

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
WATER SUPPLY BANK RENTAL AGREEMENT

RECEIVED

JUN 07 2016

**DEPARTMENT OF
WATER RESOURCES**

This is to certify that: **FREMONT-MADISON IRRIGATION DISTRICT**
PO BOX 15
ST ANTHONY ID 83445
(208) 624-3381

filed an application to rent water from the Water Supply Bank ("Bank"). The Idaho Water Resource Board ("Board"), being authorized to operate a Bank and to contract by and through the Director of the Idaho Department of Water Resources ("Director, Department") for rental of water from the Bank, agrees to rent water as follows:

Summary of Water Rights or Portions Rented from the Bank

Water Right	Priority Date	Source	Tributary	Rented Rate	Annual Rented Volume
21-12897	04/25/1885	Henrys Fork	Snake River	16.38 cfs	786.7 af
21-12912	04/01/1939	Henrys Fork	Snake River	1.88 cfs	90.5 af
21-12934	03/01/1890	Henrys Fork	Snake River	16.38 cfs	786.7 af
Total Annual Combined Limit				34.65 cfs	1663.9 af
21-12908	04/01/1939	Henrys Fork	Snake River	1.97 cfs	131.9 af
21-12921	07/29/1892	Henrys Fork	Snake River	8.19 cfs	549.6 af
21-12922	06/21/1888	Henrys Fork	Snake River	49.15 cfs	3297.6 af
Total Annual Combined Limit				59.31 cfs	3979.1 af
21-12910	04/01/1939	Henrys Fork	Snake River	2.87 cfs	159.5 af
21-12928	06/14/1895	Henrys Fork	Snake River	32.77 cfs	1823.0 af
Total Annual Combined Limit				35.64 cfs	1982.5 af
21-12961	02/09/1897	Henrys Fork	Snake River	18.02 cfs	1006.0 af
21-12962	02/09/1897	Henrys Fork	Snake River	9.83 cfs	548.8 af
Total Annual Combined Limit				18.02 cfs	1006.0 af
Annual Combined Rental Totals				147.63 cfs	*8631.5 af

* This rental is limited to an annual diversion volume of 7151.7 AF at the measurement point of the rental place of use.

Term of Rental: This rental is in effect from the day the Idaho Water Resource Board signs the rental agreement and shall be in effect until December 31, 2020.

Rental Fee: **Years 2016-2017 \$14,673.55 annually**
 Years 2018-2020 \$17,263.00 annually

The full fee for rental of the above-described water rights is \$146,735.50 annually for years 2016-2017 and \$172,630.00 annually for years 2018-2020. Ten percent of the rental fee (\$14,673.55/\$17,263.00) will be retained by the Department to offset administrative costs. Note that the renter has an agreement with the owner of water right(s) 21-12897, 21-12912, 21-12934, 21-12908, 21-12921, 21-12922, 21-12910, 21-12928, 21-12961 and 21-12962 and is therefore obligated to pay only the administrative fee associated with the rental of those water rights.

SUPPORT DATA

IN FILE # 21-12897

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
WATER SUPPLY BANK RENTAL AGREEMENT

An annual payment shall be received by the Department prior to January 1 each year for the duration of the rental period. The agreement will be void if payment is not received prior to the due date in a given year. To terminate the agreement prior to the end of the rental period, written notice must be received by the Department at least 30 days prior to the rental fee due date.

No rental fees will be refunded once the fee is collected and the start date for a Rental Agreement has passed.

Detailed water right conditions are attached.

The undersigned renter agrees to use the water rented under this agreement in accordance with the Water Supply Bank rules and in compliance with the limitations and conditions of use described in this agreement:

 Jeff Raybould, Chairman 6-6-16
Signature of Renter Printed Name and Title* Date

Signature of Renter Printed Name and Title* Date

*Please provide title of signatory if signing on behalf of a company or organization or with power of attorney

Having determined that this agreement satisfied the provisions of Idaho Code § 42-1763 and IDAPA 37.02.03.030 (Water Supply Bank Rule 30), for the rental and use of water under the terms and condition herein provided, and none other, I hereby execute this Rental Agreement on behalf of the Idaho Water Resource Board.

By  Date 6/8/2016
BRIAN PATTON, Acting Administrator
Idaho Water Resource Board

Rental Approved by IDWR  Date 6-8-2016

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
WATER SUPPLY BANK RENTAL AGREEMENT

LOCATION OF POINT(S) OF DIVERSION

HENRYS FORK L 7 (NE¼NW¼) Sec. 33 Twp 08N Rge 41E FREMONT County

BENEFICIAL USE

GROUND WATER RECHARGE

SEASON OF USE

04/01 TO 10/31 except for the following:

<u>Water Right</u>	<u>From</u>	<u>To</u>	<u>Diversion Rate</u>
21-12934	04/01	to 07/01	16.38 cfs
	07/02	to 07/16	8.19 cfs
	07/17	to 08/01	16.38 cfs
	08/02	to 10/31	8.19 cfs
21-12922	04/01	to 07/01	49.15 cfs
	07/02	to 07/16	40.96 cfs
	07/17	to 07/31	49.15 cfs
	08/01	to 10/31	40.96 cfs
21-12928	04/01	to 07/01	32.77 cfs
	07/02	to 07/16	29.49 cfs
	07/17	to 07/31	32.77 cfs
	08/01	to 10/31	29.49 cfs
21-12961	04/01	to 07/01	18.02 cfs
21-12962	07/02	to 10/31	9.83 cfs

RENTER'S PLACE OF USE: RECHARGE

Twp	Rge	Sec	NE				NW				SW				SE				Totals
			NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	
07N	38E	12			X	X									X	X	X		
07N	39E	04											X	X					
07N	39E	05											X	X			X	X	
07N	39E	07	X	X	X		X		X	X		X							
07N	39E	08	X	X			X	X											
07N	39E	09		X	X		X	X		X	X					X			

CONDITIONS APPLICABLE TO ALL RENTED WATER RIGHTS

1. The use of water under this agreement shall be subject to the provisions of Idaho Code § 42-1766.
2. Rental of the specified right from the bank does not, in itself, confirm the validity of the right or any elements of the water right, or improve the status of the right including the notion of resumption of use. It does not preclude the opportunity for review of the validity of this water right in any other department application process.
3. Use of water under this agreement does not constitute a dedication of the water to renter's place of use, and upon expiration of this agreement, the points of diversion and place of use of the water shall revert to those authorized under the water right and/or again be available to rent from the bank.
4. This rental does not grant any right-of-way or easement to use the diversion works or conveyance works of another party.

5. Use of water under this agreement shall not prejudice any action of the Department in its consideration of an application for transfer or permit filed by the applicant for this same use.
6. Renter agrees to comply with all applicable state and federal laws while using water under this agreement.
7. Renter agrees to hold the Board, the Director and the state of Idaho harmless from all liability on account of negligent acts of the renter while using water.
8. Renter acknowledges and agrees that the Director may terminate diversion of water if the Director determines there is not a sufficient water supply for the priority of the right or portion thereof being rented.
9. Failure of the renter to comply with the conditions of this agreement is cause for the Director to rescind approval of the rental agreement.
10. The water rights rented under this rental agreement are appurtenant to irrigation of 2466.1 acres
11. Pursuant to Section 42-234(4), Idaho Code, to ensure that other water rights are not injured by the operations of the recharge project authorized by this right, the Director has authority to approve, disapprove, or require alterations in the methods employed to achieve ground water recharge.
12. Pursuant to Section 42-234(3), Idaho Code, the Director may reduce the amount of water that may be diverted for recharge purposes under this right even though there is sufficient water to supply the entire amount authorized for appropriation under this right.
13. Consistent with Section 42-234(5), Idaho Code, seepage from canals incidental to or coincident with delivery of irrigation water shall not be considered ground water recharge under this right. Canal seepage will be considered to be ground water recharge only when the canals are not conveying water for irrigation or other beneficial uses.
14. The renter shall record the daily quantity of water diverted for ground water recharge at the rental location place of use and shall report the diversion data for the prior calendar year to the Department by February 1 each year. Reporting shall occur in the manner specified by the Department, consistent with Section 42-701, Idaho Code. To facilitate this reporting requirement, the right holder shall install and maintain a totalizing measuring device approved by the Department at each point of diversion and at each point where water is delivered from the conveyance system into a designated recharge site.
15. Prior to the diversion and use of water under this approval, the renter shall comply with applicable water quality monitoring and/or permitting requirements administered by the Department of Environmental Quality or the Department of Agriculture.
16. Use of water under this agreement will be regulated by a watermaster with responsibility for the distribution of water among appropriators within a water district. At the time of this approval, these water rights are within State Water District No. 01 and 100.
17. This rental is not an authorization for the described recharge effort to be used as mitigation or credit for any other purpose. The sufficiency of the recharge effort authorized under this rental for mitigation or credit for some other purpose may be determined by the Department upon proper submission of a mitigation plan pursuant to the Department's Rules of Conjunctive Management of Surface and Ground Water Resources, a mitigation plan to offset depletion in association with a water right application, a Management Program pursuant to Idaho Code Section 42-1416B, or any other proposal to utilize credit for the recharge effort.
18. The following rights are diverted through point(s) of diversion described above: 21-12922, 21-12921, 21-12908, 21-121A, 21-126A, 21-123A, 21-124A, 21-24A, 21-26A, 21-27A, 21-120A, 21-125A, and 21-122A.

STATE OF IDAHO
WATER RESOURCE BOARD

RECEIVED

DEC 07 2015

DEPARTMENT OF
WATER RESOURCES

APPLICATION TO RENT WATER
FROM THE BOARD'S WATER SUPPLY BANK

Applicant Name: Fremont-Madison Irrigation District

Is this application being submitted with a lease application as a lease/rental package? Yes ☒ No ☐

An *Application to Rent Water from the Board's Water Supply Bank* must be completed in accordance with the minimum requirement checklist below to be acceptable for processing by the Idaho Department of Water Resources (IDWR). This checklist is part of the rental application and must be included with the rental application. Applications that do not meet the minimum requirements will not be placed in the processing queue and may be returned until all minimum requirements have been met.

Applications to rent water should be submitted well in advance of the desired start date for the use of water. Rental applications may be submitted as early as November 1 of the year prior to the intended use of rental water. Rental applications submitted more than one year in advance of the proposed start date for water use will not be accepted and will be returned to applicants. Rental applications will not be processed if they are received after the end of the rental season of use.

One rental application per beneficial use of water. One rental application can be submitted if you propose to rent water from multiple sources. For multiple beneficial uses of water, individual rental requests should be submitted for each unique beneficial use of water.

For additional instructions on completing a rental application, visit the Department's website at www.idwr.idaho.gov.

Checked All Items as Either Attached (Yes) or Not Applicable (N/A)

YES

☒ Completed *Application to Rent Water from the Board's Water Supply Bank*

Attachment N/A YES

- | | | |
|----|-------------------------------------|--|
| 2 | ☒ | A map showing the proposed point(s) of diversion, place(s) of use, and water diversion and distribution systems proposed to be used with your rental request |
| 3A | ☐ | ☒ Detailed information on a proposed use of rental water |
| 3E | ☐ | ☒ Authorization from the owner/operator of the rental point(s) of diversion |
| 3G | ☒ | ☐ Water modeling to account for the impacts of the rental request |
| 3J | ☒ | ☐ Documents justifying a need to rent water for irrigation at a rate of flow greater than 0.02 cfs/acre |
| 3K | ☐ | ☒ Authorization from the owner/operator of the property at the proposed rental place(s) of use |
| 4B | ☐ | ☒ Explanation of how the rental water will sufficiently accomplish your rental purposes |
| 4C | ☒ | ☐ Explanation of consumptive use amounts for water rights experiencing a change in nature of use |

Department Use Only – Proposed Water Right(s)

21-12897	21-12908	21-12910	21-12912	21-12921
21-12922	21-12928	21-12934	21-12961	21-12962

STATE OF IDAHO
WATER RESOURCE BOARD

Application to Rent Water (Continued)

1. CONTACT INFORMATION

A. Applicant Fremont-Madison Irrigation District

Mailing Address P.O. Box 15, St. Anthony, Idaho 83445

Email Address fmid@myidahomail.com

Phone Number 208-624-3381

B. Is this application being completed by an authorized representative on behalf of the applicant? Yes ☒ No ☐

If yes, representatives (includes company employees if the applicant is a corporation, as well as legal counsel or consultants) should provide their information below if they desire to be included on correspondence with the rental applicant.

Representative Dale L. Swensen

Professional Title Executive Director

Organization Fremont-Madison Irrigation District

Relationship to Applicant employee

Mailing Address P.O. Box 15, St. Anthony, Idaho 83445

Email Address fmid@myidahomail.com

Phone Number 208-624-3381

2. MAP

Create a map of the proposed point(s) of diversion, place(s) of use, and water diversion, delivery and distribution systems. Make sure the place of use is outlined with an obvious, bolded line. For irrigation purposes, note that the place of use outlined on your map cannot exceed the number of acres you are proposing to rent. Attach the map to this application and label it Attachment 2.

3. DESCRIPTION OF PROPOSED USE FOR RENTAL WATER

A. Describe the purpose of your rental request. Include any anticipated rates of water application, water use practices or number of stock (if any). If the proposed use is not for irrigation, please provide a detailed description of the proposed use and how you determined the amount of rental water required. Attach additional sheets if required and label it Attachment 3A:

Purpose of this rental request is to recharge up to 9,798 acre feet of water at Egin Lakes to provide for mitigation of groundwater wells located within Fremont-Madison Irrigation District and Madison Groundwater District.

B. Enter the desired and/or minimum necessary rates of flow, volume, or irrigable acres requested for your rental purposes:

Desired Rate (Cubic Feet/Second)	Desired Volume (Acre-Foot)	Minimum Rate* (Cubic Feet/Second)	Minimum Volume* (Acre-Foot)	Acres (if applicable) (Acre)
CFS	9,798 AF	CFS	AF	AC

Sometimes water rights available for rent provide an exceptionally low rate per acre and/or low volume per acre. This section is meant to establish an acceptable range of water sufficient for your proposed water use. Please see question 4B and complete if necessary.

C. Enter the proposed start date and latest possible start date for using rental water. Also provide the number of years you would like to rent water:

Proposed Start Date (month/day/year)	Latest Possible Start (month/day/year)	* Proposed Rental Duration (Max 5 Years)	** For multi-year rentals, indicate whether you desire to rent water for remaining years if a rental request cannot be approved for the first year?	
April 1, 2016	June 1, 2016	5 years	☒ Yes, approve rental for all remaining future years.	☐ No, return rental request if first year is unapprovable.

* The number of years permissible for a rental is subject to the lease contract duration for the water right(s) being rented.

** Subject to the availability of rentable water. A multi-year rental that cannot begin during the first year requested may be approved for some or all remaining years, depending on availability. Rental requests will be returned if no water is available to rent in the first and/or subsequent years of the rental request.

STATE OF IDAHO
WATER RESOURCE BOARD

Application to Rent Water (Continued)

- D. Refer to the map you created in item 2 and specify the location of the point(s) of diversion (POD) from which rental water is proposed to be diverted:

Water Source	TWP	RGE	SEC	¼	¼	¼	County	Other water rights for the same purpose diverted from this POD
Henry's Fork	08N	41E	33	NE	NW		Fremont	

The entry in this grid must match the map from item 2 on the application.

- E. Do you own and/or possess the authority to divert water from the above POD(s)? Yes ☐ No ☒
If no, provide documentation from the owner/operator confirming your authorization to use the POD(s) and label it Attachment 3E.
- F. Do any POD(s) identified in Question 3D divert from a water source that may require water modeling? Yes ☐ No ☒
Refer to the Water Modeling Requirements Information Sheet to determine if a rental POD may require water modeling.
- G. Has water modeling been provided with your rental request? Yes ☐ No ☐
If yes, include as Attachment 3G. Otherwise please explain why modeling was not provided:

Rental applications that require modeling will be returned if modeling is not provided.

- H. Specify the proposed beneficial use: ☐ Irrigation ☐ Commercial ☐ Industrial ☐ Municipal
☒ Groundwater Recharge ☐ Mining ☐ Stockwater ☐ Other: _____
- I. Refer to the map you created in item 2 and specify below the places you propose to use water. If for irrigation, specify the number of acres to be irrigated per ¼ ¼ tract. Otherwise indicate usage by marking the ¼ ¼ tracts with the first letter of your proposed use identified above:

TWP	RGE	SEC	NE				NW				SW				SE				TOTALS
			NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	NE	NW	SW	SE	
7N	38E	12			G	G									G	G	G		
7N	39E	4											G	G					
7N	39E	5											G	G			G	G	
7N	39E	7	G	G	G		G		G	G		G							
7N	39E	8	G	G			G	G											
7N	39E	9		G	G		G	G		G	G					G			
The entry in this grid must match the map from item 2 on the application.																			Total Acres (for irrigation)

- J. For irrigation uses, do you propose a water diversion rate greater than 0.02 cfs/acre? N/A ☒ Yes ☐ No ☐
If yes, explain the justification for this rate of flow and attach any supporting documents as Attachment 3J:

- K. Do you own the land at the proposed rental place of use (POU)? Yes ☐ No ☒
If no, attach documentation from the POU owner/operator confirming your authorization to use the POU and label it Attachment 3K.

- L. Describe your water distribution system and how water will be delivered from the POD(s) to the proposed POU(s):
Egin Bench Canals, Inc. owns the water distribution system which consists of earthen lined canals and headgates that deliver the water from the POD to the POU. Much of the POU is owned by the Bureau of Land Management but Egin Bench Canals, Inc. has a permit from BLM to conduct recharge on the identified land.

STATE OF IDAHO
WATER RESOURCE BOARD

Application to Rent Water (Continued)

M. List all other water rights and sources of water at the rental place of use for the same purpose and explain why additional water is required. Include privately owned water rights and water received from a municipal supplier, an irrigation district, a canal company, or any other water deliver entity:

21-12897, 21-12908, 21-12910, 21-12912, 21-12921, 21-12922, 21-12928, 21-12934, 21-12961, 21-12962, Egin

Bench Canals, Inc. water rights. 21-72C, 21-13060, Ronald Green Family Trust water rights.

4. RENTAL REQUESTS FOR SPECIFIC WATER RIGHTS

A. Are you requesting to rent specific water rights?

Yes ☒ No ☐

If yes, specify below the water rights you are requesting to rent. Otherwise continue to Section 5 of this application form.

Please note: Diversion rates and volumes to be rented from a leased water right must be proportionate to the per acre diversion rates and per acre volume limits of the water right leased to the Bank. Applicants should query a water right's rental availability by reviewing active lease and rental documents, searchable via [IDWR's website](#), to ensure all elements of a water right remain available in sufficient quantity to satisfy a rental request.

Water rights identified below must either already be leased to the Bank or a lease proposal should accompany the rental request. **Rental requests for water rights not yet leased to the Bank will be returned if companion lease applications are not provided with the rental request.**

For leased rights with combined limits, applicants should request to rent against the combined limit diversion rate, volume or acre limits.

Elements of Water Rights Leased to the Bank (Contract Details)								Leased totals minus water actively engaged in rental agreement equals rental availability	Rental Request		
Water Right Number	Nature of Use	Water Source	Rate (CFS)	Volume (AF)	Acres (AC)	Start (year)	End (year)		Rate (CFS)	Vol. (AF)	Acres (AC)
21-12897	Recharge	Henry's Fork									
21-12908	Recharge	Henry's Fork									
21-12910	Recharge	Henry's Fork									
21-12912	Recharge	Henry's Fork									
21-12921	Recharge	Henry's Fork									
21-12922	Recharge	Henry's Fork									
21-12928	Recharge	Henry's Fork									
21-12934	Recharge	Henry's Fork									
21-12961	Recharge	Henry's Fork									
21-12962	Recharge	Henry's Fork		9,236	2,639						
Applicants must ensure the requested rate per acre and volume per acre do not exceed the rate per acre and volume per acre that have been leased to the Water Supply Bank								TOTAL		next	next
									CFS	AF	AC

Attach multiple copies of this page if space above is insufficient to list all water rights requested to be rented on this application.

B. If water right conditions, combined limits, or the sum of all water right elements being requested provide an unconventional duty of water (e.g., an unusually low rate per acre or volume per acre for irrigation use), explain how your proposed rental will sufficiently accomplish your intended purposes. Attach a separate page if space is insufficient and label it **Attachment 4B**:

**STATE OF IDAHO
WATER RESOURCE BOARD**

Application to Rent Water (Continued)

M. List all other water rights and sources of water at the rental place of use for the same purpose and explain why additional water is required. Include privately owned water rights and water received from a municipal supplier, an irrigation district, a canal company, or any other water deliver entity:

~~21-12897, 21-12908, 21-12910, 21-12912, 21-12921, 21-12922, 21-12928, 21-12934, 21-12961, 21-12962. These are all stacked water rights.~~

4. RENTAL REQUESTS FOR SPECIFIC WATER RIGHTS

A. Are you requesting to rent specific water rights?

Yes ☒ No ☐

If yes, specify below the water rights you are requesting to rent. Otherwise continue to Section 5 of this application form.

Please note: Diversion rates and volumes to be rented from a leased water right must be proportionate to the per acre diversion rates and per acre volume limits of the water right leased to the Bank. Applicants should query a water right's rental availability by reviewing active lease and rental documents, searchable via [IDWR's website](#), to ensure all elements of a water right remain available in sufficient quantity to satisfy a rental request.

Water rights identified below must either already be leased to the Bank or a lease proposal should accompany the rental request. Rental requests for water rights not yet leased to the Bank will be returned if companion lease applications are not provided with the rental request.

For leased rights with combined limits, applicants should request to rent against the combined limit diversion rate, volume or acre limits.

Elements of Water Rights Leased to the Bank (Contract Details)								Leased totals minus water actively engaged in rental agreement equals rental availability	Rental Request		
Water Right Number	Nature of Use	Water Source	Rate (CFS)	Volume (AF)	Acres (AC)	Start (year)	End (year)		Rate (CFS)	Vol. (AF)	Acres (AC)
21-72C	Recharge	Fall River									
21-13060	Recharge	Fall River		562	160.6						
Applicants must ensure the requested rate per acre and volume per acre do not exceed the rate per acre and volume per acre that have been leased to the Water Supply Bank								TOTAL		9,798	2799.6
									CFS	AF	AC

Attach multiple copies of this page if space above is insufficient to list all water rights requested to be rented on this application.

B. If water right conditions, combined limits, or the sum of all water right elements being requested provide an unconventional duty of water (e.g., an unusually low rate per acre or volume per acre for irrigation use), explain how your proposed rental will sufficiently accomplish your intended purposes. Attach a separate page if space is insufficient and label it Attachment 4B:

STATE OF IDAHO
WATER RESOURCE BOARD

Application to Rent Water (Continued)

- C. Does your rental request propose to change the nature of use for any water right(s) being requested? Yes ☒ No ☐

If yes, explain how the water right(s) will be converted to new uses. Include the historic, consumptive use amounts for the water right being rented, as well as the new consumptive use amount for your proposed beneficial use. Attach a separate page if space is insufficient and label it **Attachment 4C**:

2,639 acres irrigated by water rights held by Egin Bench Canals, Inc. are being dried up. In addition 160.6 acres irrigated by water rights held by Ronald Green are being dried up. The duty of water is 3.5 acre feet per acre which equates to 9,798 ac-ft.

5. ADDITIONAL INFORMATION

- A. Is this the first time that rental water is being requested for this purpose at the rental place of use? Yes ☒ No ☐

If no, list previous rental requests/agreements and explain why you have not secured a permanent water right for your needs: Fremont-Madison Irrigation District has a pending application for permit, 21-13144 for recharge using various canals within the District and the Egin Lakes area.

- B. Have you or do you intend to submit an application for permit or transfer proposing a similar use as this rental? Yes ☐ No ☒

If yes, describe:

- C. Was this rental application submitted in response to a Notice of Violation (NOV) or a pending NOV? Yes ☐ No ☒

If yes, describe the date and location of the NOV.

DECLARATION

I hereby assert that the information contained in this application is true to the best of my knowledge. I understand that any willful misrepresentations made in this application may result in rejection of the application or cancellation of an approval. I understand that if this rental application is approved, it will be subject to the provisions of Section 42-1766, Idaho Code and all applicable state and federal laws.

Signature of Applicant

Printed Name of Applicant

Date

Dale L. Swensen

Dale L. Swensen

12-4-15

Signature of Representative

Printed Name of Representative

Date

Mail to:

Idaho Department of Water Resources
P.O. Box 83720
Boise, ID 83720-0098

APPLICATION TO RENT WATER
ATTACHMENT 3E

Authorization from the owner/operator of the rental point(s) of diversion

This attachment is authorization from Egin Bench Canals, Inc. for Fremont-Madison Irrigation District to utilize the canal company's point of diversion and canals to conduct recharge activities at the place of use. The point of diversion, canals, and place of use are all identified on Attachment 1.



Dale L. Swensen

Secretary/Treasurer, Egin Bench Canals, Inc.



United States Department of the Interior
BUREAU OF LAND MANAGEMENT
Upper Snake Field Office
1405 Hollipark Drive
Idaho Falls, Idaho 83401
(208) 524-7500



Reply to:
2870 (ID310)
IDI-36709

April 27, 2012

CERTIFIED MAIL 7008 1140 0004 9528 3969
RETURN RECEIPT REQUESTED

DECISION

Egin Bench
PO Box 15
St. Anthony, Idaho 83445

:
: Right-of-Way Grant IDI-36709
:
:
:

Right-of-Way Grant IDI-36709 Issued
Monitoring Fee and Rent Exempt

Your right-of-way (ROW) grant, serial number IDI-36709, which allows the use of public land in Fremont County for a water recharge site was approved by the BLM on April 25, 2012. The grant will expire on December 31, 2042. Your copy of the grant was mailed to Dale Swensen on April 25, 2012.

You are exempt from Cost Recovery Monitoring Fees according to regulations 43 CFR 2804.21(3). Rent is exempt according to regulations found at 43 CFR 2806.14(b).

This decision may be appealed to the Interior Board of Land Appeals, Office of the Secretary, in accordance with the regulations contained in 43 CFR, Part 4 and the enclosed Form 1842-1. If an appeal is taken, your notice of appeal must be filed in this office (at the above address) within 30 days from receipt of this decision. The appellant has the burden of showing that the decision appealed from is in error.

If you wish to file a petition (request) pursuant to regulation 43 CFR 2801.10 or 43 CFR 2881.10 for a stay (suspension) of the effectiveness of this decision during the time that your appeal is being reviewed by the Board, the petition for a stay must accompany your notice of appeal. A petition for a stay is required to show sufficient justification based on the standards listed below. Copies of the notice of appeal and petition for a stay must also be submitted to each party named in this decision and to the Interior Board of Land Appeals and to the appropriate Office of the Solicitor (see 43 CFR 4.413) at the same time the original documents are filed with this office. If you request a stay, you have the burden of proof to demonstrate that a stay should be granted.

Standards for Obtaining a Stay

Except as otherwise provided by law or other pertinent regulation, a petition for a stay of a decision pending appeal shall show sufficient justification based on the following standards:

- (1) The relative harm to the parties if the stay is granted or denied,
- (2) The likelihood of the appellant's success on the merits,
- (3) The likelihood of immediate and irreparable harm if the stay is not granted, and
- (4) Whether the public interest favors granting the stay.

If you have any questions, please contact Becky Lazdauskas, Realty Specialist, at (208) 524-7521.

acting for 
Jeremy Casterson
Field Manager

Appendix A. Egin Lakes Managed Recharge Ground Water Quality Monitoring Program

Project Description

Introduction and Location

Water and maintaining aquifers continues to be a critical issue in the state of Idaho. Many agencies, water users, educational institutes and private citizen groups are partnering to study and develop ways to successfully maintain and add to Idaho's aquifers. The Eastern Snake Plain Aquifer stretches from Hagerman to St. Anthony, annually irrigating more than 2.1 million acres across southern Idaho. The Egin Bench Canals, Inc., which is part of the Fremont Madison Irrigation District, is working collaboratively with the Eastern Idaho Water Rights Coalition and the Idaho Water Resources Board to once again study the recharge potential at Egin Lakes. The recharge area is located on public lands in Fremont County.

Specifically, the project is located in: Township 7 North, Range 38 East, Section 12, S½NE¼ and S½SE¼, Boise Meridian, Fremont County, Idaho and Township 7 North, Range 39 East, Section 7, Lots 2 and 3, Boise Meridian, Fremont County, Idaho.

Physical Description

The site is west of St. Anthony in very sandy soils and in dune sand. Most of the recharge area is flat with mostly grasses and sagebrush cover, with some chokecherry shrubs and some cottonwoods along the bottom.

Land Ownership

The existing area is 71.25 acres, now added with an additional 182 acres will total 253 acres, administered by the Bureau of Land Management.

Expected Outcome and Source of Recharge Water

In the spring Fremont-Madison will recharge with a portion of water right number 01-7054 in the name of the Idaho Water Resources Board with a priority date of August 25, 1980. The water could be used from approximately March 1 to July 1. The maximum diversion into the recharge areas will be about 100 cubic feet per second (cfs) with an average of 40-60 cfs.

In the fall Fremont-Madison will use its own storage water and will divert from about mid-September to mid-December. Fremont-Madison will use up to 10,000 acre-feet (AF) of storage with an average of 5,000 AF.

Recharge Area Characterization

The Egin recharge site was studied as early as 1974 and continues to be examined for its recharge potential. The area's geologic, aquifer system characterization and other details can be found in many other published reports identified in the references section.

Water Quality Monitoring

Baseline Water Quality

No streams are found in the recharge area and no ground water quality data exists. The Idaho Department of Water Resources and the Idaho Water Resources Research Institute conducted preliminary monitoring in 2008. Information collected includes: aquifer water levels, estimates of the timing and location of recharge (both experiment recharge and other recharge), and a reconnaissance of seeps and springs on the face of the Egin Bench bluff. The entire report is attached as Appendix A.

Nutrient and Bacteria Constituents

Nutrient constituents are limited to total phosphorus, and nitrate+nitrite. Bacteria monitoring will include *e. coli* and total coliform analyses.

Radioactivity and Tritium

No radioactive isotopic monitoring is required for this recharge site.

Volatile Organic Compounds and Pesticides

BLM has no records of organic herbicides or pesticides application at the recharge site. For this reason, volatile or semi-volatile organic compounds, including pesticides, herbicide and poly chlorinated bi-phenyls will not be collected or analyzed until such time conditions change and evidence warrants an investigation.

Water Quality Monitoring Locations

Three locations will serve to monitor the recharge project: at the end of the canal system, where the water first enters the recharge area ("spill site") and existing groundwater wells. One well is within the recharge area, and the other approximately 4 miles down gradient. The figure in Appendix B displays the ground water monitoring locations.

Water Quality Monitoring Parameters and Frequency

The following table displays the sample parameters, frequency and locations.

Location	Frequency	Parameters
Ground Water	Monthly March- December	Total coliform, nitrate+nitrite, field parameters (water depth, conductivity, dissolved oxygen)
Surface Water	Frequency	Parameter
	Monthly March-December	E. coli, total phosphorus, flow

Reporting Schedule

Fremont-Madison and its partners in the project will draft an annual report and submit to the Department of Environmental Quality (Idaho Falls Regional Office), BLM (Idaho Falls District) and the Idaho Department of Water Resources (Eastern Regional Office).

Recharge Water Treatment

Water used for this project requires no pre-application treatment.

References

Idaho Department of Water Resources (December, 1999). Feasibility of large scale managed recharge of the eastern snake plain aquifer system.

Contor, A., Taylor, S., Quinn, G.W. (2009) Monitoring of Egin, Idaho recharge experiment fall 2008. Idaho Water Resources Research Institute and Idaho Department of Water Resources.

Idaho Department of Water Resources (February, 1975). St. Anthony Pilot recharge project.

Appendix A. Monitoring of Egin, Idaho Recharge Experiment, Fall 2008

(IWERRI Technical Completion Report 200901; June 2009)

Appendix B. Ground Water Well Location Map

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
RIGHT-OF-WAY GRANT

SERIAL NUMBER ID-36709

1. A right-of-way is hereby granted pursuant to Title V of the Federal Land Policy and Management Act of October 21, 1976 (90 Stat. 2776; 43 U.S.C. 1761).

2. Nature of Interest:

a. By this instrument, the holder:

EGIN BENCH CANALS, INC.
PO BOX 15
ST. ANTHONY, ID 83445

receives a right to operate, maintain, and terminate a recharge site on public lands described as follows:

B.M., IDAHO

Fremont County

T. 7 N., R. 38 E.,

Section 12: S $\frac{1}{2}$ NE $\frac{1}{4}$ and N $\frac{1}{2}$ SE $\frac{1}{4}$,

T. 7 N., R. 39 E.,

Section 7: lots 2 and 3, N $\frac{1}{2}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$, SW $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$, S $\frac{1}{2}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$,
S $\frac{1}{2}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$, N $\frac{1}{2}$ SW $\frac{1}{4}$ NE $\frac{1}{4}$, N $\frac{1}{2}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$,
SW $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$

Within the recharge project area the holder is allowed to a berm along the western boundary of the area in W $\frac{1}{2}$ E $\frac{1}{2}$ of section 12, T. 7 N., R. 38 E. The dimension of the berm would be up to 300 feet in length, 10 feet and 4 feet high.

The holder is allowed to construct and maintain 4 sandpoint wells and 1 drilled monitoring well with the recharge area. One drilled monitoring well is authorized outside of the recharge area as shown on the attached Exhibit A encumbering 0.23 acres, more or less.

b. The right-of-way granted herein contains a project area of approximately 253.25 acres, more or less and an area for the drilled monitoring well of 0.23 acres, more or less, outside of the project area.

- c. This instrument shall terminate on December 31, 2042, unless, prior thereto, it is relinquished, abandoned, terminated, or modified pursuant to the terms and conditions of this instrument or of any applicable Federal law or regulation.
- d. Notwithstanding the expiration of this instrument or any renewal thereof, early relinquishment, abandonment, or termination, the provisions of this instrument, to the extent applicable, shall continue in effect and shall be binding on the holder, its successors, or assigns, until they have fully satisfied the obligations and/or liabilities accruing herein before or on account of the expiration, or prior termination, of the grant.

3. Rental: EXEMPT

For and in consideration of the rights granted, the holder agrees to pay the Bureau of Land Management fair market value rental as determined by the authorized officer unless specifically exempted from such payment by regulation. Provided, however, that the rental may be adjusted by the authorized officer, whenever necessary, to reflect changes in the fair market rental value as determined by the application of sound business management principles, and so far as practicable and feasible, in accordance with comparable commercial practices.

4. Terms and Conditions:

- a. This grant or permit is issued subject to the holder's compliance with all applicable regulations contained in Title 43 Code of Federal Regulations part 2800.
- b. Upon grant termination by the authorized officer, all improvements (if applicable) shall be removed from the public lands within 90 days, or otherwise disposed of as directed by the authorized officer.
- c. Failure of the holder to comply with applicable law or any provision of this right-of-way grant or permit shall constitute grounds for suspension or termination thereof.
- d. The holder shall perform all operations in a good and workmanlike manner so as to ensure protection of the environment and the health and safety of the public.
- e. In negotiation with Idaho DEQ, if water quality standards are being threatened or exceeded, the Holder may have to cease or modify operations of the recharge project.

- f. The Holder shall comply with all associated water rights as determined and regulated by Idaho Department of Water Resources.**
- g. The Holder must ensure that the management of the recharge site is in compliance with the Ground Water Quality Protection Act (Idaho Code section 39-120 (1) and the Ground Water Quality Plan (Idaho Code sections 39-122 through 124 (1989)).**
- h. The Holder must ensure that the water quality of recharge waters does not cause the local ground water to exceed ground water standards found in the Ground Water Quality Protection Act.**
- i. The Holder must ensure that all water quality monitoring is in compliance with the Guidance for Developing a Ground Water Quality Monitoring Program for Managed Recharge Projects by Land Application (DEQ, 2006 (revised 8/1/2006)).**
- j. The Holder shall submit to BLM an annual report that summarizes each year's recharge activities, including records of all water diverted, by date and flow rate, all water quality data from sampled surface water as well as ground water, and an estimated total diverted volume for the year in acre-feet. Any incidences of recharge shut-downs and their causes should be described in the annual report as well.**
- k. The Holder must submit a Contingency Plan that attempts to protect ground water from hazardous materials or substances from entering the aquifer.**
- l. The Holder shall conduct all activities associated with the construction, operation, and termination of the right-of-way within the authorized limits of the right-of-way.**
- m. The Holder shall monitor and if necessary erect a berm within the project area to protect and prevent water from entering the Sands WSA.**
- n. No construction or routine maintenance activities shall be performed during periods when the soil is too wet to adequately support construction equipment. If such equipment creates ruts in excess of 4 inches deep, the soil shall be deemed too wet to adequately support construction equipment.**
- o. All construction and vehicular traffic shall be confined to the right-of-way or designated access routes, roads, or trails unless otherwise authorized in writing by the authorized officer.**
- p. The Holder shall remove only the minimum amount of vegetation necessary**

for the construction and maintenance of the berm, sandpoint wells, and monitoring wells. Topsoil shall be conserved during excavation and reused as cover on disturbed areas to facilitate regrowth of vegetation.

- q. During surface disturbing construction and maintenance activities, the Holder shall ensure that all construction equipment and vehicles are cleaned of all vegetation (stems, leaves, seeds, and all other vegetative parts) prior to entering public lands in order to minimize the transport and spread of noxious weeds.
- r. The Holder shall be responsible for weed control on disturbed areas within the limits of the right-of-way. The holder is responsible for consultation with the authorized officer and/or local authorities for acceptable weed control methods (within limits imposed in the grant stipulations).
- s. The Holder shall seed all disturbed areas, using an agreed upon method suitable for the location. Seeding shall be repeated if a satisfactory stand is not obtained as determined by the authorizing officer.
- t. The Holder of right-of-way No. ID-36709 agrees to indemnify the United States against any liability arising from the release of any hazardous substance or hazardous waste (as these terms are defined in the Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U.S.C. 9601, et seq. or the Resource Conservation and Recovery Act of 1976, 42 U.S.C. 6901 et seq.) on the right-of-way (unless the release or threatened release is wholly unrelated to the right-of-way holder's activity on the right-of-way.) This agreement applies without regard to whether a release is caused by the holder, its agent, or unrelated third parties.
- u. There is reserved to the Authorized Officer, the right to grant additional rights-of-way or permits for compatible use on, over, under, or adjacent to the land involved in this grant.
- v. Any cultural and/or paleontological resource (historic or prehistoric site or object) discovered by the holder, or any person working on his behalf, on public or Federal land shall be immediately reported to the authorized officer. Holder shall suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the authorized officer. An evaluation of the discovery will be made by the authorized officer to determine appropriate actions to prevent the loss of significant cultural or scientific values. The holder will be responsible for the cost of evaluation and any decision as to proper mitigation measures will be made by the authorized officer after consulting with the holder.

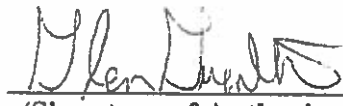
- w. Pursuant to 43 CFR 10.4(g), the holder of this authorization must immediately notify the authorized officer by telephone, with written confirmation, upon the discovery of human remains, funerary items, sacred objects, or objects of cultural patrimony. Further, pursuant to 43 CFR 10.4(c) and (d), the holder must stop activities in the vicinity of the discovery and protect it for 30 days or until notified to proceed by the authorized officer.
- x. Ninety (90) days prior to termination of the right-of-way, the holder shall contact the authorized officer to arrange a joint inspection of the right-of-way. This inspection will be held to agree to an acceptable termination (and rehabilitation) plan. This plan shall include, but is not limited to, removal of facilities, drainage structures, or surface material, recontouring, topsoiling, or seeding. The authorized officer must approve the plan in writing prior to the holder's commencement of any termination activities.

IN WITNESS WHEREOF, The undersigned agrees to the terms and conditions of this right-of-way grant or permit.

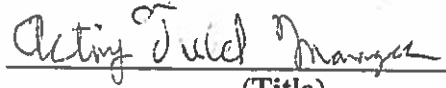
EGIN BENCH CANALS, INC

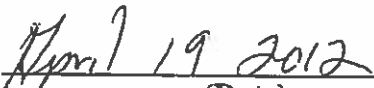
BUREAU OF LAND MANAGEMENT

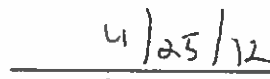

(Signature of Holder)


(Signature of Authorized Officer)


(Title)

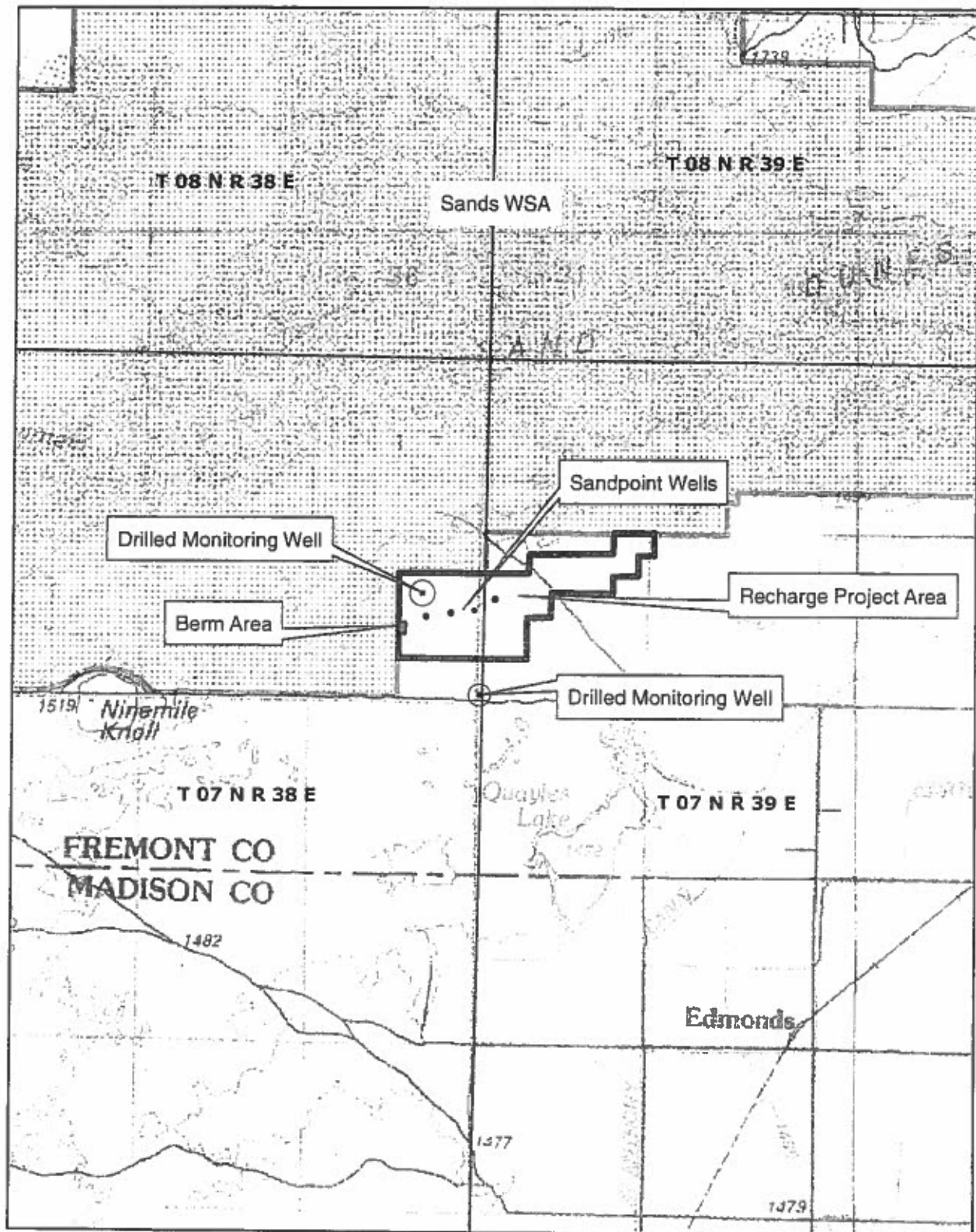

(Title)


(Date)


(Effective Date of Grant)

ID 36709
EGIN BENCH CANALS INC
RECHARGE ROW

HIBIT A
T. 7 N., R. 38 E., Section 12
T. 7 N., R. 39 E., Section 7
April 5, 2012



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Miles



No warranty is made by the Bureau
of Land Management for use of the
data for purposes not intended by BLM.

DRAFT



Monitoring of Egin, Idaho Recharge Experiment, Fall 2008

Bryce A. Contor
Stacey L. Taylor
Idaho Water Resources Research Institute

G.W. (Bill) Quinn
Idaho Department of Water Resources

June 2009

IWRRI Technical Completion Report 200901



Monitoring of Egin, Idaho Recharge Experiment, Fall 2008

INTRODUCTION

The Egin Lakes are ponds located near a Bureau of Land Management recreational site at the end of the Recharge Canal in southwestern Fremont County, approximately 11 miles west of the town of St. Anthony. A canal extends west of Egin Lakes approximately two more miles to a series of ephemeral ponds referred to in this report as the "West Recharge Area." Tibbitts Lake is located approximately one mile south of the West Recharge Area. Davis Lake is east of Egin Lakes near the confluence of the Last Chance Canal and the Recharge Canal. The subject area for the 2008 Recharge Experiment and the associated Monitoring Project includes all these locations, and in this report the collective area will be referred to as the "Egin Lakes area." Figure 1 indicates the location of the study area.

The study area has historically been considered a potential groundwater recharge site. Previous investigations, including a pilot recharge project, concluded that more detailed investigations needed to be conducted to determine recharge feasibility and benefit to the Eastern Snake Plain Aquifer (ESPA).

Previous Recharge Studies

A recharge project in this area was first proposed by the U. S. Bureau of Reclamation in 1962 (White, 1962; Mundorff, 1962). The St. Anthony Pilot Recharge Project was initiated by the Idaho Water Resource Board (IWRB) in late 1970 in response to public interest concerning utilization and storage of excess spring runoff in the Snake River Basin. A 1975 report (Anderson) concluded that recharge was feasible at an average infiltration rate of approximately 0.5 acre-foot per acre per day (0.5 ft/day). The report also recommended increased monitoring and extending the duration of testing. Because of the unavailability of sophisticated computer modeling capabilities at the time, questions regarding the effects that Egin Lakes area recharge has upon the Mud Lake area (approximately 25 miles west of Egin Lakes) as well as the overall Eastern Snake Plain Aquifer were not addressed.



Figure 1. – Location of Egin Lakes Study Area

Fall 2008 Recharge Experiment

Between October and December 2008 Fremont-Madison Irrigation District (FMID) diverted storage water from the Henry's Fork of the Snake River through the St. Anthony, Last Chance and Recharge Canals to the Egin Lakes for a late-season recharge project. In this pilot project, approximately 4,860 acre-feet were recharged at Egin Lakes, the West Recharge Area, Tibbitts Lake, and the canals solely devoted to the recharge experiment. During the period of the experiment, additional water entered the aquifer in association with canal leakage from diversions for stockwater rights via the St. Anthony and Last Chance Canals. The IWRB provided funding to compensate FMID for the cost of the storage water and related maintenance and operation costs of the project. In February 2009, a memorandum of understanding was signed between the Idaho Department of Water Resources (IDWR) and the Eastern Idaho Water Rights Coalition (EIWRC) to provide funding for the University of Idaho, acting through the Idaho Water Resources Research Institute (IWRRI) to provide technical assistance for conducting and evaluating recharge monitoring through spring 2009. It is likely this monitoring will continue either through a renewed agreement with IWRRI or involvement of IDWR personnel.

Continued Recharge Activity

The Egin Lakes area was included in the IWRB's Early Season Recharge Program in 2009. Through the end of May 2009, nearly 17,000 acre-feet were recharged via the Egin Lakes area and supply canals. On-going monitoring and analysis will provide further details on the extent of ESPA and Snake River benefits.

GOALS OF MONITORING PROJECT

An important component of managing aquifer recharge is to quantify the timing and location of benefits that accrue to springs and surface water reaches, as a result of recharge activities. The monitoring project described in this report was performed in conjunction with the 2008 recharge experiment described above. The purpose of the monitoring project was to assess the potential for monitoring activities to quantify the benefits of aquifer recharge, independent of aquifer modeling.

A regional aquifer model (ESPAM1.1) has been constructed for the Eastern Snake Plain Aquifer, designed specifically to address the impacts of activities such as pumping or recharge on springs and reaches of the Snake River. The Egin recharge area is included within the aquifer model, and may be used to estimate the timing and location of benefits that recharge generates.

Because ESPAM 1.1 is a regional model, stakeholders sometimes express concerns about the ability of the model to correctly apportion the benefits of recharge to springs and Snake River reaches. An alternate way of phrasing the goal of this monitoring project is: "Can monitoring independently evaluate the appropriateness of the aquifer model's apportioning of recharge benefits, in time and space?" Three specific questions are:

1. Does recharge generate more benefit to the Henrys Fork than indicated by ESPAM1.1?
2. Does recharge generate more benefit to the regional system (and therefore to distant springs and river reaches) than indicated by ESPAM1.1?
3. Does ESPAM1.1 accurately represent the timing of the arrival of benefits to various springs and river reaches?

An important topic that can be addressed neither by the aquifer model alone nor by monitoring is: "Recharge that increases reach gains to the Henrys Fork positively affects downstream diversions and storage. This may facilitate additional recharge in other locations and reduce supplemental groundwater pumping. What are the benefits to river, spring and aquifer users from these secondary impacts?" Additional information on this important question is available on the following Websites:

1. http://www.idwr.idaho.gov/WaterInformation/projects/espam/meetings/2008/ESHMC/10-28&29-2008/D_Blew.PDF
2. http://www.idwr.idaho.gov/WaterInformation/projects/espam/meetings/2008/ESHMC/10-28&29-2008/CAMP_Environmental_Model_Summary-1.doc

DATA GATHERED AND SUMMARY RESULTS

Data gathered in the monitoring project include aquifer water levels, estimates of the timing and location of recharge (both experiment recharge and other recharge), a reconnaissance of seeps and springs on the face of the Egin Bench bluff, a literature search, and application of the Transfer Tool realization of the ESPAM1.1 aquifer model.

Photos of fieldwork are available at:¹

1. <http://picasaweb.google.com/bryce.contor/ShorelineMeasurementPointsForEginLakesRechargeProject?authkey=Gv1sRgCIH2zUUUpKmpaA#>
2. <http://picasaweb.google.com/bryce.contor/EginBench20081018?authkey=Gv1sRgCIDf6-Th6Y3r6AE#>

¹ Note that starting a slide show is the most convenient way to view photos, but clicking on individual photos allows viewing of comments posted at the bottom of the slides. Users may have to drag the slider bar on the right of the screen to see the comments. High-resolution copies may be downloaded by clicking "download" above the photo. Low-resolution copies may be obtained by right clicking on the photo itself and selecting "save picture as."

3. http://picasaweb.google.com/bryce.contor/EGIN_Spring_2009?authkey=Gv1sRgCN_A0pTVsrKtaA#.

A slideshow presented in 2008 may be viewed at:

<http://picasaweb.google.com/bryce.contor/SlidesFromMeeting17DecemberAtFMIDOffice?authkey=Gv1sRgCLLBoeawibHnsAE#>

Aquifer Water Levels

Impacts of recharge on aquifer water levels are best assessed when compared to aquifer conditions prior to the beginning of the recharge process. This background information allows for comparison of previous water level measurements to measurements acquired during the recharge process. Early in October 2008, the recharge experiment began and water was released from Egin Lakes to the West Recharge Area. However, prior background information had not been collected; as a result, data are limited. The following is a timeline of events that occurred during the 2008 recharge experiment in Egin:

- 30 October 2008: Water that was delivered by the canal out of the lower Egin Lake reached the largest pond at the West Recharge Area.
- 31 October 2008: The irrigation season ended and all canals were off except for the canals associated with the recharge experiment.
- 13 December 2008: The headgate at the Henrys Fork was closed allowing no additional water to enter recharge site or canals from the river.
- 16 December 2008: The canals continued to drain.
- 22 December 2008: Canals were found essentially empty.

Aquifer water levels were measured manually by hand using electric water level sounder devices or steel tape, whichever was most appropriate for a specific well. Aquifer water levels were collected at 13 different sites in the Egin vicinity starting in the middle of October 2008 as shown in Figure 2. Several of the sites included wells with multiple wells or piezometers with different completion depths. Water level measurements were collected weekly at most sites except for those that were inaccessible in the winter. Four IDWR LevelTROLL transducers and two IWRRI miniTROLL transducers were placed in the wells to monitor water level twice daily. Since water levels were recorded in these wells by transducers, they were only visited once a month.

Figure 3 is a hydrograph of the wells measured during the recharge experiment. The lines represent data collected from the transducers and the points represent data collected from manual hand measurements. Since monitoring was initiated as the recharge process was beginning, it is difficult to distinguish a change in water levels relative to the recharge experiment. One well in particular, 7N 39E 7BDA1, had an obvious increase in water level. This well will be discussed in more detail in a later section (DISCUSSION). Most of the wells in Figure 3 show a decrease in water level after the irrigation season ended and no more water was released to the recharge site.

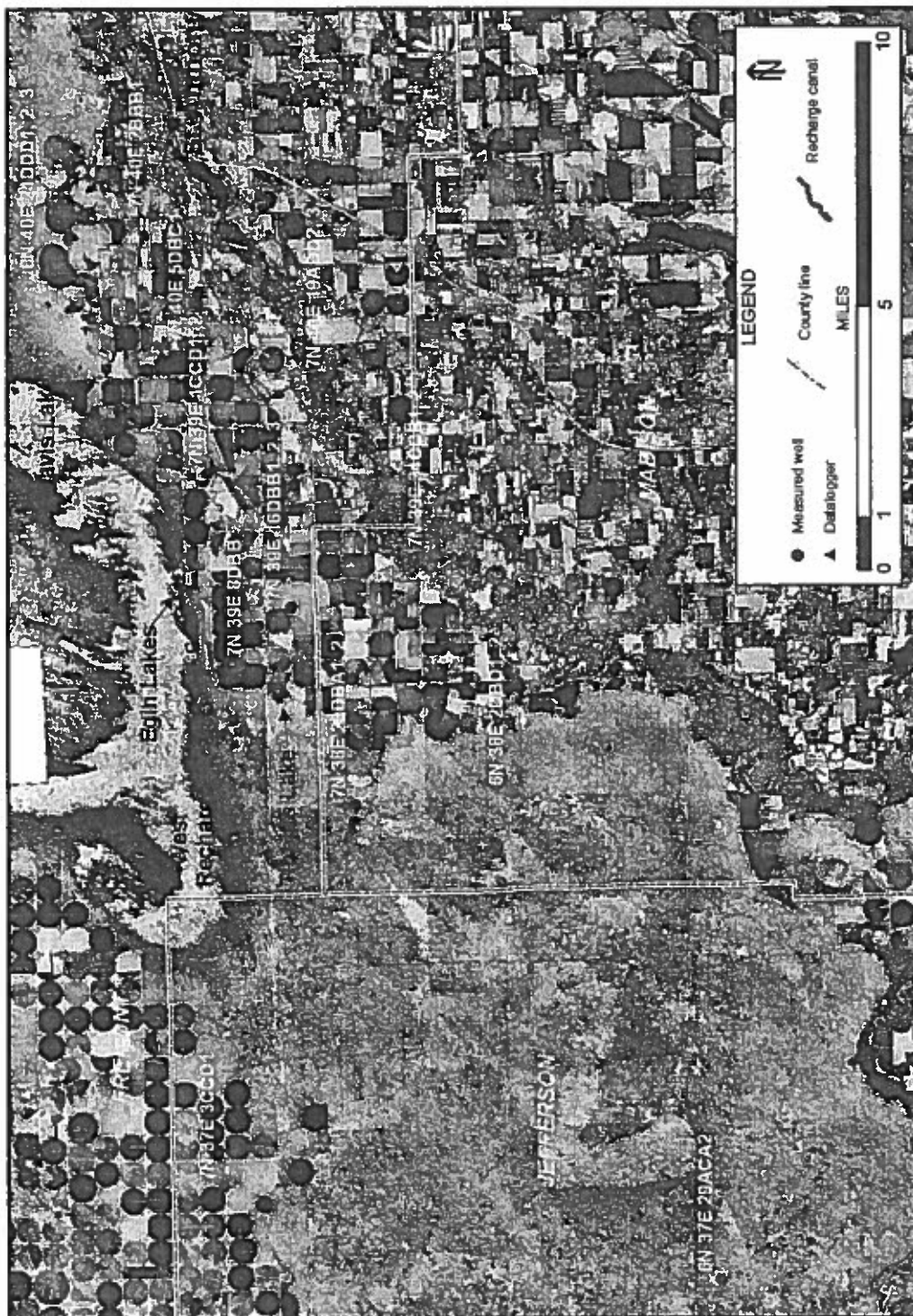


Figure 2. Aquifer sites monitored during the recharge experiment.

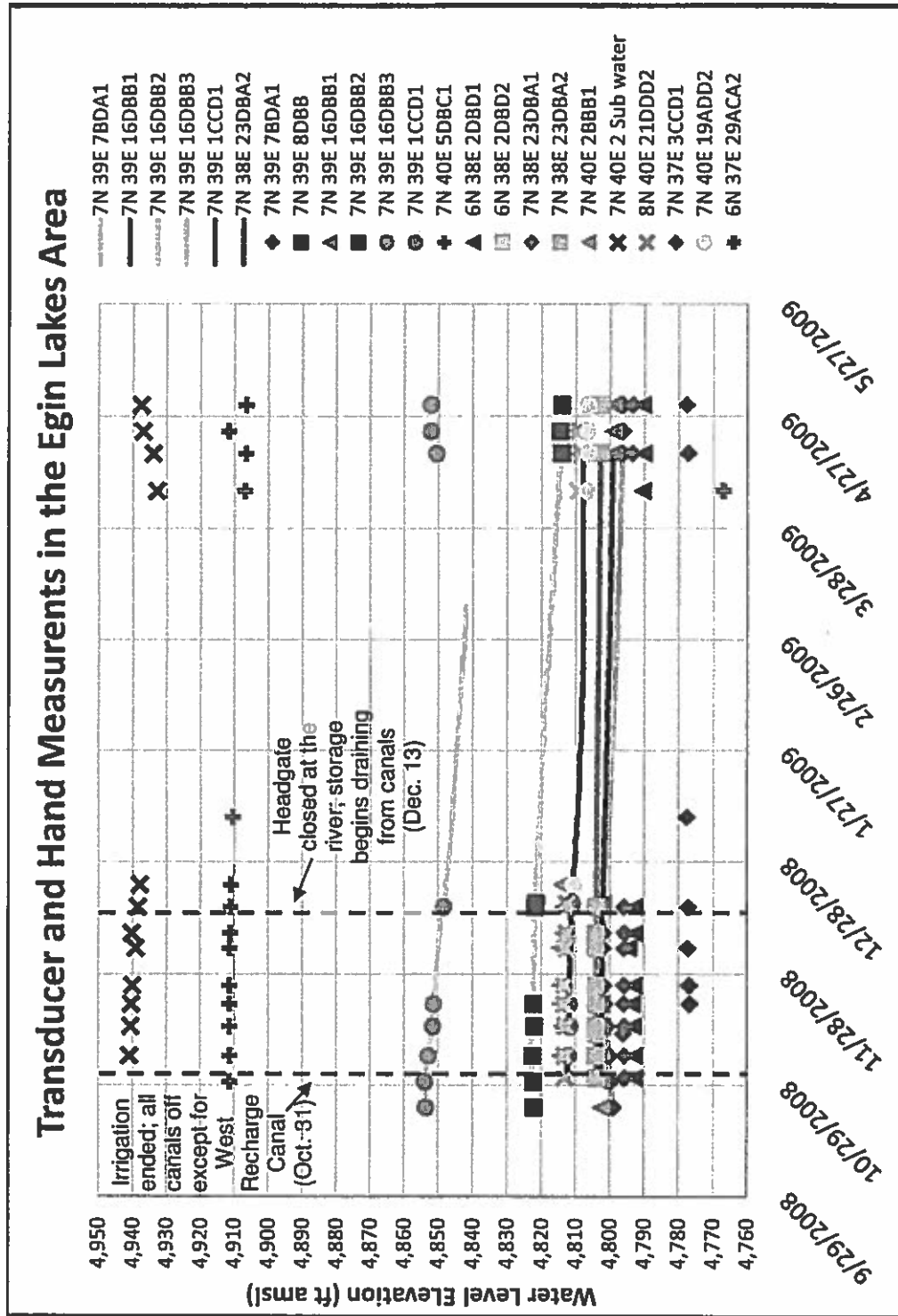


Figure 3. Hydrograph of all wells measured during the recharge experiment.

Perched Aquifer Systems

Several previous investigations indicate aquifer perching in the Egin area, in which there is an unsaturated zone below a saturated zone. Analysis of sites with multiple piezometers or wells may suggest otherwise; there are strong vertical gradients in the area, but none high enough to indicate actual perching. The following formula can be used to determine perching or non-perching aquifer systems:

$$\frac{(H_{\text{shallow}} - H_{\text{deep}})}{(C_{\text{top shallow}} - C_{\text{top deep}})}, \quad \begin{array}{l} > 1 \text{ indicates perched system} \\ < 1 \text{ indicates non-perched system} \\ \text{(i.e. fully saturated even if multiple} \\ \text{aquifer layers and strong gradients} \\ \text{exist)} \end{array}$$

where H_{shallow} is the measured aquifer head elevation in the shallow well of a group of wells/piezometers, H_{deep} is the measured aquifer head elevation in the deep well of a group of wells/piezometers, $C_{\text{top shallow}}$ is the elevation of the top of the completion zone or the open interval of a well in the shallow well, and $C_{\text{top deep}}$ is the top of the completion zone or open interval of a well in the deep well. When a value is greater than one, this indicates that the aquifer is perched and a value less than one indicates that there is a non-perched system (i.e. the saturation is continuous in depth zones between the well completion depths).

Several sites have multiple wells or piezometers completed at varying depths (see Figure 2). Table 1 displays a list of sites in which multiple completions are located. When calculating the value to estimate whether the aquifer system is

Table 1.
Aquifer Water Level Measurement Sites in the Egin Area with
Multiple Wells or Piezometers.

Well Location	Calculated Vertical Gradient (ft/ft)	Perched?	Not Perched?
7N 39E 16DBB1, 2, 3	0.17		X
7N 39E 34CCB1, 2	0.18		X
7N 40E 19ADD2, 3, 4	0.16		X
7N 38E 23DBA1, 2, 3	0.07		X
8N 40E 21DDD1, 2, 3 ²	0.0002		X
6N 38E 2DBD1, 2 ²	-0.01 ³		X

² These sites include multiple piezometers with different completion intervals.

³ Piezometers may be damaged since water levels were approximately the same during the 2008-2009 experiment despite different completion depths. Negative value indicates an upward gradient which is not expected for this location.

perched or not, data from several dates were compared in order to calculate an average. All six of the sites with multiple wells were not perched and it is assumed there is continuous saturation at these sites.

Timing, Amount and Location of Recharge

Measurement and calculation of recharge volumes for purposes of IWRB recharge accounting was performed by IDWR, Water District 01 and St. Anthony Canal personnel. This included adjustments for deliveries that are accounted as part of other water uses such as irrigation or stockwater diversions, although they physically resulted in aquifer recharge. This accounting is beyond the scope of the report.

For purposes of understanding and interpreting depth-to-water measurements and the reconnaissance of seepage, an attempt was made at a rough accounting of all aquifer recharge and discharge for the summer and fall of 2008. Table 2 lists recharge and discharge components considered, regardless of water-right accounting status. Figure 1 shows the spatial location of all components except neglected domestic and municipal pumping.

Table 2.
Approximate Aquifer Recharge and Discharge
in the Egin Bench, Idaho, Area, Summer and Fall 2008

Component	Rech/Disch	Estimation Method
Net impact, domestic GW uses	Discharge	Neglected
Net impact, municipal GW use	Discharge	Neglected
Net impact of GW irrigation (incl. mixed-source parcels)	Discharge	County-wide crop mix from National Ag Statistics (2006), ET from Agrimet, acreage from ESPAM1.1 data (2008). Assume irrigation supports full crop production.
St. Anthony, Last Chance and Recharge Canal seepage	Recharge	Based on IDWR and IWRRI flow measurements November 2008
Other canal seepage	Recharge	Extrapolated from per-mile seepage on St. Anthony Canal measured Nov. 2008

Component	Rech/Disch	Estimation Method
Net recharge from SW irrigation	Recharge	Crop mix from National Ag Statistics, ET from Agrimet (2008), acreage from ESPAM1.1 data, diversions and returns from ESPAM1.1 data (2006), canal seepage as above. Assume irrigation supports full crop production, calculate percolation as residual.
Seepage from Egin Lakes	Recharge	IWRRI & IDWR field measurements fall 2008
Seepage from Tibbitts Lake	Recharge	IWRRI field measurements fall 2008
Seepage, West Recharge Area	Recharge	IWRRI field measurements fall 2008

Approximate time series of recharge and discharge for various components are illustrated in Figures 4 through 6. Note the differences in scale of the vertical axes of the graphs. The average Tibbitts Lake seepage rate during the 2008 monitoring activity was approximately 0.6 feet/day.⁴ The Egin Lakes rate was about 0.2 ft/day and the West Recharge Area rate was approximately 1.1 feet/day. Davis Lake appears to have a bottom sealed with mud and algae, with very little seepage.

⁴ This is calculated at the IWRRI-observed rate of 10 cfs. Per Bob Davis of St. Anthony Canal Co., the lake's full recharge capacity is nearer 15 cfs, which would be a seepage rate of 0.9 ft/day.

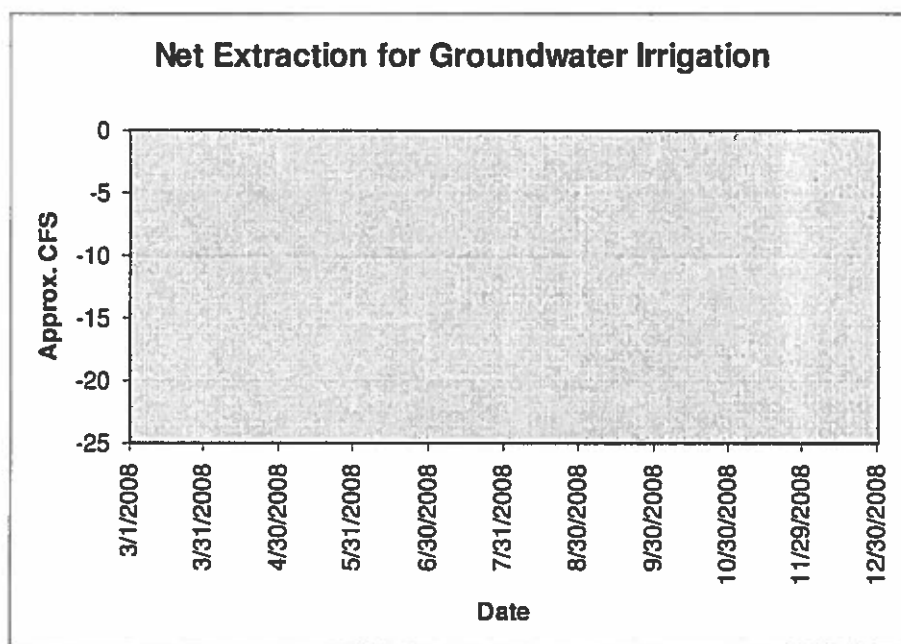


Figure 4. Approximate net extraction for groundwater irrigation in Egin Bench, including estimates of groundwater extraction for mixed-source lands.

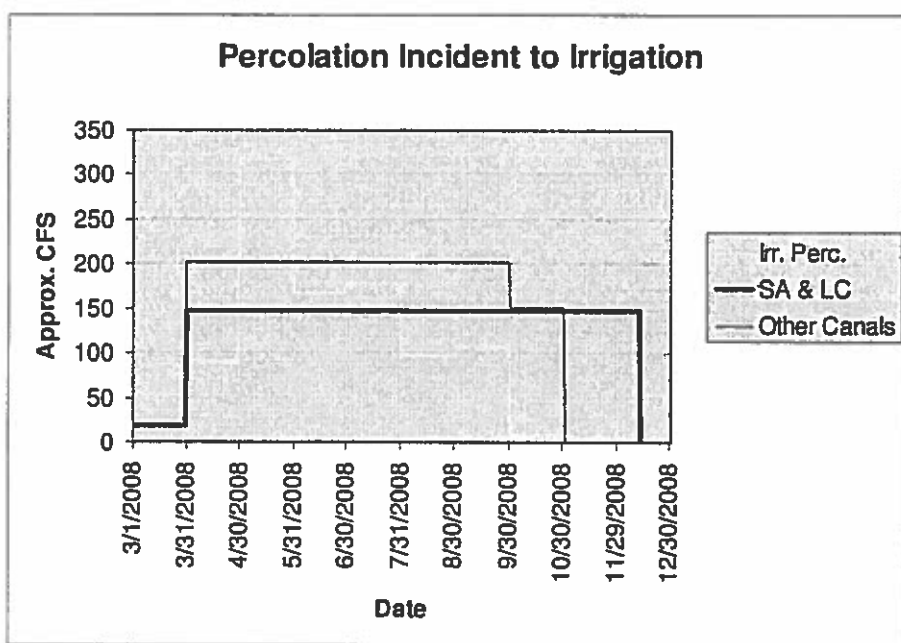


Figure 5. Approximate percolation incident to irrigation in the Egin Bench area, including effects of surface water delivered to mixed-source lands. "SA & LC" refers to the St. Anthony Canal and Last Chance Canal, including the part of the St. Anthony Canal known as the Recharge Canal.

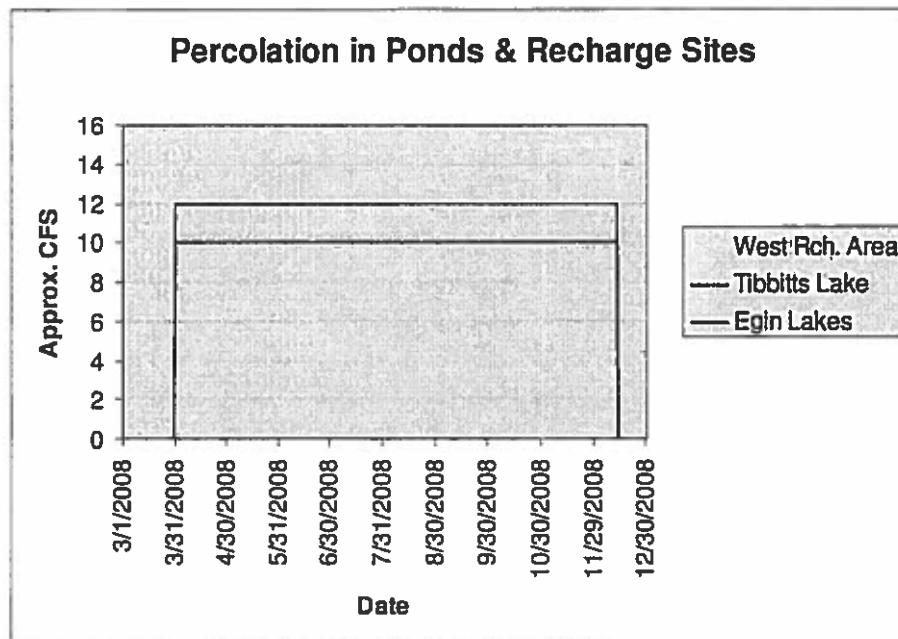


Figure 6. Approximate percolation in ponds and recharge sites, Egin Bench area.

Reconnaissance of Seeps and Springs

In order to improve assessment of migration of recharge and percolation to the Henrys Fork, a reconnaissance of seeps and springs was performed in the fall of 2008 and repeated in the spring of 2009. Photos may be viewed at the websites referenced above. Figure 7 is a map of the reconnaissance path. This is reconnaissance-level work, and more detailed study could refine the results and conclusions. Tentative findings are:

1. Seeps from the face of the Egin Bench are small in magnitude relative to total recharge.
 - a. The ditch at Waypoint 18 (see Figure 7) drains approximately 1.2 miles of bench face, with estimated flow 1.5 to 6 cfs. Extrapolating this to the 13-mile face of the bench suggests that surface-expressed seepage and springs sum to approximately 20 to 80 cfs.
 - b. At Waypoints 25 and 28 bridges cross large, unnamed side channels in the Henrys Fork bottoms. It appears that hyporheic flows (flows within the flood-plain gravels) or surface connections to the Henrys Fork dominate flow in these channels, overwhelming any seepage from the face of the bench. This is assumed based on observation of little change in flow from fall to spring, followed by a marked increase in flow over the course of just a few weeks as flow in the Henrys Fork increased in the spring of 2009. See Figure 8, 9 and 10. All photos are of the same location.

2. Seeps and springs respond to canal seepage and incidental recharge from irrigation. This is based on observation that ponds, wetlands and ditch discharges decreased significantly from fall to spring.
3. There is significant temporal dampening in response. Water was in the canals by the time of the first springtime observation on 4 April 2009, but had not appeared in seeps as of 12 May 2009.
4. Definitively quantifying seeps and springs from the face of Egin Bench would be technically challenging.
 - a. Trees and vegetation interfere with aerial photo interpretation.
 - b. Private land interferes with field inspection.
 - c. Slow flows and wide channels make quantification of flow difficult.
 - d. Presence of river gravels, side channels and oxbows make it difficult to separate seepage from hyporheic flows.
 - e. Mingling of surface returns with seepage flows may confound quantification of seepage flows.



Figure 7. Map of seepage reconnaissance with Global Positioning System (GPS) waypoint numbers, fall 2008.



Figure 8. Looking SW at Waypoint 28, 18 October 2008



Figure 9. Looking SW at Waypoint 28, 6 April 2009.



Figure 10. Looking SW at Waypoint 28, 25 April 2009.

Literature Search

Stearns, Bryan and Crandall (1939) report on the effect that irrigation of Egin Bench had upon the regional aquifer system, and the Mud Lake area in particular. Important points include:

1. Pre-irrigation aquifer water levels in Parker were more than 100 feet below land surface.
2. By the 1920s, water levels had risen to within a few feet to a few tens of feet of surface.
3. The post-irrigation water levels may be associated with a perched aquifer.
4. Shallow wells showed a typical surface-water-irrigation dominated hydrograph with highs in summer to fall and lows in springtime. Seasonal variations of two to 20 feet were shown in various wells. Note that this is consistent with present trends.
5. Water recharging in Egin Bench has three fates:
 - a. Seepage back to Henrys Fork
 - b. Seepage northwest to Mud Lake and tributaries
 - c. Seepage southwestward towards Roberts
6. Significant delay of impact to the Mud Lake area was reported: "Nearly 5 years was required for the water from the Egin Bench to have any visible effect on the Mud Lake Basin, and about 23 years more for it to produce the maximum effect."

7. Approximately half the recharge on the Egin Bench goes "into ground storage beyond the borders" of the bench. We interpret this to be the investigators' indication of the fraction of recharge that reaches the regional system rather than the local aquifer or the Henrys Fork.

The White (1962) and Mundorff (circa 1962) reports detail an extensive investigation in the 1950s and 1960s that included construction of dedicated monitoring wells, engineering studies of recharge sites, and recharge experiments at various locations. They include cost-benefit studies and find that recharge has positive net effects on irrigation, flood-control and power-generation. Projected lost hydropower revenues during times of recharge (typically high-flow periods when hydropower production is capacity limited) are more than offset by projected increased revenues during low-flow periods when recharge sustains base flow and capacity exists to utilize any additional flow.

Highlights from the White (1962) and Mundorff (circa 1962) investigations with relevance to the 2008 Egin recharge experiment include:

1. Relative to other locations in the Eastern Snake River Plain, recharge in the northeast (i.e. near St. Anthony) offers the potential of "greatest benefit to present and future water use."
2. Seepage rates from experiments in the Egin Lakes area were in the range of 0.3 to 0.5 feet/day.
3. About 35% of St. Anthony-area recharge would return to the Snake River above Milner and the balance would return to springs and river reaches between Milner and Bliss.
4. The water-supply benefits of recharge flow in all hydraulically-connected direction and not just down-gradient.
5. The reports include test data that possibly could be re-analyzed to obtain localized estimates of aquifer properties.
6. Though recharge will provide significant benefits, it cannot be the sole solution: "Groundwater withdrawals undoubtedly will continue to increase and the water table will continue to decline. Artificial recharge will not reverse that trend, not enough water is available for that.... [However] there is no question but that large quantities of water can be successfully added to the groundwater supply."

As discussed in the introduction, Anderson (1975) reported on a pilot recharge project that occurred at the same location as the 2008 recharge experiment. Relevant findings include:

1. With construction of dikes, the West Recharge Area could be enlarged to a ponded area of 320 acres, with capacity of 1,640 acre feet.
2. Observed seepage rates were in the range of 0.5 ft/day.
3. The recharge had "no measurable effect on the regional groundwater table beyond the mounding effect directly below the recharge pond." This was attributed to the small magnitude of the recharge experiment relative to other stresses on the system.

4. Computer modeling "may represent a better tool to determine the effects of a long term, large scale recharge project" than a physical pilot experiment. "In order to determine the impacts from the project [using physical measurements] a highly sophisticated monitoring network would have to be established."

Wytzes.(1980) developed a numerical groundwater model that included the Egin Bench area. Key results include:

1. A local perched aquifer exists in the Egin Bench area. The Henrys Fork is hydraulically connected to the perched aquifer, rather than to the underlying regional system.
2. The Egin Bench perched aquifer has little communication with groundwater southeast of the Henrys Fork.
3. A large amount of water percolates downward from the Egin Bench aquifer to the regional aquifer.
4. The Henrys Fork from St. Anthony to Rexburg is at times a net gaining reach and at times a net losing reach. Wytzes estimated 12-month gains of 91,600 acre feet and losses of 8,000 acre feet. This is an annual average gain of 115 cfs, which Wytzes compared to 1938 estimates of 400 cfs. The difference was attributed to drought and reduced water supplies.
5. Groundwater impact on the Henrys Fork varied from 6,460 acre feet gain the last two weeks of August 1977 (217 cfs) to 2,260 acre feet loss the last two weeks of April 1978 (-81 cfs).

The 1987 report on sprinkler conversion on the Egin Bench (V.G. King) analyzes the expected impacts to local irrigation, flows in the Henrys Fork, and water supply at Mud Lake from conversion. Elements important for the current recharge experiment include:

1. King's conceptual model is that there is a local perched aquifer system maintained by lower-permeability basalt underlying sand.
2. As of 1987, "Over 80 percent of the water diverted infiltrates into the soil and 60 percent of that diverted enters the regional aquifer."
3. There is no explicit discussion of contributions to the Henrys Fork, and especially no indication whether some of the contributions to the regional aquifer may contribute to Henrys Fork gains.
4. Measured infiltration rates at seven sites range from 0.5 to 2.7 ft/day.
5. Effects upon water supply in Mud Lake and flows in the Henrys Fork are addressed qualitatively, but not quantified.
6. About 371 acres of additional infiltration would be needed to offset the reduced infiltration from the "Condition III" scenario, which was defined as follows: "All the area converts to sprinklers, winter diversions are discontinued and spring diversions are delayed two weeks (to the middle of April)." Note that this scenario closely parallels what has actually occurred.

Hortness and Vidmar (2003) estimated reach gains in the Henrys Fork using mass-balance calculations based on measured flows in the river, measured outflows and measured inflows. Work was conducted in the fall of 2001, and spring, summer and fall of 2002. Relevant findings for the recharge experiment are:

1. Any "extensive trend analysis with respect to time would likely require additional data."
2. The Henrys Fork between St. Anthony and Rexburg includes alternating gaining and losing reaches. Overall gain and loss patterns vary seasonally, as shown in Table 3.

Table 3.

Henrys Fork Gains and Losses between St. Anthony and Rexburg, Idaho Power and USGS Seepage Study 2001-2002

(Positive numbers indicated river gains from the aquifer; negative numbers indicate river losses to the aquifer.)

Reach	Fall 2001 (cfs, 29-31 October)	Spring 2002 (cfs, 8-9 April)	Summer 2002 (cfs, 22-23 July)	Fall 2002 (cfs, 4-5 November)
St. Anthony - Near Parker	-42	112	95	-44
Near Parker - Near Hibbard	-93	-156	-196	-60
Near Hibbard - Near Rexburg	55	93	200	-18
Total St. Anthony - Rexburg	-80	49	99	-122

3. Between St. Anthony and Rexburg, no major inflows were noted on the northwest (Egin Bench) side of the Henrys Fork, except for an end-of-canal spill between Waypoint 35 and Waypoint 36 on Figure 1.⁵

The ESPAM1.1 final report (Cosgrove and others, 2006) describes the most recent numerical computer model of the aquifer. Its representation of the Egin Bench area includes the following:

1. The aquifer is represented as a single-layer system with time-constant transmissivity. Aquifer properties (transmissivity and storage coefficient) are smoothly interpolated between pilot points. Relative to the Egin Bench, pilot points are widely spaced. The effect is that locally, the aquifer is represented as a uniform porous medium.

⁵ Gains calculations are adjusted for this inflow, which ranged from zero to 49 cfs on the measurement dates. Repeated measurements in the fall of 2008 and spring of 2009 range from five to 60 cfs.

2. The Henrys Fork is modeled as hydraulically connected with the aquifer whenever aquifer water levels are higher than the elevation of the representation of the bottom of riverbed sediments.
3. The model was calibrated to match aquifer water level observations and observed reach gains. Reach gains were calculated based on measured flows in river reaches, measured or estimated tributary inflows, measured diversions, and estimated irrigation return flows. Confidence is high for all values except estimated irrigation return flows.
4. Figure 11 shows filtered (temporally smoothed) measured and modeled river gains. Figure 12 shows monthly modeled and measured gains.

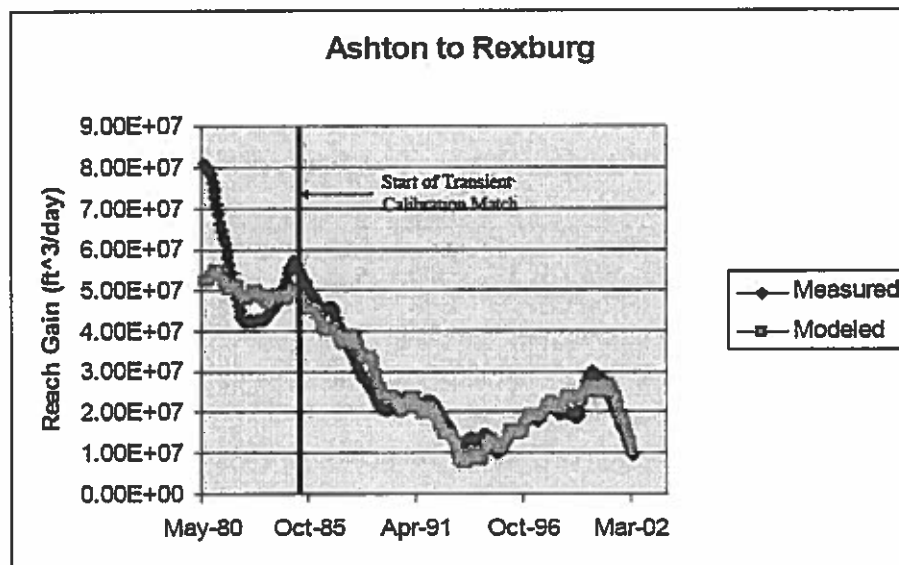


Figure 11. Smoothed reach gains from ESPAM1.1 model calibration. This is Figure 66 from Cosgrove et al. (2006). For scale comparison, $6.00\text{E}+07 \text{ ft}^3/\text{day}$ is equivalent to 694 cfs.

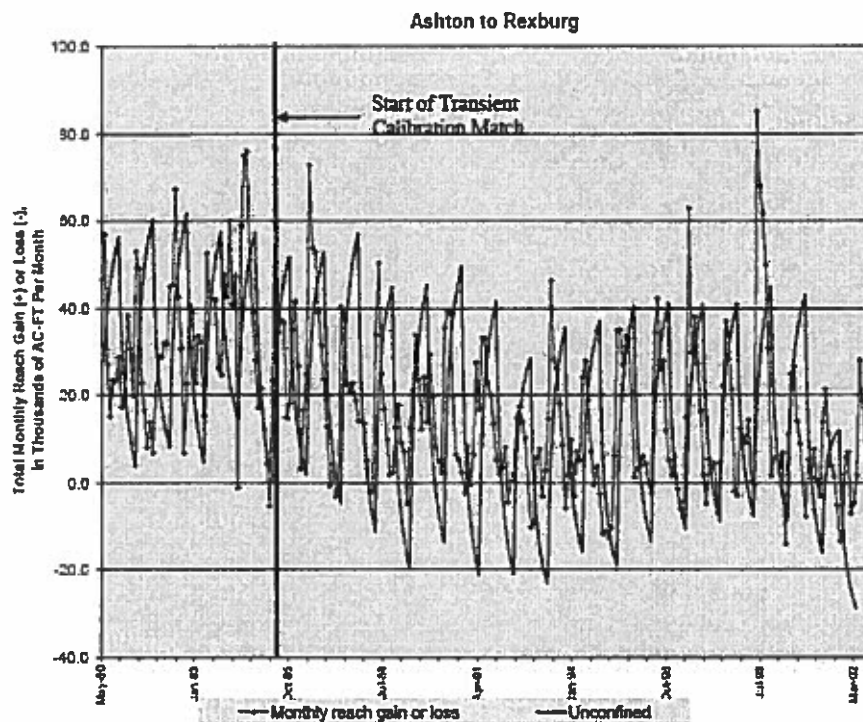


Figure 12. Monthly reach gains from ESPAM1.1 calibration. "Monthly Reach Gain or Loss" is measured, "Unconfined" is modeled. This is Figure 71 in Cosgrove and others (2006). A value of "40.0" on the vertical scale represents 40,000 acre feet/month, equivalent to 663 cfs.

Transfer Tool Analysis

One of the realizations of ESPAM1.1 is a water-rights transfer tool, which allows users to quickly obtain model results for a hypothetical recharge or discharge event applied at a single model cell. The tool and documentation may be downloaded at <http://www.if.uidaho.edu/%7EJohnson/ifiwri/projects.html>. Figure 13 illustrates the model's final allocation of benefits to spring and river reaches, using the tool with recharge applied at the West Recharge Area for a single four-month period. Figure 14 shows the model's representation of timing of benefits to the Henrys Fork.

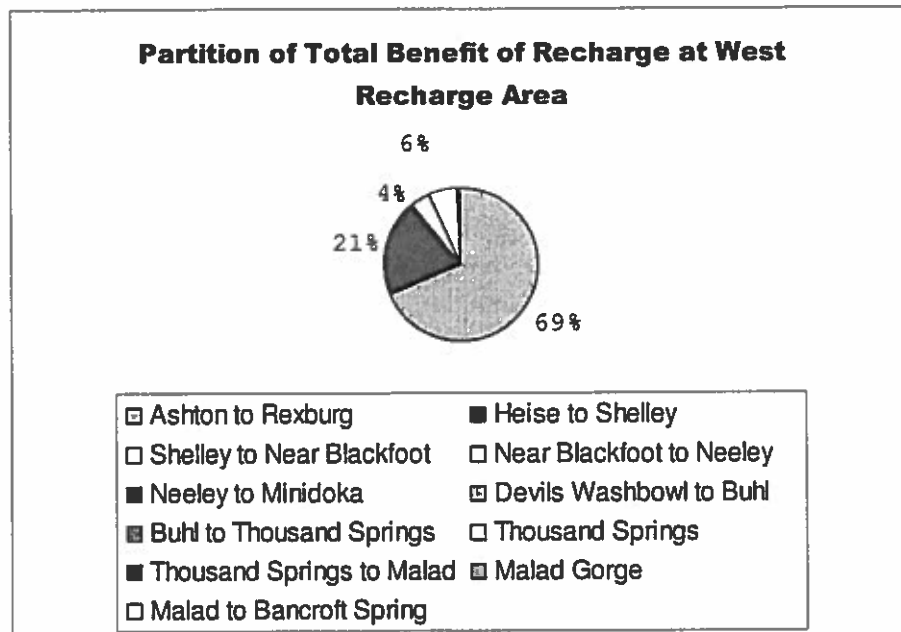


Figure 13. ESPAM1.1 spatial distribution of recharge applied at the West Recharge Area.

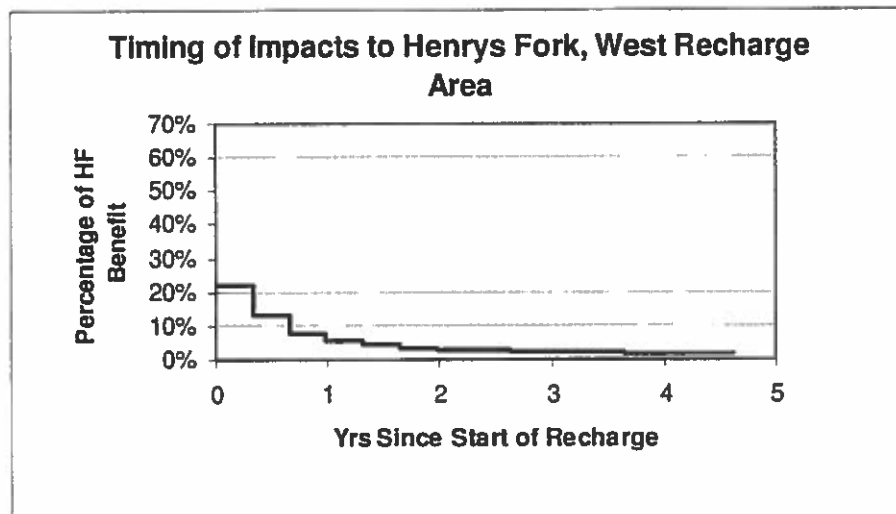


Figure 14. ESPAM1.1 Indication of timing of impacts to the Henrys Fork, from recharge applied at the West Recharge Area.

The model indicates over 30% of recharge that occurs at the West Recharge Area will benefit reaches beyond the Henrys Fork reach, as illustrated in Figure 13. Even benefits to the nearby Henrys Fork are significantly delayed in the model; over 75% of the benefit to that reach is represented in trimesters beyond the one in which recharge occurred, as shown in Figure 14.

DISCUSSION

Apportioning of Benefits of Recharge, Independent of Aquifer Modeling

While it is difficult to allocate the recharge benefit independently of aquifer modeling, response in the regional aquifer system can be qualitatively shown.

Observed water-level responses. The greatest water level change was found in two wells close to the ponds in the West Recharge Area. Figure 15 shows the location of these two wells relative to the ponds. Figure 16 shows the response in well 7N 39E 7BDA1 as recorded by a transducer. The blue points are data recorded by the transducer while the red points are data collected manually during the course of the experiment. This well is located approximately 100 feet from the ponds and is completed at 340 ft. On 30 October 2008, water had reached the ponds at the West Recharge Area and on 31 October 2008, irrigation season had ended and water was continually delivered to the West Recharge Area by the recharge canal. Figure 16 shows the water level in the well increasing from approximately 4799 ft up to about 4802 ft. On 13 December 2008, no more additional water from the Henrys Fork was delivered to the canal system and water levels in well 7N 39E 7BDA1 began to decline.

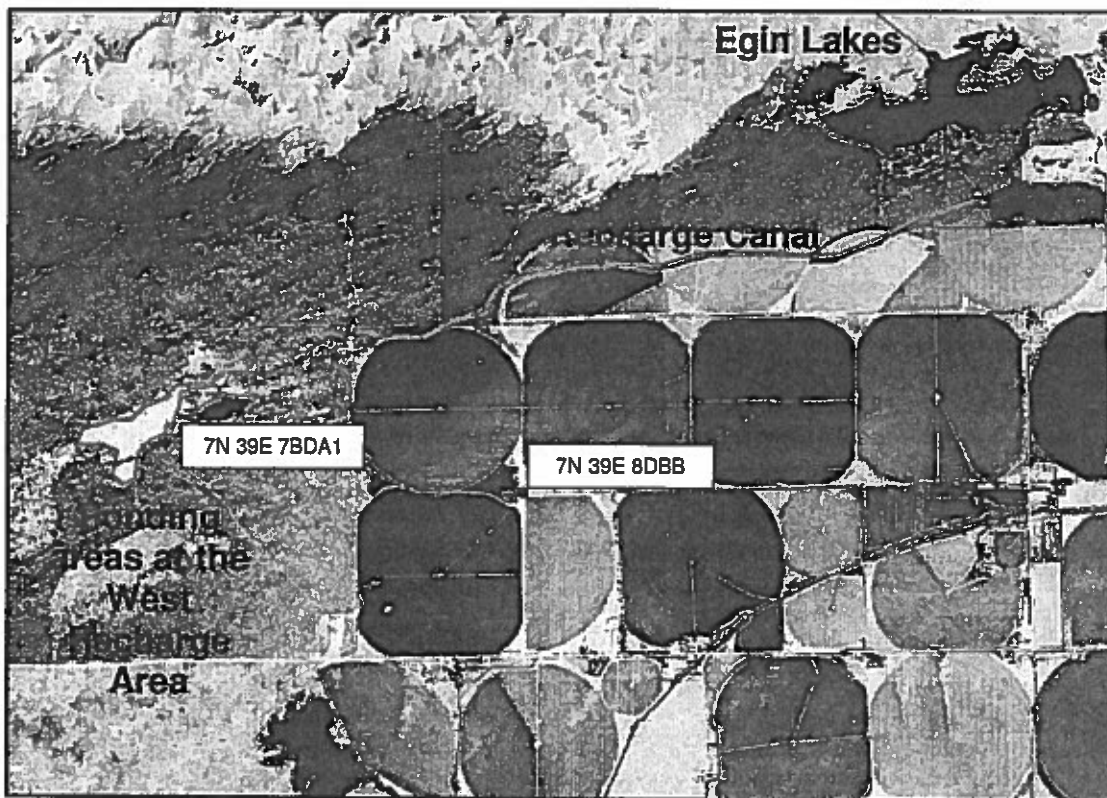


Figure 15. Wells closest to the West Recharge Area.

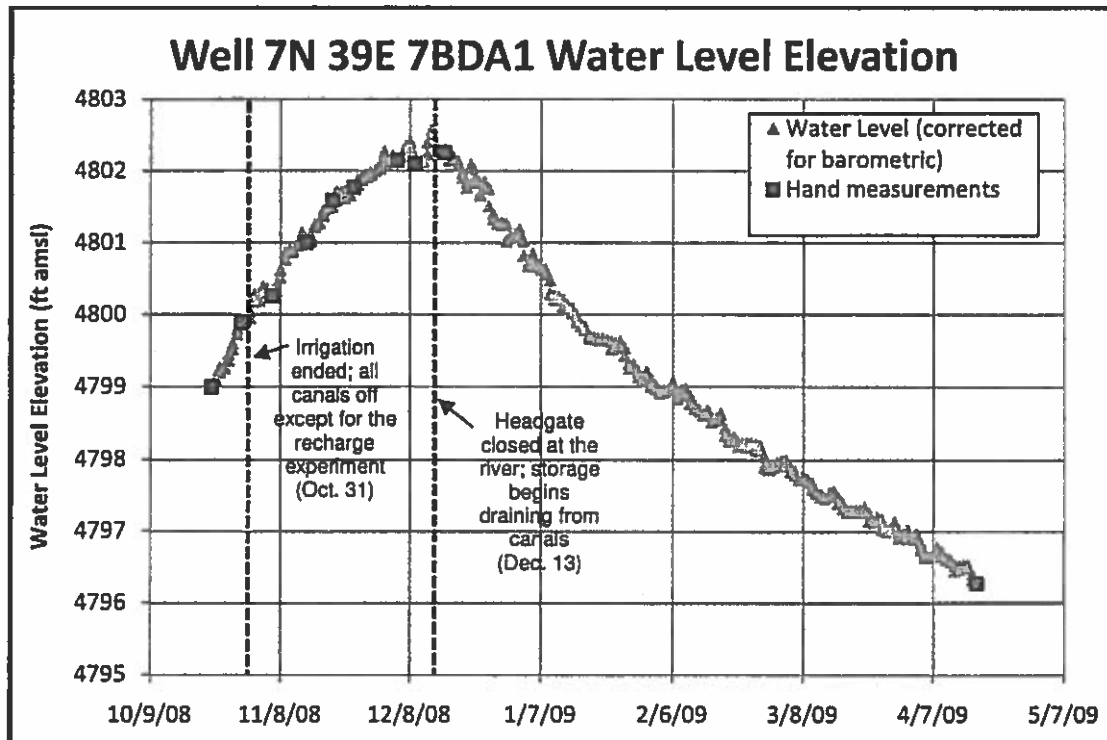


Figure 16. Aquifer water levels recorded by transducer in well 7N 39E 7BDA1.

The shape of the hydrograph in Figure 16 shows a classic response and recovery pattern. While the rising limb might be consistent with either a recharge response or a response to cessation of groundwater pumping, the falling limb is too early to be associated with resumption of pumping for irrigation. This well (7N 39E 7BDA1) is completed in the deep aquifer system (340 ft). Another well (7N 39E 7BDA2) located approximately 20 ft from 7N 39E 7BDA1 was characteristically dry throughout the recharge experiment. This well is 55 ft deep. Not enough recharge accumulated in the shallow system (if such a system exists) to reach the 55-foot level. However, enough recharge appeared to reach the deeper part of the system to noticeably raise the potentiometric surface.

Manual water level measurements were collected in a private irrigation well (7N 39E 8DBB) southeast of the ponds in the West Recharge Area. These measurements are shown in Figure 17. When water began entering the canal to the West Recharge Area, a rise in water level occurred. This well water level began dropping after 22 December 2008.

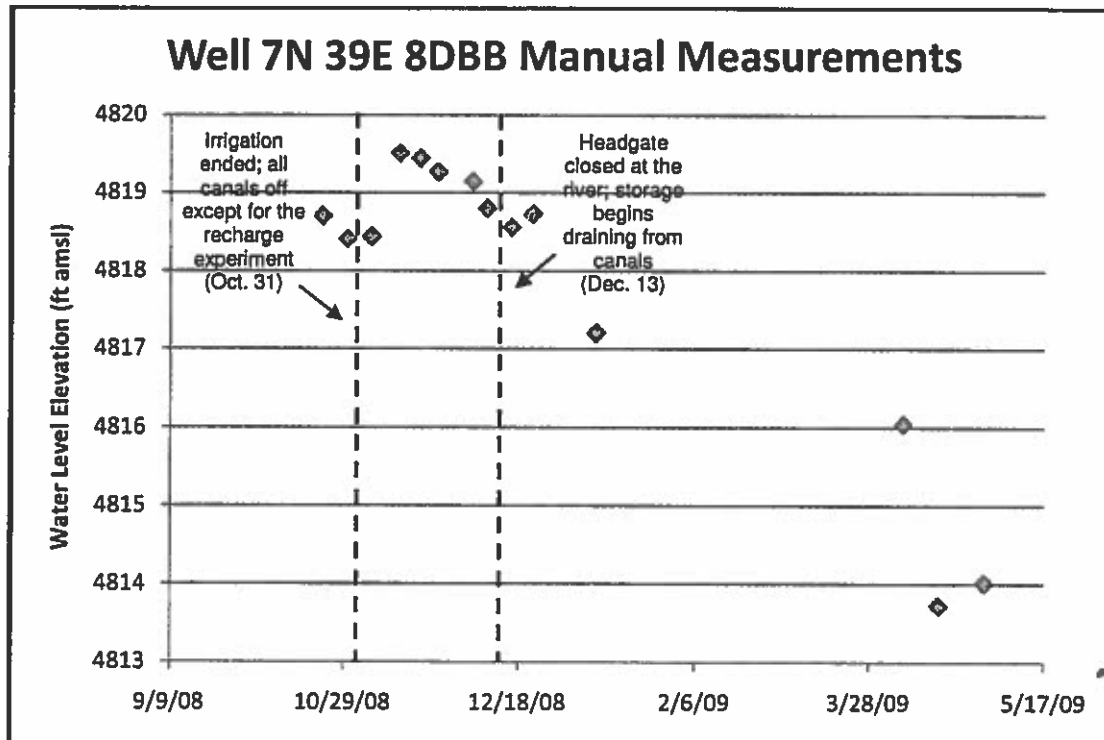


Figure 17. Aquifer water levels recorded manually in well 7N 39E 8DBB.

Transducer data were collected for well 7N 38E 23DBA2 located approximately 2.5 miles southwest of the ponds at the West Recharge Area (see Figure 2). This well is about 110 ft deep; therefore, it is not quite as deep as the well (7N 39E 7BDA1) directly south of the ponds at the recharge site. The recorded measurements are shown in Figure 18. The transducer recording was initiated at this site on 31 October 2008. After 31 October 2008, the water level in the well experienced an increase of about one tenth of a foot. At the end of November, the water level stabilized until the end of December in which the water level then declined.

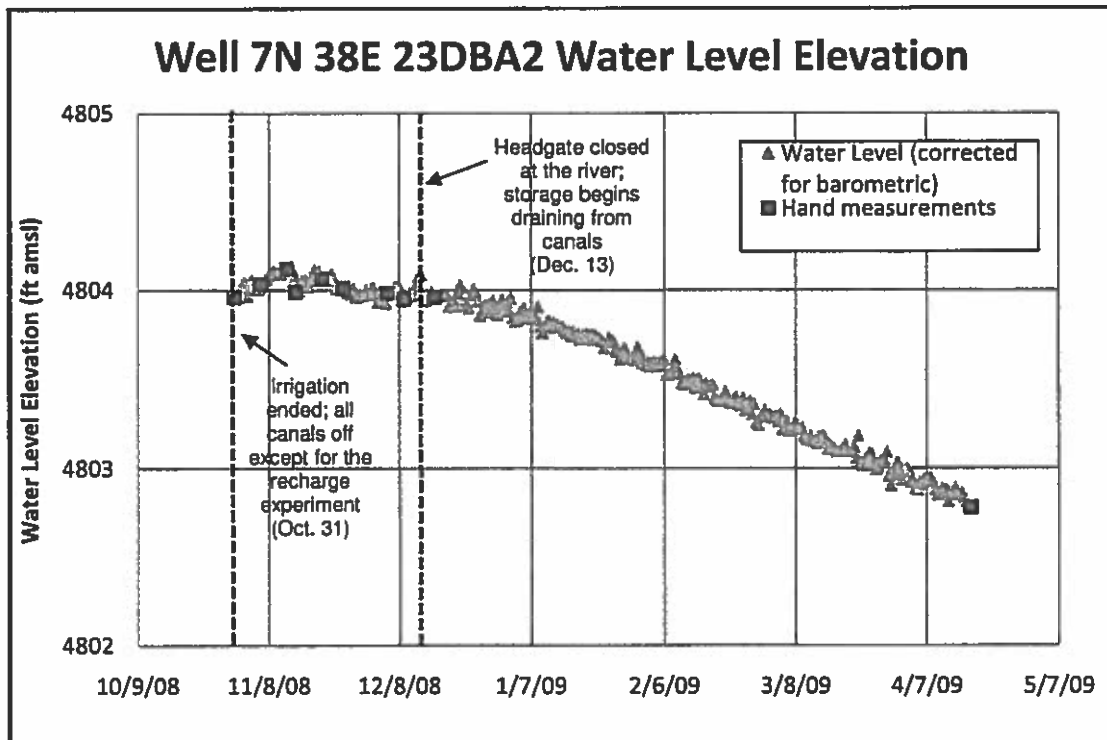


Figure 18. Aquifer water levels recorded by transducer in well 7N 38E 23DBA2.

In section 16 of township 7 north range 39 east, three wells were monitored with transducers. Each well is completed at a different depth. Figure 19 shows the transducer data for a well (7N 39E 16DBB1) that is approximately 444 ft deep. After data collection was initiated at the end of October in this well, the water level slowly declined, possibly due to the end of irrigation season. After the middle of December, which is also when the recharge canal was turned off, the declining water level slope became steeper as shown by the lines in Figure 19. This same change is visible in another well (7N 39E 16DBB2) located about 10 feet south and is completed at a depth of 107 ft. Figure 20 shows the results of data recorded by a transducer in this well (7N 39E 16DBB2). Like the well in Figure 19, this well also appears to experience a change in slope shortly after water is shut off to the recharge canal. Figure 21 shows a shallow well in section 16 of township 7 north range 39 east. This well (7N 39E 16DBB3) is about 38 ft deep. It shows several changes in water level, which are likely due to the water in the canal nearby. Although this is a shallow well, it is difficult to visibly find any changes in water level related to the recharge experiment.

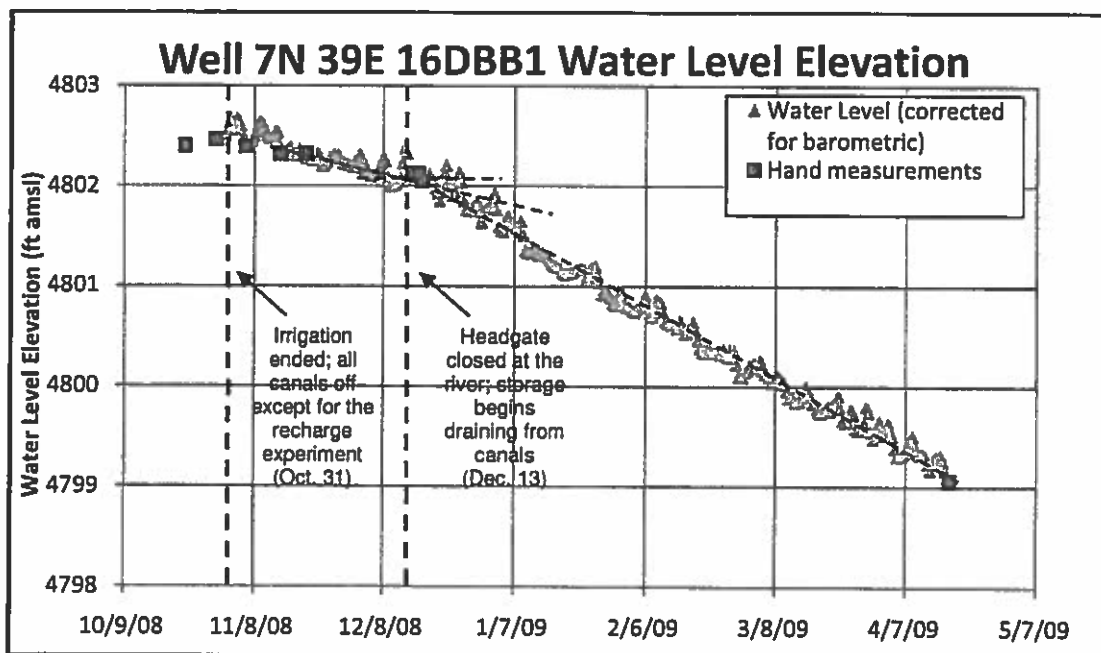


Figure 19. Aquifer water levels recorded by a transducer in well 7N 39E 16DBB1 (completion depth 444 feet)

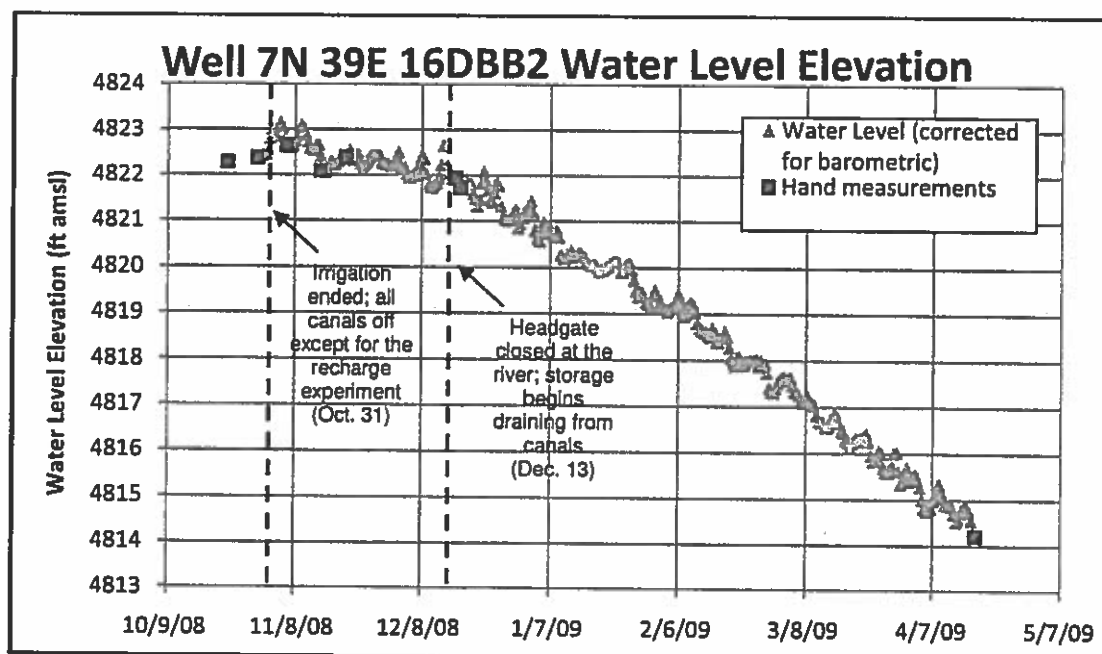


Figure 20. Aquifer water levels recorded by a transducer in well 7N 39E 16DBB2. This well is located about 10 feet south of the well in Figure 19. (completion depth 107 feet)

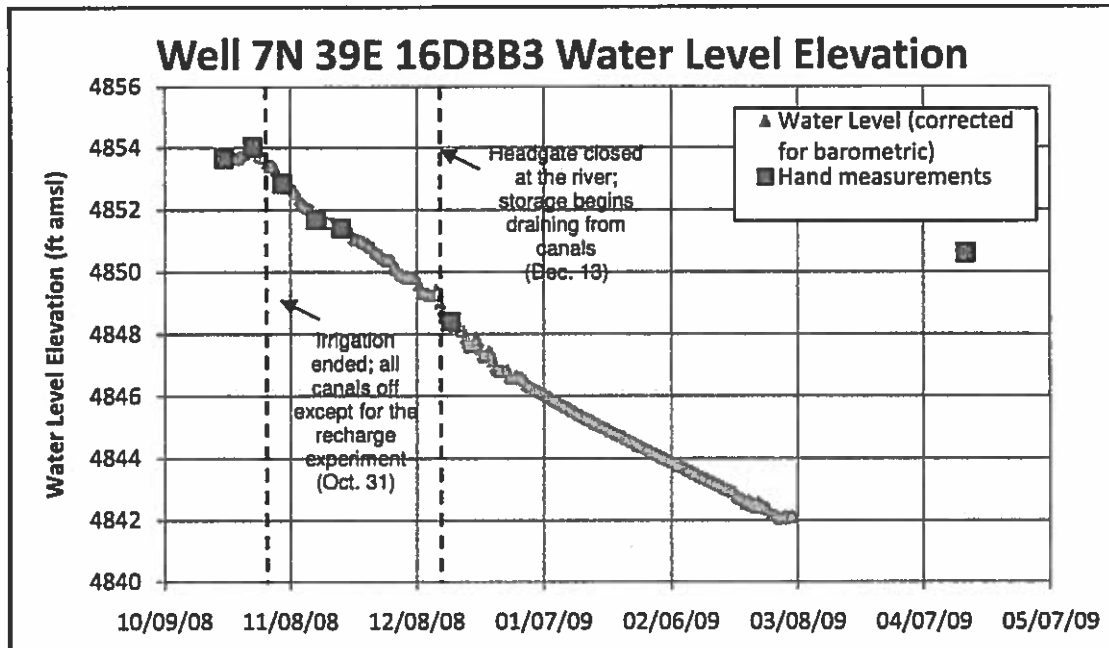


Figure 21. Aquifer water levels recorded by a transducer in well 7N 39E 16DBB3. (completion depth 38 feet)

Seepage Reconnaissance. Due to the measurement difficulties described above in the section "Reconnaissance of Seeps and Springs", it is difficult to use seeps monitoring to draw definitive conclusions about partitioning of recharge benefits.

Ability of Monitoring to Confirm or Contradict Aquifer Model

The ESPAM1.1 aquifer model was specifically developed for administrative analysis of questions of surface-water/groundwater interaction. It is a regional model designed for exactly the type of question presented by managed recharge at Egin. The model can be used to estimate the distribution of impacts of recharge in space and time, to 11 spring reaches and Snake River reaches.

A primary purpose of the monitoring project is to assess the ability of monitoring to confirm or contradict the model's apportionment of benefits and indications of timing of benefits. To fulfill this purpose, this section of the report compares and contrasts the findings of the literature search, data gathered in the monitoring project, and the representation of ESPAM1.1.

In the context of confirming or contradicting results of the ESPAM1.1 model, three questions are important:

1. Does more benefit of recharge accrue to the regional system than represented by ESPAM1.1?
2. Does more benefit of recharge accrue to the Henrys Fork than represented by ESPAM1.1?

3. Does ESPAM1.1 appropriately represent temporal delay of benefits?

Conceptual Models. ESPAM1.1 simplifies the aquifer as a locally-uniform porous medium in hydraulic connection with the Henrys Fork of the Snake River.⁶ This is not necessarily in conflict with Stearns and others' (1939) representation, though it does not explicitly include the perched system they indicated. Stearns and others indicated that about half the recharge at Egin Bench is stored "beyond the borders" of the bench. This is mildly contradictory with the ESPAM1.1 representation that about 70% of recharge benefits the Henrys Fork and 30% benefits other reaches. King's (1987) estimate that 60% of diversions reach the regional system is more contradictory of ESPAM1.1.

The ESPAM1.1 conceptual model is in conflict with Wytzes' (1980) assertion that the Henrys Fork is in communication with the perched system but not the regional system. However, Wytzes' conceptual model includes significant downward movement of water from the Egin Bench perched system to the regional aquifer. There is at least theoretically room for the Wytzes conceptual model to accommodate the ESPAM1.1 apportionment of benefits of recharge, even with the difference in hypothesized physical structures.

White (1962) estimated that only 35% of St. Anthony-area recharge would accrue above Milner. This is in strong contrast to the ESPAM1.1 representation, where virtually all benefits are represented as benefiting the Snake River above Milner, and most above Rexburg.

No other strong contradictions of ESPAM1.1 are noted in the literature.

Data. Stearns and others (1939), White and Mundorff (1962) and Wytzes (1980) all present groundwater levels and hydrographs generally consistent with data gathered in the project. Vertical gradients are consistent with a multi-layer or reduced-vertical-conductivity conceptual model, and not contradictory (though not explicitly confirming) of the ESPAM1.1 uniform porous medium conceptual model. Vertical gradients are less than 1.0 ft/ft and therefore contradict Wytzes' conceptual model of a truly perched aquifer.

White (1962) reports of short-term reach gains ranging from -80 to 217 cfs and average gains ranging from 115 to 400 cfs are consistent with both the data and simulation results of ESPAM1.1. Hortness and Vidmar's data (2003) are also consistent with the ESPAM1.1 data. As shown in Figure 13 and Figure 14, ESPAM1.1 calibration simulation gains were reasonably consistent with target data.

End-of-canal spills reported by Hortness and Vidmar (2003) are consistent with those measured in the 2008 monitoring project. This project's reconnaissance estimate of 20 to 80 cfs of seepage from the bench face is inconsistent with

⁶ Hydraulically-connected when aquifer water levels are in an appropriate range.

Hortness and Vidmar's report of no other major inflows on the northwest side of the Henrys Fork. Possible explanations include:

1. This projects' seepage reconnaissance estimates probably have higher uncertainty than Hortness and Vidmar's observations.
2. Seepage could have entered the river in small channels difficult to identify.
3. Seepage could have percolated into the flood plain before reaching the stream as surface flows.

Recharge-site seepage rates in literature were reasonably consistent with one another and with the 2008 monitoring study.

ESPAM1.1 vs. Data and Literature Summary. Table 4 summarizes the discussion in terms of the ESPAM1.1 representation of the spatial and temporal partitioning of benefits of recharge. This is a practical test; a conflict noted above between the Wytzes (1980) and ESPAM1.1 conceptual models is not noted in the table, since the Wytzes model is not necessarily contradictory to the ESPAM1.1 partitioning of benefits. The regional system is the larger Eastern Snake Plain Aquifer (ESPA). The fact that response was seen in a 340 ft well in such a short period of time indicates that not all the recharge was captured by a shallow system. Therefore this observation supports both the ESPAM1.1 representation or a representation that attributes even more benefit to the regional aquifer.

Table 4.
Consistency of Data and Literature Search
with ESPAM1.1 Representation of Spatial and
Temporal Partitioning of Benefits of Recharge

Observation or Literature Assertion	More Benefit to Regional System Than ESPAM1.1	Less Benefit to Regional System Than ESPAM1.1	Partitioning of Benefit Consistent with ESPAM1.1	Timing of Benefits Consistent with ESPAM1.1
Deep-well response, 2008 monitoring	<u>Supports</u>	Contradicts	<u>Supports</u>	
Seepage reconnaissance				<u>Supports</u>
Wytzes (1980) discussion of Henrys Fork reach gains			<u>Supports</u>	

Observation or Literature Assertion	More Benefit to Regional System Than ESPAM1.1	Less Benefit to Regional System Than ESPAM1.1	Partitioning of Benefit Consistent with ESPAM1.1	Timing of Benefits Consistent with ESPAM1.1
Hortness and Vidmar (2003) gain/loss study			<u>Supports</u>	<u>Supports</u>
Stearns and others (1939) partitioning of benefits	<u>Supports</u>	Contradicts	(not strongly contradictory)	
White (1962) partitioning of benefits	<u>Supports</u>	Contradicts	Contradicts	
King (1975) partitioning of benefits	<u>Supports</u>	Contradicts	Contradicts	
Calibration target reach gains data			<u>Supports</u>	<u>Supports</u>

The general indication of data and literature is that the benefit of recharge to the regional system is at least as great as ESPAM1.1 represents and possibly greater, but not less. Data and literature tend to support in a general way the model's timing of benefits to the Henrys Fork.

Secondary Effects

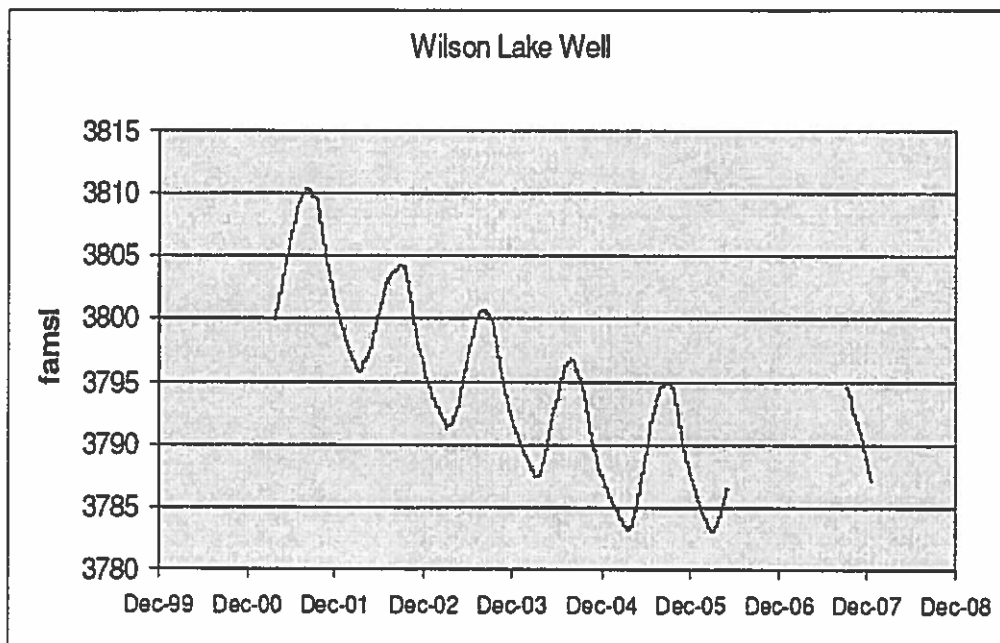
Early-spring recharge in the Egin Bench area could sustain summertime reach gains lower down the river, reducing supplemental groundwater pumping and thereby positively affecting spring discharges. Delivery to recharge could capture spring runoff that otherwise might have been spilled for flood control purposes. The result of this recharge may be to sustain fall and winter baseflows that become storage in American Falls Reservoir. It may even facilitate additional aquifer recharge at other sites, via increasing reservoir carryover or sustaining natural flow. Neither monitoring nor aquifer modeling alone can appropriately describe the cascading benefits that can result from these kinds of secondary effects.

FUTURE WORK

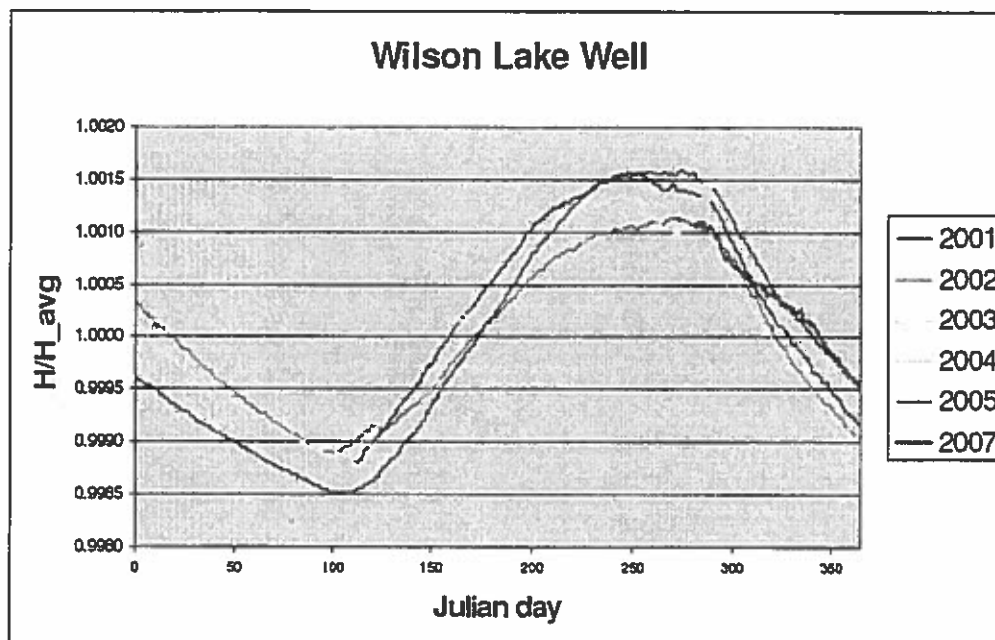
A number of activities could be carried out to refine the findings of this project, improve the estimates of partitioning of benefits of recharge, and provide input to future refinements of the aquifer model. These include:

1. Ongoing monitoring of aquifer water levels. This is probably the single most valuable activity that could be undertaken in the near future. It has two benefits:
 - a. Provides input to future calibration of aquifer model.
 - b. Allows for normalization of water levels to compare different years.

IDWR conducted a recharge experiment in October 2007 using the Northside Canal in collaboration with the Idaho Groundwater Appropriators, Idaho Dairyman's Association, and the Northside Canal Company (Wylie et al, 2008). Water-level records prior to the recharge event were available to compare to the data recorded during the 2007 recharge event. Figure 22 is a hydrograph of a well monitored during the experiment. Figure 23 was produced from Figure 22 in which part of the data were normalized by dividing the observed water level with the average water level (H/H_{avg}). This technique allows qualitative comparison of hydrographs from different years. The 2007 data were recorded after the irrigation season. The typical recession of water levels is noticeably dampened; the recession is not as steep in 2007 as it was in previous years. This qualitatively suggests the benefit of the recharge experiment.



**Figure 22. Wilson Lake well hydrograph before and during the Northside Canal recharge experiment.
(Courtesy Allan Wylie)**



**Figure 23. Normalized water levels in the Wilson Lake well.
(Courtesy Allan Wylie)**

2. Better accounting of movement of water on land surface. Personnel of the St. Anthony Canal were very willing to participate in data gathering, and the project relied heavily on their observations. However, they have responsibility for a large system with many headgates, water users, and reporting needs. Weirs, flumes or structures with recording devices at the Recharge Canal heading, entrance and exit to Egin Lakes, and the entrance to Tibbitts Lake could reduce the burden on the canal company and provide finer temporal resolution of data. IDWR Eastern Region personnel and canal company managers should be consulted if this effort is contemplated.
3. Better understanding of seeps and return flows. This would provide additional qualitative information on timing and partitioning of benefits of recharge, and would provide useful information to future aquifer modeling efforts. Monitoring return flow and end-of-canal spills would be necessary.
4. Geologic framework studies. A detailed review of well logs would be beneficial in better understanding the hydrogeologic units in the area. Definition of the horizontal and vertical extents of the clay layers in the area would aid understanding of the hydrologic units. Geophysical studies may be helpful in defining such units as well. Additional literature research would also be essential.
5. Acquire additional wells in the monitoring network. Several wells have been drilled for the purpose of monitoring in the Egin area for previous studies. Some of these were not located until early spring 2009 and consequently were not included in the fall-2008 measurement activities. Additional wells that may be considered are found in T7N R40E of

sections 8, 16, 18, and 20 of Fremont County. These wells have not been measured for quite some time and it is not known if all are appropriate sites to monitor.

6. Pumping tests. Pumping tests can allow estimation of local hydraulic properties of aquifer materials. Two locations (7N 39E 16 and 7N 40E 19) include a large production well in close proximity to monitoring wells at three different depths. These provide an excellent opportunity to conduct pump tests to refine understanding of vertical connections in the aquifer. This would aid in resolving the conflict between the Wytzes and ESPAM1.1 conceptual models.
7. Tracer tests. Tracer tests can provide insight into flow rate and direction, as well as preferential flow paths. One benefit of tracer tests is to provide data relating to water-quality concerns for domestic or municipal wells in the vicinity of recharge activities. They may also aid in understanding conceptual models and resolving conflicts.

Tracer tests indicate movement of individual molecules of water but do not indicate the propagation of water-supply benefits. A hazard is that readers may not understand this distinction and may misinterpret results.

SUMMARY AND CONCLUSIONS

Potential for Monitoring to Quantify Benefits of Recharge

From the 2008 recharge experiment at Egin Lakes and the associated monitoring project, it appears that monitoring of aquifer water levels and seepage can provide qualitative information regarding the partition of the benefits of recharge and the timing of benefits. Monitoring can also confirm or contradict conceptual models that underlie computerized aquifer models, and can provide important data for calibration. As shown by the Northside Canal recharge experiment (Wylie et al, 2008), long term monitoring provides beneficial information for distinguishing between the benefits of recharge relative to recovering water levels in the aquifer. As pointed out by Anderson (1975), quantitative partitioning of recharge benefits would be very difficult to obtain from monitoring alone, without the use of computerized aquifer modeling.

Indications from this monitoring project include the following:

1. Transducer data suggest the recharge experiment benefitted the deeper aquifer system.
2. Data and literature support the general ESPAM1.1 indication of the timing of benefits to the Henrys Fork.
3. Data and literature tend to either support the ESPAM1.1 partitioning of benefits or indicate that more benefit accrues to the regional system and less to the Henrys Fork than indicated by ESPAM1.1.

Developing Public Policy for Future Management of the Eastern Snake Plain Aquifer

Recharge is a recognized beneficial use of water in Idaho and the public interest is served by recharge projects benefiting the Eastern Snake Plain Aquifer and the Snake River. The cooperation between the Idaho Department of Water Resources, the Eastern Idaho Water Rights Coalition, the Idaho Water Resources Board and the Fremont-Madison Irrigation District in supporting Egin Lakes recharge and continued monitoring and analysis serves as a model of state agencies and local groups working together to obtain mutual benefits to the public.

Future recharge projects at Egin Lakes will conform with the Eastern Snake Plain Aquifer Comprehensive Management Plan (ESPA – CAMP) which was approved by the Idaho Legislature and signed into law on April 23, 2009. CAMP establishes a long-term program for managing water supply and demand in the ESPA through a phased approach to implementation and an adaptive management process to allow for adjustments in management techniques as implementation proceeds. The goal of the Plan is to: "Sustain the economic viability and social and environmental health of the Eastern Snake Plain by adaptively managing a balance between water uses and supplies." The Plan sets forth actions, which include aquifer recharge, that stabilize and improve spring flows, aquifer levels, and river flows across the Eastern Snake Plain.

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