Report

Mainstem Willamette River Reserve Capacity Analysis

State of Oregon
Department of Environmental Quality

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1. Purpose

The Mainstem Willamette temporary reserve capacity (TRC) analysis was prepared to document the technical analysis behind the temporary reserve capacity allocations used in the Willamette TMDL Implementation Orders and potentially in future NPDES permits. The orders were issued by the Oregon Department of Environmental Quality (ODEQ) to the City of Albany, the Metropolitan Wastewater Management Commission, and the Northwest Pulp and Paper Association (ODEQ 2009a, ODEQ 2009b, ODEQ 2009c).

The analysis identifies the amount of thermal load, in excess of the waste load allocations (WLAs), the department will temporarily allocated to individual NPDES sources that discharge to the Willamette River and its major tributaries. Any allocated thermal load will be drawn from the amount set aside for reserve capacity, described in **Table 1**. The temporary allocation is in addition to the WLAs established in the TMDL.

The temporary allocations are based on the amount needed while maintaining compliance with the water quality temperature standard. The amount of temporary allocation needed will be based on recent source data that shows the thermal discharge would have exceeded the assigned WLA. The difference between the thermal discharge and the assigned WLA will be the basis for the temporary allocation, as long as that amount does not violate the temperature standard and there is sufficient reserve capacity to allocate.

Table 1 Facility allocations and reserve capacity.

River	River Mile	Individual Point Source Allocation	Small Point Source Bubble Allocation	Reserve Capacity	Individual Point Source Allocation + Reserve Capacity
Willamette River	187 - 132 Headwaters to Mary's R.	0.19 °C	0.01 °C	0.05 °C	0.24 °C
Willamette River	132 - 108 Mary's R. to Santiam R.	0.22 °C	0.01 °C	0.035 °C	0.26 °C
Willamette River	108 - 28 Santiam R. to Tualatin R.	0.19 °C	0.01 °C	0.05 °C	0.24 °C
Willamette River	28 - 25 Tualatin to Clackamas R.	0.19 °C	0.01 °C	0.015 °C	0.205 °C
Willamette River	25 - 0 Clackamas R. to Mouth	0.19 °C	0.01 °C	0.05 °C	0.24 °C
McKenzie River	12.7 – 0 Weyerhaeuser outfall to Mouth	0.23 °C	0.00 °C	0.00 °C – 0.01 °C *	0.23 °C
Coast Fork Willamette River	Below Cottage Groove WWTP outfall	0.25 °C	0.00 °C	0.025 °C	0.28 °C

*The TMDL reserve capacity section (page 4-81) states there is 0.01 °C at the mouth of the McKenzie. Upstream the human use allowance has been allocated to EWEB and non point sources.

2. Methods

To determine the amount of thermal load, in excess of the WLA, the actual excess thermal load for all individual sources was calculated using effluent discharge data from 2000-2006. The specific time period varies between individual sources. See **Table 2** for a data summary. After the excess thermal load was calculated it was compared to the WLA limit for the same time period. The method for calculating both of these values is the same method outlined in the TMDL (ODEQ, 2006) and presented in **Appendix 3**.

Table 2 Time period of available effluent data for facilities in TRC analysis.

Facility	Grab Sample Effluent Temperature	Daily Average Effluent Temperature	Daily Maximum Effluent Temperature	Average Daily Effluent flow
Albany WWTP	1/2000 – 10/2006	n/a	n/a	1/2000 – 10/2006
Blue Heron Paper	1/2000 – 10/2000	n/a	1/2002 – 12/2003	1/2000 – 12/2003
Corvallis WWTP	4/2000 – 5/2001 8/2004 – 10/2006	n/a	5/2001 – 8/2004	4/2000 – 10/2006
Cottage Grove WWTP	n/a	n/a	6/2001 – 7/2002	4/2001 – 12/2002
Evanite	n/a	n/a	4/2004 – 10/2006	4/2004 – 10/2006
GP (Fort James) Halsey	n/a	n/a	1/2000 – 6/2007	1/2000 – 6/2007
IP (Weyerhaeuser) Albany	1/2000 – 12/2006	n/a	5/2006 – 12/2006	1/2000 – 12/2006
IP (Weyerhaeuser) Springfield	1/2000 – 12/2004	n/a		1/2000 – 12/2004
Jefferson WWTP	7/2001 – 9/2001	n/a	n/a	7/2001 – 9/2001
Kellogg Creek WWTP	n/a	n/a	5/2001 – 11/2004 1/2006 – 10/2006	4/2000 – 10/2006
Lebanon WWTP	1/2000 – 3/2002	n/a	n/a	1/2000 – 12/2002
MWMC	n/a	1/2000 – 4/2002	5/2002 – 10/2006	1/2000 – 10/2006
Newberg WWTP	n/a	n/a	6/2002 – 9/2002	3/2002 – 10/2002
Oak Lodge WWTP	1/2000 – 12/2004	n/a	n/a	1/2000 – 12/2004
ODFW Clackamas River Hatchery	n/a	n/a	n/a	n/a
Pope & Talbot	4/2000 – 12/2006	n/a	8/2000 – 12/2006	1/2000 – 12/2006
Siltronic	n/a	n/a	2/2002 – 10/2006	2/2002 – 10/2006
SP Newsprint	n/a	n/a	7/2002 – 8/2002	4/2001 – 12/2002
Stayton WWTP	7/2001 – 10/2001	n/a	n/a	7/2001 – 10/2001
Sweet Home WWTP	1/2000 – 10/2004	n/a	n/a	1/2000 – 10/2004
Teledyne Wah Chang	n/a	n/a	4/2000 – 10/2006	4/2000 – 10/2006
Tri-City WWTP	n/a	n/a	5/2000 – 12/2000 1/2002 – 12/2003 5/2003 – 10/2004 12/2005 – 10/2006	1/2000 – 10/2006
Tryon Creek WWTP	3/2001 – 5/2007	n/a	n/a	1/2000 – 5/2007
University Of Oregon Heat Plant	n/a	n/a	n/a	1/2002 – 12/2002
West Linn Paper	n/a	n/a	8/2001 – 10/2006	1/2000 – 10/2006
Willow Lake (Salem) WWTP	1/2000 – 10/2006	n/a	5/2000 – 10/2000 5/2001 – 10/2006	1/2000 – 10/2006
Wilsonville WWTP	n/a	4/2002 – 11/2002	5/2001 – 12/2001	1/2001 – 12/2001 4/2002 – 11/2002

Some facilities collect a single daily instantaneous grab sample of their effluent temperature. Typically this sample is taken in the morning when effluent temperatures may not be characteristic of the daily maximum. Because the WLA requires a daily maximum temperature value, daily maximums were estimated for days when a grab samples is the only available data.

At facilities where both grab samples and continuous temperature data is available, this difference is based on two standard deviations between the grab samples and the daily maximum temperatures. Differences were quantified between April and October only. Two standard deviations was used rather than the average difference to minimize type II errors in predicting the actual amount of need for temporary reserve capacity.

For the seven domestic wastewater treatment plants where estimates could not be based on available data, daily maximums were estimated by adding two degrees Celsius to the grab samples. Two degrees Celsius was chosen because data from all the other domestic facilities show the difference did not exceed this amount. It is anticipated as more continuous data is collected, these estimates will be revised. Individual results are summarized in **Table 3**. Graphs from individual facilities are presented in **Appendix 1**.

Table 3 Summary of values added to grab samples determines daily maximum temperatures.

Facility	Increase to Sample
Albany WWTP	grab + 2.0 ^{o}C (estimated)
Blue Heron	n/a
Corvallis WWTP	grab + 1.3 ^{o}C (see Appendix 1)
Cottage Groove WWTP	n/a
Evanite	n/a
GP Halsey (Fort James)	n/a
IP (Weyerhaeuser) Albany	grab + 2.8 ^{o}C but not > 32 ^{o}C (see Appendix 1)
IP (Weyerhaeuser) Springfield	grab + 2.0 ^{o}C but not > 32 ^{o}C (estimated)
Jefferson WWTP	grab + 2.0 ^{o}C (estimated)
Kellogg Creek WWTP	n/a
Lebanon WWTP	grab + 2.0 ^{o}C (estimated)
MWMC	n/a
Newberg WWTP	n/a
Oak Lodge WWTP	grab + 2.0 ^{o}C (estimated)
Pope Talbot	grab + 3.4 ^{o}C (see Appendix 1)
ODFW Clackamas Fish Hatchery	n/a
Siltronic	n/a
SP Newsprint	n/a
Stayton WWTP	grab + 2.0 ^{o}C (estimated)
Sweet Home WWTP	grab + 2.0 ^{o}C (estimated)
Teledyne Wah Chang	n/a
Tri City WWTP	n/a
Tryon Creek WWTP	grab + 2.0 ^{o}C
University of Oregon	n/a
West Linn Paper	n/a
Willow Lake WWTP	grab + 1.1 ^{o}C (see Appendix 1)
Wilsonville WWTP	daily average + 1.0 ^{o}C (see Appendix 1)

3. What facilities "Need"

Need was based on the amount of thermal load facilities discharged that exceeded their WLA. This was calculated by comparing daily WLAs to the actual estimated daily excess thermal load discharged. Frequency distributions for each facilities' discharged excess thermal load compared to their WLA is presented in **Appendix 2**. The maximum observed exceedance, if any, is shown in **Table 4**. These values represent the amount the WLA would be multiplied to cover the largest discharge. This definition of need does not consider the trend for future discharges beyond 2006, implications from technology upgrades, or water quality trading scenarios.

Table 4 Maximum observed exceedance to WLAs.

	Summer Use Period (million kcals/day)			Spawning Use Period (million kcals/day)		
Facility	Maximum Exceedance	Actual	WLA	Maximum Exceedance	Actual	WLA
Albany WWTP	38.9	162.3	123.4	12.0	197.3	185.3
Blue Heron	No Exceedance	n/a	n/a	n/a	n/a	n/a
Corvallis WWTP	27.4	161.7	134.3	No Exceedance	n/a	n/a
Cottage Groove WWTP	0.9	11.5	10.6	No Exceedance	n/a	n/a
Evanite	8.2	24.2	15.9	No Exceedance	n/a	n/a
GP Halsey (Fort James)	No Exceedance	n/a	n/a	35.6	191.5	155.9
IP (Weyerhaeuser) Albany	114.2	451.3	337.1	241.3	581.1	339.8
IP (Weyerhaeuser) Springfield	134.7	1230.4	1095.7	477.3	1441.9	964.6
Jefferson WWTP	No Exceedance	n/a	n/a	Unknown (data not available)	n/a	n/a
Kellogg Creek WWTP	No Exceedance	n/a	n/a	n/a	n/a	n/a
Lebanon WWTP	No Exceedance	n/a	n/a	No Exceedance		
MWMC	No Exceedance	n/a	n/a	91.7	698.6	606.9
Newberg WWTP	No Exceedance	n/a	n/a	n/a	n/a	n/a
Oak Lodge WWTP	5.5	49.3	43.7	n/a	n/a	n/a
ODFW Clackamas Fish Hatchery	Unknown (data not available)	n/a	n/a	Unknown (data not available)	n/a	n/a
Pope Talbot	163.5	597.8	434.3	-27.0	459.3	486.3
Siltronic	No Exceedance	n/a	n/a	n/a	n/a	n/a
SP Newsprint	No Exceedance	n/a	n/a	n/a	n/a	n/a
Stayton WWTP	No Exceedance	n/a	n/a	No Exceedance	n/a	n/a
Sweet Home WWTP	No Exceedance	n/a	n/a	No Exceedance	n/a	n/a
Teledyne Wah Chang	2.9	117.2	114.3	No Exceedance	n/a	n/a
Tri City WWTP	No Exceedance			n/a	n/a	n/a
Tryon Creek WWTP	24.0	81.3	57.3	n/a	n/a	n/a
University of Oregon	21.2	233.7	212.5	No Exceedance		
West Linn Paper	14.3	211.3	197.0	n/a	n/a	n/a
Willow Lake WWTP	No Exceedance	n/a	n/a	No Exceedance		
Wilsonville WWTP	No Exceedance	n/a	n/a	n/a	n/a	n/a

4. Input and Model Updates

After the TMDL was issued, USGS discovered an error in the original Tri-City WWTP WLA model input. The error made Tri-City WWTP temperature impact appear less than it really is. In addition, two programming errors in the macro utility used to calculate WLA inputs were addressed. The first error corrected the macro's use of the instantaneous river flows and temperatures instead of the 7 day average and maximum metrics. The other programming error relates to how the "a" value was calculated for facilities downstream of the Santiam River.

To be as accurate as possible, these three errors were corrected for the reserve capacity analysis. It is assumed these fixes will increase the impact from discharges over what was modeled in the TMDL. All other inputs and model parameters were left the same as the simulations performed in the TMDL.

5. Temporary Reserve Capacity Allocations

Multipliers in **Table 5** may be used in NPDES permits for temporary allocation of reserve capacity. Model results using multipliers in **Table 5** are shown in **Section 6**. The equations used to calculate temporary reserve capacity allocations are described in **Appendix 3**. An additional request was made

In the Coast Fork of the Willamette and in the Willamette River upstream of the Santiam River, the amount of capacity needed by facilities exceeds the available reserve capacity during the summer fish use period. Only 92% of the needed capacity is available for temporary allocation in this portion of the river. In the McKenzie River there is no amount of reserve capacity available for temporary allocation. In the Willamette River downstream of the Santiam River, there is enough temporary reserve capacity to allocate based on each facilities needs.

Additionally, no temporary reserve capacity is allocated to IP (Weyerhaeuser) Albany's outfall 002 filter bed discharges because the impact is unknown and presumed to be negligible (ODEQ, 2006). If future analysis shows the impact from this discharge is not negligible, than an allocation may be assigned to this outfall when the next TRC or TMDL analysis is completed.

There may be desire to transfer allocations among source. A transfer scenario was explored and discussed in **Appendix 4**.

Table 5 Temporary reserve capacity multipliers which may be applied to waste load allocations.

Facility	Salmon & Trout Rearing Use, Core Cold Water Use, or Migration Corridor	Spawning Use Period
Albany WWTP	1.290	1.065
Blue Heron	none	n/a
Corvallis WWTP	1.187	none
Cottage Groove WWTP	1.077	none
Evanite	1.474	none
GP Halsey (Fort James)	none	1.228
IP (Weyerhaeuser) Albany	1.312	1.710
IP (Weyerhaeuser) Springfield	none	none
Jefferson WWTP	none	none
Kellogg Creek WWTP	none	n/a
Lebanon WWTP	none	none
MWMC	none	1.151
Newberg WWTP	none	n/a
Oak Lodge WWTP	1.127	n/a
ODFW Clackamas Fish Hatchery	none	none
Pope Talbot	1.346	none
Siltronic	none	n/a
SP Newsprint	none	n/a
Stayton WWTP	none	none
Sweet Home WWTP	none	none
Teledyne Wah Chang	1.023	none
Tri City WWTP	none	n/a
Tryon Creek WWTP	1.418	n/a
University of Oregon	1.092	none
West Linn Paper	1.073	n/a
Willow Lake WWTP	none	none
Wilsonville WWTP	none	n/a

6. Model Results

Figure 1 and **Figure 2** show the 5th, median and 95th percentile change to the seven day average daily maximum natural thermal potential river temperatures that are above the biological criteria in the Coast Fork and Willamette Rivers. Temporary reserve capacity allocations are set to those allocated in **Table 5**.

Separate model runs shown in **Figure 3** and **Figure 4** describes the impact for PGE's Willamette Falls Project, point source WLAs, plus the temporary reserve capacity allocations.

Figure 1 Impacts from WLAs plus temporary reserve capacity during 2001.

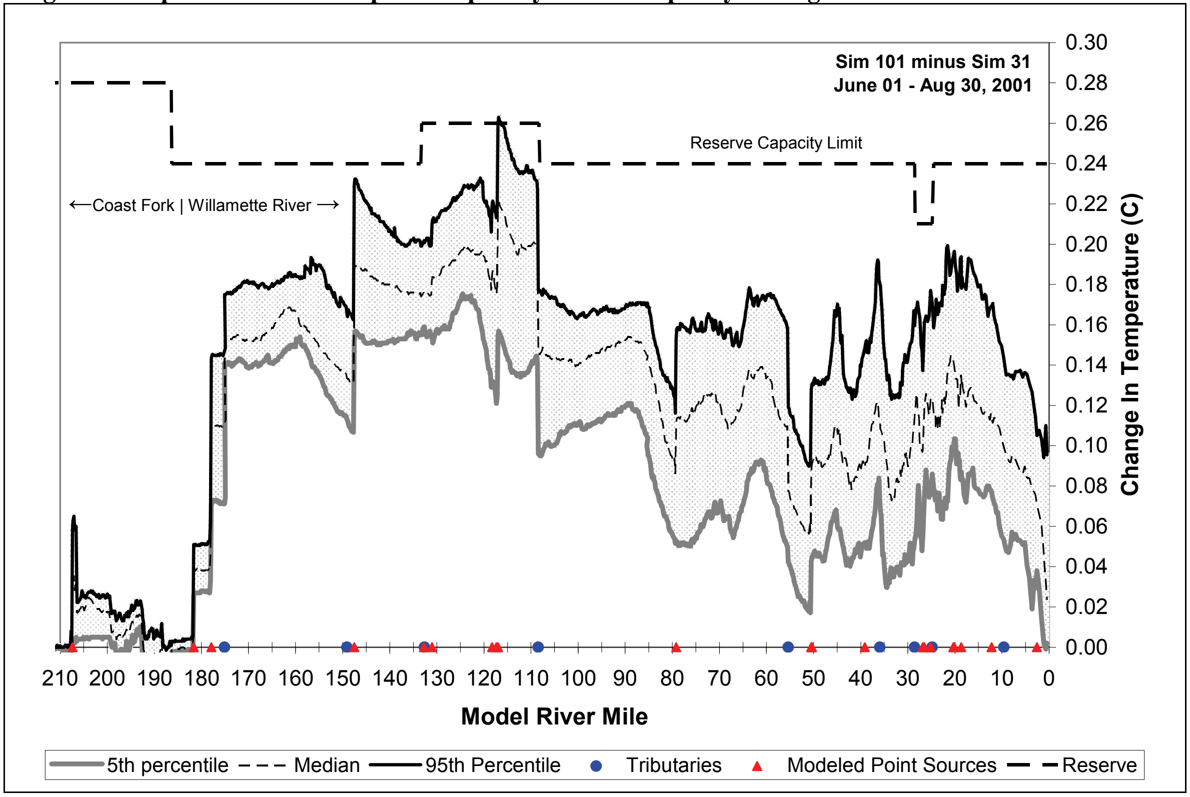


Figure 2 Impacts from WLAs plus temporary reserve capacity during 2002.

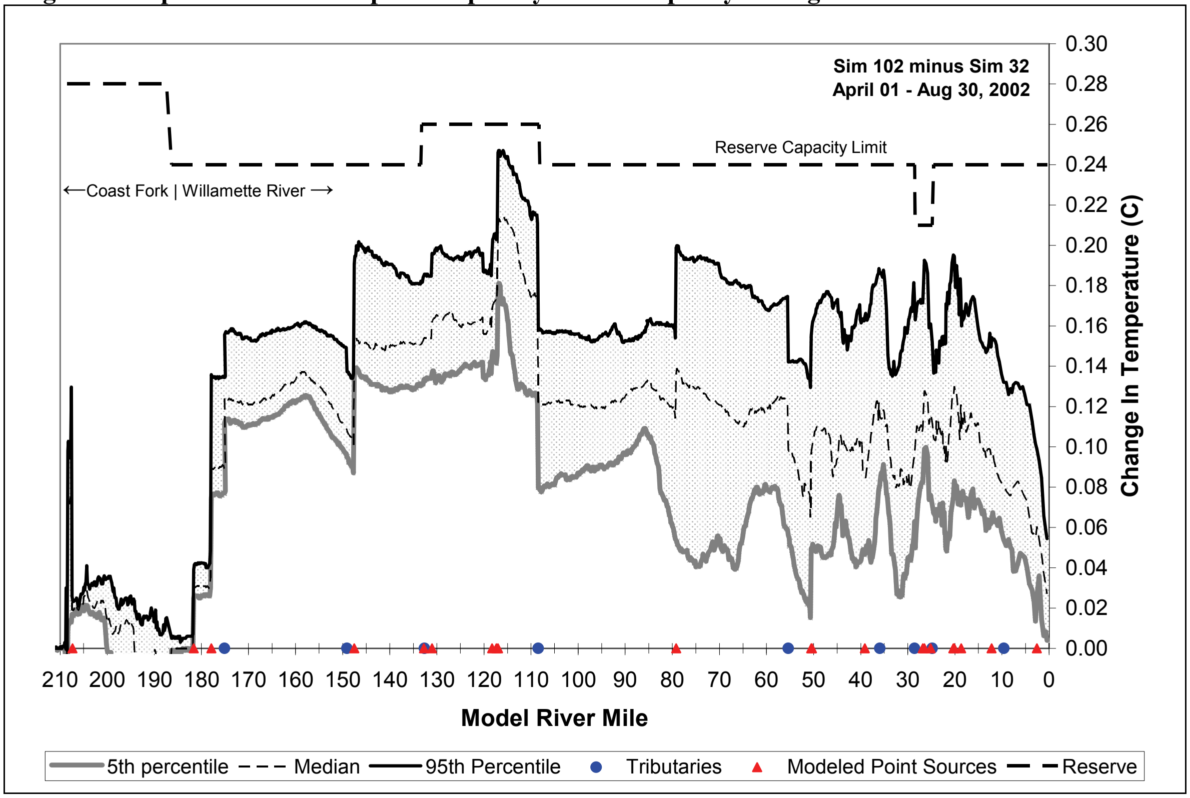


Figure 3 Impact of Willamette Falls and point sources with reserve capacity during 2001.

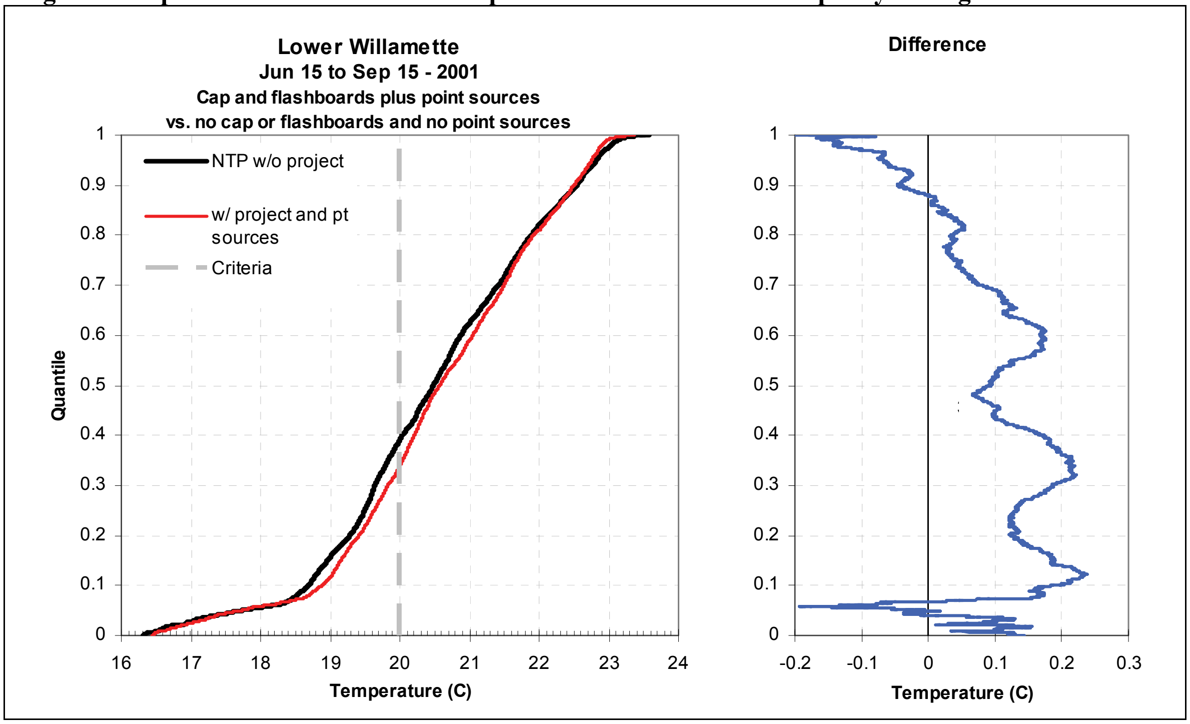
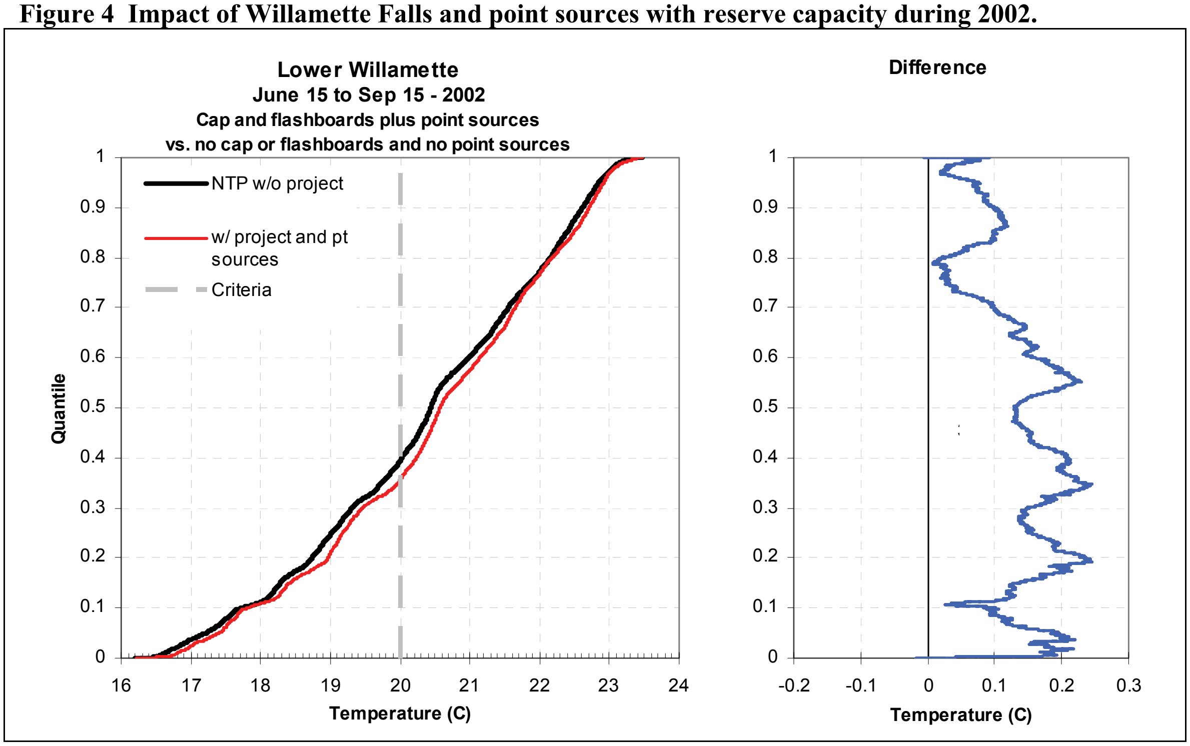


Figure 4 Impact of Willamette Falls and point sources with reserve capacity during 2002.



7. How to use Temporary Reserve Capacity in Permits

Excess thermal limits using temporary reserve capacity are calculated by the product of the multiplier presented in **Table 5** and the current excess thermal load allowed under the current WLA.

As an example, if the multiplier in **Table 5** is 1.331, than the excess thermal load a facility must meet, shown as "New Limit", is calculated as follows:

$$\text{New Limit} = WLA \cdot 1.331$$

This method may be applied to all WLA options presented in the TMDL (ODEQ, 2006).

Appendix 1 Grab and Daily Maximum Comparisons

Figure 5 through **Figure 10** show the temperature difference between effluent grab samples and daily maximums. These differences were used to establish daily maximum effluent temperatures at facilities where daily maximum effluent temperatures were not available.

Figure 5 Difference between grab samples and daily maximums at Corvallis WWTP.

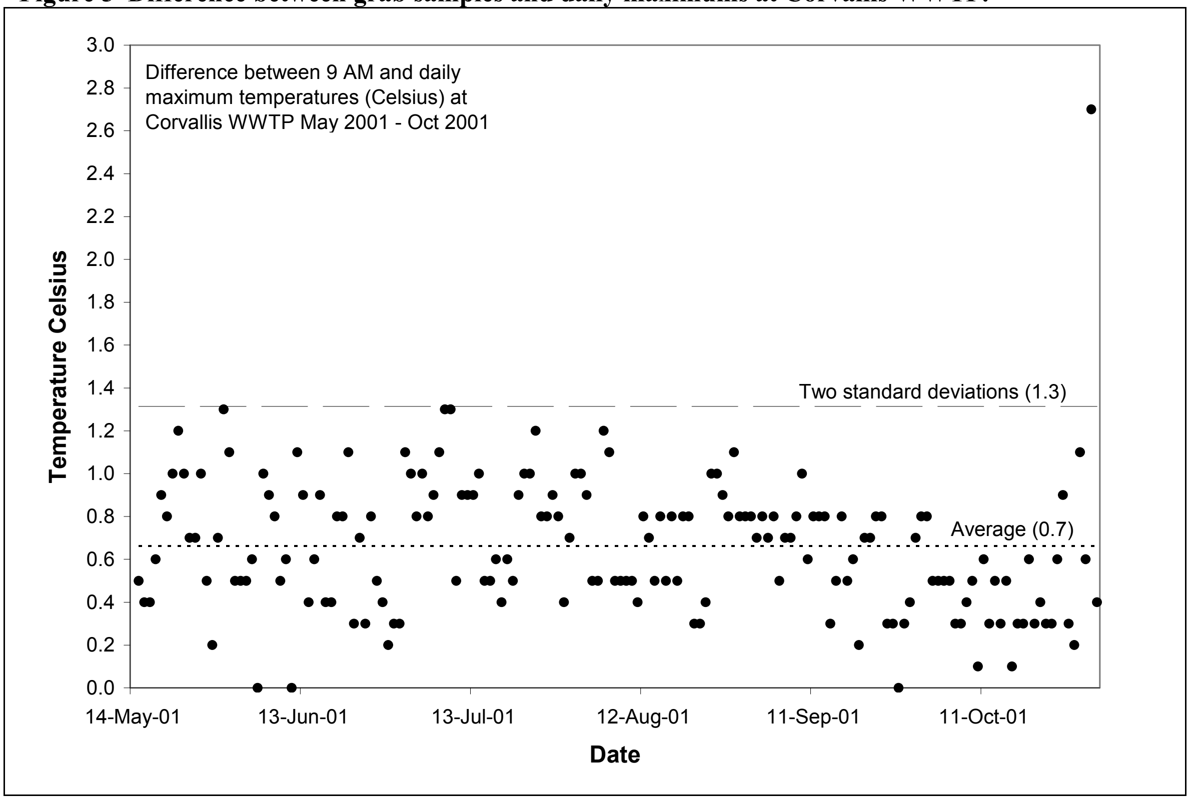


Figure 6 Difference between grab samples and daily maximums at IP (Weyerhaeuser) Albany.

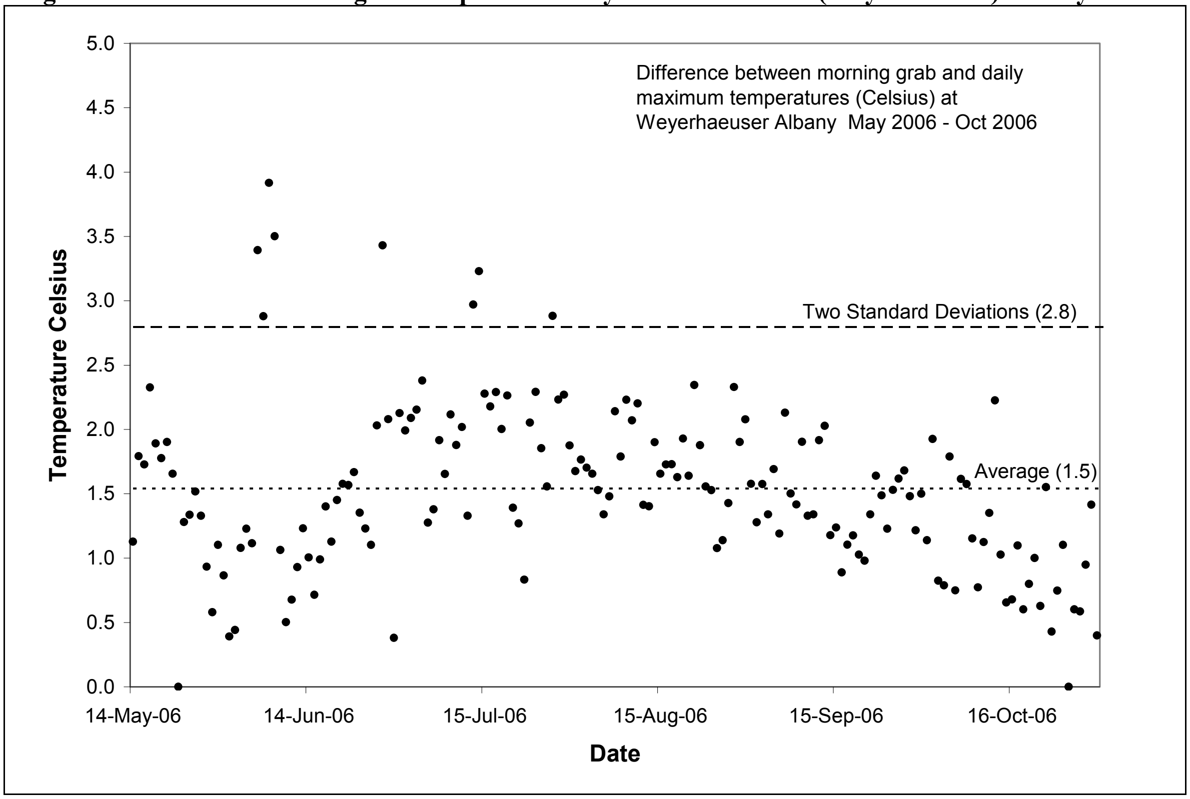


Figure 7 Difference between daily averages and daily maximums at MWMC.

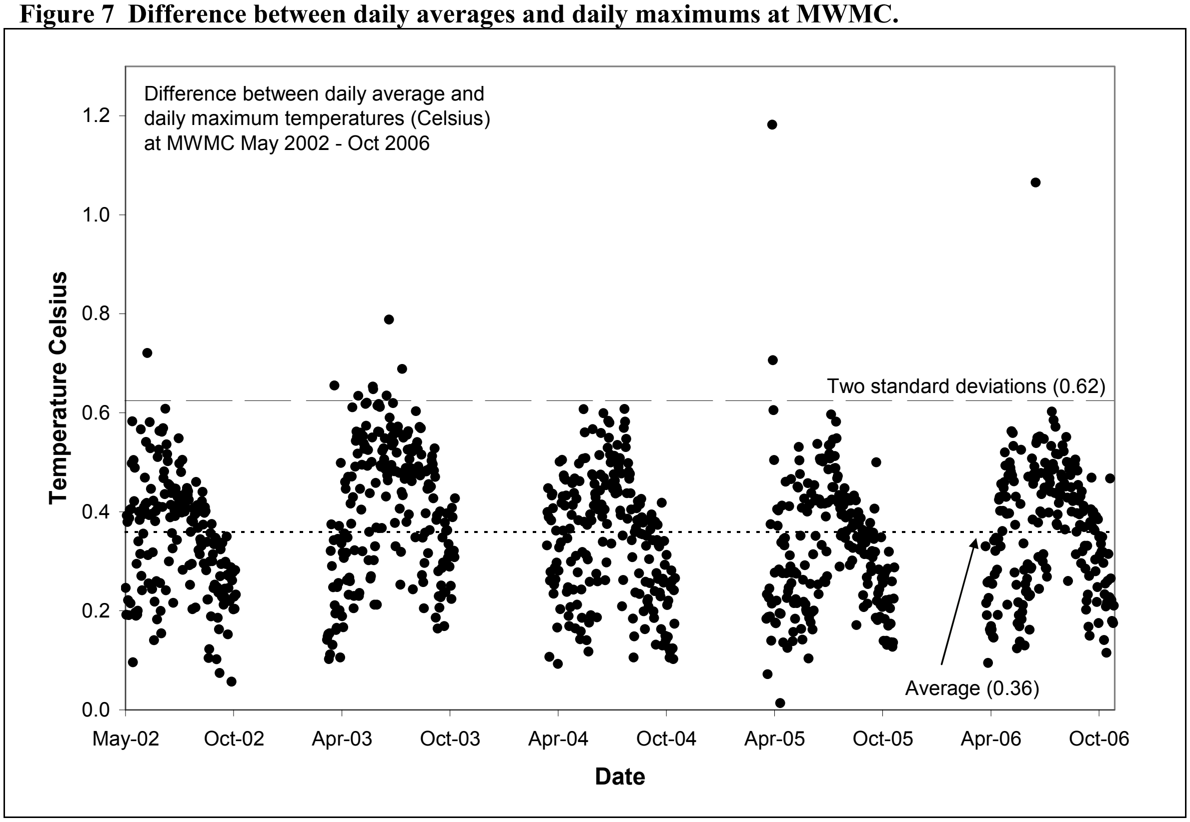


Figure 8 Difference between grab samples and daily maximums at Pope Talbot.

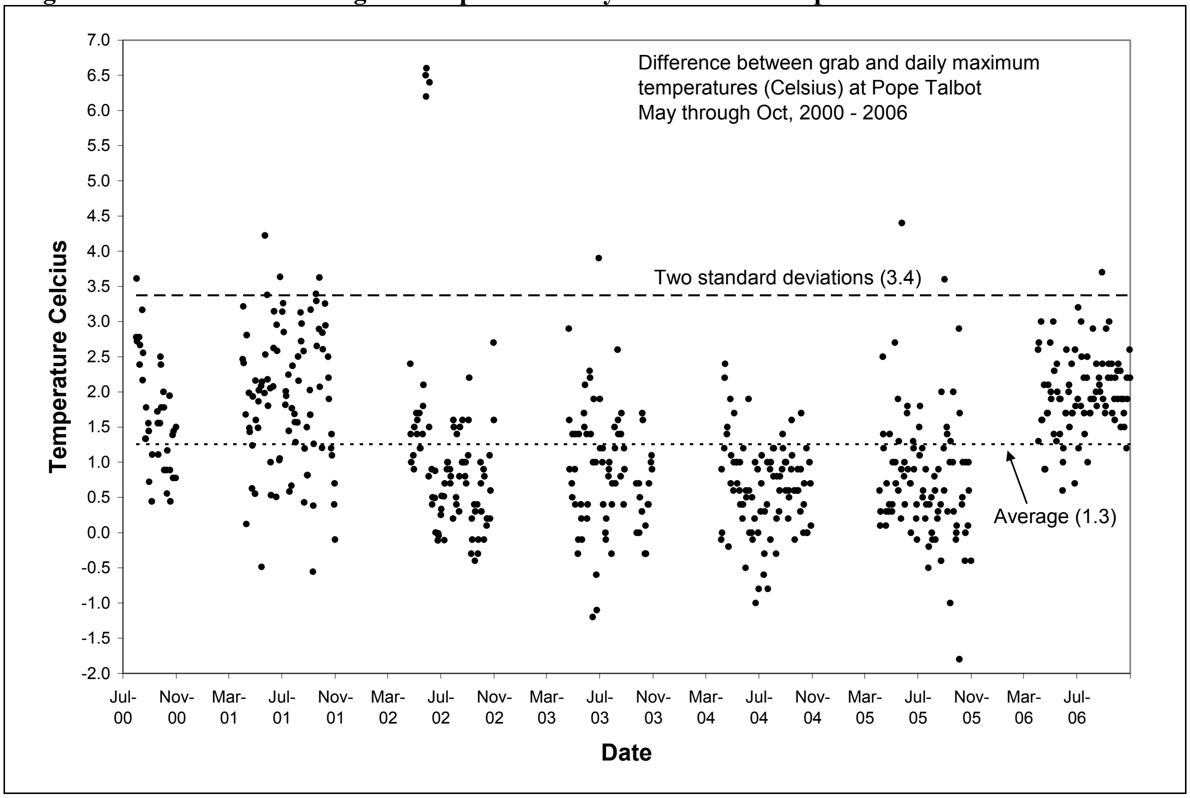


Figure 9 Difference between grab samples and daily maximums at Willow Lake WWTP.

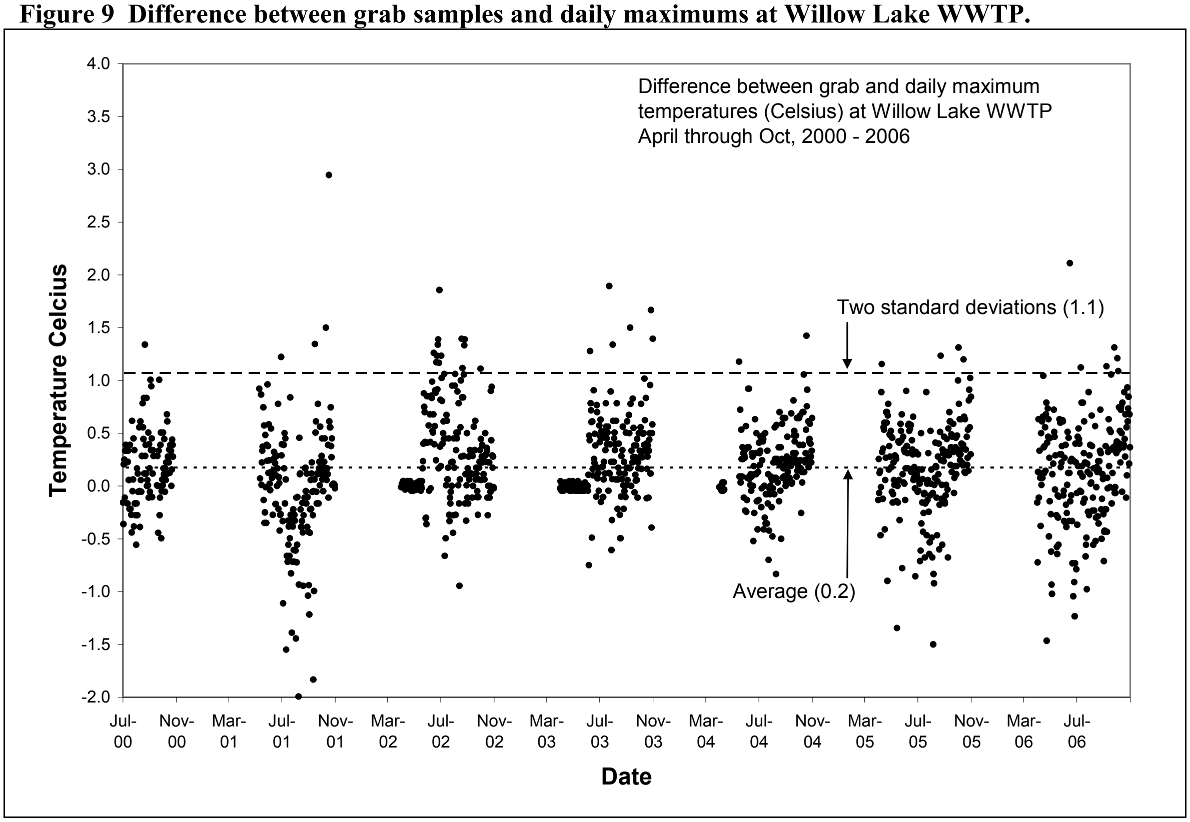
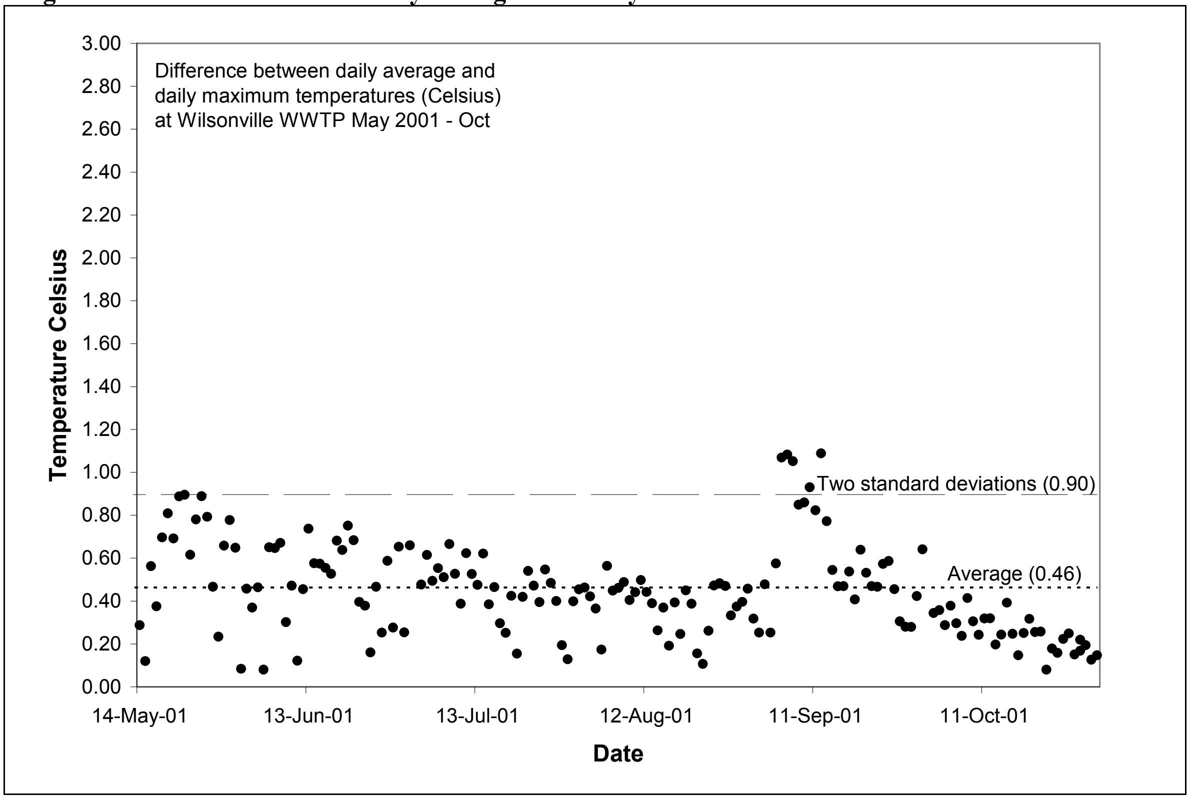


Figure 10 Difference between daily averages and daily maximums at Wilsonville WWTP.



Appendix 2 Facility WLA Utilization Frequency Distributions

Figure 11 Albany WWTP WLA utilization frequency distribution.

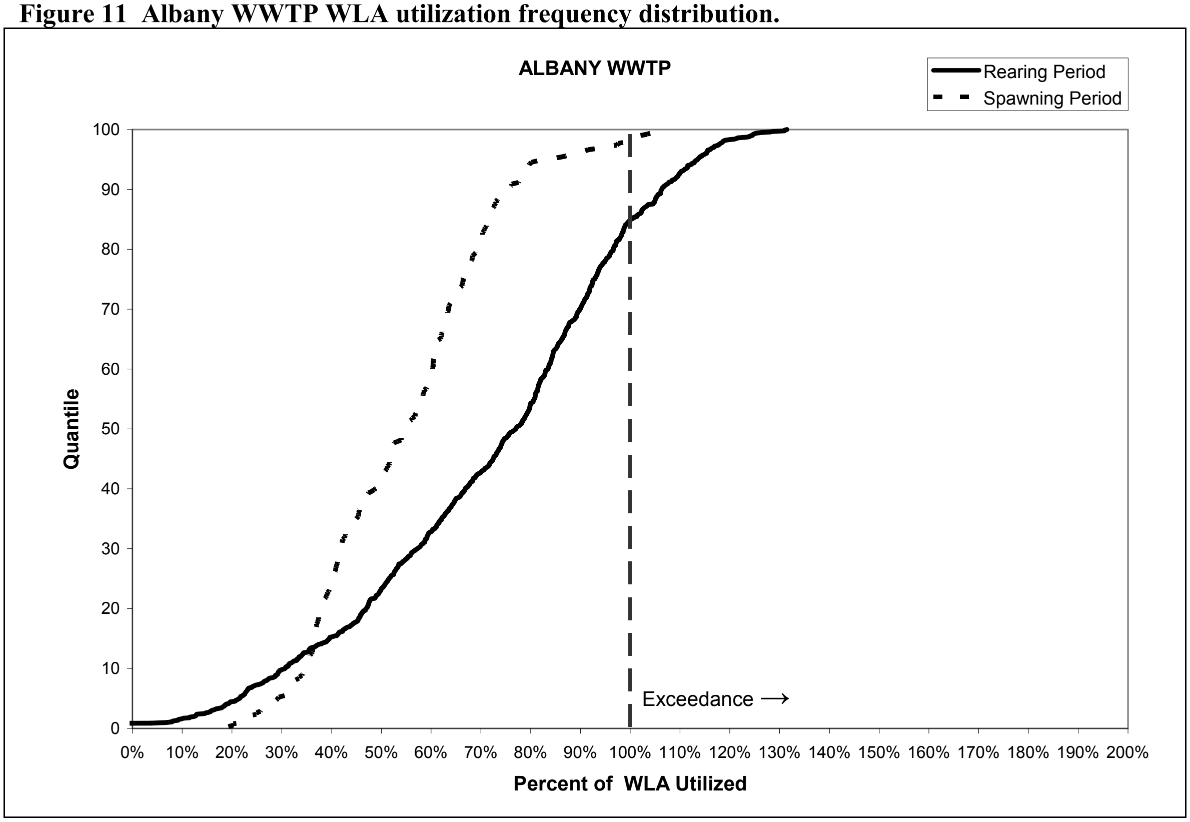


Figure 12 Blue Heron Paper WLA utilization frequency distribution.

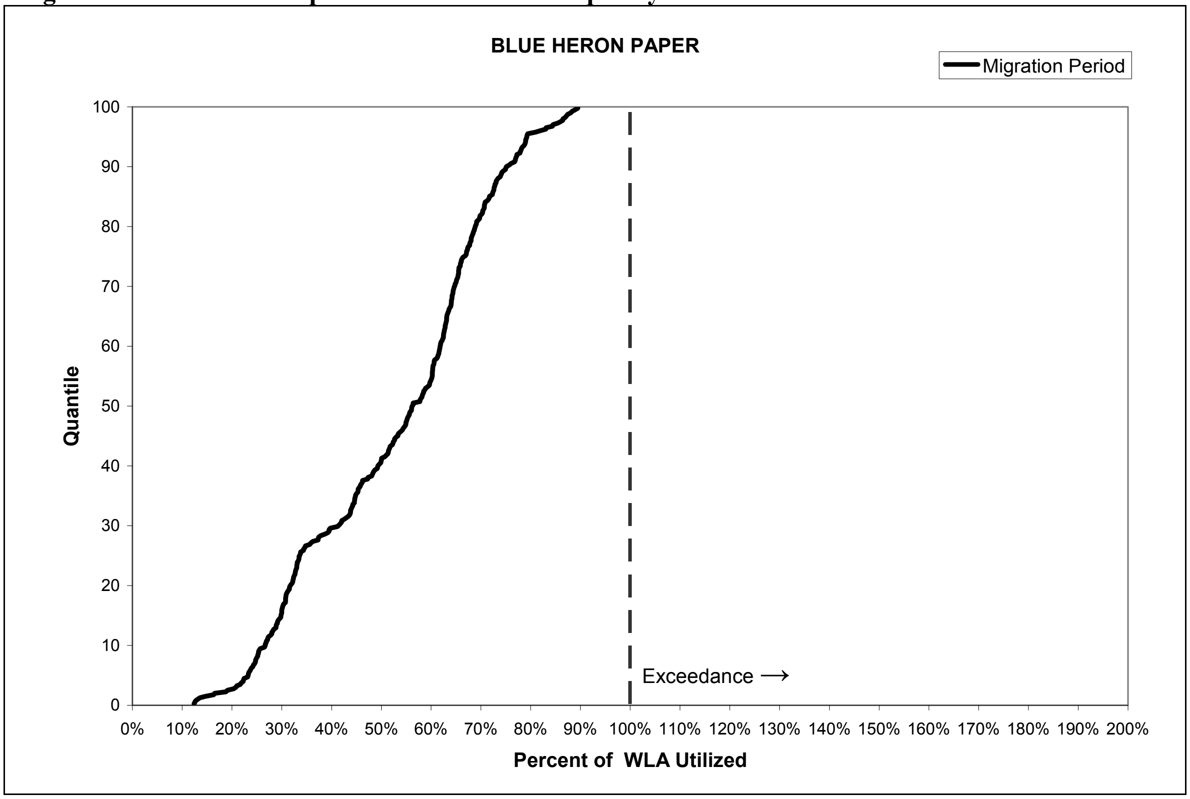


Figure 13 Corvallis WWTP WLA utilization frequency distribution.

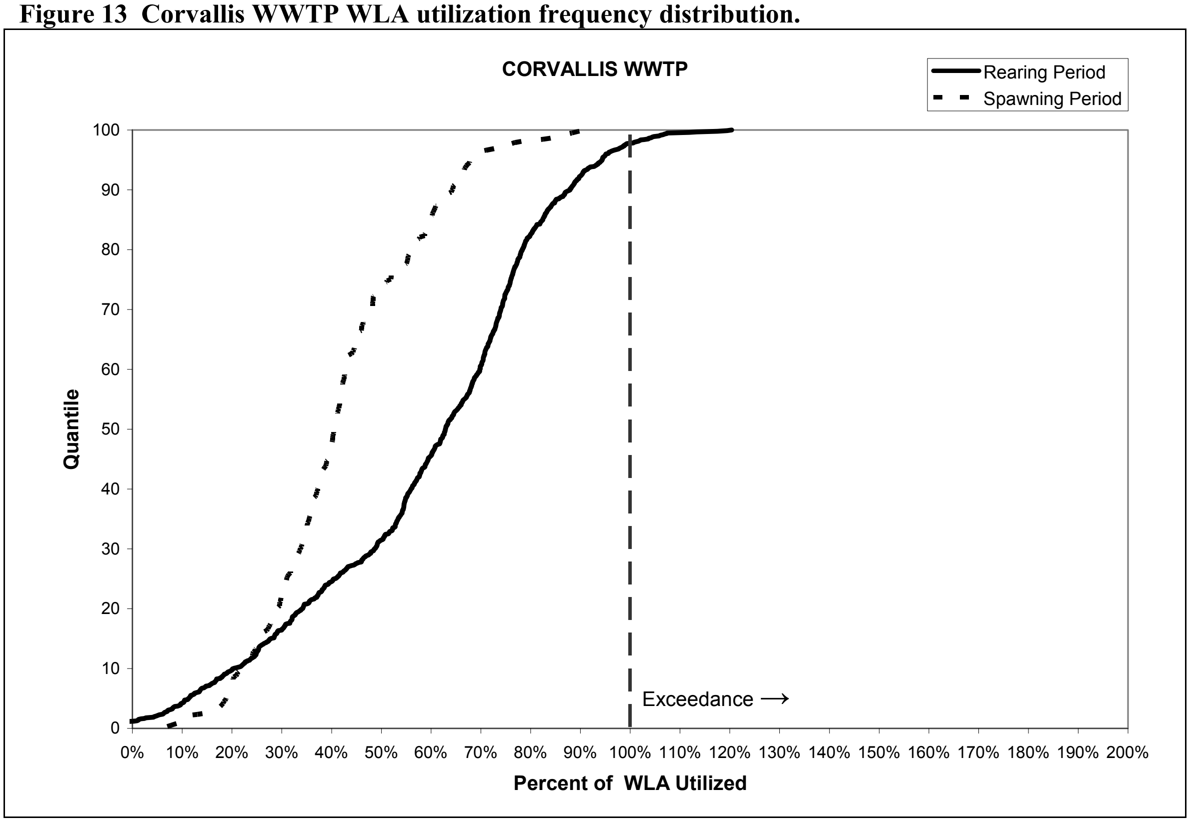


Figure 14 Cottage Groove WWTP WLA utilization frequency distribution.

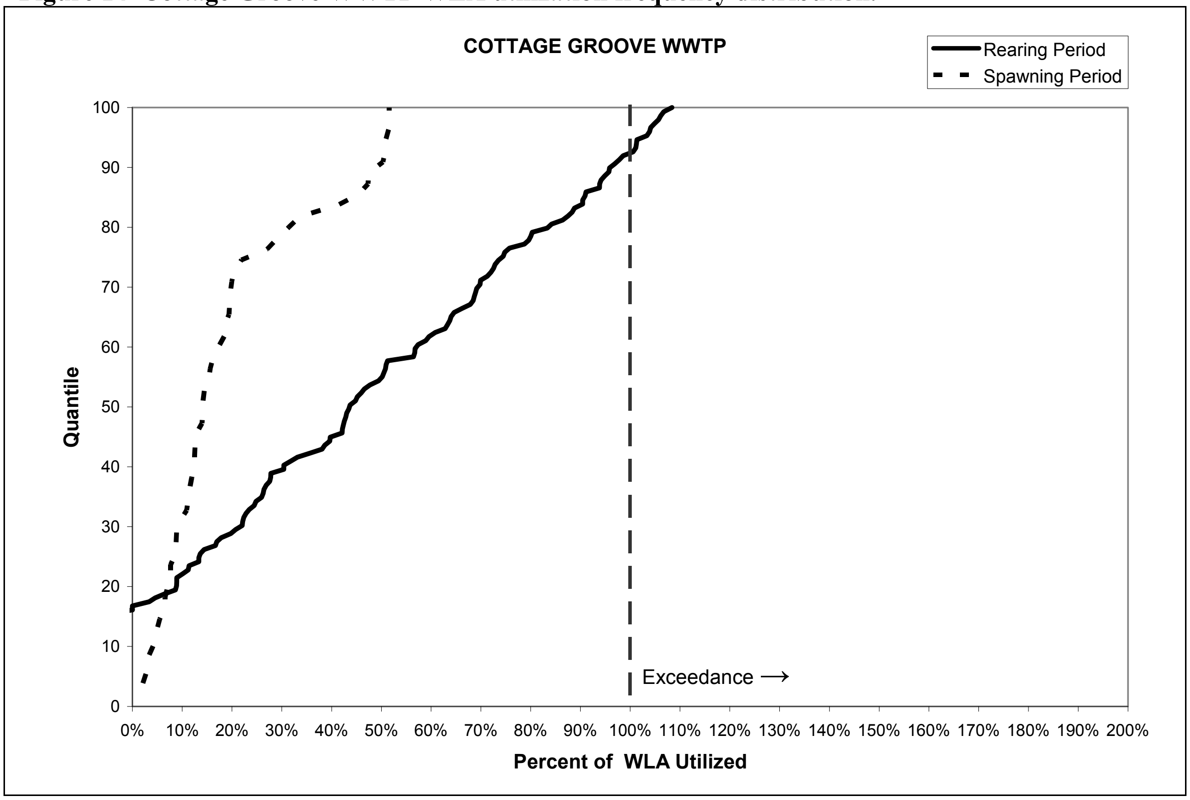


Figure 15 Evanite WLA utilization frequency distribution.

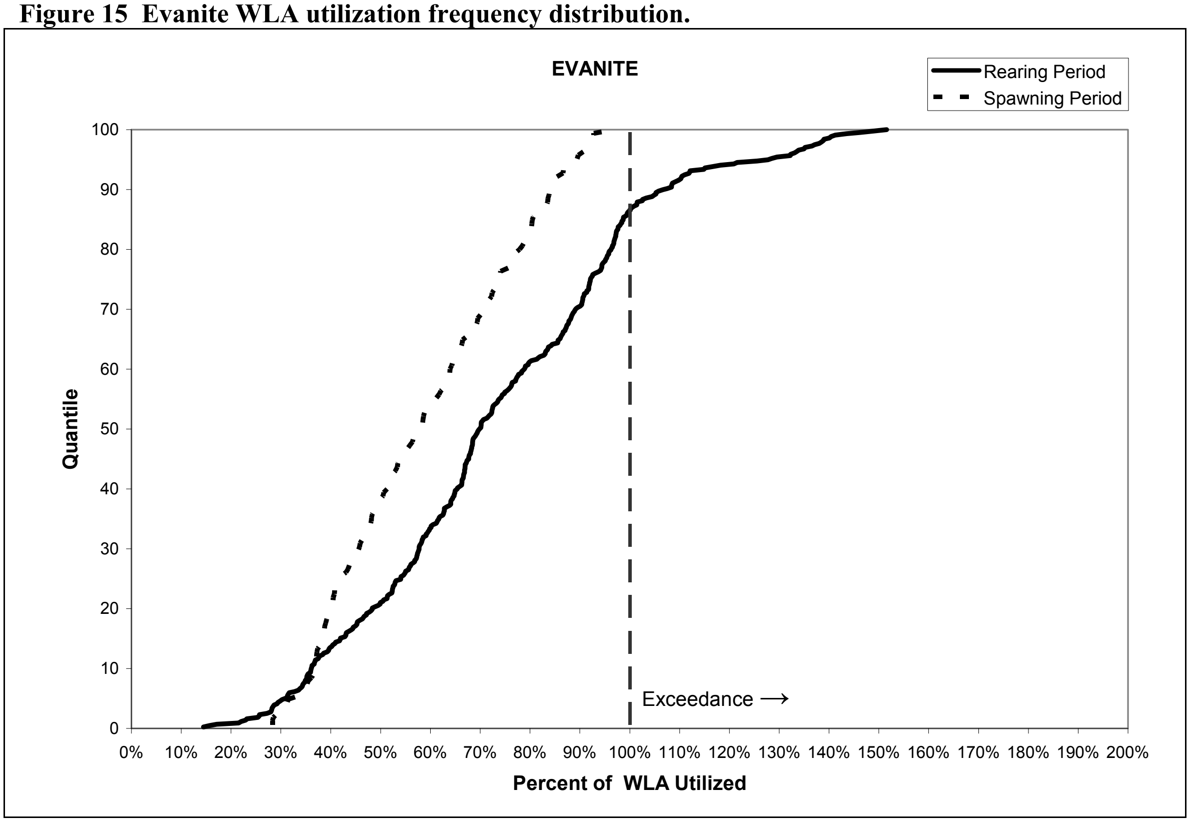


Figure 16 GP Halsey (Fort James) WLA utilization frequency distribution.

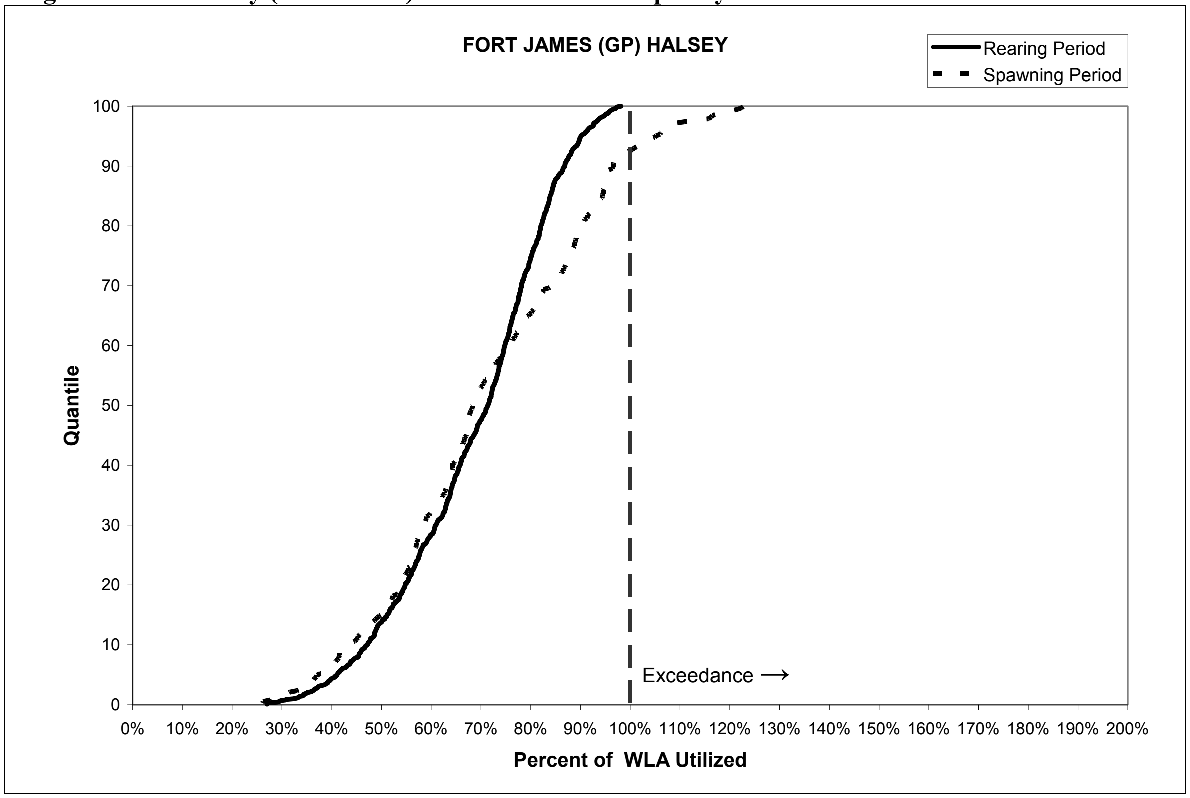


Figure 17 IP (Weyerhaeuser) Albany WLA utilization frequency distribution.

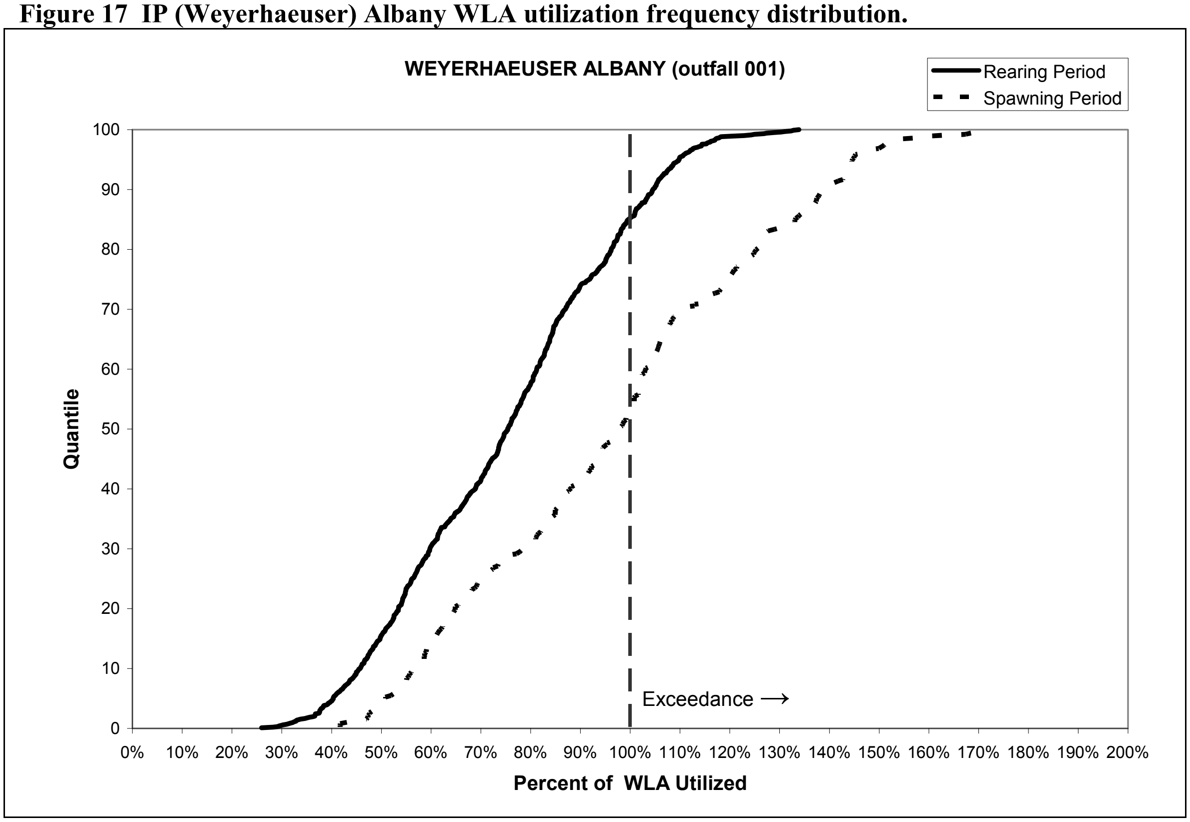


Figure 18 IP (Weyerhaeuser) Springfield WLA utilization frequency distribution.

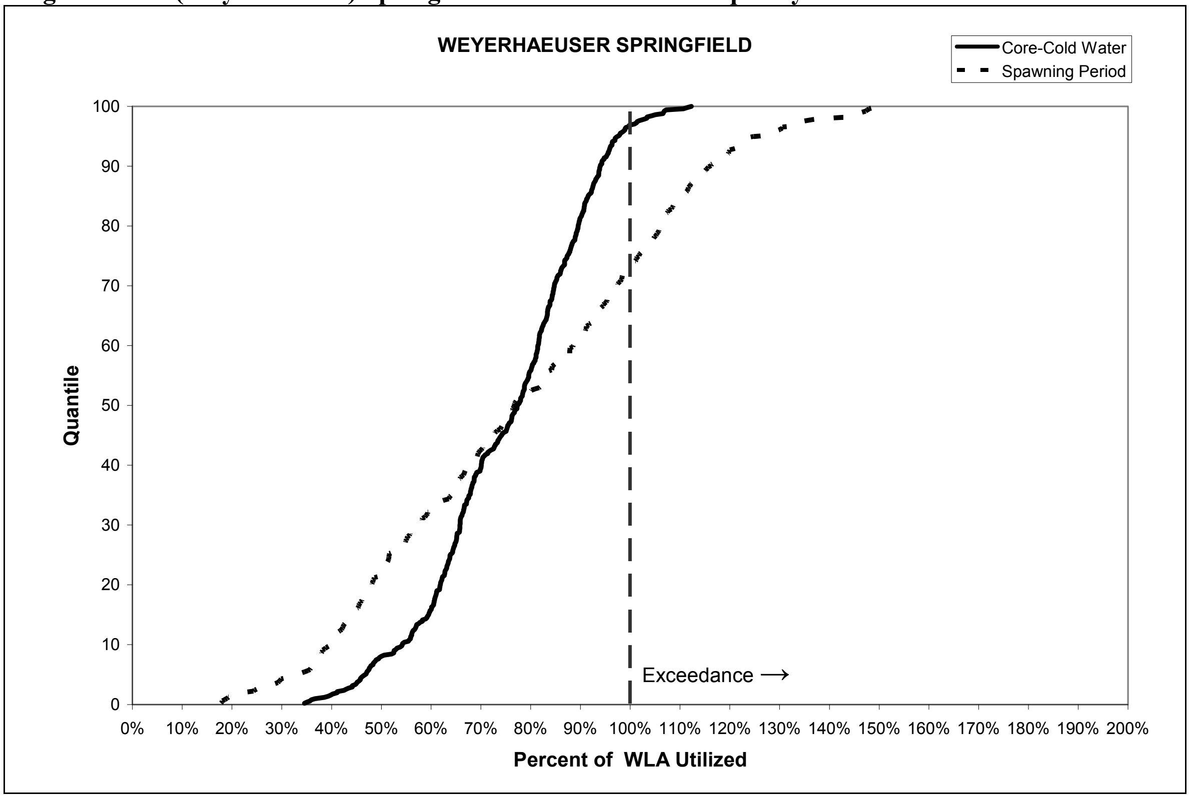


Figure 19 Jefferson WWTP WLA utilization frequency distribution.

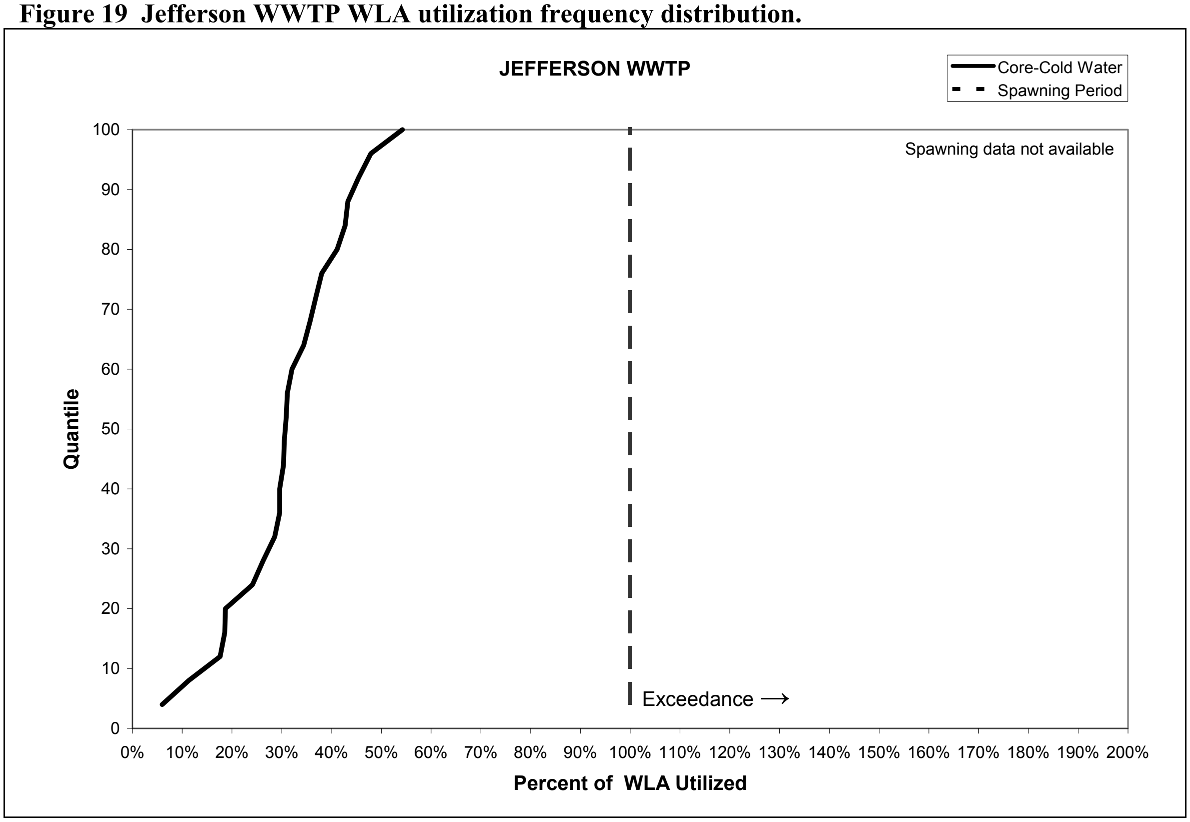


Figure 20 Kellogg Creek WWTP WLA utilization frequency distribution.

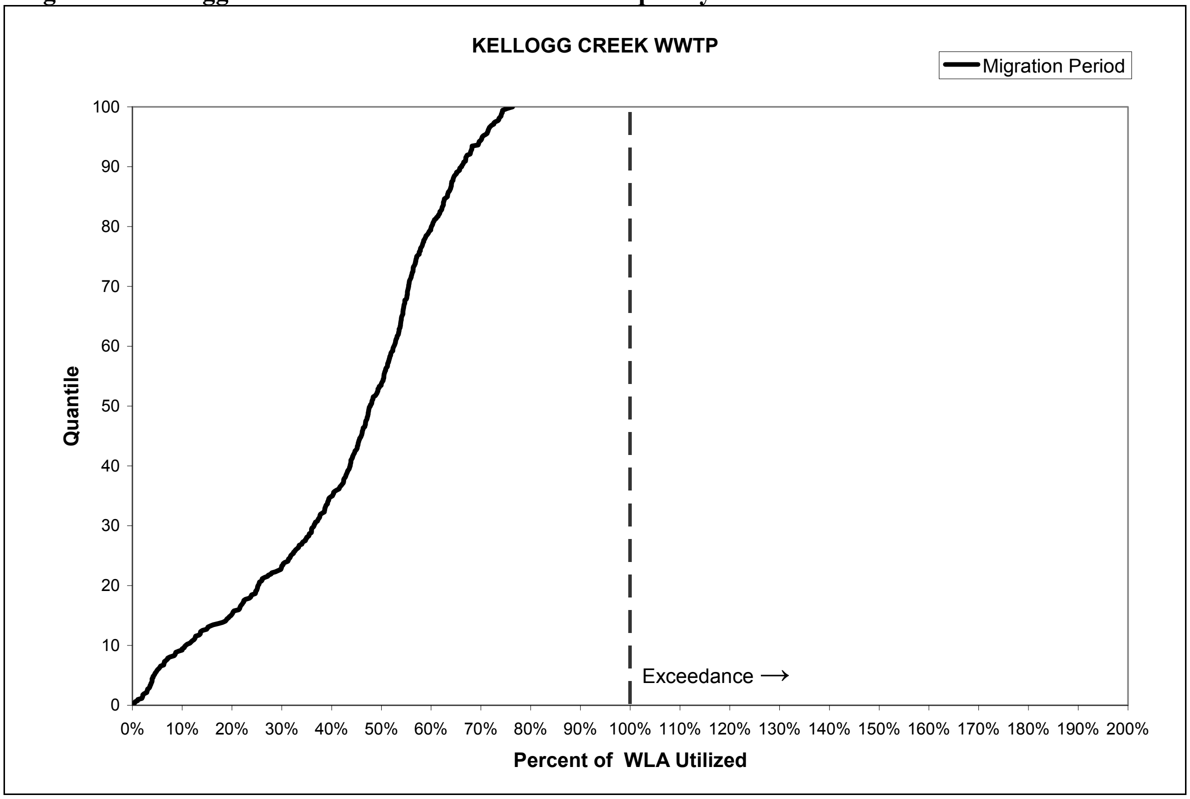


Figure 21 Lebanon WWTP WLA utilization frequency distribution.

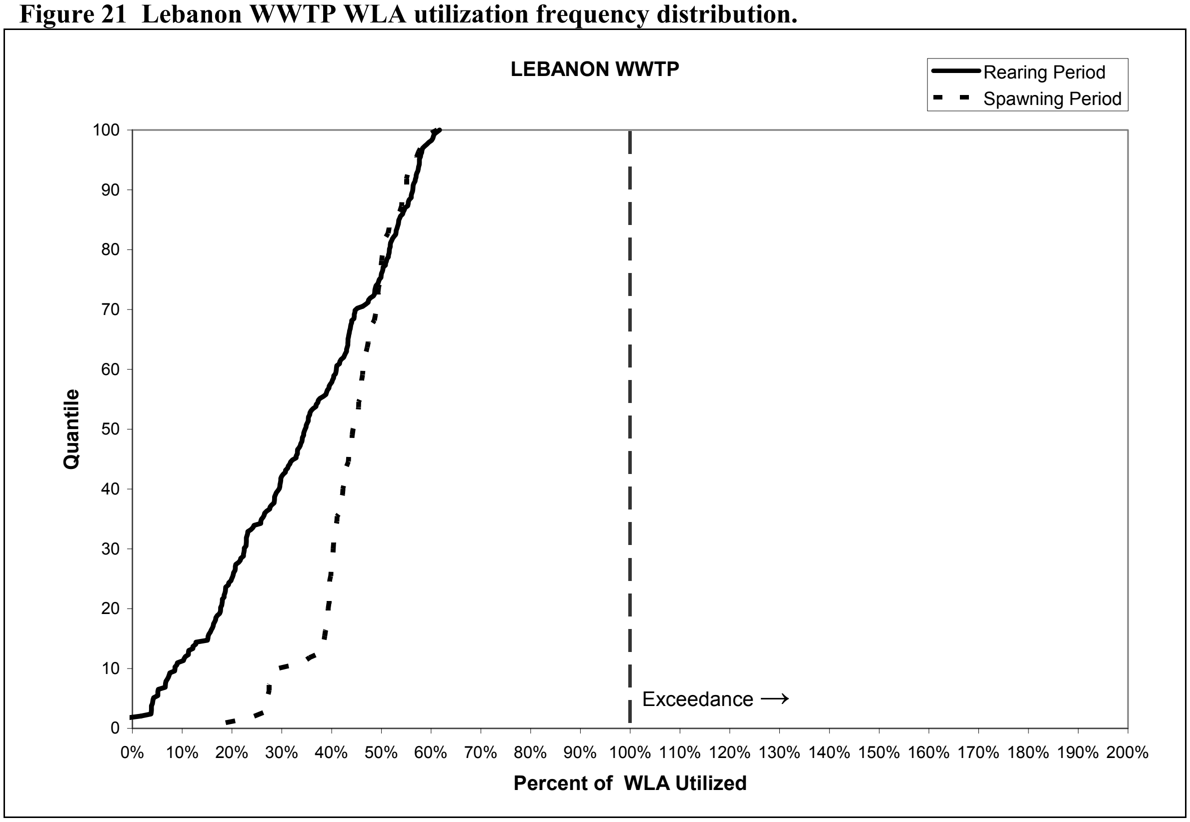


Figure 22 MWMC WLA utilization frequency distribution.

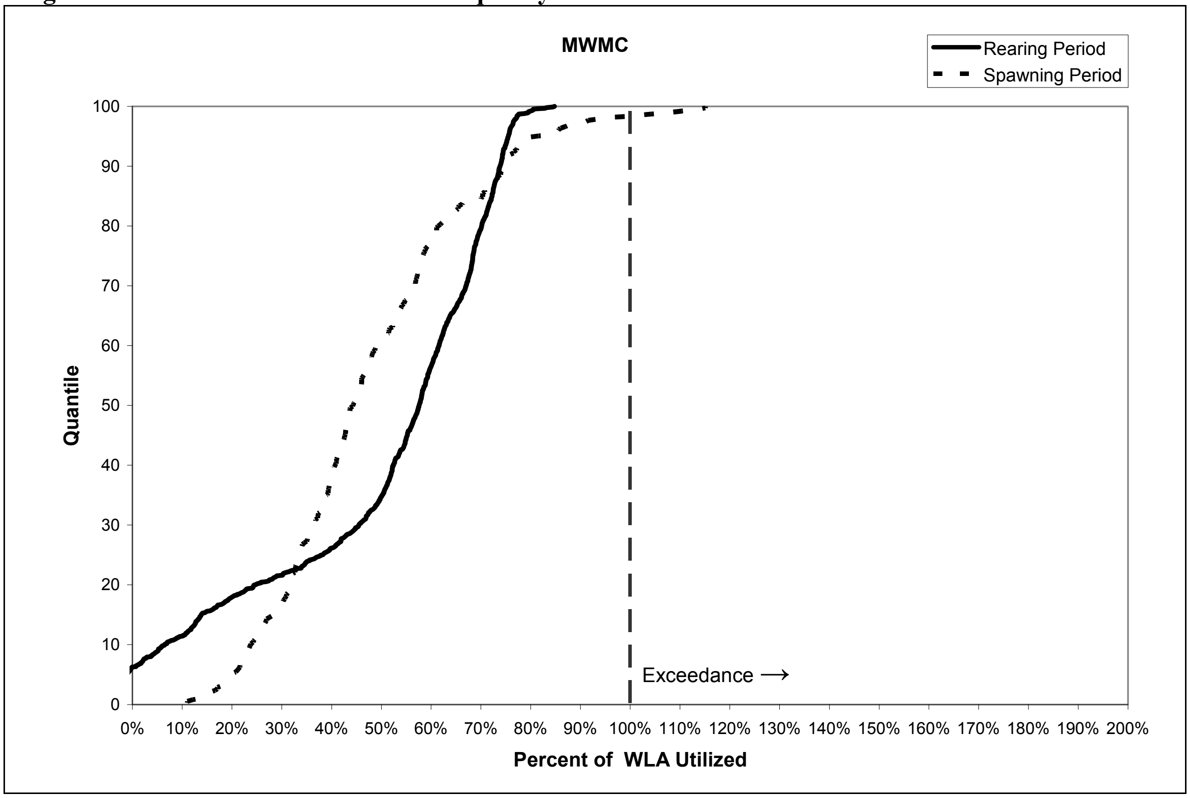


Figure 23 Newberg WWTP WLA utilization frequency distribution.

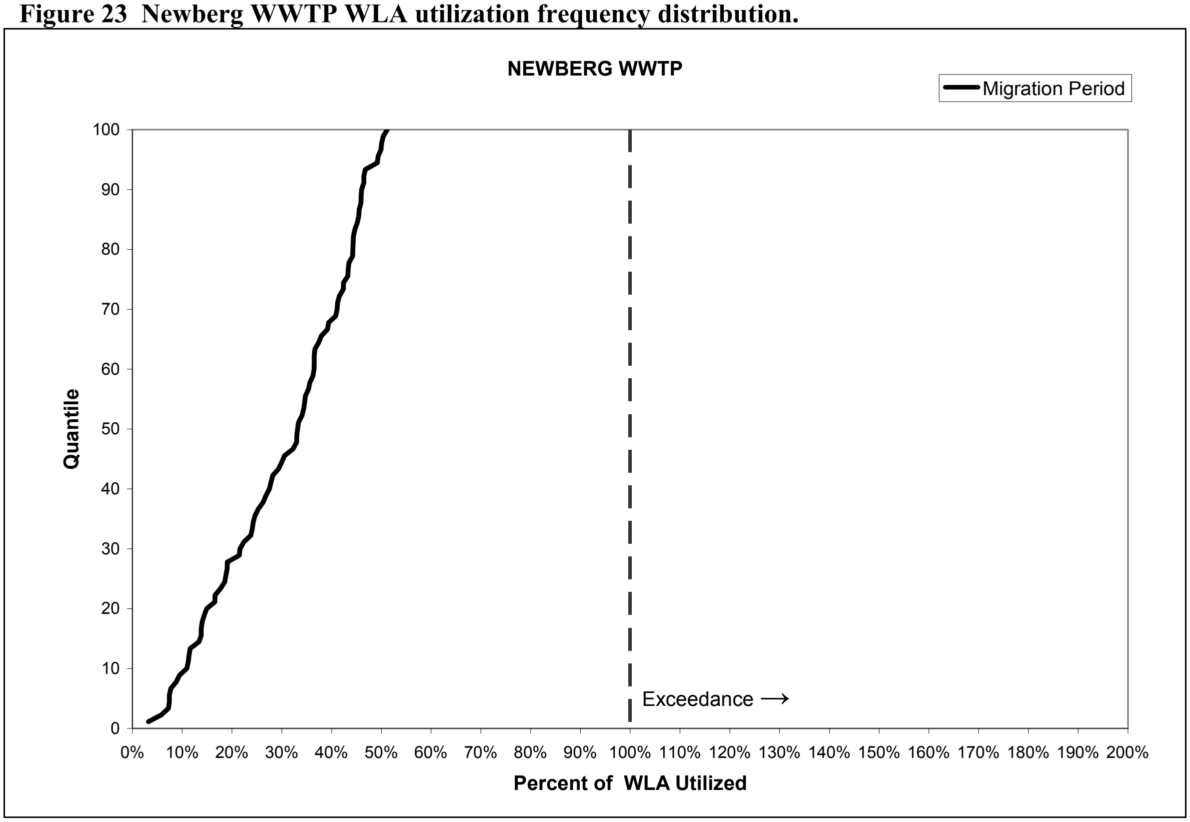


Figure 24 Oak Lodge WWTP WLA utilization frequency distribution.

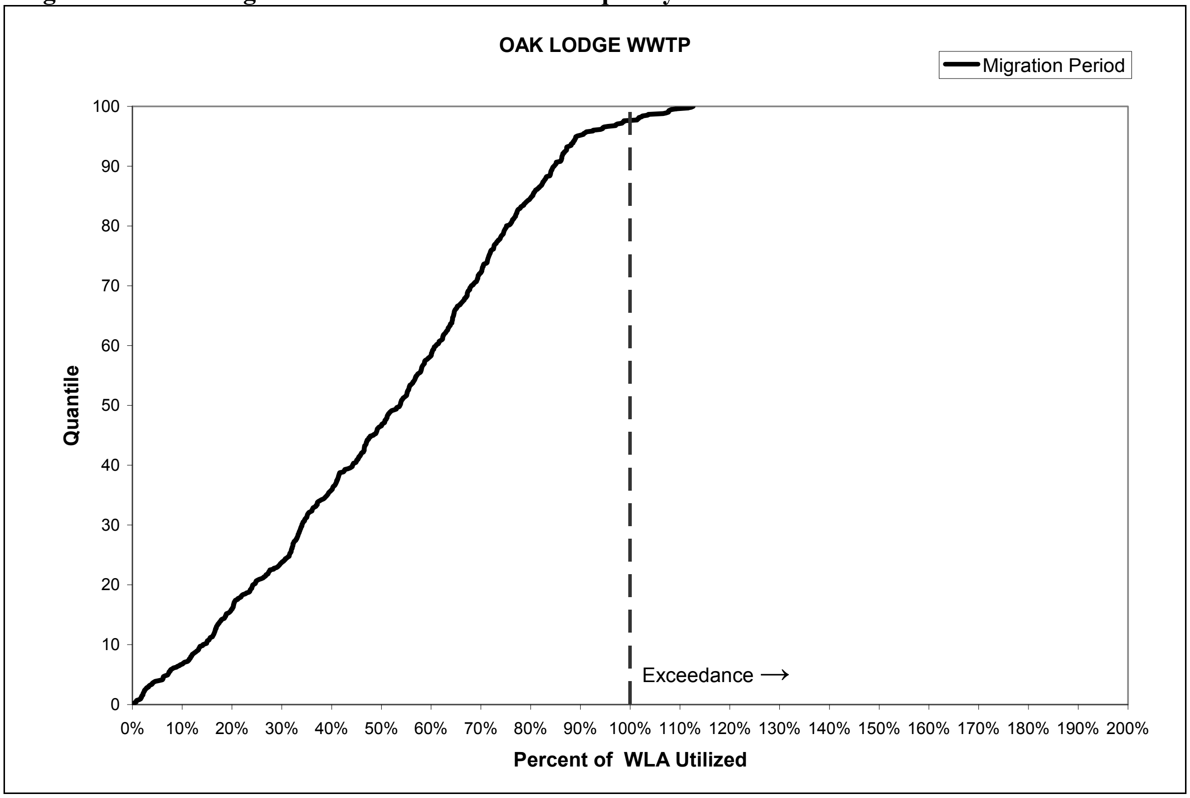


Figure 25 Pope & Talbot WLA utilization frequency distribution.

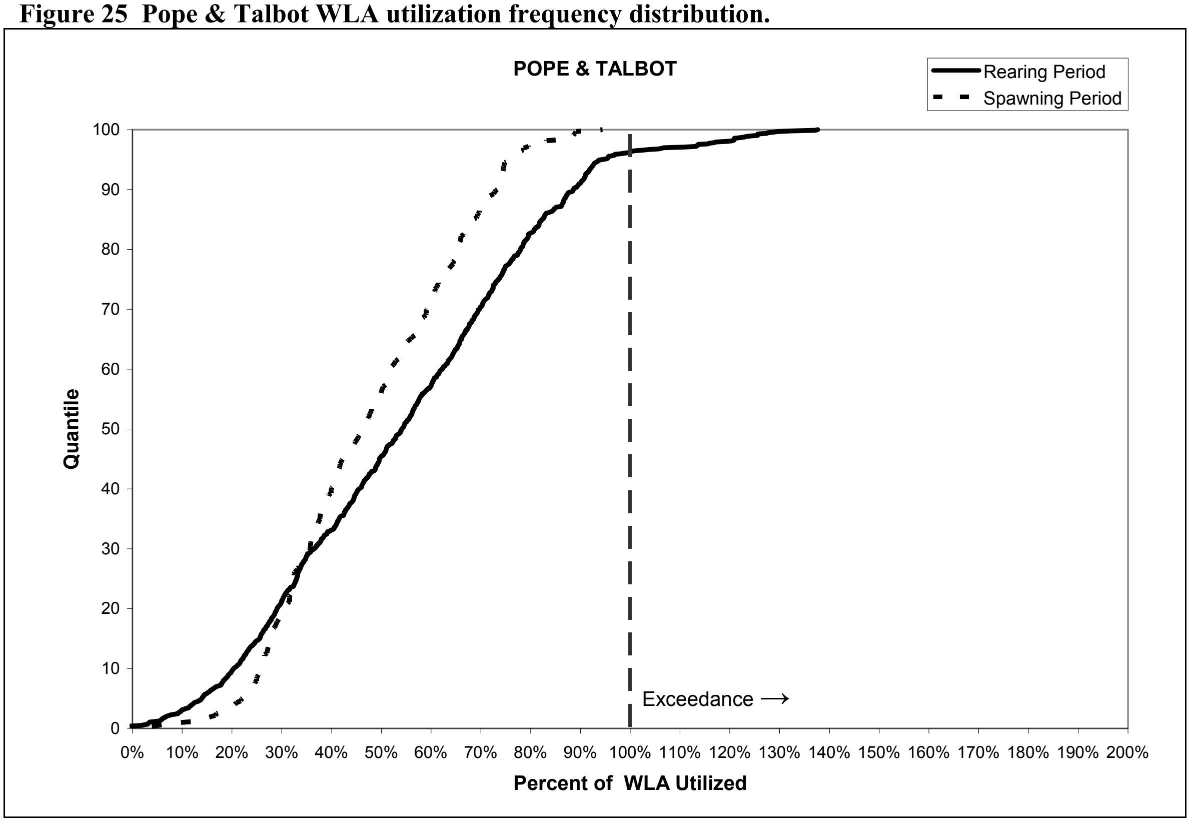


Figure 26 Siltronic WLA utilization frequency distribution.

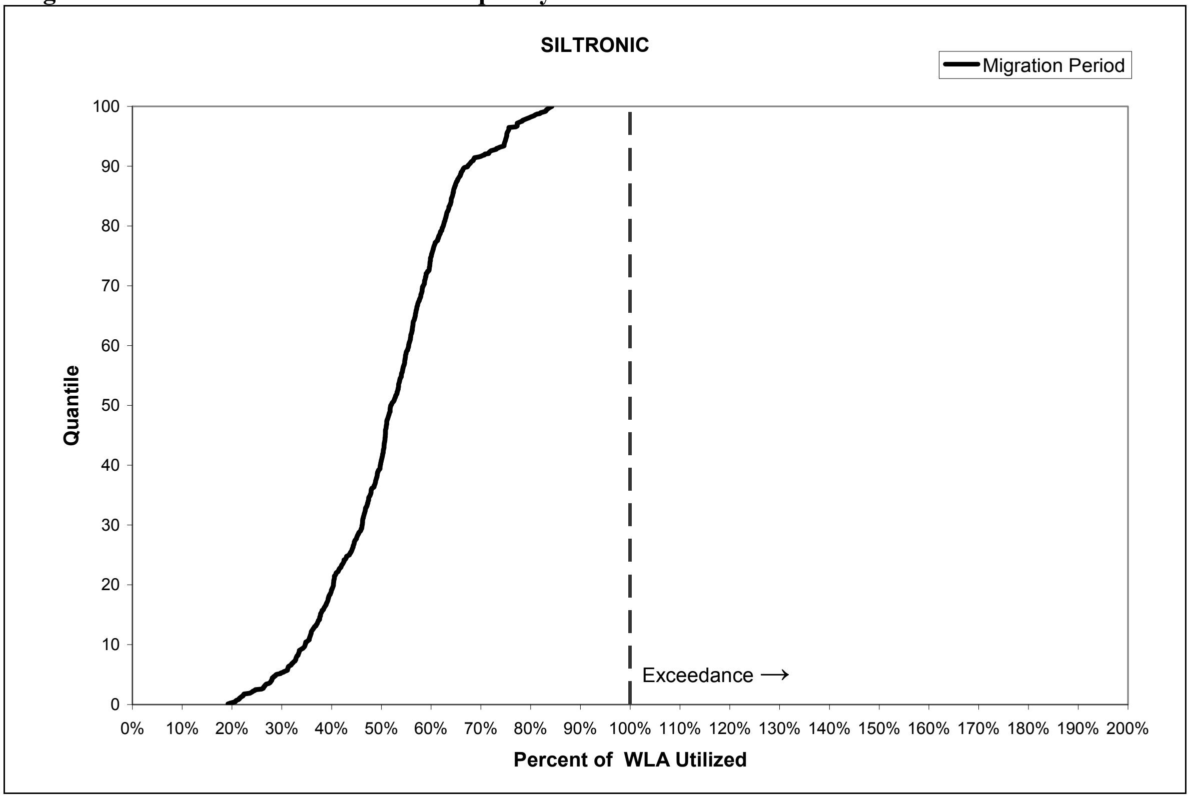


Figure 27 SP Newsprint WLA utilization frequency distribution.

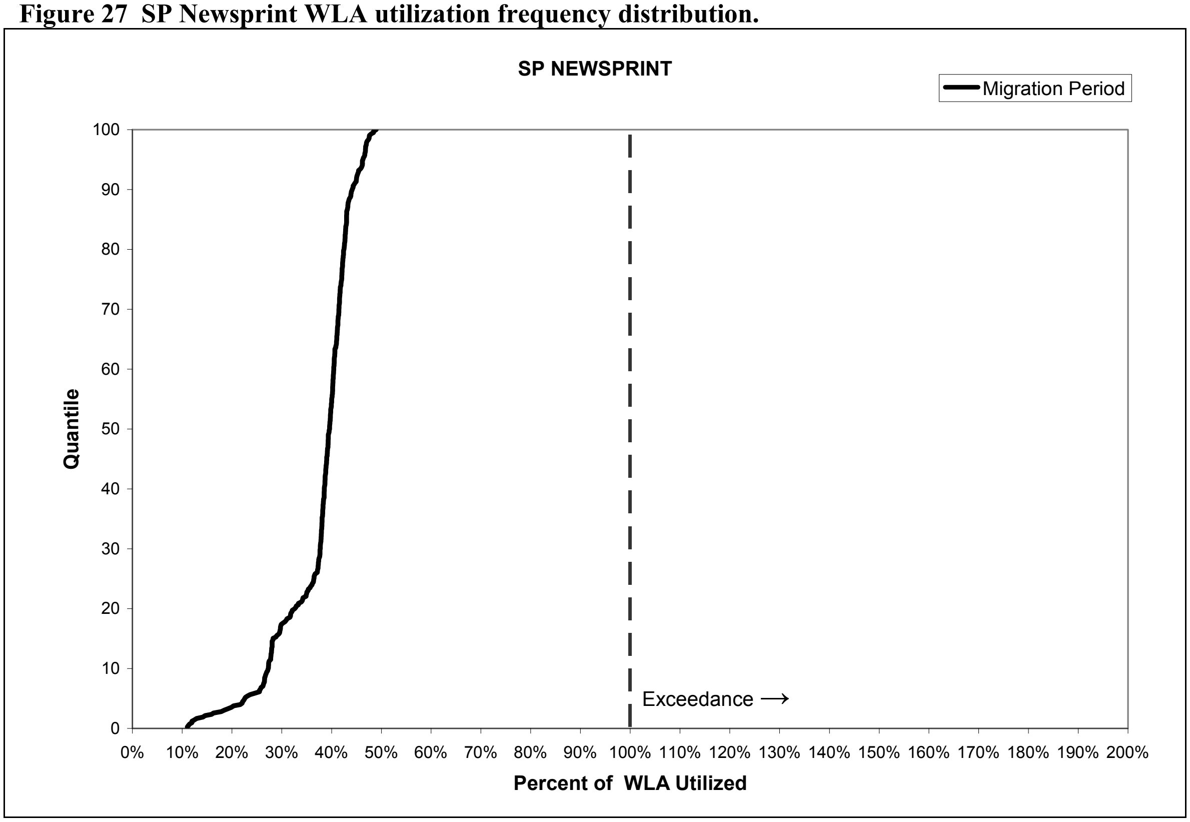


Figure 28 Stayton WWTP WLA utilization frequency distribution.

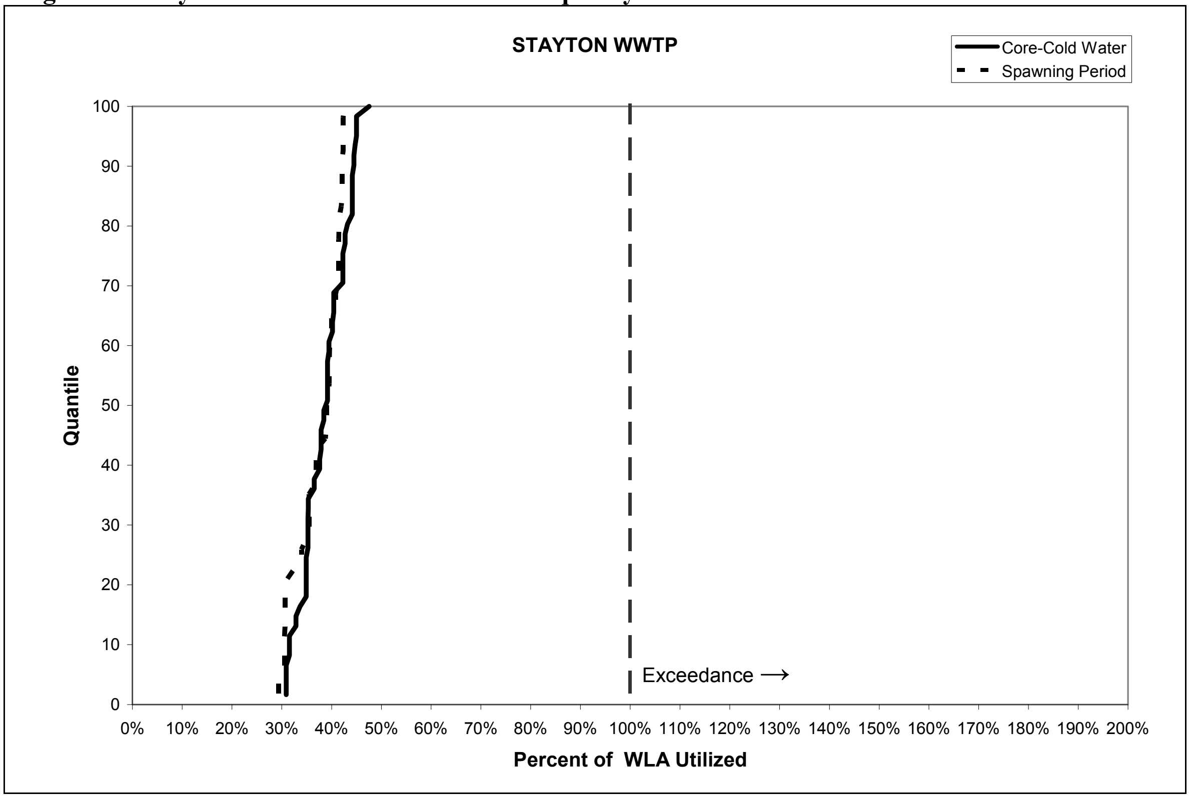


Figure 29 Sweet Home WWTP WLA utilization frequency distribution.

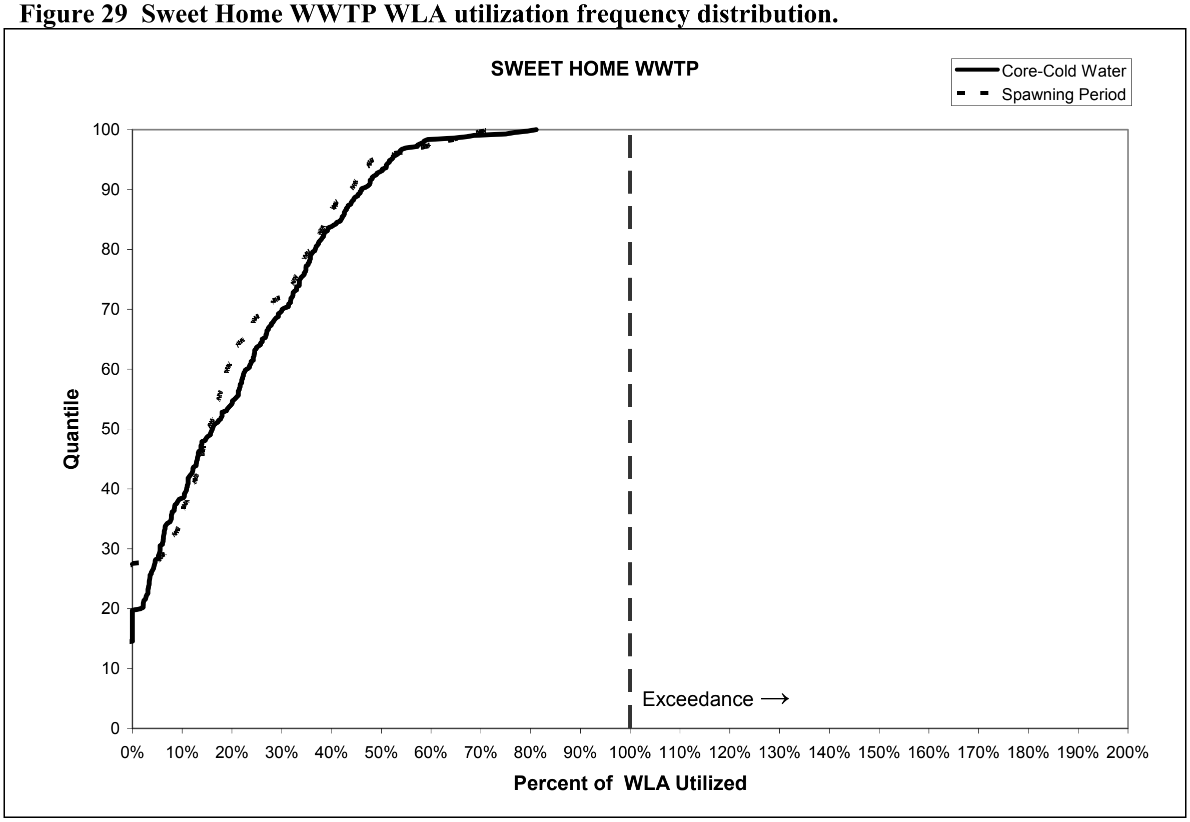


Figure 30 Tri-City WWTP WLA utilization frequency distribution.

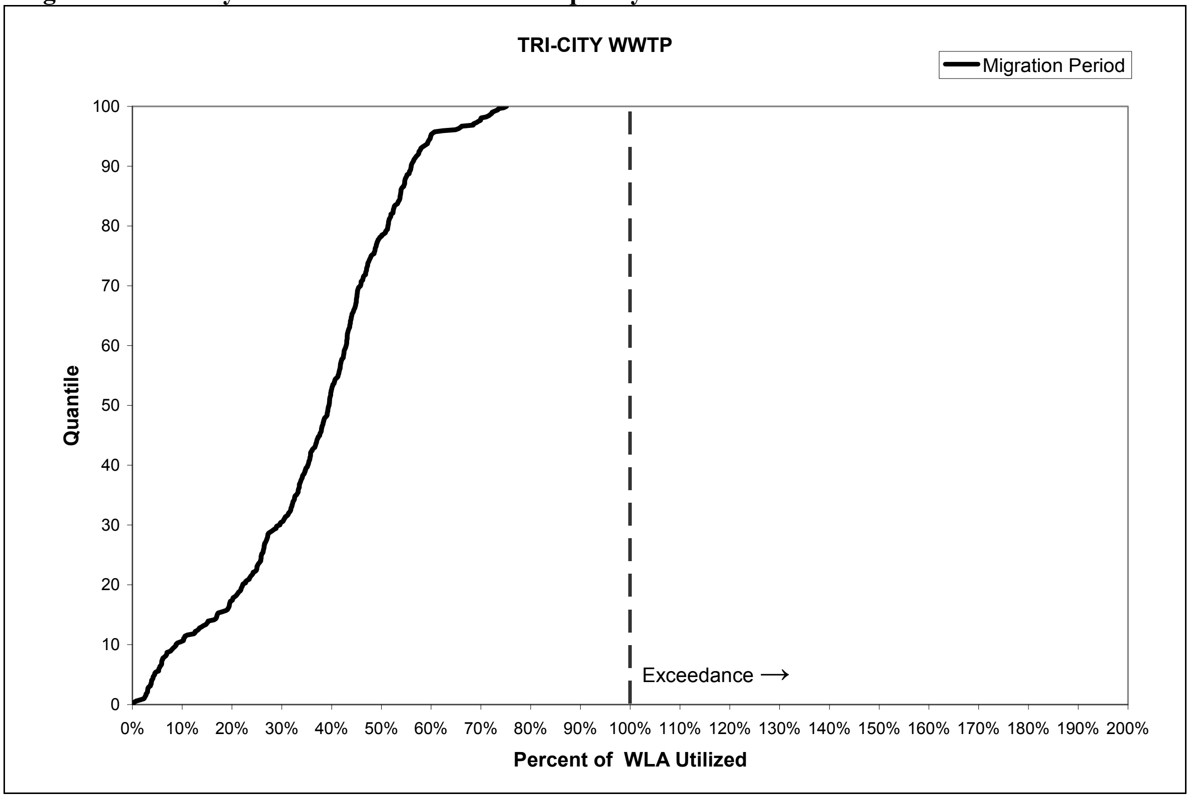


Figure 31 Tryon Creek WWTP WLA utilization frequency distribution.

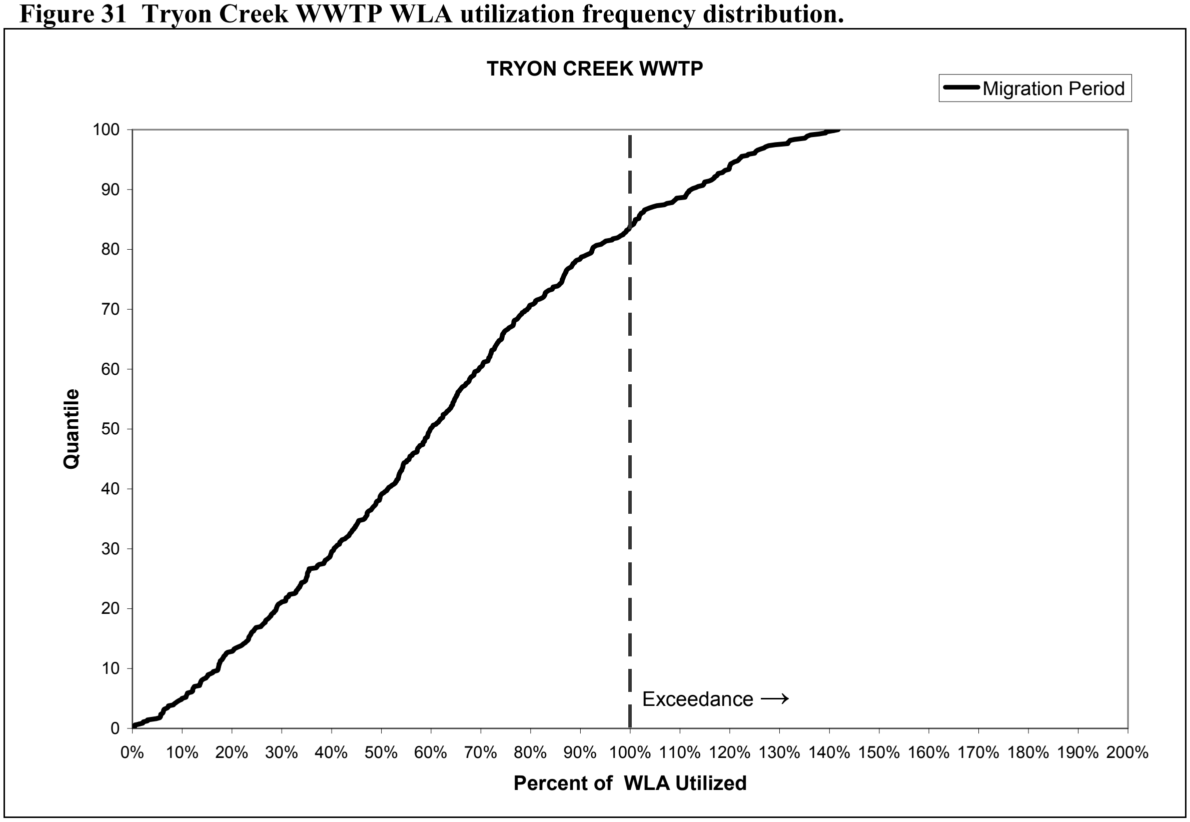


Figure 32 University of Oregon HP WLA utilization frequency distribution.

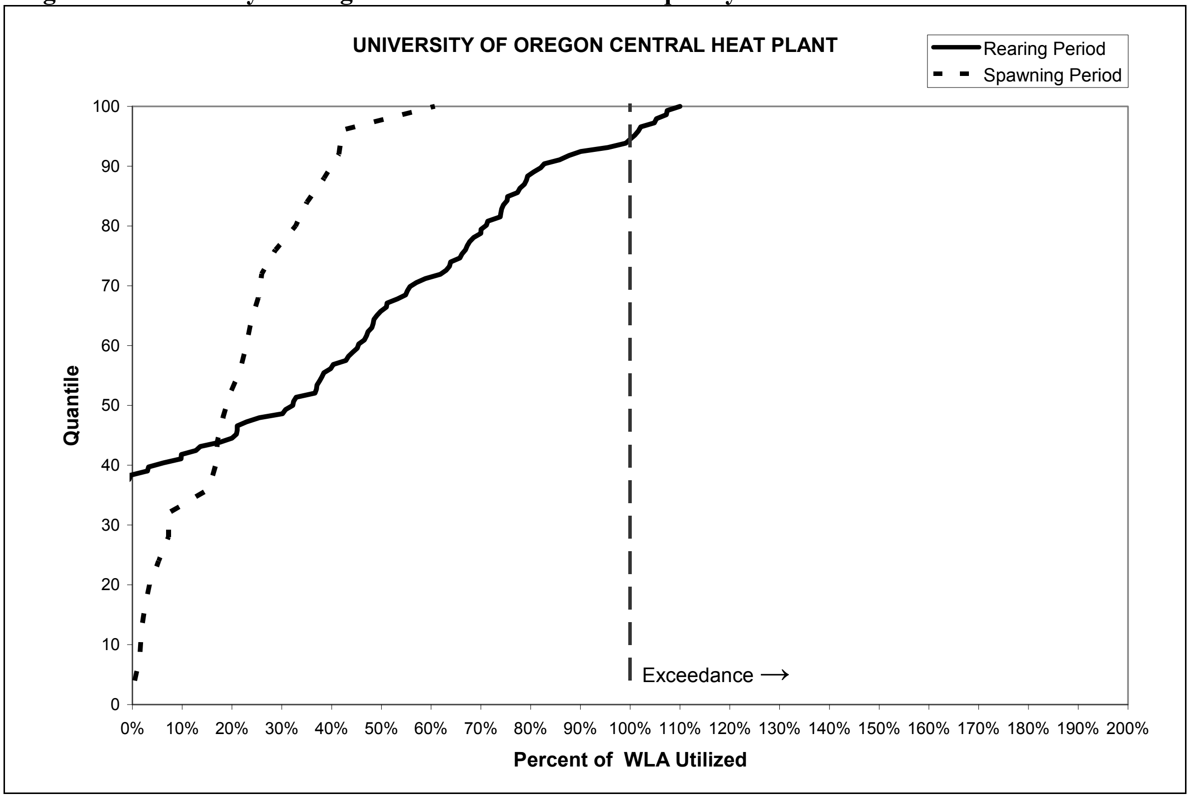


Figure 33 Teledyne Wah Chang WLA utilization frequency distribution.

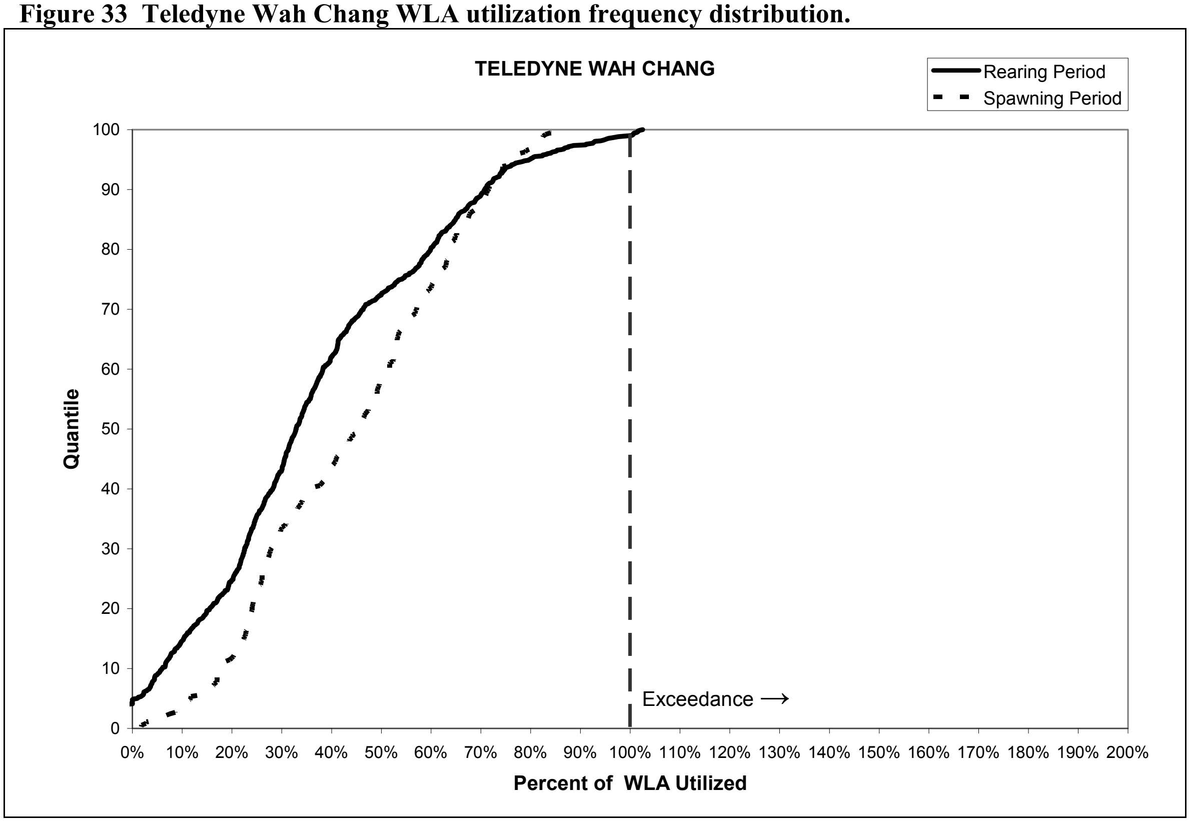


Figure 34 West Linn Paper WLA utilization frequency distribution.

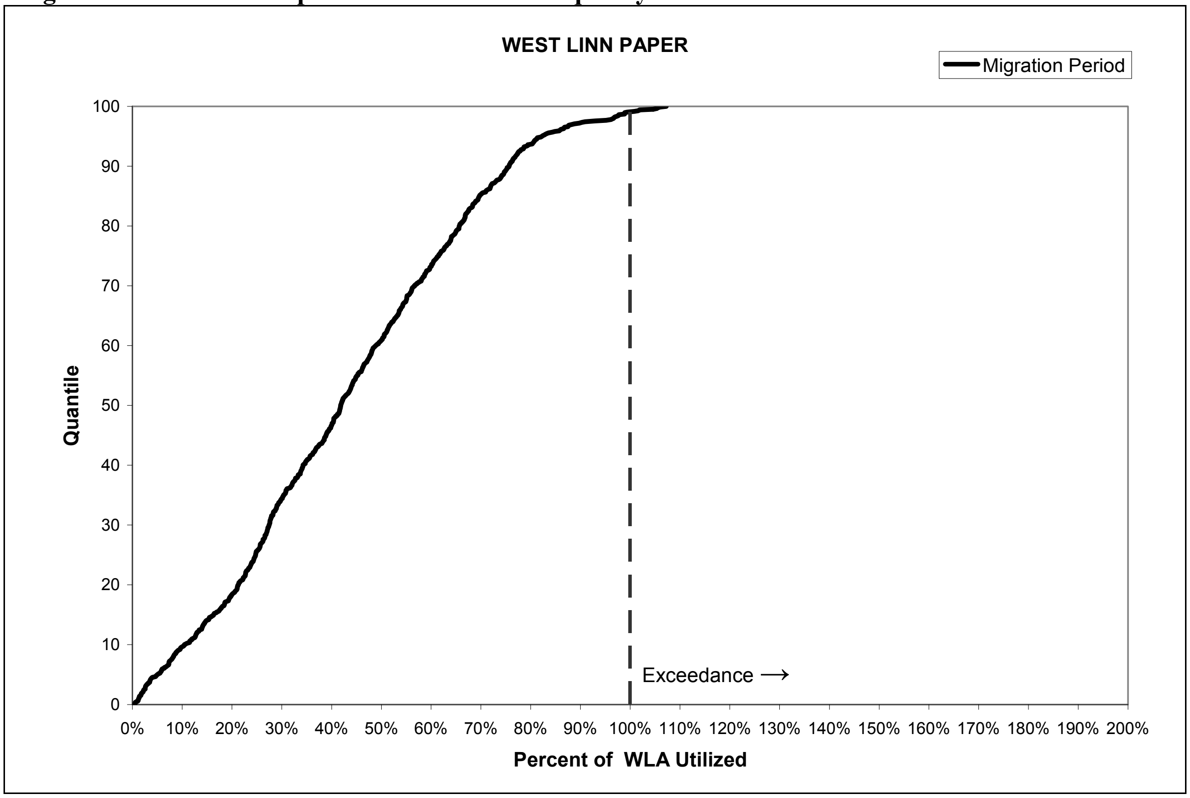


Figure 35 Willow Lake WWTP WLA utilization frequency distribution.

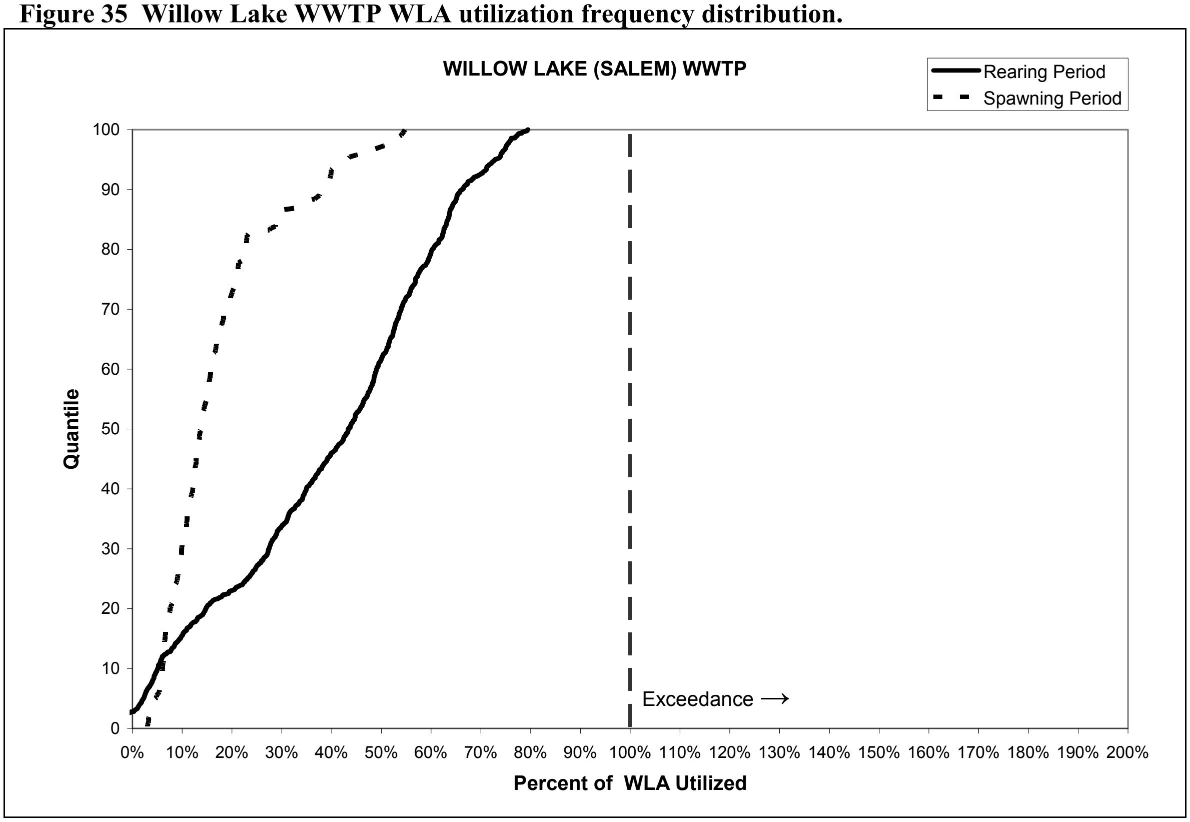
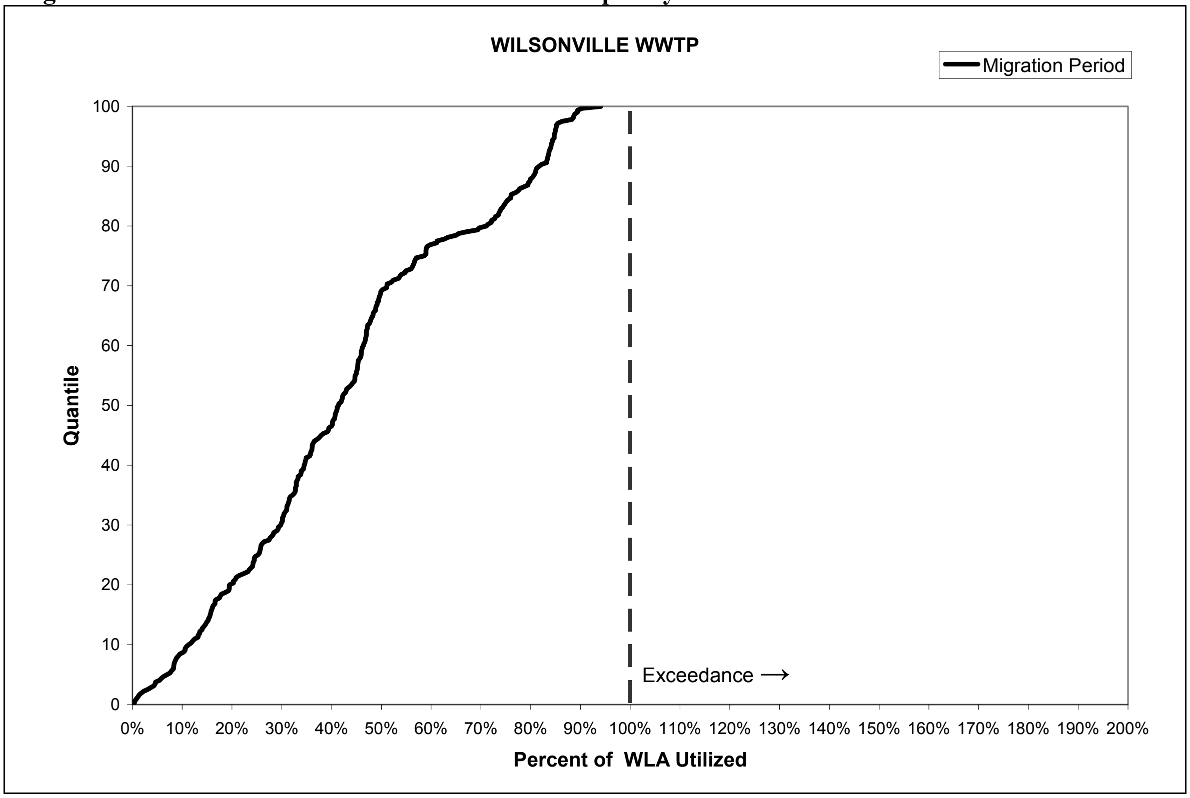


Figure 36 Wilsonville WWTP WLA utilization frequency distribution.



Appendix 3 Calculation of Temporary Reserve Allocations

The equations in this section were used to determine values in **Table 6** and **Table 7**.

$\text{Actual} = Q_{PSC} \cdot k \cdot (T_{PSC} - T_{RC})$ **(Eq. 10)** from (ODEQ 2006)

where,

T_{RC} = The fish use designation period numeric biological temperature criteria (°C).

Q_{PSC} = The rolling seven-day average effluent flow (cfs).

T_{PSC} = The rolling seven-day average maximum effluent temperatures (°C).

Million kilocalories conversion factor: (2.447 million kcals/day °C)

$$k = \frac{1\,\text{ft}^3}{1\,\text{sec}} \cdot \frac{1\,\text{m}^3}{35.31\,\text{ft}^3} \cdot \frac{1000\,\text{kg}}{1\,\text{m}^3} \cdot \frac{86400\,\text{seconds}}{1\,\text{day}} \cdot \frac{1\,\text{kcal}}{1\,\text{kg} \cdot 1\,°\text{C}} \cdot \frac{1\,\text{Million kcals}}{1000000\,\text{kcals}} = 2.447$$

The WLA is calculated using the following equation from the TMDL.

$WLA = d \cdot Q_{PS} \cdot k \cdot (T_{PS} - T_{RC})$ **(Eq. 6)** from (ODEQ 2006)

where,

d = Scaling factor between maximum observed effluent flow and the effluent flow at the river's loading capacity. See Scaling Factor Equation 7 (ODEQ 2006)

T_{PS} = The effluent temperature (°C) that is defined as the maximum observed effluent discharge. This value is a constant.

T_{RC} = The fish use designation period numeric biological temperature criteria (°C).

Q_R = The rolling seven-day average ambient river flow (cfs).

Q_{PS} = The effluent flow (cfs) that is defined as the maximum observed effluent discharge. This value is a constant.

Million kilocalories conversion factor: (2.447 million kcals/day °C)

$$k = \frac{1\,\text{ft}^3}{1\,\text{sec}} \cdot \frac{1\,\text{m}^3}{35.31\,\text{ft}^3} \cdot \frac{1000\,\text{kg}}{1\,\text{m}^3} \cdot \frac{86400\,\text{seconds}}{1\,\text{day}} \cdot \frac{1\,\text{kcal}}{1\,\text{kg} \cdot 1\,°\text{C}} \cdot \frac{1\,\text{Million kcals}}{1000000\,\text{kcals}} = 2.447$$

Maximum Exceedance = Actual - WLA **(Eq. 1)**

The maximum exceedances is the largest exceedance to the WLA during the time period of available effluent data and when WLAs apply.

Multiplier Needed = Actual / WLA **(Eq. 2)**

This multiplier is what is needed to cover the maximum exceedances during the time period of available effluent data.

Percent Available: This value was determined through a series of model runs to verify temporary TRC allocations would comply with the water quality temperature standard. The first iteration started at 100% and was reduced with each model run until no exceedances occurred. USGS's Trading Tool V 1.2 aided in the determination of the percent available.

Available TRC = Maximum Exceedance * Percent Available **(Eq. 3)**

This is the reserve capacity available for temporary allocation.

TRC Multiplier = (WLA + Available TRC) / WLA **(Eq. 4)**

This is the multiplier that is available for allocation of temporary reserve capacity.

Table 6 Calculation of summer use period multipliers.

	Eq. 1	Eq. 10	Eq. 6	Eq. 2		Eq. 3	Eq. 4
Facility	Maximum Exceedance (million kcals/day)	Actual (million kcals/day)	WLA (million kcals/day)	Multiplier Needed	Percent Available	Available TRC (million kcals/day)	TRC Multiplier
Albany WWTP	38.862	162.309	123.447	1.315	92%	35.753	1.290
Blue Heron	No Exceedance	n/a	n/a	none	n/a	n/a	none
Corvallis WWTP	27.373	161.712	134.339	1.204	92%	25.183	1.187
Cottage Groove WWTP	0.894	11.541	10.647	1.084	92%	0.822	1.077
Evanite	8.222	24.170	15.948	1.516	92%	7.564	1.474
GP Halsey (Fort James)	No Exceedance	n/a	n/a	none	n/a	n/a	none
IP(Weyerhaeuser) Albany	114.196	451.304	337.108	1.339	92%	105.060	1.312
IP (Weyerhaeuser) Springfield	134.697	1230.421	1095.724	1.123	0%	0.000	none
Jefferson WWTP	No Exceedance	n/a	n/a	none	n/a	n/a	none
Kellogg Creek WWTP	No Exceedance	n/a	n/a	none	n/a	n/a	none
Lebanon WWTP	No Exceedance	n/a	n/a	none	n/a	n/a	none
MWMC	No Exceedance	n/a	n/a	none	n/a	n/a	none
Newberg WWTP	No Exceedance	n/a	n/a	none	n/a	n/a	none
Oak Lodge WWTP	5.534	49.270	43.736	1.127	100%	5.534	1.127
ODFW Clackamas Fish Hatchery	Unknown/No data	no data	n/a	n/a	n/a	n/a	none
Pope Talbot	163.487	597.818	434.331	1.376	92%	150.408	1.346
Siltronic	No Exceedance	n/a	n/a	none	n/a	n/a	none
SP Newsprint	No Exceedance	n/a	n/a	none	n/a	n/a	none
Stayton WWTP	No Exceedance	n/a	n/a	none	n/a	n/a	none
Sweet Home WWTP	No Exceedance	n/a	n/a	none	n/a	n/a	none
Teledyne Wah Chang	2.893	117.181	114.288	1.025	92%	2.661	1.023
Tri City WWTP	No Exceedance	n/a	n/a	none	n/a	n/a	none
Tryon Creek WWTP	23.962	81.310	57.347	1.418	100%	23.962	1.418
University of Oregon	21.214	233.672	212.458	1.100	92%	19.517	1.092
West Linn Paper	14.294	211.294	197.000	1.073	100%	14.294	1.073
Willow Lake WWTP	No Exceedance	n/a	n/a	none	n/a	n/a	none
Wilsonville WWTP	No Exceedance	n/a	n/a	none	n/a	n/a	none

Table 7 Calculation of spawning use period multipliers.

	Eq. 1	Eq. 10	Eq. 6	Eq. 2		Eq. 3	Eq. 4
Facility	Maximum Exceedance (million kcals/day)	Actual (million kcals/day)	WLA (million kcals/day)	Multiplier Needed	Percent Available	Available TRC (million kcals/day)	TRC Multiplier
Albany WWTP	12.046	197.333	185.287	1.065	100%	12.046	1.065
Blue Heron	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Corvallis WWTP	No Exceedance	n/a	n/a	none	n/a	n/a	none
Cottage Groove WWTP	No Exceedance	n/a	n/a	none	n/a	n/a	none
Evanite	No Exceedance	n/a	n/a	none	n/a	n/a	none
GP Halsey (Fort James)	35.609	191.530	155.921	1.228	100%	35.609	1.228
IP(Weyerhaeuser) Albany	241.303	581.102	339.799	1.710	100%	241.303	1.710
IP (Weyerhaeuser) Springfield	477.287	1441.896	964.608	1.495	0%	0	none
Jefferson WWTP	Unknown/No data	no data	n/a	n/a	n/a	n/a	none
Kellogg Creek WWTP	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lebanon WWTP	No Exceedance	n/a	n/a	n/a	n/a	n/a	none
MWMC	91.657	698.606	606.949	1.151	100%	91.657	1.151
Newberg WWTP	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Oak Lodge WWTP	n/a	n/a	n/a	n/a	n/a	n/a	n/a
ODFW Clackamas Fish Hatchery	Unknown/No data	no data	n/a	n/a	n/a	n/a	none
Pope Talbot	No Exceedance	n/a	n/a	none	n/a	n/a	none
Siltronic	n/a	n/a	n/a	n/a	n/a	n/a	n/a
SP Newsprint	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Stayton WWTP	No Exceedance	n/a	n/a	none	n/a	n/a	none
Sweet Home WWTP	No Exceedance	n/a	n/a	none	n/a	n/a	none
Teledyne Wah Chang	No Exceedance	n/a	n/a	none	n/a	n/a	none
Tri City WWTP	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Tryon Creek WWTP	n/a	n/a	n/a	n/a	n/a	n/a	n/a
University of Oregon	No Exceedance	n/a	n/a	none	n/a	n/a	none
West Linn Paper	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Willow Lake WWTP	No Exceedance	n/a	n/a	none	n/a	n/a	none
Wilsonville WWTP	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Appendix 4 Allocation Transfers

It may be desirable to transfer temporary reserve capacity allocations. One such scenario was explored in which Evanite's summer use period temporary reserve capacity allocation was transferred to the City of Albany. A temperature trading tool (Rounds 2009) was used to calculate a combined multiplier of 1.362. Using the combined multiplier, the model predicts the cumulative temperature increases will not exceed the human use allowance allocation (**Figure 37**). If such a scenario were to be implemented, the summer use period multiplier for the City of Albany would be 1.362, no multiplier for Evanite, and the multipliers described in **Table 6** for other sources. For other transfer scenarios, a similar methodology should be utilized to verify the human use allowance is not exceeded.

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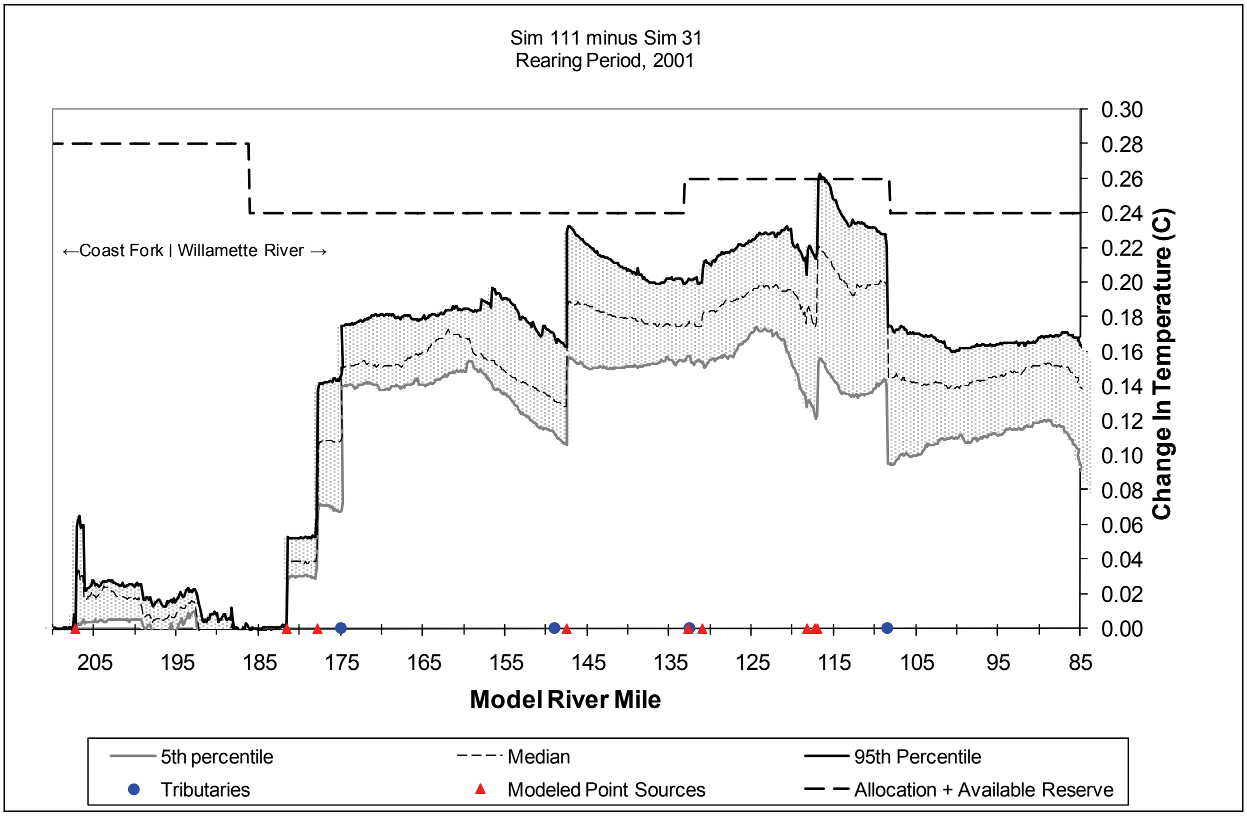
Figure 37 Impacts from WLAs plus temporary reserve capacity with an Evanite/City of Albany allocation transfer.



Appendix 5 References

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Rounds S, 2009. Trading Tool version 1.5. Accessed at http://or.water.usgs.gov/proj/will_temp/trading_tool.html U.S. Department of the Interior, U.S. Geological Survey, Portland, OR.