Idaho Department of Water Resources

Use of the ESPA Model Transfer Spreadsheet (ETRAN) & Mitigation Analysis Spreadsheet for Water Right Transfers in the Eastern Snake Plain Aquifer

October 2016

rev.
9/27/2016

Note: This document is not intended for use with Water Supply Bank rental applications.

Important information for all modelers:

This guide is a resource for completing ground water modeling required for water right transfers in the Eastern Snake Plain Aquifer (ESPA). Requirements may differ for Water Supply Bank rentals and for applications for new water rights.

Purpose:

This document is intended for the following purposes:

1. Summarize the Department's transfer modeling guidance for the ESPA in a single resource. The information in this document comes from the ESPA Model Transfer User's Manual, Transfer Processing Memorandum No. 24, and IDWR's experience processing transfer applications based on modeling results.

2. Provide a foundational level of common understanding among the staff and members of the public who use the ESPA modeling tools.

3. Improve the quality and consistency of the modeling products submitted to the Department with transfer applications.

This document is a general resource, and it will not prevent the Department from allowing variances in sound analysis methodology on a case-specific basis. However, Ground water modeling that does not follow these guidelines may require extra technical review, resulting in delay of processing. Also, erroneous data entry will result in unacceptable modeling.

Applicants with questions about ESPA ground water modeling or these guidelines can reach the Water Rights staff by contacting the IDWR state office at (208) 287-4800.

These guidelines are subject to change, but are considered current as of October 1, 2016.

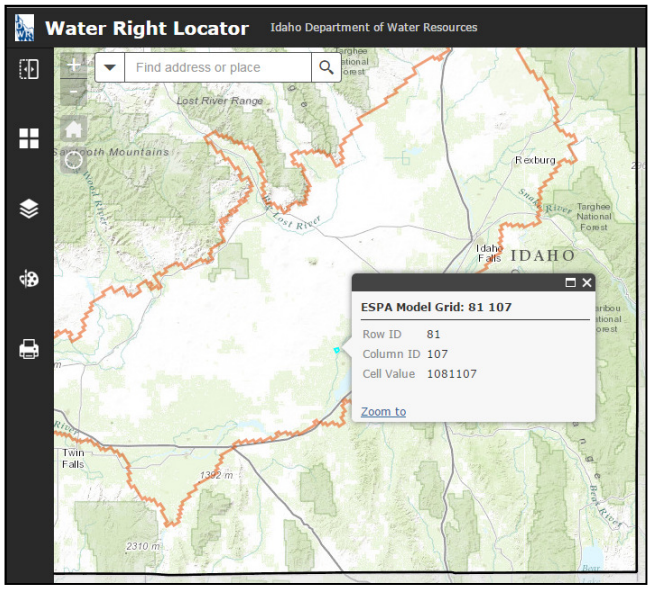
What is the purpose of the ESPA modeling analysis? Idaho Code §42-222 states that water right transfers must not injure other water rights. Surface water in the Snake River upstream from Milner is considered fully appropriated during all or much of the year, as are many spring flows tributary to the Snake River above and below Milner. Changes to ground water use in the Eastern Snake Plain Aquifer (ESPA) can change the location of depletions in the river and in the tributary springs. An ESPA model analysis is necessary to quantify those depletions so injury to other water rights can be identified and avoided or, if possible, mitigated.

ESPA ground water modeling is required for water right transfer requests that seek to change the point of diversion of an established water right located within the model boundaries of the ESPA. Moving points of diversion from a tributary aquifer to the ESPA, or from the ESPA to a tributary aquifer, must also be evaluated as described in Section 2.4.

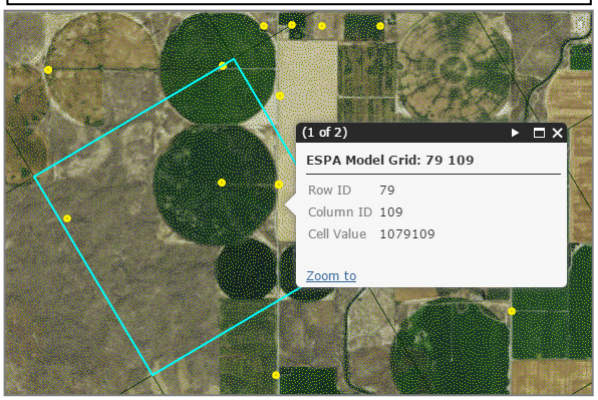
Modeling Procedure:

1. **Download the modeling package.** The ESPA Model Transfer Spreadsheet may be downloaded for free on the Department's website: http://www.idwr.idaho.gov/. Simply navigate to: *Water Rights* > *Water Right Transfers* > *Modeling Resources*. Download and unzip the ESPA Model Transfer (ETRAN3.2). Save it into a root directory on your computer. As of **January 31, 2016**, use of the model version ETRAN 3.2 is required.

2. **Identify your grid cells**. The grid cells are numbered units of area in the ESPA.
   2.1. Use the online Water Right Locator to view the grid cells themselves. Simply follow the link to view a map of the grid cells within the ESPA: https://idwr.maps.arcgis.com/apps/webappviewer/index.html?id [1]
   2.2. Turn on the *ESPA Model Grid* layer and then zoom into each of the locations of the *To well* (where the well for the proposed use is located) and *From well* (where the well will be idled) of the water right(s) being considered in the transfer proposal. Zoom in until the model grid cells are added to the viewing area.
   2.3. Zoom in to the *To* and *From* locations until the row and column values are identifiable for each location. Take note of row and column values; they are inputs into the ESPA Model Transfer Spreadsheet.



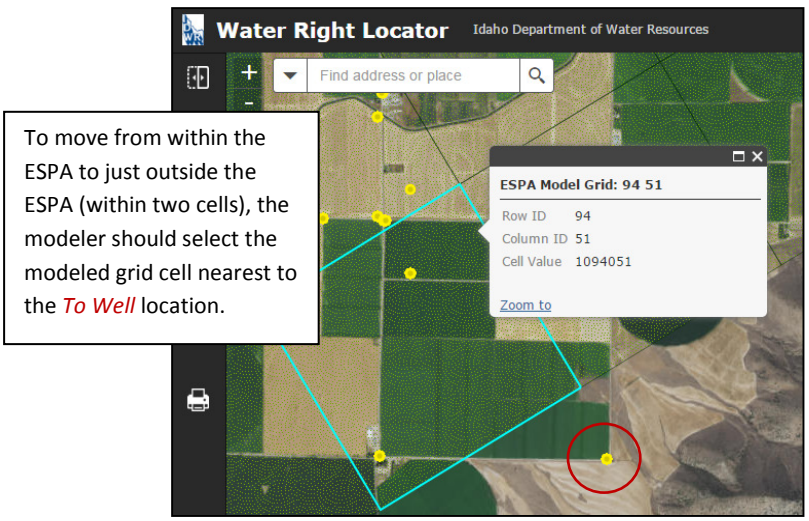
In this example, the well in Row 81 Column 107 will be idled. The well in Row 79 Column 109 will be pumped.



[1] The full web address is: https://idwr.maps.arcgis.com/apps/webappviewer/index.html?id=bdaa8ddbf5a84d63b722a16e26695ff5.

2.4. Transfers of ground water from within the ESPA to locations outside the ESPA may be allowable as long as the outside point of diversion is within an aquifer tributary to the ESPA. Moving a water right diversion from the ESPA to a completely separate, distinct aquifer cannot be approved. To move a diversion from within the ESPA to a tributary aquifer, the modeler should select the model grid cell nearest to the *To Well* location. At some locations, the grid cells extend beyond the model boundary. If the *To Well* location is farther than a distance of two grid cells from the ESPA boundary, then the modeler will need to employ additional modeling tools or methods in conjunction with the ESPA modeling tool to calculate the timing and quantity of the impacts to the Snake River.

Transfer of a ground water diversion from a tributary aquifer to a location within the ESPA may also be approvable with sufficient modeling and other necessary evaluations to demonstrate the impacts to the Snake River. However, such proposals will be vigorously evaluated to prevent injury to other water rights and ensure compliance with statutory criteria.



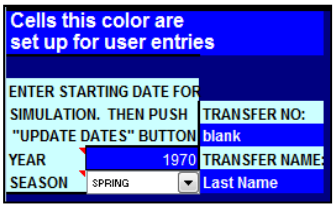
To move from within the ESPA to just outside the ESPA (within two cells), the modeler should select the modeled grid cell nearest to the *To Well* location.

2.5. Open the *Etransfer_V3_2.xlsm* (Macro-enabled Excel Worksheet) file within the zipped folder that you downloaded in step 1. Enable the modeling functionality by enabling the macros.

3. Update the date range in the ESPA Model Transfer Spreadsheet.

3.1. Review the priority dates of all of the water rights to be modeled. The *Year* and *Season* cells should be populated with the same year and trimester season that corresponds to the priority date of the oldest water right to be modeled. {Spring: March-June, Summer: July-October, Winter: November-February}

3.1.1. For this example, we will consider a transfer requesting a change in point of diversion for three water rights with different priorities: No.1: March 9, 1970, No. 2: January 18, 1974, and No. 3: July 31, 1987. Water right No. 1 is the most senior. Because March falls during the Spring Trimester, *Spring 1970* should be data entered.



3.2. The modeler should input the transfer number in the *TRANSFER NO:* cell. The *TRANSFER NAME:* cell should reflect the last name or the business name of the transfer applicant.

3.3. Click the *UPDATE DATES* button. The dates starting in row 21 should now begin on or before the year of the priority date for the most senior water right being transferred.

TRIMESTER OF ACTIVITY	TO WELL Projected Use AF/TRIMESTER	FROM1 WELL With Transfer AF/TRIMESTER	FROM1 WELL Without Transfer AF/TRIMESTER	FROM2 WELL With Transfer AF/TRIMESTER	FROM2 WELL Without Transfer AF/TRIMESTER	FROM3 WELL With Transfer AF/TRIMESTER	FROM3 WELL Without Transfer AF/TRIMESTER
SPR 1970	0	100	100	100	100	100	100
SUM 1970	0	100	100	100	100	100	100
WIN 1970	0	100	100	100	100	100	100
SPR 1971	0	100	100	100	100	100	100
SUM 1971	0	100	100	100	100	100	100
WIN 1971	0	100	100	100	100	100	100

4. **Add point of diversion cell locations to the ESPA Model Transfer Spreadsheet.** Utilize the *'TO CELL,' 'FROM1' CELL*, *'FROM2' CELL*, and *'FROM3' CELL* to program the *From Well* and *To Well* locations.

4.1. Resuming our example from 3.1.1., an application for transfer proposes to change the point of diversion for three water rights. The three water rights are authorized to divert from one point of diversion, or well. The well associated with these rights is located in the model grid cell designated Row 81 Column 107. This well is a *From Well*. If there is only one *From Well*, the grid address can be entered into any one of the three possible *From Well* cell locations but typically 'FROM1' CELL is used. The proposal requests to change the POD to a well located within the model grid cell designated Row 79 Column 109. This is the *To Well*. The modeling utility can only use one *To Well* at a time. These values were determined using the method described in step 2. Enter this data into the *ENTER CELL LOCATIONS* area of the worksheet.

ENTER CELL LOCATIONS:	'TO' CELL	'FROM1' CELL	'FROM2' CELL	'FROM3' CELL
ROW	79	81		
COLUMN	109	107		

4.2. In some cases, the water rights proposed for transfer do not share a well, and the wells are not even located in the same grid cells. In such instances, the modeler would need to use the *'FROM2' CELL* and the *'FROM3' CELL* locations for each of the other wells. Each model run can handle up to three *From Wells*. If there are more than three wells (in different grid cells) associated with the water rights to be transferred, the modeler will need to decide which of the following three modeling methods to utilize.[2]

4.2.1. Identify the *From Well* which is the farthest from the *To Well* location. Model the farthest *From Well* as though the entire volume of water will be diverted at this location. This method may be utilized only if all of the *From Wells* are within a 2-by-2 grid of model cells. The 2-by-2 grid was selected to standardize assumptions surrounding the questions, "How can I determine if a group of POD's are clustered enough to model the farthest *From Well*? What is the maximum distance that each POD can be from the others?"

[2] If necessary, a 'FROM WELL With Transfer' column can be used as a TO WELL. For more information on this method, see Appendix A.

4.2.2. Calculate the location of a weighted centroid which represents the volume of water which will be idled at each *From Well*. Model the weighted centroid location as the *From Well* with the entire volume of water to be transferred modeled as if it has been diverted historically at this single *From Well* location. This method may be utilized only if all of the *From Wells* are within a 3-by-3 grid of model cells.

4.2.3. Divide the *From Well* points-of-diversion into groups of up to three, and then perform two or more separate model runs. The results of each model run (the data in the perforated box at the bottom of the Calculated Effects tab), should be copied and pasted into the Mitigation Analysis Spreadsheet (see section 8). In the Mitigation Analysis Spreadsheet, the sets of model results should be added together to determine the full impact to each reach.

5. **Enter the *quantity* of water to be transferred into the modeling area of the ESPA Model Transfer Spreadsheet.** The modeler should think of this area as a timeline for the operation of each of the wells involved in the transfer proposal. The timeline begins at the priority date of the oldest water right; the timeline ends approximately 150 years later.

5.1. Begin by zero-ing out all of the data in the main body of the spreadsheet (blue modeling area).

TRIMESTER OF ACTIVITY	TO WELL	FROM1 WELL		FROM2 WELL		FROM3 WELL	
	Projected Use	With Transfer	Without Transfer	With Transfer	Without Transfer	With Transfer	Without Transfer
	AF/TRIMESTER	AF/TRIMESTER	AF/TRIMESTER	AF/TRIMESTER	AF/TRIMESTER	AF/TRIMESTER	AF/TRIMESTER
SPR 1970	0	0	0	0	0	0	0
SUM 1970	0	0	0	0	0	0	0
WIN 1970	0	0	0	0	0	0	0
SPR 1971	0	0	0	0	0	0	0
SUM 1971	0	0	0	0	0	0	0
WIN 1971	0	0	0	0	0	0	0
SPR 1972	0	0	0	0	0	0	0
SUM 1972	0	0	0	0	0	0	0
WIN 1972	0	0	0	0	0	0	0
SPR 1973	0	0	0	0	0	0	0
SUM 1973	0	0	0	0	0	0	0
WIN 1973	0	0	0	0	0	0	0
SPR 1974	0	0	0	0	0	0	0
SUM 1974	0	0	0	0	0	0	0
WIN 1974	0	0	0	0	0	0	0

Zero-out all 150 years worth of data that may have been left in the model from a previous use.

5.2. Analyze the water rights to be transferred. If necessary, create a chart to facilitate the calculation of the trimester volume associated with each right. The chart should include space for known values and unknown values which must be calculated by the modeler. Let's continue with our example from steps 3.1 and 4.1 by creating a chart, like the one below, for the water rights in our example. To create your chart, use a separate spreadsheet or sheet of paper.

Known, from License or Decree				
WR No.	Priority Date	Diversion Rate	Diversion Volume	Acres
Right No. 1	3/9/1970	6.0 CFS	Not stated	315
Right No. 2	1/18/1974	2.4 CFS	Not stated	120
Right No. 3*	7/31/1987	0.4 CFS	Not stated	20
Combined Limits		8.4 CFS	1820 AFY	455
* Water Right No. 3 is an enlargement of the prior licensed right; it adds no additional rate.				

5.2.1. To determine the diversion volumes of the three water rights, one must first identify whether any of the three rights overlap. In our example, all three of the water rights are for irrigation. The water rights are subject to a combined diversion

rate of 8.4 cfs, instead of the sum of 8.8 cfs, because Right No. 3 adds acres and volume but not rate. The modeler may also identify the volume-per-acre allowed. In our example, the rights allow 4 acre-feet per acre (1820 AF / 455 acres).

Calculated by Modeler			
WR No.	Priority Date	Acres	Diversion Volume (AFY*)
Right No. 1	3/9/1970	315	4 AF/AC * 315 = 1260 AFY
Right No. 2	1/18/1974	120	4 AF/AC * 120 = 480 AFY
Right No. 3*	7/31/1987	20	4 AF/AC * 20 = 80 AFY
Combined Limits		455	1820 AFY
*AFY means "acre-feet per year"			

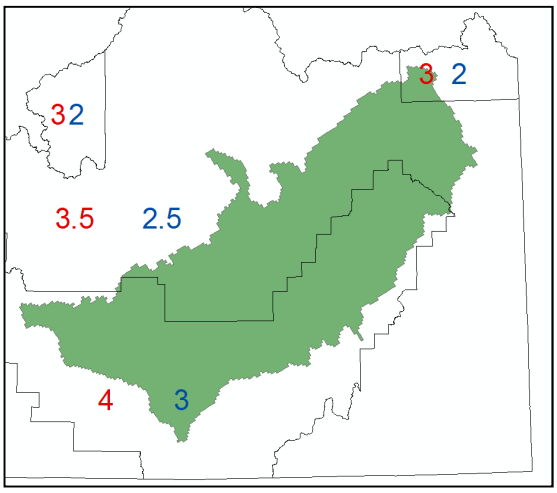
5.2.2. The annual consumptive use volume must be estimated for each right. For transfer applications proposing a change in nature of use from irrigation and a change in point of diversion, the historic maximum year consumptive use (highest-use crop rotation using a climatic average for crop water uses estimates) over a period of no less than five years, will be the basis for the annual consumptive use volume available to transfer. Multiply the irrigated acres for each right by the *consumptive irrigation requirement* to estimate the total consumptive volume available for transfer to the new use.[3] For transfer of irrigation rights that will still be used for irrigation when the transfer is complete, use the standard consumptive use volume for the irrigated place of use. Standard consumptive volumes vary based on climate variations throughout the state of Idaho (Transfer Processing Memorandum No. 24).

Use the online Water Right Locator to view consumptive use volumes throughout Idaho. Simply follow the link below: https://idwr.maps.arcgis.com/apps/webappviewer/index.html?id [4]

CONSUMPTIVE IRRIGATION REQUIREMENT
(Acre feet per year per acre)

FIELD HEADGATE REQUIREMENT
(Acre feet per year per acre)

ESPA is shaded in map of southeast Idaho, at right



5.2.3. For transfer of water rights with purposes of use other than irrigation, the modeler should prepare and attach an evaluation of the historic beneficial use

[3] Use of the field headgate volume is acceptable in an irrigation to irrigation transfer where mitigation is accomplished by reduction in volume.
[4] The full web address is: https://idwr.maps.arcgis.com/apps/webappviewer/index.html?id=bdaa8ddbf5a84d63b722a16e26695ff5.

under the right. Normally the highest-year consumptive use within the last five years will be the basis for the annual volume of consumptive use available.

5.3. In our example, all of the water for 455 acres associated with Water Right Nos. 1-3 is proposed to be permanently diverted at a new location in the ESPA. The resulting consumptive use volumes are as follows:

Proposed Transfer Acres Calculated by Modeler			
WR No.	Transfer Acres	Consumptive Use Volume	Consumptive Use per Trimester
Right No. 1	315	3 AF/AC * 315 AC = 945 AFY	945 AFY/3 = 315 AF
Right No. 2	120	3 AF/AC * 120 AC = 360 AFY	360 AFY/3 = 120 AF
Right No. 3	20	3 AF/AC * 20 AC = 60 AFY	60 AFY/3 = 20 AF
Combined Limits	455 AC	1365 AFY	455 AF

5.4. Begin data entry of the Consumptive Use per Trimester into the FROM1 WELL columns of the spreadsheet. Start with the oldest priority date. As the junior rights are input, the volumes should become additive. Remember that the *From Well* should be idled for the time of the transfer forward (*With Transfer* column). In the *Without Transfer* column, enter data as if the transfer did not occur and pumping had continued at the original water right place of use. In this example, the transfer will occur starting Jan 1, 2015. At the *To Well*, pumping will begin at the start of 2017. The volume diverted is evenly distributed over the entire year for the ease of analysis.

TRIMESTER OF ACTIVITY	TO WELL	FROM1 WELL		FROM2 WELL		FROM3 WELL	
	Projected Use	With Transfer	Without Transfer	With Transfer	Without Transfer	With Transfer	Without Transfer
	AF/TRIMESTER	AF/TRIMESTER	AF/TRIMESTER	AF/TRIMESTER	AF/TRIMESTER	AF/TRIMESTER	AF/TRIMESTER
SPR 1970	0	315	315	0	0	0	0
SUM 1970	0	315	315	0	0	0	0
WIN 1970	0	315	315	0	0	0	0
WIN 1972	0	315	315	0	0	0	0
SPR 1973	0	315	315	0	0	0	0
SUM 1973	0	315	315	0	0	0	0
WIN 1973	0	435	435	0	0	0	0
SPR 1974	0	435	435	0	0	0	0
SUM 1974	0	435	435	0	0	0	0
SUM 1986	0	435	435	0	0	0	0
WIN 1986	0	435	435	0	0	0	0
SPR 1987	0	435	435	0	0	0	0
SUM 1987	0	455	455	0	0	0	0
WIN 1987	0	455	455	0	0	0	0
SPR 1988	0	455	455	0	0	0	0
SPR 2016	0	455	455	0	0	0	0
SUM 2016	0	455	455	0	0	0	0
WIN 2016	0	455	455	0	0	0	0
SPR 2017	455	0	455	0	0	0	0
SUM 2017	455	0	455	0	0	0	0
WIN 2017	455	0	455	0	0	0	0

5.5 Check your work. It is critical that correct volumes are captured in the correct trimester date cells in the correct chronological order.

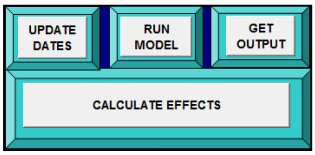
Modeler FAQ

Must the amount that I model always be limited to the amount I am proposing to transfer, or can I enter the entire volume of the water right in the From Well columns?

In short, yes. If a modeler only needs to transfer a portion of a water right, any leftover portion of the un-transferred right should not be included in the modeled values. Modeling with any un-transferred portion of the right will artificially deflate the percent change calculated as a result of the transfer.

In some cases, the applicant may need to prevent injury by transferring more water than the amount that will actually be diverted. When this occurs, the *From Well* may show greater diversion volumes or a greater number of diversion years than the *ToWell*. Water rights which mitigate by remaining un-diverted should be included in a FROM WELL column, but not a TO WELL column of the modeling spreadsheet. (See section 9.6)

6. **Run the model**. Use the buttons embedded in the Data Entry worksheet to execute model calculations.
   6.1. Click the *Run Model* button. A black command prompt will appear on the screen. When the model is finished running, the prompt will disappear. This may take a few moments.
   6.2. Click the *Get Output* button and wait a few seconds for the spreadsheet to work.
   6.3. Click the *Calculate Effects* button and wait for the spreadsheet to calculate. The workbook will automatically change to the *GRAPHS ABOVE MILNER* tab of the workbook. This worksheet allows the modeler to view the effects of the transfer proposal.



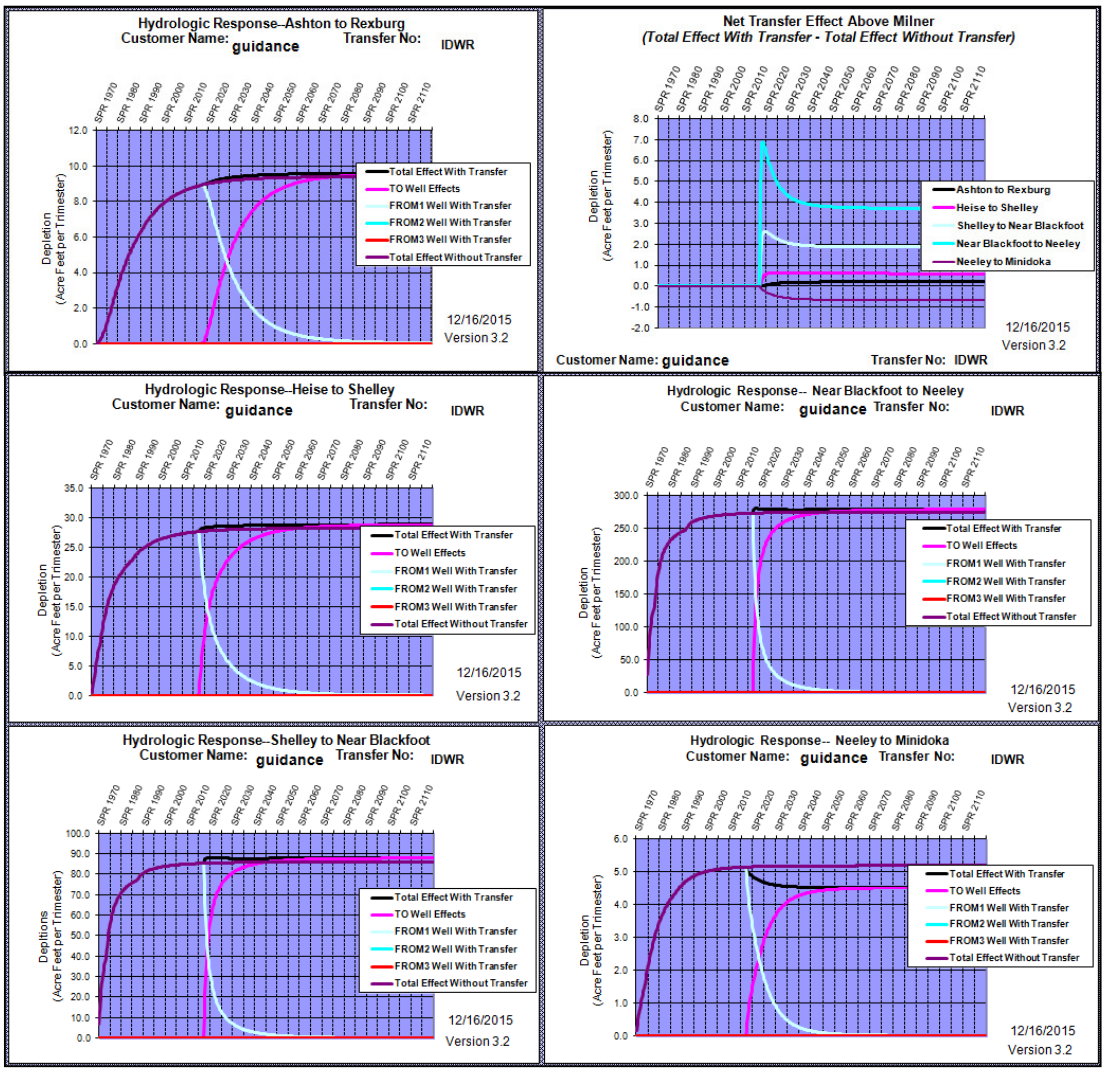
7. **View the results**. Inspect the GRAPHS BELOW MILNER and GRAPHS ABOVE MILNER tabs to look for depletion to various reaches of the Snake River. These graphs display the impact of the proposed transfer on each of 11 reaches of the Snake River:
   1. Ashton to Rexburg
   2. Heise to Shelley
   3. Shelley to near Blackfoot
   4. Near Blackfoot to Neeley
   5. Neeley to Minidoka
   6. Devil's Washbowl to Buhl
   7. Buhl to Thousand Springs
   8. Thousand Springs
   9. Thousand Springs to Malad
   10. Malad
   11. Malad to Bancroft

This is the first opportunity to evaluate whether a change in depletion amounts will necessitate some adjustments or mitigation to make the proposed transfer approvable.

7.1. For each reach, if the *Total Effect with Transfer* line is above the *Total Effect without Transfer* line, depletions will increase in the reach. Oppositely, if the *Total Effect without Transfer* line is above the *Total Effect with Transfer* line, depletions will decrease in the reach.

Modeler Tip

Remember that reading the depletion graphs is not entirely intuitive. When interpreting these graphs, the user should note that a large positive value indicates a greater depletion of the reach due to the transfer. A negative value indicates a beneficial effect on flow of a reach (greater spring discharges).



8. **Analyze the results using the ESPA Mitigation Analysis Spreadsheet (no mitigation).** Download and open the ESPA Mitigation Analysis Spreadsheet (informally called the Mitigation Analysis Tool, or MAT).

8.1. In the ESPA Model Transfer Spreadsheet, navigate to the bottom of the *Calculated Effects* tab. Key in the first time step (beginning trimester of proposed transfer) in the "Enter First Time Step Transfer" cell and press *enter*.

Enter First Time Step of Transfer: SPR 2017

8.2. Copy the data in the perforated box.

AtR	HtS	StNB	NBtN	NtM	DWtB	BtTS	TS	TStM	M	MtB	Total
9.42	28.22	85.95	274.78	5.18	14.79	16.81	7.46	4.71	4.31	0.27	451.91
9.62	28.81	87.81	278.48	4.53	13.15	14.95	6.64	4.19	3.83	0.24	452.24
9.42	28.22	85.95	274.78	5.18	14.79	16.81	7.46	4.71	4.31	0.27	451.91
9.62	28.81	87.95	279.77	5.09	14.58	16.57	7.36	4.64	4.25	0.26	458.91

8.3. Paste the data (paste special, values) into the perforated box at the top of the Mitigation Analysis Spreadsheet.

	Impact by Reach (AF/Trimester)										
	Ashton to Rexburg	Heise to Shelley	Shelley to Nr Blckft	Nr Blckft To Neeley	Neeley to Minidoka	Dev. Wbl. To Buhl	Buhl to Kspr	Kspr	Kspr to Malad	Malad	Malad to Bancroft
Pre-SS	9.42	28.22	85.95	274.78	5.18	14.79	16.81	7.46	4.71	4.31	0.27
Post-SS	9.62	28.81	87.81	278.48	4.53	13.15	14.95	6.64	4.19	3.83	0.24
Pre-TS	9.42	28.22	85.95	274.78	5.18	14.79	16.81	7.46	4.71	4.31	0.27
Post-TS	9.62	28.81	87.95	279.77	5.09	14.58	16.57	7.36	4.64	4.25	0.26

8.4. At the top of the Mitigation Analysis Spreadsheet, make sure the *Mitigation Analysis Period* is set to *Trimester*.

Mitigation Analysis Period

Trimester

8.5. *New Water Right* box: The highlighted box on the left-hand side of the Mitigation Analysis Spreadsheet (orange) is designated for the modeler's reference. For the purposes of this activity, the data input here (water right number, diversion rate, volume, irrigated acres, priority date, diversion location, transferred volume, node) does not affect the modeling analysis.

New Water Right

WR No.	Div. Rate (CFS)	Con. Vol. (AFA)	No. of Irr. Acres	Priority Date	POD Location	Dedicated Vol. AFA/	AFT	Model Node
Transfer 1: Proposed Steady State Impacts following Transfer								
0	8.4	1365.0	455.0	3/9/1970	8S26E-3	1365	455.0	SP082075
0	8.4	1365	455	3/9/1970	8S26E-3	1365	455.0	SP068066
Transfer 1: Worst Case Transient State Impacts following Transfer								
0	8.4	1365	455	3/9/1970	8S26E-3	1365	455.0	SP082075
0	8.4	1365	455	3/9/1970	8S26E-3	1365	455.0	SP068066

8.6. *Impact by Reach* box: The plain box on the right-hand side of the Mitigation Analysis Spreadsheet (pasted into the sheet) entitled *Impact by Reach (AF/Trimester)* displays the pre- and post- steady state and transient state depletion values for each of 11 reaches of the Snake River. (For the 11 reaches of the Snake River, see section 7.) A *Steady State* change represents a long-term or permanent depletion or accretion to Snake River flows. A *Transient State* change represents a shorter-term change in depletion or accretion to Snake River flows. The transient state may show a spike in depletions because the new pumping associated with the change is combined with the lingering impacts of the previous pumping at the old location.

	Impact by Reach (AF/Trimester)										
	Ashton to Rexburg	Heise to Shelley	Shelley to Nr Blckft	Nr Blckft To Neeley	Neeley to Minidoka	Dev. Wbl. To Buhl	Buhl to Kspr	Kspr	Kspr to Malad	Malad	Malad to Bancroft
Pre-SS	9.42	28.22	85.95	274.78	5.18	14.79	16.81	7.46	4.71	4.31	0.27
Post-SS	9.62	28.81	87.81	278.48	4.53	13.15	14.95	6.64	4.19	3.83	0.24
Pre-TS	9.42	28.22	85.95	274.78	5.18	14.79	16.81	7.46	4.71	4.31	0.27
Post-TS	9.62	28.81	87.95	279.77	5.09	14.58	16.57	7.36	4.64	4.25	0.26

8.7. *Steady State/Transient State Analysis* boxes: Beneath the *Impact by Reach* box, the depletion values are broken out by Steady State Analysis and Transient State Analysis. Because water right transfers are long-term, the modeler will need to review both the *Steady State Analysis* and the *Transient State Analysis* boxes. The steady state has three 'mitigation checks,' or tests to determine whether mitigation is necessary to prevent injury to senior surface water rights. The transient state has two 'mitigation checks.'

Steady State Analysis	Mitigation Check 1 - >10% of Historical:	2.0%	2.1%	2.2%	1.3%	-12.7%	-11.1%	-11.1%	-11.1%	-11.1%	-11.1%	-11.1%
	Mitigation Check 2: > 2 AF/T:	0.2	0.6	1.9	3.7	-0.7	-1.6	-1.9	-0.8	-0.5	-0.5	0.0
	Mitigation Check 3 - >10% of Total:	2.1%	6.4%	19.4%	61.6%	1.0%	2.9%	3.3%	1.5%	0.9%	0.8%	0.1%
	Mitigation Required?:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	Mitigation Vol. Req'd (ac-ft):	0.2	0.6	1.9	3.7	-0.7	-1.6	-1.9	-0.8	-0.5	-0.5	0.0
Transient State Analysis	Mitigation Check 1 - >10% of Historical:	2.0%	2.1%	2.3%	1.8%	-1.8%	-1.4%	-1.4%	-1.4%	-1.4%	-1.4%	-1.4%
	Mitigation Check 2: > 2.01 AF/T:	0.2	0.6	2.0	5.0	-0.1	-0.2	-0.2	-0.1	-0.1	-0.1	0.0
	Mitigation Required?:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	Mitigation Vol. Req'd (ac-ft):	0.2	0.6	2.0	5.0	-0.1	-0.2	-0.2	-0.1	-0.1	-0.1	0.0

8.7.1. Steady State Analysis: Depletions to the Snake River require adjustment or mitigation when <u>all three</u> steady state conditions below occur for any reach:

- ***Net increased depletion caused by the transfer is greater than 10% of the historical depletion volume.***
- ***Depletion increases are greater than 2 acre-feet/trimester.***
- ***The depletion in a specific reach is greater than 10% of the total depletion to all reaches.***

8.7.2. For those reaches where all three conditions occur, the increase in depletion volume must be fully mitigated. It is not acceptable for the applicant to mitigate only enough to fall below one of the criteria in the steady state.

8.7.3. Transient State Analysis: Depletions to the Snake River require adjustment or mitigation when <u>both</u> of the two conditions below occur for any reach:

- ***Net increased depletion caused by the transfer is greater than 10% of the historical depletion volume.***
- ***Depletion increases are greater than 2 acre-feet/trimester.***

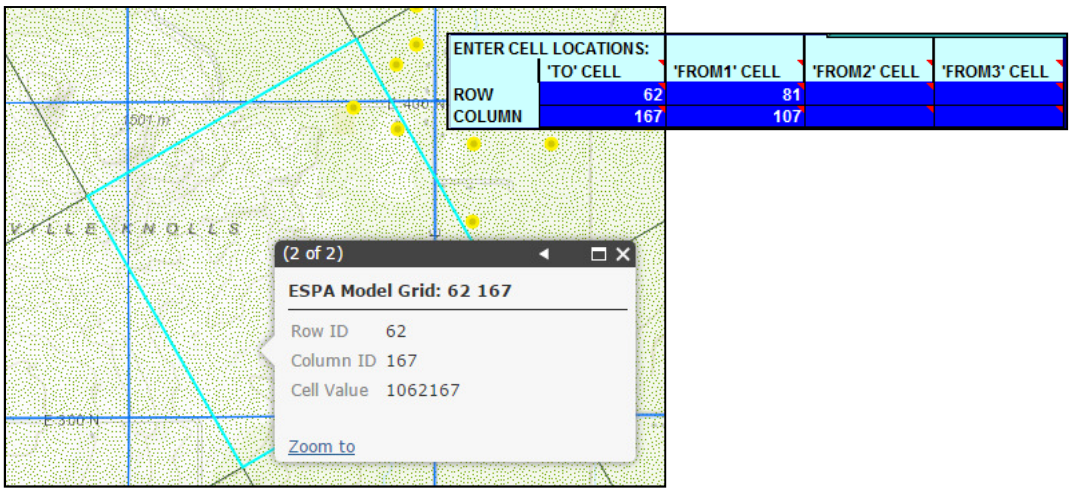
8.7.4. For those reaches where both conditions occur, the increase in depletion volume must be fully mitigated. It is not acceptable for the applicant to mitigate only enough to fall below one of the two criteria in the transient state.

For additional information regarding departmental policy for the analysis requirements, see Administrative Transfer Processing Memo No. 24 pages 12-14.

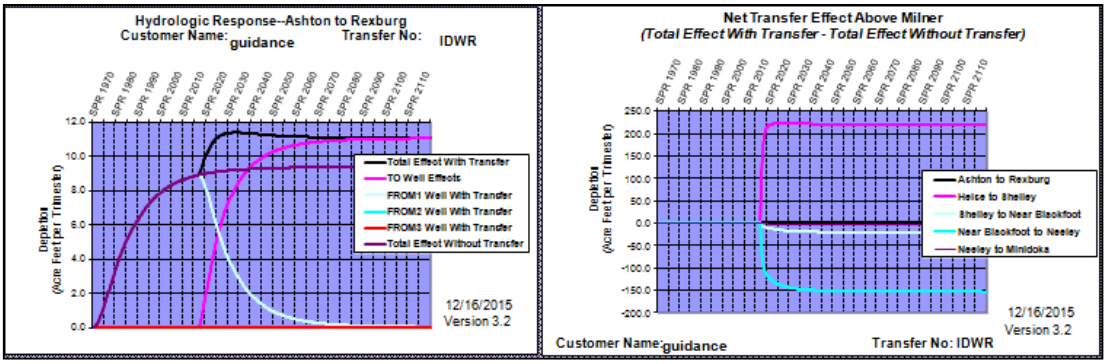
8.8. Therefore, the transfer in our example does not require mitigation because it passes both depletion evaluations in every reach. The Mitigation Analysis Spreadsheet table shown below demonstrates this conclusion with a "NO" entry in the "Mitigation Required?" row for each reach.

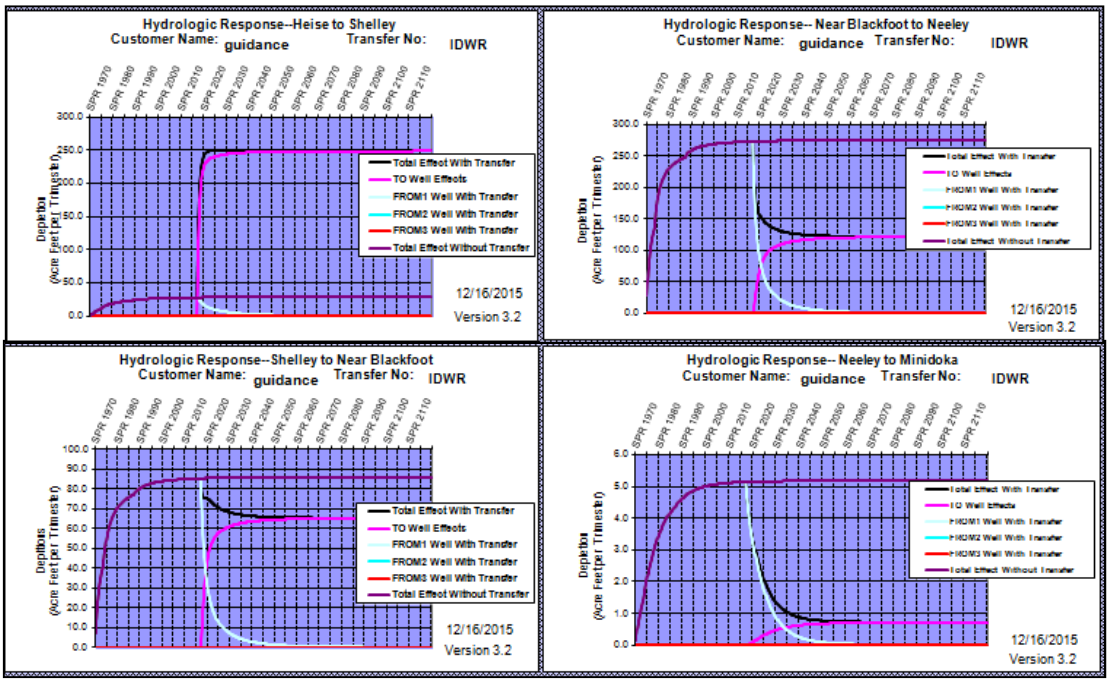
Steady State Analysis	Mitigation Check 1 - >10% of Historical:	2.0%	2.1%	2.2%	1.3%	-12.7%	-11.1%	-11.1%	-11.1%	-11.1%	-11.1%	-11.1%
	Mitigation Check 2: > 2 AF/T:	0.2	0.6	1.9	3.7	-0.7	-1.6	-1.9	-0.8	-0.5	-0.5	0.0
	Mitigation Check 3 - >10% of Total:	2.1%	6.4%	19.4%	61.6%	1.0%	2.9%	3.3%	1.5%	0.9%	0.8%	0.1%
	Mitigation Required?:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	Mitigation Vol. Req'd (ac-ft):	0.2	0.6	1.9	3.7	-0.7	-1.6	-1.9	-0.8	-0.5	-0.5	0.0
Transient State Analysis	Mitigation Check 1 - >10% of Historical:	2.0%	2.1%	2.3%	1.8%	-1.8%	-1.4%	-1.4%	-1.4%	-1.4%	-1.4%	-1.4%
	Mitigation Check 2: > 2.01 AF/T:	0.2	0.6	2.0	5.0	-0.1	-0.2	-0.2	-0.1	-0.1	-0.1	0.0
	Mitigation Required?:	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
	Mitigation Vol. Req'd (ac-ft):	0.2	0.6	2.0	5.0	-0.1	-0.2	-0.2	-0.1	-0.1	-0.1	0.0

9. Analyze the results using the ESPA Mitigation Analysis Spreadsheet (mitigation required).
Now let's work through an example with mitigation or adjustment required. For our new example, let's change the location of the TO WELL to the cell to Row 62 Column 167.



9.1. Click "Run Model," followed by "Get Output," then "Calculate Effects."
9.2. If you desire, view the graphical results. Inspect the GRAPHS BELOW MILNER and GRAPHS ABOVE MILNER tabs to look for depletion to various reaches of the Snake River. This is the modeler's initial opportunity to determine whether the depletion values align with any of the mitigation check questions.

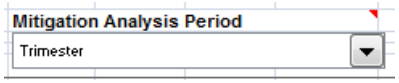




9.3. Copy the outlined data at the bottom of the "Calculated Effects" tab. Paste (paste special, values) it into the outlined area of the Mitigation Analysis Spreadsheet.

	Impact by Reach (AF/Trimester)										
	Ashton to Rexburg	Heise to Shelley	Shelley to Nr Blckft	Nr Blckft To Neeley	Neeley to Minidoka	Dev. Wbl. To Buhl	Buhl to Kspr	Kspr	Kspr to Malad	Malad	Malad to Bancroft
Pre-SS	9.42	28.22	85.95	274.78	5.18	14.79	16.81	7.46	4.71	4.31	0.27
Post-SS	11.11	248.69	65.19	121.46	0.72	2.29	2.60	1.15	0.73	0.67	0.04
Pre-TS	9.42	28.22	85.95	274.78	5.18	14.79	16.81	7.46	4.71	4.31	0.27
Post-TS	11.40	249.83	79.51	235.26	4.92	14.44	16.37	7.28	4.60	4.22	0.26

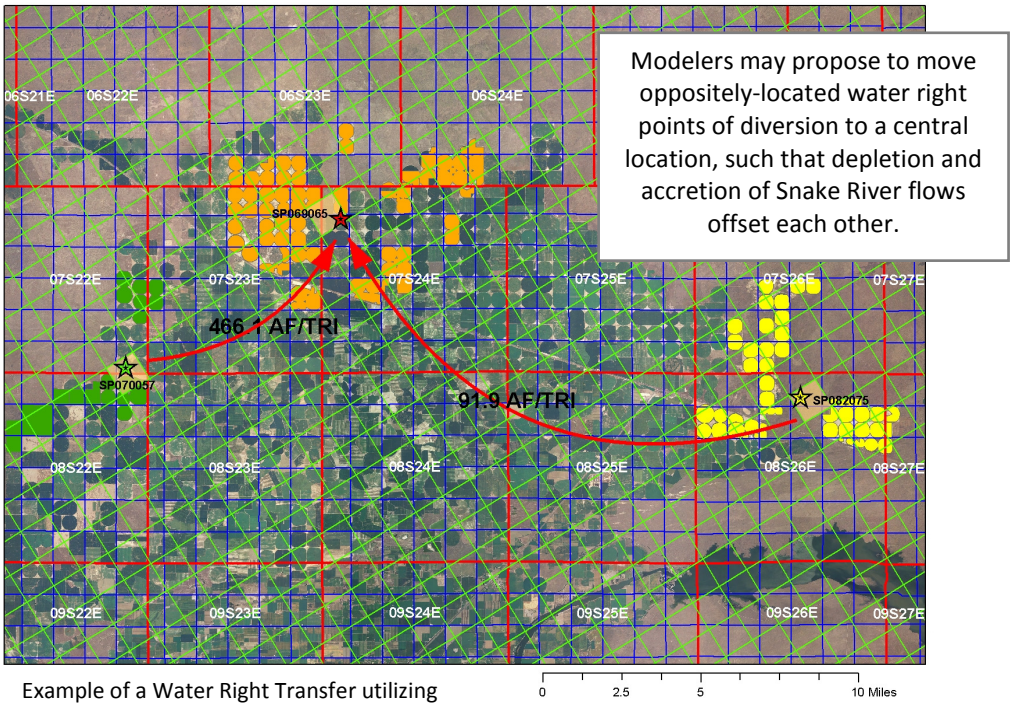
9.4. At the top of the Mitigation Analysis Spreadsheet, make sure the *Mitigation Analysis Period* is set to *Trimester*.



9.5. *Steady State/Transient State Analysis* boxes: Beneath the "Impact by Reach" box, the depletion values are broken out by Steady State Analysis and Transient State Analysis. Each state has multiple "mitigation checks," or tests to determine whether mitigation is necessary. Notice that in each of the analyses, one of the boxes is now illuminated in yellow, and notes *YES* to the mitigation requirement. Mitigation or adjustment is required because the increase in depletion in the *Heise to Shelley* reach meets all of the 'mitigation checks' in each of the steady state and transient state analyses.

Steady State Analysis	Mitigation Check 1 - >10% of Historical:	17.9%	781.3%	-24.2%	-55.8%	-86.2%	-84.5%	-84.5%	-84.5%	-84.5%	-84.5%	-84.5%
	Mitigation Check 2: > 2 AF/T:	1.7	220.5	-20.8	-153.3	-4.5	-12.5	-14.2	-6.3	-4.0	-3.6	-0.2
	Mitigation Check 3 - >10% of Total:	2.4%	54.7%	14.3%	26.7%	0.2%	0.5%	0.6%	0.3%	0.2%	0.1%	0.0%
	Mitigation Required?:	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO
	Mitigation Vol. Req'd (ac-ft):	1.7	220.5	-20.8	-153.3	-4.5	-12.5	-14.2	-6.3	-4.0	-3.6	-0.2
Transient State Analysis	Mitigation Check 1 - >10% of Historical:	21.0%	785.3%	-7.5%	-14.4%	-5.2%	-2.4%	-2.6%	-2.4%	-2.3%	-2.1%	-2.0%
	Mitigation Check 2: > 2.01 AF/T:	2.0	221.6	-6.4	-39.5	-0.3	-0.3	-0.4	-0.2	-0.1	-0.1	0.0
	Mitigation Required?:	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO
	Mitigation Vol. Req'd (ac-ft):	2.0	221.6	-6.4	-39.5	-0.3	-0.3	-0.4	-0.2	-0.1	-0.1	0.0

10. **When mitigation is necessary, determine how to proceed**. If your analysis reveals that mitigation is required to execute the transfer proposal, you will need to consider some methods to offset the calculated depletions to each Snake River reach. Each of the options below may allow the applicant to fulfill the mitigation volumes required and demonstrate that the transfer request meets the mitigation requirements. Modelers must mitigate the entire volume of each reach which requires mitigation, not just enough to meet a mitigation threshold.
    10.1. Using the information calculated, the modeler can now determine whether to (1) reduce the volume[5] of ground water being diverted at the *From Well* location to less than the proposed transfer amount, so that a re-model of the transfer proposal does not fail the tests, (2) seek to obtain and model additional water rights, (3) revise the transfer proposal to move oppositely-located water right points of diversion to a central location, (4) or utilize offsetting water right transfers.



Example of a Water Right Transfer utilizing oppositely located water rights (option 3)

[5] Generally, acres and rate do not have to be reduced unless injury or enlargement concerns are identified.

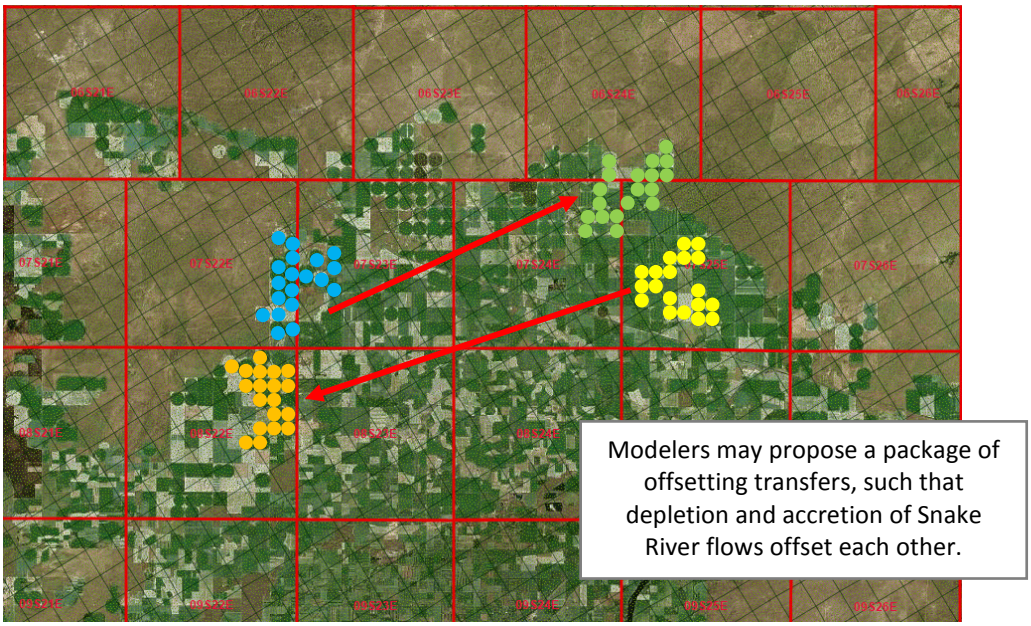
10.2. Offsetting transfers: An offsetting transfer package is the utilization of two or more water right transfers, typically a change in place-of-use to oppositely positioned locations, such that depletions of Snake River flows offset each other completely.

1) Model each transfer independently.

2) Identify reaches which require mitigation.

3) Each of those reaches must be fully mitigated in the offsetting transfer package.

4) Add the results of each transfer model run (pre- and post- SS and TS depletions) to confirm that each reach is fully mitigated by the offsetting transfer package.



11. Modeling Products to be Submitted with the Transfer Application:

11.1. Submit any tables or spreadsheets used to analyze the water rights before data entering them into the ESPA Model Transfer Spreadsheet.

11.2. Provide a copy or printout of the Data Entry sheet tab (this will require more than one page). In order to verify modeling submittals, water rights staff must be able to review the data entry for accuracy and completeness.

11.3. Provide a copy or printout of the Mitigation Analysis Spreadsheet (MAT Tool), including all of the tables utilized within the sheet.

Appendix A

Use of 'FROM WELL With Transfer' column as a TO WELL

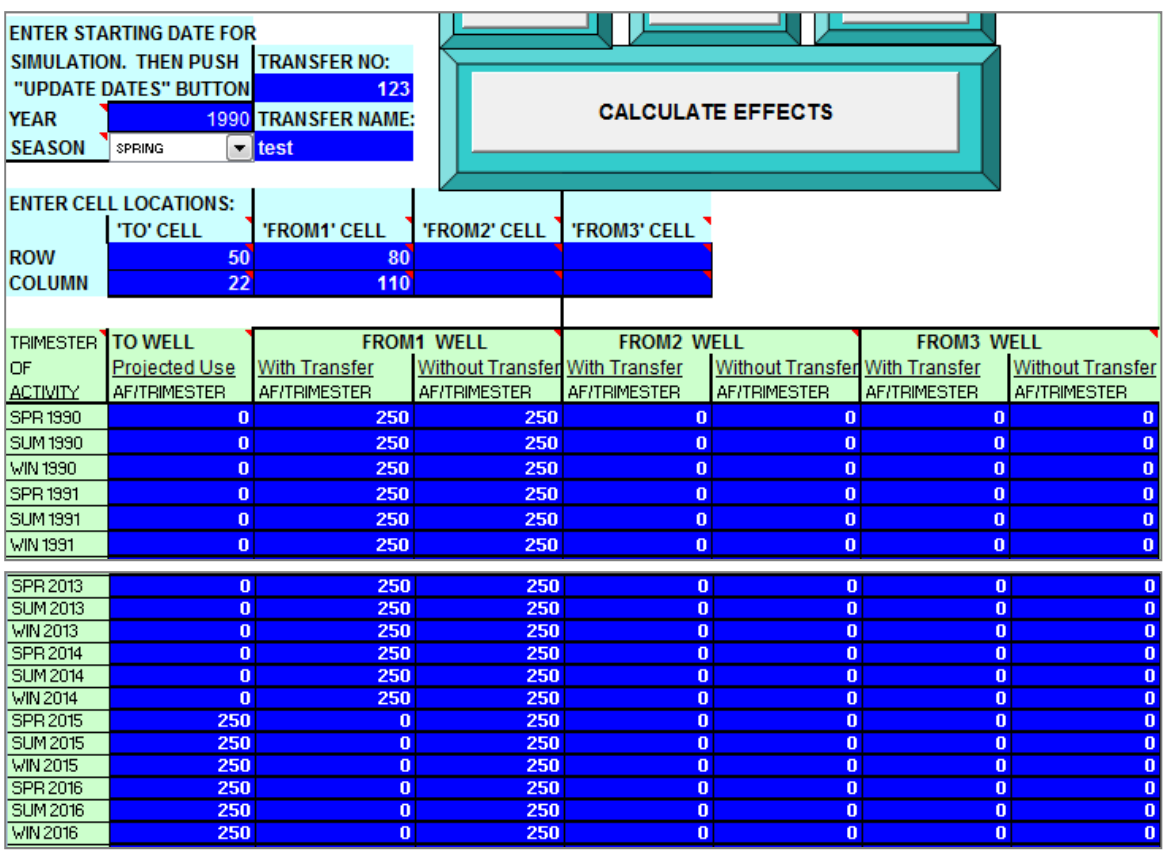
Scenario 1		Scenario 2		Scenario 3	
To Cell:		To Cell:		To Cell:	
Row	50	Row	52	Row	50
Column	22	Column	21	Column	22
				Row	52
				Column	21
From Cell:		From Cell:		From Cell:	
Row	80	Row	80	Row	80
Column	110	Column	110	Column	110

Modeling information regarding transfer:

A water right with a volume of 1500 acre-feet (500 ac-ft/trimester) is diverted from a well located in cell R80 C110 (from-well). A transfer application proposes to move the right and divert it from two to-wells located in cells R50 C22 and R52 C21. The diversion infrastructure at the new location is one interconnected system. For the purposes of this example, we should assume that each of the wells will be used 50% of the amount currently diverted at the to-well.

One method for calculating the total depletion values might be to model a transfer from R80 C110 to R50 C22 (scenario 1), then complete a separate model run of a transfer from R80 C110 to R52 C21 (scenario 2), and finally add the CalculatedEffects results. A second method to calculating the total depletions might be to utilize a "FROM WELL With Transfer" column as a TO WELL column, in order to reduce the number of model runs required.

Scenario 1 Data Entry:



Scenario 1 Calculated Effects:

Enter First Time Step of Transfer:	SPR 2015											
Match:	76		Match:	456								
	AtR	HtS	StNB	NBtN	NtM	DWtB	BtTS	TS	TStM	M	MtB	Total
Preexisting Effects @ SS (Last Time Step):	5.29	15.84	48.26	153.22	2.48	7.16	8.14	3.61	2.28	2.09	0.13	248.49
ady State - Value of Dep. @ Last Time Step:	0.69	2.00	5.99	18.97	1.03	51.13	83.59	36.11	22.42	19.87	1.21	243.01
ts @ Transient State (Max Value Timestep):	5.29	15.84	48.26	153.22	2.48	7.16	8.14	3.61	2.28	2.09	0.13	248.49
nt State - Max. Value of Dep. After Transfer:	4.29	14.18	40.63	123.89	2.28	51.51	84.00	36.27	22.52	19.92	1.21	400.71
Steady State Change:	-4.60	-13.83	-42.27	-134.24	-1.45	43.97	75.45	32.49	20.14	17.78	1.08	
Transient State Change:	-0.99	-1.66	-7.63	-29.32	-0.20	44.35	75.86	32.66	20.24	17.84	1.08	

Scenario 2 Data Entry:

ENTER STARTING DATE FOR SIMULATION. THEN PUSH "UPDATE DATES" BUTTON

YEAR: 1990

SEASON: SPRING

TRANSFER NO: 123

TRANSFER NAME: test

CALCULATE EFFECTS

ENTER CELL LOCATIONS:

	'TO' CELL	'FROM1' CELL	'FROM2' CELL	'FROM3' CELL
ROW	52	80		
COLUMN	21	110		

TRIMESTER OF ACTIVITY	TO WELL Projected Use AF/TRIMESTER	FROM1 WELL With Transfer AF/TRIMESTER	FROM1 WELL Without Transfer AF/TRIMESTER	FROM2 WELL With Transfer AF/TRIMESTER	FROM2 WELL Without Transfer AF/TRIMESTER	FROM3 WELL With Transfer AF/TRIMESTER	FROM3 WELL Without Transfer AF/TRIMESTER
SPR 1990	0	250	250	0	0	0	0
SUM 1990	0	250	250	0	0	0	0
WIN 1990	0	250	250	0	0	0	0
SPR 1991	0	250	250	0	0	0	0
SUM 1991	0	250	250	0	0	0	0
WIN 1991	0	250	250	0	0	0	0
SPR 2013	0	250	250	0	0	0	0
SUM 2013	0	250	250	0	0	0	0
WIN 2013	0	250	250	0	0	0	0
SPR 2014	0	250	250	0	0	0	0
SUM 2014	0	250	250	0	0	0	0
WIN 2014	0	250	250	0	0	0	0
SPR 2015	250	0	250	0	0	0	0
SUM 2015	250	0	250	0	0	0	0
WIN 2015	250	0	250	0	0	0	0
SPR 2016	250	0	250	0	0	0	0
SUM 2016	250	0	250	0	0	0	0
WIN 2016	250	0	250	0	0	0	0

Scenario 2 Calculated Effects:

Enter First Time Step of Transfer:	SPR 2015											
Match:	76		Match:	456								
	AtR	HtS	StNB	NBtN	NtM	DWtB	BtTS	TS	TStM	M	MtB	Total
Preexisting Effects @ SS (Last Time Step):	5.29	15.84	48.26	153.22	2.48	7.16	8.14	3.61	2.28	2.09	0.13	248.49
ady State - Value of Dep. @ Last Time Step:	0.74	2.16	6.46	20.47	1.11	73.83	71.41	30.34	18.77	16.67	1.02	242.97
ts @ Transient State (Max Value Timestep):	5.29	15.84	48.26	153.22	2.48	7.16	8.14	3.61	2.28	2.09	0.13	248.49
nt State - Max. Value of Dep. After Transfer:	4.29	14.18	40.63	123.90	2.28	74.08	71.67	30.44	18.83	16.70	1.02	398.02
Steady State Change:	-4.55	-13.68	-41.80	-132.75	-1.37	66.67	63.27	26.72	16.49	14.58	0.89	
Transient State Change:	-0.99	-1.66	-7.63	-29.32	-0.20	66.92	63.53	26.83	16.55	14.61	0.89	

Scenario 3 Data Entry:

Note that this modeling scenario is intended to combine the impacts of Scenarios 1 and 2 into one model run. The 'FROM2 WELL With Transfer' column will be used as a TO WELL column.

ENTER STARTING DATE FOR SIMULATION. THEN PUSH "UPDATE DATES" BUTTON		TRANSFER NO:	123
YEAR	1990	TRANSFER NAME:	test
SEASON	SPRING		

CALCULATE EFFECTS

ENTER CELL LOCATIONS:	'TO' CELL	'FROM1' CELL	'FROM2' CELL	'FROM3' CELL
ROW	50	80	52	
COLUMN	22	110	21	

TRIMESTER OF ACTIVITY	TO WELL Projected Use AF/TRIMESTER	FROM1 WELL With Transfer AF/TRIMESTER	FROM1 WELL Without Transfer AF/TRIMESTER	FROM2 WELL With Transfer AF/TRIMESTER	FROM2 WELL Without Transfer AF/TRIMESTER	FROM3 WELL With Transfer AF/TRIMESTER	FROM3 WELL Without Transfer AF/TRIMESTER
SPR 1990	0	500	500	0	0	0	0
SUM 1990	0	500	500	0	0	0	0
WIN 1990	0	500	500	0	0	0	0
SPR 1991	0	500	500	0	0	0	0
SUM 1991	0	500	500	0	0	0	0
WIN 1991	0	500	500	0	0	0	0
SPR 2013	0	500	500	0	0	0	0
SUM 2013	0	500	500	0	0	0	0
WIN 2013	0	500	500	0	0	0	0
SPR 2014	0	500	500	0	0	0	0
SUM 2014	0	500	500	0	0	0	0
WIN 2014	0	500	500	0	0	0	0
SPR 2015	250	0	500	250	0	0	0
SUM 2015	250	0	500	250	0	0	0
WIN 2015	250	0	500	250	0	0	0
SPR 2016	250	0	500	250	0	0	0
SUM 2016	250	0	500	250	0	0	0
WIN 2016	250	0	500	250	0	0	0

Scenario 3 Calculated Effects:

Note that the Scenario 3 Calculated Effects are equivalent to the sum of the Scenario 1 and 2 Calculated Effects.

Enter First Time Step of Transfer: SPR 2015

Match: 76 Match: 456

	AtR	HtS	StNB	NBtN	NtM	DWtB	BtTS	TS	TStM	M	MtB	Total
Preexisting Effects @ SS (Last Time Step):	10.57	31.67	96.52	306.44	4.96	14.32	16.28	7.23	4.56	4.17	0.26	496.98
ady State - Value of Dep. @ Last Time Step:	1.43	4.16	12.45	39.44	2.15	124.96	155.00	66.45	41.19	36.54	2.23	485.99
ts @ Transient State (Max Value Timestep):	10.57	31.67	96.52	306.44	4.96	14.32	16.28	7.23	4.56	4.17	0.26	496.98
nt State - Max. Value of Dep. After Transfer:	8.59	28.36	81.26	247.79	4.56	125.58	155.66	66.71	41.35	36.62	2.23	798.70
Steady State Change:	-9.15	-27.51	-84.08	-266.99	-2.82	110.64	138.72	59.22	36.63	32.36	1.97	
Transient State Change:	-1.98	-3.31	-15.26	-58.64	-0.41	111.26	139.38	59.48	36.79	32.45	1.97	