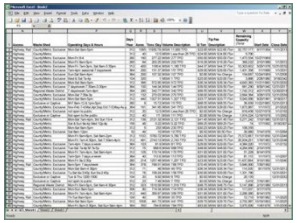
Analysis Process

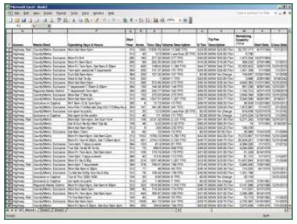
SYSTDG Output



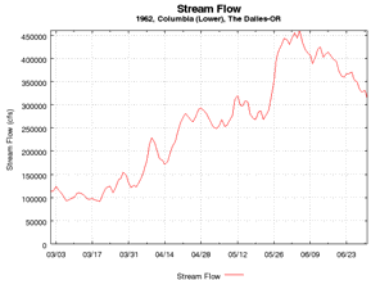
Spill Caps

HYDSIM

Average Flows and Spills



COMPASS Spill Modulator



Daily water Temperature Data

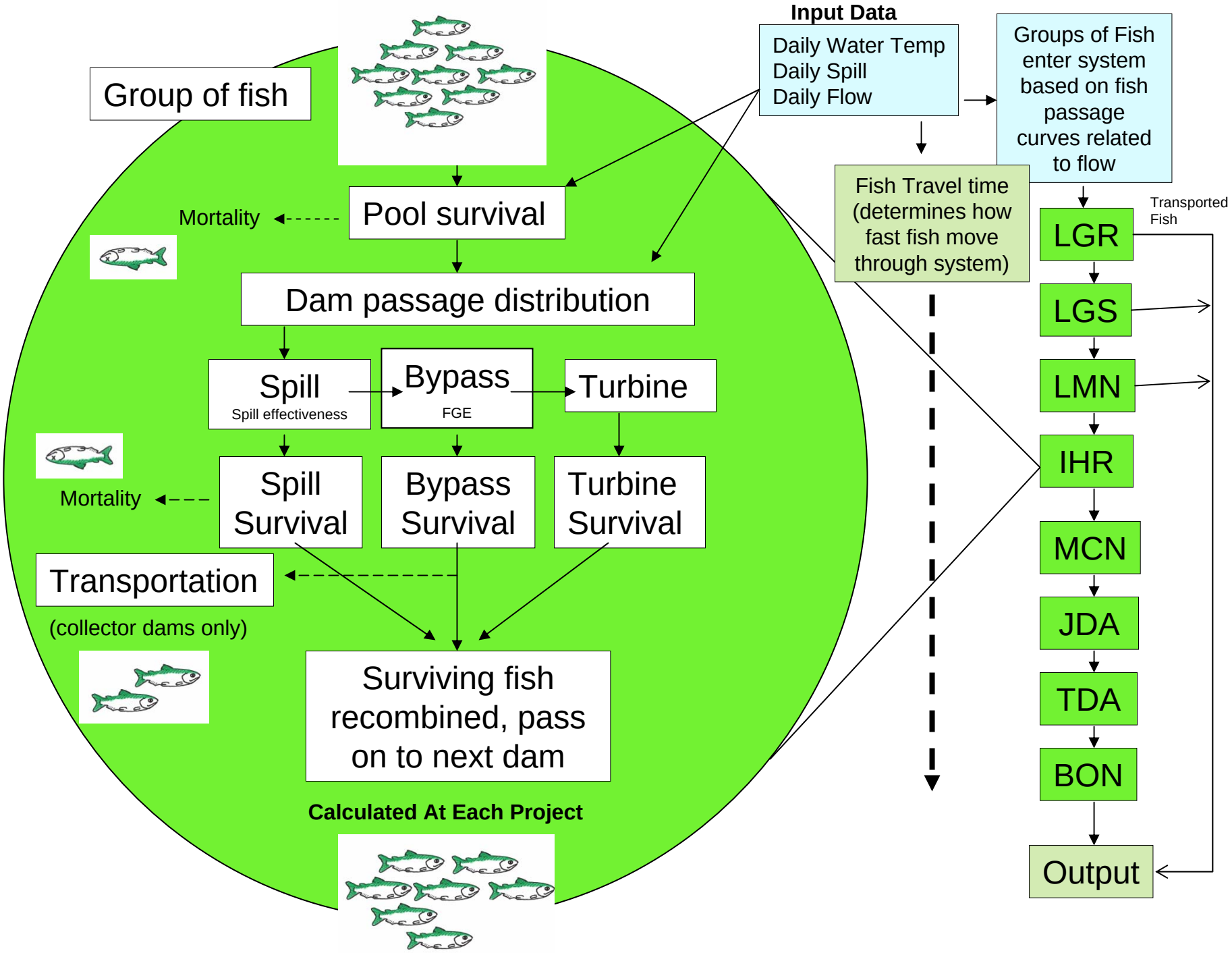
Daily Flow and Spill Data

COMPASS Model

Pool Survival

Dam Passage and Survival

Fish Travel Time


Input Data
Daily Water Temp
Daily Spill
Daily Flow
Groups of Fish enter system based on fish passage curves related to flow
Fish Travel time (determines how fast fish move through system)
Group of fish
Mortality
Pool survival
Dam passage distribution
Spill
Spill effectiveness
Bypass
FGE
Turbine
Mortality
Spill Survival
Bypass Survival
Turbine Survival
Transportation
(collector dams only)
Surviving fish recombined, pass on to next dam
Calculated At Each Project
Transported Fish
LGR
LGS
LMN
IHR
MCN
JDA
TDA
BON
Output

Compass Outputs

- Provides output for 5 ESUs and 2 species
  - Snake River Spring/Summer Chinook
  - Snake River Steelhead
  - Upper Columbia Spring Chinook
  - Upper Columbia Steelhead
  - Mid Columbia Steelhead

Survival only calculated for four lower Columbia dams using Snake River stocks as surrogates

Currently the Model does not address Fall Chinook or Sockeye

Important COMPASS Outputs

- In-River Survival
- Proportion Destined for Transport
- FCRPS Survival (no post-Bonneville effects)
- LGR-LGR SAR (includes estimate of post-Bonneville effects)

Results

- 120 only Operations produced no effect, or very small positive effect on SAR for all species except Snake River steelhead (-1.11%)
- The negative effect on Snake River steelhead SAR was primarily due to reduced transport numbers
- Most species experienced a very small, positive effect on in-river survival (<1%)

Mean result for 70- year water Record Analysis (1929-1999)

	In River Survival	"destined" for transport	FCRPS survival	Whole population LGR-LGR SAR
Snake River Spring/Summer Chinook				
120	60.9%	66.0%	86.0%	0.922%
115*120 cap	60.8%	68.6%	86.9%	0.915%
absolute change	0.1%	-2.6%	-0.9%	0.007%
Relative change from 115*120 cap	0.2%	-3.8%	-1.0%	0.8%
Snake River Steelhead				
120	38.7%	75.3%	84.7%	1.783%
115*120 cap	38.6%	77.2%	85.8%	1.803%
absolute change	0.1%	-1.9%	-1.1%	-0.020%
Relative change from 115*120 cap	0.3%	-2.5%	-1.3%	-1.1%

Mean result for 70- year water Record Analysis (1929-1999)

(Survival analysis only includes Lower Four Columbia River Dams)

	In River Survival	"destined" for transport	FCRPS survival	Whole population LGR-LGR* SAR
Upper Columbia River Chinook				
120	72.7%	NA	NA	0.768%
115*120 cap	72.7%	NA	NA	0.768%
absolute change	0.0%	NA	NA	0.000%
Relative change from 115*120 cap	0.0%	NA	NA	0.0%
Upper Columbia River Steelhead				
120	52.9%	NA	NA	0.716%
115*120 cap	52.9%	NA	NA	0.716%
absolute change	0.0%	NA	NA	0.000%
Relative change from 115*120 cap	0.0%	NA	NA	0.0%

* Serves as a surrogate for Rocky Reach Dam to Rocky Reach Dam SAR

Mean result for 70- year water Record Analysis (1929-1999)

(Survival analysis only includes Lower Four Columbia River Dams)

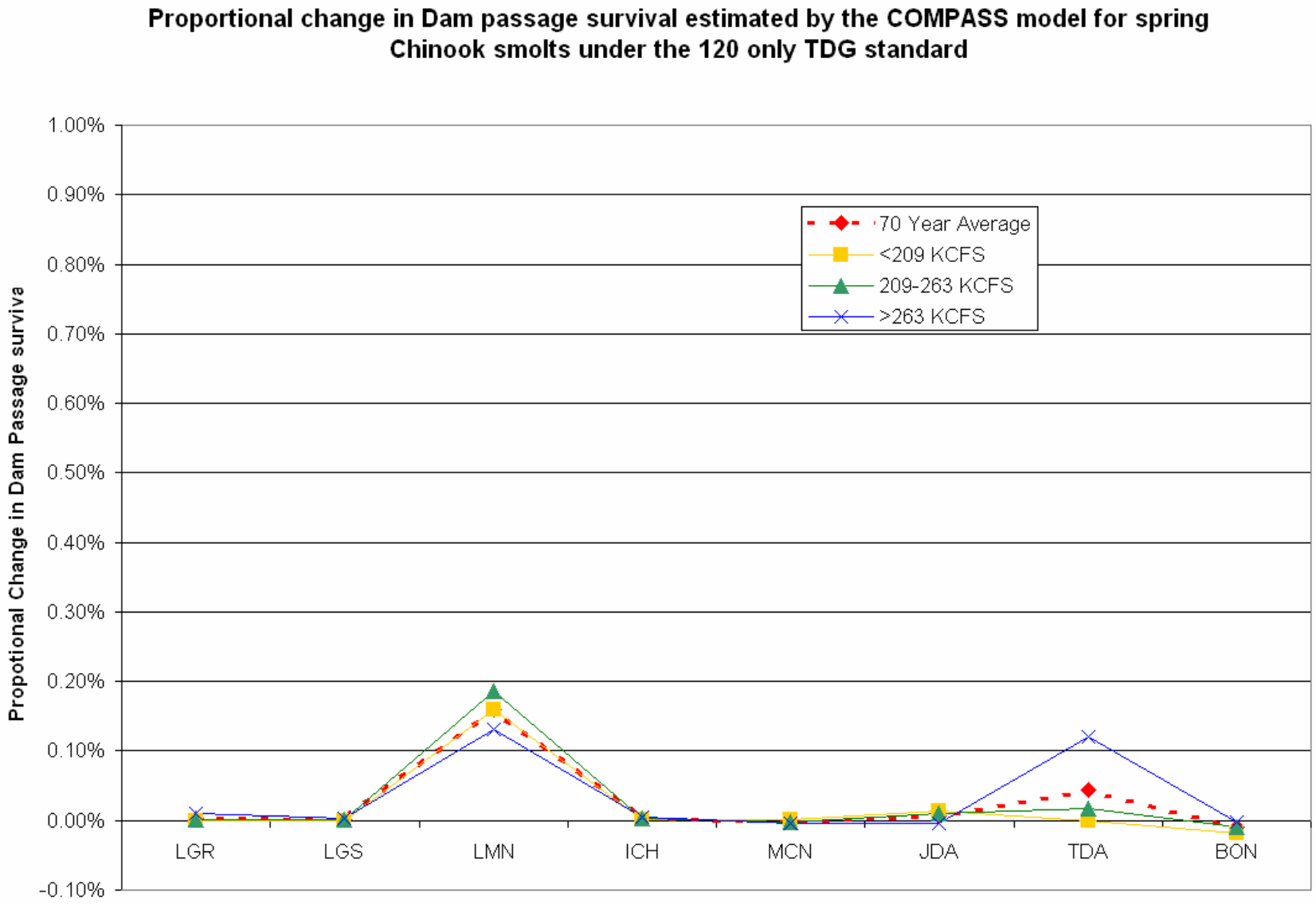
Mid-Columbia Steelhead

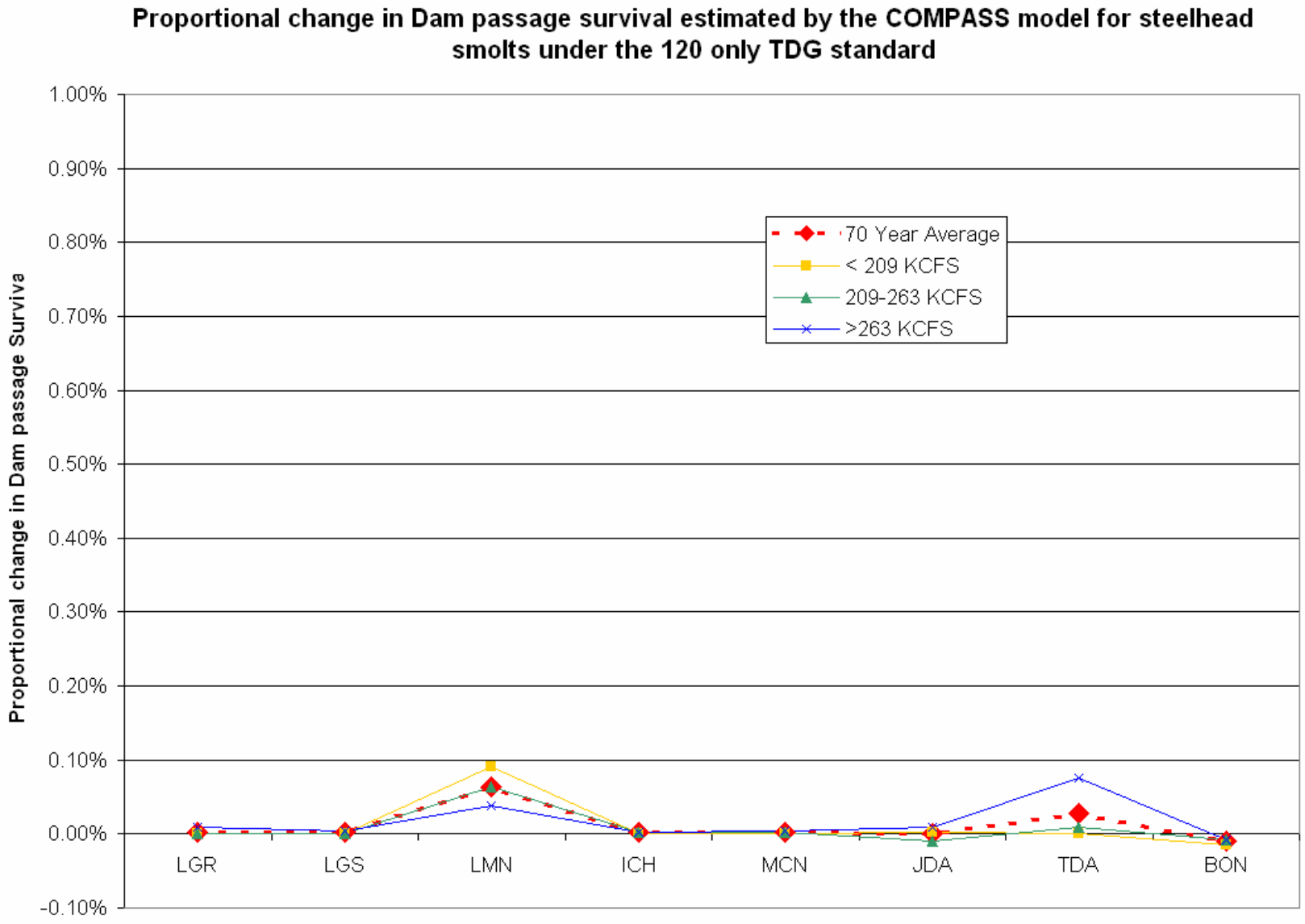
In River Survival

Stock enters FCRPS at:	McNary	**John Day**	The Dalles	Bonneville
		Stocks		
	Yakima, Walla Walla	**Umatilla, John Day**	**Deschutes**	**Bonneville Pool**
120	52.5%	58.0%	76.8%	90.3%
115*120 cap	52.4%	57.9%	76.8%	90.3%
absolute change	0.1%	0.1%	0.0%	0.0%
Relative change from 115*120 cap	0.2%	0.2%	0.00%	0.00%

Spring Chinook Reach Survivals		Snake River	Columbia River
120		85.5%	71.3%
120*115		85.3%	71.3%
absolute difference	70 year Average	0.2%	0.0%
Relative change from 115*120		0.23%	0.00%
120	Low Flows	81.8%	68.8%
120*115	n=23	81.7%	68.8%
absolute difference	<209.1 KCFS	0.1%	0.0%
Relative change from 115*120		0.12%	0.00%
120	Mid-Range Flows	86.7%	71.7%
120*115	n=24	86.5%	71.7%
absolute difference	209.2-263.4 KCFS	0.2%	0.0%
Relative change from 115*120		0.23%	0.00%
120	High Flows	88.0%	73.4%
120*115	n=23	87.9%	73.4%
absolute difference	>263.5 KCFS	0.1%	0.0%
Relative change from 115*120		0.11%	0.00%

Steelhead Reach Survivals		Snake River	Columbia River
120		66.0%	67.1%
120*115		65.9%	67.0%
absolute difference	70 year Average	0.1%	0.1%
Relative change from 115*120		0.2%	0.2%
120	Low Flows	49.8%	56.2%
120*115	n=23	49.7%	56.2%
absolute difference	<209.1 KCFS	0.1%	0.0%
Relative change from 115*120		0.2%	0.0%
120	Mid-Range Flows	70.3%	69.9%
120*115	n=24	70.2%	69.9%
absolute difference	209.2-263.4 KCFS	0.1%	0.0%
Relative change from 115*120		0.1%	0.00%
120	High Flows	81.0%	76.3%
120*115	n=23	81.0%	76.2%
absolute difference	>263.5 KCFS	0.0%	0.1%
Relative change from 115*120		0.0%	0.1%

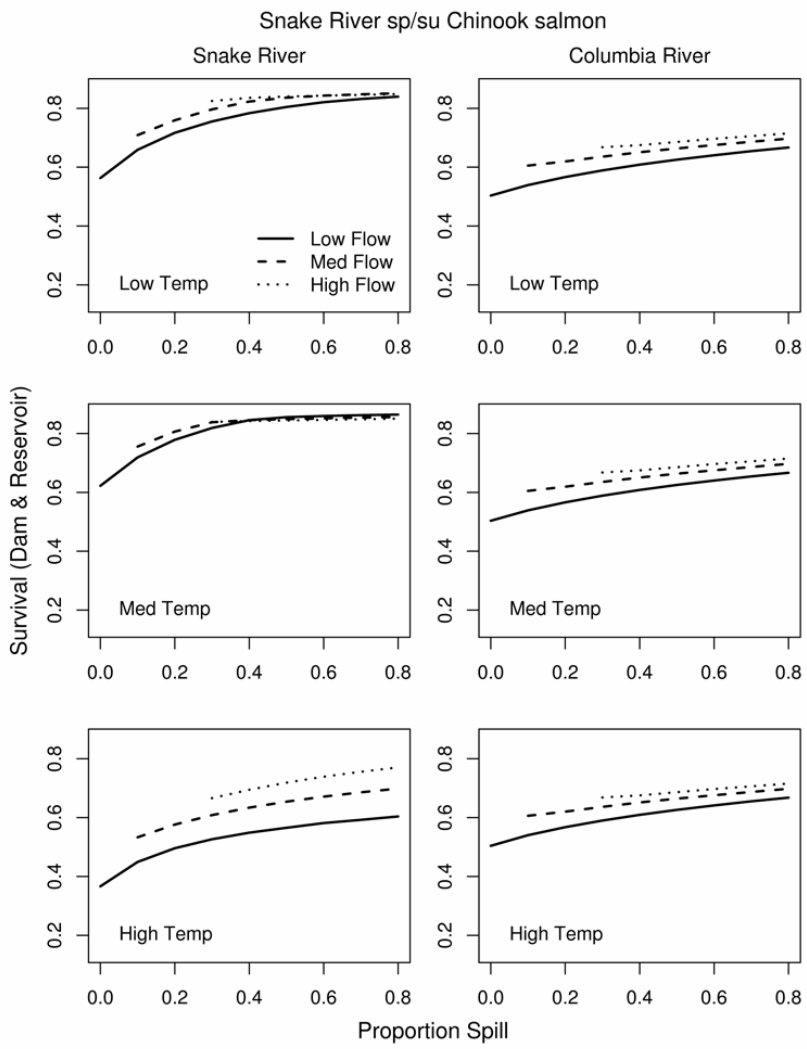

Proportional change in Dam passage survival estimated by the COMPASS model for spring Chinook smolts under the 120 only TDG standard
Propotional Change in Dam Passage surviva
1.00%
0.90%
0.80%
0.70%
0.60%
0.50%
0.40%
0.30%
0.20%
0.10%
0.00%
-0.10%
70 Year Average
<209 KCFS
209-263 KCFS
>263 KCFS
LGR
LGS
LMN
ICH
MCN
JDA
TDA
BON


Proportional change in Dam passage survival estimated by the COMPASS model for steelhead smolts under the 120 only TDG standard
Proportional change in Dam passage Survival
1.00%
0.90%
0.80%
0.70%
0.60%
0.50%
0.40%
0.30%
0.20%
0.10%
0.00%
-0.10%
70 Year Average
< 209 KCFS
209-263 KCFS
>263 KCFS
LGR
LGS
LMN
ICH
MCN
JDA
TDA
BON

COMPASS Model sensitivity to spill
Spring Chinook

Sensitivity of overall survival (dam and reservoir) through the Snake (Lower Granite forebay to the mouth) and Columbia (mouth of the Snake River to Bonneville tailrace) as a function of proportion spill for Snake River spring/summer Chinook.

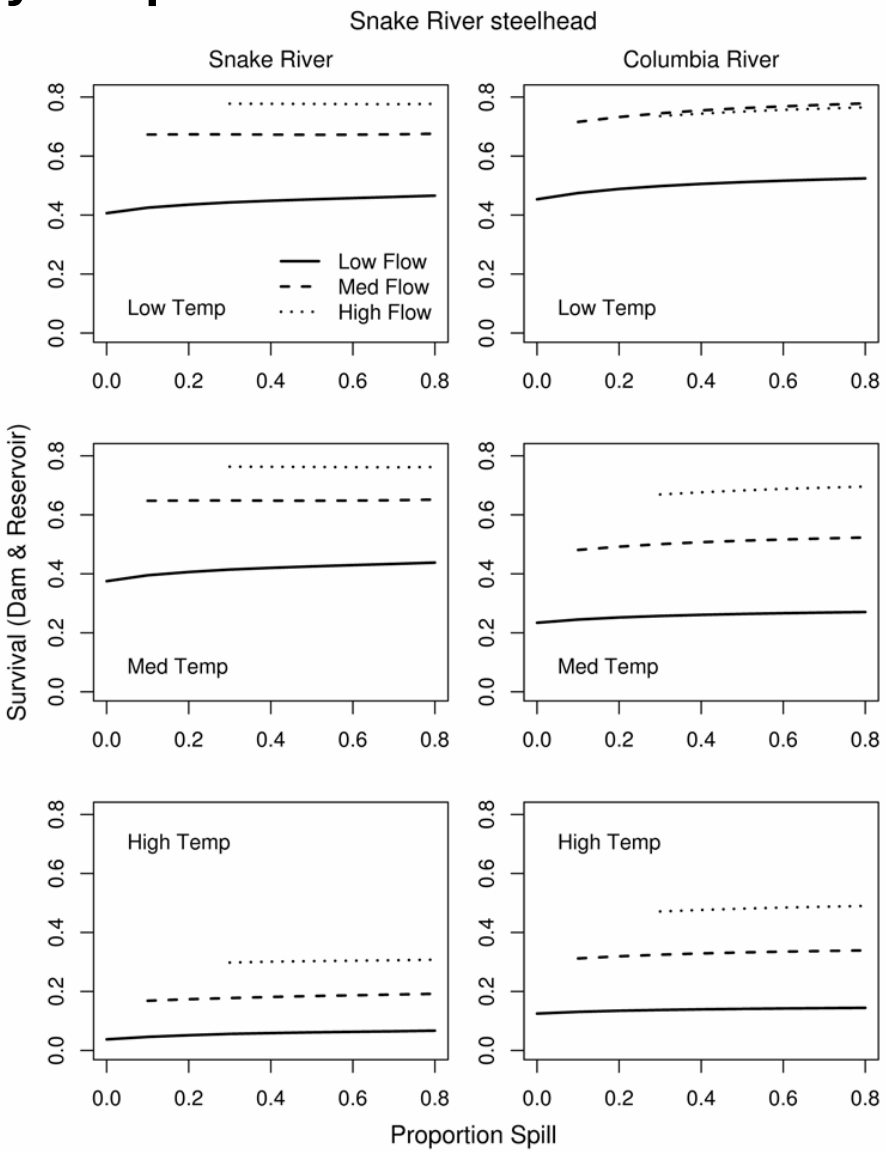
Sensitivities were performed for three levels of flow and three levels of temperature.



COMPASS Model sensitivity to spill Steelhead

Sensitivity of overall survival (dam and reservoir) through the Snake (Lower Granite forebay to the mouth) and Columbia (mouth of the Snake River to Bonneville tailrace) as a function of proportion spill for Snake River steelhead.

Sensitivities were performed for three levels of flow and three levels of temperature.



Detailed Analysis Results

Mid Columbia Steelhead
Average estimates for analysis parameters

AMT gas analysis

		Project Survival				fixed	Stock survivals			
		Bonneville	The Dalles	John Day	McNary		Yakima Walla Walla	Umatilla, John Day	Deschutes	Bonneville Pool
120 only	70 year	0.903	0.851	0.748	0.892		0.525	0.580	0.768	0.903
115&120	Average	0.903	0.851	0.748	0.892		0.524	0.579	0.768	0.903
absolute change		0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000
Relative change from 115&120		-0.01%	0.02%	0.01%	0.00%		0.02%	0.02%	0.01%	-0.01%
120 only	<209.1 KCFS	0.879	0.820	0.563	0.829		0.345	0.409	0.720	0.879
115&120	n=	0.879	0.820	0.563	0.829		0.345	0.409	0.720	0.879
absolute change	23	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000
Relative change from 115&120	low Flows	-0.02%	0.00%	0.00%	0.00%		-0.02%	-0.02%	-0.02%	-0.02%
120 only	209.2-263.4 KCFS	0.912	0.859	0.797	0.909		0.573	0.626	0.784	0.912
115&120	n=	0.912	0.859	0.797	0.909		0.573	0.626	0.784	0.912
absolute change	24	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000
Relative change from 115&120	Med Flows	-0.01%	0.02%	-0.01%	0.00%		0.01%	0.01%	0.02%	-0.01%
120 only	>263.5 KCFS	0.897	0.872	0.881	0.935		0.644	0.689	0.782	0.897
115&120	n=	0.897	0.871	0.880	0.935		0.643	0.688	0.782	0.897
absolute change	23	0.000	0.000	0.001	0.000		0.001	0.001	0.000	0.000
Relative change from 115&120	High Flows	-0.01%	0.06%	0.09%	0.00%		0.14%	0.14%	0.05%	-0.01%

Detailed Analysis Results

Snake River Spring/Summer Chinook 1

Average estimates for analysis parameters 5/2/2008 14:02

	April-August Avg flow	In River Survival	"destined" for transport	FCRPS Survival	Proportion of population below Bonneville: In River Migrants	Proportion of population below Bonneville: Transported	Median day of arrival at Bonneville Tailrace (Julian Date): In River Migrants	Median day of arrival at Bonneville Tailrace (Julian Date): Transported	Composite Bon-LGR SAR Estimate: In River Migrants	Composite Bon-LGR SAR Estimate: Transported	Whole population LGR-LGR SAR
120 cap	70 year	0.609	0.660	0.860	0.259	0.741	140.306	129.338	0.01302	0.00948	0.00922
115*120 cap	Average	0.608	0.686	0.869	0.237	0.763	140.592	128.974	0.01289	0.00945	0.00915
absolute change		0.001	-0.026	-0.009	0.022	-0.022	-0.285	0.363	0.00013	0.00003	0.00007
Relative change from 115*120 cap		0.19%	-3.76%	-1.00%	9.39%	-2.91%	-0.20%	0.28%	1.00%	0.28%	0.80%
120 cap	<209.1 KCFS	0.559	0.773	0.889	0.157	0.843	152.819	131.334	0.00882	0.00954	0.00868
115*120 cap	n=	0.558	0.789	0.896	0.144	0.856	152.973	131.219	0.00873	0.00953	0.00867
absolute change	23	0.001	-0.016	-0.007	0.013	-0.013	-0.155	0.116	0.00008	0.00001	0.00002
Relative change from 115*120 cap	low Flows	0.20%	-2.02%	-0.82%	9.00%	-1.52%	-0.10%	0.09%	0.93%	0.12%	0.20%
120 cap	209.2-263.4 KCFS	0.622	0.662	0.880	0.255	0.745	138.527	129.946	0.01377	0.00953	0.00922
115*120 cap	n=	0.621	0.690	0.870	0.231	0.769	138.909	129.496	0.01362	0.00950	0.00914
absolute change	24	0.001	-0.028	0.009	0.024	-0.024	-0.382	0.450	0.00015	0.00003	0.00008
Relative change from 115*120 cap	Med Flows	0.17%	-4.10%	1.08%	10.37%	-3.12%	-0.28%	0.35%	1.09%	0.29%	0.84%
120 cap	>263.5 KCFS	0.646	0.545	0.848	0.364	0.545	129.651	126.707	0.01645	0.00936	0.00975
115*120 cap	n=	0.644	0.578	0.839	0.335	0.578	129.966	126.186	0.01629	0.00933	0.00963
absolute change	23	0.001	-0.033	0.009	0.030	-0.033	-0.315	0.520	0.00016	0.00004	0.00013
Relative change from 115*120 cap	High Flows	0.20%	-5.73%	1.06%	8.85%	-5.73%	-0.24%	0.41%	0.96%	0.43%	1.32%

Detailed Analysis Results

Snake River Steelhead **AMT Gas Analysis** 1

Average estimates for analysis parameters 5/2/2008 14:04

	April-August Avg flow	In River Survival	"destined" for transport	FCRPS Survival	Proportion of population below Bonneville: In River Migrants	Proportion of population below Bonneville: Transported	Median day of arrival at Bonneville Tailrace (Julian Date): In River Migrants	Median day of arrival at Bonneville Tailrace (Julian Date): Transported	Composite Bon-LGR SAR Estimate: In River Migrants	Composite Bon-LGR SAR Estimate: Transported	Whole population LGR-LGR SAR
120 cap	70 year	0.387	0.753	0.847	0.135	0.865	137.879	133.556	0.01433	0.02282	0.01783
115*120 cap	Average	0.386	0.772	0.858	0.124	0.876	138.014	133.377	0.01420	0.02283	0.01803
absolute change		0.001	-0.019	-0.010	0.011	-0.011	-0.135	0.178	0.00013	-0.00001	-0.00020
Relative change from 115*120 cap		0.36%	-2.45%	-1.22%	8.92%	-1.26%	-0.10%	0.13%	0.94%	-0.03%	-1.12%
120 cap	<209.1 KCFS	0.192	0.819	0.844	0.055	0.945	151.096	135.429	0.01114	0.02230	0.01752
115*120 cap	n=	0.190	0.833	0.855	0.049	0.951	150.959	135.376	0.01104	0.02229	0.01768
absolute change	23	0.001	-0.014	-0.011	0.006	-0.006	0.137	0.053	0.00009	0.00001	-0.00016
Relative change from 115*120 cap	low Flows	0.62%	-1.74%	-1.24%	12.40%	-0.64%	0.09%	0.04%	0.85%	0.03%	-0.91%
120 cap	209.2-263.4 KCFS	0.411	0.765	0.837	0.125	0.875	136.540	133.937	0.01531	0.02270	0.01794
115*120 cap	n=	0.409	0.787	0.862	0.113	0.887	136.788	133.730	0.01517	0.02271	0.01818
absolute change	24	0.002	-0.022	-0.026	0.013	-0.013	-0.247	0.206	0.00014	-0.00001	-0.00023
Relative change from 115*120 cap	Med Flows	0.39%	-2.75%	-2.97%	11.14%	-1.42%	-0.18%	0.15%	0.91%	-0.05%	-1.29%
120 cap	>263.5 KCFS	0.558	0.675	0.851	0.225	0.775	126.060	131.284	0.01652	0.02347	0.01801
115*120 cap	n=	0.556	0.696	0.856	0.211	0.789	126.350	131.010	0.01635	0.02348	0.01822
absolute change	23	0.001	-0.021	-0.005	0.015	-0.015	-0.290	0.274	0.00017	-0.00002	-0.00021
Relative change from 115*120 cap	High Flows	0.25%	-2.95%	-0.59%	6.88%	-1.84%	-0.23%	0.21%	1.02%	-0.07%	-1.16%

Detailed Analysis Results

UC Chinook **AMT gas analysis**

Average estimates for analysis parameters fixed

		In River Survival only includes lower Columbia Dams	Median day of Bonneville Tailrace arrival		Estimated SAR BON-LGR	Estimated LGR to LGR SAR
120 only	70 year	0.727	149.1		0.01053	0.00768
120/115	Average	0.727	149.1		0.01052	0.00768
absolute change		0.000	-0.005		0.00000	0.00000
Relative change from 115/120		0.03%	0.00%		0.01%	0.05%
120 only	<209.1 KCFS	0.690	150.0		0.01015	0.00730
120/115	n=	0.691	150.0		0.01014	0.00730
absolute change	23	0.000	-0.003		0.00000	0.00000
Relative change from 115/120	low Flows	-0.02%	0.00%		0.02%	0.02%
120 only	209.2-263.4 KCFS	0.733	148.2		0.01091	0.00811
120/115	n=	0.733	148.2		0.01091	0.00811
absolute change	24	0.000	-0.009		0.00000	0.00001
Relative change from 115/120	Med Flows	0.01%	-0.01%		0.02%	0.07%
120 only	>263.5 KCFS	0.757	149.2		0.01050	0.00761
120/115	n=	0.756	149.2		0.01050	0.00761
absolute change	23	0.001	-0.002		0.00000	0.00000
Relative change from 115/120	High Flows	0.09%	0.00%		0.01%	0.05%

Detailed Analysis Results

UC Steelhead
Average estimates for analysis parameters

AMT gas analysis
fixed

		In River Survival only includes lower Columbia Dams	Median day of arrival		Estimated SAR BON-LGR	Estimated LGR to LGR SAR
120 only	70 year	0.529	150.3		0.01364	0.00716
115&120	Average	0.529	150.3		0.01364	0.00716
absolute change		0.000	0.0		0.00000	0.00000
Relative change from 115&120		0.02%	0.00%		0.01%	0.04%
120 only	<209.1 KCFS	0.346	150.1		0.01377	0.00645
115&120	n=	0.346	150.1		0.01376	0.00645
absolute change	23	0.000	0.0		0.00000	0.00000
Relative change from 115&120	low Flows	-0.02%	0.00%		0.01%	0.01%
120 only	209.2-263.4 KCFS	0.564	151.4		0.01309	0.00786
115&120	n=	0.564	151.4		0.01309	0.00786
absolute change	24	0.000	0.0		0.00000	0.00000
Relative change from 115&120	Med Flows	0.00%	0.00%		0.02%	0.05%
120 only	>263.5 KCFS	0.674	149.3		0.01409	0.00714
115&120	n=	0.674	149.3		0.01409	0.00713
absolute change	23	0.000	0.0		0.00000	0.00000
Relative change from 115&120	High Flows	0.06%	0.00%		0.01%	0.05%