

Scott Valley Stream Depletion SMC Development

Scott Valley GSA Advisory Committee

January 26, 2021

LARRY
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ASSOCIATES



Stantec

UC DAVIS

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DAVIDS
ENGINEERING, INC¹

Agenda

- MT definition document

Scenario results available to supplement discussion

- a) Flow changes
- b) Fall reconnection date changes

Minimum Threshold options discussed so far

- Flow > 20 cfs for 60 days, Sept 1-Nov 1
- “Reconnection days” gained in fall
 - And/or days disconnection delayed in spring/summer
- SMC (*proposed today*)
 - % of Total Depletion Reversed
- SMC – additional information (*described today*)
 - Distribution of reconnection dates or days > threshold (over 28 years)

Scenario information

DRAFT

Scenario Type	Scenario ID	Scenario description
Enhanced Recharge	MAR	Divert surface water to over-irrigate fields and enhance groundwater recharge during the wet season (Dec-Mar) . Allow diversions from tributaries to continue as long as water is available (on a monthly volume basis).
	ILR	Divert surface water to irrigate fields during the growing season (Apr-Jun or Jul) in lieu of pumping groundwater. Allow diversions from tributaries to continue as long as water is available (on a monthly volume basis).
	MAR_ILR	Combination of MAR and ILR scenarios.
Crop change	80% Irrigation	Assumes unspecified irrigated crop change, reducing all irrigated acreage water demand by 20%.
	90% Irrigation	Assumes unspecified irrigated crop change, reducing all irrigated acreage water demand by 10%.
Irrigation schedule change	Alfalfa irrigation schedule - July 10 end date	Alfalfa irrigation ceases on July 10th of every growing season.
	Alfalfa irrigation schedule - Aug 01 end date	Alfalfa irrigation ceases on Aug 1st of every growing season.
Attribution - adjudicated area impacts	Natural Vegetation Outside Adjudicated area (NVOA)	Turns off pumping for wells serving all fields outside the adjudicated zone. Assumes that these fields, where pumping is turned off, revert to natural vegetation with a k_c value of 1.0. Assumes that all fields with 5% or more of their area overlapping with the adjudicated zone are "inside" the adjudicated zone. Increase ET extinction depth (in MODFLOW .ETS package) to 4.5 m in native vegetation areas outside the Discharge Zone.
	Natural Vegetation, on Groundwater- or Mixed-source fields, Outside Adjudicated area (NV-GWM-OA)	Turns off pumping for wells serving fields outside the adjudicated zone, which have a "groundwater" or "mixed groundwater and surface water" irrigation source. Assumes that these fields, where pumping is turned off, revert to natural vegetation with a k_c value of 1.0. Assumes that all fields with 5% or more of their area overlapping with the adjudicated zone are "inside" the adjudicated zone. Increase ET extinction depth (in MODFLOW .ETS package) to 4.5 m in native vegetation areas outside the Discharge Zone.
	Natural Vegetation Inside Adjudicated area (NV-GWM-IA)	Turns off pumping for wells serving all fields inside the adjudicated zone. Assumes that these fields, where pumping is turned off, revert to natural vegetation with a k_c value of 1.0. Assumes that all fields with 5% or more of their area overlapping with the adjudicated zone are "inside" the adjudicated zone. Increase ET extinction depth (in MODFLOW .ETS package) to 4.5 m in native vegetation areas outside the Discharge Zone.
	Natural Vegetation, on Groundwater- or Mixed-source fields, Inside Adjudicated area (NV-GWM-IA)	Turns off pumping for wells serving fields inside the adjudicated zone, which have a "groundwater" or "mixed groundwater and surface water" irrigation source. Assumes that these fields, where pumping is turned off, revert to natural vegetation with a k_c value of 1.0. Assumes that all fields with 5% or more of their area overlapping with the adjudicated zone are "inside" the adjudicated zone. Increase ET extinction depth (in MODFLOW .ETS package) to 4.5 m in native vegetation areas outside the Discharge Zone.
	Natural Vegetation (NV)	Turns off pumping for wells serving all irrigated fields in the SVIHM model. Assumes that these fields, where pumping is turned off, revert to natural vegetation with a k_c value of 1.0. Assumes that all fields with 5% or more of their area overlapping with the adjudicated zone are "inside" the adjudicated zone. Increase ET extinction depth (in MODFLOW .ETS package) to 4.5 m in native vegetation areas outside the Discharge Zone.
	Natural Vegetation on all Groundwater- or Mixed-source fields (NV-GWM)	Turns off pumping for wells serving all irrigated fields which have a "groundwater" or "mixed groundwater and surface water" irrigation source. Assumes that these fields, where pumping is turned off, revert to natural vegetation with a k_c value of 1.0. Assumes that all fields with 5% or more of their area overlapping with the adjudicated zone are "inside" the adjudicated zone. Increase ET extinction depth (in MODFLOW .ETS package) to 4.5 m in native vegetation areas outside the Discharge Zone.
Reservoir	Reservoir, 30 cfs release, Shackleford	Simulates a small reservoir on the Shackleford Creek tributary by withholding wet-season flow and releasing it during the dry season according to set operations rules. Minimum release: 30 cfs
	Reservoir, 30 cfs release, Etna	Simulates a small reservoir on the Etna Creek tributary by withholding wet-season flow and releasing it during the dry season according to set operations rules.
	Reservoir, 30 cfs release, French	Simulates a small reservoir on the French Creek tributary by withholding wet-season flow and releasing it during the dry season according to set operations rules. Minimum release: 30 cfs
	Reservoir, 30 cfs release, S. Fork	Simulates a small reservoir on the South Fork tributary by withholding wet-season flow and releasing it during the dry season according to set operations rules.

Reconnection date distribution graphs

Basecase (Simulated historical period)

Sep 1

Month	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
1-Sep NA	2495	2475	2376	2785	2734	2704	2617	2591	2570	2550	2532	2515	2499	2483	2467	2451	2435	2419	2403	2387	2371	2355	2339	2323	2307	2291	2275	2259	2243	2227
2-Sep NA	3484	3474	2939	3687	2024	1087	5591	6289	6361	6392	6423	6454	6485	6516	6547	6578	6609	6640	6671	6702	6733	6764	6795	6826	6857	6888	6919	6950	6981	7012
3-Sep NA	3500	2187	9706	2035	6159	6366	6381	1500	8741	6210	1601	3621	3442	3263	3084	2905	2726	2547	2368	2189	2010	1831	1652	1473	1294	1115	936	757	578	399
4-Sep NA	3184	6141	3721	2344	822	6244	4761	3281	1801	611	1011	1611	2211	2811	3411	4011	4611	5211	5811	6411	7011	7611	8211	8811	9411	10011	10611	11211	11811	12411
5-Sep NA	3504	2575	9736	2366	6271	6022	7024	10247	8987	6254	1952	3752	3507	3262	3017	2772	2527	2282	2037	1792	1547	1302	1057	812	567	322	77	177	377	577
6-Sep NA	3634	2614	9743	2033	1031	6101	6204	6424	6644	6864	7084	7304	7524	7744	7964	8184	8404	8624	8844	9064	9284	9504	9724	9944	10164	10384	10604	10824	11044	11264
7-Sep NA	3872	2853	9746	1111	1053	6047	7052	10057	8817	6126	2435	4235	4012	3789	3566	3343	3120	2897	2674	2451	2228	2005	1782	1559	1336	1113	890	667	444	221
8-Sep NA	3742	2697	9727	2189	1989	6233	6336	6536	6736	6936	7136	7336	7536	7736	7936	8136	8336	8536	8736	8936	9136	9336	9536	9736	9936	10136	10336	10536	10736	10936
9-Sep NA	3792	2743	9729	2189	1989	6233	6336	6536	6736	6936	7136	7336	7536	7736	7936	8136	8336	8536	8736	8936	9136	9336	9536	9736	9936	10136	10336	10536	10736	10936
10-Sep NA	3847	2787	1717	2223	2111	6191	7096	25458	905	6481	2226	301	4212	4019	3826	3633	3440	3247	3054	2861	2668	2475	2282	2089	1896	1703	1510	1317	1124	931
11-Sep NA	3884	2827	9729	2189	1989	6233	6336	6536	6736	6936	7136	7336	7536	7736	7936	8136	8336	8536	8736	8936	9136	9336	9536	9736	9936	10136	10336	10536	10736	10936
12-Sep NA	3927	2870	9730	2190	1990	6234	6337	6537	6737	6937	7137	7337	7537	7737	7937	8137	8337	8537	8737	8937	9137	9337	9537	9737	9937	10137	10337	10537	10737	10937
13-Sep NA	3970	2913	9731	2191	1991	6235	6338	6538	6738	6938	7138	7338	7538	7738	7938	8138	8338	8538	8738	8938	9138	9338	9538	9738	9938	10138	10338	10538	10738	10938
14-Sep NA	4013	2956	9732	2192	1992	6236	6339	6539	6739	6939	7139	7339	7539	7739	7939	8139	8339	8539	8739	8939	9139	9339	9539	9739	9939	10139	10339	10539	10739	10939
15-Sep NA	4056	2999	9733	2193	1993	6237	6340	6540	6740	6940	7140	7340	7540	7740	7940	8140	8340	8540	8740	8940	9140	9340	9540	9740	9940	10140	10340	10540	10740	10940
16-Sep NA	4100	3042	9734	2194	1994	6238	6341	6541	6741	6941	7141	7341	7541	7741	7941	8141	8341	8541	8741	8941	9141	9341	9541	9741	9941	10141	10341	10541	10741	10941
17-Sep NA	4144	3085	9735	2195	1995	6239	6342	6542	6742	6942	7142	7342	7542	7742	7942	8142	8342	8542	8742	8942	9142	9342	9542	9742	9942	10142	10342	10542	10742	10942
18-Sep NA	4188	3128	9736	2196	1996	6240	6343	6543	6743	6943	7143	7343	7543	7743	7943	8143	8343	8543	8743	8943	9143	9343	9543	9743	9943	10143	10343	10543	10743	10943
19-Sep NA	4232	3171	9737	2197	1997	6241	6344	6544	6744	6944	7144	7344	7544	7744	7944	8144	8344	8544	8744	8944	9144	9344	9544	9744	9944	10144	10344	10544	10744	10944
20-Sep NA	4276	3214	9738	2198	1998	6242	6345	6545	6745	6945	7145	7345	7545	7745	7945	8145	8345	8545	8745	8945	9145	9345	9545	9745	9945	10145	10345	10545	10745	10945
21-Sep NA	4320	3257	9739	2199	1999	6243	6346	6546	6746	6946	7146	7346	7546	7746	7946	8146	8346	8546	8746	8946	9146	9346	9546	9746	9946	10146	10346	10546	10746	10946
22-Sep NA	4364	3300	9740	2200	2000	6244	6347	6547	6747	6947	7147	7347	7547	7747	7947	8147	8347	8547	8747	8947	9147	9347	9547	9747	9947	10147	10347	10547	10747	10947
23-Sep NA	4408	3343	9741	2201	2001	6245	6348	6548	6748	6948	7148	7348	7548	7748	7948	8148	8348	8548	8748	8948	9148	9348	9548	9748	9948	10148	10348	10548	10748	10948
24-Sep NA	4452	3386	9742	2202	2002	6246	6349	6549	6749	6949	7149	7349	7549	7749	7949	8149	8349	8549	8749	8949	9149	9349	9549	9749	9949	10149	10349	10549	10749	10949
25-Sep NA	4496	3429	9743	2203	2003	6247	6350	6550	6750	6950	7150	7350	7550	7750	7950	8150	8350	8550	8750	8950	9150	9350	9550	9750	9950	10150	10350	10550	10750	10950
26-Sep NA	4540	3472	9744	2204	2004	6248	6351	6551	6751	6951	7151	7351	7551	7751	7951	8151	8351	8551	8751	8951	9151	9351	9551	9751	9951	10151	10351	10551	10751	10951
27-Sep NA	4584	3515	9745	2205	2005	6249	6352	6552	6752	6952	7152	7352	7552	7752	7952	8152	8352	8552	8752	8952	9152	9352	9552	9752	9952	10152	10352	10552	10752	10952
28-Sep NA	4628	3558	9746	2206	2006	6250	6353	6553	6753	6953	7153	7353	7553	7753	7953	8153	8353	8553	8753	8953	9153	9353	9553	9753	9953	10153	10353	10553	10753	10953
29-Sep NA	4672	3601	9747	2207	2007	6251	6354	6554	6754	6954	7154	7354	7554	7754	7954	8154	8354	8554	8754	8954	9154	9354	9554	9754	9954	10154	10354	10554	10754	10954
30-Sep NA	4716	3644	9748	2208	2008	6252	6355	6555	6755	6955	7155	7355	7555	7755	7955	8155	8355	8555	8755	8955	9155	9355	9555	9755	9955	10155	10355	10555	10755	10955

Oct 1

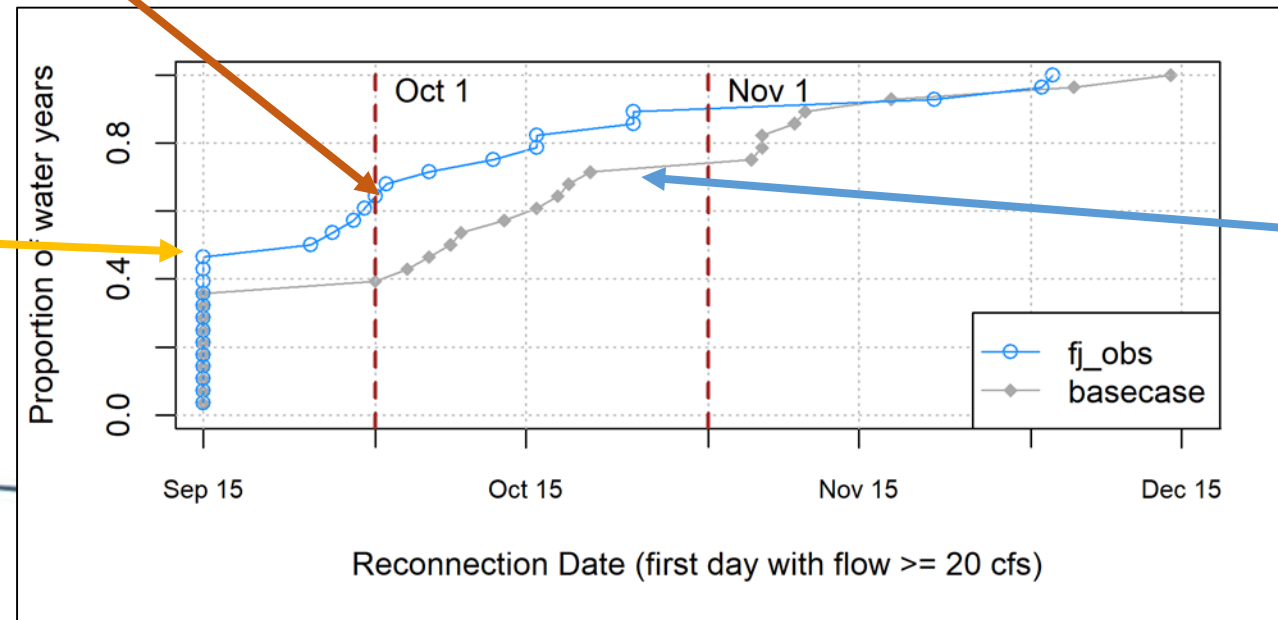
1-Oct NA	4760	3687	9749	2209	2009	6253	6357	6557	6757	6957	7157	7357	7557	7757	7957	8157	8357	8557	8757	8957	9157	9357	9557	9757	9957	10157	10357	10557	10757	10957
2-Oct NA	4804	3730	9750	2210	2010	6254	6358	6558	6758	6958	7158	7358	7558	7758	7958	8158	8358	8558	8758	8958	9158	9358	9558	9758	9958	10158	10358	10558	10758	10958
3-Oct NA	4848	3773	9751	2211	2011	6255	6359	6559	6759	6959	7159	7359	7559	7759	7959	8159	8359	8559	8759	8959	9159	9359	9559	9759	9959	10159	10359	10559	10759	10959
4-Oct NA	4892	3816	9752	2212	2012	6256	6360	6560	6760	6960	7160	7360	7560	7760	7960	8160	8360	8560	8760	8960	9160	9360	9560	9760	9960	10160	10360	10560	10760	10960
5-Oct NA	4936	3859	9753	2213	2013	6257	6361	6561	6761	6961	7161	7361	7561	7761	7961	8161	8361	8561	8761	8961	9161	9361	9561	9761	9961	10161	10361	10561	10761	10961
6-Oct NA	4980	3902	9754	2214	2014	6258	6362	6562	6762	6962	7162	7362	7562	7762	7962	8162	8362	8562	8762	8962	9162	9362	9562	9762	9962	10162	10362	10562	10762	10962
7-Oct NA	5024	3945	9755	2215	2015	6259	6363	6563	6763	6963	7163	7363	7563	7763	7963	8163	8363	8563	8763	8963	9163	9363	9563	9763	9963	10163	10363	10563	10763	10963
8-Oct NA																														

“Reconnection date distribution” graphs (how to interpret)

In the last 28 years (1991-2018), the FJ flow gauge measured flow > 20 cfs **on or before Oct. 1** in ~**62%** of years.

Notes on model performance:

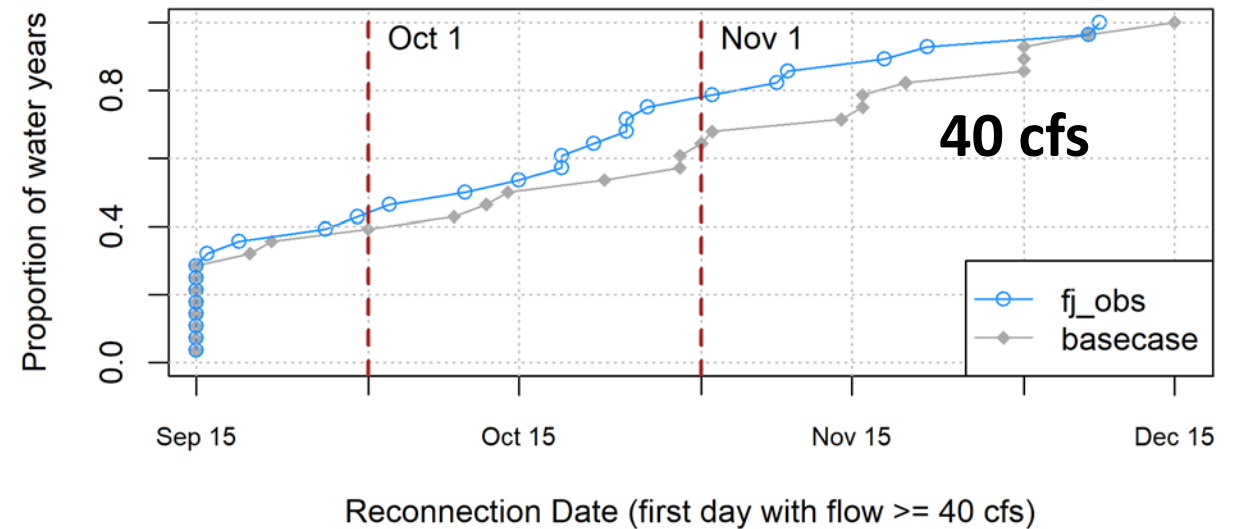
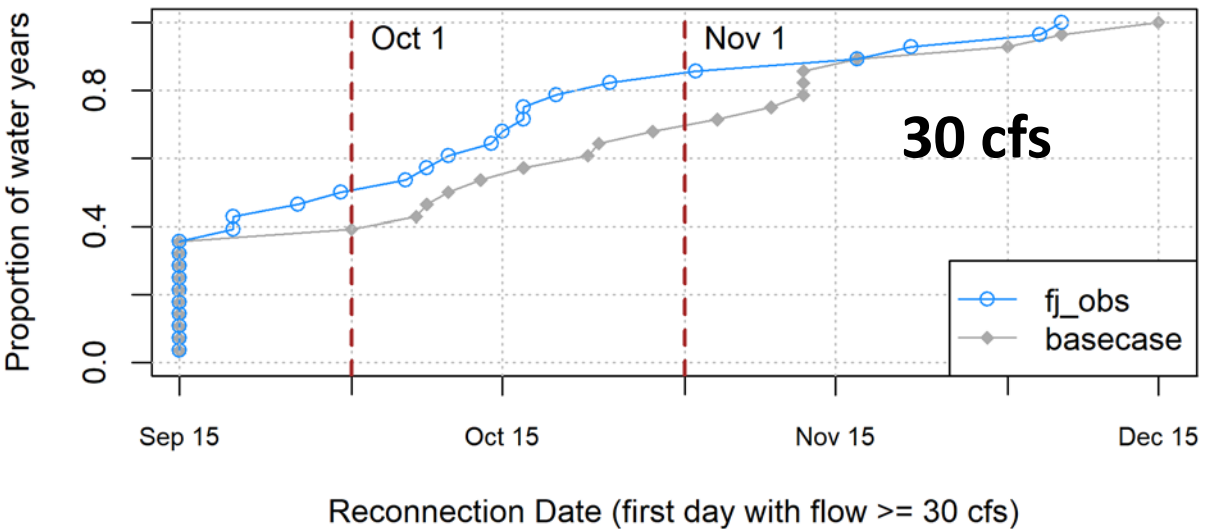
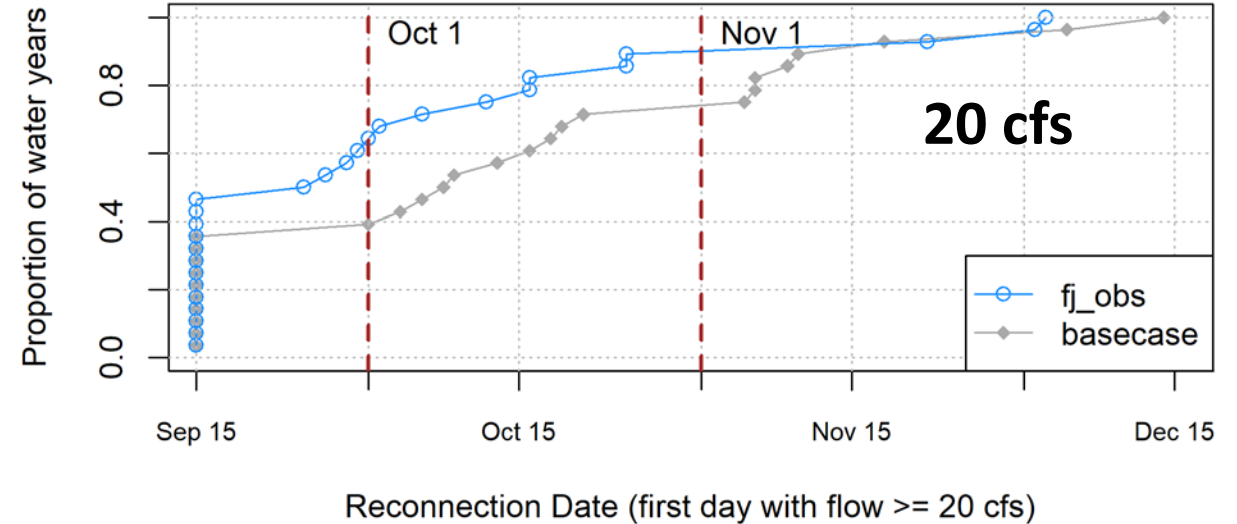
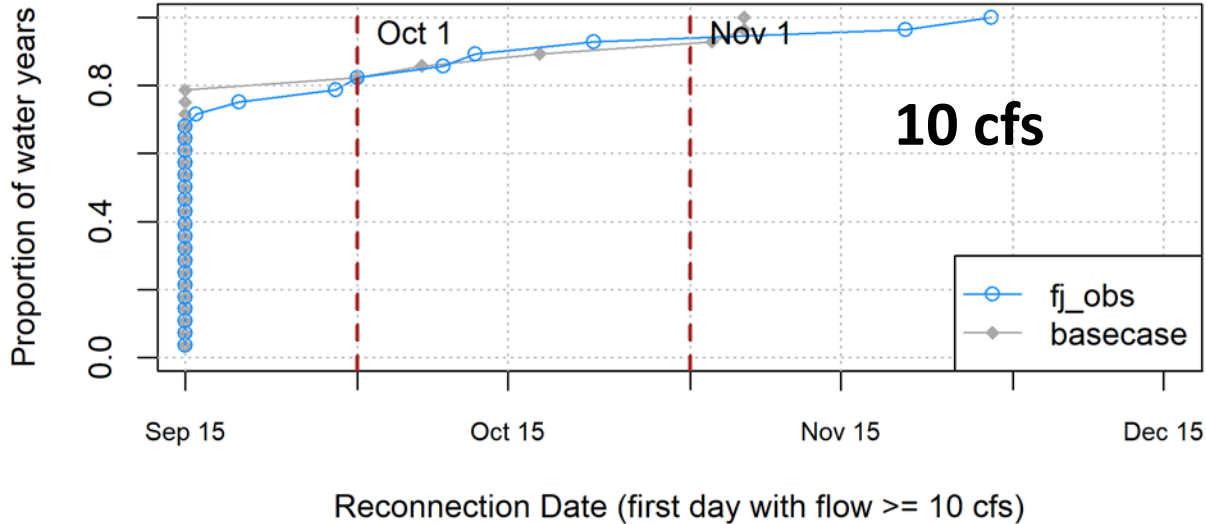
The basecase simulates ~38% of years reconnecting before Sept 15; in the observed record it's more like 50%.



Notes on model performance:
The discrepancies between the observed and simulated basecase distributions are another reason to think of scenario results as “relative change” rather than a prediction of future conditions.

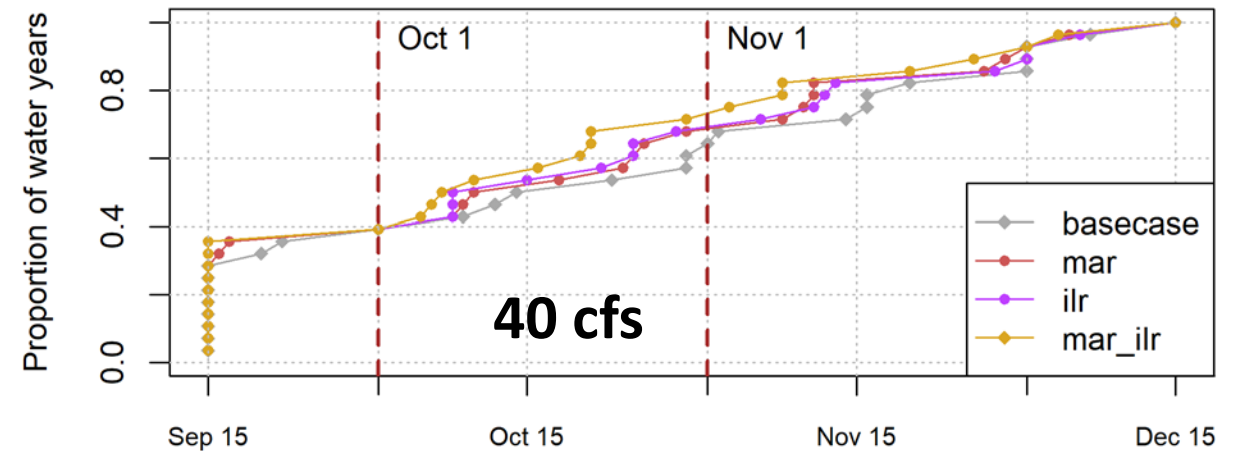
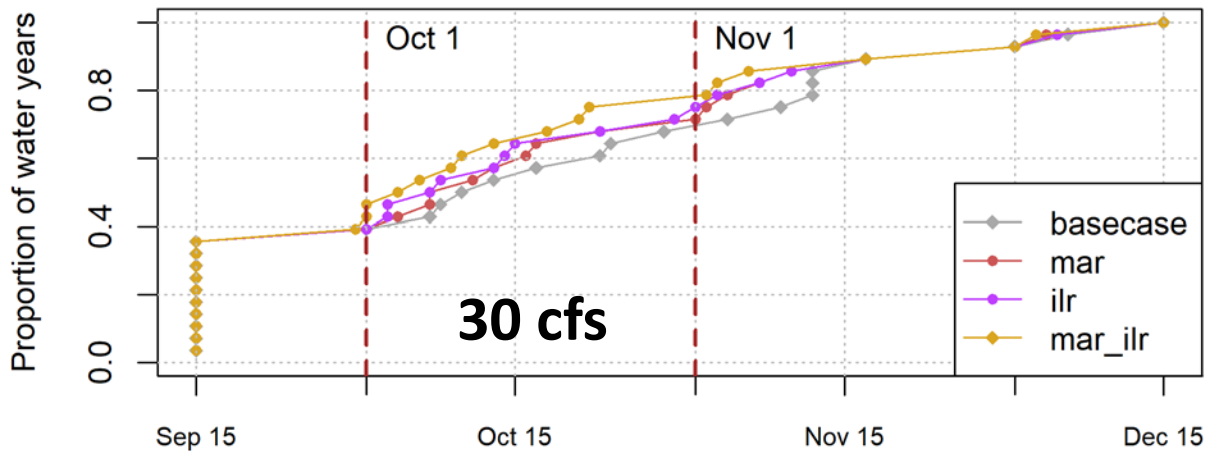
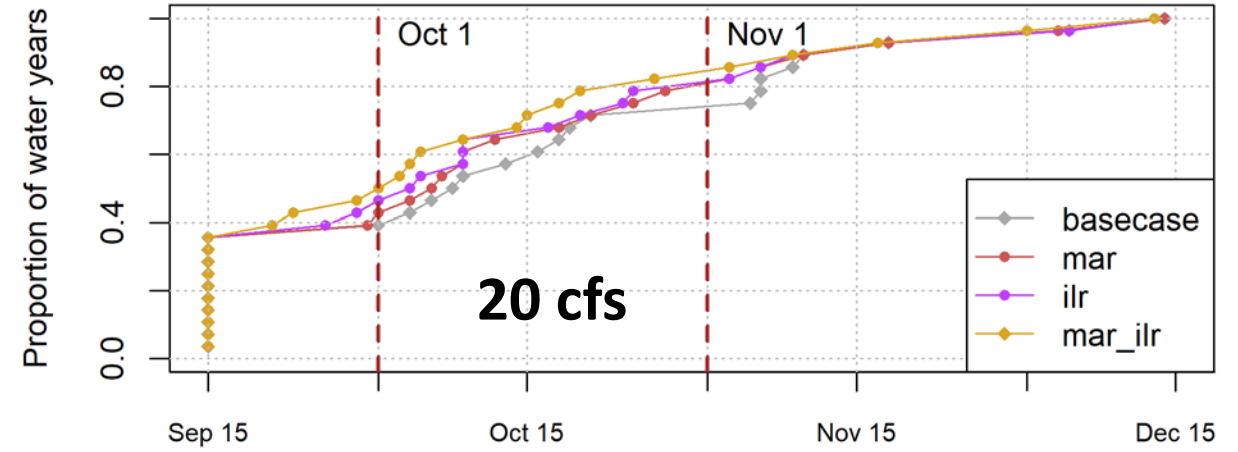
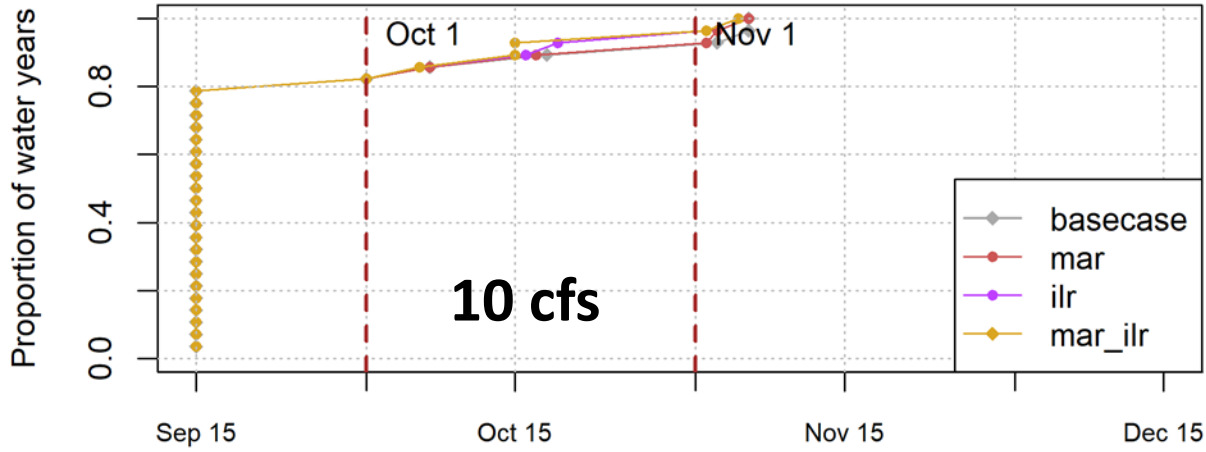
Distribution of Reconnection Dates in 28 water years

In “average” water years, SVIHM tends to predict *later* reconnection date at 20, 30 cfs than observed



Distribution of Reconnection Dates in 28 water years

Recharge Scenarios

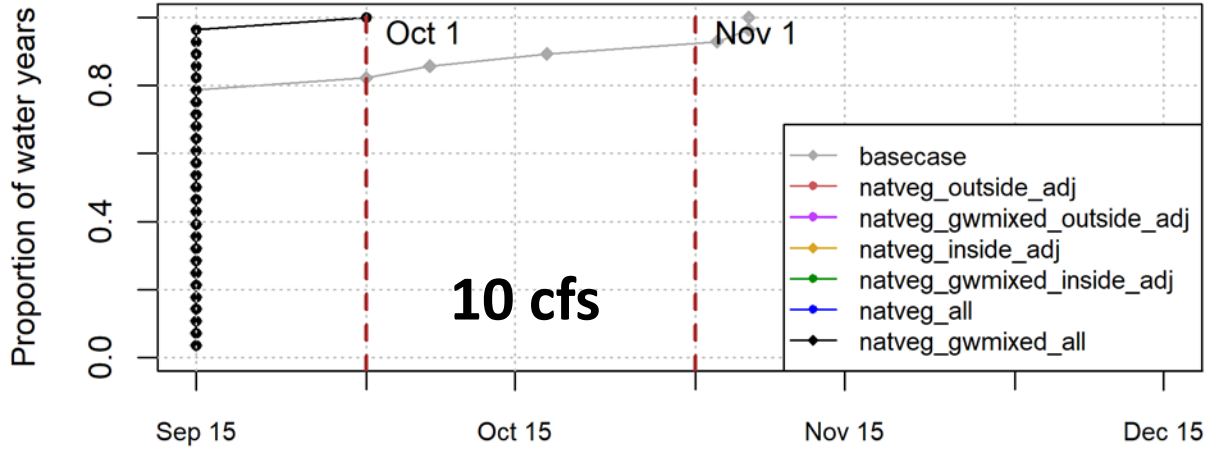


Reconnection Date (first day with flow ≥ 30 cfs)

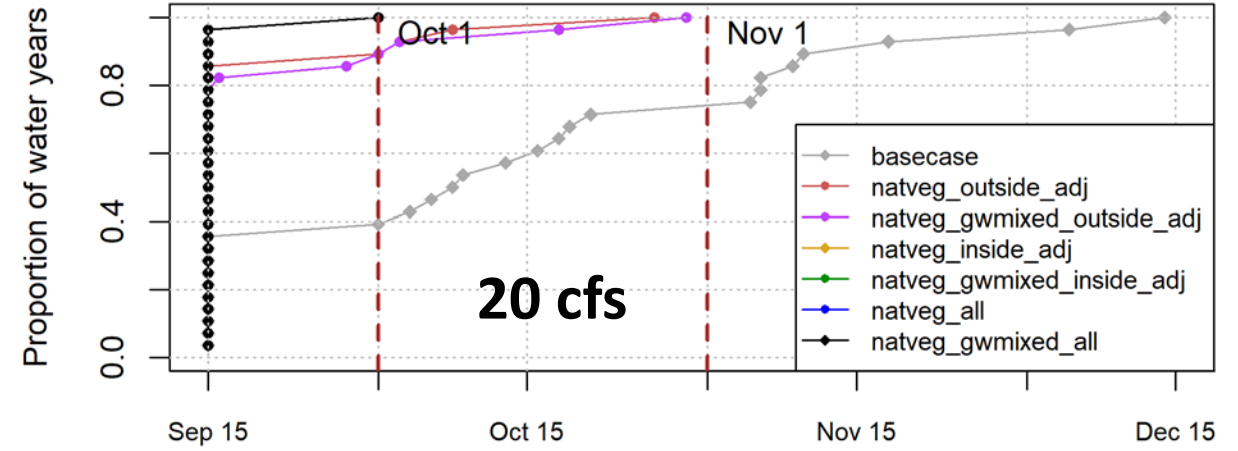
Reconnection Date (first day with flow ≥ 40 cfs)

Distribution of Reconnection Dates in 28 water years

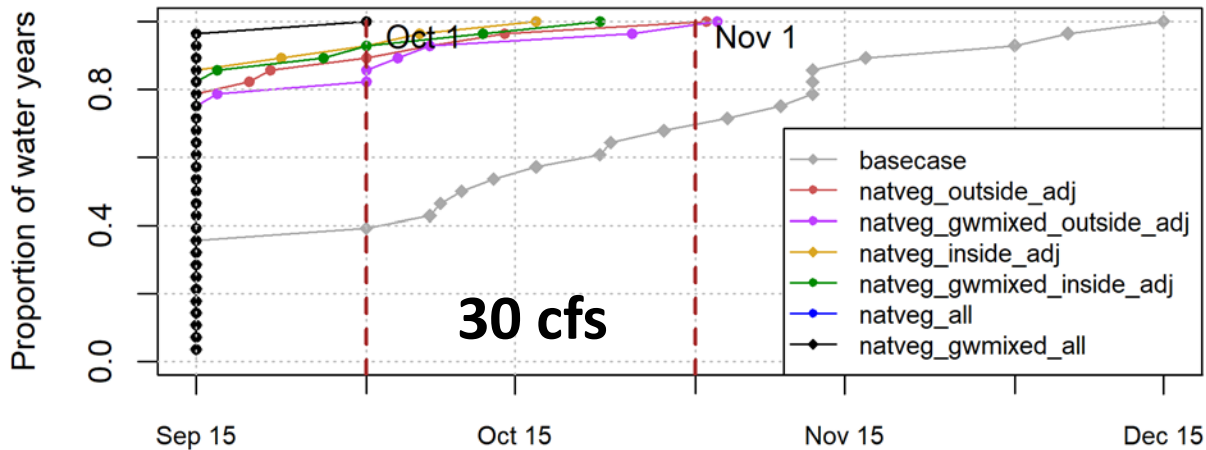
Landuse Change scenarios



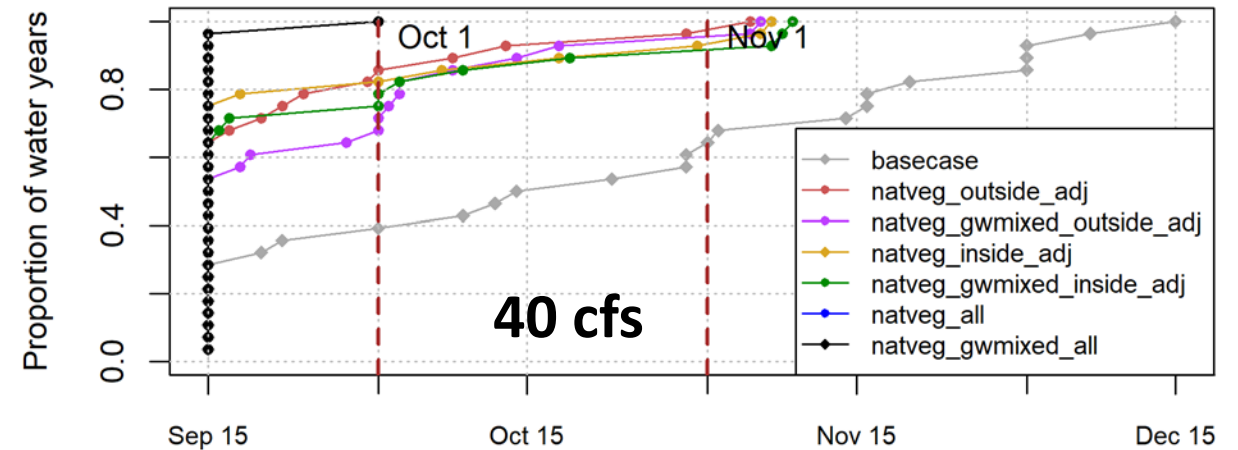
Reconnection Date (first day with flow \geq 10 cfs)



Reconnection Date (first day with flow \geq 20 cfs)



Reconnection Date (first day with flow \geq 30 cfs)



Reconnection Date (first day with flow \geq 40 cfs)