<td>Ground Water Increase (million m³)</td>
<td>0.19</td>
<td>0.87</td>
<td>2.07</td>
<td>4.77</td>
</tr>
<tr>
<td>Total Storage Increase (million m³)</td>
<td>0.26</td>
<td>1.31</td>
<td>3.07</td>
<td>6.65</td>
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</tbody>
</table>

From Hafen (2017)
**Estimated Leaky Water Storage Increase**

**Hafen (2017) Empirical Dam Storage Data**

<table>
<thead>
<tr>
<th>Year</th>
<th>Pond Storage</th>
<th>Groundwater Storage</th>
<th>Total Storage</th>
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<tbody>
<tr>
<td>2014</td>
<td>55 ± 9</td>
<td>125 ± 30</td>
<td>180 ± 39</td>
</tr>
<tr>
<td>2015</td>
<td>55 + 9</td>
<td>125 ± 30</td>
<td>180 ± 39</td>
</tr>
<tr>
<td>2016</td>
<td>55 + 9</td>
<td>125 ± 30</td>
<td>180 ± 39</td>
</tr>
<tr>
<td>2017</td>
<td>55 + 9</td>
<td>125 ± 30</td>
<td>180 ± 39</td>
</tr>
<tr>
<td>Total</td>
<td></td>
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</table>

**Scaling Information**

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>w/Dams</th>
<th>% w/Dams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stream Length (m)</td>
<td>6304</td>
<td>1523</td>
<td>24%</td>
</tr>
<tr>
<td>Average Stream Width (m)</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Valley Bottom Width (m)</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimated Stream Area</td>
<td>12,608</td>
<td>0.01</td>
<td>3.1</td>
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<tr>
<td>Estimated Valley Bottom Area</td>
<td>94,560</td>
<td>0.09</td>
<td>23.4</td>
</tr>
<tr>
<td>Watershed Area (Birch Creek)</td>
<td>14,450,000</td>
<td>14.45</td>
<td>3570</td>
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<tr>
<td>Estimated Valley Bottom Impacted</td>
<td>22,845</td>
<td>0.02</td>
<td>5.6</td>
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Combined pond storage & increase in groundwater storage.

**Approximate Total Increase in Water Storage**

- **Natural Beaver Dams**
- **Beaver Dam Analogues (BDAs)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Each Year's Increase in Storage (acre-feet)</th>
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<tbody>
<tr>
<td>2014</td>
<td>0.04 ± 0.01</td>
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<tr>
<td>2015</td>
<td>0.04 ± 0.01</td>
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<tr>
<td>2016</td>
<td>0.10 ± 0.02</td>
</tr>
<tr>
<td>2017</td>
<td>0.15 ± 0.03</td>
</tr>
<tr>
<td>Total</td>
<td>0.39 ± 0.03</td>
</tr>
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</table>
THE BEAR RIVER BASIN: SOME BIG NUMBERS

- Is 1.3 – 10 million m³ from beaver dams big number?

- Annual precipitation ~10.6 billion m³ (8.6 million acre-feet) with ~43% snow

- Annual discharge to Great Salt Lake ~1.7 billion m³ (1.4 million acre-feet)

- Current reservoir storage 383 million m³ (~310,000 acre-feet)

- Proposed reservoir storage = 271 million m³ (~250,000 acre-feet)

From Hafen (2017)
WHAT'S IN A LINE TYPE? WATER!
WHAT’S HAPPENED SINCE ABOUT 1985

RIVERS, LAKES, AND CANALS

- Perennial stream
- Perennial river
- Intermittent stream
- Intermittent river
- Disappearing stream
- Falls, small

MINK CREEK, IDAHO
42111-B6-TF-024
1969
PHOTOINSPECTED 1980
DMA 3098 II NW—SERIES Y895