

Supporting Materials

Rocky Mountain Population of Trumpeter Swans *Cygnus buccinator*
(U.S. Breeding Segment): results of the autumn 2022 survey and
long-term trends

Table S1. Counts of Trumpeter Swans from the Rocky Mountain Population U.S. Breeding Segment during autumn, 1967–2022.

Year	Greater Yellowstone Flocks			Restoration Flocks			RMP U.S. Breeding Segment		
	White birds	Cygnets	Total	White birds	Cygnets	Total	White birds	Cygnets	Total
1967	520	45	565	60	13	73	580	58	638
1968	431	154	585	58	20	78	489	174	663
1969	^a			69	23	92			
1970				45	16	61			
1971	431	68	499	46	27	73	477	95	572
1972				42	16	58			
1973				42	7	49			
1974	457	80	537	35	9	44	492	89	581
1975				41	9	50			
1976				31	9	40			
1977	403	86	489	51	4	55	454	90	544

Table S1 (continued).

Year	Greater Yellowstone Flocks			Restoration Flocks			RMP U.S. Breeding Segment		
	White birds	Cygnets	Total	White birds	Cygnets	Total	White birds	Cygnets	Total
1978				39	15	54			
1979				41	42	83			
1980	462	23	485	71	26	97	533	49	582
1981				77	14	91			
1982				56	20	76			
1983	398	54	452	73	22	95	471	76	547
1984	431	58	489	65	9	74	496	67	563
1985	368	139	507	63	5	68	431	144	575
1986	331	61	392	34	26	60	365	87	452
1987	365	175	540	52	19	71	417	194	611
1988	464	137	601	49	9	58	513	146	659
1989	505	60	565	30	3	33	535	63	598
1990	432	147	579	36	11	47	468	158	626
1991	414	91	505	32	18	50	446	109	555
1992	390	92	482	75	6	81	465	98	563
1993	248	29	277	55	22	77	303	51	354
1994	239	130	369	63	22	85	302	152	454
1995	307	55	362	58	7	65	365	62	427

Table S1 (continued).

Year	Greater Yellowstone Flocks			Restoration Flocks			RMP U.S. Breeding Segment		
	White birds	Cygnets	Total	White birds	Cygnets	Total	White birds	Cygnets	Total
1996	316	63	379	64	15	79	380	78	458
1997	310	54	364	48	15	63	358	69	427
1998	304	90	394	60	15	75	364	105	469
1999	312	56	368	35	14	49	347	70	417
2000	324	102	426	48	7	55	372	109	481
2001	362	59	421	54	12	66	416	71	487
2002	273	53	326	38 ^b	7 ^b	45 ^b	311 ^b	60 ^b	371 ^b
2003	291	95	386	30 ^b	1 ^b	31 ^b	321 ^b	96 ^b	417 ^b
2004	291	94	385	27 ^b	5 ^b	32 ^b	318 ^b	99 ^b	417 ^b
2005	355	98	453	49	8	57	404	106	510
2006	377	82	459	39 ^c	9 ^c	48 ^c	416 ^c	91 ^c	507 ^c
2007	383	115	498	28	1	29	411	116	527
2008	379	48	427	29	3	32	408	51	459
2009	361	75	436	35	2	37	396	77	473
2010	375	107	482	2 ^{c,d}	0	2 ^{c,d}	377	107	484
2011	354	89	443	37	0	37	391	89	480
2012	381	178	559	24	10	34	405	188	593
2013	455	110	565	44 ^c	1 ^c	45 ^c	499	111	610

Table S1 (continued).

Year	Greater Yellowstone Flocks			Restoration Flocks			RMP U.S. Breeding Segment		
	White birds	Cygnets	Total	White birds	Cygnets	Total	White birds	Cygnets	Total
2014	452	137	589	20 ^d	2 ^d	22 ^d	472	139	611
2015 ^f	548	175	723	170	75	245	718	250	968
2016	578	143	721	153	70	223	731	213	944
2017	595	115	710	186	69	255	781	184	965
2018	600	147	747	226 ^d	70 ^d	296 ^d	826	217	1,043
2019	542	76	618	218	70	288	760	146	906
2020	579	88	667	238	65	303	817	153	970
2021	437	91	528	306	89	395	743	180	923
2022 ^g	473	83	556	253	131	384	726	214	940

^aBlank denotes value not calculated because of incomplete survey.

^bData for only Malheur NWR and the Nevada Flock included; Summer Lake WMA survey not completed.

^cCount biased low; only a portion of Summer Lake WMA surveyed.

^dRuby Lake NWR did not provide data.

^eMalheur NWR did not conduct survey.

^fFlathead Flock Restoration Program in northwest Montana was added to the annual surveys, Restoration Flock, due to the success of the programme, which is now considered self-sustaining.

^gBlackfoot Swan Restoration Program in northwest Montana was added to the annual surveys, Restoration Flock, due to the success of the programme, which is now considered self-sustaining.

Table S2. Counts of Trumpeter Swans from the Rocky Mountain Population U.S. Breeding Segment during autumn 1967–2022.

Year	Montana			Idaho			Wyoming			Flathead Indian Reservation			Malheur NWR			Summer Lake WMA			Nevada		
	White birds	Cygnets	Total	White birds	Cygnets	Total	White birds	Cygnets	Total	White birds	Cygnets	Total	White birds	Cygnets	Total	White birds	Cygnets	Total	White birds	Cygnets	Total
1967	334	25	359	87	8	95	99	12	111				33	12	45	a			27	1	28
1968	242	123	365	88	6	94	101	25	126				34	11	45				24	9	33
1969	b												36	14	50				33	9	42
1970													37	13	50				8	3	11
1971	297	49	346	60	6	66	74	13	87				38	22	60				8	5	13
1972													32	13	45				10	3	13
1973													36	4	40				6	3	9
1974	296	49	345	71	17	88	90	14	104				29	9	38				6	0	6
1975													33	7	40				8	2	10
1976													23	8	31				8	1	9
1977	267	64	331	60	7	67	76	15	91				33	0	33				18	4	22
1978													24	13	37				15	2	17
1979	324	63	387										31	33	64				10	9	19
1980	315	6	321	73	11	84	74	6	80				53	15	68				18	11	29
1981													53	9	62				24	5	29
1982													38	17	55				18	3	21
1983	228	32	260	92	6	98	78	16	94				55	17	72				18	5	23
1984	268	22	290	80	21	101	83	15	98				40	6	46				25	3	28
1985	212	87	299	83	27	110	73	25	98				38	2	40				25	3	28
1986	174	28	202	83	14	97	74	19	93				19	24	43				15	2	17
1987	210	133	343	63	15	78	92	27	119				38	14	52				14	5	19
1988	268	77	345	87	28	115	109	32	141				33	8	41				16	1	17
1989	294	23	317	101	16	117	110	21	131				20	3	23				10	0	10
1990	245	108	353	92	28	120	95	11	106				27	7	34				9	4	13
1991	176	60	236	138	26	164	100	5	105				22	14	36		0		2	8	4
1992	156	74	230	109	8	117	125	10	135				28	6	34		34		0	13	0
1993	60	16	76	94	6	100	94	7	101				22	12	34		5		30	8	5
1994	70	48	118	79	49	128	90	33	123				15	7	22		33		6	39	15
1995	84	17	101	118	21	139	105	17	122				11	3	14		34		3	37	1
1996	95	36	131	127	20	147	94	7	101				17	5	22		32		5	37	5

Table S2 (continued).

Year	Montana			Idaho		Wyoming		Flathead Indian Reservation		Malheur NWR		Summer Lake WMA		Nevada	
	White birds	Cygnets	Total	White birds	Cygnets	Total	White birds	Cygnets	Total	White birds	Cygnets	Total	White birds	Cygnets	Total
1997	88	18	106	112	19	131	110	17	127	16	7	23	15	2	17
1998	105	35	140	110	37	147	89	18	107	22	5	27	17	3	20
1999	120	21	141	103	23	126	89	12	101	11	3	14	8	6	14
2000	127	24	151	102	40	142	95	38	133	10	5	15	12	0	12
2001	140	9	149	124	23	147	98	27	125	11	12	23	12	0	12
2002	76	18	94	103	14	117	94	21	115	34	14	7	21	0 ^c	2 ^c
2003	89	29	118	100	27	127	102	39	141	34	11	1	2 ^c	0 ^c	2 ^c
2004	89	32	121	112	23	135	90	39	129	0	7	10	5	15	17
2005	112	40	152	136	22	158	107	36	143	26	5	31	20	5	25
2006	117	17	134	132	39	171	128	26	154	20	8	28	17	5	22
2007	157	41	198	113	15	128	113	59	172	32	17	49	11	0	11
2008	140	7	147	112	5	117	127	36	163	38	19	57	9	3	12
2009	138	21	159	122	21	143	101	33	134	74	13	87	4 ^c	2 ^c	6 ^c
2010	129	30	159	101	29	130	145	48	193	59	20	79	2 ^c	0 ^c	11 ^a
2011	123	40	163	98	12	110	133	37	170	94	37	131	5	0	5
2012	129	96	225	97	30	127	155	52	207	124	20	144	7	17	10
2013	208	26	234	80	28	108	167	52	219	164	34	198	24	1	25
2014	198	57	255	74	23	97	180	57	237	123	42	165	2	1	3
2015	212	60	272	104	47	151	232	68	300	144	72	216	4	1	5
2016	215	48	263	127	28	155	236	67	303	138	60	198	13	10	23
2017	260	29	289	114	28	142	221	58	279	158	67	225	2	0	2
2018	257	72	329	140	26	166	203	49	252	194	64	258	4	0	4
2019	280	33	313	100	14	114	162	29	191	177	66	243	5	0	5
2020	298	27	325	131	17	148	150	44	194	202	54	256	2	0	2
2021	216	27	243	89	11	100	132	53	185	273	89	362	2	0	2
2022	196	7	203	109	32	141	168	44	212	175	102	277	2	0	2

^aSwans translocated to Summer Lake WMA beginning in winter 1991; count from 1991 and 2010 not used in analyses.

^bBlank denotes survey was not conducted.

^cIncomplete count; data not used in analyses.

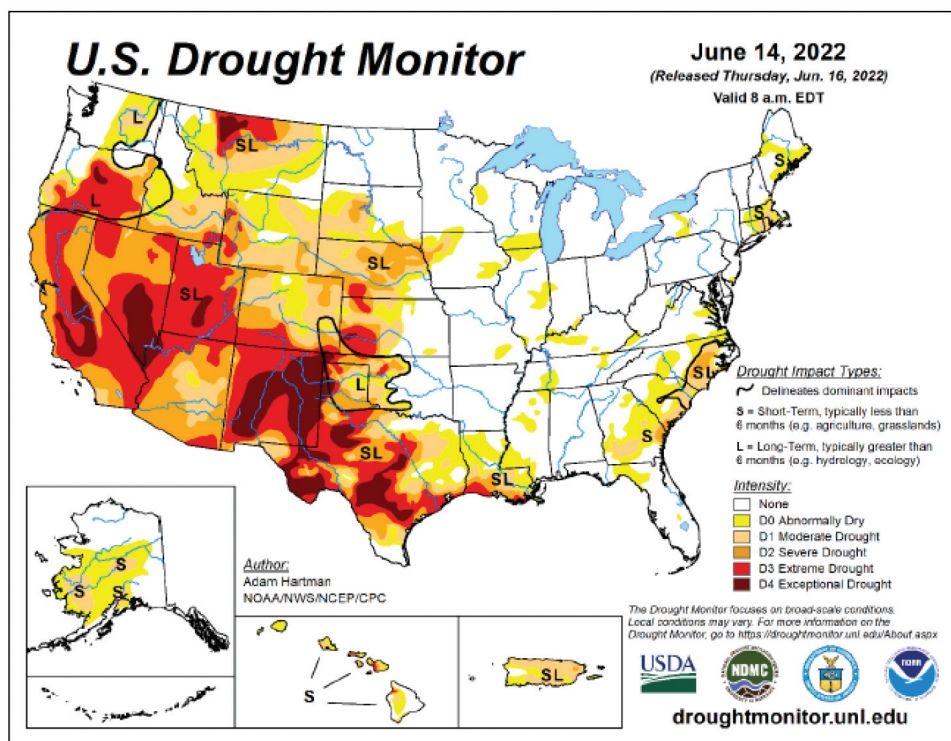


Figure S1. Palmer Drought Index map for June 14, 2022 (Joint Agricultural Weather Facility 2022b).

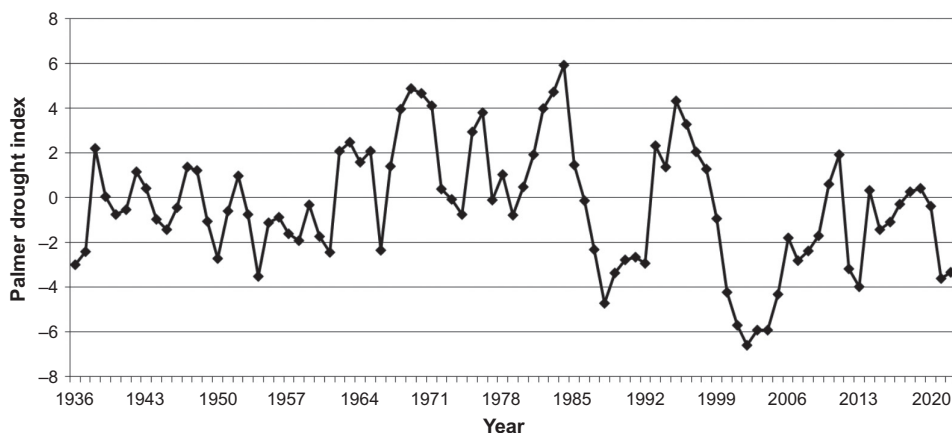


Figure S2. Annual Palmer Drought Indices for climate division 2 in southwest Montana (data from the National Climatic Data Center, at <http://www1.ncdc.noaa.gov/pub/data/cirs/climdiv/climdiv-pdsidv-v1.0.0-20211204>).

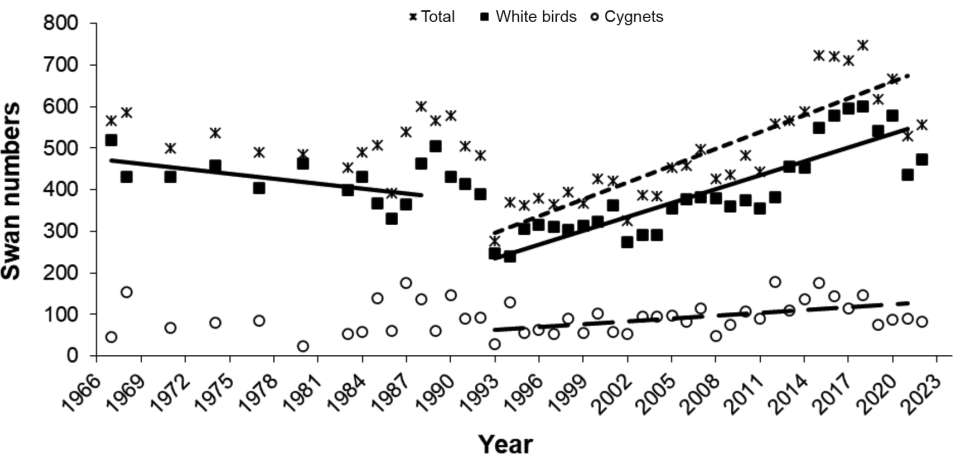


Figure S3. Counts of swans in the Greater Yellowstone Flocks during the autumn Trumpeter Swan surveys, 1967–2021 (dotted, solid and dashed lines depict trends for total swans, white birds, and cygnets, respectively). Historical trends 1967–1988: total birds $F_{1,10} = 1.39$, $P = 0.27$; white birds $F_{1,10} = 5.14$, $P = 0.05$; cygnets $F_{1,10} = 0.34$, $P = 0.57$.

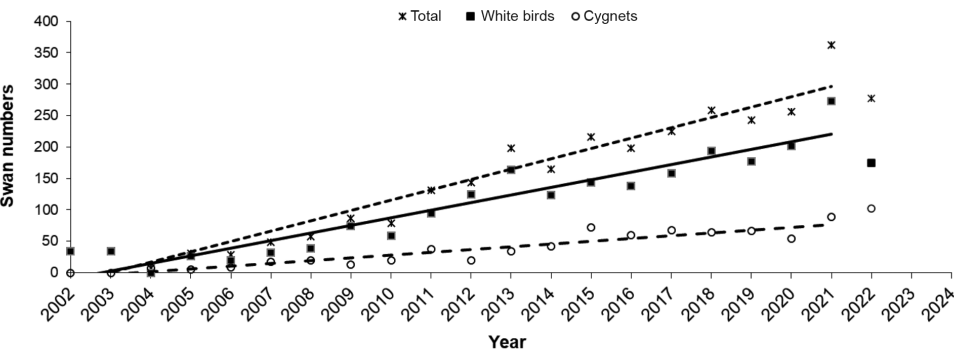


Figure S4. Numbers of swans counted at Flathead Indian Reservation during the Trumpeter Swan Surveys in autumns 2002–2022.

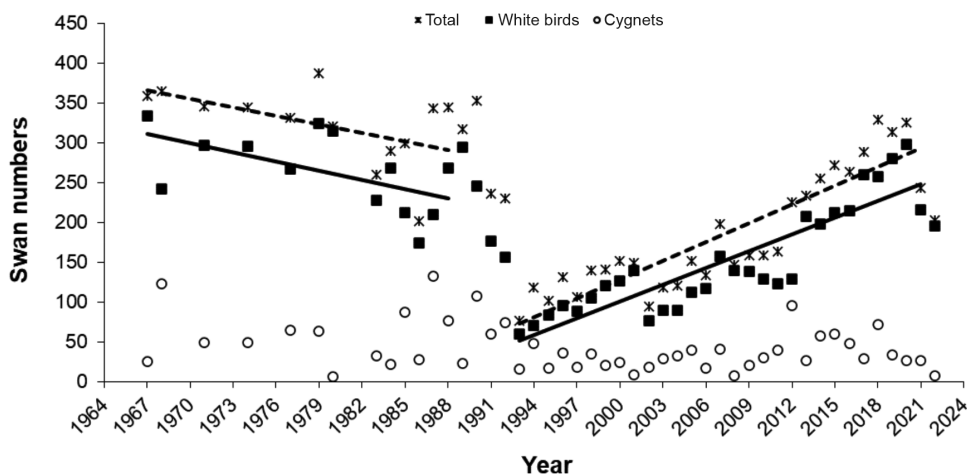


Figure S5. Numbers of swans counted in Montana during the Trumpeter Swan Surveys in autumns 1967–2022. Dotted and solid lines depict trends for total swans and white birds, respectively. Historical trends 1967–1988: total birds $F_{1,11} = 4.01$, $P = 0.07$; white birds $F_{1,11} = 5.69$, $P = 0.04$; cygnets $F_{1,11} = 0.004$, $P = 0.95$.

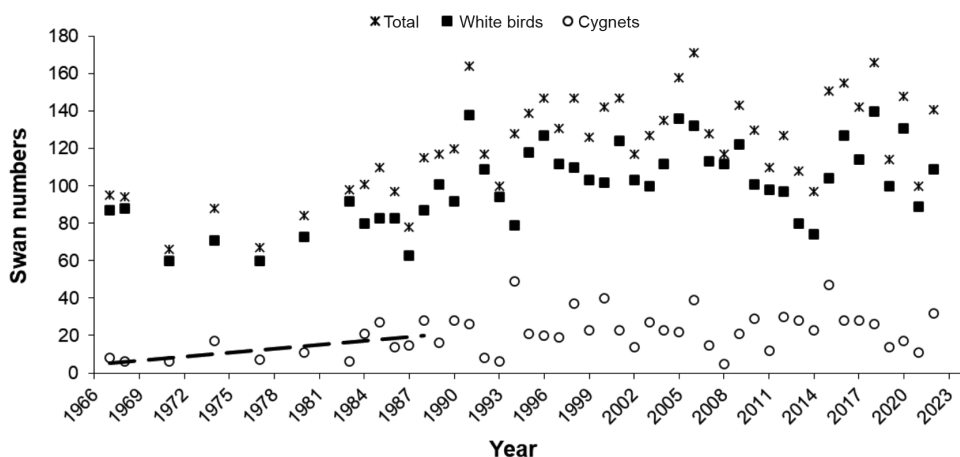


Figure S6. Numbers of swans counted in Idaho during the Trumpeter Swan Surveys in autumns 1967–2022. Solid and dashed lines depict trend for white birds and cygnets, respectively. Historical trend 1967–1988: total birds $F_{1,10} = 1.79$, $P = 0.21$; white birds $F_{1,10} = 0.10$, $P = 0.76$; cygnets $F_{1,10} = 8.13$, $P = 0.02$.

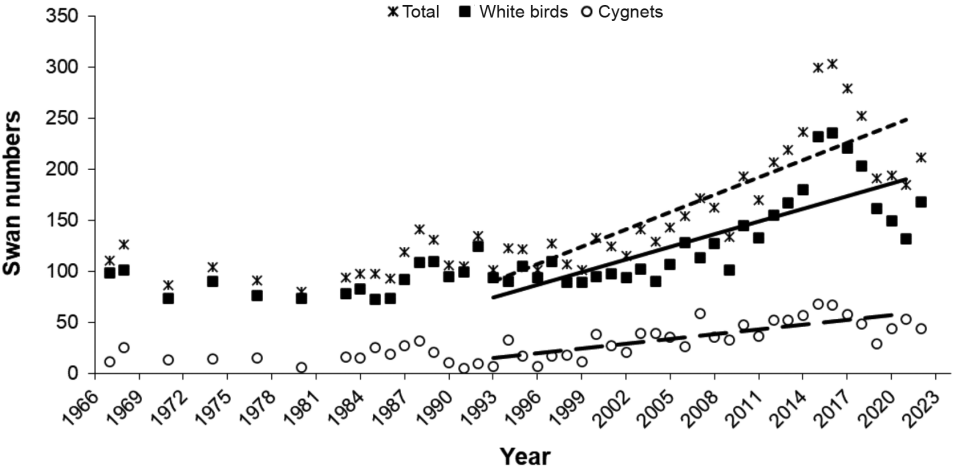


Figure S7. Numbers of swans counted in Wyoming during the Trumpeter Swan Surveys in autumns 1967–2022 (dotted, solid, and dashed lines depict trends for total swans, white birds, and cygnets, respectively). Historical trend 1967–1988: total birds $F_{1,10} = 0.02$, $P = 0.90$; white birds $F_{1,10} = 0.38$, $P = 0.55$; cygnets $F_{1,10} = 1.57$, $P = 0.24$.

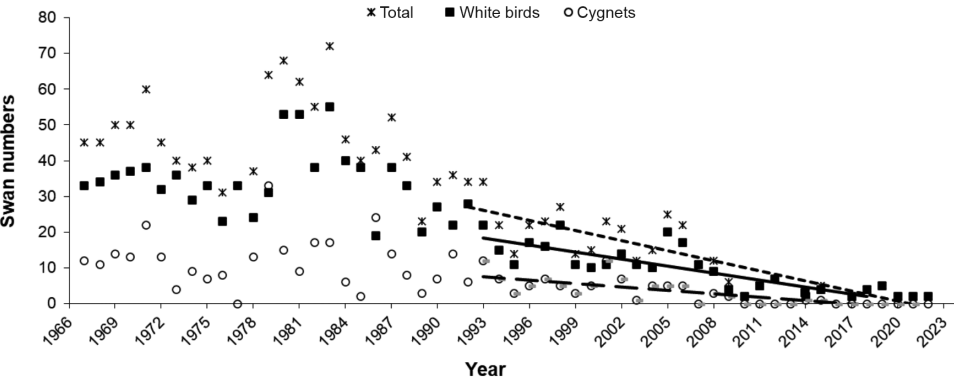


Figure S8. Numbers of swans counted at Malheur NWR during Fall Trumpeter Swan Surveys in autumns 1967–2022. Dotted and solid lines depict trends for total swans and white birds, respectively. No surveys in 2013 and 2016. Historical trend 1967–1983: total birds $F_{1,15} = 2.01$, $P = 0.18$; white birds $F_{1,15} = 2.09$, $P = 0.17$; cygnets $F_{1,15} = 0.03$, $P = 0.87$. Historical trend 1984–1991: total birds $F_{1,6} = 2.60$, $P = 0.16$; white birds $F_{1,6} = 2.71$, $P = 0.15$; cygnets $F_{1,6} = 0.23$, $P = 0.65$.

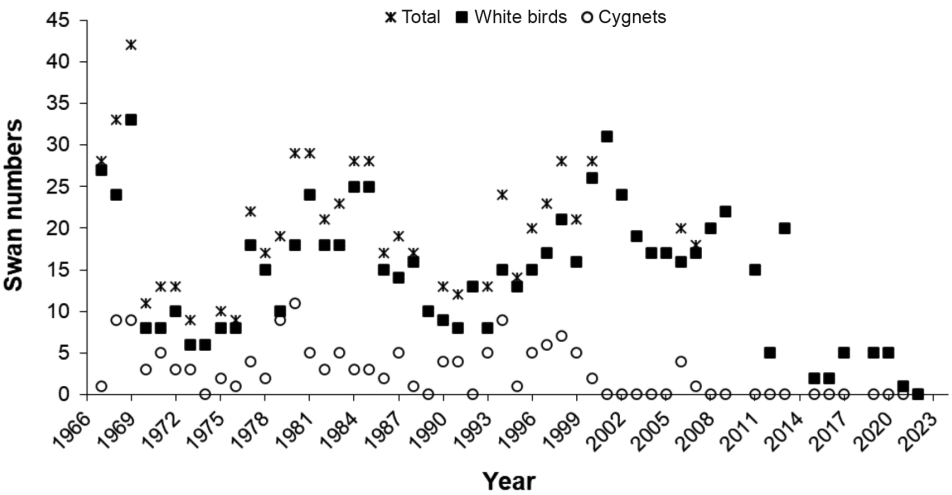


Figure S9. Numbers of swans counted in the Nevada Flock during the Trumpeter Swan Surveys in autumns 1967–2022. (No data for 2014 and 2018.) Ground counts were performed for 2015 through 2017 which might underrepresent the number of swans in Nevada. Historical trend 1967–1988: total birds $F_{1,20} = 0.44$, $P = 0.52$; white birds $F_{1,20} = 0.81$, $P = 0.38$; cygnets $F_{1,20} = 0.07$, $P = 0.79$.

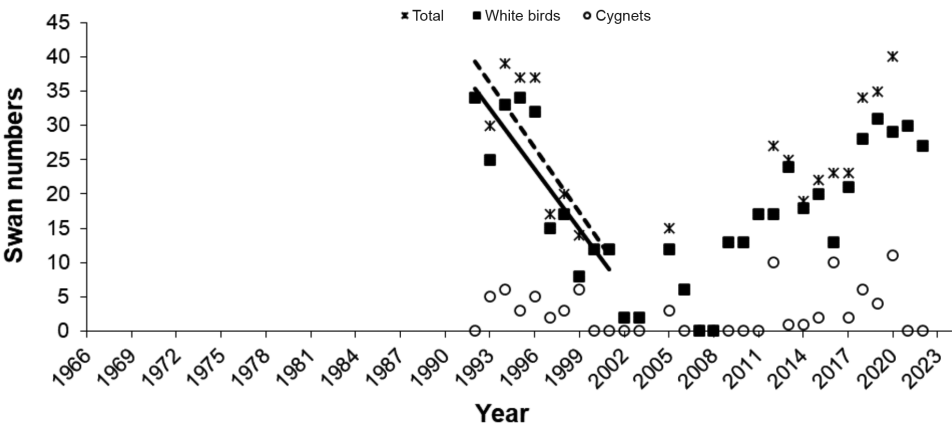


Figure S10. Numbers of swans counted at Summer Lake WMA during the Trumpeter Swan Surveys in autumns 1992–2022. Dotted and solid lines depict trends for total swans and white birds, respectively.