

# Passage Behavior and Survival for Radio-Tagged Yearling Chinook Salmon and Juvenile Steelhead at Ice Harbor Dam, 2007

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**Northwest Fisheries Science Center**

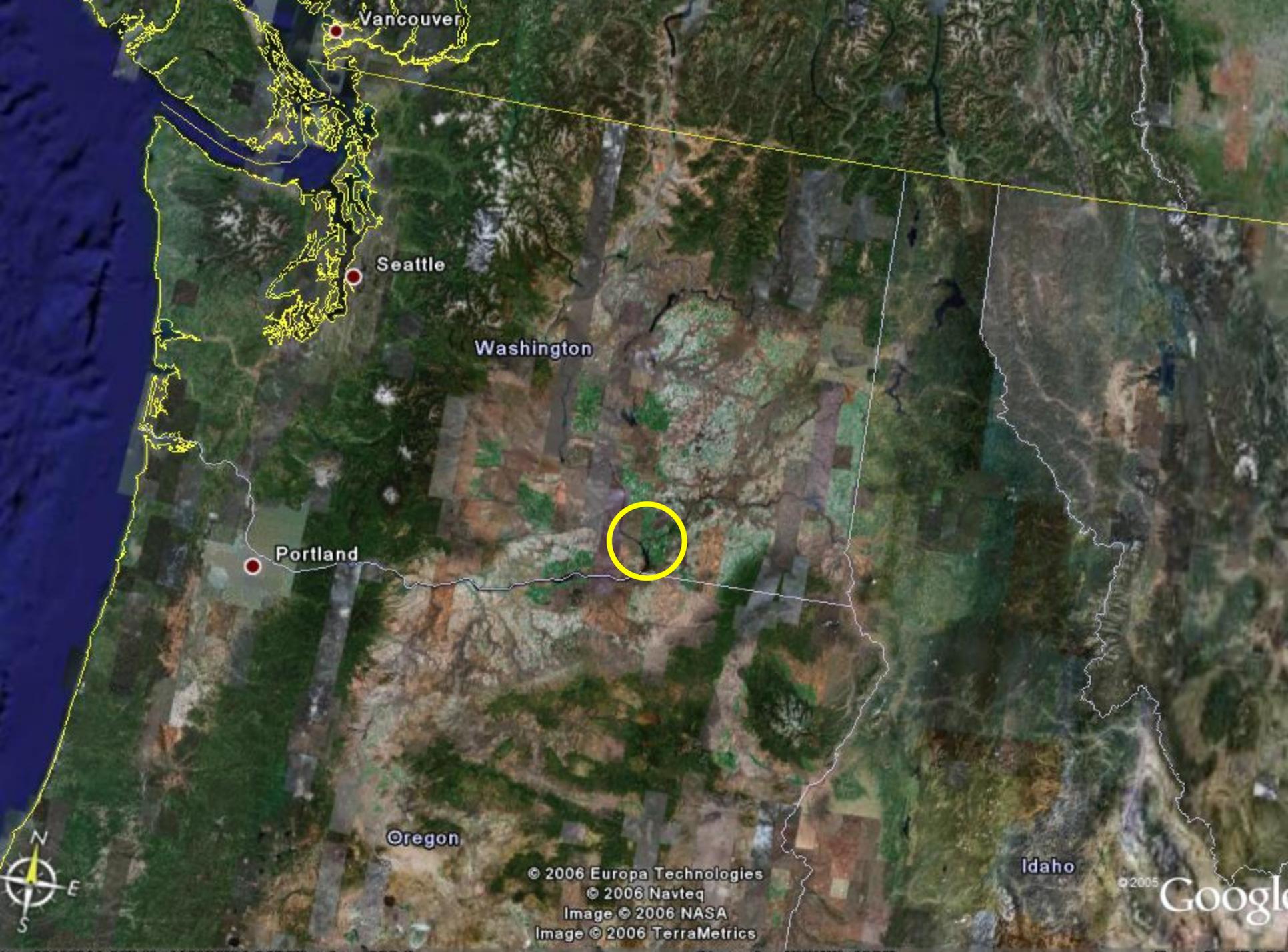
**NOAA Fisheries Service**

## Study objectives for Ice Harbor Dam, 2007

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- Identify approach and passage distribution for yearling Chinook salmon and juvenile steelhead
- Determine forebay residence, spill efficiency, FPE, FGE, and spill effectiveness
- Determine tailrace egress
- Estimate survival for the dam and individual passage routes





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Pasco

Kennewick

Strawberry Island

Goose Island

**Ice Harbor Dam**

Indian Island

Foundation Island

Casey Island

Tanglefoot Island

Peavine Island

Two Rivers Islands

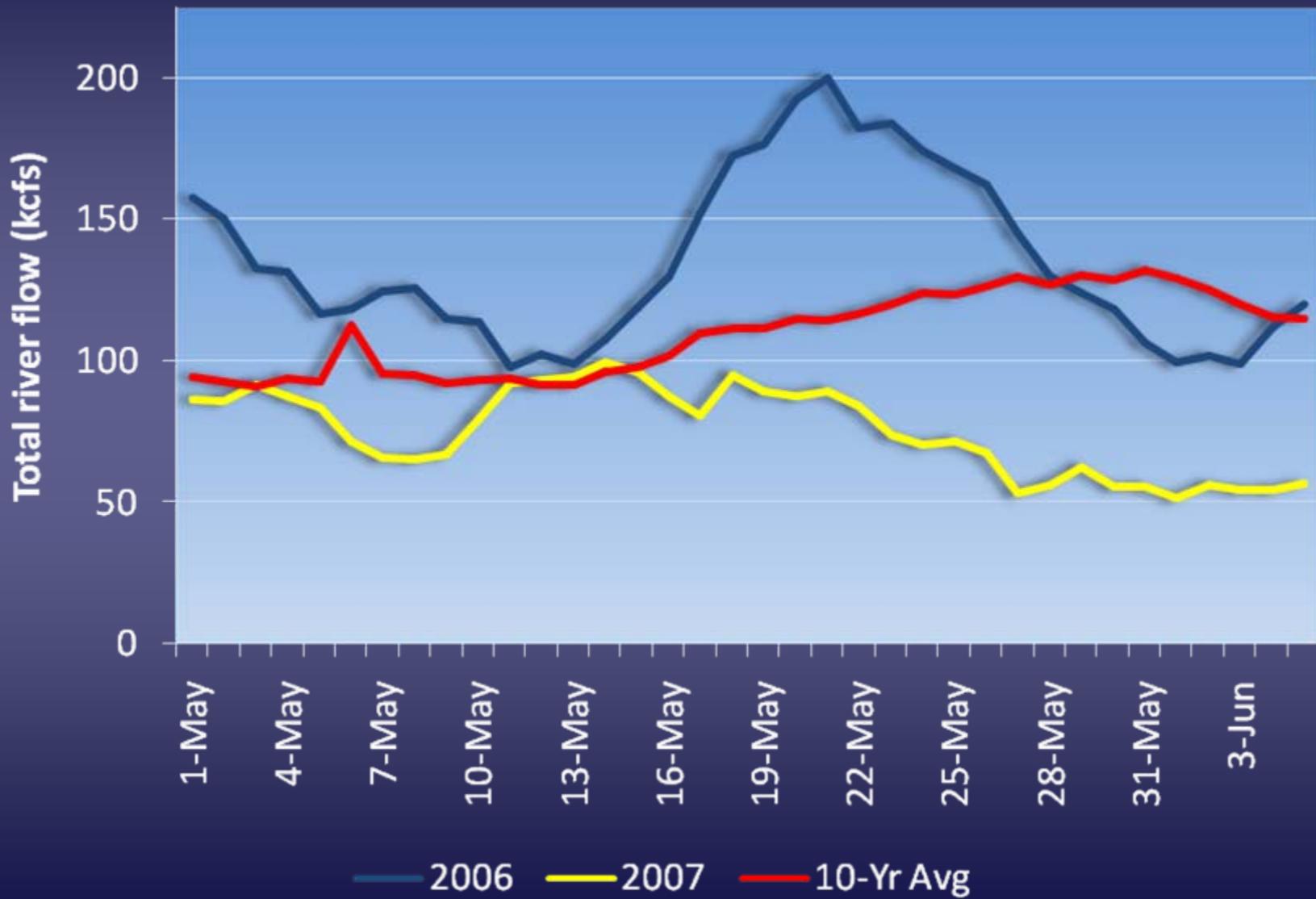
Badger Island

Crescent Island

# Smolt Passage Index at Lower Monumental Dam for fish collection and tagging, 2007



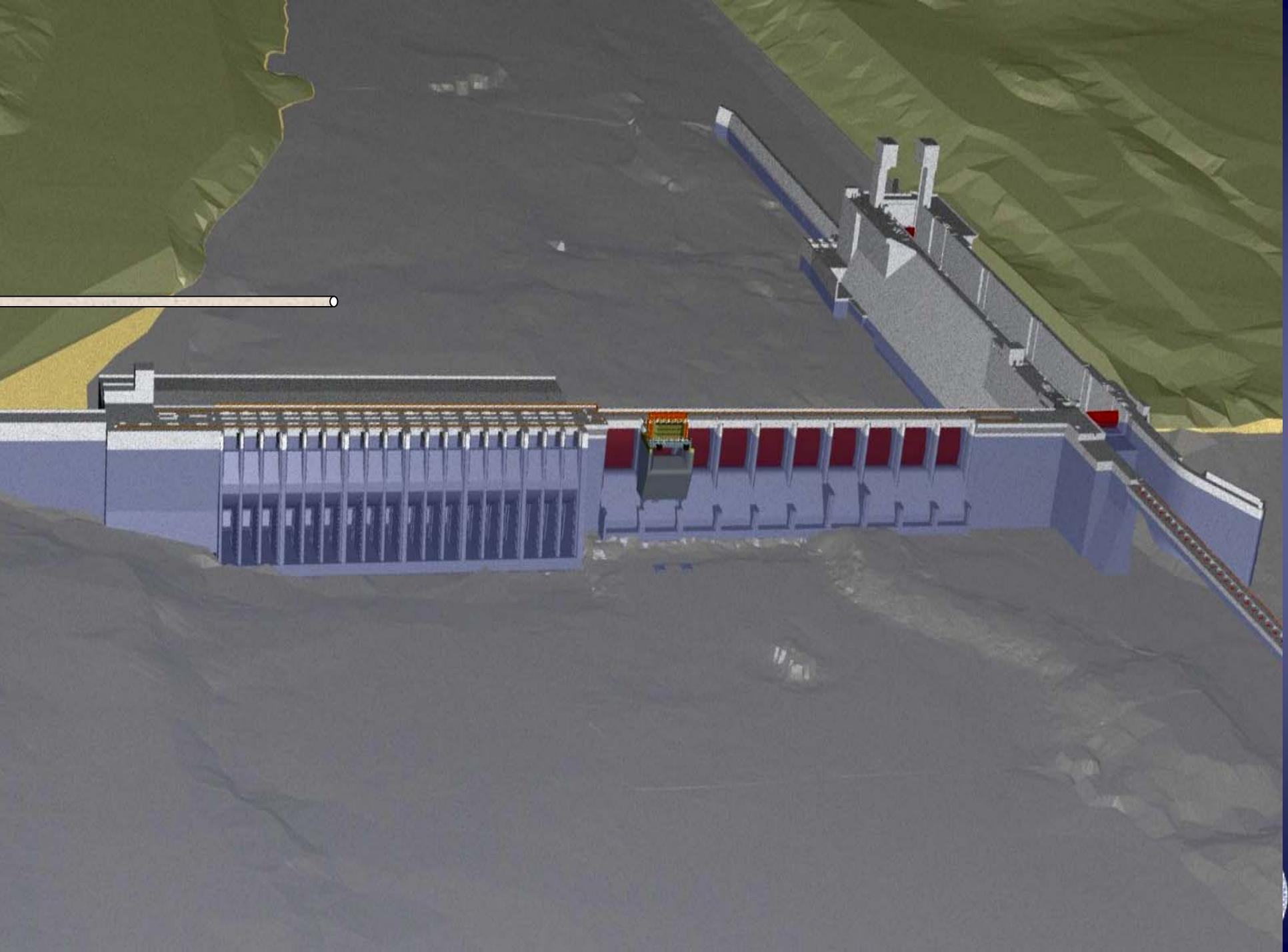
# Project operations at Ice Harbor Dam for radio-tagged spring migrants, 2007



## Results - *Ice Harbor Dam Spring Operations*

	2006 (High Flow)		2007 (Low Flow)	
	Reduced	BiOp	Reduced	BiOp
Total River Flow (kcfs)	120	144	75	79
Mean Training Spill (kcfs)	32	76	15	46
% Spill Training	26%	52%	20%	58%
Mean RSW (kcfs)	8	8	8	8
% RSW Spill	7%	6%	11%	10%





# Sample sizes for radio-tagged spring migrants, 2007

## Yearling Chinook

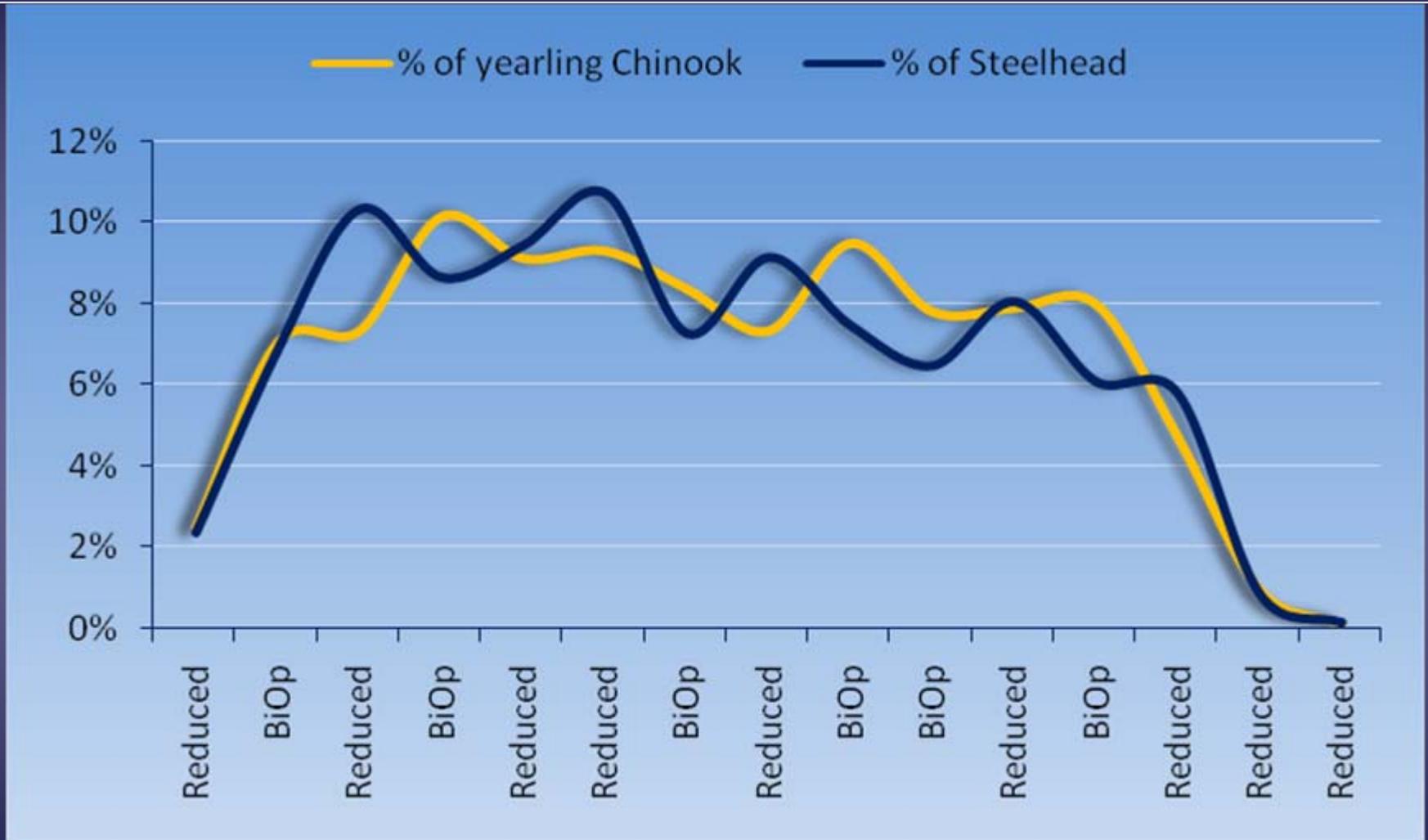
Treatment	Number of fish	Mean forklength (mm)	Mean weight (g)
BiOp Spill	541	146	26
Reduced Spill	523	146	26
BiOp Control	400	146	26
Reduced Control	430	145	26

## Juvenile steelhead

Treatment	Number of fish	Mean forklength (mm)	Mean weight (g)
BiOp Spill	436	219	83
Reduced Spill	579	220	86
BiOp Control	434	223	89
Reduced Control	440	220	86



# Percent of radio-tagged spring migrants entering the forebay at Ice Harbor Dam during two spill treatments, 2007



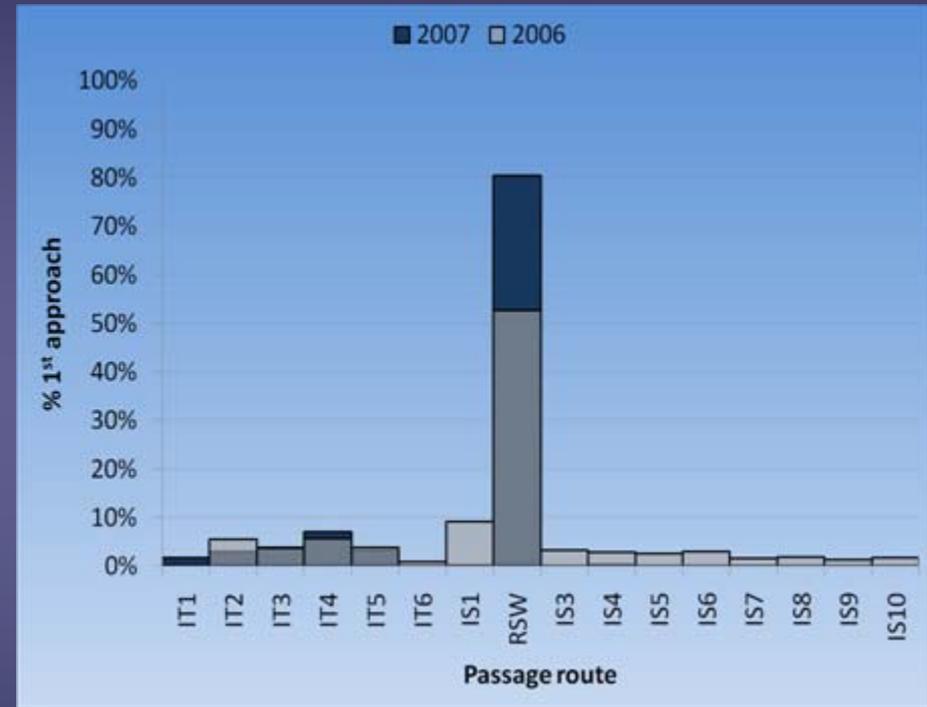
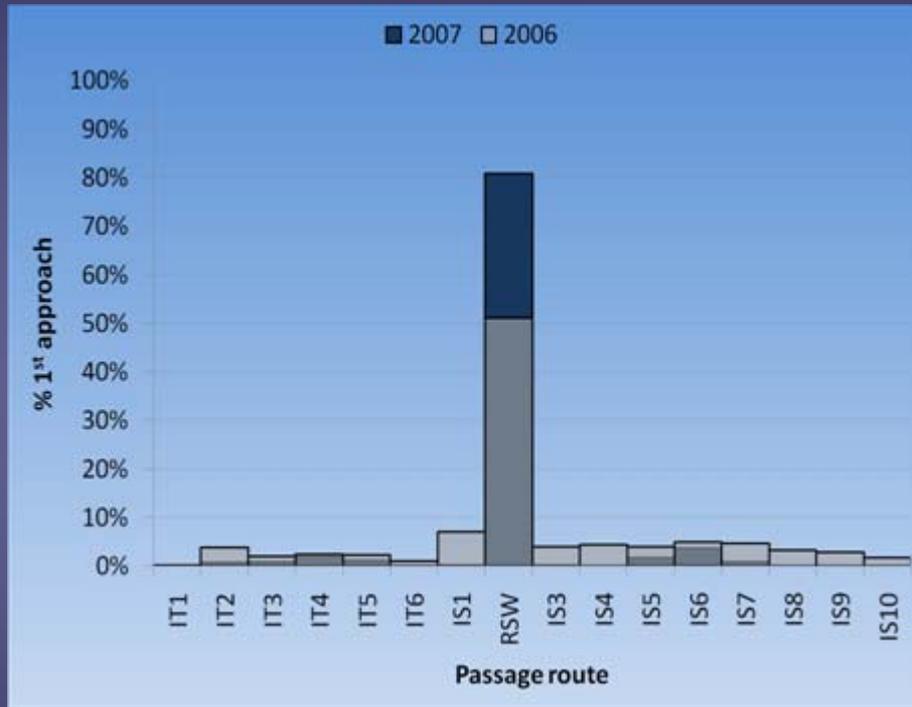
Date →



# Results - Yearling Chinook Salmon: First Approach (5 m resolution)

BiOp Spill

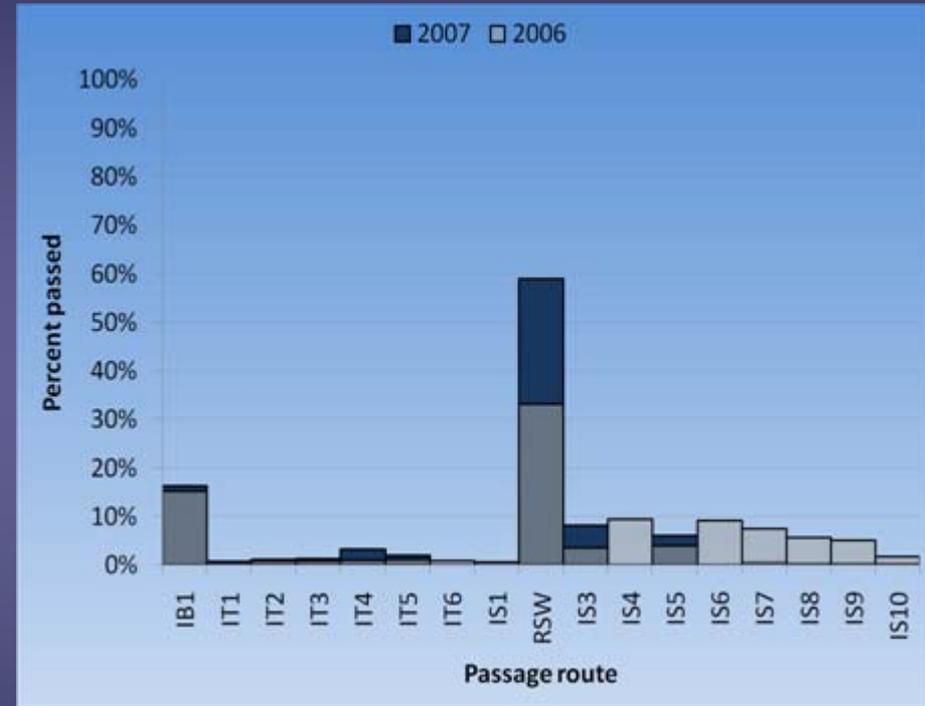
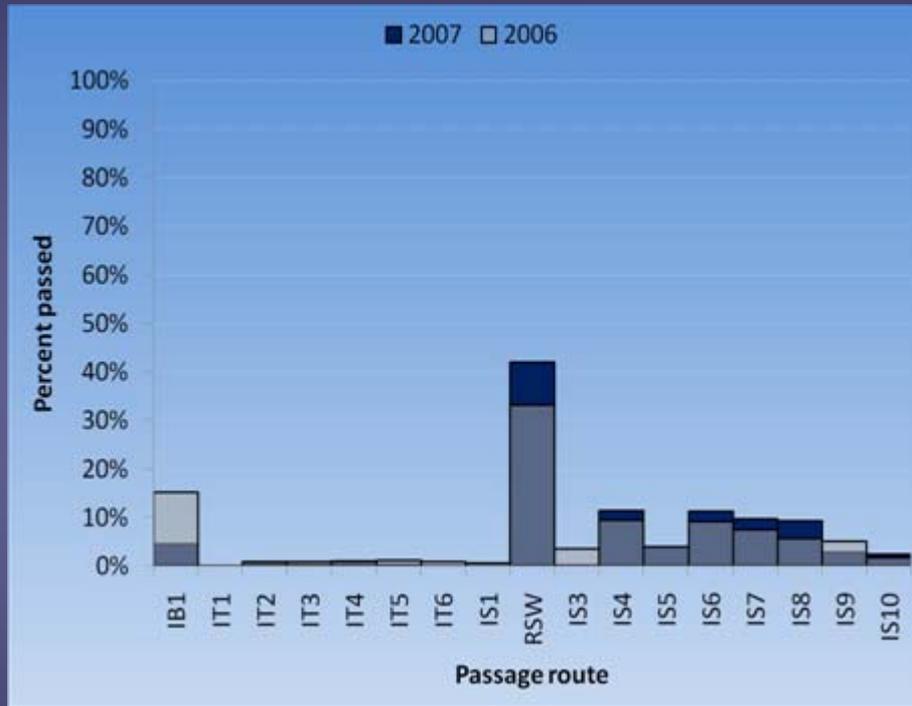
Reduced Spill



# Results - Yearling Chinook Salmon: Passage Distribution

BiOp Spill

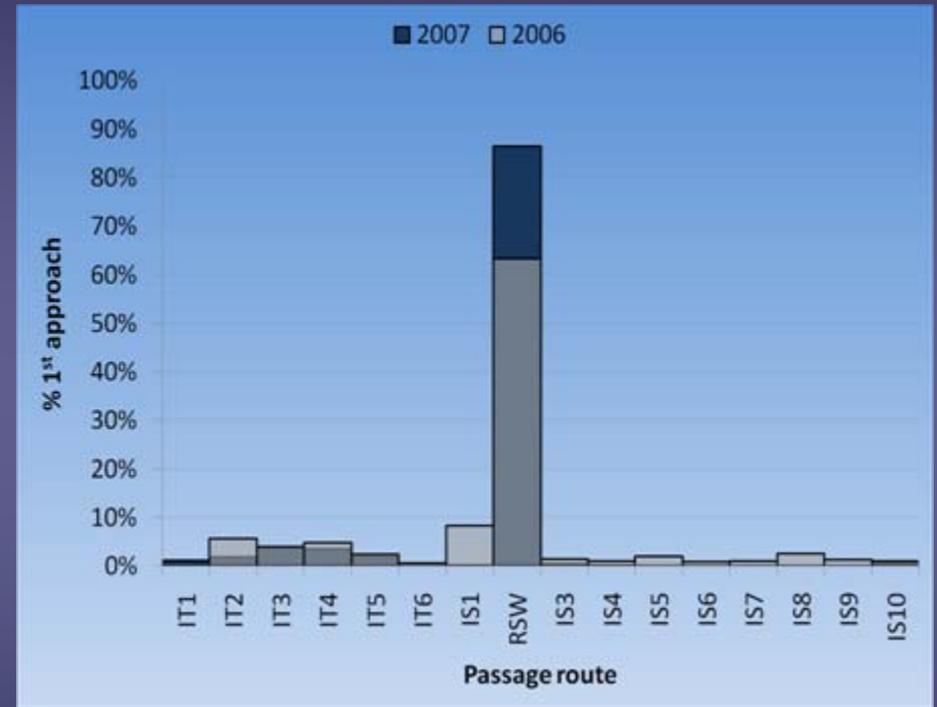
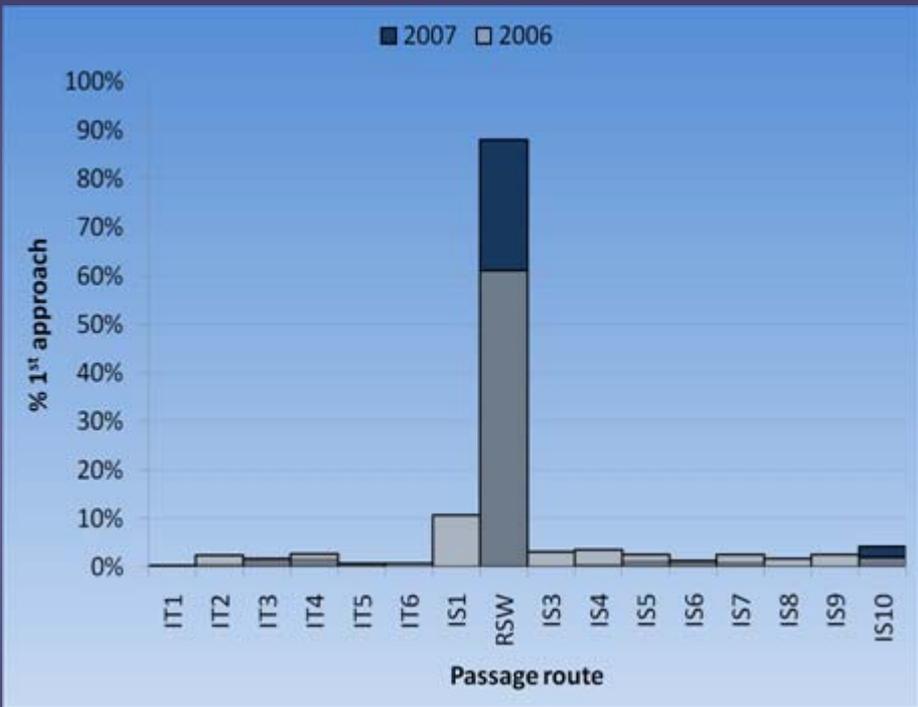
Reduced Spill



# Results - Juvenile Steelhead: First Approach (5 m resolution)

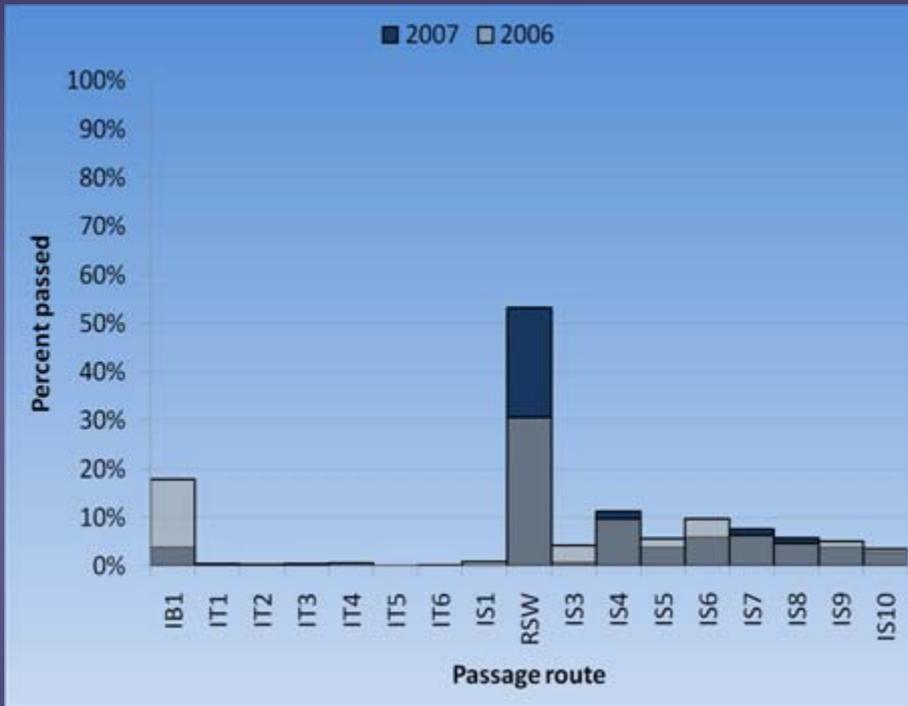
BiOp Spill

Reduced Spill

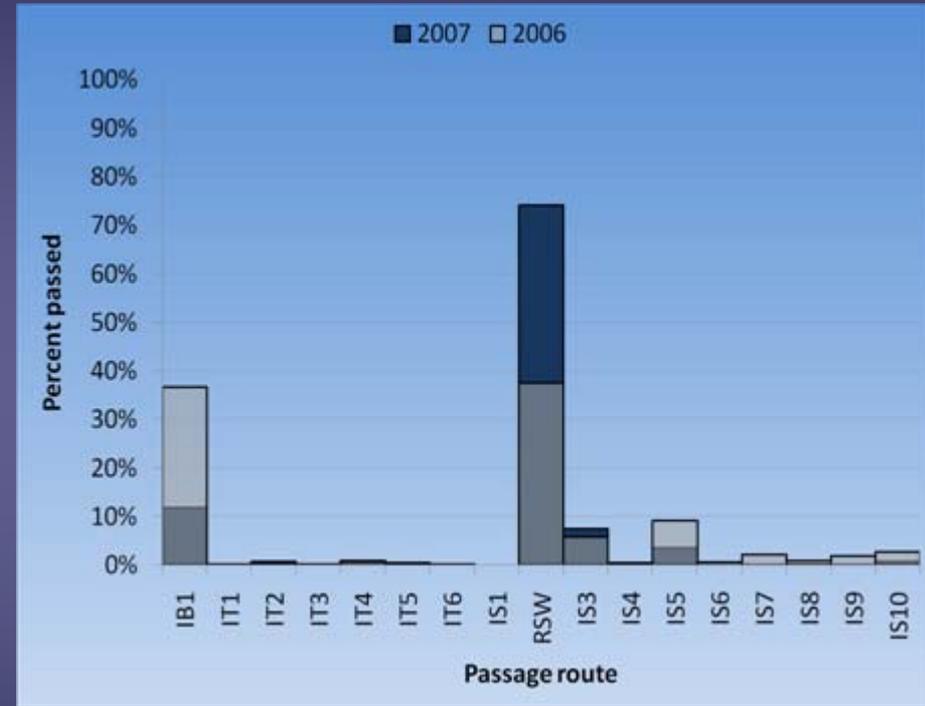


# Results - Juvenile Steelhead: Passage Distribution

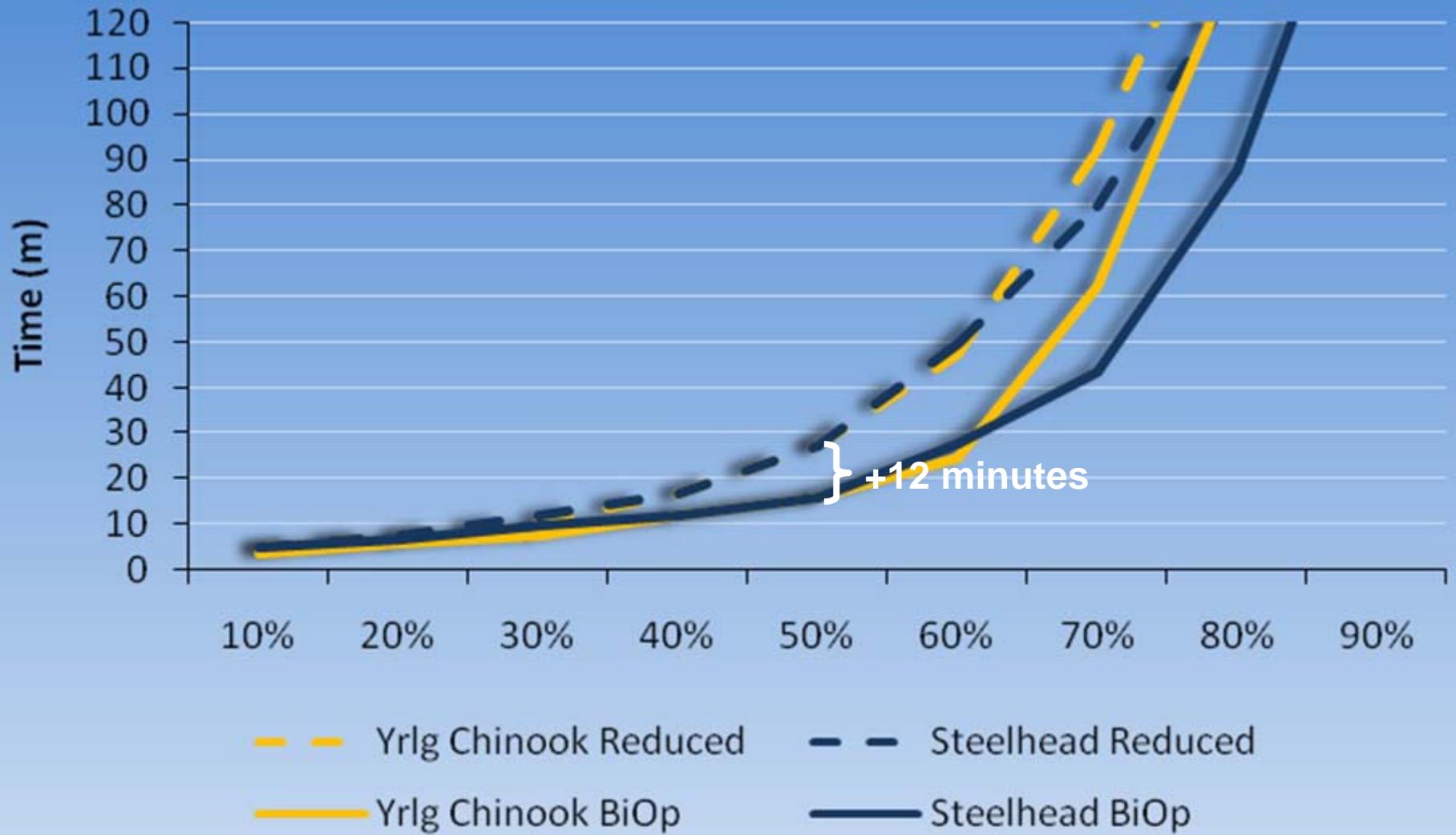
BiOp Spill



Reduced Spill

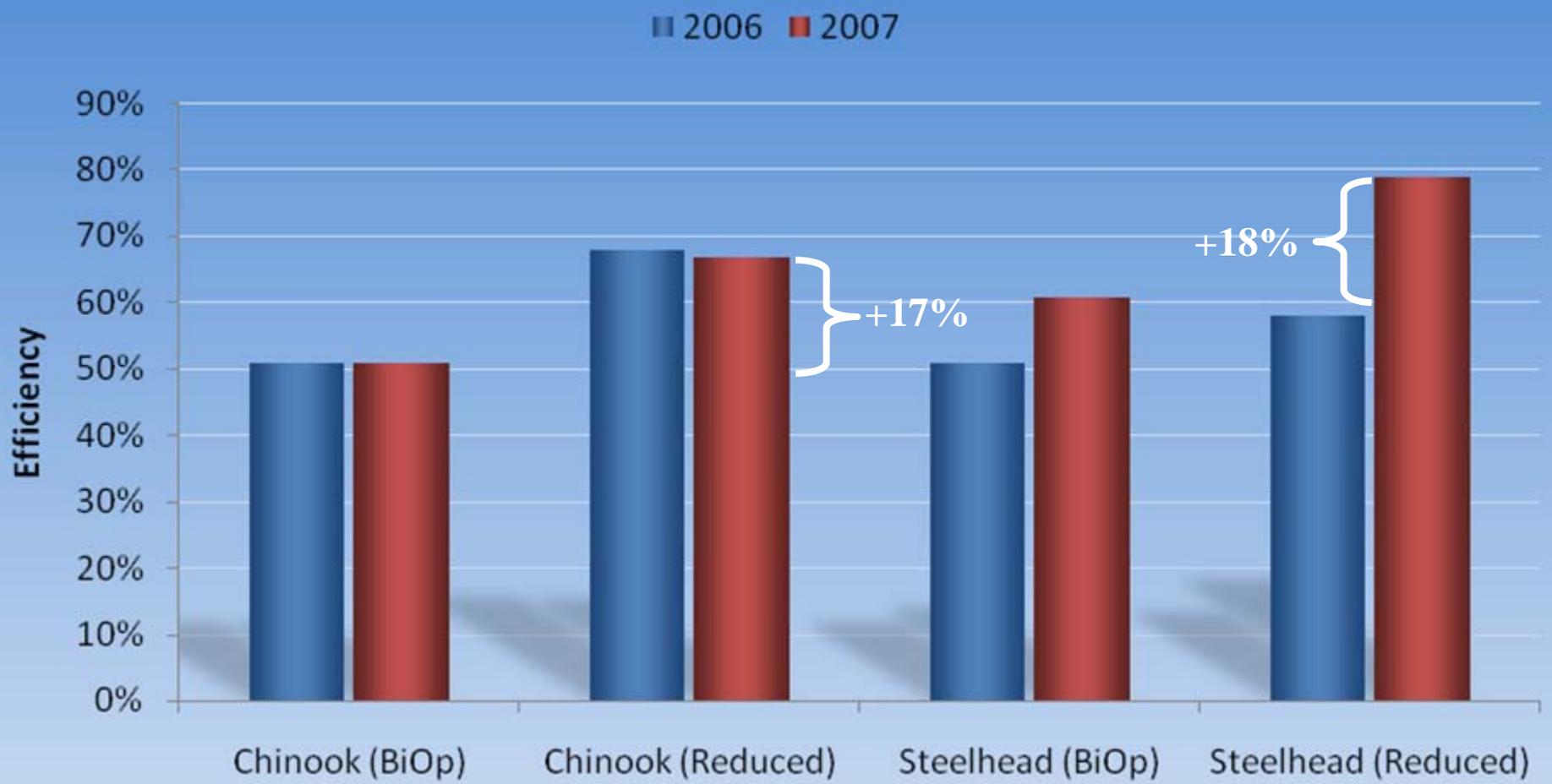


# Results - Spring migrants: RSW delay

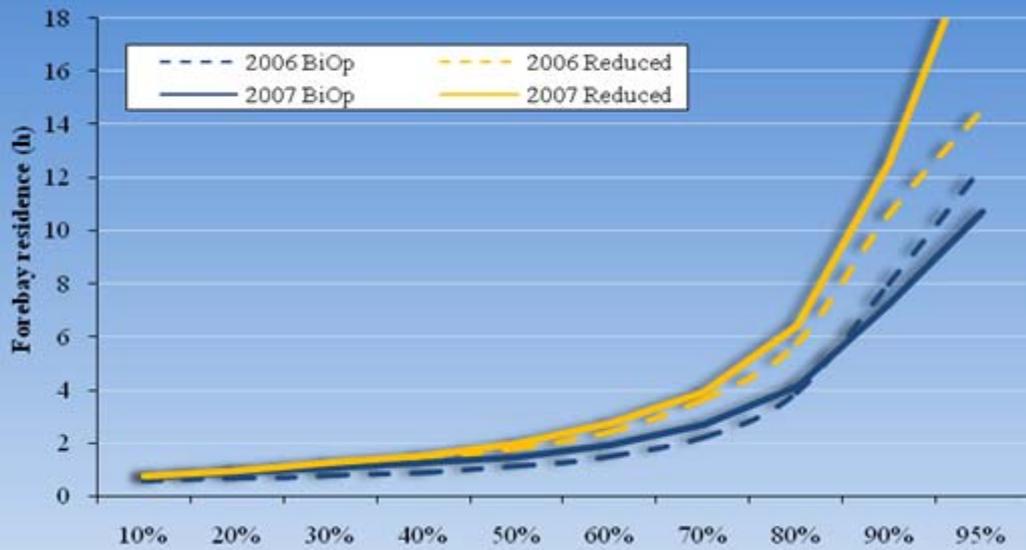


# Results - Spring Migrants: RSW Entrance Efficiency

$(RSW_{E\text{ eff}} = \text{Number passed} / \text{number first approached RSW})$

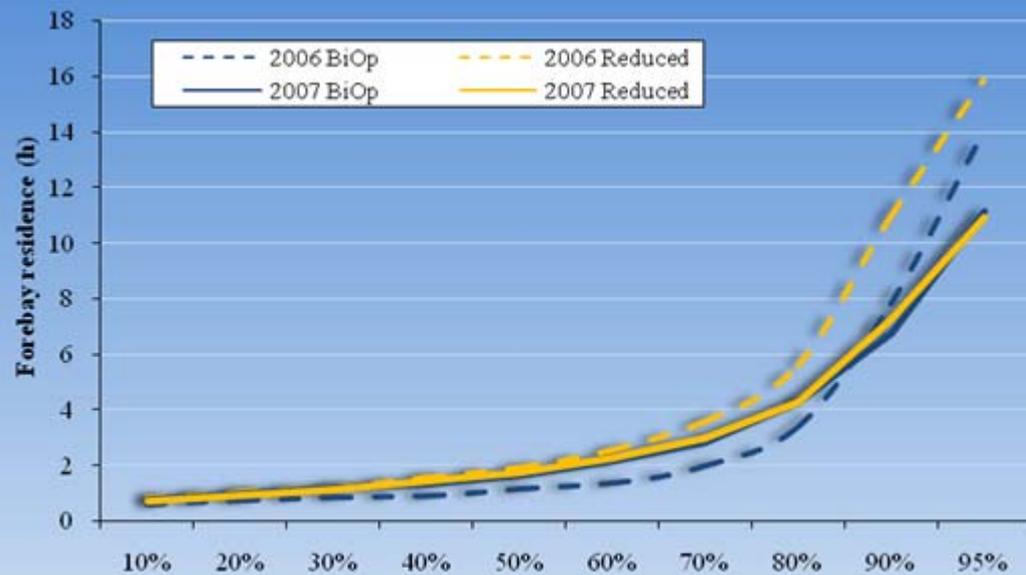


# Forebay Residence: *by spill treatment*



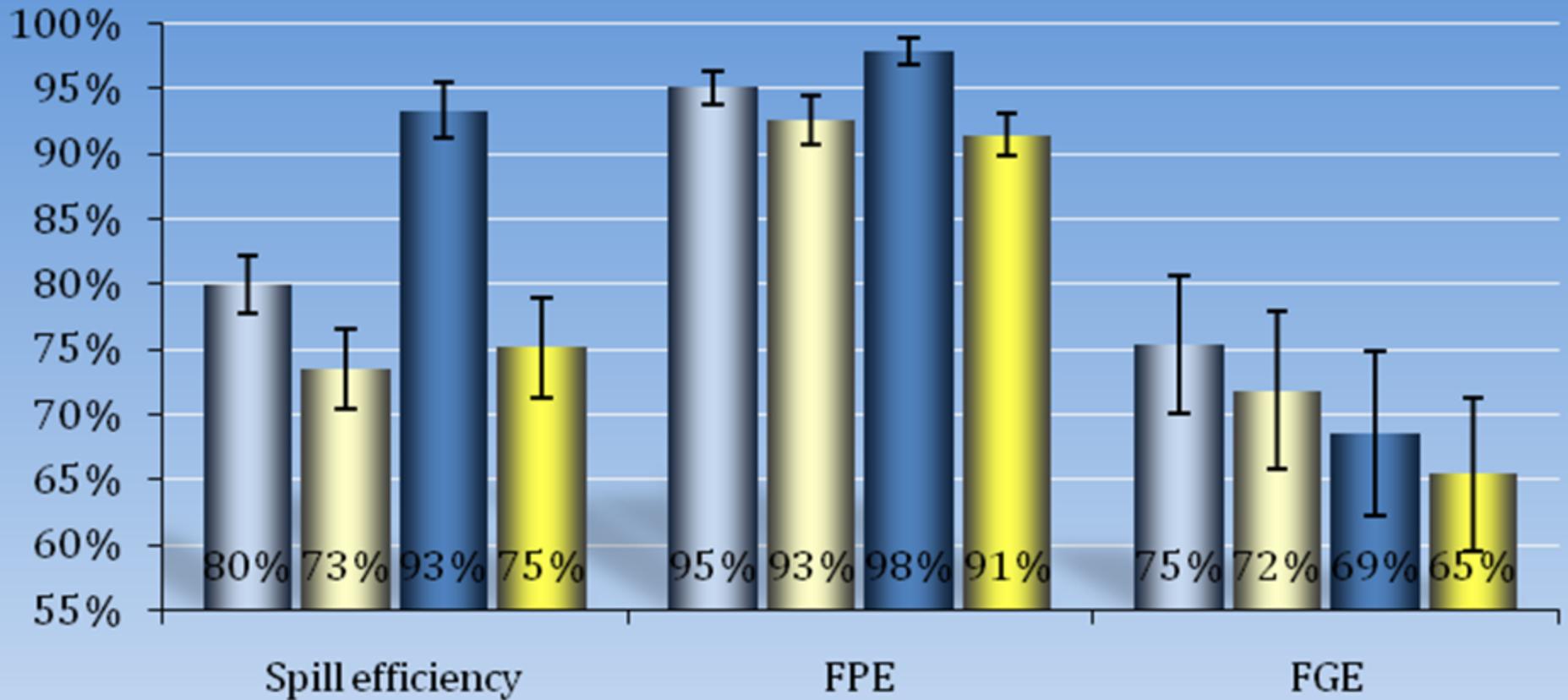
Yearling  
Chinook

Steelhead



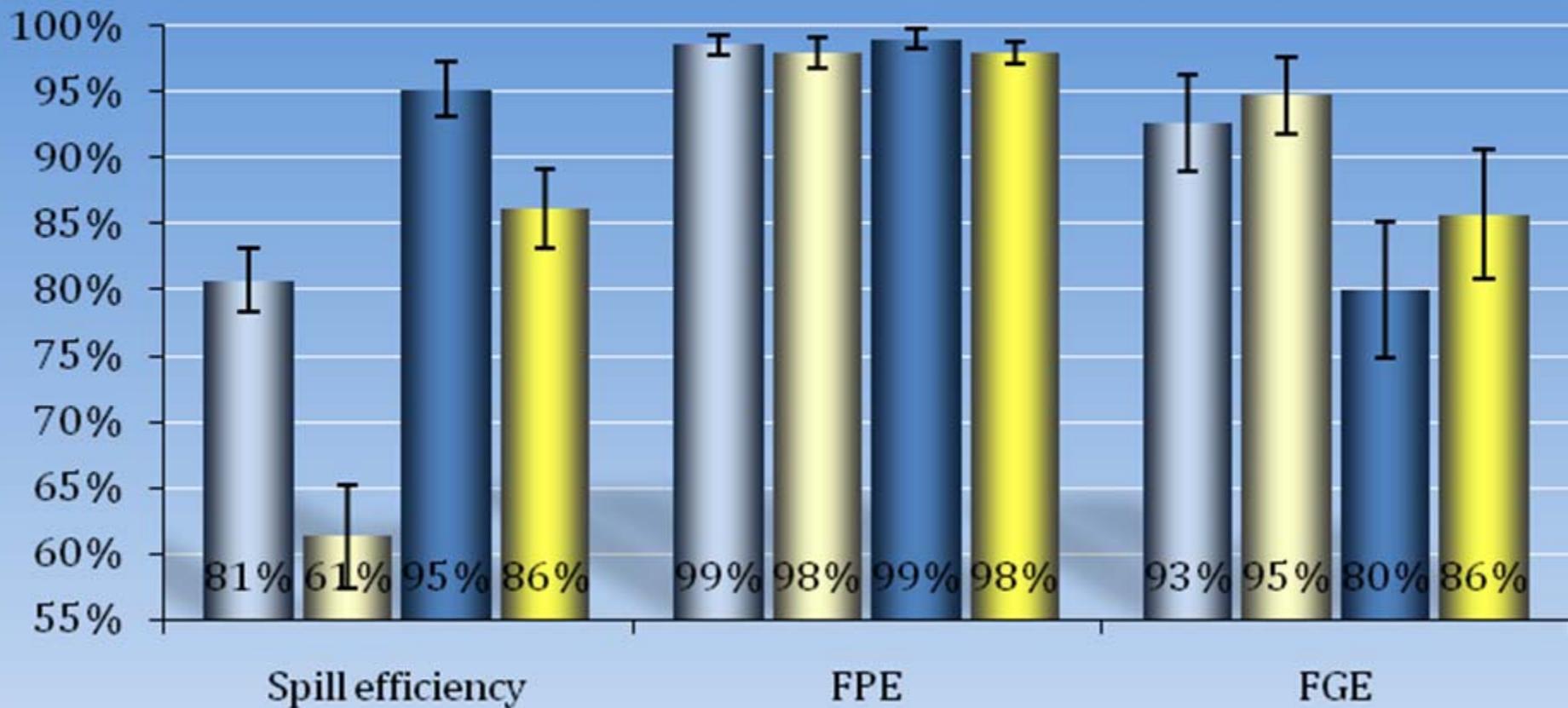
# Chinook: *Passage metrics by spill treatment*

■ 2006 BiOp   ■ 2006 Reduced   ■ 2007 BiOp   ■ 2007 Reduced

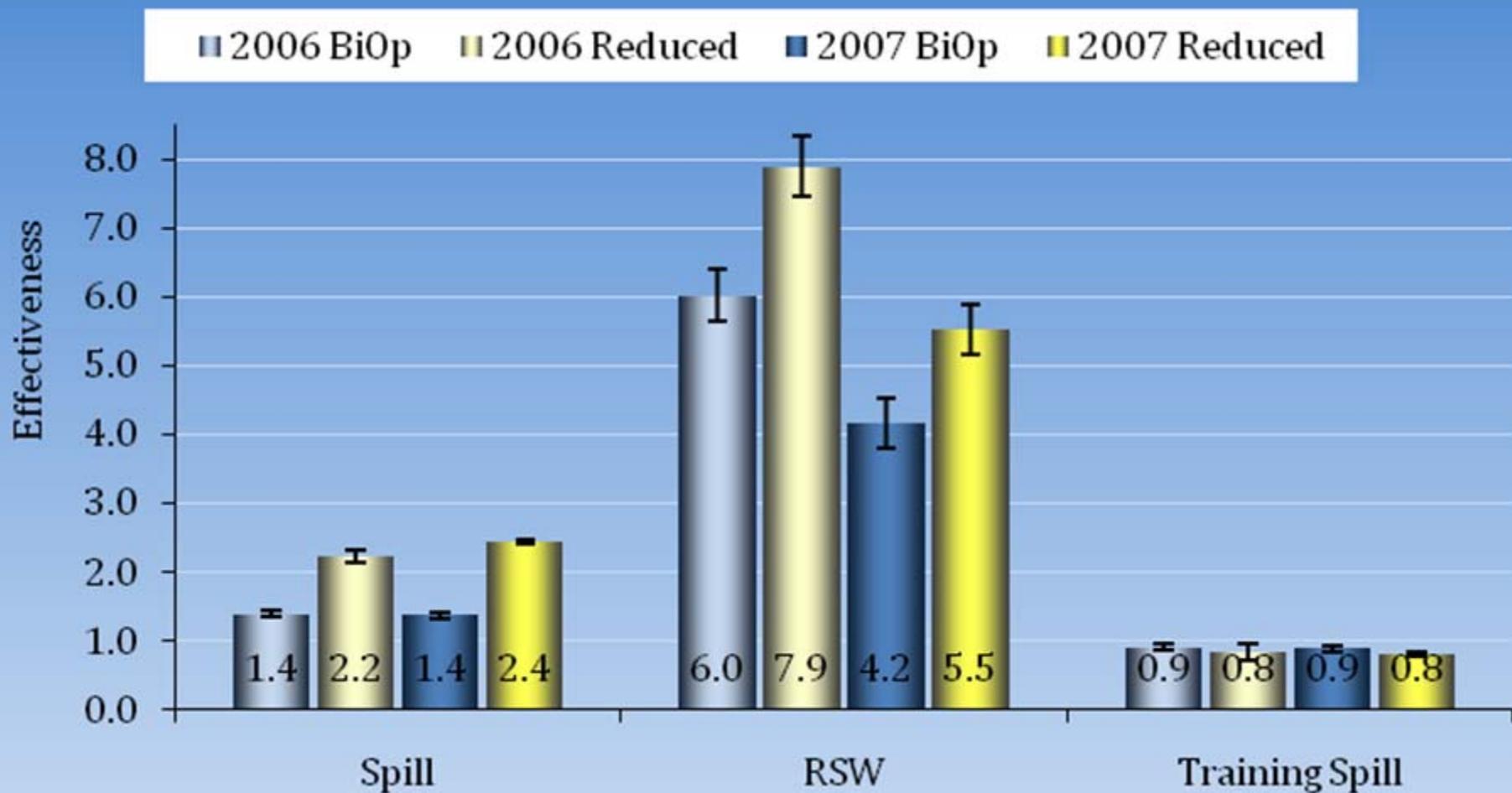


# Steelhead: *Passage metrics by spill treatment*

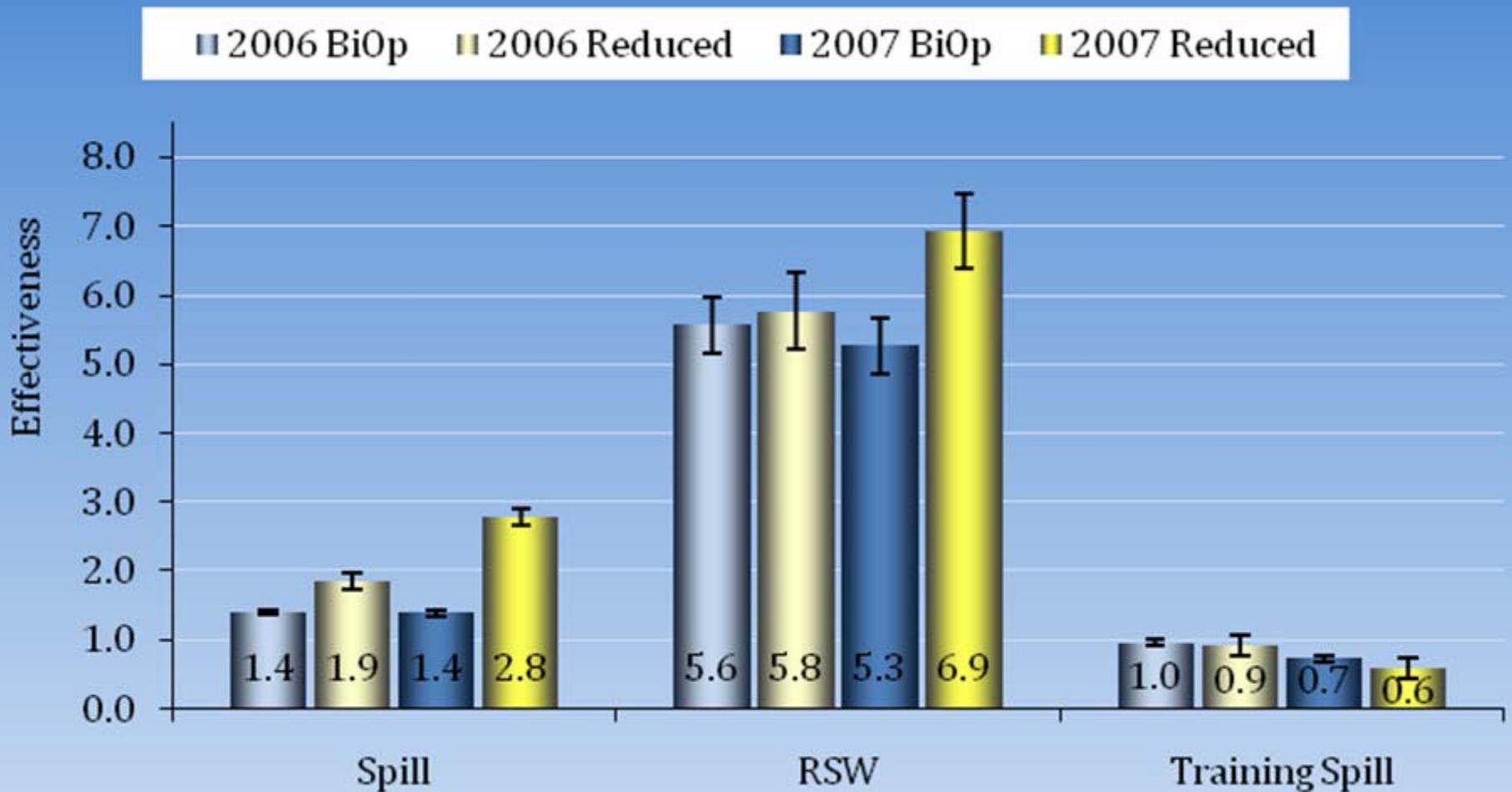
■ 2006 BiOp   ■ 2006 Reduced   ■ 2007 BiOp   ■ 2007 Reduced



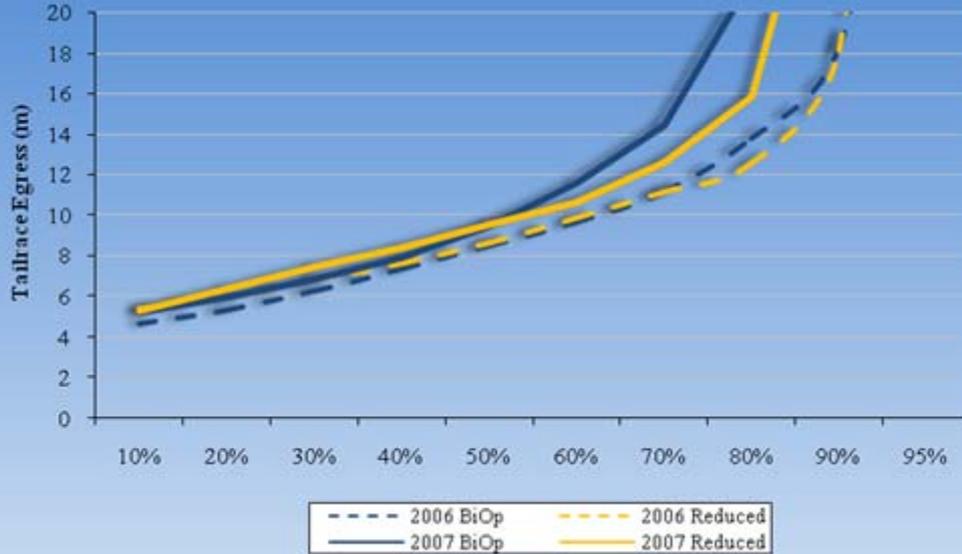
# Chinook: *Passage effectiveness by spill treatment*



# Steelhead: *Passage effectiveness by spill treatment*

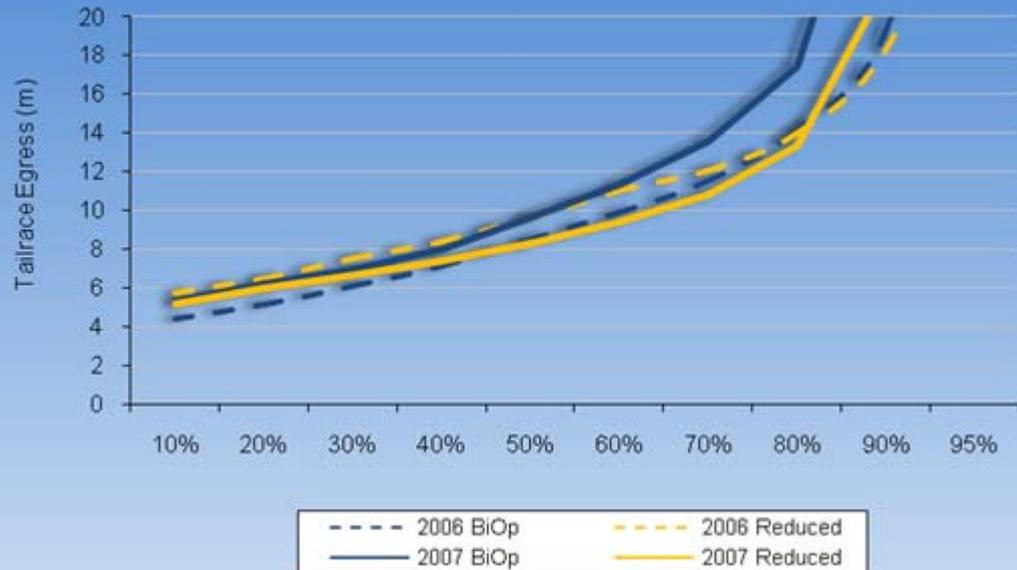


# Tailrace egress: *by spill treatment*

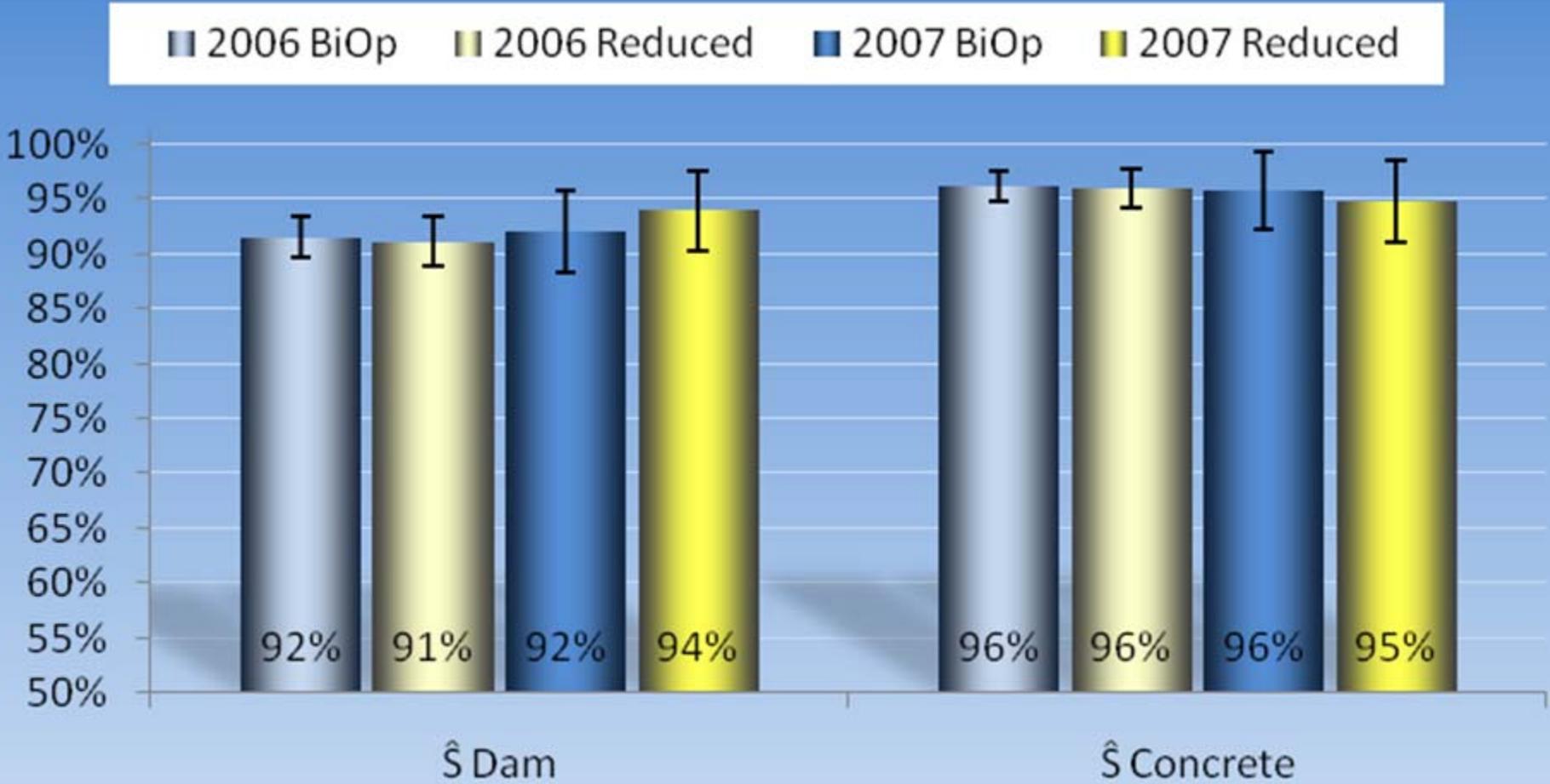


**Yearling  
Chinook**

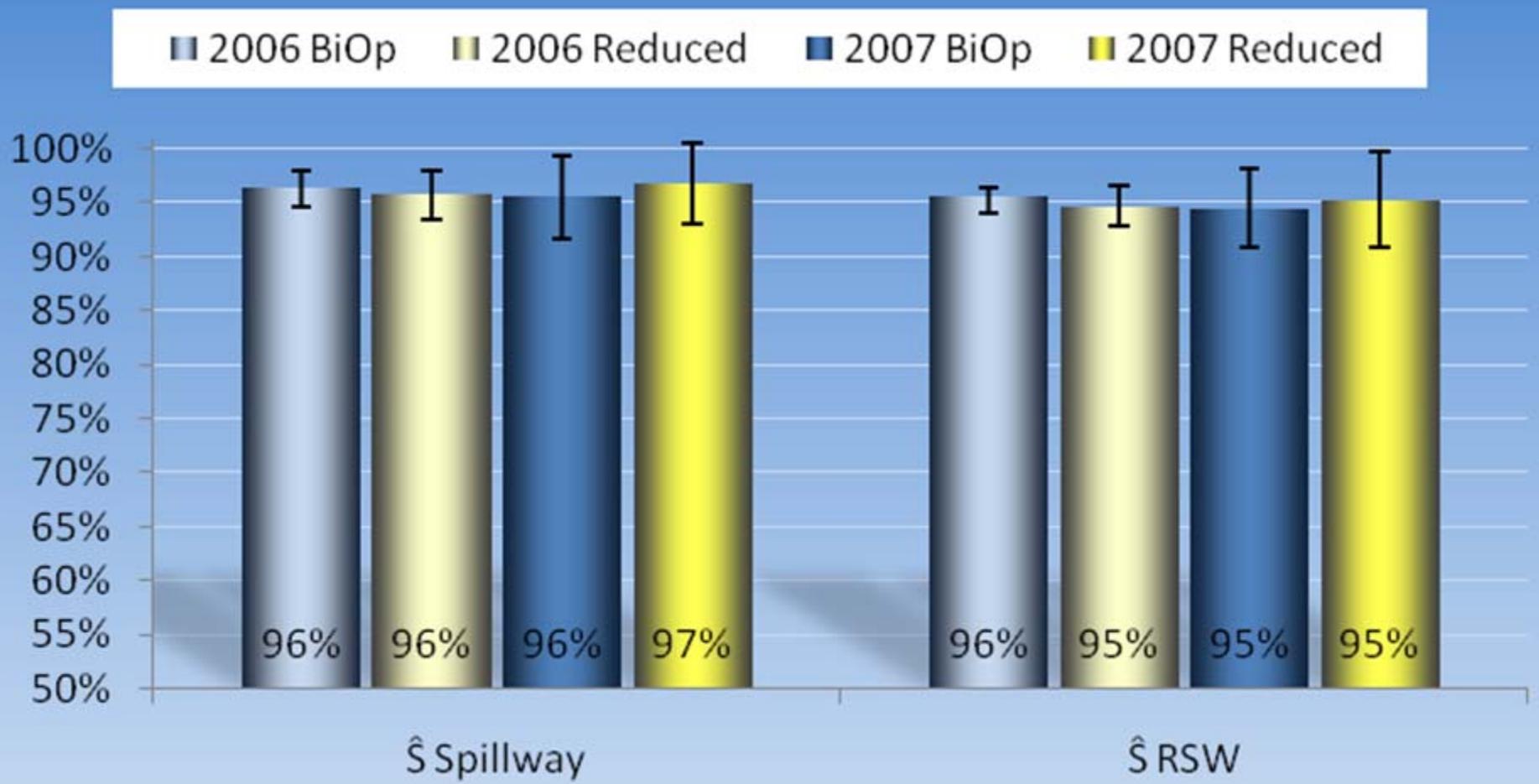
**Steelhead**



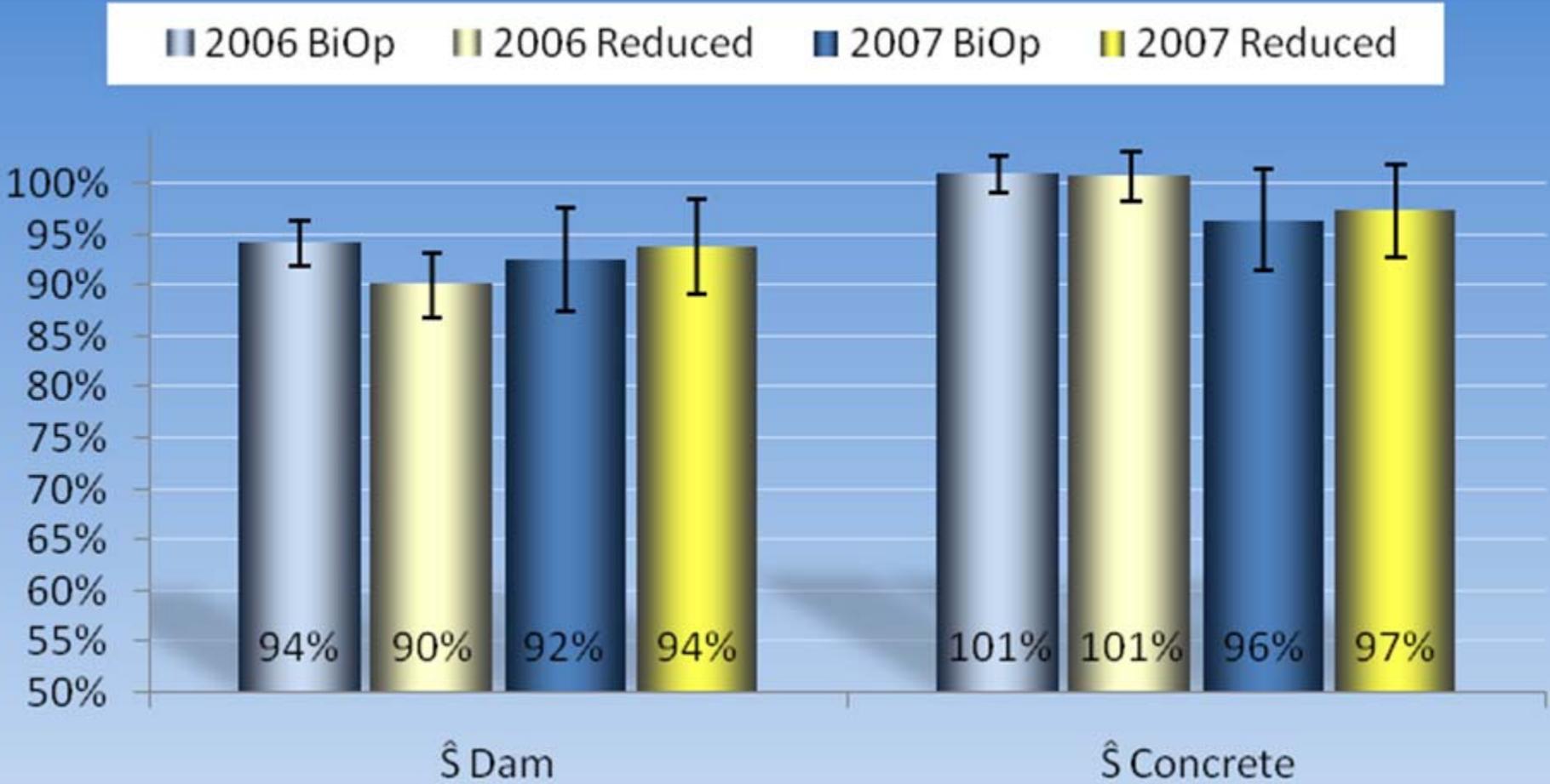
# Survival Results – Yearling Chinook Salmon



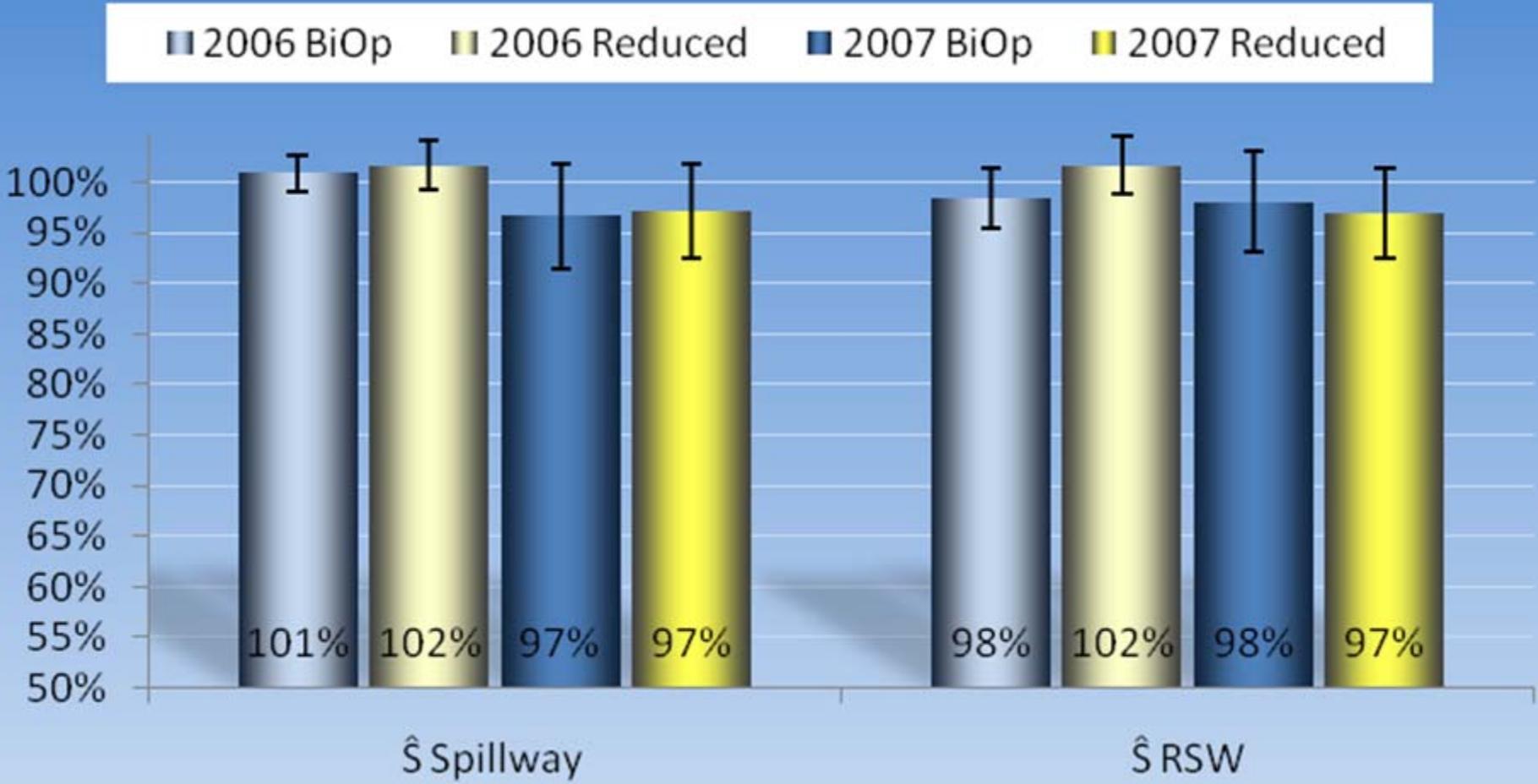
# Survival Results – Yearling Chinook Salmon



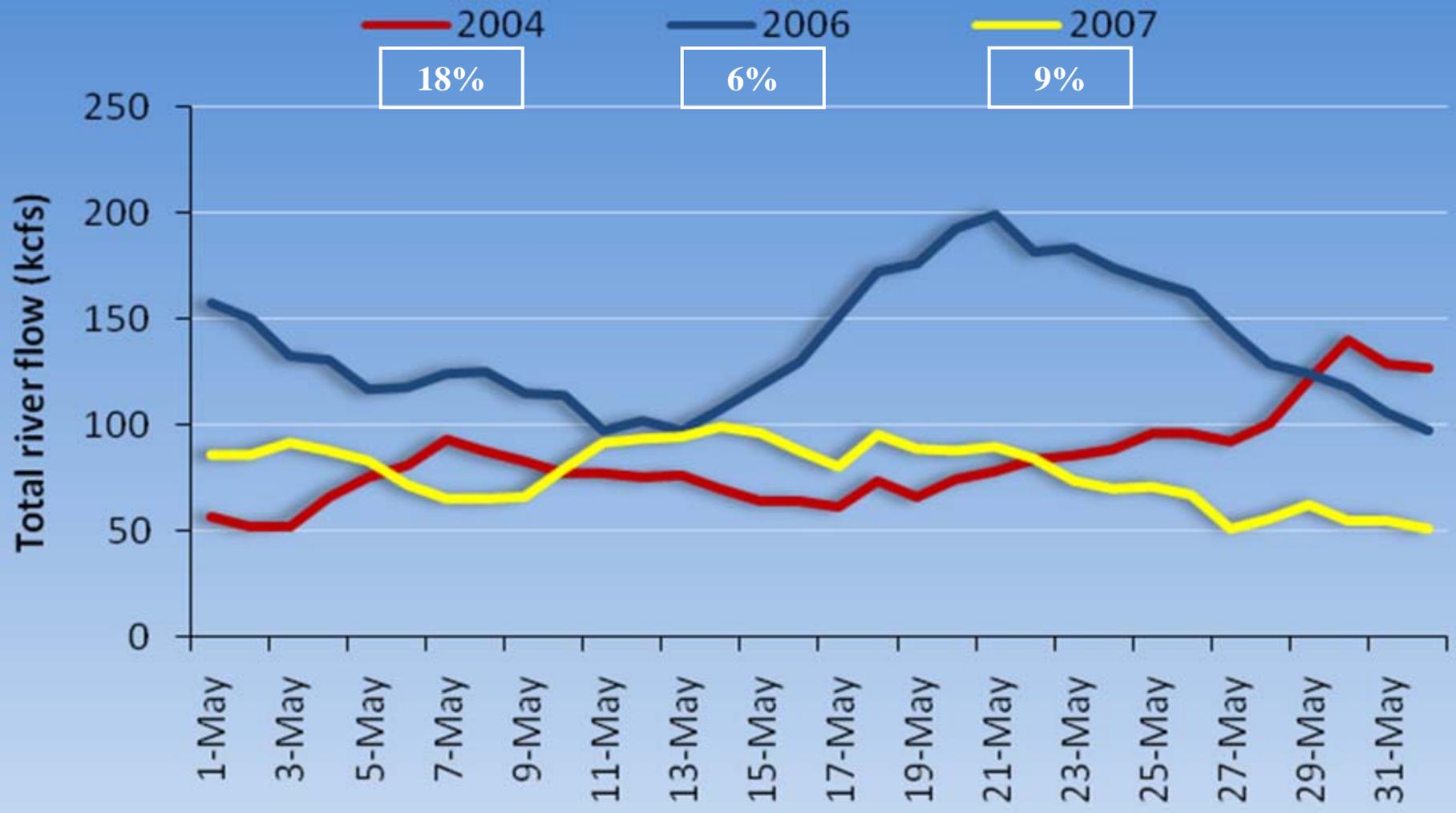
# Survival Results – Juvenile Steelhead



# Survival Results – Juvenile Steelhead



# Caspian Tern Predation vs. River Flow – *Juvenile Steelhead*



# Conclusions

- Increasing percentage of river flow through RSW by 4% increased passage through RSW by 10% for yearling Chinook and 35% for steelhead
- Increasing the forebay depth (from MOP to MOP+1) could increase percentage of flow through the RSW by 2% during a high flow year and 3% during a low flow year
- Steelhead tended to key on reduced spill conditions for approaching and passing the project
- BiOp spill slightly reduces forebay residence for both species; though it does not significantly alter forebay loss
- No difference in survival by species, treatment, or flow years



# Acknowledgements

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