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May 30, 2023
DEPARTMENT OF
WATER RESOURCES

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BEFORE THE DEPARTMENT OF WATER RESOURCES
OF THE STATE OF IDAHO

IN THE MATTER OF THE DISTRIBUTION OF WATER TO VARIOUS WATER RIGHTS HELD BY AND FOR THE BENEFIT OF A&B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, AND TWIN FALLS CANAL COMPANY	Docket No. CM-DC-2010-001 **BINGHAM GROUND WATER DISTRICT'S DISCLOSURE OF PROPOSED EXHIBITS, PROPOSED WITNESSES, AND EXPERT REPORT OF DARRYLL OLSEN Ph.D.**

Bingham Ground Water District (BGWD), submits this DISCLOSURE OF PROPOSED EXHIBITS, PROPOSED WITNESSES, AND EXPERT REPORT OF DARRYLL OLSEN Ph.D. in accordance with the Director's Scheduling Order dated May 2nd, 2023.

EXHIBIT LIST

At this time, Bingham Ground Water District does not expect exhibits that have not been identified by other parties, but reserves the right to provide rebuttal exhibits as needed.

POSSIBLE WITNESS LIST AND SCOPE OF TESTIMONY

1. Darryll Olsen, Ph.D
   Pacific Northwest Project
   3030 W. Clearwater, Ste. 205-A
   Kennewick, WA
   509-783-1623

Mr. Olsen may testify regarding the economic impacts of possible curtailment within a specific 5 county area covered by groundwater districts. These impacts include micro and macro impacts as outlined by his white

paper prepared in January 2023 for Bingham Ground Water District, and his updated memo created May 30, 2023 for these proceedings. Bothe the memo and white paper are attached as his expert report at the end of this document.

2. Alan Jackson
   Bingham Ground Water District
   1725 Riverton Rd,
   Blackfoot ID, 83221
   208 684-9634

Mr. Jackson may testify regarding groundwater operations, as well as past experience with canal companies and Rubicon Water systems. He may testify regarding Bingham Ground Water District's participation in proceedings, settlements, meetings, or other relevant information.

Bingham Ground Water District, reserves the right to call rebuttal witnesses as needed.

EXPERT REPORTS

Attached to this document is a Memo and White Paper, both constituting the report from Darryll Olsen Ph.D, prepared for Bingham Ground Water District.

Dated May 30, 2023

Dylan Anderson Law, PLLC

___/s/ Dylan Anderson_____
Dylan Anderson,
Attorney for Bingham Groundwater District

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on this 130th day of May, 2023, I caused to be filed a true and correct copy of the foregoing document via E-File and Serve, and upon such filing, the following parties were served via electronic mail:

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/s/ Dylan Anderson .
Dylan Anderson
Attorney for Bingham Groundwater District

Pacific Northwest Project
Technical Information Memorandum

DATE: May 30, 2023

TO: Mr. Gary Spackman, Director, IDWR
SE Idaho Groundwater District Boards-Managers

FROM: Darryll Olsen, Ph.D., Pacific NW Project*

SUBJECT: Supplemental Technical Memorandum for:
Policy White Paper Review for Economic Impacts Surrounding Water Right-Water Supply Restrictions to Groundwater Appropriators, Irrigation Sector Operations

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Given the pending decisions affecting groundwater and surface-water irrigation allocations in South-East Idaho, the Pacific NW Project is providing supplemental information to the initial Policy White Paper (January 2023), further highlighting key economic impacts associated with water right-water supply curtailments/regulations affecting groundwater irrigators (see attached Table 1).

This information should better inform water managers. the IWRD Director, Gov. Brad Little, Idaho legislators, and other key parties (including the media/press) about the probable economic impacts affecting water supply curtailments to South-East Idaho groundwater pumpers with junior appropriation water rights. At best, the economic impacts should be viewed as the assets at risk to Idaho and the five-county study area.

The IDWR is taking a very cautious approach to protecting surface water right allocations;[1] so being, an equally cautious approach to recognizing, and appreciating, probable economic impacts to groundwater allocations restrictions should be employed as well. The regional/state economic impacts are very real, and they provoke the need to call for a workable course of action to deal with both groundwater and surface-water irrigation needs.

This Technical Memorandum raises the following questions:

1. <u>What is the significance of Irrigated Agriculture or the Irrigated Agriculture Industry in Idaho and the primary project area?</u>

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[1] The IDWR relies on judicial/cultural review of definitions for "material injury" and "reasonable use" to formulate its initial 2023 water allocation rule. While the approach retains justification, it does not bar discretionary decisions by the IDWR Director. Current above average flow conditions could be given greater deference in determining the difference between a "material injury" versus an "empirical injury," where reduced water supply impacts cannot be physically observed on the ground.

2. What does the current water supply situation in SE Idaho suggest (per Table 2 attached)?

3. How is "material injury" to senior water rights considered versus "empirical injury?" What does this mean for the current decision-making situation?

4. What types of economic impact measures and methods are used in this Technical Memorandum and the White Paper?

5. How are irrigated acreage impacts derived? What does this mean in terms of curtailed groundwater acres relative to surface supplies, acre-ft. and acres?

6. What does the economic impact analysis indicate affecting household income, revealed as direct and secondary (regional impacts)?

7. How should near-term versus long-term economic impacts be best understood?

8. What about water resources policy? What can the director do or consider given legal and conventional water resources management rules?

9. If *empirical impacts* are highly improbable, or difficult to measure, should that factor be given consideration by the IDWR director in determining reasonable protection for senior appropriator water rights? Does the weight of the probable economic impacts further support a "do no harm" approach?

10. The White Paper speaks to "internal" and "external" factors affecting groundwater and surface-water allocation conflicts in SE Idaho. What does this mean?

*Principal Investigator:

Darryll Olsen, Ph.D., Regional Planner/Resource Economist.

- About 35 years of experience preparing/directing all types of water resources economic impact projects and policy issues (Western U.S.).
- Principal economist for Argonne National Laboratory-FERC water resources project evaluations—hydro power, NED and RED impacts.
- Extensive economic evaluation work with Utah Dept. of Water Resources, water supply delivery projects; including water right change/transfers.
- Board Representative for Columbia-Snake River Irrigators Association; lead economic, technical, legislative, and litigation projects.
- Board Director, Badger Mt. Irrigation District (Ag. Irrigation, Domestic Irrigation-Household Water Service).
- Principal Author, RCW 90.80, Water Conservancy Boards in WA State; evaluated and/or approved hundreds of water right changes/transfers.
- Contributing Author, RCW 90.90, Columbia R. Basin Water Supply Act.

Table 1. Estimated Household Income Impacts--State and Subject Area for Irrigated Agriculture, 2021$, with Junior Water Rights Curtailment, At Risk Acres in Primary Southeast Idaho Area

Economic Sector	Direct Impacts	Estimated Irrigated Ag. %	Adjusted Direct Sector Values	Secondary* Income Adjusted Multiplier**	Direct & Secondary Total Impact Area
Idaho					
Farm Production	$1,699,000,000	85%	$1,444,150,000	1.5	$2,166,225,000
Ag. Services	$426,178,000	80%	$340,942,400	1.3	$443,225,000
Food Processing	$1,508,185,000	85%	$1,281,957,250	3.3	$4,230,459,000
State Total Impact:	**$3,633,363,000**	------	**$3,067,049,650**	**2.2**	**$6,839,909,000**
Bingham Co.					
Farm Production	$48,489,000	90%	$43,640,100	1.5	$65,460,000
Ag. Services	$30,467,000	90%	$27,420,300	1.25	$34,275,000
Food Processing	$72,221,000	90%	$64,998,900	2.9	$188,497,000
County Total Impact:	**$151,177,000**	------	**$136,059,300**	**2.1**	**$288,232,000**
Bonneville Co.					
Farm Production	$34,279,000	90%	$30,851,100	1.5	$46,277,000
Ag. Services	$10,367,000	90%	$9,330,300	1.25	$11,663,000
Food Processing	$197,406,000	92%	$181,613,520	2.9	$526,679,000
County Total Impact:	**$242,052,000**	------	**$221,794,920**	**2.6**	**$584,619,000**
Clark Co.					
Farm Production	$2,000,000	75%	$1,500,000	1.5	$2,250,000
Ag. Services	$1,000,000	75%	$750,000	1.25	$937,500
Food Processing	$100,000	75%	$75,000	2.9	$217,500
County Total Impact:	**$3,100,000**	------	**$2,325,000**	**1.5**	**$3,405,000**
Jefferson Co.					
Farm Production	$22,300,000	90%	$20,070,000	1.5	$30,105,000
Ag. Services	$21,888,000	90%	$19,699,200	1.25	$24,624,000
Food Processing	$56,752,000	92%	$52,211,840	2.9	$151,414,000
County Total Impact:	**$100,940,000**	------	**$91,981,040**	**2.2**	**$206,143,000**
Power Co.					
Farm Production	$37,219,000	90%	$33,497,100	1.5	$50,246,000
Ag. Services	$11,128,000	90%	$10,015,200	1.25	$12,519,000
Food Processing+	$40,000,000	92%	$36,800,000	2.9	$106,720,000
County Total Impact:	**$88,347,000**	------	**$80,312,300**	**2.1**	**$169,485,000**
Total Multi-County:	**$585,616,000**		**$532,472,560**	**2.4**	**$1,252,000,000**

Estimated annual household income impact for Multi-County Area: About $1,500/irrigated acre, crop/pasture.
Estimated annual household income for impact of 150,000 acres multi-county impacts: $225,000,000.
Estimated annual household income for impact of 400,000 acres multi-county impacts: $600,000,000.

* Secondary or regional impacts include indirect and induced impacts, associated with direct sector production inputs (inter-sector purchases throughout the regional economy) and related purchases from community services.

** Bureau of Economic Analysis (BEA) RIMS II economic sector multipliers have been adjusted to avoid inter-sector double counting of of income streams (production revenues). Adjustments made by Pacific NW Project.

+ Food processing sector data for Power County are a "place holder" estimate to avoid IRS disclosure issues; it may be a conservative estimate.

Sources:

White Paper (January 2023) data, tables, and methodology and sources cited therein; see attached White Paper.
U.S. Bureau of Economic Analysis (BEA), Regional and Local Data Bases and Apps., multiple data bases for state and county NAICS sector data, for 2021 (2022). Household income data includes farm proprietor, labor income, agricultural services, and food processing. Generally cited under "BEAR Facts" data bases and apps (multiple BEA website locations, updated annually; detailed regional multipliers prepared for the state and five-county primary subject area by BEA I-O modelers, May 2023; review of NASS Idaho State Agricultural Data, 2022 (National Agricultural Statistics Service).

NOTE: Food processing sector for Power County is a "place holder" estimate to avoid IRS disclosure issues; some corporate income is included in the state-county areas. Main access site initiated at: https://apps.bea.gov/regional/bearfacts/, and sites referenced therein (includes state GDP and household income and employment estimates).

Table 2

Northwest River Forecast Center, Water Supply Forecast, Snake River Control Points

April-September Forecast Flows-KAF: May 27, 2023.

Control-Monitoring Point	KAF Probability of Average Flows (50%)	KAF Probability of 90% Exceedence of Low Flows	Low vs Average Flows Difference KAF
Near Heise ID--April-Sept*			
5-13-2023	4,107	3,999	108
	107% of Ave.		
Near Shelley ID--April-Sept			
5-13-2023**	5,289	5,087	202
	108% of Ave.		
American Falls Dam--April-Sept			
5-13-2023	3,179	2,977	202
	121% of Ave.		
King Hill--April-Sept			
5-13-2023	2,793	2,667	126
	82% of Ave.		
Swan Falls--April-Sept			
5-13-2023	2,996	2,874	122
Estimated Difference Between Shelly and King Hill--KAF	2,496	2,420	76

IDWR April 2023 Forecast, April-July 2023

	Predicted Natural Flow Supply	Predicted Storage Allocation	Minidoka Credit Adjustment	Total Supply	BLY 2018	Shortfall
A&B	14,833	135,411		150,244	64,192	0
AFRD2	115,223	387,853	1,000	504,076	453,890	0
BID	109,313	221,713	5,130	336,156	262,211	0
Milner	18,347	88,047		106,393	58,417	0
Minidoka	156,468	342,620	8,370	507,458	354,851	0
NSCC	457,802	819,773	-7,750	1,269,825	1,026,661	0
TFCC	820,663	232,606	-6,750	1,046,519	1,121,717	75,200
				Total Projected Demand Shortfall (AF)		75,200

*** Estimated volume flows Near Heise at 4,107, for the April-Sept period, 107% of average flows are estimated.**

Sources: NOAA, Northwest River Forecast Center, Water Supply Forecast Listing, 5-27-2023; IDWR, Flows Forecast April 1, 2023.

Observations:

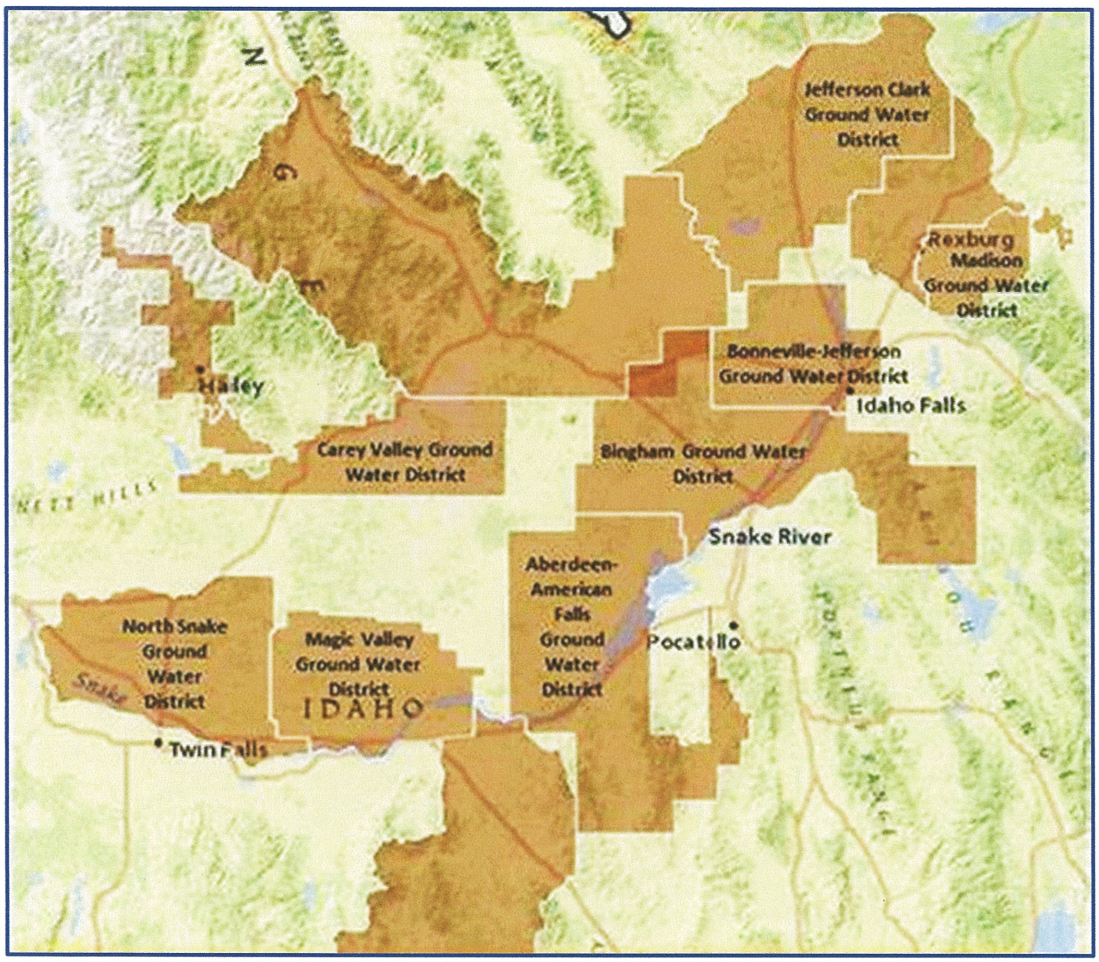
1) The estimated acre-ft./acre water demand/use for the Twin Fall Canal Company at 5.76 act-ft./acre, Total Supply, with forecast supply at 5.37 acre-ft./acre. Total irrigated acres are about 194,732.

This suggests that 3.5 acre-ft./acre could be net crop consumptive use, with 2.26 acre-ft./acre applied to carriage use/loss with some return flows; or about 40% of total dedicated supply demand.

2) For conversion to groundwater curtailment levels, it requires approximately 3 acre-ft./acre to supply 1 acre-ft. at TFCC. Conversion/impact rate is still under review for the Snake River Plain Acquifer.

Southeastern Idaho Water Resources Management Impacts

Surface-Groundwater Irrigation Demands



A Policy White Paper Review

Prepared By
Darryll Olsen, Ph.D.
Pacific Northwest Project

Prepared For:
Bingham Groundwater District
January 2023

In Summary

1. Idaho's Irrigated Agriculture Industry—Cannot be Replaced.

Idaho's Irrigated Agriculture Industry—composed of direct agricultural production, agricultural services, and food processing—sustains valuable regional, national, and international markets. It is a benchmark for agricultural producers throughout the world. State political leaders should appreciate that loss of any part of it cannot be replaced.

2. Irrigation Water Supply—the Big Picture.

Idaho's Irrigated Agriculture Industry does not exist in a geographical vacuum. Western Industry assets and the Irrigated Agriculture Industry are facing unprecedented water supply challenges. This is being exacerbated by climate change impacts, turning important Industry producers into *climate change refugees*. The Pacific Northwest retains a relatively stable water supply.

3. Surface and Groundwater Conflicts in Southeastern Idaho.

The water supply conflicts in Southeastern Idaho have evolved after decades of successful Industry growth. Conflict has revolved around changing conjunctive surface and groundwater supplies strained by increasing demands, and long-term drought. Without implementing new water management options, 150,000 acres of irrigated land will be in jeopardy.

4. Idaho's Irrigated Agriculture Industry—How Valuable Are We?

a. Idaho's Irrigated Agriculture Industry relies on about 3.4 million acres, with a farmgate value of about $6.4 billion.

b. The five-county Focus Area (Bingham, Bonneville, Clark, Jefferson, and Power counties), consists of about 843,000 acres, with a farmgate value of about $1.1 billion. "Target acres" within the Focus Area represents about 150,000 acres.

c. The statewide Industry provides about $8.8 billion in total, annual household income.

d. The Focus Area creates about $1.1 to $1.6 billion in total household income (regional-statewide impacts).

e. The irrigated land market value for 150,000 acres is about $862,000,000 to $1.7 billion, generating about $15-30 million in property tax revenues.

f. The loss of 150,000 acres would reduce household income by about $268 million.

5. Reducing Conflict—Action Items for the Idaho Legislature and Executive Office.

a. Pragmatic institutional, operational, and infrastructure measures—do exist.

b. State funding role—provide a 10-year "fixed" program for $175 million, for enhanced water management in the Focus Area.

6. Final Thoughts.

Southeastern Idaho's long-standing surface-groundwater conflict is best resolved by the state's Irrigated Agriculture Industry. Otherwise, less sympathetic interests will enter the picture.

Southeastern Idaho Water Resources Management Impacts
Surface-Groundwater Irrigation Demands

1. Idaho's Irrigated Agriculture Industry—Cannot be Replaced.

Idaho's Irrigated Agriculture Industry ("Industry") is composed of direct irrigated agriculture production, agricultural services, and food processing sectors. It has been developed across the span of three centuries, and it sustains regional, national, and international markets. It is a benchmark for agricultural producers throughout the world. State political leaders should embrace the reality that it cannot be replaced; nor should it be taunted by avoidable risks.

The pressing concern is on the Eastern Snake Plain Aquifer (ESPA) Area, where four of the groundwater districts are most directly affected, along with surface water irrigators who are part of the conjunctive water use, water supply regime (see Figures-Maps 1, 2, and 3 attached).[1]

For Idaho's elected leadership, three important factors should be better understood:

1) Climate change has significantly added to state water resources problems; and it has forced a future generation of Western production agriculture to turn toward the Pacific Northwest. This has some potential opportunities for the region and state.

2) The economic impact to the Southeastern Idaho Region is highly significant. Its prevalence should be respected, not taken as a given.

3) All pragmatic management measures must be employed to avoid a 150,000-acre plus impact to either surface or groundwater irrigators. The economic magnitude of such a predicament should make political leaders' heads spin.

So, a complex set of economic, technical, and ecological factors beg the questions of what can local water resources managers and state political leaders do to bring about pragmatic water supply-delivery management actions, and to what extent should state leadership accept fiscal responsibility to keep Idaho's Irrigated Agriculture Industry from being diminished?

Answering the technical question may require some realization that cultural change and new mindsets may bring benefits for all parties concerned. A second question suggests that a realistic fiscal criterion should be adopted to justify legislative decisions to allocate capital budget funds.

2. Irrigation Water Supply—the Big Picture.

Idaho's Irrigated Agriculture Industry does not exist in a vacuum.

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[1] The American-Falls-Aberdeen, Bingham, Bonneville-Jefferson, and Jeferson-Clark Districts; with key counties being Bingham, Bonneville, Clark, Jefferson, and Power.
Also see attached Figure-Maps 1, 2, and 3.

Western irrigation assets and the Irrigated Agriculture Industry are facing unprecedented water supply challenges, reflecting changing water demands and dwindling supplies. For better or worse, elected officials are now making "hard" predictions regarding what to expect from climate change in key agricultural regions.[2] This includes forecast changes in much of California, the Colorado River system, and within the Greater Columbia-Snake River Basin area.[3]

This change means Western Industry asset decisions must embrace that climate change is becoming an inalterable reality, and each Western sub-region embodies a different set of risks affected by increasing climate change trends. To some degree, water supply uncertainty can be reasonably understood among the different regions, and industry managers are now formulating future action plans.[4]

So, what does this mean, more specifically, for the situation in Idaho and the Eastern Snake Plain Aquifer (ESPA) Area?

There are both direct water supply-aquifer recharge impacts, and the increasing Western Industry desire to leave highly water-stressed regions in California and literally seek refuge in all parts of the Pacific Northwest. The first constraint is empirically internal to Southeastern Idaho—how should declining surface-groundwater supplies to be allocated, or managed? This is an added complication to a well-known dilemma.

The second concern is external in origin. The irrigation sector *climate change refugees* see a future—in Idaho, Oregon, and Washington. They are actively surveying the Greater Columbia-Snake River systems, seeking available water supplies—for their long-term future. This should not be necessarily perceived as a "threat" for the Industry, given more capital, joint ventures, and market outlets may be offered to Idaho irrigators.

3. Surface and Groundwater Conflicts in Southeastern Idaho.

Keep in mind that water supply conflicts in Southeastern Idaho represent decades of successful Irrigated Agriculture Industry growth. The Industry, and political leaders, should not lose sight of that fact.

The technical issue surrounds surface-groundwater conjunctive use along the Eastern Snake Plain Aquifer Area, stretching westward from the far corner of Southeastern Idaho to the Magic Valley Region (see Figure-Map 3 attached). Since the 1950s, groundwater pumping has operated with surface water diversions. Aquifer recharge has been, and is, derived from surface water flows

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[2] Such as, recent changes to reallocate the Colorado River system, significantly requiring water "conservation" actions in major irrigated agriculture regions like the Imperial Valley and Central Valley (CA). In effect, the Colorado Compact has been (is being) renegotiated.

[3] U.S. Bureau of Reclamation, USBR SECURE Water Availability in the West, U.S. Dept. of the Interior, WA-DC, January 2021; Bonneville Power Administration, BPA RMJOC-II Report, 2018; Office of Columbia River, Ecology, "Long-Term Water Supply and Demand Forecast," Olympia, WA, August 2022.

[4] This situation has been best characterized by Columbia-Snake River Irrigators association (CSRIA), "A White Paper Review, Climate Change and Western Irrigation Assets," August 2022, Kennewick, WA.

from the Upper Snake River system, from tributary seepage, and incidental recharge from surface water conveyance systems. The surface water flows are protected as senior water rights, whereas the groundwater flows depend on more junior vintage rights. The groundwater "return flows" re-enter the Snake River, where it is used by surface water irrigators in the Magic Valley Region (see Figure-Map 3).

The most immediate Snake River reach area being affected by groundwater pumping is north of American Falls Reservoir, including the five-county Focus Area. Significant groundwater development began in the early 1950s, continuing until a moratorium in 1992. Through the 1980s, when roughly 90% of the groundwater irrigation had been developed, the river reach gains and aquifer levels held steady, peaking in 1985. Extended drought periods in the 1990s and 2000s led to rapid declines, but readjusted to a reduced level since 2010, with varying fluctuation following precipitation trends (see attached Figure 4). This condition brings a great deal of uncertainty for irrigators.

Both surface and groundwater managers now struggle to meet the demands of our prosperous Irrigated Agriculture Industry; the struggle coincides with low system operating budgets and the need for technological improvements to water delivery and application infrastructure. Opportunities to make better use of river flows to conserve groundwater exist, but infrastructure and management changes are fiscally out of reach for most surface water systems. Given the increasing severity of water supply shortages and the implementation time line for new infrastructure and management regimes, action needs to be immediately initiated. The public benefit from improved water resources management more than justifies an investment of public funds to expedite technological adoption, as is occurring throughout the west.

4. Idaho's Irrigated Agriculture Industry—How Valuable Are We?

The "Irrigated Agriculture Industry" depicts the direct agricultural production, agricultural services, and food processing sectors of the state and regional economies. These sectors are the economic engine of irrigated agriculture, affecting numerous other economic sectors; collectively, the sectors are the direct impact sectors, with indirect and induced impacts throughout the state and regional economies.

Economists and regional planners use various measures of economic activity to express the significance of industries or projects to an economy. For this White Paper, the preference is to target the value of the Irrigated Agriculture Industry in terms of state and regional household income; the regional income based on county income data attached to the irrigation acres, and further tied to estimates of irrigated acres that could be at greater risk for either surface water or groundwater sources.

Attached is the detailed Analysis Methodology applied to derive reliable estimates for making decisions affecting the surface and groundwater resources for the Southeastern Idaho Region under review here. Also attached are the more detailed analysis tables used to calculate the allocated irrigation production and resulting household income (Table 1 and 2).

The first step is to define irrigated agriculture production values.[5]

a. Direct Farmgate Production Value:

- At the state level, irrigated acres reside across 3.4 million acres.
- The direct farmgate production value is about $6.4 billion.

- At the multi-county level, about 843,000 irrigated acres are farmed.[6]
- This comprises about $1.1 billion of direct production value.

The second step is to estimate household income values (2020$):

b. State and Regional Annual Household Income:

- The statewide Industry provides about $3.5 billion in direct household income.
- Including all direct and secondary (indirect-induced) impacts, about $8.8 billion in household income is generated.

- At the multi-county level, the direct Industry income impact is about $624 million.
- Total regional income created is about $1.3 to $1.6 billion with an estimated regional to statewide impact range.
- The 150,000 target acres provide about $233-$291 million in household income. This could be attributable to either surface or groundwater acres (or both).

Another economic impact consideration is to estimate irrigated land values within the Focus Area. While it may be asserted that changes to land use could actually increase some land values, this is done at the expense of removing irrigated acres, losing a portion of this land value sector.

c. Land Market Value:

- The land market value within the multi-county area, for a targeted 150,000 irrigated acres is about $862 million to $1.7 billion, largely depending on whether land is distressed (lacks adequate irrigation water). This estimate also attempts to avoid irrigated lands that are in the "path" of new residential/commercial development.

- The market range accepted is about $10,500-$16,500 per acre, with an "index" value set at $11,500 per acre.

d. County Property Taxes:

- Irrigated property taxes reflect multiple assessment factors and outlay obligations. Based on an average weighted value for the counties, for the Focus counties, a range of about $15-30 million is estimated, for 150,000 acres (many assumptions at play).

So, the above economic value estimates, or impact measures, undeniable affirm the high impact of the Industry to the Focus Area and targeted irrigated acres at risk. No small deal.

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[5] The production value for U.S. agricultures has varied widely during the past decade, see Figure 2 attached.

[6] The groundwater water Focus Area here is Bingham, Bonneville, Clark, Jefferson, and Power counties.

5. Reducing Conflict—Action Items for the Idaho Legislature and Executive Office.

State legislators and the Executive Office are no strangers to difficult economic and social issues. Their constituents are often eager to throw to them seemingly intractable problems. Some may argue that the situation cannot be successfully resolved. But that is not the case.

a. Administrative and Infrastructure and Management.

- The state of Idaho retains a relatively benevolent water code, where loss of water rights (relinquishment) can be avoided under conservation actions, water right leases for change/transfers, and water right mitigation measures. This may involve changing some cultural norms, but it does not involve loss of water rights or water access to effectively farm crops.

- Even more important, the Director of the Idaho Department of Water Resources (IDWR) wants to work with the Industry, not against it, to reach satisfactory solutions.

- The surface and groundwater right irrigators *still have* a viable list of operational measures that can be employed to improve water distribution system management and on-farm water application efficiencies. This is fortunate.

b. How Much Should the Legislature (and Irrigators) Spend?

- The legislature, and junior water right holders, should assume fiscal responsibility for meeting new water management objectives. It could be argued that several hundred-of-millions of dollars in land values are on the table, and that should influence what is deemed to be acceptable to spend. It sets a higher range bar to judge the value of expenditures.

- Establishing a "fixed" time horizon for implementing a plan is very important. Senior and junior water right holders cannot "horse around" with uncertainty. That timeline and task protocol schedule must be determined soon, and religiously held firm.

- A recommendation needs to be made. It would be appropriate to establish a ten-year implementation schedule, with a $175 million budget, for varying appropriations each year. The $175 million is approximately one-tenth of the land market values within the five-county area.

- Improved distribution system management should be a priority in the stressed river reaches of most direct need—specifically in the areas north of American Falls.

6. Final Thoughts.

The long-standing water supply issue in Southeastern Idaho needs to be settled by Idaho's Irrigated Agriculture Industry, before others enter the picture.

Western water law is under siege by interests that are unsympathetic to irrigated agriculture. Across the Western U.S., cries for greater regulatory intervention are being made by frustrated or bias state regulators, environmental groups, and Tribes. Even some irrigators are turning to courts to comply with, or modify, earlier vintage water supply agreements that can no longer survive under the effects of climate change or sustained irrigation water demands. And Idaho is no stranger to calls for added fish flows from Endangered Species Act (BiOp) inriver, fish flow targets.

Some of the regulatory and statutory proposals call for a complete overhaul of state water rights, management, and regulation. Even from the University of Utah College of Law, comes a call for re-adjudicating existing water rights, to give priority to socio-ecological "needs." In Washington, the state's water management authority has proposed legislative recommendations, to restrict measures for water right change/transfers and marketing that do not address environmental justice and social equity issues (as defined by the state). This has been coined "Critical Water Theory," where all state administrative actions constrict or uncritically control water rights, particularly those in private sector hands.[7]

Idaho is unique in that junior and senior water right holders have usually sought a high level of collaboration, and they are working with a state water management agency that clearly wants to resolve problems for the Irrigated Agriculture Industry.[8] This period of grace may be short-lived, and a reasoned mindset may fade away or be disrupted by others.

[7] University of Utah, S.J. Quinney College of Law, "Climate Change and Water Law Scholarship," Utah Law Digital Commons, 2020; Water Resources Program, Ecology, "Trust, Transfers, and Water Banking Legislative Report," Draft Recommendations, August-September 2022, Olympia, WA.

[8] Some point to the Yakima River Basin, WA, Yakima Integrated Plan (YIP), as a "model" of collaboration. But most improvements to date are "ecological" in nature, and the most significant water supply mitigation for irrigators has come from direct irrigator development of access to "dead storage" in the upper basin. The overall YIP is multidecadal in structure and costs billions of dollars.

ATTACHMENTS

1. Analysis Methodology for State-Regional Irrigated Agriculture Industry Household Income Impacts.

2. Table 1. Estimated Farmgate Production Value.

3. Table 2. Estimated Household Income Impacts.

4. Table 3. Estimated Markey Irrigated Land Values and Property Tax Values.

5. Figure 1. Groundwater Focus Districts.

6. Figure-Map 2. Easter Snake Plain Aquifer Area-1.

7. Figure-Map 3. Eastern Snake Plain Aquifer Area-2.

8. Figure 4. Climate Analysis for Blackfoot-Neeley Reach Gain/loss.

9. Figure 5. Agricultural Production Prices Received and Costs Index.

Analysis Methodology for State-Regional Irrigated Agriculture Industry Household Income Impacts[9]

There exist ample data and modeling experience to analyze the impacts of Irrigated Agriculture to the state and regional economies. The basic approach used in this White Paper is to determine income impacts relying on: 1) Agricultural Census-NASS and Economic Research Service data; 2) U.S. Bureau of Economic Analysis (BEA) data sets for income by place of use and detailed sectors; and 3) available state and regional input-output and IMPLAN model multipliers for the Irrigated Agriculture Industry (agricultural production, agricultural services, and food process sectors).

While several descriptive, irrigation/agricultural economic statistics are often cited, the Industry's contribution to household income is rarely expressed in total household income impacts at either the state or regional level. This type of estimate requires estimating the allocation of direct production to irrigated agriculture, and the use of input-output analysis multipliers (usually) to estimate aggregated industry sector secondary impacts (direct, indirect, and induced impacts from the Industry). The resulting estimates likely fall within an acceptable range.[10]

In summary, the steps used to calculate household income from the Industry are described below:

- By state and county, total agricultural production values (2017-18) are obtained from the Ag. Census-NASS data, and Economic Research Service for annual data series (where available). These data sources breakdown crop/livestock production value contributions by commodities and specialty crops by state/county.

- The NASS data sources have data (20017-18) for irrigated acres by state and farms, with and without irrigated acreage. Irrigation includes pasture ground for beef/livestock.

- The U.S production value (crops and livestock) did not increase between 2017 and 2021. Since that time, aggregate production value increased by about 30% (see Figure 5).

- Using the above data and related state sources, estimates of production value by commodities and specialty crop, bay state and counties, are prepared, that are allocated to irrigation lands (both primary and secondary production). This includes crop/livestock production.

- The estimated production value percentages linked to irrigated agriculture must take into account dry-land versus irrigation production, where no irrigation is used. There are no

[9] Also see Table 2 footnotes and analysis comments.

[10] This White Paper represents the fourth time that the Pacific NW Project has estimated Western Irrigated Agriculture impacts, as generally described herein. Consequently, greater confidence in the methodology has been obtained over time, including revised data assumptions and receipt of peer review comments from public and private sector economists (per previous analysis); nevertheless, all assumptions or analytical errors are solely the responsibility of the Pacific NW Project. The numbers and analysis presented are perceived as providing decision makers with useful information for water resources management in Idaho.

direct irrigation production data to make precise estimates, so qualitative or judgment-based assumptions must be applied, taking into account state-regional production data and conditions. The estimated irrigation-production allocations are presented in Table 1.

- An estimated percent of production value allocated to irrigated agriculture then can be applied to household income created by agricultural production, agricultural services, and food processing sectors (see Table 2). The allocations are combined to derive direct household income to the state and region (counties). These estimates are highly reliable, based on BEA 2020 income data.

- Economic sector linkages among the agricultural production, agricultural services, and food processing sectors are relatively direct and uniform; as such, the application of the production value estimates to direct household income among the sectors is considered a reasonable estimate as well. In particular, higher levels of income derived from irrigated agriculture (versus non-irrigated agriculture) are expected, and the impacts to agricultural services and food processing are usually higher as well.

- Using input-output model (IMPLAN and state sources where available) multipliers for the state and select region, value added (and income) multipliers have been calculated for the combined economic sectors of the Irrigated Agriculture Industry. The multipliers are then applied to the direct income estimates (see Table 2 and discussion therein). In previous studies the multipliers used here reflect several years of estimation and review, and the overall approach has been previously discussed with IMPLAN modelers and other conversant with I/O applications.

- The direct and secondary linkages among the economic sectors are relatively stable over time, although efficiencies in production and newly developed production products will increase the multipliers impacts. As such, it could be assumed that the multiplier levels considered here (VA multipliers and household income estimates) may be conservative. Future estimates would benefit from new IMPLAN modeling work that may marginally change the impact estimates.

Table 1. Estimated Farmgate Production Value--Total and for Irrigated Agriculture, 2018

State	Market Value Crops	Market Value Livestock	Total $ Ag. Production	Estimated Acres Irrigated Land*	Market Est. Irr. Ag. %	Estimated $$ Irrigated Land*
Idaho/Crops**	$3,210,800,000	$4,356,600,000	$7,567,400,000	3,398,100	85%	$6,432,290,000
Potatoes				335,000		
Hay-Forage				1,510,000		
Sugar Beets				168,000		
All Corn				418,100		
All Cattle Nos.		2,435,100				
Inventory						
County/Crops**						
Bigham	$352,322,000	$100,822,000	$453,144,000	333,894	90%	$407,829,600
Potatoes				67,300		
Hay-Forage				92,700		
Sugar Beets				21,800		
All Corn				5,720		
All Cattle Nos.		97,760				
Inventory						
Bonneville	$110,833,000	$57,029,000	$167,862,000	131,620	90%	$151,075,800
Potatoes				NA		
Hay-Forage				21,600		
All Corn				NA		
All Cattle Nos.		58,100				
Inventory						
Clark	$19,233,000	$66,628,000	$85,861,000	31,600	75%	$64,395,750
Potatoes				NA		
Hay-Forage				12,500		
All Corn				NA		
All Cattle Nos.		8,130				
Inventory						
Jefferson	$172,865,000	$121,692,000	$294,557,000	198,300	90%	$265,101,300
Potatoes				31,000		
Hay-Forage				81,980		
All Corn				5,160		
All Cattle Nos.		84,800				
Inventory						
Power	$210,861,000	$24,581,000	$235,442,000	147,746	90%	$211,897,800
Potatoes				43,850		
Hay-Forage				11,300		
Sugar Beets				15,200		
All Corn				12,900		
All Cattle Nos.		27,500				
Inventory						
County						
Totals:	$866,114,000	$371,000,790	$1,236,866,000	843,160	89%	$1,100,810,740
Potatoes				142,150		
Hay-Forage				220,080		
Sugar Beets				37,000		
All Corn				18,060		
All Cattle Nos.		276,290				
Inventory						

* Includes irrigated pasture.
** Major crops considered for State/County production.

Sources: NASS, 2017 Census of Agriculture, State and County Data, Idaho; and NASS Statistical Highlight, IDA, 2020.
NASS: National Agricultural Statistics Service, Data Series for Idaho and Counties.

NOTE: Percentage estimate of market value tied primarily to irrigated agriculture (including cattle production) from Pacific Northwest Project. Assumes relatively small percentages of non-irrigated wheat-pasture, other.

Table 2. Estimated Household Income Impacts--Groundwater Subject Area for Irrigated Agriculture, 2020$.

State	Direct Impact Sectors				Est. Irr. Ag. %	Est. Irr. Ag.	Multiplier Est. Income	Total Impact
	Farm Production	Ag Services	Food Processing	Total Ag. Industry				
Idaho	$2,354,384,000	$322,461,300	$1,446,332,000	$4,123,177,300	85%	$3,504,700,705	2.5	$8,761,752,000
		(70% Serv. Est.)						
County								County-Statewide
Bigham	$115,256,000	$24,251,500	$66,862,000	$206,369,500	90%	$175,414,080	2.1	$368,370,000
		(70% Serv. Est.)					2.5	$516,000,000
Bonneville	$60,781,000	NA	$198,521,000	$259,302,000	90%	$233,371,800	2.1	$490,080,780
							2.5	$583,430,000
Clark	$5,115,000	NA	$67,000	$5,182,000	75%	$3,886,500	1.8	$6,996,000
							2.0	$7,773,000
Jefferson	$47,772,000	$23,249,350	$54,942,000	$125,963,350	90%	$113,367,020	2.1	$238,070,700
		(95% Serv. Est.)					2.5	$283,417,550
Power	$68,193,000	$10,701,900	$30,000,000	$108,894,900	90%	$98,005,410	2.1	$205,811,300
		(90% Serv. Est.)					2.5	$245,013,500
								County-Statewide
TOTAL:	$297,117,000	$58,202,750	$350,392,000	$705,711,750	------	$624,044,810	------	$1,309,328,780
								$1,635,634,050

Estimated annual household income impact for Multi-County Area: $1,550/irrigated acre, crop and pasture.
Estimated annual household income impact for Statewide Area: $1,940/irrigated acre, crop and pasture.
Estimated annual household income for impact of 150,000 acres multi-county impacts: $232,500,000.
Estimated annual household income for impact of 150,000 acres state-wide impacts: $291,000,000.

U.S. Bureau of Economic Analysis (BEA), Regional and Local Data Bases and Apps, multiple data bases for state and county NAICS sector data, for 2020 (2022). Household income data includes farm proprietor, labor income, agricultural services, and food processing. Generally cited as "BEAR Facts" data bases and apps (multiple BEA web site locations, updated annually..

NOTE: Food processing sector for Power County is a "place holder" estimate to avoid IRS disclosure issues; some corporate income is included in the state-county areas. Main access site initiated at: https://apps.bea.gov/regional/bearfacts/, and sites referenced therein (includes state GDP and household income).

NOTE: Regional-state household income multipliers based on IMPLAN and state input-output modeling for multiple areas, including WA-ID-CA and the Columbia Basin areas focusing on Production Irrigated Agriculture industry (production agriculture, agricultural services, and food processing combined sectors). Multiple analyses where considered. The modeling runs were relying on 1998-2013 data; the intersector linkages remain relatively stable over time, as such the multiplier estimates used here are deemed reasonable for the needs of this Policy White Paper. We note that the concentration of food processing for the counties is high, and this sector retains higher multiplier values, than the production irrigated agriculture sector alone. We note as well that more recent impact analyses for irrigation manufacturing and services suggest higher range multipliers.

For IMPLAN modeling purposes, the above sectors are combined (direct impact), with indirect-induced impacts calculated from the joint sector modeling (Pacific Northwest Project approach). Previously working with IMPLAN group modeling staff and regional IMPLAN modeling economists, this review considered both income and value added (VA) multiplier use, recognizing structural differences. Nevertheless, the VA multiplier is applied here in an attempt to reflect the full household income impacts associated with labor income, all forms of proprietary income, and associated land income (rent), and taxes contributed to additional statewide income. In effect, all income. The U.S. BEA Regional Input-Output Modeling System, RIM II Guidebook, defines value added income as generated from compensation, payments to government (taxes), and investment returns--essentially all income impacts.

Regional impact sources include: Pacific Northwest Project, "The Economic Importance of Western Irrigated Agriculture, 2015," White Paper Review, Prepared for the Family Farm Alliance, Kennewick WA (available at CSRIA.org and FFA web site). Statewide VA multipliers in the 2.0 to 2.5 range.

Office of Financial Management/UW, "The 2012 Washington Input-Output Study," OFM-Olympia-WA, Forecasting & Research, 2021. Used by State of Washington for estimating biennial budget impacts, multipliers for agriculture and food processing (employment multipliers at 1.5-3.3, often associated with income multipliers).

Entrix, Inc., "Economic Contribution of Agriculture Irrigated by the Columbia Basin Project," Prepared for the Columbia Basin Irrigation Dists., 2010, Entrix, Inc, Vancouver, WA. Multi-County and Statewide VA multipliers in the 1.8 to 2.4 range (some multi-state "linkage" indicated).

Columbia-Snake River Irrigators Association/IRZ Consulting, "Economic Impacts from Irrigation Development, East-Low Canal, Columbia Basin Project," Prepared for Office of Columbia River-Adams County, CSRIA, Kennewick WA 2013. (Regional and Statewide VA multipliers in the 1.5 to 2.0 range.

Congressional Research Service, "California Agricultural Production and Water Use, CRS, WA-DC, 2015. Statewide employment multipliers estimated at 2.2, usually associated with income multipliers.

Minnesota IMPLAN Group, Inc., "2004-2007 WA State IMPLAN Modeling Data Multipliers Reports," MIG, Stillwater, MN, 2007. Agriculture and food processing VA multipliers in the 1.4 to 2.4 range, not including dairy processing.

Numerous technical articles on I/O Model multipliers, such as Irrigation Association, "Economic Impact of the Irrigation Services Industry," 2021, IA. National employment multipliers in the 2.3 range (usually associated with income multipliers).

IMPLAN Blog, Understanding IMPLAN Multipliers, 2020, IMPLAN, Blog.IMPLAN.com, and other regional economic impact articles on internet sites.

Table 3. Estimated Market Irrigated Land Values and Benchmark County Property Tax Values

County Area	Market Values for 2018-2022 Sales, $/Acre Estimated Range $	Est. Index Value	Focus Area Acres	Total Est. Value	Land Value 50% Impaired Use Value	Est. Tax Rate Per $100 Taxable Value	Est. County Tax Revenue @ 100%	Est. County Tax Revenue @ 50%
Multi-County Area	$10,500-16,500	$11,500	150,000	$1,725,000,000	$862,500,000	1.75%	$30,187,500	$15,093,750
		(weighted est.)					------	------
Bigham						2.16%	------	------
Bonneville						4.60%	------	------
Clark						1.03%	------	------
Jefferson						1.63%	------	------
Power						2.21%	------	------
TOTAL:	$10,500-16,500	$11,500	150,000	$1,725,000,000	$862,500,000	1.75%	$30,187,500	$15,093,750
		(weighted est.)						

Estimated market value range indicates $10,150-16,500 per acre. Approximately 50 market transactions reviewed for the 2018-2022 period.
Irrigated transactions reviewed as land with some infrastructure included (irrigation, farm buildings), no residential structures.
Irrigated transactions reviewed as land not in development path of existing communities and commercial development (location proximity considered).
Estimated irrigated land values above assume adequate crop water duties; index value should be considered relatively conservative estimate, given active demand for agricultural lands (for various production needs).

Sources include: Idaho Land Sales & Prices, Acre-Value, "Sold Land," https://www.acrevalue.com/sales/ID (covers 2018-2022 period).
Several state-wide real estate office listings, "Land and Farm" and "Landsearch" web sites; and Ag. Census data from NASS sites (conservative values).
Https://www.tax-rates.org/idaho/property-tax; data from Associated Tax Payers of Idaho, www.ati-taxinfo.com and personal communications with county Treasurers' Offices and online site information, November-December 2022.

Figure-Map 1. Groundwater Focus Districts.

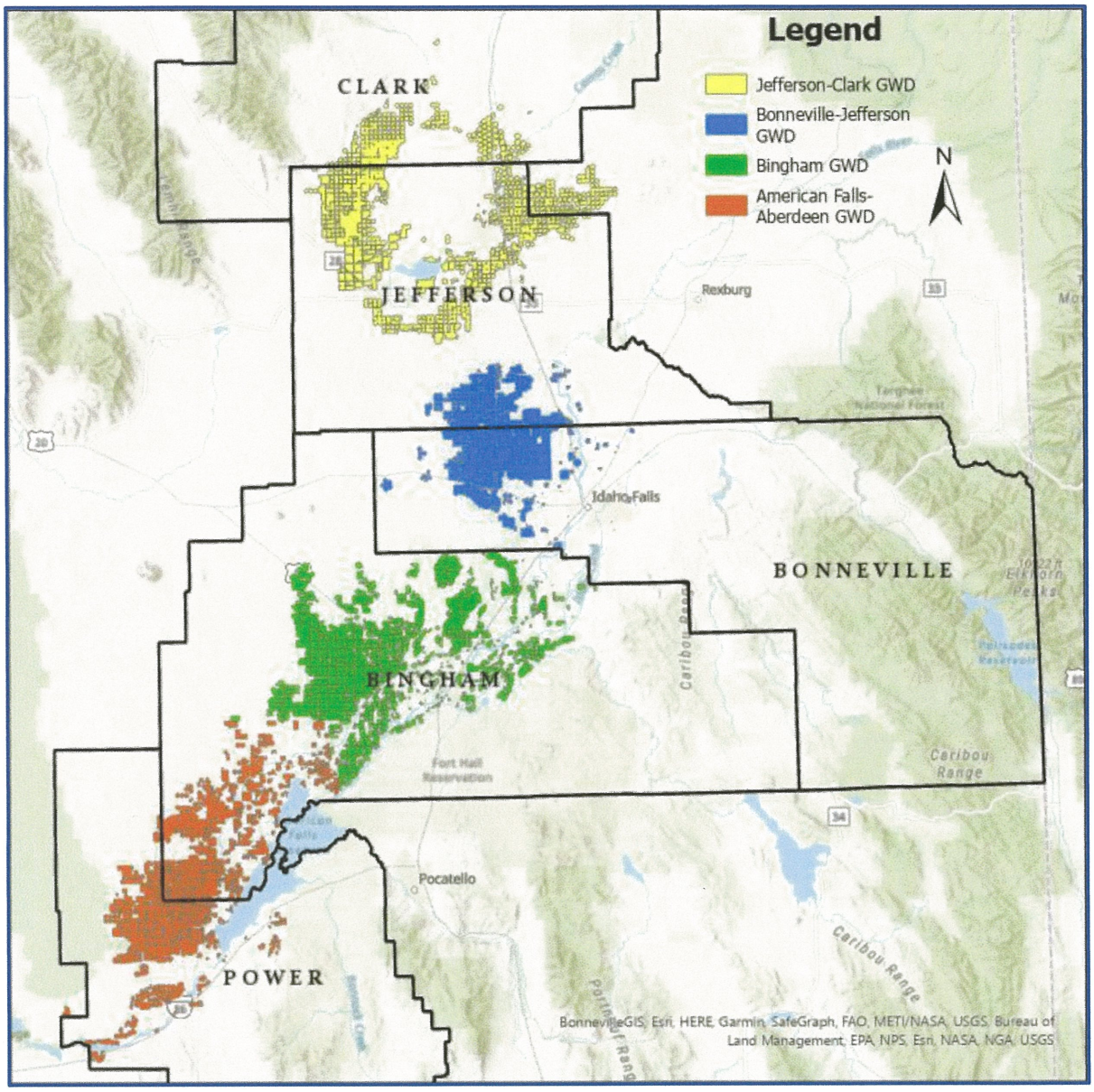

Figure-Map 2. Eastern Snake Plain Aquifer Area-1.

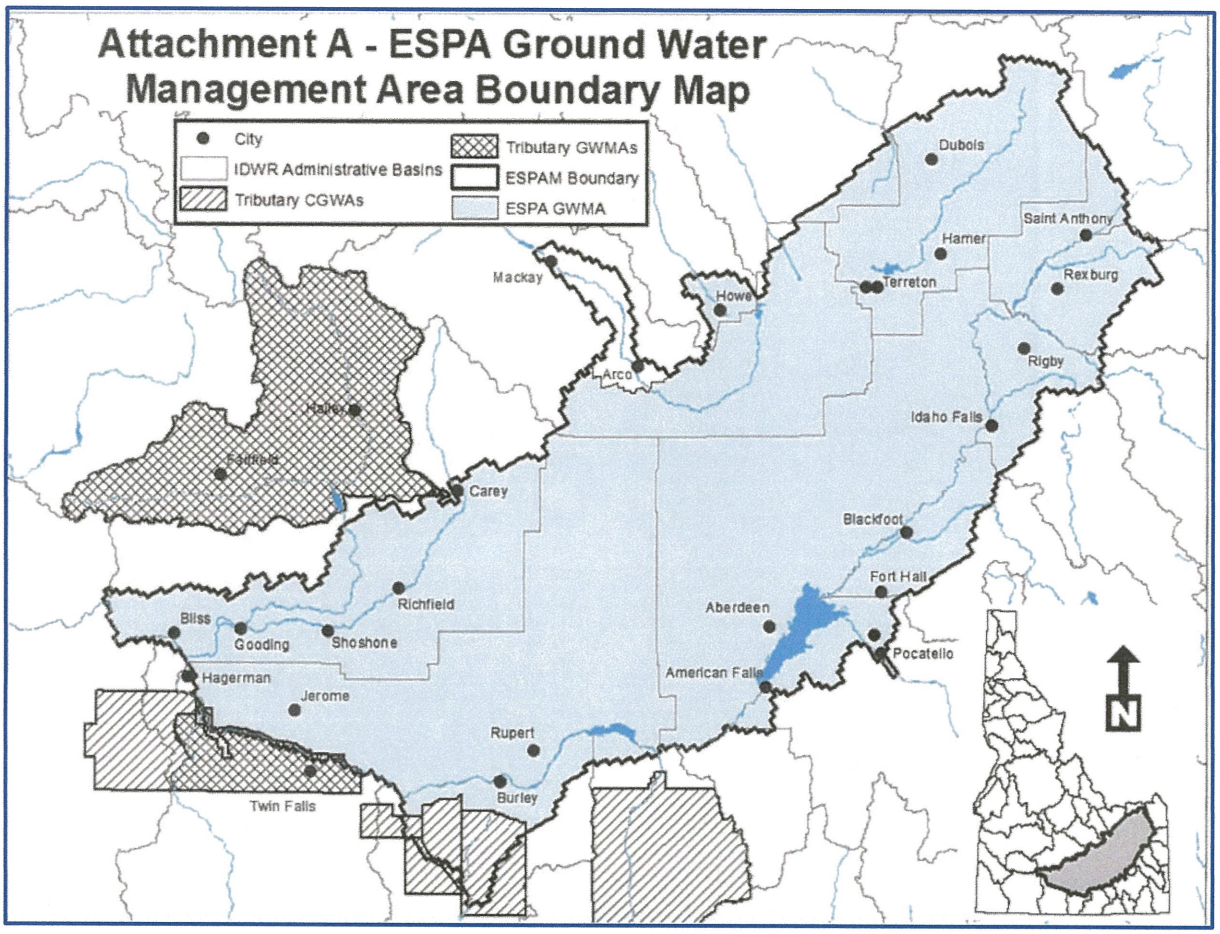

Figure-Map 3. Eastern Snake Plain Aquifer Area-2.

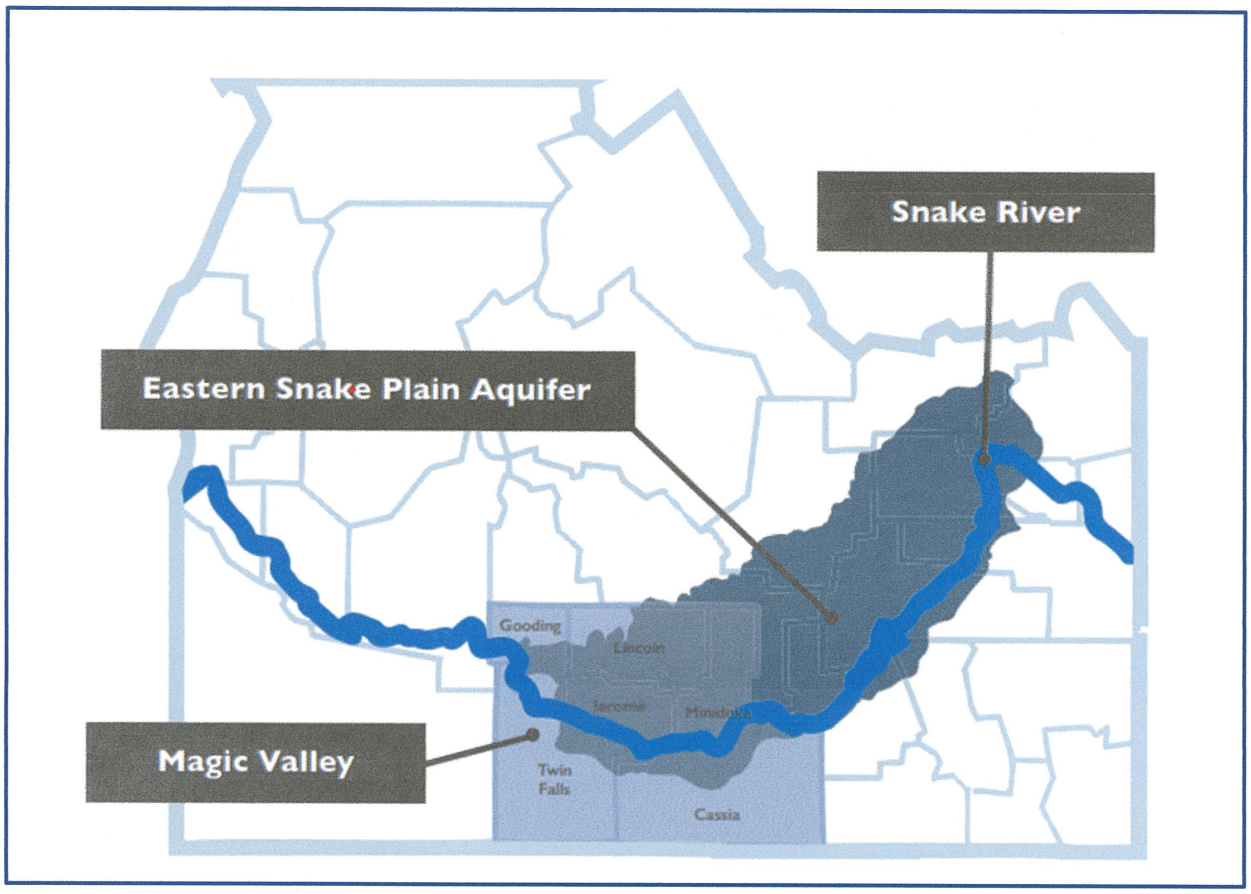

Figure 4. Climate Analysis of Blackfoot to Neeley Reach Gain/Loss.

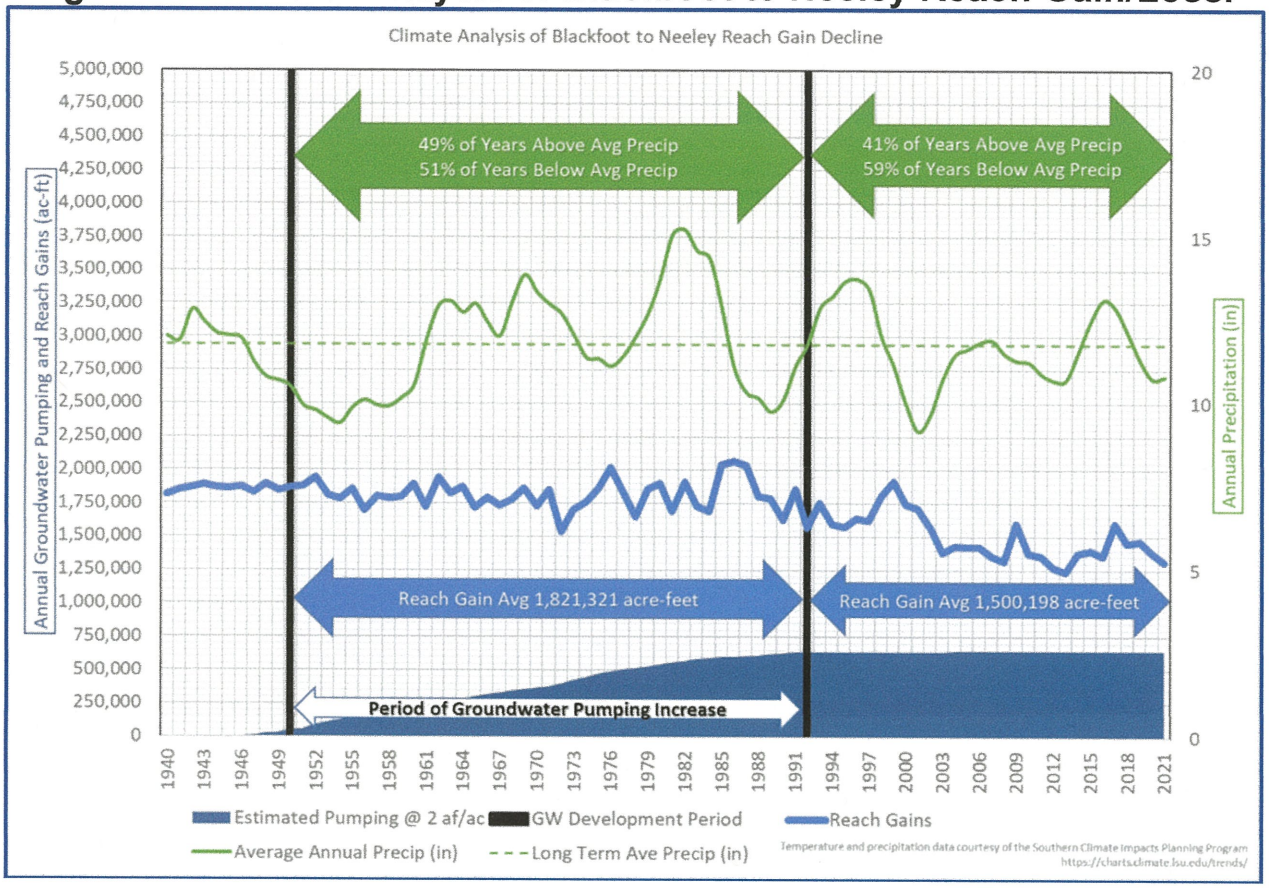

Figure 5. U.S. Agricultural Production, Prices Received and Costs Index.