

Puget Sound Recreational Fisheries Enhancement Fund– Oversight Committee

January 27, 2022



WELCOME – THANKS FOR JOINING US!

ZOOM MEET/ CALL LOGISTICS / GROUND RULES

- You can turn your camera on and mute or unmute yourself through the control panel at the bottom of your screen.
- We will keep folks muted during the beginning of our program, then will unmute folks when we open it up for questions and feedback. Callers can unmute yourself by pressing *6 on your phone.
- We ask that you “raise their hand” to ask a question which you can access through the control panel at the bottom of the screen. You can also raise your hand by hovering over your face or name on the list of participants. Callers can raise their hand by dialing *9.
- Be respectful of others
 - Mute phone or line
 - Be tough on issues and questions, not on people or organizations
 - No personal attacks, insults or threats
 - Listen
 - Speak and act professional – *no offensive, disrespectful, or derogatory language, including profanity*
 - Allow for a balance of speaking time – *limit length and number of times to speak on each topic*
- This meeting is being recorded.
- If you have any technical issues during the call, use the chat button and we will help you through those.
Please do not use the chat for questions or comments on the presentation, we will take those live.



Agenda

- Hatchery Policy Update
- Budget
- Oak Harbor Net Pens
- In-Season Modeling Presentation
- Marine Area 10 Update
- NOF Schedule



WDFW Staff

- Mark Baltzell – Statewide Salmon and Steelhead Manager
- Kirsten Simonsen – Puget Sound Recreational Biologist
- Hailey Rosenthal – Fish and Wildlife Biologist
- Eric Kinne – Hatchery Division Manager
- Jill Cady – Hatchery Evaluation Manager
- Joe Coutu – Hatchery Operations Manager, Region 6



Advisory Group Expectations

- Strive to attend and participate in all meetings and review materials beforehand.
- Recognize that the group operates openly and transparently.
- Be respectful of the views and opinions of other advisors, citizens, and WDFW staff.
- Understand that this advisory group represents a broad geographic range and a diverse set of interests unique to Washington State.
- Understand that the authority to advise the Department is granted to the advisory group as a whole; not to individual members.
- Recognize that individual members often will have to compromise to enable the advisory group to reach a recommendation.





HATCHERY POLICY UPDATE

Hatchery Policy Update





Budget Breakdown

BUDGET

MI Code	Program	Production numbers	Grand Total
53422	Psrfe Marblemount Coho	250k Coho	17,800
		500k Chin Yearlings	
53455	Psrfe Wallace R	150k Coho	545,600
53475	Psrfe Soos Crk Htch	3.2 mil Chin Sub-Yearlings	427,882
		950k Chin Sub-Yearlings	
53615	Psrfe Garrison Spr Ops	200k Late Chin Sub-Yearlings	332,900
53622	Psrfe Voights Crk Zeroes	1.2 million Chin Sub-Yearlings	114,000
53639	Psrfe Minter Crk/Gorst Crk	750k Chin Sub-Yearlings	73,100
53640	Psrfe Hupp Coho	125k Coho	27,900
53642	Psrfe Minter Crk Zeroes	1.4 million Chin Sub-Yearlings	97,500
57637	Psrfe Hoodsport Htch	120k Chin Yearlings	176,352
54911	Psrfe Glenwood Springs Ltck	Chin Sub-Yearlings	30,000
53465	Psrfe Icy Crk	300k Chin Yearlings	188,318
52102	Psrfe Fish Health		112,769
54915	Psrfe Mrkn & Tag		315,935
54912	Psrfe Goal Development		190,000
54910	Psrfe Coordinator		169,644
Grand Total			2,819,700



Breakdown of ALL Marking and Tagging Programs

M&T PROGRAMS	SPECIES/ RUN	ANNUAL COST
** Wallace River	300k Summer Chinook Yearlings	\$51,408
Minter Creek	AD Only 100k Fall Chinook Subyearlings	\$17,136
Hoodsport	100k Fall Chinook Yearlings	\$20,496
Soos Creek - Icy Creek	AD Only 100k Fall Chinook Yearlings	\$5,353
Glenwood Springs	AD Only 100k Fall Chinook Subyearlings	\$5,406
Glenwood Springs	AD Only 100k Fall Chinook Yearlings	\$3,975
Voight's Creek	AD Only 1 million Fall Chinook Subyearlings	\$26,250
Voights Creek- PDNP	50k Fall Chinook Subyearlings	\$8,736
Clarks Creek- PDNP	CWT 50k Fall Chinook Subyearlings	\$4,730
** Hupp Springs	AD Only 150k Coho	\$8,215
Release Time Studies		
Garrison	300k Fall Chinook Subyearlings	\$51,408



Budget Updates– differences to original tables to level out Budget.

- PSRFE will no longer be funding Gorst; however, the program will continue through a different fund.
- PSRFE will only fund the marking of fish at Glenwood springs
- PSRFE will fund 300k Wallace summer chinook yearlings
- PSRFE will fund 150k Hupp Coho



Breakdown of marking and tagging programs by MI Code

54912 Goals and Development								
Race	Type	Species	Processed at:	Release Facility	Mark or Tag	2020 FBD Program Number	Projected Production	Est Cost
Fall	1+	Chin	Soos Creek	Icy Creek	Ad	100,000	101,000	\$5,353
Fall	0+	Chin	Garrison Springs	Garrison Springs	Ad+CWT	100,000	102,000	\$17,136
Fall	0+	Chin	Garrison Springs	Garrison Springs	Ad+CWT	100,000	102,000	\$17,136
Fall	0+	Chin	Garrison Springs	Garrison Springs	Ad+CWT	100,000	102,000	\$17,136
54915 Marking and Tagging								
Fall	1+	Chin	Hoodsport	Hoodsport	Ad+CWT	100,000	102,000	\$17,136
Fall	1+	Chin	Glenwood Springs	Glenwood Springs	Ad	100,000	100,000	\$5,300
Fall	0+	Chin	Glenwood Springs	Glenwood Springs	Ad	100,000	100,000	\$5,300
Fall	0+	Chin	Voights Creek	Point Defiance NP	Ad+CWT	50,000	52,000	\$8,736
Fall	0+	Chin	Clarks Creek	Point Defiance NP	CWT Tagwire only	50,000	50,000	\$4,730
Fall	0+	Chin	Minter Creek	Minter Creek	Ad+CWT	100,000	102,000	\$17,136
	1+	Chin	Wallace River	Wallace River	Ad+CWT	300,000	310,000	\$52,080
	1+	CO	Minter Creek	Hupp Springs	Ad	150,000	155,000	\$8,215
53622 Voights Creek Production								
Fall	0+	Chin	Voights Creek	Voights Creek	Ad	1,000,000	1,100,000	\$27,500



21-23 Biennium Totals per MI code

54912	PSRFE Goal Development / Marking and Tagging Needs	\$113,522 / \$190,000
54915	PSRFE Mrkn & Tag Needs	\$237,266 / \$315,935
53622	PSRFE Voights Creek Zeroes Marking Needs	\$55,000 / \$114,000

Note: Voights Creek Zeroes includes production of 1.2 million subyearling Chinook. No unallotted funds in MI 53622.



What do we have to spend?

From Goals and Development and Marking and Tagging (54912 and 54915) we **predict**:

\$155,147

- \$8,500 (caps total versus control total)

\$146,647

-\$4,903.63 (Oak Harbor Marina feed costs)

-\$11,279.63 (Oak Harbor net pens next fiscal year)

= \$130,463.74

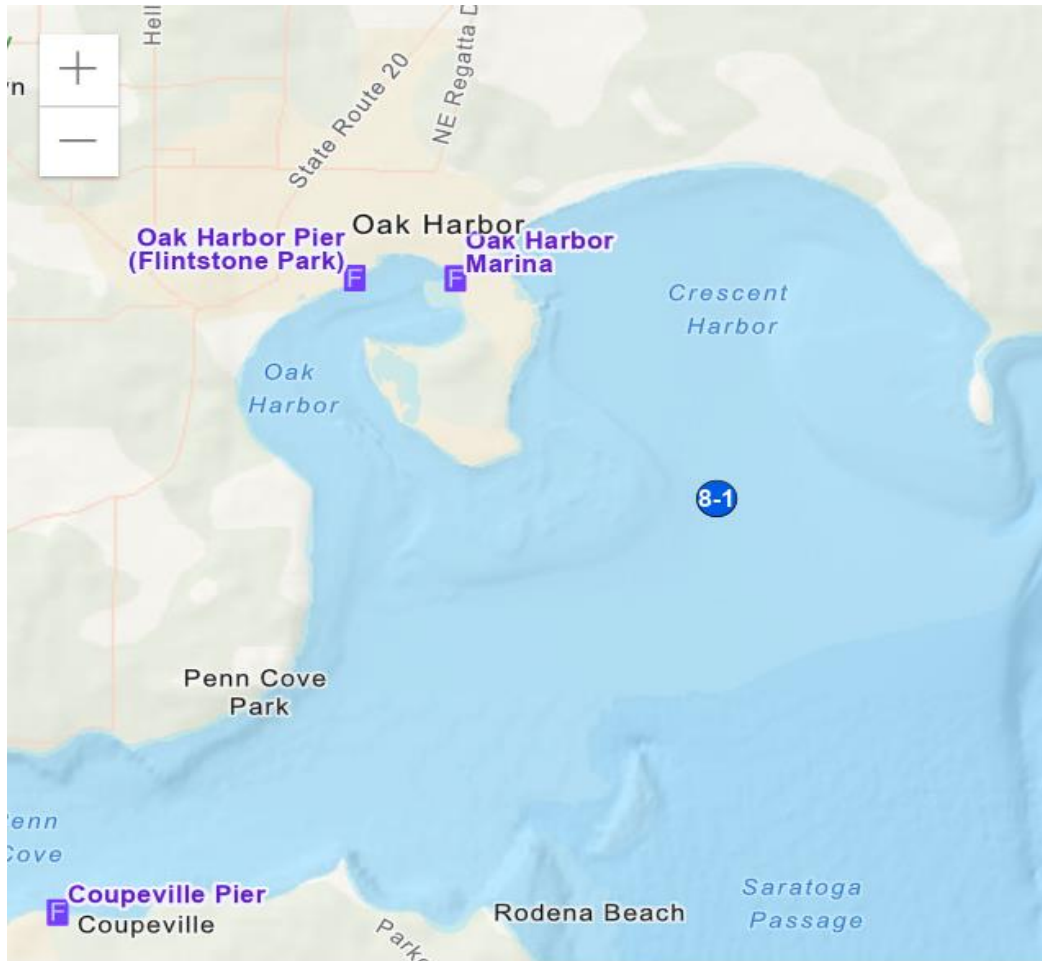


Oak Harbor Net Pens Update

- The net pens are in the water!
- The fish are ready to be transferred!
- Tentative fish transfer dates:
 - February 15th PM
 - February 16th PM
 - *Note: times are tide dependent.. High tides are at 1537 and 1618. Hatchery will get there 1-2 hours prior for set up.*



Looking to the future..



Things we are starting thinking about:

- Sampling and monitoring
- Potential bubble fishery
- Bubble boundary

Anticipate return in 2023



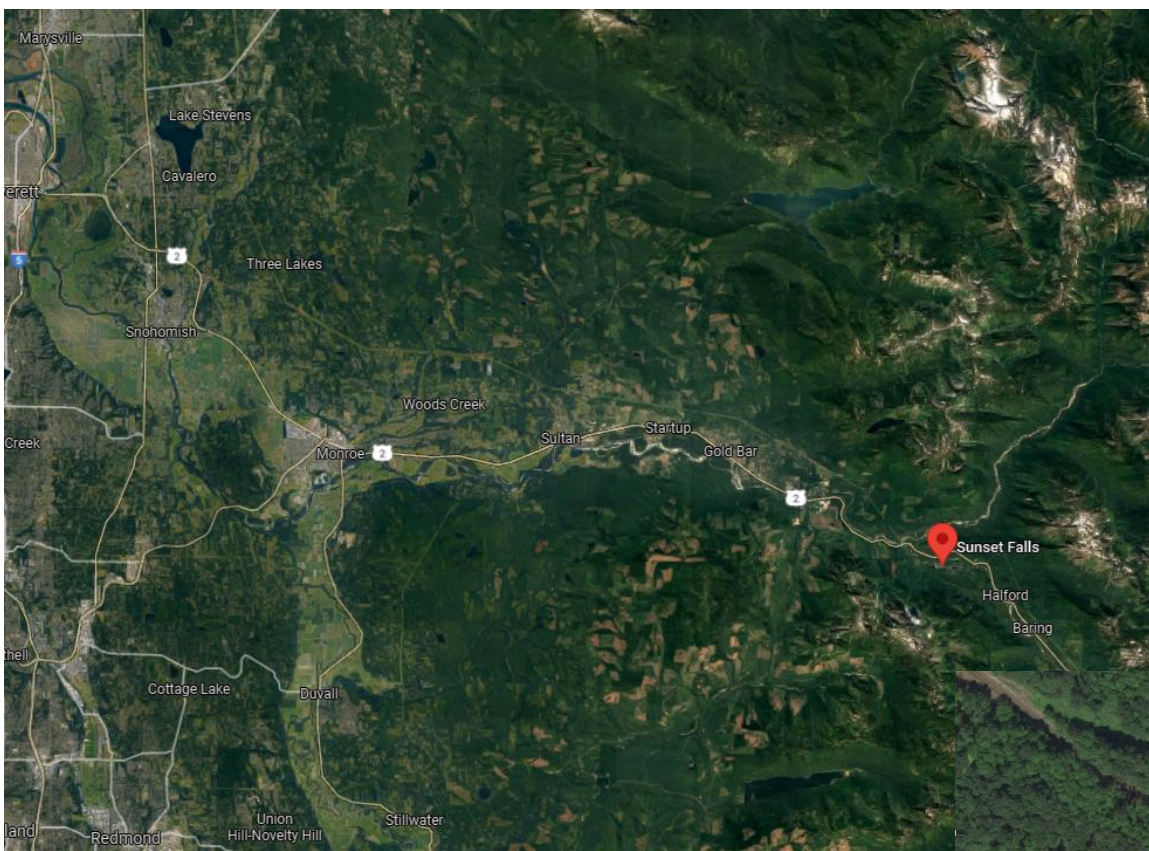


Improving In-Season Updates

SNOHOMISH COHO ESCAPEMENT MODEL

Snohomish Basin

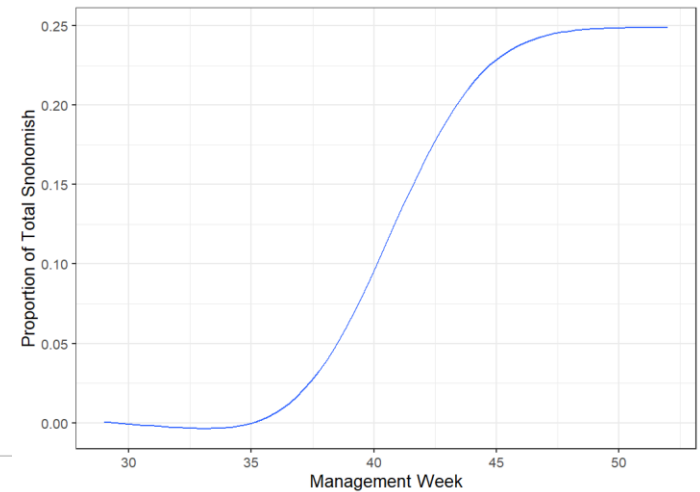




- Snohomish escapement estimated from Coho returning to Sunset Falls
- ~25% of Snohomish Coho pass through Sunset annually



Snohomish Coho

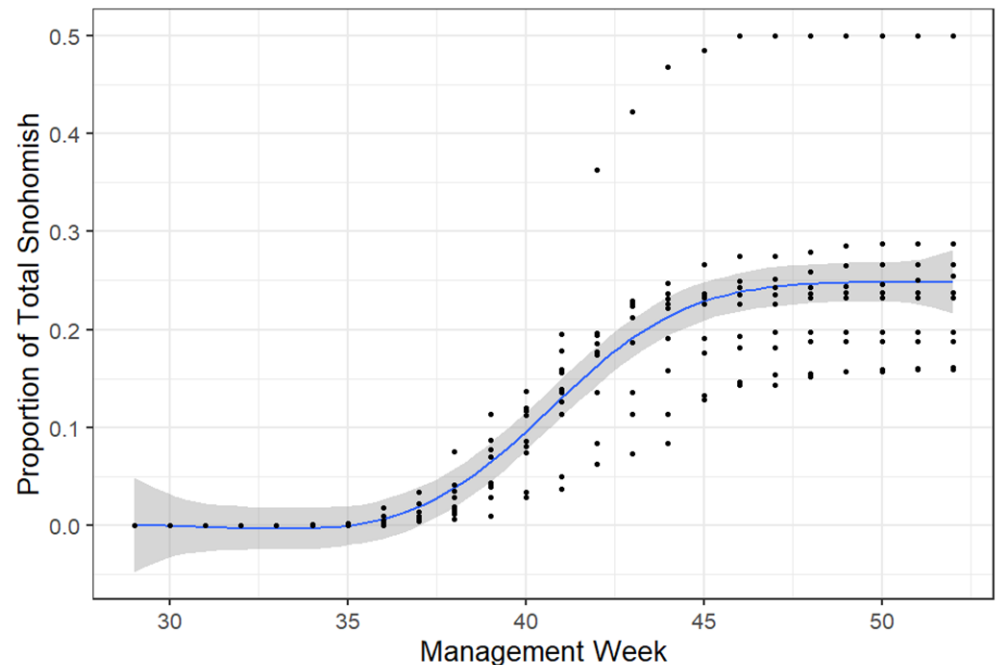


Adult Coho Returns to Sunset Falls		2021				2011-2020	
		returns to Sunset falls		In Season Prediction		avg % of total returns by this week	
		adult coho		Based on returns to Sunset			
Mgmt_week	Year	weekly	cumulative	ISU return to Sunset Falls	ISU return to Snohomish	Sunset EE	Snohomish EE
29	2021	0				0.0%	0.0%
30	2021	0				0.0%	0.0%
31	2021	0	0	-	-	0.0%	0.0%
32	2021	0	0	-	-	0.0%	0.0%
33	2021	2	2	12,157	54,029	0.0%	0.0%
34	2021	7	9	9,493	33,488	0.1%	0.0%
35	2021	5	14	3,858	14,970	0.4%	0.1%
36	2021	42	56	3,965	13,061	1.4%	0.4%
37	2021	0	56	1,291	4,886	4.3%	1.1%
38	2021	0	56	566	2,126	9.9%	2.6%
39	2021	4371	4427	20,193	79,940	21.9%	5.5%
40	2021	8101	12528	33,690	138,197	37.2%	9.1%
41	2021	1,275	13,803	26,067	107,122	53.0%	12.9%



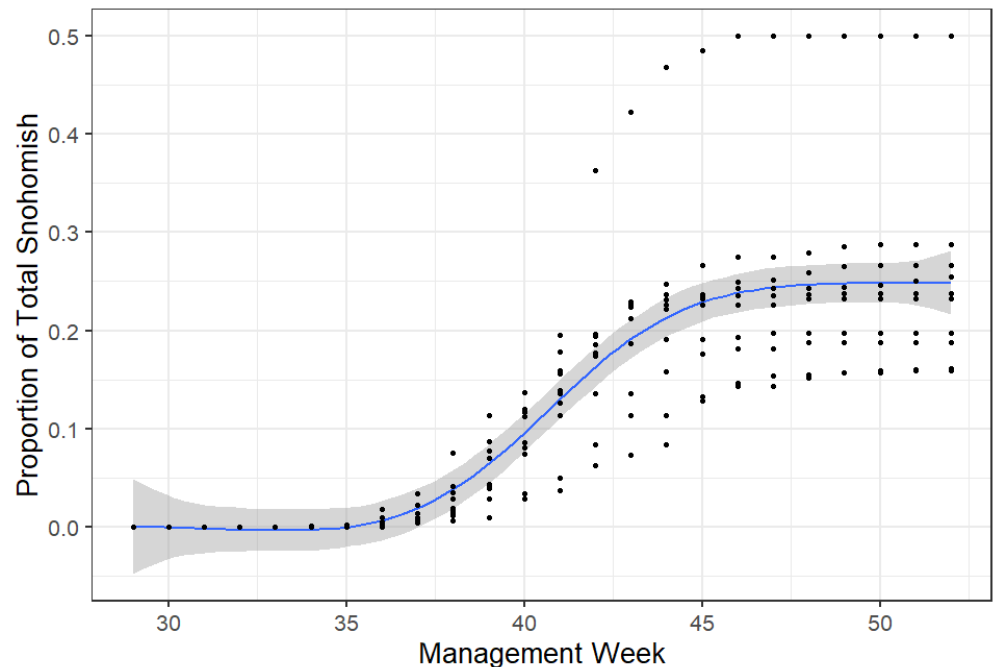
Updated approach

- Wanted a way to account for variability around the estimate
- First step was to look at the relationship between Week and the Proportion (Sunset / total Sno)



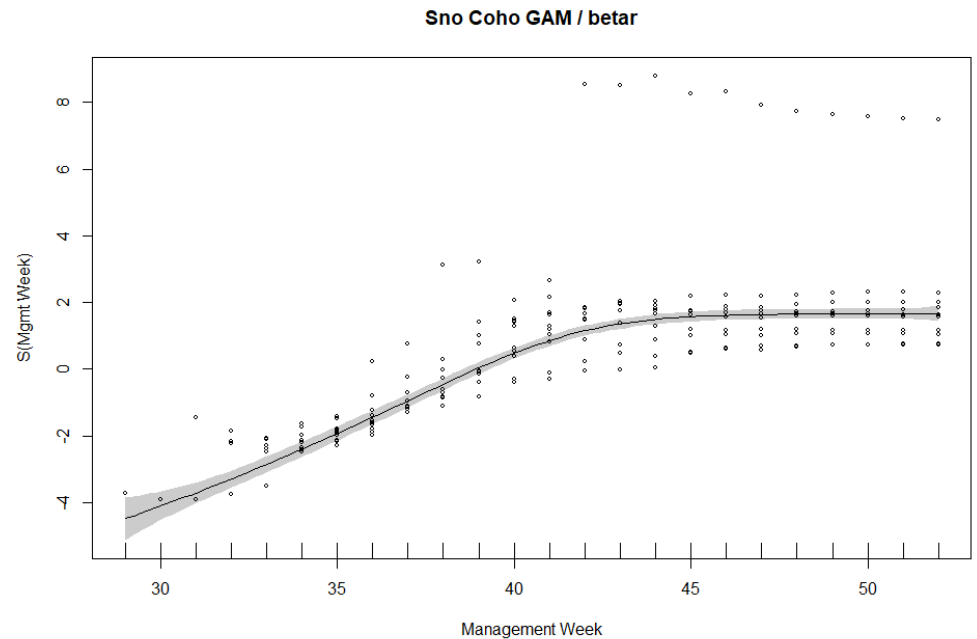
Modeling Approach

- Used Generalized Additive Model (GAM) due to flexibility in the fit and ability to add to it.
- Family = beta regression due to the shape of the relationship
- Beta regressions fit probabilities between (0,1)
- Used `gam.predict` to fit 2021 data to the model created from 2011 – 2020 data



Model 1: Prop ~ Management Week

- Explained 97.3% of the variance in the data set
- Significant relationship with week



Model 1: Escapement Estimates

Week	Year	weekly	cumulative	Modeled Proportion	Modeled SE	Predicted Sno EE	Predict Low	Predict High
29	2021	0	0	0.001	0.000	0.000	0.000	0.000
30	2021	0	0	0.001	0.000	0.000	0.000	0.000
31	2021	0	0	0.002	0.000	0.000	0.000	0.000
32	2021	0	0	0.002	0.000	0.000	0.000	0.000
33	2021	2	2	0.004	0.001	560.679	489.671	655.773
34	2021	7	9	0.006	0.001	1599.749	1403.420	1859.942
35	2021	5	14	0.009	0.001	1556.905	1375.020	1794.244
36	2021	42	56	0.015	0.002	3857.241	3429.174	4407.425
37	2021	0	56	0.024	0.003	2372.781	2126.383	2683.765
38	2021	0	56	0.038	0.004	1463.385	1324.780	1634.383
39	2021	4371	4427	0.061	0.006	72968.422	66708.165	80525.359
40	2021	8101	12543	0.092	0.008	137045.759	126656.007	149292.402
41	2021	1,260	13,803	0.128	0.009	107667.683	100458.339	115991.777

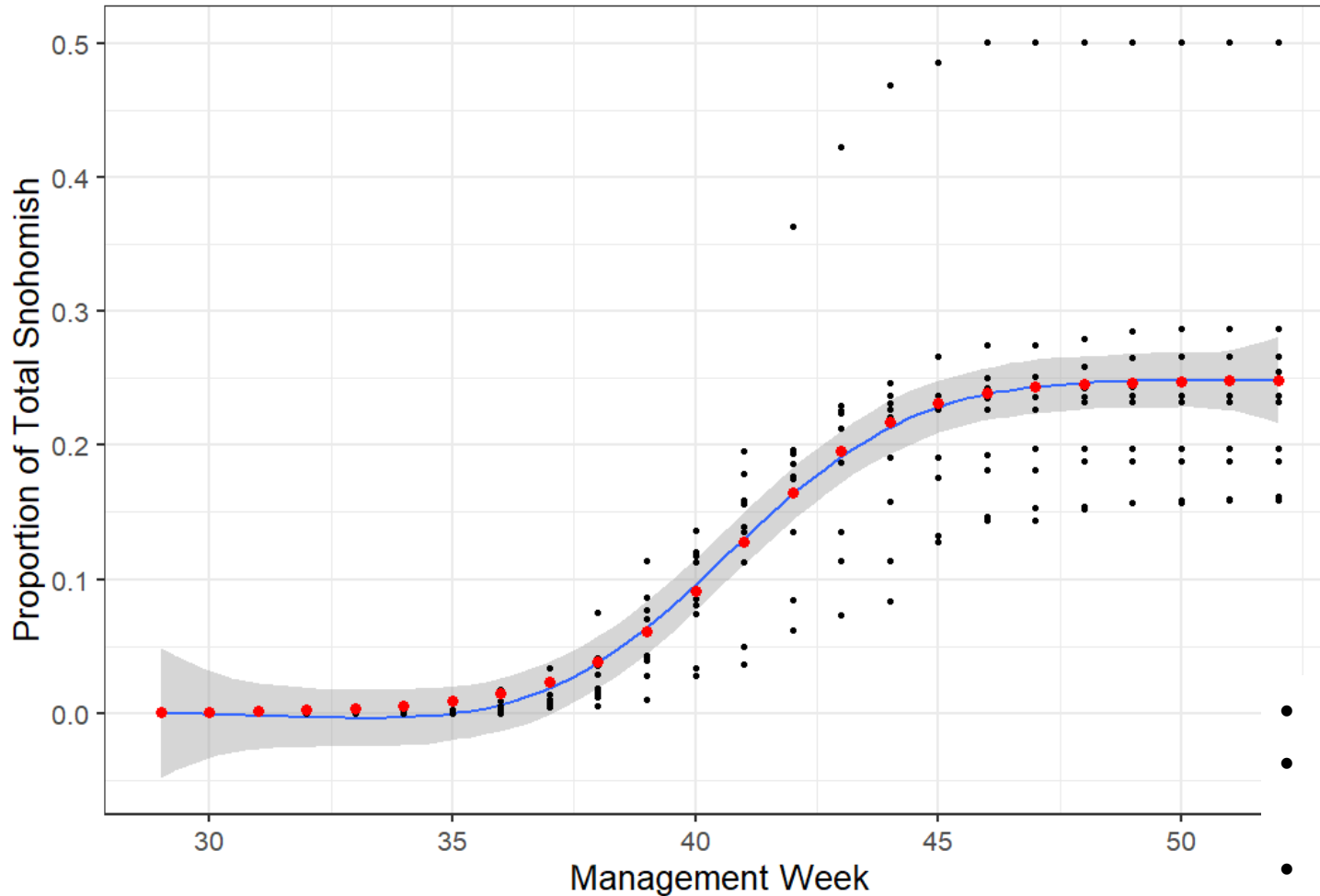
Original Method (mean)

40	9.1%	138,197
41	12.9%	107,122



Model 1: Fit

Model 1

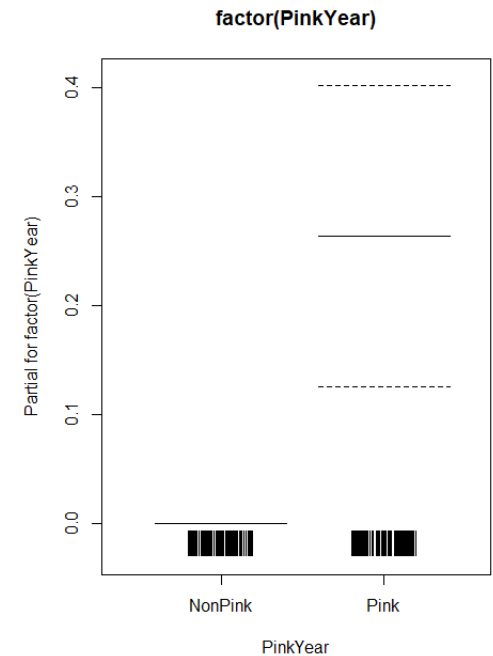
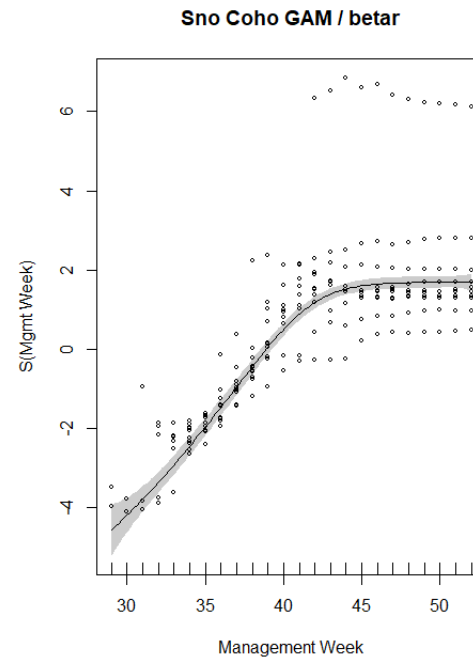


- Black – historic
- Blue – mean model fit
- Red – model predicted 2021



Model 2: Prop ~ Management Week + Pink Year

- Explained 97.5% of the variance in the data set
- Significant relationship with week and Pink Year



Model 2: Escapement Estimates

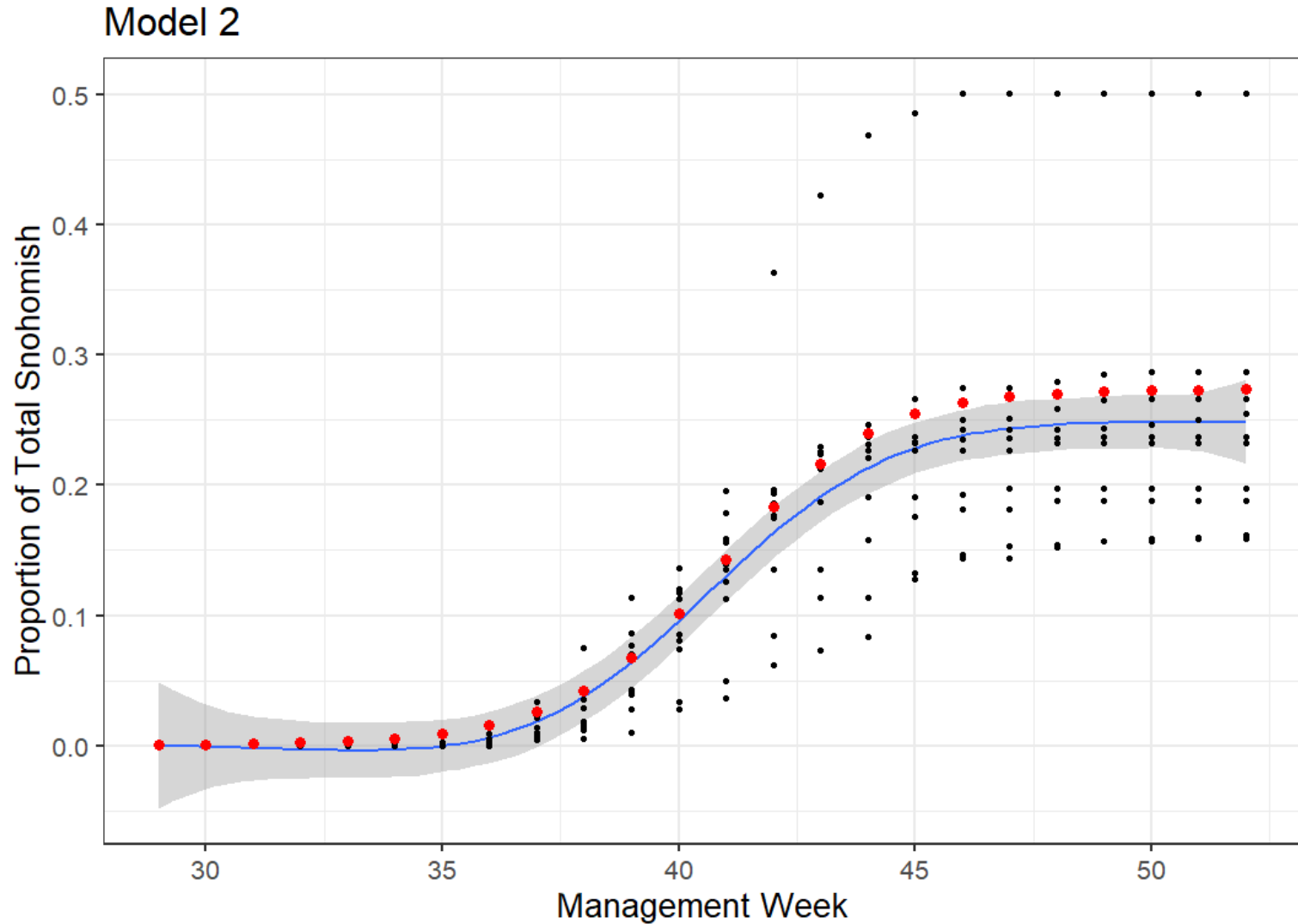
Week	Year	weekly	cumulative	Modeled Proportion	Modeled SE	Predicted Sno EE	Predict Low	Predict High
29	2021	0	0	0.001	0.000	0.000	0.000	0.000
30	2021	0	0	0.001	0.000	0.000	0.000	0.000
31	2021	0	0	0.002	0.000	0.000	0.000	0.000
32	2021	0	0	0.002	0.000	0.000	0.000	0.000
33	2021	2	2	0.004	0.001	538.786	468.783	633.367
34	2021	7	9	0.006	0.001	1518.410	1327.085	1774.196
35	2021	5	14	0.010	0.001	1458.313	1283.370	1688.476
36	2021	42	56	0.016	0.002	3566.902	3160.769	4092.793
37	2021	0	56	0.026	0.003	2169.523	1938.650	2462.821
38	2021	0	56	0.042	0.005	1326.020	1197.460	1485.506
39	2021	4371	4427	0.067	0.006	65707.983	59942.533	72700.537
40	2021	8101	12543	0.102	0.009	123026.840	113476.736	134332.116
41	2021	1,260	13,803	0.143	0.011	96651.694	90009.176	104352.742

Original Method (mean)

40	9.1%	138,197
41	12.9%	107,122

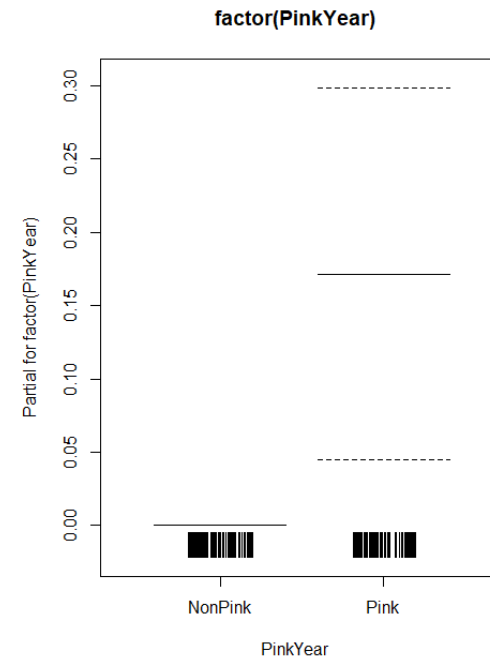
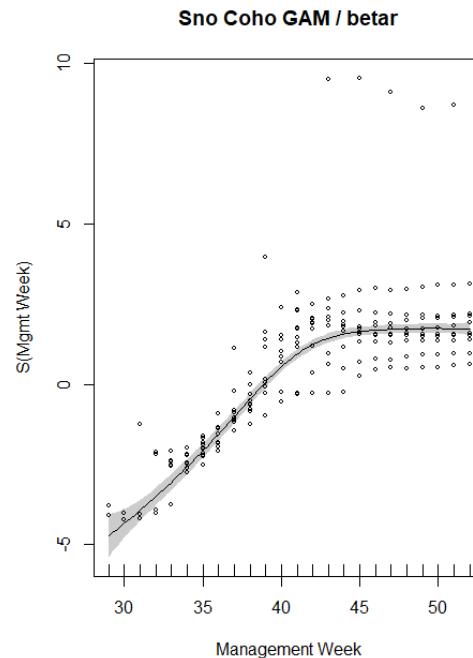


Model 2: Fit



Model 3: Prop ~ Management Week + Pink Year without 2015

- 2015
 - Coho Crash
 - Pink Year
- Might be biasing the results
- Explained 98.7% of the variance in the data set
- Significant relationship with week and Pink Year



Model 3: Escapement Estimates

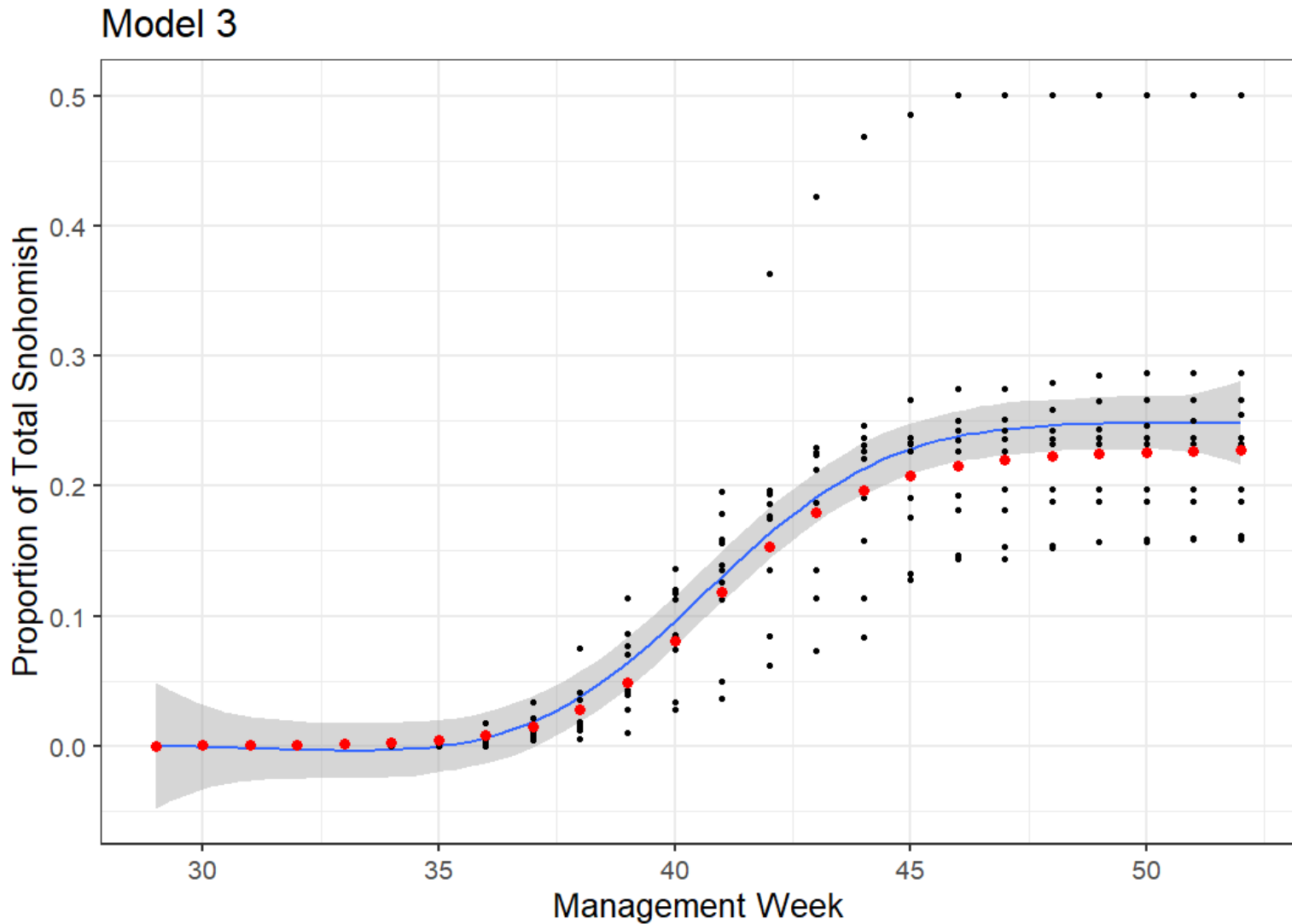
Week	Year	weekly	cumulative	Modeled Proportion	Modeled SE	Predicted Sno EE	Predict Low	Predict High
29	2021	0	0	0.000	0.000	0.000	0.000	0.000
30	2021	0	0	0.000	0.000	0.000	0.000	0.000
31	2021	0	0	0.001	0.000	0.000	0.000	0.000
32	2021	0	0	0.001	0.000	0.000	0.000	0.000
33	2021	2	2	0.002	0.000	1194.490	1030.332	1420.870
34	2021	7	9	0.003	0.000	3238.968	2809.218	3823.951
35	2021	5	14	0.005	0.001	2954.805	2585.738	3446.768
36	2021	42	56	0.008	0.001	6718.875	5934.323	7742.475
37	2021	0	56	0.015	0.002	3707.697	3312.249	4210.372
38	2021	0	56	0.028	0.003	2024.765	1835.816	2257.072
39	2021	4371	4427	0.049	0.004	90080.723	82762.065	98819.326
40	2021	8101	12543	0.081	0.006	155505.240	144699.401	168055.242
41	2021	1,260	13,803	0.118	0.008	116954.534	109952.550	124908.972

Original Method (mean)

40	9.1%	138,197
41	12.9%	107,122

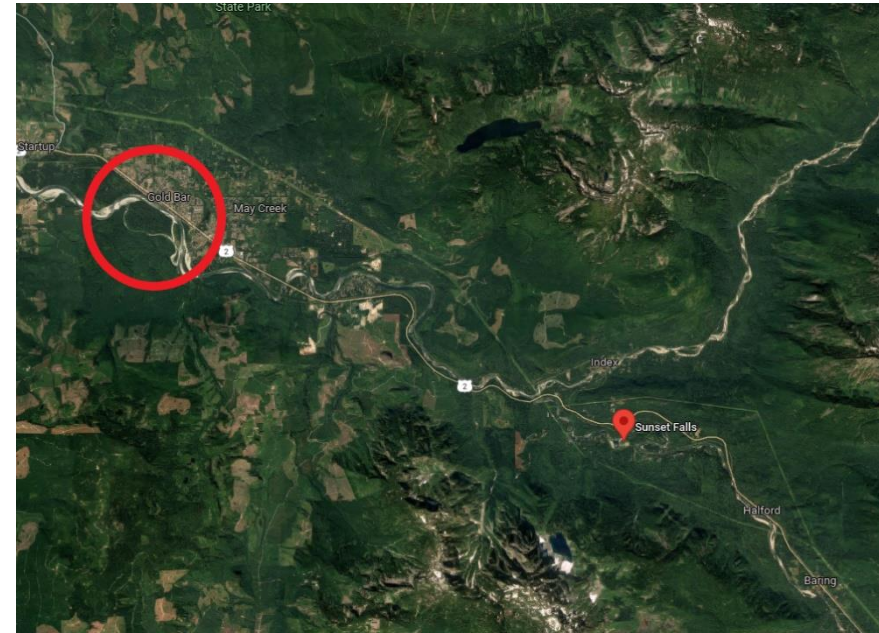


Model 3: Fit



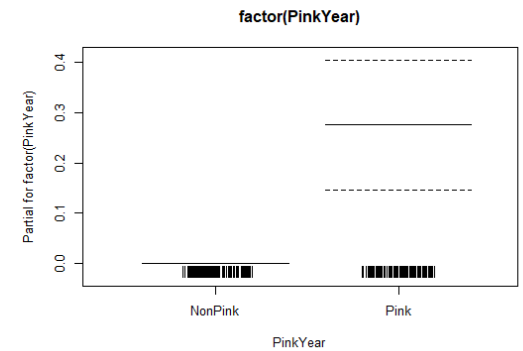
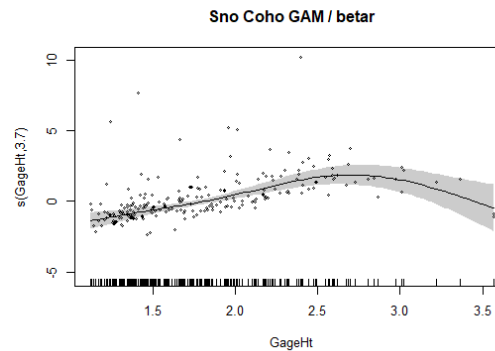
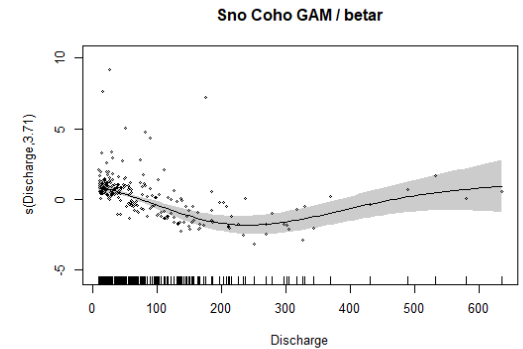
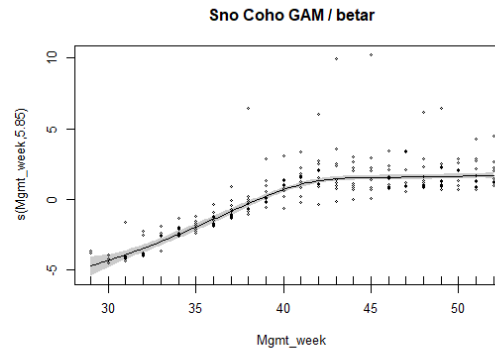
MORE DATA!

- Next Step was to include Environmental Variables
- USGS Flow data from Skykomish River station in Gold Bar
- Discharge ($\text{m}^3 \cdot \text{s}^{-1}$)
- Gage Height (m)



Model 4: Prop ~ Management Week + Discharge + Gage Height + Pink Year

- Explained 98.4% of the variance in the data set
- Significant relationship with ALL variables



Model 4: Escapement Estimates

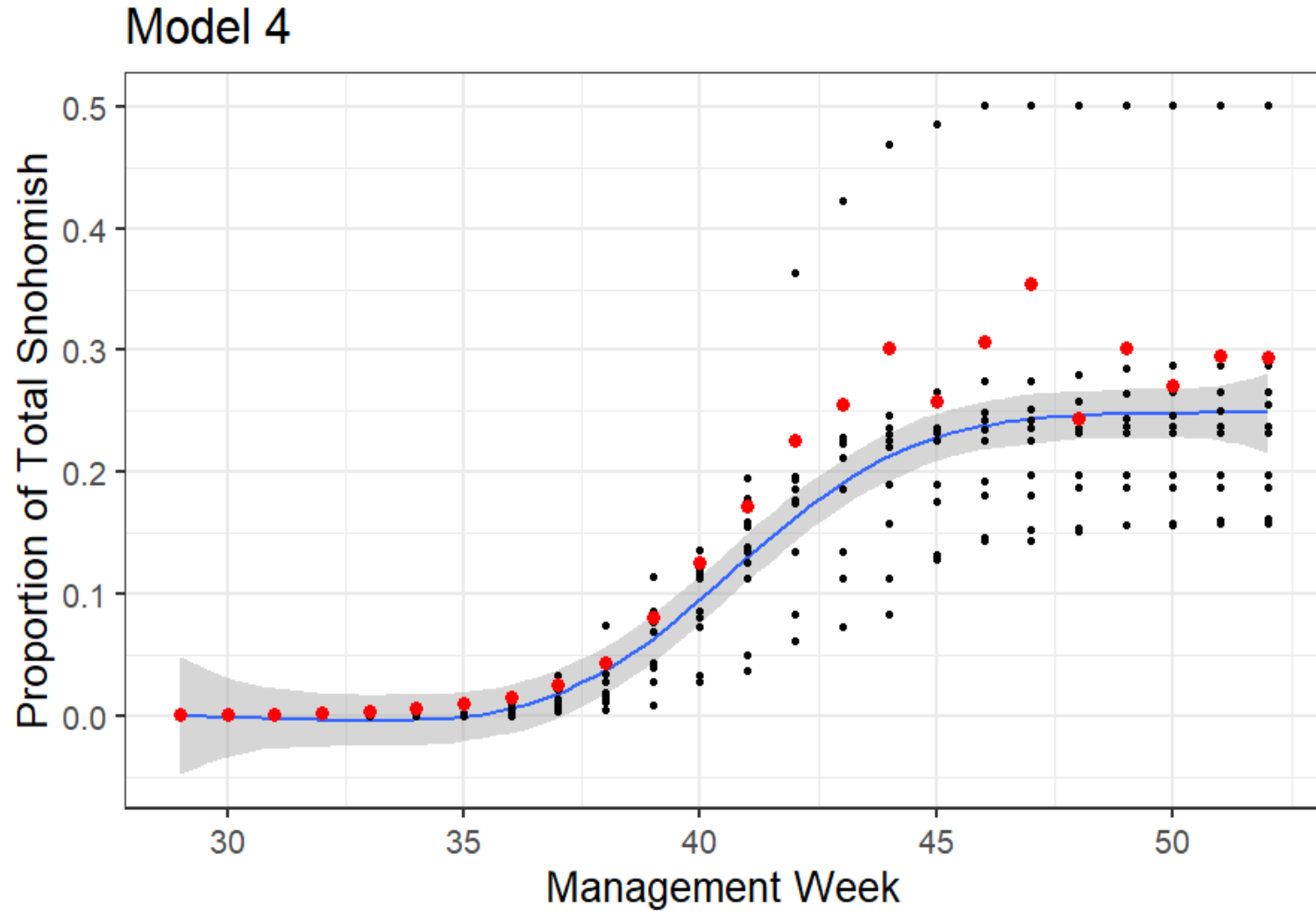
Week	Year	weekly	cumulative	Modeled Proportion	Modeled SE	Predicted Sno_EE	Predict Low	Predict High
29	2021	0	0	0.001	0.000	0	0	0
30	2021	0	0	0.001	0.000	0	0	0
31	2021	0	0	0.001	0.000	0	0	0
32	2021	0	0	0.002	0.000	0	0	0
33	2021	2	2	0.003	0.001	574.5788	492.3945	689.6937
34	2021	7	9	0.005	0.001	1676.204	1449.399	1987.16
35	2021	5	14	0.009	0.001	1590.898	1388.526	1862.324
36	2021	42	56	0.014	0.002	3868.867	3408.925	4472.281
37	2021	0	56	0.024	0.003	2346.872	2087.501	2679.841
38	2021	0	56	0.045	0.005	1234.022	1104.447	1398.041
39	2021	4371	4427	0.081	0.009	54338.57	48880.82	61168.26
40	2021	8101	12543	0.142	0.016	88536.75	79408.89	100035.6
41	2021	1,260	13,803	0.183	0.019	75252.45	69478.04	82073.72

Original Method (mean)

40	9.1%	138,197
41	12.9%	107,122

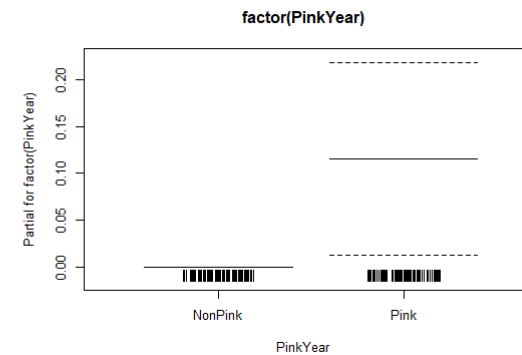
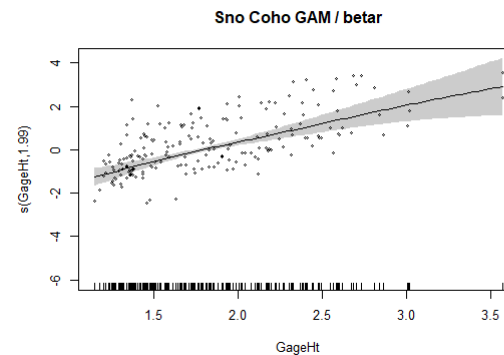
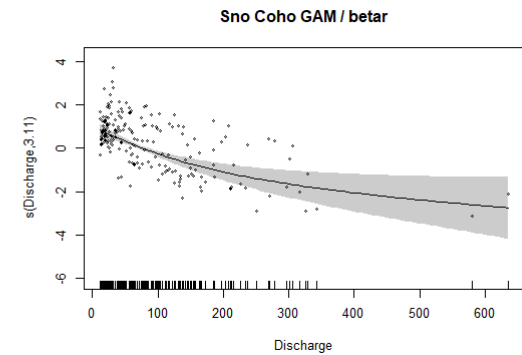
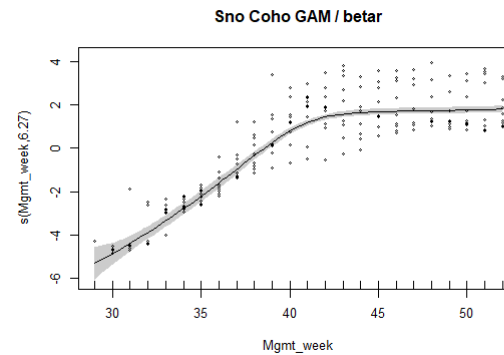


Model 4: Fit



Model 5: Prop ~ Management Week + Discharge + Gage Height + Pink Year Without 2015

- Explained 99% of the variance in the data set
- Significant relationship with ALL variables



Model 5: Escapement Estimates

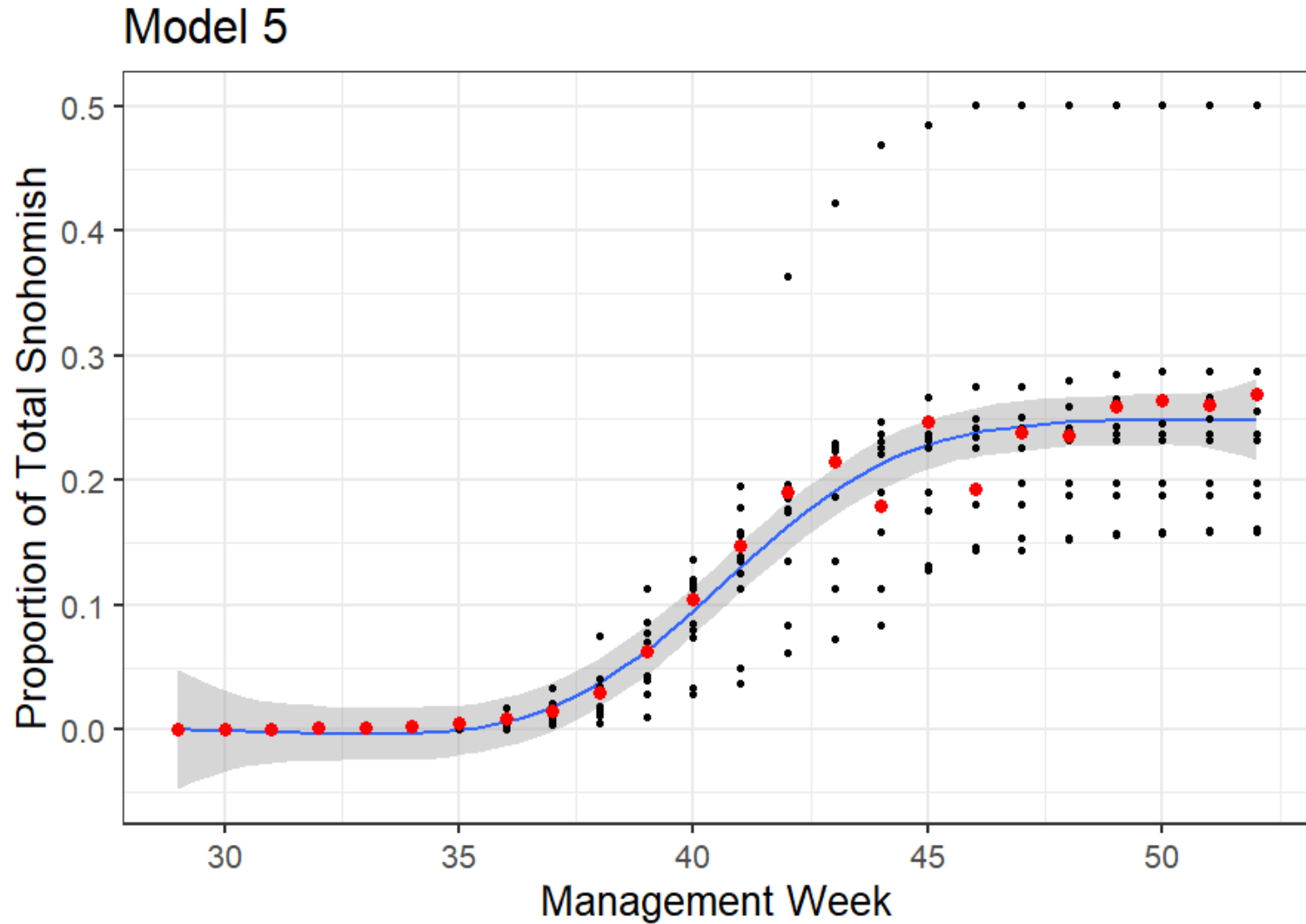
Week	Year	weekly	cumulative	Modeled Proportion	Modeled SE	Predicted Sno_EE	Predict Low	Predict High
29	2021	0	0	0.000	0.000	0.000	0.000	0.000
30	2021	0	0	0.000	0.000	0.000	0.000	0.000
31	2021	0	0	0.001	0.000	0.000	0.000	0.000
32	2021	0	0	0.001	0.000	0.000	0.000	0.000
33	2021	2	2	0.002	0.000	1147.325	984.697	1374.296
34	2021	7	9	0.003	0.000	3216.407	2779.633	3816.033
35	2021	5	14	0.005	0.001	2902.625	2533.669	3397.351
36	2021	42	56	0.008	0.001	6622.280	5842.942	7641.513
37	2021	0	56	0.015	0.002	3704.619	3309.299	4207.199
38	2021	0	56	0.033	0.003	1715.360	1554.585	1913.224
39	2021	4371	4427	0.064	0.006	68807.882	62935.528	75888.881
40	2021	8101	12543	0.111	0.011	113191.891	103270.117	125222.789
41	2021	1,260	13,803	0.155	0.010	88813.916	83224.191	95208.568

Original Method (mean)

40	9.1%	138,197
41	12.9%	107,122



Model 5: Fit



Model Validation

- Used leave-one-out cross validation to test robustness of each model
- Fits each model without one of the years (2011 – 2020)
 - AIC
 - Deviance Explained
- Fits missing year with `gam.predict`
- Calculate mean squared prediction error (MSPE) of each model



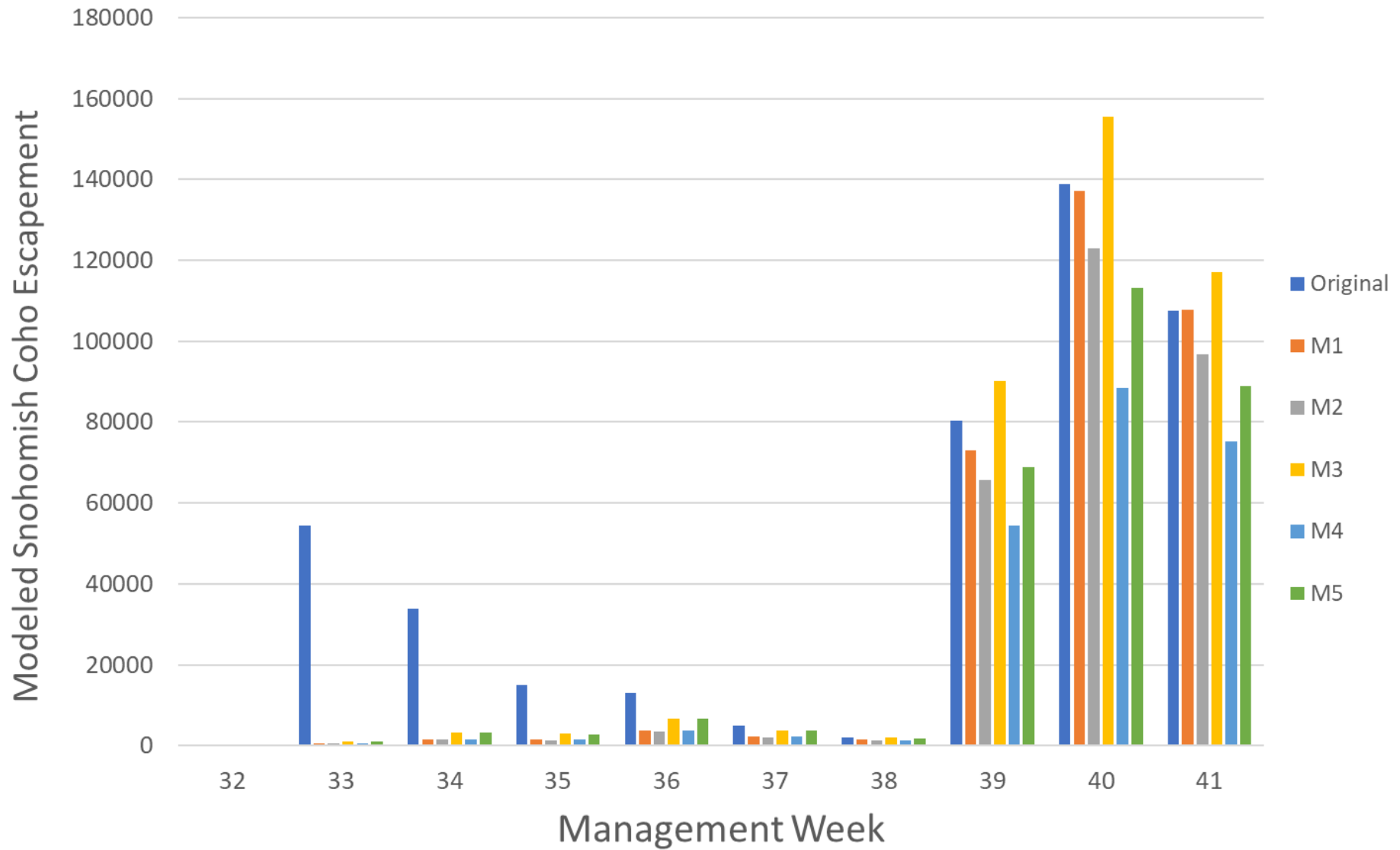
Model Validation

Deviance Explained						MSPE					
	m1	m2	m3	m4	m5		m1	m2	m3	m4	m5
2011	71%	73%	88%	83%	91%	2011	0.0002	0.0002	0.0013	0.0010	0.0022
2012	76%	76%	90%	84%	91%	2012	0.0054	0.0040	0.0023	0.0027	0.0016
2013	76%	80%	94%	86%	94%	2013	0.0063	0.0107	0.0054	0.0062	0.0051
2014	71%	74%	88%	83%	91%	2014	0.0002	0.0004	0.0012	0.0027	0.0025
2015	89%	89%	88%	91%	90%	2015	0.0351	0.0340	0.0348	0.0343	0.0348
2016	71%	74%	87%	83%	89%	2016	0.0008	0.0020	0.0029	0.0019	0.0023
2017	72%	74%	87%	83%	90%	2017	0.0004	0.0008	0.0005	0.0022	0.0004
2018	73%	75%	88%	83%	89%	2018	0.0019	0.0011	0.0001	0.0013	0.0002
2019	71%	73%	88%	83%	89%	2019	0.0003	0.0003	0.0007	0.0003	0.0005
2020	73%	74%	88%	84%	90%	2020	0.0011	0.0008	0.0003	0.0023	0.0002
Mean	74%	76%	89%	84%	91%	Mean	0.00517	0.00544	0.00496	0.00550	0.00498

AIC					
	m1	m2	m3	m4	m5
2011	-532.84	-546.08	-733.38	-622.94	-777.18
2012	-559.10	-565.83	-771.92	-634.62	-779.30
2013	-563.87	-601.35	-818.87	-656.03	-827.53
2014	-532.34	-546.85	-723.61	-626.43	-767.16
2015	-831.87	-832.57	-832.57	-860.82	-860.82
2016	-535.17	-554.34	-763.92	-628.52	-784.88
2017	-533.20	-548.87	-723.62	-628.53	-748.35
2018	-540.84	-550.80	-723.91	-625.17	-754.81
2019	-532.88	-546.68	-729.44	-619.90	-748.32
2020	-536.84	-549.22	-721.46	-629.80	-750.86
Mean	-569.90	-584.26	-754.27	-653.30	-779.92



Model Comparisons



Conclusions

- M5 provides the best fit to the data
 - Highest deviance explained
 - Lowest AIC
 - Low error based on LOOCV
- Likely more conservative than other models examined
- New method shows largest deviation from original in early weeks (<35)
 - Likely not a huge issue since we are not finalizing escapement until later
 - Subject to sufficient data set?



Final Escapement Estimates

- Snohomish Final escapement determined from fish counts in different reaches of the river
 - ~95,000 Coho
- Modeling Approach:
 - Mean EE: 97,168 (!!)
 - low EE: 90,098
 - high EE: 105,442



Broader Applicability

- Potential for this model to be used in other systems besides Snohomish
 - Has been presented to other regions and comanagers
- Forecasting models are starting to include more environmental data
 - Better models improve our ability to manage fisheries
 - Finding common factors driving distribution improves our ability to plan





MA-10 UPDATE

Current Season - PAUSED

MA-10 Winter Chinook

- Season planned for January 1 – March 30
- Saturday, Sunday, Monday only
- 1-fish limit for Chinook

- Currently on hold to preserve opportunity for February/March



MA-10 Winter Estimates

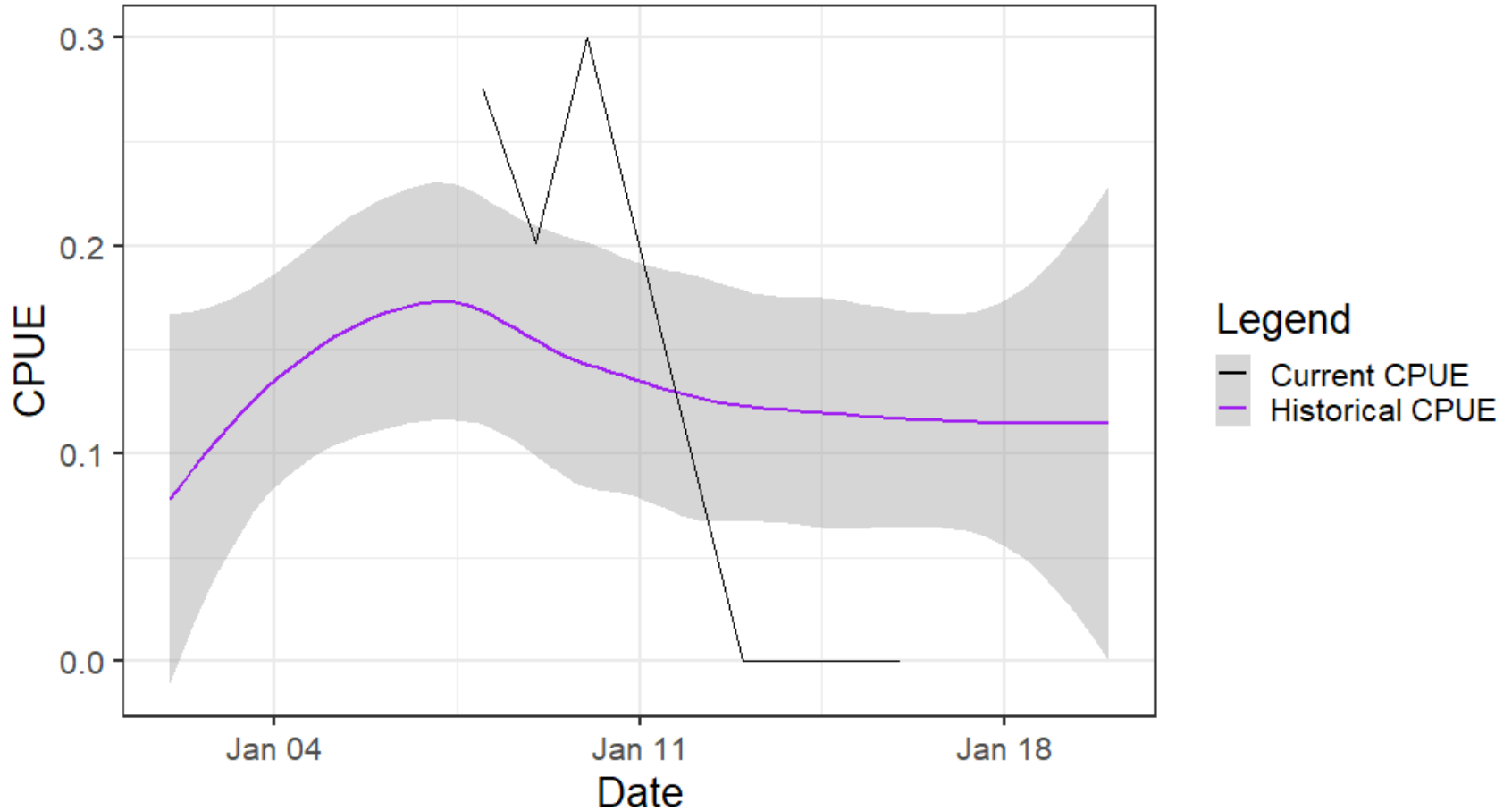
	Total Encounters	Sublegal Encounters	Unmarked Encounters
Estimate	2,054	1,797	514
FRAM	8,475	7,319	1,105
% of Total	24%	25%	46%

- Currently at 25% of Total and Sublegal Encounters and 46% of Unmarked Encounters
- These estimates are based off the WDFW Test Fishing number for the legal marked rate, which to date is 12.5%.



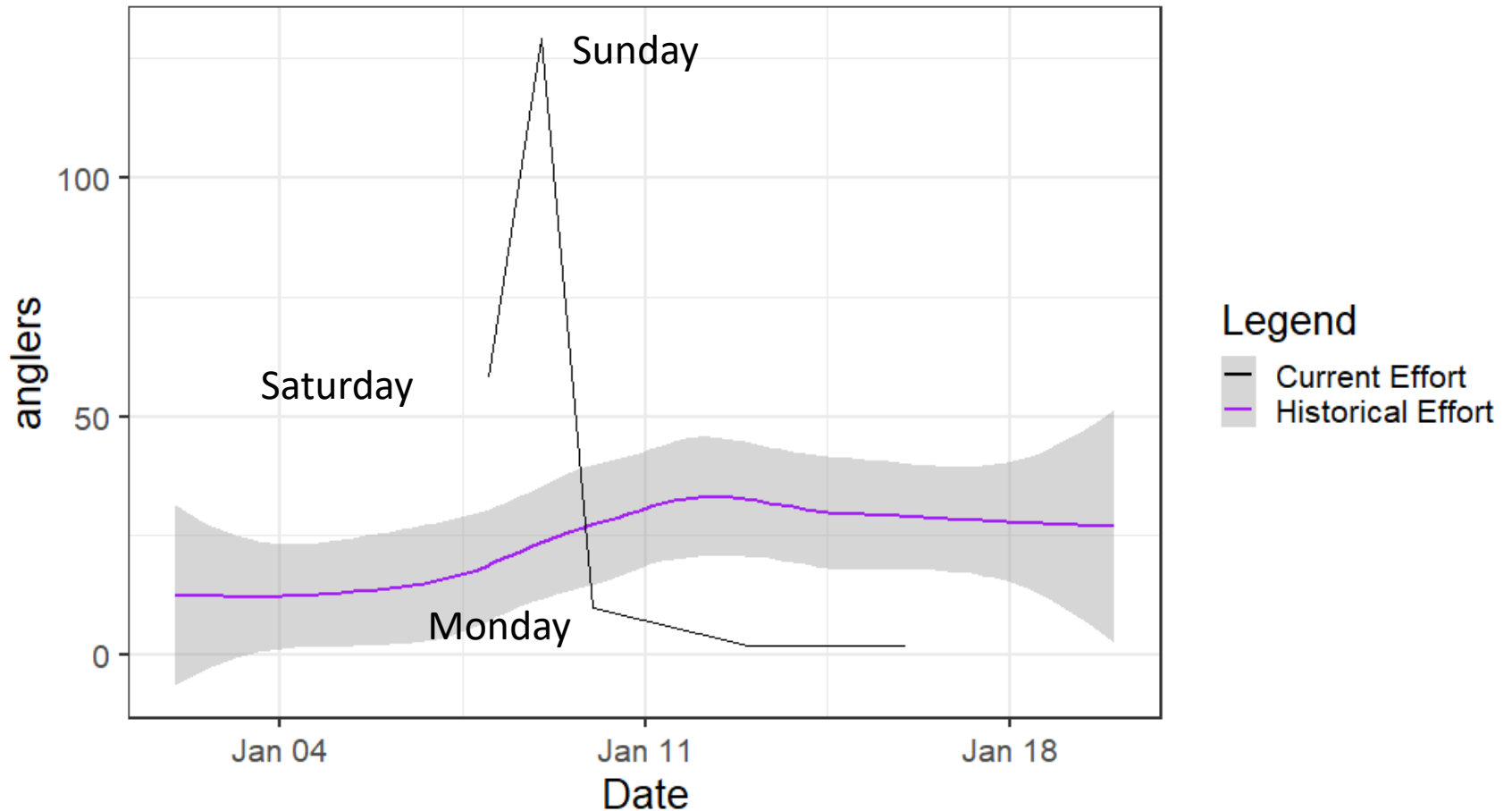
MA-10 CPUE

Area 10 CPUE Comparison



MA-10 Angler Effort

Area 10 Angler Effort Comparison



NOF SCHEDULE (tentative)

- Jan 18 – Emerging Issues Meeting
- Jan 28 – Preliminary Forecasts
- Feb 4 – Technical Forecast Agreement
- Feb 14-18 – PSC Annual Meeting
- Mar 4 – Forecast Meeting
- Mar 16-18 – NOF #1
Mar 29-31 – NOF #2
- <https://wdfw.wa.gov/fishing/management/north-falcon/public-meetings>



Questions/Comments?

