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

1:30 – 1:45 PM	Introduction	Clive Strong
1:45 – 2:30 PM	Hydrogeology of the Upper Lemhi Basin	Ryan McCutcheon
2:30 – 3:00 PM	Recharge	Wesley Hipke
3:00 – 3:30 PM	Water Right Development & Administration	Mat Weaver Clive Strong
3:30 – 4:00 PM	Upper Lemhi Basin Fishery Biological Goals	Tom Curet
4:00 – 4:30 PM	Lemhi River Basin Model	Carter Borden
4:30 – 5:30 PM	Reconciling Competing Water Supply Needs	Group Discussion
5:30 PM	Set Next Meeting Date and Adjourn	

Hydrogeology of the Upper Lemhi Basin

Presented by Ryan McCutcheon, Hydrogeologist

07/14/2020

Outline

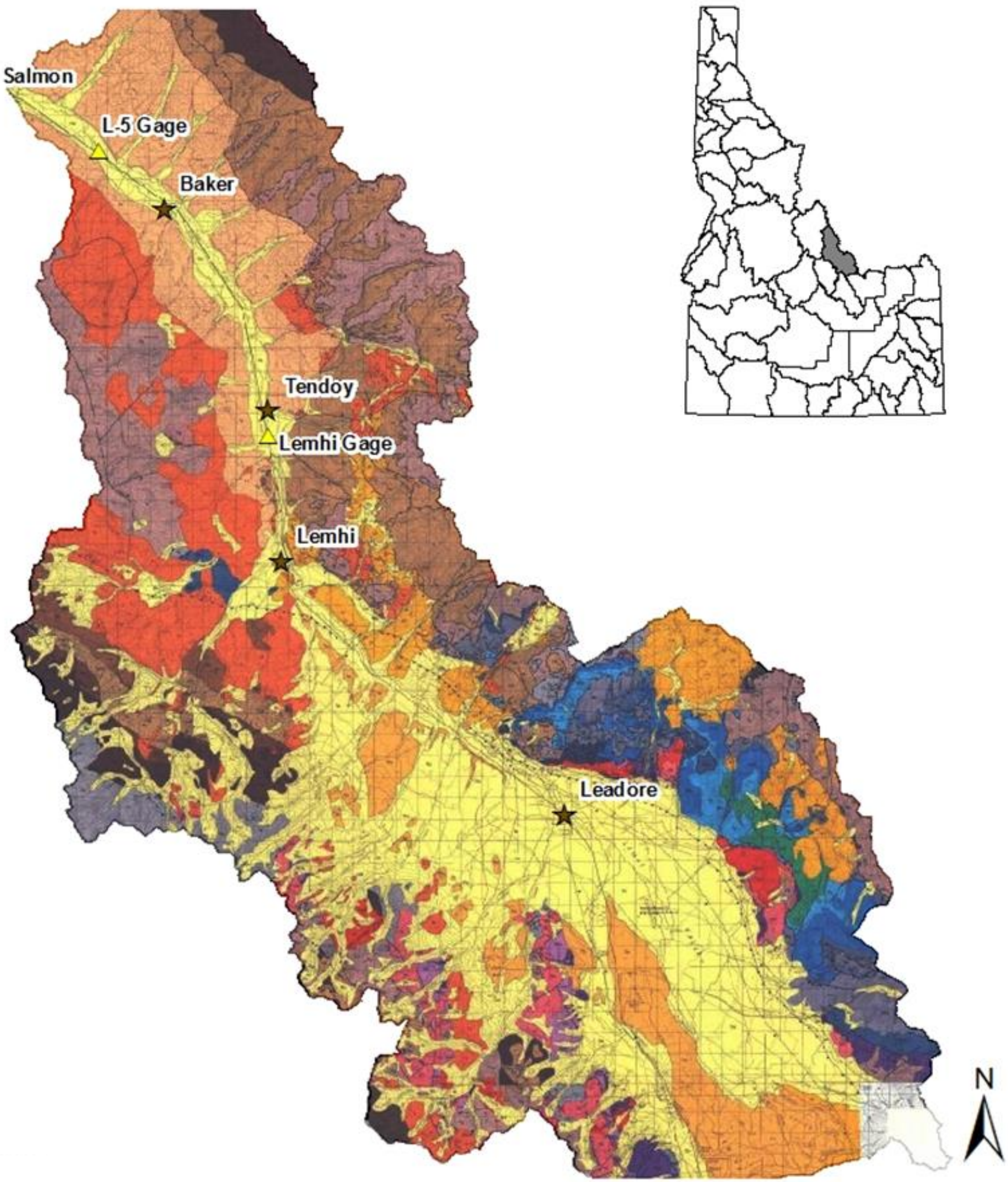
- Purpose
- Background
  - Geology
  - Hydrology
  - Hydrogeology
- Previous Studies
  - Groundwater levels and flow direction
  - Groundwater flow rate
  - Groundwater impact on streamflow
- Unanswered questions
- Future work?

Purpose

- 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

Geology

- **Water-bearing units in unconsolidated sediment**
  - Near streams: Gravel, sand, silt
  - Basin flanks: Sand, silt, clay
  - Terraces: Bouldery gravel



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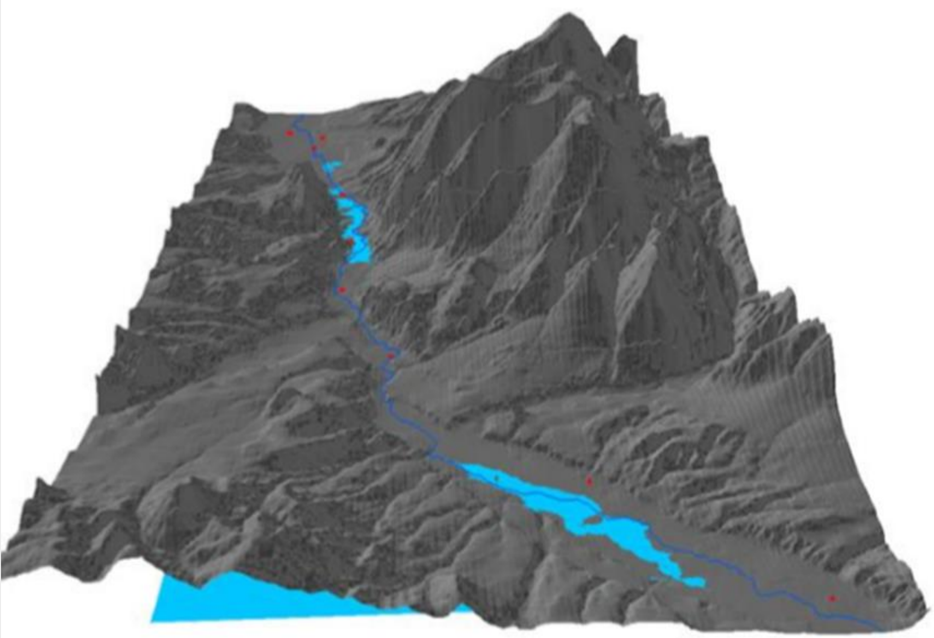
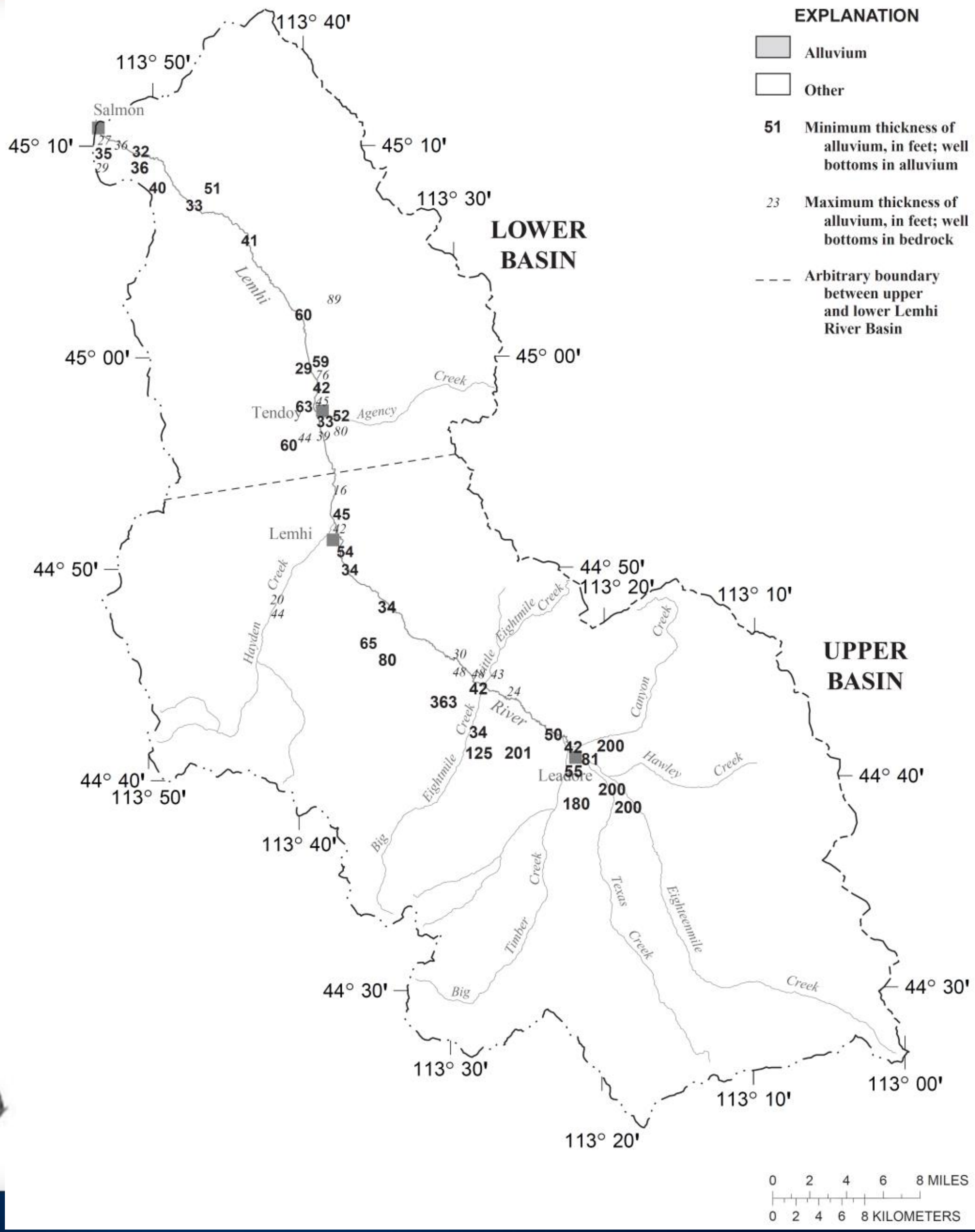
Geology

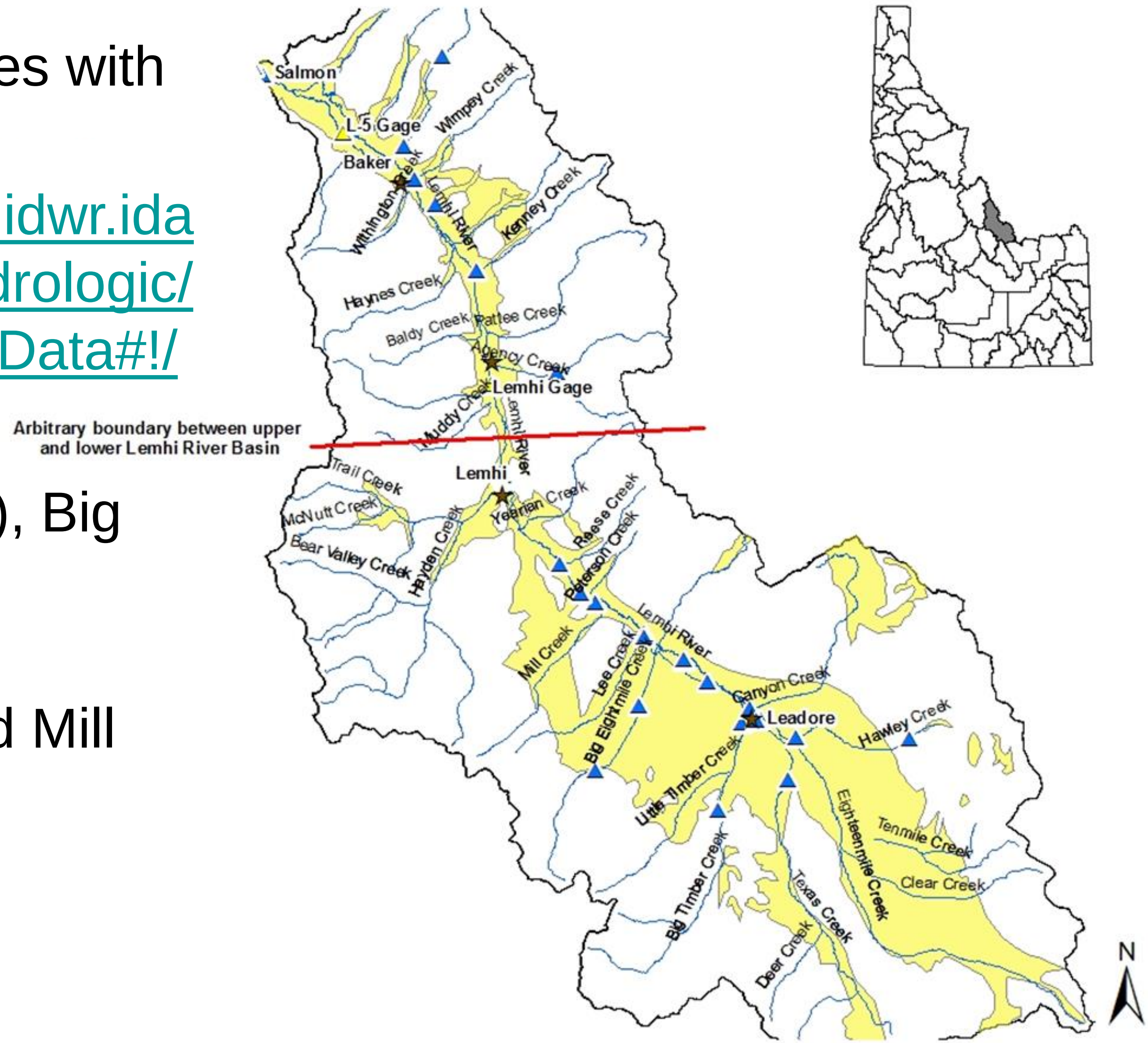
- Almost all groundwater discharges into the Lemhi River at the “narrows”
- The narrows divides the upper and lower basins





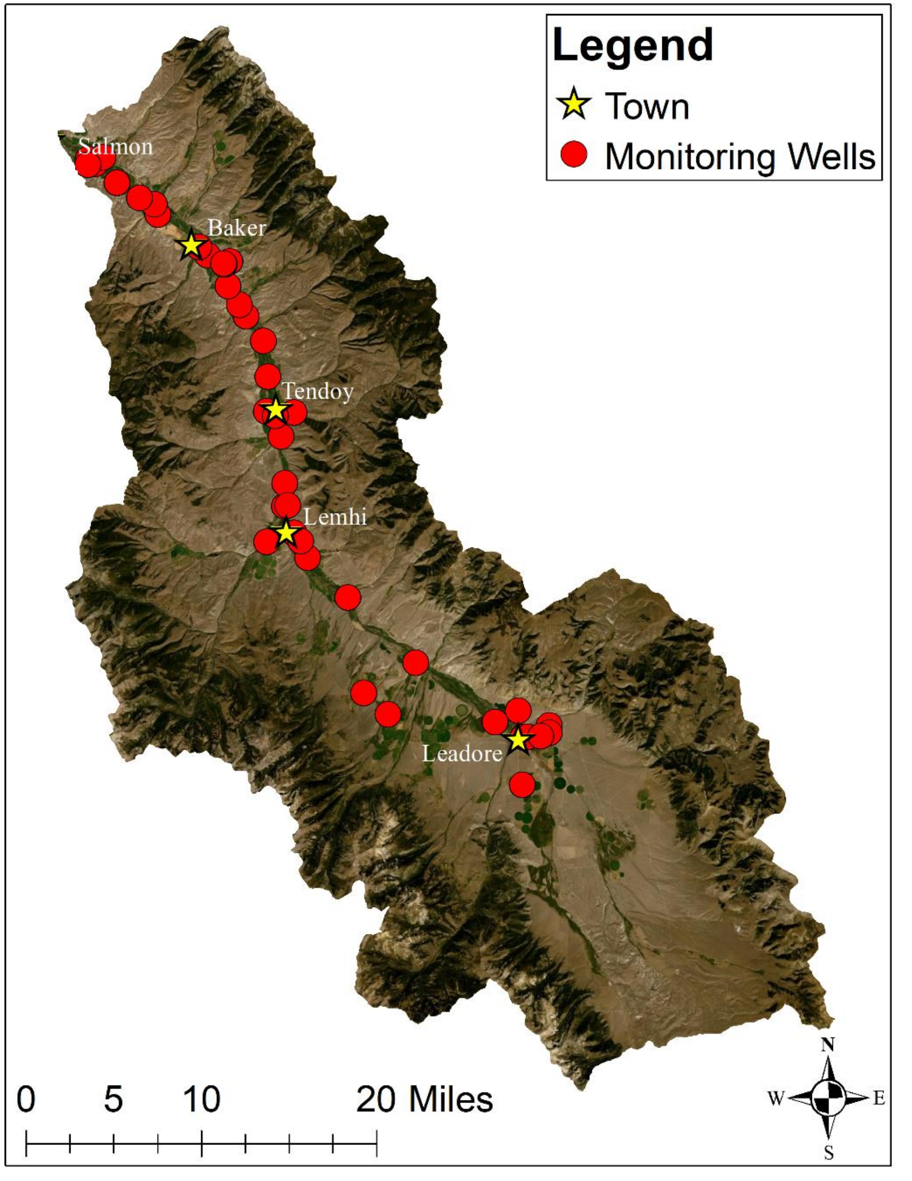
Hydrology

- 27 stream gauges with daily mean data
- https://research.idwr.idaho.gov/apps/hydrologic/aquainfo/Home/Data#!/
- Eighteenmile (1), Big Timber (2), Big Eightmile (2)
- Little Timber and Mill (modeled)



Hydrogeology

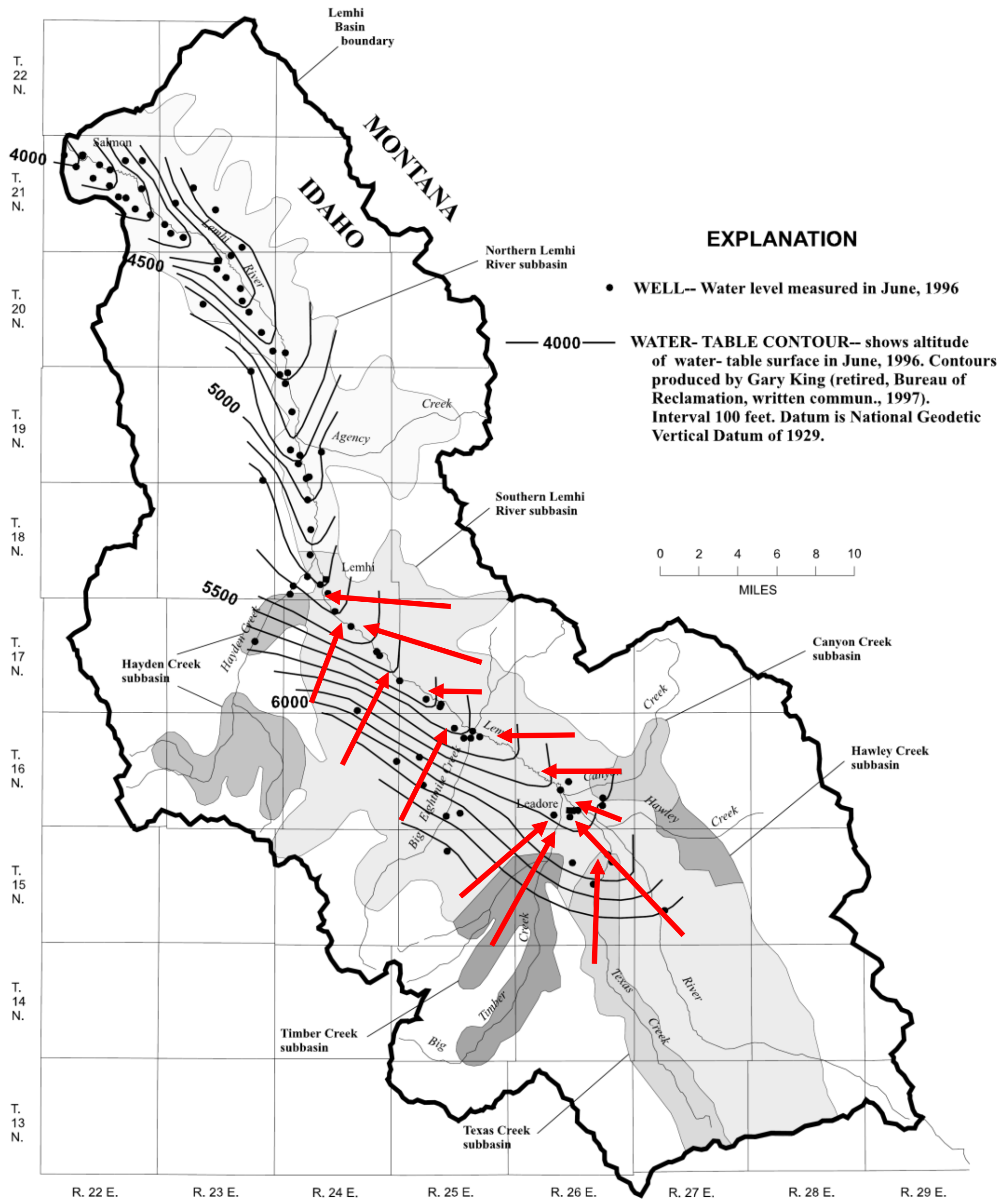
- 25 continuously monitored wells with hourly data
- 18 wells with bi-weekly discrete measurements
- https://maps.idwr.idaho.gov/agol/GroundwaterLevels/



Previous Studies

Groundwater Levels (Spinazola, 1998, USBR)

- Groundwater flow direction is perpendicular to the water table contours



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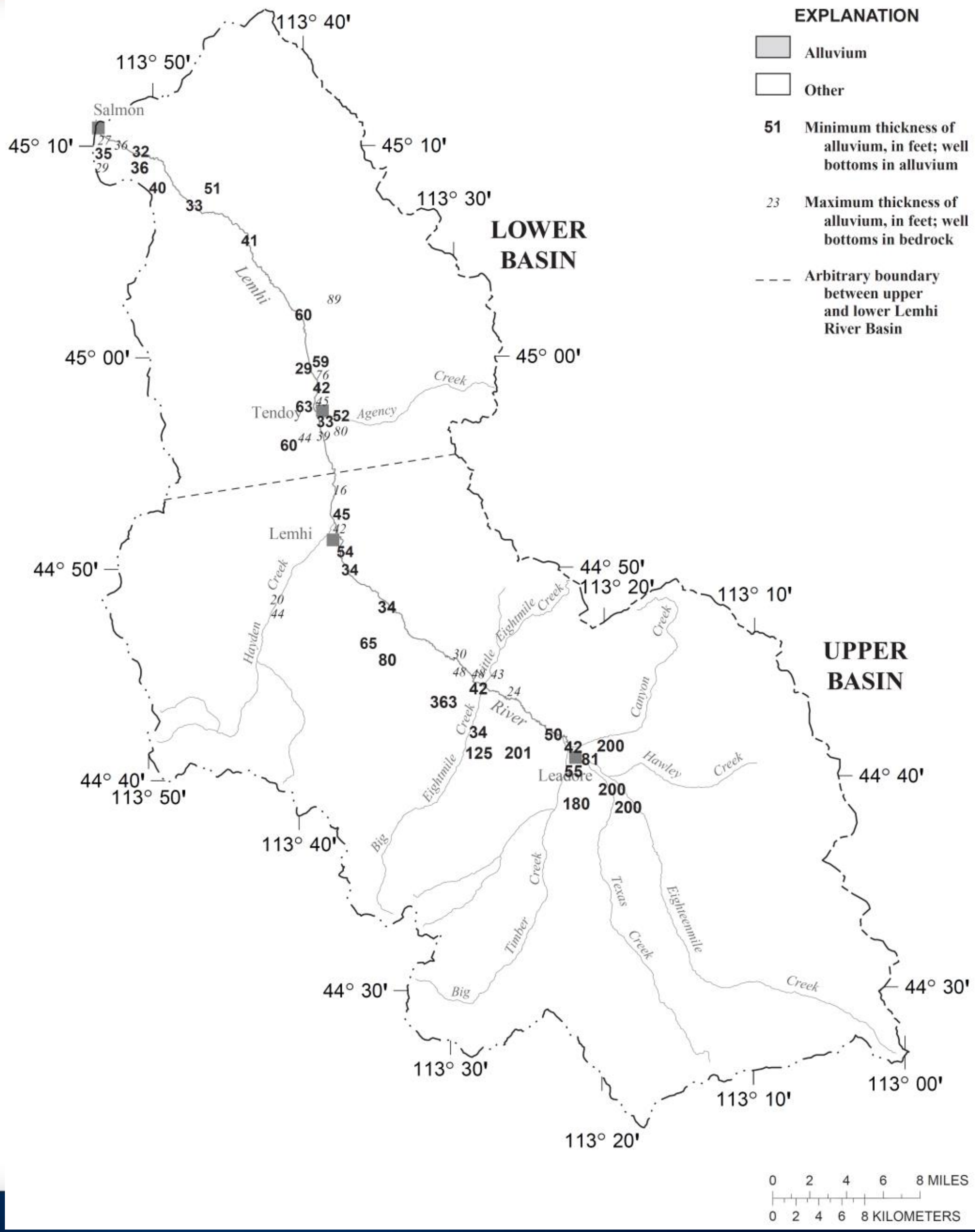
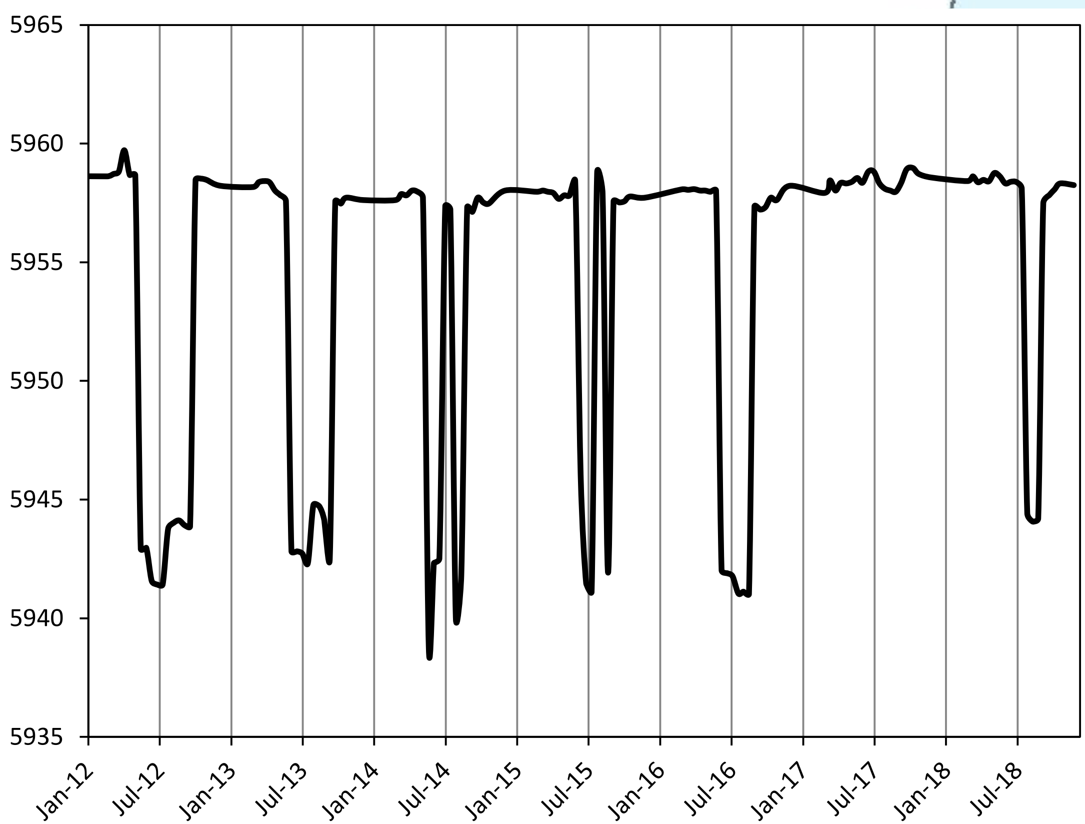
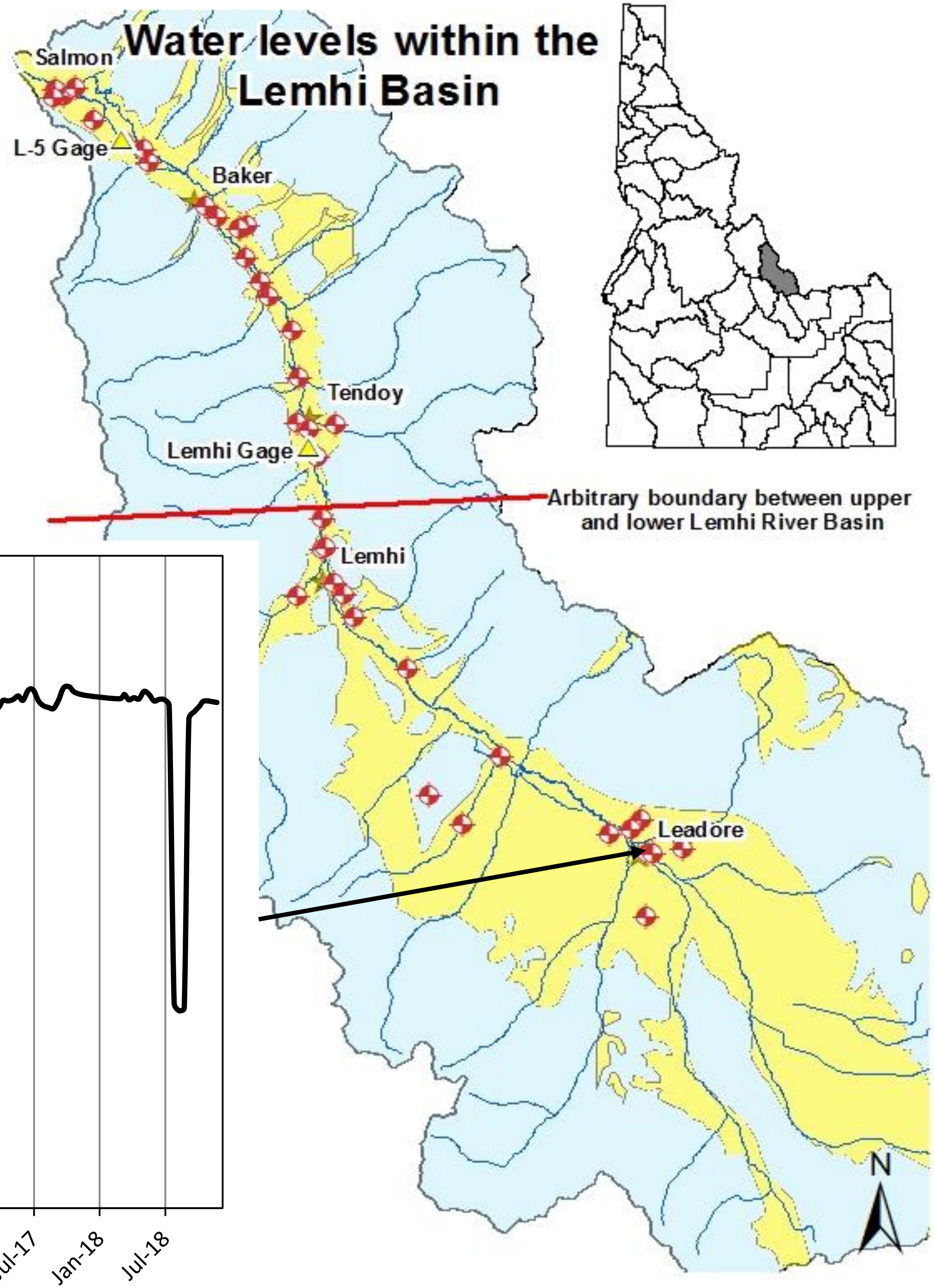
Previous Studies

- **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.

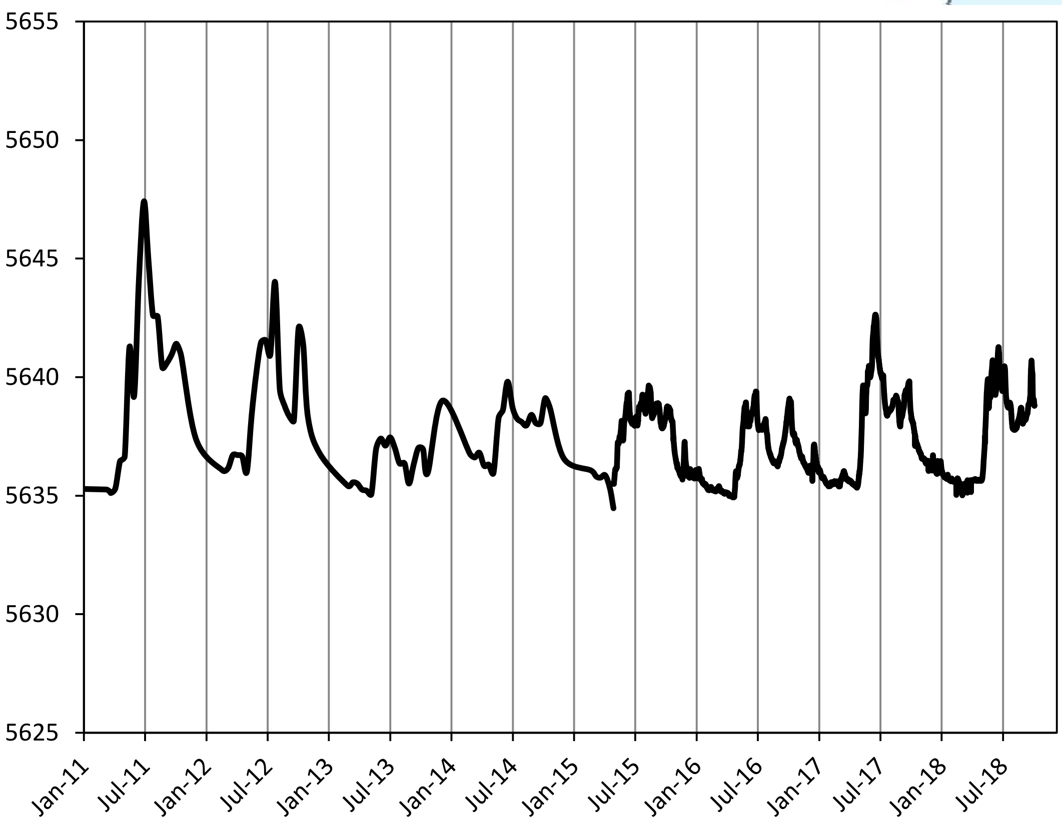


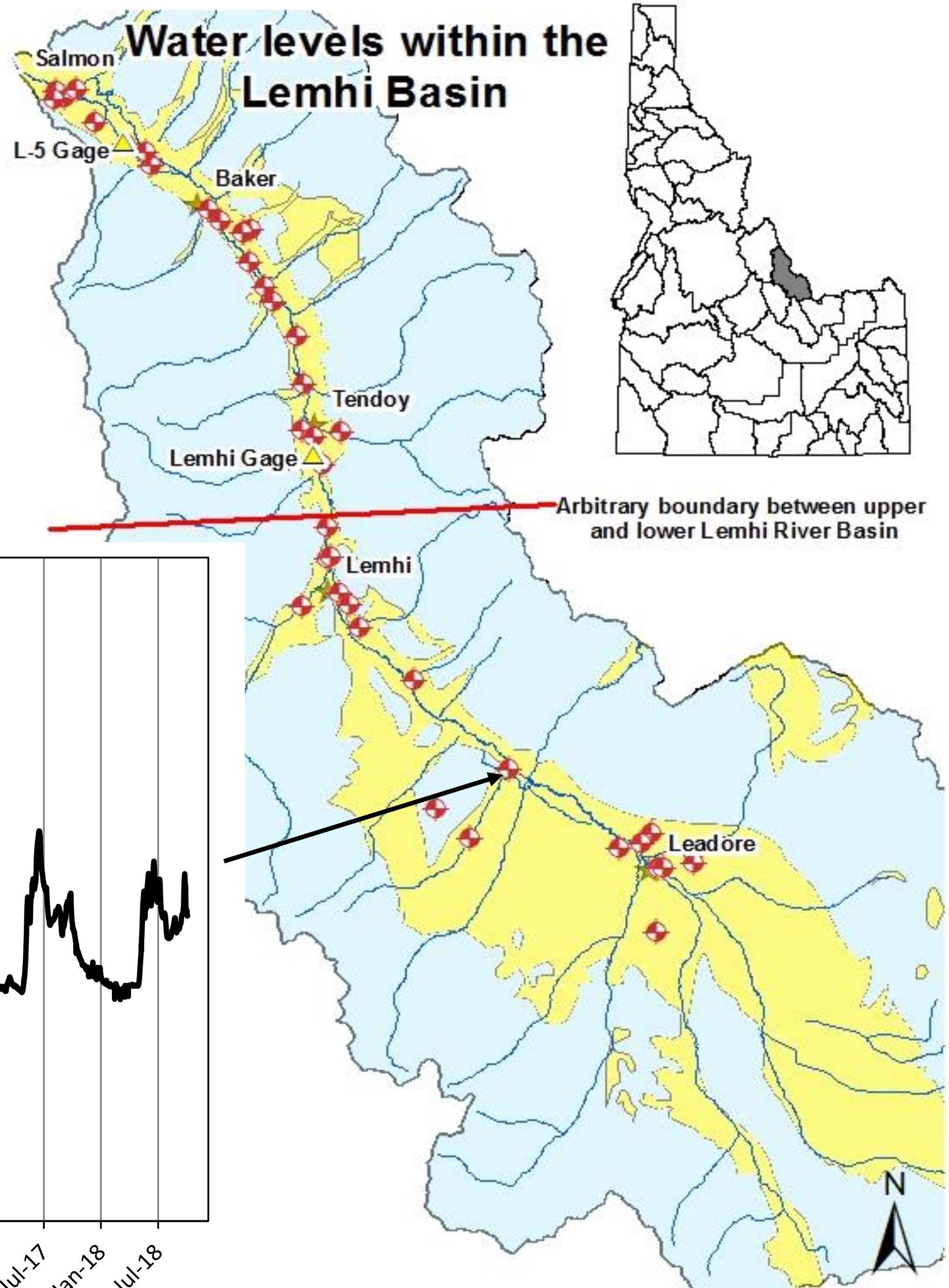
- High variability of groundwater levels
- High levels in the winter, low in the summer.



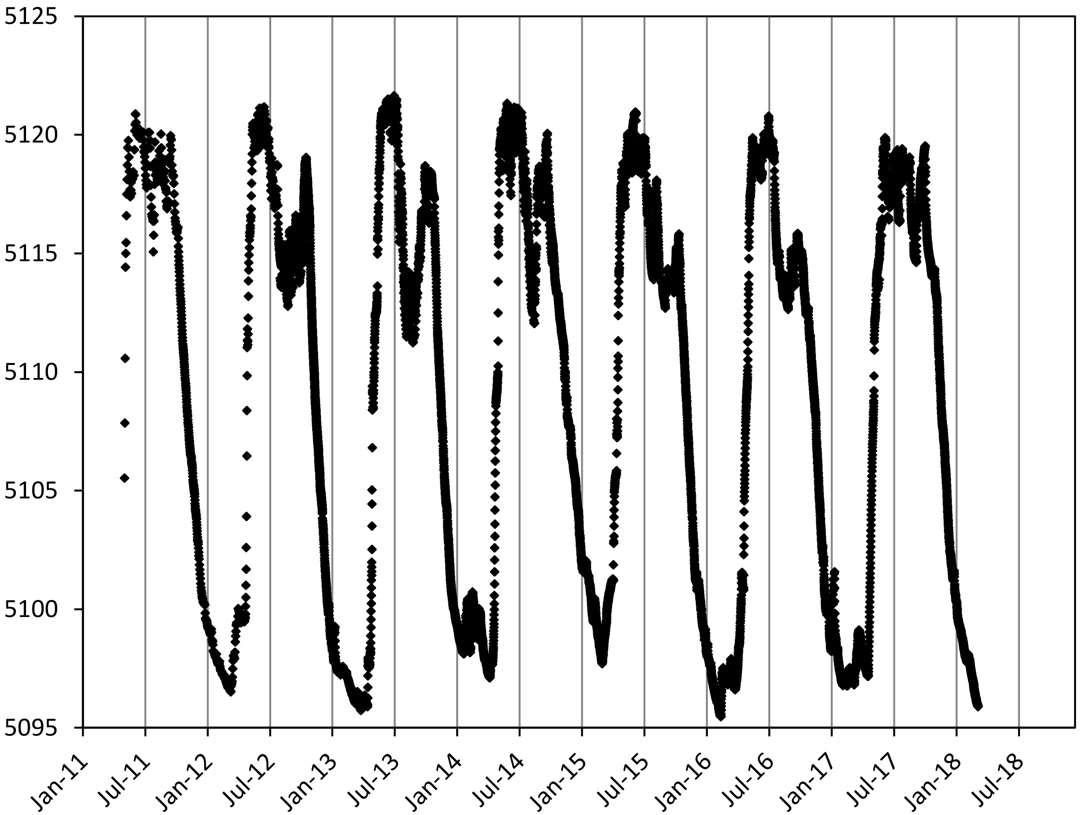


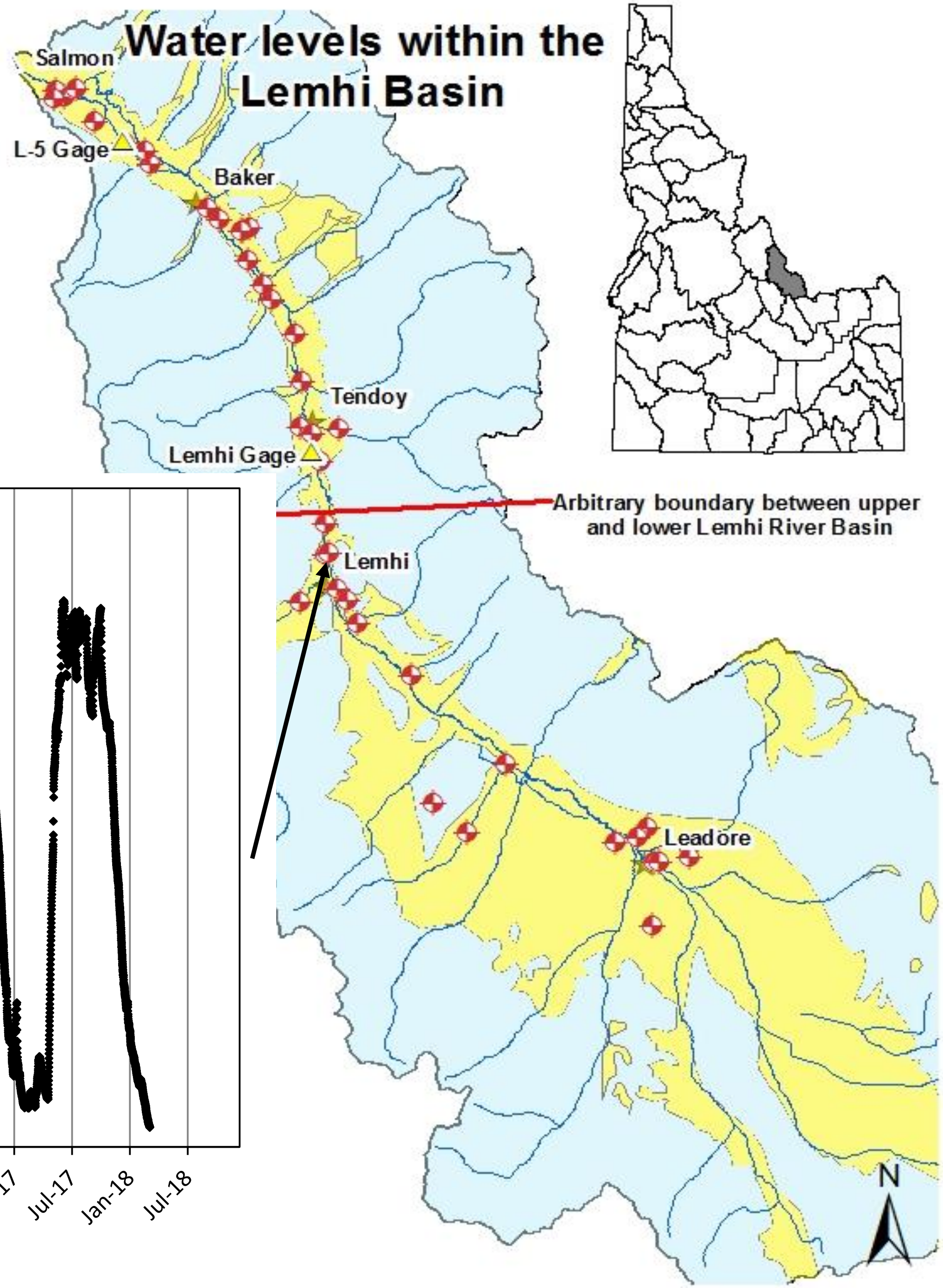
- Low variability of groundwater levels
- Low levels in the winter, high in the summer.





- Very high variability of groundwater levels
- Low levels in the winter, high in the summer.





Previous Studies

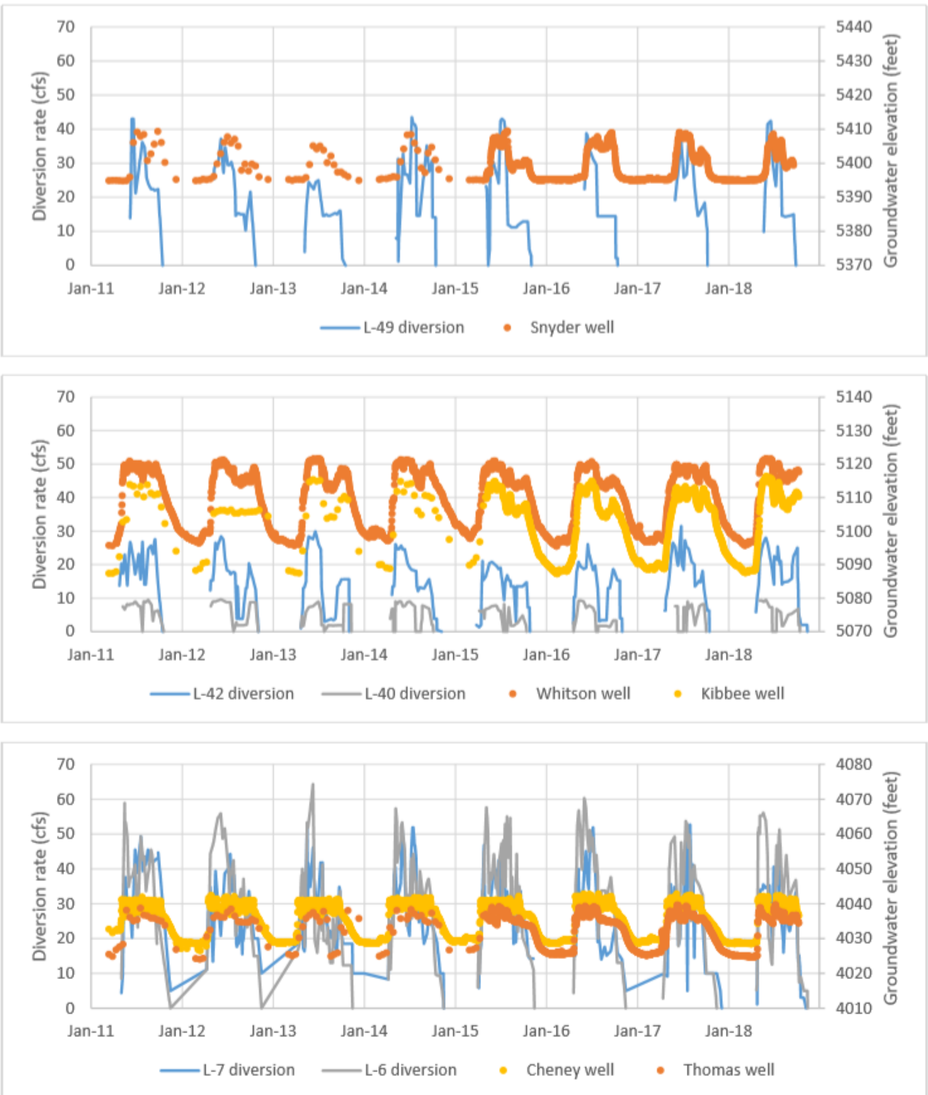
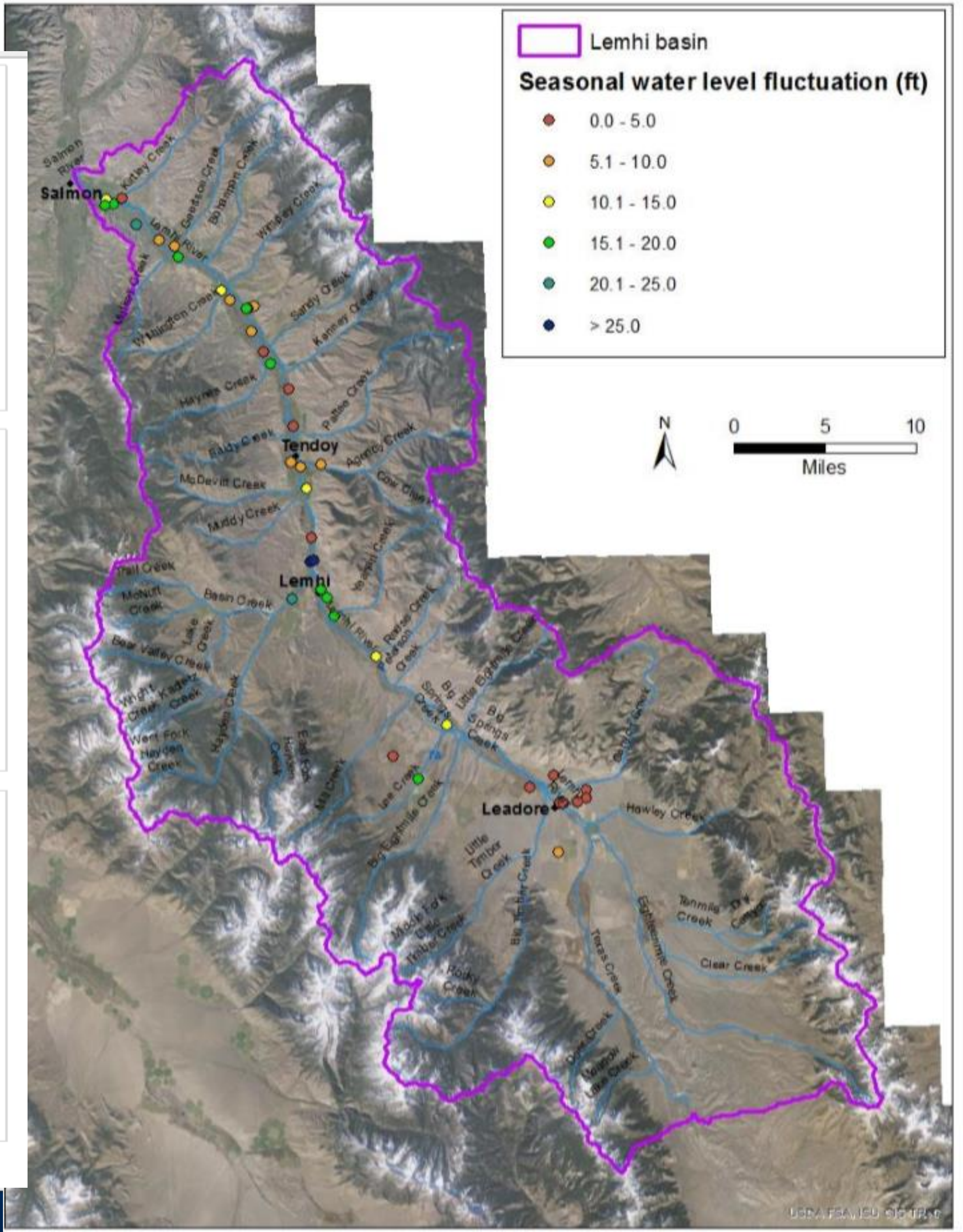


Figure J-2. Examples of the relationship between surface water diversions and groundwater head



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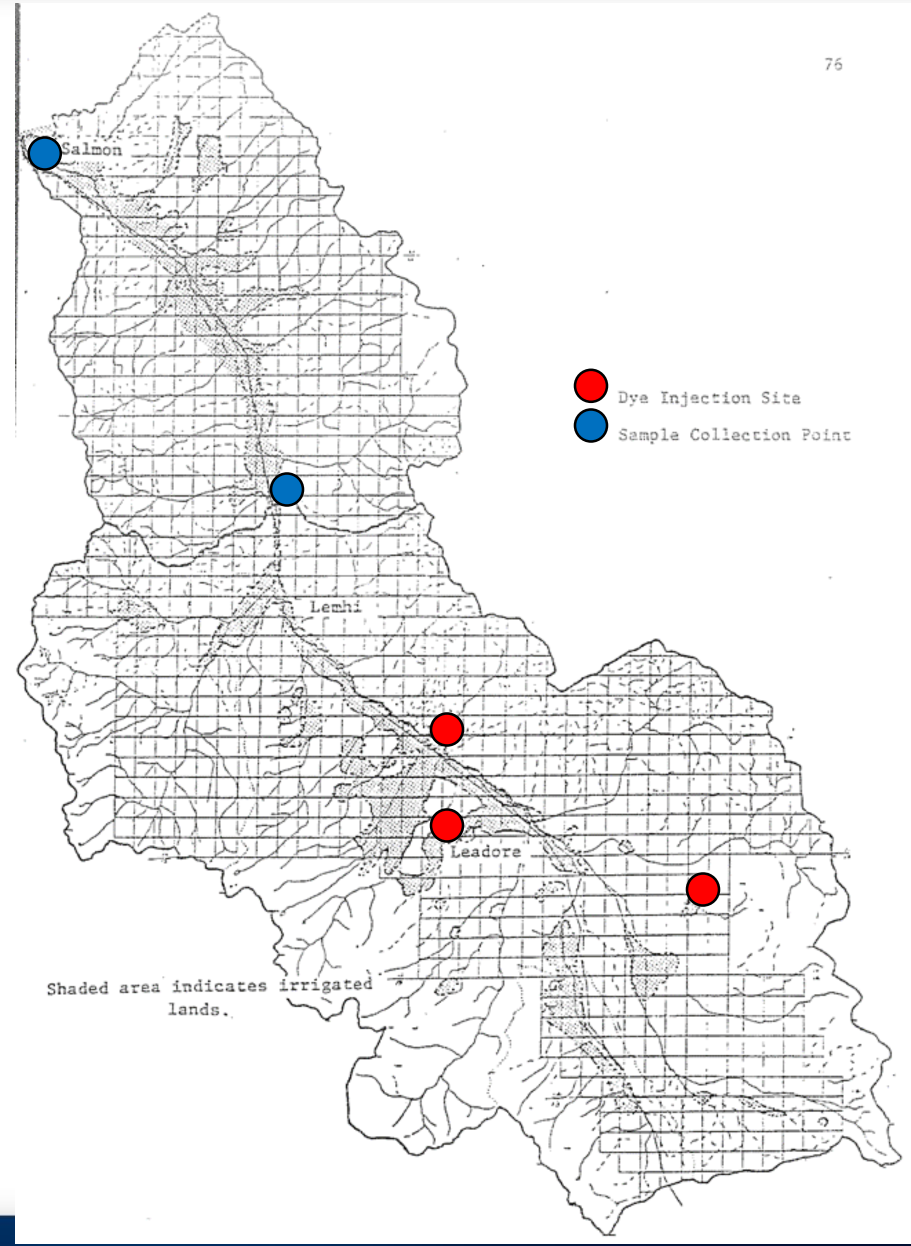
Previous Studies

Groundwater flow rate (Haws et al., 1977)

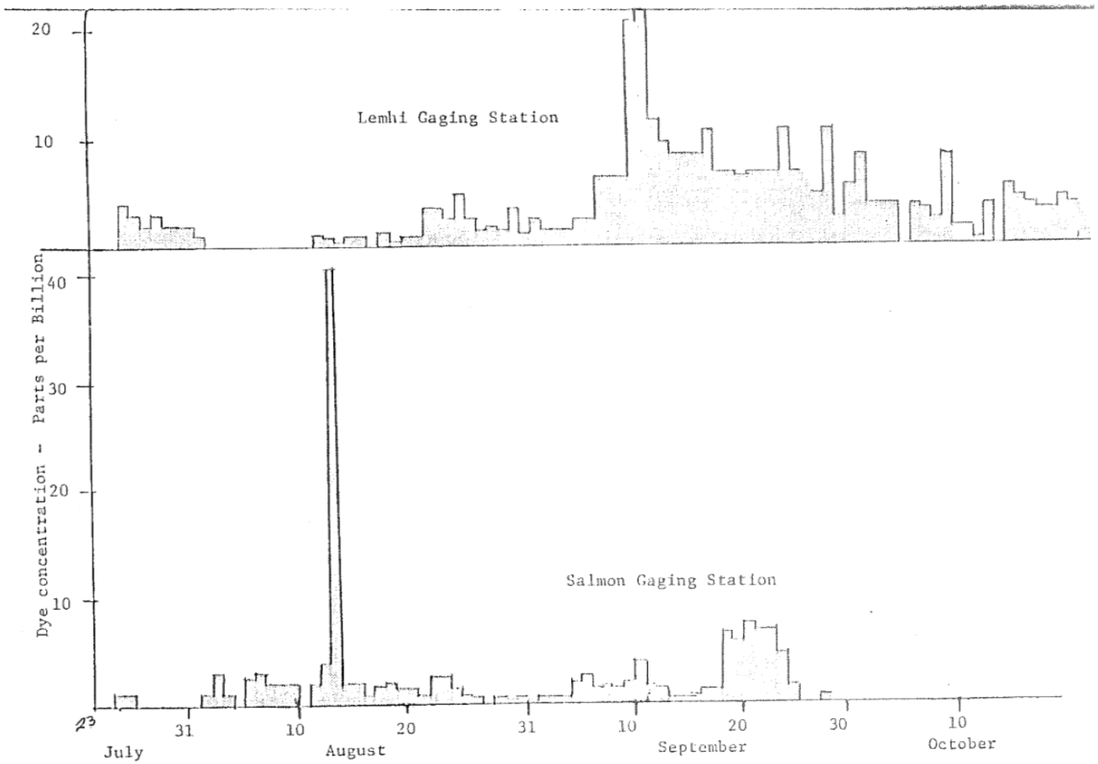
- Rhodamine dye was applied to three irrigation ditches in July, 1976.
- No direct surface route to Lemhi River.
- Monitored the river in Lemhi, ID and Salmon, ID until October.



Previous Studies

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



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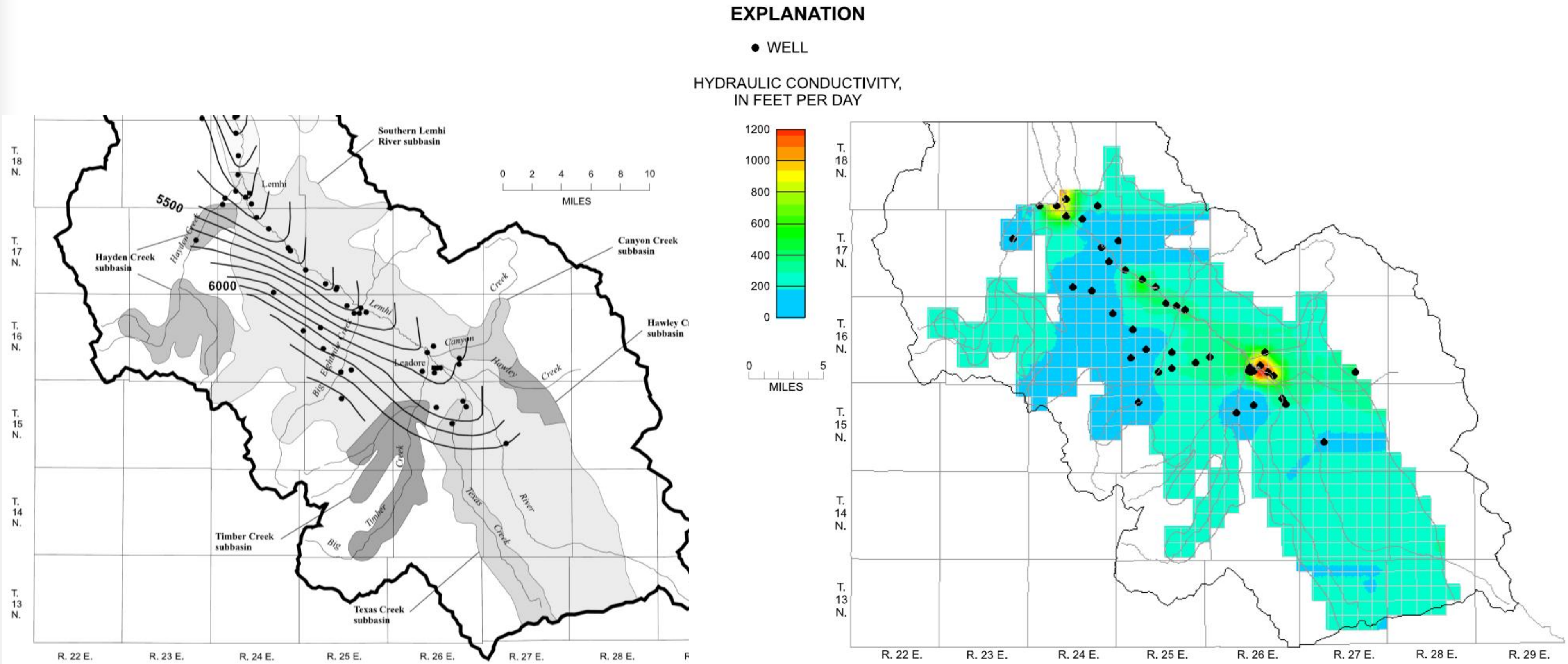
Previous Studies

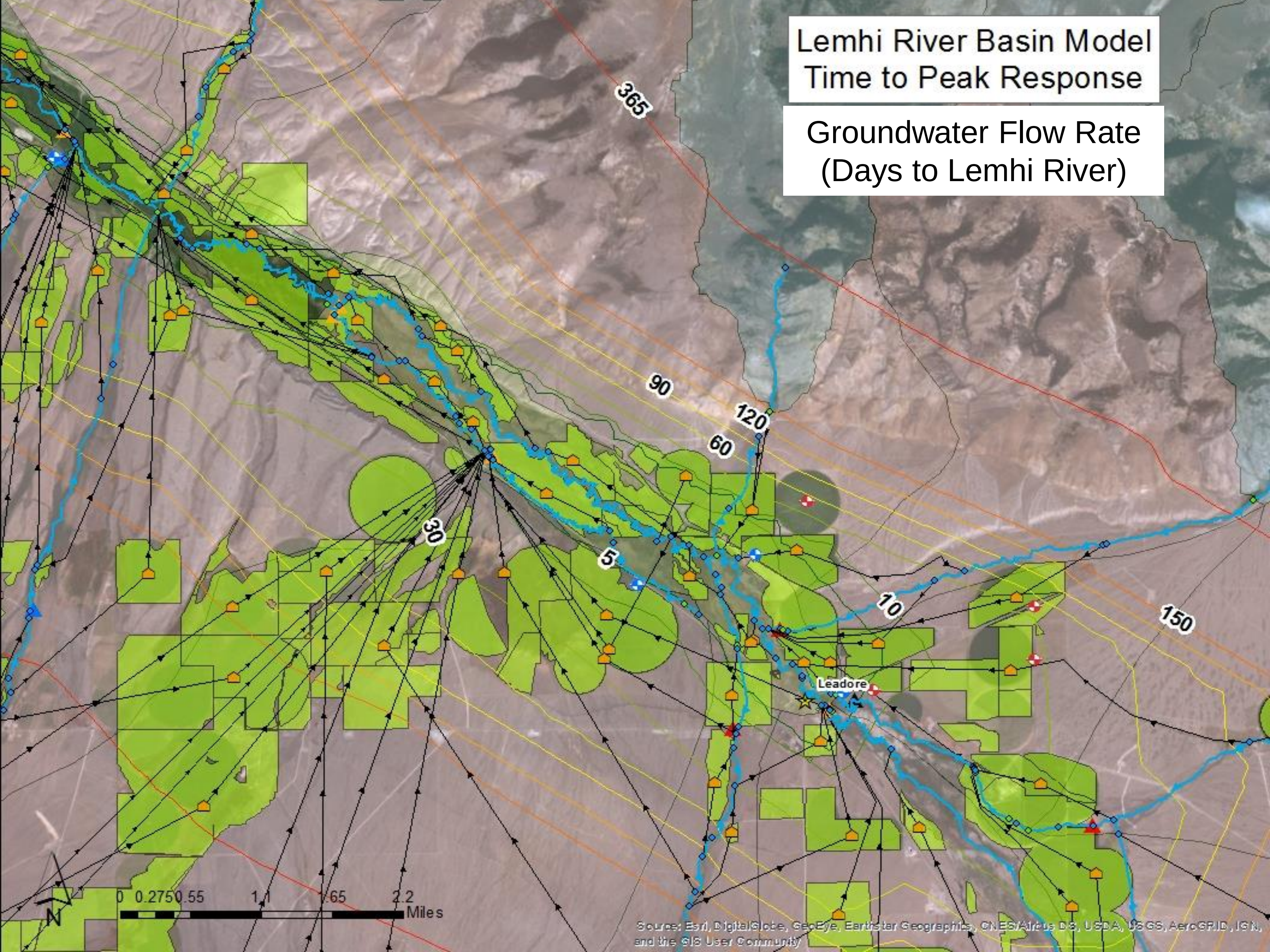
Groundwater flow rate (Spinazola 1998, USBR)



- Average linear groundwater flow velocity of 27 ft/d
- High variability of groundwater flow rates across the basin

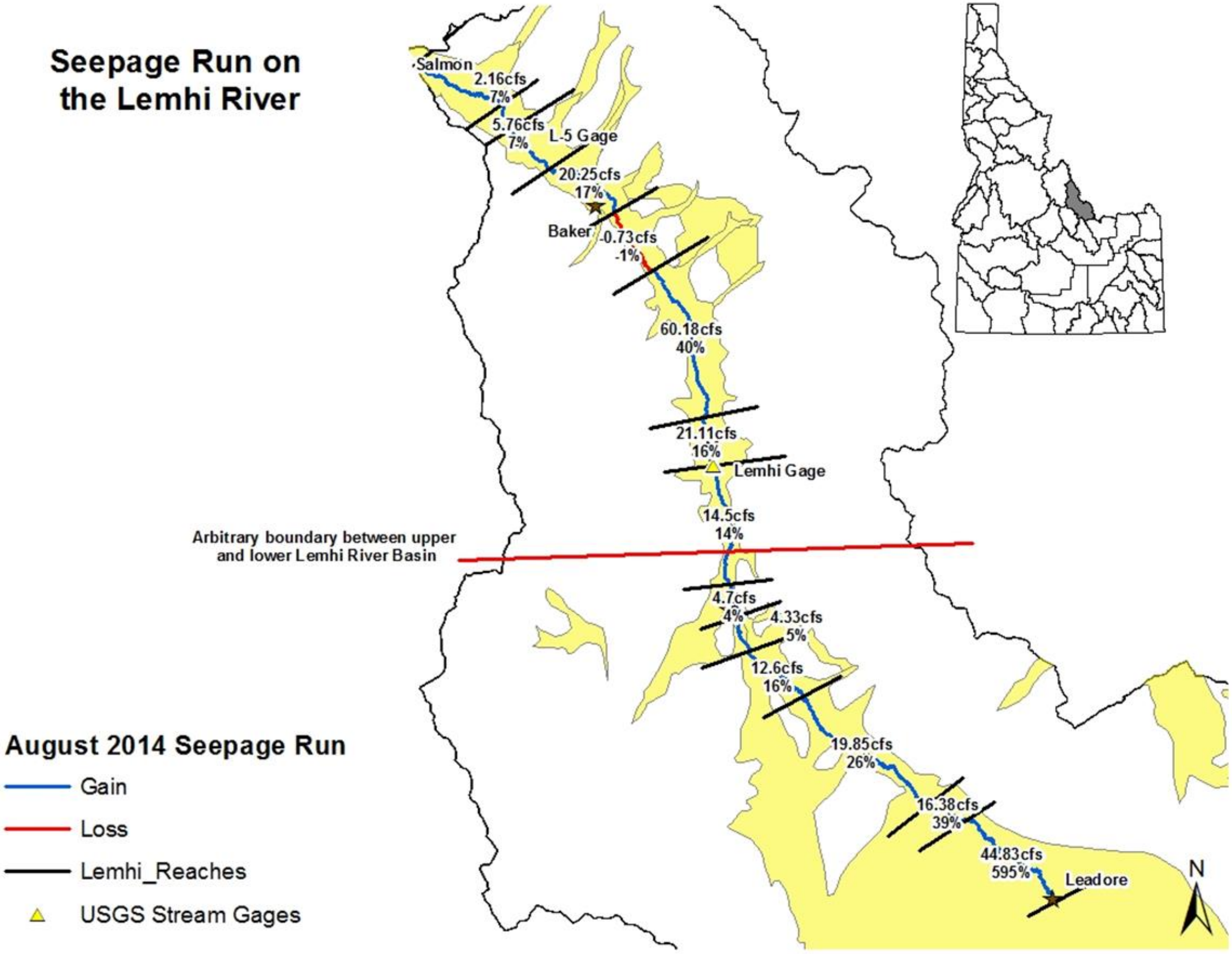
Lemhi River Basin Model
Time to Peak Response

Groundwater Flow Rate
(Days to Lemhi River)



Previous Studies

Groundwater impact on streamflow (Boggs 2014, CH2MHill)



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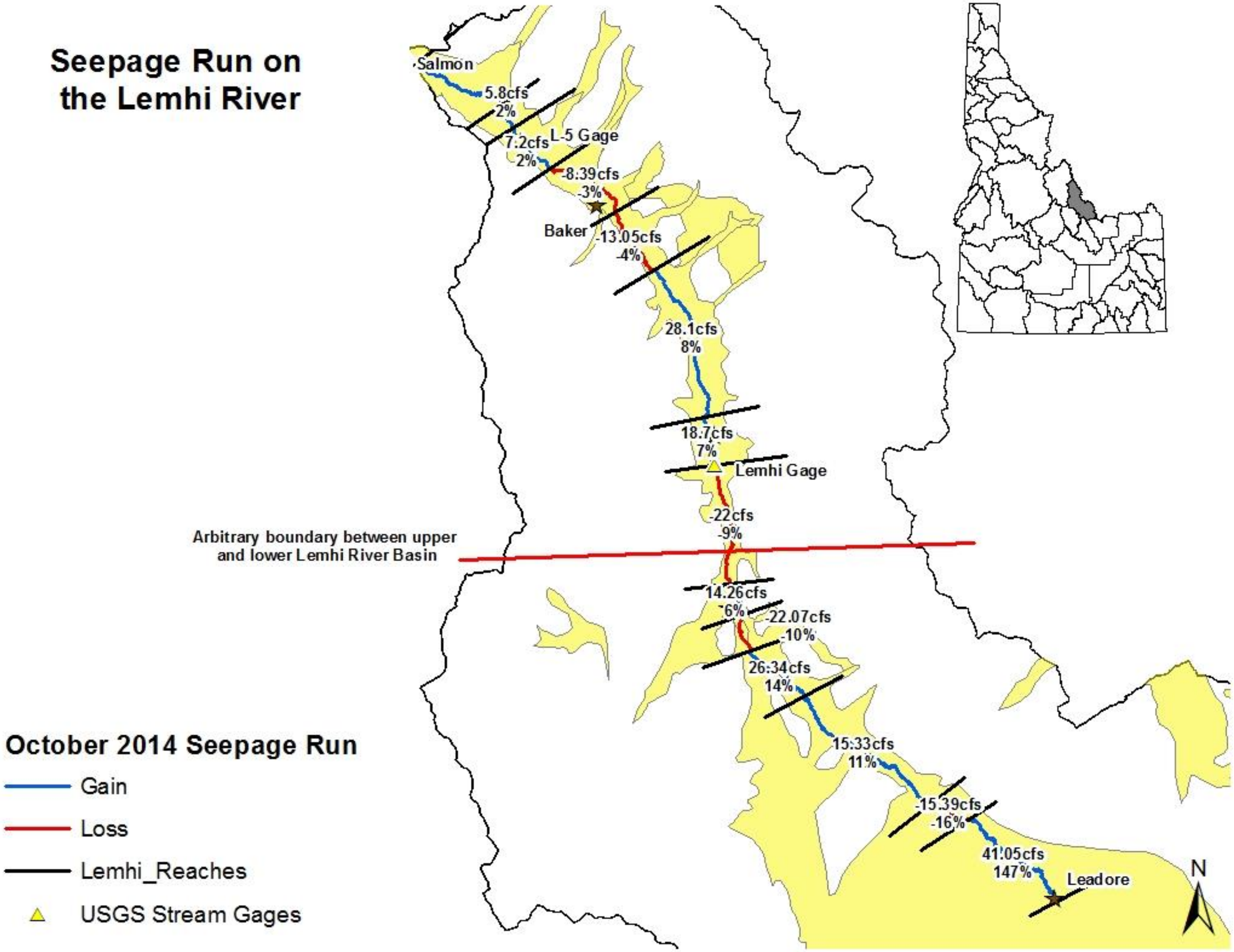

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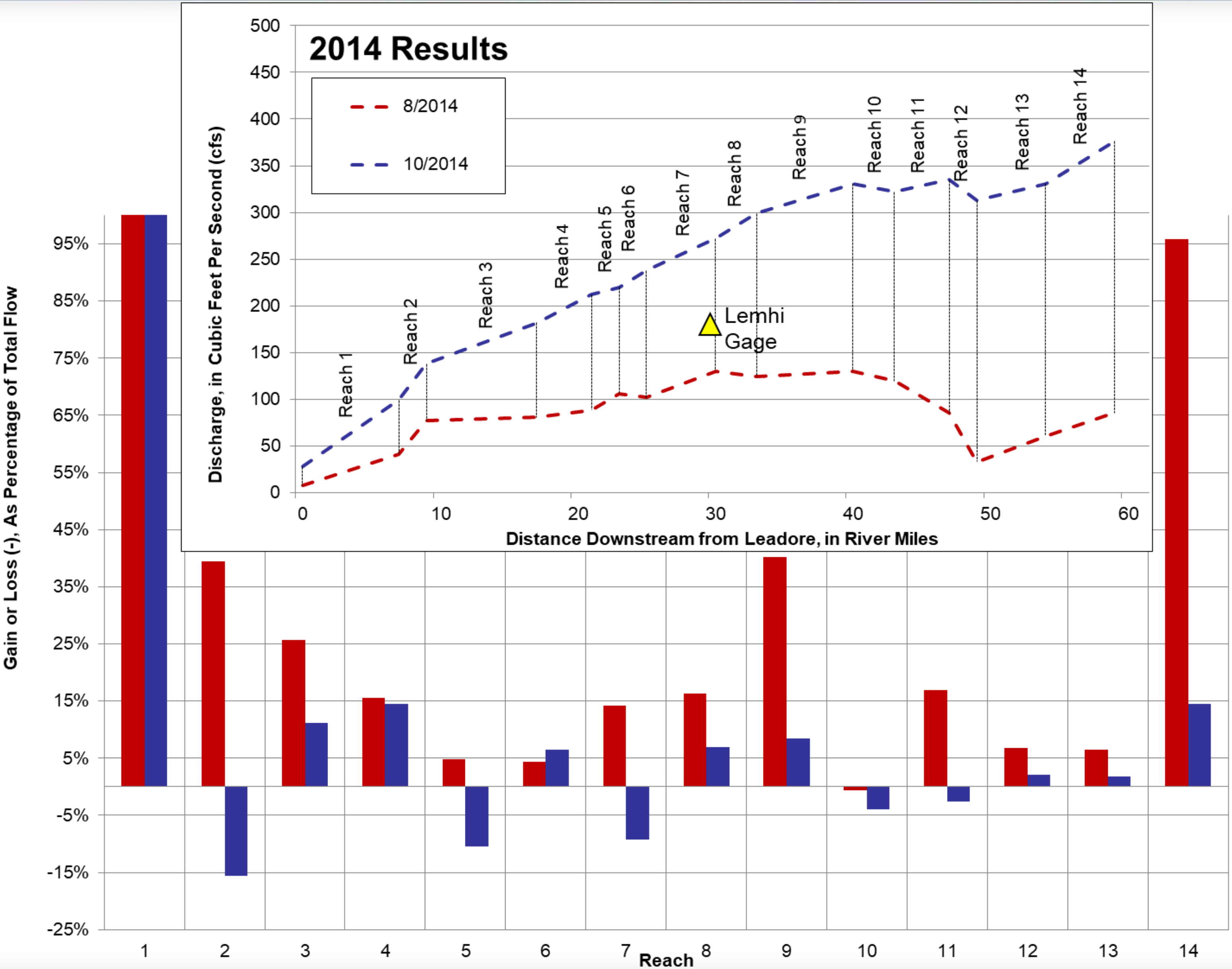
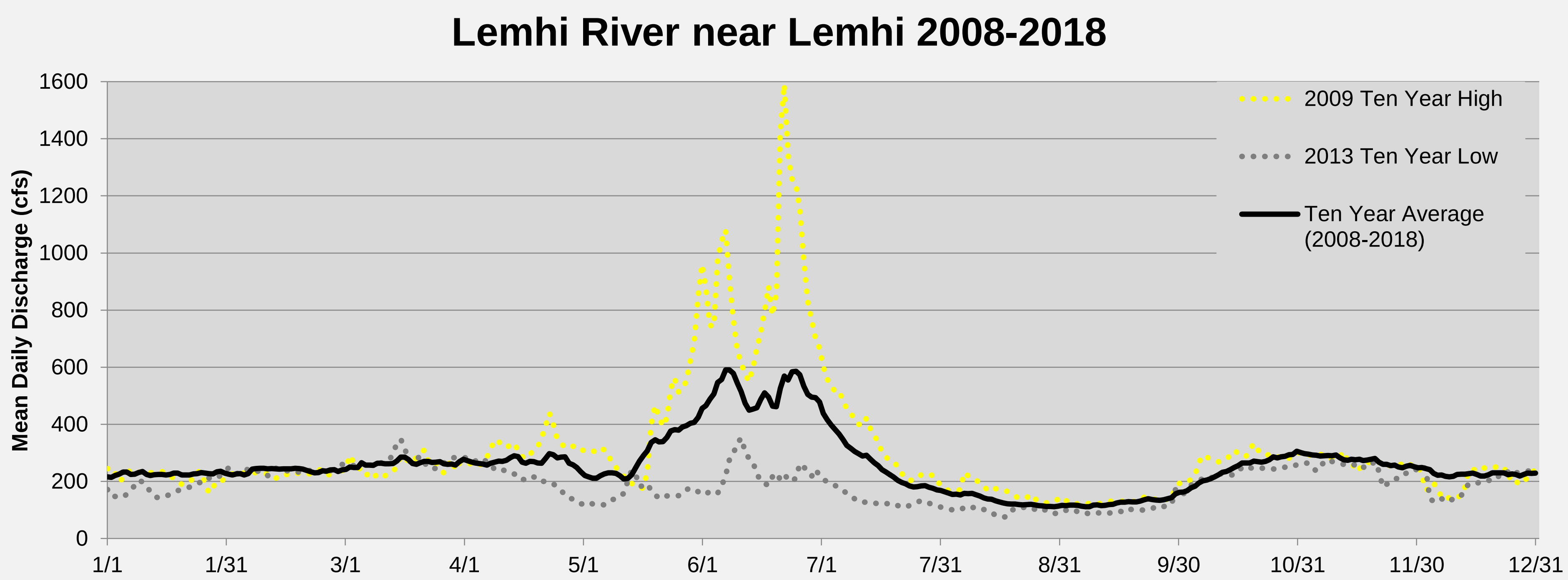


Previous Studies



Previous Studies

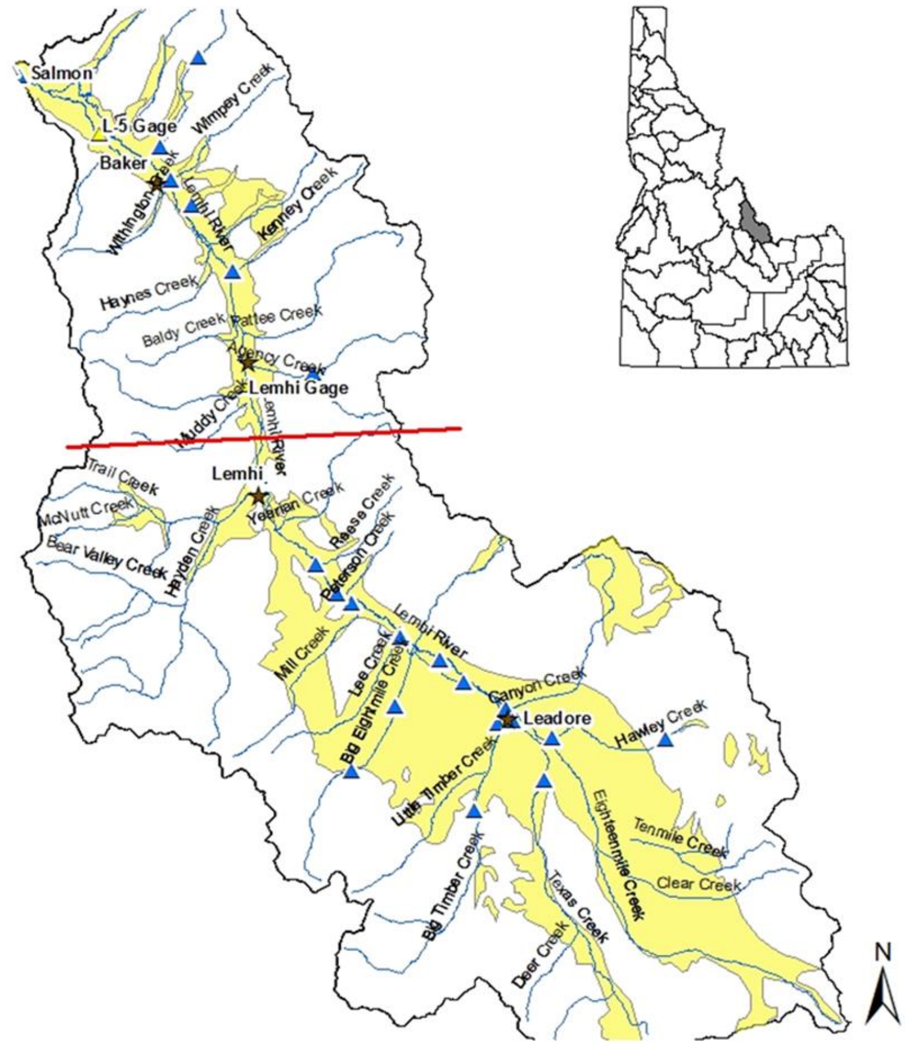
- **Groundwater Impact on Streamflow Discussion**
  - Streamflow gains and losses are partially governed by the slope of the aquifer between the adjacent aquifer and the river.
  - The water table slopes more steeply downhill toward the river in August than in October at locations downstream of Leadore.
    - 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.

Previous Studies

- **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

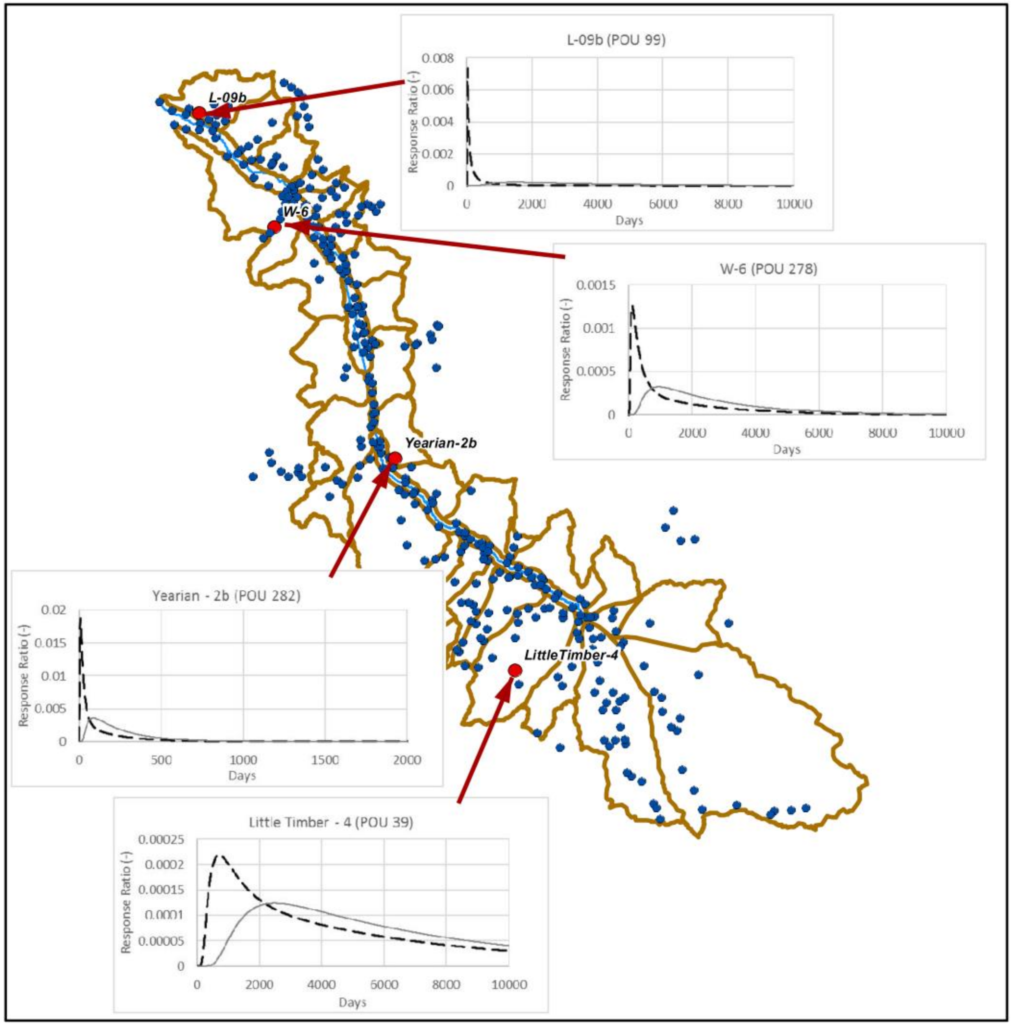
- Where and when do spring runoff and irrigation-induced groundwater recharge contribute to streamflow?
  - Tracer analyses
  - Collect improved aquifer properties data
  - Coupled groundwater and surface water model
- What are the hydrologic impacts of conversion from flood to sprinkler irrigation?
  - 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?

Previous Studies

Groundwater impact on streamflow (Boggs 2014, CH2MHill)

- **Mountain-front recharge (regional) -**
- **Applied irrigation water (local) --**
- Irrigation ditch conveyance losses (local) has not been calculated



Idaho Water & Managed Recharge

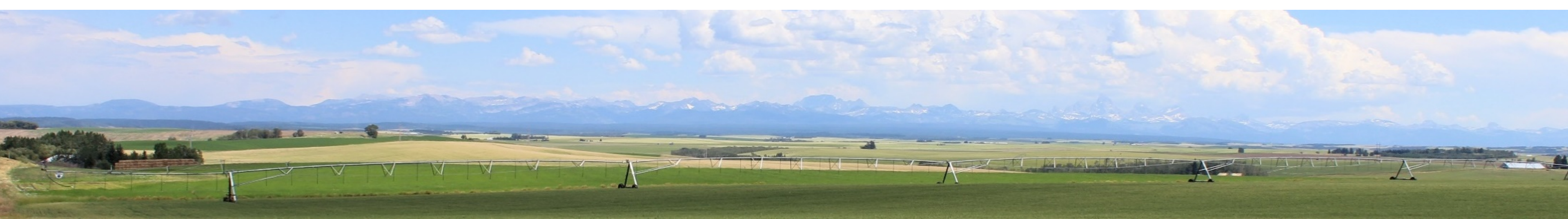
Lemhi Water Supply Meeting

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**

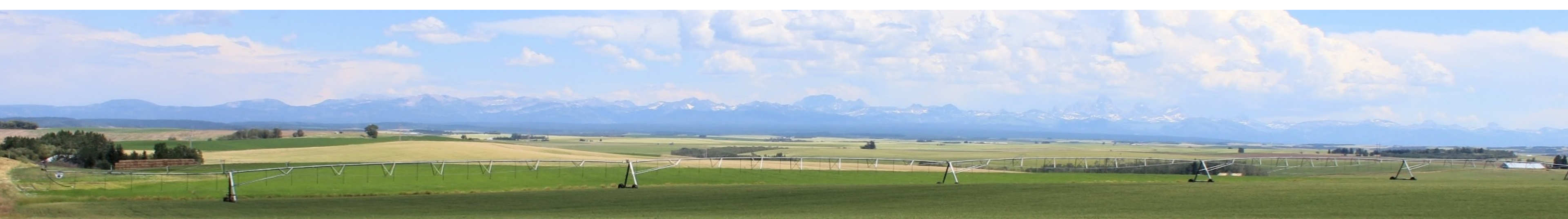
  Rain and snow infiltrating into ground water aquifers

- **Incidental Recharge**

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

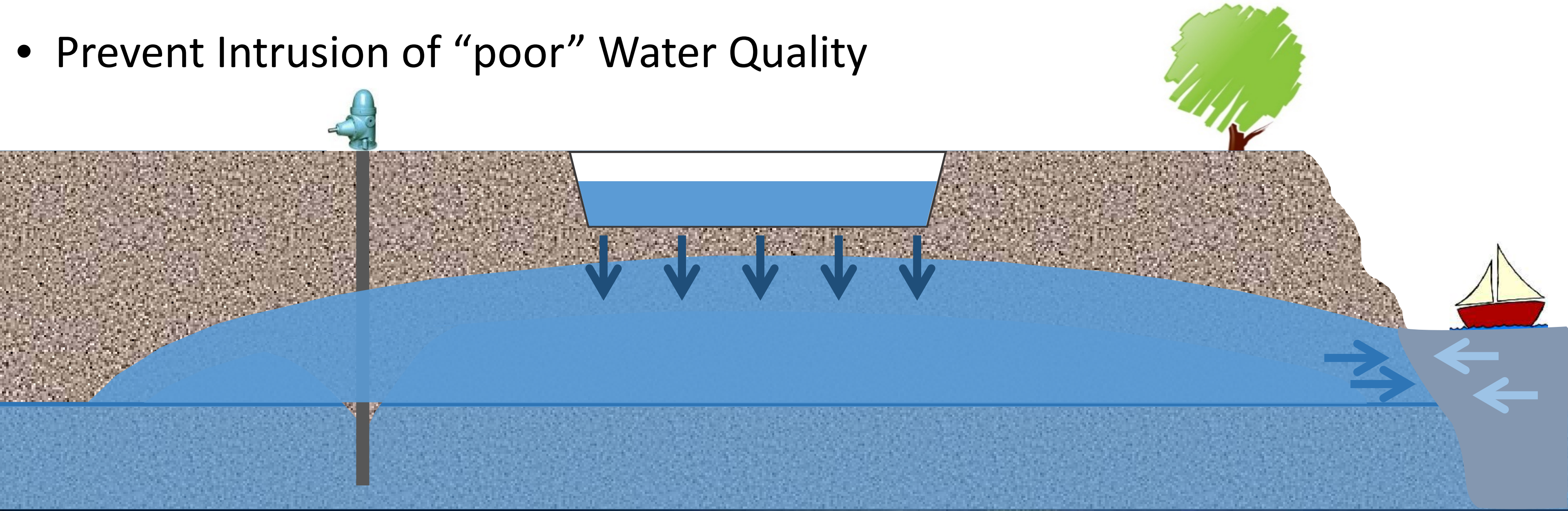
- **Managed Recharge**

  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**

IDAHO
Water Resource Board

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

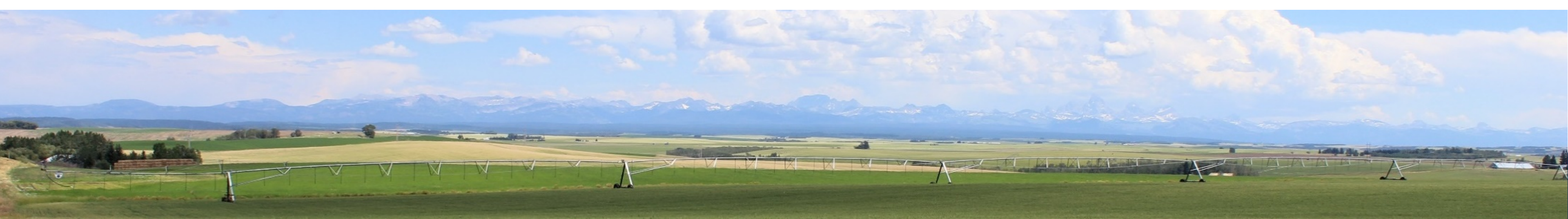
Recharge Water Right (Idaho Code § 42-234)

- "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

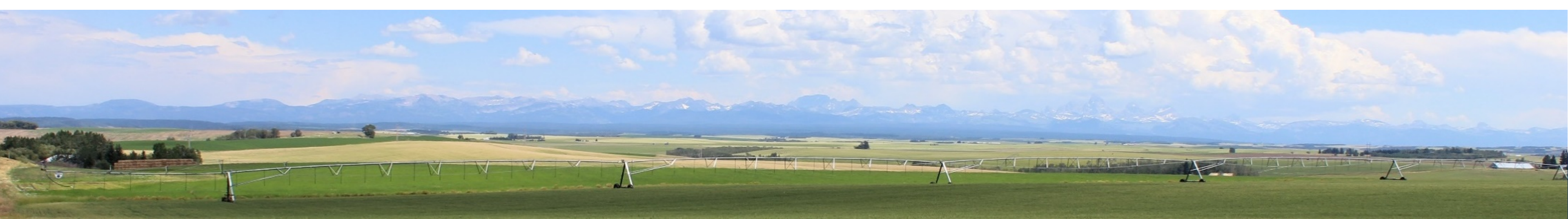
Water Quality – Protect the Aquifer and the Recharge Site:

- 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

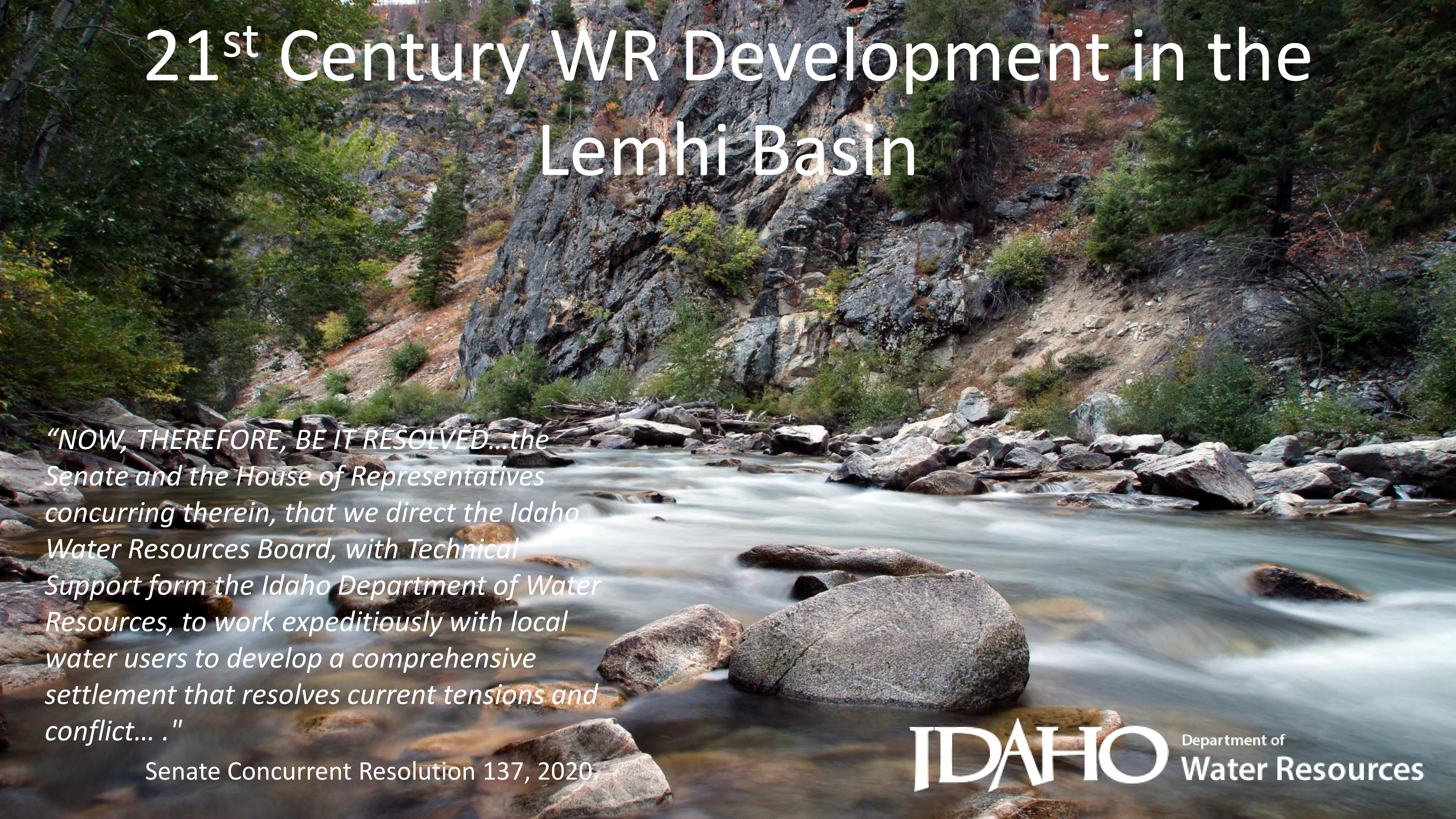


Questions

ESPA Sampled Analytes

- **Avg 130 analytes per sample**
  - Bacteria
  - Metals
  - Common Ions
  - Herbicides / Pesticides
  - VOCs / SVOCs
  - Field Parameters
    - Temp
    - DO
    - Specific Conductivity
    - pH

Arsenic	Picloram	Atrazine	Diphenamid	Fenarimaol
Cadmium	Acifluorfen	Propazine	Heptachlor epoxi	Permethrin
Chromium	Isophorone	beta-BHC	2,2',3'4,6-Pentachlorobiphenyl	Benzo(b)fluoranthene
Lead	Hexachlorocyclopentadiene	Pentachlorophenol	alpha-Chlordane	Benzo(k)fluoranthene
Selenium	EPTC	gamma-BHC (Linda	Tetrachlorvinphos	Benzo(a)pyrene
Uranium	Mevinphos	Pronamide	Pyrene	Fluridone
Total Phosphorus	Dichlorovos	Diazinon	Butachlor	Indeno(1,2,3-cd)pyrene
Fluoride	Butylate	Phenanthrene	Endosulfan I	Dibenz(a,h)anthracene
Nitrite as N	Vernolate	Anthracene	g-Chlordane	Benzo(g,h,i)perylene
Nitrate as N	Dimethyl-phthalate	Methyl Paraoxon	trans-Nonachlor-chlordane	
Sulfate	Pebulate	Terbacil	Napropamide(Devrinol)	
Chloride	Etridiazole	delta-BHC	Tricyclazole (Beam)	
Calcium	2,6-Dinitrotoluene	Chlorothalonil	4,4'-DDE	
Magnesium	Chloroneb	2,4,5-Trichlorobiphenyl	Dieldrin	
Potassium	Acenaphthylene	Metribuzin	2,2'4,4'5,6'Hexachlorobiphenyl	
Silica as SiO_2	2-Chlorobiphenyl	Simetryn	Endrin	
Sodium	Tebuthiuron	Ametryn	Chlorobenzilate	
Alkalinity, Bicarbonate	2,4-Dinitrotoluene	Alachlor	Endosulfan II	
Total Coliform	Molinate	Prometryn	4,4'-DDD	
E. coli	Diethylphthalate	Heptachlor	Endrin aldehyde	
Dalapon	Fluorene	Terbutryn	Norflurazon	
3,5-Dichlorobenzoic acid	Propachlor	Di-n-butylphthalate	Endosulfan Sulfate	
Dicamba	Ethoprop	Bromacil	Butylbenzylphthalate	
Dichloroprop	Cycloate	Malathion	4,4'-DDT	
2,4-D	Chlorpropham	2,2'4,4'-Tetrachlorobiphenyl	Hexazinone (Velpar)	
Pentachlorophenol	Trifluralin (Treflan)	Aldrin	Di(2-ethylhexyl)adipate	
2,4,5-TP (Silvex)	2,3-Dichlorobiphenyl	Metolachlor	Benzo(a)anthracene	
2,4,5-T	alpha-BHC	Cyanazine	Chrysene	
2,4-DB	Atraton	Chloropyrifos (Dursban)	2,2',3,3'4,4',6-Heptachlorobip	
Dinoseb	Prometon	Triadimefon	Methoxychlor	
Bentazon	Hexachlorobenzene	DCPA	2,2',3,3'4,5',6,6'-Octachlorob	
DCPA	Simazine (Princep)	MGK-264	bis(2-ethylhexyl)phthalate	



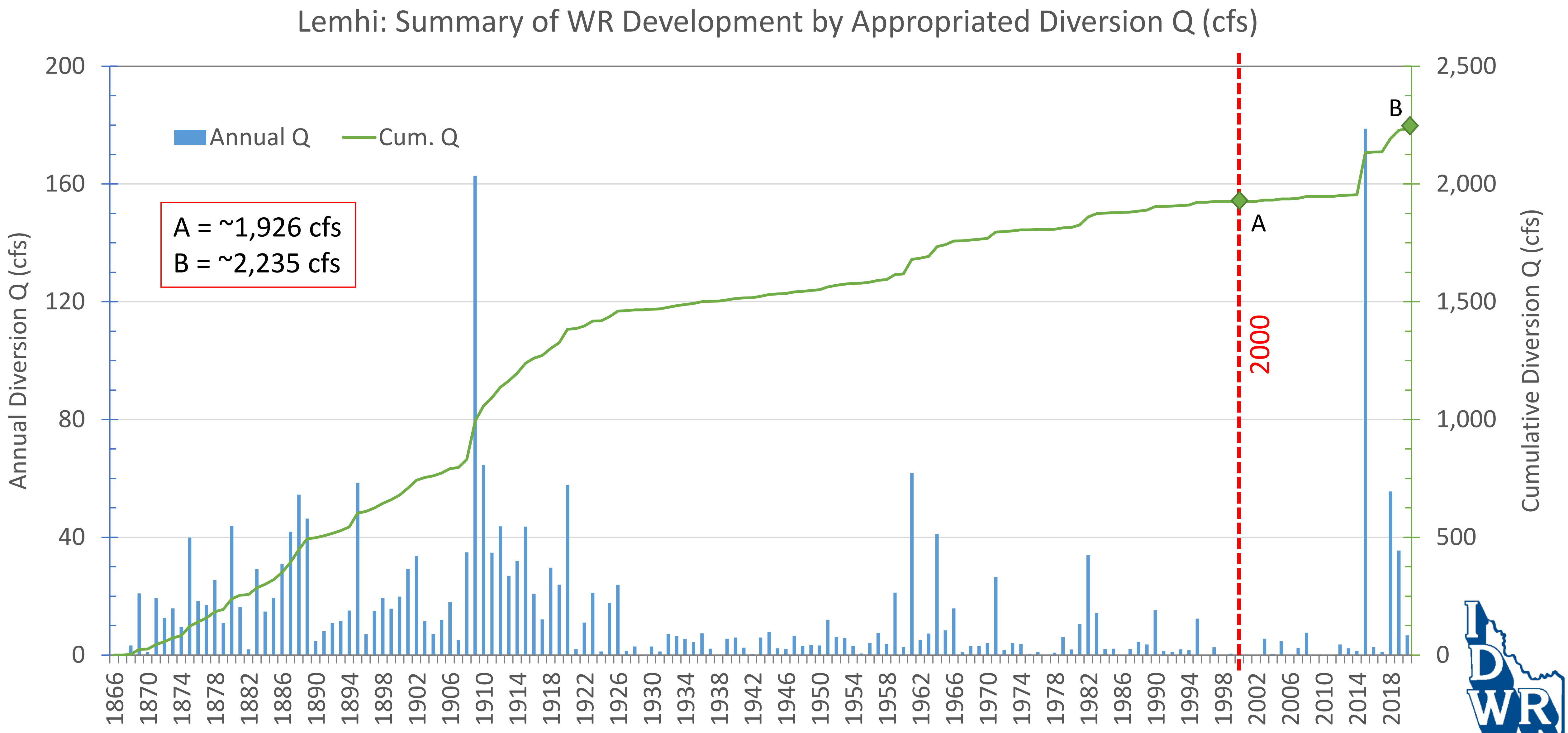
21st Century WR Development in the Lemhi Basin

"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 form 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.

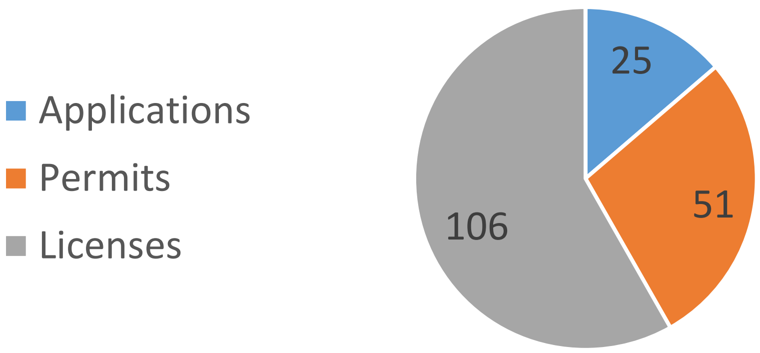
IDAHO Department of Water Resources

Lemhi: Historic WR Development

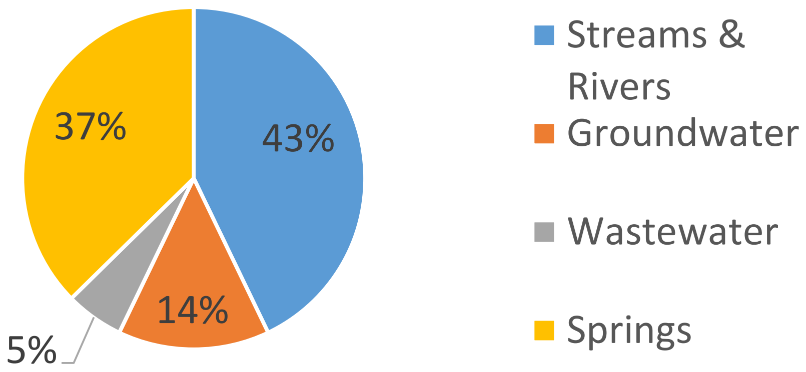


Lemhi: Post-2000 WR Summary Metrics

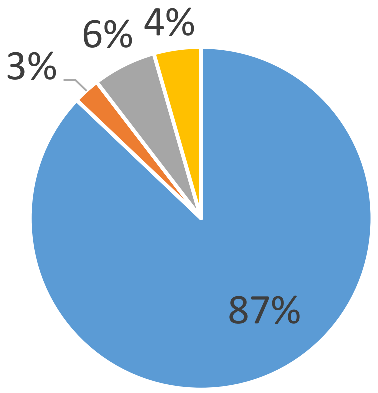
1. Post-2000 WR Records by Type
(182 Lic., Per., & App.)



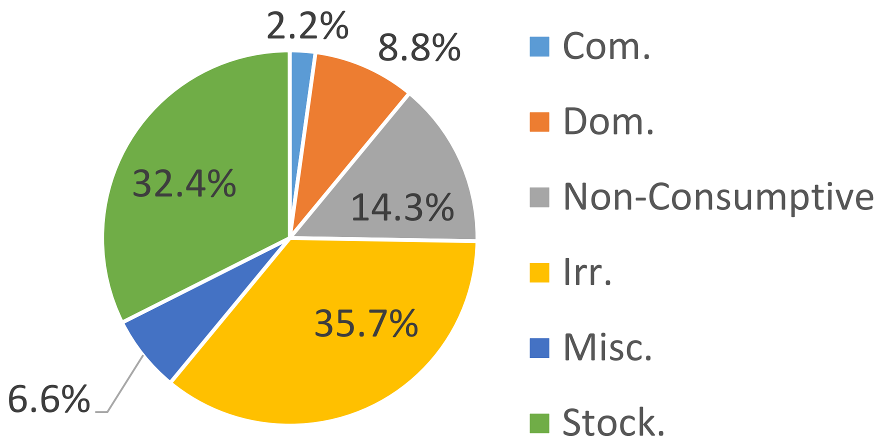
2. Post-2000 WRs – Sources
Combined Div. Q = 309 cfs



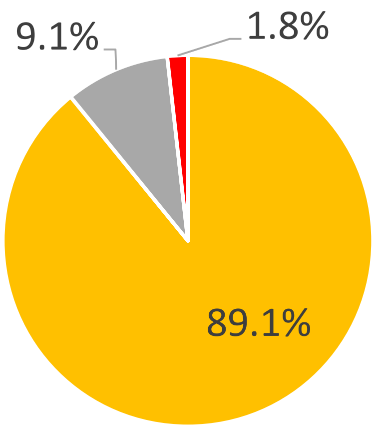
3. % of Total Diversions (309 cfs)
by Source



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



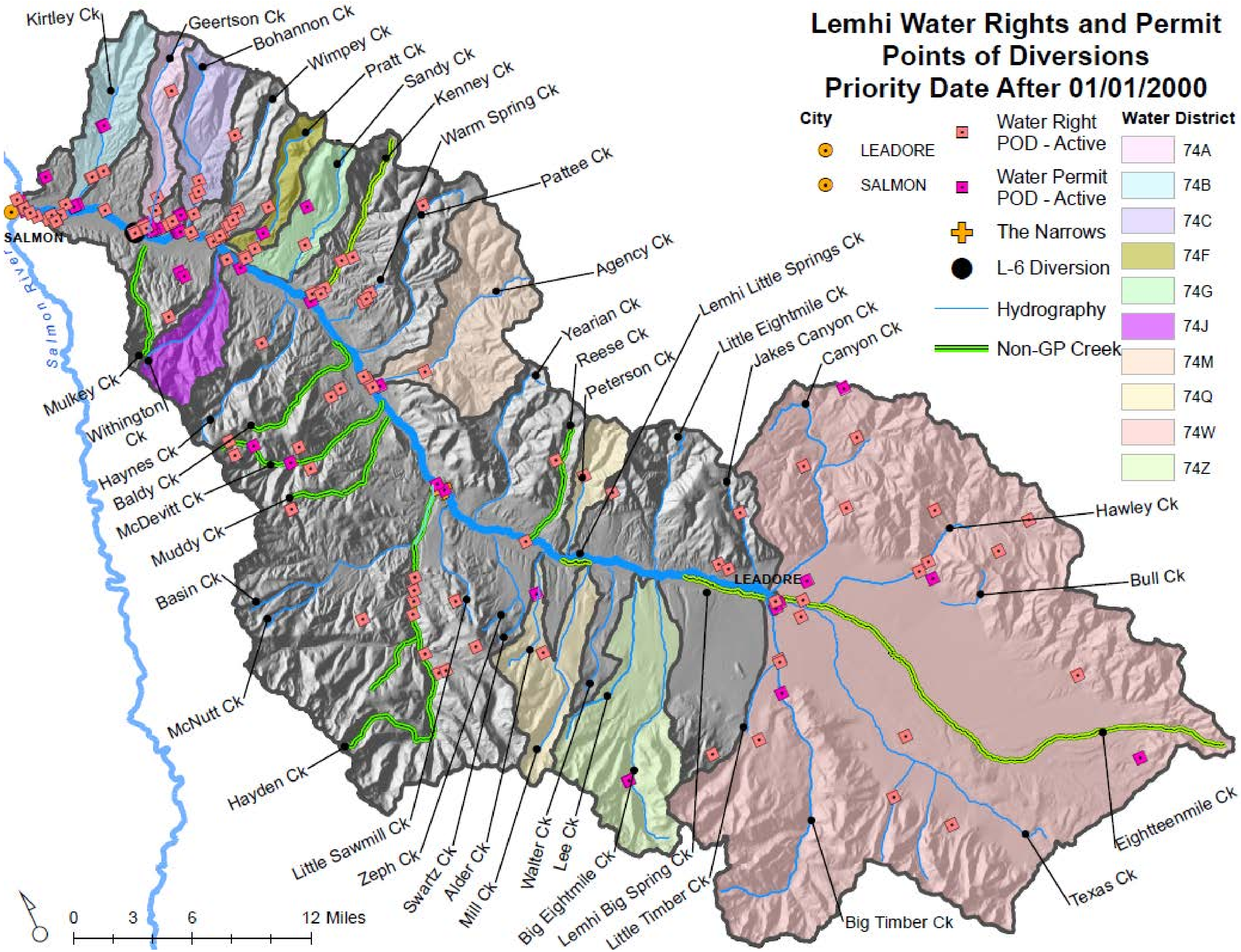
5. % of Total Diversions
(309 cfs)



Take Aways:

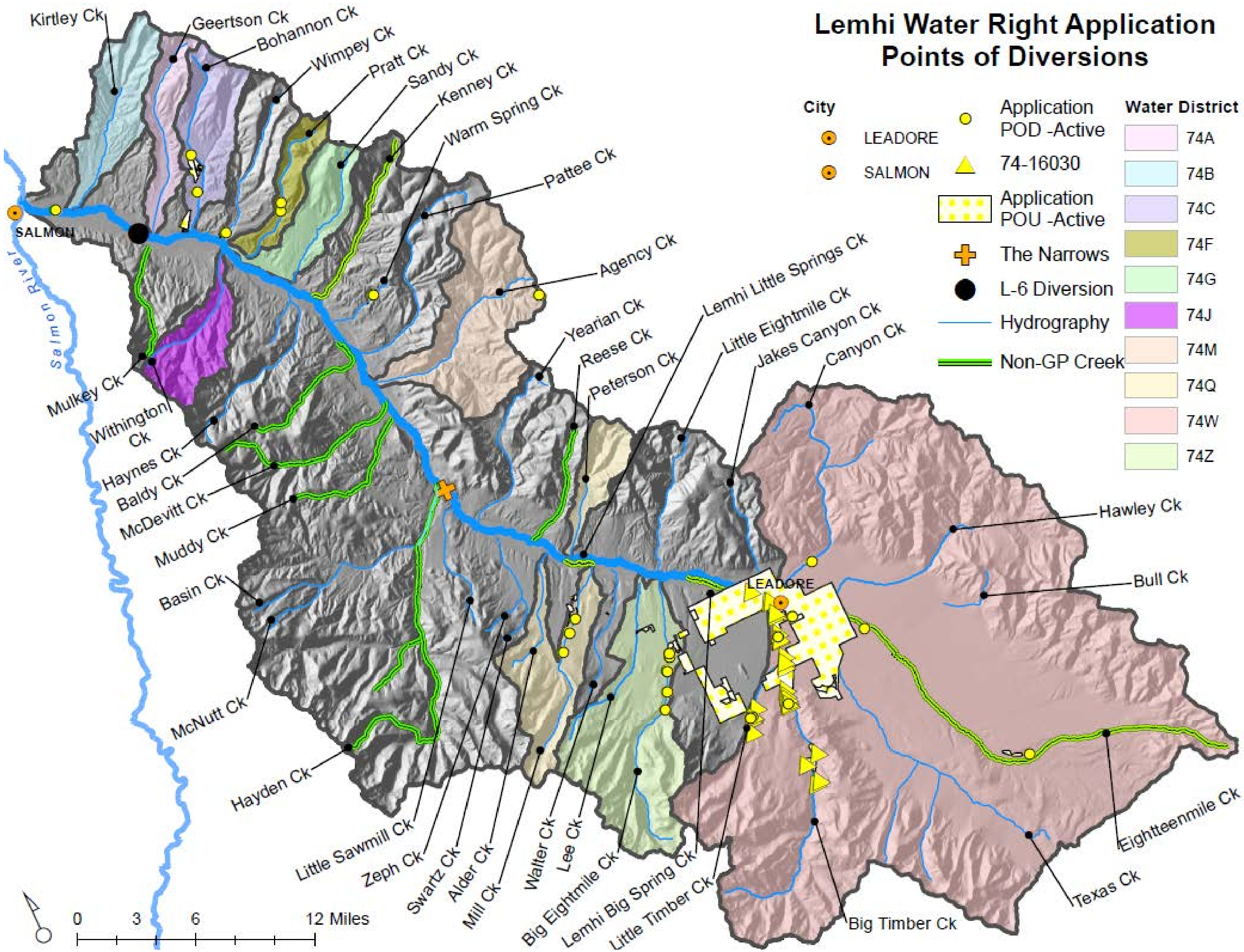
- 182 Records
- ∑Q = 309 cfs
- 87% Streams (269 cfs)
- 36% of Records for Irr.
- 275 cfs (89%) for Irr.

Lemhi: Post-2000 Licensed and Permitted WRs

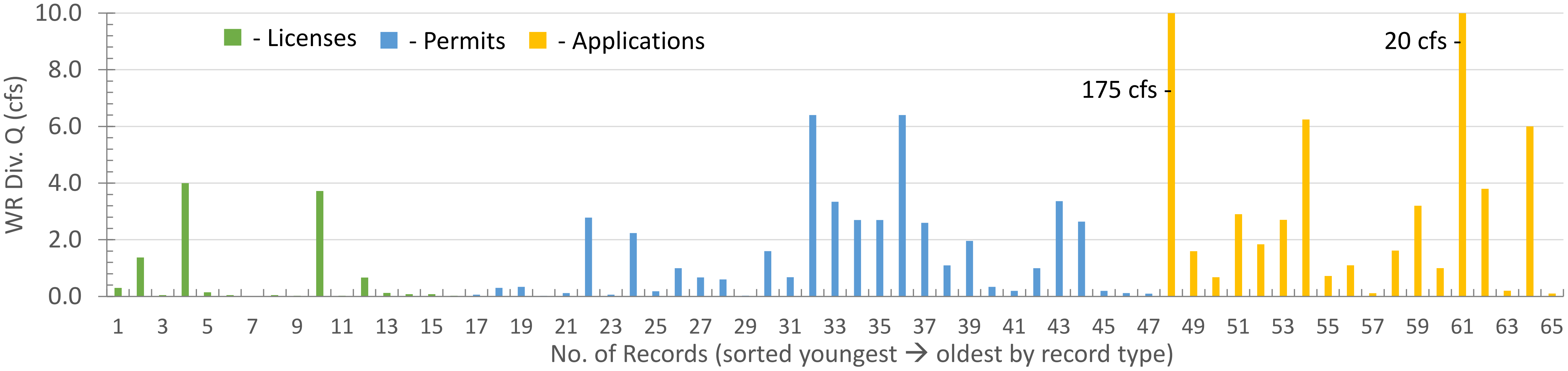


Lemhi: Post-2000 Pending WR Applications

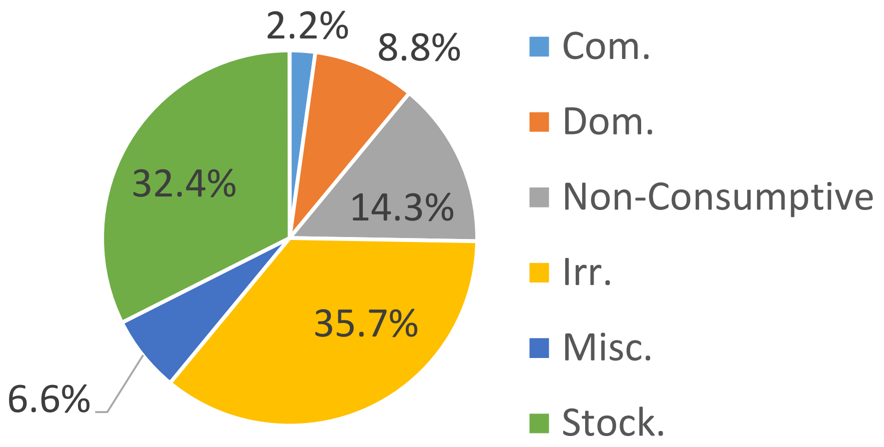
- 25 active applications
- Primarily Irr.
- Combined Diversion Q = 227 cfs
- 175 cfs for irrigation application 74-16030



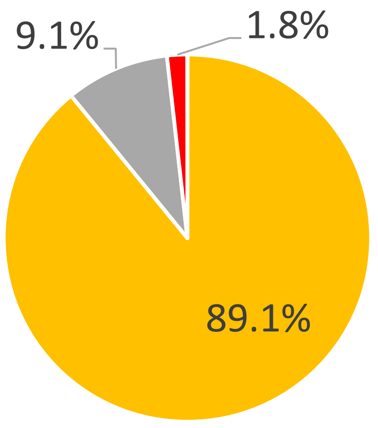
Lemhi: Post-2000 Irrigation Water Right Records



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



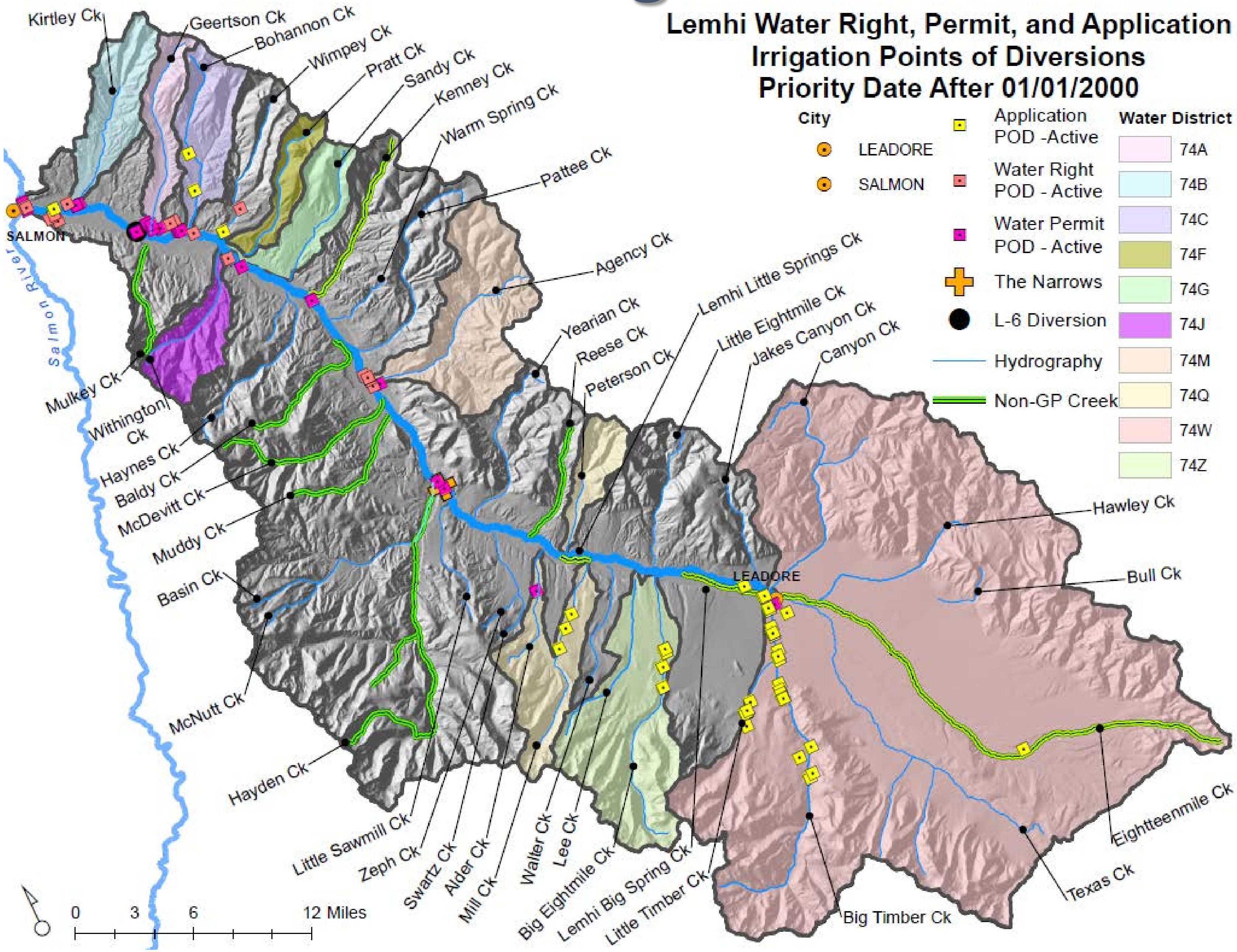
2. % of Total Diversions (309 cfs)



Take Aways:

- 182 Total Records
- 65 Records (36%) Irr.
- 309 cfs Total Diversions
- 275 cfs (89%) for Irr.

Lemhi: Post-2000 Irrigation WR Records



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/

IDWR Federal Wild and Scenic On-Line Resources

Wild and Scenic Summary Report

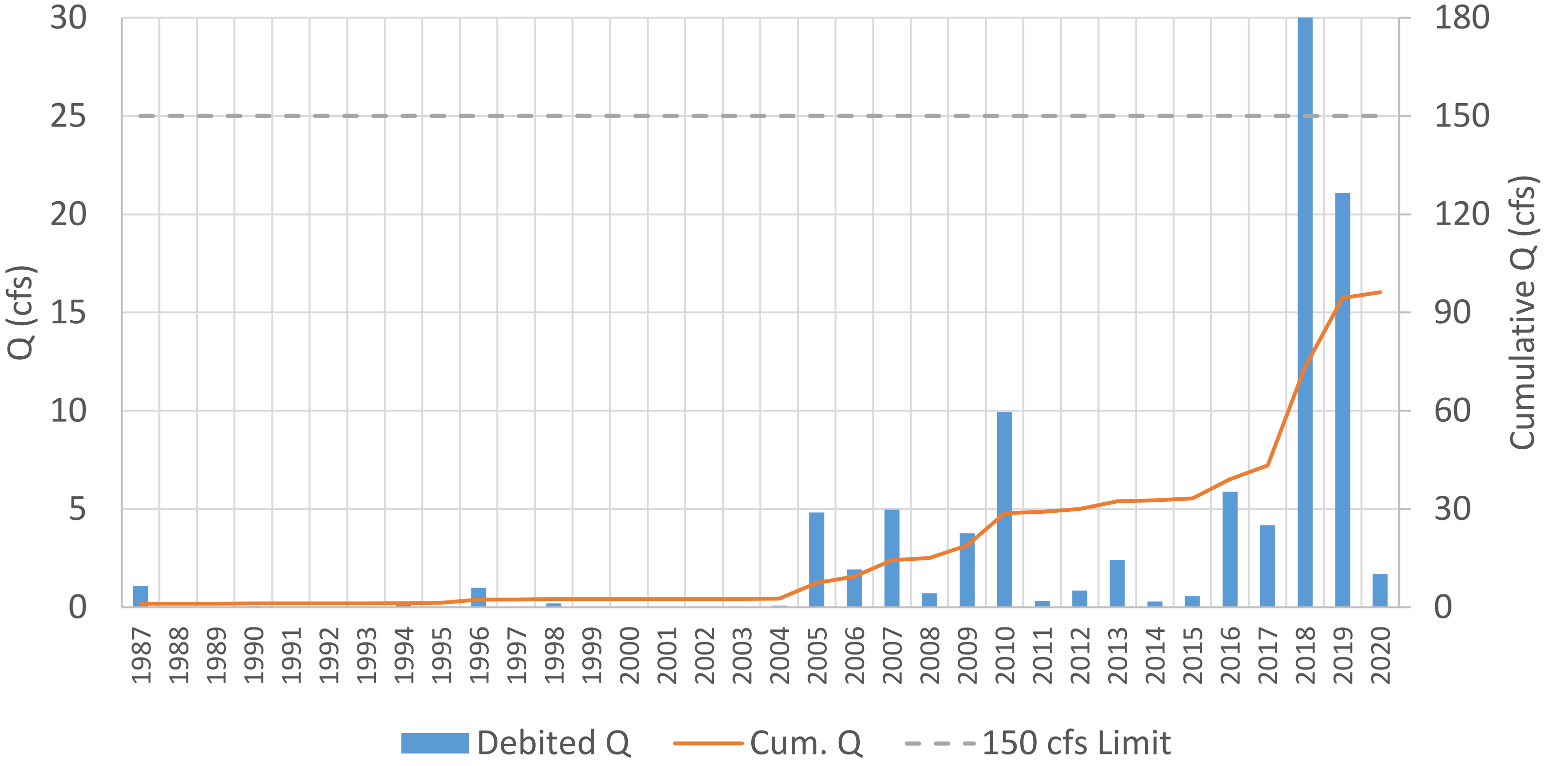
Wild & Scenic River	Future Use Subordination Account -- Acres	Acres Used	Acres Remaining	Future Use Subordination Account -- Rate	Rate Used	Rate Remaining
Lochsa River	500	60.6	439.4	40	1.31	38.69
Middle Fork Clearwater River	500	10.5	489.5	40	0.61	39.39
Middle Fork Salmon River	2000	2	1998	60	0.04	59.96
Rapid River	300	0	300	10	32	-22
Salmon River	5000	4116.7	883.3	150	97.54	52.46
Selway River	500	0	500	40	0	40
St. Joe River	0	0	0	5	0	5

IDWR WR Wild and Scenic Webpage:

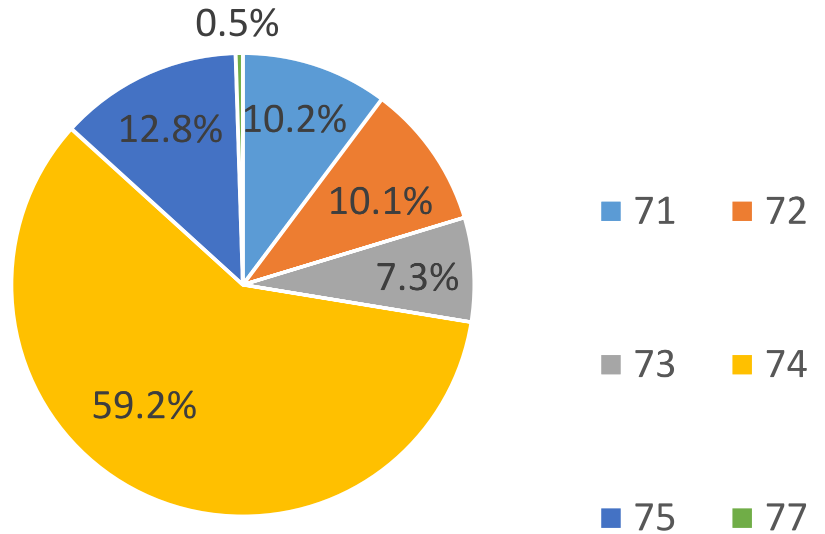
- URL: https://idwr.idaho.gov/water-rights/wild-and-scenic-rivers/research.html
- Published Documents, Research, Maps, and IDWR Contacts
- Download Decrees, Spreadsheets of WR Records, and Summary Tables (see above)

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



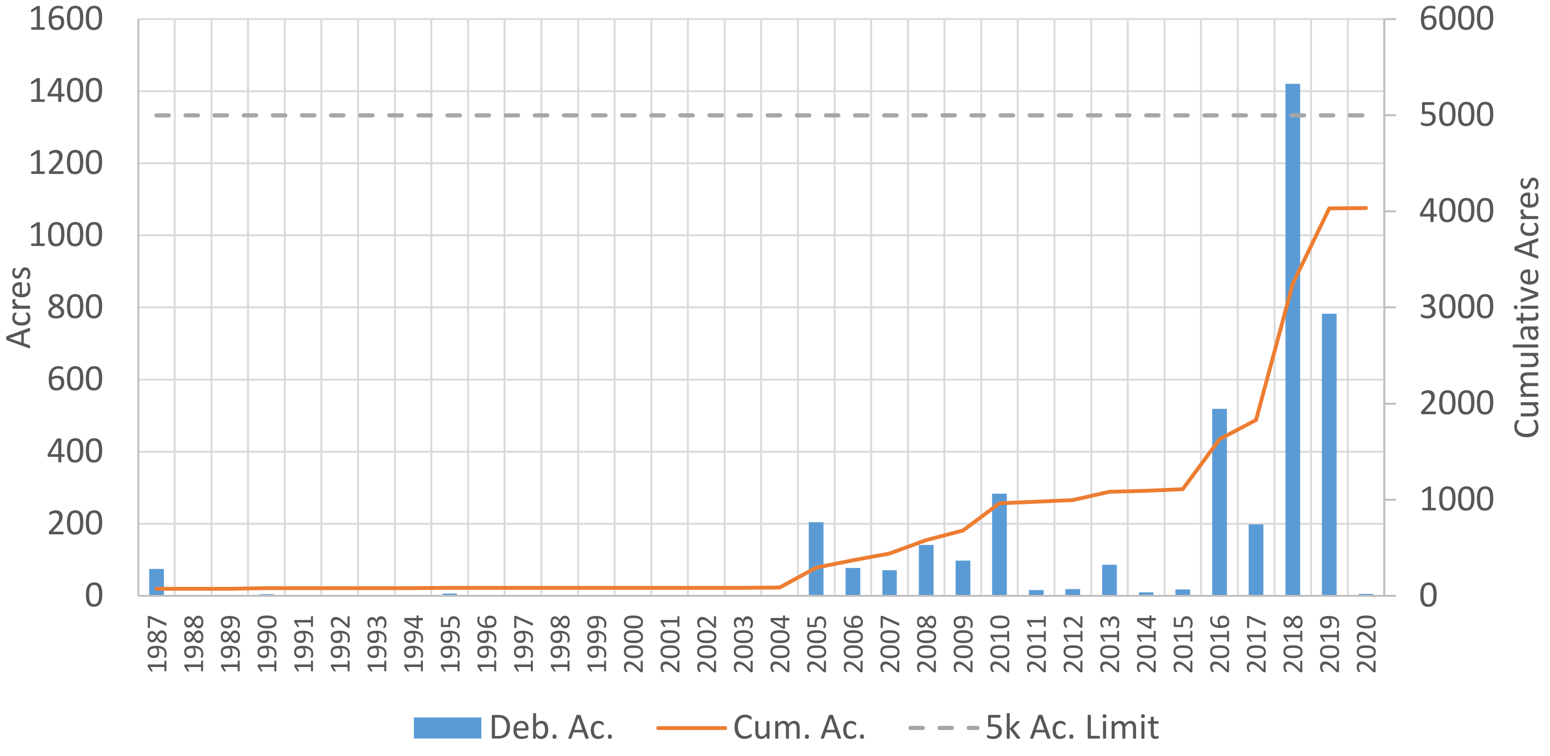
2. Salmon River Wild and Scenic WR - 150 cfs Reservation Break Down by Upper Salmon River Basins



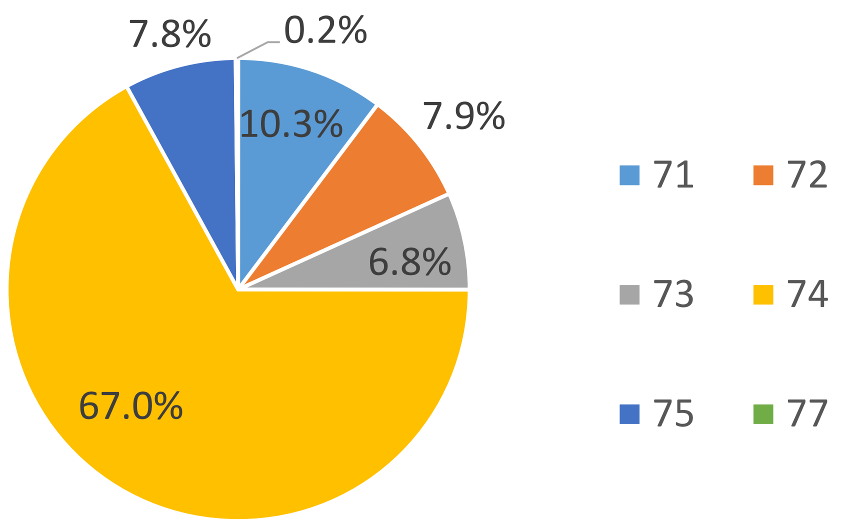
Reservation = 150 cfs
Current Debited ∑Q = 97.54 cfs
Remaining Q = 52.46 cfs (35%)

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)

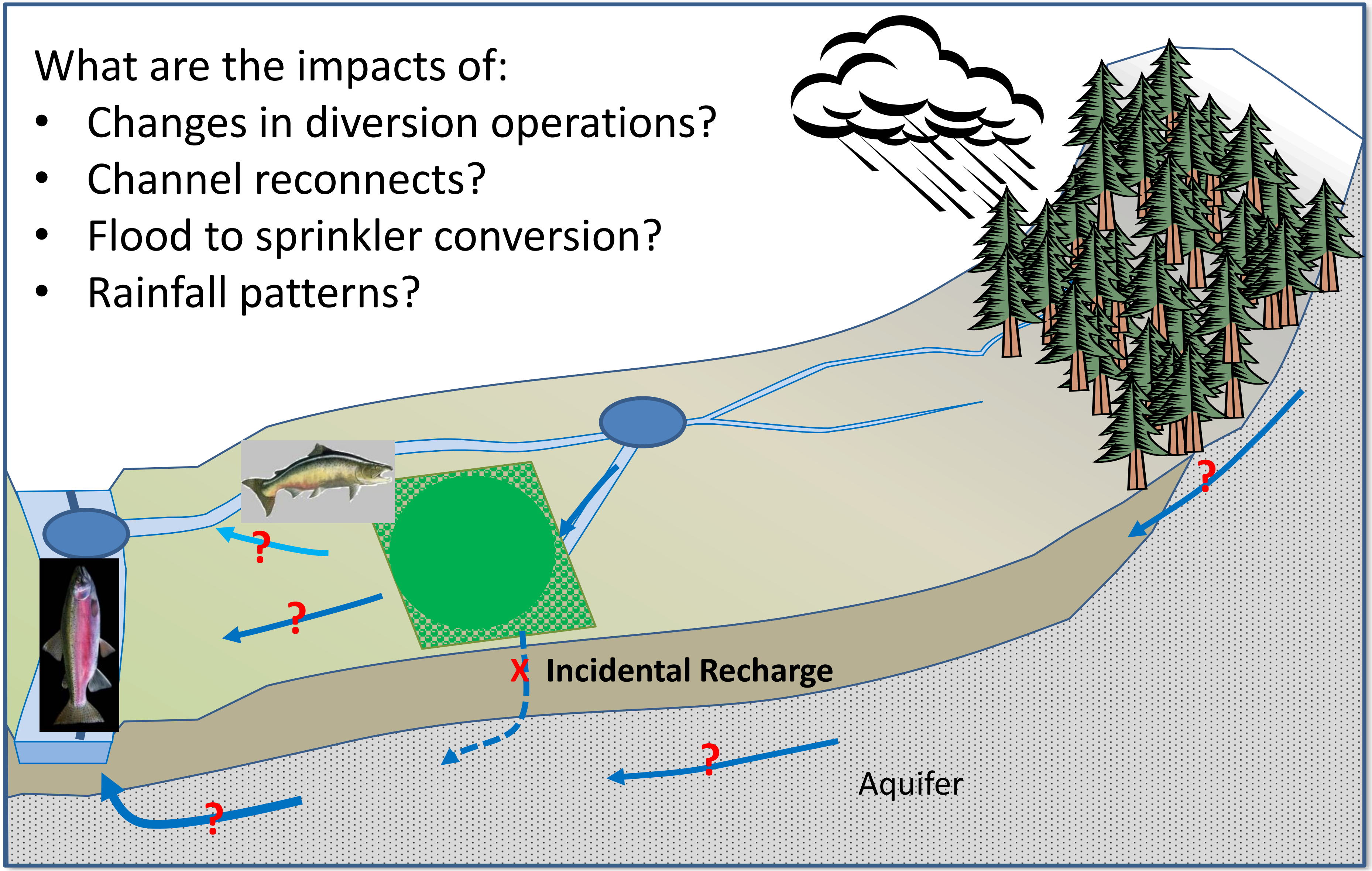
LRBM: Big Timber Creek

Carter Borden, Ph.D.
July 14, 2020

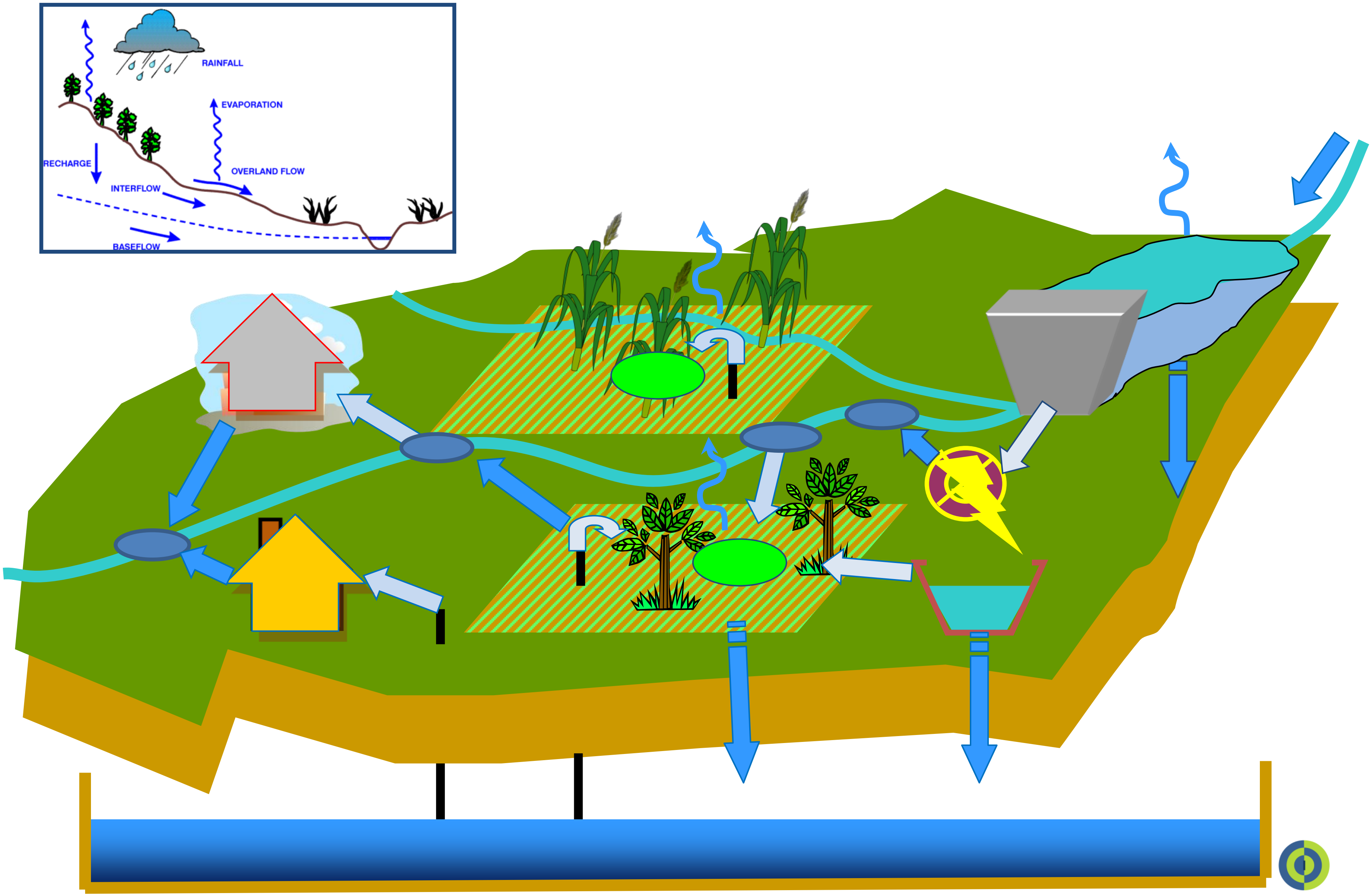
Overall Purpose

What are the impacts of:

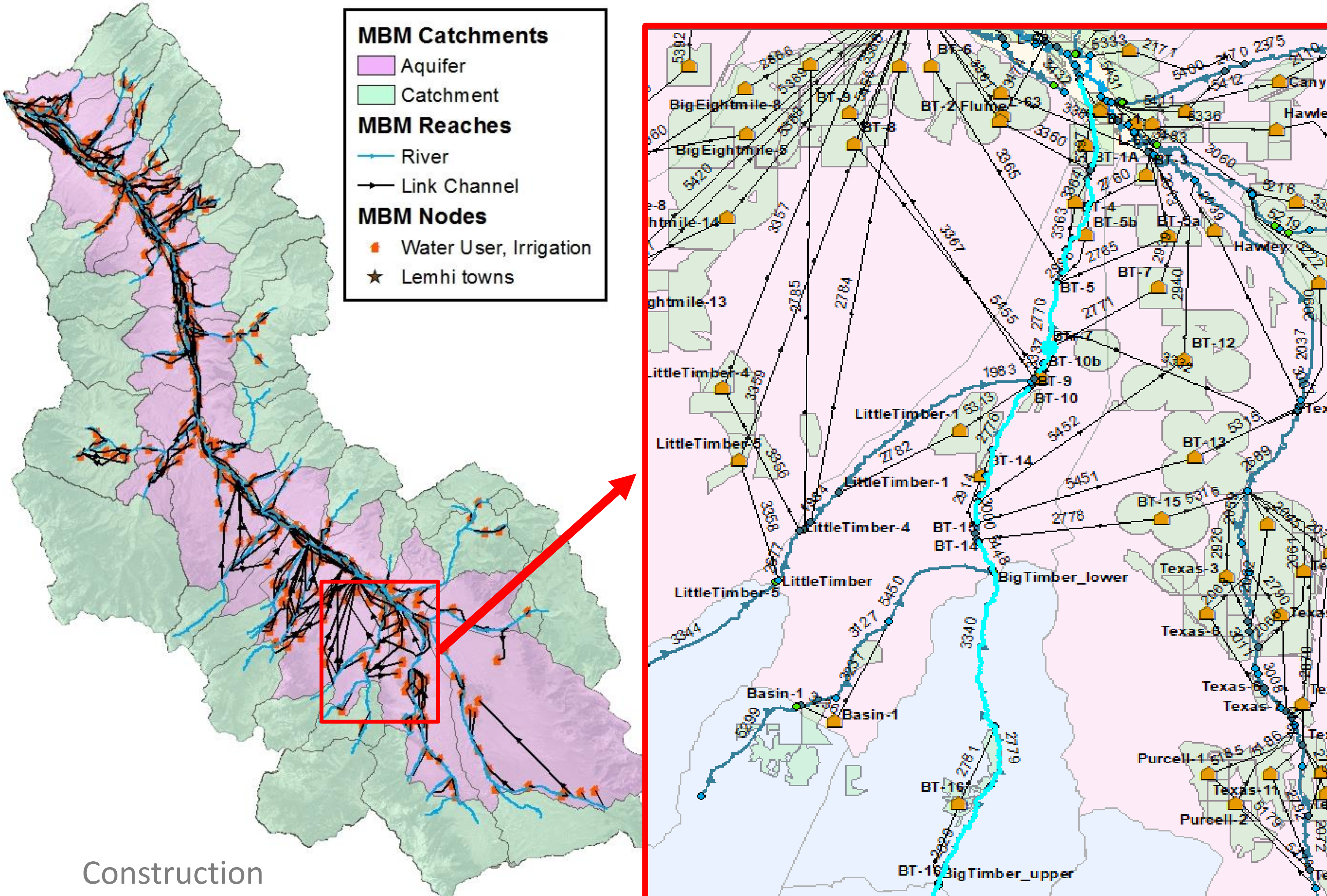
- Changes in diversion operations?
- Channel reconnects?
- Flood to sprinkler conversion?
- Rainfall patterns?



River Basin Model Concept

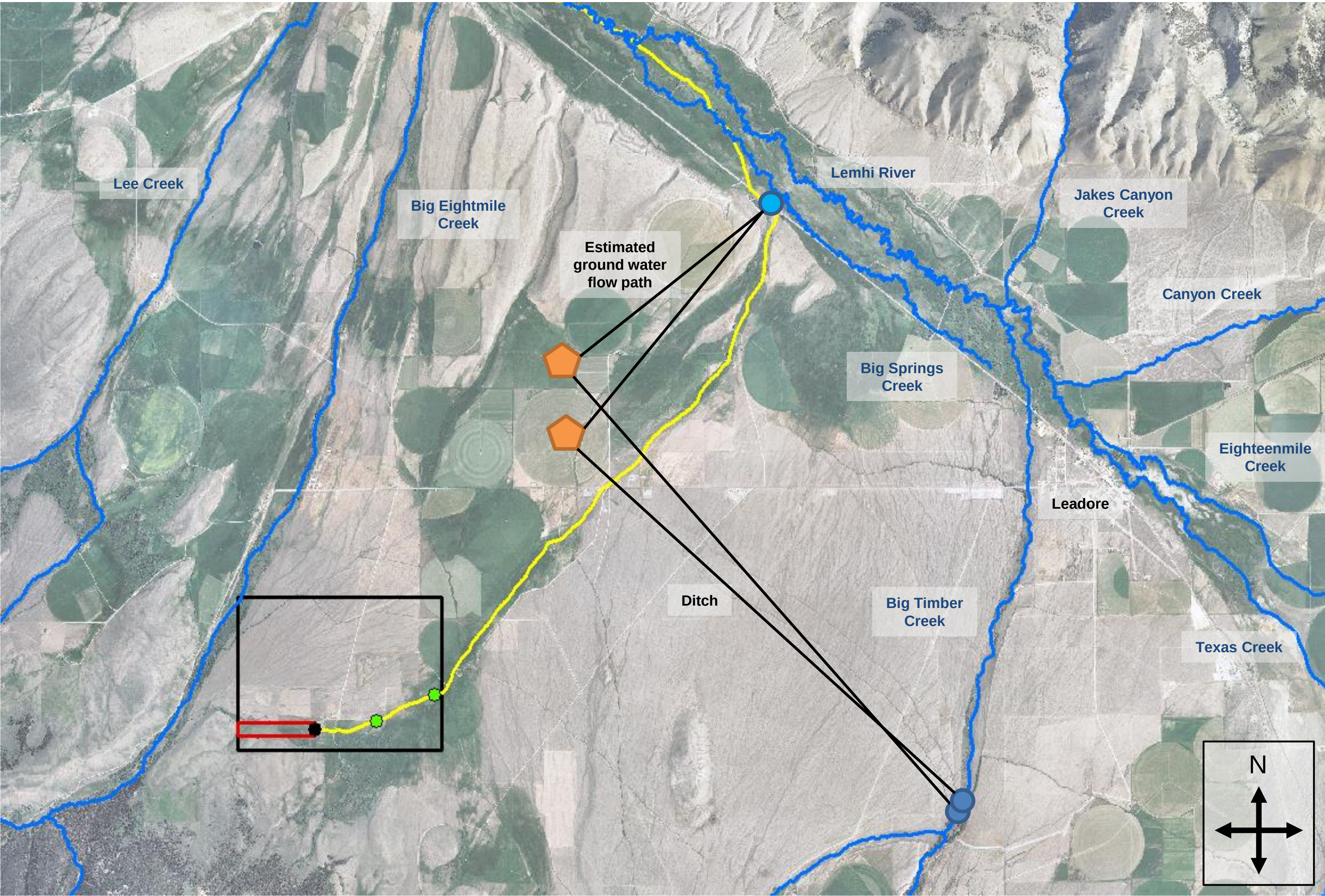


LRBM

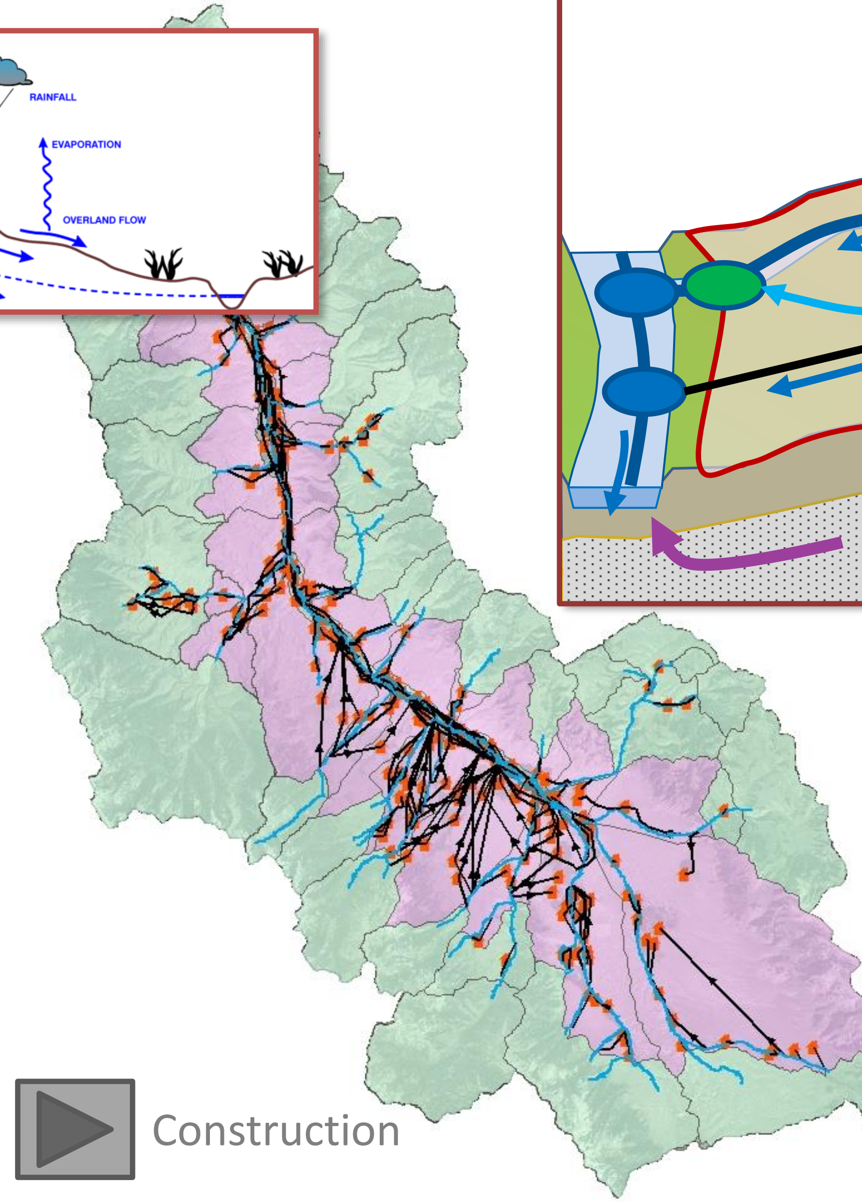


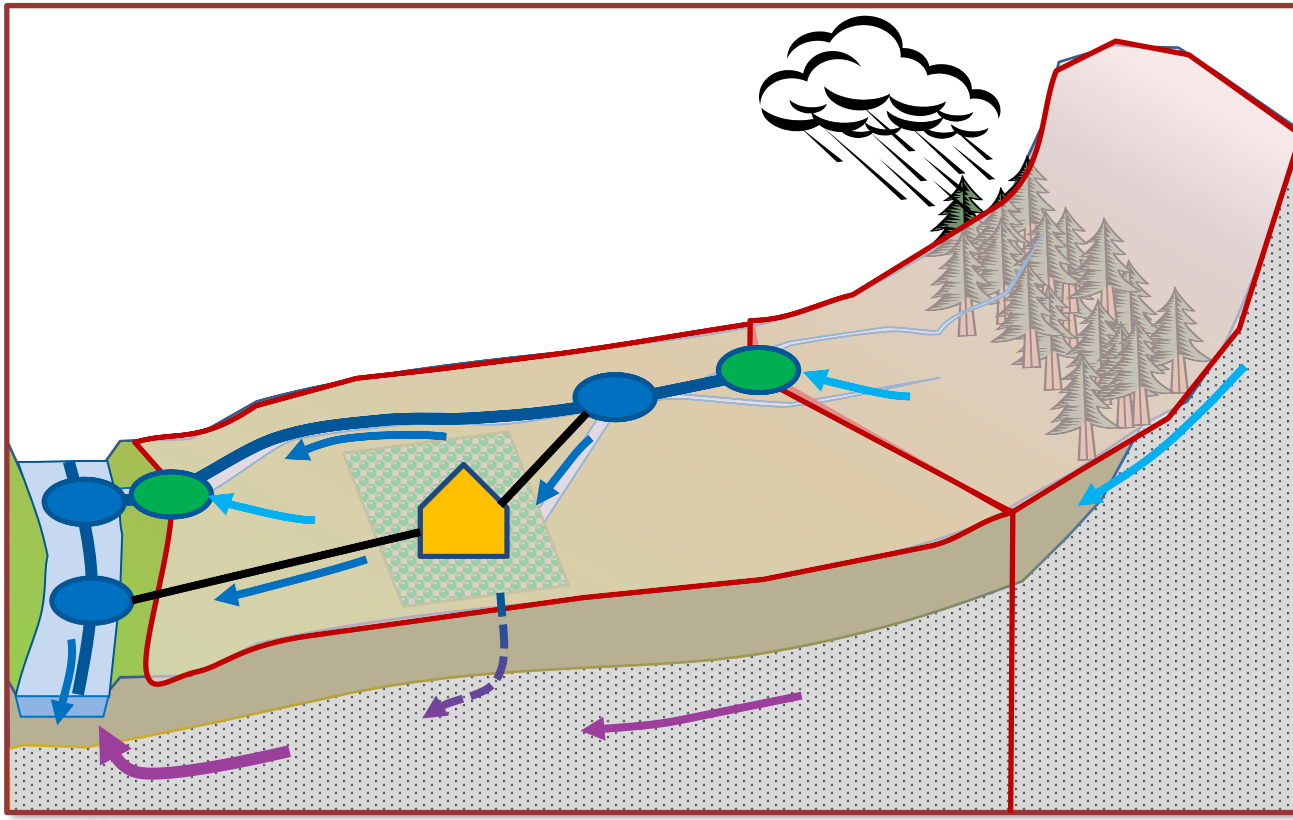
Construction

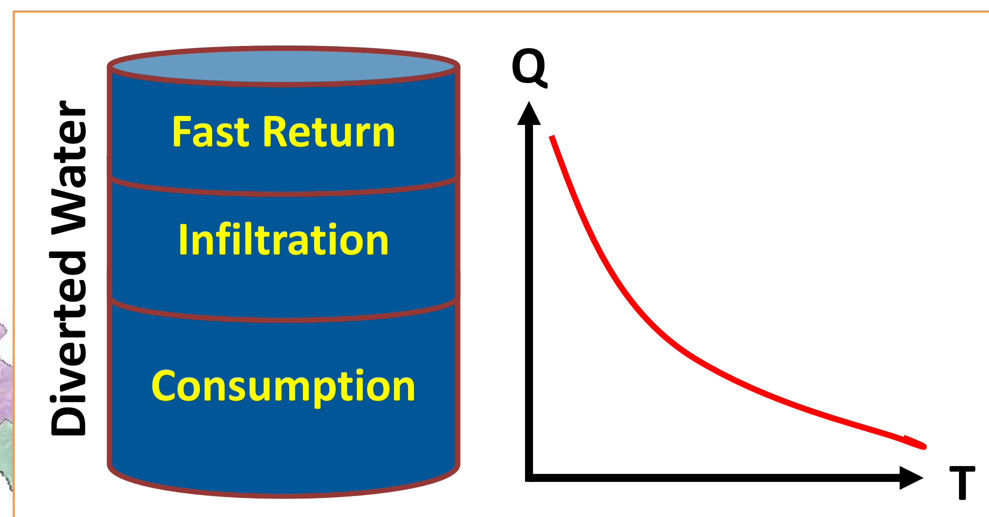
LRBM: Model Network



LRBM Diversions

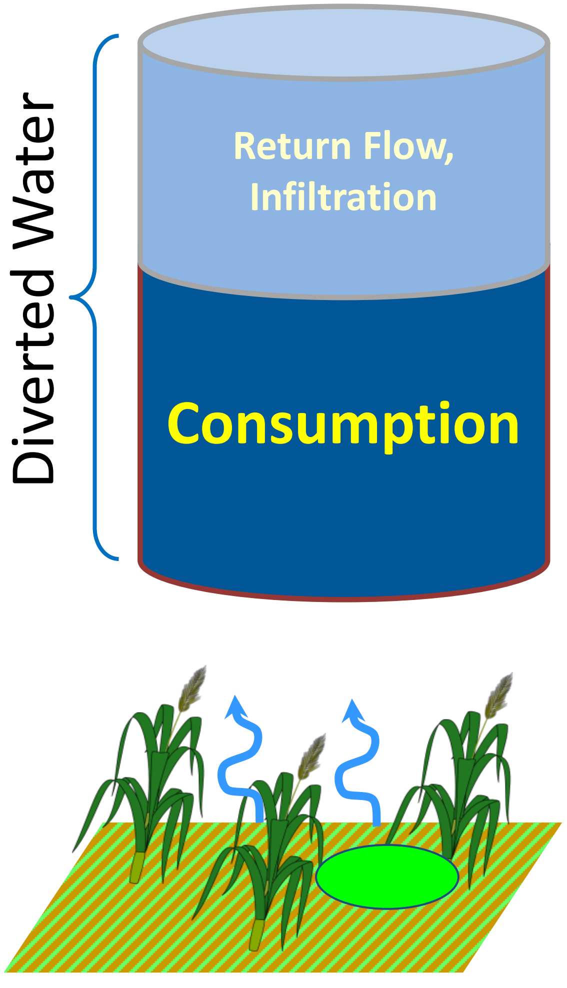




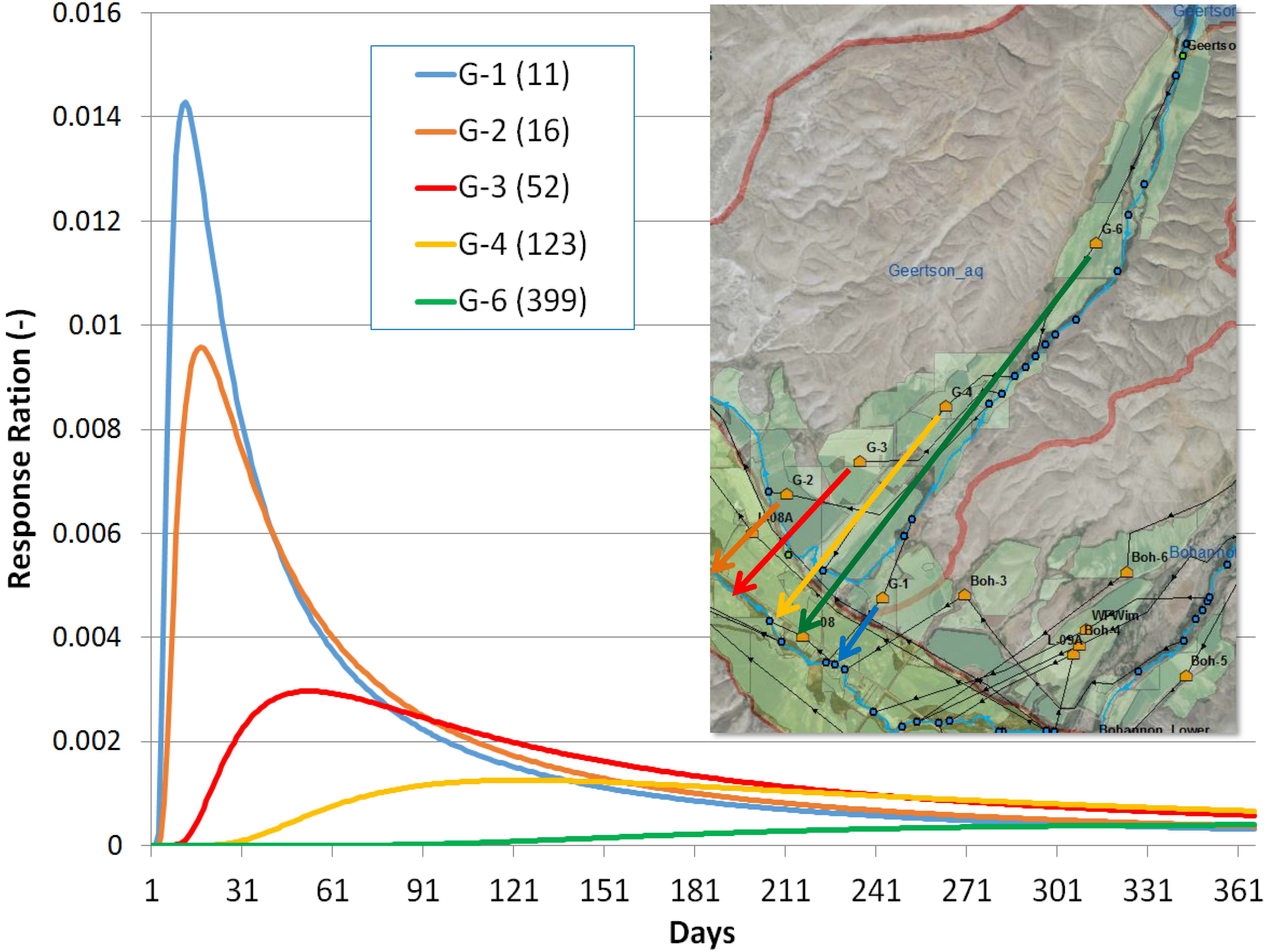


Construction

Crop Consumption Method

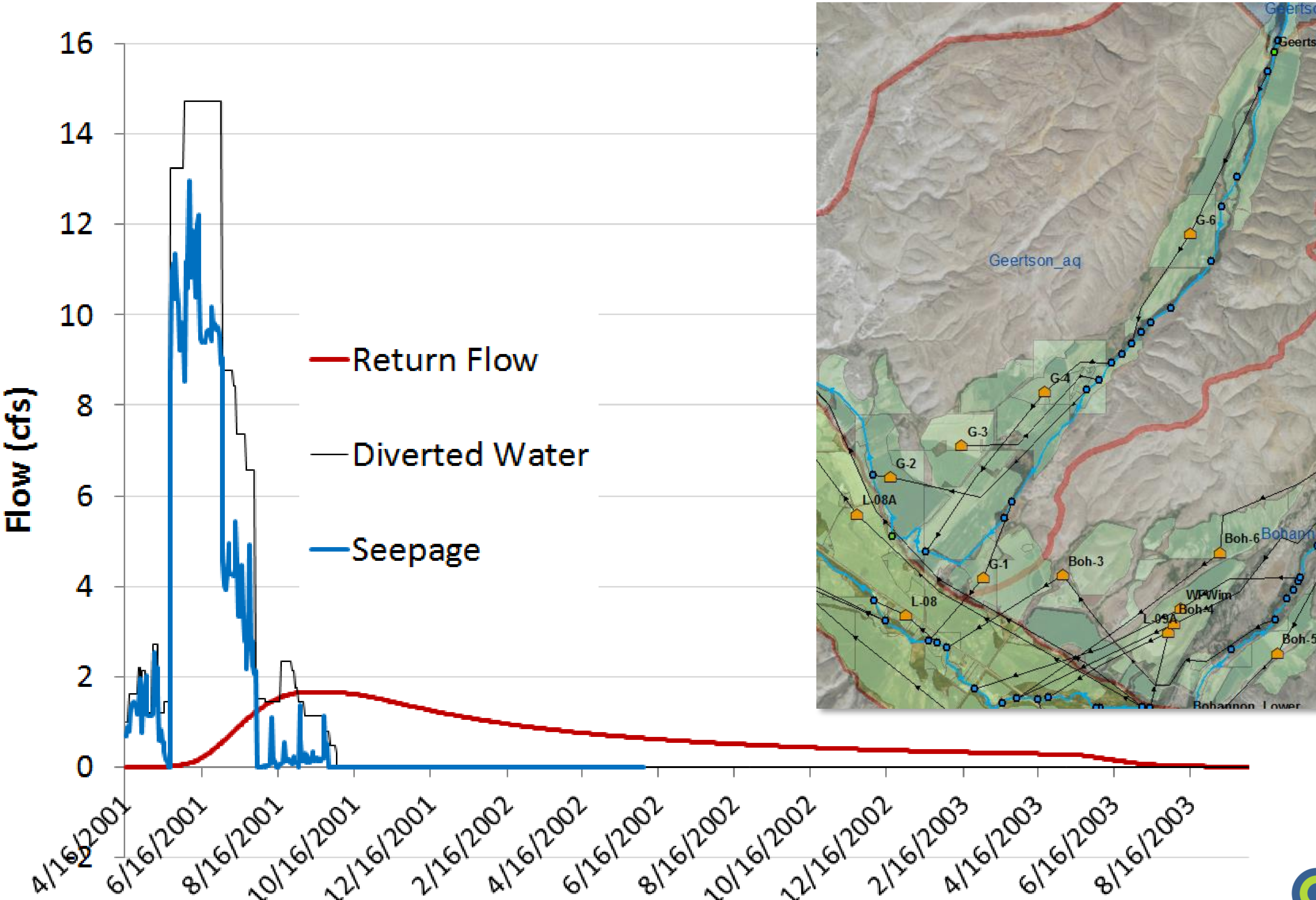


- Ref ET (UI Kimberly)
- Calculations depend on:
  - Irrigated area
  - Crops grown
  - Irrigation method
  - Daily reference ET rate
  - Ditch loss (not used)

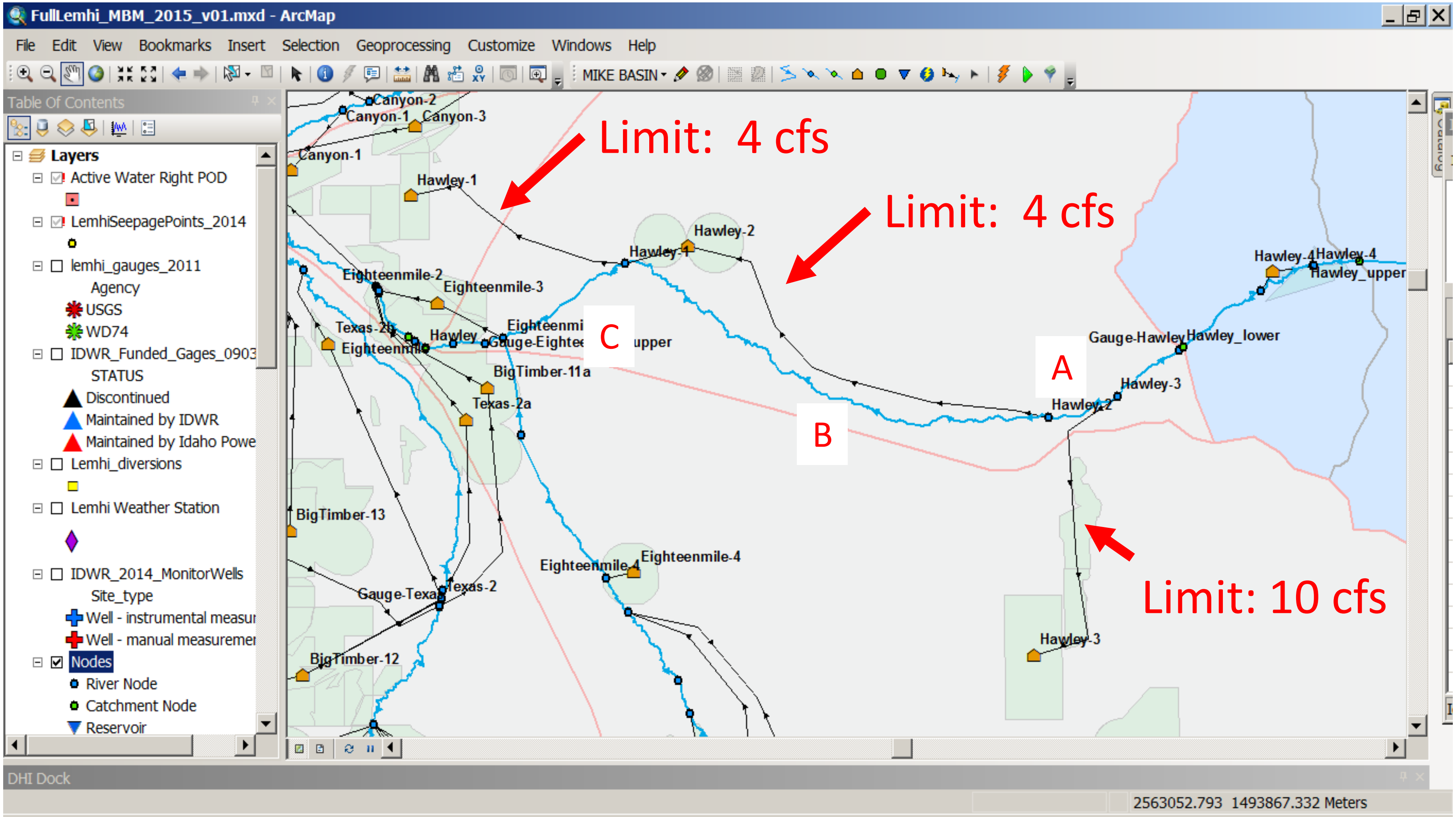


Response Ration (-)
Days
G-1 (11)
G-2 (16)
G-3 (52)
G-4 (123)
G-6 (399)
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
1
31
61
91
121
151
181
211
241
271
301
331
361
Geertson_aq
G-6
G-4
G-3
G-2
G-1
Boh-3
Boh-6
Boh-5

Groundwater Return

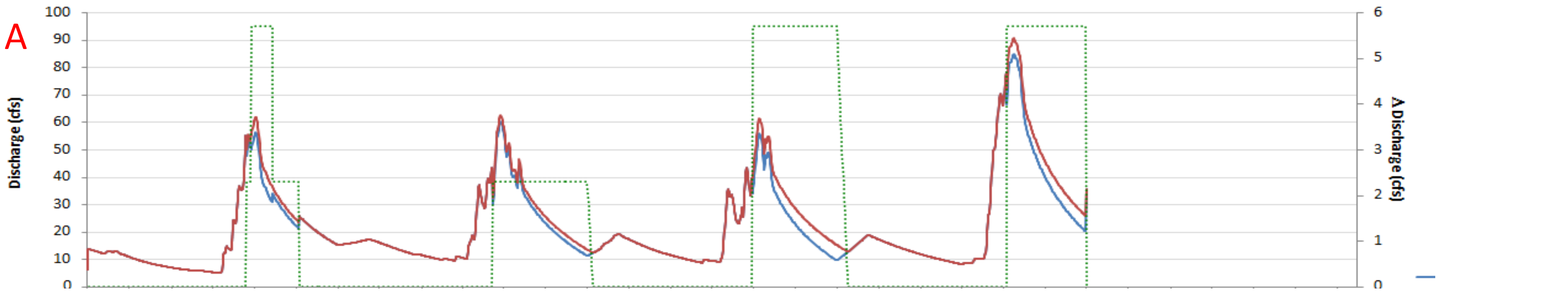


Hawley Creek Scenario

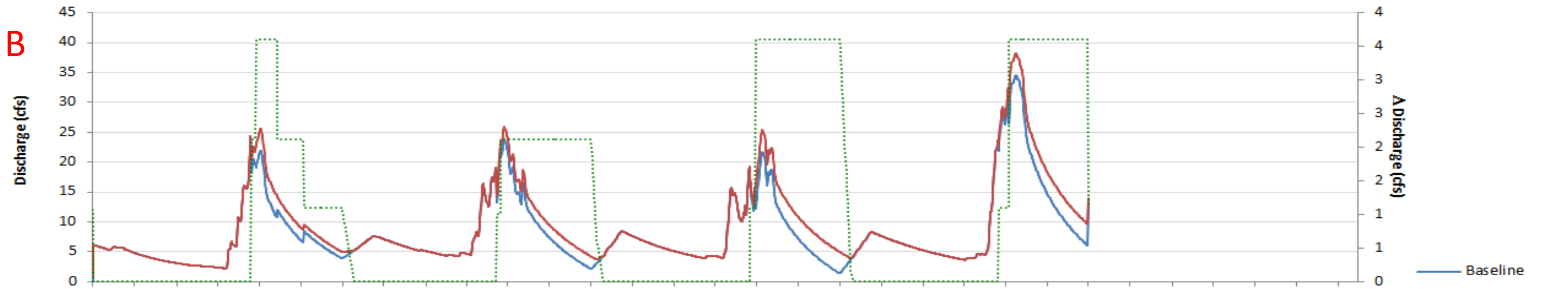


Hawley Creek Scenario

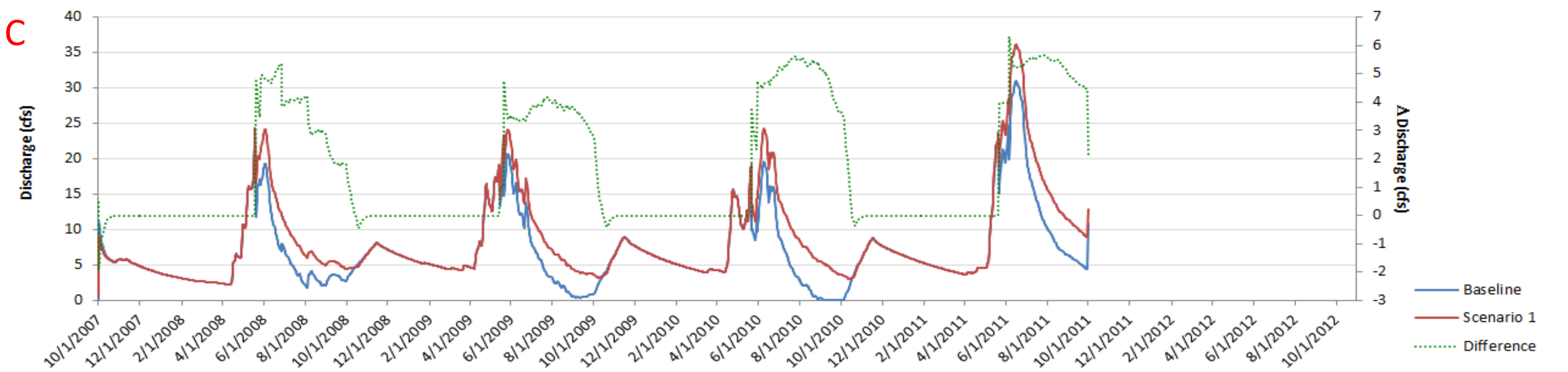
Cross-Section 2	E2189	Baseline	Scen. 1	Description	Hawley Creek Inflow



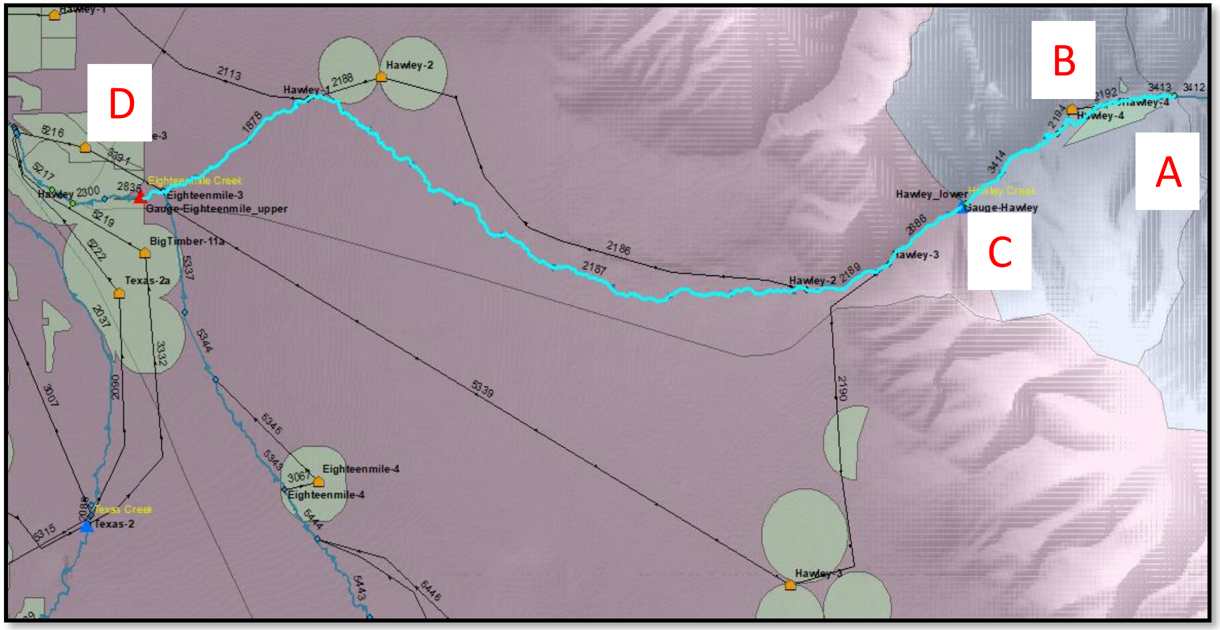
Cross-Section 3	E2187	Baseline	Scen. 1	Description	Hawley blw Hawley-2

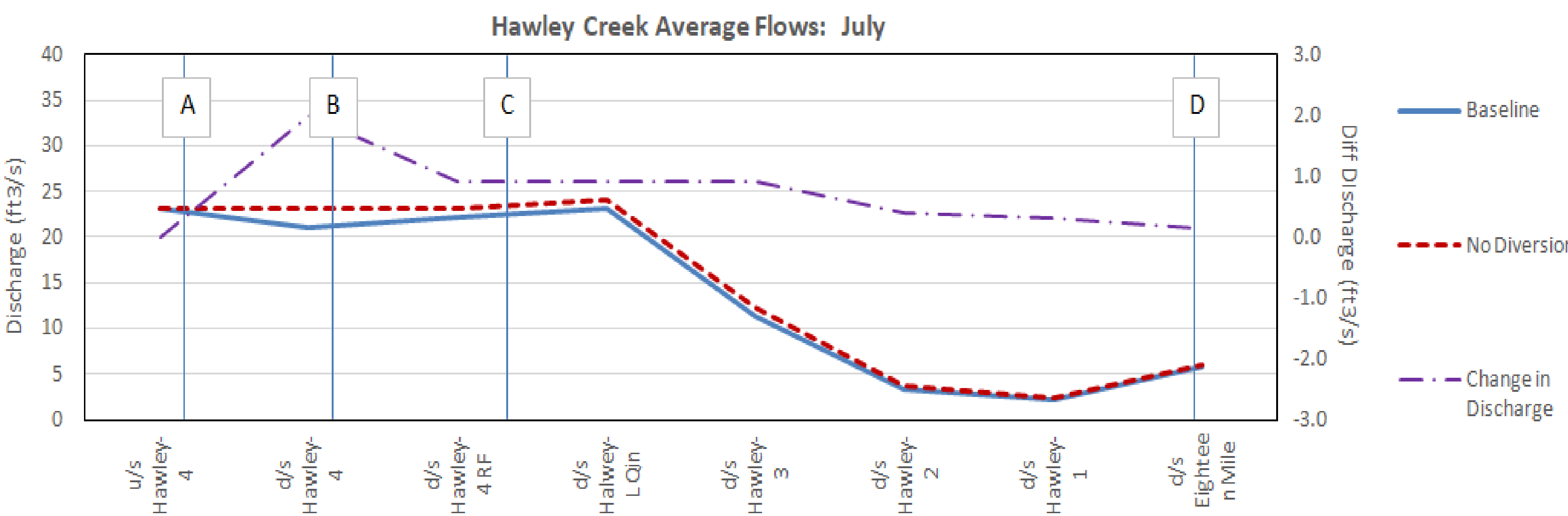


Cross-Section 4	E1878	Baseline	Scen. 1	Description	Hawley blw Hawley-1



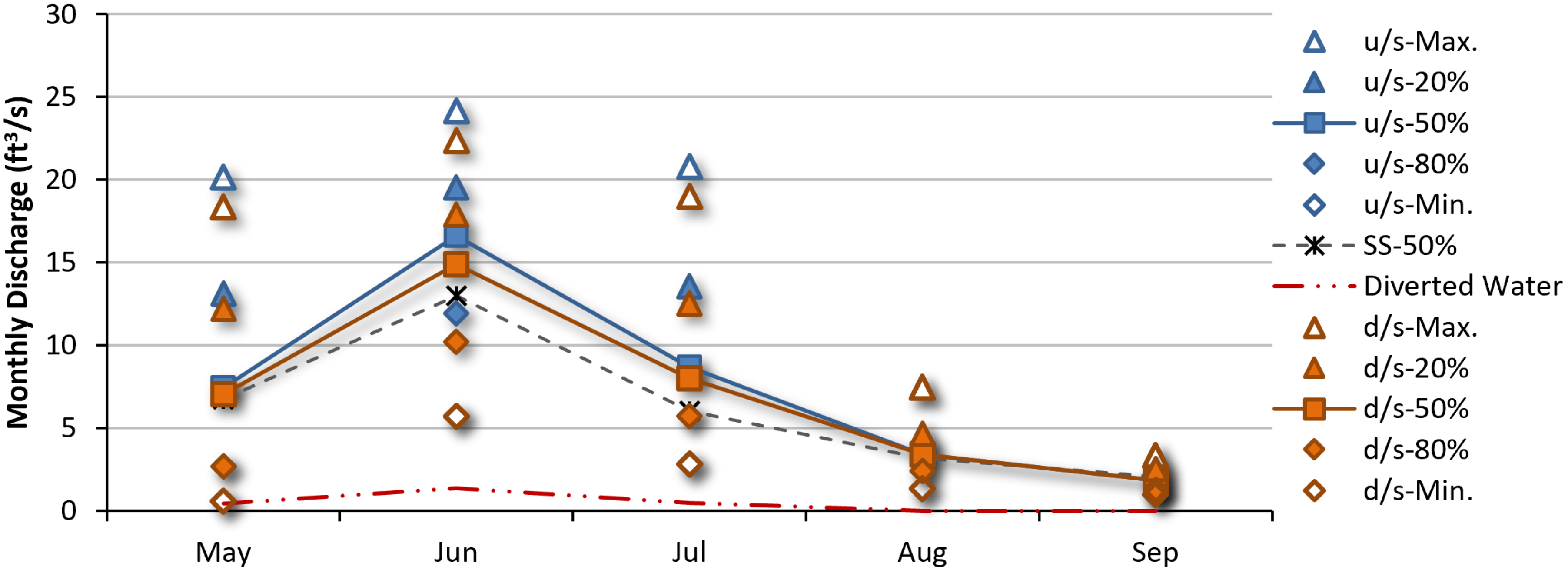
LRBM Outputs
Discharge





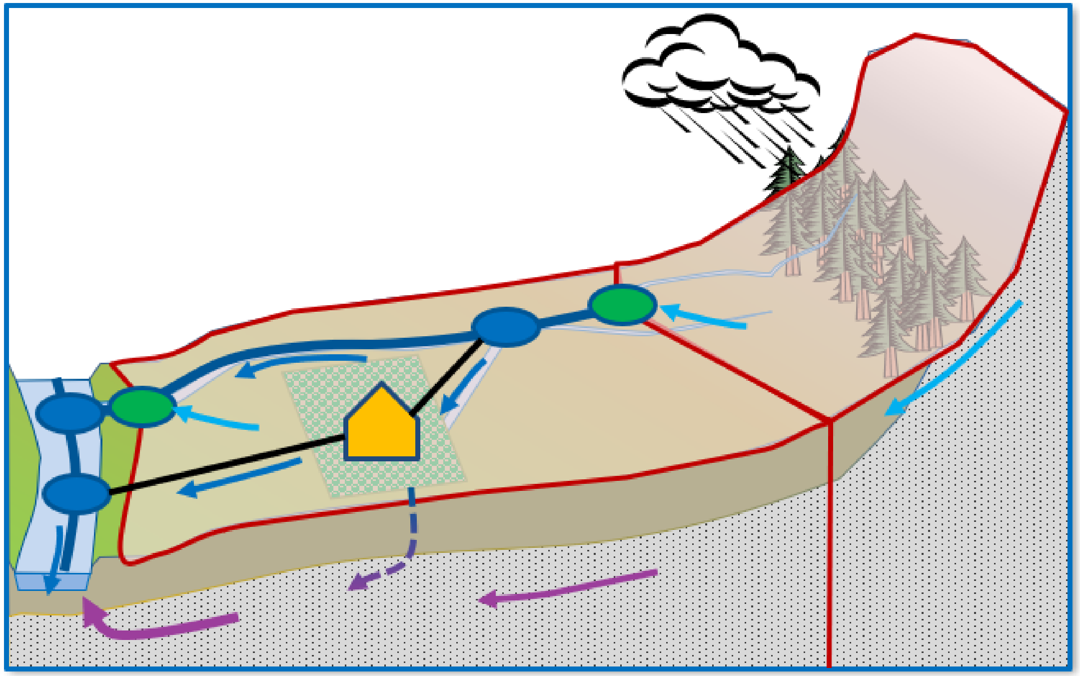
LRBM Outputs

Discharge Statistics



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

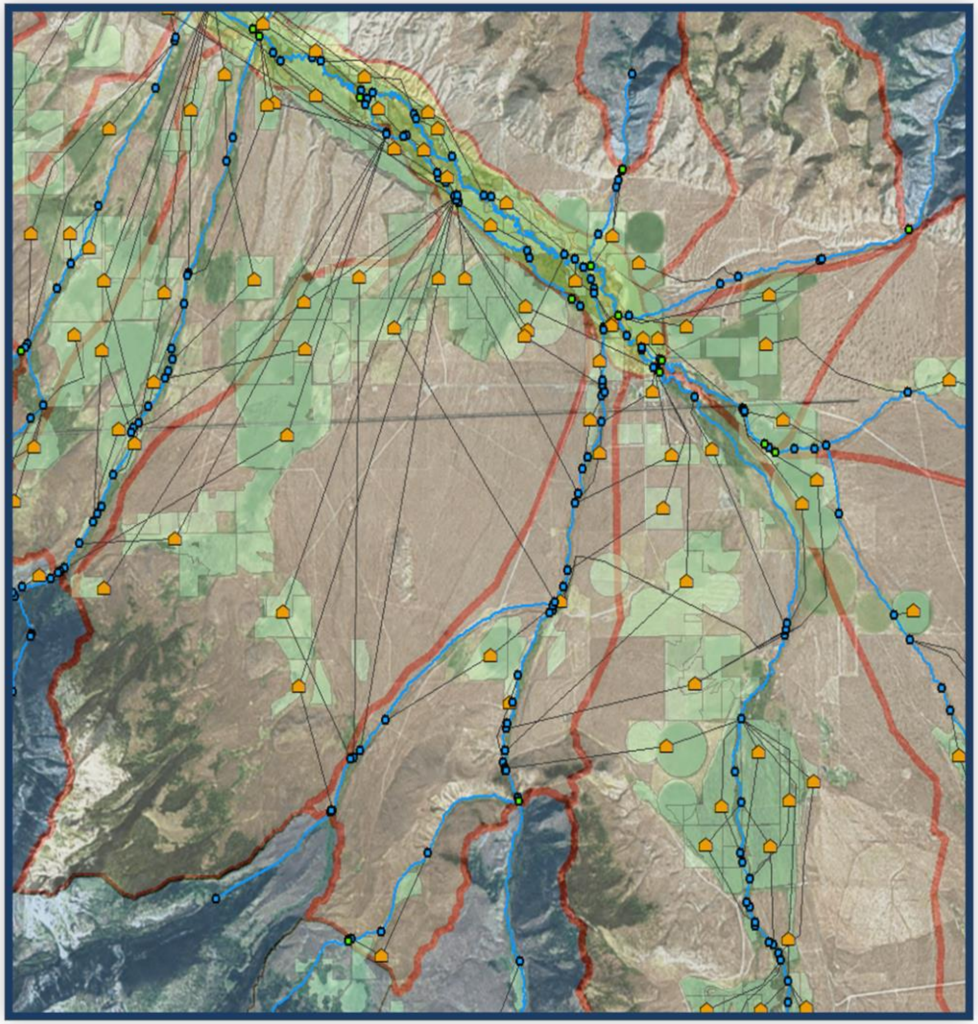


Application Limitations

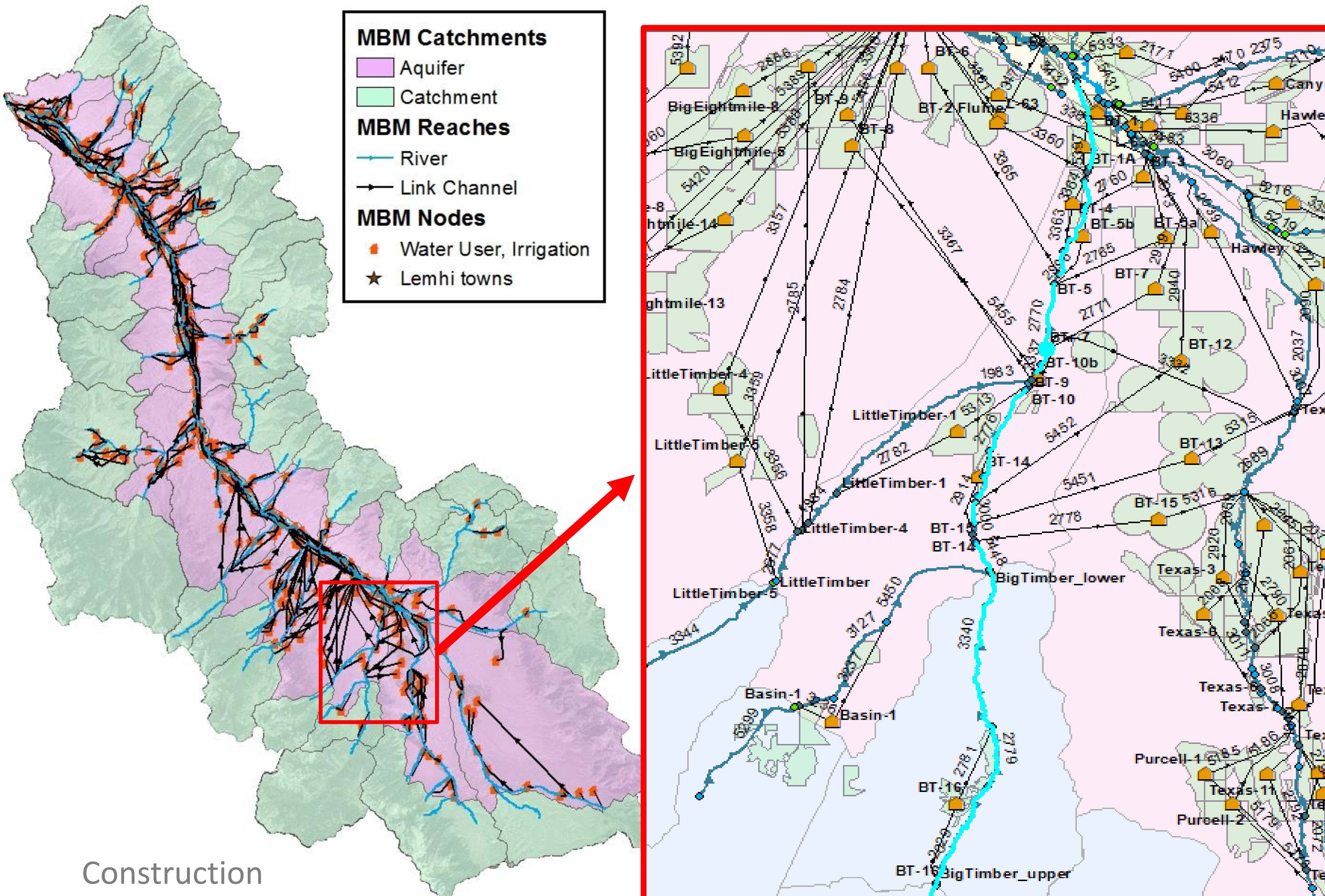
- Not physically based
- Diversion averaged over POU
- Groundwater flow is not explicitly calculated

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



LRBM



Construction

BTC Tool: Water Rights Table

BTC Bird Analysis

BTC Diversion Information

From Amy Cassel

About

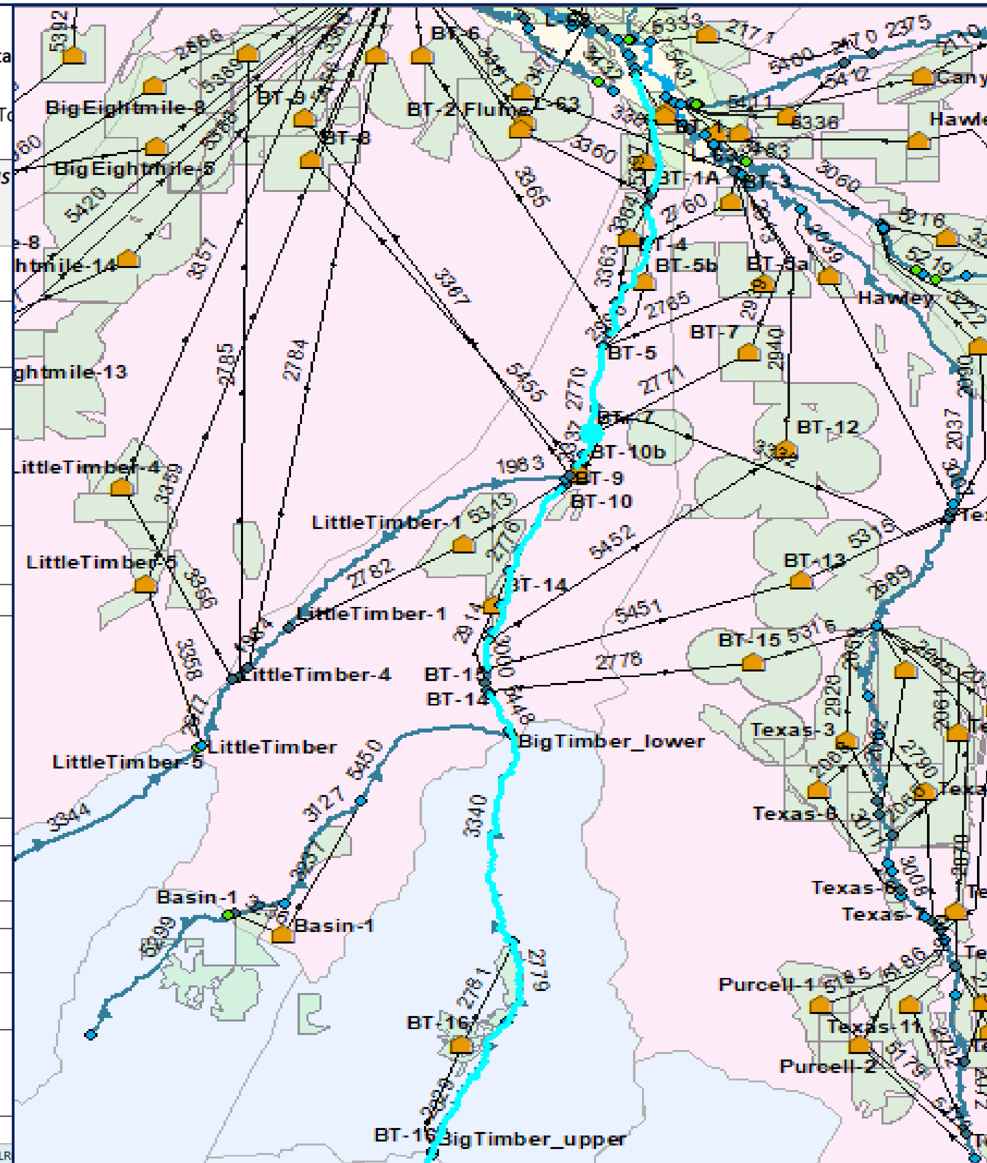
Curta

To

Water Right List

SOURCE	Diversion Name	Water Right	Right ID	Priority Date	WR RATE (CFS)	MAX FOR THIS DIVERSION (CFS)
BIG TIMBER CREEK	BT1	74-31	638093	6/1/1884	1.40	0.00
		74-31	638093	6/1/1884	1.40	
GROUND WATER	GW	74-7047		4/22/1980	0.88	0.88
BIG TIMBER CREEK	BT1A	74-7175	567645	7/26/1990	0.50	0.50
	BT2 FLUME	74-37	622333	9/1/1874	3.35	5.90
		74-39A	660213	6/10/1901	2.53	
		74-31		6/1/1884	1.40	
	BT2	74-37	622333	9/1/1874	3.35	1.38
		74-39A	660213	6/10/1901	2.53	
	BT2A	74-992	567058	5/15/1940	0.02	0.02
	BT3	74-43C	78152	2/21/1910	0.02	0.14
		74-43A	565243	2/21/1910	0.04	
		74-43B	565249	2/21/1910	0.02	
		74-43D	565252	2/21/1910	0.02	
		74-43E	565259	2/21/1910	0.02	
		74-15598	586515	2/21/1910	0.01	
		74-15599	586516	2/21/1910	0.01	
	BT4	74-59A	565368	7/8/1911	2.00	2.00
	BT5	74-51	612716	6/7/1909	6.40	6.68
		74-59B	565375	7/8/1911	0.28	
	BT6	74-61	565377	2/6/1952	3.72	
	BT7	74-54	565348	11/12/1909	3.20	
	BT8	74-15613	662509	4/22/2005	4.00	4.00
	BT9	74-398	566429	9/12/1933	5.76	7.61
		74-399	566432	12/7/1946	0.48	
		74-1834	567081	4/1/1951	1.37	
		74-33	565137	7/1/1879	1.20	

Contents | Master | BTC InputTS | BT12 Inputs | BTC Profile | PHABSIM | Delivery Sum | Div List | LRBM Q Data | Sheet1 | LR

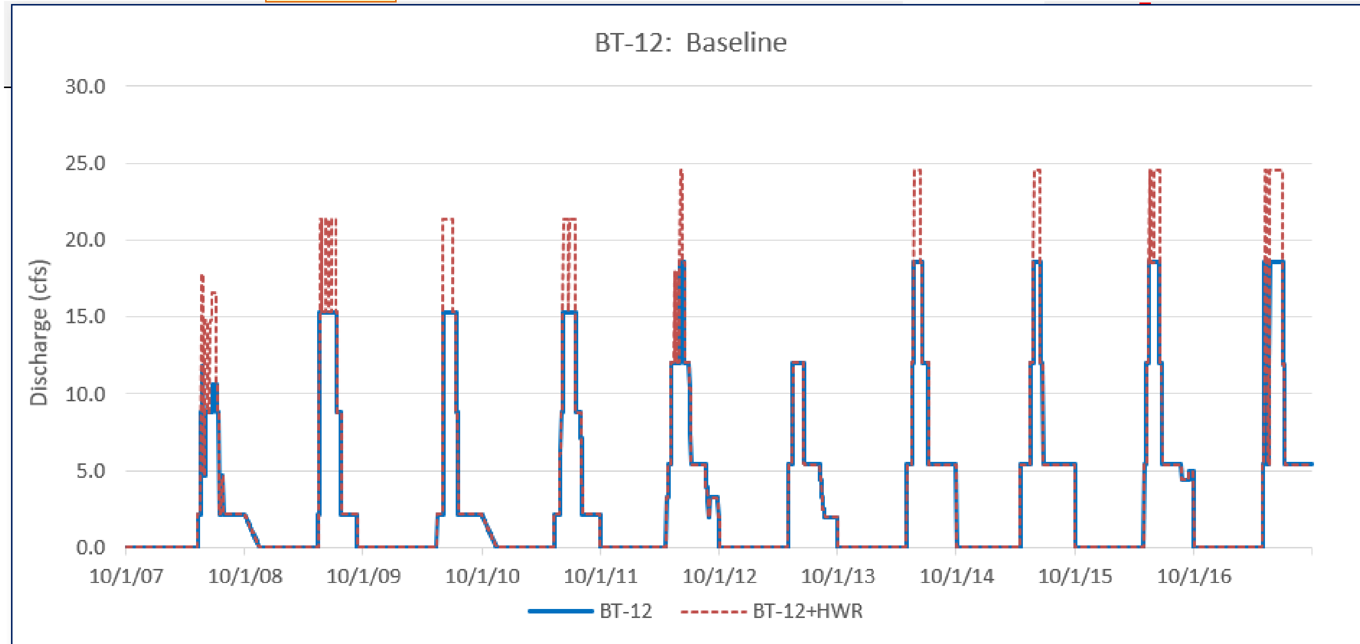


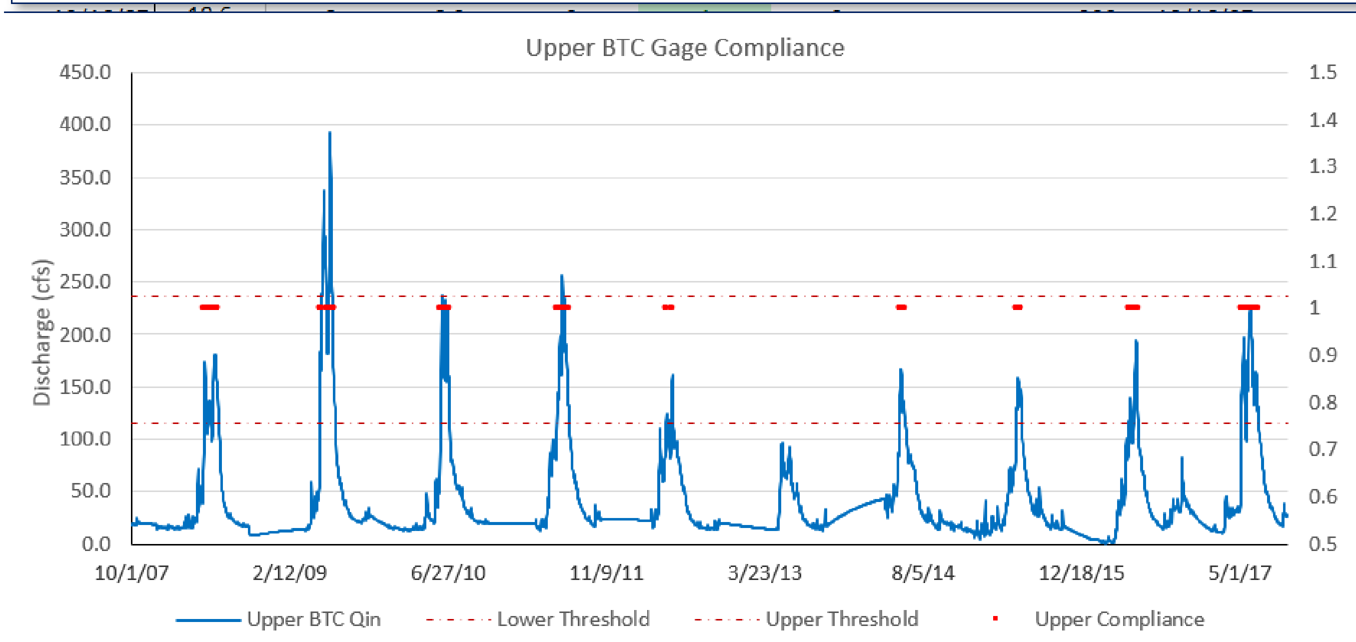
BTC Tool: Diversion Inputs

BTC Tool: Diversion Scenarios

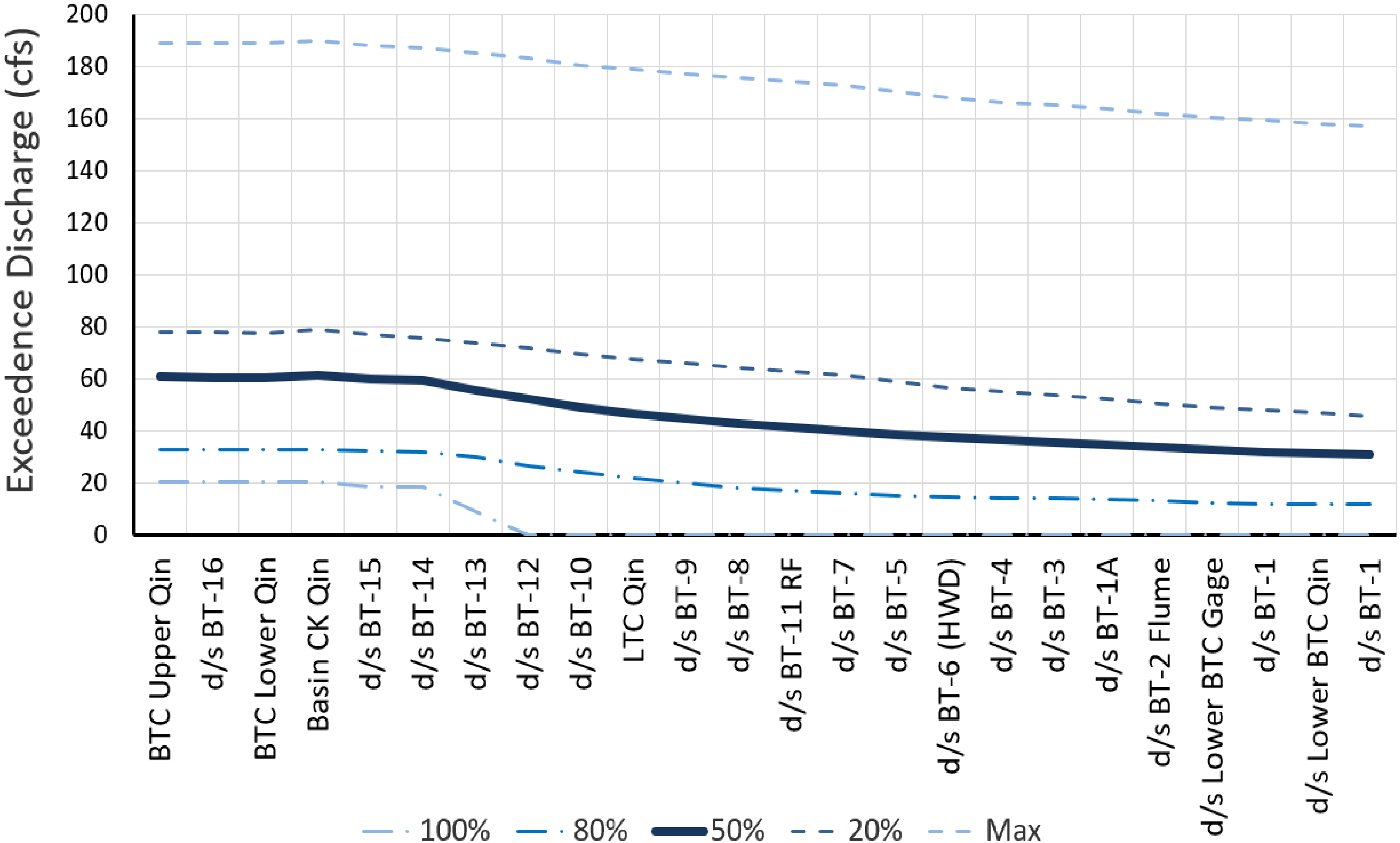
BTC Compliance

Lower Threshold	115	Lower	18	Shoup	1250	HWR	6
Upper Threshold	237						





Big Timber Creek Hydrograph



BTC Tool: Water Delivery

BTC Bird Analysis

Water User Delivery/Deficit

About

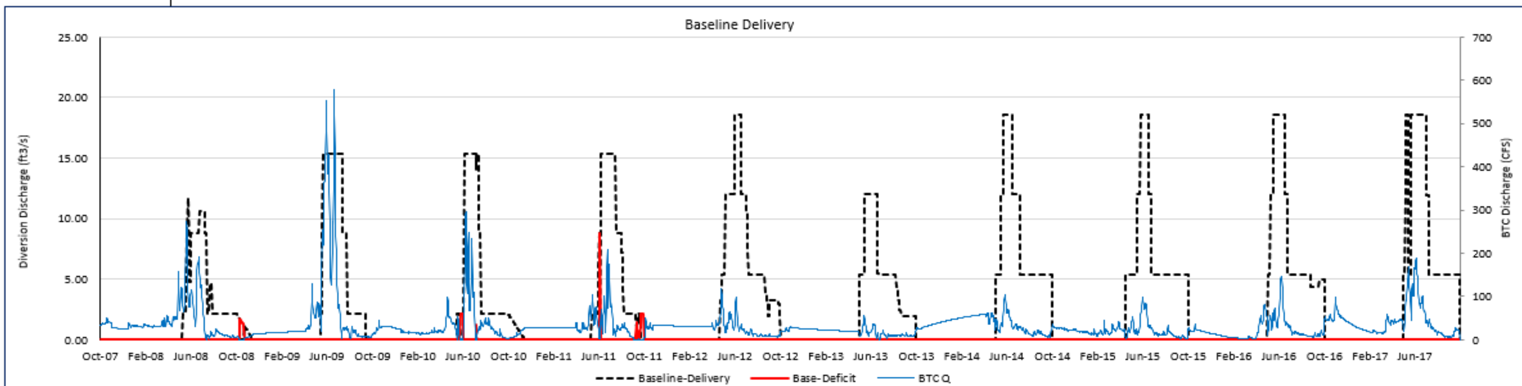
Summary Delivery Information

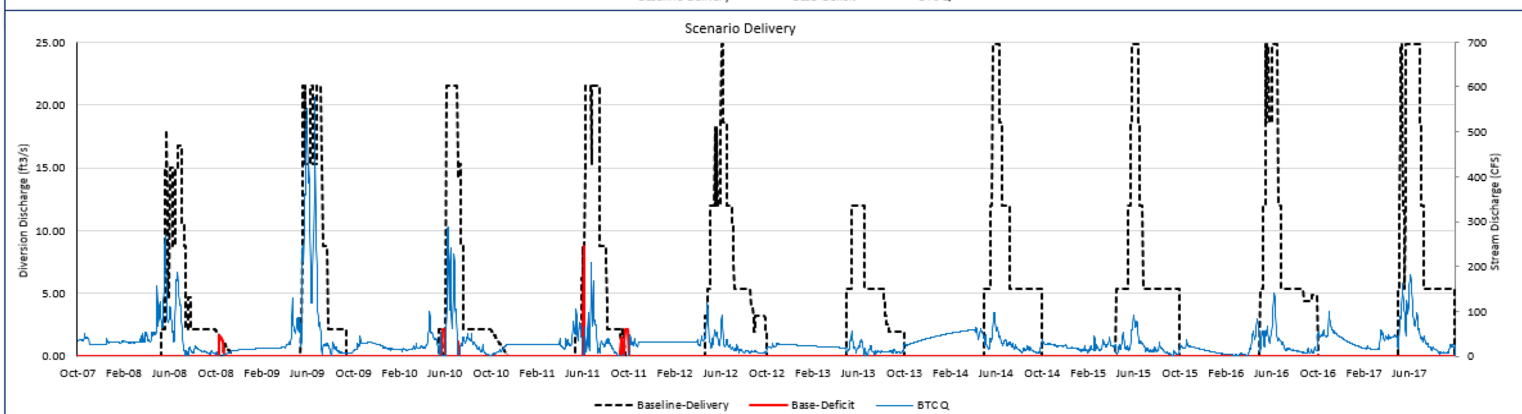
Diversion	BT-1	BT-1A	BT-2 Flume	BT-3	BT-4	BT-5a	BT-5a	BT-6	BT-7	BT-8	BT-9	BT-10	BT-12	BT-13	BT-14	BT-15	BT-16	LT-1	LT-2	LT-3	LT-4	LT-5	Basin-1
No of WR	1	1	3	7	2	1	1	1	1	1	3	2	8	4	1	4	2	3	3	3	4	2	5
WR	1.40	0.50	7.28	0.14	2.00	6.40	0.28	3.72	3.20	4.00	7.61	4.96	29.95	29.22	0.50	10.68	2.45	7.28	9.31	13.22	14.10	6.20	5.10
Max Diversion Rate	1.40	0.50	5.90	0.14	2.00	6.40	0.28			4.00	7.61	4.96	18.15	29.22	0.50	10.68	2.00	7.28	9.31	13.22	14.10	6.20	5.10
Baseline	**BT-1**	**BT-1A**	**BT-2 Flume**	**BT-3**	**BT-4**	**BT-5a**	**BT-5a**	**BT-6**	**BT-7**	**BT-8**	**BT-9**	**BT-10**	**BT-12**	**BT-13**	**BT-14**	**BT-15**	**BT-16**	**LT-1**	**LT-2**	**LT-3**	**LT-4**	**LT-5**	**Basin-1**
Max Demand	0.0	0.5	0.0	0.1	2.0	7.3	0.3	3.7	0.0	5.5	7.6	6.4	18.6	38.0	0.0	13.4	2.5	9.6	7.1	17.0	14.1	6.2	5.1
Max Delivery	0.0	21.0	0.0	0.0	2.0	6.4	3.7	3.7	0.0	5.5	7.6	6.4	18.6	38.0	0.0	13.4	2.5	9.3	7.1	17.0	14.1	6.2	5.1
Max Deficit	0.0	*21.0*	0.0	0.0	*2.0*	*6.4*	*3.7*	*3.7*	0.0	0.0	*4.5*	*4.8*	*8.8*	*25.2*	0.0	*6.0*	0.0	*9.6*	*7.1*	*13.2*	*1.0*	0.0	*4.3*
Days of Deficit	0	82	0	0	14	16	8	8	0	0	6	56	44	32	0	10	0	1309	1189	1023	3	0	1004
Scenario																							
Max Demand	0.0	0.5	0.0	0.1	2.0	7.3	0.3	3.7	0.0	5.5	7.6	6.4	24.8	38.0	0.0	13.4	2.5	9.6	7.1	17.0	14.1	6.2	5.1
Max Delivery	0.0	21.0	0.0	0.0	2.0	6.4	3.7	3.7	0.0	5.5	7.6	6.4	24.8	38.0	0.0	13.4	2.5	9.3	7.1	17.0	14.1	6.2	5.1
Max Deficit	0.0	*21.0*	0.0	0.0	*2.0*	*6.4*	*3.7*	*3.7*	0.0	0.0	*4.5*	*4.8*	*8.8*	*25.2*	0.0	*6.0*	0.0	*9.6*	*7.1*	*13.2*	*1.0*	0.0	*4.3*
Days of Deficit	0	84	0	0	20	17	10	10	0	0	6	56	44	32	0	10	0	1309	1189	1023	3	0	1004

Water User Information

		u/s Discharge		Delivery		Deficit	
Day of the Year	Date	Base	Scen	Base	Scen	Base	Scen

Graphing BT-12





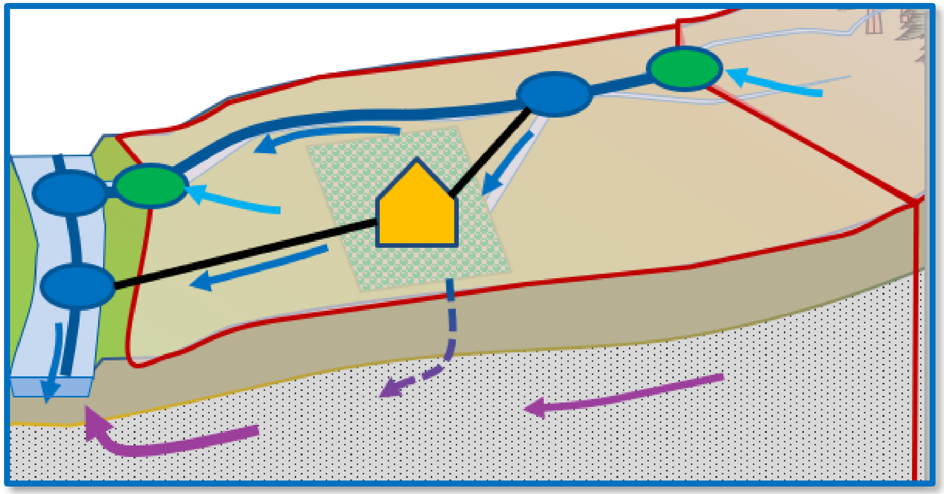
BTC Application

- **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