

# Migratory Behavior in the Sammamish River 1998 - 2000

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# Migratory Behavior of Adult Chinook Salmon in the Lake Washington Watershed

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# Methodology

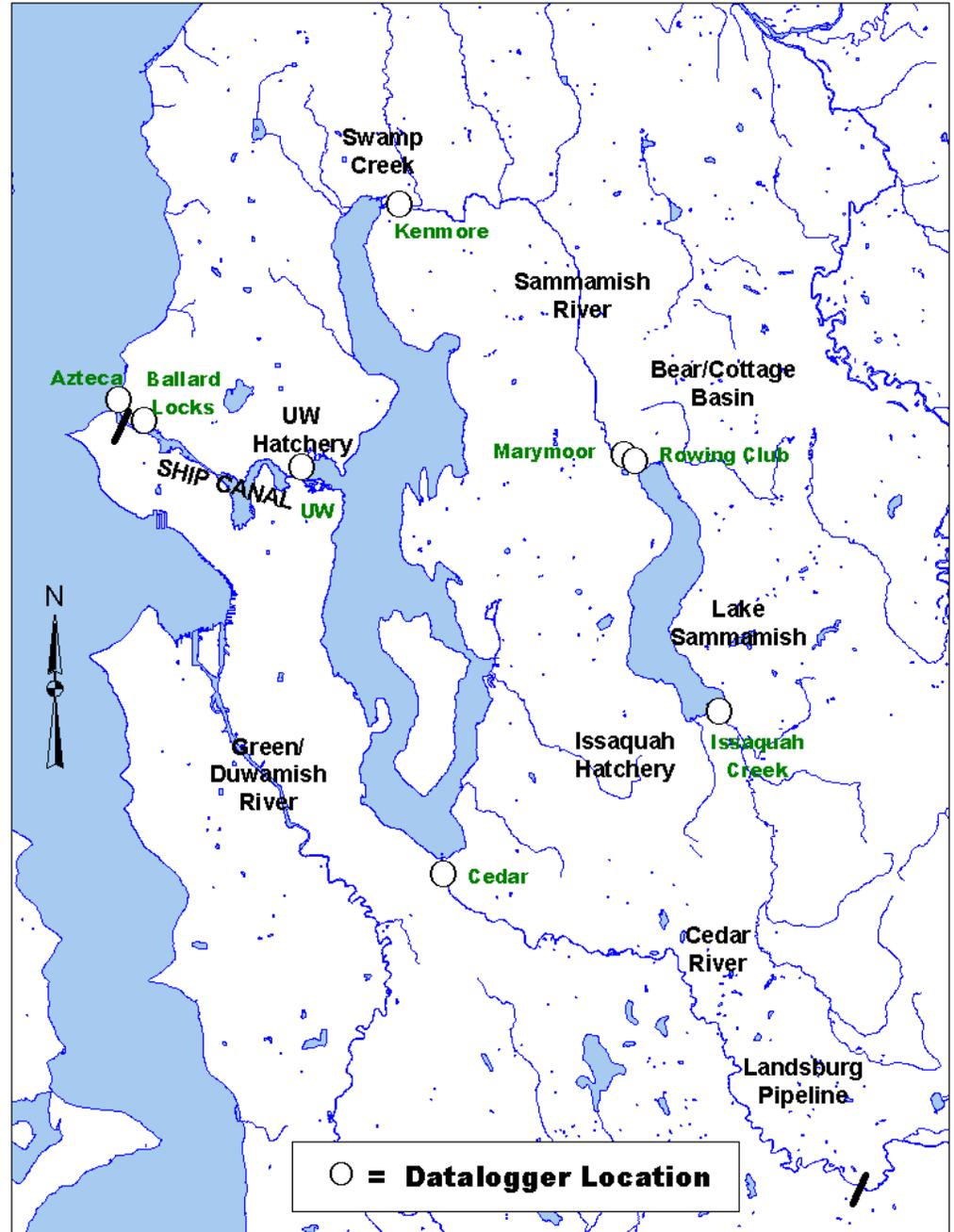
- Study conducted 1998 - 2000
- Capture chinook at Ballard Locks
- Implant Ultrasonic tag in stomach
- Fixed dataloggers throughout watershed
- Mobile tracking with emphasis on Sammamish R, Locks, Lake Washington
- Collection of temperature and other environmental data concurrently

# Objectives

- Collect basic information on migratory behavior; such as transit times, depth selection, lake/river migration patterns
- Determine relationships to temperature and other environmental factors
- Location of major holding areas in the Sammamish River and other areas.

# Lake Washington Watershed

## Adult Chinook Study Area 1998 - 2000



## Sammamish River Mobile Sampling Dates

	<u>1998</u>	<u>1999</u>	<u>2000</u>
Aug. 1-7			
8-14		8-Aug MM Pool to Bothell Landing	
15-21		18-Aug Entire River	
22-30		25-Aug Entire River	
Sept. 1-7	4-Sep Lower river to west end of golf course	1-Sep Entire River	6-Sep Entire River
8-14	8-Sep Marymoor and lower 0.6 miles	8-Sep Entire River	
	9-Sep Boat ramp to Little Bear Cr.	9-Sep Marymoor Pool	
	14-Sep Marymoor and Redmond sites	14-Sep Entire River	15-Sep Entire River
15-21	16-Sep Entire river	17-Sep Marymoor Pool	
22-30	23-Sep Major sites	22-Sep Entire River	
	29-Sep Major sites	29-Sep Entire River	29-Sep Entire River
Oct. 1-7	5-Oct Major sites		
8-14	8-Oct Entire river		
	13-Oct Marymoor		
15-21	14-Oct Marymoor		
	19-Oct Major sites		
22-30		22-Oct Entire River	

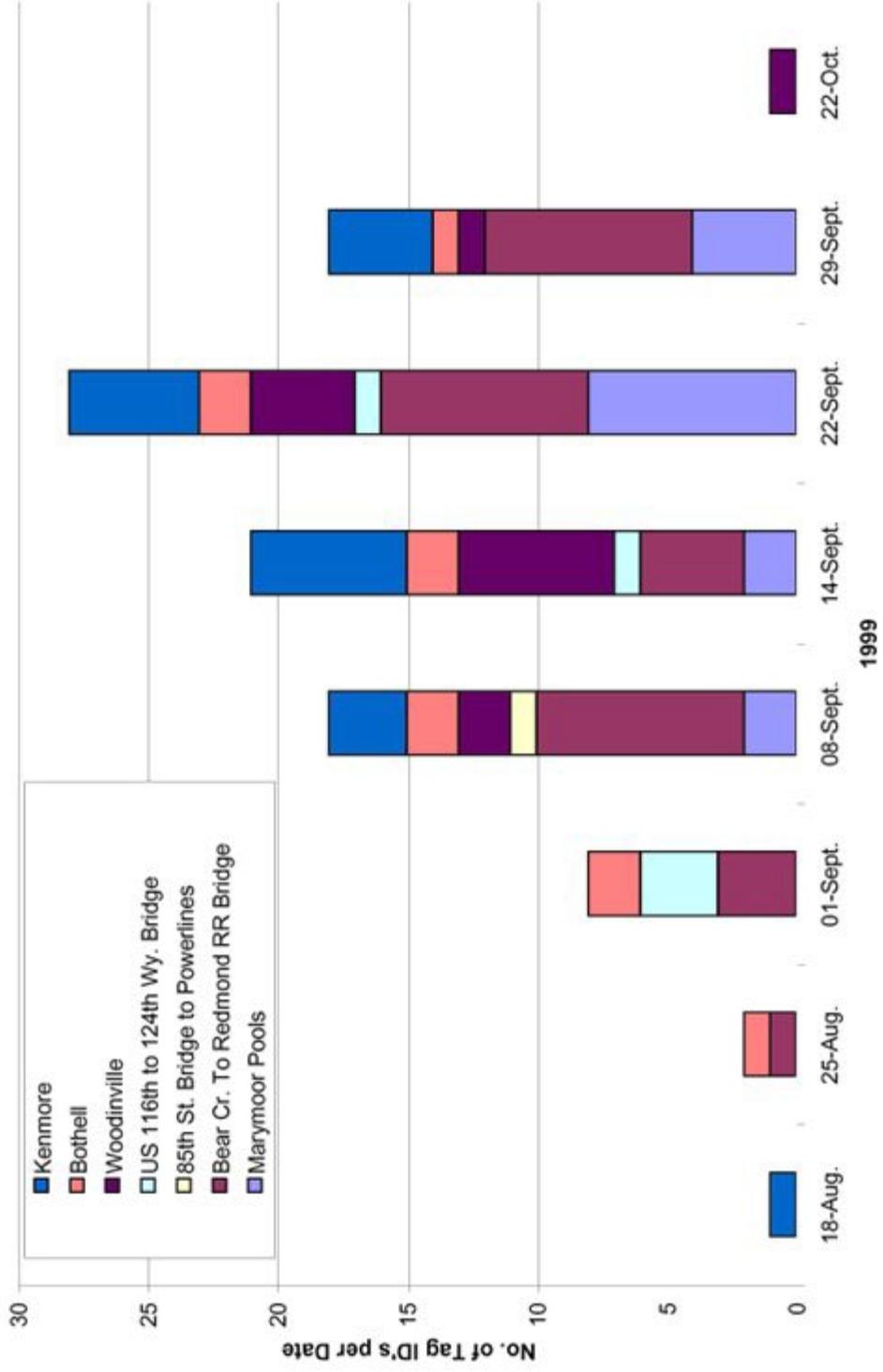
# Sammamish River Adult Tagging Study

Years: 1998 - 2000

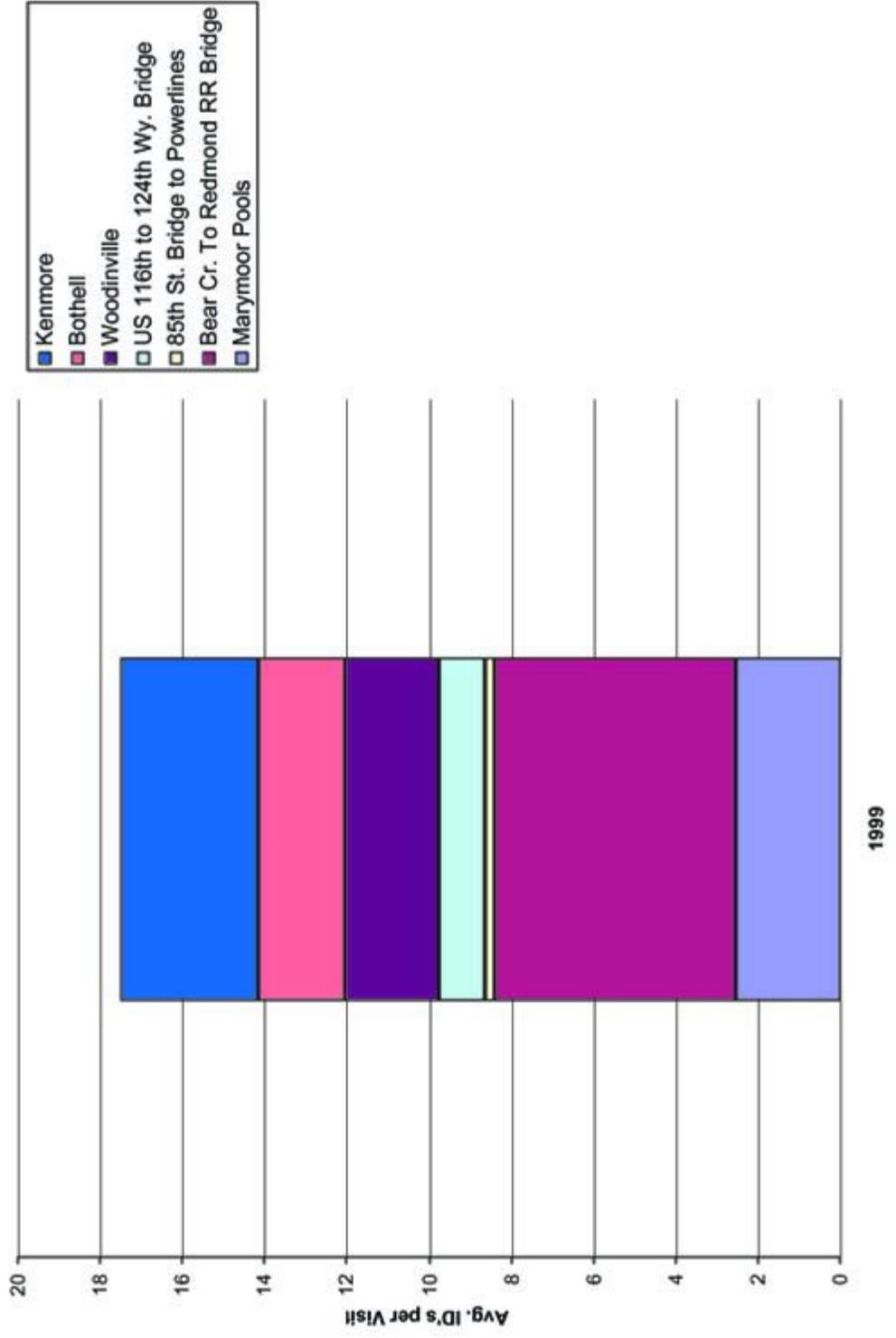
All Sites with acoustic tags

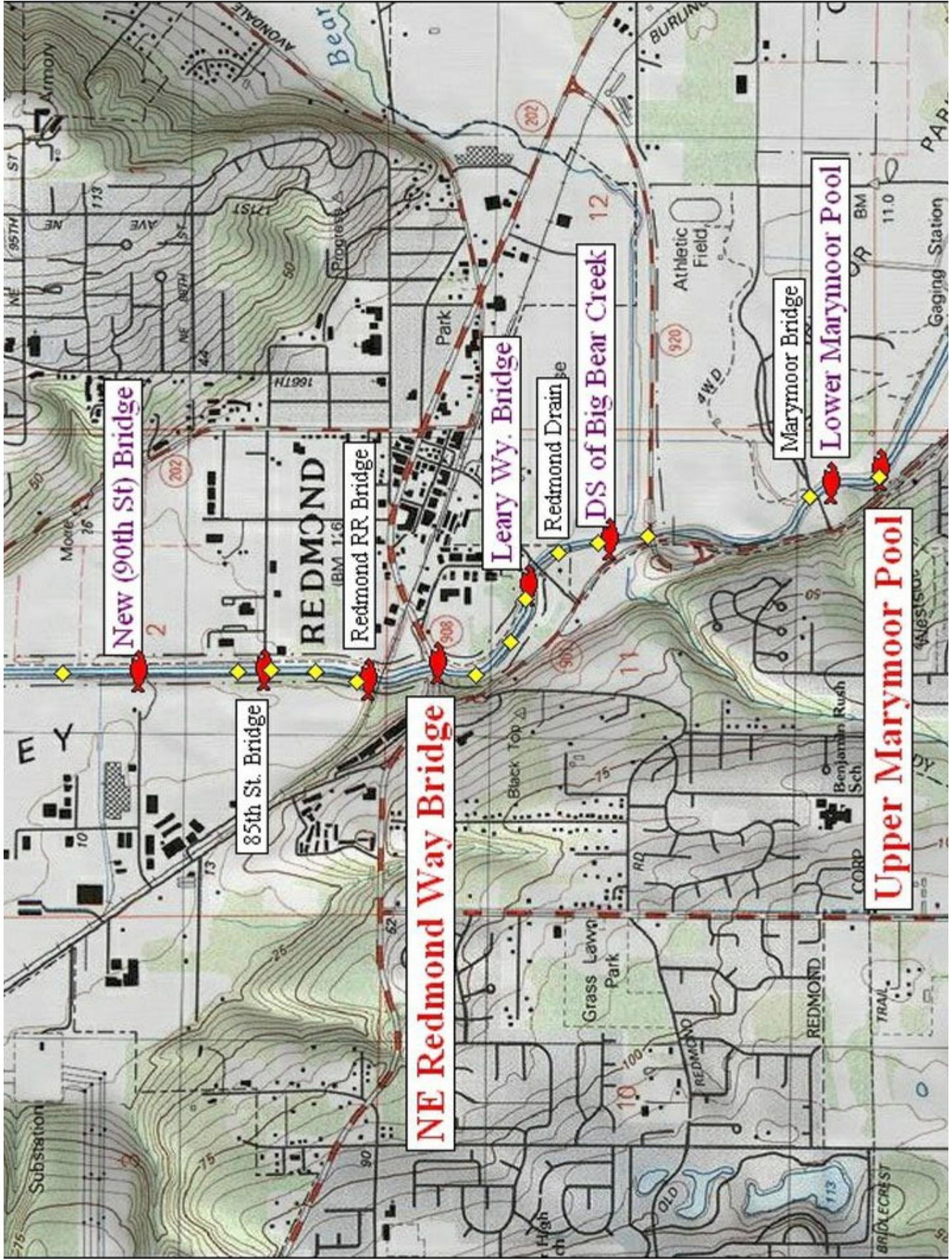
98 Sta. No.	Reach	Site Name	Avg. Det. Per Visit			Annual Percent Detections					
			98-00 #/N	1998 #/N	1999 #/N	2000 #/N	98-00	1998	1999	2000	
		<b>Marymoor Pools</b>									
A1		Upper pool	<b>3.17</b>	<b>5</b>	<b>2.5</b>	<b>2</b>	<b>0.56</b>	<b>0.92</b>	<b>0.25</b>	<b>0.50</b>	<b>0.50</b>
A2		Lower pool	2.17	2	2.5	2	0.83	1.00	0.50	1.00	1.00
		<b>Bear Cr. To Redmond RR Bridge</b>									
A3		Bear Creek	<b>3.29</b>	<b>0.3</b>	<b>5.9</b>	<b>3.7</b>	<b>0.25</b>	<b>0.04</b>	<b>0.47</b>	<b>0.25</b>	<b>0.25</b>
		Leary Way Bridge	0.47	0	0.75	0.67	0.24	0.00	0.38	0.33	0.33
		NE Redmond Way Bridge	0.54	0	1.63	0	0.21	0.00	0.63	0.00	0.00
A4		Redmond RR Bridge	2.19	0.33	3.25	3	0.53	0.17	0.75	0.67	0.67
		<b>85th St. Bridge to Powerlines</b>									
		85th St. Bridge	0.08	0	0.25	0	0.04	0.00	0.13	0.00	0.00
		New (90th) Bridge	0.44	0	0	1.33	0.22	0.00	0.00	0.67	0.67
		<b>US 116th to 124th Wy. Bridge</b>									
		US 116th St. Bridge	<b>1.04</b>	<b>0</b>	<b>1.1</b>	<b>2</b>	<b>0.14</b>	<b>0.00</b>	<b>0.25</b>	<b>0.17</b>	<b>0.17</b>
		124th Wy. Bridge	0.08	0	0.25	0	0.04	0.00	0.13	0.00	0.00
		<b>Woodinville</b>									
A5		Redhook Hole	0.96	0	0.88	2	0.24	0.00	0.38	0.33	0.33
		Woodinville RR Bridge	<b>1.86</b>	<b>1.3</b>	<b>2.3</b>	<b>2</b>	<b>0.38</b>	<b>0.33</b>	<b>0.31</b>	<b>0.50</b>	<b>0.50</b>
		<b>Bothell</b>									
		Upper Trail Bridge	1.64	1.33	2.25	1.33	0.65	0.67	0.63	0.67	0.67
A6		Bothell Landing Bridge	0.22	0	0	0.67	0.11	0.00	0.00	0.33	0.33
A7		Bothell RR Bridge	<b>1.60</b>	<b>1</b>	<b>2.1</b>	<b>1.7</b>	<b>0.25</b>	<b>0.22</b>	<b>0.29</b>	<b>0.22</b>	<b>0.22</b>
A8			1.40	0.67	1.88	1.67	0.58	0.33	0.75	0.67	0.67
		<b>Kenmore</b>									
		Golf Course	0.06	0.17	0	0	0.06	0.17	0.00	0.00	0.00
		US of Swamp Creek	0.14	0.17	0.25	0	0.10	0.17	0.13	0.00	0.00
		Swamp Creek	<b>2.10</b>	<b>0.8</b>	<b>3.4</b>	<b>0</b>	<b>0.18</b>	<b>0.11</b>	<b>0.25</b>	<b>0.25</b>	<b>0.25</b>
A9		Kenmore Boat Landing	0.13	0	0.25	0	0.06	0.00	0.13	0.13	0.13
			0.31	0	0.63	0	0.13	0.00	0.25	0.25	0.25
			1.54	0.83	2.25	0.25	0.42	0.33	0.50	0.50	0.50
			0.25	0.25	0.25	0.25	0.13	0.13	0.13	0.13	0.13

# Sammamish R. Adult Tracking



# Sammamish R. Adult Tracking





New (90th St) Bridge

85th St. Bridge

NE Redmond Way Bridge

Redmond RR Bridge

Leary Wy. Bridge

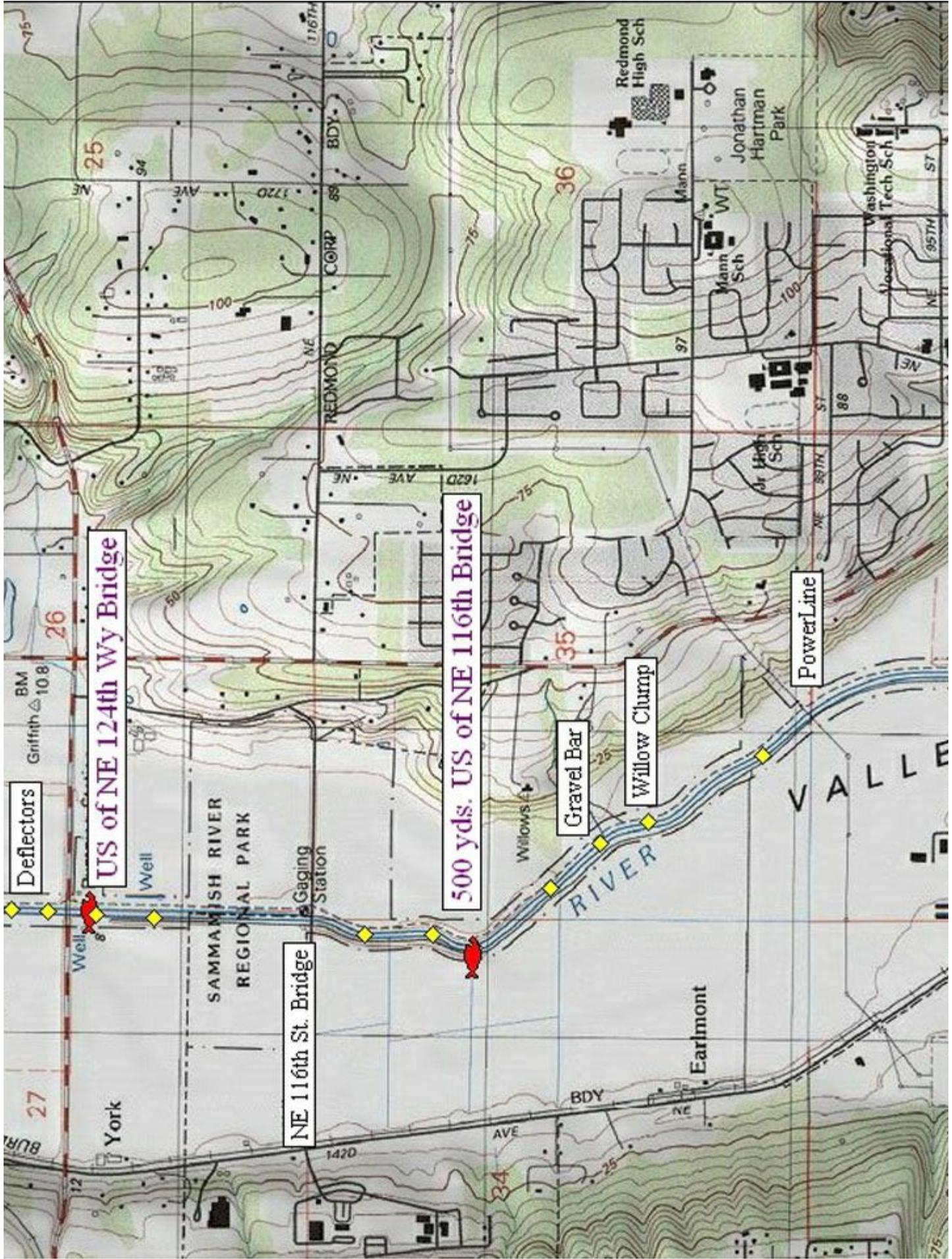
Redmond Drainage

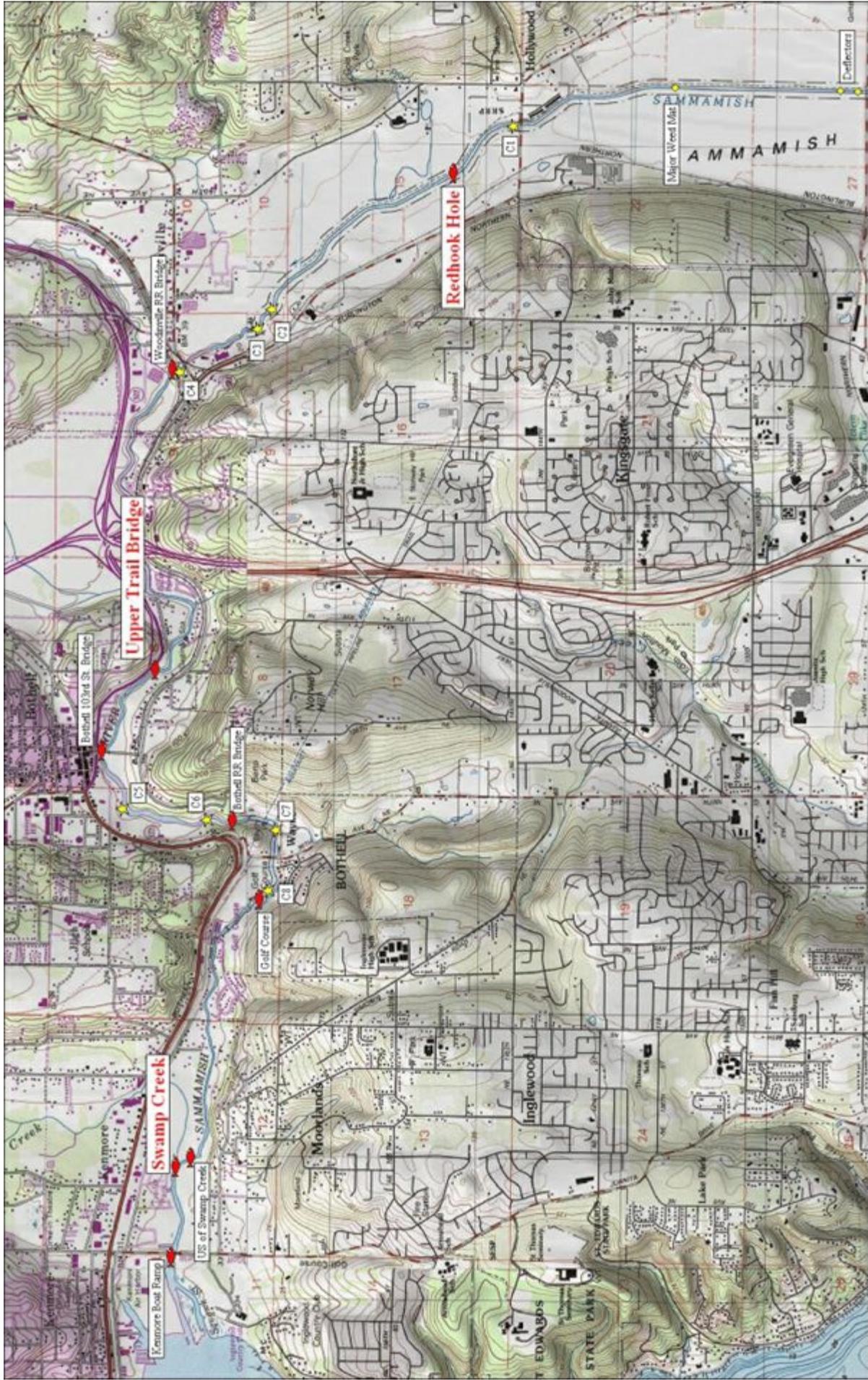
DS of Big Bear Creek

Upper Marymoor Pool

Marymoor Bridge

Lower Marymoor Pool





Scale: 1:50,000  
 1000 METERS  
 1000 FEET  
 Printed from TOPOI ©2000 National Geographic Holdings (www.topo.com)

34° 15' N  
 122° 15' W

# Upper Marymoor Pool



# Redmond Drain



# DS Leary Bridge



# DS Leary Bridge



# Redmond Way Bridge



# NE 90th (New) Bridge



# NE 90th (New) Bridge



# DS of NE 90th Bridge



# 124th Bridge & Deflectors



# Redhook Hole



# Ranking of Holding Sites 98-00

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>40 Percent

20-40 Percent

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Upper Marymoor Pool

Lower Marymoor Pool\*

NE Redmond Wy. Bridge

Mouth Big Bear Creek

Redhook Hole

Leary Way Bridge\*

Upper Trail Bridge

NE 90<sup>th</sup> Bridge\*

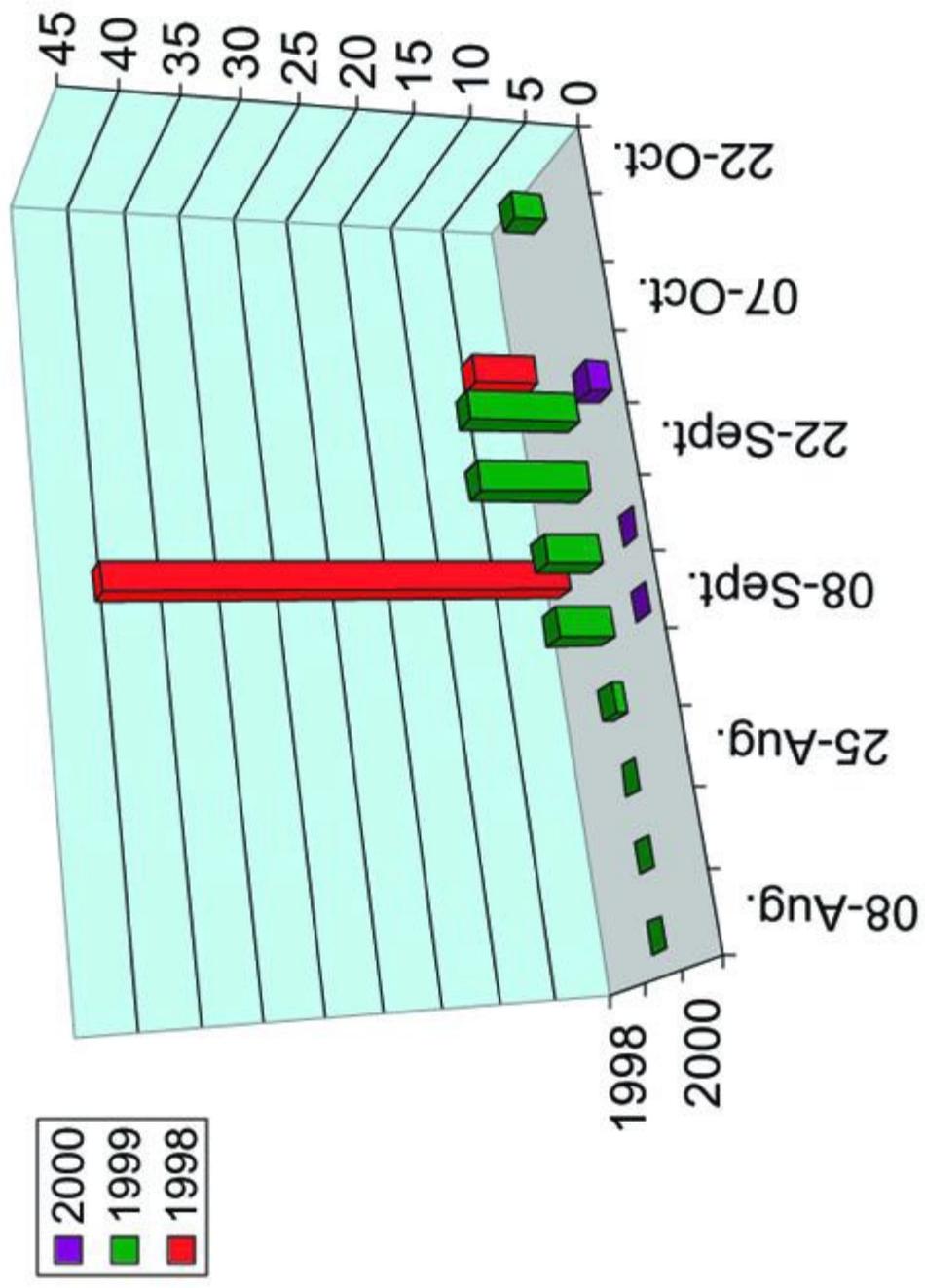
Mouth Swamp Creek

NE 124<sup>th</sup> Bridge

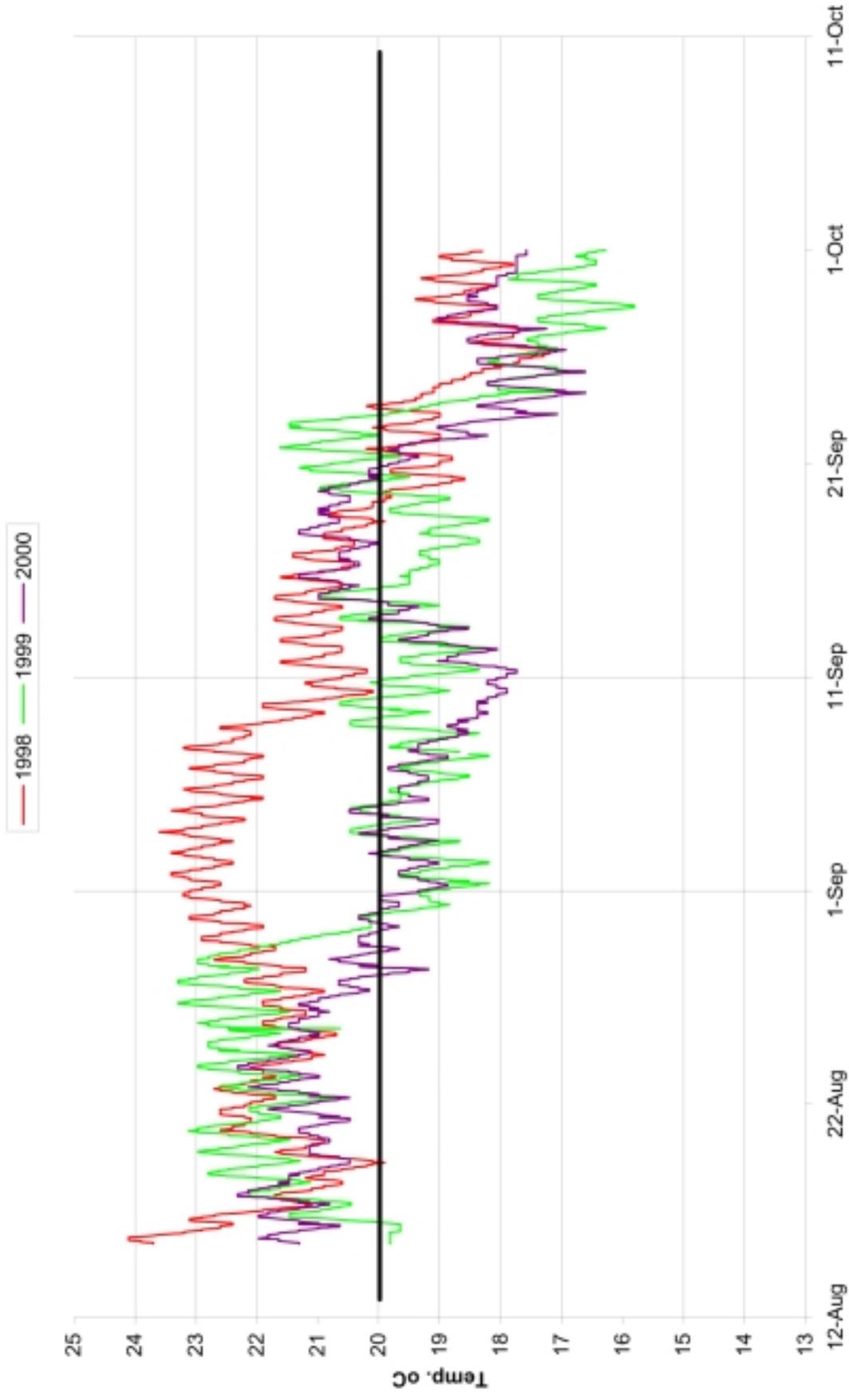
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\* Only One Year of Detection

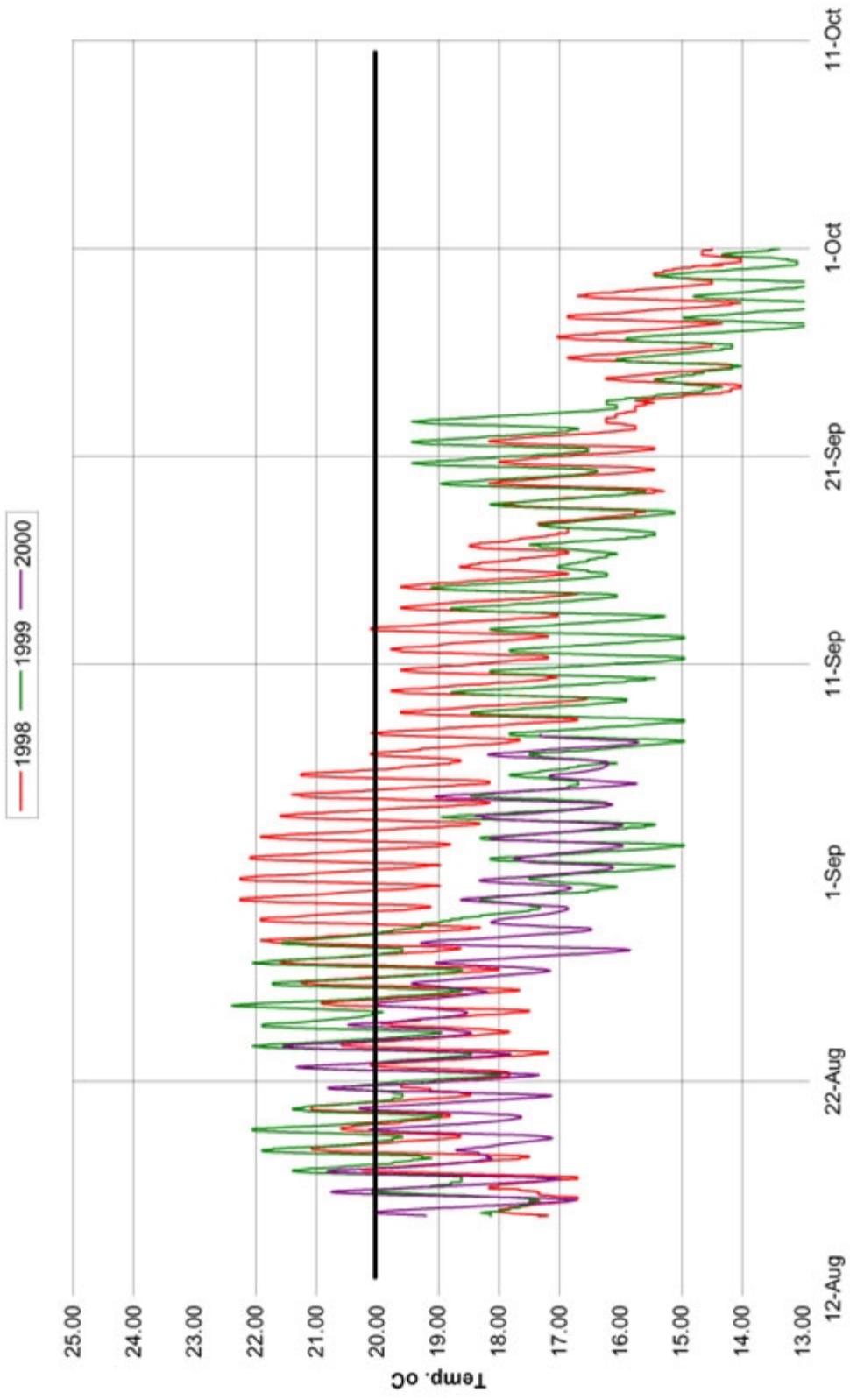
# Sammamish River Chinook Mortalities



# Lk. Sammamish Outlet/Marymoor Pools



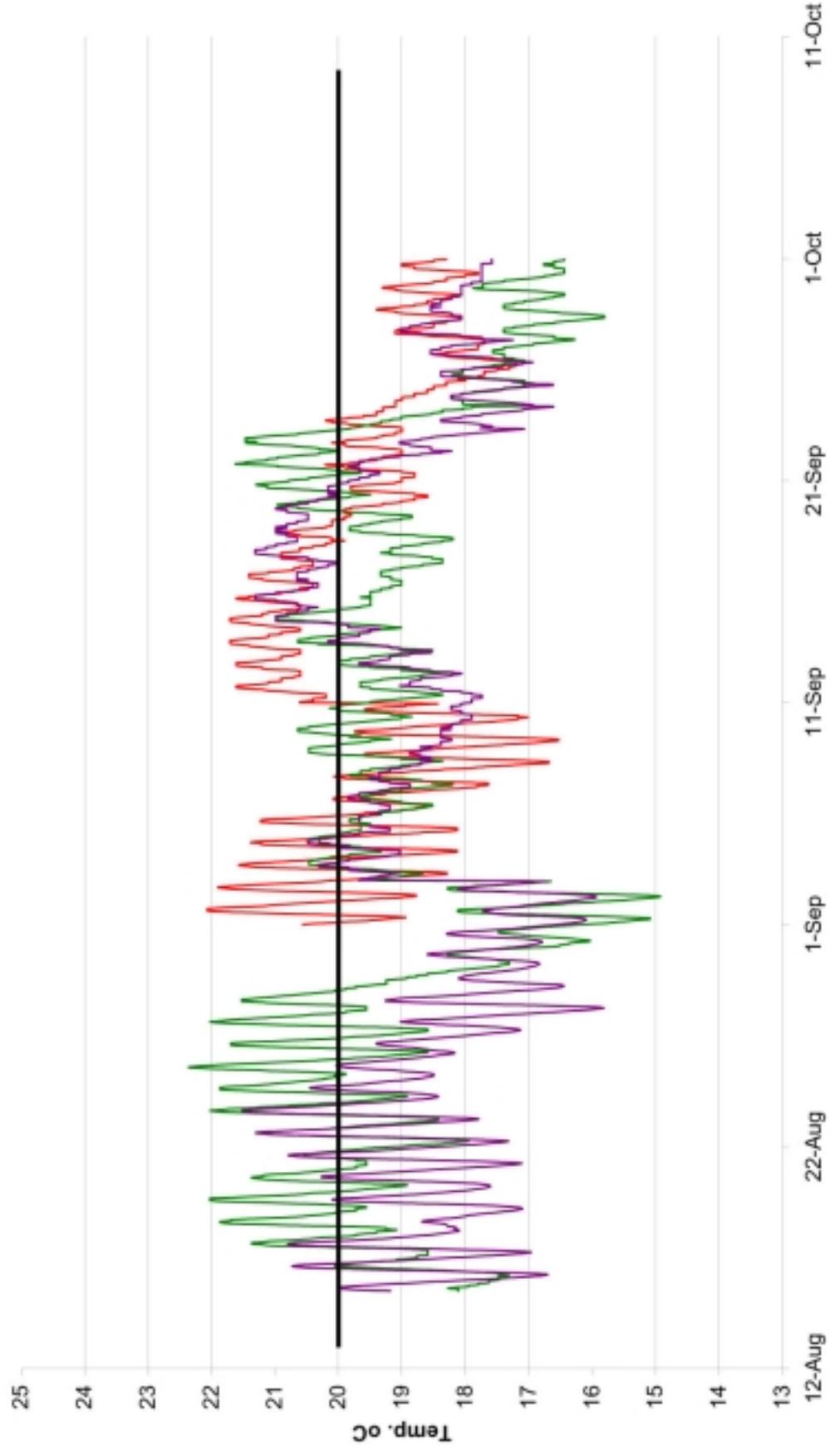
# Redmond RR Bridge



# Sammamish River -- Marymoor Pool

1998 - Sept. 11  
1999 - Sept. 03  
2000 - Sept. 03

— 1998 — 1999 — 2000



## Sammamish River Temperature Summary Data

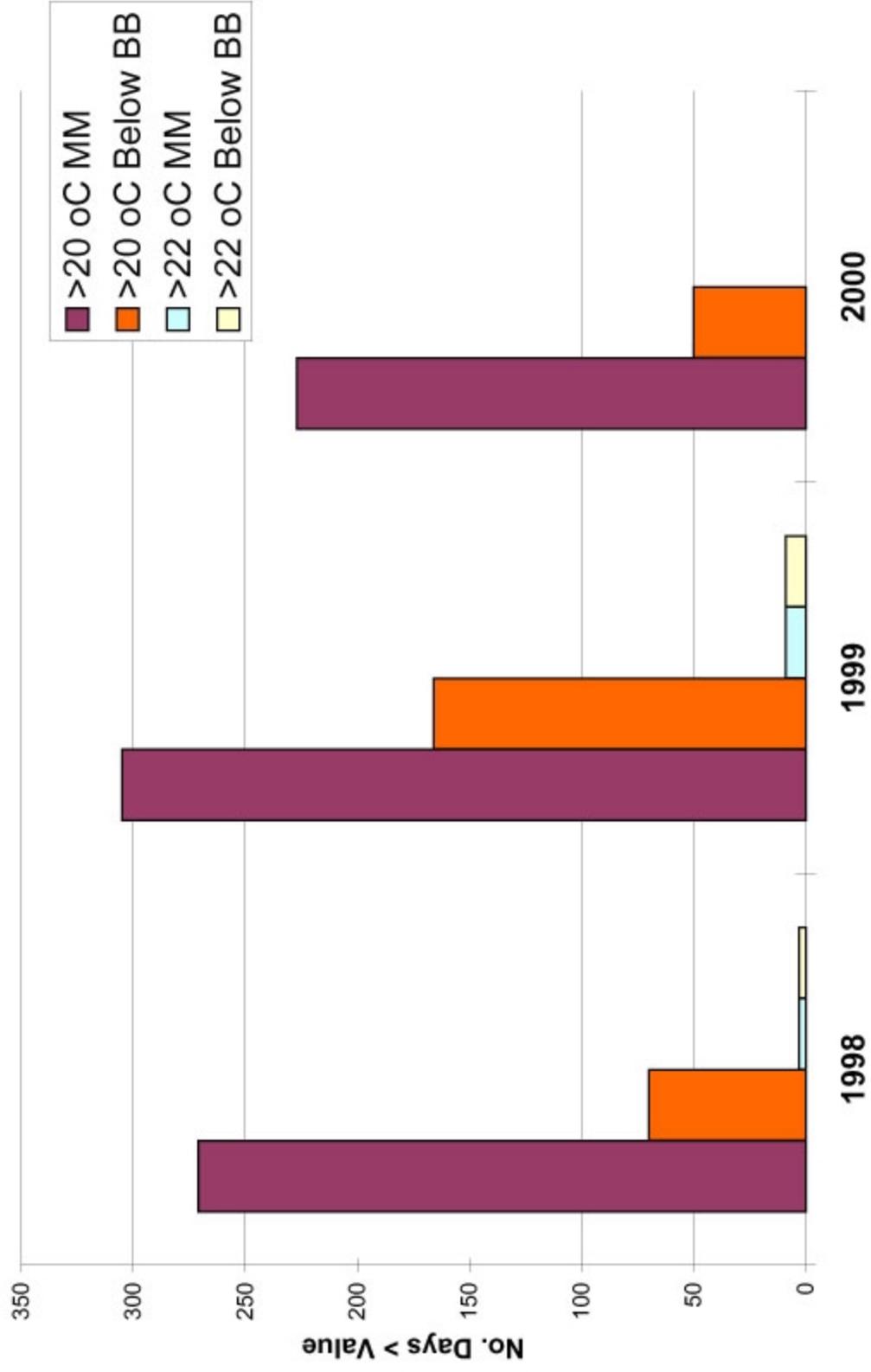
<b>Marymoor Pools</b>	<u>1998</u>	<u>1999</u>	<u>2000</u>	<b>Marymoor Pool Combined</b>						
Mean	21.0	20.0	19.8	<table style="margin: auto; border-collapse: collapse;"> <tr> <td style="text-align: center;"><u>*1998</u></td> <td style="text-align: center;"><u>1999</u></td> <td style="text-align: center;"><u>2000</u></td> </tr> <tr> <td style="text-align: center;">19.5</td> <td style="text-align: center;">19.2</td> <td style="text-align: center;">18.8</td> </tr> </table>	<u>*1998</u>	<u>1999</u>	<u>2000</u>	19.5	19.2	18.8
<u>*1998</u>	<u>1999</u>	<u>2000</u>								
19.5	19.2	18.8								
hrs.>20oC	840	484	500	<table style="margin: auto; border-collapse: collapse;"> <tr> <td style="text-align: center;">Aug 15 -- Sept. 30</td> <td style="text-align: center;">hrs.&gt;20oC</td> <td style="text-align: center;">271</td> <td style="text-align: center;">305</td> <td style="text-align: center;">227</td> </tr> </table>	Aug 15 -- Sept. 30	hrs.>20oC	271	305	227	
Aug 15 -- Sept. 30	hrs.>20oC	271	305	227						
hrs.>22oC	348	177	16	<table style="margin: auto; border-collapse: collapse;"> <tr> <td style="text-align: center;">Aug 15 -- Sept. 30</td> <td style="text-align: center;">hrs.&gt;22oC</td> <td style="text-align: center;">3</td> <td style="text-align: center;">9</td> <td style="text-align: center;">0</td> </tr> </table>	Aug 15 -- Sept. 30	hrs.>22oC	3	9	0	
Aug 15 -- Sept. 30	hrs.>22oC	3	9	0						

\* 1998 Chinook entered river approximately Sept. 1  
 1998 - Chinook entered MM Pool approximately Sept. 11  
 1999 & 2000 - Chinook entered MM Pool approximately Sept. 3rd.

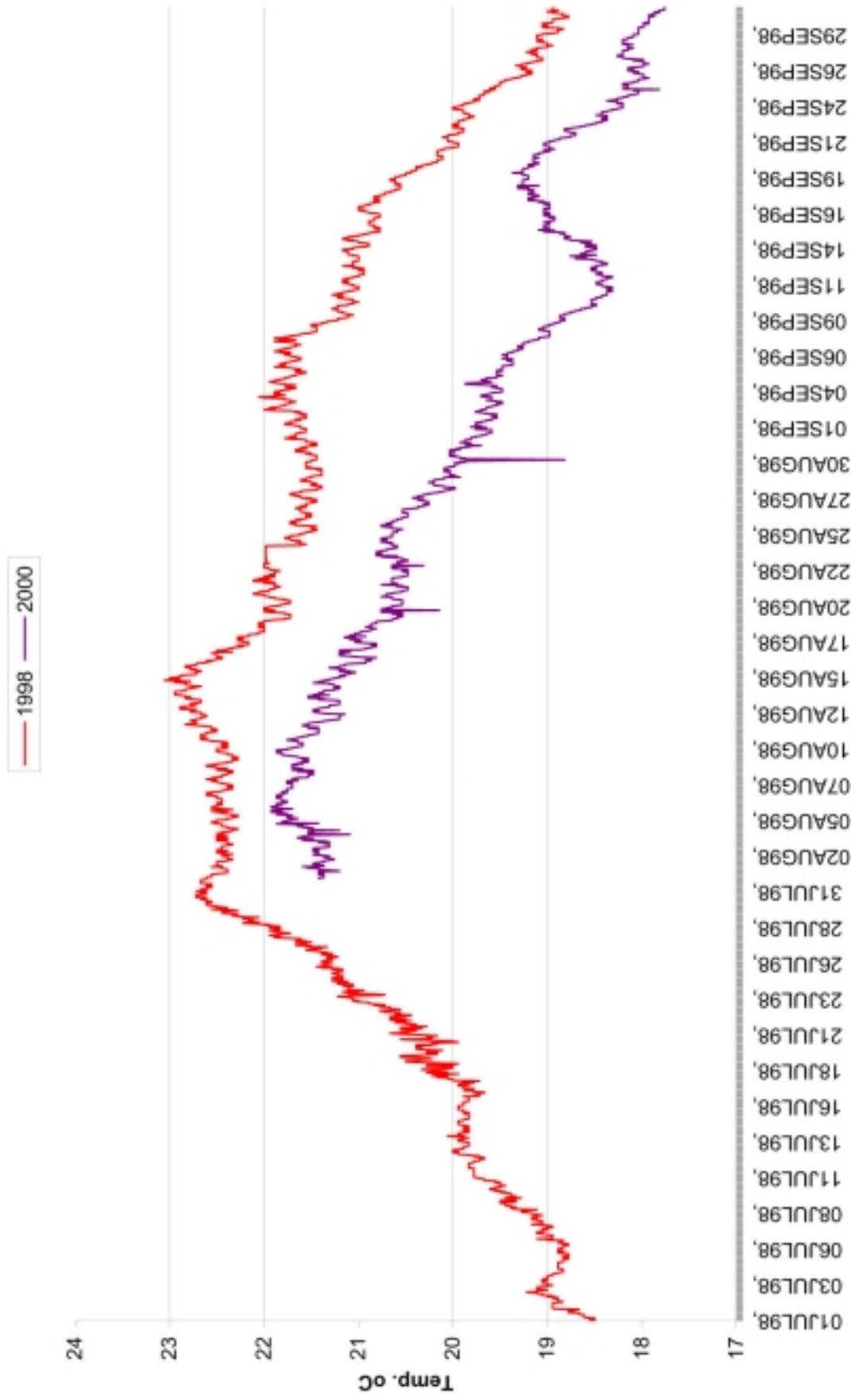
<b>Redmond RR Bridge</b>	<u>1998</u>	<u>1999</u>	<u>2000*</u>
Mean	18.1	17.5	18.1
hrs.>20oC	200	166	50
hrs.>22oC	12	9	0

\* Data only goes through Sept. 7th

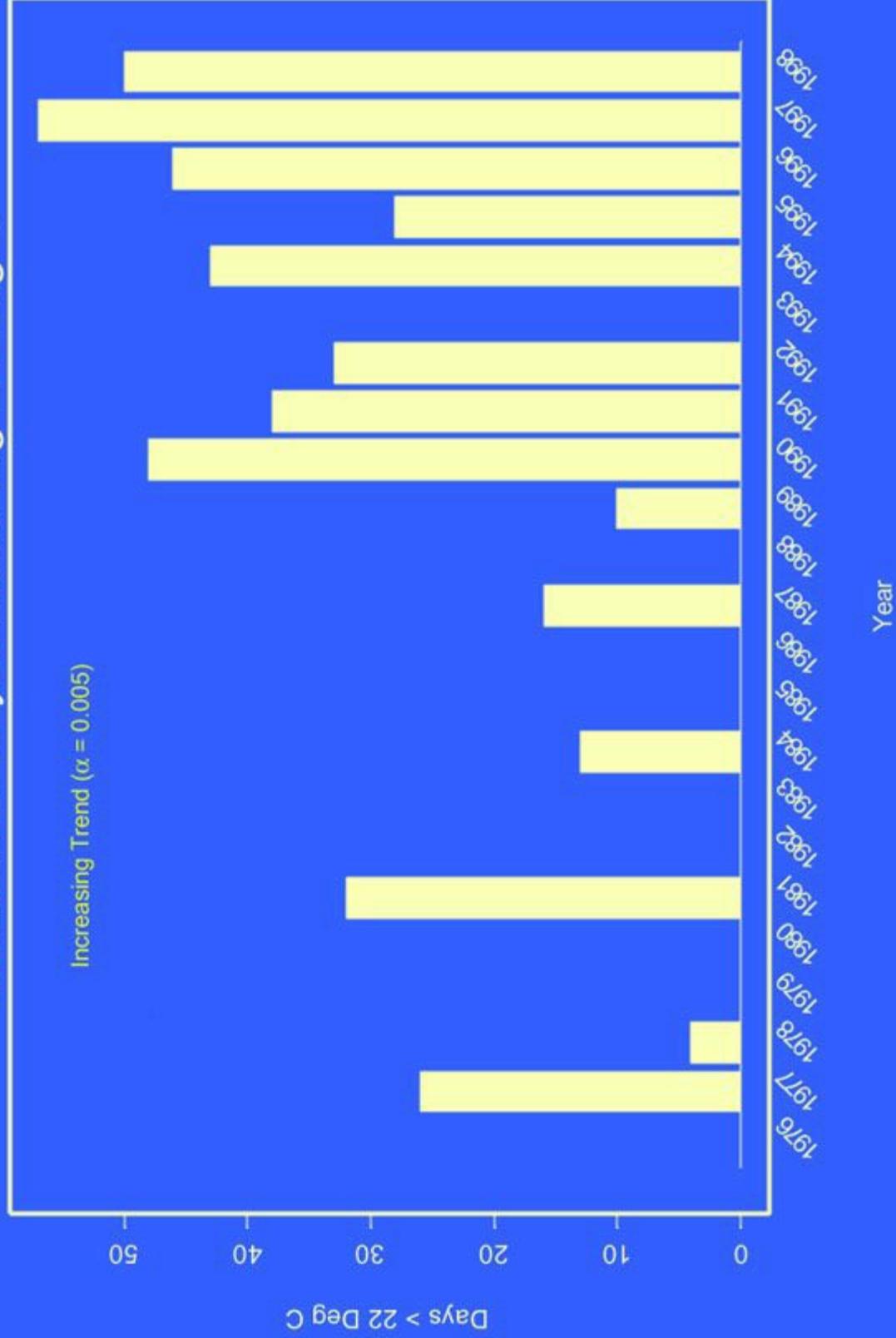
# Sammamish River Thermal Stress



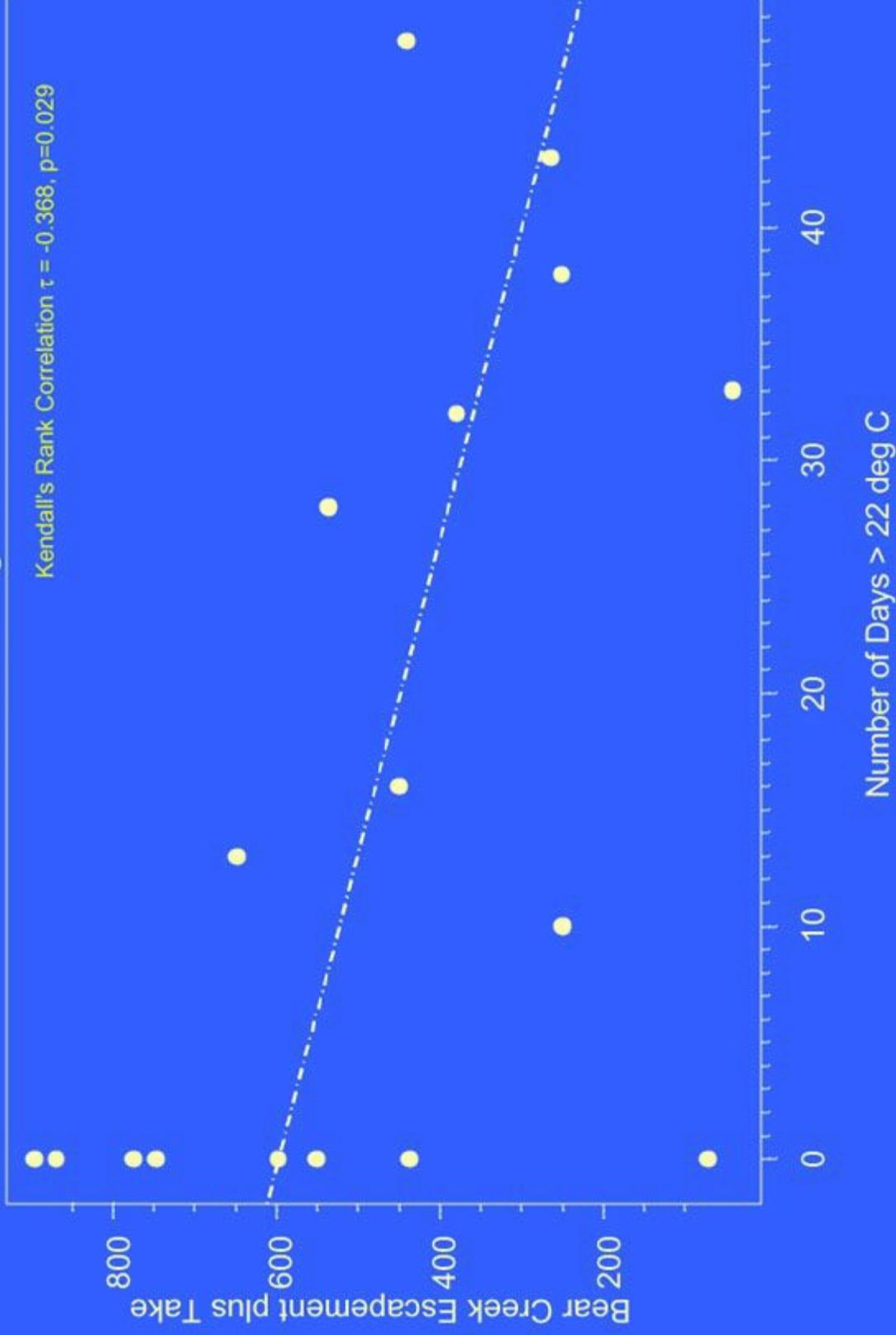
# Large Locks @ 2 meters



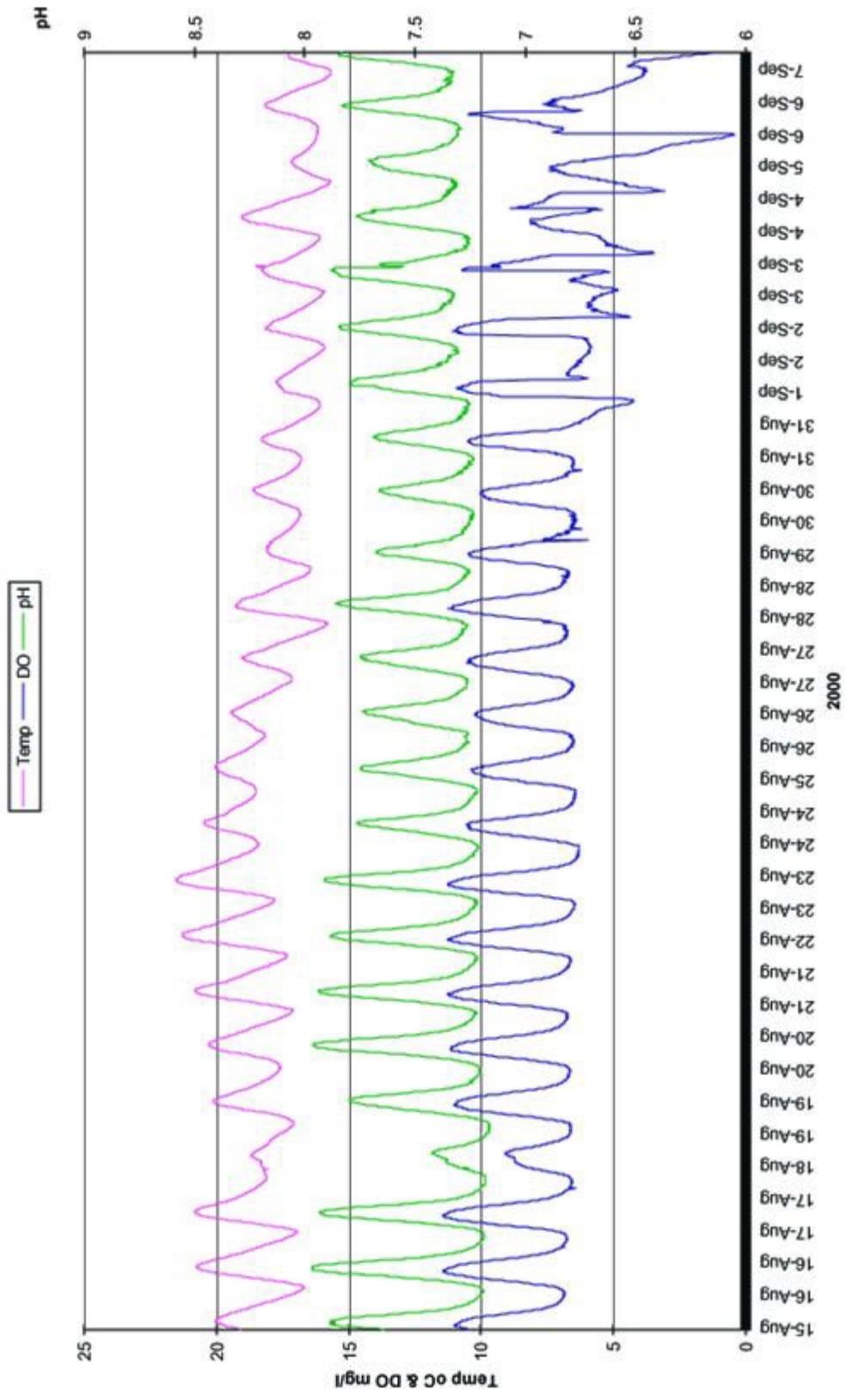
# Sammamish River Temperature Number of Days Exceeding 22 Deg C



# Sammamish River Maximum Temperature vs Bear Creek Chinook Correlation 1983 through 1999



# Redmond RR Bridge



# Conclusions

## Holding Areas

- Chinook choose specific areas in Sammamish River to hold
- Upper reach of river is most used
- High annual variability for certain sites
- Issaquah Cr. chinook hold both above and below Big Bear Creek
- Water depth and bridges are important factors in site selection.

# Conclusions

## Temperature

- 1998 saw significantly higher pre-spawn mortalities than 1999 or 2000.
- Thermal “stress” for chinook within Sammamish River was similar for all 3 yrs.
- Some indication of cumulative effect of Sammamish River water temperature
- Primary source of thermal stress is at Locks