V. RESULTS

Q7. Comparison of PATH passage model results to empirical estimates

General Comments:

- Comparison of models to historical estimates not necessarily strong test of future performance

- Future responses may be outside range of historical data (e.g. drawdown)

- Historical data sets a combination of:
  - empirical measurements
  - assumptions, expansions, adjustments

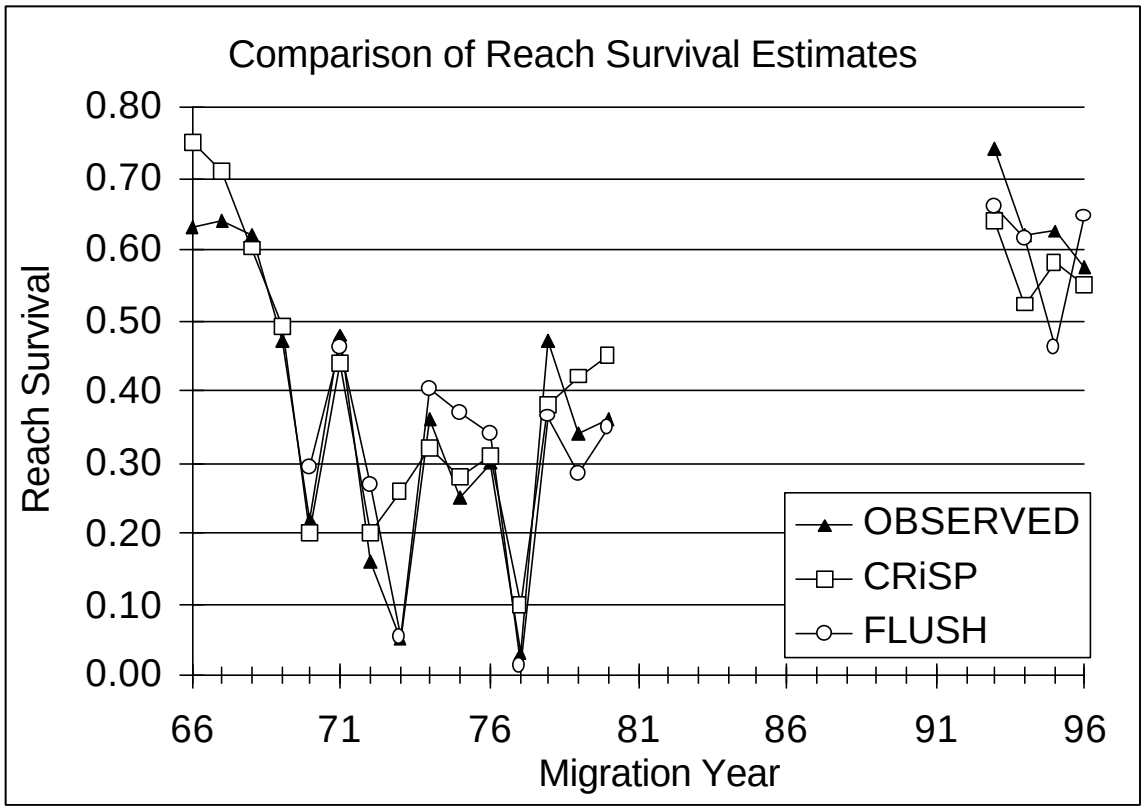
- SRP: recruits/spawner most important measure because of potential delayed effects

A. 1966-1996 Reach survival estimates

Description

- study reaches: 55 – 209 miles[1]
- not entire reach; assumptions required to compare in-river survival estimates from models

Comparison



[1] PDA Table A.2.1-2

R-squared values – fits of model predictions to observed[2]

	FLUSH	CRiSP
TURB1	0.85	0.83
TURB4	0.77	0.87
TURB5	0.86	0.84

Limitations

- weaknesses in Raymond's survival rate estimates
- assumptions required to compare to in-river survival estimates from passage models
- data not truly independent (out-of-sample)

B. 1997-1998 Reach survival estimates

Description

- estimated survival rates from LGR - BON[3]

Comparison

Year	**Observed Survival**	**CRiSP estimate**	**FLUSH estimate**
1997	45.5%	46.4%	43.6%
1998	57.8%	52.3%	n/a

[2] PDA Section A.2.1.2
[3] See WOE Submission 16 for details

Limitations[4]

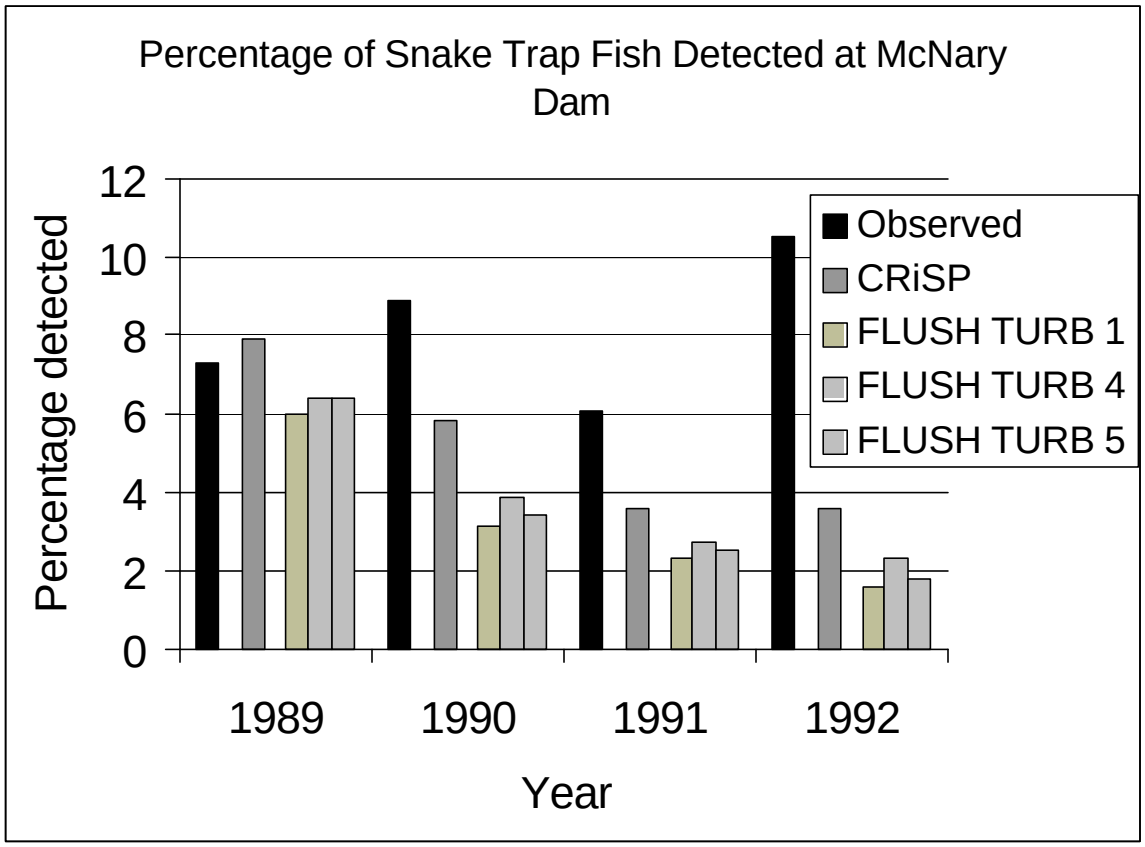
- Uses coho as surrogate to estimate s/s chinook detections at BON in 1997
- Lack of detections at lower projects
- Estimation method inconsistent with 1966-1996 estimates

C. 1989-1992 PIT-tag detections

Description

- 1989-1992 detection probabilities from LGR to MCN[5]

Comparison



[4] WOE Submission 22
[5] WOE Submission 16

Limitations[6]

- 1989-1992 data not intended for use as survival rate estimates
- PIT-tag data for a mixture of wild and hatchery fish
- Comparison to passage models depend on FGE, spills, flows, etc.
- PIT-tag releases not made throughout entire migration

D. Smolt-to-Adult Returns (SARs)

Description

- Survival rate of smolts from first dam to adults returning to same dam (Raymond)[7]
- Model SAR estimates calculated from passage survival estimates (passage models) and spawner-recruit data

Comparison

Model (life cycle/passage)	**Variance of Predicted SAR** (lower number are better)
Delta / CRiSP and FLUSH	0.081
Alpha / CRiSP	0.345 to 0.381
Alpha / FLUSH	0.188 to 0.207

[6] WOE Submission 22
[7] WOE Submissions 9 and 10

Limitations

- Weaknesses in Raymond's data
- Weaknesses in model SAR estimates[8]
- Comparisons of passage models only possible with Alpha model[9]
- Not true "out of sample" data set

E. Spawner-Recruit Data

Description

- Spawner-recruit data described in Beamesderfer et al. 1997[10,11]
- Direct passage mortality (from passage models) affects life-cycle model fit of predicted recruits to observed[12]

Comparison

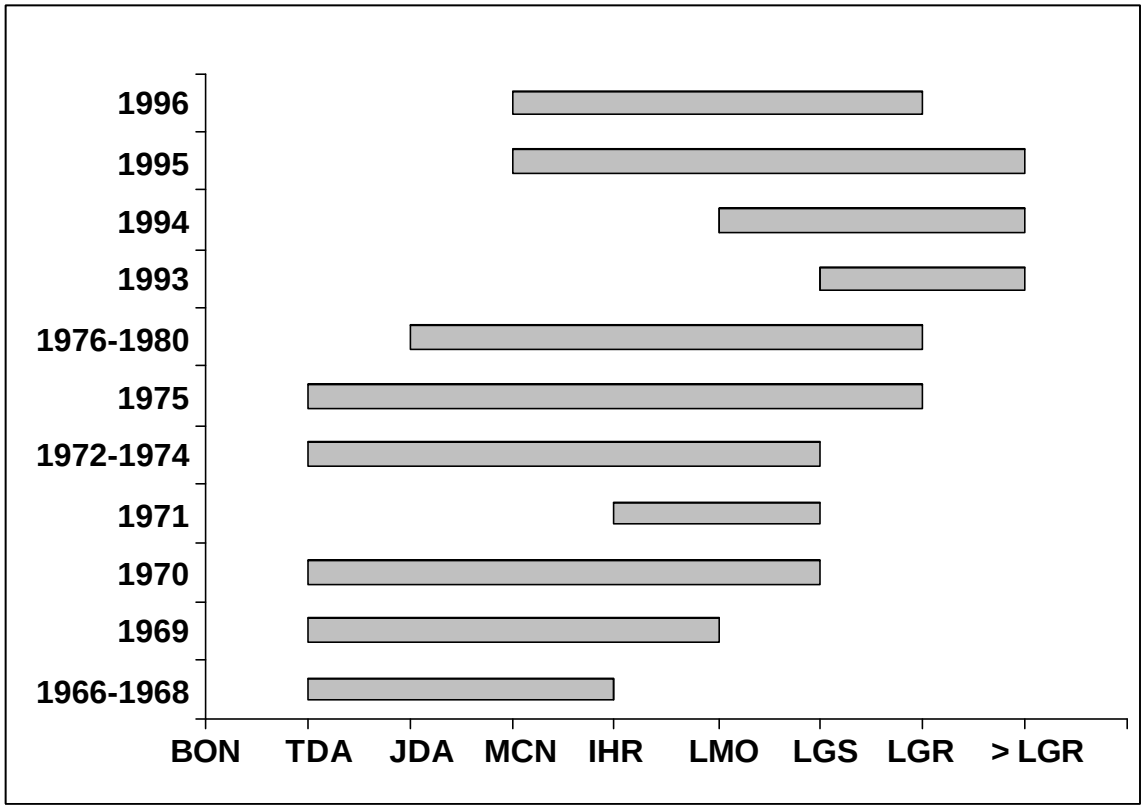
Models (life cycle/passage)	**Goodness of fit scores (lower scores indicate better fits)**	
	AIC	**BIC**
Delta / CRiSP and FLUSH	802	1147
Alpha / FLUSH	1042 to1053	1170 to 1181
Alpha / CRiSP	1074 to1096	1202 to 1225

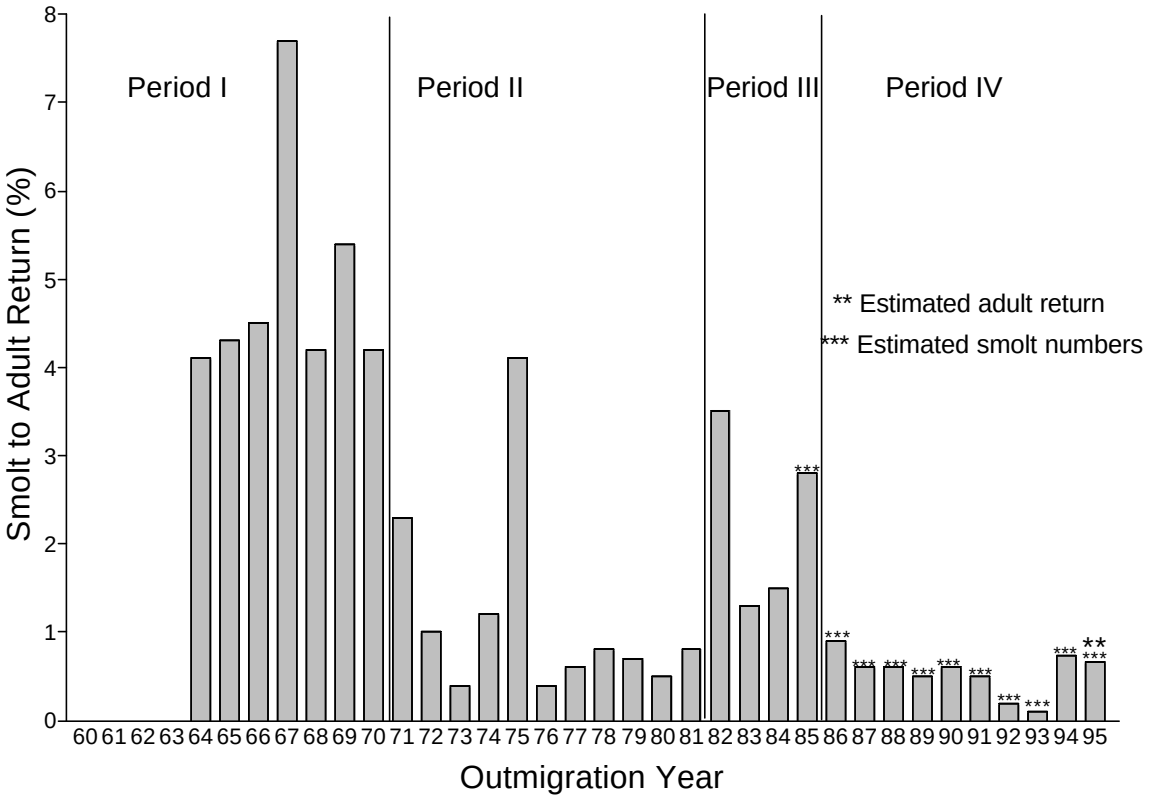
[8] WOE p. 32; Toole FY97 Report
[9] see WOE p. 28-29 for an explanation
[10] FY97 Report
[11] WOE Figure 4-0a
[12] WOE p. 26-30

Limitations

- Not true “out-of-sample” data set; both alpha and delta models calibrated
- Concerns about uncertainties and assumptions in spawner-recruit data

1966-1996 Reach Survival Data




Period I
Period II
Period III
Period IV
** Estimated adult return
*** Estimated smolt numbers
Smolt to Adult Return (%)
Outmigration Year
0
1
2
3
4
5
6
7
8
60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95