

Appendix F— Waterfowl Survey Data from San Francisco Bay

Survey Limitations

Waterfowl population goals for San Francisco Bay are based on the best available data. Currently, the best data are the midwinter aerial surveys performed by USFWS personnel from the San Francisco Bay National Wildlife Refuge. Two caveats must be considered in any discussion of San Francisco Bay waterfowl populations. First, counting waterfowl is an inexact science, and the midwinter counts are at best an index of local abundance. Even though the USFWS collects the data using a repeatable protocol of standard transects, these estimates can be affected by factors that have nothing to do with population changes. Examples include weather conditions, changes in migratory behavior, and observer error. Another concern is changes in the survey technique and area surveyed over the 45 years of its existence. Data from different decades reflect slightly different methodologies, and thus are not totally comparable. For example, the findings of Accurso (1992) led to a major revamping of survey techniques in about 1998 (John Takekawa, USGS-BRD, personal communication). These changes resulted in more thorough cov-

erage of the Bay, and a higher percentage of birds counted. More recently, some transects have been removed from the survey due to increased air traffic at San Francisco International Airport. Second, the midwinter index is not the best estimate of peak waterfowl abundance. Accurso (1992) surveyed from October through April, and reported peaks for certain species as early as October 3–4, and as late as March 20–21. Thus the midwinter count consistently underestimates the peak abundance for all species. For this reason, Accurso's data is used to derive correction factors that translate midwinter indices to annual peaks (**Table F-3**). Third, waterfowl populations in San Francisco Bay do not simply reflect local habitat conditions. Rather they are a product of numerous factors throughout the life history and geographic range of these birds. For example, conditions in the major breeding habitats of the Central Plains will in large part determine how many waterfowl are produced in a given year. One exception is the locally breeding mallard population, which will be a valuable indicator of local habitat conditions. Restoration of wintering habitat in San Francisco Bay is very important, but by itself will not ensure healthy waterfowl populations.

Figure F-1:
Midwinter Indices for Scaup in the Pacific Flyway 1955-99

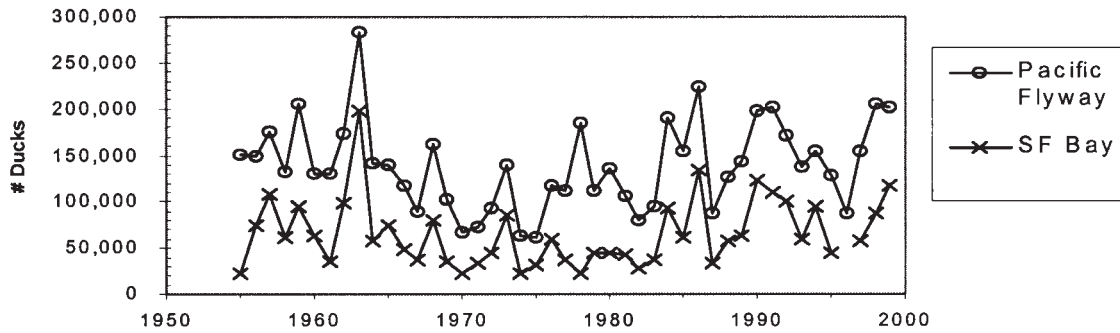


Figure F-2:
Midwinter Indices for Canvasbacks in the Pacific Flyway 1955-99

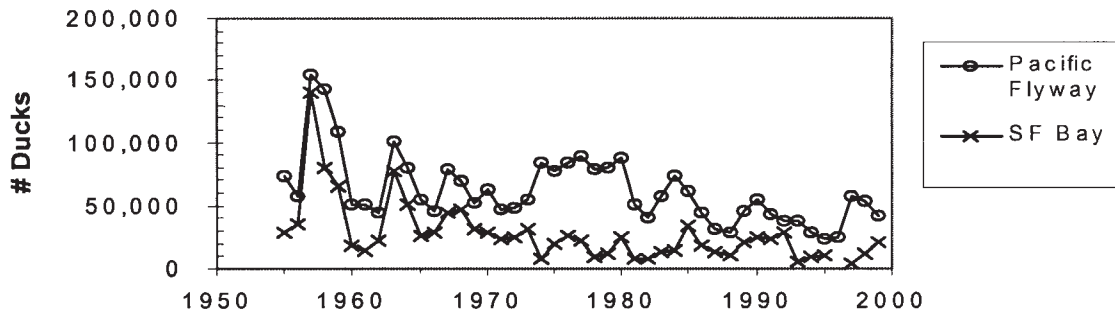


Figure F-3:
Midwinter Indices for Scoters in the Pacific Flyway 1955-99

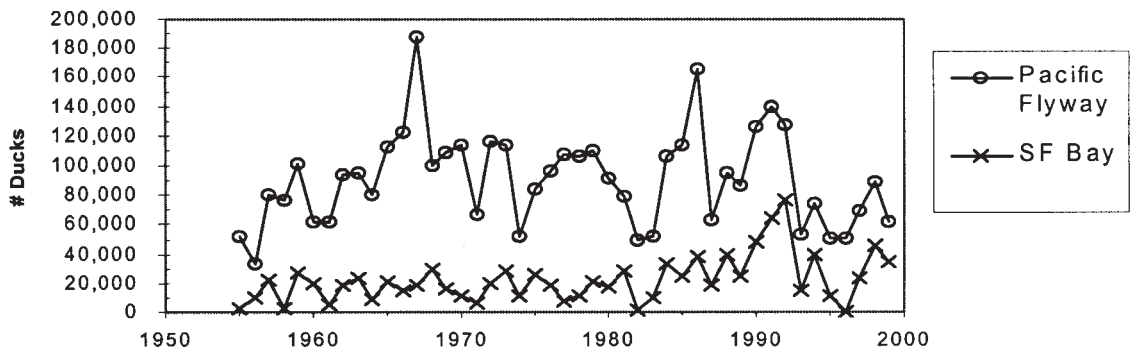


Table F-1:
Midwinter Indices for Canvasback, Scaup, Scoters, & Pintail 1955–99

	Canvasback		Scaup		Scoters		Pintails	
	Pacific Flyway	% in SF Bay	Pacific Flyway	% in SF Bay	Pacific Flyway	% in SF Bay	Pacific Flyway	% in SF Bay
1955	73,553	40%	150,953	15%	51,736	5%	2,221,786	1%
1956	57,977	62%	148,386	50%	32,989	31%	2,521,200	1%
1957	154,499	90%	175,122	61%	80,289	27%	2,155,306	2%
1958	142,257	56%	132,528	47%	76,846	4%	2,882,530	0%
1959	108,487	61%	205,016	47%	101,582	26%	2,321,848	1%
5 yr average	107,355	65%	162,401	44%	68,688	19%	2,420,534	1%
1960	50,713	36%	129,816	50%	61,855	32%	1,962,322	1%
1961	50,713	29%	129,816	28%	61,855	7%	1,962,322	2%
1962	44,761	50%	172,972	58%	93,413	20%	1,585,198	4%
1963	100,034	77%	283,418	70%	94,616	25%	1,641,994	0%
1964	80,383	63%	141,098	41%	79,972	11%	1,682,528	1%
1965	54,316	47%	140,588	53%	112,740	19%	2,288,802	0%
1966	45,599	63%	117,216	41%	121,874	12%	1,633,828	0%
1967	78,360	56%	88,904	42%	187,214	10%	2,342,643	0%
1968	69,186	68%	162,086	50%	99,852	30%	1,378,472	1%
1969	51,681	61%	101,952	34%	108,414	15%	1,685,502	0%
10 yr average	62,575	58%	146,787	50%	102,181	17%	1,816,361	1%
1970	63,157	45%	66,699	33%	113,000	10%	2,449,789	0%
1971	47,615	49%	72,039	47%	66,337	9%	3,857,712	1%
1972	48,204	53%	93,826	48%	116,425	17%	2,918,980	1%
1973	54,587	57%	139,120	62%	113,232	25%	2,868,092	0%
1974	83,260	10%	64,221	34%	52,121	22%	3,441,401	1%
1975	77,668	25%	61,785	50%	83,459	30%	3,278,495	1%
1976	83,261	31%	116,836	52%	96,801	20%	3,326,695	0%
1977	89,135	25%	112,083	34%	107,554	7%	3,620,038	1%
1978	78,308	11%	184,688	12%	105,877	10%	2,996,528	0%
1979	80,263	15%	111,658	41%	110,313	19%	3,265,814	1%
10 yr average	70,546	29%	102,296	40%	96,512	16%	3,202,354	1%

Table F-1: (continued)

Midwinter Indices for Canvasback, Scaup, Scoters, & Pintail 1955–99

	Canvasback		Scaup		Scoters		Pintails	
	Pacific Flyway	% in SF Bay	Pacific Flyway	% in SF Bay	Pacific Flyway	% in SF Bay	Pacific Flyway	% in SF Bay
1980	87,599	29%	135,270	32%	91,492	20%	4,015,739	
1981	50,432	15%	105,824	41%	79,554	35%	2,508,739	1%
1982	40,596	21%	79,498	36%	49,067	3%	1,831,832	0%
1983	57,933	22%	95,123	40%	51,299	19%	1,181,335	0%
1984	73,801	20%	190,833	49%	106,388	31%	2,411,716	1%
1985	60,996	55%	154,416	40%	113,554	22%	859,305	0%
1986	44,626	42%	223,838	60%	165,222	23%	1,254,794	1%
1987	31,570	42%	87,214	38%	62,455	29%	663,212	1%
1988	28,857	36%	125,835	45%	95,435	41%	1,262,689	1%
1989	45,888	44%	143,363	44%	86,617	28%	685,403	1%
10 yr average	52,230	32%	134,121	44%	90,108	26%	1,667,476	1%
1990	54,861	46%	196,652	62%	125,597	38%	888,876	1%
1991	42,690	55%	201,662	55%	139,892	46%	1,051,819	0%
1992	37,855	75%	170,566	59%	127,292	61%	773,548	2%
1993	37,509	16%	137,225	43%	52,578	28%	741,120	0%
1994	29,233	29%	154,321	61%	74,035	53%	1,055,970	0%
1995	23,994	43%	129,188	34%	50,134	23%	1,012,086	0%
1996	24,476	0%	87,099	0%	50,618	0%	1,435,296	0%
1997	57,447	7%	154,245	38%	69,563	34%	962,026	0%
1998	53,631	22%	205,084	43%	88,807	52%	1,278,494	0%
1999	41,847	51%	201,207	58%	61,358	56%	1,129,553	1%
10 yr average	40,354	34%	163,725	49%	83,987	43%	1,032,879	0%
45 yr average	62,085	44%	139,584	46%	90,474	24%	1,984,297	1%

Table F-2:

Midwinter Aerial Surveys for Waterfowl in San Francisco Bay (including salt ponds)

	Canvasback	Scaup	Scoters	Pintails
1955	29311	22896	2650	15612
1956	35810	73672	10300	22475
1957	139365	107480	21750	41980
1958	80180	61855	3055	13895
1959	65825	95350	26650	22095
5 year average	70098.2	72250.6	12881	23211.4
1960	18095	64270	19935	26445
1961	14650	36320	4570	39620
1962	22445	99650	18570	55935
1963	77325	197185	23464	2960
1964	50550	58085	8720	13145
1965	25523	74340	21313	10452
1966	28580	47640	15013	6200
1967	44120	37565	18930	6722
1968	47022	80440	29775	15770
1969	31595	34490	16360	1735
10 yr average	35990.5	72998.5	17665	17898.4

Table F-2: (continued)

Midwinter Aerial Surveys for Waterfowl in San Francisco Bay (including salt ponds)

	Canvasback	Scaup	Scoters	Pintails
1970	28370	22080	10745	4325
1971	23260	33610	6010	19840
1972	25378	45485	19272	31735
1973	31315	85676	27819	9587
1974	8035	21795	11390	17290
1975	19086	30760	25326	28430
1976	26025	60285	19100	7610
1977	22160	37865	7235	36590
1978	8752	22352	10804	13295
1979	11735	45410	21265	19940
10 yr average	20411.6	40531.8	15896.6	18864.2
1980	25260	43930	17885	28300
1981	7700	42990	27850	5070
1982	8470	28800	1250	1175
1983	12910	38110	9865	14480
1984	14860	93075	33300	11485
1985	33555	61970	24610	7535
1986	18599	134605	38502	14717
1987	13265	33282	18134	3319
1988	10245	56908	39352	12379
1989	20272	62728	24106	4006
10 yr average	16513.6	59639.8	23485.4	10246.6
1990	25087	122092	48278	5119
1991	23391	110331	63867	2964
1992	28297	100895	77040	13075
1993	5875	59503	14537	597
1994	8565	94379	39368	1902
1995	10428	44223	11459	4205
1996	No survey	No survey	No survey	No survey
1997	3746	58659	23352	1780
1998	11575	87301	46037	2621
1999	21316	117141	34143	14323
9 yr average	13828.3	79452.4	35808.1	4658.9
44 year average	27,065	64,166	22,066	14,061

Source: Dan Yparraguirre, Waterfowl Coordinator, California Department of Fish & Game

Table F-3:

Conversion Factors for Deriving Annual Peak Waterfowl Counts from Midwinter Aerial Survey Data

Conversions are species-specific, and are based on the three years of fall–winter surveys conducted by Accurso (1992). To obtain annual peak, multiply midwinter count by the conversion factor.

Species	Peak Conversion Factor
Northern pintail	1.341622
Canvasback	1.451713
Scaup	1.603405
Scoter	1.476519