

# Effects of Total Dissolved Gas on Chum Fry

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# 2006 TDG Monitoring Results

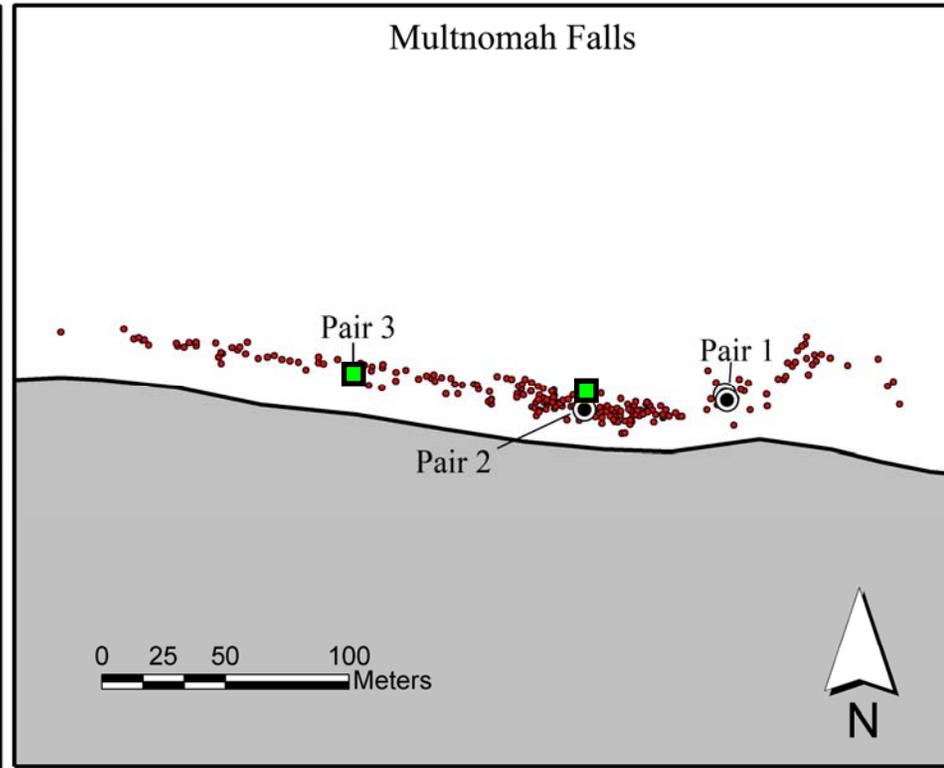
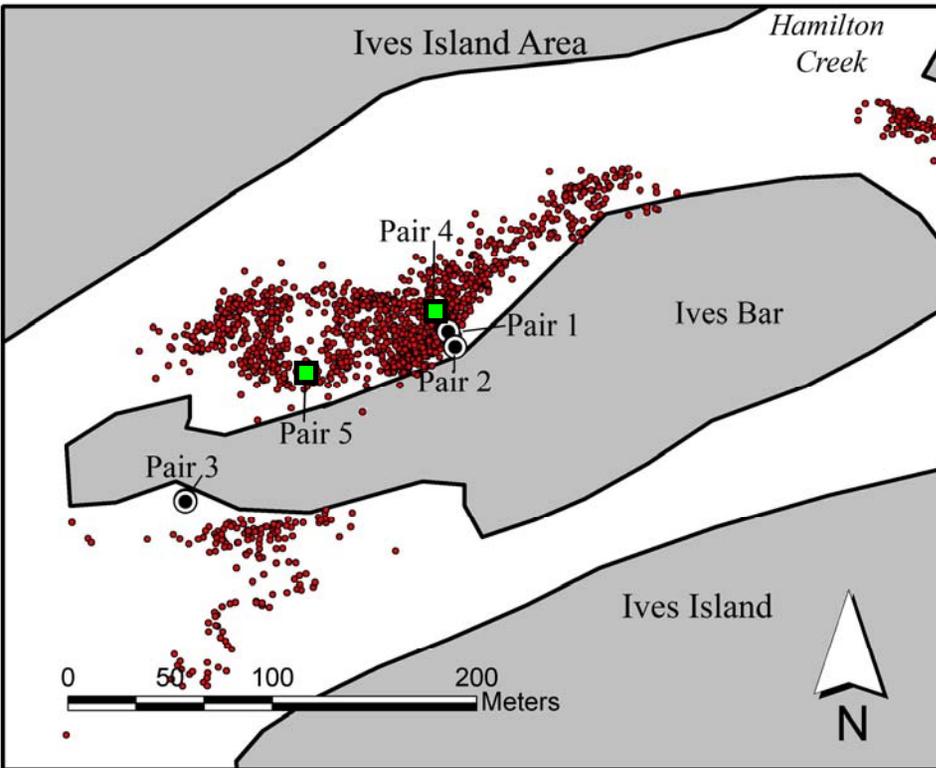
- ▶ River TDG increased during the spill season.
- ▶ Depth-compensated TDG values of the hyporheic zone remained less than 103% at all the sites monitored during the incubation period.
- ▶ The 2006 water year was relatively high and may not represent conditions in low water years when depth compensation not available.
- ▶ Both sites influenced by groundwater, with groundwater more prevalent at Multnomah Falls.

# 2007 Objectives

- ▶ Determine depth compensated TDG concentrations at chum salmon redd sites downstream from Bonneville Dam
- ▶ Conduct toxicity tests on the formation of gas bubble signs in chum salmon fry at TDG levels ranging up to 113%
- ▶ Sample chum salmon sac-fry during spill operations at Bonneville Dam to determine if there is a physiological response to TDG levels

# Objective 1 – Monitoring of Hyporheic TDG

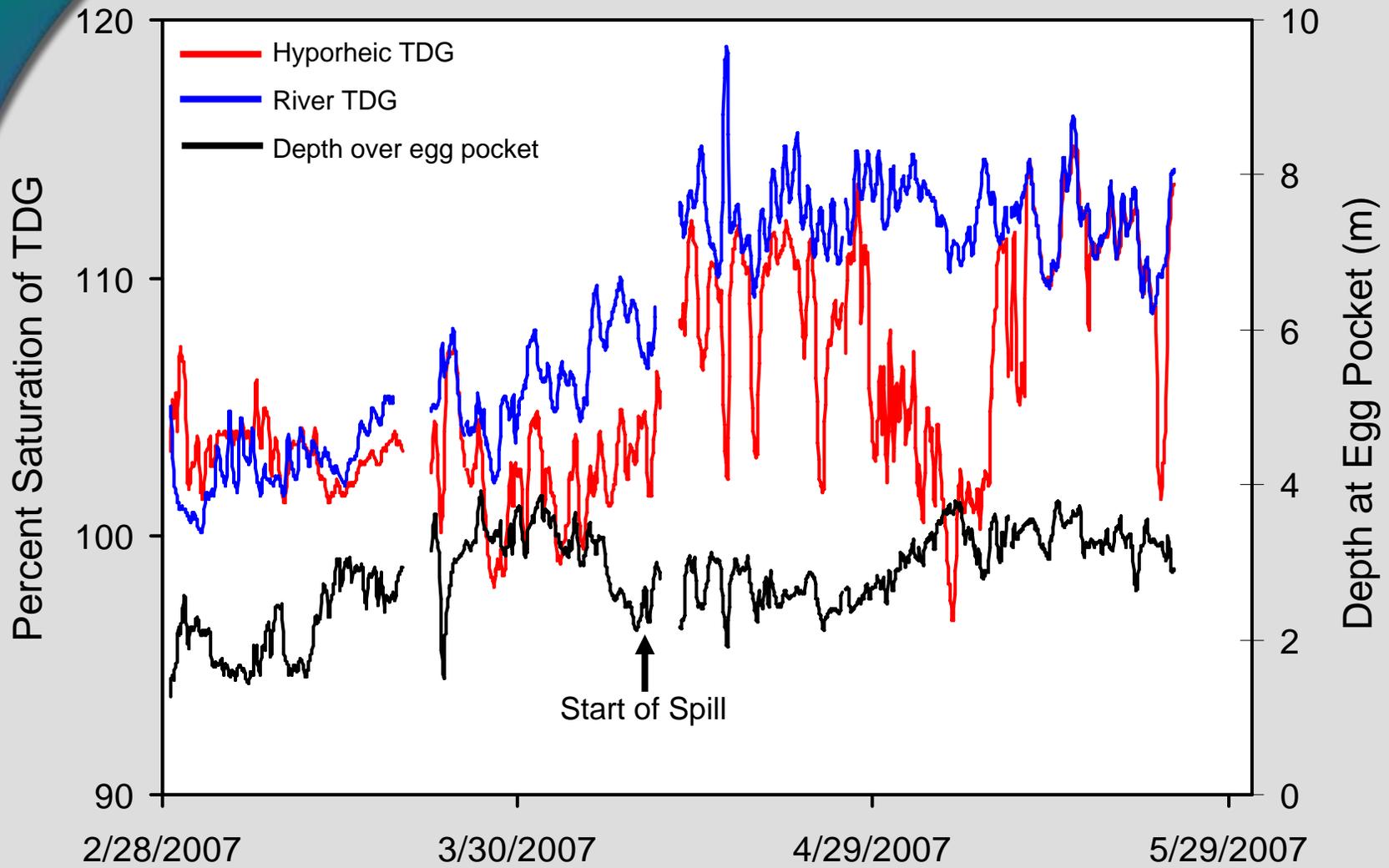
# Sensor Locations



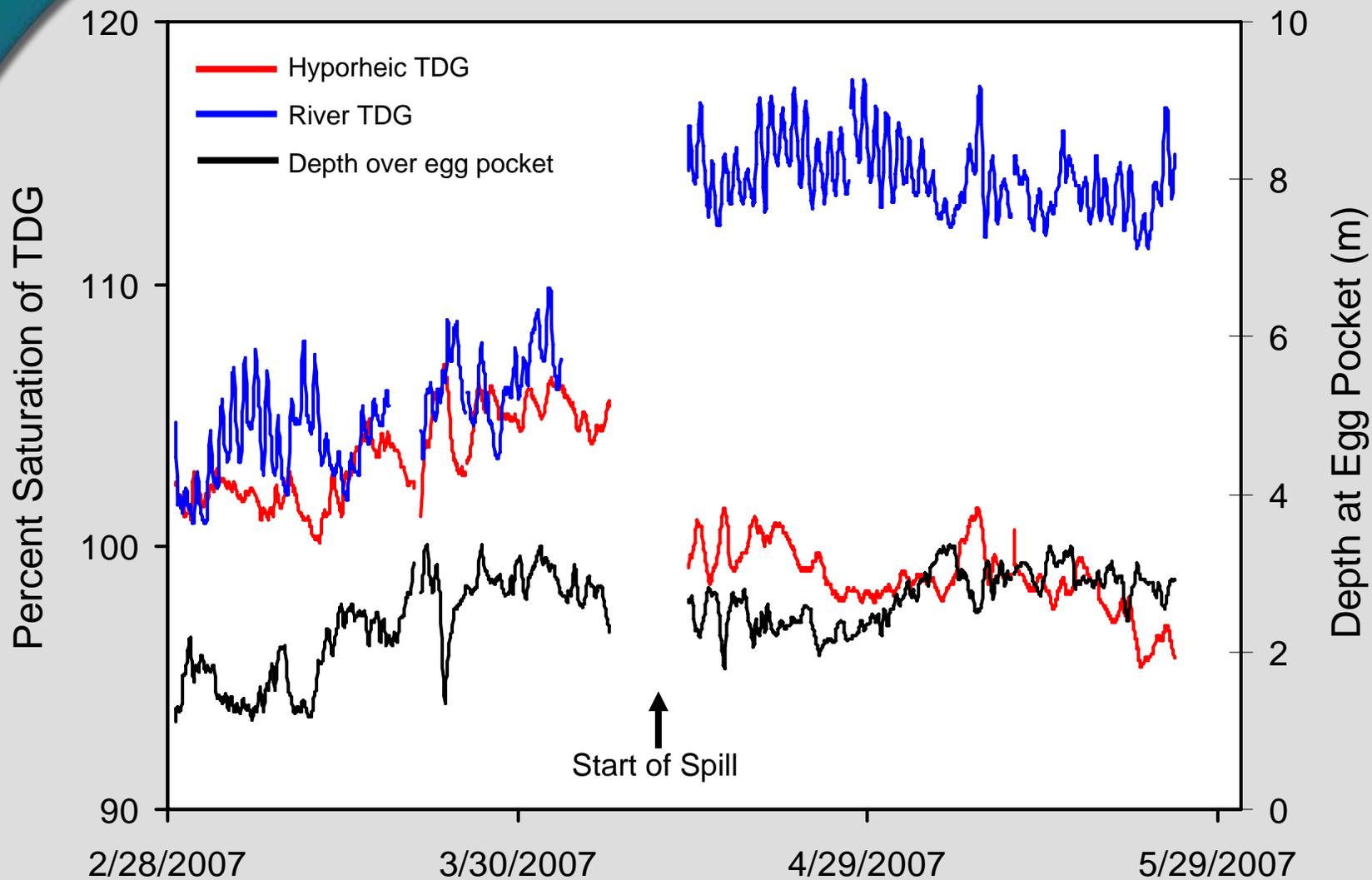
⊙ 2006 Location

■ 2007 Location

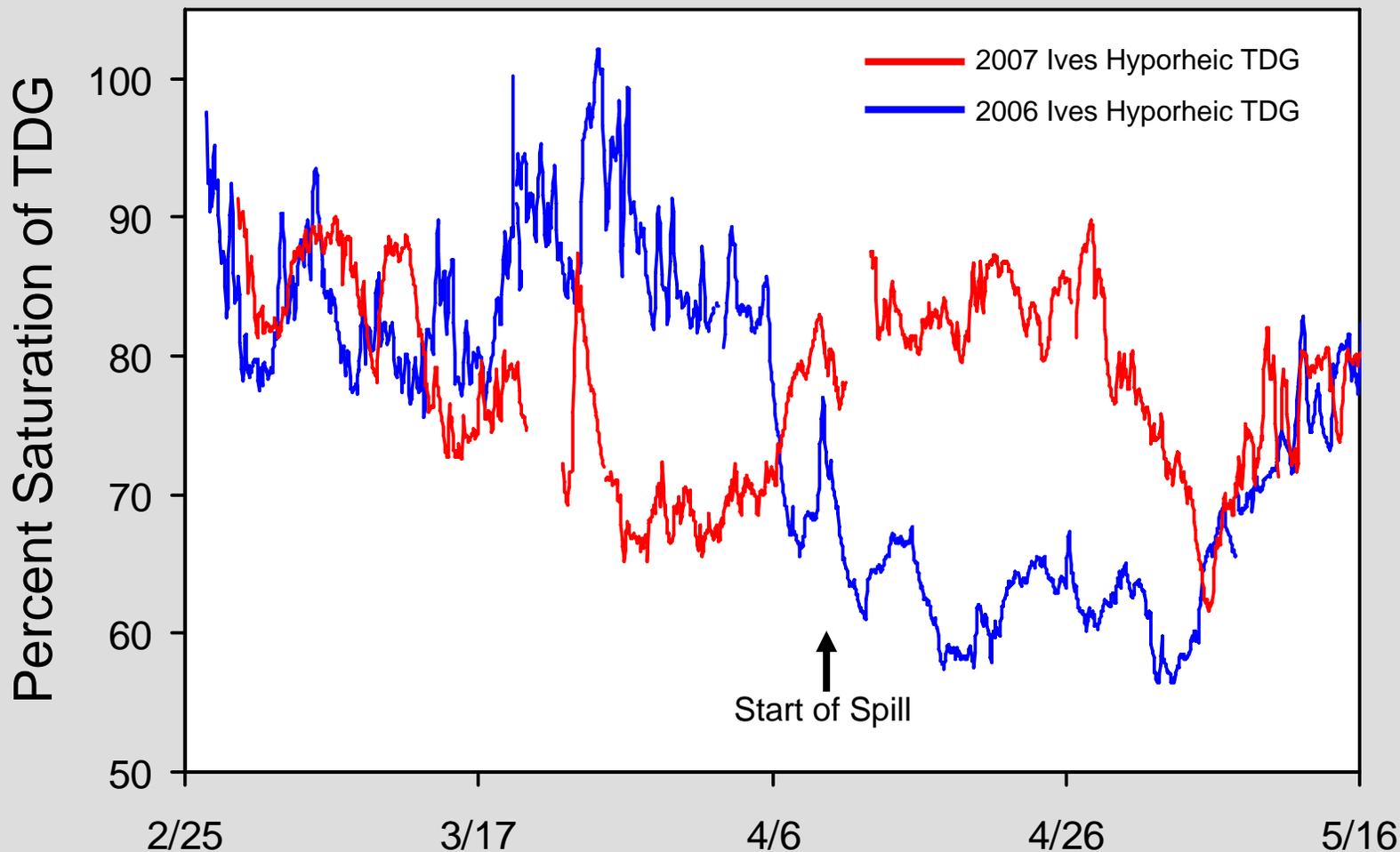
# 2007 TDG Ives Island



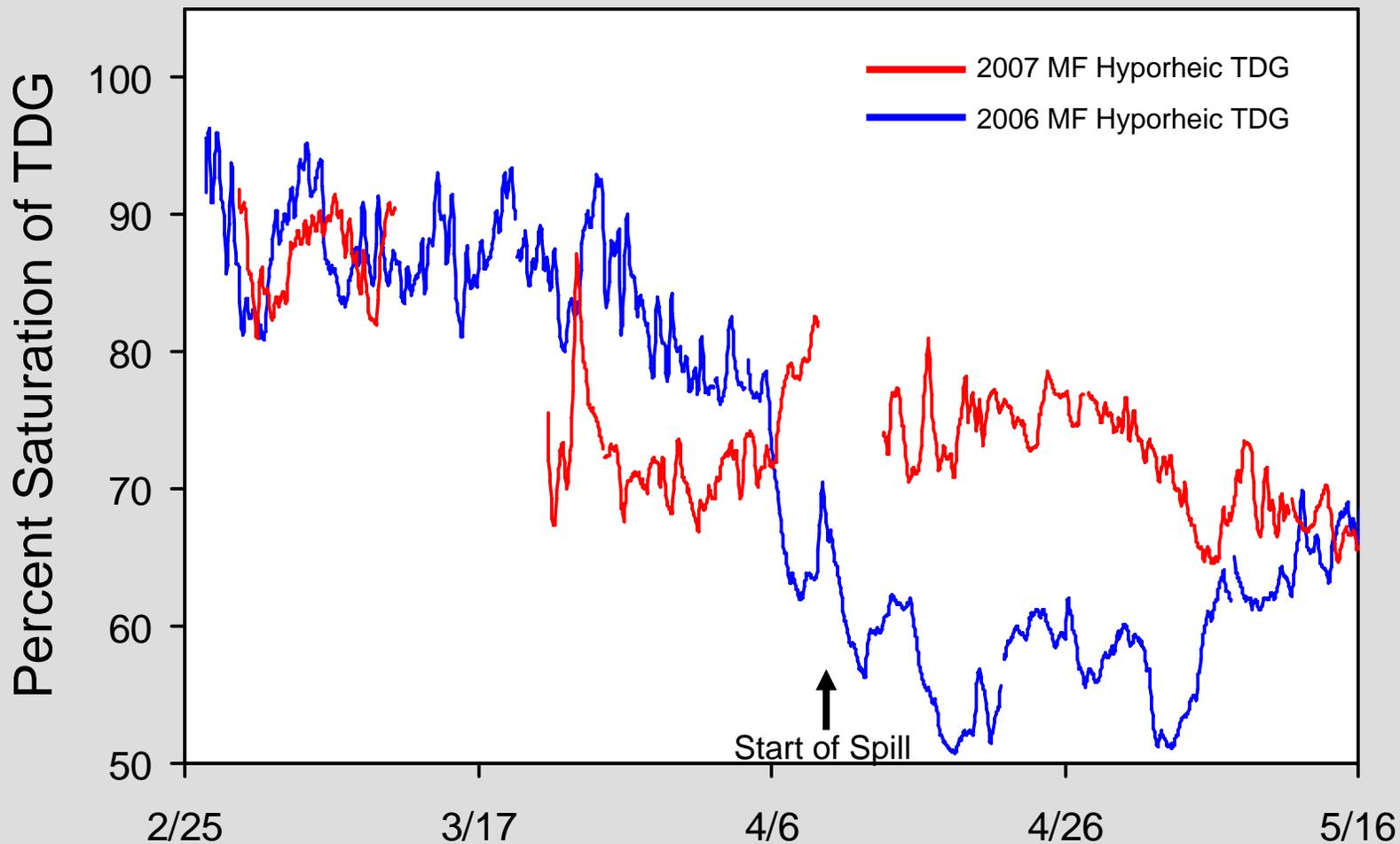
# 2007 TDG Multnomah Falls



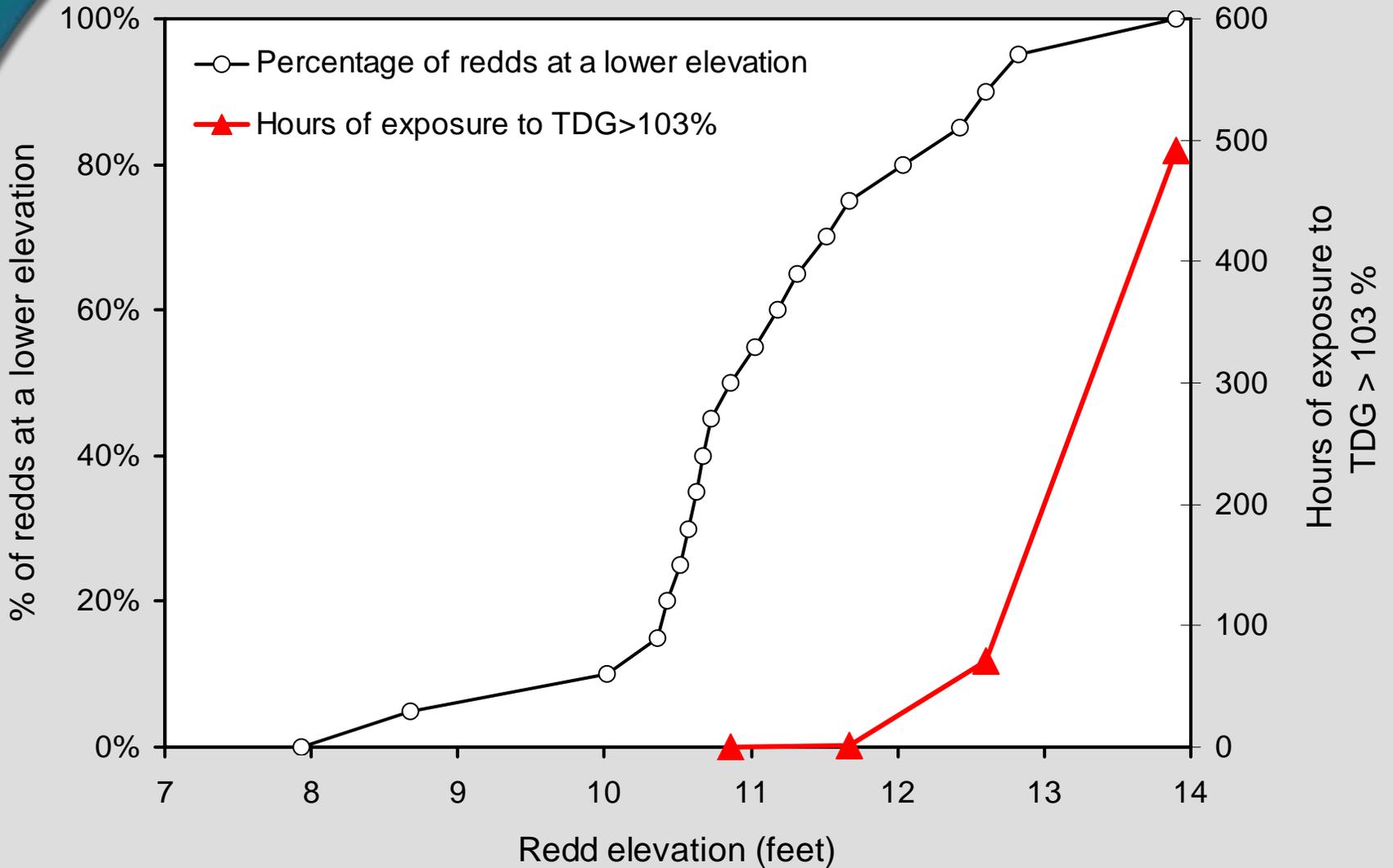
# Depth-Compensated Hyporheic TDG Ives Island



# Depth-Compensated Hyporheic TDG Multnomah Falls



# 2006-2007 Ives Chum Redd Exposure to TDG



# **Objective 2 – Effects of TDG on Chum Fry**

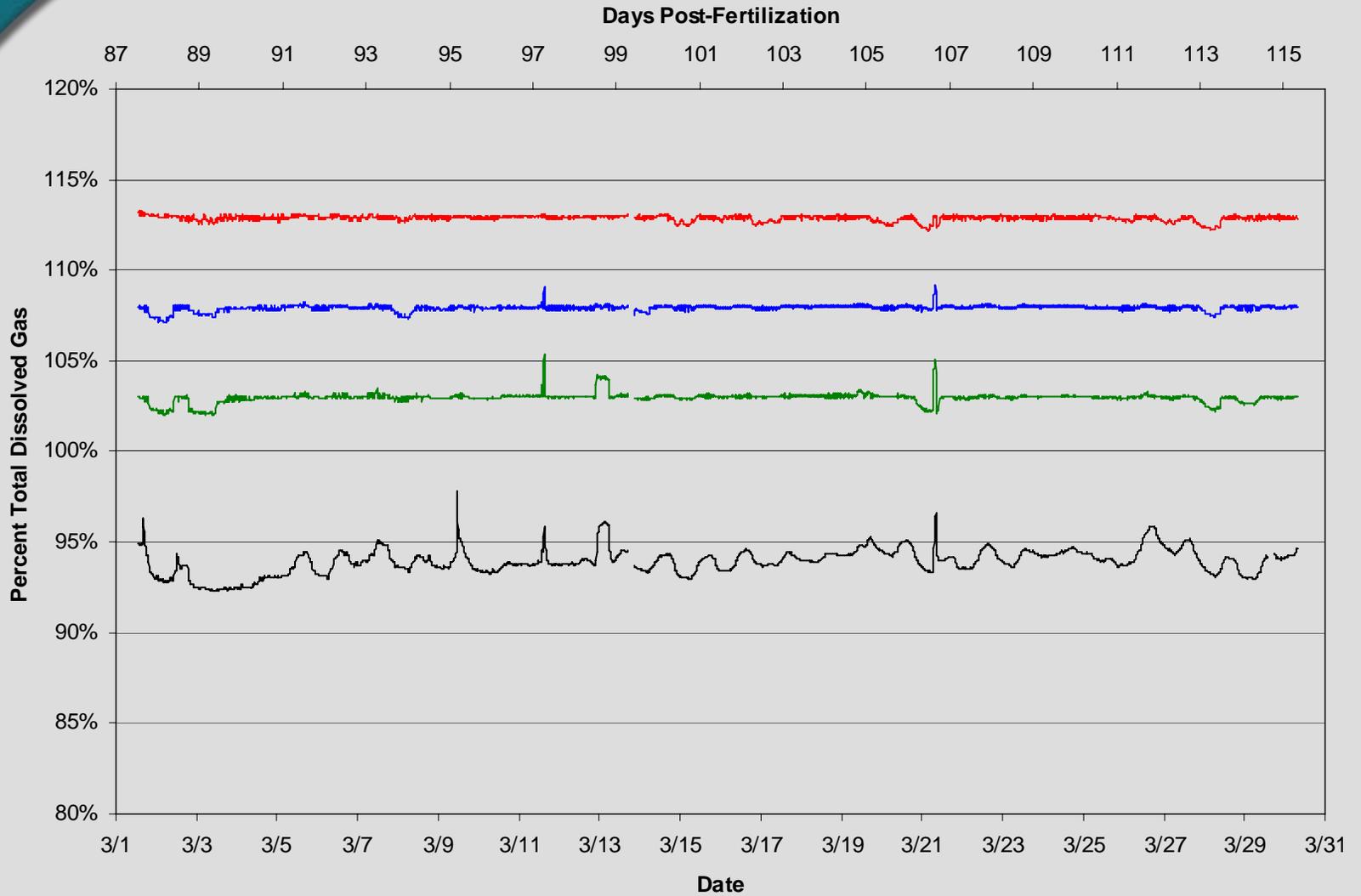


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# TDG Levels Throughout Exposure Period



# Survival and Timing to 50% Emergence

	<b>Control</b>	<b>103% TDG</b>	<b>108% TDG</b>	<b>113% TDG</b>
Survival	99.7% (99-100%)	99.3% (98-100%)	99.8% (99-100%)	95.2% (90-100%)
Emergence (days post- fertilization)	109 (108-110)	108 (106-111)	107 (106-111)	105 (104-106)

# Size at 50% Emergence

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	<b>Control</b> (n=90)	<b>103% TDG</b> (n=90)	<b>108% TDG</b> (n=90)	<b>113% TDG</b> (n=90)
Weight (mg)	308 (227-379)	311 (237-398)	309 (240-386)	299 (230-369)
Length (mm)	36.7 (33-39)	36.7 (34-40)	36.4 (33-39)	36.0 (33-39)

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CONTINUOUS - QUAD - Normal

C04[Position4]2007/08/12-10:28:27

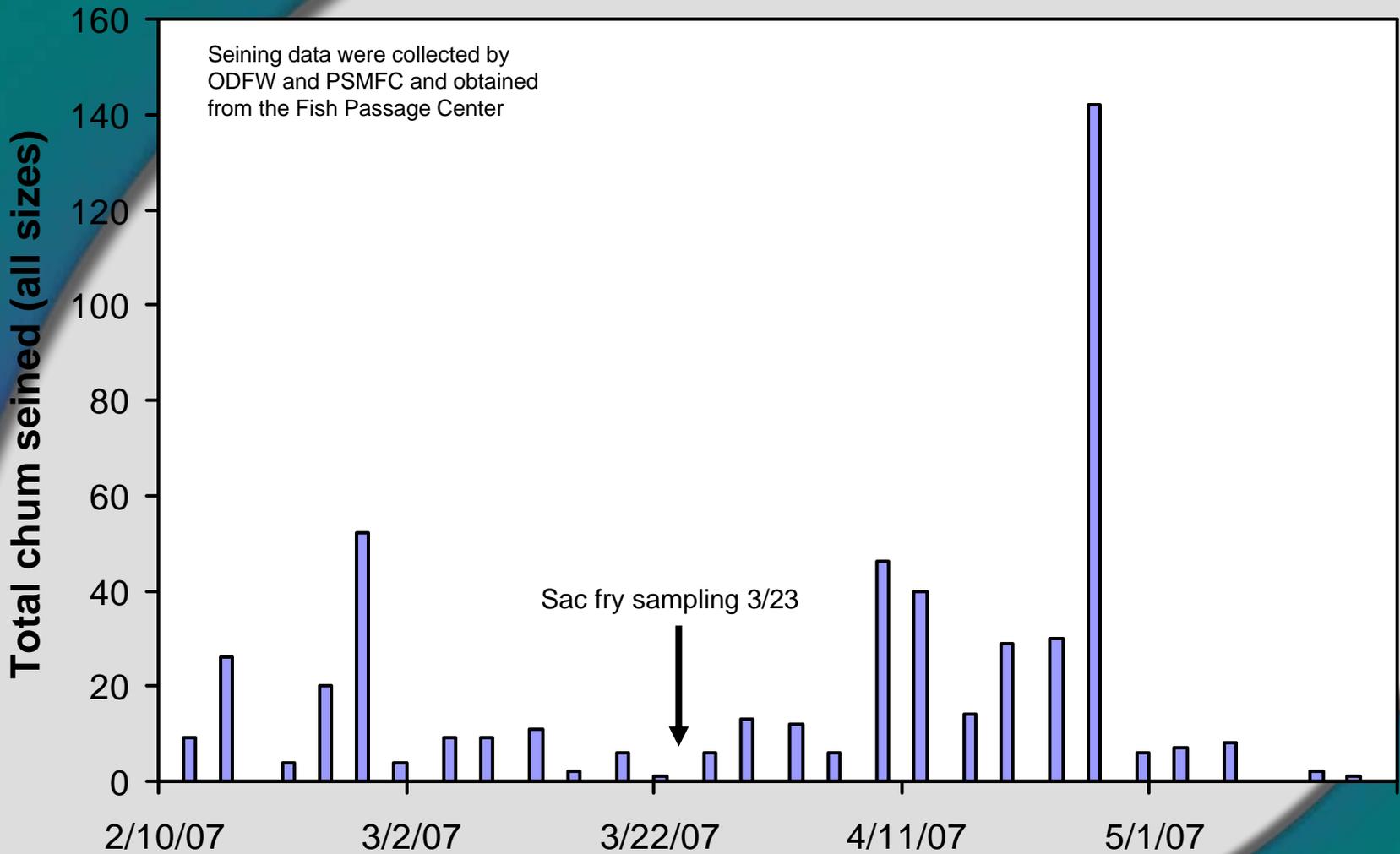
CONTINUOUS - QUAD - Normal

C04[Position4]2007/08/12-13:56:04

# Sac-Fry Dissections

	<b>Control</b> (n=7)	<b>103% TDG</b> (n=7)	<b>108% TDG</b> (n=4)	<b>113% TDG</b> (n=13)
Bubbles in eyes	57%	57%	50%	69%
Bubbles in nares	14%	14%	25%	31%
Over-inflated air bladder	43%	100%	100%	46%

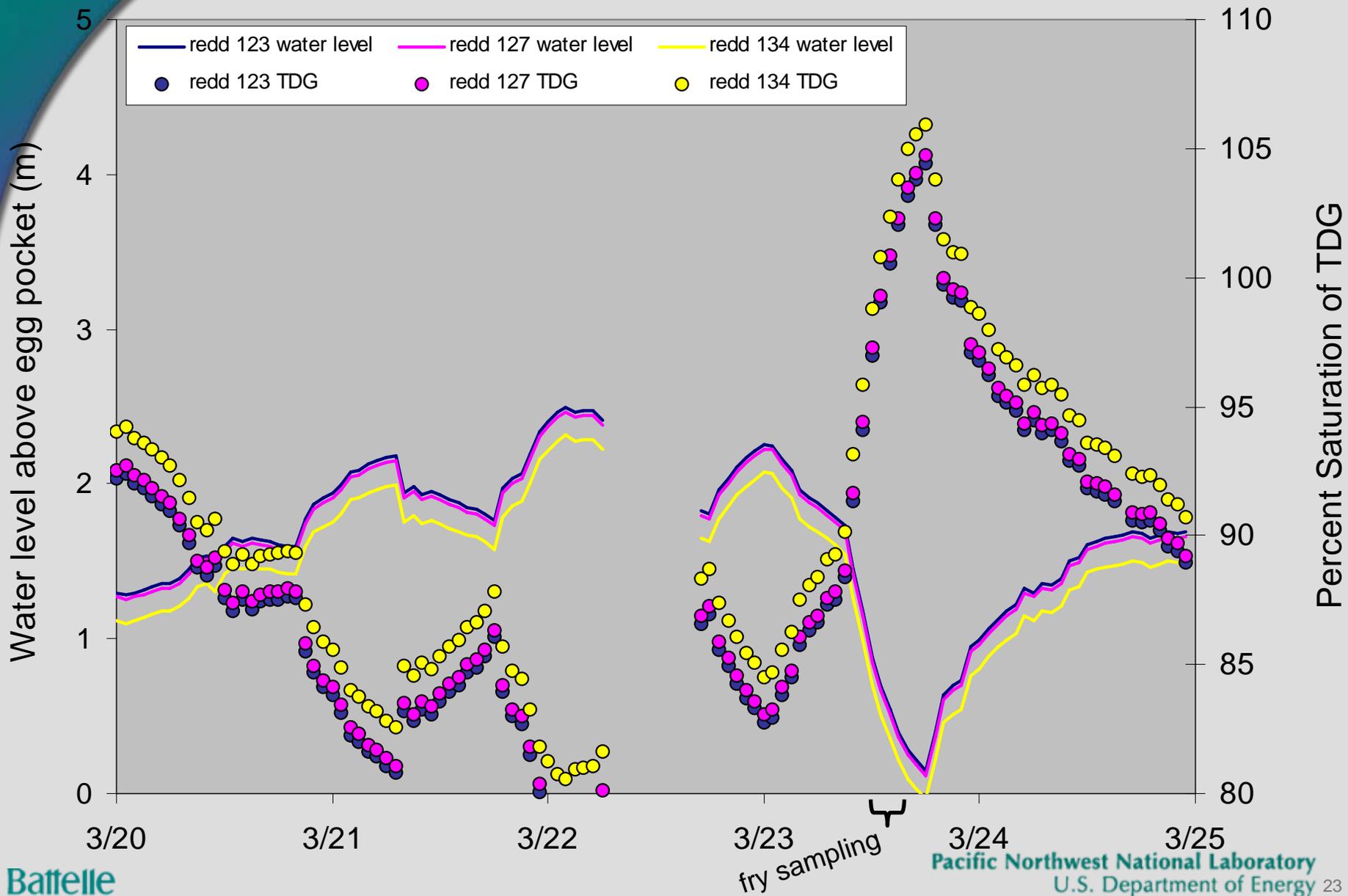
# Objective 3 – Fry Sampling At Ives







# Depth-Compensated TDG at Chum Salmon Fry Sampling Locations



# Redd Sampling

<b>Redd #</b>	<b>Num of live fish</b>	<b>Num of morts</b>	<b>Total collected</b>	<b>Avg length (mm)</b>	<b>Comment</b>
123	49	2	51	29.2	Sac-fry
127	14	1	15	38.9	Nearly buttoned-up
134	21	0	21	40.3	Nearly buttoned-up
Total	84	3	87		