

# Conveyance Losses, Travel Times, and Re-diversion Proportions along the Bear River

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# History – Project funding

- University of Wyoming Water Research Program Request for Proposals
- “ Wyoming is a headwater state and most of the streams are regulated to meet downstream needs... Currently there is a need to determine the conveyance losses between Woodruff Narrows Reservoir and Pixley Diversion Dam...”

# Bear River Segment

## DIVERSIONS IN BEAR RIVER BEAR RIVER MAIN STEM

### UTAH

- 1 Lannon
- 2 Hilliard West Side
- 3 Bear
- 4 Tropic
- 5 Danielson
- 6 Pine Grove & Crown
- 7 McGrow
- 8 Big Bend
- 9 Homer
- 10 Lewis
- 11 Lewis & Blanchard
- 12 Myers No. 2
- 13 Hare
- 14 Coffman No. 1
- 15 Coffman No. 2
- 16 Knoder
- 17 Myers No. 1
- 18 Myers Irrigation
- 19 Booth
- 20 Evanston City Pipe Line
- 21 Anel
- 22 Cornellson
- 23 Evanston Water Supply
- 24 Anderson
- 25 Knight No. 2
- 26 Evanston Water
- 27 Barton
- 28 Faulkner
- 29 Rocky Mountain Blythe
- 30 Fila
- 31 Johnson-Narramore
- 32 Bruce Barton
- 33 A. W. Sims
- 34 John Anderson
- 35 Crompton No. 2
- 36 Fearne
- 37 Saxton-Turner
- 38 Saxton Irrigation
- 39 John Sims
- 40 Southern Pacific
- 41 Heward
- 42 Saxton-Thomas
- 43 Ramsey
- 44 Almy
- 45 Sims Blythe Turner
- 46 Bowns
- 47 Russell
- 48 Turner
- 49 Upper Morris
- 50 Chapman
- 51 Lower Morris
- 52 Bruce Bowns
- 53 Tunnel
- 54 Foxess
- 55 Christensen
- 56 Upper Island
- 57 Bligh Irrigation
- 58 Acock & Cowlishaw
- 59 Lower Island
- 60 Francis Lee
- 61 Bear River

### UTAH

- 62 Neville
- 63 Rees Land & Livestock
- 64 Booth
- 65 Randolph-Woodruff
- 66 Crawford-Thompson
- 67 Dykens
- 68 Randolph-Sage Creek
- 69 McMinn
- 70 Enberg

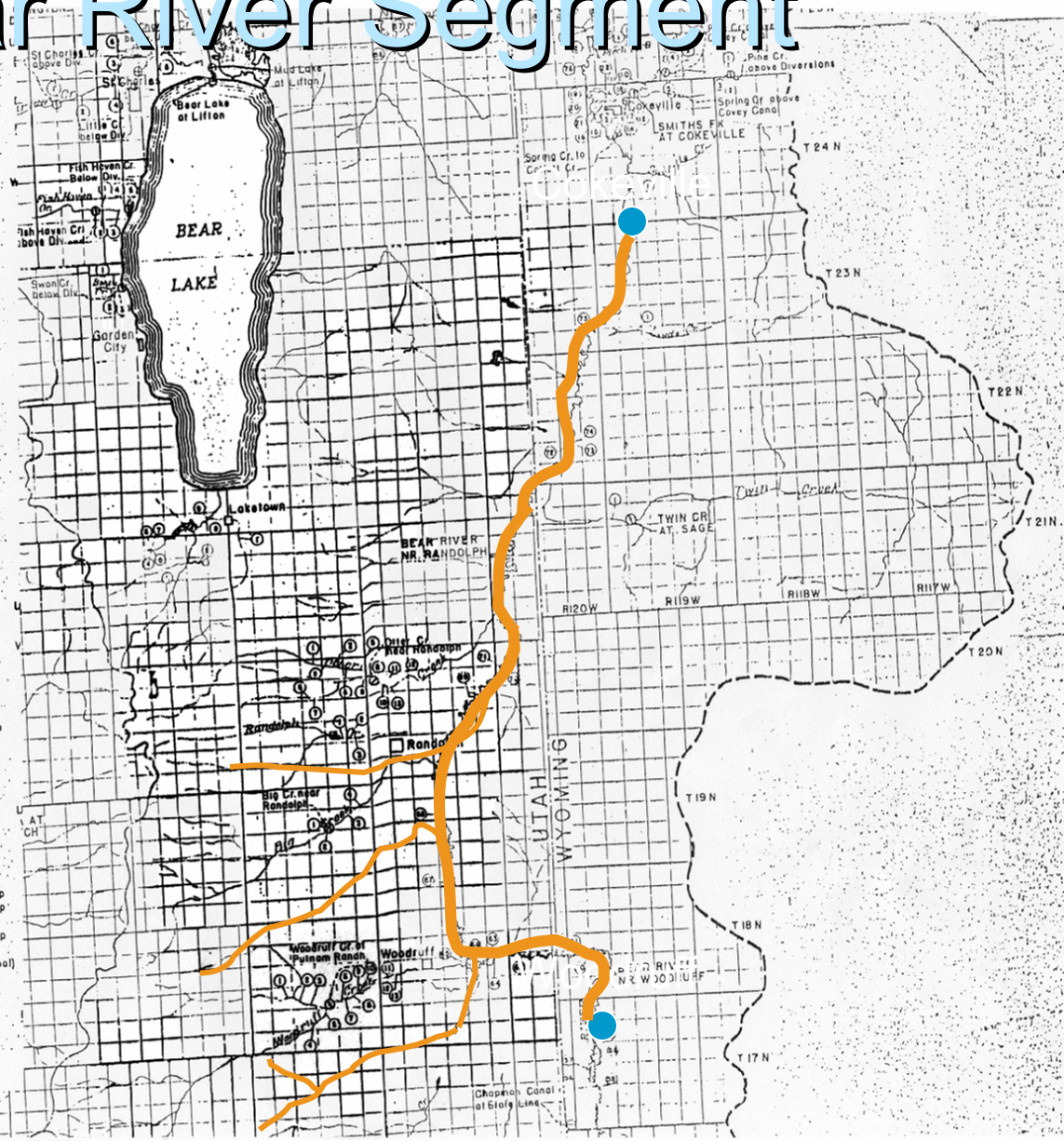
- 72 B O. West Slough
- 73 McFarland
- 74 B Q. East Side
- 75 Peley
- 76 Garrett
- 77 Sights
- 78 Wyman (East)
- 79 Wyman (West)
- 80 Snyder
- 81 Rocky Point
- 82 Cook
- 83 John R. Richards

### IDAHO

- 84 Miller
- 85 Nuffer
- 86 Sorensen
- 87 Pacific
- 88 Transtrum
- 89 Loyd
- 90 Phelps Estate
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- 93 Black Otter & Peg Leg
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- 95 Kent-Larocco
- 96 Pugmire
- 97 West Fork
- 98 Nambow
- 99 Outlet Canal
- 100 Johnson
- 101 Budge No. 1
- 102 Budge No. 2
- 103 Last Chance
- 104 Bench B
- 105 Tanner
- 106 Gentile Valley
- 107 Smith-Bosen
- 108 Riverdale - Preston
- 109 Nelson
- 110 Riverdale
- 111 West Cache
- 112 Cub River Pumps

### UTAH

113. W. D. Goodwin Pump
- 114 J. E. Lowe & Goodwin Bros.
- 115 Hill Irr. Co. Pump
- 115a Wood Irr. Co. Pump
116. Altsop Pump
117. Smithfield West Bench
118. West Cache Canal Pump
119. Riverside Pump
120. Johnston Smith Pump
121. Munn & Jorgensen Pump
122. Thain & Hoffman
123. King Irr. Co. Pump
124. Rees & Clark Pump
125. Foster Reese Pump
126. H.W. Ballard Pump
127. Rees No. 1 Pump
128. Griffith Pump
129. J. A. Baer Pump
130. M. J. B. H.W. Ballard Pump
131. Benson Bear Lake Pump
132. W. H. Thain No. 1 Pump
133. Cronquist & Bough Pump
134. Ray Smith Pump
135. Hammond (East Side Canal)
136. West Side Canal





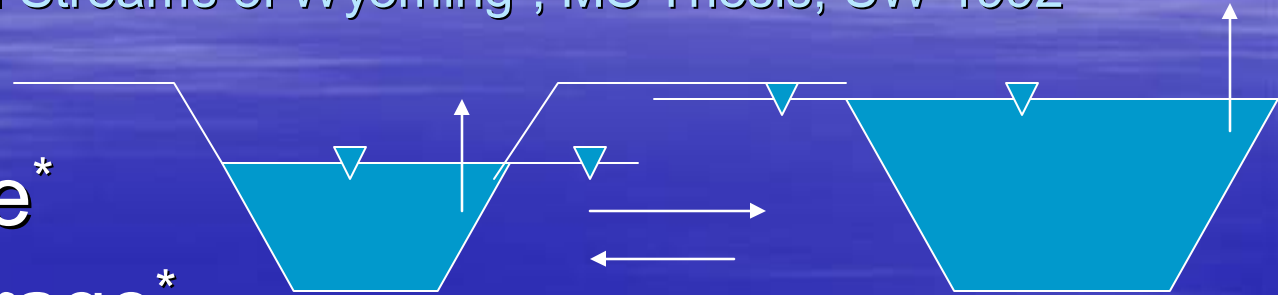
# Benefits

- Quantifying conveyance losses for this portion of the Bear River may provide **additional irrigation water within Wyoming.**
- Aside from this direct benefit, there are other advantages in quantifying conveyance losses for this stretch of river. Irrigation return flows, **relative portions of natural flow and whether a stream reach is gaining or losing water** are also determined when characterizing conveyance losses.
- This type of information is **useful for irrigators when estimating the amount and timing of water that will reach their diversions** after a reservoir release.

# Components to consider for conveyance losses

Adapted from Farber, "Conveyance Loss Modeling of Reservoir Releases in Natural Streams of Wyoming", MS Thesis, UW 1992"

- Bank storage\*
- Channel storage\*
- Evaporation
- Inadvertent diversions
  - (fixed gate settings)
- Groundwater inflow reduction
  - (reduced gradient)



\* Transient

# Definitions of Conveyance Losses

1 Total loss (difficult)

Gaining:

= evaporation + reduced groundwater inflows

Losing:

= evaporation + streambed infiltration

2 Net total loss

= Outflow + Diversions - Inflow

3 Incremental loss (this study)

=  $\Delta$ Outflow -  $\Delta$ Inflow +  $\Delta$ Diversions



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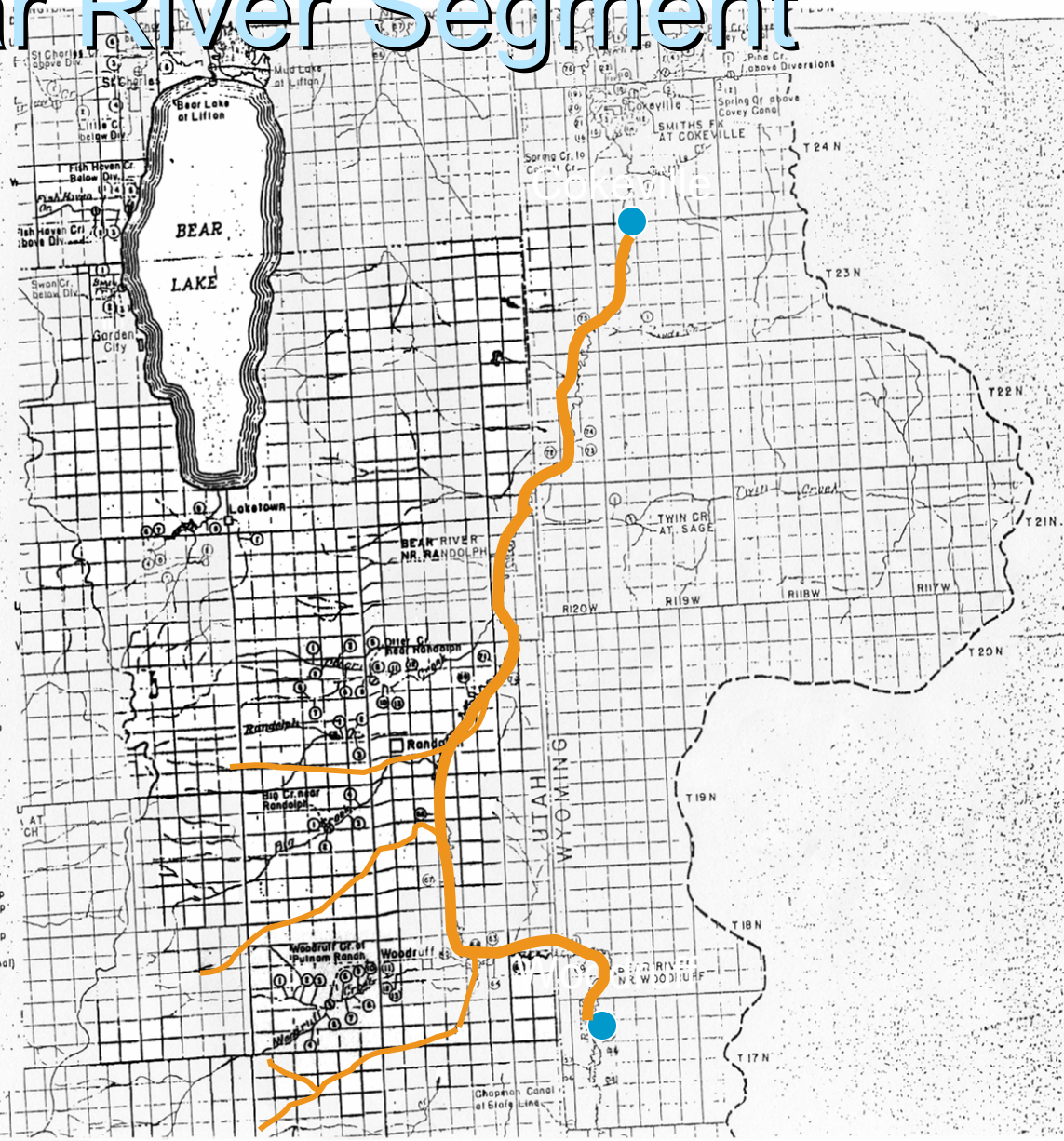
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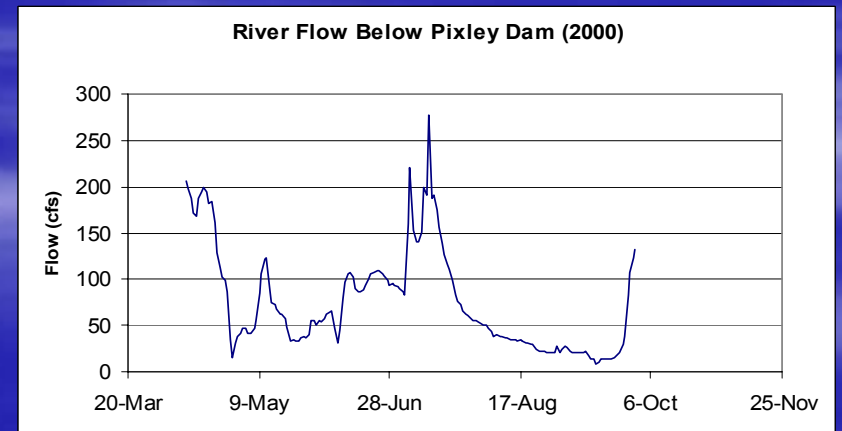
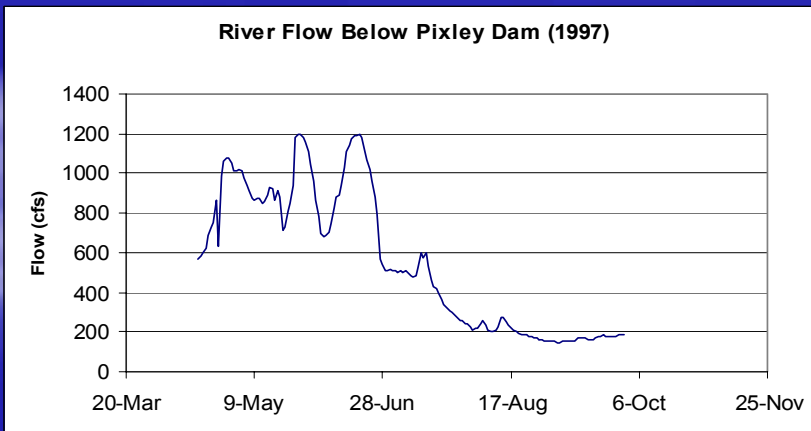
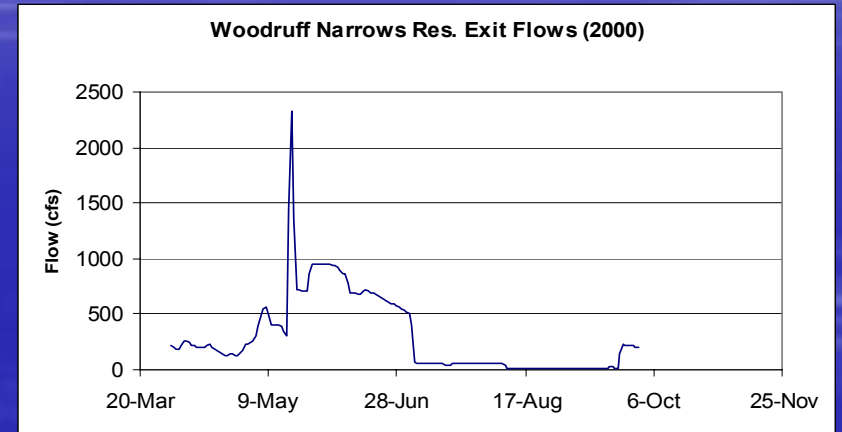
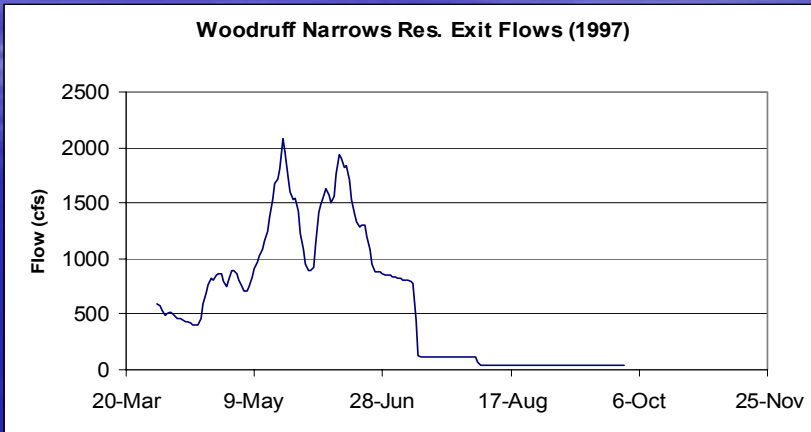
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# Woodruff Narrows Reservoir Releases

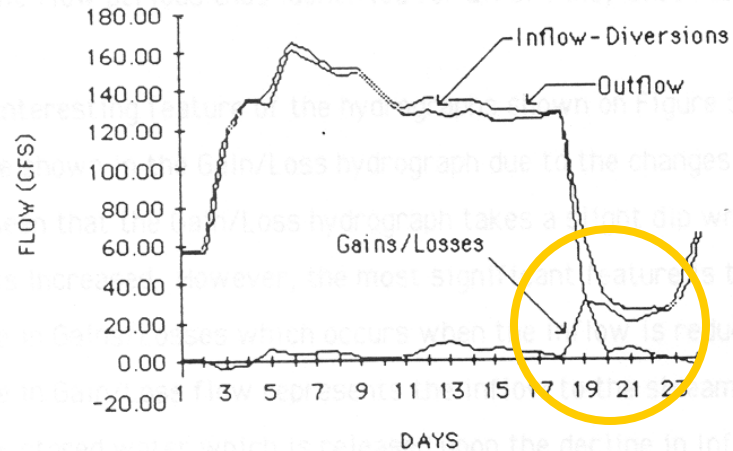
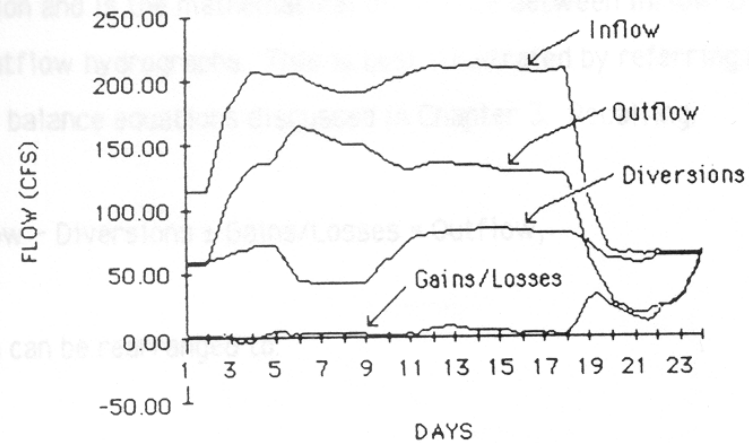




# Objectives

- This research will determine Bear River conveyance losses between Woodruff Narrows Reservoir and Cokeville, WY. Specific Objectives are:
- Identify mechanisms that may contribute to losses or gains from the system
- Perform a water budget analysis to determine losses or gains from the systems
- Determine magnitude of losses or gains associated with each mechanism.

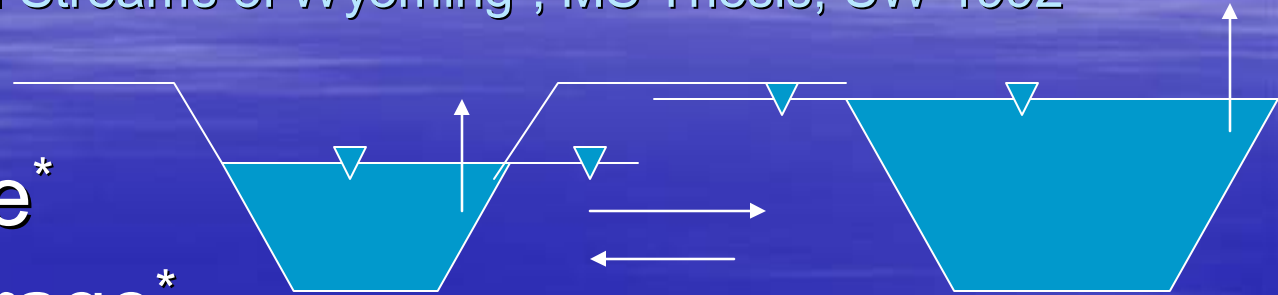
# Hydrograph Analysis



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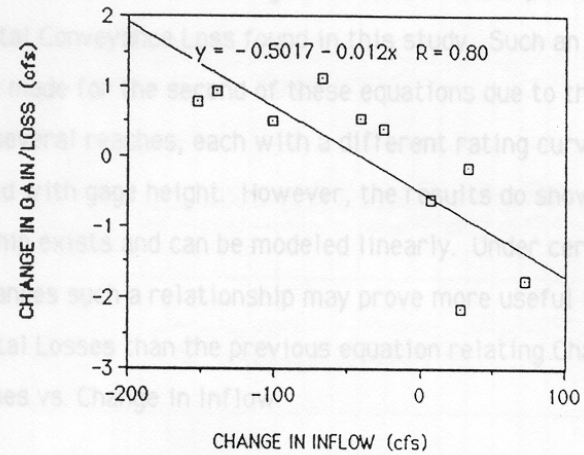


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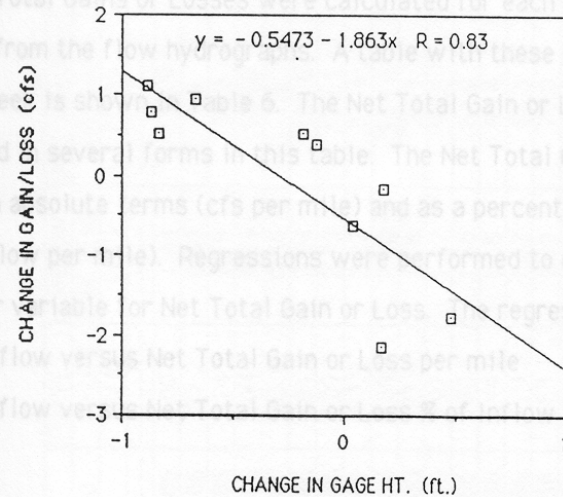


# Typical Application of Information

A) Change in Inflow vs. Change in Gain/Loss



B) Change in Gage Ht. vs. Change in Gain/Loss



# Project Schedule:

- Year 1 (now)

Assessment of monitoring network?,  
establishment of baseline information

- Years 2 and 3

Development of incremental loss /  
incremental flow relationships

# Help

- General information about project objectives, what else should we consider?
- Problems we are likely to encounter?
- Information retrieval/coordination.



# Thank you

- Questions ?