The Potential Application of Additional Surface Water to Irrigated Lands Having Both Surface-water and Ground-water Irrigation Rights, to Benefit the Eastern Snake Plain Aquifer:

Soft Conversions

Prepared by Idaho Water Resources Research Institute
In fulfillment of Task 4
of Contract # CON00762
TECHNICAL ASSISTANCE FOR EASTERN SNAKE PLAIN AQUIFER
COMPREHENSIVE AQUIFER MANAGEMENT PLAN STUDIES

for
The Idaho Water Resource Board
and
The Idaho Department of Water Resources

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EXECUTIVE SUMMARY

Overlying the Eastern Snake Plain Aquifer are irrigated lands that nominally have both surface-water and ground-water irrigation rights, but physically are supplied only by ground water. Of these lands, about 53,000 acres could be converted to again receive surface-water supplies from the Snake River. All water delivered to such conversions is beneficial to the aquifer, either by reducing extraction or by increasing incidental recharge. All water delivered to conversions enjoys the legal status of irrigation water.

Data indicate that the infrastructure requirements to convert these 53,000 acres would cost approximately $15,000,000. About 30% of the benefit could be realized by converting only the sites that need just a pumping plant, at a cost of approximately $3,000,000.

Average benefit to the aquifer would be approximately 90,000 acre feet per year if supplies were made available through June. If supplies were available for the full irrigation season, the average benefit would be nearly 170,000 acre feet per year.

INTRODUCTION

The Idaho Water Resource Board is preparing a Comprehensive Aquifer Management Plan for the Eastern Snake Plain Aquifer. As part of the data-gathering process for preparation of the plan, the Board and its advisory group have requested an evaluation of the potential to benefit the aquifer by delivering additional surface water to lands that currently have both a surface-water and a ground-water irrigation water right. This practice has been called "soft conversions." Soft conversions are attractive on a practical basis because most of the infrastructure to deliver surface water to the parcels may already be in place. They are attractive administratively because surface-water irrigation rights, often with relatively senior priority dates, are already in place. The legal authority and ability to deliver water to these lands is more certain than for other uses of water that may benefit the aquifer.

When additional surface water is delivered to soft conversions, the benefit is essentially doubled; the first benefit is that ground-water pumping for irrigation is reduced, and the second benefit is that incidental recharge from surface-water irrigation is increased. There are only four possible fates for water that is delivered to soft conversions:

1. Replace incidental recharge to the aquifer that was formerly supplied from ground water.
2. Increase incidental recharge in the canal system between the river and the field.
3. Replace consumptive use that was formerly supplied by ground water.
4. Replace overland (field runoff) return flows of irrigation water to the river that formerly were supplied from ground water.

The first two effects benefit the aquifer by providing infiltration that would not otherwise have occurred. The second two effects benefit the aquifer by reducing extractions that otherwise would have occurred. All four effects benefit the aquifer on an acre-foot per acre-foot basis, so that all additional surface-water diversions for soft conversions are essentially 100% beneficial to the aquifer.[1]

QUESTIONS CONSIDERED BY THE STUDY

The study addressed four fundamental questions:

1. How many of these mixed-source parcels (parcels with both surface-water and ground-water rights) are actually supplied only from ground water?
2. What is the degree and cost of infrastructure improvement needed to deliver surface water from existing canals to these parcels?
3. Is there capacity in the canal systems to bring additional surface water to the soft conversions?
4. What is the magnitude of benefit that could be realized, if supplies were to be identified and made available?

A companion study[2] performed for Idaho Department of Water Resources (IDWR) in support of the Eastern Snake Plain Aquifer Model addressed additional mixed-source-lands questions.

[1] If soft conversions were supplied by "stretching" existing surface-water supplies (perhaps by efficiency gains or canal lining) *without increasing diversions from the river,* there would be no net benefit to the aquifer. The reduction in pumping would be offset exactly by a reduction in incidental recharge.
[2] (IWRRI, 2008)

METHODS

Potential sites and infrastructure requirements

A random statistical sample of 300 nominally mixed-source parcels was selected from the Eastern Snake Plain Aquifer model data and evaluated for purposes of the IDWR modeling study (IWRRI, 2008). For this soft-conversions study, a sub-sample of more than 50 parcels was evaluated more carefully with field inspection to determine how many parcels could be converted to receive additional surface water, and what infrastructure improvements would be needed. Only parcels with physical access to Snake River water were field inspected. IDWR engineering staff provided cost estimates for these infrastructure improvements (VanGreuningen, 2008). Figure 1 shows the sites investigated with GIS and office review of water rights, as well as the field-inspected subset.

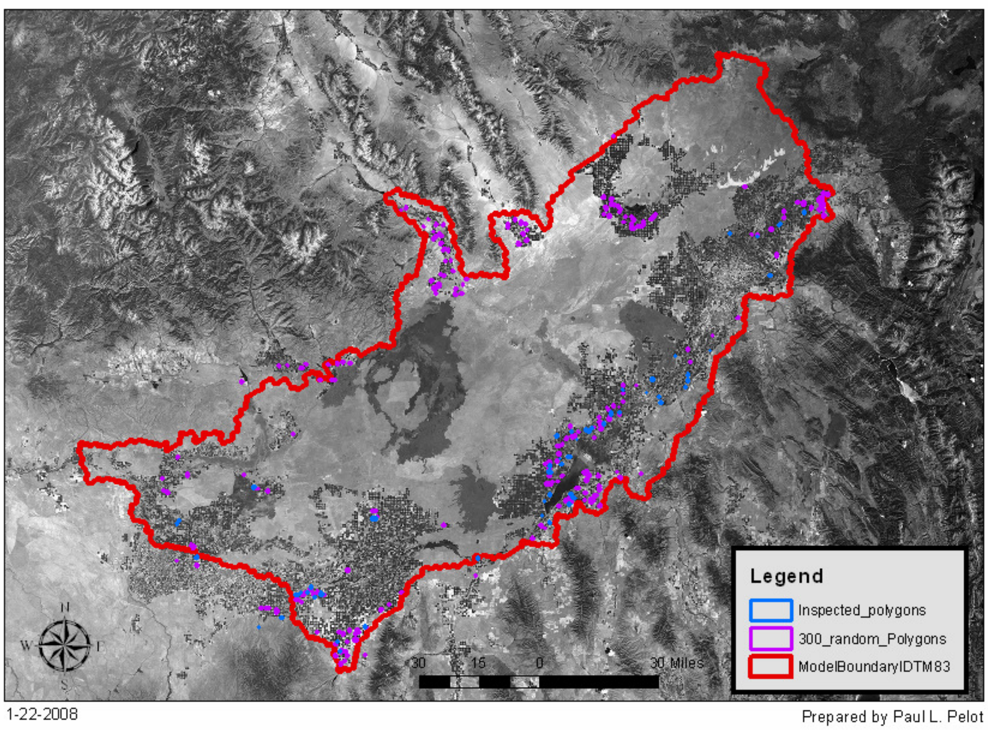


Figure 1. Statistical-sampling polygons and field sub sample.

Delivery capacity

The capacity question was addressed by evaluating historical diversion records for irrigation entities diverting from the Snake River to lands overlying the Eastern Snake Plain Aquifer (IDWR, 2007). It was assumed that the monthly capacity of a canal system is the volume delivered in months of highest diversion volume. Figure 2 shows a typical canal record, showing the highest-month diversion volume for each year of the record.

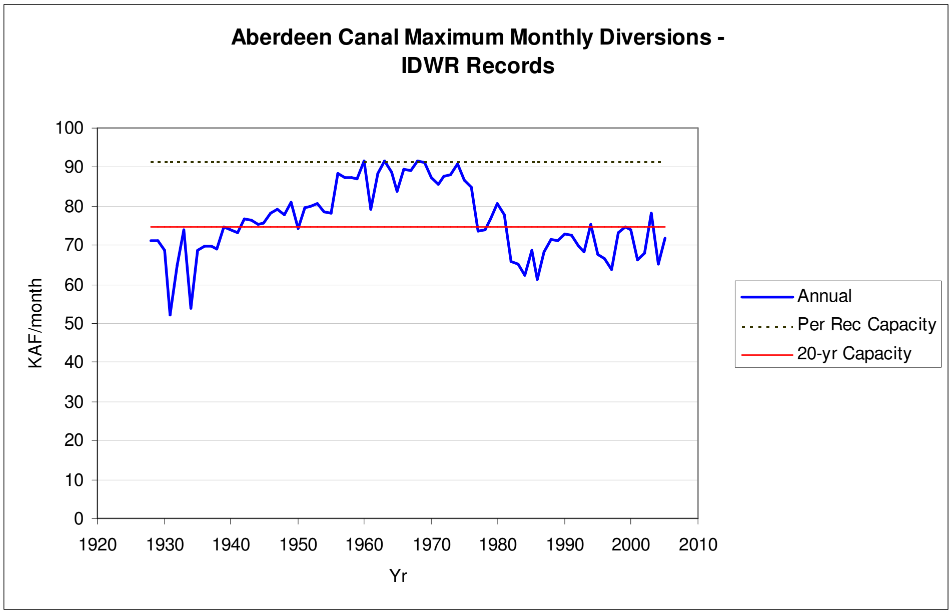


Figure 2: Typical record of maximum monthly diversion volume for each year in the period of record. The "Per Rec" (period of record) capacity is based on the third-highest monthly observation in the period of record and the "20-yr" capacity is based on the third-highest monthly observation after 1984. *The reader is cautioned that this is NOT a display of annual diversion volume.*

For some reason (perhaps a change in data gathering and reporting or an actual decline in diversions of surface water), data for many canals show a marked reduction in maximum deliveries sometime in the 1970s or early 1980s. Therefore, the calculation of maximum capacity was based only on years after 1984. To avoid an overly-optimistic estimate based on one or two anomalous months, the capacity of each canal was assumed to be represented by the third-highest month in the data from 1985 through 2006. Available capacity to deliver water to soft conversions (or other aquifer-enhancing activities) was represented by subtracting each month's diversions in this period from the maximum capacity.

Capacity estimates were verified by submitting the data and estimates to managers for comments, for the largest canal in each of the modeling project "irrigation entities." Twenty six questionnaire letters were distributed to canal managers.

Potential magnitude of benefit

The potential benefit to the aquifer of soft conversions is limited by several factors, including:

1. Available water supplies.
2. Convertible parcels.
3. Conveyance capacity to deliver water to convertible parcels.
4. Irrigation requirement on convertible parcels (based on crops, evapotranspiration requirement and irrigation method).

The availability of supply is considered in work performed for the Idaho Water Resource Board by other investigators and not discussed in this report. Investigations of the extent of convertible lands and conveyance capacity are described above.

The final limitation is the irrigation requirement, investigated using Eastern Snake Plain Aquifer Model version 1.1 (ESPAM1.1) data files. In these files, groups of canals with similar diversion and return flow characteristics are represented as "irrigation entities," illustrated in Figure 3. Irrigation requirements were considered for irrigation entities served from the Snake River, Henrys Fork, and Teton River. Additional information on surface-water entities is available in the report "Aggregation of Surface-water Canal Companies Into Surface-water Irrigation Entities" (Gilliland, 2002).

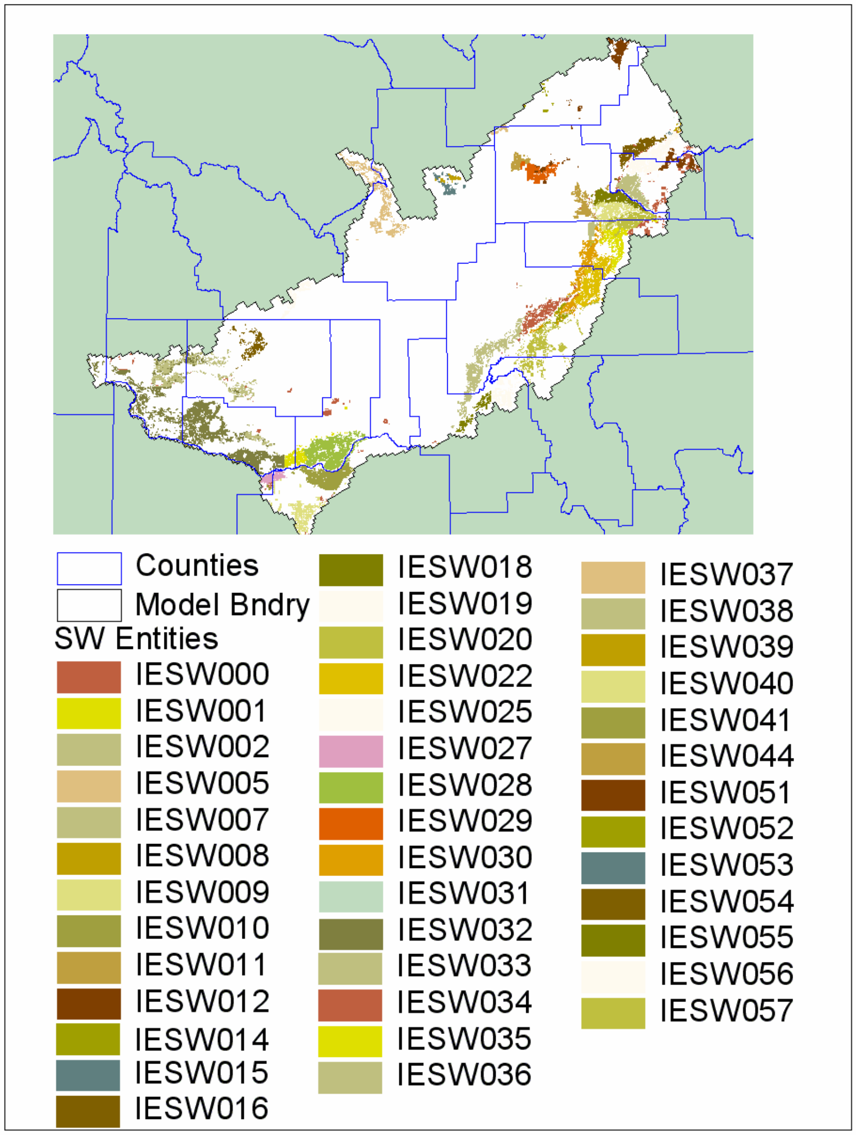


Figure 3. Surface-water irrigation entities from ESPAM1.1 data files. The appendix contains more detailed maps of individual entities.

The location of convertible parcels was based on the ESPAM1.1 representation of mixed-source lands shown in Figure 4[3]. Mixed-source parcels (parcels with both ground-water and surface-water rights) nearest irrigation wells were identified as likely to be physically supplied from ground water only, and total convertible acreage in each entity was calculated as the product of (ground-water-only acres) times (potential conversion fraction).

[3] See IWRRI (2008) for discussion of updates to this map.

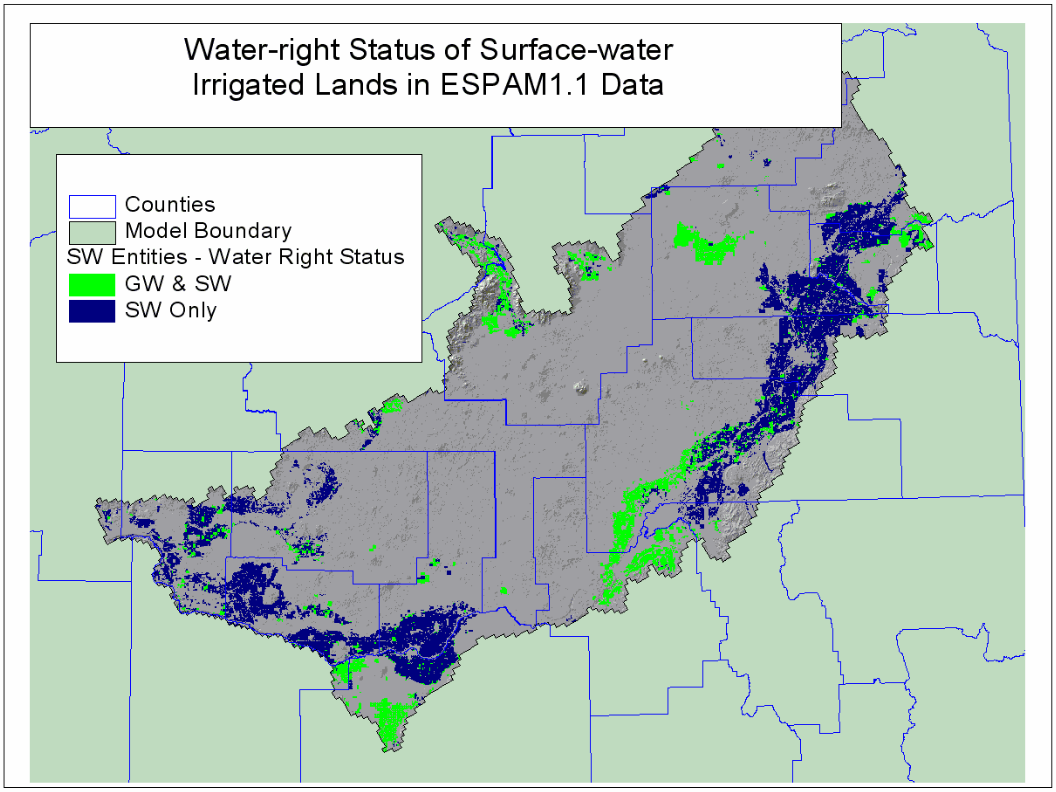


Figure 4. Water-right status of irrigated lands served by surface water.

The requirement for conversion supply was based upon the monthly evapotranspiration (ET) depth required to produce a hypothetical crop mix of one-half alfalfa, one-fourth potatoes and one-fourth barley. Monthly AGRIMET (citation) ET depths for these crops were obtained for the Aberdeen, Idaho station and applied to all irrigation entities. Total evapotranspiration requirement for each entity was simply the product of the convertible acres in the entity and the monthly ET depth. Total *delivery* requirement was the evapotranspiration requirement divided by estimated irrigation efficiency.

For each entity, for each month, the available excess supply was compared to the delivery requirement. For this comparison, a low efficiency (50%) was used to be sure that delivery requirement was not underestimated, which could have produced an overly-optimistic view of the ability of canals to deliver required volumes of water. For each entity, for each month, the percentage of the requirement for conversions that could be satisfied was calculated using the requirement and the capacity values.

To calculate the total potential magnitude of benefit, a higher efficiency (70%) was used to determine the volumes of surface water that would be required for conversions. This produced a lower required volume and therefore a lower net benefit to the aquifer. This assured that the potential benefit was not overestimated or over-represented. For each month, this more conservative (lower) potential benefit volume was multiplied by the fraction of deliveries that could be met, given capacity limitations.

RESULTS

Number of sites that currently have access to surface-water supplies

Field inspection and water-right paper files indicate that across the plain, few nominally mixed-source parcels actually have infrastructure for delivery of both surface water and ground water.[4] Most of those that do are concentrated in the Mud Lake area and in areas served by exchange wells that deliver ground water to the Teton River, replacing river water that has been pumped to the mixed-source irrigated lands. Figure 5 shows the proportion of lands supplied from each source for the 47 inspected parcels for which a determination could be made.[5] About half the inspected parcels (surface-water-only parcels) already receive virtually all their supply from surface water. The other half (the ground-water-only parcels and the truly mixed-source parcels) are potentially eligible for delivery of additional surface water.

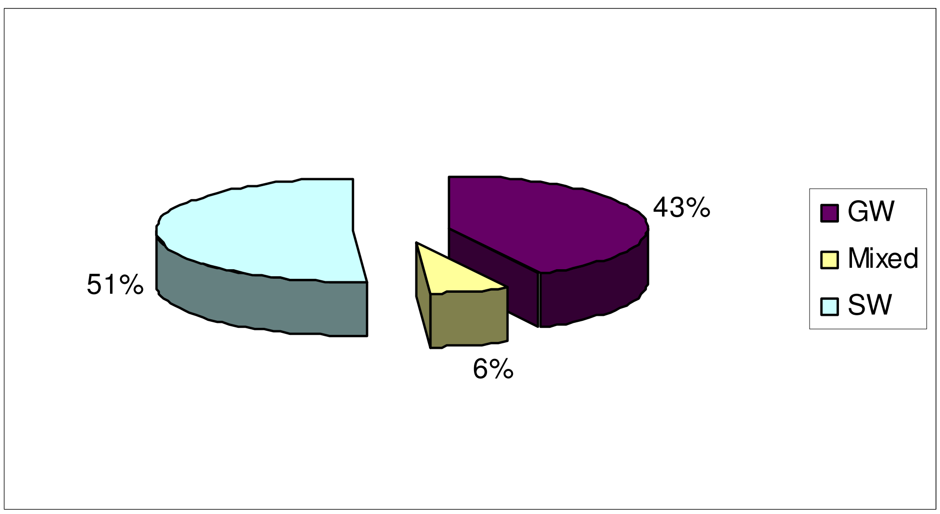


Figure 5. Physical-source determination of field inspected parcels.

[4] Some parcels are supplied only from a canal, but the canal company or irrigation district does pump some water from wells into the canal. It is believed that ground water is only a small portion of the total supply. While these parcels actually do receive some ground water, for the purposes of this study they were classified as surface-water-only supplied.

[5] A total of 54 sites were inspected, and actual physical source of water was determined on 47 of these.

Improvements needed to deliver surface water to parcels.

Of the parcels that are physically supplied by ground water, about 1/3 were determined to be impractical to convert due to the distance to existing surface-water delivery structures, rolling terrain that would preclude ditch construction, or right-of-way issues. The remainder of these parcels all required the installation of a surface-water pump and motor. Figure 6 shows the number of improvements needed beyond pump and motor.

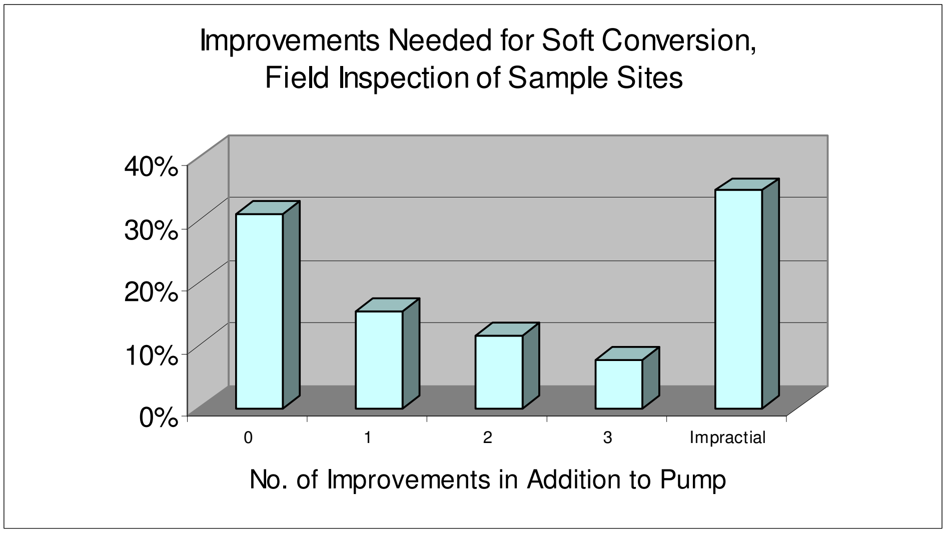


Figure 6. Number of improvements needed (in addition to pump and motor) for mixed-source parcels that currently have only ground-water infrastructure.

The additional improvements needed were three-phase power lines, ditches, and pressurized pipelines. For some sites, one or more of these other improvements were needed because the best location for the surface-water pump was not at the same location as the existing well pump. Figures 7, 8 and 9 show histograms of the amount of each improvement needed for the various inspected sites. There did not appear to be a strong correlation between the different improvements (need for a pipeline did not necessarily imply need for a ditch or powerline), though this was not tested statistically.

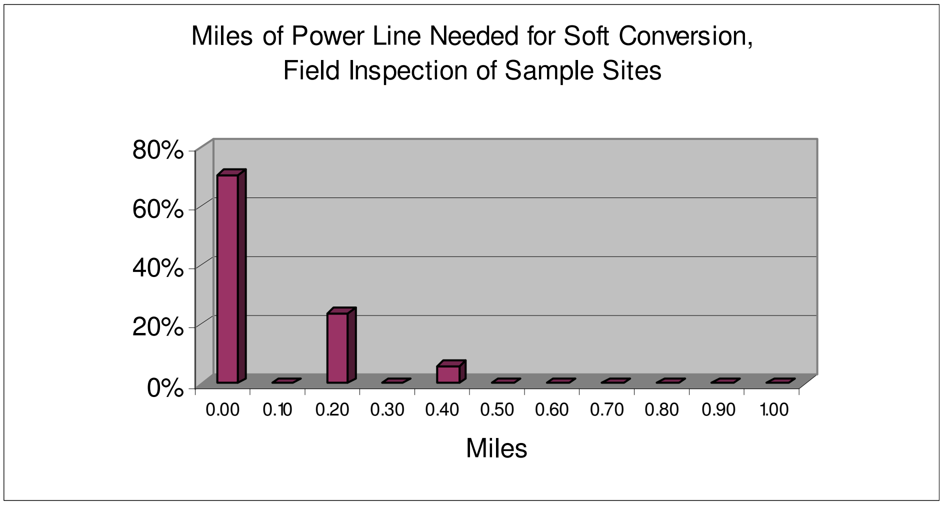


Figure 7. Histogram of three-phase power line requirements.

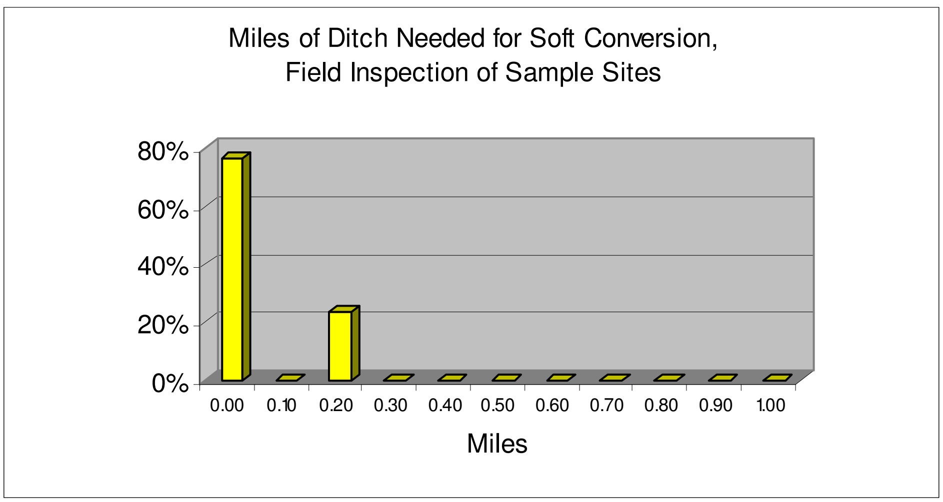


Figure 8. Histogram of ditch construction requirements.

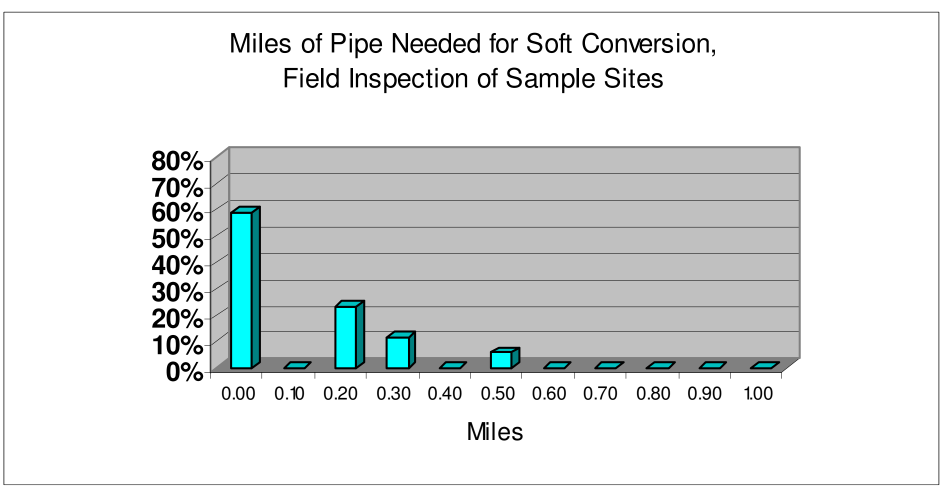


Figure 9. Histogram of buried pipeline requirements.

Sites were subjectively rated as low, medium, or high potential for conversion. Assuming that only the medium- and high-potential sites would be converted to receive additional surface-water supplies, the total convertible acreage with access to Snake River water[6] is approximately 53,000 acres. Assuming an average parcel size of 130 acres (the size of a 1/4-mile center-pivot), there are approximately 410 parcels to be converted. Applying the data shown in the figures to 410 parcels, an estimate was made of the total infrastructure improvements needed. These are shown in Table 1. Costs are based upon per-site or per-mile estimates (Please see appendix and VanGreuningen, 2008).

Table 1
Infrastructure Improvements Needed
for Soft Conversion of 53,000 Acres (410 sites)
Within the Eastern Snake Plain Aquifer

Improvement	Number	Approximate Cost
Pumping plant	410	$9,060,000
3-phase power line	29 miles	$3,220,000
Earthen ditch	19 miles	$150,000
Buried pipeline	46 miles	$2,470,000
Total cost		$14,900,000
Average cost/site		$36,500

A possible implementation strategy might be to first convert the approximately 125 sites that need only a pumping plant, at a cost of under $3,000,000. This would provide about 30% of the total potential benefit. After more experience with soft conversions, converting additional sites could be considered.

Potential benefit

The potential benefit is limited by available supplies of surface water, number of convertible parcels, irrigation requirement, and canal capacity. The fraction of convertible parcels has already been discussed above, and other investigators are studying availability of supply.

Irrigation Requirement. Based on the findings shown in Figure 4, the physically ground-water only parcels and physically mixed-source parcels are approximately one-half of the parcels that nominally have both surface-water and ground-water rights. This is compatible with data from the larger sample

[6] In the case of the Teton River, this access is via exchange with upper-valley reservoir storage. Per Tony Olenichak of Water District 01 (2008), many of the nominally mixed-source lands that are served by pumping from the Teton River are sometimes supplied by exchange with upper-valley storage water, rather than with ground water. This indicates that there is adequate flow in the Teton to support exchanges to facilitate soft conversions.

considered in the companion study (IWRRI, 2008). Of these, many could reasonably be converted to receive supplemental surface water when available. Medium- and high-potential convertible acreage per entity is shown in Table 2.

Table 2
Soft-conversion Convertible Acres
by Surface-water Irrigation Entity

Entity	Acres	Entity	Acres	Entity	Acres
IESW001	112	IESW018	4,317	IESW034	4,924
IESW002	19,020	IESW019	2,471	IESW035	448
IESW007	3,310	IESW020	495	IESW036	623
IESW009	555	IESW022	2,627	IESW038	60
IESW010	1,976	IESW027	932	IESW039	280
IESW011	302	IESW028	634	IESW055	241
IESW012	1,508	IESW030	1,562	IESW056	762
IESW014	753	IESW031	0		
IESW015	0	IESW032	4,157		
IESW016	695	IESW033	72		

The other component of irrigation requirement is the evapotranspiration required for growing crops. Figure 10 illustrates the monthly irrigation requirement used for this study.

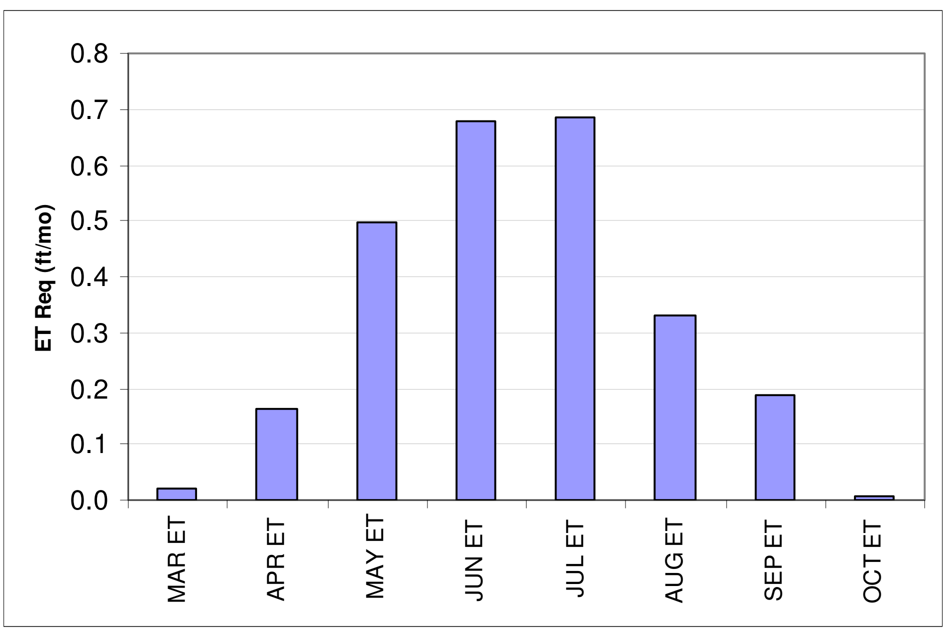


Figure 10. Evapotranspiration used to calculate irrigation requirement, from AGRIMET Alfalfa, potato and barley ET for 2006 at Aberdeen.

Canal capacity to deliver surface water. Figure 11 shows the combined capacity of canals to deliver additional surface water beyond historical deliveries. Charts for individual entities are found in the Appendix. This available capacity would need to serve not only soft conversions, but also other new uses of water such as managed recharge.

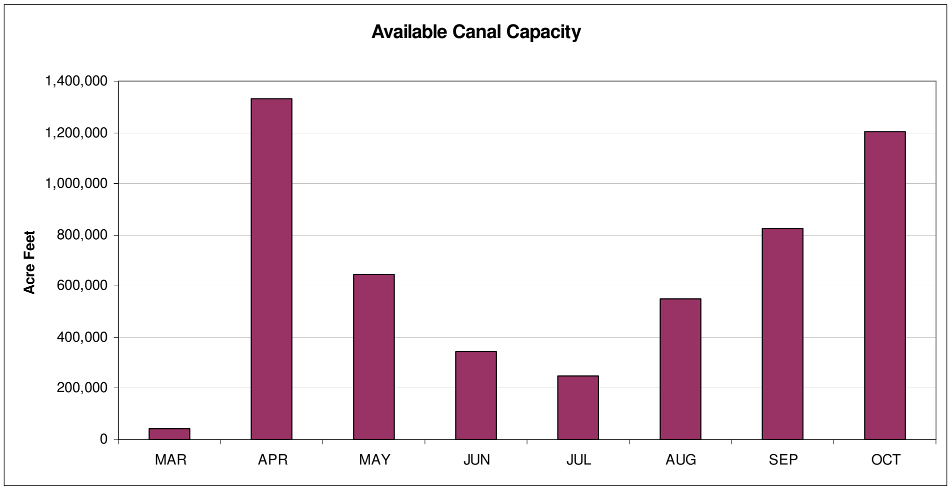


Figure 11. Average excess canal capacity in Snake River entities, acre feet per month.

Combined conversion potential. The first step in determining the total conversion potential was to identify periods of time when the available canal capacity would be limiting. Table 3 shows the percent of requirement for conversion acres that can be served by average available excess canal capacity. The requirement was calculated at 50% efficiency, which biases results conservatively towards indicating a capacity limitation. The charts in the appendix show that for many entities, the minimum excess capacity for some months is quite low. This indicates that for most soft conversions, at times irrigation might still need to be supplied from ground water, even if average capacities were adequate. Even if a well must be run during parts of June and July, great benefit to the aquifer still occurs if surface water can be delivered to the parcel in earlier periods.

Table 3
Average Percentage of Irrigation Requirement
for Soft Conversions that Can Be Served
With Available Unused Canal Capacity

Entity	Apr	May	Jun	Jul	Aug	Sep	Oct
IESW001	100%	100%	100%	100%	100%	100%	100%
IESW002	100%	100%	***37%***	***27%***	100%	100%	100%
IESW007	100%	100%	100%	100%	100%	100%	100%
IESW009	100%	100%	100%	100%	100%	100%	100%
IESW010	100%	100%	100%	100%	100%	100%	100%
IESW011	100%	100%	100%	100%	100%	100%	100%
IESW012	100%	100%	100%	100%	100%	100%	100%
IESW014	100%	100%	100%	100%	100%	100%	100%
IESW015	N/A	N/A	N/A	N/A	N/A	N/A	N/A
IESW016	100%	100%	100%	100%	100%	100%	100%
IESW018	100%	100%	***31%***	***27%***	100%	100%	100%
IESW019	100%	100%	100%	100%	100%	100%	100%
IESW020	100%	100%	100%	100%	100%	100%	100%
IESW022	100%	100%	100%	100%	100%	100%	100%
IESW027	100%	100%	100%	100%	100%	100%	100%
IESW028	100%	100%	100%	100%	100%	100%	100%
IESW030	100%	100%	100%	100%	100%	100%	100%
IESW031	N/A	N/A	N/A	N/A	N/A	N/A	N/A
IESW032	100%	100%	100%	100%	100%	100%	100%
IESW033	100%	100%	100%	100%	100%	100%	100%
IESW034	100%	100%	100%	100%	100%	100%	100%
IESW035	100%	100%	100%	100%	100%	100%	100%
IESW036	100%	100%	100%	100%	100%	100%	100%
IESW038	100%	100%	100%	100%	100%	100%	100%
IESW039	100%	100%	100%	100%	100%	100%	100%
IESW055	100%	100%	100%	100%	100%	100%	100%
IESW056	100%	100%	100%	100%	100%	100%	100%

The second step in determining conversion potential was to combine the convertible acres in Table 1, the ET requirement in Figure 9, and the capacity limitations in Table 2. In this case, total irrigation requirements were calculated at 70% efficiency. This is more conservative in that it results in calculation of lower delivery to conversions (and hence lower benefit to the aquifer) than would have been calculated at 50% efficiency. The conservative calculation also results in an automatic safety margin for the capacity limitations of Table 2 (the table is more restrictive than it would have been if calculated at 70%).

Figure 12 illustrates the combined average delivery to soft conversions (and hence the average benefit to the aquifer) as constrained by convertible acres, irrigation requirement, and canal capacity limitations. Figure 13 illustrates the spatial distribution of the benefit that would accrue to the aquifer from soft conversions.

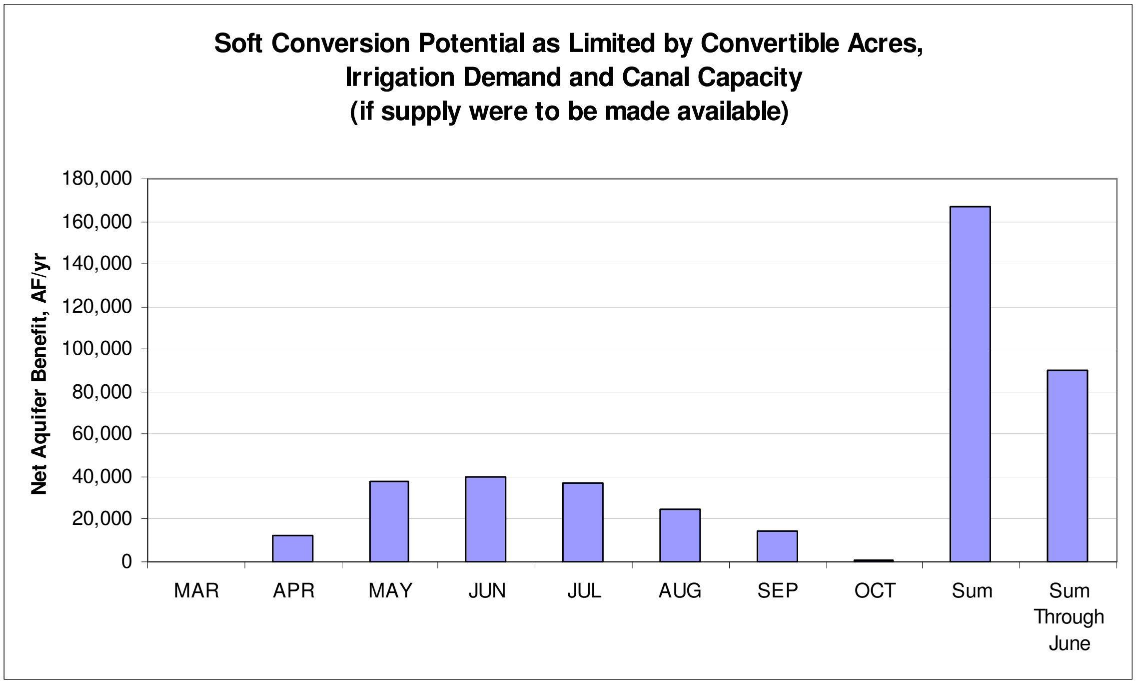


Figure 12. Average benefit to the aquifer of soft conversions, as limited by constraints.

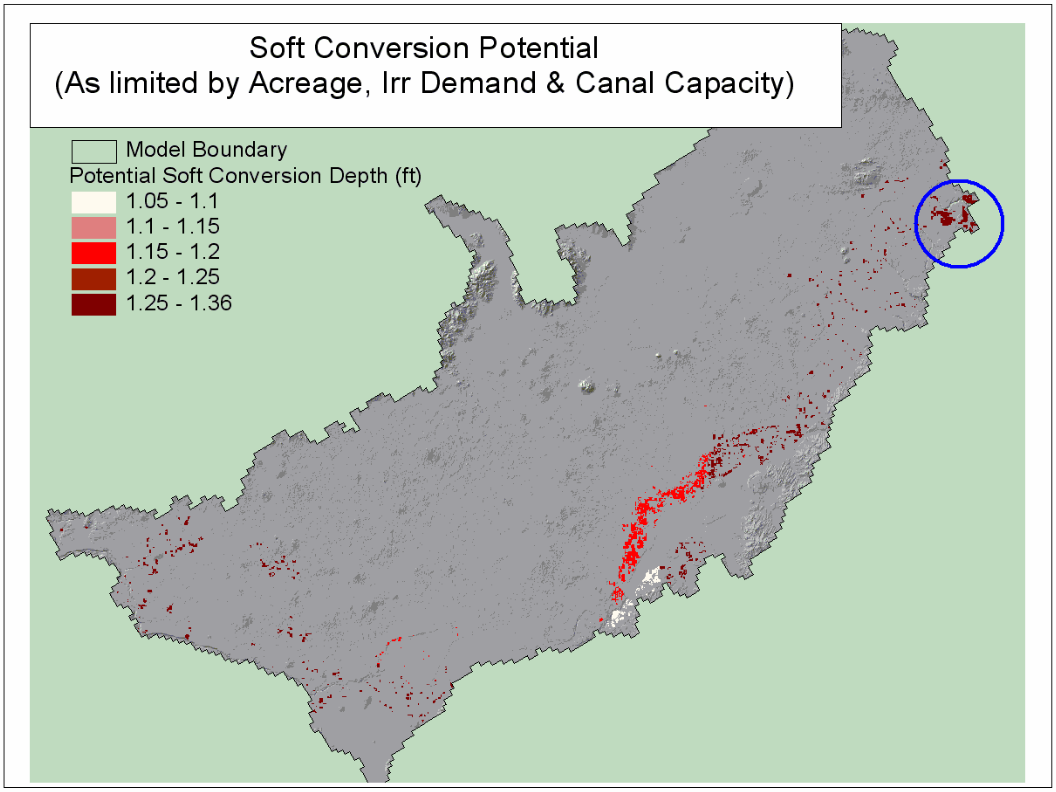


Figure 13. Spatial distribution of soft conversion benefit (in feet of depth per year) based on average excess canal capacity, irrigation requirement, and convertible acres. The blue circled area is the area served by exchange pumps from the Teton River; conversions there would depend on adequate flow in the Teton River to support exchange with Snake River supplies that may be made available for soft conversions.

Interference with managed recharge. One concern with soft conversions is that there may be competition for available canal capacity with managed recharge or other activities designed to also benefit the aquifer. Figure 14 compares the calculated excess canal capacity with the requirements for soft conversions. The red bracket indicates April capacity that would not be used by soft conversions and could be made available for other purposes. As individual managed-recharge projects and soft-conversions are considered, this analysis should be repeated for the individual canals affected; Figure 14 is only an aggregate comparison.

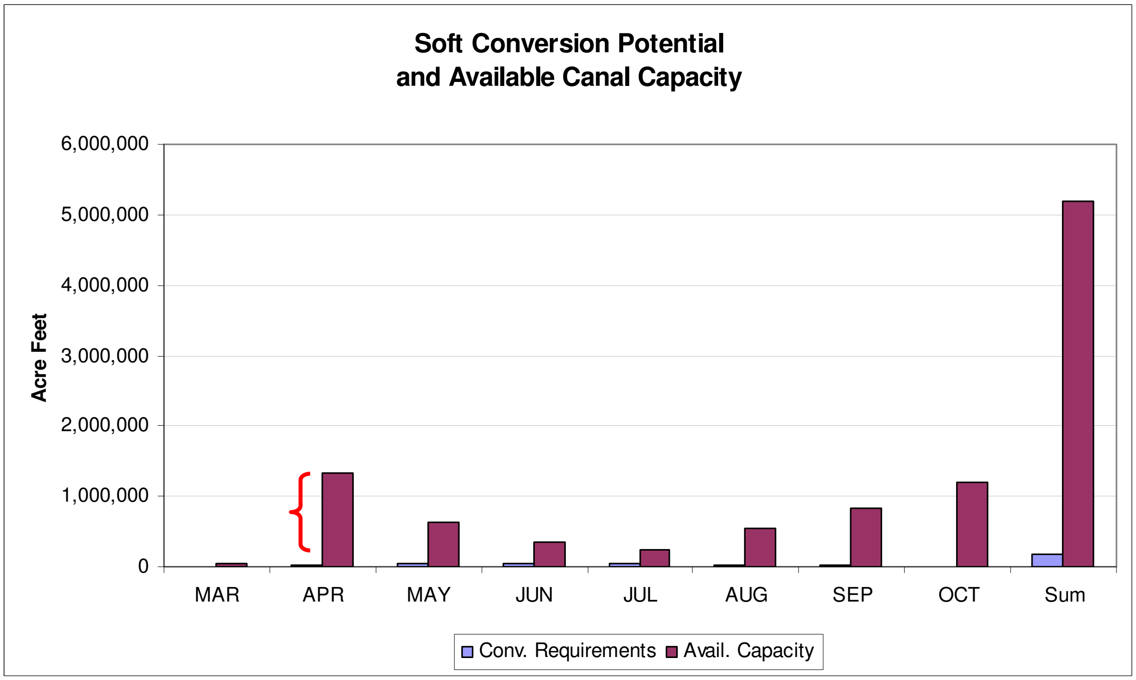


Figure 14. Comparison of available excess canal capacity with soft-conversion requirements. The quantity by which capacity (dark red) exceeds soft-conversion requirements (light blue) is the capacity which is available for other new uses, without competition from soft conversions.

<u>Canal-manager response.</u> Of the 26 questionnaire letters sent to canal managers, eleven responses were received. In general, managers indicated that our diversion data were essentially correct. Figure 15 and Figure 16 compare IWRRI average diversion estimates with data from the two managers who mailed detailed diversion data. Another manager did not send data, but indicated a canal capacity about 30% higher than IWRRI's estimates.

Two managers expressed concern that we were over-estimating the ability of systems to deliver additional water to conversions and managerd recharge projects. Two others expressed concern that we were *under*-estimating the ability to deliver water to various activities to benefit the aquifer.

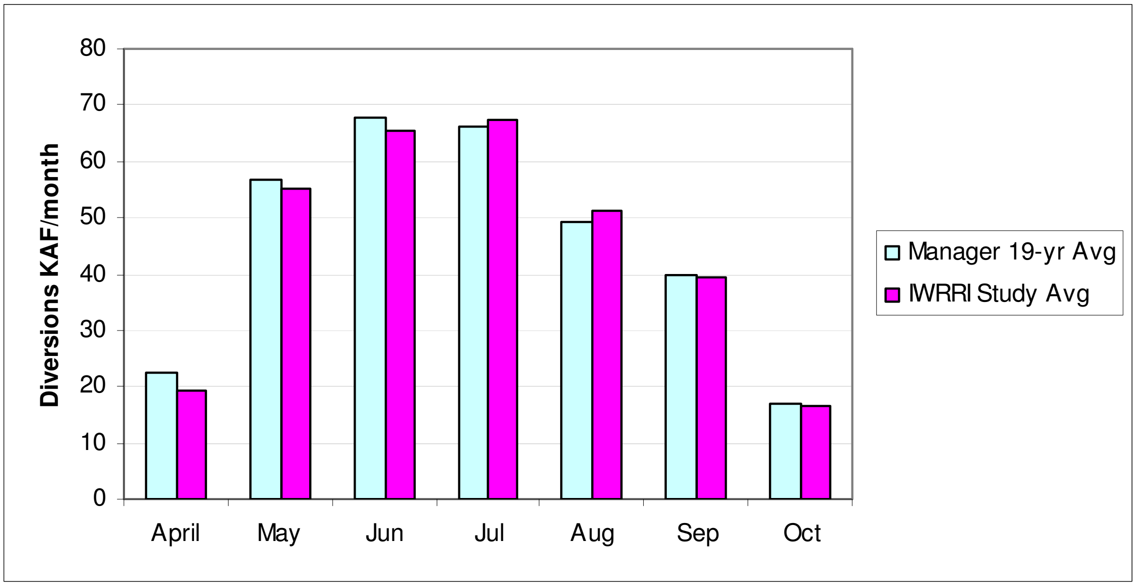


Figure 15. Comparison of IWRRI and manager's data[7] for monthly average diversions, Aberdeen Canal.

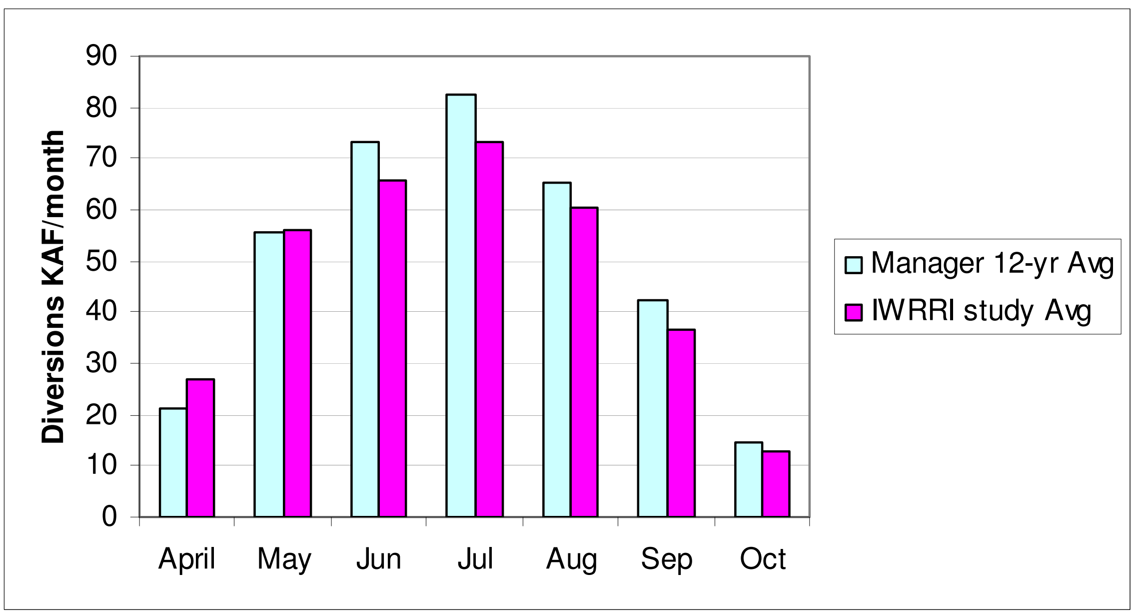


Figure 16. Comparison of IWRRI and manager's data for monthly average diversions, Minidoka North Side canal.

[7] IWRRI scaled daily cfs from a paper graph provided by the manager and estimated a monthly average; there may be some imprecision in the representation of manager's data.

Other results from the managers' survey include:

1. Delivery of additional water increases management and maintenance requirements for canals. This study estimated the on-site cost of infrastructure to support soft conversions. The point is well taken that there will also be costs associated with obtaining and delivering water to the conversions.

2. Three managers pointed out recent changes that would indicate that the 1985-2005 period used in the study was too long; diversions in the last five to ten years have been lower than in the 1980s and early 1990s. Review of recent-years' diversion data supported the managers' assertions, though it could be argued that capacity that existed only five to ten years ago could probably be reclaimed at reasonable cost.

3. One manager described limitations on diversion volume in later months due to the configuration of the river headgate and influences of river stage on diversion capacity. This further underscores the need for individual investigation before undertaking a project. If plans included diverting additional water when river flows were low, additional investment might be needed to improve diversion works at the river.

4. Another manager gave a qualitative indication that there were few convertible acres within his service area. This confirmed IWRRI estimates of fewer than 1,000 acres in this irrigation entity.

5. A different manager provide a range of potentially-convertible acres in his district that was 100% to 150% of the IWRRI estimate. However, the manager indicated that some parcels would likely not be practical to convert, bringing his estimate more in line with IWRRI's.

6. One manager confirmed IWRRI's finding that his system would be capacity-limited in mid summer.

7. Managers indicated that the threat of curtailment could be an important factor in bringing about soft conversions. One stated that many of the nominally mixed-source parcels under his canal have already converted back to surface water, specifically due to curtailment concerns. On the other hand, another indicated that shareholders in his company would not be motivated to undertake conversion projects, believing themselves essentially immune to curtailment under a settlement agreement in the Snake River Basin Adjudication.

8. Though this study is focussed on soft conversions, managers understood the interrelationship with managed recharge. One

manager pointed out that the Winter Water Savings Agreement precludes five months of diversions, and that Adjudication Decrees and Water District 01 practice essentially limit irrigation diversion to six months. That leaves one month available to deliver water to managed recharge. He suggested that November deliveries to managed recharge have the following advantages:

a) Canals are free of snow and ice at the start of November.
b) At the start of November, canals are in full maintenance and operation and immediately ready to receive additional water.
b) November diversion of recharge water leaves time in the spring for canal maintenance.
c) By November, the reservoir carry-over situation can be assessed prior to making managed recharge commitments.

FURTHER WORK NEEDED

The sample sizes used in this study are adequate only for determining aquifer-wide trends and fractions. Prior to undertaking a program of soft conversions within any particular irrigation entity, a field inspection of at least 50 samples per entity is strongly recommended. Refinement of the cost estimates is also warranted, as is careful review of the experience with the conversions that have been accomplished in the North Side Canal area. Finally, as pointed out by canal managers, thorough investigation of canal delivery capacity should be undertaken prior to pursuing soft conversions under any particular canal. This investigation of course should involve the managers and directors of the delivery organizations.

CONCLUSION

The study indicates that soft conversions could be applied to about 53,000 acres. The infrastructure costs[8] would be approximately $15,000,000 and the benefit to the aquifer (assuming water supplies were made available) would be 90,000 to 170,000 acre feet per year. About 30% of the total benefit could be realized from the easiest-to-convert sites, at a total cost of about $3,000,000.

[8] Additional cost may be associated with obtaining water supplies, increased costs of canal operation, and perhaps river headgate improvements. These costs are outside the scope of this study.

REFERENCES

Gilliland, B. 2002. Aggregation of Surface Water Canal Companies into Surface Water Irrigation Entities. Eastern Snake Plain Aquifer Model Enhancement Project Scenario Document Number DDW-008. Accessed January 2008 at http://www.if.uidaho.edu/%7ejohnson/DDW008_AggIEs.pdf.

Idaho Department of Water Resources. 2007. Electronic irrigation diversion data, file SKG_histupsnake05.xls.

Idaho Water Resources Research Institute. 2008. Report to Idaho Department of Water Resources on source of irrigation water on mixed-source parcels. Work is ongoing; a report title will be assigned and a report issued in the first part of 2008.

Olenichak, T. 2008. Water District 01, Idaho Falls, Idaho. Personal communication.

VanGreuningen, Stuart. 2008. Idaho Department of Water Resources. Personal communication.

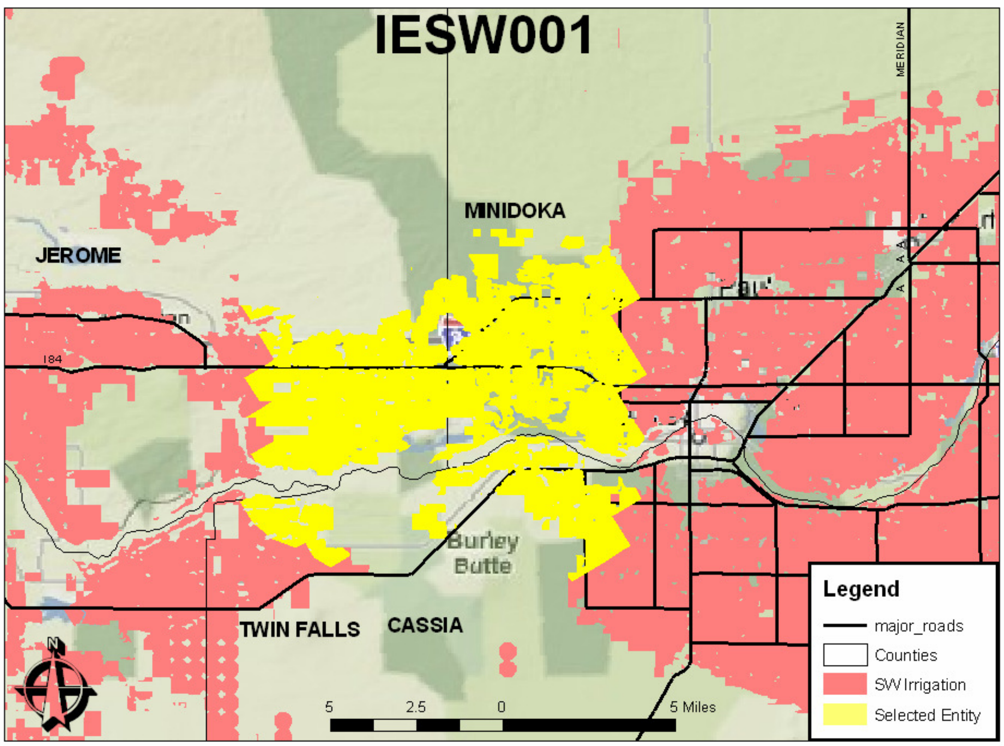
APPENDIX

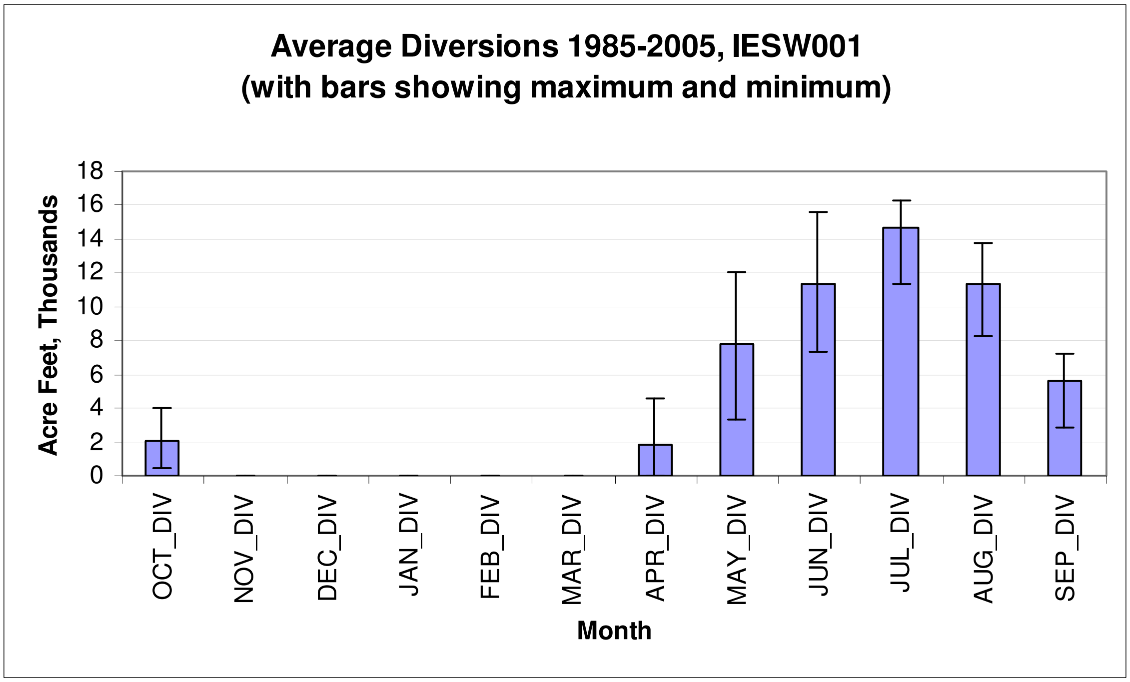
I. Maps of entities, diversion and capacity data: page 23

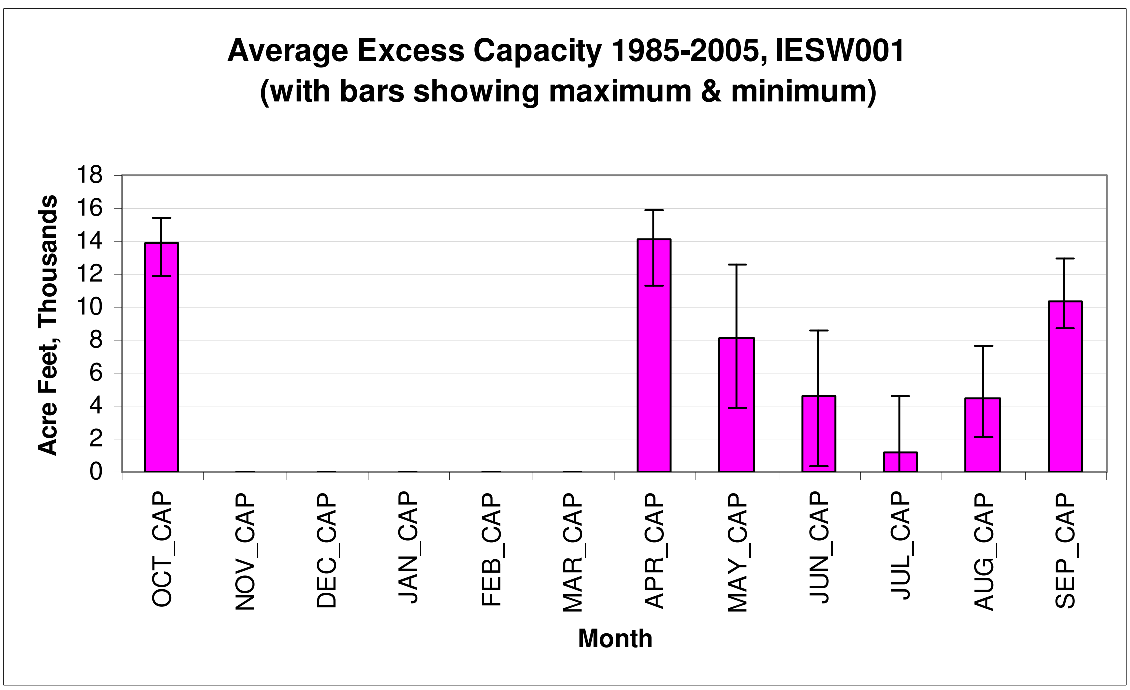
II. Cost data: page 62

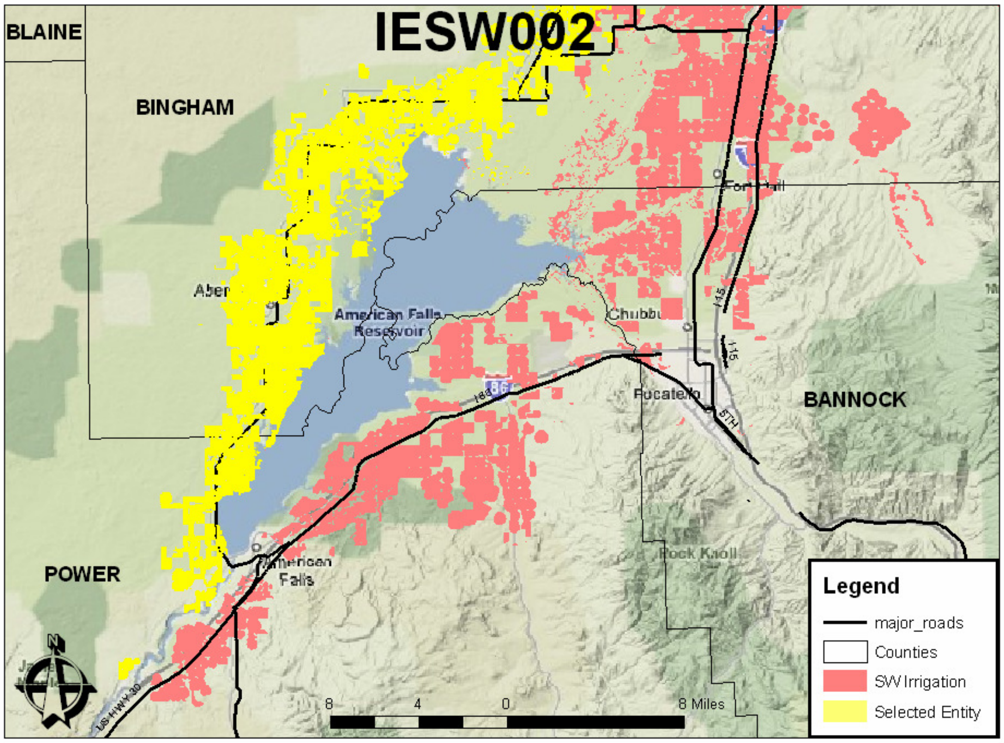
MAPS, DIVERSIONS AND CAPACITY

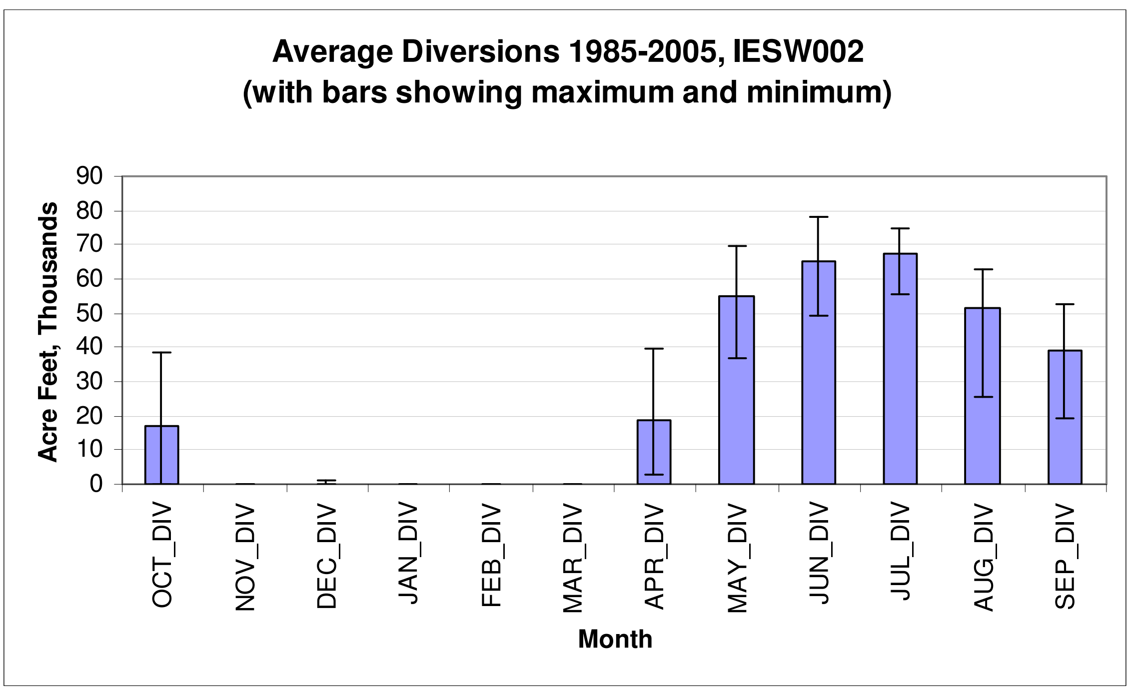
This section contains maps of individual entities along with histograms of diversions and excess capacity by irrigation entity. In the histograms, heavy bars indicate the average of 1985-2005 data, with whiskers representing the high and low values during that period. All values are in thousands of acre feet per month.

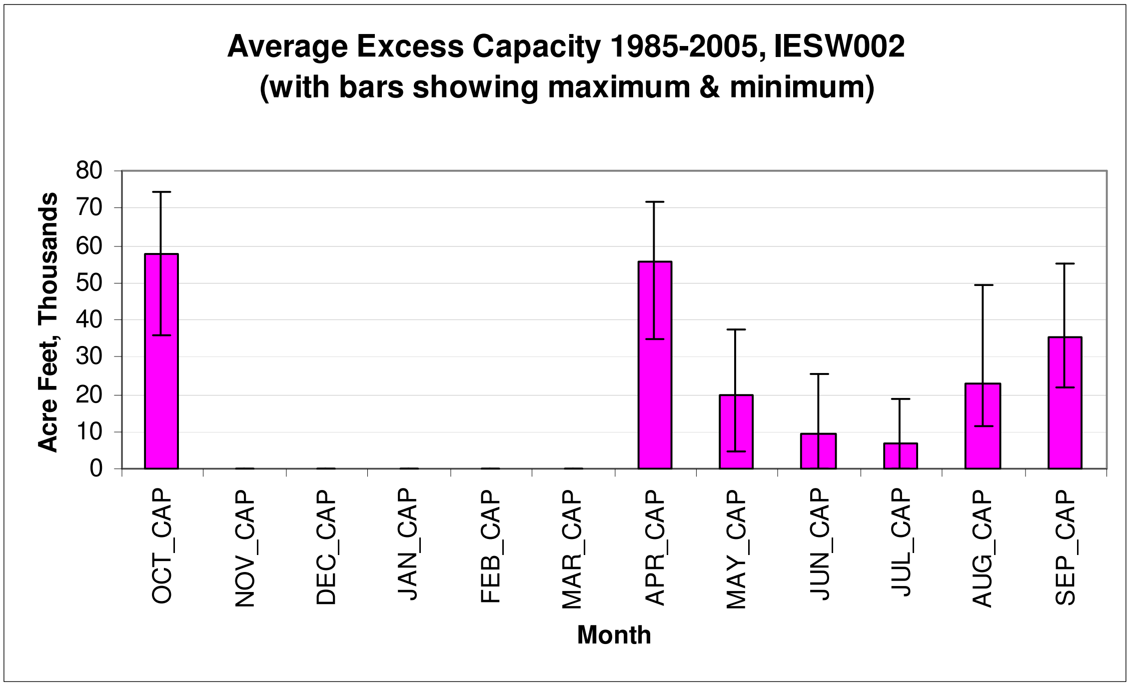


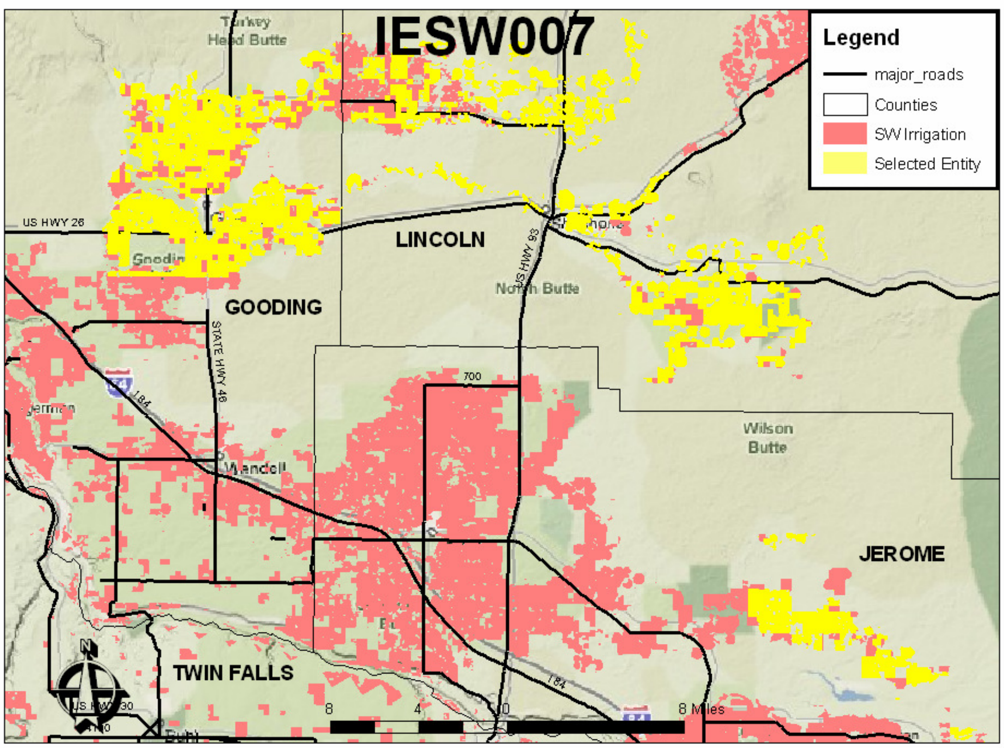

Average Diversions 1985-2005, IESW001
(with bars showing maximum and minimum)
Acre Feet, Thousands
18
16
14
12
10
8
6
4
2
0
OCT_DIV
NOV_DIV
DEC_DIV
JAN_DIV
FEB_DIV
MAR_DIV
APR_DIV
MAY_DIV
JUN_DIV
JUL_DIV
AUG_DIV
SEP_DIV
Month

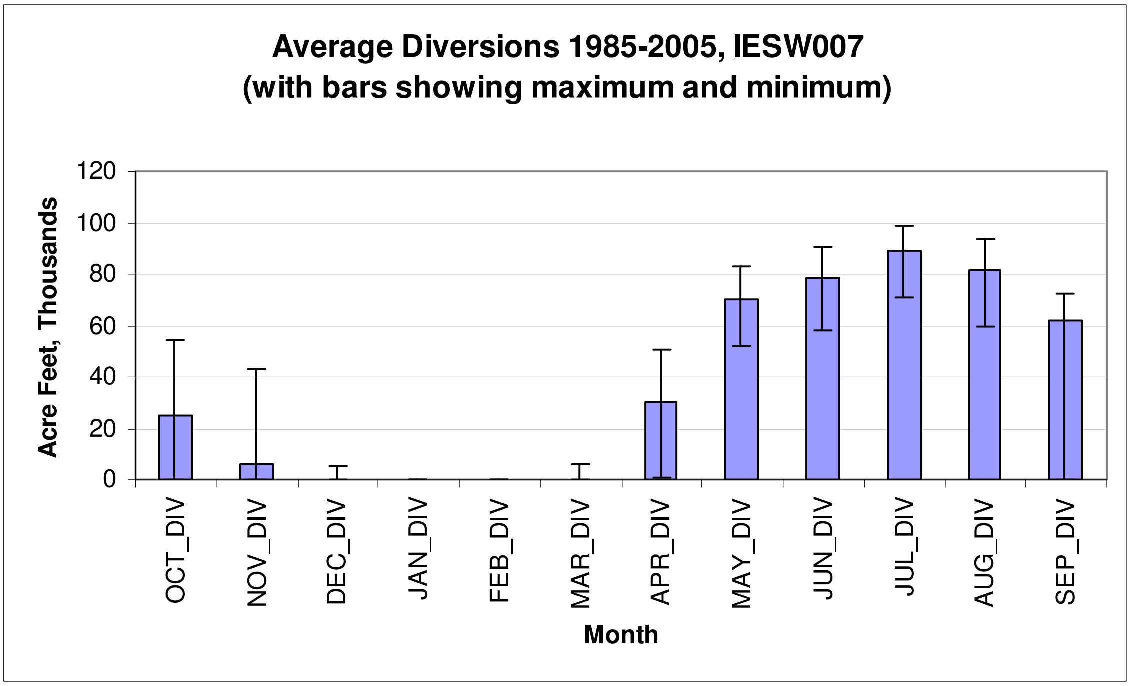

Average Excess Capacity 1985-2005, IESW001
(with bars showing maximum & minimum)
Acre Feet, Thousands
18
16
14
12
10
8
6
4
2
0
OCT_CAP
NOV_CAP
DEC_CAP
JAN_CAP
FEB_CAP
MAR_CAP
APR_CAP
MAY_CAP
JUN_CAP
JUL_CAP
AUG_CAP
SEP_CAP
Month

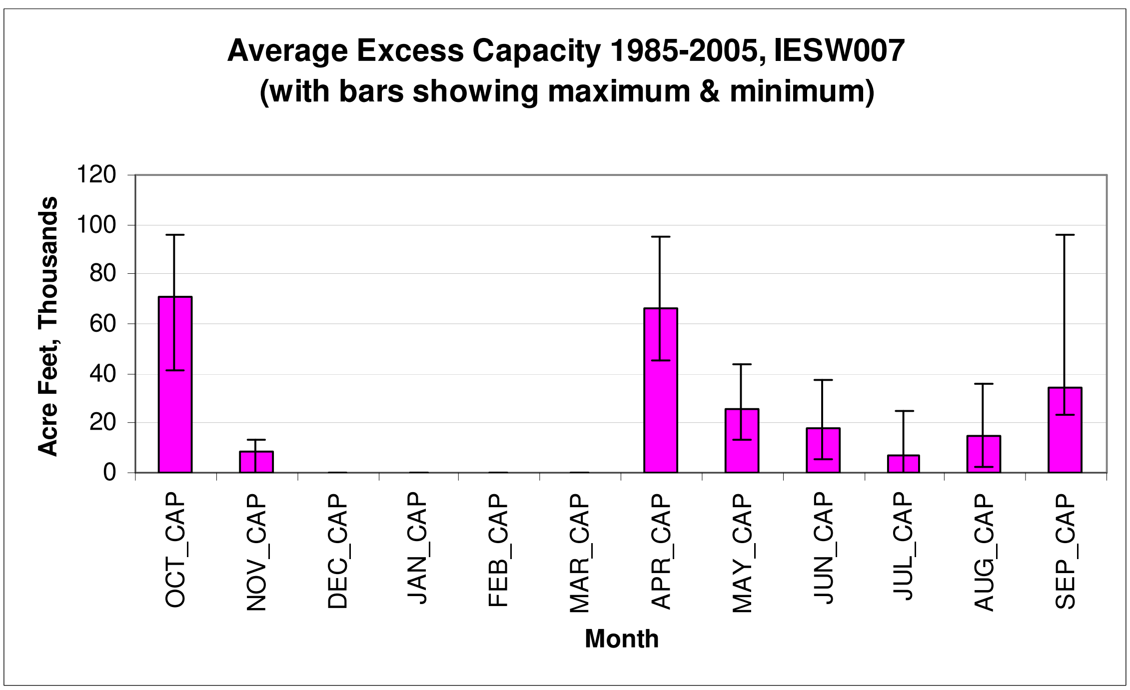

IESW002
BLAINE
BINGHAM
POWER
BANNOCK
American Falls Reservoir
American Falls
Pocatello
Chubbuck
Fort Hall
Rock Knoll
Legend
major_roads
Counties
SW Irrigation
Selected Entity
8 4 0 8 Miles

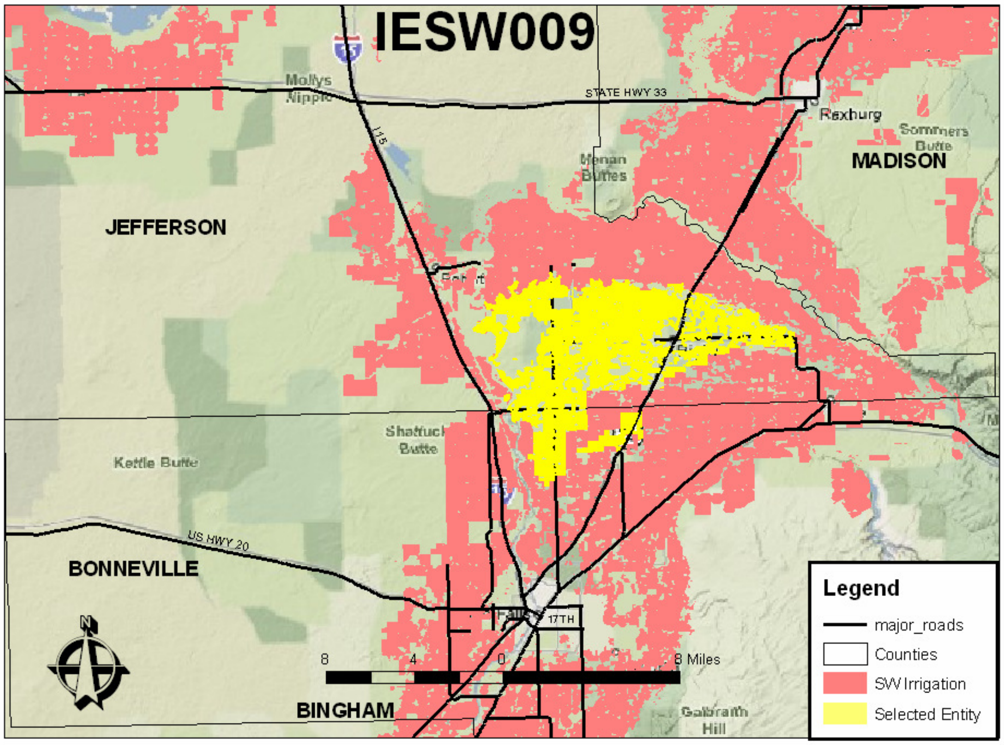

Average Diversions 1985-2005, IESW002
(with bars showing maximum and minimum)
Acre Feet, Thousands
0
10
20
30
40
50
60
70
80
90
OCT_DIV
NOV_DIV
DEC_DIV
JAN_DIV
FEB_DIV
MAR_DIV
APR_DIV
MAY_DIV
JUN_DIV
JUL_DIV
AUG_DIV
SEP_DIV
Month


Average Excess Capacity 1985-2005, IESW002
(with bars showing maximum & minimum)
Acre Feet, Thousands
80
70
60
50
40
30
20
10
0
OCT_CAP
NOV_CAP
DEC_CAP
JAN_CAP
FEB_CAP
MAR_CAP
APR_CAP
MAY_CAP
JUN_CAP
JUL_CAP
AUG_CAP
SEP_CAP
Month

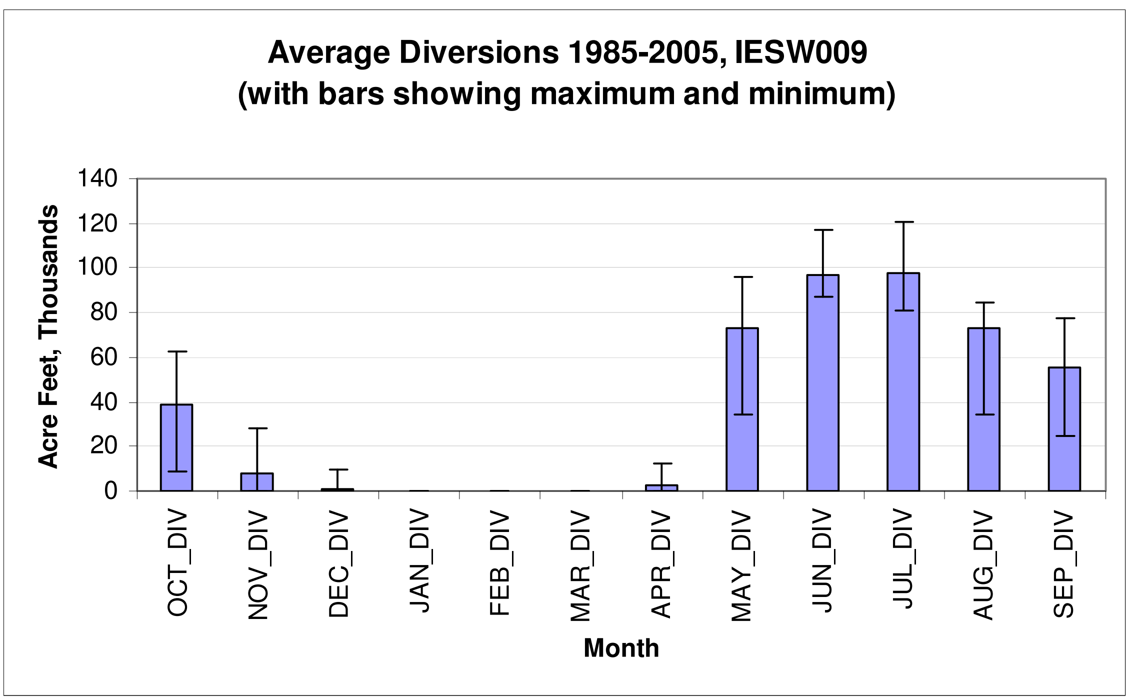

IESW007
Legend
major_roads
Counties
SW Irrigation
Selected Entity
LINCOLN
GOODING
JEROME
TWIN FALLS
US HWY 26
US HWY 93
STATE HWY 46
North Butte
Wilson Butte
Wendell
8
4
0
8 Miles


Average Diversions 1985-2005, IESW007
(with bars showing maximum and minimum)
Acre Feet, Thousands
120
100
80
60
40
20
0
OCT_DIV
NOV_DIV
DEC_DIV
JAN_DIV
FEB_DIV
MAR_DIV
APR_DIV
MAY_DIV
JUN_DIV
JUL_DIV
AUG_DIV
SEP_DIV
Month

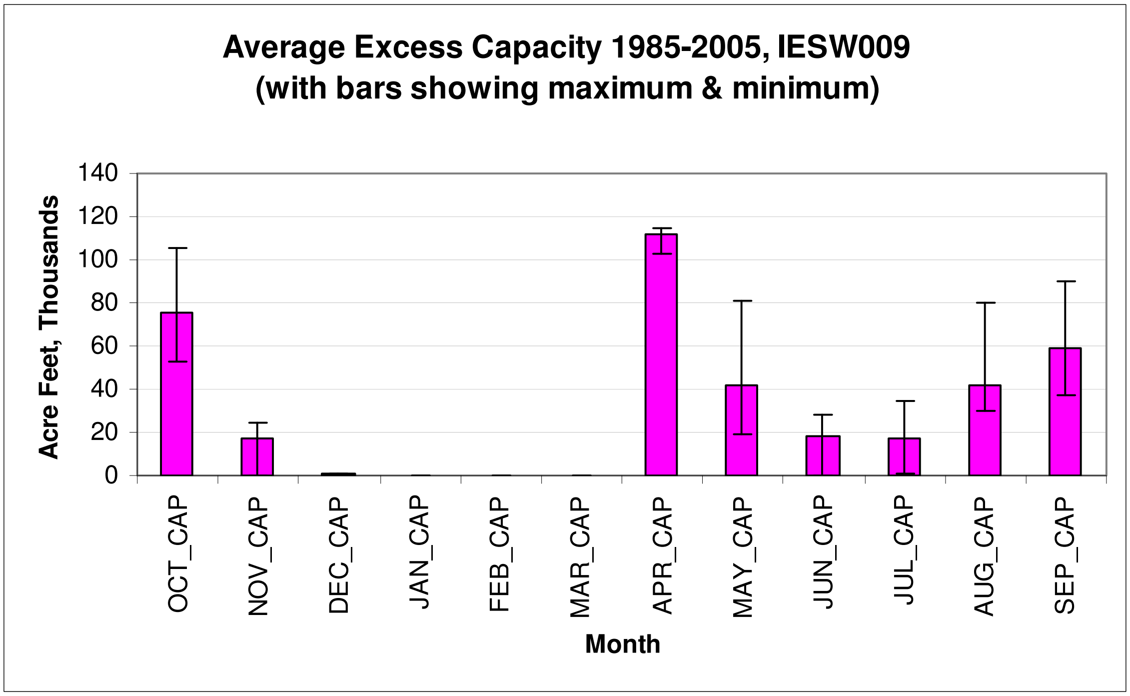

Average Excess Capacity 1985-2005, IESW007
(with bars showing maximum & minimum)
Acre Feet, Thousands
120
100
80
60
40
20
0
OCT_CAP
NOV_CAP
DEC_CAP
JAN_CAP
FEB_CAP
MAR_CAP
APR_CAP
MAY_CAP
JUN_CAP
JUL_CAP
AUG_CAP
SEP_CAP
Month

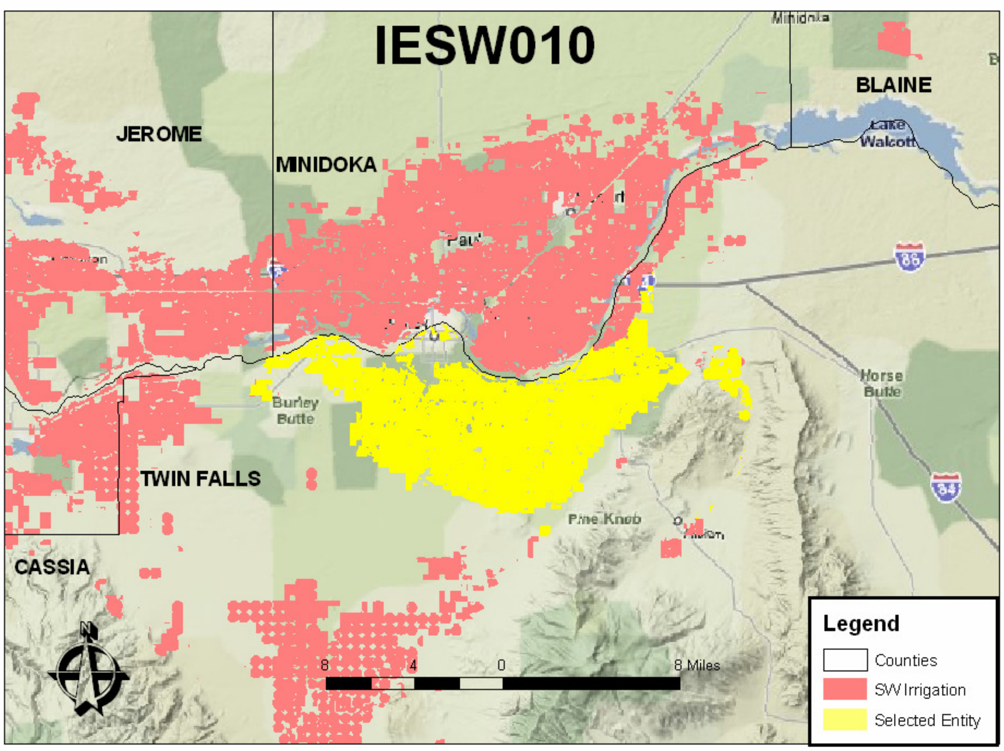


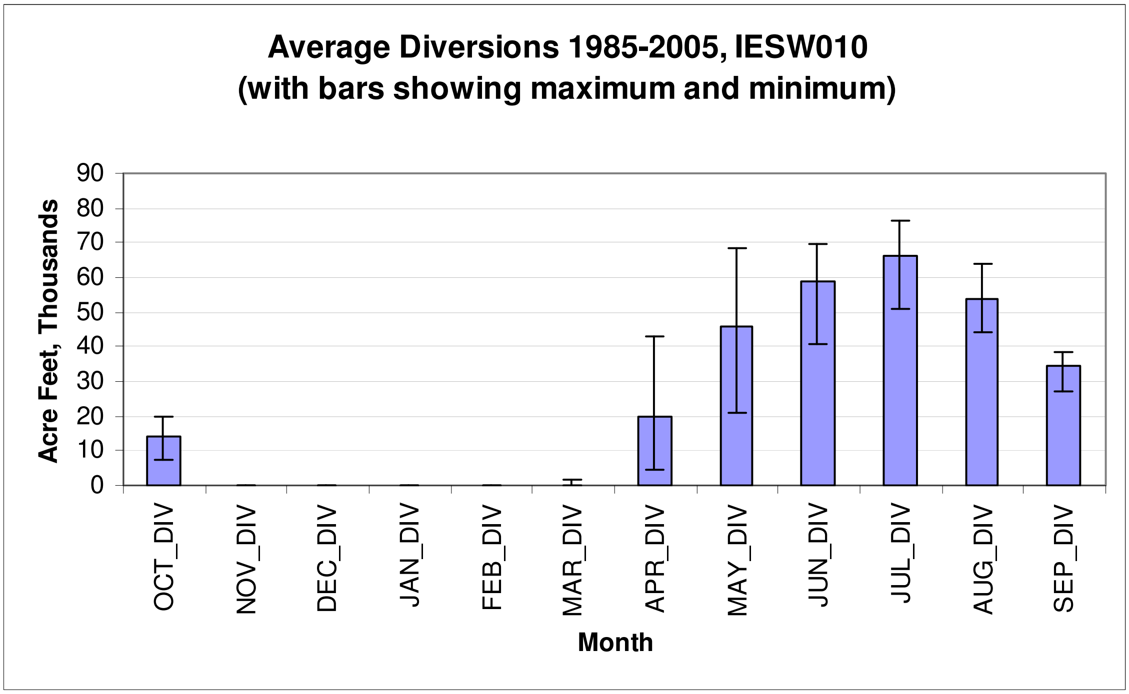
IESW009
Mollys Nipple
STATE HWY 33
Rexburg
Sommers Butte
MADISON
Menan Buttes
JEFFERSON
Shattuck Butte
Kettle Butte
US HWY 20
BONNEVILLE
17TH
8
4
0
8 Miles
BINGHAM
Galbraith Hill
Legend
major_roads
Counties
SW Irrigation
Selected Entity

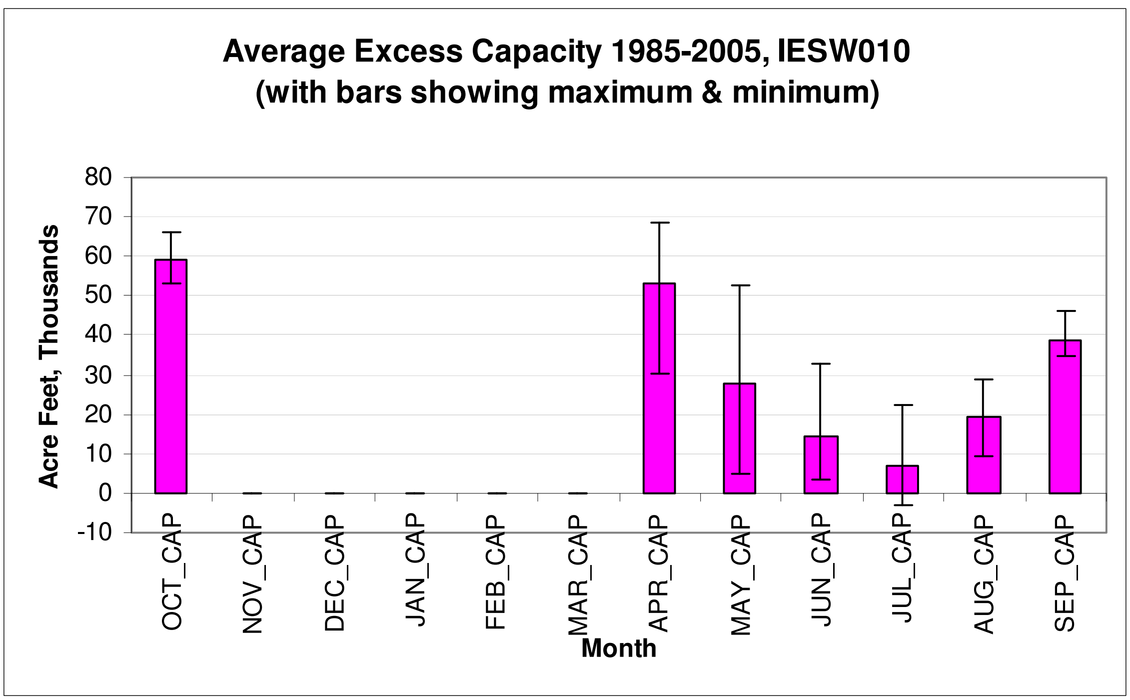


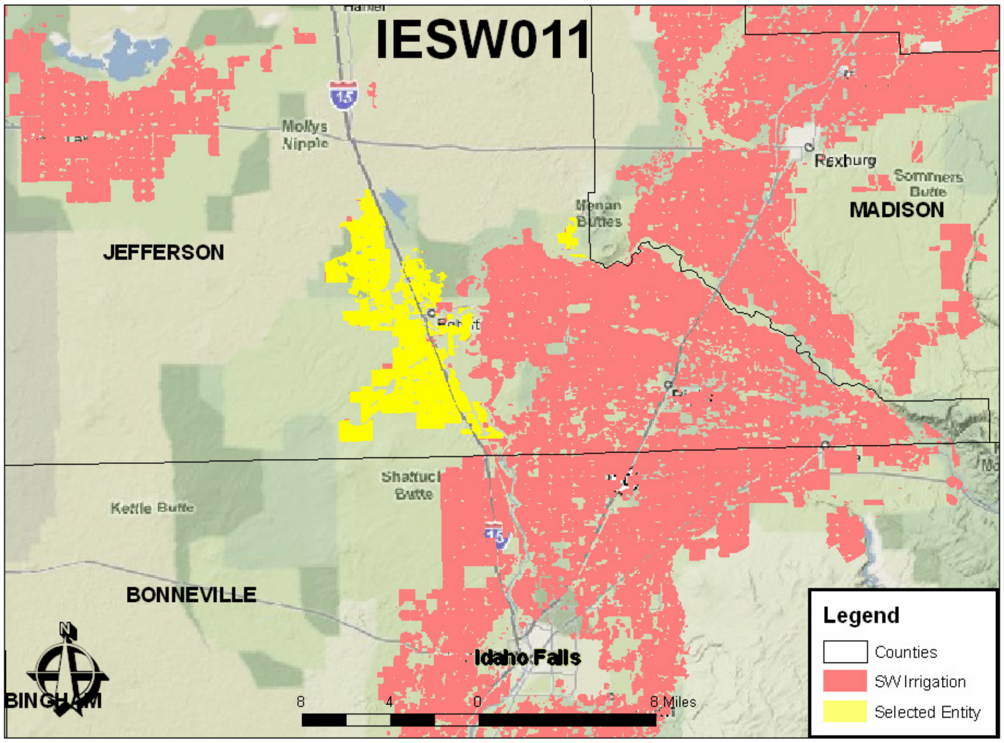
Average Diversions 1985-2005, IESW009
(with bars showing maximum and minimum)
Acre Feet, Thousands
140
120
100
80
60
40
20
0
OCT_DIV
NOV_DIV
DEC_DIV
JAN_DIV
FEB_DIV
MAR_DIV
APR_DIV
MAY_DIV
JUN_DIV
JUL_DIV
AUG_DIV
SEP_DIV
Month

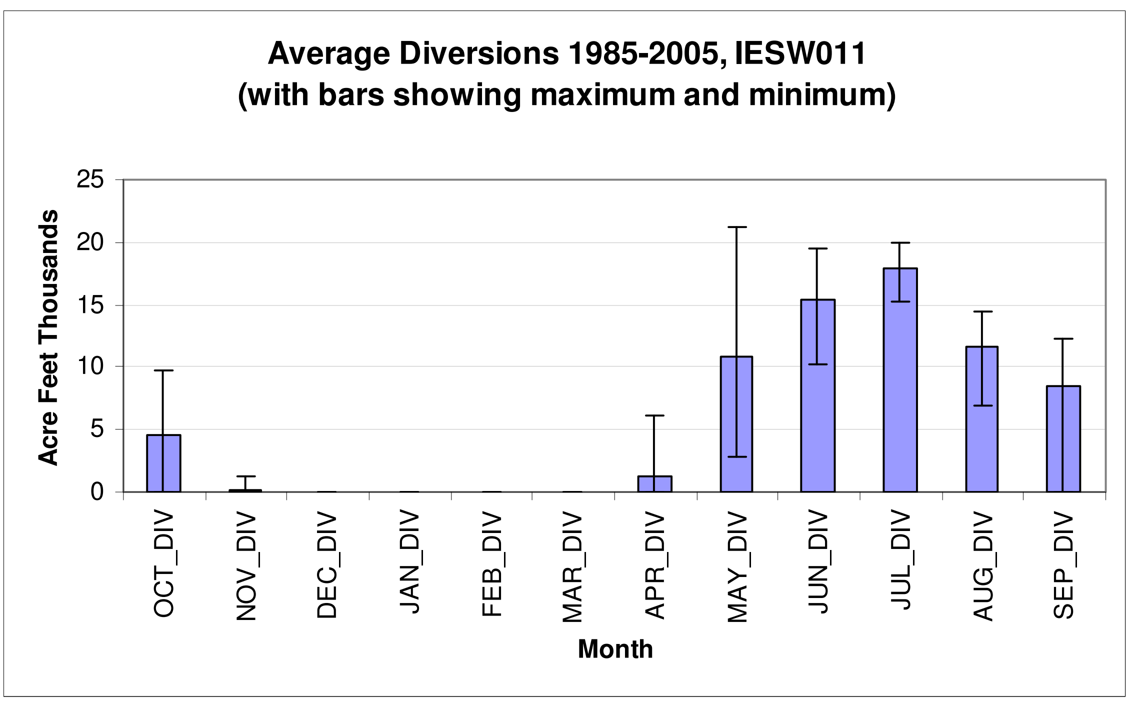

Average Excess Capacity 1985-2005, IESW009
(with bars showing maximum & minimum)
Acre Feet, Thousands
140
120
100
80
60
40
20
0
OCT_CAP
NOV_CAP
DEC_CAP
JAN_CAP
FEB_CAP
MAR_CAP
APR_CAP
MAY_CAP
JUN_CAP
JUL_CAP
AUG_CAP
SEP_CAP
Month

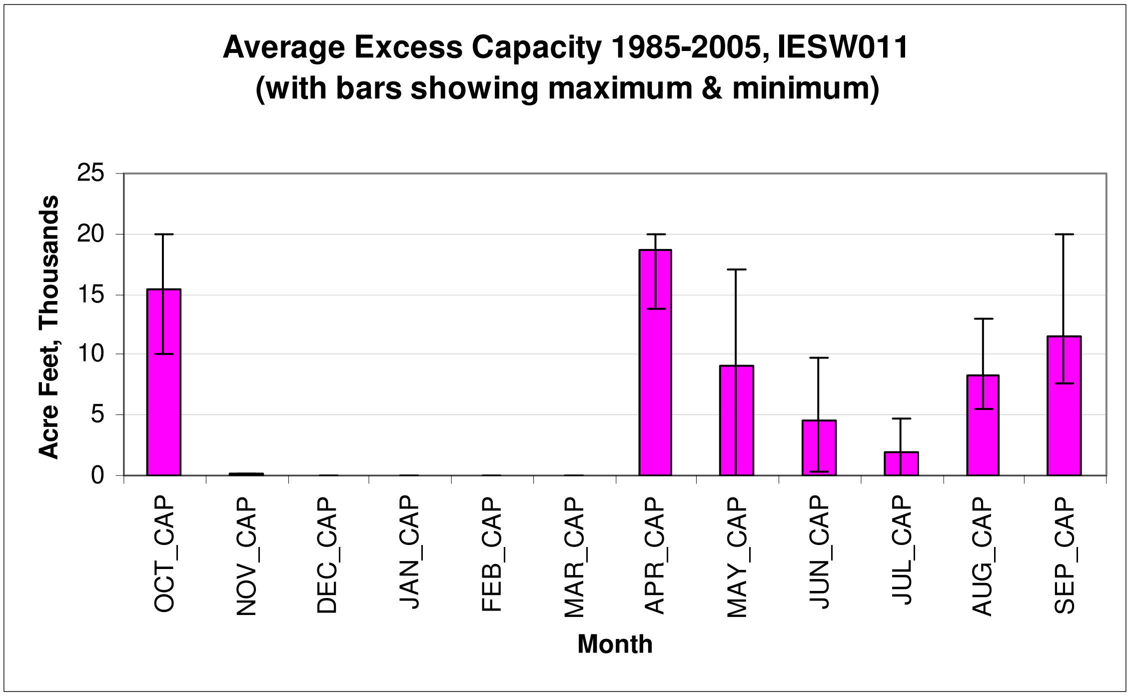

IESW010
BLAINE
Lake Walcott
JEROME
MINIDOKA
TWIN FALLS
CASSIA
Burley Butte
Horse Butte
Pine Knob
8
4
0
8 Miles
Legend
Counties
SW Irrigation
Selected Entity


Average Diversions 1985-2005, IESW010
(with bars showing maximum and minimum)
Acre Feet, Thousands
90
80
70
60
50
40
30
20
10
0
OCT_DIV
NOV_DIV
DEC_DIV
JAN_DIV
FEB_DIV
MAR_DIV
APR_DIV
MAY_DIV
JUN_DIV
JUL_DIV
AUG_DIV
SEP_DIV
Month

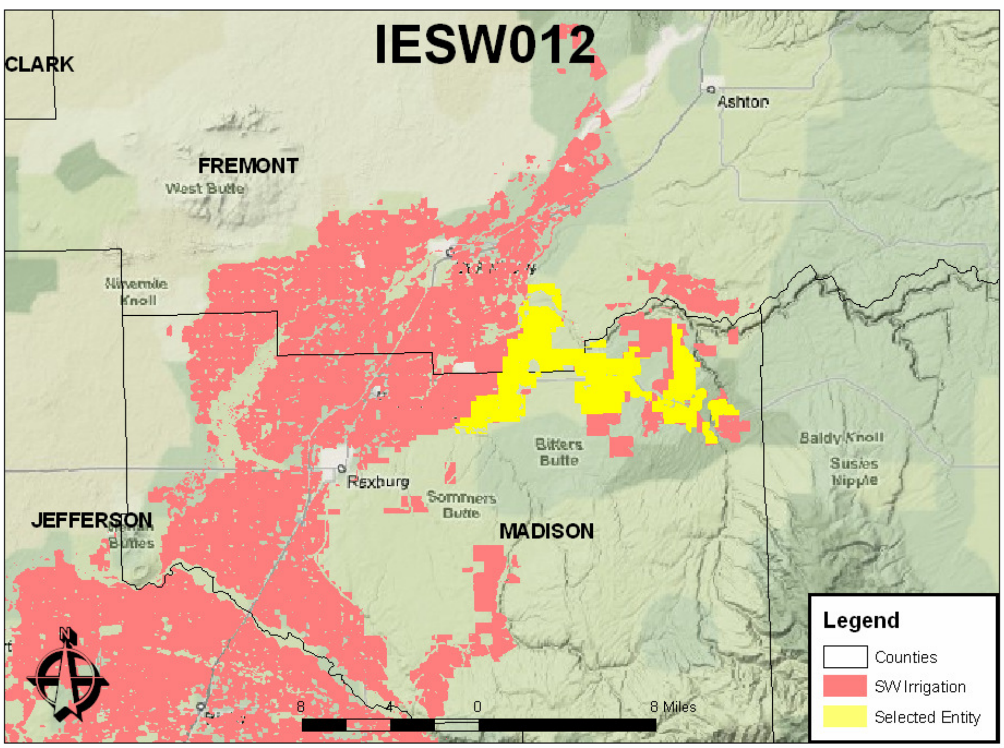

Average Excess Capacity 1985-2005, IESW010
(with bars showing maximum & minimum)
Acre Feet, Thousands
80
70
60
50
40
30
20
10
0
-10
OCT_CAP
NOV_CAP
DEC_CAP
JAN_CAP
FEB_CAP
MAR_CAP
APR_CAP
MAY_CAP
JUN_CAP
JUL_CAP
AUG_CAP
SEP_CAP
Month


IESW011
Mollys Nipple
Rexburg
Sommers Butte
MADISON
Menan Buttes
JEFFERSON
Shattuck Butte
Kettle Butte
BONNEVILLE
Idaho Falls
BINGHAM
8 4 0 8 Miles
Legend
Counties
SW Irrigation
Selected Entity

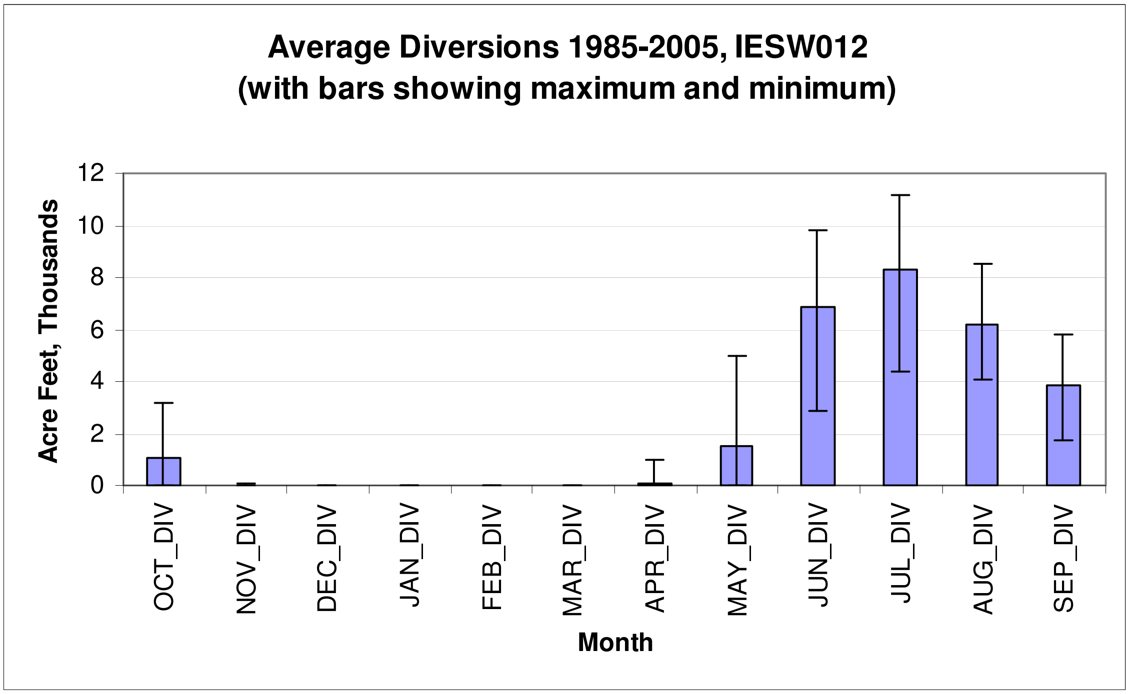

Average Diversions 1985-2005, IESW011
(with bars showing maximum and minimum)
Acre Feet Thousands
25
20
15
10
5
0
OCT_DIV
NOV_DIV
DEC_DIV
JAN_DIV
FEB_DIV
MAR_DIV
APR_DIV
MAY_DIV
JUN_DIV
JUL_DIV
AUG_DIV
SEP_DIV
Month

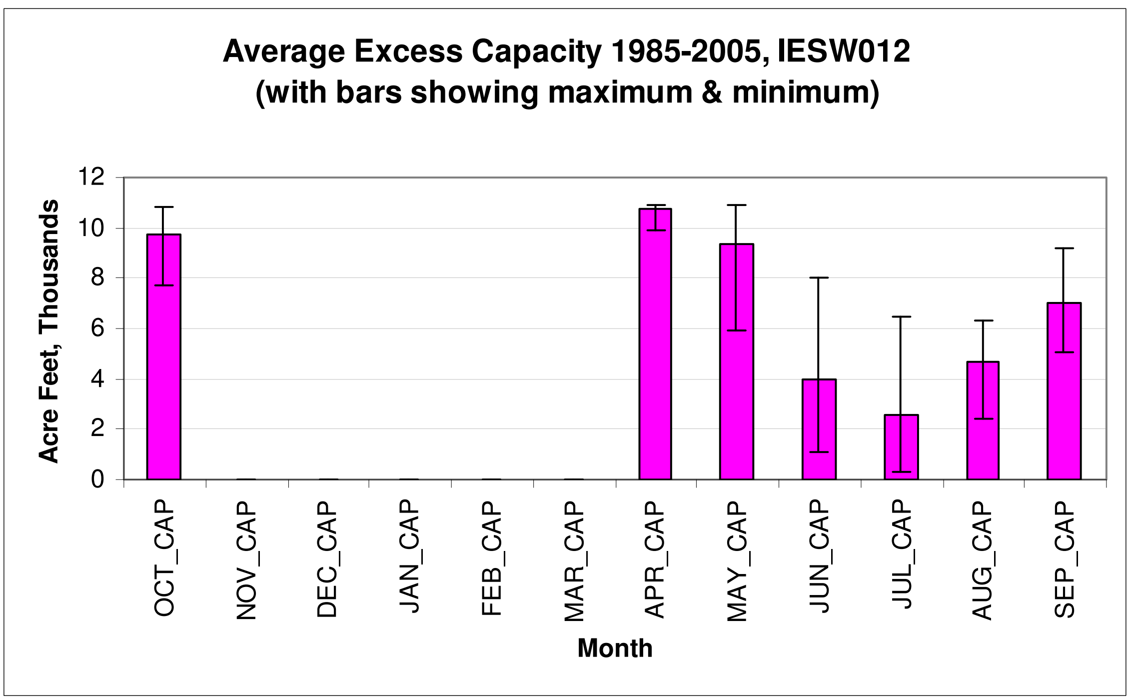


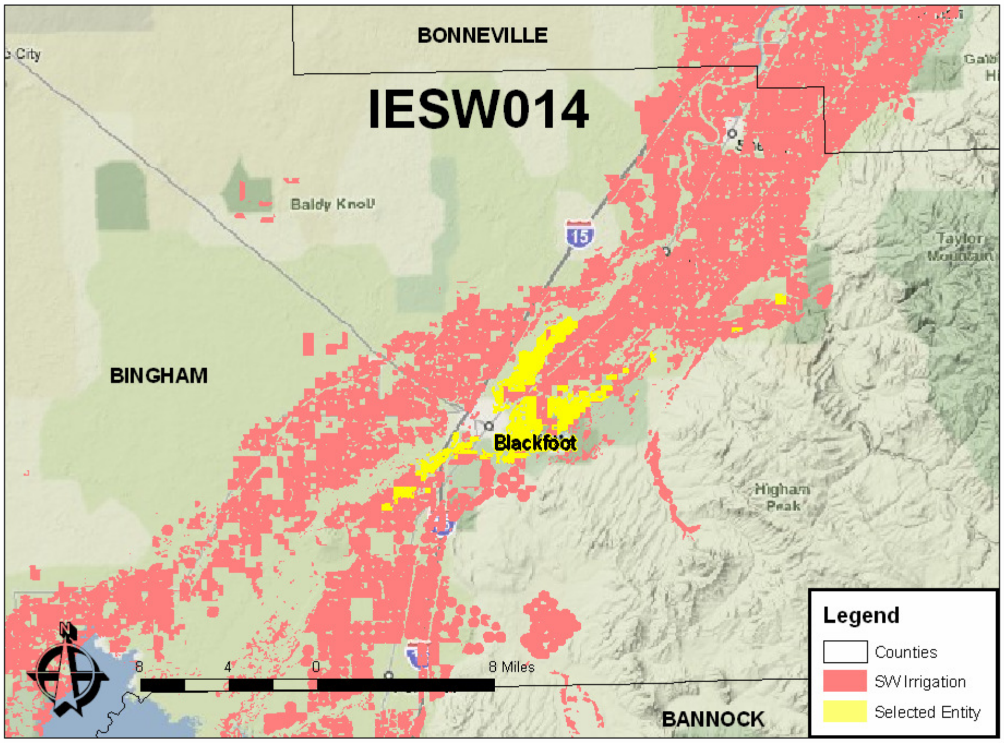
Average Excess Capacity 1985-2005, IESW011
(with bars showing maximum & minimum)
Acre Feet, Thousands
25
20
15
10
5
0
OCT_CAP
NOV_CAP
DEC_CAP
JAN_CAP
FEB_CAP
MAR_CAP
APR_CAP
MAY_CAP
JUN_CAP
JUL_CAP
AUG_CAP
SEP_CAP
Month

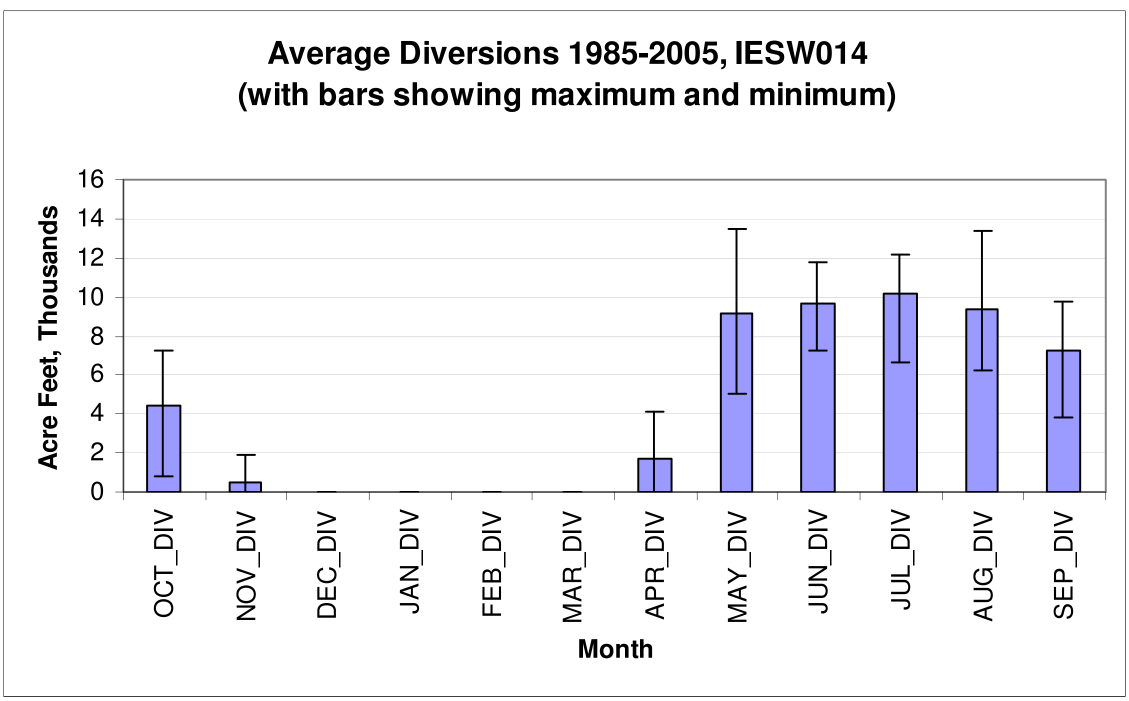


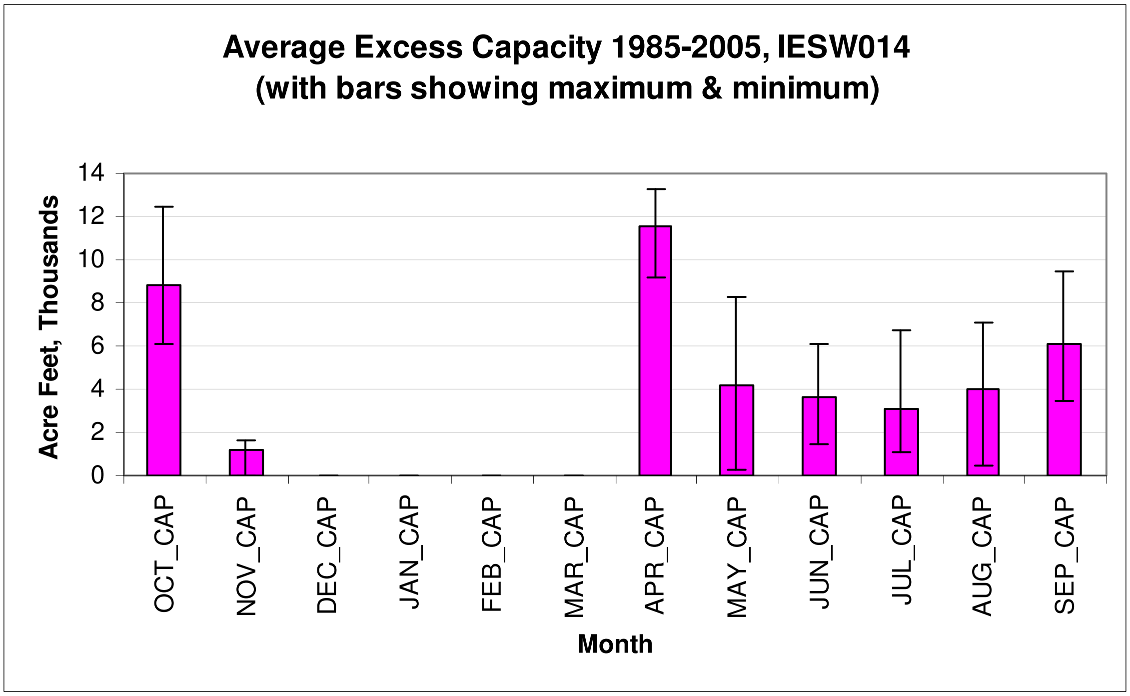
IESW012
CLARK
Ashton
FREMONT
West Butte
Ninemile Knoll
Bitters Butte
Baldy Knoll
Susies Nipple
Rexburg
Sommers Butte
JEFFERSON
MADISON
8
4
0
8 Miles
Legend
Counties
SW Irrigation
Selected Entity

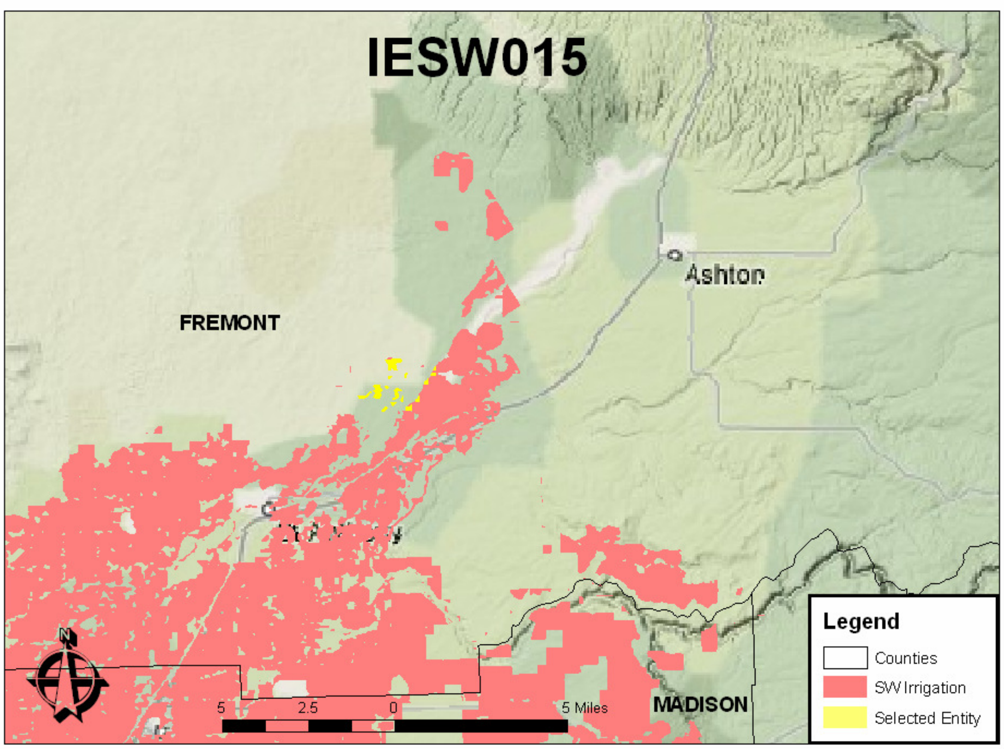

Average Diversions 1985-2005, IESW012
(with bars showing maximum and minimum)
Acre Feet, Thousands
12
10
8
6
4
2
0
OCT_DIV
NOV_DIV
DEC_DIV
JAN_DIV
FEB_DIV
MAR_DIV
APR_DIV
MAY_DIV
JUN_DIV
JUL_DIV
AUG_DIV
SEP_DIV
Month


Average Excess Capacity 1985-2005, IESW012
(with bars showing maximum & minimum)
Acre Feet, Thousands
12
10
8
6
4
2
0
OCT_CAP
NOV_CAP
DEC_CAP
JAN_CAP
FEB_CAP
MAR_CAP
APR_CAP
MAY_CAP
JUN_CAP
JUL_CAP
AUG_CAP
SEP_CAP
Month

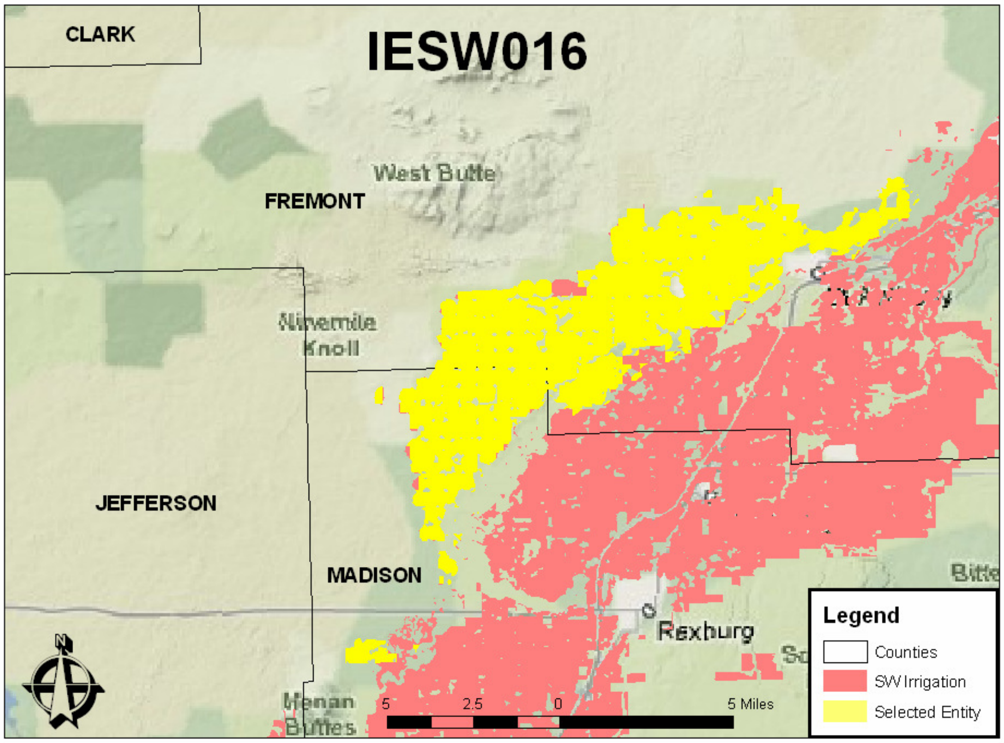

BONNEVILLE
IESW014
Baldy Knoll
BINGHAM
Blackfoot
Higham Peak
Taylor Mountain
BANNOCK
8
4
0
8 Miles
Legend
Counties
SW Irrigation
Selected Entity

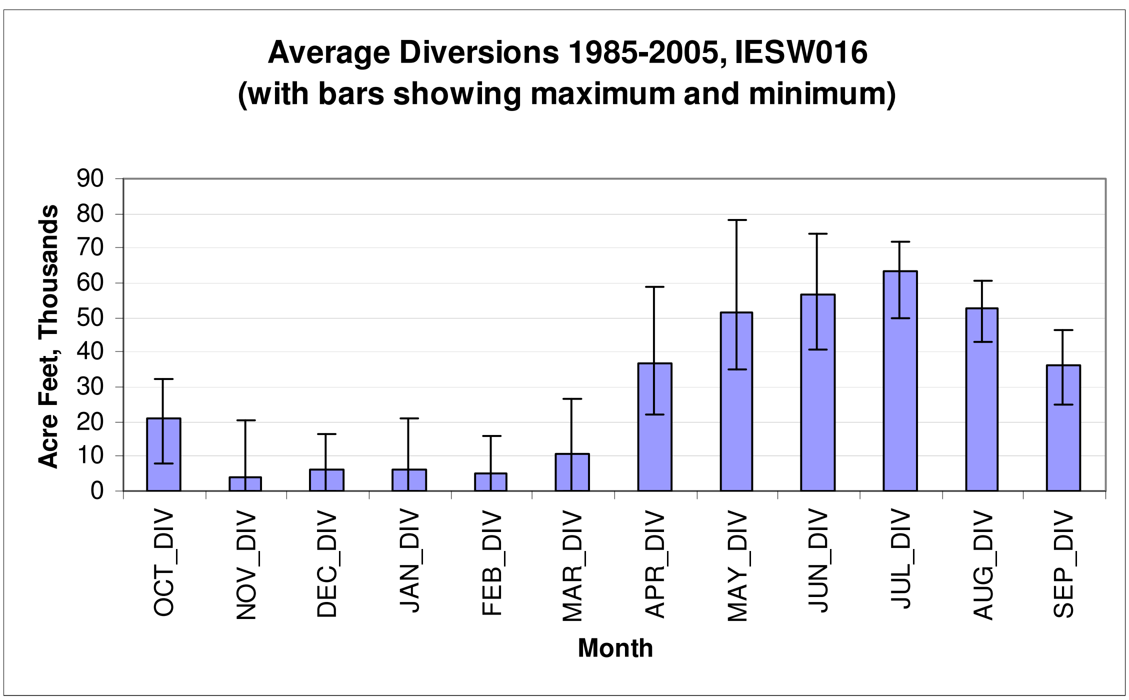

Average Diversions 1985-2005, IESW014
(with bars showing maximum and minimum)
Acre Feet, Thousands
16
14
12
10
8
6
4
2
0
OCT_DIV
NOV_DIV
DEC_DIV
JAN_DIV
FEB_DIV
MAR_DIV
APR_DIV
MAY_DIV
JUN_DIV
JUL_DIV
AUG_DIV
SEP_DIV
Month

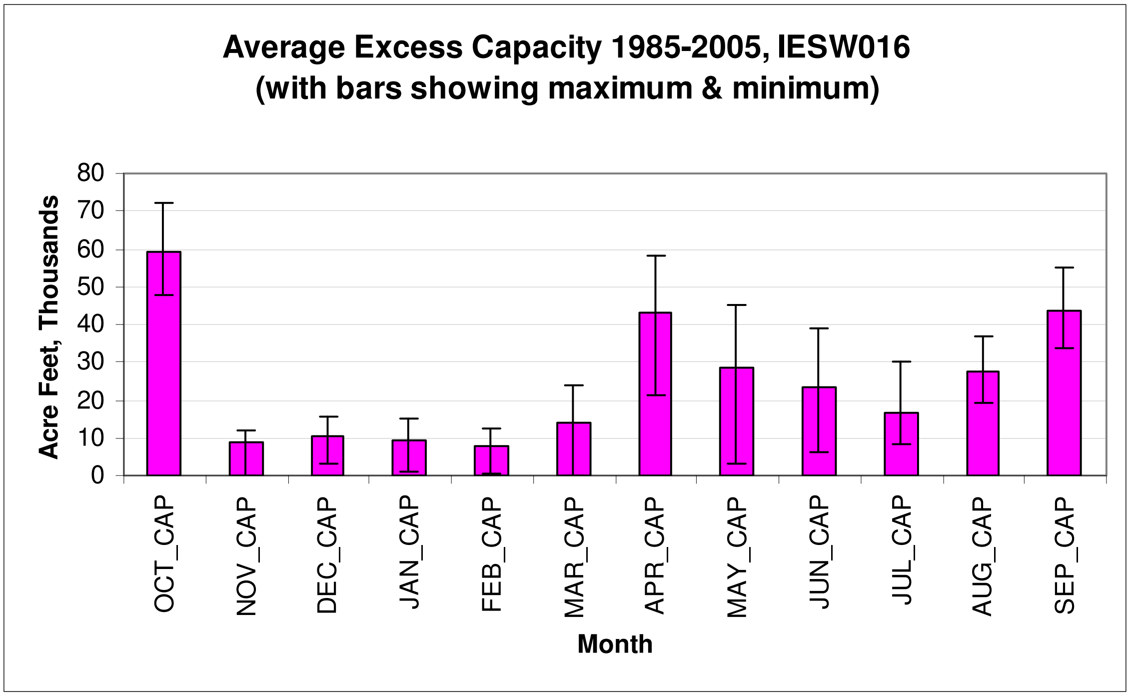




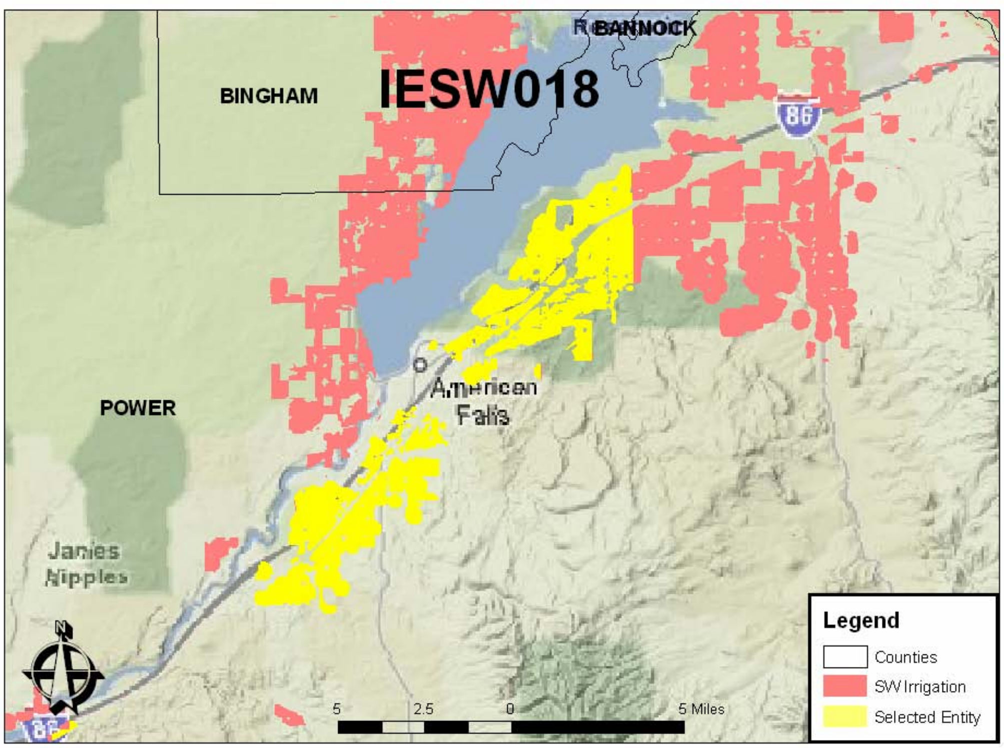
The study found no meaningful acreage of convertible lands in IESW015.


IESW016
CLARK
FREMONT
West Butte
Ninemile Knoll
JEFFERSON
MADISON
Rexburg
Menan Buttes
5 2.5 0 5 Miles
Legend
Counties
SW Irrigation
Selected Entity

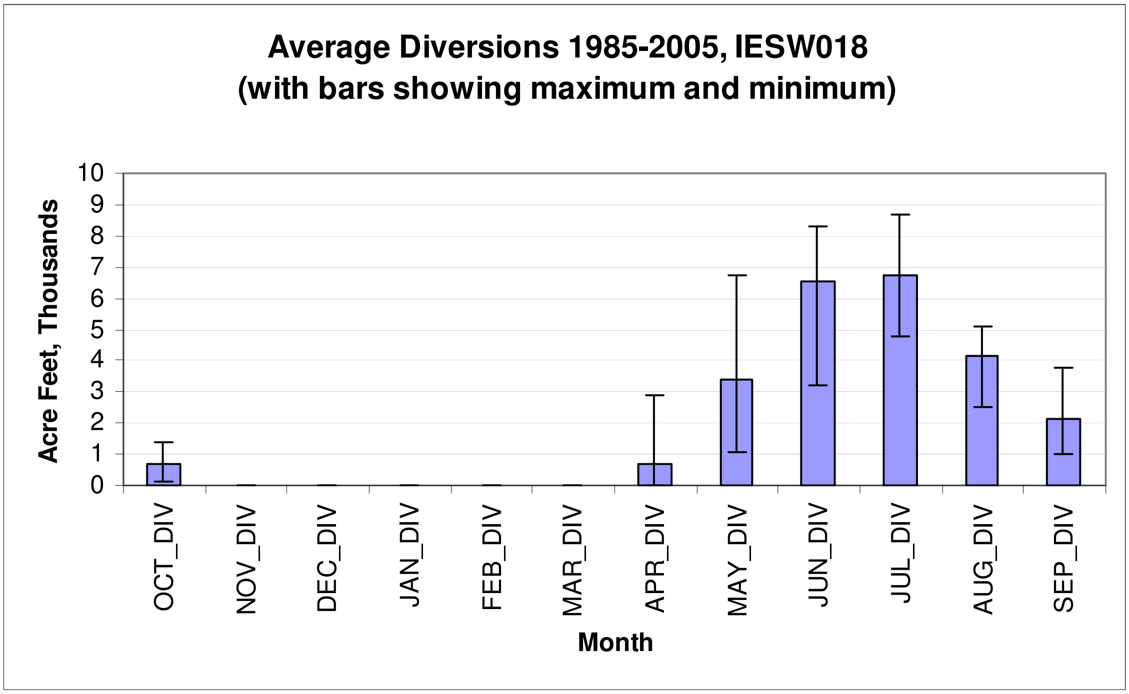

Average Diversions 1985-2005, IESW016
(with bars showing maximum and minimum)
Acre Feet, Thousands
0
10
20
30
40
50
60
70
80
90
OCT_DIV
NOV_DIV
DEC_DIV
JAN_DIV
FEB_DIV
MAR_DIV
APR_DIV
MAY_DIV
JUN_DIV
JUL_DIV
AUG_DIV
SEP_DIV
Month

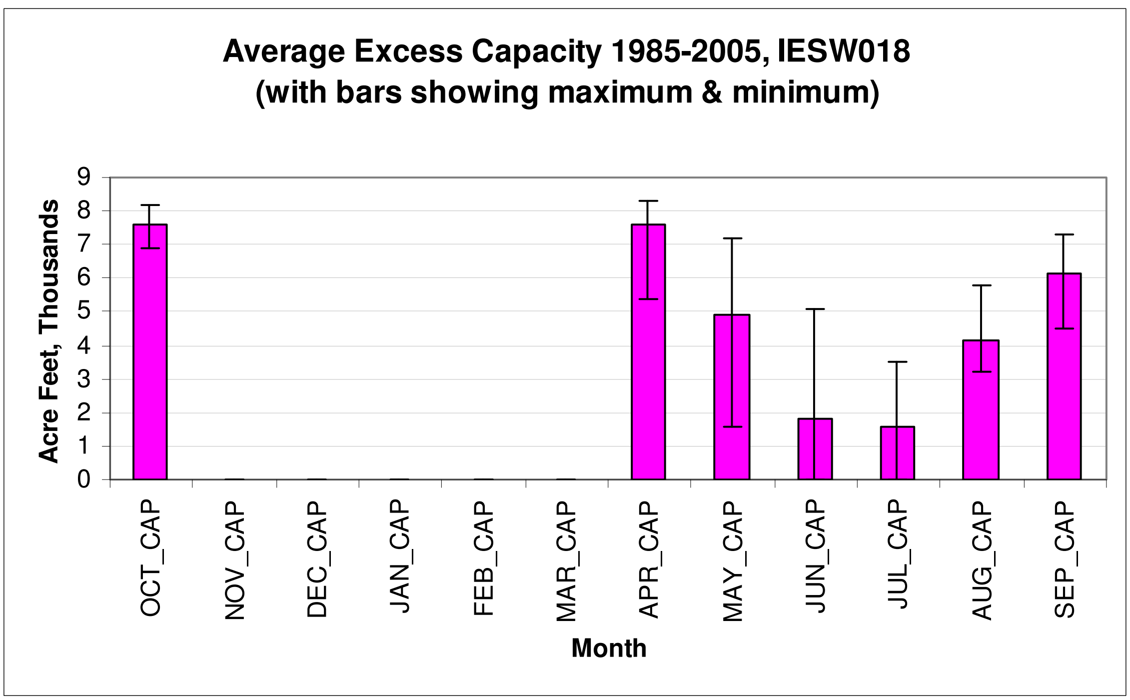


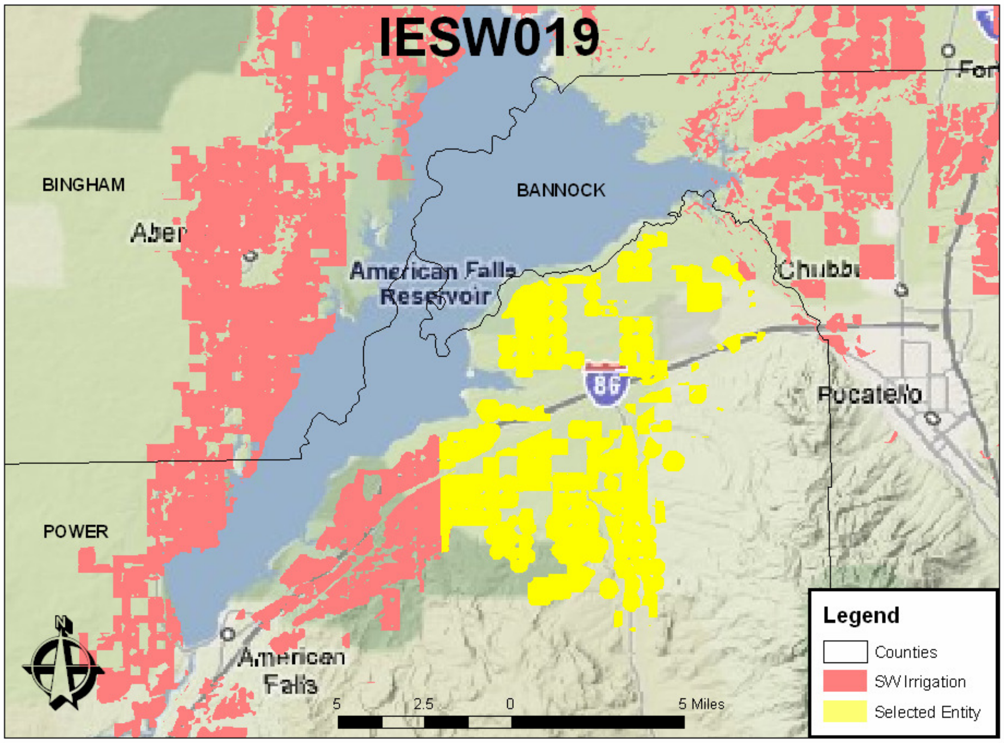
Average Excess Capacity 1985-2005, IESW016
(with bars showing maximum & minimum)
Acre Feet, Thousands
80
70
60
50
40
30
20
10
0
OCT_CAP
NOV_CAP
DEC_CAP
JAN_CAP
FEB_CAP
MAR_CAP
APR_CAP
MAY_CAP
JUN_CAP
JUL_CAP
AUG_CAP
SEP_CAP
Month



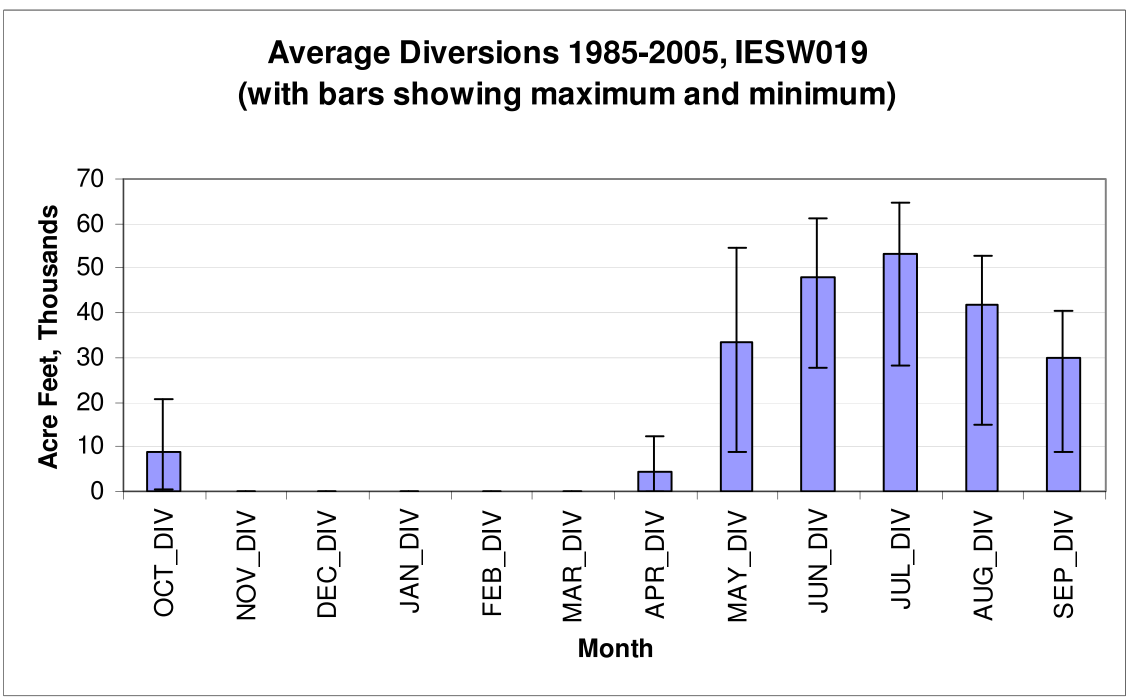
BANNOCK
BINGHAM
IESW018
86
POWER
American Falls
James Nipples
N
5
2.5
0
5 Miles
Legend
Counties
SW Irrigation
Selected Entity


Average Diversions 1985-2005, IESW018
(with bars showing maximum and minimum)
Acre Feet, Thousands
0
1
2
3
4
5
6
7
8
9
10
OCT_DIV
NOV_DIV
DEC_DIV
JAN_DIV
FEB_DIV
MAR_DIV
APR_DIV
MAY_DIV
JUN_DIV
JUL_DIV
AUG_DIV
SEP_DIV
Month

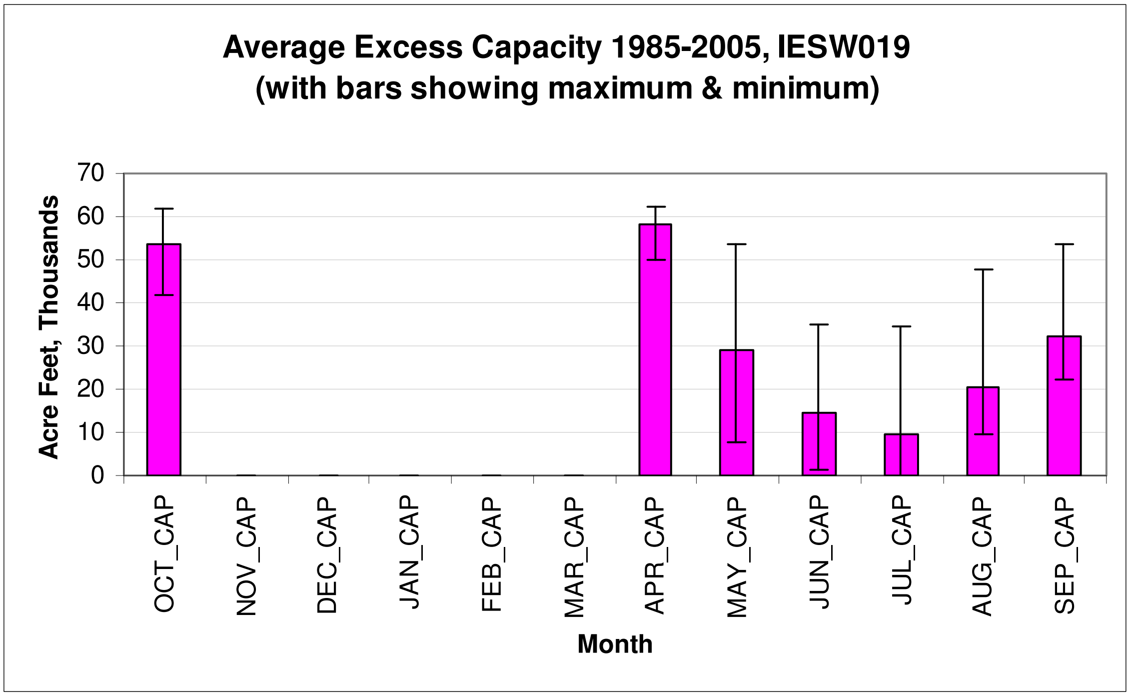

Average Excess Capacity 1985-2005, IESW018
(with bars showing maximum & minimum)
Acre Feet, Thousands
0
1
2
3
4
5
6
7
8
9
OCT_CAP
NOV_CAP
DEC_CAP
JAN_CAP
FEB_CAP
MAR_CAP
APR_CAP
MAY_CAP
JUN_CAP
JUL_CAP
AUG_CAP
SEP_CAP
Month

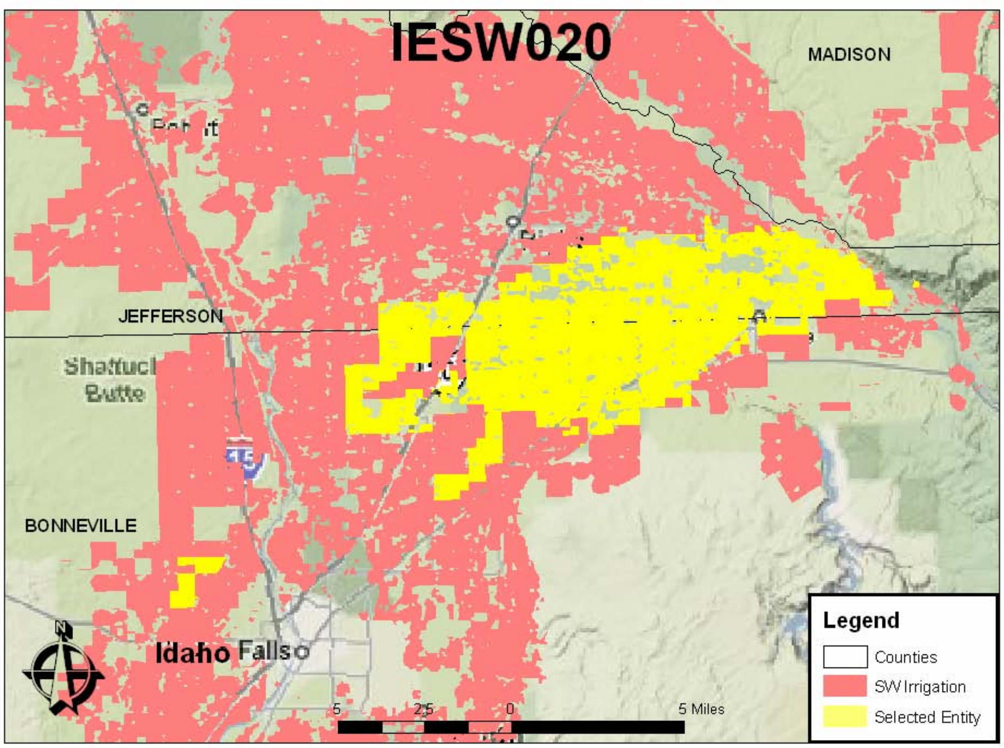


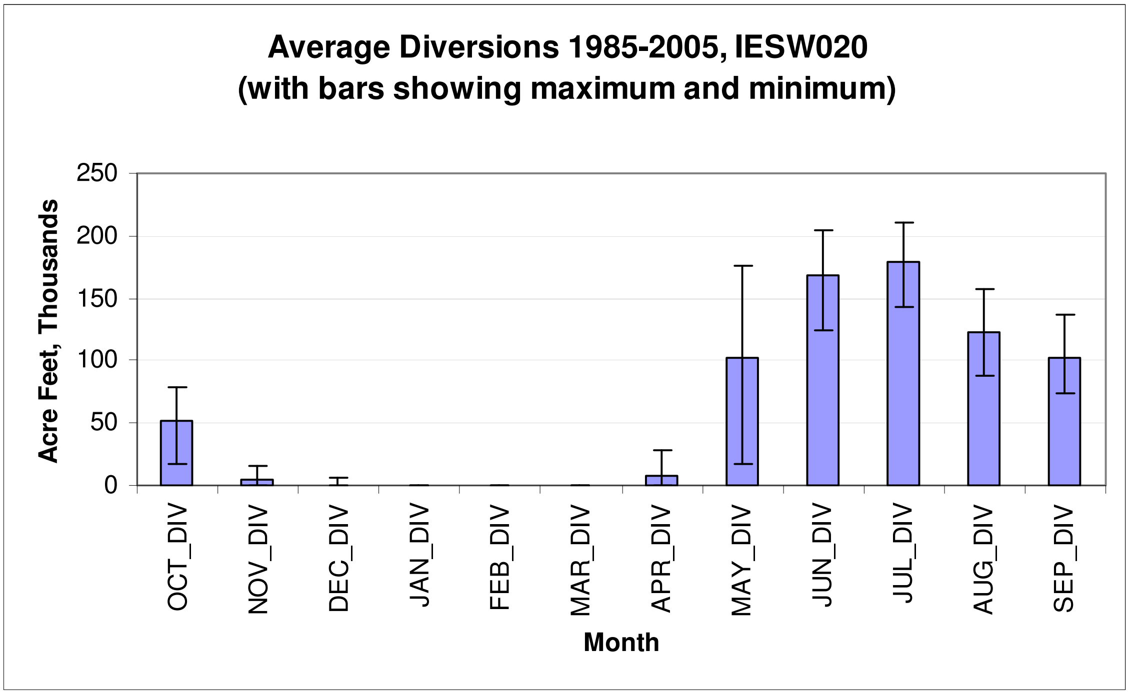
IESW019
BINGHAM
Aber
BANNOCK
American Falls
Reservoir
Chubbu
Pocatello
POWER
American
Falls
For
86
N
5
2.5
0
5 Miles
Legend
Counties
SW Irrigation
Selected Entity

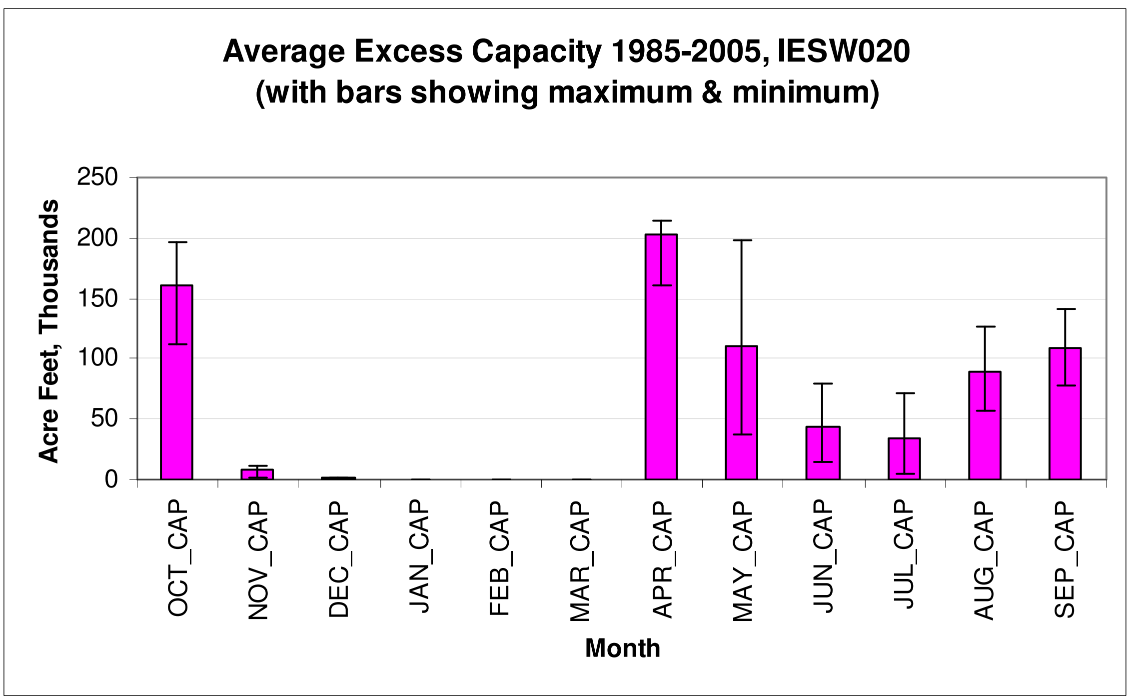


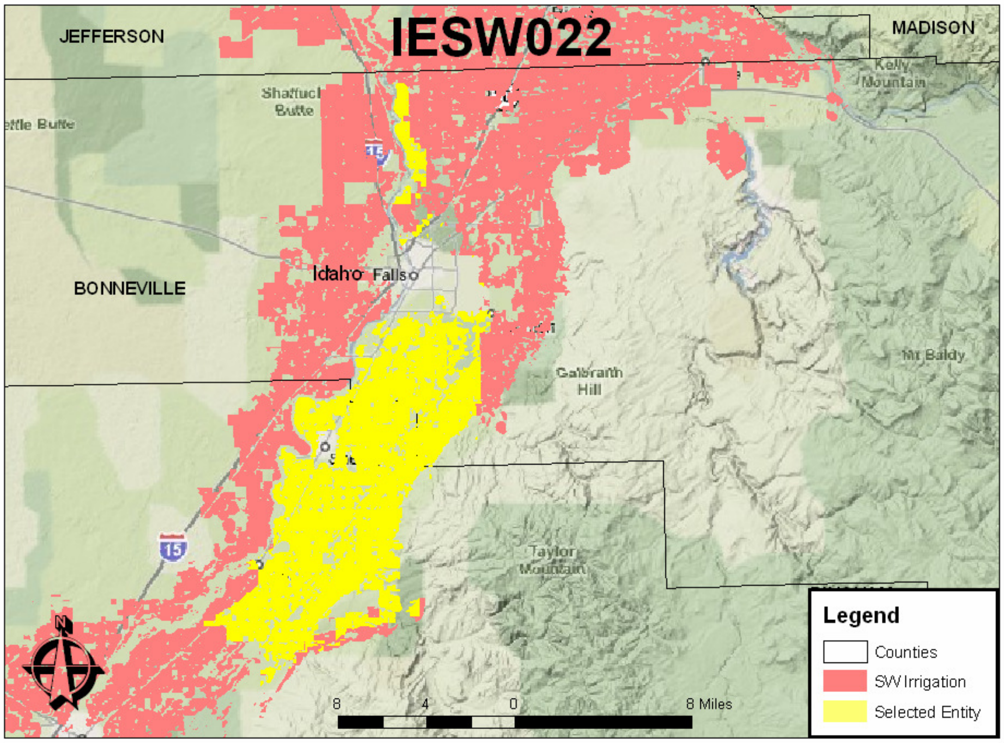
Average Diversions 1985-2005, IESW019
(with bars showing maximum and minimum)
Acre Feet, Thousands
70
60
50
40
30
20
10
0
OCT_DIV
NOV_DIV
DEC_DIV
JAN_DIV
FEB_DIV
MAR_DIV
APR_DIV
MAY_DIV
JUN_DIV
JUL_DIV
AUG_DIV
SEP_DIV
Month

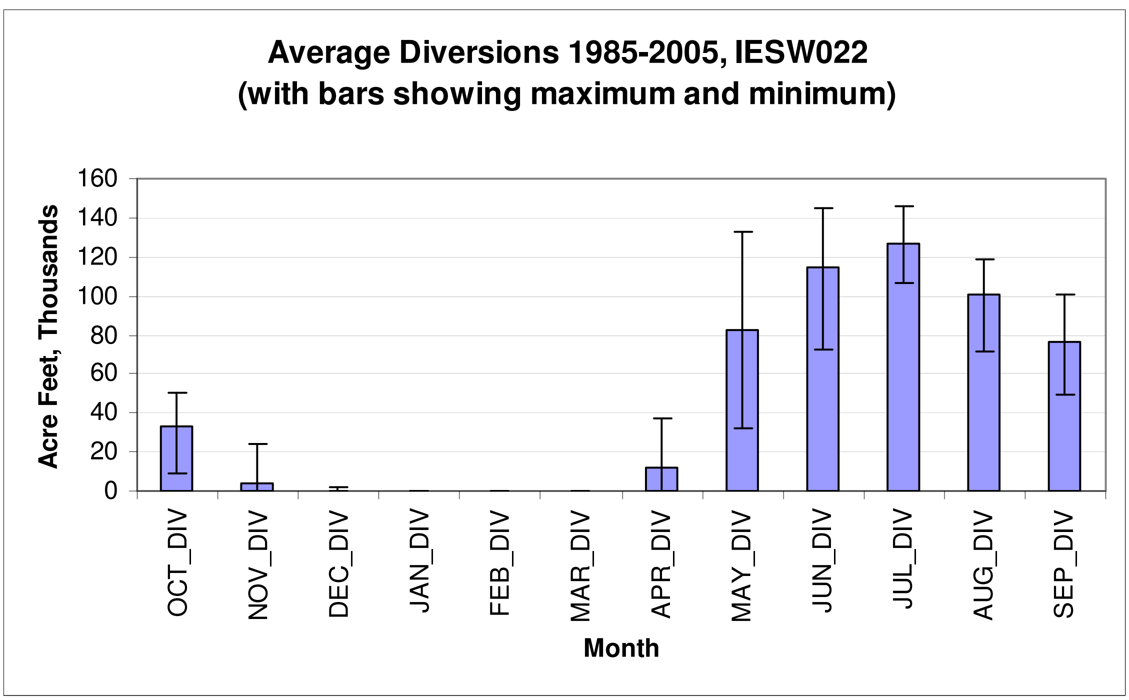

Average Excess Capacity 1985-2005, IESW019
(with bars showing maximum & minimum)
Acre Feet, Thousands
70
60
50
40
30
20
10
0
OCT_CAP
NOV_CAP
DEC_CAP
JAN_CAP
FEB_CAP
MAR_CAP
APR_CAP
MAY_CAP
JUN_CAP
JUL_CAP
AUG_CAP
SEP_CAP
Month

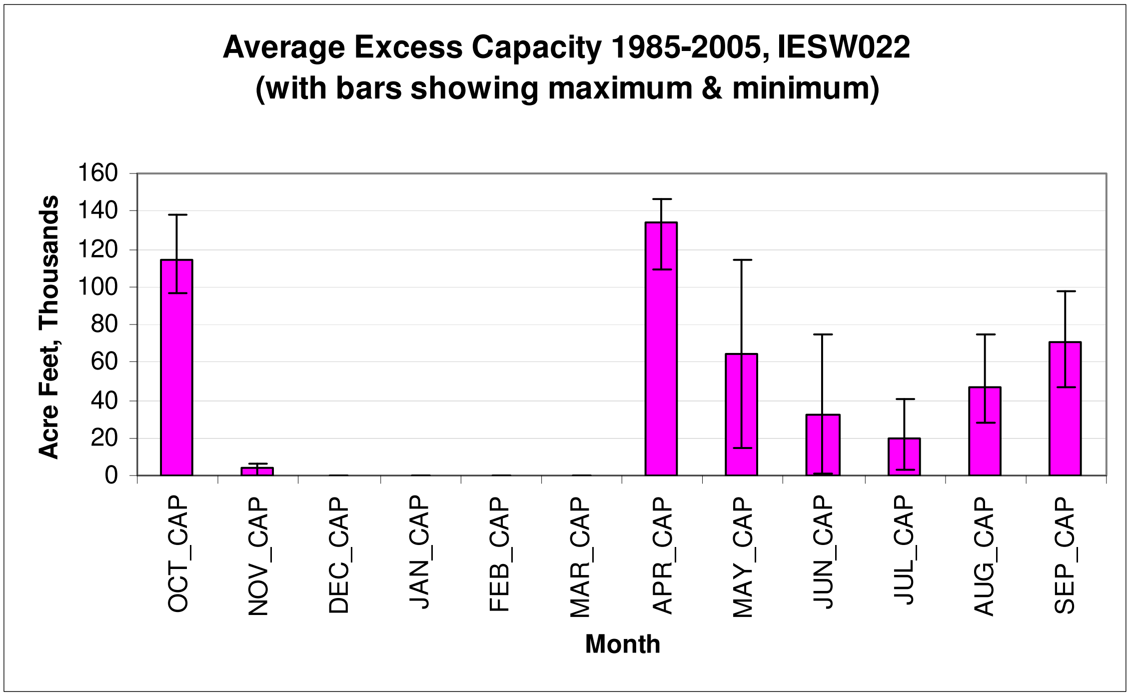

IESW020
MADISON
JEFFERSON
Shattuck
Butte
BONNEVILLE
Idaho Falls
5
2.5
0
5 Miles
Legend
Counties
SW Irrigation
Selected Entity


Average Diversions 1985-2005, IESW020
(with bars showing maximum and minimum)
Acre Feet, Thousands
250
200
150
100
50
0
OCT_DIV
NOV_DIV
DEC_DIV
JAN_DIV
FEB_DIV
MAR_DIV
APR_DIV
MAY_DIV
JUN_DIV
JUL_DIV
AUG_DIV
SEP_DIV
Month

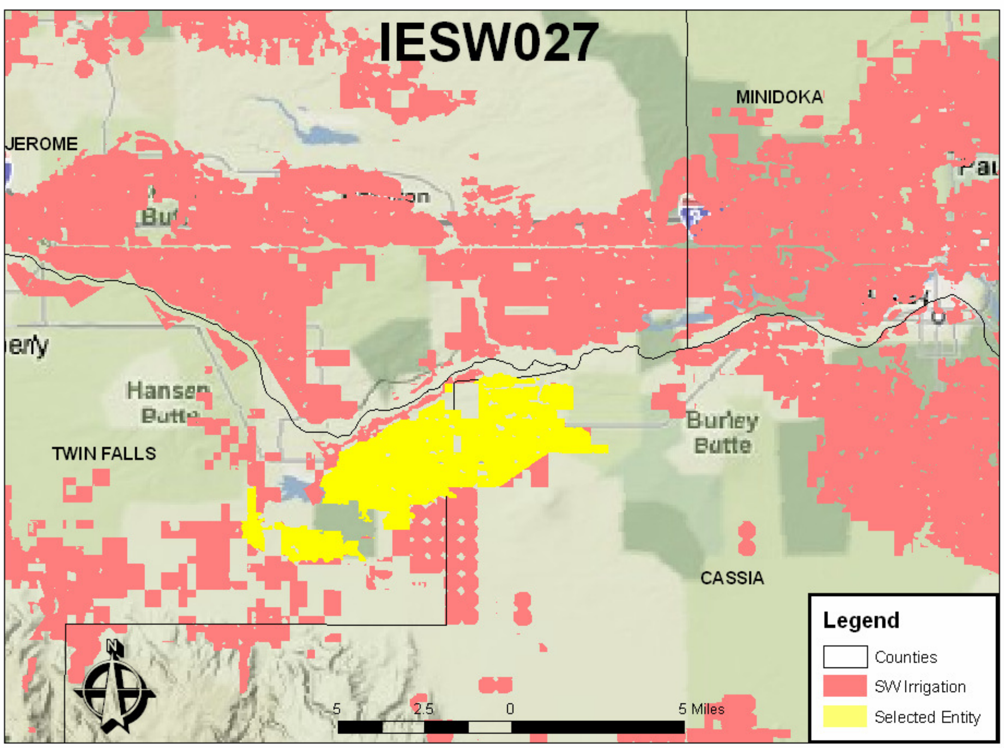

Average Excess Capacity 1985-2005, IESW020
(with bars showing maximum & minimum)
Acre Feet, Thousands
250
200
150
100
50
0
OCT_CAP
NOV_CAP
DEC_CAP
JAN_CAP
FEB_CAP
MAR_CAP
APR_CAP
MAY_CAP
JUN_CAP
JUL_CAP
AUG_CAP
SEP_CAP
Month


IESW022
JEFFERSON
MADISON
Kelly Mountain
Shattuck Butte
BONNEVILLE
Idaho Falls
Galbraith Hill
Mt Baldy
Taylor Mountain
8 4 0 8 Miles
Legend
Counties
SW Irrigation
Selected Entity

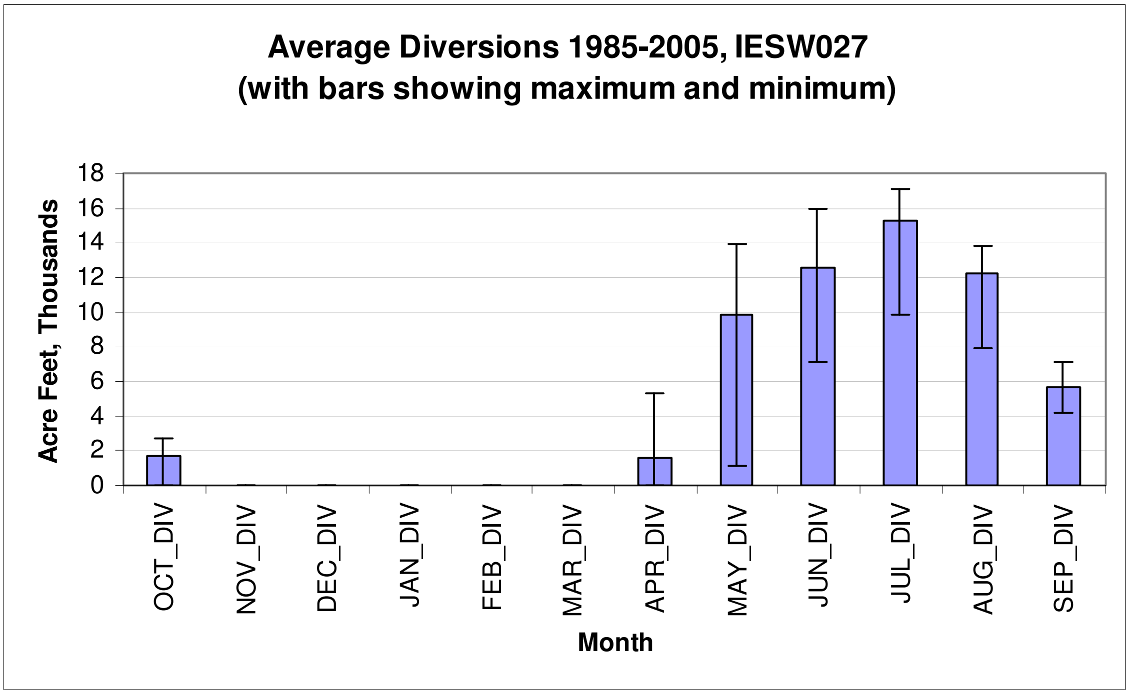

Average Diversions 1985-2005, IESW022
(with bars showing maximum and minimum)
Acre Feet, Thousands
160
140
120
100
80
60
40
20
0
OCT_DIV
NOV_DIV
DEC_DIV
JAN_DIV
FEB_DIV
MAR_DIV
APR_DIV
MAY_DIV
JUN_DIV
JUL_DIV
AUG_DIV
SEP_DIV
Month



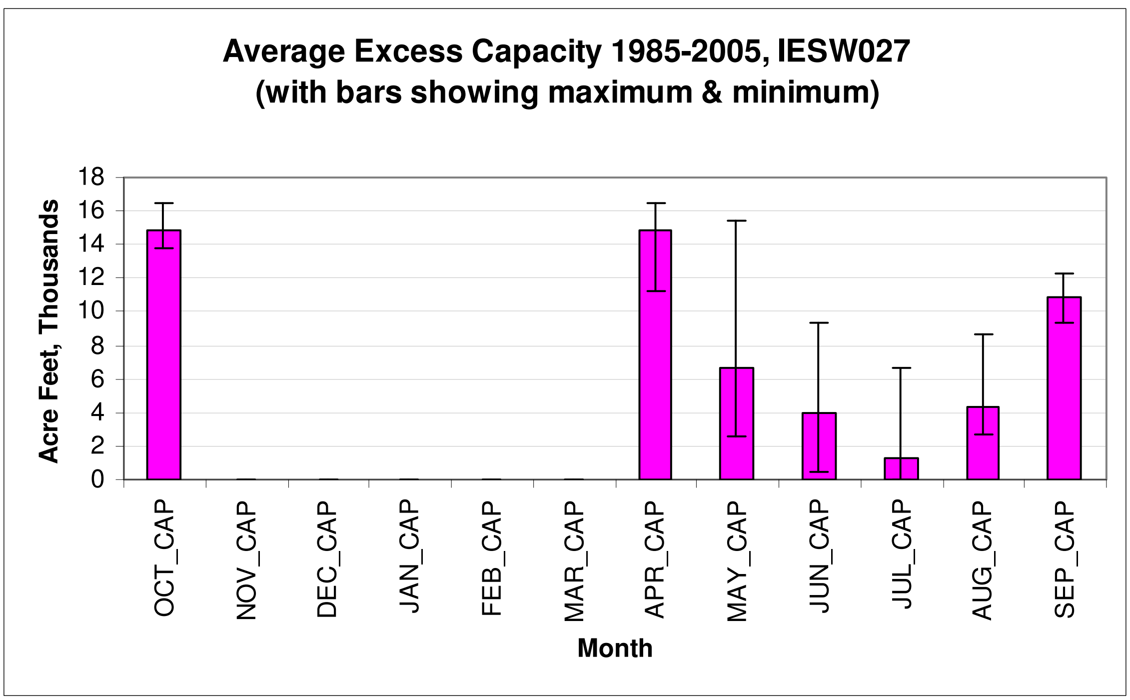
Average Excess Capacity 1985-2005, IESW022
(with bars showing maximum & minimum)
Acre Feet, Thousands
160
140
120
100
80
60
40
20
0
OCT_CAP
NOV_CAP
DEC_CAP
JAN_CAP
FEB_CAP
MAR_CAP
APR_CAP
MAY_CAP
JUN_CAP
JUL_CAP
AUG_CAP
SEP_CAP
Month



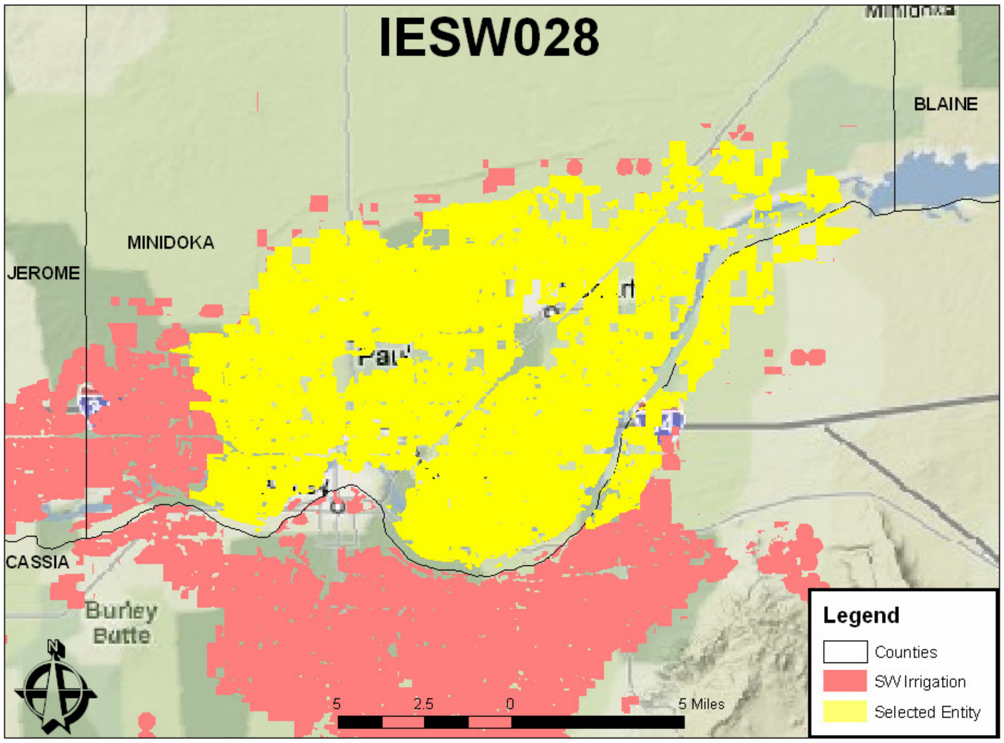
IESW027
MINIDOKA
JEROME
TWIN FALLS
CASSIA
Hansen Butte
Burley Butte
Legend
Counties
SW Irrigation
Selected Entity
5
2.5
0
5 Miles



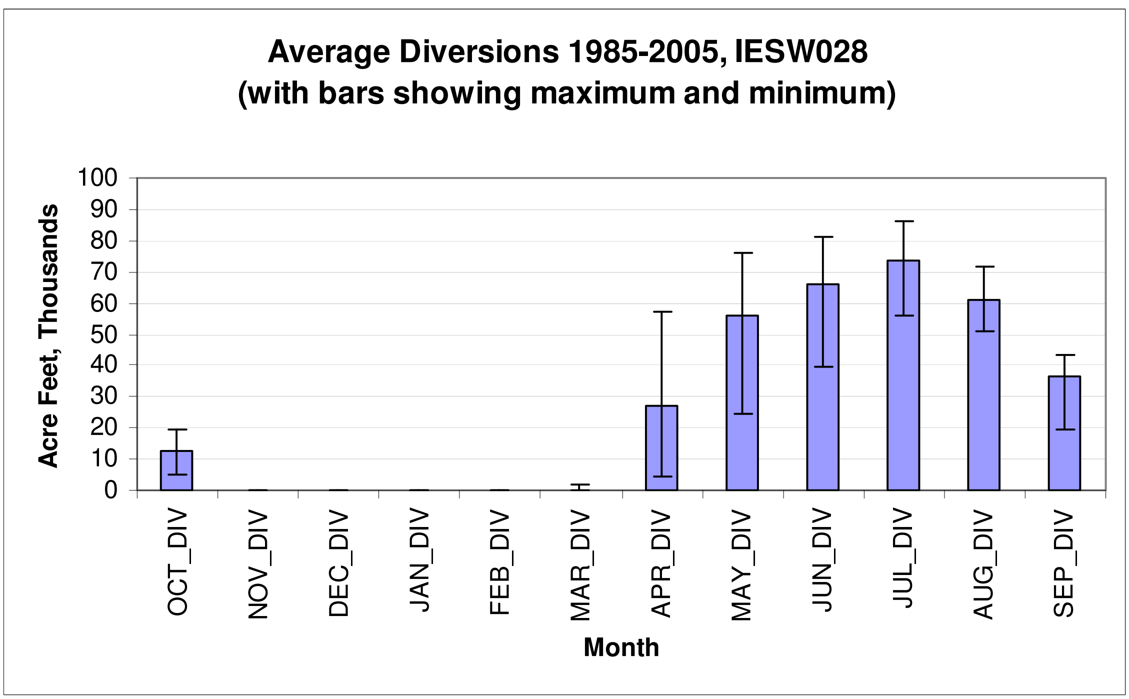
Average Diversions 1985-2005, IESW027
(with bars showing maximum and minimum)
Acre Feet, Thousands
18
16
14
12
10
8
6
4
2
0
OCT_DIV
NOV_DIV
DEC_DIV
JAN_DIV
FEB_DIV
MAR_DIV
APR_DIV
MAY_DIV
JUN_DIV
JUL_DIV
AUG_DIV
SEP_DIV
Month



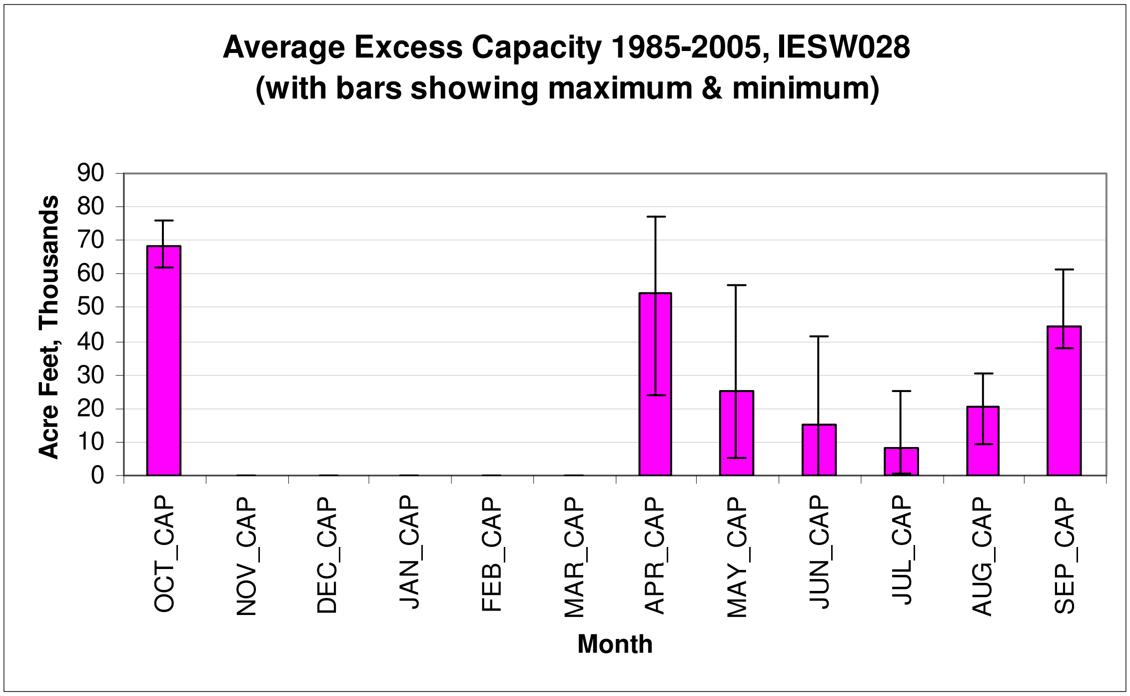
Average Excess Capacity 1985-2005, IESW027
(with bars showing maximum & minimum)
Acre Feet, Thousands
18
16
14
12
10
8
6
4
2
0
OCT_CAP
NOV_CAP
DEC_CAP
JAN_CAP
FEB_CAP
MAR_CAP
APR_CAP
MAY_CAP
JUN_CAP
JUL_CAP
AUG_CAP
SEP_CAP
Month

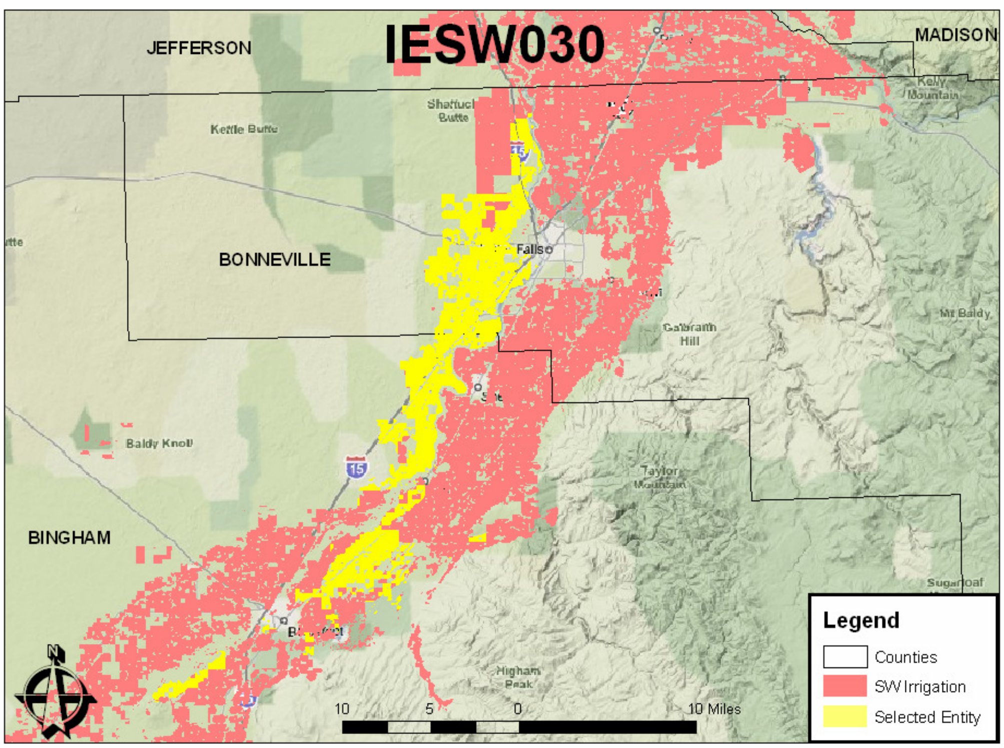


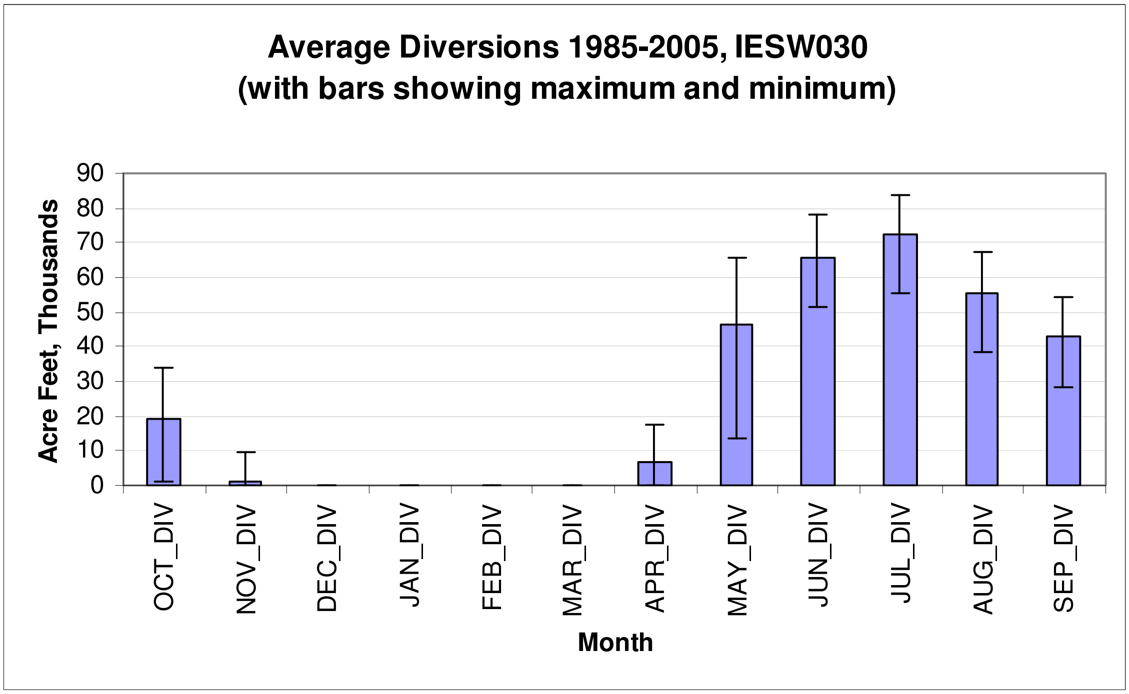
IESW028
MINIDOKA
JEROME
CASSIA
BLAINE
Burley Butte
Legend
Counties
SW Irrigation
Selected Entity
5 2.5 0 5 Miles



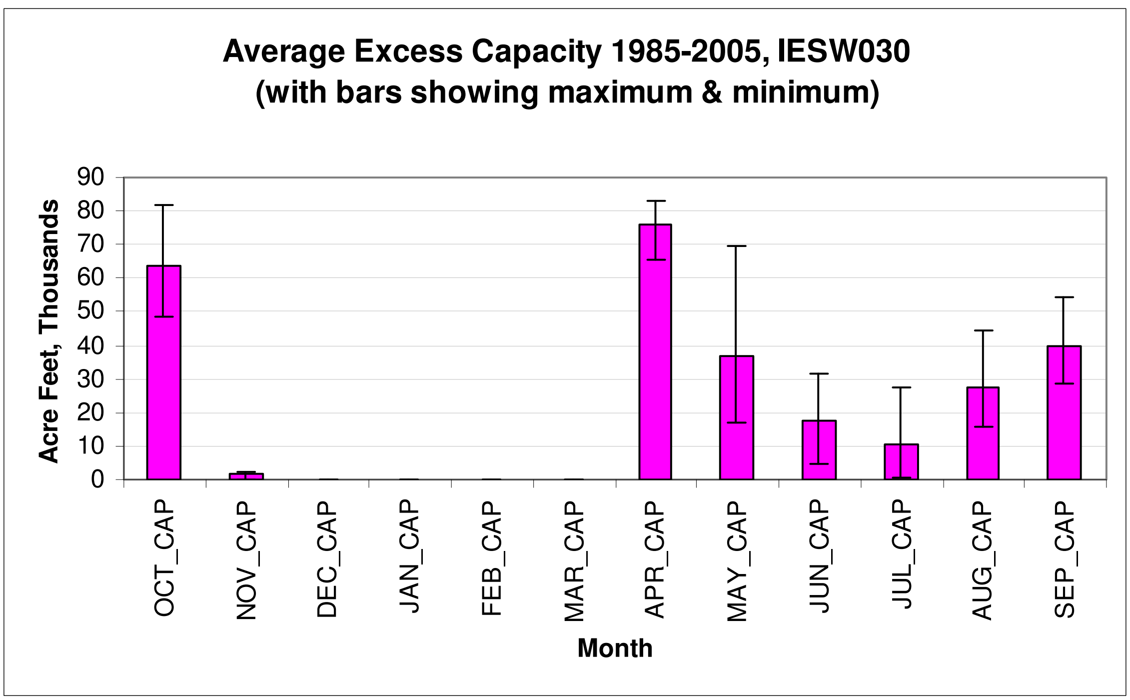
Average Diversions 1985-2005, IESW028
(with bars showing maximum and minimum)
Acre Feet, Thousands
100
90
80
70
60
50
40
30
20
10
0
OCT_DIV
NOV_DIV
DEC_DIV
JAN_DIV
FEB_DIV
MAR_DIV
APR_DIV
MAY_DIV
JUN_DIV
JUL_DIV
AUG_DIV
SEP_DIV
Month


Average Excess Capacity 1985-2005, IESW028
(with bars showing maximum & minimum)
Acre Feet, Thousands
90
80
70
60
50
40
30
20
10
0
OCT_CAP
NOV_CAP
DEC_CAP
JAN_CAP
FEB_CAP
MAR_CAP
APR_CAP
MAY_CAP
JUN_CAP
JUL_CAP
AUG_CAP
SEP_CAP
Month

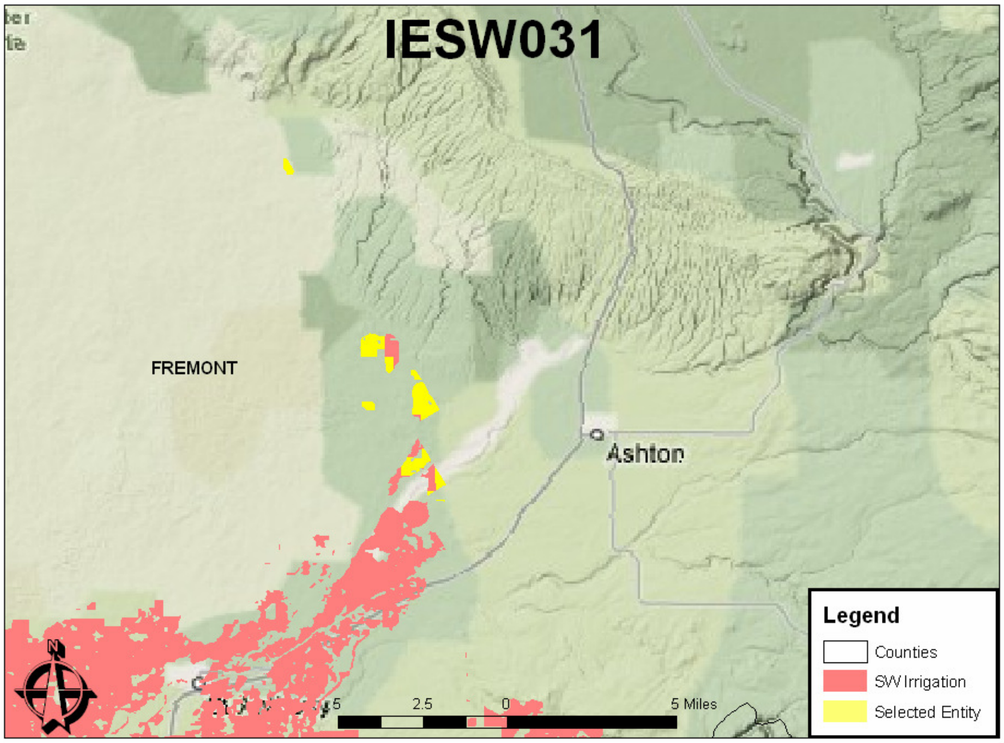

IESW030
JEFFERSON
MADISON
BONNEVILLE
BINGHAM
Falls
Baldy Knoll
Kettle Butte
Galbraith Hill
Mt Baldy
Taylor Mountain
Higham Peak
10
5
0
10 Miles
Legend
Counties
SW Irrigation
Selected Entity



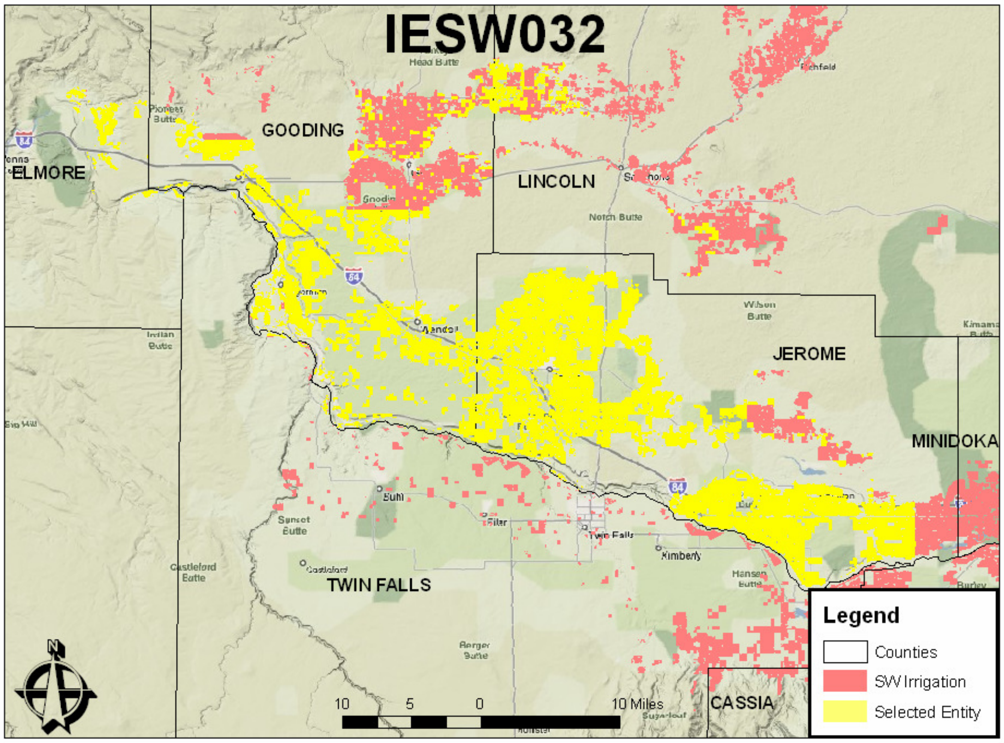
Average Diversions 1985-2005, IESW030
(with bars showing maximum and minimum)
Acre Feet, Thousands
0
10
20
30
40
50
60
70
80
90
OCT_DIV
NOV_DIV
DEC_DIV
JAN_DIV
FEB_DIV
MAR_DIV
APR_DIV
MAY_DIV
JUN_DIV
JUL_DIV
AUG_DIV
SEP_DIV
Month

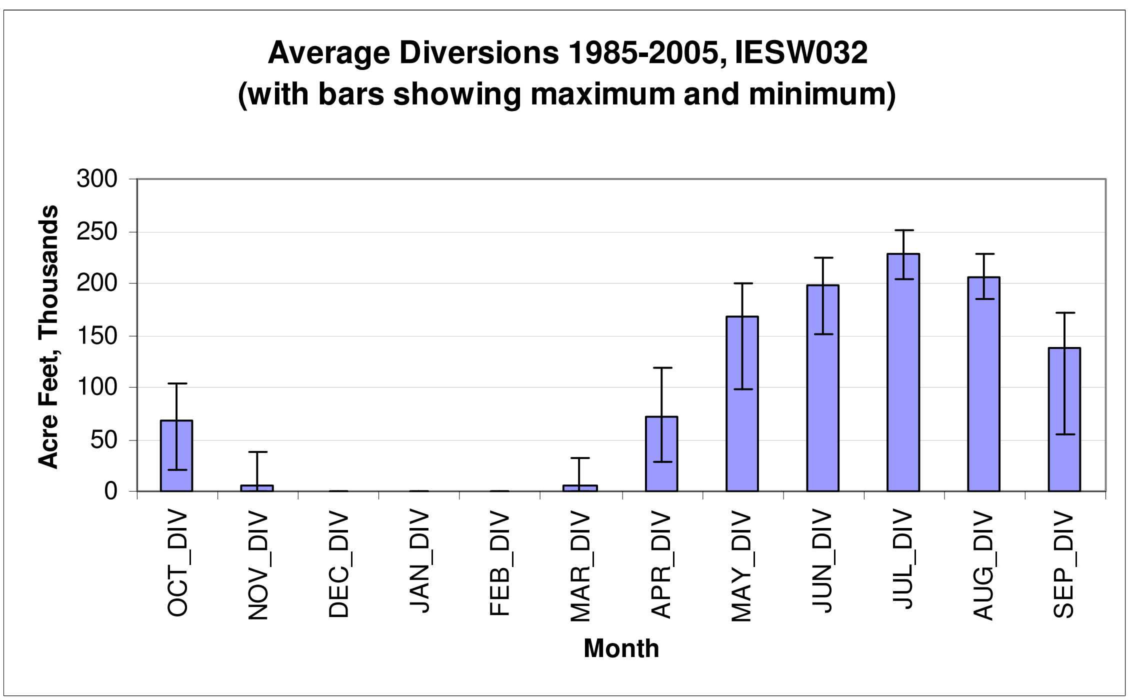


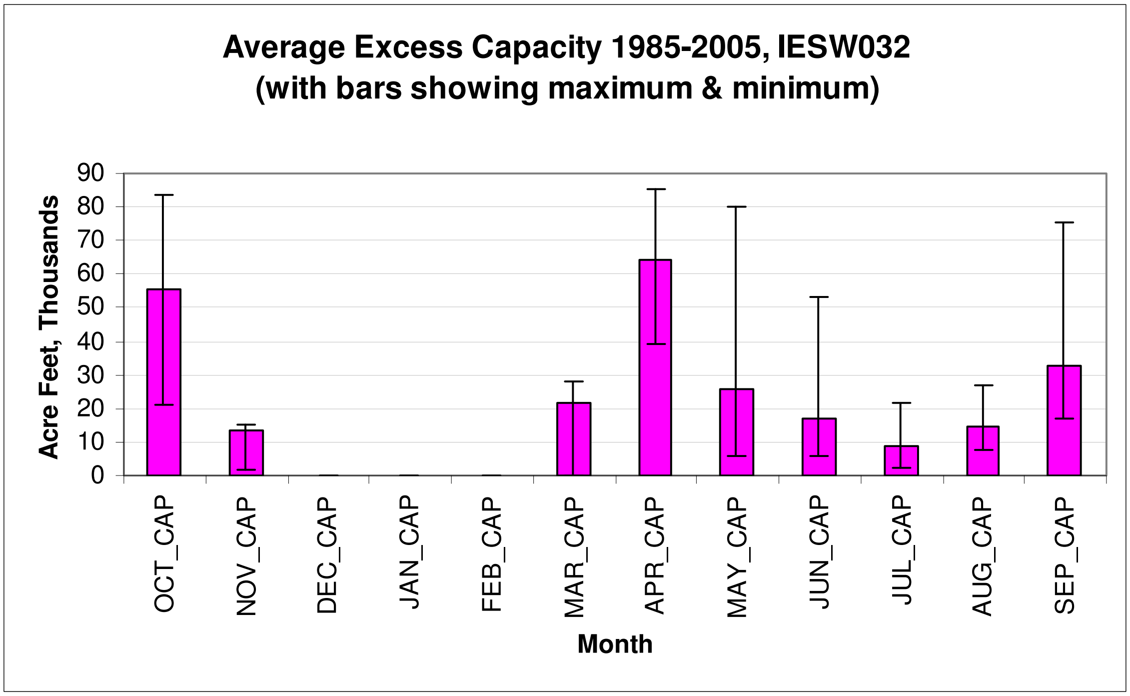
Average Excess Capacity 1985-2005, IESW030
(with bars showing maximum & minimum)
Acre Feet, Thousands
0
10
20
30
40
50
60
70
80
90
OCT_CAP
NOV_CAP
DEC_CAP
JAN_CAP
FEB_CAP
MAR_CAP
APR_CAP
MAY_CAP
JUN_CAP
JUL_CAP
AUG_CAP
SEP_CAP
Month



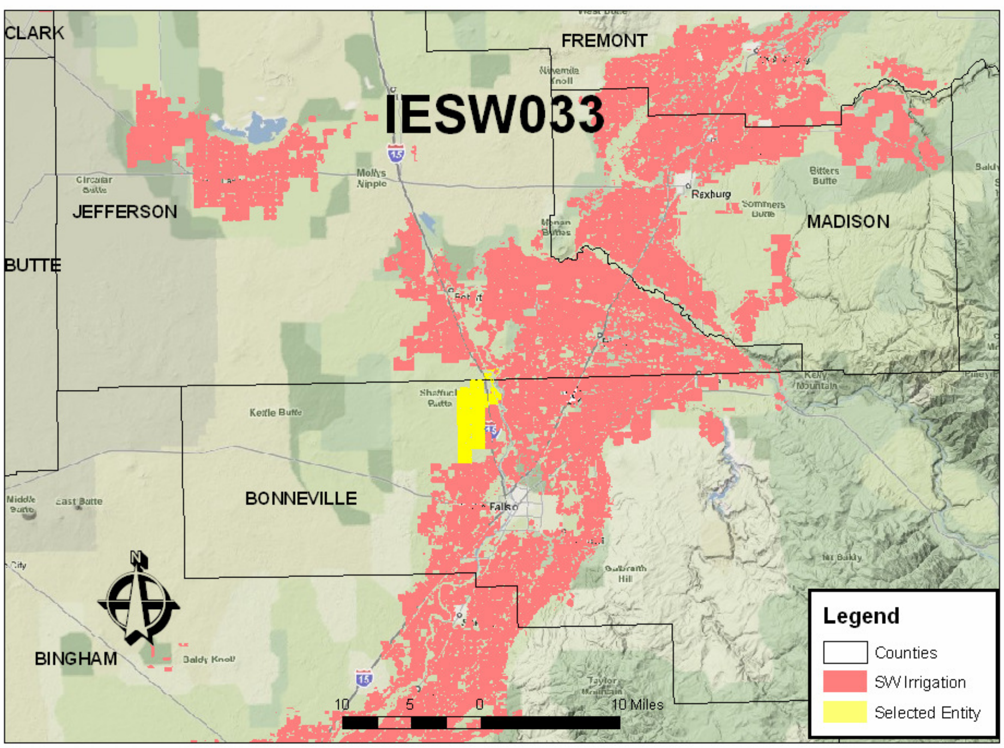
Only those parts of Entity 31 lying over the aquifer are illustrated; nearly all of IESW031 lies outside the Eastern Snake Plain Aquifer. No convertible acres were attributed to this entity for the study.


IESW032
GOODING
ELMORE
LINCOLN
JEROME
MINIDOKA
TWIN FALLS
CASSIA
Legend
Counties
SW Irrigation
Selected Entity
10 5 0 10 Miles

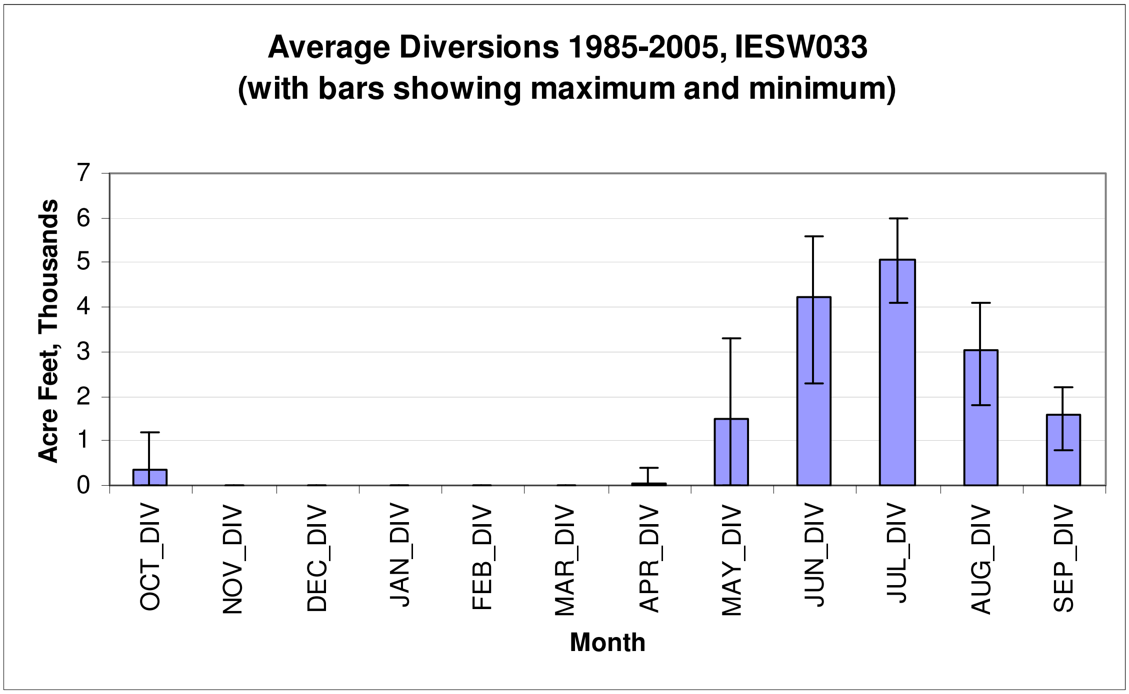

Average Diversions 1985-2005, IESW032
(with bars showing maximum and minimum)
Acre Feet, Thousands
300
250
200
150
100
50
0
OCT_DIV
NOV_DIV
DEC_DIV
JAN_DIV
FEB_DIV
MAR_DIV
APR_DIV
MAY_DIV
JUN_DIV
JUL_DIV
AUG_DIV
SEP_DIV
Month

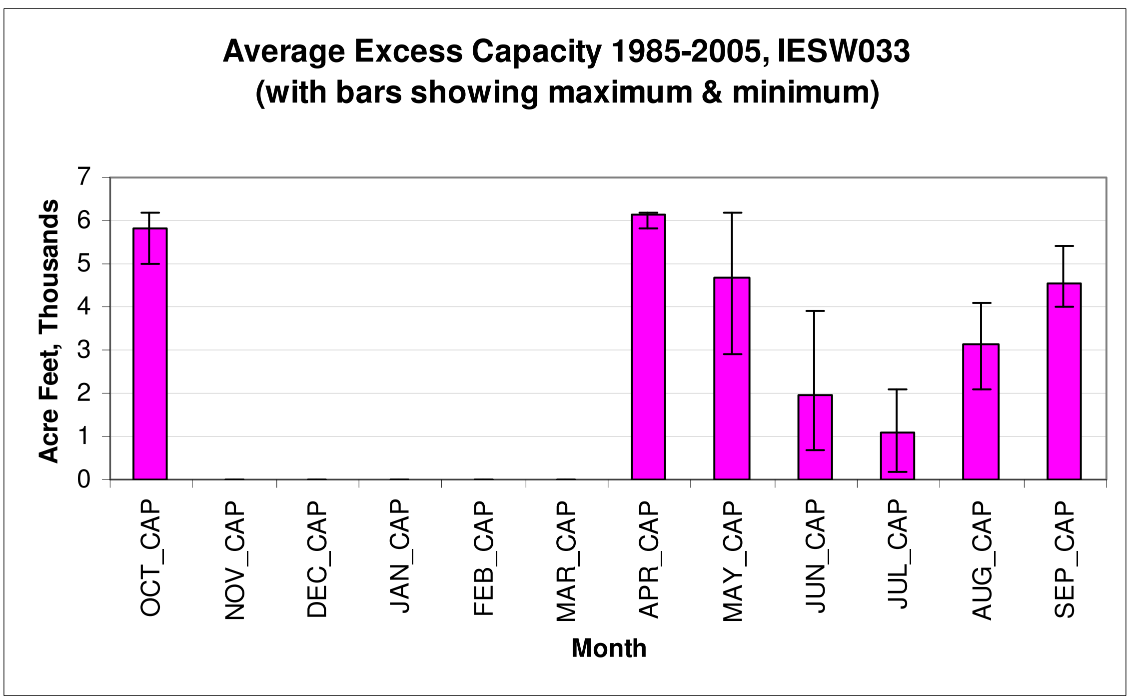


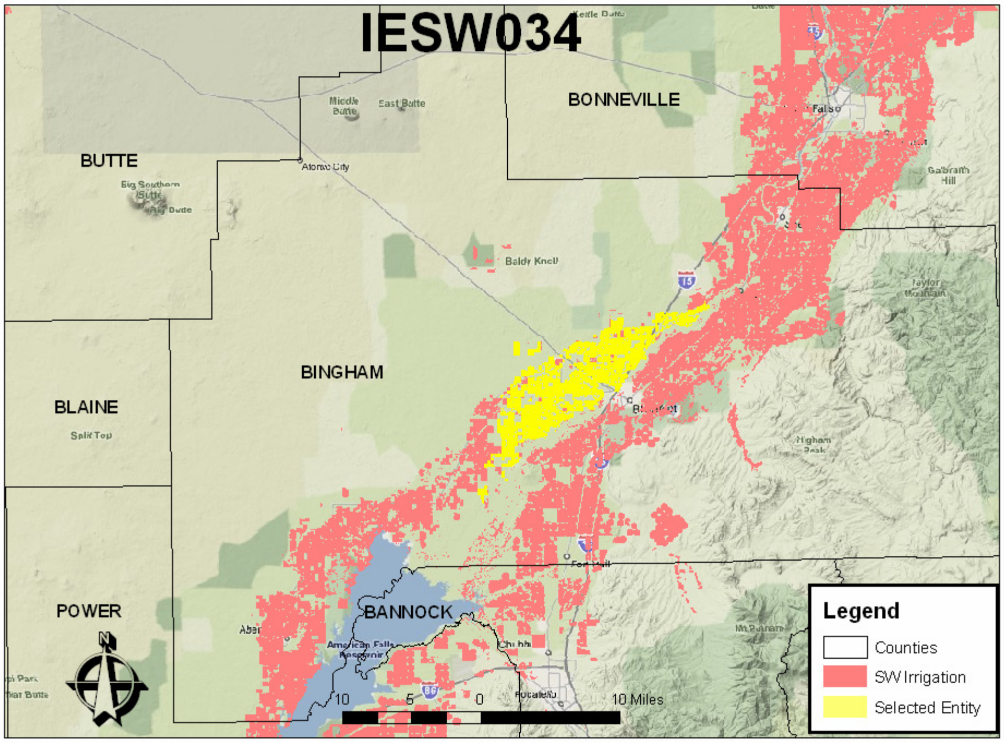
Average Excess Capacity 1985-2005, IESW032
(with bars showing maximum & minimum)
Acre Feet, Thousands
90
80
70
60
50
40
30
20
10
0
OCT_CAP
NOV_CAP
DEC_CAP
JAN_CAP
FEB_CAP
MAR_CAP
APR_CAP
MAY_CAP
JUN_CAP
JUL_CAP
AUG_CAP
SEP_CAP
Month

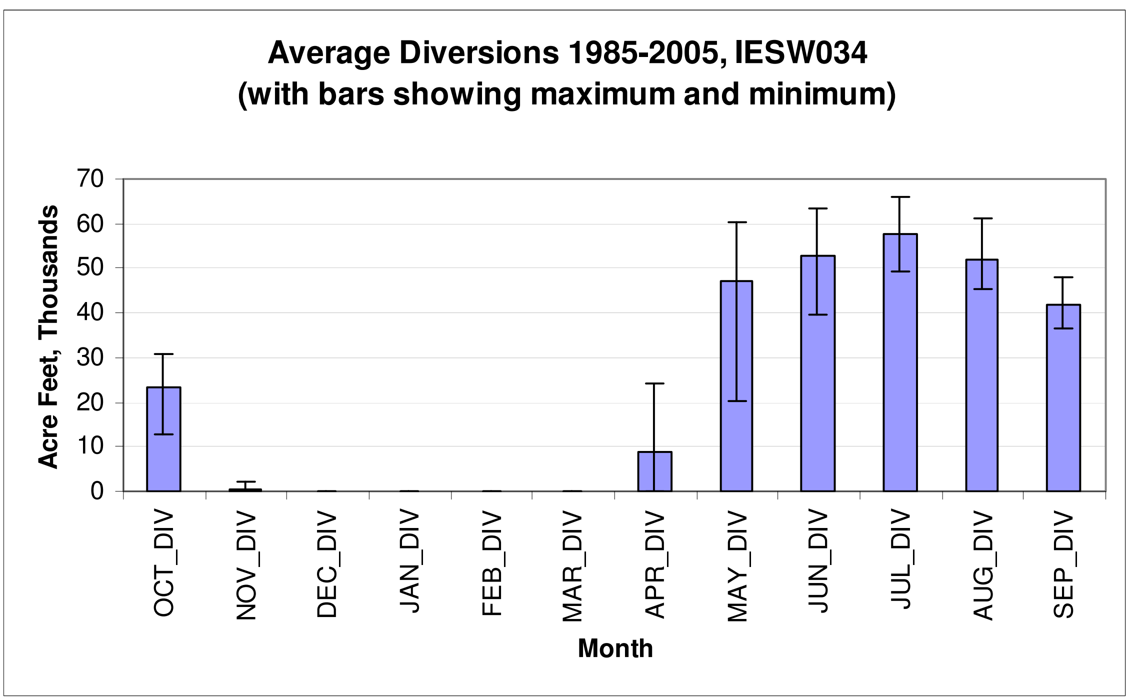


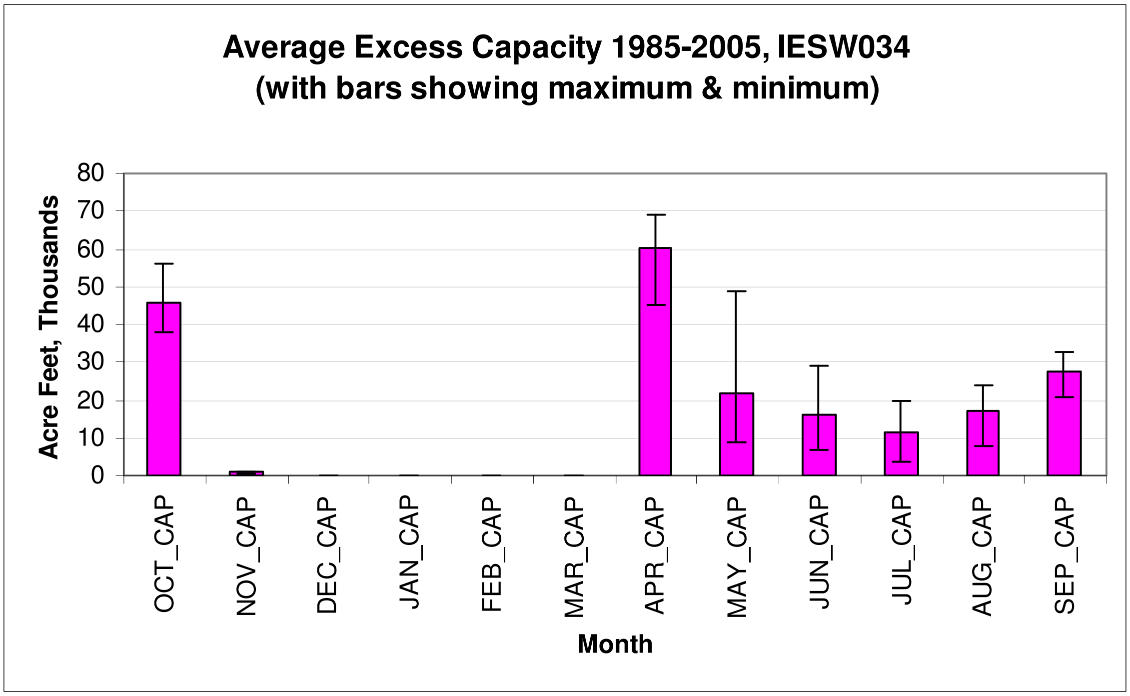
IESW033
CLARK
FREMONT
JEFFERSON
BUTTE
MADISON
BONNEVILLE
BINGHAM
Rexburg
Kettle Butte
Legend
Counties
SW Irrigation
Selected Entity
10
5
0
10 Miles

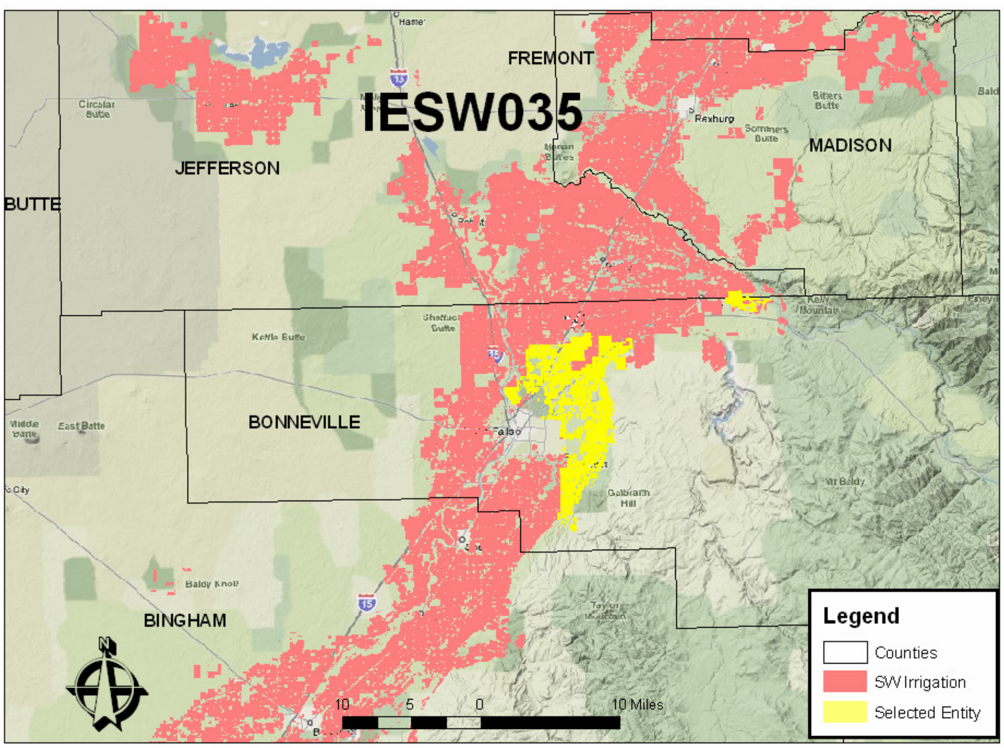

Average Diversions 1985-2005, IESW033
(with bars showing maximum and minimum)
Acre Feet, Thousands
0
1
2
3
4
5
6
7
OCT_DIV
NOV_DIV
DEC_DIV
JAN_DIV
FEB_DIV
MAR_DIV
APR_DIV
MAY_DIV
JUN_DIV
JUL_DIV
AUG_DIV
SEP_DIV
Month

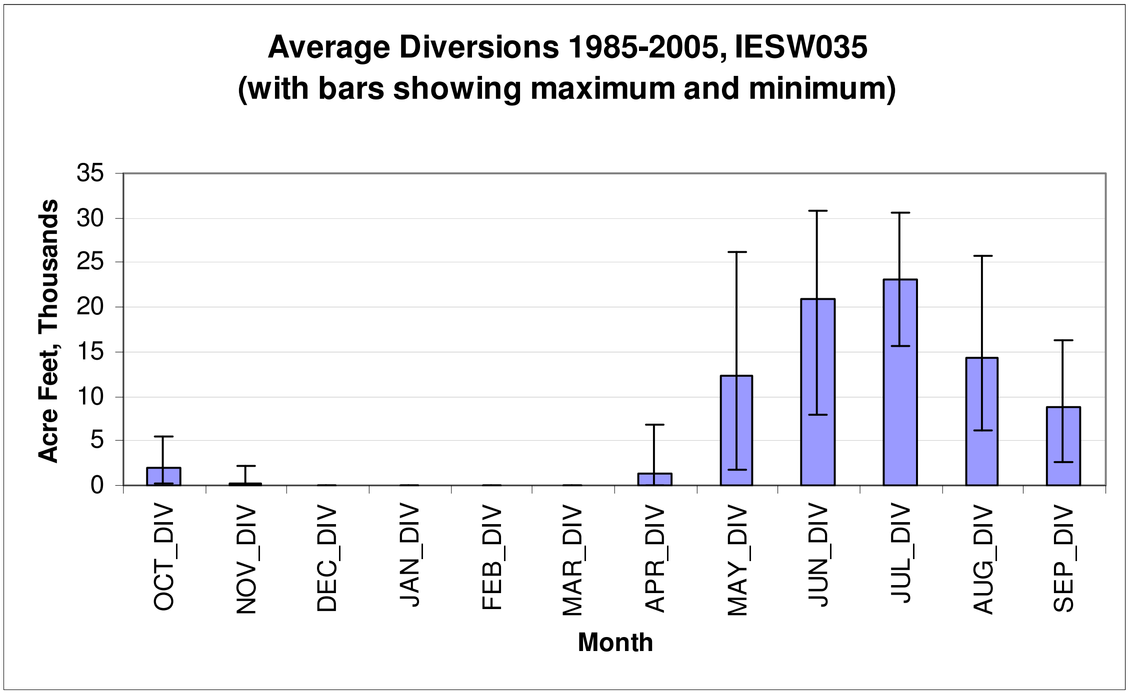

Average Excess Capacity 1985-2005, IESW033
(with bars showing maximum & minimum)
Acre Feet, Thousands
0
1
2
3
4
5
6
7
OCT_CAP
NOV_CAP
DEC_CAP
JAN_CAP
FEB_CAP
MAR_CAP
APR_CAP
MAY_CAP
JUN_CAP
JUL_CAP
AUG_CAP
SEP_CAP
Month

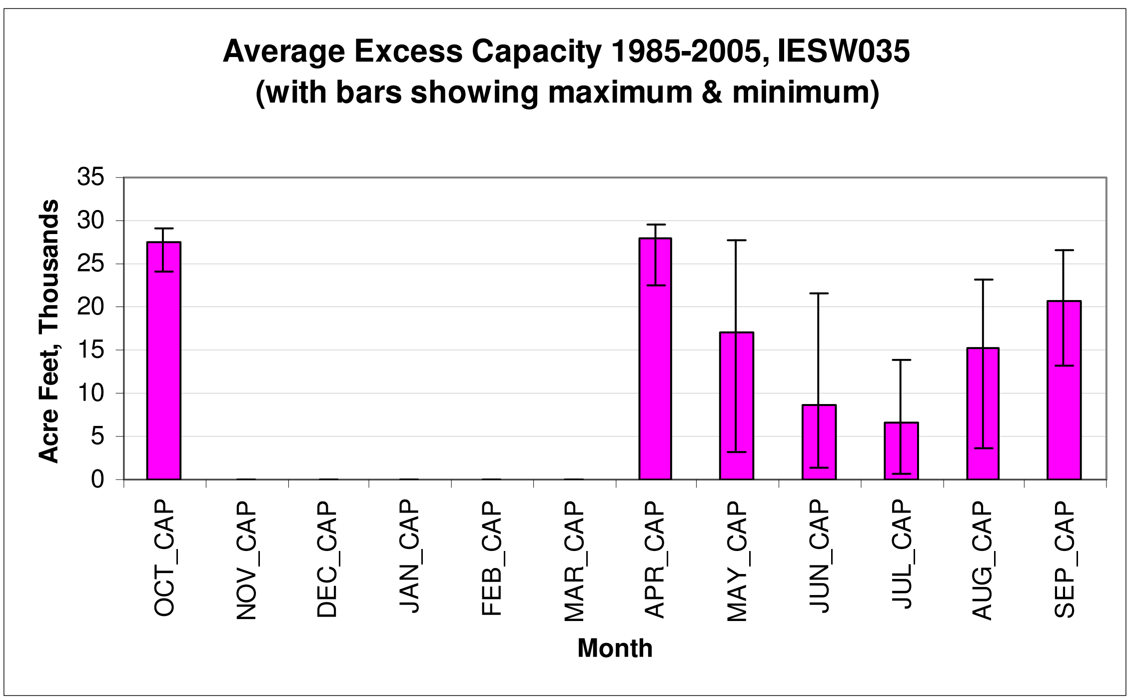

IESW034
BONNEVILLE
BUTTE
BINGHAM
BLAINE
POWER
BANNOCK
10
5
0
10 Miles
Legend
Counties
SW Irrigation
Selected Entity

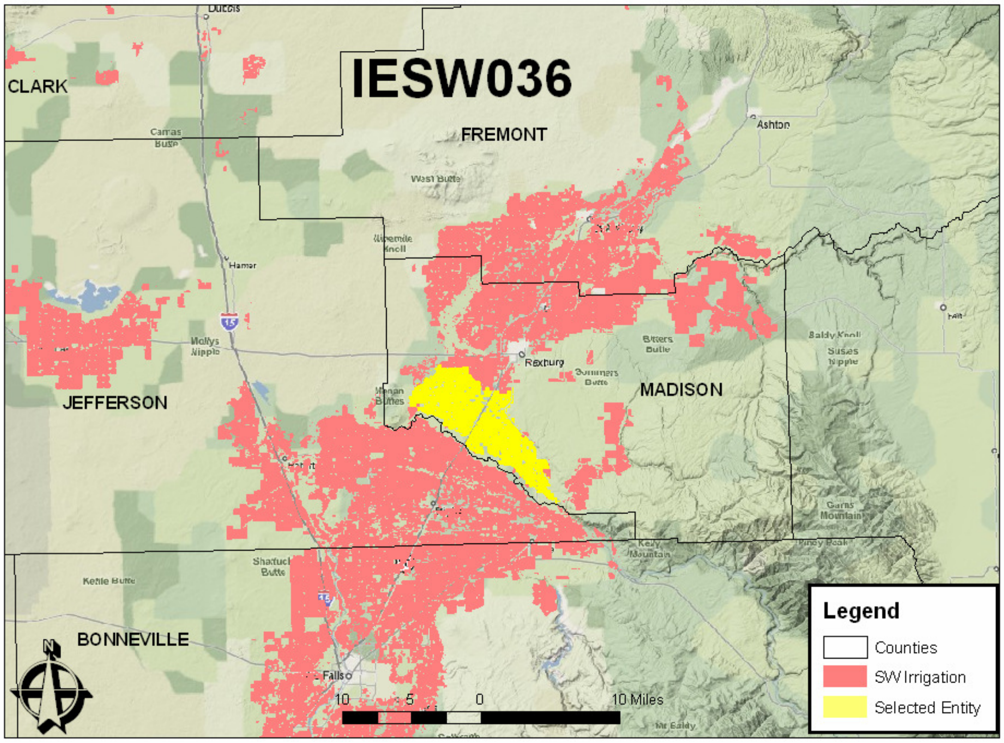

Average Diversions 1985-2005, IESW034
(with bars showing maximum and minimum)
Acre Feet, Thousands
70
60
50
40
30
20
10
0
OCT_DIV
NOV_DIV
DEC_DIV
JAN_DIV
FEB_DIV
MAR_DIV
APR_DIV
MAY_DIV
JUN_DIV
JUL_DIV
AUG_DIV
SEP_DIV
Month

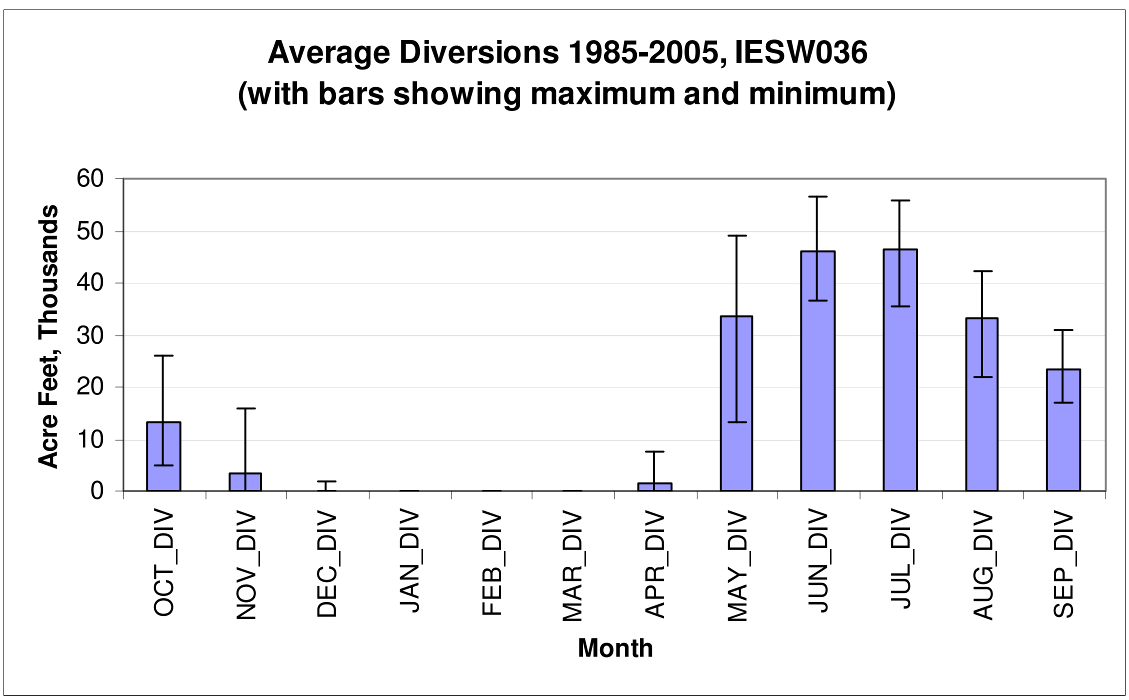

Average Excess Capacity 1985-2005, IESW034
(with bars showing maximum & minimum)
Acre Feet, Thousands
0
10
20
30
40
50
60
70
80
OCT_CAP
NOV_CAP
DEC_CAP
JAN_CAP
FEB_CAP
MAR_CAP
APR_CAP
MAY_CAP
JUN_CAP
JUL_CAP
AUG_CAP
SEP_CAP
Month

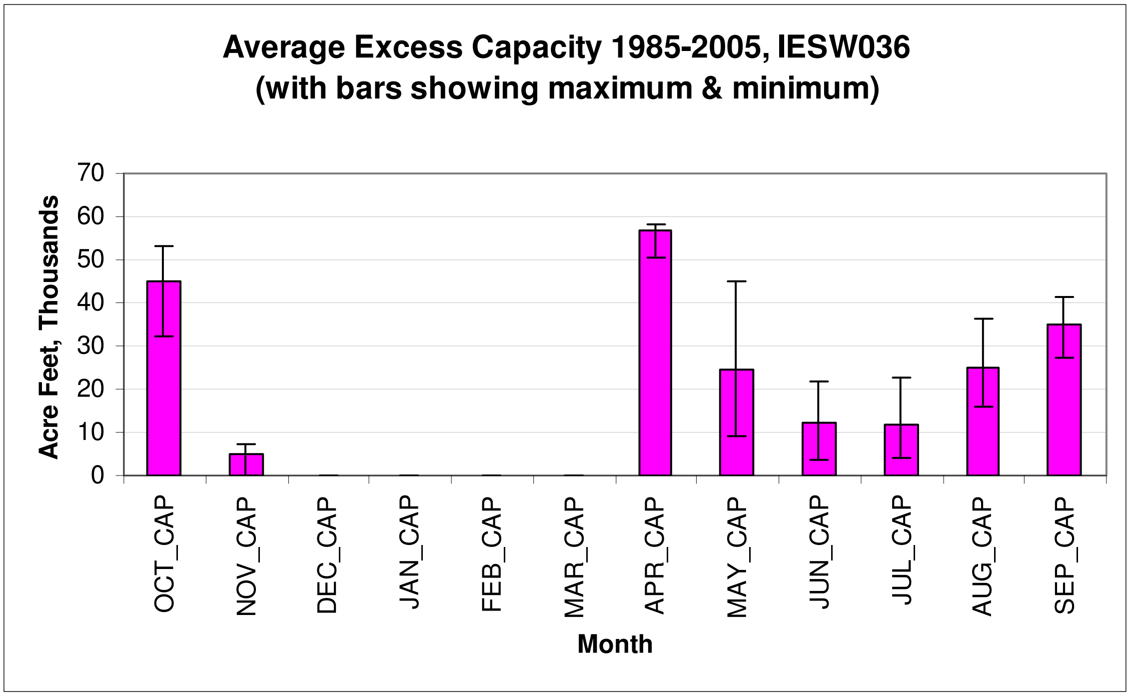

IESW035
FREMONT
JEFFERSON
BUTTE
MADISON
BONNEVILLE
BINGHAM
Circular Butte
Rexburg
Sommers Butte
Bitters Butte
Kelly Mountain
Shattuck Butte
Kettle Butte
East Butte
Middle Butte
Galbraith Hill
Baldy Knob
N
10
5
0
10 Miles
Legend
Counties
SW Irrigation
Selected Entity

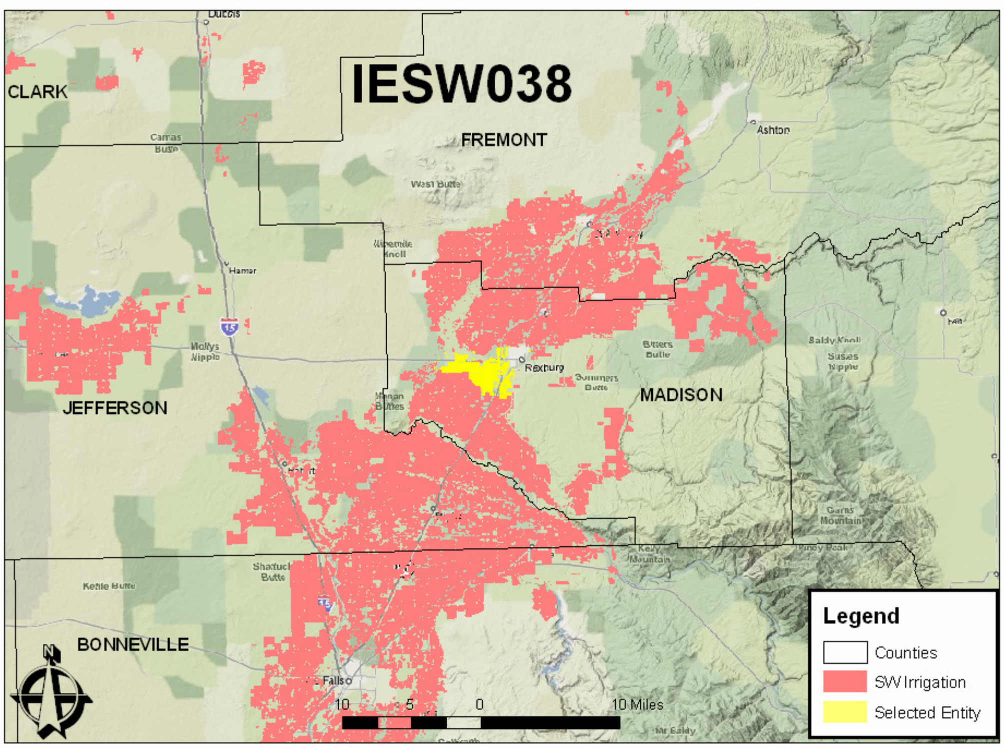

Average Diversions 1985-2005, IESW035
(with bars showing maximum and minimum)
Acre Feet, Thousands
35
30
25
20
15
10
5
0
OCT_DIV
NOV_DIV
DEC_DIV
JAN_DIV
FEB_DIV
MAR_DIV
APR_DIV
MAY_DIV
JUN_DIV
JUL_DIV
AUG_DIV
SEP_DIV
Month

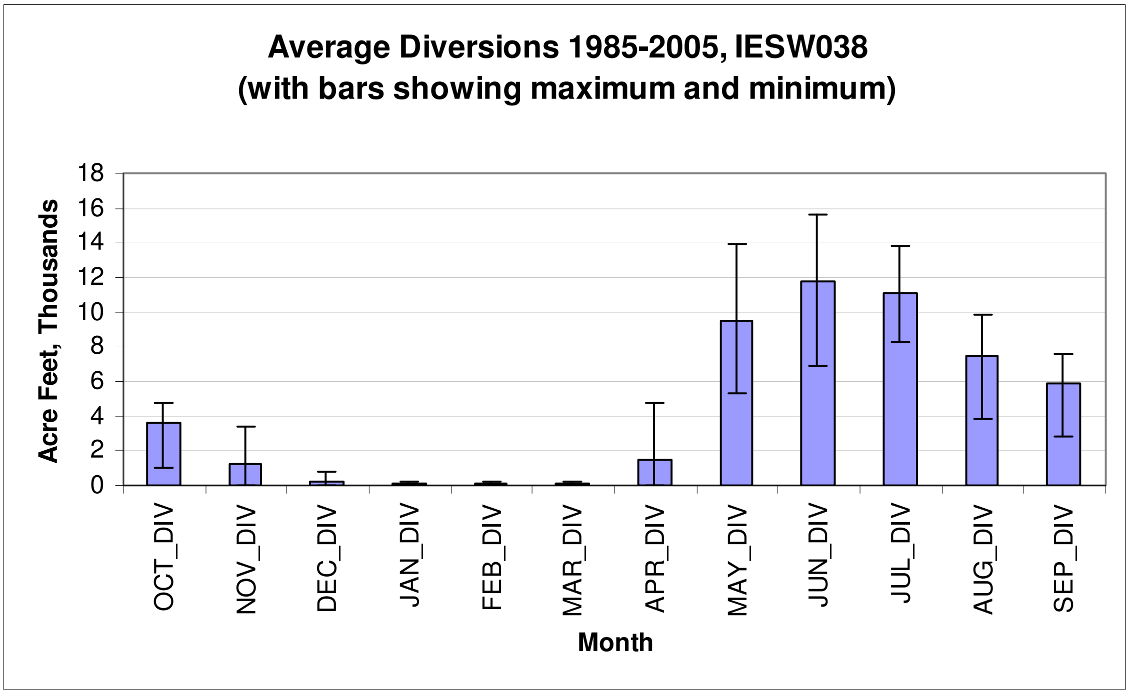

Average Excess Capacity 1985-2005, IESW035
(with bars showing maximum & minimum)
Acre Feet, Thousands
35
30
25
20
15
10
5
0
OCT_CAP
NOV_CAP
DEC_CAP
JAN_CAP
FEB_CAP
MAR_CAP
APR_CAP
MAY_CAP
JUN_CAP
JUL_CAP
AUG_CAP
SEP_CAP
Month


IESW036
CLARK
FREMONT
JEFFERSON
MADISON
BONNEVILLE
Rexburg
Ashton
10 5 0 10 Miles
Legend
Counties
SW Irrigation
Selected Entity

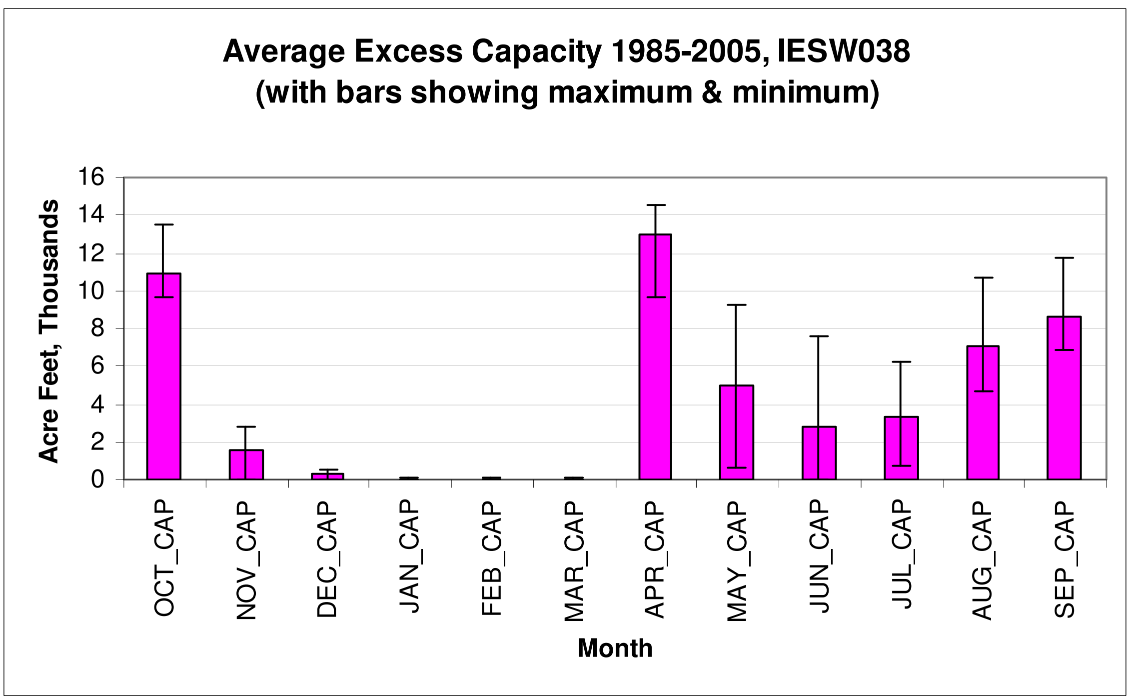

Average Diversions 1985-2005, IESW036
(with bars showing maximum and minimum)
Acre Feet, Thousands
0
10
20
30
40
50
60
OCT_DIV
NOV_DIV
DEC_DIV
JAN_DIV
FEB_DIV
MAR_DIV
APR_DIV
MAY_DIV
JUN_DIV
JUL_DIV
AUG_DIV
SEP_DIV
Month


Average Excess Capacity 1985-2005, IESW036
(with bars showing maximum & minimum)
Acre Feet, Thousands
70
60
50
40
30
20
10
0
OCT_CAP
NOV_CAP
DEC_CAP
JAN_CAP
FEB_CAP
MAR_CAP
APR_CAP
MAY_CAP
JUN_CAP
JUL_CAP
AUG_CAP
SEP_CAP
Month

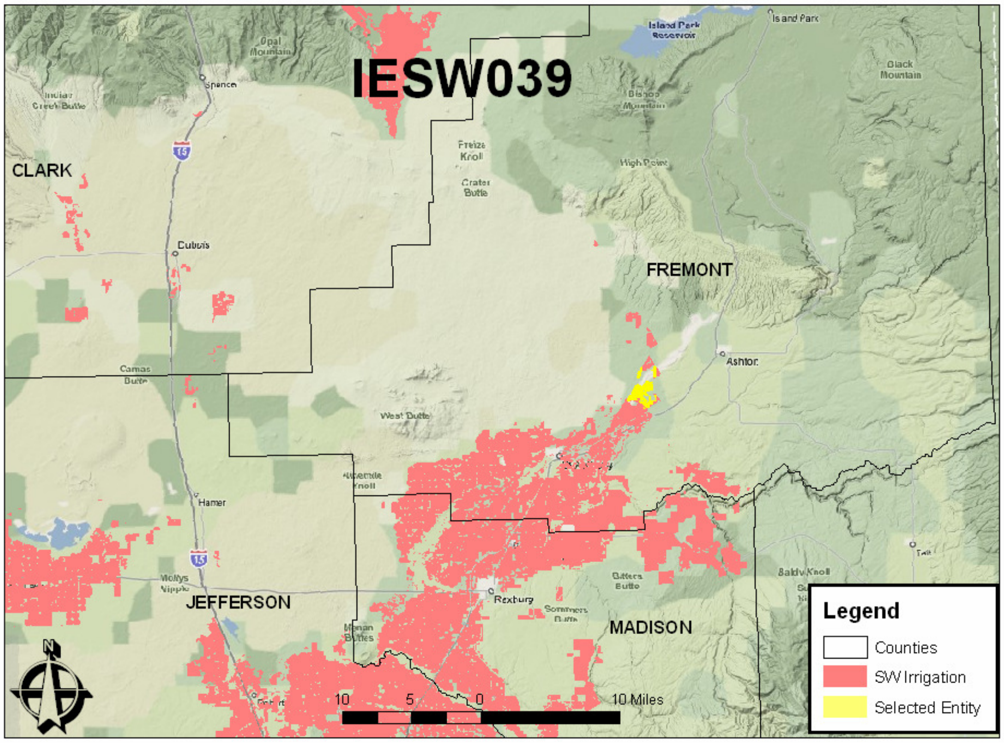

IESW038
CLARK
FREMONT
Ashton
JEFFERSON
Rexburg
MADISON
BONNEVILLE
Legend
Counties
SW Irrigation
Selected Entity
10
5
0
10 Miles



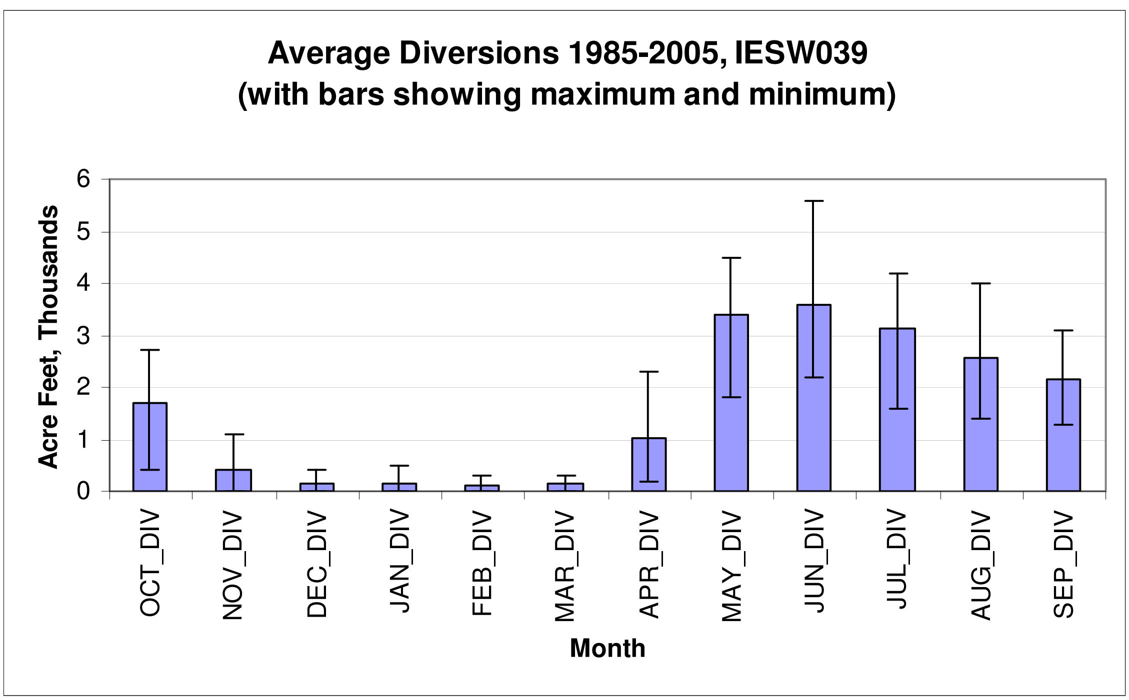
Average Diversions 1985-2005, IESW038
(with bars showing maximum and minimum)
Acre Feet, Thousands
0
2
4
6
8
10
12
14
16
18
OCT_DIV
NOV_DIV
DEC_DIV
JAN_DIV
FEB_DIV
MAR_DIV
APR_DIV
MAY_DIV
JUN_DIV
JUL_DIV
AUG_DIV
SEP_DIV
Month

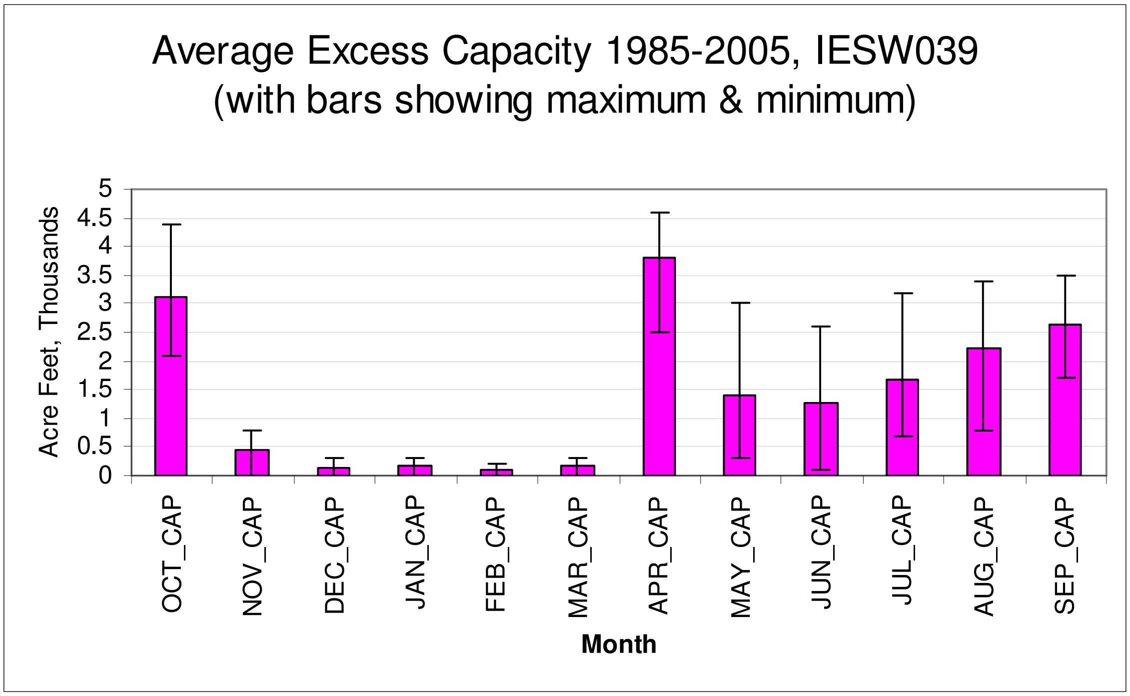


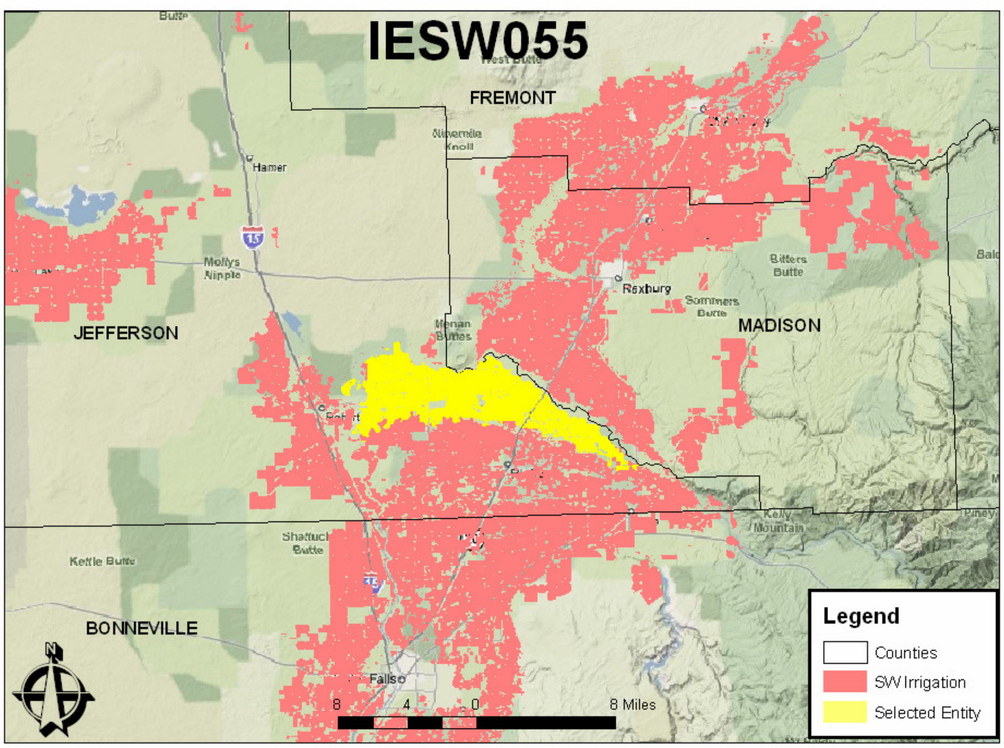
Average Excess Capacity 1985-2005, IESW038
(with bars showing maximum & minimum)
Acre Feet, Thousands
0
2
4
6
8
10
12
14
16
OCT_CAP
NOV_CAP
DEC_CAP
JAN_CAP
FEB_CAP
MAR_CAP
APR_CAP
MAY_CAP
JUN_CAP
JUL_CAP
AUG_CAP
SEP_CAP
Month

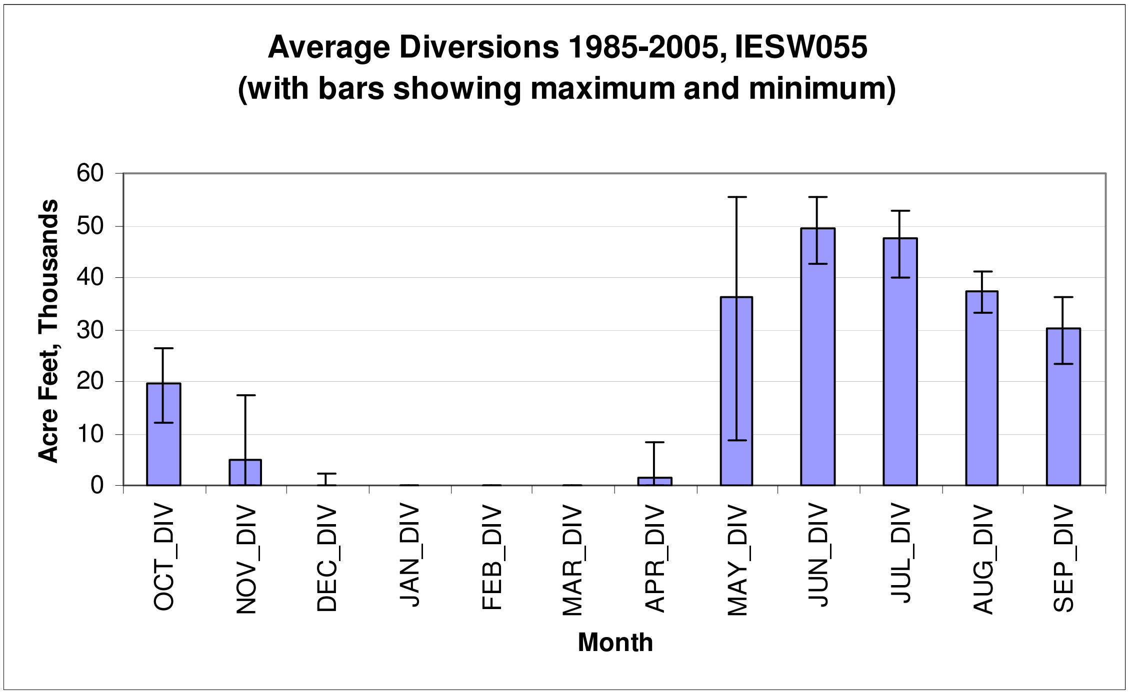


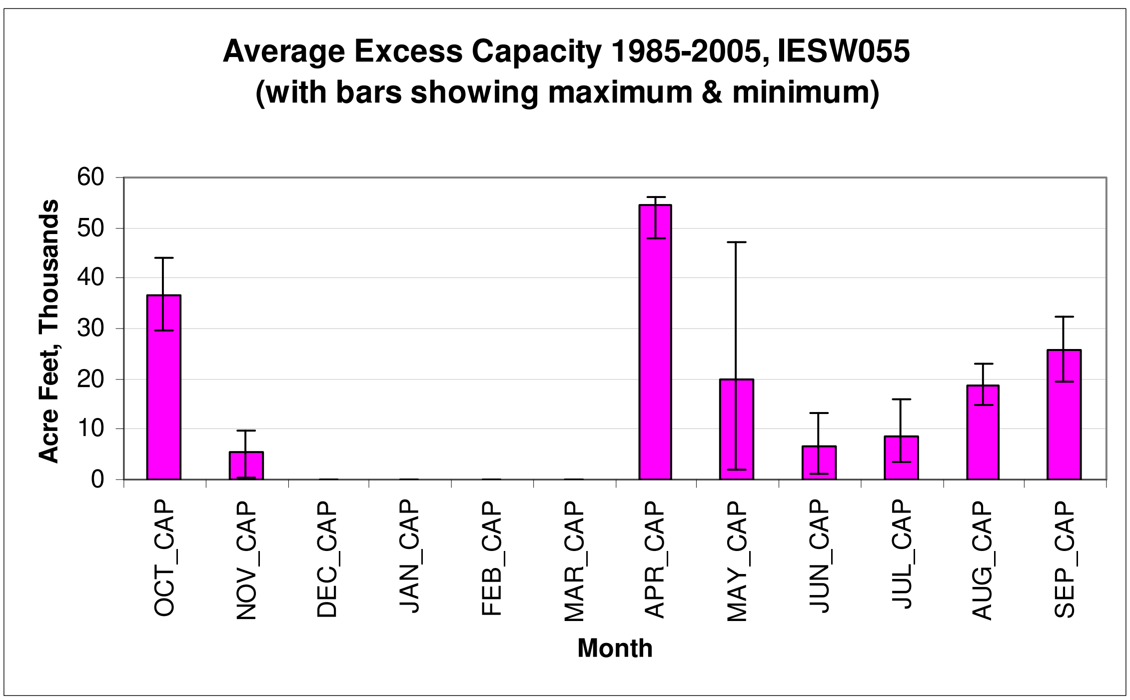
Only those parts of Entity 39 lying over the aquifer are illustrated.

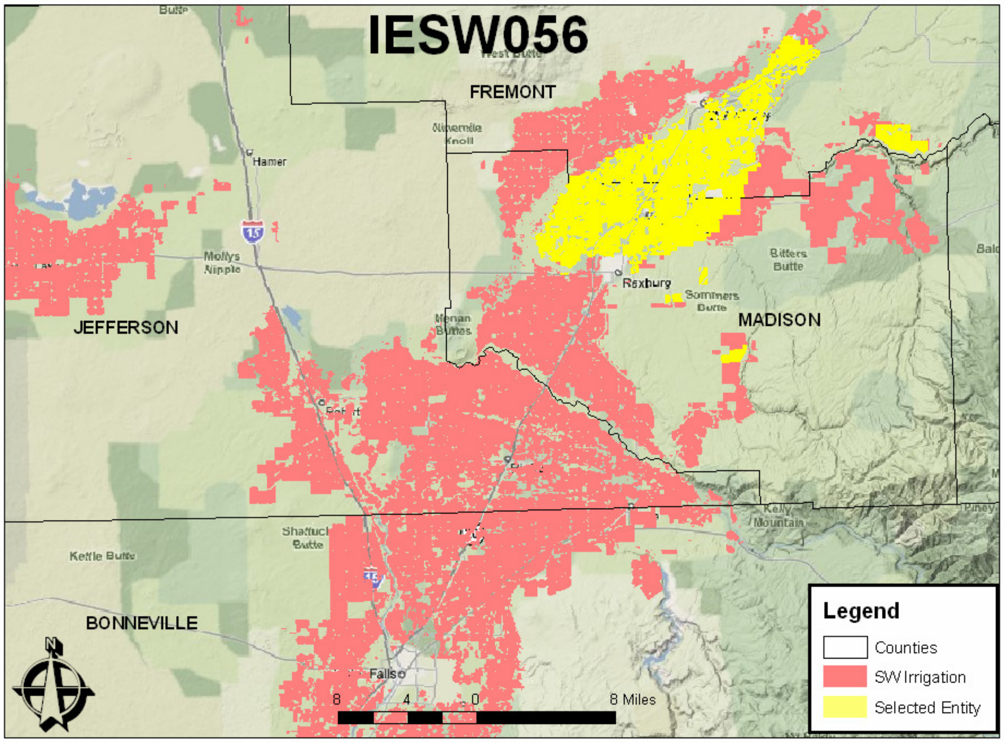



Average Excess Capacity 1985-2005, IESW039
(with bars showing maximum & minimum)
Acre Feet, Thousands
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
OCT_CAP
NOV_CAP
DEC_CAP
JAN_CAP
FEB_CAP
MAR_CAP
APR_CAP
MAY_CAP
JUN_CAP
JUL_CAP
AUG_CAP
SEP_CAP
Month

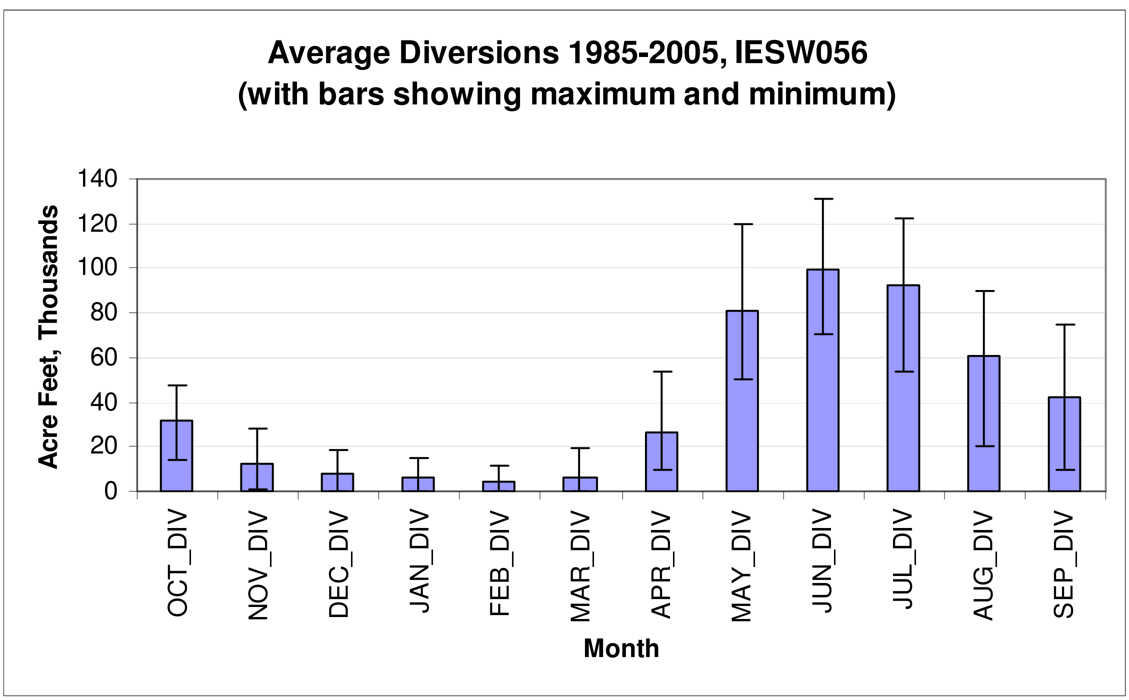

IESW055
FREMONT
Hamer
Mollys Nipple
JEFFERSON
Menan Buttes
Rexburg
Sommers Butte
Bitters Butte
MADISON
Shattuck Butte
Kettle Butte
Kelly Mountain
BONNEVILLE
8
4
0
8 Miles
Legend
Counties
SW Irrigation
Selected Entity


Average Diversions 1985-2005, IESW055
(with bars showing maximum and minimum)
Acre Feet, Thousands
60
50
40
30
20
10
0
OCT_DIV
NOV_DIV
DEC_DIV
JAN_DIV
FEB_DIV
MAR_DIV
APR_DIV
MAY_DIV
JUN_DIV
JUL_DIV
AUG_DIV
SEP_DIV
Month


Average Excess Capacity 1985-2005, IESW055
(with bars showing maximum & minimum)
Acre Feet, Thousands
60
50
40
30
20
10
0
OCT_CAP
NOV_CAP
DEC_CAP
JAN_CAP
FEB_CAP
MAR_CAP
APR_CAP
MAY_CAP
JUN_CAP
JUL_CAP
AUG_CAP
SEP_CAP
Month



IESW056
FREMONT
JEFFERSON
MADISON
BONNEVILLE
Rexburg
Legend
Counties
SW Irrigation
Selected Entity
8
4
0
8 Miles



Average Diversions 1985-2005, IESW056
(with bars showing maximum and minimum)
Acre Feet, Thousands
140
120
100
80
60
40
20
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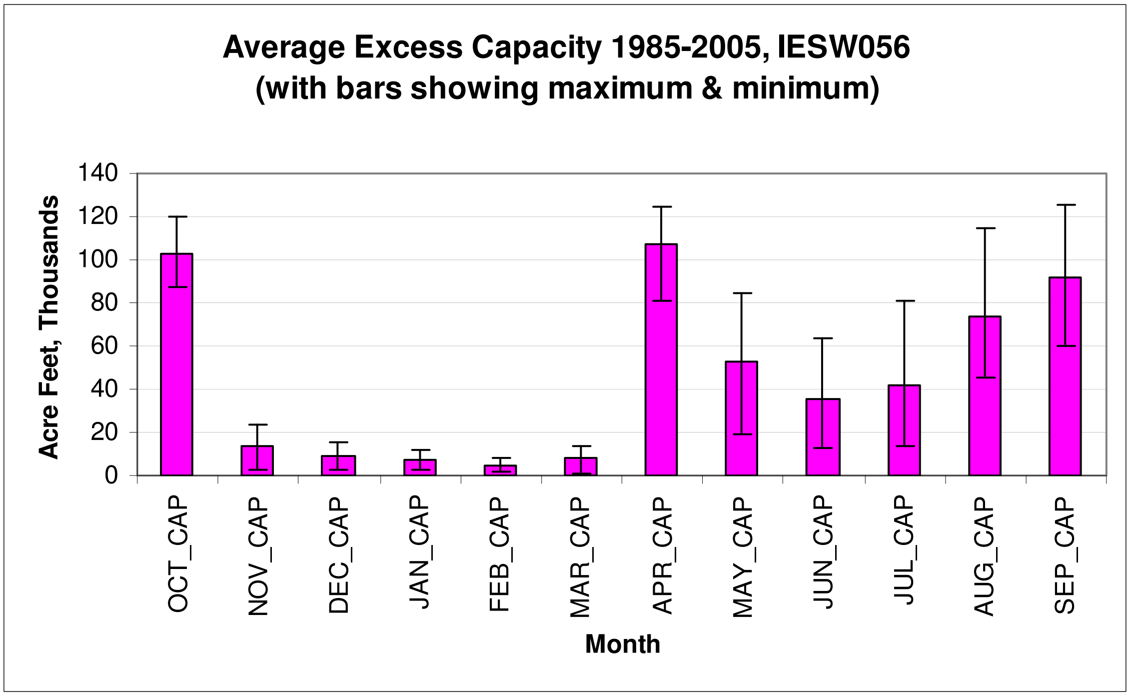

COST ESTIMATES

Per-site cost estimates in Table A1 are for a single site that requires all three improvements. Estimates represent the cost of pump, motor and panel, 1/4 mile of 3-phase power line, 1/4 mile of 6" PVC buried mainline, and 1/4 mile of ditch. Improvements are sized to be suitable to serve 130 acres (VanGreuningen, 2008).

Table A1
Cost Estimates to Develop One Site

Item	**Cost**
100hp pump with screen and panel	$14,250
3 - phase power using 350mcm wire	$19,000
1320 feet of 6" PVC mainline	$7,000
Installation cost	$10,000
Plus 20% contingency fee on equipment	$8,050
Total	$58,300

VanGreuningen and IWRRI agreed that ditching would likely be performed by the water user at reasonably low cost.

Because many soft conversions require only one or two of the improvements, IWRRI adapted these values to obtain a unit cost (per site for pumping plant, per mile for other improvements). The installation costs were increased because VanGreuningen's estimates assumed all the improvements would be applied to the site, and IWRRI believes that the $10,000 included some general overhead costs that would be required for any site, no matter how many improvements were considered. Therefore, the per-improvement installation costs for the improvements add up to more than $10,000 in order to represent the site overhead cost if only one or two improvements are installed. These adjustments, along with IWRRI's rough estimate for the users' costs to construct ditches, are incorporated into Table A2:

Table A2
Adjusted Per-improvement Unit Costs

Item	**Base Estimate**	**Pump Only**	**Power Line**	**Mainline**	**Ditch**
Pumping Plant	$14,250	$14,250			
Power	$19,000		$19,000		
Mainline	$7,000			$7,000	
Ditch[9]	$2,000				$2,000
Installation	$10,000	$5,000	$5,000	$5,000	
Contingency (20%)	$8,050	$2,850	$3,800	$1,400	
Total	$60,300	$22,100	$27,800	$13,400	$2,000
Unit		Site	Mile	Mile	Mile
Units in Base Estimate		1	0.25	0.25	0.25
Per Unit		$22,100	$111,200	$53,600	$8,000

Table 1 in the body of the text applies the per-unit costs from Table A2, rounding the total to the nearest $10,000.

[9] IWRRI estimate.