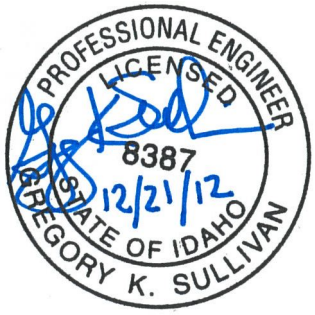
BEFORE THE DIRECTOR
OF THE DEPARTMENT OF WATER RESOURCES
OF THE STATE OF IDAHO

IN THE MATTER OF DISTRIBUTION FOR WATER TO WATER RIGHT NOS. 36-02551 AND 36-07694 (RANGEN, INC.)	**SPRONK WATER ENGINEERS, INC.** **EXPERT REPORT** **DATED DECEMBER 21, 2012** **PREPARED FOR THE CITY OF POCATELLO**



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Expert Report
Dated December 21, 2012
Prepared for the
City of Pocatello

1.0 Introduction

On December 13, 2011, Rangen, Inc. ("Rangen") filed a Petition for Delivery Call ("Rangen Petition," or "Rangen Call") with the Idaho Department of Water Resources ("IDWR") seeking curtailment of ground water rights in the Eastern Snake Plain Aquifer ("ESPA") with priority dates junior to Rangen's water right nos. 36-02551 (July 13, 1962 priority) and 36-07694 (April 12, 1977 priority). As part of the petition, Rangen requested that the Director:

A. *find that Rangen has suffered, and will suffer, material injury as a result of junior-priority ground water pumping in the areas encompassed by ESPAM2;*

B. *administer and distribute water in the areas encompassed by ESPAM2 in accordance with the prior appropriation doctrine as required by I.C. § 42-602;*

C. *order the water masters of the areas encompassed by ESPAM2 to curtail junior-priority ground water pumping as necessary to deliver Rangen's water in accordance with the prior appropriation doctrine. See I.C. § 42-607.*

D. *order immediate curtailment before any hearing is held because: (i) immediate curtailment is necessary to secure an important government or public interest, to-wit, the guaranteed delivery of water rights obtained under the laws of the State of Idaho; (ii) there is a need for prompt action in that junior diversions continue to prevent Rangen's ability to obtain all its decreed water flows; and (iii) the State of Idaho, by and through its Department of Water Resources and Director, has a duty to supervise the allotment of both surface and ground water to those diverting water for any beneficial purpose; and*

E. *if the Department does not order immediate curtailment, then convene a timely hearing of this matter before further damage is done by junior-priority ground water pumping*

On May 29, 2012, IDWR entered an Order that designated the City of Pocatello ("Pocatello" or "City") as a respondent in the Rangen Call. Unlike in prior delivery calls, IDWR has not issued a preliminary order assessing the merits of the call.

The Rangen Research Hatchery, also known as the Rangen Aquaculture Research Center ("Rangen Hatchery"), is located at the headwaters of Billingsley Creek approximately four miles southeast of Hagerman, Idaho. **Figure 1-1** is a map showing the locations of the Rangen Hatchery and the City of Pocatello ("Pocatello"). Pocatello has an interest in the case because its municipal water supply is derived primarily from wells, many of which are junior to Rangen's 1962 and 1977 priority water rights that are the subject of the delivery call. This report was prepared to provide technical information relevant to the Rangen Call and to support Pocatello's response and defense against the delivery call.

Section 2 of the report describes the Rangen Hatchery and summarizes historical records of Rangen's water use. Section 3 discusses the source of supply for Rangen's water rights. Section 4 summarizes fish production records disclosed by Rangen. Section 5 summarizes research data that were obtained from Rangen. Section 6 summarizes water quality data that is submitted by Rangen in compliance with its NPDES discharge permit. Section 7 describes Pocatello's water system, its reliance on ground water as a primary source of municipal water supply, and its ground water rights that are potentially subject to curtailment as a result of Rangen Call. Section 8 analyzes the effect of Pocatello's pumping on the Curren Spring. Section 9 lists the information that was relied on in preparing the report.

2.0 Rangen Hatchery

Rangen is primarily a producer and supplier of fish feed to fish hatcheries. The Rangen Hatchery was developed so that Rangen could conduct research to improve its fish feed. Commercial production of fish for sale to fish processors also became a function of the Rangen Hatchery, with production reaching a peak of almost 800,000 pounds in 1988. There has been little research performed at the Rangen Hatchery in recent years, and the hatchery is operated primarily to supply fish to the Idaho Power Company ("Idaho Power") for the fish stocking requirements that are part of its FERC licenses for hydropower production on the Snake River.

The Rangen Hatchery is located in the Hagerman Valley just below the rim of the Snake River canyon as shown in **Figure 2-1**. An aerial photograph of the Rangen facility is provided in **Figure 2-2**. The facility is comprised of a Hatch House and Greenhouse (aka Research Lab), which are indoor facilities; and three sets of outdoor raceways identified from upstream to downstream as the Small Raceways, the Large Raceways, and the CTR Raceways.

The fish rearing facilities are supplied water from a complex of springs known as the Curren Spring located immediately east of the hatchery. The Curren Spring is comprised of two components, (1) the Martin-Curren Tunnel ("Curren Tunnel" aka "Curran Tunnel") located approximately 60 feet below the canyon rim, and (2) other springs that emerge at various locations from the talus slope below the Curren Tunnel. The Curren Spring is one of many spring complexes between Kimberly and the Malad River that are surface expressions of ground water flow from the Eastern Snake Plain Aquifer ("ESPA").

A photograph of the Curren Tunnel diversion complex is shown in **Figure 2-3**. Rangen's domestic water supply is diverted through a four-inch white PVC pipeline that originates inside of the Curren Tunnel as shown on the right side of **Figure 2-3**. Two larger white PVC pipes in the center of **Figure 2-3** emerge from a collection box and provide a portion of the water supply to the Rangen Hatchery. The white pipe to the left labeled "HH/GH/SR" transmits water by gravity to a splitter box further down the hill where the water can be (a) diverted into a steel pipeline that flows to the Hatch House, Greenhouse, and Small Raceways, or (b) discharged onto the hillside where the Curren Tunnel flow mixes with the flow from the springs that emerge from the talus slope below the tunnel. The white pipe on the right side of the collection box labeled "Lower" also discharges Curren Tunnel flow to the hillside where it comingles with the flow from the talus springs.

The Curren Tunnel was also originally the source for three other irrigation pipelines not associated with the Rangen Hatchery. These pipelines, marked as "Irrigation Pipelines" in **Figure 2-3**, extend south from the collection box along the hillside to farms southwest of the Rangen Hatchery. In 2003, the Sandy Pipeline was constructed by IGWA to provide a substitute

source of irrigation water to the other Curren Tunnel users for the purpose of mitigating impacts from pumping on the Curren Tunnel flow that was available to Rangen. Other than a small amount of domestic water that reportedly is still diverted through one of the irrigation pipelines, water from the Curren Tunnel is now used solely to supply the Rangen facility.

A schematic diagram showing how water flows through the fish-rearing facilities is shown in **Figure 2-4**. There are two sources of "first use" water to the Rangen facility. Water from the Curren Tunnel is piped to the Hatch House, the Greenhouse, and the Small Raceways (collectively referred to as the "upper facilities"). The upper facilities operate in parallel, with no opportunity for reuse from one facility to another (e.g., water used in the Hatch House cannot be used in the Greenhouse or Small Raceways).

The portion of the Curren Tunnel flow that is not sent to the upper facilities (i.e., the discharges to the hillside from the Rangen pipelines described above) plus the flow from the talus springs below the Curren Tunnel collects in a basin adjacent to the Hatch House and Greenhouse, and these flows are available for diversion at Rangen's lower diversion facility for delivery to the Large Raceways. The outflow from the Small Raceways can be discharged to Billingsley Creek or reused by delivery to the Large Raceways. The outflow from the Large Raceways is the sole source of supply to the CTR Raceways.

2.1 Water Rights

According to the Rangen Petition, there are five water rights that supply water to the Rangen facility as shown in **Table 2-1**. The two most senior water rights (36-134B and 36-135A) are each decreed for less than 0.1 cubic feet per second ("cfs") for domestic and irrigation uses. Rangen has not placed a delivery call for these rights.

There are three water rights that provide water to the fish hatchery, and the decreed source for each of these is the Martin-Curren Tunnel. The most senior of the three rights (36-15501) is decreed for 1.46 cfs with a priority date of July 1, 1957. Rangen has not placed a delivery call for the 1957 right because there has reportedly always been enough water to fill it. The other two

water rights that supply the fish hatchery are 36-2551 for 48.54 cfs with a priority date of July 13, 1962, and 36-7694 for 26 cfs with a priority date of April 12, 1977. Rangen claims these two water rights are being injured by junior ground water pumping from the ESPA, and these rights are the subject of Rangen's delivery call.

At the bottom of **Table 2-1** there is a summary of the senior irrigation water rights that formerly diverted from the Curren Tunnel to supply the irrigation pipelines that extend to the south, but which now are supplied water delivered through the North Side Canal via the Sandy Pipeline. Water from the Curren Tunnel can still be used to supply these senior irrigation water rights if there is insufficient water from the Sandy Pipeline. There reportedly has been little if any water diverted from the Curren Tunnel under these irrigation water rights in recent years.

2.2 Historical Flow Records

Historical records of the flow available for use at the Rangen facility were disclosed by Rangen in response to written discovery request and requests made during depositions of Rangen employees. The following is general description of the records that have been provided by Rangen:

- Monthly handwritten records of total hatchery flow from 1966 – 2012,
- Weekly handwritten records of total hatchery flow from 1981 – 2012,
- Weekly electronic records of total hatchery flow from 1996 – 2012,
- Monthly electronic records of Martin-Curren Tunnel flow to irrigation pipelines from 1992 – 1996, and
- Monthly electronic records of total Martin-Curren Tunnel flow from 1994 – January 2009.

Rangen flow data were also obtained from IDWR as follows:

- Weekly electronic flow data measured at the Large Raceways, CTR Raceways, and Billingsley Creek Dam from 1981 – November 2003,
- Daily data of total Rangen flow from March 1995 – present, and
- Daily data of total Martin-Curren Tunnel flow from September 8, 1993 – 2011.

During depositions, the Rangen employees reported that the flow available to Rangen is diverted either at the Curren Tunnel diversion or at a headgate located in a collection area below the tunnel and adjacent to the Hatch House. Flow through the Rangen facility is currently

determined as the sum of (a) the measured flow in each of the CTR Raceways, and (b) the flow at a check dam in Billingsley Creek adjacent to the CTR Raceways ("Dam").

Rangen's consultant, Leonard Rice Engineers, Inc. ("LRE"), tabulated the hand-written and electronic hatchery flow records from 1966 – 2009 and entered them into a spreadsheet. Notes in the handwritten records show that there were variations in where the flows were measured. From 1966 – 1980, documentation in the handwritten records is not sufficient to determine where the total flow measurements were collected. From 1981 – 2009, the total Rangen flow was calculated by summing the flows measured or estimated at various locations as follows:

Period	Flow computed as:
1981 – 1983	Sum of (a) [CTR + Large Raceway flows] / 2, (b) "fishout/creek," and (c) estimated farmers flow
1984 – 1991	Sum of (a) [CTR + Large Raceway flows] / 2, (b) Dam flow, and (c) estimated farmers flow
1992 – 1993	Sum of (a) [CTR + Large Raceway flows] / 2, and (b) estimated farmers flow
1994 – 1996	Sum of (a) [CTR + Large Raceway + Dam flows] / 2, and (b) estimated farmers flow
1997	Sum of (a) CTR Raceway flows and (b) Dam flows
1998	Sum of (a) CTR Raceway flows (b) Dam flows and (c) estimated farmers flow
1999 – 2009	Sum of (a) CTR Raceway flows and (b) Dam flows

From March 1995 – 2011, there are daily Rangen flow records available from IDWR. Total hatchery flows in the IDWR records were computed as described above, but the monthly average flows do not match the values contained in the LRE spreadsheet. For the period of concurrent IDWR and LRE records from 1995 – 2009, the differences in monthly flows range as high as 5.0 cfs and average 0.2 cfs.

In Finding of Fact No. 76 in the May 19, 2005 Second Amended Order ("2005 Order") issued in response to the prior Rangen delivery call, the Director found that "…measurements of flows through hatchery raceways reported by Rangen may be systematically about 10 percent lower than actual flows." This finding was based on a December 15, 2003 memorandum from Cindy Yenter to Karl Dreher that compared measurements of Rangen flows made by IDWR staff to the flows reported by Rangen. There is insufficient information contained in the 2003 memorandum to fully understand the reasons why IDWR concluded that the Rangen staff was under-measuring the flow. In addition, the period of the flow records that may be affected by the under-measurement is also unknown. In any event, there appears to be some uncertainty about the accuracy of the historical Rangen flow records.

The handwritten Rangen flow records from 1981 - 2012 typically include one measurement for each week. The weekly flow measurements were averaged by Rangen to compute a monthly average flow. In contrast, the IDWR estimated the daily flows between the weekly flow measurements by assuming the flow remained the same until the next measurement. IDWR computed an average monthly flow by averaging the measured and estimated daily flows during the month. For purposes of the data summaries described in this report, the LRE dataset was used for 1966 – February 1995 and 2012, and the IDWR dataset was used from March 1995 – 2011.

The reported monthly average Rangen flows from January 1966 – November 2011 are summarized in **Table 2-2**. The annual average Rangen flow increased from 50 cfs in 1967 to a maximum of 58.7 cfs in 1972, and then declined to a minimum of 12.3 cfs in 2005. The flow has recovered since that time to an annual average of 15.0 cfs in 2011. The highest reported monthly average flow was 76.1 cfs in October 1972 and the lowest recorded monthly flow was 10.7 cfs in July and August of 2005.

Monthly average historical Rangen flows from 1966 – 2012 are plotted in **Figure 2-5**. The flows vary seasonally with the minimum flow occurring in the spring or summer and the maximum

flow occurring in the fall. The seasonal variation in flow was approximately 35 cfs in the late 1960s and early 1970s, and has decreased to approximately 10 cfs as the Rangen flows have declined. In addition to the seasonal flow variations, there have also been longer term cycles in the Rangen flows. The flows rose through the late 1960s and reached a peak in 1972. This was followed by declining flows through 1981, increases in flows from 1982 – 1986, decreases in flow from 1987 – 1993, increases from 1994 – 1997 and decreases from 1998 – 2005. Since 2005, the flows have recovered slightly with greater increases in the fall peak.

In addition to the reduction in the seasonal flow variations described above, there has also been a shift in the timing of the low flow point in the annual flow hydrograph. **Figure 2-6** contains line graphs illustrating the monthly average flows for five earliest years of record (1966 – 1970) and five recent years of record (2007 – 2011). During the earlier period in the mid- and late-1960s, the monthly average flow typically reached a minimum between April and May. With the decline in spring flows that have occurred during the last several decades, the minimum flow typically occurs in July. There has been a more subtle shift in the timing of the peak of the Rangen flow hydrograph. In the 1960s the peak flow typically occurred in October, while in recent years the peak flow has shifted more towards November.

The total reported flow through the Rangen facility represents the sum of the flow diverted at the Curren Tunnel and the additional flow from various springs that emerge below the tunnel and is collected and diverted at Rangen's lower diversion facility that supplies the Large Raceways and CTR Raceways. In September 1993, IDWR began measuring and reporting the flow of the Curren Tunnel. **Figure 2-7** shows the total reported flow through the hatchery, the flow measured at the Curren Tunnel, and the difference, which is the flow that originates below the tunnel. From 1993 – 2011, the Curren Tunnel flows averaged 40 percent of the total Rangen flow. Since 2001, the Curren Tunnel flow has comprised approximately 30 percent of the total Rangen flow.

The total flow necessary to satisfy Rangen's 1962 water right is 50 cfs, including 1.46 cfs for Rangen's 1957 water right. Another 22 cfs, for a total of 72 cfs, is necessary to fully satisfy

Rangen's 1977 water right. Assuming the flows of the Curren Spring in 1962 were similar to the flows that existed during the middle and late 1960s as shown in **Figures 2-5 and 2-6**, it appears there would have been sufficient flow at the time of appropriation to fully satisfy Rangen's 1962 water right from January through July, but insufficient flow would have existed during August through December.

The reported monthly average flow in April 1977 was 35.2 cfs, and this is far less than would have been necessary to supply any portion of Rangen's April 12, 1977 priority water right. The highest monthly average flow reported in 1977 was 47.1 cfs. Based on Rangen's diversion records, there was no flow available in 1977 for Rangen to appropriate on top of its 1962 water right.

In Finding of Fact No. 63 in 2005 Order, the Director stated the following:

> Based on available records, there was not water available for appropriation at the time or subsequent to the date of appropriation for water right no. 36-07694. Therefore, the Department erred in licensing water right no. 36-07694, and should not have recommended this right for decree in the SRBA. Nonetheless, since the SRBA District Court decreed water right no. 36-07964, Rangen may be entitled to divert water under this right when such water is physically available. However, because water was not available to appropriate on the date of appropriation for water right no. 36-07694, Rangen may not be entitled to have a delivery call recognized against junior priority water rights.

As described above, the reported total Rangen flow has typically been computed as the sum of (a) the flow in the Large Raceways, CTR Raceways, or an average the two, and (b) the flow over the Dam in Billingsley Creek. **Figure 2-8** summarizes the weekly spot flow measurements reported by Rangen from 1981 – 2003 for the Large Raceways, the Small Raceway, and the Dam. During this period, the flows at the Dam averaged 3.8 cfs, and ranged from an annual average of 1.34 cfs in 2003 to 6.4 cfs in 1986. The Dam flows represented an average of 13.6 percent of the total Rangen flow, ranging from an annual average of 6.9 percent in 1983 to 22.4 percent in 1993. It is unknown how much of the Dam flow was water bypassed at the lower Rangen diversion structure and how much was natural inflow or irrigation return flows to Billingsley Creek between the lower diversion structure and the Dam.

2.3 Facility Capacities

Fish production data and other information provided by Rangen were reviewed to identify the flow capacity of the rearing facilities at the Rangen Hatchery. Research reports obtained from Rangen (see Section 5.0) indicate maximum trough flows of 35 gallons per minute ("gpm") in the past while the more recent Idaho Power Hatchery Production Summaries (see Section 4.0) typically show maximum trough flows of 28 gpm. Based on these data, the combined flow capacity of the twelve hatchery troughs is in the range of 336 gpm to 420 gpm (0.75 cfs to 0.94 cfs).

The maximum flows for the Greenhouse barrels reported in the research documents are 11.5 gpm per barrel, while Doug Ramsey testified in his deposition that the barrels are typically run at 8 gpm per barrel. Based on this information, the total flow capacity of the Greenhouse barrels ranges from 192 gpm to 276 gpm (0.43 cfs to 0.62 cfs).

The flow data contained in the Idaho Power Hatchery Production Summaries were reviewed to assess the flow capacities of the raceways. The average and maximum reported flows in each of the Small Raceways, Large Raceways, and CTR Raceways are summarized in **Figure 2-9**. As shown in the diagram included in **Figure 2-9**, there are five raceways in each of the four Small Raceway strings. Water flows through two sets of parallel narrow raceways (e.g., #1, #2, #9, and #10), and then the flow is combined into a wide raceway (e.g., #17). Doug Ramsey testified in his deposition that flow can be introduced at the head of any of the narrow small raceways (i.e., #1 - #16). This is why the flow records sometimes show a greater flow in the second of two narrow raceways in series (e.g., the flow in #9 is greater than the flow in #1).

The total capacity of the Rangen raceways was estimated by multiplying the maximum flow[1] in the raceways that are currently in use by the total number of raceways that exist as follows:

[1] The maximum per raceway flow was computed at the maximum of the combined total reported flow for each type of raceways divided by the number of raceways in use at the time.

- Small Raceways – Capacity computed as the maximum wide raceway flow (2.68 cfs) multiplied by four wide raceways resulting in a total capacity of 10.7 cfs.

- Large Raceways – Capacity computed as the maximum reported flow (4.82 cfs) multiplied by ten parallel raceway strings resulting in a total capacity of 48.2 cfs.

- CTR Raceways – Capacity computed as the maximum reported flow in (17.26 cfs) multiplied by four raceway strings resulting in a total capacity of 69.0 cfs. Without the CTR Raceway that is currently being used as a waste pond, the total capacity of the three remaining CTR Raceways is 51.8 cfs.

The foregoing calculations indicate that the total current flow capacity of the Rangen facility is slightly greater than 50 cfs, which is the combined flow rate of Rangen's 1957 and 1962 priority water rights. Therefore, Rangen has little capacity in its existing facilities to convey any of the additional 22 cfs associated with the 1977 priority water right.

Additional discussion of the Rangen flows is provided in Section 4.0 in conjunction with the fish production data that were disclosed by Rangen.

3.0 Source of Water

The water source is a key element of a water right that defines what water a user is entitled to divert. The decreed source of water for all of the Rangen water rights is the Martin-Curren Tunnel. Since the source element of the decree does not appear to include the sources beyond the Curren Tunnel, it is not clear that Rangen can demand curtailment to satisfy deliveries associated with the springs below the Curren Tunnel that supply the Large Raceways and CTR Raceways. The IDWR Director needs to interpret Rangen's partial decrees to determine the appropriate scope of the Rangen delivery call.

4.0 Rangen Fish Production Data

Rangen disclosed incomplete records of fish production in various forms for the period from 1972 – 2012 in response to written discovery requests and requests made during depositions of the Rangen lay witnesses. The following is a list of the various types of data reports that were provided, and examples of the various reports are contained in the referenced appendices:

- Daily Fish Sales Tickets (**Appendix A**) – Receipts for individual sales of fish to Idaho Power, Sea Pac, and others. The records typically list the date, the pounds of fish, and the raceway from which the fish were obtained. These records were provided for the period from 1998 – 2002, and 2005 – 2011 (missing months in 1998 and 2002).

- Daily Feed & Mort Reports (**Appendix B**) – Reports summarizing the daily feed use (pounds) and the number of fish mortalities for each raceway. These records were provided from 1992, 1995, 1996, and 2002 – 2012 (missing months in 1995 and 1996).

- Monthly Hatchery Reports (**Appendix C**) – Monthly reports summarizing the overall fish inventory, mortalities, feed use, fish sales, water flow, and other information. These reports are typically hand-written and were provided from 1987 – 2003 and 2005 – 2012 (missing months in 1992, 1993, 2002, 2003, 2005, and 2012).

- Monthly Fish Sale Summary Reports (**Appendix D**) – Summaries of the daily fish sales for each month. These reports were provided from 1987 – 2011.

- Monthly Fish Inventory Reports (**Appendix E**) – Summaries of the beginning and end of month fish contained in each raceway by number and pounds, the quantities of fish added and removed, feed use, mortalities, and other parameters. These reports were provided from 1994 – 2003 and 2005 – 2010 (missing months in 1994, 2001, and 2005).

- Idaho Power Hatchery Production Summaries (**Appendix F**) - Detailed fish production data are contained in monthly reports from August 2006 – July 2012 to summarize the production of trout to satisfy Rangen's contracts with Idaho Power. The monthly reports document development of the fish for delivery to Idaho Power in the spring and fall. The reports summarize for each Trough and Raceway in use (a) the number, weight, and mean length of fish, (b) the mortalities, feed use, weight gain, and increase in length since the last report, and (c) the computed Density Index and Flow Index. Rangen's contract with Idaho Power requires that the Density Index not exceed 0.3 and the Flow Index not exceed 0.8. Rangen did not provide production reports for another Idaho Power contract that requires delivery of 8,000 pounds of fish in late May or early June each year. Graphs of the information reported in the Hatchery Production Summaries are attached in **Appendix G**.

- Annual Fish Production Report (**Appendix H**) – Report summarizing annual values of available flow rate, average inventory, fish production, feed use, fish production, and average flow rate from 1972 – 1989 (fiscal year from July – June).

Figure 4-1 is a bar chart that summarizes the years for which the above records were provided, and this chart illustrates the gaps in the data provided by Rangen. Most of the above information was provided in paper format, much of which was handwritten. Certain of the paper fish

production data were input to spreadsheets and summary tables and charts were prepared to illustrate the Rangen operations.

Summaries of the annual Rangen fish production from 1972 – 2011are provided in **Figure 4-2**. The upper chart in **Figure 4-2** shows the annual Rangen fish production in pounds along with the mean annual flow of the Curren Spring. While there was a downward trend in the annual average Curren Spring flow during the 1970s and 1980s, Rangen's fish production increased during the same period. This was followed by a precipitous decline in production from 772,000 pounds in 1988 to 218,000 pounds in 1994. Production increased again through the early 2000s, averaging 392,000 pounds from 1998 – 2001. This was followed by another sharp decline when production fell to approximately 200,000 pounds and remained at that level from 2002 - 2007. Production fell again to its current level of approximately 140,000 pounds in 2008.

The lower chart in **Figure 4-2** shows the computed annual fish production in thousand pounds per cfs ("lbs/cfs"), and for discussion purposes, this metric is defined as "production efficiency." Rangen's production efficiency generally increased through the 1970s and 1980s reaching a peak in 1988 at about 20,000 lbs/cfs, and this resulted in Rangen's fish production increasing at the same time the Curren Spring flow was declining. A sharp decline in production efficiency occurred in the early 1990s reaching a minimum in 1994 at 9,400 lbs/cfs. Production efficiency gradually increased again starting in the mid-1990s, reaching 17,200 lbs/cfs in 2005, before it fell sharply in 2008 to its current level of about 10,000 lbs/cfs.

The relatively low current production efficiency appears to be due in part to the flow and density criteria for the fish delivered to Idaho Power which suppresses the amount of fish that Rangen could otherwise raise. In addition, Rangen reportedly disposed of three other fish rearing facilities in the Magic Valley after the early 2000s that were reportedly used to assist with the fish production at the Rangen Hatchery by providing additional rearing space for portions of the fish production cycle.

The upper chart in **Figure 4-3** shows the fish production that could have occurred at Rangen if the production efficiency had been at 15,000 lbs/cfs and 20,000 lbs/cfs during the entire 1972 – 2011 period. The lower chart in **Figure 4-3** shows the difference between the fish production that could have occurred at the 15,000 lbs/cfs and 20,000 lbs/cfs production efficiency levels compared to the actual historical production.

Figure 4-4 summarizes the monthly fish sales and end-of-month fish inventory in pounds from January 1987 – July 2012. The sum of these two monthly amounts represents the pounds of fish that were contained in the Rangen Facility at some time each month. The blue bars in **Figure 4-4** represent sales to Idaho Power and the red bars are sales to others. Rangen is currently contracted to deliver fish to Idaho Power three times per year with 72,000 fish delivered in the Spring (March), 72,500 fish delivered in the Fall (October), and 8,000 pounds of fish delivered in late May or early June. The current contract between Rangen and Idaho Power was signed in June 2011. The only contracts provided by Rangen prior to 2011 were contracts back to 2006 for the 8,000 pounds of fish delivered in late May or early June. However, review of the records of sales to Idaho Power show a pattern of March and October delivery back to 2006.

Table 4-1 is a summary of the March and October fish sales to Idaho Power from Spring 2007 – Spring 2012. Also shown in **Table 4-1** are data from the Idaho Power Hatchery Production Summaries for the Large and CTR Raceways at or near the time of the sales including (a) the date of the report, (b) the number of fish, (c) the weight of the fish, (d) the mean length of the fish, and (e) the mean number of fish per pound.

Rangen's records of sales to Idaho Power are reported in pounds of fish rather than number of fish described in the 2011 contract. The number of fish involved in the spring and fall sales to Idaho Power were estimated by multiplying the reported pounds of fish sold to Idaho Power in each March and October by the corresponding average number of fish per pound from the Idaho Power Hatchery Production Summaries. The results are shown in the second column from the right in **Table 4-1**. From 2007 to 2011, Rangen sold an estimated average of 148,000 fish per year to Idaho Power, with an average of 85,000 fish in the Spring and an average of 64,000 fish

in the Fall. The estimated average annual sale of fish to Idaho Power during 2007 – 2011 (148,000 fish) is close to the current contract amount of 144,250 fish for the Spring and Fall deliveries. It appears that the 2011 contract with Idaho Power has leveled the Spring and Fall deliveries compared to the deliveries in the past that were greater in the Spring than the Fall.

The following is a summary of the pounds of fish sold to Idaho Power and to others since 2006.

Rangen Fish Sales (lbs)

2006 - 2011

Year	Sales to Idaho Power	Sales to Others	Total Sales
2006	56,700	150,400	207,000
2007	64,100	119,500	183,600
2008	71,900	61,000	132,900
2009	75,300	59,500	134,800
2010	74,300	80,600	154,900
2011	72,600	69,300	141,900
Average	69,200	90,000	159,200

Rangen sold to others an average of 90,000 pounds per year beyond what it sold to Idaho Power.

As described above, Rangen's contracts with Idaho Power require it to raise fish with a Density Index not to exceed 0.3 and a Flow Index not to exceed 0.8. **Figures 4-5 and 4-6** summarize the Density Index and Flow Index values, respectively, contained in the Idaho Power Hatchery Production Summaries since 2006. The data in **Figures 4-5 and 4-6** are color coded with the production cycles for the spring and fall deliveries of ten-inch fish shown in blue and red, respectively. The shape of the marker denotes where the index was computed (Troughs, Small Raceways, Large Raceways, or CTR Raceways). Rangen typically only computed the Density Index and Flow Index values when the fish were in the Small Raceways, Large Raceways, or CTR Raceways. The only times that Flow Index and Density Index values were reported for the

Troughs was in the Idaho Power Hatchery Production Summaries for the 2007 spring and fall production cycles.

The Density Index data in **Figure 4-5** indicate that the 0.3 limit in the Idaho Power contract is sometimes reached while the fish are in the Small Raceways, and this likely necessitates moving the fish to the large raceways. After several months in the Large Raceways, the Density Index limit is occasionally approached again, requiring some fish to be moved to the CTR Raceways.

In contrast, the Flow Index data in **Figure 4-6** reveal that the 0.8 limit is not approached while the fish are in Small Raceways. Only towards the end of the production cycle when the fish are in the Large Raceways is the Flow Index limit approached, and this is likely another reason that fish are occasionally transferred from the Large Raceways to the CTR Raceways.

The Idaho Power Hatchery Production Summaries are typically prepared monthly, and include daily flow measurements made on the date of the report in each raceway containing Idaho Power fish. **Figure 4-7** summarizes the daily flow measurements contained in the monthly reports using the same symbols and color-coding used in **Figures 4-5 and 4-6**. Also shown in **Figure 4-7** are the daily measured Curren Tunnel flow and total Rangen flow. As described above, the water supply for the Hatch House Troughs and the Small Raceways is provided from the Curren Tunnel. Comparison of the Curren Tunnel flows to the daily spot flow measurements for the Troughs and Small Raceways indicates the extent to which the Curren Tunnel flows are being fully utilized. Similarly, comparison of the total Rangen flows to the spot measurements for the Large Raceways and CTR Raceways indicates the extent to which the total flow is being utilized.

During depositions, the Rangen staff reported that availability of flow from the Curren Tunnel produces a bottleneck in the Rangen Hatchery that, at times of low flow, can limit fish production and research opportunities in the Hatch House, the Greenhouse, and the Small Raceways. This can be seen by comparing the daily spot flow measurements in **Figure 4-7** for the Troughs (diamond symbols) and Small Raceways (square symbols) to the reported Curren Tunnel flow during the low part of the flow hydrograph. During the low flow portion of the

Curren Tunnel hydrograph in the fall production cycles, most of the Curren Tunnel flow is delivered through the Small Raceways. At these times, the data in **Figure 4-5** indicate computed Density Index values approach the limit in the Idaho Power contract (0.3). This would hasten the need to move the fish out of the Small Raceways and into the Large Raceways. It may also limit the amount of flow that could be used in the Hatch House or Greenhouse.

One way to alleviate the reported bottleneck in the Small Raceways would be to construct a pumping system to deliver additional water to the Small Raceways from the collection pond that collects the flow from the talus springs for diversion at Rangen's lower diversion structure. It appears the bottleneck could be alleviated by pumping less than five cfs during the low flow portion of the Curren Tunnel hydrograph. After being used in the Small Raceways, the pumped water would be available for use in the Large Raceways and CTR Raceways. Based on the deposition testimony from Doug Ramsey that water quality is not a limitation to raising fish in the raceways, the increased proportion of second use water in the Large Raceways and CTR Raceways that would result from operation of a pumping system would not appear to be a problem.

Figures 4-8, 4-9 and 4-10 were prepared to illustrate how much of the available flow that Rangen has been using to meet the spring and fall delivery obligations to Idaho Power. **Figure 4-8** shows the reported flows in the Troughs (orange bars) and Small Raceways (brown bars) in cfs compared to the monthly average Curren Tunnel flow reported by IDWR. The flow diverted from the Curren Tunnel to the upper Rangen facilities can be directed either to the Troughs or the Small Raceways, and therefore, the bars illustrating these flows are stacked on one another.

Figure 4-9 shows the reported flows in the Large Raceways (green bars) and the CTR Raceways (purple bars) compared to the total Rangen flow. Water exiting the Large Raceways is the supply for the CTR Raceways, and therefore the bars illustrating these flows are shown side-by-side and are not stacked.

The upper chart in **Figure 4-10** illustrates all of the information contained in **Figures 4-8 and 4-9,** with the flows in the Troughs and Small Raceways combined. The lower chart in **Figure 4-10** shows the unused Curren Tunnel flow in the upper Rangen facilities (shown in blue) computed as the difference between the tunnel flow and the sum of the flows in the Troughs and Small Raceways. Also shown in the lower chart is the unused flow in the lower Rangen facilities (shown in grey) computed as the difference between the total Rangen flow and either the flow in the Large Raceways or the flow in the CTR Raceways (whichever difference is less).

In summary, the available flow records show that Rangen has more than enough flow to meet its delivery obligations to Idaho Power, and that Rangen could grow more fish if it wasn't constrained by the flow and density criteria in the Idaho Power contracts. Rangen could alleviate the flow bottleneck that exists during the low flow portion of the Curren Tunnel hydrograph by constructing a facility to deliver flow collected from the talus springs for use in the indoor rearing facilities and the small raceways.

5.0 Rangen Research Data

Because Rangen holds itself out as a research hatchery, Pocatello and IGWA requested documents related to research conducted at the Rangen Hatchery. The following describes the process by which certain documents were obtained:

1. Pocatello and IGWA initially requested that Rangen provide information regarding the fish research conducted at the Rangen Hatchery. In response, Rangen agreed to make available for review at the hatchery various research proposals, data, reports, and other documents related to the research.

2. Initially, Rangen disclosed a research index listing all "Work Units" with which Rangen was involved between 1984 and 2011 and a few research reports in electronic form from recently completed research studies. Rangen also indicated that the remainder of the research documents were stored in a room at the Rangen facility. After reviewing the index and identifying Work Units of interest, attorneys for Pocatello and IGWA traveled to the Rangen Hatchery and attempted to obtain copies of the documents.

3. However, as Pocatello and IGWA learned upon their arrival to review Rangen's research documents, a Work Unit is simply a research idea that a Rangen scientist believes may warrant further investigation. The presence of a Work Unit in the research index does not

indicate that a study about the topic was actually performed. At a deposition following the document review, Doug Ramsey, Rangen's Research Scientist, could not identify which of the Work Units had resulted in actual research studies.

4. The research documents that Rangen made available were all located in one room in the basement of a house on site, and generally consisted of documents in binders for research performed between the late1980s and early 2000s, and older documents contained in cardboard boxes. While the binders were arrange chronologically, the contents of the cardboard boxes were not well organized. After spending some time going through the documents, it became apparent that there were no final reports, proposals, or other information available for many of the Work Units in the research index.

5. To the extent possible, the attorneys obtained copies of documents for the Work Units of interest. In addition, they reviewed all of the materials in the binders and boxes for Work Unit-related documents that (a) included flow information, (b) were studies conducted in raceways, and/or (c) contained other potentially relevant information.

6. Copies of the marked documents were obtained on October 16, 2012.

7. After reviewing the copies of the Work Unit documents identified during the site visit, Doug Ramsey was subpoenaed for a second deposition on November 13, 2012. Attached to the subpoena was the research index, highlighted to indicate the Work Units for which related documents had already been obtained. The subpoena requested that Rangen provide copies of all documents for research studies conducting during or after 2001 that were not highlighted in the index (i.e., all post-2000 research documents that had not already been provided). In response to the subpoena, Rangen provided a DVD containing additional research documents.

Rangen conducts what Doug Ramsey, Rangen's Research Scientist, describes as "applied research," because results from the research are used primarily to develop or promote Rangen's fish feed formulations. Rangen personnel testified that their preference is to conduct research in the raceways rather than in the indoor facilities, but that research in the raceways was limited because of water shortages.

The research documents obtained by Pocatello and IGWA were reviewed to attempt to summarize the types of research conducted at the Rangen facility as well as where the research occurred and the flows that were utilized during the research. Preparation of the summaries was hampered because Rangen does not follow a standardized practice for documenting its Work Unit research. In addition, basic information was often missing from the Work Unit documents,

including the geographic location of the research (i.e., whether the research was conducted at Rangen or at another facility), the location of the research within the Rangen Hatchery, the water flow rates used, the species of fish involved, and the start and end dates of the research. With the foregoing qualifications, **Figures 5-1 - 5-4** were prepared to summarize the Rangen research Work Units.

Figure 5-1a summarizes the geographic locations of the Work Unit research. As shown in the graph, the geographic location of most of Rangen's research over the years cannot be determined or else was conducted at other facilities.

Figure 5-1b summarizes the type of study. As expected, based on testimony of Rangen staff, research related to fish nutrition was the most common area of research.

Figure 5-1c summarizes the location as either off-site, unknown, or within the Rangen Hatchery. The majority of the studies were conducted in the Hatch House or Greenhouse. There were a maximum of six studies performed in the raceways in any one year (1984). During the last ten years there have only been two studies performed in the raceways; one in 2008, and the ongoing study in 2012.

Figure 5-2 summarizes the location of the research within the Rangen Hatchery and the months when the research was performed. This graph shows that most of the research took place in the Hatch House and Greenhouse and that little research has been performed at Rangen since the early 2000s.

Figures 5-3a - 5-3c summarize the type of documentation that was obtained for Work Units involving cold water or unknown species. **Figure 5.3a** shows that in many instances, no documentation was obtained, either because it couldn't be located by Pocatello's and IGWA's attorneys or because it wasn't provide by Rangen in response to discovery requests. In **Figure 5-3b**, summaries of the hatchery location, start and end dates, and flow rates were compiled from the Work Unit research documents, and in some instances from the entries on the research index.

The remained of the graphs in **Figure 5-3** similarly compile information regarding the Work Unit research documents and index entries.

Figure 5-4 summarizes the limited flow data that were provided for the relatively few studies that included this information. The upper chart in **Figure 5-4** compares the reported flow for studies in the Small Raceways, Hatch House and Greenhouse to the Rangen flow from the Curren Tunnel. There appears to be sufficient flow from the Curren Tunnel to support the studies that are conducted in the indoor facilities and the Small Raceways, except during the low flow portion of the Curren Tunnel hydrograph where there may not be sufficient flow to run some of the Small Raceway studies. The lower chart in **Figure 5-4** compares the total Rangen flow to the flows that were used in studies that were performed in all Rangen facilities. Except for some Large Raceways studies performed in 1983 and 1984, there is generally sufficient flow currently available to Rangen to perform all of the documented studies that have been performed since the early 1980s.

6.0 Water Quality Data

Rangen has a National Pollutant Discharge Elimination System (NPDES) permit (#IDG-130015) for discharge of water to Billingsley Creek. The permit was issued in October 2000, and is part of a general permit for aquaculture facilities in Idaho. The permit sets forth limitations on total phosphorus and total dissolved solids, requirements for preparing a Best Management Practices Plan, monitoring requirement, reporting requirements, and compliance responsibilities of the permit holder. Among other things, the permit requires Rangen to perform quarterly monitoring of total suspended solids ("TSS") and total phosphorus ("TP"). The loading in pounds per day of each of these constituents is limited by the permit to certain values that vary depending on the flow measured in Billingsley Creek in the CTR Raceways. The constituent loading limitations were determined based on a Total Maximum Daily Load ("TMDL") analysis for Billingsley Creek prepared by the Idaho Department of Environmental Quality (IDEQ) in 1992 and approved by the Environmental Protection Agency (EPA) in 1993.

Figure 6-1 is a summary of the reported quarterly TSS and TP loadings from 2001 – present as reported in Rangen's Discharge Monitoring Reports ("DMR"). The reported loadings have typically been well below the computed limits.

7.0 Description of Interests of the City of Pocatello

Pocatello operates a municipal water system serving a population of approximately 50,000 residents in southeastern Idaho. The City's primary water service area lies along Portneuf River valley floor and the surrounding foothills, and is supplied water from numerous wells in the Lower Portneuf River Valley Aquifer ("LPRVA") and two wells in the ESPA. These wells are collectively referred to as the "City Wells." The LPRVA is an alluvial aquifer that underlies the Portneuf River and extends from the Portneuf Gap south of the City to the intersection with the ESPA north of the City. The City Wells that deliver water for culinary uses are interconnected and have been partially decreed in the SRBA as alternate points of diversion for each other.

Another water service area is located in and around the Pocatello Airport. Wells in the ESPA supply culinary water to the airport and associated development, and for irrigation of fields around the airport that are used for land application of biosolids from the City's wastewater treatment plant pursuant to an NPDES permit. These wells are collectively referred to as the "Airport Wells."

A map showing the location of the City Wells and Airport Wells is provided as **Figure 7-1**.

Wells that are located within the area of common ground water supply for the ESPA, as defined in Rule 50 of the Conjunctive Management Rules, are subject to potential administration and curtailment pursuant to the Rangen Delivery Call. The current area of common ground water supply defined in Rule 50 of the Conjunctive Management Rules does not include the LPRVA. However, in 2011 IDWR commenced a rule-making to consider modification of the area of common ground water supply for the ESPA. The proposed modifications would generally expand the area of common ground water supply to add areas tributary to the Snake River and the ESPA, including the LPRVA as well as other areas north and east of Pocatello. On August 9,

2011, the IDWR Director issued a letter that put on hold the rule-making to modify the area of common ground water supply as defined in Rule 50 pending completion of ESPAM version 2.0 that was under development at that time.

While Pocatello's LPRVA wells are currently outside the administrative boundary for the Rangen delivery call, it is possible they could be brought into the administrative area for the Rangen Delivery Call in the future, or for other delivery calls.

Two of the City Wells (Well Nos. 32 and 43) and all of the Airport Wells are located within the area of common ground water supply of the ESPA and are subject to potential curtailment as a result of the Rangen Delivery Call.

In addition to its ground water wells, Pocatello also has several sources of surface water. These include surface water rights on Mink Creek and Gibson Jack Creek, which are tributaries of the Portneuf River southwest of the City. These surface water rights served as the original water supply for the City. The City also has a contract with the Bureau of Reclamation ("Reclamation") for 50,000 acre-feet in Palisades Reservoir.

A tabulation of Pocatello's water rights is provided in **Table 7-1**. Rangen has requested curtailment of all ground water rights with priorities junior to July 13, 1962, which is the senior of the two water rights for which Rangen has made its delivery call. Pocatello has ground water priorities junior to the 1962 Rangen water right totaling 20.3 cfs in the ESPA and 38.6 cfs in the LPRVA, and curtailment of the junior Pocatello ground water rights would substantially impact the City's water supply.

Pocatello maintains records of monthly pumping from each of its wells. A summary of the total annual pumping from the City Wells and the Airport Wells during the past five years is provided in **Table 7-2**. Annual pumping during 2007 – 2011 from the City Wells averaged 13,845 acre-feet, and of this amount, 5,389 acre-feet were from wells with priorities junior to the July 13, 1962 Rangen water right (505 acre-feet from ESPA wells). Annual pumping during 2007 – 2011

from the Airport Wells averaged 3,588 acre-feet with 2,689 acre-feet from wells junior to the 1962 Rangen water right. Based on this information, approximately 8,078 acre-feet, or 46 percent of Pocatello's current water supply is potentially subject to curtailment as a result of the Rangen delivery call (3,194 acre-feet from ESPA wells).

8.0 Effect of Pocatello Water Use on Curren Spring Flows

If IDWR determines that Rangen has been injured as a result of pumping by junior ground water rights, the next step will be to determine what junior ground water rights should be curtailed to provide additional water to Rangen. In prior delivery calls, IDWR has determined that ground water uses that have little impact on the depleted supply should not be subject to curtailment. This section of the report describes the impact of Pocatello's pumping on the Curren Spring flow, and is relevant if IDWR determines that remote water users should be excluded from curtailment because their impact on the Rangen water supply is not material or is too remote in time to make curtailment a viable administration option.

As shown in **Figure 2-1**, the distance between Pocatello's wells and the Curren Spring is approximately 150 miles, and American Falls Reservoir, the Snake River, and portions of the Portneuf River are hydraulically connected to the ESPA in between Pocatello's wells and the Curren Spring. Because of these facts, intuition would suggest that most of the effect of Pocatello's pumping is likely to these surface water sources, and there would be relatively little impact on the flow of the springs along the western extent of the ESPA, and even less impact on the flow of a particular spring such as the Curren Spring.

As described above, Pocatello's wells that are within the ESPA area of common ground water supply include all of the Airport Wells and two of the City Wells (Well Nos. 32 and 43). Response functions developed using the ESPAM 2.1 were compiled to estimate the effect of pumping of Pocatello's ESPA wells on the flow of the Curren Spring. There are two types of response functions that can be computed using a ground water model like the ESPAM 2.1, steady-state response functions and transient response functions.

8.1 Steady-State Response Functions

A steady-state response function describe the simulated effect on the flow at a particular location (e.g., a river reach, spring reach, or particular spring) that would result from continuous pumping at a particular location at a constant rate for a long period of time until the simulated effect has stabilized. The response function is expressed as a decimal fraction of the pumping rate. For example, a steady-state response function of 0.05, means that pumping at particular location would deplete the flow at the point of interest by five percent of the pumping rate after a long period of pumping.

IDWR prepared steady-state response functions for ESPAM 2.1, and these were downloaded from the IDWR website. The response functions were developed using the ESPAM 2.1 run in superposition mode in which all of the model inputs were set to zero, and a unit stress was simulated at each active cell of the model. The resulting impact at each river reach, spring reach, and spring cell was compiled by IDWR into a spreadsheet.

A summary of the steady-state response functions is provided in **Table 8-1** for each of the model cells that contain one or more of Pocatello's ESPA wells. The arithmetic average of the steady-state response functions is 0.00437 (0.437 percent) for the ESPA wells. This means that 0.437 percent of Pocatello's ESPA well pumping would impact the flow of the Curren Spring under steady-state conditions. The steady-state impact on the flow of the Curren Spring from Pocatello's ESPA wells that are junior to the 1962 Rangen water right was computed by multiplying the current annual pumping of the junior ESPA wells (approximately 3,200 af/y) by their respective average response functions. The resulting steady state impact is 13.7 acre-feet per year, or an average of 0.019 cfs.

8.2 Transient Response Functions

A transient response function describes the simulated effect on the flow at a particular location that would during the months and years following the initiation of pumping, or conversely the reduction in depletions at a particular location resulting from curtailment of pumping that had previously reached a steady-state impact. Transient response functions are expressed as a series

of decimal fractions that describe the portion of the pumping that affects the location of interest during a specified time-step (e.g., months or years). The sum of the decimal fractions adds to 1.0.

Transient response functions for the model cells containing the Pocatello Wells were prepared by AMEC/Hydrosphere, consultant to the Idaho Ground Water Appropriators "(IGWA"), at the request of SWE. These response functions were also developed using the ESPAM 2.1 operated in superposition mode. A chart illustrating the average transient response functions for Pocatello's ESPA wells is shown in **Figure 8-1**.

Assuming annual pumping of 3,200 acre-feet per year for the ESPA wells, and assuming the impact on the Curren Spring from this pumping amounts had reached steady-state, **Figure 8-2** summarizes the computed increase in flow that would accrue to the Curren Spring through time as a result of curtailment of Pocatello's ESPA wells that are junior to the 1962 Rangen water right. After 10 years, the flow of the Curren spring would increase by 0.014 cfs. After 30 years, the spring flow would increase by a total of 0.018 cfs.

The results in **Figure 8-2** are based on an assumption that the depletions to the Curren Spring resulting from Pocatello's pumping had reached steady-state prior to curtailment. In actuality, the depletions have not reached steady-state, and therefore the computed accrual of water to the Curren Spring from curtailment would be less than the amounts shown in **Figure 8-2**.

8.3 Trimline

In prior delivery calls, IDWR used the ESPAM to establish a trimline for the ESPA, and ground water users outside of the trimline were excluded from curtailment. The trimlines in the prior delivery calls excluded from curtailment ground water users with steady-state impacts to the supply of the calling water right of less than 10 percent of their pumping. The 10 percent figure was selected based on the estimated accuracy of the ESPAM. During recent years, there have been discussions whether a trimline should continue to be employed in the administration of delivery calls, and if so, whether it should be based on a 10 percent impact or some other figure.

The steady-state response functions from ESPAM 2.1 were analyzed to determine the locations of trimlines assuming various steady-state pumping impact criteria ranging from 0.1 percent of pumping to 10 percent of pumping. A map showing the locations of the trimlines for these various impact criteria area shown in **Figure 8-3.**

IDWR previously conducted an analysis using the ESPAM 2.0 to determine trimline locations in using the procedure described above, and the resulting trimline locations were similar to those shown in Figure 8.3. IDWR also ran the ESPAM 2.0 to estimate the increase in the flow of the Curren Spring that would occur through curtailment of ground water users junior to Rangen's 1962 priority within the areas encompassed by the various trimlines (0.1% - 10%). **Figure 8-4** summarizes the irrigated area that would be curtailed and the computed increase in flow at the Curren Spring at steady-state for each of the trimlines that were analyzed by IDWR using ESPAM 2.0. If IDWR performed the same analysis using the ESPAM 2.1, the results would be similar to those shown in **Figure 8.4**.

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34. Idaho Department of Environmental Quality, Billingsley Creek TMDL, October 14, 1992. Available from: http://www.epa.gov/waters/tmdldocs/Billingsley%20Creek%20TMDL.pdf.

35. Environmental Protection Agency, National Pollutant Discharge Elimination System Permit Number IDG-130015.

36. Environmental Protection Agency, Discharge Monitoring Reports for Permit No. IDG-130015. Available from: http://www.epa-echo.gov/echo/compliance_report_water.html.

37. Weekly and monthly flow data provided by Rangen Inc, 1966 – November 2012.

38. Research Reports obtained from Rangen, Inc., 1981 - 2012.

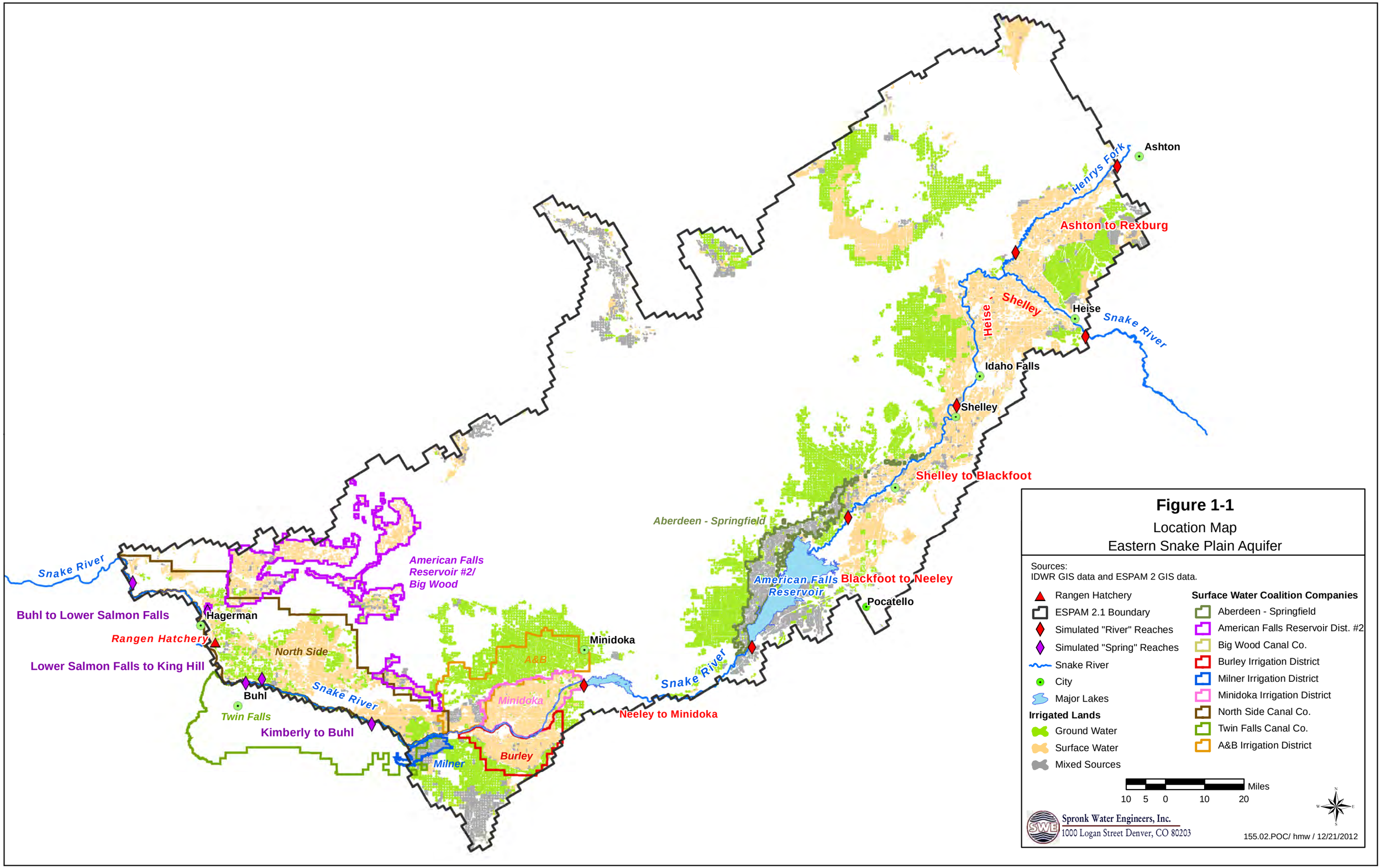
39. Fish Sale Tickets, Feed and Mort Reports, Hatchery Reports, Fish Sale Summary Reports, Fish Inventory Reports, Idaho Power Hatchery Production Summaries, and Annual Production Report, provided by Rangen Inc., 1972 – 2012.

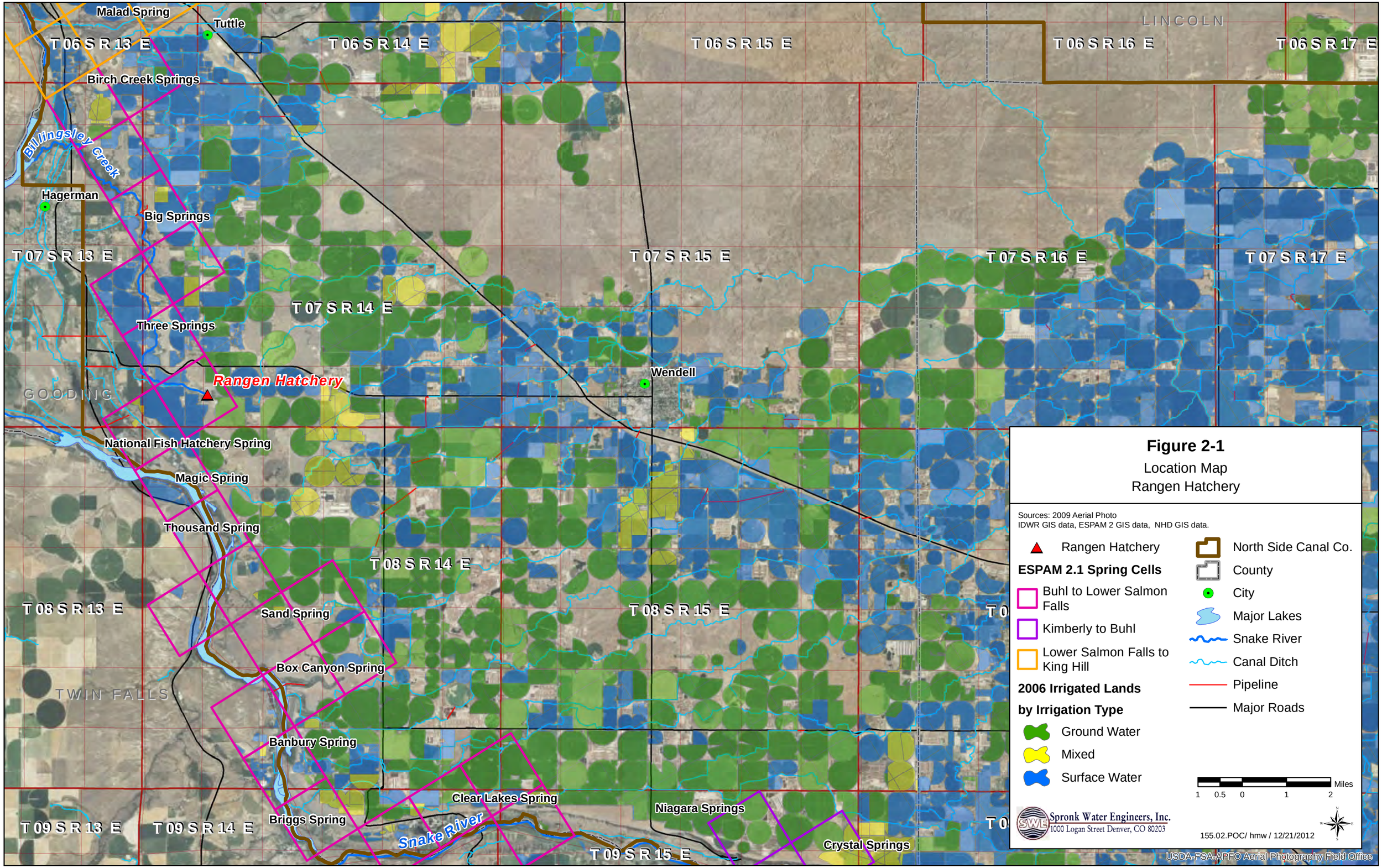
40. Schematics of Rangen Hatchery provided by Rangen, Inc.

41. Monthly Curren Tunnel Diversions to Irrigation Rights from George Lemmon provided by Rangen, Inc. 1992 – 1996.

42. NPDES Permit documents provided by Rangen Inc, 2000 – 2012.

Figures


Ashton
Henrys Fork
Ashton to Rexburg
Shelley
Heise
Heise
Snake River
Idaho Falls
Shelley
Shelley to Blackfoot
Aberdeen - Springfield
American Falls Reservoir
Blackfoot to Neeley
Pocatello
Snake River
American Falls Reservoir #2/ Big Wood
Snake River
Buhl to Lower Salmon Falls
Hagerman
Rangen Hatchery
North Side
Lower Salmon Falls to King Hill
Buhl
Snake River
Twin Falls
Kimberly to Buhl
Minidoka
A&B
Minidoka
Neeley to Minidoka
Milner
Burley
Figure 1-1
Location Map
Eastern Snake Plain Aquifer
Sources:
IDWR GIS data and ESPAM 2 GIS data.
Rangen Hatchery
ESPAM 2.1 Boundary
Simulated "River" Reaches
Simulated "Spring" Reaches
Snake River
City
Major Lakes
Irrigated Lands
Ground Water
Surface Water
Mixed Sources
Surface Water Coalition Companies
Aberdeen - Springfield
American Falls Reservoir Dist. #2
Big Wood Canal Co.
Burley Irrigation District
Milner Irrigation District
Minidoka Irrigation District
North Side Canal Co.
Twin Falls Canal Co.
A&B Irrigation District
Miles
10 5 0 10 20
Spronk Water Engineers, Inc.
1000 Logan Street Denver, CO 80203
155.02.POC/ hmw / 12/21/2012


Malad Spring
Tuttle
T 06 S R 13 E
T 06 S R 14 E
T 06 S R 15 E
T 06 S R 16 E
T 06 S R 17 E
LINCOLN
Birch Creek Springs
Billingsley Creek
Hagerman
Big Springs
T 07 S R 13 E
T 07 S R 15 E
T 07 S R 16 E
T 07 S R 17 E
T 07 S R 14 E
Three Springs
Rangen Hatchery
Wendell
GOODING
National Fish Hatchery Spring
Magic Spring
Thousand Spring
T 08 S R 14 E
T 08 S R 13 E
Sand Spring
T 08 S R 15 E
Box Canyon Spring
TWIN FALLS
Banbury Spring
Clear Lakes Spring
Niagara Springs
Briggs Spring
Snake River
T 09 S R 13 E
T 09 S R 14 E
T 09 S R 15 E
Crystal Springs
Figure 2-1
Location Map
Rangen Hatchery
Sources: 2009 Aerial Photo
IDWR GIS data, ESPAM 2 GIS data, NHD GIS data.
Rangen Hatchery
ESPAM 2.1 Spring Cells
Buhl to Lower Salmon Falls
Kimberly to Buhl
Lower Salmon Falls to King Hill
2006 Irrigated Lands
by Irrigation Type
Ground Water
Mixed
Surface Water
North Side Canal Co.
County
City
Major Lakes
Snake River
Canal Ditch
Pipeline
Major Roads
Miles
1 0.5 0 1 2
Spronk Water Engineers, Inc.
1000 Logan Street Denver, CO 80203
155.02.POC/ hmw / 12/21/2012
USDA-FSA-APFO Aerial Photography Field Office

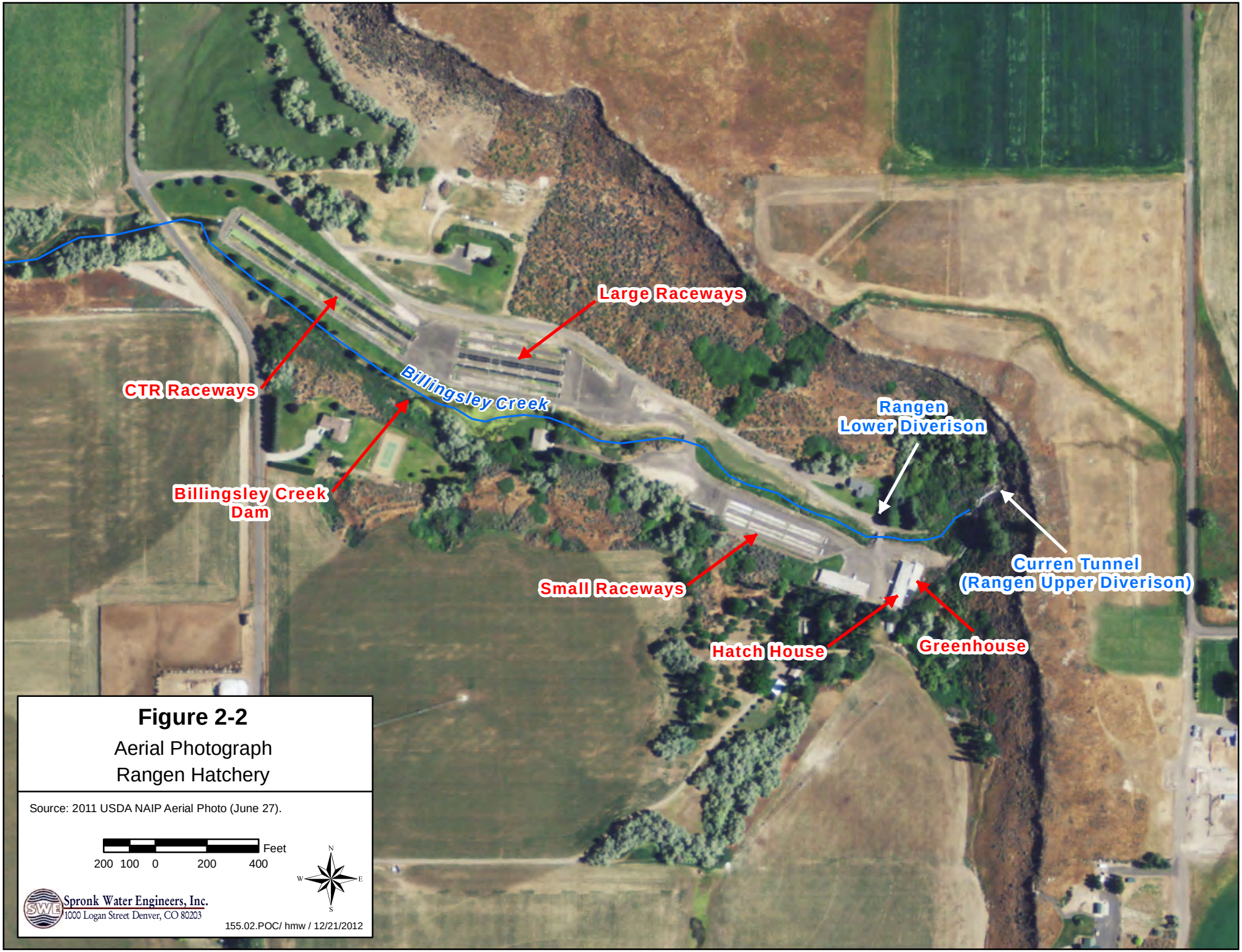


Figure 2-2

Aerial Photograph
Rangen Hatchery

Source: 2011 USDA NAIP Aerial Photo (June 27).

Figure 2-3

Photograph of Curren Tunnel Diversion Facilities

Photo taken on June 19, 2012.

FIGURE 2-4

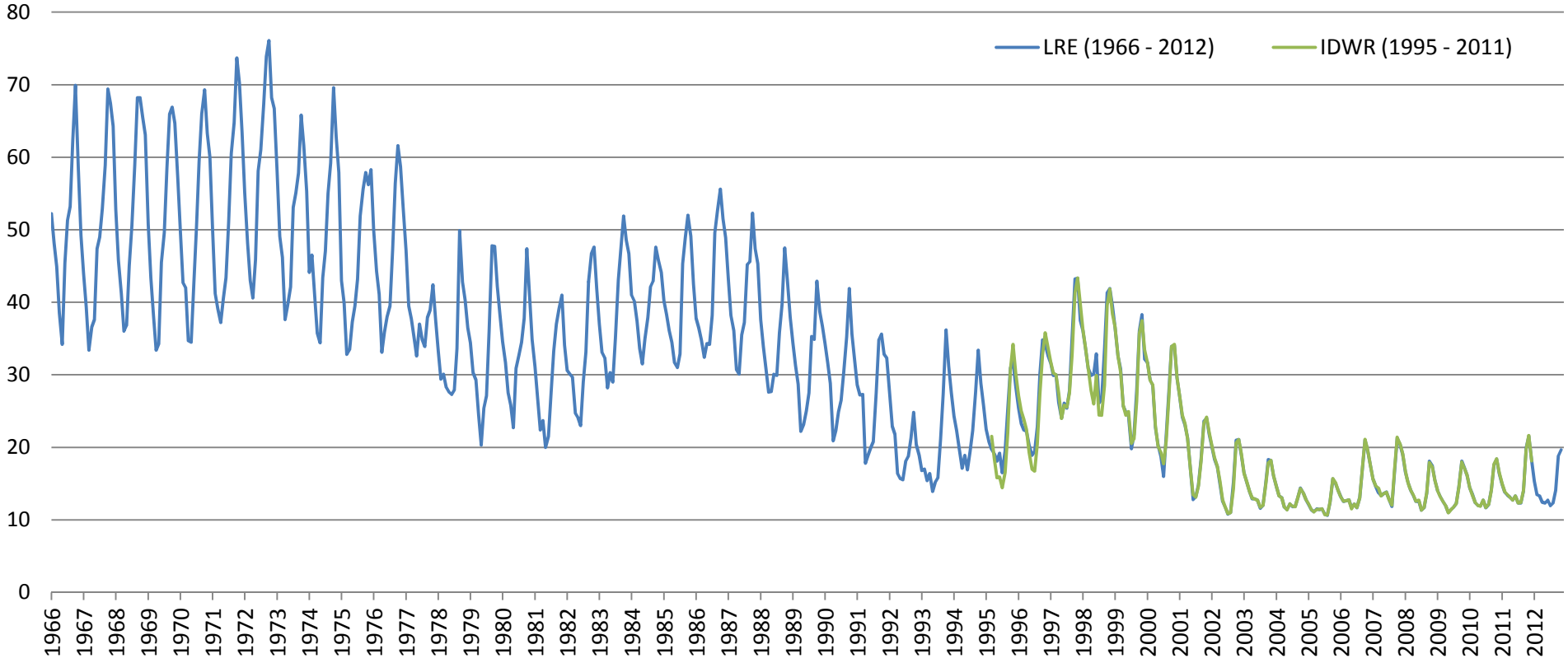
2 pages of confidential information

removed due to

Protective Order

Figure 2-5

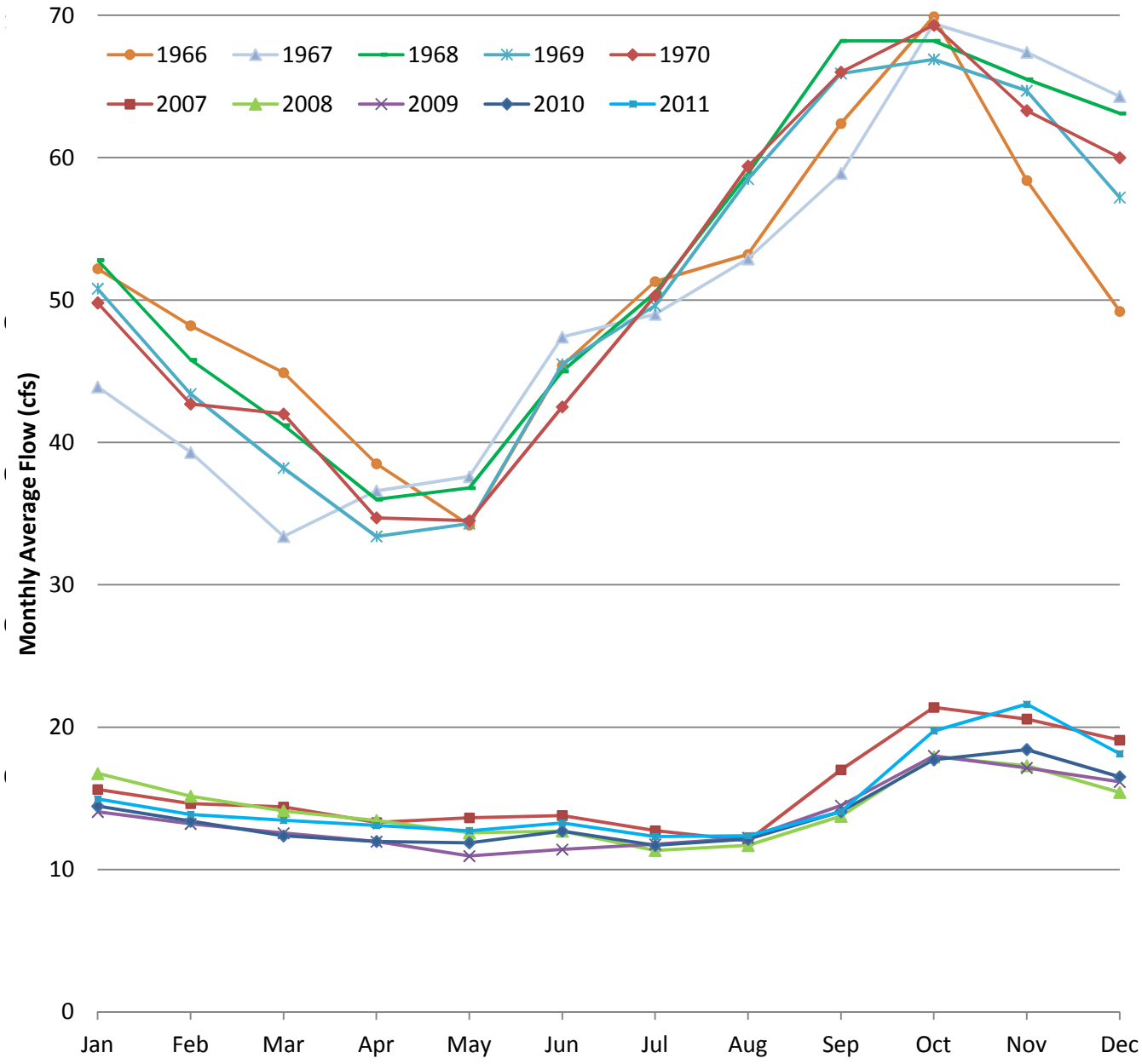
Monthly Average Flow
Rangen Hatchery
1966 - 2012
Values in CFS



Source: Rangen monthly flow data reported by Rangen and IDWR reported flow data (March 1995 - 2011).

Figure 2-6

Monthly Average Flows
Rangen Hatchery
1966 - 1970 and 2007 - 2011
Values in CFS

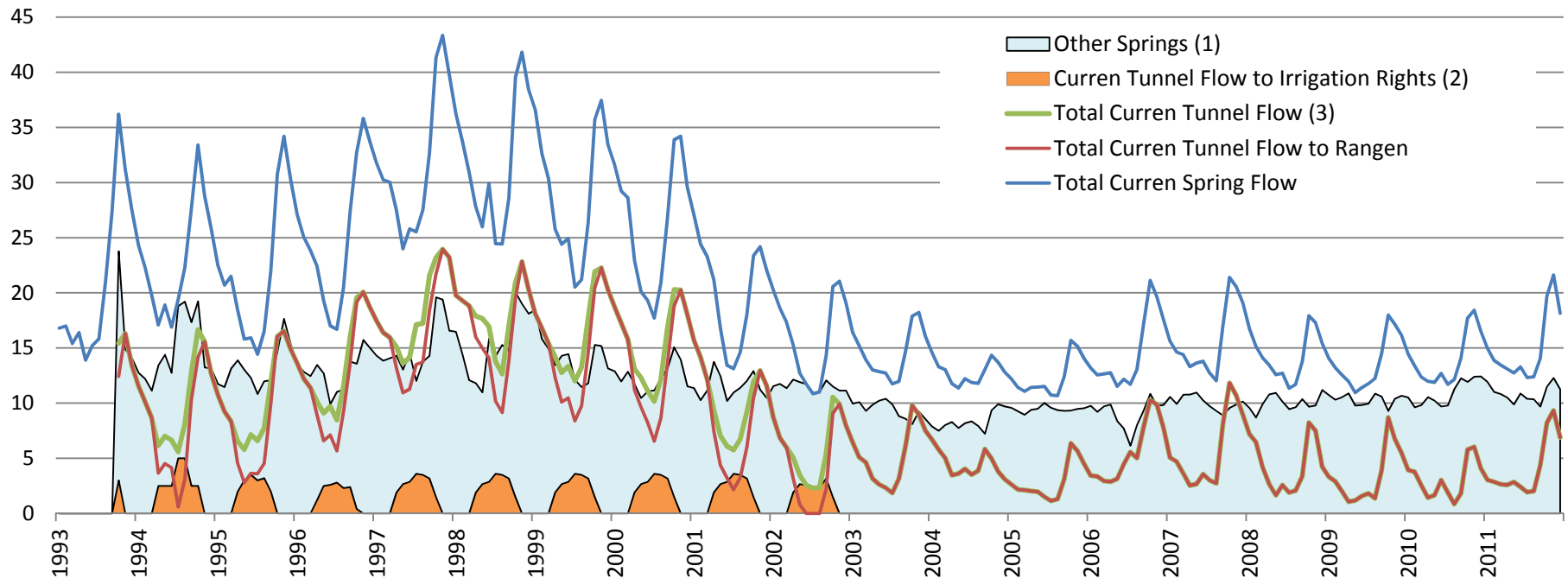


Source: Rangen monthly flow data reported by Rangen (1966 - 1970) and flow data reported by IDWR (2007 - 2011).

Figure 2-7

Monthly Average Rangen Hatchery Flow vs. Curren Tunnel and Other Springs 1993 - 2011

Values in CFS



Source: Rangen monthly flow data reported by Rangen (1993 - Feb 1995) and IDWR reported flow data (March 1995 - 2011).

Curren Tunnel flow data provided by IDWR.

Notes: The 2008 data and 2011 Curren Tunnel data have been graded by the IDWR as poor due to equipment problems. IDWR generated the 2011 data by replicating Box Canyon Spring data with a reduced amplitude and fitting the data to the flow measurements made on site.

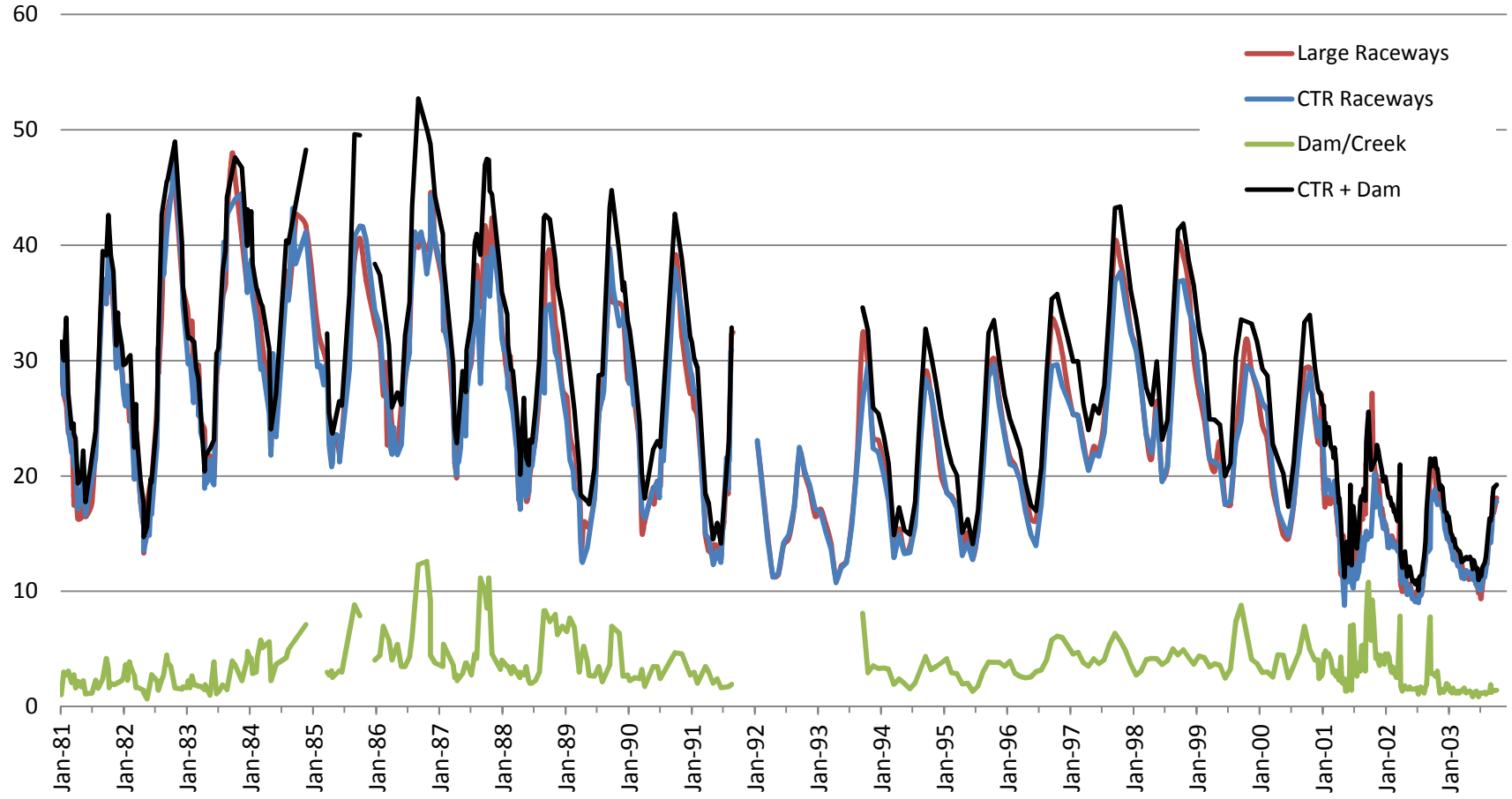
(1) Computed as Total Curren Spring Flow minus Total Curren Tunnel Flow.

(2) Curren Tunnel to irrigation rights from 1993 - 1996 provided by George Lemmon. The 1997 - 2002 irrigation diversions were estimated based on the 1993 - 1996 average monthly diversions. Diversions of the irrigation rights from the Curren Tunnel ceased after 2002 with the construction of the Sandy Pipeline to supply the irrigation water rights from the North Side Canal.

(3) Total Curren Tunnel Flow includes total flow to Rangen plus flow to irrigation pipelines, but does not include flow in Rangen's domestic pipeline.

Figure 2-8

Daily Flows
Rangen Hatchery
1981 - 2003
Values in CFS



Source: Data were submitted to IDWR by May, Sudweeks & Browning, LLP on behalf of Rangen Hatchery, November 21, 2003.

Figure 2-9

Raceway Volumes and Identifiers
Rangen Hatchery

Raceway Type	Volume (ft^3)	Identifier
Green House Tank	27	(1-24)
Hatch House Trough	17	(1-12)
Small Raceway (narrow)	580	(1-16)
Small Raceway (wide)	934	(17-20)
Large Raceway	1,640	(1-10 T,C, B)
CTR Raceway	8,244	(A, B, & D)

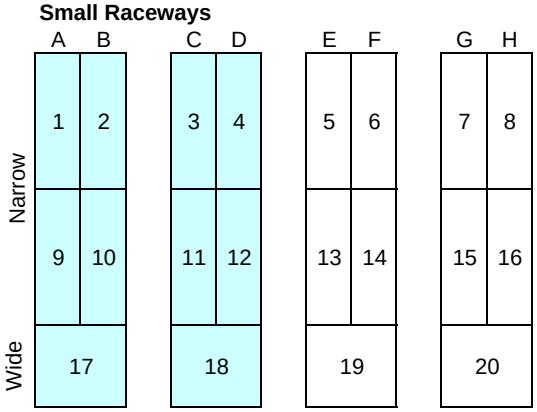
Based on flow restrictors

Max Tank flow (11.5 GPM) =	0.03 cfs
~Capacity Flow (flow x 24) =	0.61 cfs

Based on maximum flows (2007-2012)*

Max Trough flow =	0.06 cfs
~Capacity Flow (avg flow x 12) =	0.75 cfs
Est. capacity of Tanks and Troughs =	1.36 cfs

Small Raceways



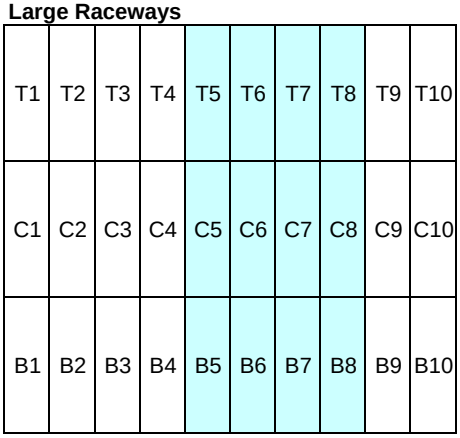
Based on average flows (2007-2012)

Avg Sm. Raceway (wide) flow =	2.28 cfs
~Capacity Flow (avg flow x 4) =	9.11 cfs

Based on maximum flows (2007-2012)*

Max Sm. Raceway (wide) flow =	2.68 cfs
~Capacity Flow (avg flow x 4) =	10.72 cfs

Large Raceways



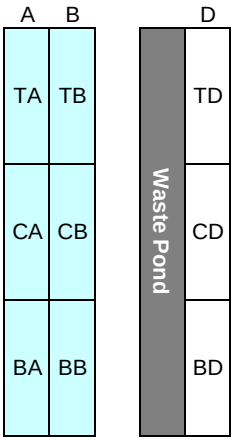
Based on average flows (2007-2012)

Avg Lg. Raceway flow =	4.29 cfs
~Capacity Flow (avg flow x 10) =	42.92 cfs

Based on maximum flows (2007-2012)*

Max Lg. Raceway flow =	4.82 cfs
~Capacity Flow (max flow x 10) =	48.18 cfs

CTR Raceways



Based on average flows (2007-2012)

Avg CTR flow =	12.39 cfs
~Capacity Flow (avg flows x3) =	37.18 cfs
~Capacity Flow w/o WP (avg flows x4) =	49.58 cfs

Based on maximum flows (2007-2012)

Max CTR flow =	17.26 cfs
~Capacity Flow (max flows x3) =	51.77 cfs
~Capacity Flow w/o WP (avg flows x4) =	69.03 cfs

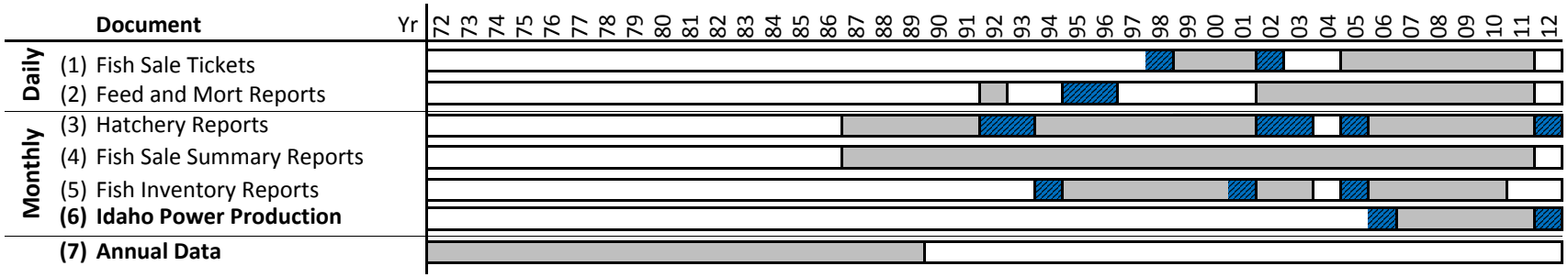
*Total reported flow divided by number of raceways in operation.

Notes

(1) Volumes from Idaho Power Hatchery Production Summaries.
(2) Raceway identifiers provided by Lonny Tate during his deposition on September 11, 2012.

Figure 4-1

Fish Production Data Provided by Rangen
1972 - 2012



Notes:

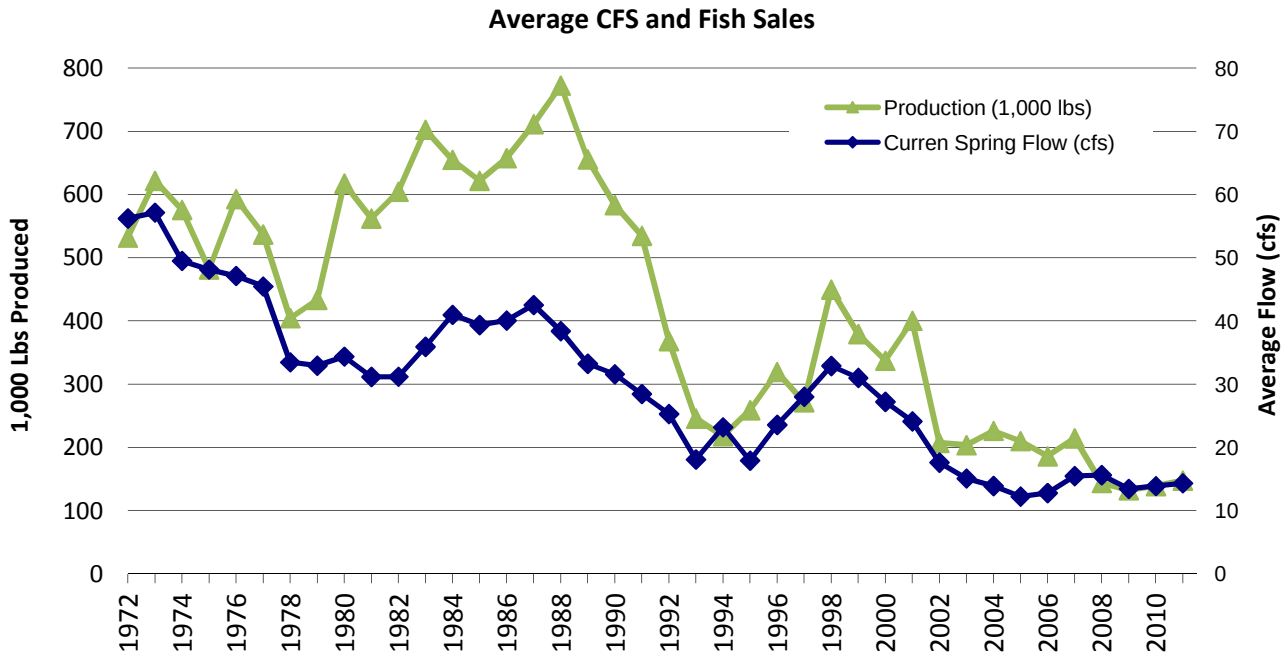
(1) Invoices showing date of sale, pounds of fish sold, type of fish sold, and buyer.
(2) Feed fed to fish and fish mortalities by raceway.
(3) Hatchery data (monthly total pounds of fish, number of fish, pounds and/or number of sales, number of mortalities, and flow in cfs).
Data in 1986 has been redacted.
Data from 1987 - 1991 difficult to read.
Missing data for all but one month in 1993 and in a few months in 1992, 2002, 2003, 2005, and 2012.
Data by raceway (inventory data) is shown in Hatchery Reports for Sep-94, Oct-94, Jul-94, Mar-95, May-95, 1998, Jul-10, Nov-11, and Dec-11.
(4) Summary of monthly sales data including date of sale, invoice number, pounds of fish sold, pond from which fish where sold, buyer, etc.
(5) Inventory data (number of fish, pounds of fish, mortalities, feed fed, weight gain, feed conversion ratio, etc.) by raceway.
(6) Idaho Power Hatchery Production Summaries by raceway for March and October sales only. Data include total pounds of fish, number of fish, length of fish, number of mortalities, feed fed, feed conversion ratio, weight gain, length increase, density index, flow index, and flow in cfs. These data do not include production data for the 8,000 lbs of fish delivered in late May or early June pursuant to a separate contract.
(7) Annual production and feed data summary (fiscal year totals 1972 - 1989).

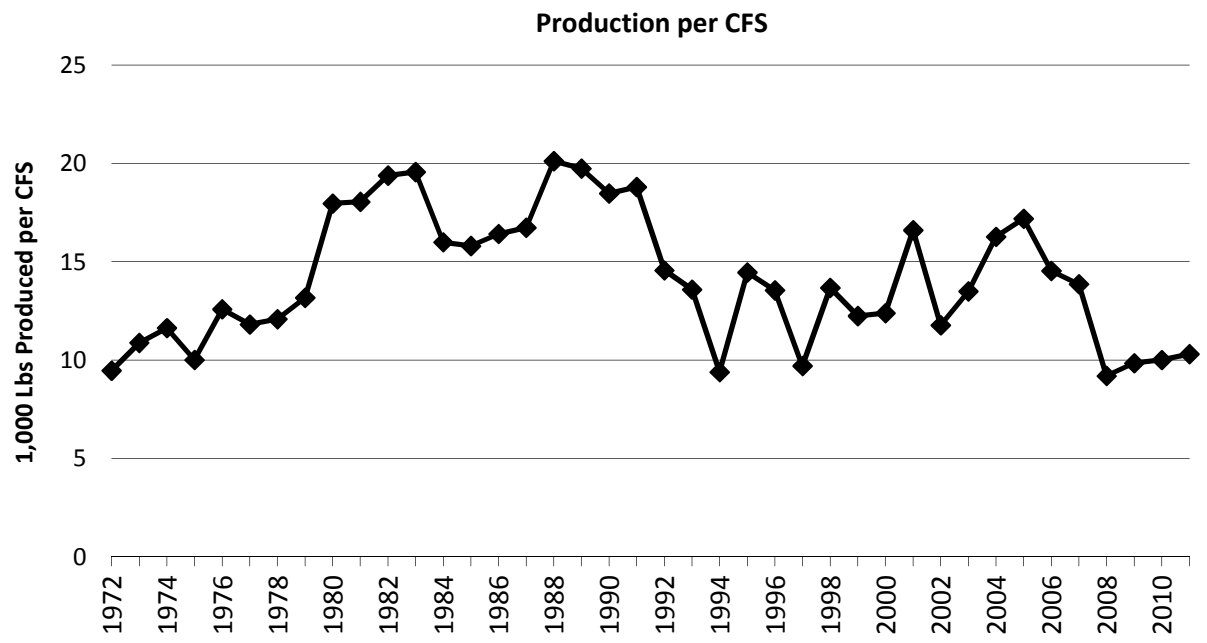
Key

Complete data provided by Rangen.
Partial data provided by Rangen (one or more missing months).
No data.

Figure 4-2

Annual Production Data
Rangen Hatchery
Fiscal Years 1972 - 2011

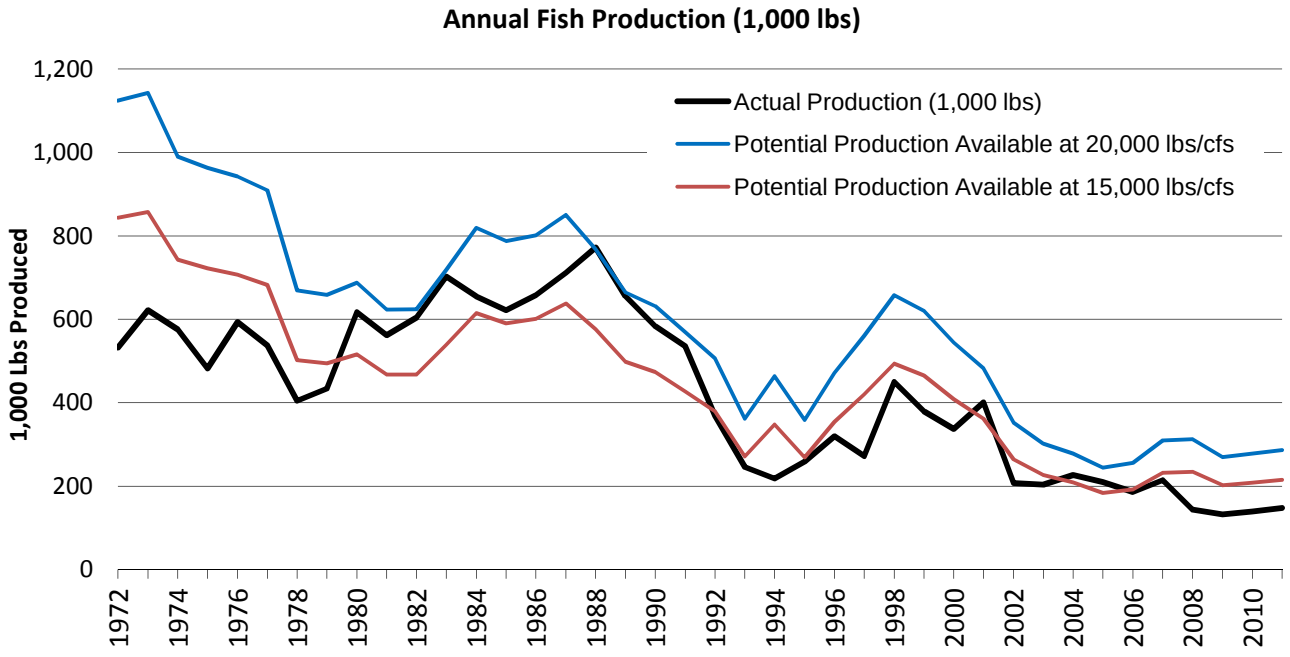


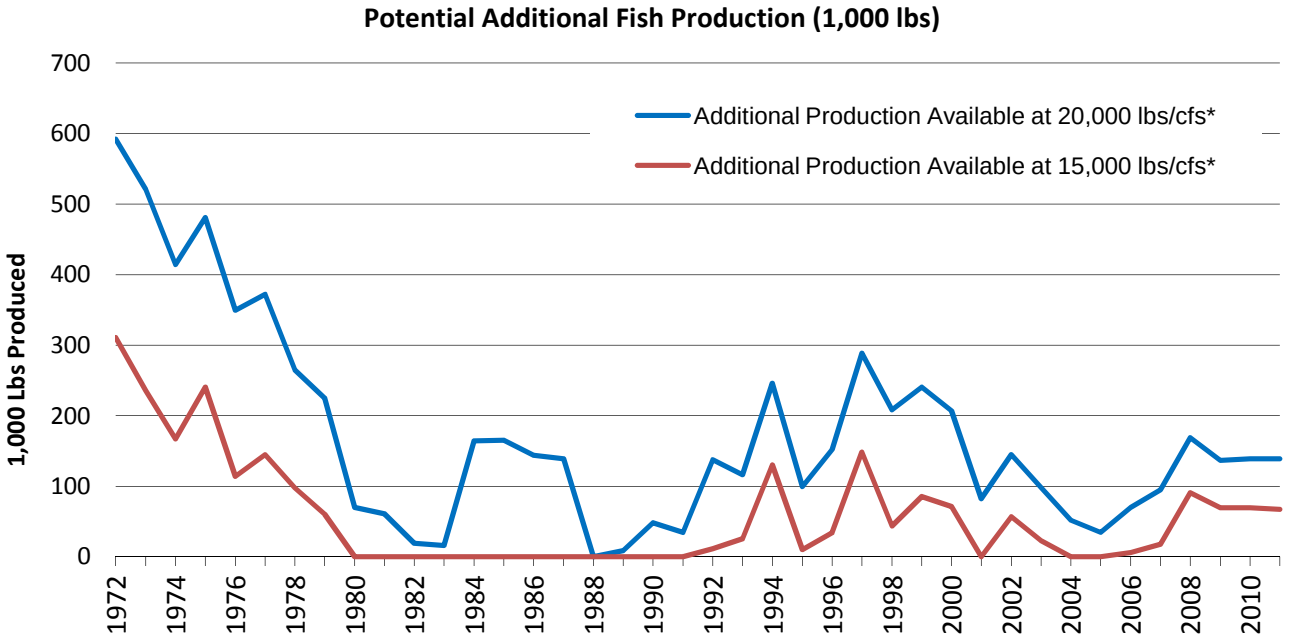


Sources: Rangen's Annual Production Report (Fiscal Years 1972 - 1989).
Production based on fiscal year (July 1 - June 30) sales in Rangen's monthly Hatchery Reports, spreadsheets, and sales summaries from 1990 - 2011.
Fiscal year annual flow computed from total Rangen flow ("Curren Spring Flow") reported by Rangen (1972 - February 1995) and reported by IDWR (March 1995 - 2011).

Figure 4-3

Potential vs. Actual Annual Production
Rangen Hatchery
Fiscal Years 1972 - 2011



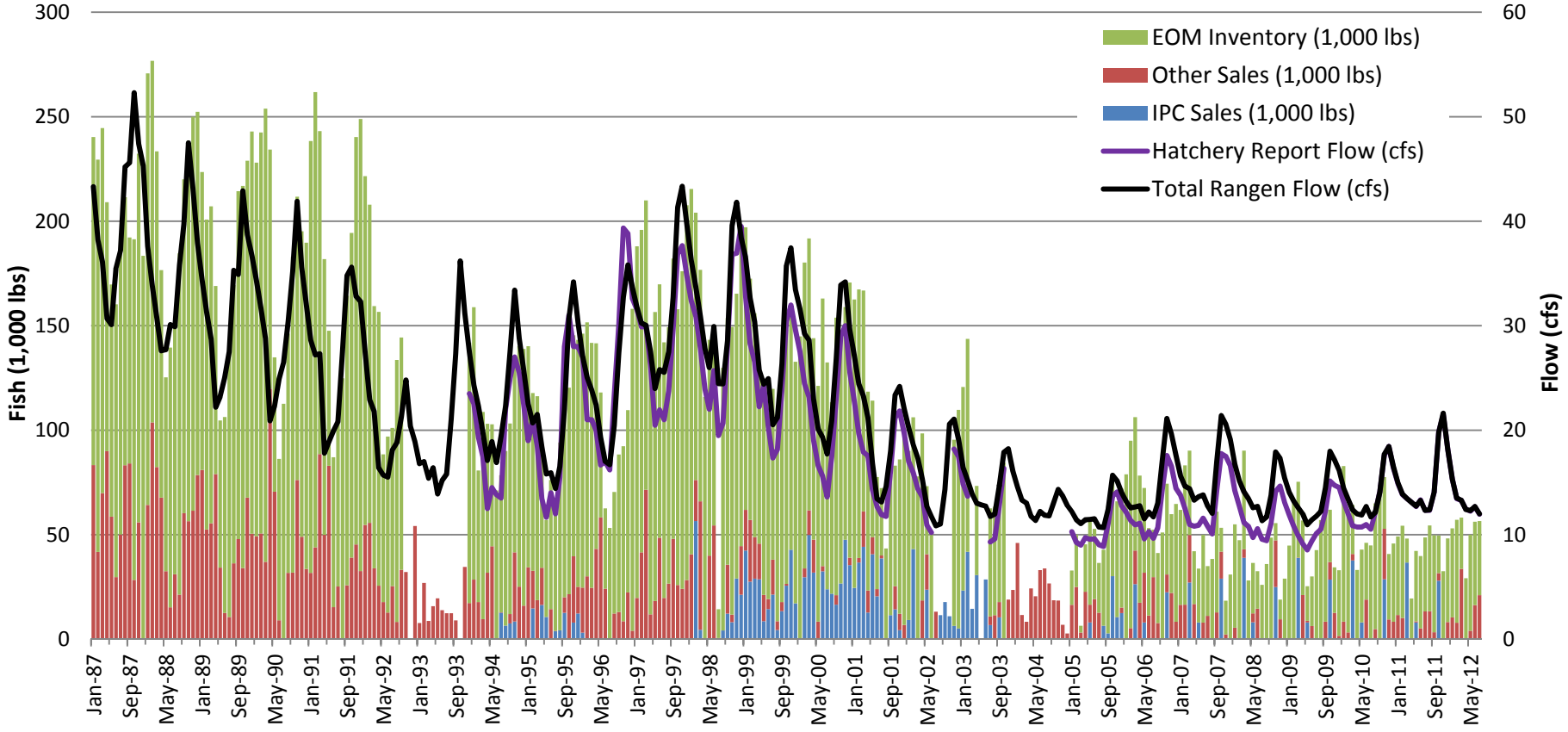


Sources: Rangen's Annual Production Report (Fiscal Years 1972 - 1989).
Production based on fiscal year (July 1 - June 30) sales in Rangen's monthly Hatchery Reports, spreadsheets, and sales summaries from 1990 - 2011.
Fiscal year annual flow computed from total Rangen flow reported by Rangen.

Notes: *Potential additional fish production computed as the difference between assumed production at 20,000 lbs/cfs and 15,000 lbs/cfs minus the actual reported historical production.

Figure 4-4

Monthly Fish Sales and End-of-Month Inventory in Pounds
Rangen Hatchery
1987 - July 2012

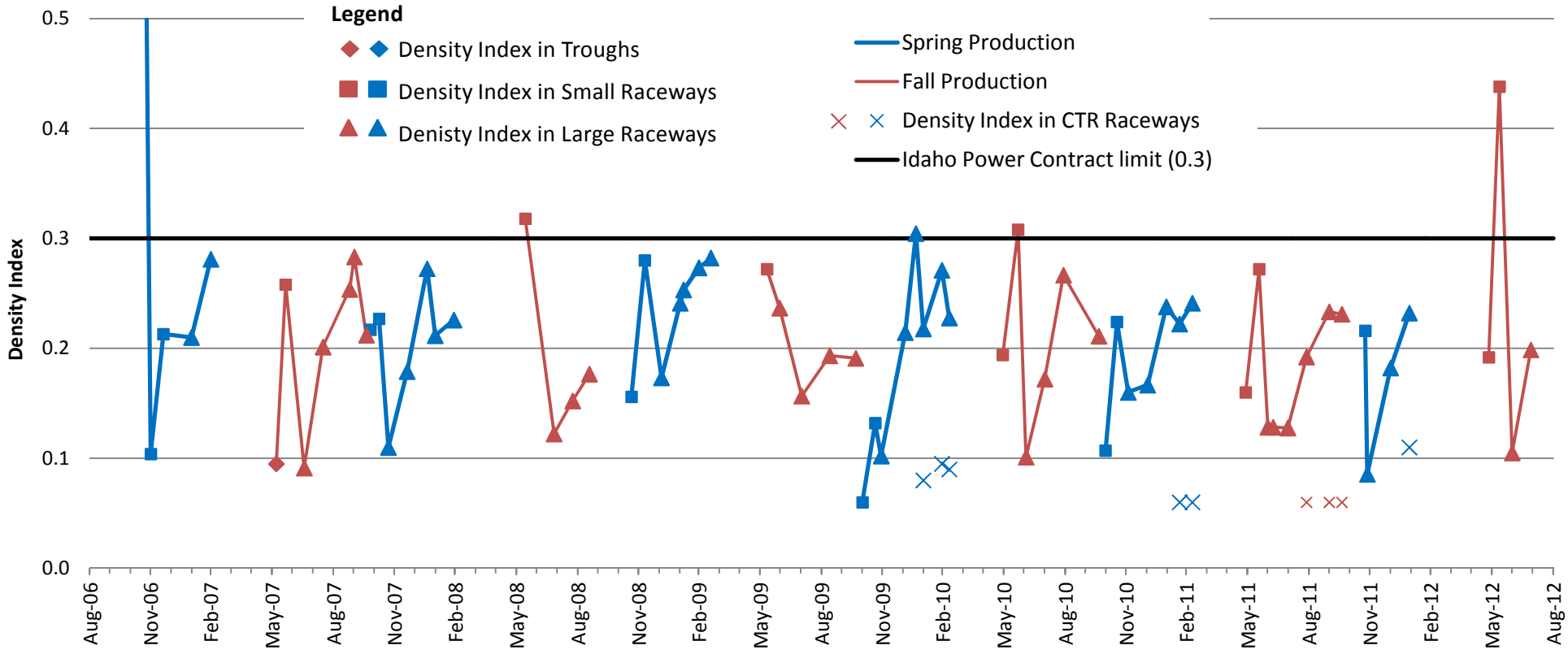


Sources: End-of-month inventory, flow, and sales are from monthly Hatchery Reports and Sales Summaries provided by Rangen.
Rangen monthly flow data reported by Rangen (1966-1970) and IDWR reported flow data (March 1995-2011).

Notes: Bars are stacked. The sum of the end-of-month inventory and the monthly fish sales is assumed to represent the total monthly fish weight in the facility.
There are no end-of-month inventory data available for 1993 and 2004 and there are missing months of data in 1992 and 2002 - 2003.
There are no Idaho Power Company (IPC) sales data in 1987 - 1993 and 2012. No IPC sales occurred in 1996 - 1997 and 2004.

Figure 4-5

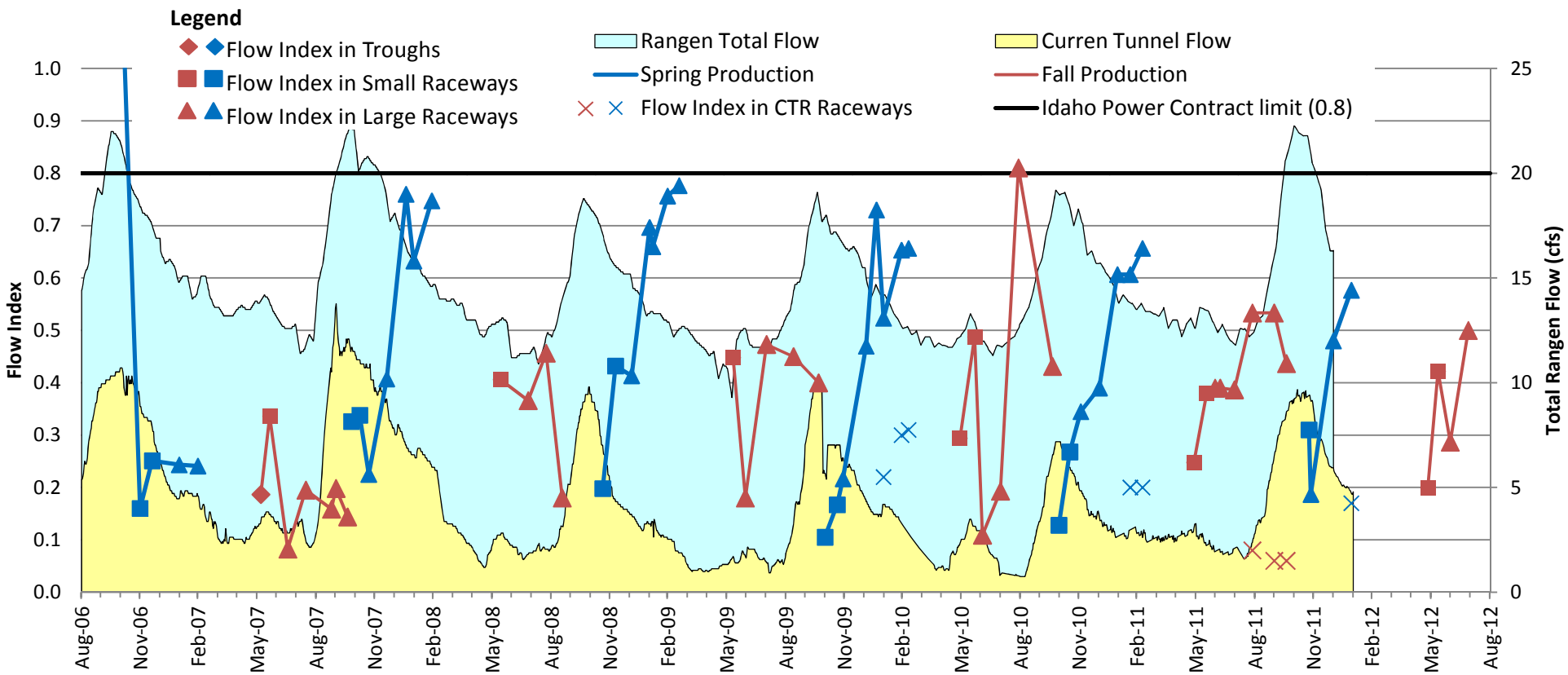
Reported Density Index
Idaho Power Hatchery Production Summaries
Rangen Hatchery
2006 - 2012



Source: Average of the Density Index values by structure type contained in the Idaho Power Hatchery Production Summaries.
Notes: Density Index = Fish Weight (lbs) / (Length of Fish (in) x Volume of Raceway or Container (cubic feet))
Density Index limit in Idaho Power Contract = 0.3.
In October 2006, the reported average density index in Troughs is 2.1.

Figure 4-6

Reported Flow Index
Idaho Power Hatchery Production Summaries
Rangen Hatchery
2006 - 2012

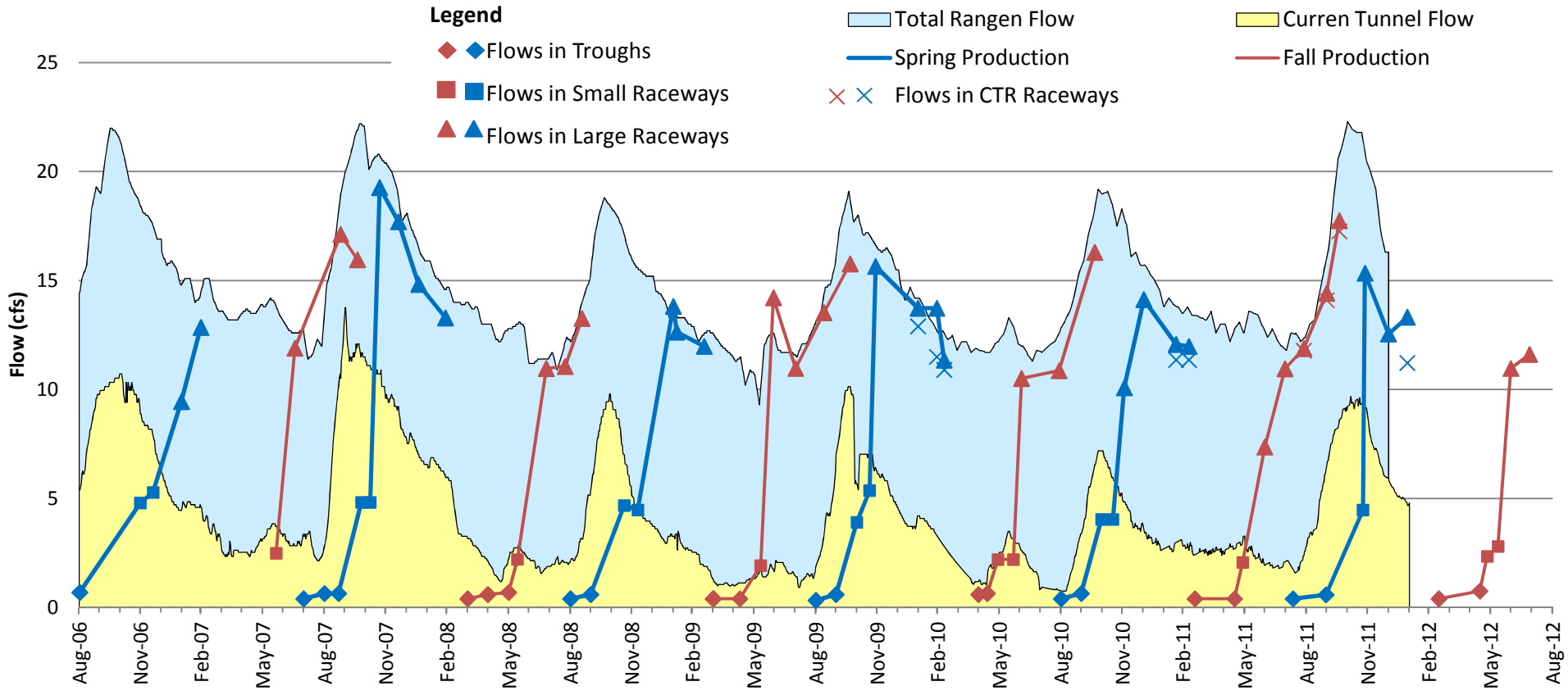


Sources: Average of the Flow Index values by structure type contained in the Idaho Power Hatchery Production Summaries.
Daily Total Rangen flow and daily Curren Tunnel flow data reported by IDWR.

Notes: Flow Index (FI) = Fish Weight (lbs) / (Length of Fish (in) x Flow rate (gallons per minute))
Flow Index limit in Idaho Power Contract = 0.8.
The reported average flow index in the Troughs is 1.2

Figure 4-7

Daily Flow (cfs)
Idaho Power Hatchery Production Summaries
Rangen Hatchery
2006 - 2012

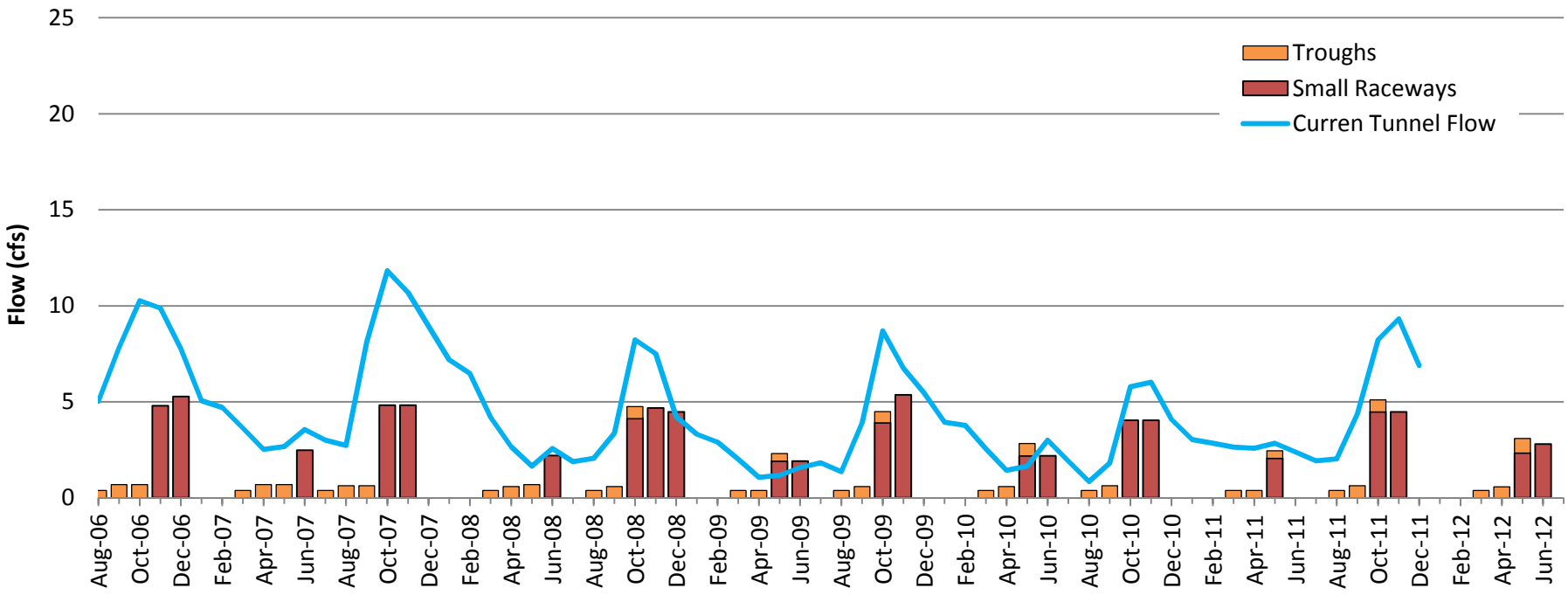


Sources: Structure flow data based on the sum of the daily flows contained in the Idaho Power Hatchery Production Summaries.
Daily Total Rangen flow and daily Curren Tunnel flow data reported by IDWR.

Note: Missing data for Troughs in March to May 2007.

Figure 4-8

Trough and Small Raceway Flows vs. Curren Tunnel Flows
Idaho Power Hatchery Production Summaries
Rangen Hatchery
August 2006 - July 2012
Values in CFS

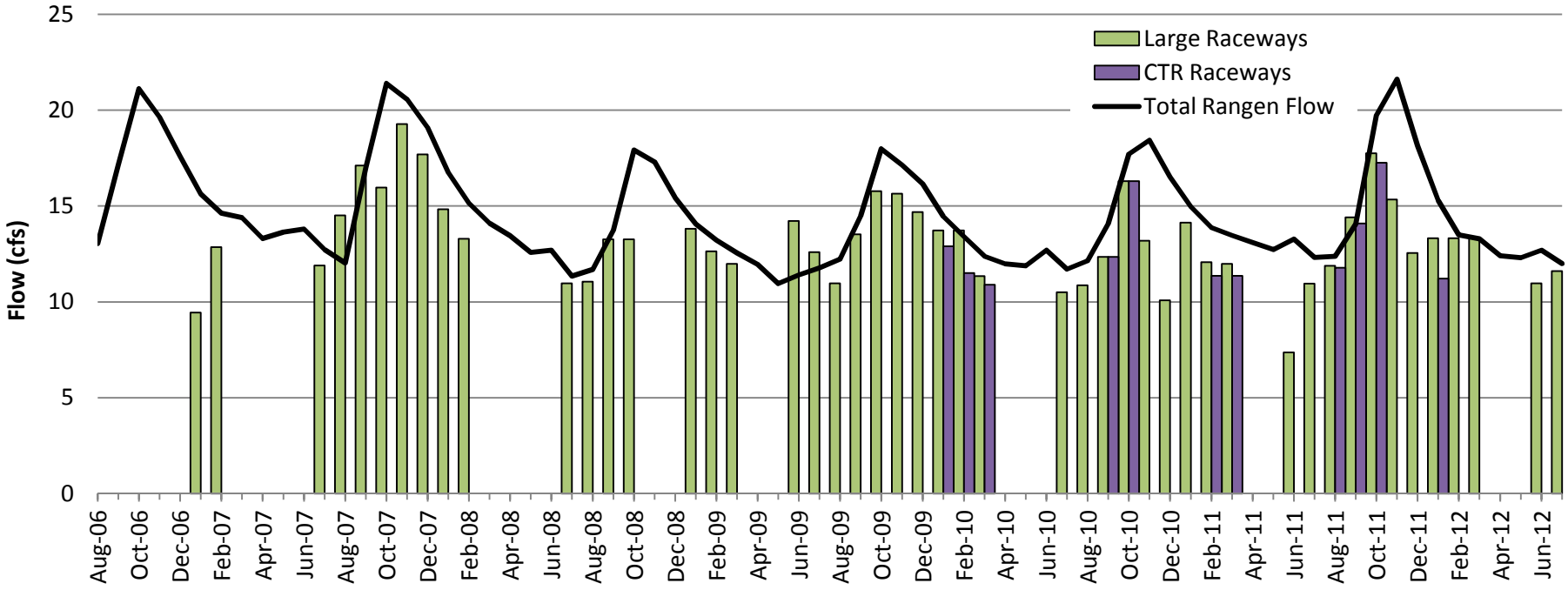


Sources: Daily Trough and Small Raceway reported flow values from the Idaho Power Hatchery Production Summaries are shown in month of occurrence. Monthly Curren Tunnel flow from IDWR. No data are available for 2012.

Notes: Missing Trough flow data filled in with average values in 8/2006, 10/2006, 10/2009, 10/2011, and 5/2012.
Monthly flows during a production cycle without daily Small Raceway flow data in that month were estimated by averaging flows in the previous and subsequent months (5/2009 and 10/2011).
There did not appear to be information in the Idaho Power Hatchery Production Summaries regarding the production of fish for the 8,000 pounds of fish that are delivered to Rangen in late May or early June for release at American Falls Reservoir. As a result, this chart does not reflect the presence of these fish in the hatchery.

Figure 4-9

Large and CTR Raceway Flows vs. Total Rangen Flow
Idaho Power Hatchery Production Summaries
Rangen Hatchery
August 2006 - July 2012
Values in CFS



Sources: Daily Large Raceway and CTR Raceway reported flows from Idaho Power Hatchery Production Summaries. The reported daily values are shown in month of occurrence.

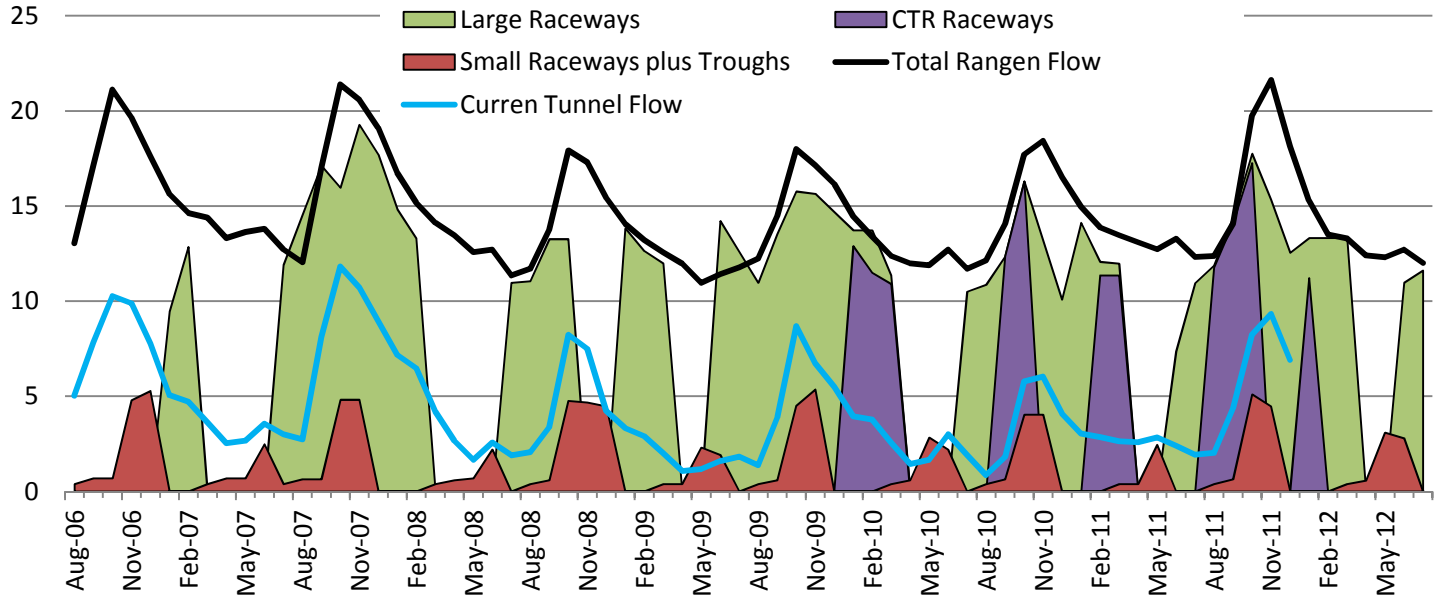
Monthly average total Rangen flow reported by Rangen.

Notes: Monthly flows during a production cycle without daily flow data were estimated by averaging flows in the previous and subsequent months (8/2007, 10/2008, 9/2010, and 3/2012 for the Large Raceways and 9/2010 and 10/2010 for the CTR Raceways).

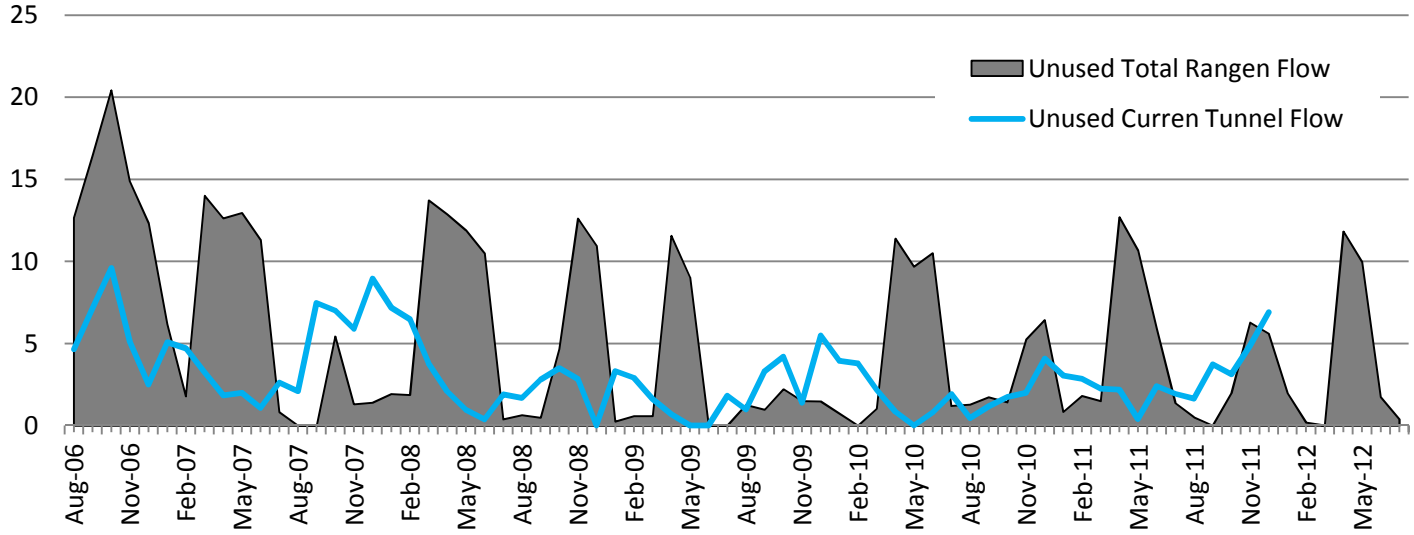
There did not appear to be information in the Idaho Power Hatchery Production Summaries regarding the production of fish for the 8,000 pounds of fish that are delivered to Rangen in late May or early June for release at American Falls Reservoir. As a result, this chart does not reflect the presence of these fish in the hatchery.

Figure 4-10

Monthly Flow Through Raceways vs. Total Rangen Flow and Curren Tunnel Flow
Rangen Hatchery
August 2006 - July 2012
Values in CFS



Total Unused Rangen Hatchery Flows

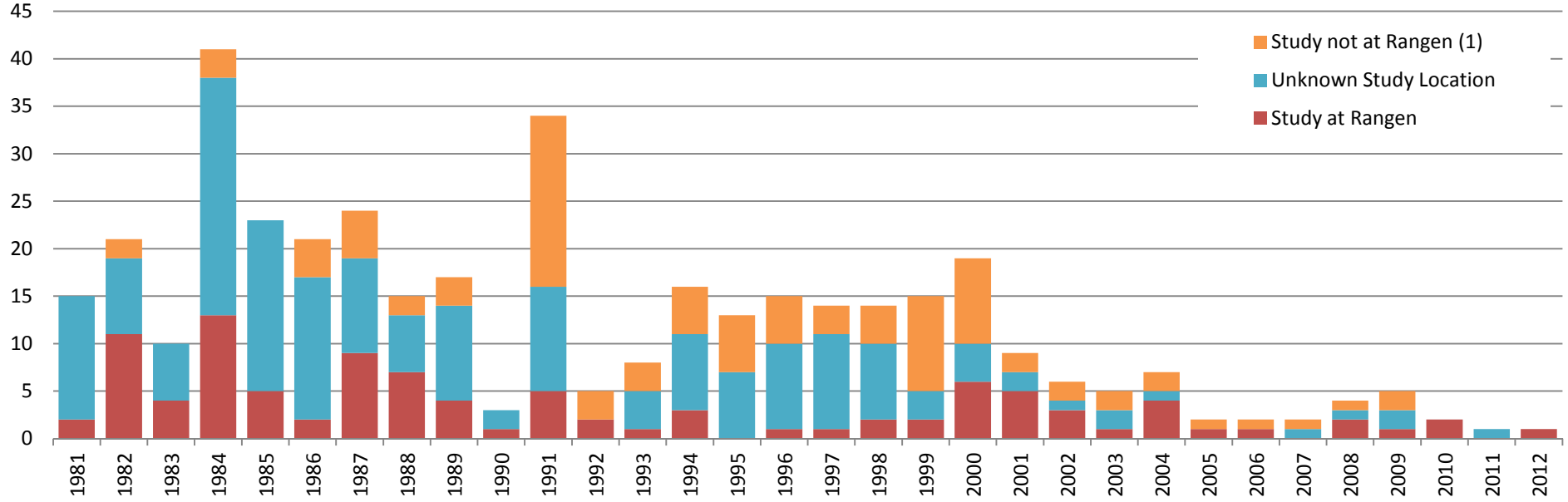


Sources: Raceway flows in the monthly Idaho Power Hatchery Production Summaries.
Total Rangen flow reported by Rangen and Curren Tunnel flow reported by IDWR.

Notes: Unused Curren Tunnel Flow is the Curren Tunnel flow minus the sum of the flows in Troughs and Small Raceways.
Unused Total Flow is the Total Rangen Flow minus the greater of the flows measured in the (Troughs plus Small Raceways), Large Raceways, or CTR Raceways.
There did not appear to be information in the Idaho Power Hatchery Production Summaries regarding the production of fish for the 8,000 pounds of fish that are delivered to Rangen in late May or early June for release at American Falls Reservoir. As a result, this chart does not reflect the presence of these fish in the hatchery.

Figure 5-1a
Summary of Research Index Work Units
All Species
Rangen Hatchery
1981 - 2012

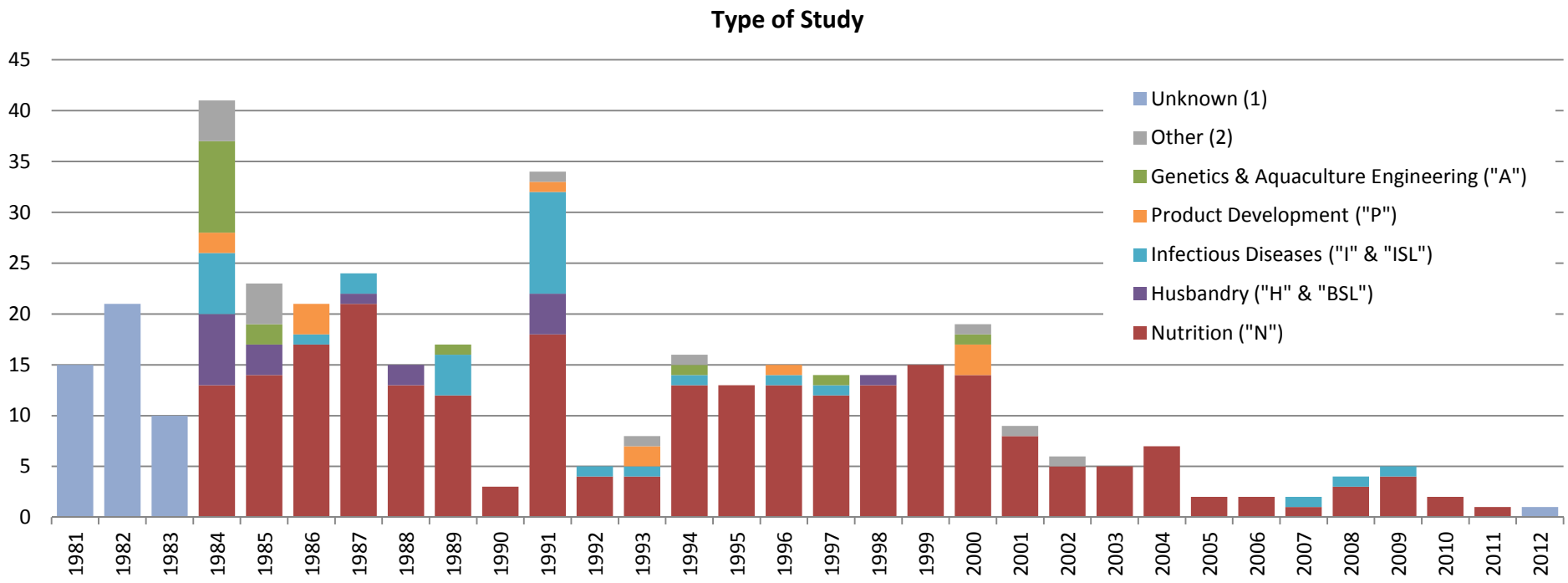
Work Units in Index by Study Site



Notes:

*Documentation or study names indicated that the research was conducted at a different site. Tilapia and other warm water fish research was assumed to be done off-site.

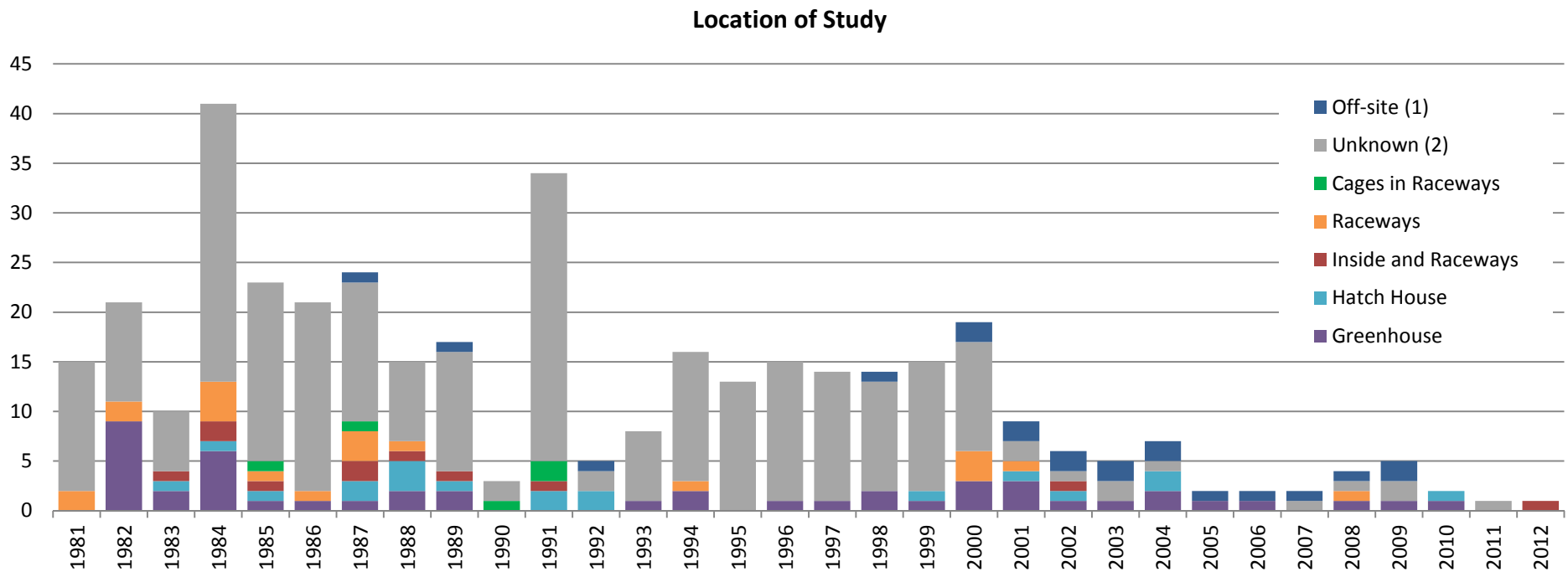
Figure 5-1b
Summary of Research Index Work Units
All Species
Rangen Hatchery
1981 - 2012



(1) Unknown types include pre-1984 studies. Nature of pre-1984 studies cannot be determined based on numbering system in index.

(2) Other types include physiology/biology/analytical chemistry ("B"), toxicology ("T"), extension service ("E"), and other ("O").

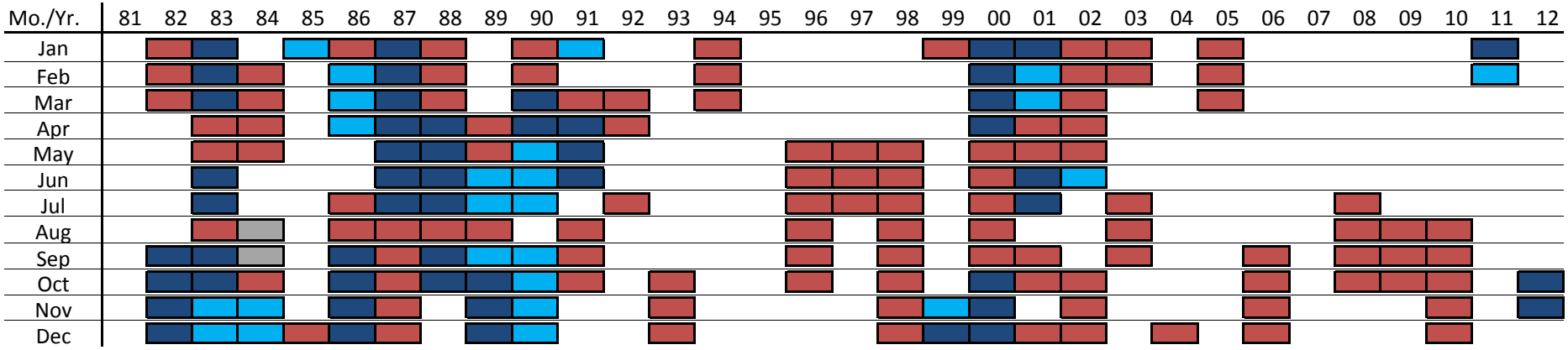
Figure 5-1c
Summary of Research Index Work Units
All Species
Rangen Hatchery
1981 - 2012



(1) Off-site means that the location of the study is known and is not at Rangen. Off-site locations include Rangen's warm water facility in Buhl, Clear Springs, etc.

(2) Unknown means location is not known. Warm water species assumed to not be at Rangen, but are included in this unknown category.

Figure 5-2
Summary of Research Documentation Obtained
Rangen Hatchery
1981 - 2012



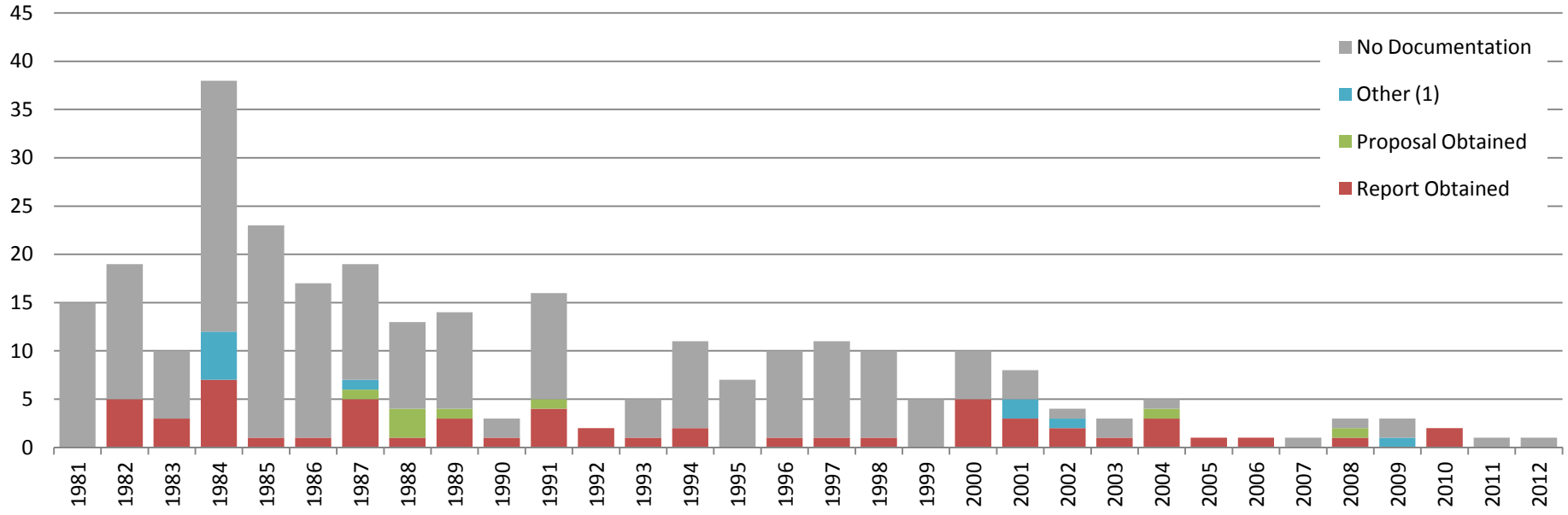
Source: Rangen's research proposals and documents obtained on October 16, 2012 and research documentation disclosed by Rangen.

Note: There are additional research proposals and documents that do not have dates and are not listed in the above chart.

Code:
- Research conducted in outside raceways.
- Research conducted in indoor facilities.
- Research conducted in both indoor and outdoor facilities.
- Research dates listed, but there are no location data.

Figure 5-3a
Summary of Research Index Work Units
Cold Water or Unknown Species
Rangen Hatchery
1981 - 2012

Type of Documentation



(1) Other documentation includes spreadsheets, data tables, mid-year reports, indices with start/end dates, or other documentation indicating research took place.

Figure 5-3b
Summary of Research Index Work Units
Cold Water or Unknown Species
Rangen Hatchery
1981 - 2012

Information Contained in Documentation

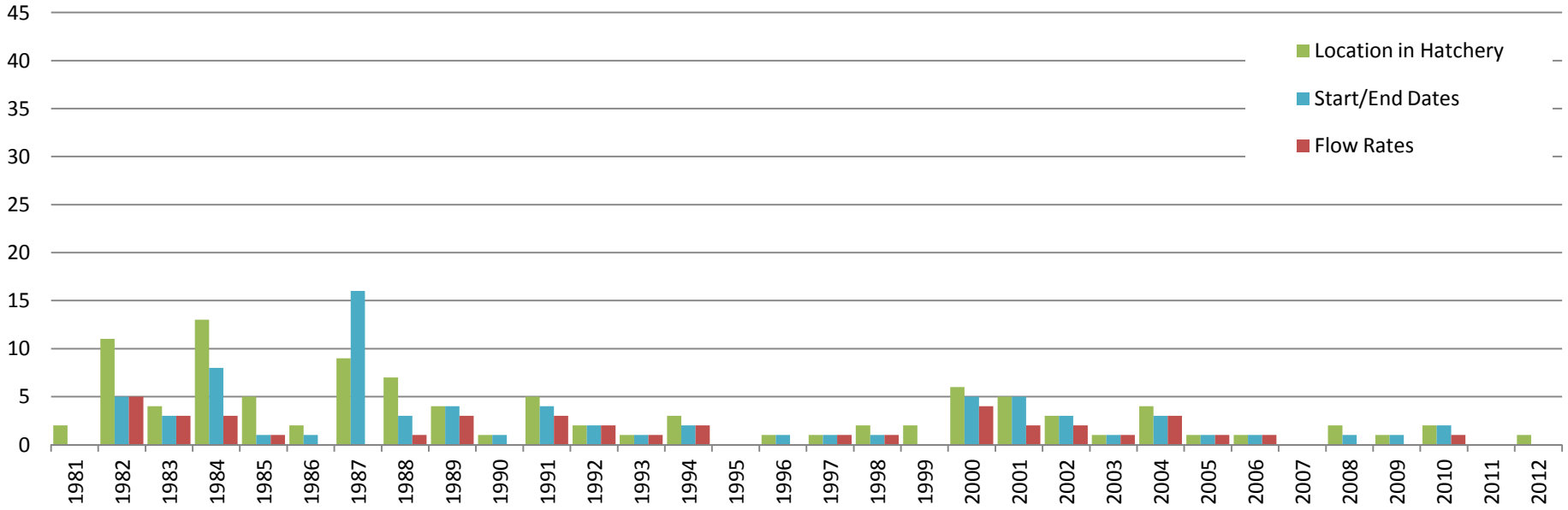
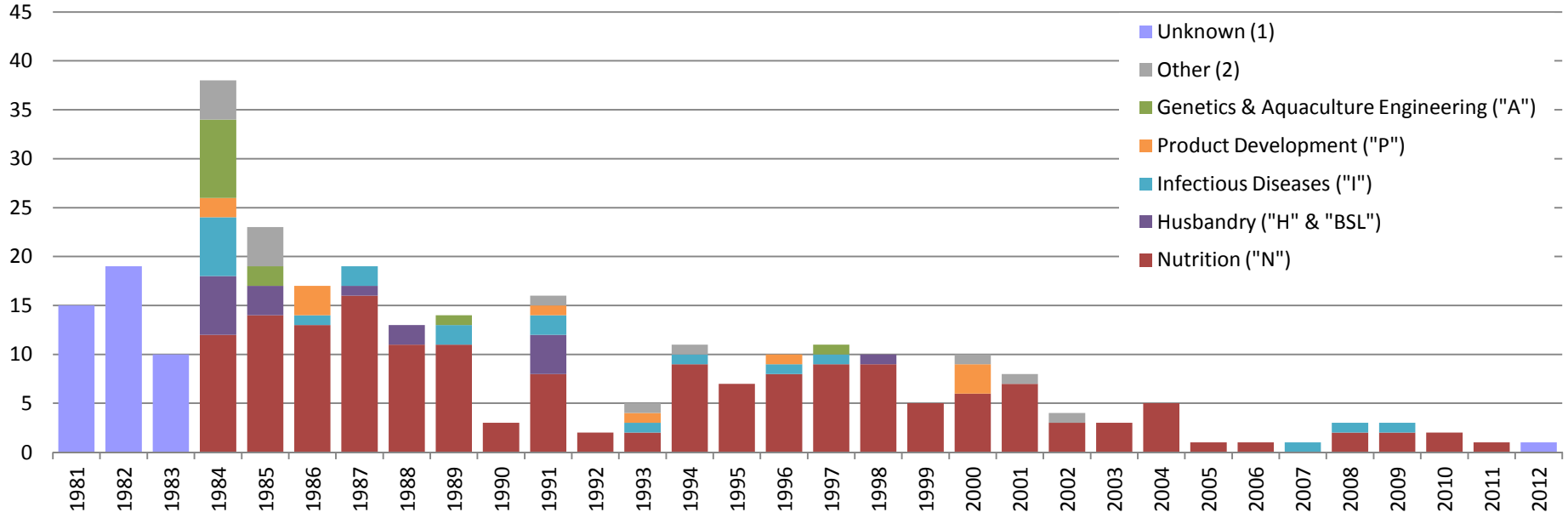


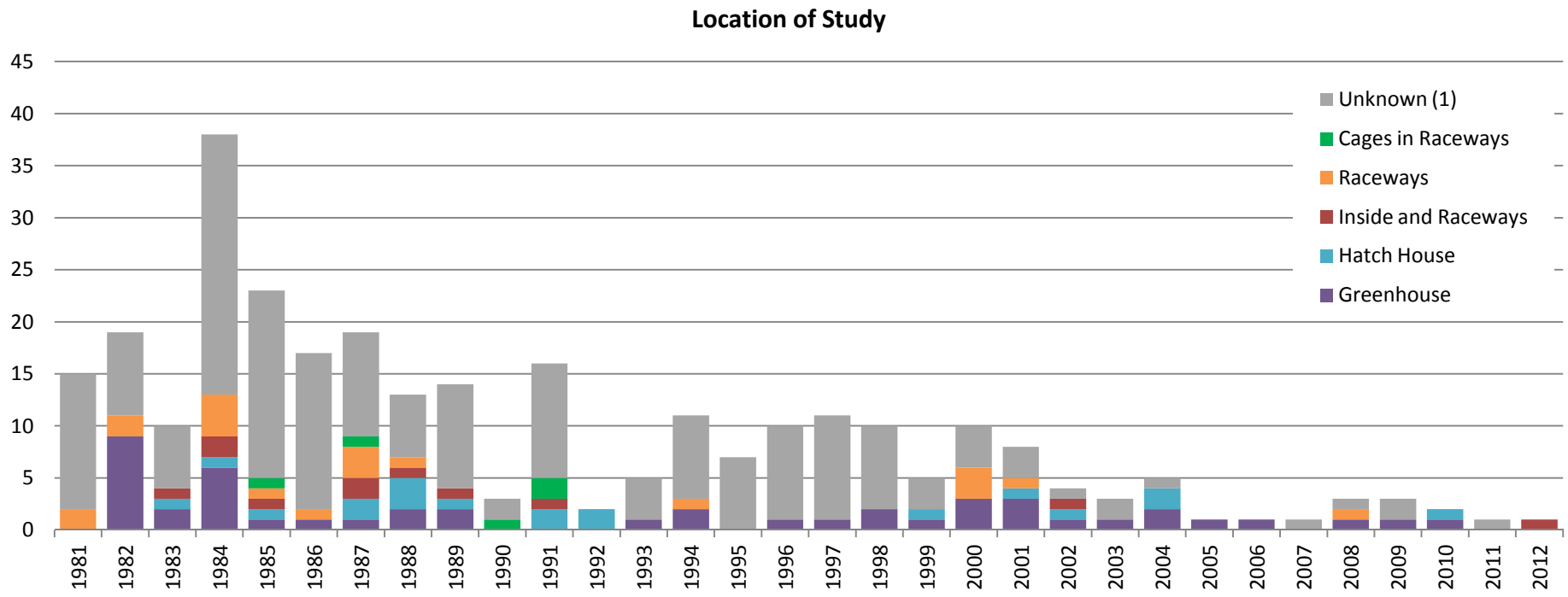
Figure 5-3c
Summary of Research Index Work Units
Cold Water or Unknown Species
Rangen Hatchery
1981 - 2012

Type of Study



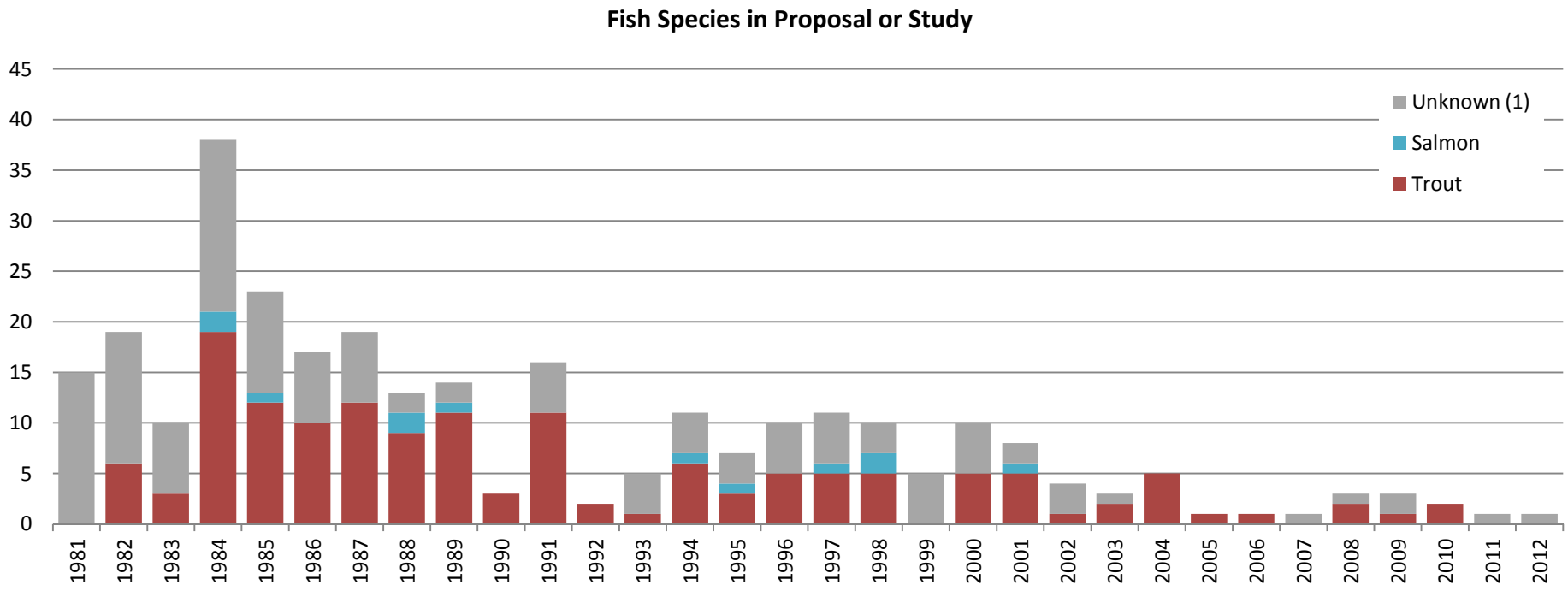
(1) Unknown include pre-1984 studies. Nature of pre-1984 studies cannot be determined based on numbering system in index.
(2) Other types include physiology/biology/analytical chemistry ("B"), toxicology ("T"), extension service ("E"), and other ("O").

Figure 5-3d
Summary of Research Index Work Units
Cold Water or Unknown Species
Rangen Hatchery
1981 - 2012



(1) Unknown means that there is not enough information to determine where the study took place (inside, outside, or off-site).

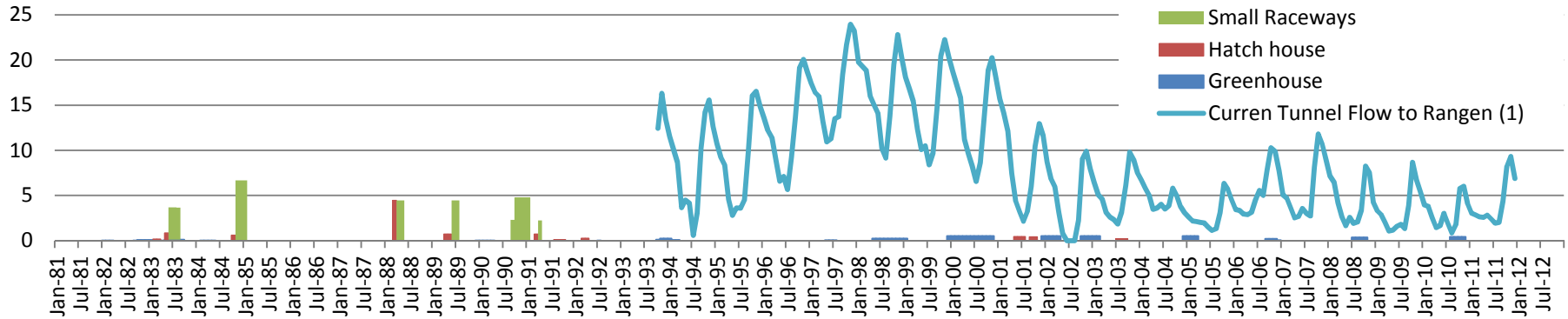
Figure 5-3e
Summary of Research Index Work Units
Cold Water or Unknown Species
Rangen Hatchery
1981 - 2012



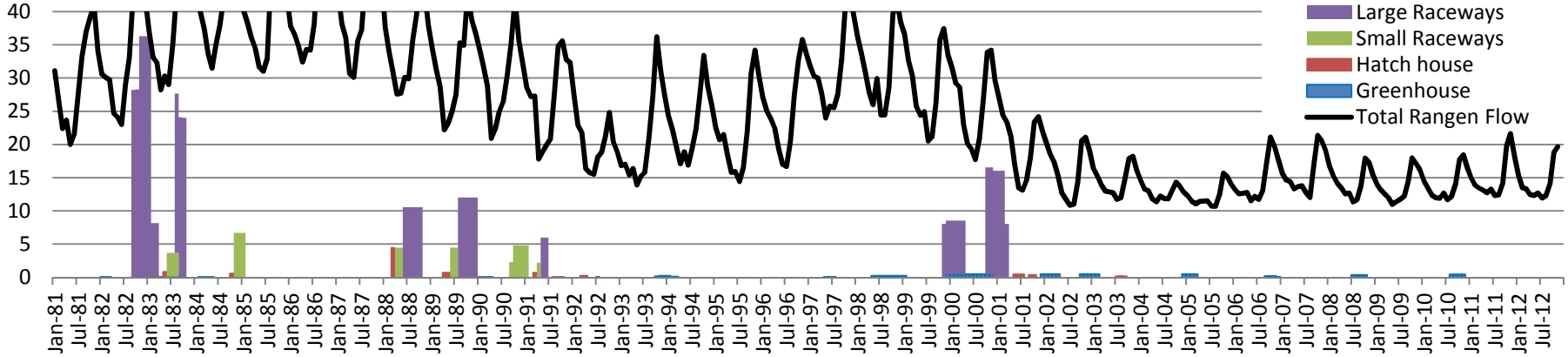
(1) Unknown means that there is not enough information to determine species type. Species could be warm water or cold water species.

Figure 5-4
Summary of Reported Flows in Research Documents
Rangen Hatchery
1981 - 2012
Values in CFS

Inside Facilities and Small Raceway Research Flows vs. Curren Tunnel Flow
(Stacked Bar Chart)



All Research Flows vs. Total Rangen Flow
(Stacked Bar Chart)



Note: This summary only shows the flows that were reported. There were other research experiments conducted during this period that did not have reported flow data.

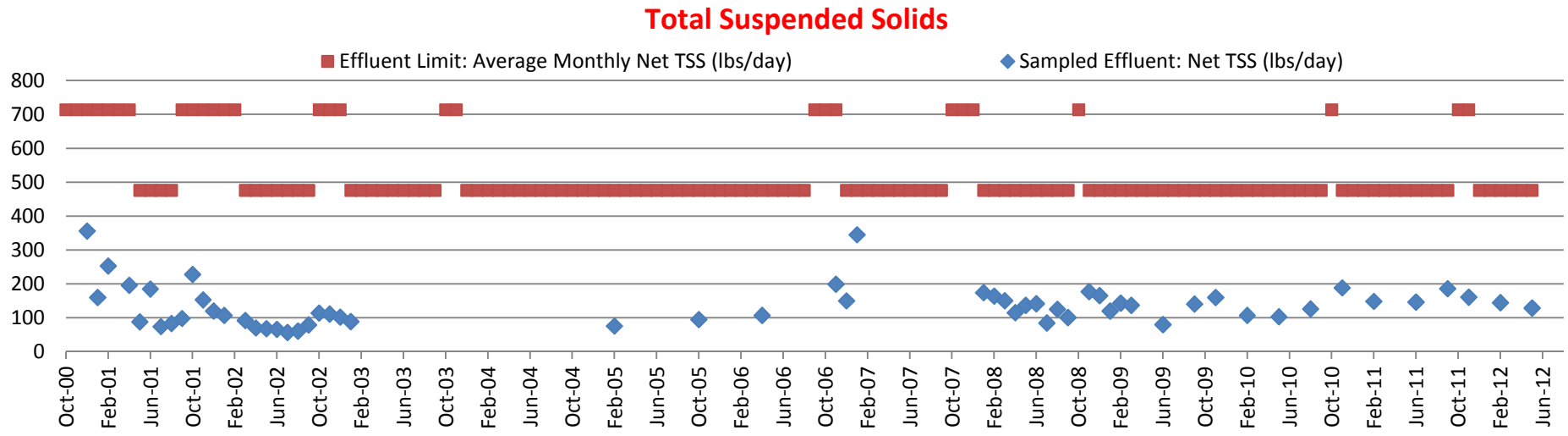
It was conservatively assumed that only first use water was used in the experiments and the flows in simultaneous experiments were additive.

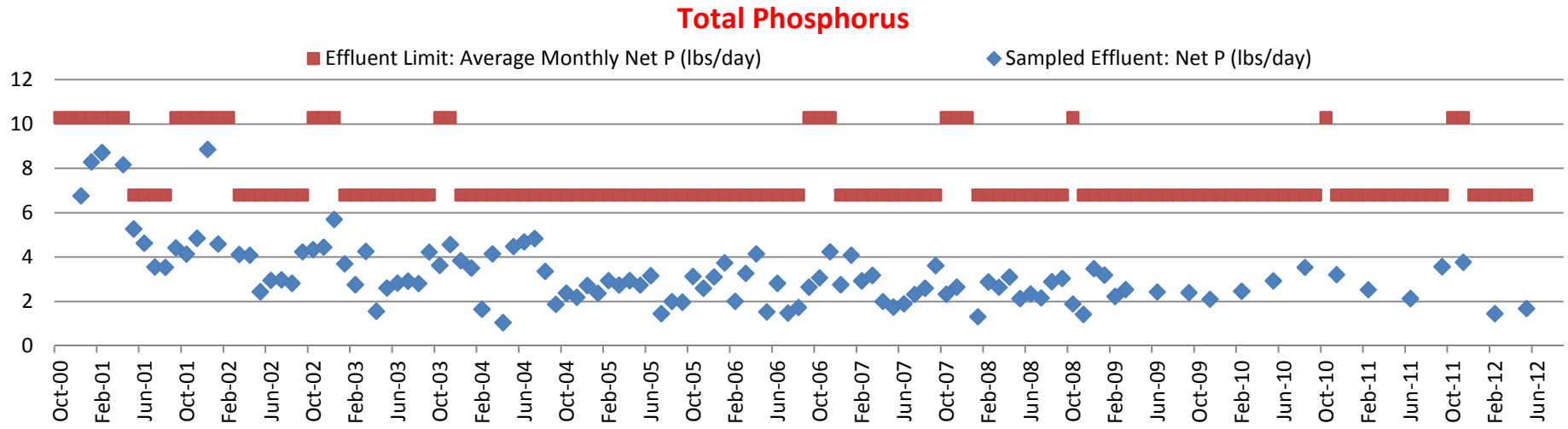
(1) Total Curren Tunnel flow to Rangen is total Curren Tunnel flow reported by the IDWR (1993 - 2011) minus diversions to irrigation from 1993 - 2002.

Total Rangen flow reported by Rangen (1981 - Feb 1995 and Jan 2012 - Nov 2012) and total Rangen flow reported by IDWR (Mar 1995 - 2011).

Figure 6-1

Discharge Monitoring Report
Rangen Hatchery (NPDES Permit #IDG130015)
Values in Pounds per Day





Notes: Net effluent values and Rangen flow data from monthly discharge monitoring reports (DMRs) online (http://www.epa.gov/enviro/facts/pcs-icis/index.html).
Effluent limits from NPDES Permit (General Permit for Aquaculture Facilities in Idaho; IDG-130000 Table 4).

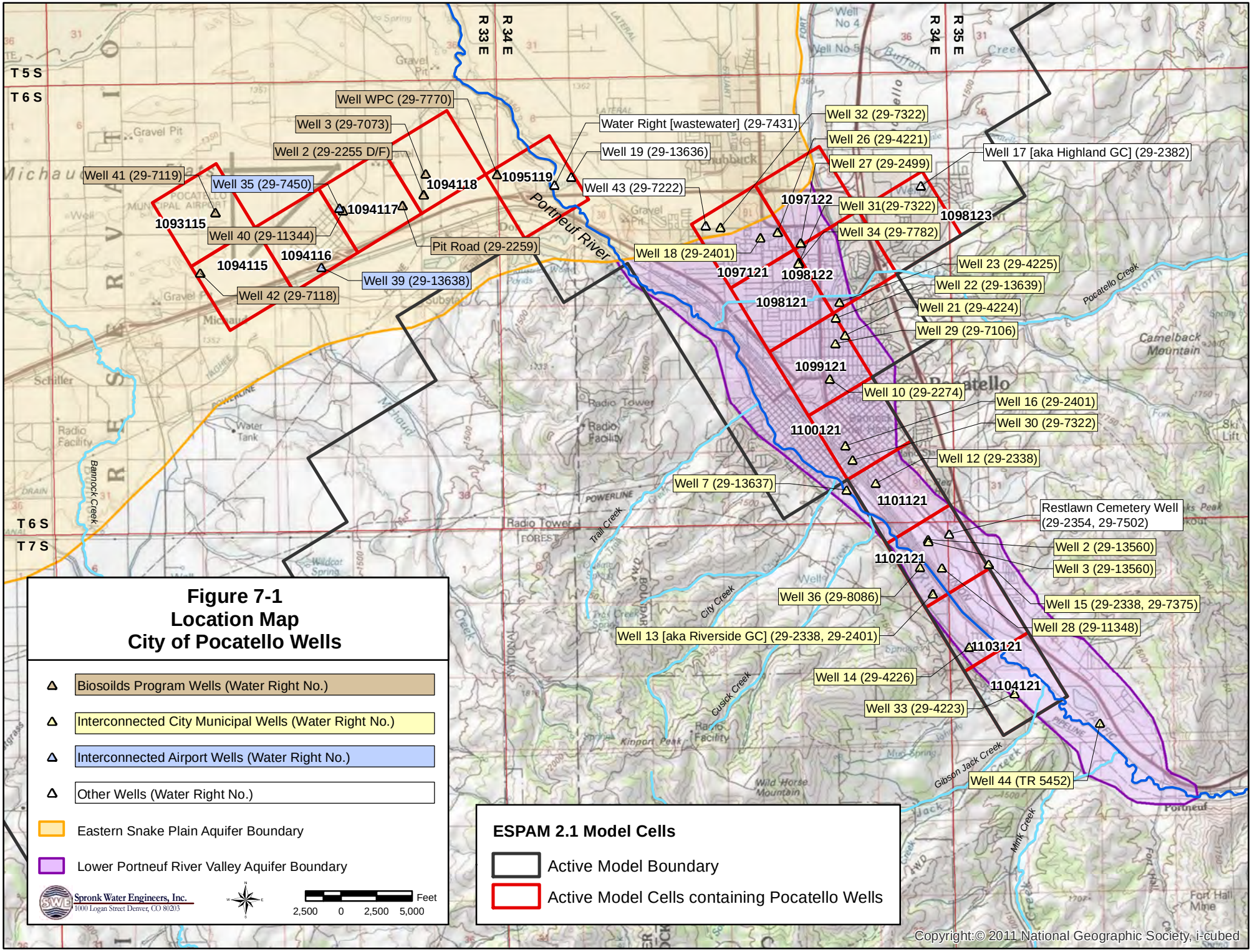


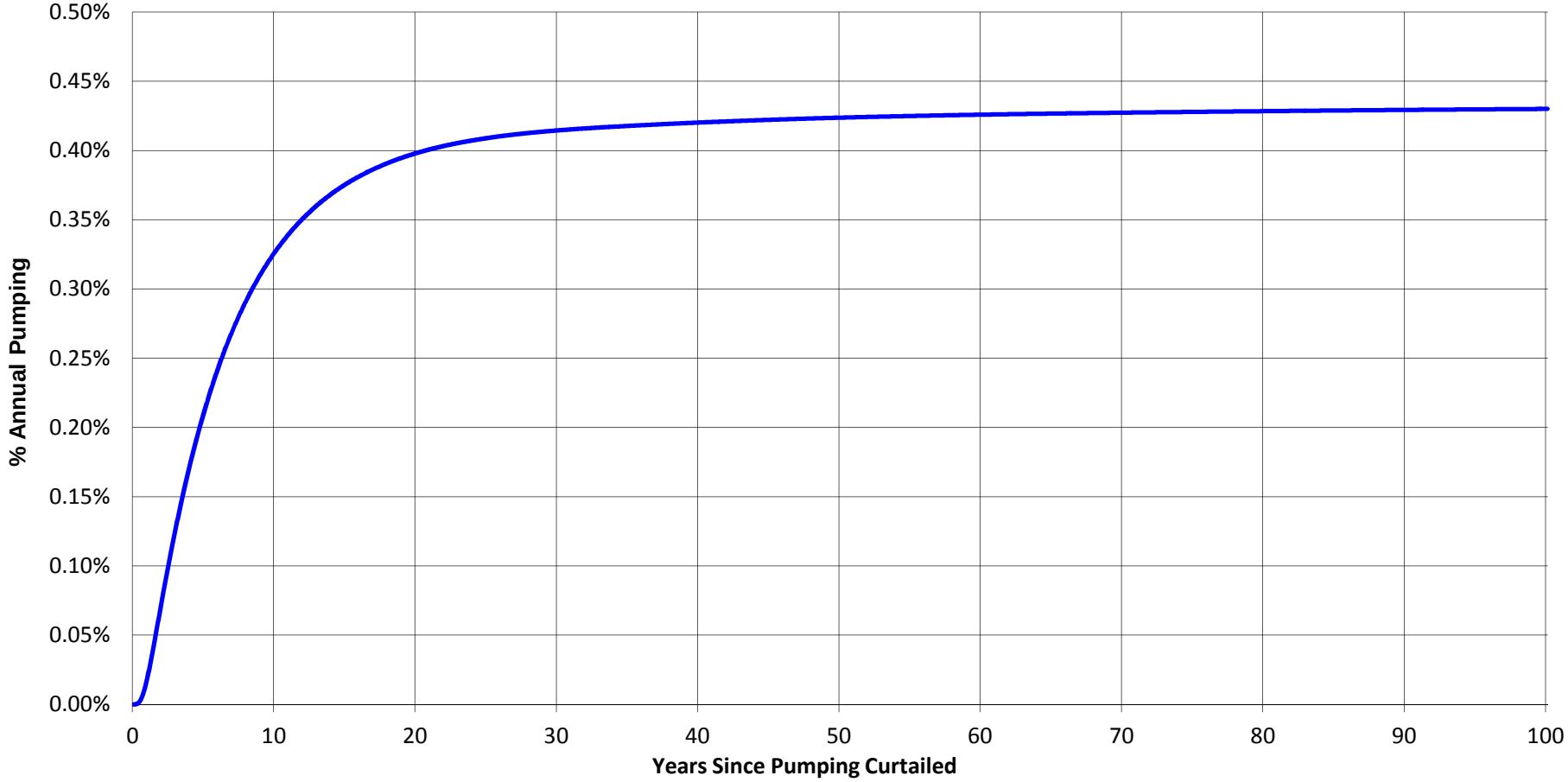
Figure 7-1
Location Map
City of Pocatello Wells
Biosoilds Program Wells (Water Right No.)
Interconnected City Municipal Wells (Water Right No.)
Interconnected Airport Wells (Water Right No.)
Other Wells (Water Right No.)
Eastern Snake Plain Aquifer Boundary
Lower Portneuf River Valley Aquifer Boundary
Spronk Water Engineers, Inc.
1000 Logan Street Denver, CO 80203
Feet
2,500 0 2,500 5,000
ESPAM 2.1 Model Cells
Active Model Boundary
Active Model Cells containing Pocatello Wells
Copyright:© 2011 National Geographic Society, i-cubed
T 5 S
T 6 S
T 7 S
R 33 E
R 34 E
R 35 E
Well WPC (29-7770)
Well 3 (29-7073)
Well 2 (29-2255 D/F)
Well 41 (29-7119)
Well 35 (29-7450)
Well 40 (29-11344)
Well 42 (29-7118)
Well 39 (29-13638)
Pit Road (29-2259)
1093115
1094115
1094116
1094117
1094118
1095119
Portneuf River
Water Right [wastewater] (29-7431)
Well 19 (29-13636)
Well 43 (29-7222)
Well 18 (29-2401)
Well 32 (29-7322)
Well 26 (29-4221)
Well 27 (29-2499)
Well 31(29-7322)
Well 34 (29-7782)
Well 17 [aka Highland GC] (29-2382)
1097122
1098123
1097121
1098122
1098121
Well 23 (29-4225)
Well 22 (29-13639)
Well 21 (29-4224)
Well 29 (29-7106)
1099121
Well 10 (29-2274)
Well 16 (29-2401)
Well 30 (29-7322)
1100121
Well 12 (29-2338)
Well 7 (29-13637)
1101121
Restlawn Cemetery Well
(29-2354, 29-7502)
Well 2 (29-13560)
Well 3 (29-13560)
1102121
Well 36 (29-8086)
Well 15 (29-2338, 29-7375)
Well 28 (29-11348)
Well 13 [aka Riverside GC] (29-2338, 29-2401)
1103121
Well 14 (29-4226)
1104121
Well 33 (29-4223)
Well 44 (TR 5452)
Pocatello Creek
Camelback Mountain
Bannock Creek
Trail Creek
City Creek
Cusick Creek
Gibson Jack Creek
Mink Creek
Kinport Peak
Wild Horse Mountain
Radio Tower
Radio Facility
Water Tank
Gravel Pit
Schiller
Michaud
Portneuf
Fort Hall Mine

Figure 8-1

Summary of Transient Response of Curren Spring to Pocatello ESPA Wells [1]

Eastern Snake Plain Aquifer Model Version 2.1

Annual Impact on Curren Spring as % Annual Pocatello Well Pumping



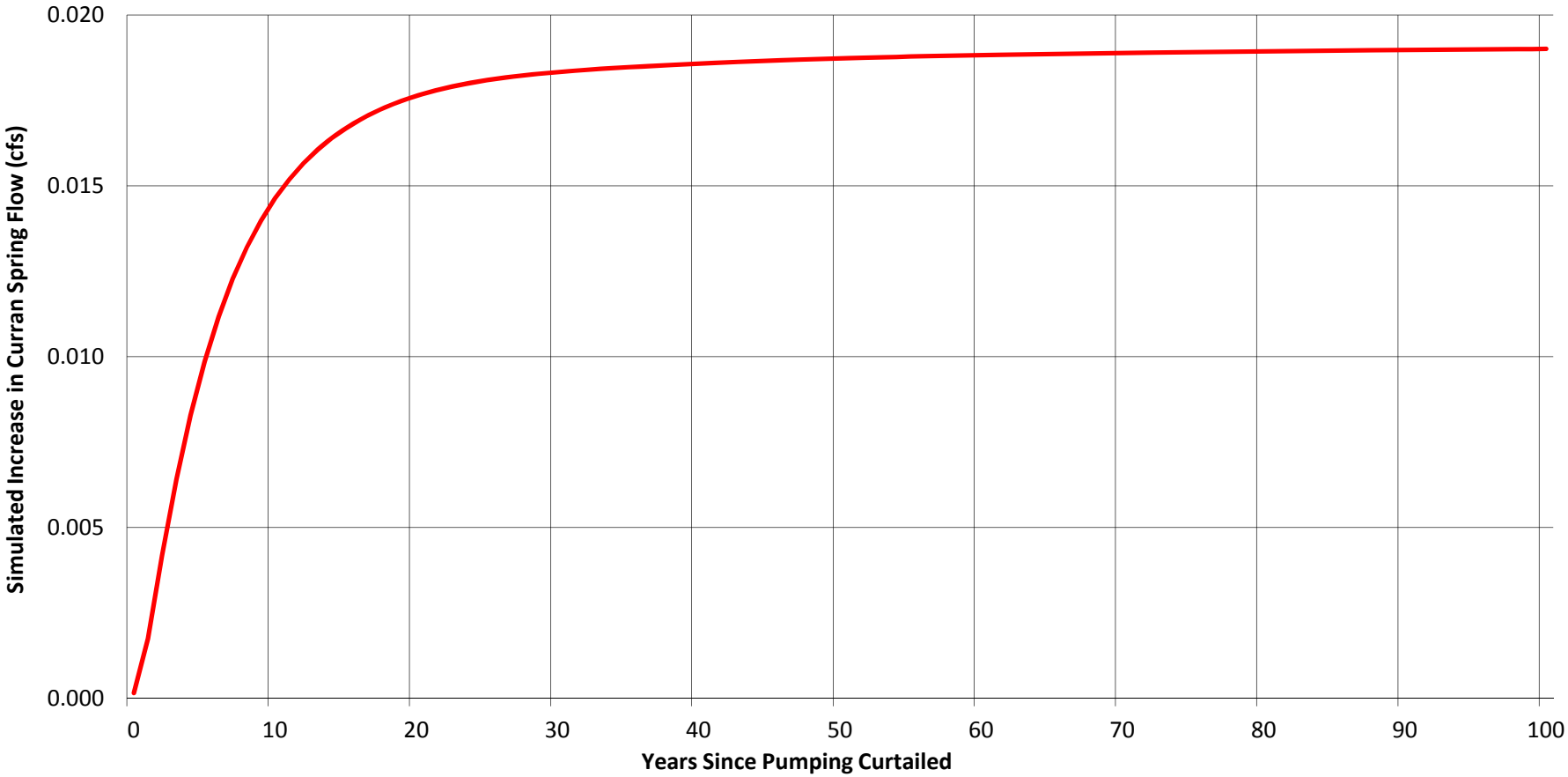
Note: (1) Wells within the ESPA Area of Common Ground Water Supply.

Figure 8-2

Summary of Transient Response of Curren Spring to Curtailment of Pocatello's ESPA Wells (1) with Priority Dates Junior to July 13, 1962

Eastern Snake Plain Aquifer Model Version 2.1

Increase in Curren Spring Flow (cfs)



Notes: (1) Wells within the ESPA Area of Common Ground Water Supply.
(2) The response from curtailment assumes that the impact of Pocatello's current level of pumping had reached steady state prior to curtailment. In actuality, Pocatello's current level of pumping has not reached steady-state and therefore, the transient response to curtailment would be less than the amounts shown.

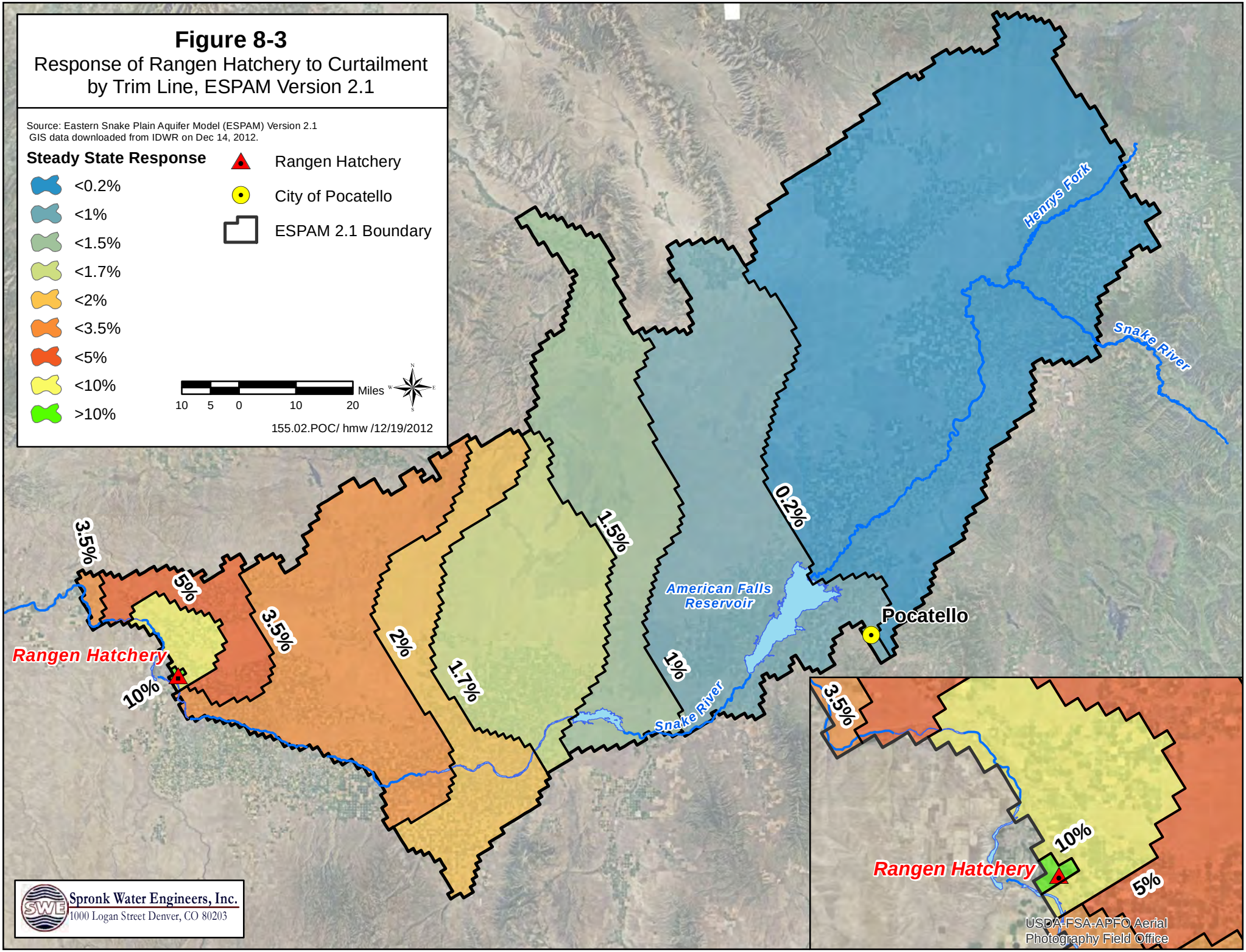
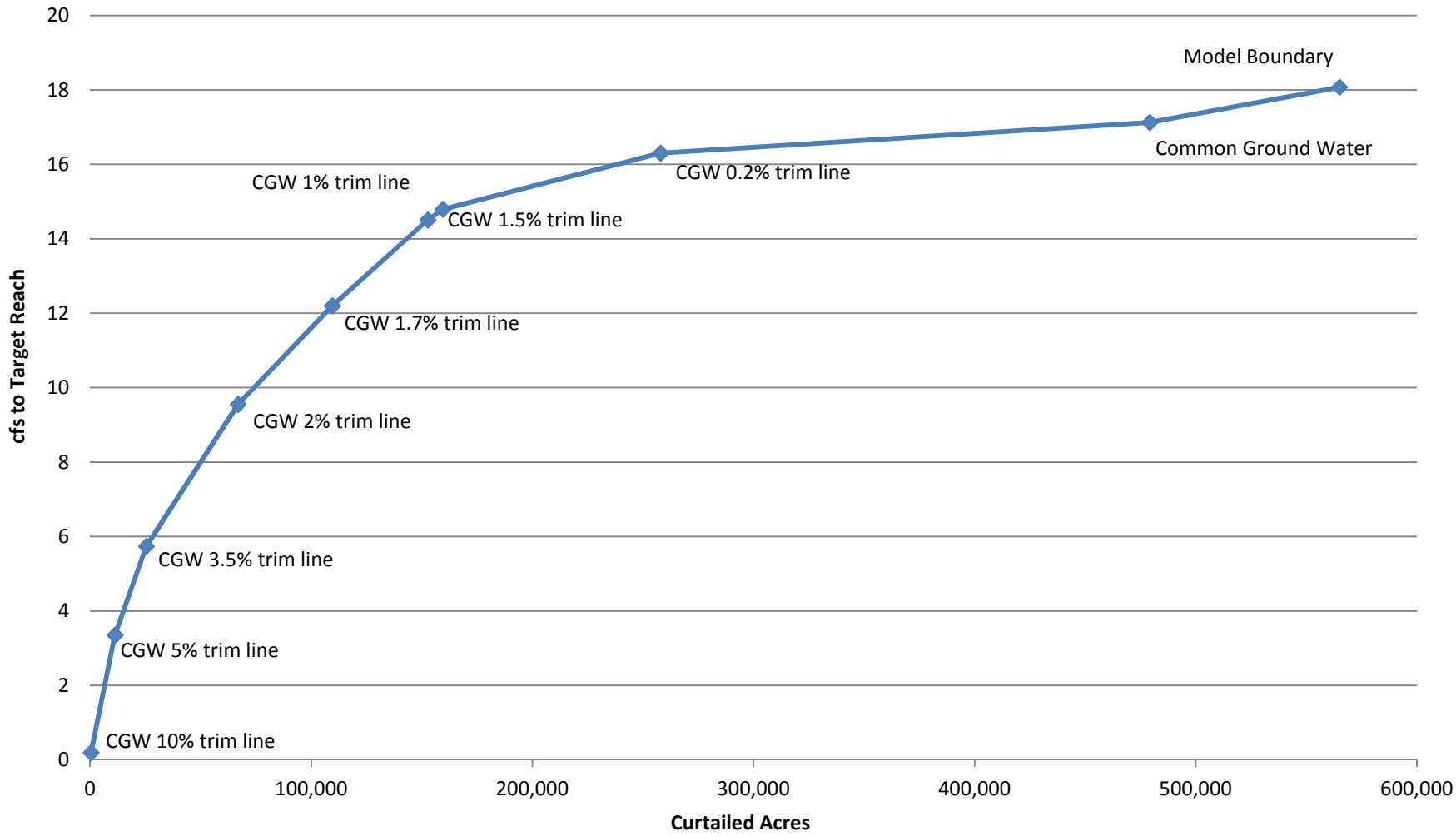


Figure 8-3
Response of Rangen Hatchery to Curtailment by Trim Line, ESPAM Version 2.1
Source: Eastern Snake Plain Aquifer Model (ESPAM) Version 2.1
GIS data downloaded from IDWR on Dec 14, 2012.
Steady State Response
<0.2%
<1%
<1.5%
<1.7%
<2%
<3.5%
<5%
<10%
>10%
Rangen Hatchery
City of Pocatello
ESPAM 2.1 Boundary
Miles
10 5 0 10 20
155.02.POC/ hmw /12/19/2012
Henrys Fork
Snake River
American Falls Reservoir
Pocatello
Rangen Hatchery
3.5%
5%
3.5%
2%
1.7%
1.5%
1%
0.2%
10%
Spronk Water Engineers, Inc.
1000 Logan Street Denver, CO 80203
USDA-FSA-APFO Aerial Photography Field Office

Figure 8-4

Response of Curran Spring to Curtailment within Various Trim Lines
Eastern Snake Plain Aquifer Model Version 2.0



Source: IDWR 7/17/2012 Rangen Scoping Calculations.

Tables

Table 2-1

Summary of Water Rights
Martin-Curren Tunnel [1]

Rangen Hatchery Water Rights

Water Right No.	36-00134B	36-00135A	36-15501	36-02551	36-07694
Source:	Martin-Curren Tunnel	Martin-Curren Tunnel	Martin-Curren Tunnel	Martin-Curren Tunnel	Martin-Curren Tunnel
Priority Date:	October 9, 1884	April 1, 1908	July 1, 1957	July 13, 1962	April 12, 1977
Beneficial Use:	Irrigation (0.09 cfs) and Domestic (0.07 cfs)	Irrigation (0.05 cfs) and Domestic (0.05 cfs)	Fish Propagation	Domestic (0.10 cfs) and Fish Propagation (48.54)	Fish Propagation
Diversion Rate (cfs):	0.09	0.05	1.46	48.54	26.00
Period of Use:	Jan. 1 - Dec. 31 (Domestic) Feb. 15 - Nov 30 (Irrigation)	Jan. 1 - Dec. 31 (Domestic) Feb. 15 - Nov 30 (Irrigation)	Jan. 1 - Dec. 31	Jan. 1 - Dec. 31	Jan. 1 - Dec. 31

Other Martin-Curren Tunnel Water Rights

Water Right No.	Owner	Diversion Rate (cfs)	Priority Date	Beneficial Use
36-134A	Margaret Candy	0.49	10/09/1884	Domestic and Irrigation
36-134D	Alvin Musser	1.58	10/09/1884	Irrigation and Stockwater
36-134E	Alvin Musser	0.82	10/09/1884	Irrigation and Stockwater
36-102	Alvin Musser	4.10	4/01/1892	Domestic, Irrigation and Stockwater
36-135B	Margaret Candy	0.51	04/01/1908	Irrigation
36-135D	Howard Morris	1.58	04/01/1908	Irrigation and Stockwater
36-135E	Howard Morris	0.82	04/01/1908	Irrigation and Stockwater
36-10141A	Howard Morris	0.82	12/01/1908	Irrigation and Stockwater
36-10141B	Howard Morris	0.43	12/01/1908	Irrigation and Stockwater
	Total	**11.15**		

Note: [1] Source of above water rights is the "Martin-Curren Tunnel" which is also known as "Curren Tunnel".

Table 2-2

Monthly Average Flow
Rangen Hatchery
1966 - November 2012

Values in CFS

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann Avg	Max	Min	Ann Total (af)
1966	52.2	48.2	44.9	38.5	34.2	45.4	51.3	53.2	62.4	69.9	58.4	49.2	50.7	69.9	34.2	36,680
1967	43.9	39.3	33.4	36.6	37.6	47.4	49.0	52.9	58.9	69.4	67.4	64.3	50.0	69.4	33.4	36,248
1968	52.8	45.8	41.2	36.0	36.8	45.0	50.5	58.9	68.2	68.2	65.5	63.1	52.7	68.2	36.0	38,253
1969	50.8	43.4	38.2	33.4	34.3	45.5	49.6	58.5	65.9	66.9	64.7	57.2	50.7	66.9	33.4	36,736
1970	49.8	42.7	42.0	34.7	34.5	42.5	50.3	59.4	66.0	69.3	63.3	60.0	51.2	69.3	34.5	37,121
1971	50.2	41.2	39.1	37.2	40.5	43.4	51.0	60.5	64.8	73.7	70.2	63.4	52.9	73.7	37.2	38,385
1972	55.1	48.1	43.0	40.6	45.9	58.1	61.0	67.3	73.9	76.1	68.2	66.7	58.7	76.1	40.6	42,619
1973	57.9	49.1	46.2	37.6	39.6	42.1	53.1	55.1	57.8	65.8	61.6	55.3	51.8	65.8	37.6	37,510
1974	44.1	46.5	41.1	35.8	34.4	43.4	47.1	55.0	59.2	69.6	62.8	57.9	49.7	69.6	34.4	36,027
1975	43.0	39.9	32.8	33.5	37.3	39.5	43.2	51.9	55.6	57.9	56.2	58.3	45.8	58.3	32.8	33,159
1976	50.0	44.3	41.1	33.1	35.9	38.0	39.5	47.2	56.4	61.6	58.7	53.0	46.6	61.6	33.1	33,815
1977	47.1	39.5	37.7	35.2	32.6	37.0	34.9	33.9	37.9	38.9	42.4	37.6	37.9	47.1	32.6	27,421
1978	33.3	29.4	30.1	28.3	27.6	27.3	27.9	33.6	49.9	42.8	40.3	36.5	33.9	49.9	27.3	24,562
1979	34.4	30.3	29.3	24.5	20.3	25.4	27.1	36.1	47.8	47.7	42.2	38.3	33.6	47.8	20.3	24,347
1980	34.6	31.7	27.5	25.8	22.7	30.9	32.7	34.5	37.8	47.4	41.1	34.9	33.5	47.4	22.7	24,299
1981	31.1	26.7	22.4	23.7	20.0	21.5	27.5	33.3	37.0	39.1	41.0	34.1	29.8	41.0	20.0	21,573
1982	30.6	30.1	29.7	24.7	24.1	23.0	29.0	33.1	42.8	46.7	47.6	41.9	33.6	47.6	23.0	24,345
1983	37.0	33.1	32.3	28.2	30.3	29.0	35.1	43.1	47.5	51.9	48.6	46.7	38.6	51.9	28.2	27,956
1984	41.0	40.1	37.4	33.6	31.5	35.0	37.9	42.1	42.9	47.6	45.8	44.1	39.9	47.6	31.5	28,982
1985	40.2	38.3	36.1	34.5	31.7	31.0	32.9	45.3	48.9	52.0	49.1	42.5	40.2	52.0	31.0	29,116
1986	37.8	36.5	34.8	32.4	34.3	34.2	38.2	49.6	52.6	55.6	51.5	48.9	42.2	55.6	32.4	30,582
1987	43.3	38.2	36.1	30.7	30.1	35.5	37.2	45.2	45.6	52.3	47.4	45.3	40.6	52.3	30.1	29,396
1988	37.6	33.9	30.8	27.6	27.7	30.1	29.9	35.8	39.7	47.5	43.1	37.9	35.1	47.5	27.6	25,510
1989	34.4	31.3	28.7	22.2	23.2	25.0	27.5	35.3	34.9	42.9	38.7	36.7	31.7	42.9	22.2	22,989
1990	34.3	31.7	28.8	20.9	22.3	24.9	26.5	30.4	35.2	41.9	35.6	32.1	30.4	41.9	20.9	21,999
1991	28.6	27.2	27.3	17.8	18.9	19.9	20.8	27.5	34.8	35.6	32.8	32.3	27.0	35.6	17.8	19,521
1992	27.4	22.9	21.8	16.4	15.7	15.5	18.1	18.8	21.3	24.8	20.4	18.9	20.2	27.4	15.5	14,643
1993	16.8	17.0	15.4	16.4	13.9	15.2	15.8	21.0	27.3	36.2	31.2	27.5	21.1	36.2	13.9	15,320
1994	24.3	22.3	19.8	17.1	18.9	16.9	19.4	22.3	27.6	33.4	28.8	25.8	23.1	33.4	16.9	16,696
1995	22.5	20.7	21.5	18.4	15.8	15.9	14.4	16.5	22.0	30.7	34.2	30.3	21.9	34.2	14.4	15,870
1996	27.1	25.0	23.8	22.4	19.3	17.0	16.7	20.5	27.4	32.7	35.8	33.7	25.1	35.8	16.7	18,235
1997	31.8	30.2	30.0	27.5	24.0	25.8	25.5	27.5	32.7	41.3	43.3	39.8	31.6	43.3	24.0	22,898
1998	36.2	33.7	30.9	27.8	26.0	29.9	24.5	24.4	28.6	39.6	41.8	38.4	31.8	41.8	24.4	23,023
1999	36.6	32.6	30.4	25.8	24.4	24.9	20.5	21.2	26.4	35.7	37.4	33.4	29.1	37.4	20.5	21,062
2000	31.6	29.2	28.6	23.0	20.1	19.3	17.7	20.9	26.8	33.9	34.2	29.6	26.2	34.2	17.7	19,047
2001	27.1	24.4	23.3	21.2	16.8	13.4	13.1	14.6	18.0	23.4	24.2	22.1	20.1	27.1	13.1	14,561
2002	20.3	18.6	17.3	15.3	12.7	11.7	10.8	11.0	14.3	20.6	21.1	19.1	16.1	21.1	10.8	11,626
2003	16.4	15.2	13.9	13.0	12.9	12.7	11.7	12.0	14.7	17.9	18.2	16.1	14.6	18.2	11.7	10,537
2004	14.6	13.3	13.0	11.8	11.4	12.2	11.9	11.8	13.1	14.3	13.7	12.8	12.8	14.6	11.4	9,304
2005	12.2	11.4	11.1	11.4	11.5	11.5	10.7	10.7	12.4	15.7	15.2	14.0	12.3	15.7	10.7	8,919
2006	13.2	12.6	12.7	12.8	11.5	12.2	11.7	13.0	17.2	21.1	19.6	17.6	14.6	21.1	11.5	10,571
2007	15.6	14.6	14.4	13.3	13.6	13.8	12.7	12.0	17.0	21.4	20.6	19.1	15.7	21.4	12.0	11,358
2008	16.7	15.2	14.1	13.5	12.6	12.7	11.3	11.7	13.7	17.9	17.3	15.4	14.3	17.9	11.3	10,413
2009	14.1	13.2	12.6	12.0	11.0	11.4	11.8	12.2	14.5	18.0	17.1	16.2	13.7	18.0	11.0	9,893
2010	14.5	13.4	12.4	12.0	11.9	12.7	11.7	12.1	14.1	17.7	18.4	16.5	13.9	18.4	11.7	10,098
2011	15.0	13.9	13.5	13.1	12.7	13.3	12.3	12.4	14.1	19.7	21.6	18.1	15.0	21.6	12.3	10,842
2012	15.3	13.5	13.3	12.4	12.3	12.7	11.9	12.3	14.1	18.8	19.7					

Source: Rangen monthly flow data reported by Rangen (1966-1970) and IDWR reported flow data (March 1995-2011).

Table 4-1

Summary of Spring and Fall Fish Sales to Idaho Power
Rangen Hatchery
Spring 2007 - Spring 2012

Idaho Power Hatchery Production Summaries						Fish Sales Summaries		
Cycle	Date	# Fish	Weight (lbs)	Mean Length (in.)	Mean Fish Per lb	Weight Sold to IPC (lbs)	Approx. No. of Fish (1)	Annual Approx. No. of Fish Sold
Spring 2007	2/28/2007	116,456	36,321	8.72	3.25	27,126	88,099	148,968
Fall 2007	10/19/2007	72,593	34,431	10.40	2.10	28,985	60,869	
Spring 2008	2/27/2008	95,356	44,511	10.03	2.15	38,915	83,505	153,531
Fall 2008	10/11/2008	72,162	25,849	9.93	2.81	24,930	70,026	
Spring 2009	3/18/2009	95,157	41,933	10.11	2.27	38,870	88,149	151,025
Fall 2009	10/21/2009	62,946	28,374	10.04	2.21	28,465	62,876	
Spring 2010	3/10/2010	100,671	42,072	10.26	2.19	37,680	82,595	145,373
Fall 2010	10/20/2010	98,446	45,107	10.47	2.19	28,640	62,779	
Spring 2011	3/9/2011	97,156	44,017	9.65	2.21	36,665	81,063	143,257
Fall 2011	10/19/2011	88,912	40,594	10.34	2.22	27,965	62,194	
Spring 2012	3/7/2012	72,508	32,360	9.95	2.25	ND	ND	
Average		88,397	37,779	9.99	2.35	31,824	74,215	148,431
Spring		96,217	40,202	9.79	2.39	35,851	84,682	
Fall		79,012	34,871	10.24	2.31	27,797	63,749	
Annual		179,971	76,642	19.99	4.72	63,648	148,431	

Sources: Number of fish, weight of fish, mean length of fish, and mean fish per pound contained in the Idaho Power Hatchery Production Summaries nearest to the time of the sale.
Weight of fish sold to Idaho Power Company from monthly Sales Summaries provided by Rangen.

Notes: (1) Weight sold to IPC (lbs) multiplied by mean fish per pound.
ND = No sales data for 2012.

Table 7-1

Summary of Water Rights
City of Pocatello

Water Right	Water Rights			Historical Well No. or Source	AKA/Name	Aquifer
	Priority Date (1)	Diversion Rate (cfs)	Cum Rate (cfs)			
SURFACE WATER RIGHTS						
29-271	2/26/1869	3.22	3.22	Mink Creek		N/A
29-4222	6/16/1898	5.00	8.22	Gibson Jack Creek		N/A
29-272	10/1/1901	0.56	8.78	Mink Creek		N/A
29-273	10/1/1917	1.218	10.00	Mink Creek		N/A
CITY INTERCONNECTED WELLS AND WATER RIGHTS						
29-13558	7/16/1924			Alameda 1		LPRVA
		1.34	1.34			
29-13559	12/31/1925	0.96	2.30	Alameda 2		LPRVA
29-13560	12/31/1926	9.13	11.43	1(5)		LPRVA
			11.43	2 (2.45 cfs)		LPRVA
			11.43	3 (4.23 cfs)		LPRVA
29-13561	8/31/1931	4.23	15.66	4		LPRVA
29-13562	12/31/1936	2.45	18.11	6		LPRVA
29-13637	12/31/1940	4.46	22.57	7		LPRVA
29-4221	6/1/1943	2.67	25.24	26	PIP	LPRVA
29-2274	6/15/1948	9.69	34.93	8		LPRVA
			34.93	9		LPRVA
			34.93	10		LPRVA
Tr 5452			34.93	44		LPRVA
29-11348	8/31/1951	4.90	39.83	28	20/Turner	LPRVA
29-13639	10/21/1952	3.68	43.51	22	Alameda 3	LPRVA
29-2338	9/1/1953	9.53	53.04	12		LPRVA
			53.04	13	17	LPRVA
			53.04	15		LPRVA
29-4224	9/15/1955	3.89	56.93	21	Alameda 4	LPRVA
29-4226	12/31/1955	0.22	57.15	14	Cree	LPRVA
29-4225	8/15/1956	4.44	61.59	23	Alameda 5	LPRVA
29-2401	10/16/1958	12.22	73.81	13	17	LPRVA
			73.81	16		LPRVA
			73.81	18		LPRVA
29-11339	12/31/1961	3.36	77.17	Alameda 6		LPRVA
			77.17	Alameda 7		LPRVA
29-4223	10/1/1962	0.21	77.38	33	Call	LPRVA
29-2499	12/10/1964	4.10	81.48	27		LPRVA
29-7106	11/6/1972	3.90	85.38	29		LPRVA
29-7322	4/25/1976	17.06	102.44	30 (5.58 cfs)		LPRVA
			102.44	31(8.03 cfs)		LPRVA
			102.44	32 (3.46 cfs)		ESPA
29-7375	2/24/1977	2.23	104.67	15		LPRVA
29-7782	1/18/1985	7.00	111.67	34		LPRVA
29-8086	3/26/1992	4.00	115.67	36		LPRVA

Table 7-1

Summary of Water Rights
City of Pocatello

Water Right	Water Rights			Historical Well No. or Source	AKA/Name	Aquifer
	Priority Date (1)	Diversion Rate (cfs)	Cum Rate (cfs)			
AIRPORT INTERCONNECTED WELLS AND WATER RIGHTS						
29-13638	12/31/1940	2.20		39	Phillips 1	ESPA
29-7450	6/13/1978	3.34		35	Phillips 3	ESPA
BIOSOLIDS PROGRAM WATER RIGHTS						
29-2255D	5/22/1939	0.482		2	A0007741	ESPA
29-11344	12/31/1942	1.92		40	Phillips 2 Fortress A0007550	ESPA
29-2259	6/20/1944	2.60		Pit Road	Swanson A0007773	ESPA
29-2255F	9/16/1949	0.40		2	A0007741	ESPA
29-7073	9/30/1971	1.49		3	A0008708	ESPA
29-7118	4/11/1973	4.01		42	Airport 1 South Smith A0007545	ESPA
29-7119	4/11/1973	6.00		41	Airport 2 North Smith 007547	ESPA
29-7770	5/21/1984	4.46		WPC	City Pivot A0007549	ESPA
OTHER WATER RIGHTS						
29-2354	8/27/1954	0.28		Restlawn Cemetery		LPRVA
29-2382	12/21/1956	3.82		17	Highland GC	LPRVA
29-13636	10/16/1958	0.80		19		ESPA
29-7502	7/6/1979	0.10		Restlawn Cemetery		LPRVA
29-7222	8/22/1974	1.00		43	Ward Park	ESPA
29-7431	12/29/1977	9.28		Wastewater		N/A
STORAGE RIGHTS						
01-2068	7/28/1939	50,000 AF		Palisades Reservoir		

TOTALS FOR GROUND WATER RIGHTS	**Diversion Rate (cfs)**
Total	148.57
Total in ESPA Aquifer	28.70
Total in LPRVA Aquifer	119.87
Total junior to July 13, 1962	58.90
Total junior to July 13, 1962 in ESPA Aquifer	20.30
Total junior to July 13, 1962 in LRPVA Aquifer	38.6

Table 7-2

Annual Pumping
City of Pocatello
2007 - 2011
Values in Acre-Feet

City Wells

		Total Junior to July 13, 1962	
Year	Total	Total	ESPA
2007	15,110	6,086	256
2008	15,060	6,012	757
2009	12,413	4,798	523
2010	13,577	5,240	622
2011	13,063	4,811	369
Avg	13,845	5,389	505

Airport Wells

		Total Junior to July 13, 1962	
Year	Total	Total	ESPA
2007	2,972	2,096	2,096
2008	3,968	2,864	2,864
2009	2,466	1,832	1,832
2010	4,447	3,414	3,414
2011	4,088	3,239	3,239
Avg	3,588	2,689	2,689

Total

		Total Junior to July 13, 1962	
Year	Total	Total	ESPA
2007	18,082	8,182	2,351
2008	19,028	8,876	3,621
2009	14,879	6,631	2,355
2010	18,024	8,654	4,036
2011	17,151	8,049	3,608
Avg	17,433	8,078	3,194

Note: All wells within the ESPAM 2.1 active model boundary (excludes Well 44).

Table 8-1

Summary of Steady-State Response of Curren Spring to Pocatello ESPA Well Pumping

Model Cell ID	% Impact to Rangen
Airport Wells	
SP093115	0.464%
SP094115	0.466%
SP094116	0.458%
SP094117	0.446%
SP094118	0.431%
SP095119	0.412%
City Wells	
SP097121	0.379%
Average	0.437%

Source: http://www.idwr.idaho.gov/Browse/WaterInfo/ESPAM/model_files/Version_2.1_Current/. Downloaded on November 12, 2012.

APPENDIX A
APPENDIX B
APPENDIX C
APPENDIX D
APPENDIX E
APPENDIX F
APPENDIX G
APPENDIX H

pages of confidential information

removed due to

Protective Order