Fall Chinook Salmon
Lower Snake River
&
Lower Columbia River

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National Marine Fisheries Service

NWPCC Symposium
9 November 2004

Lower Snake River

- Reference:

  Smith, S. G., W. D. Muir, R. W. Zabel, E. E. Hockersmith, G. A. Axel, W. P. Connor, and B.D. Arnsberg. 2002. Survival of hatchery subyearling fall chinook salmon in the free-flowing Snake River and Lower Snake River reservoirs, 1998-2001. Report to Bonneville Power Administration, Contract DE-AI79-93BP10891.

http://www.efw.bpa.gov/Environment/EW/EWP/DOCS/REPORTS/DOWNSTRM/D00004922-2.pdf

Lower Snake River

- Wild and reared at Lyons Ferry Hatchery

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- “Exposure index” based on Lower Monumental passage timing (mean during middle 50% of passage)

Lower Snake River

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- Detected at LGR and returned to river
- Weekly pooled groups
- Survival and travel time between

  Lower Granite and Lower Monumental Dams
- “Exposure index” based on Lower Monumental passage timing (mean during middle 50% of passage)
- 1995-2001, typically 8 June – 16 August

Lower Snake River

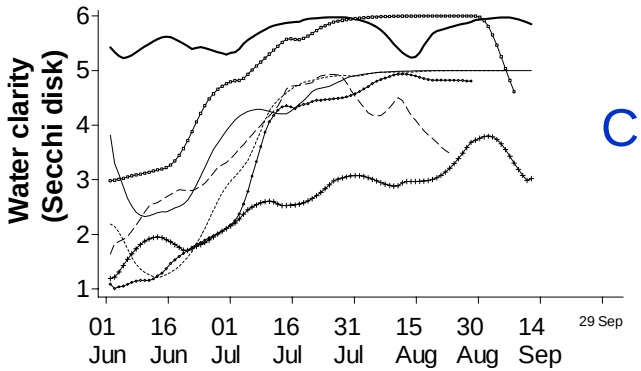
- No estimates 2002 (poor fish quality)
- Flow/travel time/survival analysis not updated for 2003-2004

Lower Snake River

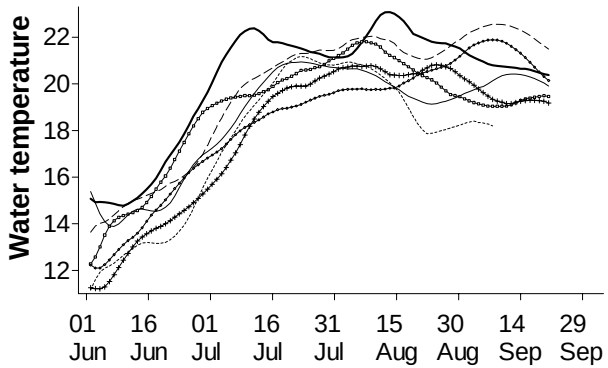
- “Survival” estimates are really joint probability of migrating as subyearling and surviving

  -- no accounting for holdovers (“reservoir-type”)

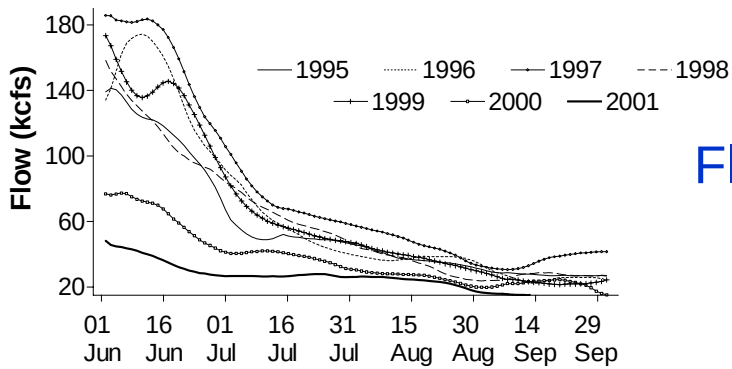
River conditions at Lower Granite Dam 1995-2001



Clarity



Temperature



Flow (kcfs)

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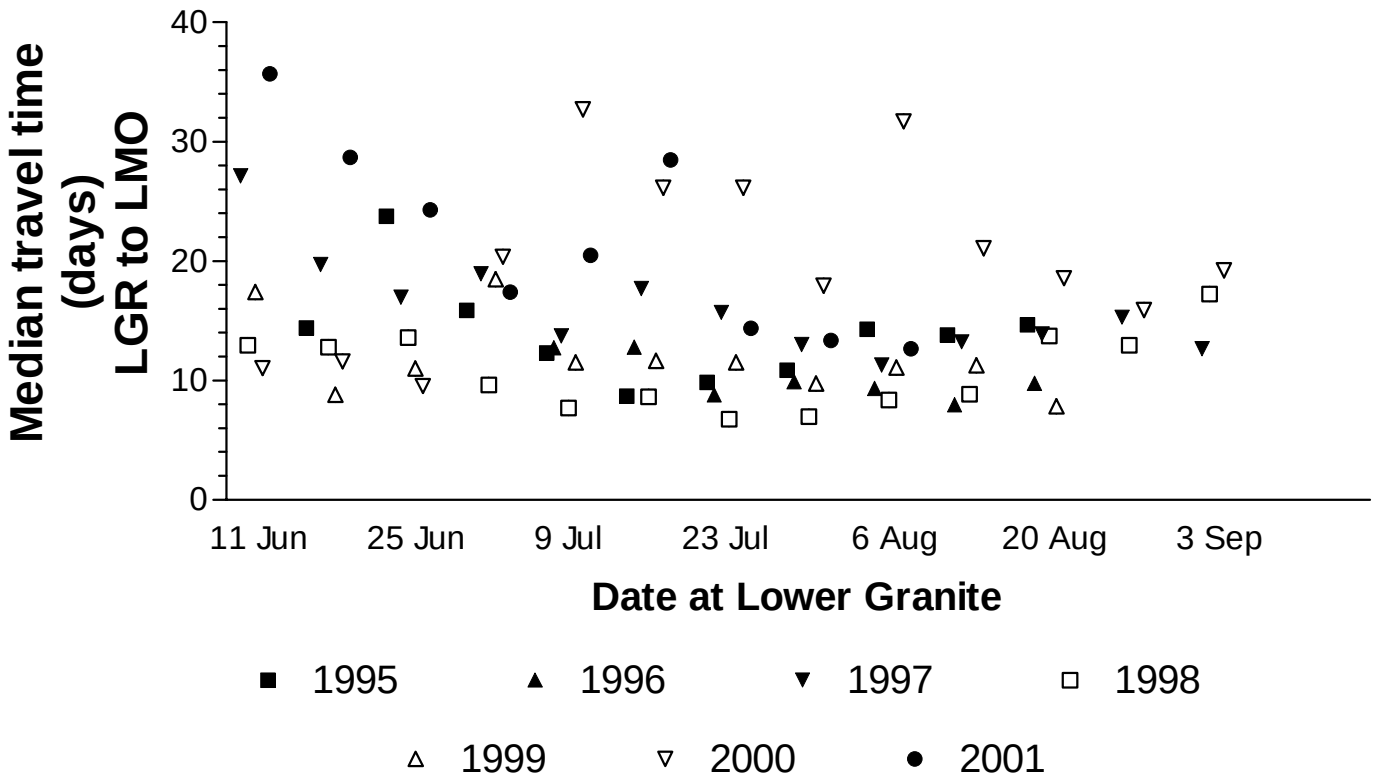
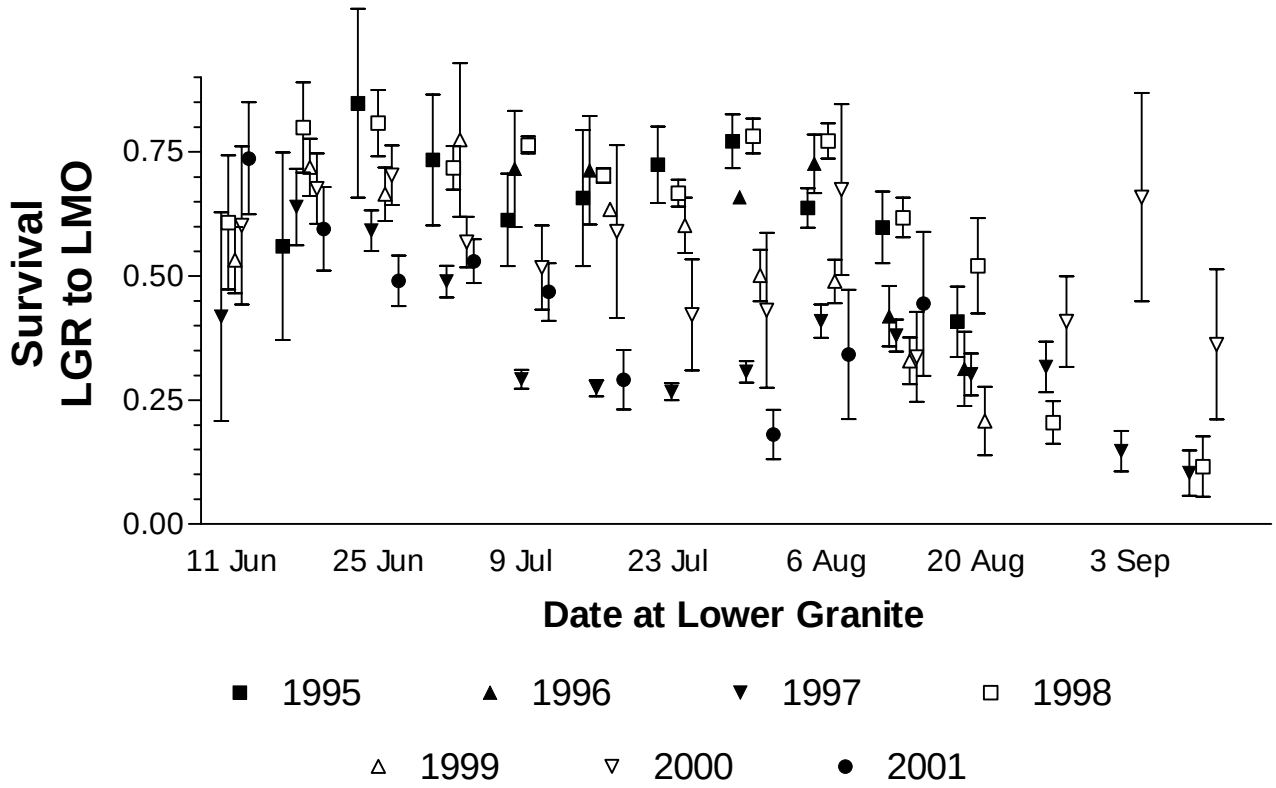
Lower Snake River

- Median travel time vs. date at L. Granite



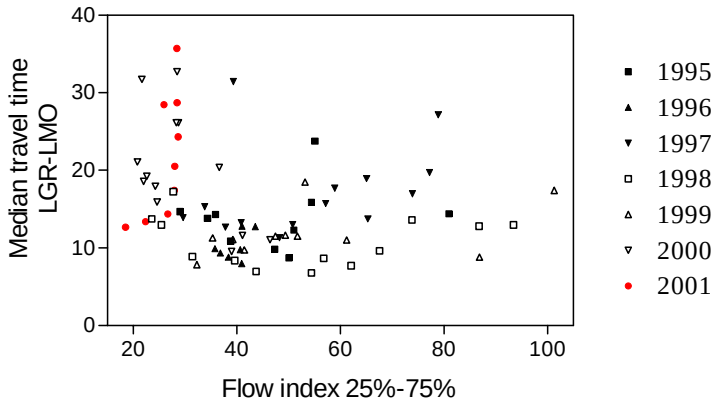
Lower Snake River

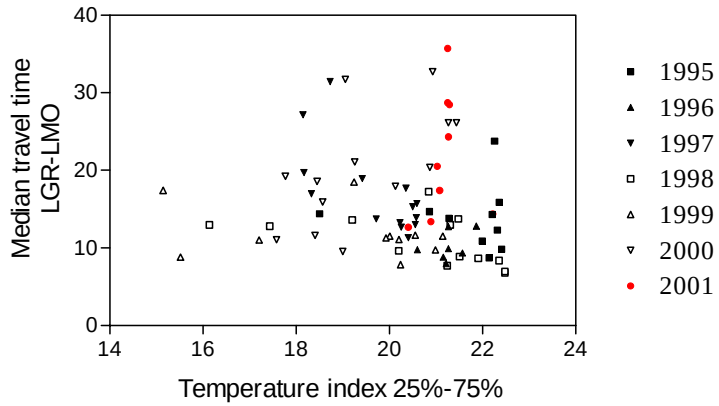
- Estimated survival vs. date at L. Granite

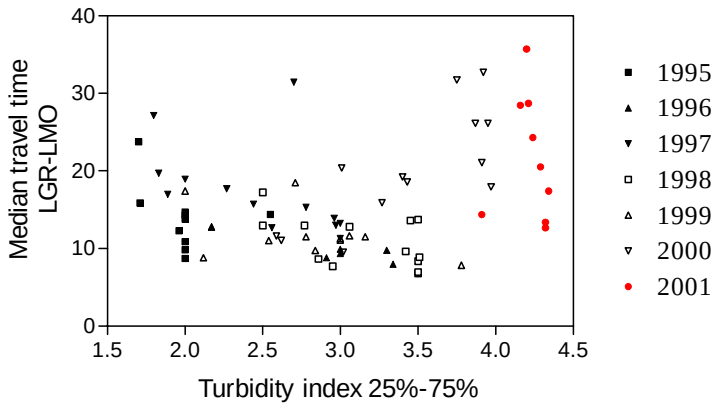


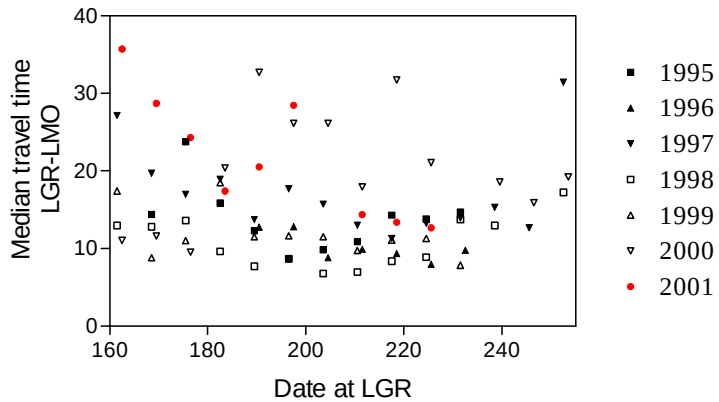
Lower Snake River

- Med. travel time LGR-LGO vs. river indices









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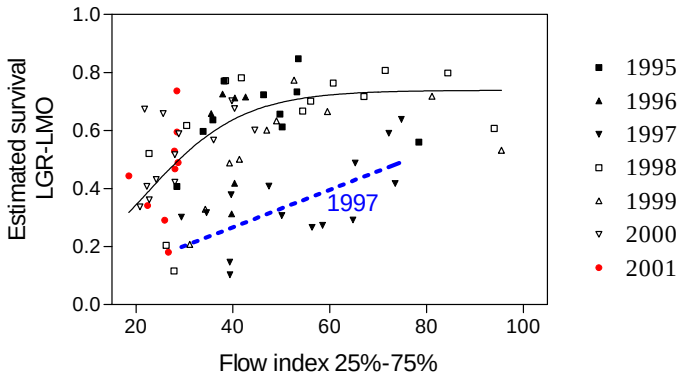
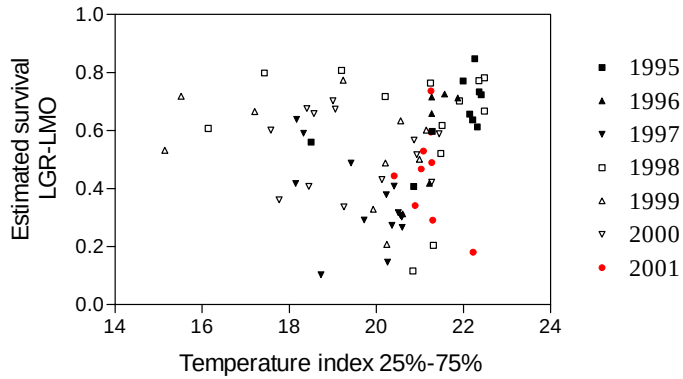
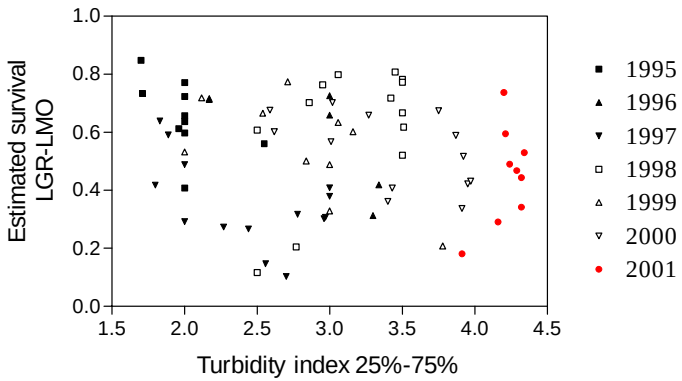
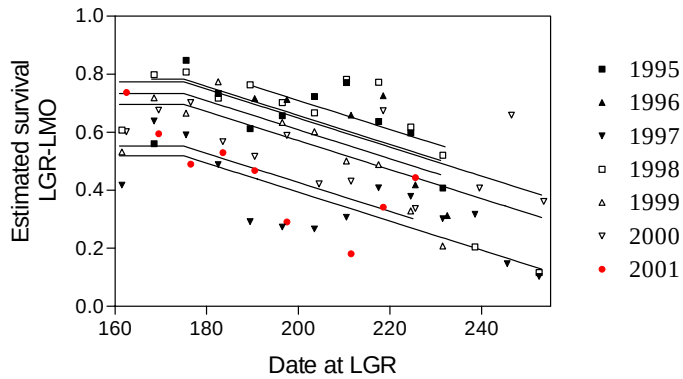
Lower Snake River

- Estim. survival LGR-LMO vs. river indices









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Lower Snake River Conclusions

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Lower Snake River Conclusions

- Definitive conclusions are not possible:
  - Sparse, highly variable data

Lower Snake River Conclusions

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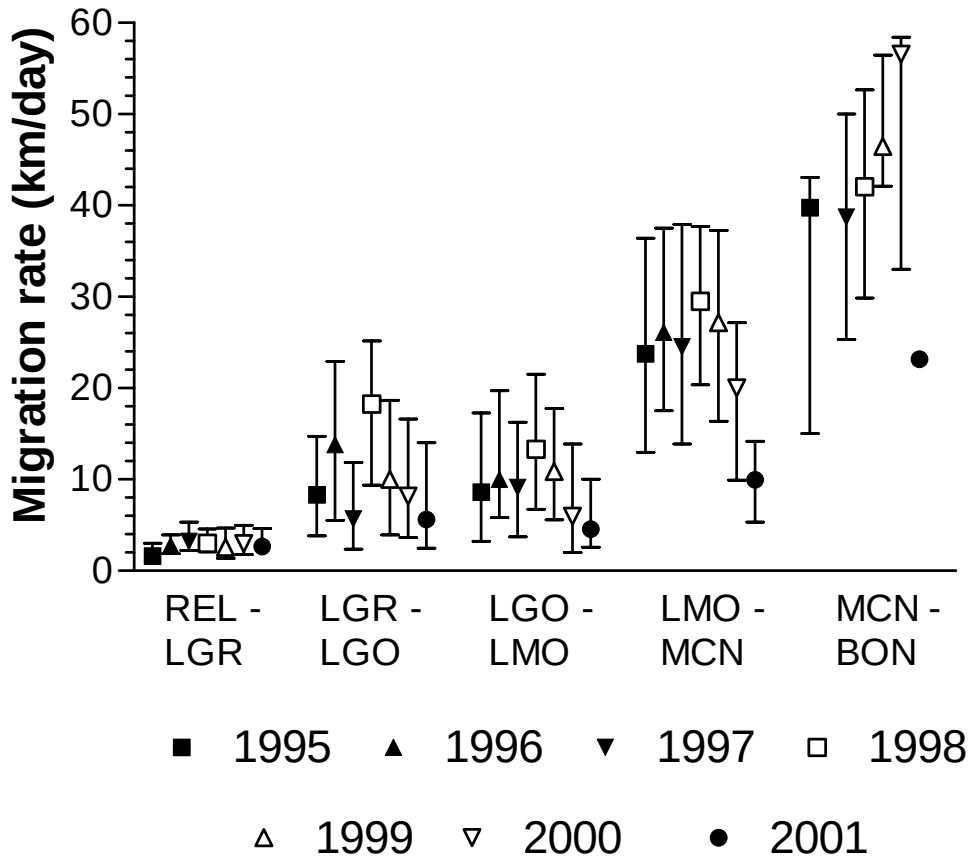
  - Sparse, highly variable data
  - Interactions between extreme flow conditions and life history traits (1997, 2001)?

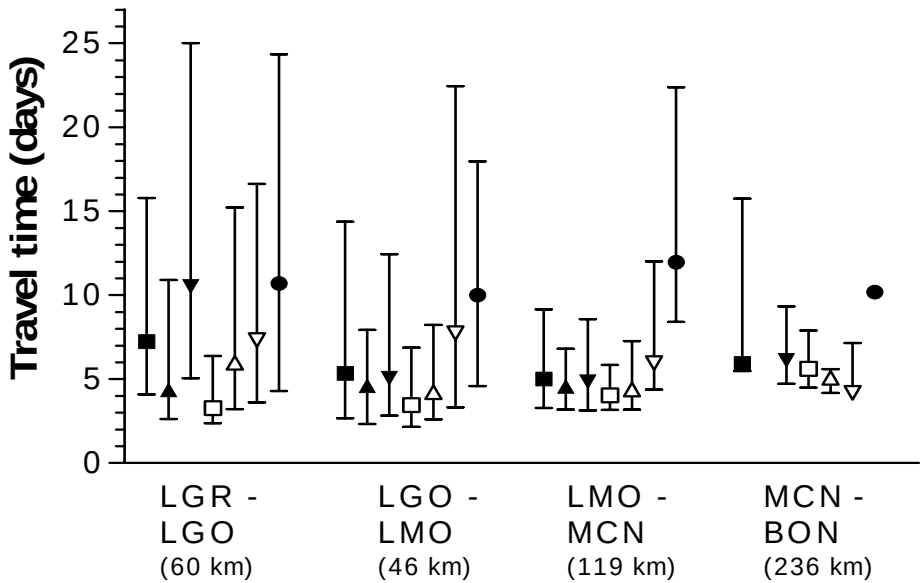
Lower Snake River

Migration rate increases as fish move downstream



Lower Snake River

Travel times moving downstream



Lower Columbia River

- Reference:

  Williams, J. R., S. G. Smith, R. W. Zabel, W. D. Muir, M. D. Scheuerell, B. P. Sandford, D. M. Marsh, R. McNatt, S. Achord. 2004. Effects of the federal Columbia River power system on salmon populations. NOAA Technical Memorandum, October 7, 2004 Draft.

http://www.salmonrecovery.gov/remand/analysis_reports/hydro/Effects_Tech_Memo_Draft_Oct07.pdf

Lower Columbia River

- Run-of-river collected & tagged at McNary Dam
  - Mostly Hanford Reach; a few hatchery

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- Weekly pooled groups
- Survival and travel time between

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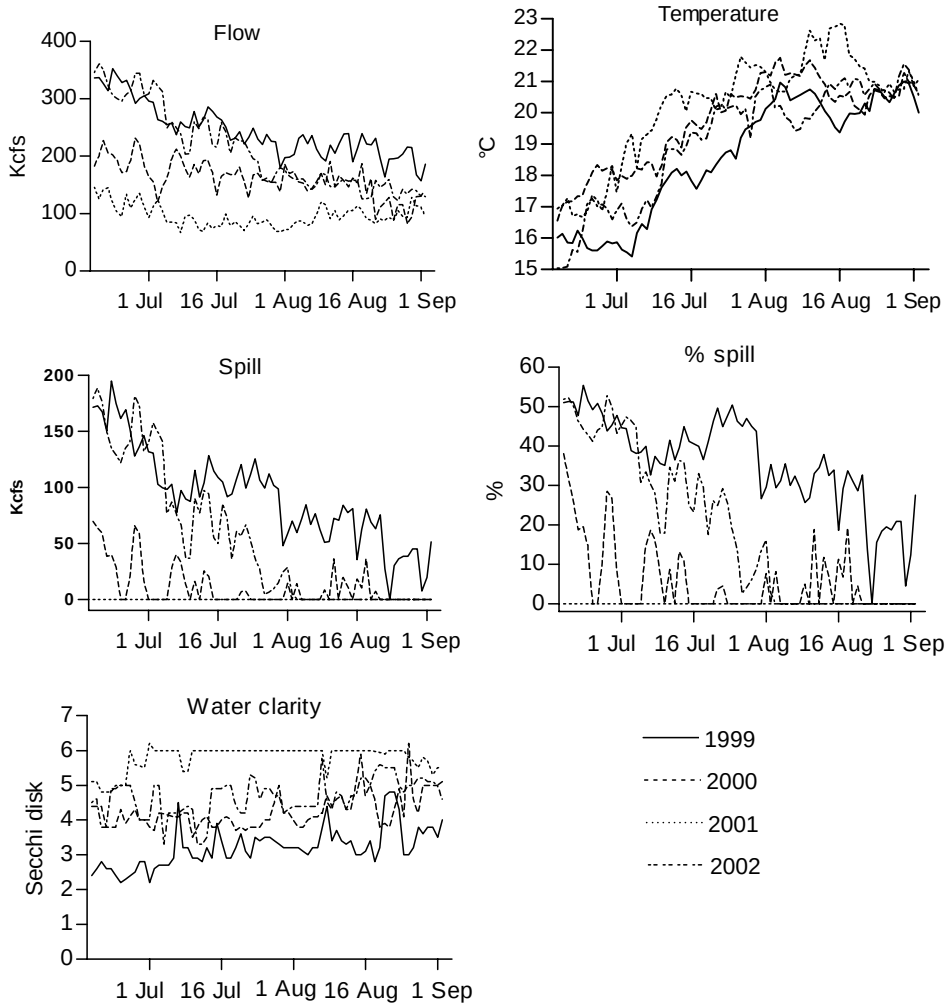
- “Exposure index” based on McNary dates and John Day passage timing (mean during release and during middle 50% of passage, respectively)
- 1999-2002, typically 19 June – 30 July

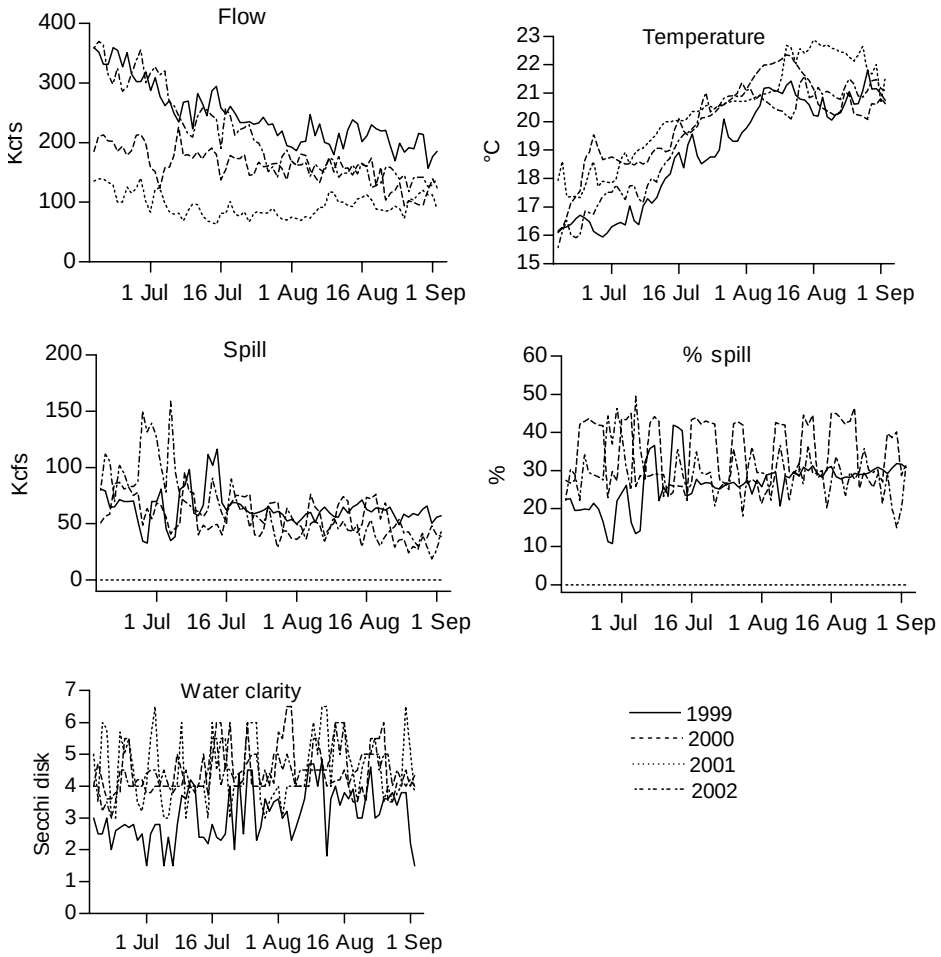
Lower Columbia River



River conditions at McNary Dam 1999-2002

Figure 46. River conditions at McNary Dam, 19 June–31 August, 1999–2002.

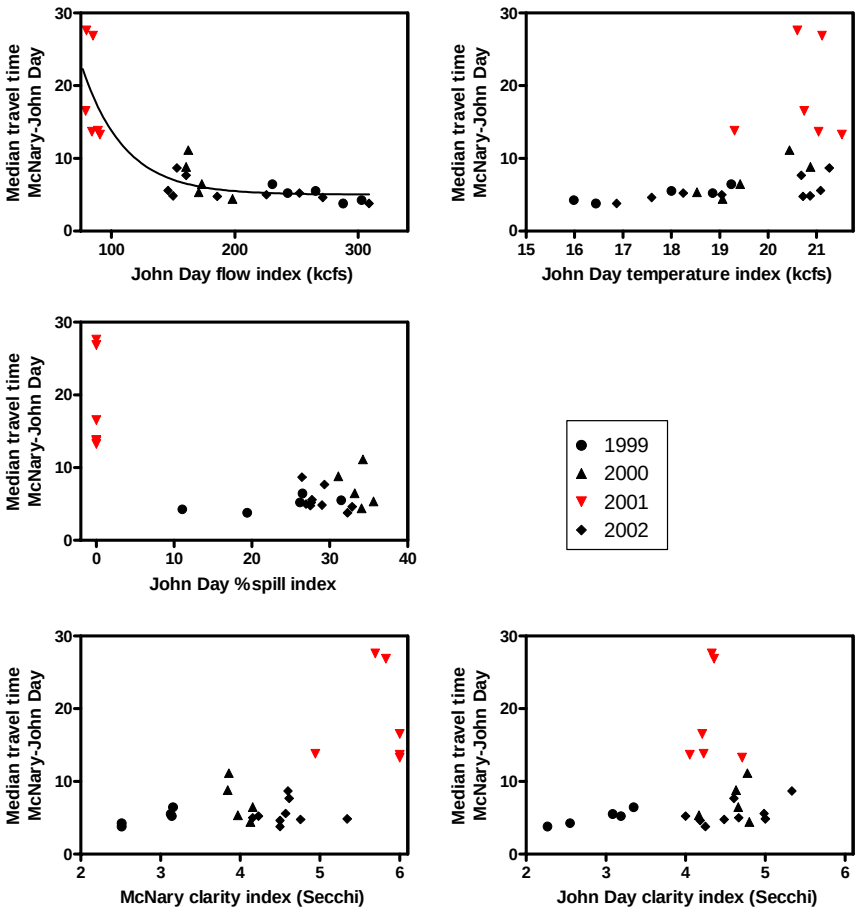
Lower Columbia River



River conditions at John Day Dam 1999-2002

Figure 47. River conditions at John Day Dam, 19 June–31 August, 1999–2002.

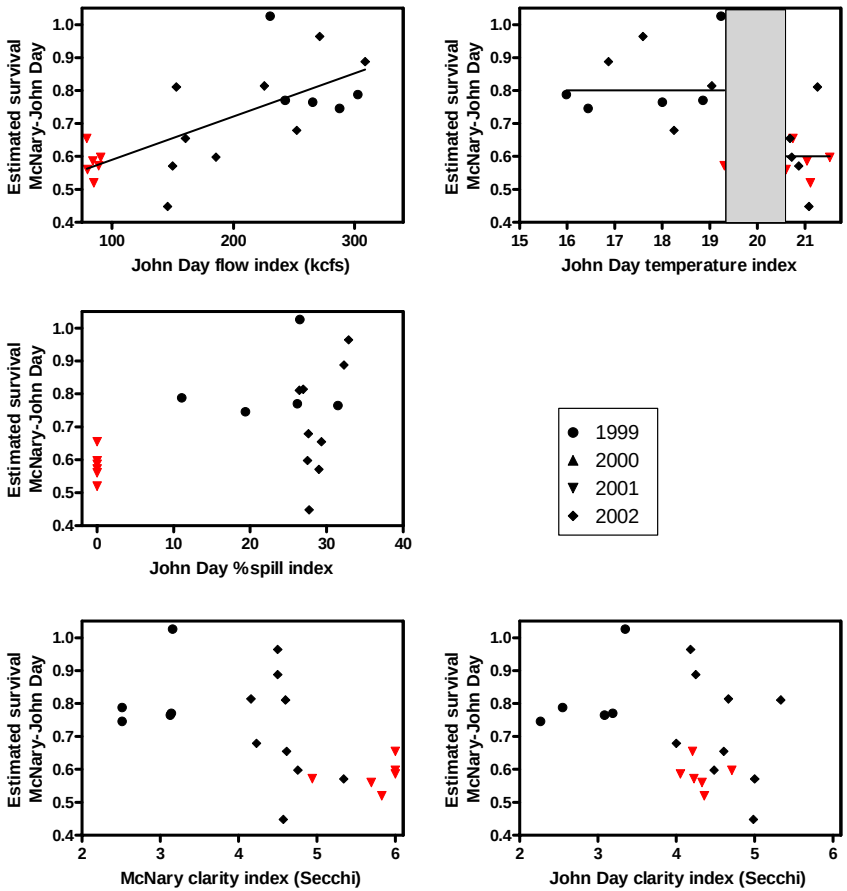
Lower Columbia River



Median travel time vs. river conditions 1999-2002

Figure 48. Median travel time between McNary and John Day Dams plotted against various river condition indices for run-of-river subyearling Chinook salmon released in the tailrace of McNary Dam, 1999–2002. Flow index panel illustrates exponential-decay curve fit to data.

Lower Columbia River



Estim. survival vs. river conditions 1999, 2001, 2002

Figure 49. Estimated survival between McNary Dam tailrace and John Day Dam tailrace plotted against various river condition indices for run-of-river subyearling Chinook salmon released in tailrace of McNary Dam, 1999, 2001, and 2002. Flow index panel illustrates simple linear regression line without year effects. Temperature index panel illustrates constant mean survival above and below 20°C.

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  - Can’t discern effects of conditions from generalized year effects

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- Tentative conclusions (Tech. Memo.):
  - Travel time likely depended on water velocity
    - Flow had larger incremental effect at low flows than at high
  - Travel time may affect survival (predation)
  - Possible threshold temperature around 20^{o}

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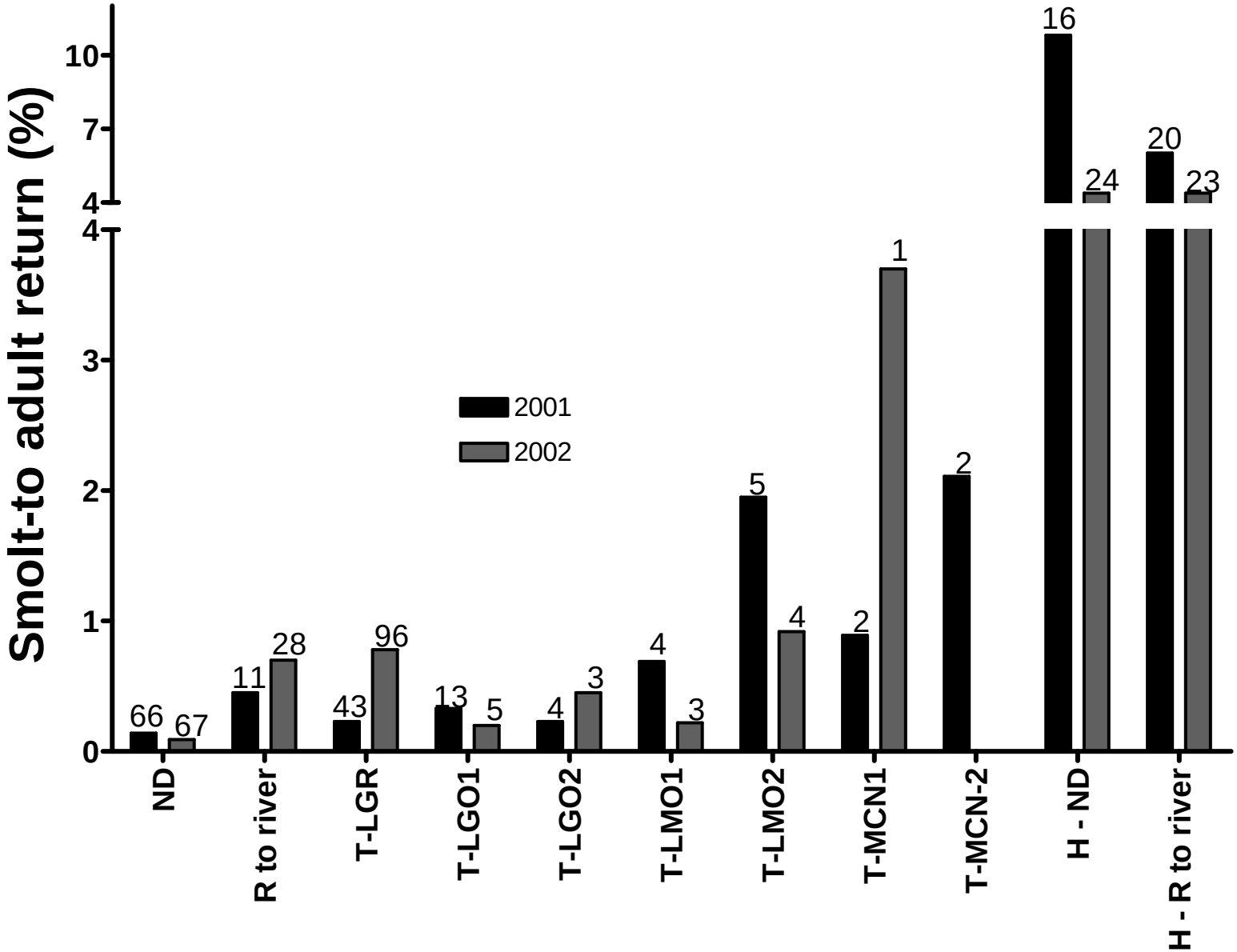
Smolt-to adult return (%)
10
7
4
4
3
2
1
0
2001
2002
66
67
11
28
43
96
13
5
4
3
4
3
5
4
2
1
2
16
24
20
23
ND
R to river
T-LGR
T-LGO1
T-LGO2
T-LMO1
T-LMO2
T-MCN1
T-MCN-2
H - ND
H - R to river
Categories