

# **Appendix J**

## **Gas Bubble Trauma Monitoring And Data Reporting For 2014**

**Fish Passage Center  
Portland, Oregon**

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## FISH PASSAGE CENTER

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November 14, 2014

Mr. Bill Proctor  
U.S. Army Corps of Engineers  
Northwestern Division  
PO Box 2870  
Portland, OR 97208-2870

Dear Mr. Proctor,

As per our agreement, we are providing both you and Mr. Paul Wagner of NOAA Fisheries with a copy of our "Gas Bubble Trauma Monitoring and Data Reporting for 2014." This report summarizes data collected during the 2014 juvenile salmonid migration.

Please feel free to contact us if you require any additional information.

Sincerely,

Michele DeHart  
Fish Passage Center Manager

CC: Scott English, USACE  
Paul Wagner, NOAA Fisheries

# Gas Bubble Trauma Monitoring and Data Reporting for 2014

## Overview

The goal of the juvenile salmonid gas bubble trauma (GBT) monitoring program is to determine the relative extent that migrating juvenile salmonids have been exposed to harmful levels of total dissolved gas (TDG). The monitoring assesses the relative severity of exposure, and provides an “early warning” of potentially harmful levels of TDG. The determination is based upon the prevalence and severity of GBT induced bubbles on the fish. The data are reported to the fisheries management entities, the water quality agencies of Washington and Oregon, and are available to other interested parties through Fish Passage Center weekly reports and daily postings to the FPC web site during the season (<http://www.fpc.org/smolt/gasbubbletrauma.html>). The fisheries management entities review the data in-season to determine if modifications to spill are necessary based on the GBT monitoring.

The monitoring of juvenile salmonids in 2014 for GBT was conducted at Upper Columbia, Middle Columbia and Snake river sites. Fish were collected and examined for signs of GBT at Rock Island Dam (RIS) on the Upper Columbia River, and at Bonneville Dam (BON) and McNary Dam (MCN) on the Middle Columbia River. The Snake River monitoring sites were Lower Granite (LGR), Little Goose (LGS), and Lower Monumental (LMN) dams. The goal of the sampling program was to sample 100 salmonids of the most prevalent species (limited to chinook and steelhead) during each day of sampling at each site, with the proportion of each species sampled dependent upon their prevalence at the time of sampling. A daily sample size of 100 fish is targeted to assure that the sample observation accurately represents the population incidence of gas bubble trauma. Yearling Chinook and steelhead were sampled through the spring at all the sampling sites. Once subyearling Chinook predominated in the smolt collections, the program shifted from sampling yearling Chinook and steelhead to sampling subyearling Chinook, which continued through the end of August unless an adequate sample could not be collected. In this case, sampling for GBT may have ended prior to the end of August.

The GBT monitoring program is designed to minimize the holding time prior to examining fish, since fish held at shallow depths for long periods of time may exhibit bubbles even at low TDG levels, and would not be representative of the migrating population (Weitkamp, 2000). Consequently, fish to be examined were netted off the separator (at LGR, LGS, LMN, and MCN) or removed from the bypass or other sampling apparatus (at RIS and BON). However, at Rock Island Dam, fish are held up to 24 hours in a shallow tank prior to examination. While not desirable there are no alternatives to this sampling procedure, and data from Rock Island Dam should be evaluated within the context of the sampling procedure. Since the values are likely biased high the results are evaluated independently of the other monitoring locations.

Once collected, fish are then anesthetized and examined using a specially designed tray that allows fish to be continually anesthetized during the GBT examination. Additional information was recorded for each fish, including species, age, fork length, fin clips, and tags. Sampling occurred two days per week at the Columbia River sites and one day a week at each of the Snake River sites throughout the spring and summer spill programs. Examinations of fish were done using variable magnification (6x to 40x) dissecting scopes. The eyes and unpaired fins were examined for the presence of bubbles.

The bubbles present were quantified using a ranking system based on the percent area of the fins or eyes covered with bubbles (USGS 1997) (Table J-1).

**Table J-1**  
**Ranking criteria used in monitoring for signs of gas bubble trauma.**

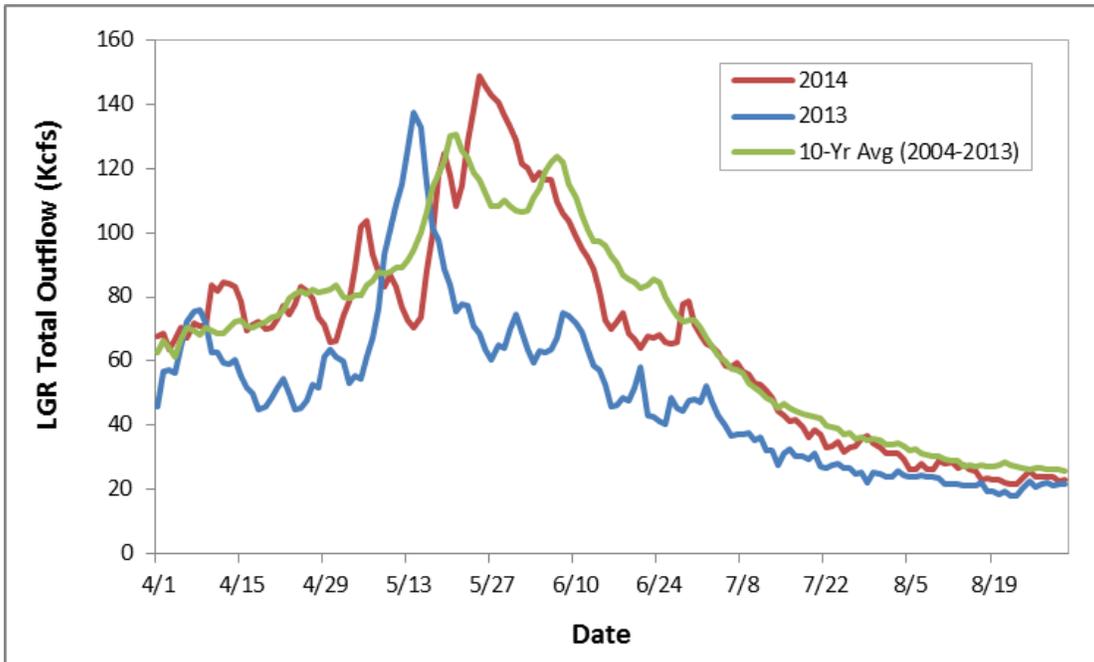
<b>Rank</b>	<b>Sign</b>
0	no bubbles present
1	up to 5% of a fin area or eye covered with bubbles
2	6% to 25% of a fin area or eye covered with bubbles
3	26% to 50% of a fin area or eye covered with bubbles
4	> than 50% of a fin area or eye covered with bubbles

These examination procedures were similar to those used in past years of the program (see the GBT Monitoring Protocol <ftp://ftp.fpc.org/GBT/> for more details of exam procedures).

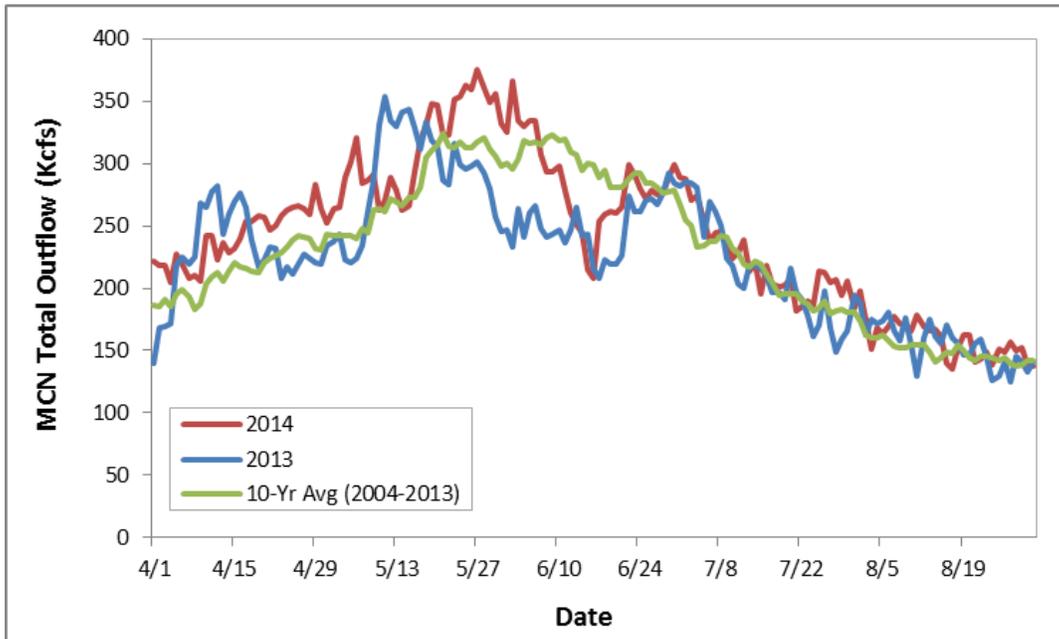
## **2014 Water Conditions**

The runoff (January–July) volume for the 2014 water year was slightly above average in the Lower Columbia River and near average in the Lower Snake River. Runoff (January–July) was 107% of average (1981–2010) at The Dalles Dam and 98% of average at Lower Granite Dam. In the Snake River, this resulted in average flows throughout the spring and summer seasons, with peak flows in mid- to late May through early June (Figure J-1). In the Lower Columbia, the 2014 runoff resulted in near average flows in both the spring and summer periods (Figure J-2). The peak flow conditions in the Snake River and Lower Columbia rivers resulted in uncontrolled spill at many of the Snake and Lower Columbia River sites. At times TDG levels were above the TDG waiver levels during these periods.

**Figure J-1.**  
**Average daily flows at Lower Granite Dam**  
**2014, 2013, and the 10-year average**



**Figure J-2**  
**Average daily flows at McNary Dam**  
**2014, 2013 and the 10-year average**



## Results

In all, 14,259 juvenile salmonids were examined for GBT between April and August of 2014 (Table J-2). The fish were collected and examined as part of the Smolt Monitoring Program.

**Table J-2.**

**Number of juvenile salmonids examined for signs of GBT at dams on the Lower Snake River and on the Columbia River from April to August 2014 as part of the GBT Monitoring Program.**

Species	BON	MCN	LMN	LGS	LGR	RIS	Total
Chinook Subyearlings	1,861	1,734	615	688	0	1,879	6,777
Chinook Yearlings	1,316	1,229	638	584	392	592	4,751
Steelhead	152	289	638	477	469	706	2,731
Total	3,329	3,252	1,891	1,749	861	3,177	14,259

Fin signs were found in 36 or 0.25% of the total fish sampled at all sites (Table J-3). Of the 36 fish that had signs of fin GBT in 2014, 34 were rank 1, where less than 5% of a fin area was covered with bubbles. The remaining two were rank 2, where 6% to 25% of a fin area was covered with bubbles. Both of the fish with rank 2 fin GBT were encountered at Rock Island Dam. No fish that were examined for GBT in 2014 exhibited fin GBT on rank 3 or 4. A more detailed breakdown of GBT exams and signs for 2014 can be found at the end of this appendix (Tables J-5 through J-10).

**Table J-3**

**Number of juvenile salmonids found with fin GBT at dams on the Lower Snake River and on the Columbia River from April to August 2014 as part of the GBT Monitoring Program.**

Sum of Fin GBT Species	Site						Grand Total
	BON	MCN	LMN	LGS	LGR	RIS	
Chinook Subyearlings	5	0	2	1	0	5	13
Chinook Yearlings	3	3	3	0	0	9	18
Steelhead	0	0	2	0	0	3	5
Total	8	3	7	1	0	17	36

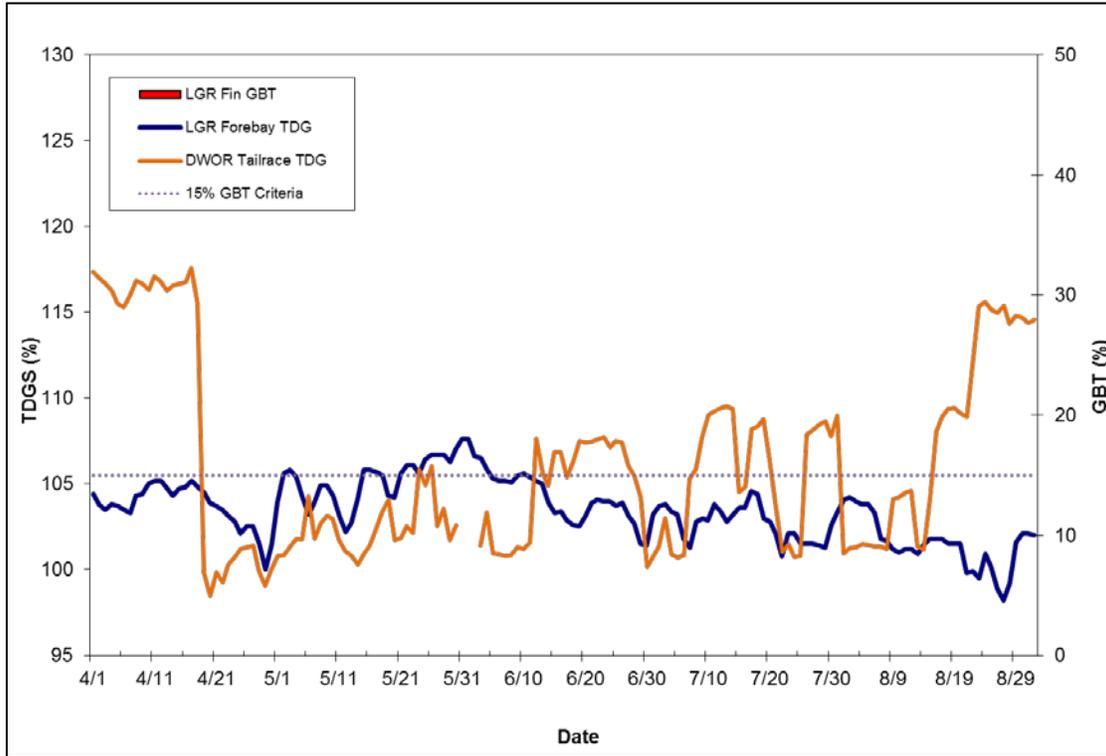
The action criteria for GBT is established as 15% of fish showing any signs of fin GBT, or 5% of the fish sampled showing signs of fin GBT greater than or equal to rank 3. Neither of these two action criteria was approached in 2014.

### ***Lower Granite Dam (LGR)***

GBT sampling at LGR occurred from April 10<sup>th</sup> to June 5<sup>th</sup>. LGR does not sample for GBT when subyearling Chinook predominate the sample. TDG in the Dworshak Dam

tailwater never exceeded 120% in 2014 and TDG in the LGR forebay never exceeded 115%. No signs of fin GBT were observed at LGR in 2014 (Table J-3).

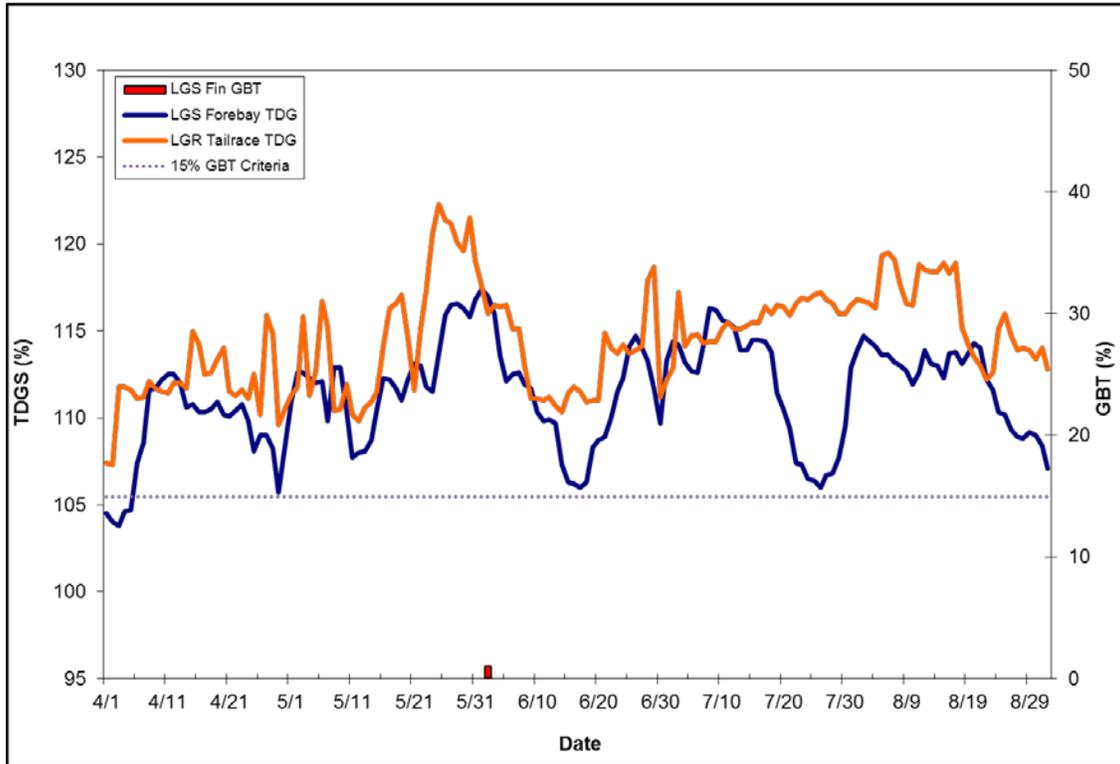
**Figure J-3**  
**Percent GBT observed in the sample at Lower Granite Dam**



***Little Goose Dam (LGS)***

GBT sampling at LGS occurred from April 6<sup>th</sup> to July 28<sup>th</sup>. Sampling was terminated after July 28<sup>th</sup> at LGS because of the inability to collect an adequate number of fish for GBT exams. Both the prevalence and severity of GBT signs at LGS were low in 2014. Signs of fin GBT were detected on one occasion in 2014 (June 2<sup>nd</sup>), with a GBT rate of 1% on that date (Figure J-4, Table J-6). This one incidence of GBT at LGS in 2014 was at the rank 1 level. TDG levels in the LGR tailwater exceeded the 120% criteria for about a week at the end of May (Figure J-4). In addition, TDG in the LGS forebay exceeded 115% for about a week in late May through early June and again in early to mid-July (Figure J-4).

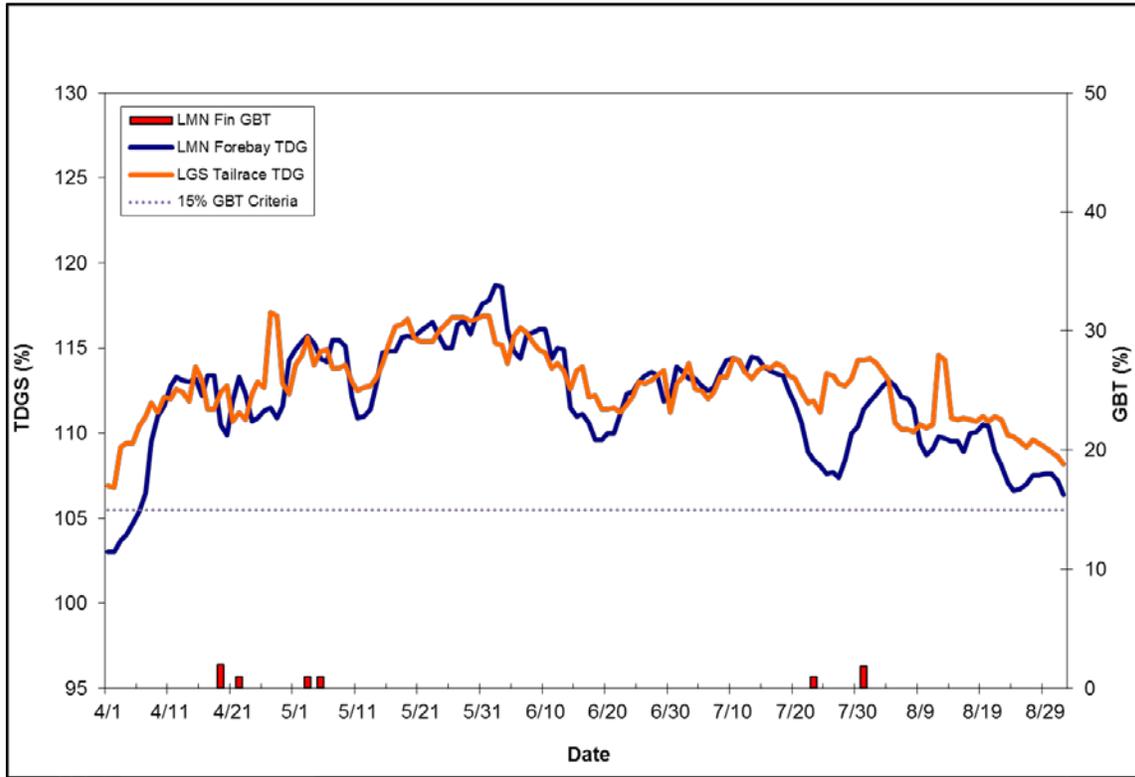
**Figure J-4**  
**Percent GBT observed in the sample at Little Goose Dam**



***Lower Monumental Dam (LMN)***

GBT sampling at LMN occurred from April 7<sup>th</sup> to July 31<sup>st</sup>. Sampling for GBT was terminated after July 31<sup>st</sup> because of the inability to collect the sample necessary to conduct GBT exams. There were six different occasions of fin GBT at Lower Monumental Dam in 2014 (Table J-7). All signs of fin GBT at Lower Monumental Dam were rank 1. Of the six occasions, the maximum rate of GBT was 2.0%, which occurred on April 19<sup>th</sup> (Figure J-5, Table J-7). Total dissolved gas in the LGS tailwater never exceeded 120% in 2014 (Figure J-5). TDG in the Lower Monumental forebay exceeded 115% several times throughout 2014. The most prolonged period where TDG in the Lower Monumental forebay exceeded 115% was from mid-May through early June. However, during this time, the maximum 12-hour average TDG in the Lower Monumental forebay was 116.9% (Figure J-5).

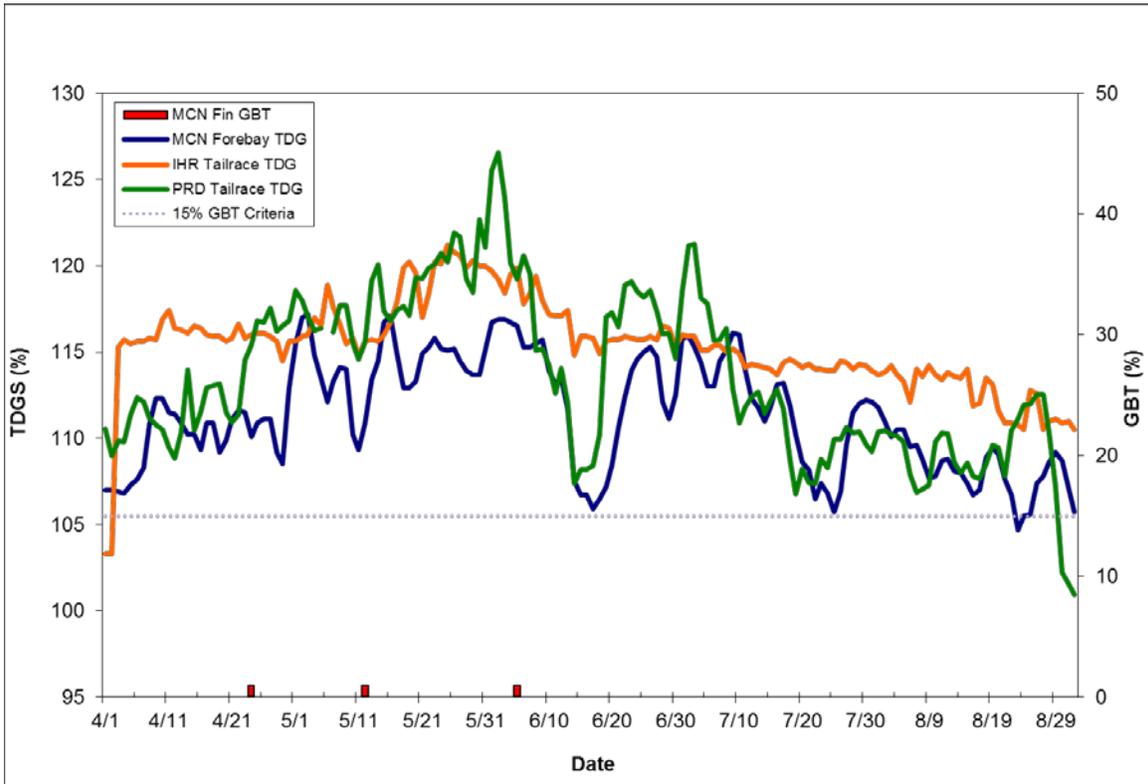
**Figure J-5**  
**Percent GBT observed in the sample at Lower Monumental Dam.**



***McNary Dam (MCN)***

GBT sampling at MCN occurred from April 14<sup>th</sup> to August 4<sup>th</sup>. Per the 2014 Fish Passage Plan, monitoring for GBT at McNary was suspended when the high temperature protocol was initiated in early August. This is the first year where this high temperature protocol has been in effect at McNary Dam. The TDG levels in the tailwater at Priest Rapids Dam (PRD) exceeded 120% for a period in late May through early June and again in early July (Figure J-6). At the Ice Harbor tailwater, TDG exceeded 120% for about a week at the end of May (Figure J-6). Total dissolved gas at the MCN forebay exceeded 115% for short periods in early May, mid-May, early June, late June, and early July (Figure J-6). There were only three incidences of GBT at McNary Dam in 2014 (Figure J-6, Table J-8). All three of these incidences had a rate of 1.0% (Figure J-6, Table J-8). All of the fish that showed signs of GBT at MCN in 2014 had rank 1 signs.

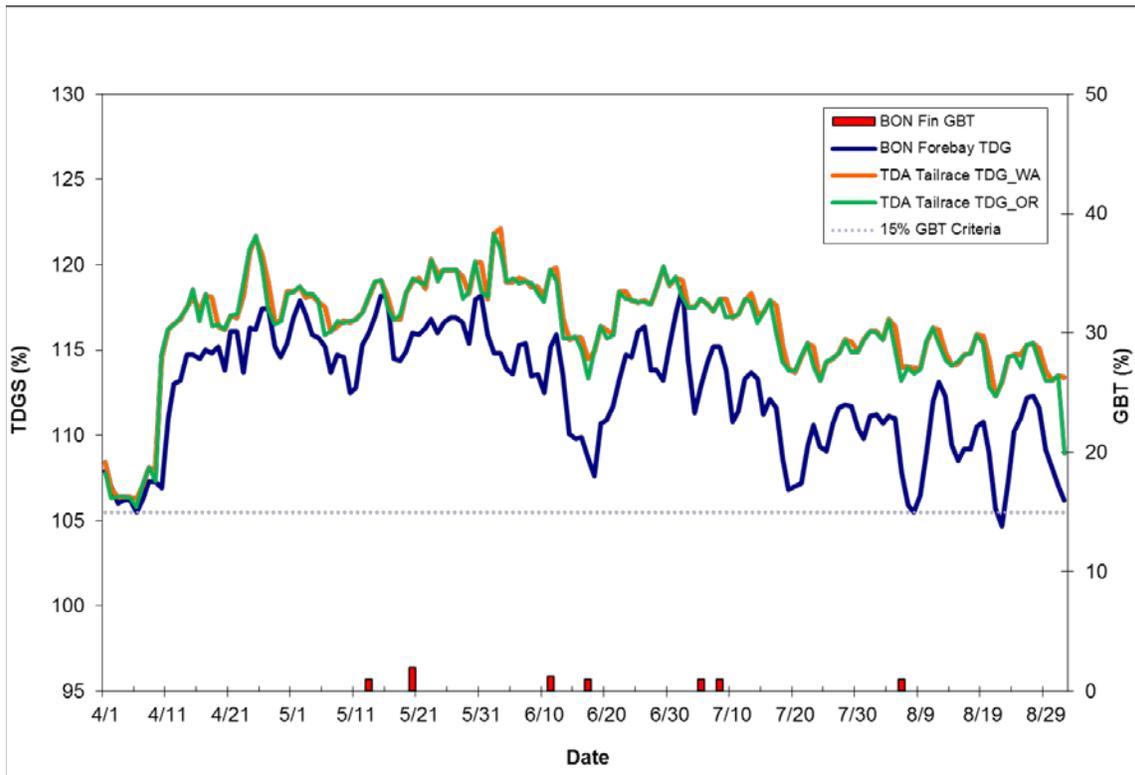
**Figure J-6**  
**Percent GBT observed in the sample at McNary Dam.**



***Bonneville Dam (BON)***

GBT sampling at BON occurred from April 19<sup>th</sup> to August 12<sup>th</sup>. Sampling for GBT was terminated after the August 12<sup>th</sup> sample because of an inability to collect an adequate sample for GBT exams. At Bonneville Dam, there were seven days in 2014 when signs of GBT in fish were recorded (Figure J-7, Table J-9). Of these seven days, the maximum GBT rate was 2.0%, which occurred on May 20<sup>th</sup> (Figure J-7, Table J-9). All of the fish that exhibited signs of GBT at BON in 2014 had signs that were rank 1. For the first time, TDG in The Dalles Dam tailwater was managed under both the Oregon and Washington methodologies of estimating a 12-hour average TDG. Under the Oregon methodology, the 12-hour average is based on the 12 highest hourly TDG measurements in a single calendar day, regardless of whether they are consecutive or not. Under the Washington methodology, the 12-hour average is based on rolling 12-hour averages. The highest of the rolling averages is what is reported as the 12-hour average for a given day. The Corps of Engineers managed to the higher of the two methodologies. For illustrative purposes, the 12-hour averages under both of these methodologies are provided in Figure J-7 below. TDG in The Dalles tailwater exceeded the 120% criteria for short periods on four occasions (Figure J-7). TDG in the BON forebay exceeded 115% for several periods throughout the spill season. The longest continuous period where the BON forebay exceeded 115% was nearly two weeks from May 20<sup>th</sup> to June 1<sup>st</sup> (Figure J-7).

**Figure J-7**  
**Percent GBT observed in the sample at Bonneville Dam.**



***Rock Island Dam (RIS)***

GBT sampling at RIS occurred from April 21<sup>st</sup> to August 26<sup>th</sup>. There were eight total days where signs of GBT were detected at RIS in 2013 (Figure J-8, Table J-10). The maximum GBT rate at RIS in 2014 was 7.1%, which occurred on June 3<sup>rd</sup> (Figure J-8, Table J-10). TDG levels in the tailwaters of Grand Coulee (GCL) and Chief Joseph (CHJ) dams never exceeded 120% in 2014 (Figure J-8). However, TDG in the tailwaters at Wells (WEL) and Rocky Reach (RRH) dams exceeded 120% for a short period in late May through early June (Figure J-8). The longest continuous period where TDG in the RRH tailwater exceeded 120% was eight days, from May 28<sup>th</sup> to June 4<sup>th</sup> (Figure J-8). All four forebay monitors above RIS (including the RIS forebay monitor) had TDG levels that exceeded 115% for some period in 2014 (Figure J-8). Of the 17 total fish that showed signs of fin GBT at RIS in 2014, all but two were rank 1. The other two fish with signs of fin GBT were rank 2.

**Figure J-8**  
**Percent GBT observed in the sample at Rock Island Dam.**

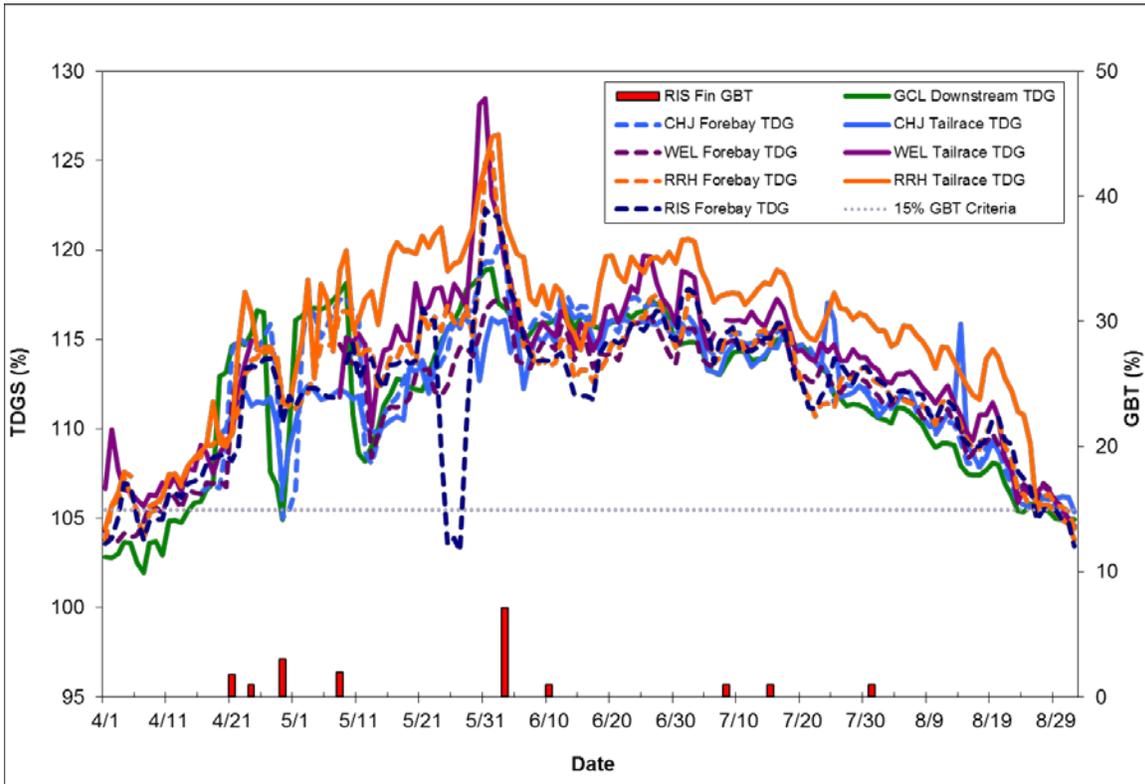


Table J-4 compares the 2014 estimates of the overall percentage of fish with signs of GBT to past years' estimates. This is not meant as a measurement of overall GBT, but is used to easily display the annual relative magnitude of GBT in 2014 compared to past years. As can be seen in the table the overall annual incidence of GBT in 2014 was in the lower range among the past 18 years. (The overall percentage was estimated both with and without Rock Island Dam included due to the potential of this site causing the estimate to be biased high in some years).

**Table J-4**  
**Percent of sampled fish with signs of fin GBT estimated for**  
**the total fish observed in each year 1996 to 2014.**

<b>Year</b>	<b>Total % Signs</b>	<b>% Signs excluding RIS</b>
<b>1996</b>	3.3	4.2
<b>1997</b>	3.2	4.3
<b>1998</b>	1.0	1.6
<b>1999</b>	0.3	1.4
<b>2000</b>	0.2	0.2
<b>2001</b>	0.001	0.1
<b>2002</b>	0.7	0.7
<b>2003</b>	1.5	0.5
<b>2004</b>	0.18	0.18
<b>2005</b>	0.46	0.11
<b>2006</b>	1.6	1.4
<b>2007</b>	2.4	2.9
<b>2008</b>	0.5	0.7
<b>2009</b>	0.29	0.23
<b>2010</b>	0.36	0.43
<b>2011</b>	2.5	0.95
<b>2012</b>	0.68	0.44
<b>2013</b>	0.31	0.28
<b>2014</b>	<b>0.25</b>	<b>0.17</b>

### **Historical Summary (1995–2014)**

The Gas Bubble Trauma monitoring program has been implemented annually since 1995. There are twenty years of data available, and as a result of involuntary spill events, data for GBT are available over a wide range of total dissolved gas concentrations. In fact, over this historic record, observations have occurred at tailwater TDG levels as high as 140%. This has allowed the assessment of the impacts of TDG on the salmonid population over a wide range of tailwater TDG conditions.

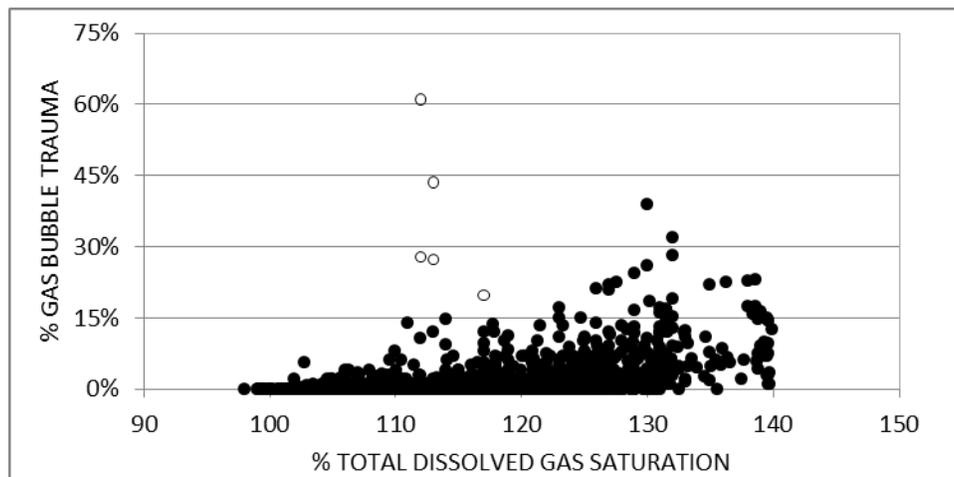
Excluding Rock Island Dam samples, a total of 2,488 daily exams have occurred over the time period, with a total of 288,083 fish examined. (The daily sample size criteria based on the monitoring protocol is 100 fish. In this analysis some flexibility was considered and all daily samples with greater than 75 fish were included). The GBT monitoring program has consistently shown over the years that signs of GBT are minimal when TDG is managed to the present dissolved gas standards associated with the implementation of the Federal Columbia River Power System (FCRPS) Biological Opinion Spill program.

In all the years when TDG and GBT have been collected (2,488 samples), there have only been 34 instances when the 15% GBT criterion was exceeded. Of those 34 instances, five (open circles in Figure J-9) can be attributed to late migrating steelhead smolts. At the time these steelhead smolts were collected at Little Goose Dam

approximately 98% of the juvenile steelhead migrating that year had already passed this project. These late migrating fish were observed in the forebay of the dam on the surface, had prolonged migration times, and were likely residualizing (see <http://www.fpc.org/documents/memos/136-07.pdf>). These fish may be considered anomalous, and were likely present due to the very low flow conditions that occurred that year. The other 29 times the biological criteria were exceeded occurred when TDG was greater than 120%. Of these 29 exceedences, 26 (90%) were observed at TDG concentrations greater than 125%. The following graph (Figure J-9) shows the summary of the 2,488 daily exams as a function of TDG.

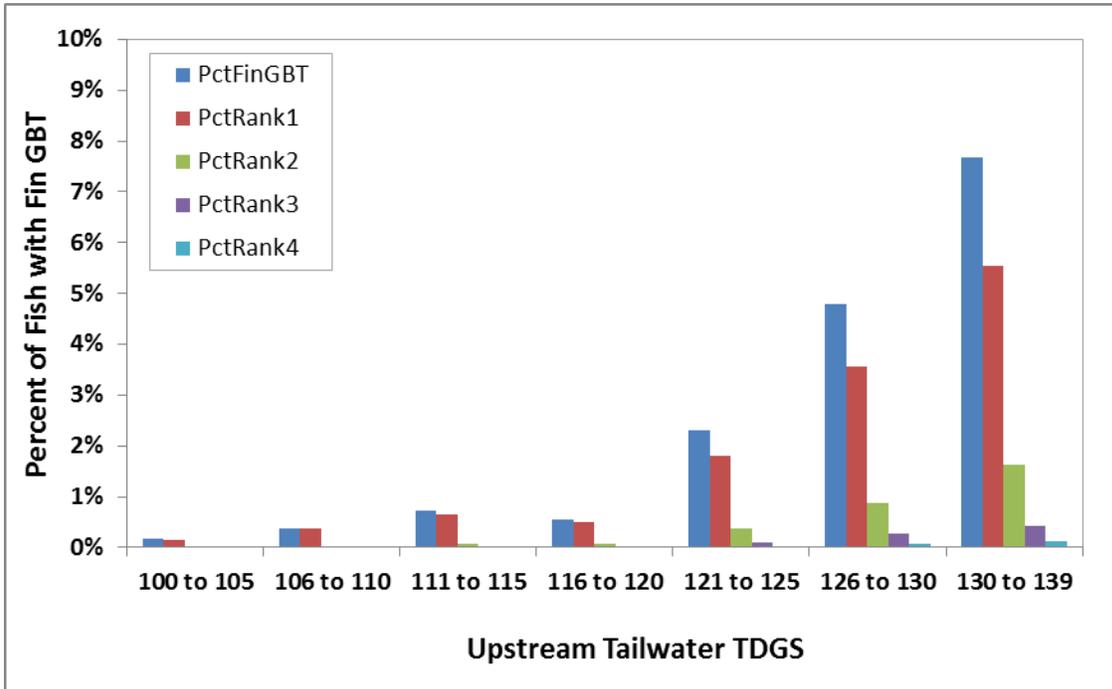
**Figure J-9**

**Percent GBT observed as a function of TDG observed. TDG measured at the tailwater of the upstream project at the Snake River projects and at John Day Dam tailwater for the Columbia River samples. Open circles indicate observations for late migrating steelhead observed in 2002 and 2007.**



Over the historic record there have been several instances where GBT data were collected during periods of uncontrolled spill that lead to higher levels of TDG. This allows fish collected over the years to be sorted into groups that migrated under similar TDG levels (Figure J-10). The following graph summarizes the gas bubble trauma data collected over the years of the implementation of the GBT Monitoring Program as a function of the TDG levels.

**Figure J-10**  
**Percent of all fish collected from 1995–2014 showing signs of GBT at given TDG levels.**



From Figure J-10 two things are apparent. The incidence of fish observed with signs of GBT and the severity of those signs increases with increasing levels of TDG supersaturation. This is consistent with the research on which the monitoring program was developed. And, secondly, signs of GBT are almost non-existent below 120% TDG, begin increasing slightly between 121 and 125% TDG, and then increase in both incidence and severity above 125% TDG.

## **Discussion**

The Biological Opinion Spill Program is managed using the data collected for TDG levels. The GBT biological monitoring is meant to complement the physical monitoring program. GBT sampling was successfully accomplished for the 2014 migration season. The 2014 TDG was managed close to 115 % in the forebay and 120% in the tailwater levels, and the low incidence of signs of GBT observed this year reflects that management.

The action criteria that serve as “early warning” indicators for potential lethal GBT conditions were not exceeded in 2014. The highest level of GBT (7.4 %) was observed at Rock Island Dam. However, this was a day when the sample size criteria were not met. The highest level observed at Rock Island Dam when the 100 fish sample size was met was 3%. The highest level observed in the FCRPS was 2% on one day at Lower Monumental Dam and one day at Bonneville Dam.

Data collected over the past 20 years strongly suggest that the Biological Monitoring serves as an effective management tool providing “early warning” of potentially harmful levels of TDG. What we have learned from the historic data is that the “early warning” signs are not triggered at TDG levels less than 120% at the tailwater monitors. Most observations indicating potential harm occurred above TDG levels of 125% as measured at the tailwater TDG monitors.

## **References**

- U.S. Geological Survey (USGS). 1997. Protocol for determining gas bubble trauma in juvenile salmonids. Columbia River Research Laboratory. Cook, Washington
- Weitkamp, D.E. 2000. Total Dissolved Gas Supersaturation in the Natural River Environment. Report by Parametrix to Chelan County Public Utility District, No.1. Wenatchee, WA. 21 p.

**Table J-5**

Detailed breakdown of GBT exams and signs of fin GBT at Lower Granite Dam in 2014.

<b>Exam Date</b>	<b>Number Examined</b>	<b>Number with Fin GBT</b>	<b>Percent with Fin GBT</b>
4/10/2014	100	0	0.0%
4/17/2014	100	0	0.0%
4/24/2014	100	0	0.0%
5/1/2014	100	0	0.0%
5/8/2014	100	0	0.0%
5/15/2014	100	0	0.0%
5/22/2014	100	0	0.0%
5/29/2014	100	0	0.0%
6/5/2014	61	0	0.0%

**Table J-6**

Detailed breakdown of GBT exams and signs of fin GBT at Little Goose Dam in 2014.

<b>Exam Date</b>	<b>Number Examined</b>	<b>Number with Fin GBT</b>	<b>Percent with Fin GBT</b>
4/6/2014	100	0	0.0%
4/11/2014	100	0	0.0%
4/16/2014	100	0	0.0%
4/21/2014	100	0	0.0%
4/26/2014	100	0	0.0%
5/1/2014	100	0	0.0%
5/7/2014	100	0	0.0%
5/12/2014	100	0	0.0%
5/19/2014	100	0	0.0%
5/26/2014	100	0	0.0%
6/2/2014	100	1	1.0%
6/9/2014	99	0	0.0%
6/16/2014	100	0	0.0%
6/23/2014	100	0	0.0%
6/30/2014	100	0	0.0%
7/7/2014	100	0	0.0%
7/14/2014	66	0	0.0%
7/21/2014	43	0	0.0%
7/28/2014	41	0	0.0%

**Table J-7**

**Detailed breakdown of GBT exams and signs of fin GBT at Lower Monumental Dam in 2014.**

<b>Exam Date</b>	<b>Number Examined</b>	<b>Number with Fin GBT</b>	<b>Percent with Fin GBT</b>
4/7/2014	90	0	0.0%
4/10/2014	100	0	0.0%
4/13/2014	95	0	0.0%
4/19/2014	100	2	2.0%
4/22/2014	100	1	1.0%
4/25/2014	100	0	0.0%
4/29/2014	100	0	0.0%
5/3/2014	100	1	1.0%
5/5/2014	100	1	1.0%
5/14/2014	100	0	0.0%
5/21/2014	100	0	0.0%
5/28/2014	100	0	0.0%
6/4/2014	100	0	0.0%
6/11/2014	100	0	0.0%
6/18/2014	50	0	0.0%
6/25/2014	38	0	0.0%
7/2/2014	100	0	0.0%
7/9/2014	63	0	0.0%
7/16/2014	100	0	0.0%
7/23/2014	100	1	1.0%
7/31/2014	55	1	1.8%

**Table J-8**  
**Detailed breakdown of GBT exams and signs of fin GBT at McNary Dam in 2014.**

<b>Exam Date</b>	<b>Number Examined</b>	<b>Number with Fin GBT</b>	<b>Percent with Fin GBT</b>
4/14/2014	77	0	0.0%
4/18/2014	100	0	0.0%
4/20/2014	100	0	0.0%
4/24/2014	100	1	1.0%
4/28/2014	100	0	0.0%
5/2/2014	100	0	0.0%
5/4/2014	100	0	0.0%
5/8/2014	100	0	0.0%
5/12/2014	100	1	1.0%
5/16/2014	100	0	0.0%
5/18/2014	100	0	0.0%
5/22/2014	100	0	0.0%
5/26/2014	100	0	0.0%
5/30/2014	75	0	0.0%
6/1/2014	100	0	0.0%
6/5/2014	100	1	1.0%
6/9/2014	100	0	0.0%
6/13/2014	100	0	0.0%
6/15/2014	100	0	0.0%
6/19/2014	100	0	0.0%
6/23/2014	100	0	0.0%
6/27/2014	100	0	0.0%
6/29/2014	100	0	0.0%
7/3/2014	100	0	0.0%
7/7/2014	100	0	0.0%
7/11/2014	100	0	0.0%
7/13/2014	100	0	0.0%
7/17/2014	100	0	0.0%
7/21/2014	100	0	0.0%
7/25/2014	100	0	0.0%
7/27/2014	100	0	0.0%
7/31/2014	100	0	0.0%
8/4/2014	100	0	0.0%

**Table J-9**

Detailed breakdown of GBT exams and signs of fin GBT at Bonneville Dam in 2014.

<b>Exam Date</b>	<b>Number Examined</b>	<b>Number with Fin GBT</b>	<b>Percent with Fin GBT</b>
4/19/2014	100	0	0.0%
4/22/2014	100	0	0.0%
4/26/2014	100	0	0.0%
4/29/2014	100	0	0.0%
5/3/2014	100	0	0.0%
5/6/2014	100	0	0.0%
5/10/2014	100	0	0.0%
5/13/2014	100	1	1.0%
5/17/2014	100	0	0.0%
5/20/2014	100	2	2.0%
5/24/2014	100	0	0.0%
5/27/2014	100	0	0.0%
5/31/2014	100	0	0.0%
6/3/2014	100	0	0.0%
6/7/2014	68	0	0.0%
6/11/2014	79	1	1.3%
6/14/2014	100	0	0.0%
6/17/2014	100	1	1.0%
6/21/2014	100	0	0.0%
6/24/2014	100	0	0.0%
6/29/2014	100	0	0.0%
7/1/2014	100	0	0.0%
7/5/2014	100	1	1.0%
7/8/2014	100	1	1.0%
7/12/2014	100	0	0.0%
7/15/2014	100	0	0.0%
7/19/2014	100	0	0.0%
7/22/2014	100	0	0.0%
7/26/2014	100	0	0.0%
7/29/2014	100	0	0.0%
8/2/2014	86	0	0.0%
8/6/2014	100	1	1.0%
8/10/2014	100	0	0.0%
8/12/2014	96	0	0.0%

**Table J-10**

Detailed breakdown of GBT exams and signs of fin GBT at Rock Island Dam in 2014.

<b>Exam Date</b>	<b>Number Examined</b>	<b>Number with Fin GBT</b>	<b>Percent with Fin GBT</b>
4/21/2014	56	1	1.8%
4/24/2014	100	1	1.0%
4/29/2014	100	3	3.0%
5/1/2014	100	0	0.0%
5/8/2014	100	2	2.0%
5/13/2014	100	0	0.0%
5/15/2014	100	0	0.0%
5/20/2014	100	0	0.0%
5/22/2014	100	0	0.0%
5/27/2014	100	0	0.0%
5/30/2014	100	0	0.0%
6/3/2014	70	5	7.1%
6/5/2014	71	0	0.0%
6/10/2014	100	1	1.0%
6/12/2014	100	0	0.0%
6/17/2014	100	0	0.0%
6/19/2014	100	0	0.0%
7/1/2014	54	0	0.0%
7/3/2014	89	0	0.0%
7/8/2014	100	1	1.0%
7/10/2014	100	1	1.0%
7/15/2014	100	1	1.0%
7/17/2014	100	0	0.0%
7/22/2014	100	0	0.0%
7/24/2014	100	0	0.0%
7/29/2014	100	0	0.0%
7/31/2014	100	1	1.0%
8/5/2014	100	0	0.0%
8/7/2014	101	0	0.0%
8/13/2014	36	0	0.0%
8/14/2014	100	0	0.0%
8/15/2014	100	0	0.0%
8/19/2014	100	0	0.0%
8/26/2014	100	0	0.0%