

A trend count of New Zealand Shoveler Duck - 2012

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Summary

Fish and Game New Zealand conducted a national count of shoveler duck (*Anas rhynchosotis*) on 6 August 2012. This is the 13th annual count (2000-2013) to monitor change in the New Zealand population. A total of 12,119 were counted at 228 sites. Population change was examined using a variant of the Route Regression method (Geissler and Sauer, 1990) using Program WinBUGS (Spiegelhalter et al., 2003).

The population of shoveler duck at the sites counted appear to be stable, (percentage change = 1.01; -4.07 2.41 95% Credible Interval¹) over the 13 years. Short term (2011/2012) the credible interval spans zero suggesting no change (percentage change = -3.62; -22.45 19.88 95% Credible Interval)

Sex ratios were examined using chi-squared goodness of fit test. Males were significantly more numerous ($P < 0.001$) with a ratio of 1.52 males to female. This sex imbalance is consistent with counts in previous years.

Count sites were not randomly selected so inference about national shoveler populations cannot be made.

Introduction

The effective monitoring of game birds has been set as a high priority by the New Zealand Game Bird Research Committee. As part of achieving this goal it was proposed to monitor shoveler duck within a national framework (Rodway, 1999).

The shoveler duck does not make up a large component of the national hunter bag (8,193, $SE = 785$ in the 2007 game season) and the five year harvest trend is fairly stable (-0.007 , [$Se = 0.012$]) (Barker, 1998). There is a need however, to ensure that this population is adequately monitored and managed.

The proposal to monitor shoveler nationally stemmed from the perception that this species is very mobile (Williams, 1981a, Caithness et al., 2002, Sutton et al., 2002) and tends to disperse nationally. This compares with other game species in New Zealand such as the mallard (Balham and Miers, 1959, McDougall, 2012) or the paradise shelduck (Williams, 1981b, Barker, 1990) which are more sedentary.

Method

Survey Design

The aim of the survey is to detect an annual change in the population of shoveler duck at indicator ponds and to monitor long term changes.

¹ With the 95% credible interval there is a 95% chance that the true estimate lies within the interval, whereas 95% confidence limit is a random variable (Link and Barker, 2010) whereby if the data were repeated numerous times 95% of these confidence intervals would encompass the true mean (McCarthy, 2007).

$$\lambda = \frac{P_{t+1} - P_t}{P_t}$$

Where:

λ = Population change at selected ponds;

P_t = The population in year t;

P_{t+1} = The population in year t+1.

Fish and Game staff were asked to select a minimum of 10 count sites in each region. Sites were not randomly chosen but selected as likely places to encounter shoveler.

Survey forms (refer Appendix 1) were distributed to all Fish and Game Regions who made them available to observers. The survey forms included pre-printed site name, grid references, and site access details. Site information was provided to minimise between year observer variation.

The census date was set to be Sunday 6th of August 2012. Chosen sites were visited and the number of male and female shoveler duck recorded. Where sex could not be determined due to light conditions, distance, or large numbers, they were recorded as unidentified sex.

Analysis

Counts were converted to their natural log and a temporal regression line was fitted to each site. An estimate of the mean and variance of all the regression coefficients provided an estimate of population change. This technique is based on the route regression analysis described by Geissler and Sauer (1990)

$$\ln(C_{ij} + 1) = y_{ij}$$

where C_{ij} is the count at site i in year j , ($i=1 \dots n$; $j=2000 \dots 2012$).

Regression analysis was used for the y_{ij} 's for each site:

$$b_i = \frac{\sum(y_{ij} - \hat{Y})(T_j - \hat{T})}{\sum(T_j - \hat{T})^2} \text{ (Kutner et al., 2005)}$$

Where T_j is the count year ($j=2000 \dots 2012$) and b_i is the regression coefficient for site i .

And variance
$$S_i^2\{b\} = \frac{MSE}{\sum(T_i - \hat{T})^2}$$

Where:
$$MSE = \frac{SSE}{n-2} = \frac{\sum(Y_i - \hat{Y})^2}{n-2}$$

An estimate of the average regression coefficient across all sites:

$$\bar{b} = \frac{\sum \hat{b}_i}{N}$$

And variance:

$$S_p^2\{b\} = \frac{\sum MSE_i}{\sum (T_{ij} - \bar{T}_i)^2}$$

where N is the number of sites counted in 2012.

Program WinBUGS (Spiegelhalter et al., 2003) was used to calculate the average regression coefficient (see Appendix 2 for the code). The 12 year mean (normal distribution) and variance (lognormal distribution) of the regression analysis was used for the prior distribution.

The exponent of \bar{b} estimate is back transformed into percentage population change estimate:

$$\hat{\lambda} = (e^{\bar{b}} - 1) \times 100 \quad (\text{Rosenberg, 1998})$$

Results

Sites

A total of 228 (refer to Table 1) sites were counted throughout New Zealand, 7 more than last year. The count included 3 new sites. 2 sites that were counted last year were not counted this year. The number of sites counted in each region varied from 7-31.

Count Spread

209 of the 228 sites were counted on 6 & 7 August 2012. The remainder were counted 5 to 22 August 2012.

Count Results

12,119 shoveler were counted throughout the country (refer to Table 2), up on last year's 10,436.

The average regression coefficient of the 13 year trend distribution indicates no change in the shoveler population at the sites counted (-1.01% per annum; -4.1 – 2.4, 95% Credible Interval; $n=224$; Figure 1). An evaluation of the total count for those sites that have been counted ever year ($n=98$) (Figure 2) also suggests the population hasn't changed ($r=0.185$, $t_{(11)}=0.625$, $P=0.545$).

The two year trend (2011–2012) showed no change (-3.6% per annum; -22.45 – 19.88, 95% Credible Interval; $n=218$) in counts, however the 95% credible interval is very large.

Table 1. Number of sites counted by year and region

Region	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Northland	19	20	23	21	18	21	16	22	12	10	12	12	13
Auckland/Waikato	47	48	27	26	17	22	21	20	20	25	21	18	20
Eastern	17	17	17	16	18	18	18	18	19	18	18	16	16
Taranaki	23	23	15	16	16	23	18	22	11	11	22	22	22
Hawke's Bay	10	10	9	9	9	9	11	11	10	11	11	11	10
Wellington	18	22	20	22	23	23	23	23	23	24	29	32	32
Nelson/Marlborough	63	67	45	43	44	56	55	42	33	26	26	26	26
West Coast	10	11	12	14	13		12	12	12	12	12	12	12
North Canterbury	7	8	9	8	9	7	9	9	9	9	8	5	7
Central South Island	16	17	20	20	20	20	20	20	22	22	22	22	22
Otago	42	32	30	30	29	31	27	29	21	23	25	29	31
Southland	16	16	15	16	16	16	16	16	16	16	16	16	17
Total	288	291	242	241	232	246	246	244	208	207	222	221	228

Table 2: Total shoveler counted by fish and game region.

Region	Data	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Auckland/Waikato	Males	561	356	181	242	186	322	222	62	123	267	572	619	175
	Females	397	240	94	176	139	227	150	36	69	196	328	222	102
	Unknown Sex	168	1434	259	987	1602	151	2210	1548	1010	1096	268	2247	713
	Total	1126	2030	534	1405	1927	700	2582	1646	1202	1559	1168	3088	990
Central South Island	Males	0	229	166	241	168	174	267	220	267	825	265	228	1296
	Females	0	138	140	167	115	127	210	154	122	242	122	183	67
	Unknown Sex	629	94	160	31	52	134	18	56	98	49	281	33	99
	Total	629	461	466	439	335	435	495	430	487	1116	668	444	1462
Eastern	Males	549	232	77	177	638	216	99	162	57	119	149	60	96
	Females	288	124	60	121	402	82	58	104	40	72	58	31	62
	Unknown Sex	285	2786	683	931	91	697	936	534	1027	59	731	174	129
	Total	1122	3142	820	1229	1131	995	1093	800	1124	250	938	265	287
Hawke's Bay	Males	446	400	267	307	357	355	55	183	97	161	430	223	128
	Females	304	281	200	188	235	246	36	133	102	77	148	115	105
	Unknown Sex	2404	1055	3059	1575	2501	2093	2834	4243	1803	2758	2373	1988	3054
	Total	3154	1736	3526	2070	3093	2694	2925	4559	2002	2996	2951	2326	3287
Nelson/ Marlborough	Males	111	116	122	198	155	205	169	135	143	236	82	165	257
	Females	61	100	94	204	120	141	111	93	112	179	69	96	183
	Unknown Sex	453	22	27	301	366	1055	851	1373	327	885	668	694	1707
	Total	625	238	243	703	641	1401	1131	1601	582	1300	819	955	2147
North Canterbury	Males	83	38	278	482	181	120	108	636	27	148	106	101	186
	Females	68	27	124	308	152	124	89	586	21	112	122	92	102
	Unknown Sex	185	143	124	10	73	65	482	256	0	75	13	0	0
	Total	336	208	526	800	406	309	679	1478	48	335	241	193	288
Northland	Males	30	53	28	53	60	41	24	12	64	17	23	33	101
	Females	27	44	26	49	46	27	28	9	73	12	24	13	76
	Unknown Sex	0	5	0	0	1	0	0	0	0	0	0	1	0
	Total	57	102	54	102	107	68	52	21	137	29	47	47	177

Region	Data	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Otago	Males	0	800	662	123	110	760	578	568	296	350	266	187	482
	Females	0	505	507	105	96	509	532	475	120	331	233	232	444
	Unknown Sex	1073	136	290	826	1103	241	213	423	535	338	430	845	57
	Total	1073	1441	1459	1054	1309	1510	1323	1466	951	1019	929	1264	983
Southland	Males	369	260	27	92	98	216	117	228	126	114	183	430	489
	Females	210	164	22	96	101	116	103	133	68	72	93	257	243
	Unknown Sex	56	134	806	651	1118	640	359	519	204	569	537	102	128
	Total	635	558	855	839	1317	972	579	880	398	755	813	789	860
Taranaki	Males	76	100	155	135	30	72	8	25	26	51	85	203	147
	Females	47	84	114	98	25	58	3	22	10	27	63	134	86
	Unknown Sex	210	196	165	68	238	3	121	124	0	40	82	115	37
	Total	333	380	434	301	293	133	132	171	36	118	230	452	270
Wellington	Males	246	480	253	455	203	152	114	489	347	461	366	565	657
	Females	196	244	104	150	94	78	67	214	220	293	265	313	364
	Unknown Sex	755	459	815	787	367	311	243	60	108	116	45	175	196
	Total	1197	1183	1172	1392	664	541	424	763	675	870	676	1053	1217
West Coast	Males	39	34	37	125	89		48	55	71	54	35	82	80
	Females	18	37	40	115	85		38	51	47	30	42	49	71
	Unknown Sex	48	49	32	50	66		71	0	3	0	0	0	0
	Total	105	120	109	290	240		157	106	121	84	77	131	151
Total Males		2510	3098	2253	2630	2275	2633	1809	2775	1644	2803	2562	2896	4094
Total Females		1616	1988	1525	1777	1610	1735	1425	2010	1004	1643	1567	1737	1905
Total Unknown Sex		6266	6513	6420	6217	7578	5390	8338	9136	5115	5985	5428	6374	6120
Total Shoveler		10392	11599	10198	10624	11463	9758	11572	13921	7763	10431	9557	11007	12119

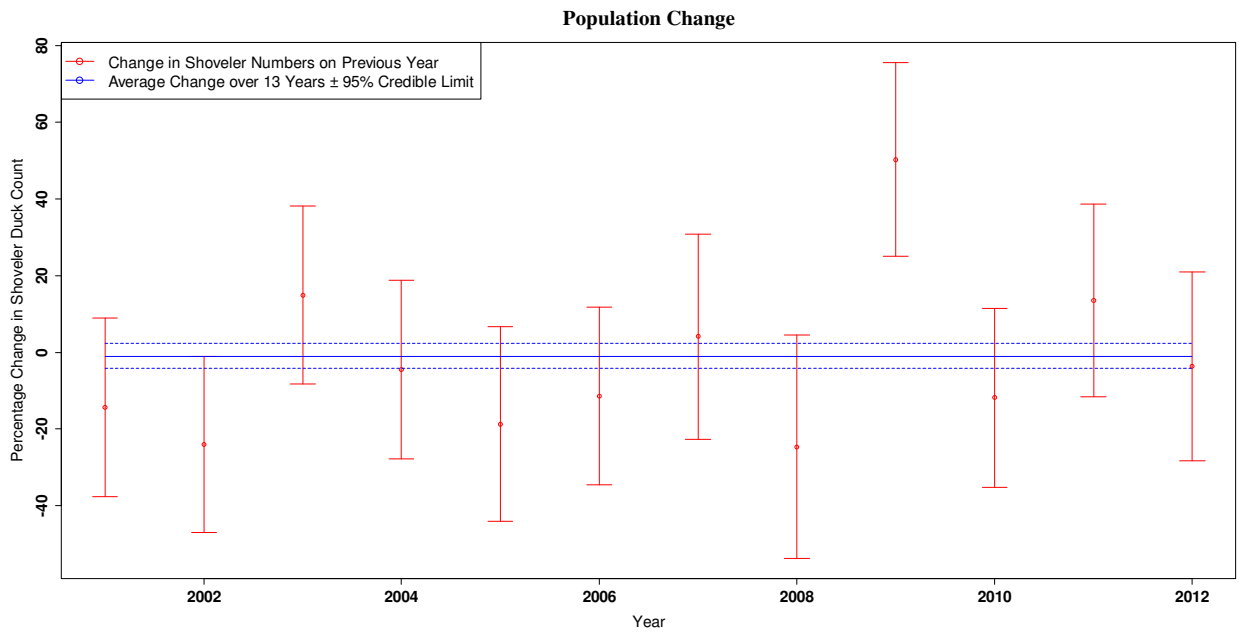


Figure 1. Percentage annual Change in Shoveler count (red point estimates \pm 95% CI). Blue line is percentage change over the 13 years (\pm 95% Credible Interval) ($n=224$).

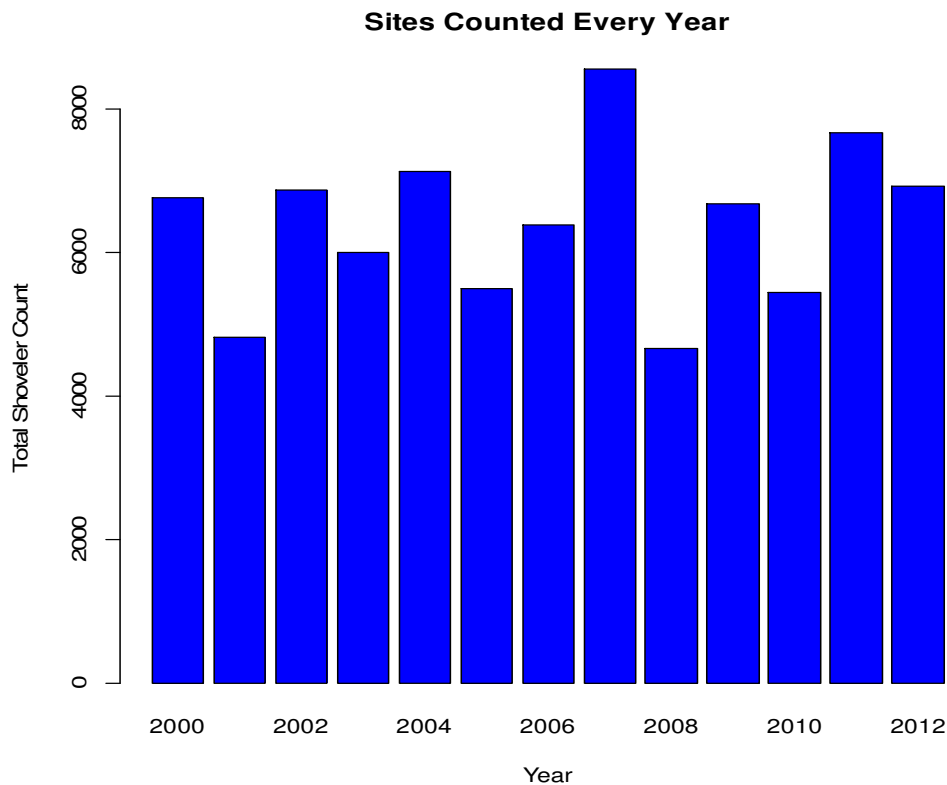


Figure 2. Total Shoveler count of the sites that have been counted for all 13 years ($n=98$). The correlation over time indicates no change (H_0 : That the true correlation is $=0$ was not rejected $r=0.185$, $t_{(11)}=0.625$, $P=0.545$).

Male female ratios

The chi-square goodness of fit test was used to test whether the expected ratio of 50:50 males to females was observed.

$$\chi^2 = \sum_{i=1}^k \frac{(f_i - \hat{f})^2}{f_i}$$

Where:

\hat{f} = The expected frequency of the *i*th class

f = The observed frequency of the *i*th class

Degrees of freedom; $\nu = k-1 = 2-1 = 1$

The Hypothesis is:

H₀: That the ratio of males to females is 50:50,

The results are presented in Table 3.

Table 3: Chi-square test for goodness of fit to a hypothesised ratio of 50:50 male female. In all instances where the hypothesis was rejected the number of male shoveler counted exceeded females.

Region	P	
Auckland/Waikato	<0.001	Males greater
Central South Island	<0.001	Males greater
Eastern	0.007	Males greater
Hawke's Bay	0.132	
Nelson/Marlborough	<0.001	Males greater
North Canterbury	<0.001	Males greater
Northland	0.060	
Otago	0.212	
Southland	<0.001	Males greater
Taranaki	<0.001	Males greater
Wellington	<0.001	Males greater
West Coast	0.464	
All Regions	<0.001	Males greater

The combined male: Female ratio was 1.52 ($P < 0.001$)¹.

Discussion

Sites

Originally a target of ten sites per region was selected as it was considered this would provide a level of effort that was achievable annually. Most were sites where shoveler were known to frequent and were relatively handy (keeping total effort to a minimum). Because the sites were not randomly selected however, no inference

¹ 1200 male only shoveler were counted at one site in CSI, because no females were counted this count was removed from the male: female chi square test.

about the status of the national population can be made. Fish and Game should consider a review of the current survey design (refer Conclusion and Recommendations).

Count Results

Shoveler numbers at the sites counted are stable over the long term (13 years). This is an improvement on last years long term trend results (-3.5% per annum; -0.9 – -6, 95%CI).

Sex ratios

A chi-square goodness of fit test strongly suggests (Table 3) a sex imbalance at the time of the count. There were 1.52 (range over 13 years, 1.27-1.71) times more males identified than females.

The imbalance may be due to the ease of distinguishing a male shoveler from other waterfowl at this time of the year, or it may be that males were identified as males and females as unidentified sex, or it may be a true reflection of the population balance. This imbalance is very similar to mallards trapped for banding in the Eastern Region (1.5 juvenile males: juvenile females; 1.35 adult males: adult females) (McDougall, 2010). Shoveler banding data (Department of Conservation band schedules 1973 – 1986) further corroborates these observations with an imbalance of 2.5 males to females.

Count Date

The 6th of August was chosen as count date. This date coincides with the end of the waterfowl season and the pre-breeding flocks that begin to gather at the end of July (Williams, 1981a).

The count date was brought forward in 2001, following comments from a number of observers that they believed the 20th of August was too late. They considered the lack of females was an indication that they had already left to breed. The male female ratios reported in Table 2 support this notion, however Williams (1981a) reports shoveler sex ratios as almost two males to one female and reports that most pairs are established by September and are starting to leave the flocks to nest. It is likely that the imbalance in the sex ratio is a true reflection of the population dynamics at the time of the count rather than a large number of females away nesting.

The timing of the count is a compromise between females moving away to nest and the end of the waterfowl season.

Analysis technique

The natural log of the count data were regressed over time and the average of these slope estimates were back transformed to indicate annual percentage population change.

Using the route regression method is useful where counted sites are not consistent from year to year. In addition:

- New sites can be included.

- Small sites are comparable to large sites.
- Sites that are disturbed or missed don't affect the estimate (but may affect the error of the estimate).
- The estimate is an estimate of the change in population with an associated error.

Nevertheless this method provides no insight on the total population size and as alluded to above is compromised by lack of randomisation in count site selection.

Managers are left to judge for themselves if the average trend of approximately 220 sites is going to be indicative of the population at large.

Conclusion and Recommendations

Shoveler duck at the sites counted appear to be stable over the long term.

Fish and Game should consider a review of the survey. The review could consider:

- Inclusion of randomly selected sites (some form of random stratified design)?
- Is it useful to know the size of the national population of shoveler duck (for example every five years), or density (shoveler km⁻²)?
- Is it appropriate to monitor the shoveler population as one national population?
- Should Fish and Game agree on a national harvest strategy given the presumption that the population is monitored as such?

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Appendix 1

Shoveler Counts Survey Sheet

Fish & Game Region: _____ Observer: _____

Date: _____ Time: _____

Location: _____ Grid ref: _____

Map No (260 Series): _____

Access Details: _____

Weather Conditions

Wind direction: _____ Wind Strength¹: _____

Cloud²: _____ Rain³: _____

Shoveler Males: _____

Shoveler Females: _____

Shoveler unknown sex: _____

Total Shoveler: _____

Comments: _____

Please return completed form to your nearest Fish and Game Office

If you have any queries phone Matthew McDougall 07-357-5501 (wk) 07-357-2687 (AH)

¹ Wind strength: Nil, moderate, Strong.

² Cloud: Estimate percentage cover; eg no cloud 0%, complete cover 100% cover.

³ Rain: Drizzle, Moderate Showers, Heavy Showers, Moderate, Heavy.

Appendix 2

WinBugs Code

Program WinBUGS (Spiegelhalter et al., 2003) code for estimating the average regression coefficient for the long term (13 year) population change.

```
#Estimating the average
model
{
  mean~dnorm(-0.03674, 0.000181)
  var~dlnorm(0.03803, 1.38905E-05)
  prec<-1/var
  for(i in 1:224)
  {
    Y[i]~dnorm(mean, prec)
  }
}
Data
list(Y=c(1.582409, 1.540445, 1.386294, 0.854534, 0.332914, 0.317371, 0.31072, 0.288952,
0.285572, 0.271125, 0.256327, 0.244621, 0.228316, 0.22223, 0.205026, 0.202752,0.20088,
0.191007, 0.189125, 0.183733, 0.183297, 0.177039, 0.17346, 0.167831, 0.164021, 0.162271,
0.16099, 0.158686, 0.154721, 0.15196, 0.149023, 0.148444,0.13916, 0.136073, 0.131933,
0.131805, 0.128156, 0.117986, 0.111311, 0.108806, 0.106127, 0.105024, 0.103191,
0.102252, 0.100576, 0.097717, 0.096102, 0.092601,0.092465, 0.092119, 0.088477,
0.086167, 0.085784, 0.084424, 0.076324, 0.07234, 0.071505, 0.068882, 0.065072, 0.063794,
0.057136, 0.052476, 0.051966, 0.050399,0.048163, 0.045967, 0.045713, 0.042157,
0.041984, 0.040892, 0.037224, 0.035555, 0.034715, 0.032418, 0.027937, 0.022851,
0.018443, 0.016815, 0.01518, 0.014349,0.009164, 0.008566, 0.001633, 0.000855, 0.00024,
0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, -0.00129, -0.00565, -0.00653, -0.01081, -0.01527, -
0.0153, -0.01792, -0.01873, -0.02099, -0.02193,-0.02344, -0.02373, -0.02381, -0.0249, -
0.02604, -0.02654, -0.02678, -0.02814, -0.034, -0.035, -0.03622, -0.03657, -0.03699, -
0.03759, -0.03974, -0.03976,-0.04463, -0.04489, -0.0461, -0.04666, -0.0477, -0.04806, -
0.05251, -0.05267, -0.05333, -0.05425, -0.05434, -0.05502, -0.05874, -0.05897, -0.05946, -
0.05997,-0.06144, -0.06588, -0.06749, -0.0684, -0.06967, -0.06994, -0.07507, -0.07851, -
0.08179, -0.08293, -0.09049, -0.09226, -0.09397, -0.10018, -0.1019, -0.1027,-0.10484, -
0.11079, -0.11138, -0.11252, -0.11426, -0.11944, -0.11982, -0.12286, -0.12297, -0.12539, -
0.12614, -0.12736, -0.13396, -0.1407, -0.14176, -0.14232,-0.14543, -0.14811, -0.15038, -
0.15864, -0.1597, -0.16272, -0.1672, -0.16799, -0.1732, -0.17693, -0.18371, -0.18744, -
0.1879, -0.19219, -0.19384, -0.19699,-0.19759, -0.19866, -0.20213, -0.20438, -0.21322, -
0.21724, -0.22195, -0.23078, -0.24078, -0.24662, -0.2508, -0.25235, -0.25397, -0.26257, -
0.26838, -0.27587,-0.28327, -0.28978, -0.29371, -0.29736, -0.29892, -0.29905, -0.30466, -
0.30735, -0.31712, -0.3274, -0.34386, -0.40724, -0.44142, -0.4445, -0.4987, -0.69628))
Initial values
list(var=0.04, mean=-.03)
```

Appendix 3

2011 Count Details

Region	Auckland/Waikato				
Site	Male	Female	Unknown	Total	
Chick's Pond	3	2	3	8	
Fisher Pond	6	4	8	18	
Helensville Oxy. Ponds	0	0	0	0	
Helensville Project	0	0	0	0	
Karaka Lakes	0	0	0	0	
Karaka Shellbank	2	1	0	3	
Lake Waikare	0	0	400	400	
Lake Whangape	0	0	0	0	
Leighton's Lake	5	5	0	10	
Mangere Water Storage	65	34	0	99	
North Shore Oxy.	4	2	0	6	
Ralph Road Ponds	19	12	0	31	
Rhyburns Lagoon	1	1	0	2	
Strakas Refuge	15	12	0	27	
Tee Head Pond	14	7	5	26	
Tuakau Oxy. Ponds	16	8	0	24	
Wairewa Oxy. Ponds	1	0	0	1	
Wellsford Oxy Ponds	5	1	0	6	
Whangamarino	19	13	297	329	
Whitney's Lake	0	0	0	0	
Region	Central South Island				
Site	Male	Female	Unknown	Total	
All Day Bay Lagoon	0	0	0	0	
Bells Irrigation Pond	2	0	0	2	
Bortons Settling Pond	4	0	0	4	
Devils Bridge Wetland	11	5	0	16	
Horseshoe Lagoon	0	0	0	0	
Normanby Lagoon	8	6	10	24	
Old Orari Lagoon	6	6	10	22	
Opihi Lagoon	3	3	0	6	
Opihi Lagoon Nth Arm	0	0	0	0	
Opihi Lagoon Sth Arm	0	0	0	0	
Orari Lagoon	0	0	0	0	
Otipua Wetland	10	6	4	20	

Pareora Freezing Works	0	0	0	0
Pareora Lagoon	0	0	0	0
Pig Hunting Creek	0	0	15	15
Rooneys Pond	0	0	0	0
Saltwater Creek	5	2	0	7
Smithfield Settling Pond	1	1	0	2
Spider Lagoon	18	18	28	64
Wainono Lagoon	0	0	0	0
Wainono Reserve	1200	0	0	1200
Washdyke Lagoon	28	20	32	80

Region

Eastern

Site	Male	Female	Unknown	Total
Aniwhenua Lake	23	14	0	37
Awaiti Wildlife	19	9	0	28
Bethlehem Wetlands	0	0	0	0
Bookers Pond	0	0	0	0
Braemar Lagoon	2	1	4	7
East Valley Pond	0	0	0	0
Kaituna Cut	0	0	0	0
Kaituna Wildlife	0	0	0	0
Kawerau Road Pond	1	0	0	1
Matata Wildlife Refuge	21	17	0	38
Rerewhakaaitu	0	0	0	0
Rotoitipau Lake	0	0	0	0
Rotoroa Lake	0	0	125	125
Tamurenui Lake	0	0	0	0
Thornton Lagoon	30	21	0	51
Urupa Lake	0	0	0	0

Region

Hawke's Bay

Site	Male	Female	Unknown	Total
Hatuma	0	0	785	785
Oingo Lake	0	0	34	34
Pirimu	2	1	0	3
Poukawa	0	0	2150	2150
Roto O Kiwa	2	0	0	2
Runanga Lake	0	0	13	13
Turfrey Swamp	29	19	72	120
Waitangi (Horseshoe)	27	15	0	42
Westshore Ponds	41	48	0	89
Willow Dam	27	22	0	49

Region	Nelson/Marlborough				
	Site	Male	Female	Unknown	Total
	Bell's Island	196	153	0	349
	Best Island	0	0	0	0
	Big Lagoon	0	0	170	170
	Carter's Pond	11	5	0	16
	Coastal Highway Pond	1	0	0	1
	Corder Pond	0	0	0	0
	Eastern Waimea Inlet	0	0	0	0
	Havelock Estuary	18	9	19	46
	Kumaras/Oxidation	2	1	0	3
	Kumera Estuary	7	4	0	11
	Lake Grassmere	0	0	830	830
	Lower Waimea River	0	0	0	0
	Maori Lookout	0	0	330	330
	Mapua	0	0	0	0
	Motueka Sandspit	0	0	0	0
	Moutere Inlet	0	0	0	0
	Mouth of O'Connor's	2	2	0	4
	Neiman's Creek	0	0	0	0
	Oxidation Ponds	0	0	248	248
	Pearl Creek	0	0	0	0
	Port Motueka Estuary	5	3	0	8
	Rough Island bridge	0	0	0	0
	Te Aropipi Channel	0	0	110	110
	Traverse	0	0	0	0
	Wakapuaka Oxidation	15	6	0	21
	Wakapuaka Pond	0	0	0	0

Region	North Canterbury				
	Site	Male	Female	Unknown	Total
	Cheviot Settling Ponds	11	8	0	19
	Coopers Lagoon	2	2	0	4
	Greenpark Sands (Lake	6	4	0	10
	Harts Creek Reserve	2	2	0	4
	Lake Ellsmere - Kaituna	0	0	0	0
	Lake Forsyth	95	66	0	161
	St Annes Lagoon	70	20	0	90

Region	Northland				
	Site	Male	Female	Unknown	Total
	Ararua	0	0	0	0

Borrowcut Wetland	0	0	0	0
Dargaville (Oxidation	2	0	0	2
Flaxmill Wetland	2	2	0	4
Hikurangi Oxidation	0	0	0	0
Kawakawa Wetlands	94	71	0	165
Lake Omapere Kaikohe	0	0	0	0
Lake Ora	3	3	0	6
Lake Owhareiti	0	0	0	0
Matakohe (Murphys Rd)	0	0	0	0
Opahi Swamp	0	0	0	0
Red Hill	0	0	0	0
Waro Lake	0	0	0	0

Region

Otago

Site	Male	Female	Unknown	Total
Balclutha Oxidation	3	3	0	6
Blakelys Dam	5	5	0	10
Blueskin Bay	9	5	0	14
Borrow Pits	9	9	0	18
Carr's Oxbow	0	0	0	0
Creamery RD Pond	0	0	0	0
Duffys Lane	0	0	0	0
Finegand WR	0	0	0	0
Hawksbury Lagoon	40	33	0	73
Inch Clutha WMR	0	0	0	0
Kaikorai Estuary	7	7	0	14
Kaitangita Oxidation	0	0	0	0
Kogans Bridge Oxbows	0	0	0	0
Lake Tuakitoto	173	173	0	346
Lake Waihola	7	6	0	13
Lake Waipori	15	15	0	30
Lone Pine Reservior	0	0	55	55
Mathias Dam	0	0	0	0
McSkimmings Pond	8	6	0	14
Merton Arm	10	15	0	25
Old River Channel	0	0	0	0
Palmerston Oxidation	11	8	0	19
Patersons Dam	40	32	0	72
Ranfurly Sewage	0	0	2	2
Rutherfords Dam	35	40	0	75
Sinclair Wetland	1	1	0	2

Stirling Oxidation	0	0	0	0
Taieri Lake	80	64	0	144
Tomahawk Lagoon	23	20	0	43
Tomahawk Lagoon	0	0	0	0
Waikouaiti Sewage	6	2	0	8

Region Southland

Site	Male	Female	Unknown	Total
Acton Downs Pond	3	1	0	4
Big Lagoon	1	1	0	2
City Lagoon	79	27	0	106
Daffodil Bay	21	11	0	32
Dawson City GMA	4	5	0	9
Gore Oxidation Ponds	219	109	13	341
Lake Murihiku	21	8	13	42
Lake Te Anau Outlet	0	0	0	0
Little Lake Waituna	8	3	2	13
Lumsden Oxidation	0	0	92	92
Mataura Oxidation	117	68	8	193
Outlet Area Kakapo	0	0	0	0
Peter Menlove's Pond	2	2	0	4
Riversdale Gravel Pit	2	1	0	3
Ryan's Pond	8	6	0	14
Te Anau Oxidation	0	0	0	0
Waimatuku Wetland	4	1	0	5

Region Taranaki

Site	Male	Female	Unknown	Total
Hawera Oxidation	24	5	0	29
Julian's Lake	9	3	0	12
Kaitoke Lake	17	8	0	25
Lake Grassmere	0	0	0	0
Lake Herengawe	0	0	0	0
Lake Kohata	0	0	0	0
Lake Marahau	3	6	1	10
Lake Oturi	0	0	23	23
Lake Pauri	12	12	3	27
Lake Rotokauwau	12	9	5	26
Lake Waiau	0	0	0	0
Lake Waikato	9	10	4	23
Lake Waipu	27	14	1	42
Lake Westmere	18	8	0	26

Lake Wiritoa	0	0	0	0
Lower Ball Road	6	5	0	11
Lower Taumaha Road	0	0	0	0
Milne's Lake	1	1	0	2
Nowell's Lake	1	0	0	1
Patea Oxidation Ponds	8	5	0	13
Ratana Oxidation	0	0	0	0
Waverly Oxidation	0	0	0	0

Region

Wellington

Site	Male	Female	Unknown	Total
Barton's Lagoon	2	2	0	4
Carterton Sewage	13	17	0	30
Edwards Lagoon	2	1	0	3
Featherston Sewage	1	1	0	2
Foxton 3	14	8	0	22
Foxton 4	60	41	14	115
House Lake	6	4	0	10
Kaikokopu Lake	70	20	70	160
Kourarau Dam	12	4	2	18
Lake Domain wetland	1	1	0	2
Lake Koputara	11	8	0	19
Lake Omanu	13	13	50	76
Lake Omanuka	30	14	0	44
Lake Rotomahana	0	0	0	0
Lake Rotowhero	0	0	0	0
Lake Wairarapa -	0	0	0	0
Lake Wairarapa -	2	0	2	4
Lake Wairarapa -	0	0	0	0
Lake Wairongomai	1	1	0	2
Lakeview Farm	0	0	0	0
Masterton Sewage	243	144	0	387
Matthews Lagoon	0	0	0	0
Middle Lake	8	5	0	13
Otaki Sewage Ponds	47	20	0	67
O-Te-Pua Wetland	0	0	0	0
Pounui Lagoon	12	9	2	23
Pukepuke Lagoon	68	24	56	148
Smiths	14	8	0	22
Voss Lagoon	0	0	0	0
Waikanae Sewage Ponds	15	11	0	26

	Waitawa Lake	0	0	0	0
	Waiterere Beach Road	12	8	0	20
Region	West Coast				
	Site	Male	Female	Unknown	Total
	Blaketown Lagoon	22	17	0	39
	Hokitika Oxidation	11	10	0	21
	Lake Brunner - Iveagh	0	0	0	0
	Lake Brunner - Swan	4	2	0	6
	Lake Ianthe	22	21	0	43
	Lake Poerua	0	0	0	0
	Lake Ryan	2	1	0	3
	Mahinapua	1	1	0	2
	NE Shore Lake Brunner	14	16	0	30
	North Cobden Lagoon	4	3	0	7
	Pheonix Meat Works	0	0	0	0
	South Cobden Lagoon	0	0	0	0

Appendix 4

Count Location

Region	Auckland/Waikato				Ref No
Site	Map No	Grid Ref	Access Details	Ref No	
Beachlands	R11	775-874	North Beachlands Marina "Pine Harbour"	433	
Black Lake,	S13	913-189		378	
Cambridge	S15	243-642		400	
Cathcart	S12	910-370	From Mill Creek, left boat and walked McKenzie stopbank. Scanned Cathcart from McKenzie	436	
Chick's Pond	T13			391	
Duck Creek -	T11	623-568	Access by road (Hikenai- Pauanui Rd 16acre "sanctuary" opp Tanners Sawmill. Small numbers present for last 6 years	437	
Finlayson	S12	038-333	From findlayson Road	376	
Firth of Thames	T12	312-400	From landing (Pipiroa Landing) Very popular shoveler counts	377	
Fisher Pond	T13	324-225		390	
Francis's Pond				559	
Friedlanders				561	
Hahei	T11	605-808		387	
Helensville	Q10	393-038		370	
Helensville	Q10	400-010	From side of Mangakura Road	534	
Howarth	T13	490-030		397	
Huntly Oxy.	S13	023-055		395	
Karaka Lakes	Q10	264-092	woodhill Forest Block 7b. Note may be closed due to deer hunting. Access via gate immediately of Lake Kereta (marked no trespassing) thence 100m to locked forest gate, past Karaka Lake No. 1 along Decon Road, thence next track left along forest boundary	535	
Karaka				560	
Kidds, Karaka	R12	722-562		445	
Kopuatai West	T13	326-259	Checked most ponds from Dagger Road to the Waikaka River along the side of the Piakp River.	446	

Lake Areare	S14	045-905		406
Lake B	S14	085-890	Through andrew Singers	402
Lake C	S14	082-895	Via Andrew Hayes	403
Lake D	S14	072-894		404
Lake E	S14	105-865		405
Lake Harihari	R16	610-310		412
Lake Huiputea	S16	040-326		453
Lake Kimihia	S13	040-112		394
Lake Koromatua	S14	060-715		454
Lake	S15	053-610		407
Lake Ngaroto	S15	109-575	Used walking track around perimeter of Lake - viewing from all outcrops. Started from jetty finishing at rowing club approx 6km walk	408
Lake Ohinewai	S13	025-097	From Ohinewai Domain	384
Lake Pikopiko	S14	035-910		401
Lake	S13	040-113	Access canal waikare-Rotokawau - boated length of lake until too shallow	383
Lake Taharoa	R16	625-360	By foot from Taharoa Village	410
Lake Waahi	S13	980-030	from crossing, under haulage road tunnell to Coalcorp plantings, to marae and back (includes bays and streams)	396
Lake Waikare	S13	060-175	From yacht club to refuge islands then down lake to Rotokawau entry.	380
Lake	S13	900-137	from Shuggs Landing to SE Arm to Swann Island to Tikotiko arm and back.	385
Leighton's Lake	Q10	310-113		542
Main Karaka	260 (sheet	261-095	Parked car in Wilson's Road (at south end of Main Kareta Lake) Crossed private property of Geoff and Belinda Ward (025 933 729) to get to eastern edge of Woodhill Forest. Followed a well formed track (heading south) that runs along the western margins of the Kareta South Lakes (H2+3) and also the Main Karaka Lake.	530
Mangere Water	R11	670-705	Due to major works at the Ponds access is limited to Perimeter Roads	371
Matarangi Oxy.	T10	495-933		386

Miranda	S12	162-438	South of Pukorokoro and Miranda Streams	467
Ngaruawahia	S14	005-931	Park in entrance to /ponds and walk approx 80 mtrs to ponds which are visible from the road	399
North Shore	R10	639-933	Along southern shore from plant to motorway box tunnel	369
Otorohanga	S16	050-345		409
Owera Oxy.	R10	605-102		368
Paeroa Oxy.	T13	455-215		413
Patetonga /	T13	323-230		389
Peter	S13	035-265		381
Pike's Pond				558
Ralph Road	S13	015-059	Ralphs Road	393
Rhyburns	S12	924-378	From creek, walked along stopbank	375
Seagrove	R12	678-555	Through private property walked the foreshore from Clarks Creek 3.5km West	548
Strakas Refuge	R10	613-162	From weir to opposite teal	366
Te Awamutu	S15	115-538	Walked perimeter	411
Te Kuiti Oxy.	S16	983-186		414
Tee Head Pond	T13	392-192	Awaiti Canal	392
Thames Oxy	T12	370-450		388
Tuakau Oxy.	R12	797-357	From internal roads round ponds off Friedlander Rd	374
Waikato Delta	R13	655-292	Hoods Landing. Waikato Delta to top of windy channel.	373
Wairewa Oxy.	R10	619-165	On foot from road entrance along stopbank	367
Wattle Downs	R11	785-605		372
Wellsford Oxy	Q09	487-425	From St1 used Ray McFaddens race to pond entrance - walked perimeter of ponds.	487
Whangamarino	S13	995-265	Used boat from end Wattle Rd launched at Herlet's Hut, down Reo Stream, along Suttons causeway to Penninsula, then across country to scan by binoc to Lone Pine	476
Whangapoa	T10	455-925	5 different points including inlets to Opitonui, Owera and Matarangi Stream	488
Whitford	R11	743-859	cnr Potts and Clifton Rds - Ayrlires Pond owner Bev	489

	Whitianga	T11	505-795	Via various farms and by boat	490
	Whitianga	T11	510-820		379
	Whitney's Lake	S13	929-165	From roof of Whitney family	382
Region	Central South Island				
	Site	Map No	Grid Ref	Access Details	Ref No
	All Day Bay	J42	438-526	Count from Waianakarua Beach Rd	77
	Bells Irrigation	J41	495-882	Ross Road off Ikiwai Tawai Road at Tawai.	519
	Bortons	J41	358-895	Public road from SH 83 at Black Point.	518
	Devils Bridge	J41	480-722	Devils Bridge Road from Ardgown Road. Source of an Oamaru Creek tributary.	517
	Horseshoe	K38	762-553	Connollys Rd, through Tom Lister's property	70
	Normanby	J39	707-378	Count from beach dune with access from Normanby Rd off SH1	73
	Old Orari	K38	834-623	Count from beach dune north of Orari Rv mouth, Parke Rd	64
	Opihi Lagoon	K38	784-573	Count from stop bank through Milford hut settlement on Milford Lagoon Rd	69
	Opihi Lagoon	K38	794-585	Ken Rooneys property off Prattleys Rd. Along stopbank on northside of lagoon	67
	Opihi Lagoon	K38	779-569	Same as for Opihi Lagoon. From end of Connollys Rd and beach track head left up to macrocarpas parallel to lagoon	68
	Orari Lagoon	K38	827-617	Stopbank on true left. Parke Rd	65
	Otipua	J39	705-415	From walking track along hillside to south of wetland from carpark off SH1	72
	Pareora	J39	681-329	Count from access track parallel to beach from behind freezing works	75
	Pareora	J39	678-323	Count from riverbed access track immediately on left of SH1 bridge over Pareora Rv travelling south	76
	Pig Hunting	J39	703-369	Count from top of beach dune with access from Craigies Rd off SH1	74
	Rooneys Pond		646-055	Off Myers Road	554
	Saltwater Creek	J39	715-415	Count from stopbank on true left of river with access from SH1 just before Saltwater	71

				Creek bridge travelling south	
	Smithfield		703-466	From Timaru end behind works	555
	Spider Lagoon	K38	816-607	Macaulay Rd then along macrocarpa shelter belt approx 500m back from road edge	66
	Wainono	J40	640-100	2 counts necessary due to size. Count eastern half from roof of concrete hut on beach track. Western half from Clay Rd opposite Waimate turn off from SH1	78
	Wainono	J40	645-086	Count from top of beach dunes open seaward side of lagoon. Access from Poingdestres Rd.	79
	Washdyke	J39			429
Region		Eastern			
	Site	Map No	Grid Ref	Access Details	Ref No
	Aniwhenua	V16	410-126	Access at Rabbit Bridge or Dam. Count from Kopuriki Bridge first (upstream and downstream). Good idea to do this area by Kayak and lower lake by motor boat.	12
	Awaiti	V15	453-577	Access off Gregg Road.	7
	Bethlehem	U14	853-858	SH 2 Tauranga, turn right at Bethlehem round-about into Bethlehem Road, right into Westmorland Rise, and follow down to first wetland	550
	Bookers Pond	V15	356-442	The outlet is used for sprinklers on the effluent	20
	Braemar	V15	382-507	Braemar Road	25
	East Valley	V15	361-449	Recently formed. This flows into pond 3.	21
	Kaituna Cut	V14	110-780	End of Ford Road	27
	Kaituna	U14	070-780	Access off Parr Road, where road takes a sharp right angle to the West.	9
	Kawerau Road	V15	330-410	Kawera Road	26
	Lake McLaren	U14	779-722		416
	Matata Wildlife	V15	410-615	Access off SH 2. Can get good view from on top of sand dunes.	8
	Repongaere	Y18	345-780	Though John Tuhoe's property. Access track to ridge line which overlooks the lake. 4WD when dry.	18
	Rerewhakaaitu	V16	160-170	Access off Brett Road or Ash Pit Road.	11

Rotoitipau Lake	V15	358-427	As coming from Rotorua to kawerau go through first set of traffic lights (offices go left big car park opposite) there is an overhead road with access to it off to right off SH34. Go over bridge and head towards river will need to phone 07-323-3456 to get to open green gate (Safety Card No. 3395 exp 4/8/2010).	23
Rotomahana	V16	110-200	From Norsk Skog Effluent Turn off Waimangu Road into Wairua Road then follow angler access signs to Lake.	10
Rotorua Lake	V15	360-445	Is called pond 4 & is the pond before the outfall into the Tarawera River.	19
Tamurenui	V15	375-460	Access off SH 30.	24
Thornton	W15	518-583	Access off Thornton Road	532
Urupa Lake	V15	359-430	From Norske Skog Tasman Effluent Plant	22
Whakaki	X19	040-300	View from railway line. Eastern side viewed from Max Pakus or A Power? Access via 1st gate on left when traveling from Whakaki to Wairoa when you first reach the lake. Other access to the Eastern end can be through H Solomon via Whakaki Trustees.	17

Region		Hawke's Bay			
Site	Map No	Grid Ref	Access Details	Ref No	
Hatuma	V23	110-255	Access sign off Race Course Road by cattle stop (past race course)	529	
Hurimoana	V21	297-767	Access of Taihape Road. Second gate after cross the Ohiwa Stream. Follow farm track around base of hill. Gate is next to a sheep dip. Farm owners are Selwyn Dorward Alness Farm 644 Taihape Road,	2	
Oingo Lake	V21	315-745		15	
Pirimu	U23	068-126	Access off Lake Road. Travel along high ridge Gate is the second? one back from the Lake Road intersection. John & Raymer? Barrett, Lake Station 478 Lake Road.	4	
Poukawa	V22	271-515	Access Settlement Road. Turn left at sign that says Private Access beyond this point. Travel down farm track until hit	6	

			drain that enters Pokawa from South end. Can Launch boat/kayak here.	
Pump House	V21	431-830	Best access is from Tamatea Drive and walking down eastern side of drain.	14
Roto O Kiwa	V22	232-475	At the end of Boundary Road turn left and follow farm track. Land is managed by Brownriggs. First pod is dry, other one is on the West side of the railway tracks.	3
Runanga Lake	v21	427-860		16
Turfrey Swamp	V21	428-870	From SH2, 200m past Turfrey Rd by Napier airport. Best done early am to get light right.	507
Waitangi	V21	467-749	Off SH2, across Railway. Count from Railway embankment.	545
Westshore	V21	433-846	Turn off SH 2 at Westshore on to Watchman Road. Count birds from causway.	13
Willow Dam	U23	085-205	Access off Nichols Road. Farm House Doug Mackie 852 Porongahau Road.	5

Region Nelson/Marlborough

Site	Map No	Grid Ref	Access Details	Ref No
Aorere Estuary	M25	807-614	Road	309
Aorere	M25	814-602	Road	310
Aorere River	M25	824-593	Boat -Ruataniwha Inlet/Aorere Mouth	308
Balfour's Pond	P28	970-618	From road bridge	256
Bankhouse	O28	694-637	Canoe from south bank	268
Bell's Island	N27	249-907	On NE Pond + other ponds	284
Best Island	N27	233-896	From road. Corner besides estuary + bridges	285
Big Lagoon	P28	035-624	From 4WD Track	251
Carter's Pond	N27	174-845	With permission, downstream pond	290
Casey Road	P29	024-466	From road	248
Coastal	N27	137-028	All ponds cut off by highway, especially freshwater (Easton's)one	292
Corder Pond	O27	367-968	From beside internal road	279
Duck Shooter's	P28	020-602	Top of terrace & Department of Conservation sign	255
Dune Lake,	M24	882-773	From vehicle track	313

Eastern	N27	275-868	From Whakatu Drive	280
Elterwater	P29	058-334	Gate/Hill past gravel stock pile, Mrs Sandall's front lawn	246
Ferrer Creek	N26	106-149	From both sides of Lodder	299
Grove Arm	P27	862-927	From road	269
Grove Mill	P28	766-650	From behind winery	267
Grovetown	P28	916-695	From Crafar maimai, olive nursery to road side	263
Havelock	P27	733-917	From vantage points from SH6	274
Island Lake,	M24	810-772	From vehicle track	314
Kaihoka Lakes	M24	756-726		317
Kenepuru Head	P27	044-035		271
Kidney Ponds	P28	042-611	From 4WD Track	253
Kumaras/Oxida	N26	125-119	From end of Staples St	297
Kumera	N26			501
Lake Grassmere	P29	095-415	SH 1 Clifford Bay Farm gate	247
Lake Jasper	P29	912-487	From vehicle halfway along lake	249
Lake Otuhie	M25	603-575		319
Lake Rotoiti	O31	588-677		245
Lake Rotorua	O31	583-663	Brian Seddon on both sides of lake	244
Lower Opawa				257
Lower Pelorus				275
Lower Waimea	N27	218-915	From Rough Island and O'Connors and out to boat ramp on Rabbit Island	282
Mahikipawa Arm	P27	795-905	Boat	270
Mangarakau				318
Maori Is	P28	914-696	Drive along Maori Island Rd	262
Maori Lookout	P28	020-603		252
Mapua	N27	183-938	Grossis Point Reserve to Noman's Island	289
Marahau	N26	108-235	High tide roosts at mouth of Marahau	302
Marlborough	P28	828-631	From Lake View Rd	266
Mississippi	P28	969-647	From True LH Stopbank	259
Motueka River	N26	115-138	From west bank road and from Kaiteriteri Road	298
Motueka	N26	123-102	From Motueka Quay only	296
Motupipi Inlet	N25	961-407	Boat - Mouth and estuary of Motupipi.River. On Foot at	304

			grid ref	
Moutere Inlet	N27	141-022	From vehicle, especially at head and beside island	291
Mouth of	N27	197-921	From Hunter Brown Reserve and Equestrian Road	287
Neiman's Creek	N27	234-890	From track leading from corner of Lansdowne Rd and from Best Island road corner	281
North Wairau	P28	981-668	From Department of Conservation track beside large pines	261
Otarawao	O26	675-180	Ask Jeremy Foley	272
Otuwhero	N26	097-213	In estuary from Marahau Road	301
Oxidation	P28	969-632	All ponds including PPCS	258
Pakawau	M25	833-688	Road	311
Para	P28	898-780	By canoe from new pond outlet to Boat Point and Mackels & return	265
Parapara Inlet	M25	833-543	Road	525
Parapara Inlet	M25	832-526	Road	306
Pearl Creek	N27	210-904	End of Cotterel's Rd	283
Port Motueka	N27	113-080	High tide roost from York Park looking towards Wharf Rd	295
Puponga	M24	875-758	Road	312
Riverside Pond	N27			293
Riwaka River	N26	100-159	High tide roosts from Kaiteriteri Road	300
Robinson's	P25	785-434	D'Urville Island	273
Rough Island	N27	208-911	Old Waimea R channel to west	288
Saxton Field	N27	281-867	Off Station Road	513
Takaka River	N25	933-431	Boat - Mouth and estuary of Takaka River from Rangitaeata to Waitapu Estuary	305
Taylor Dam	P28	877-589	Flushed lake edges	264
Te Aropipi	P28	996-652	From Boulder Bank, near Waverley wreck	254
Traverse	N27	204-928	From bridge and drive along road on Southern side	286
Triangle Lake	M24	883-768	From East	315
Upper Lagoon	P28	977-633	From Harding's Rd and walkway	250
Upper Moutere	N27	107-901	Various locations	294
Wainui Inlet				303
Wairau Estuary				260

	Wakapuaka	O27	465-034	From Maori Pa Rd	276
	Wakapuaka	O27	377-007	From northern access road	277
	Wakapuaka	O27	375-990	Sewerside Drive and adjacent estuary	278
	Westhaven	M24	741-710	Ferguson's Letterbox	316
Region	North Canterbury				
	Site	Map No	Grid Ref	Access Details	Ref No
	Bromley	M35	870-415	Drove and walked around pond. 6 ponds in all.	131
	Cheviot	O33	315-216		556
	Coopers Lagoon	M37	540-044	Viewed from McEvedys Road, then drove along beach side to top of lagoon in order to cover all bays.	205
	Greenpark	M36	672-152	From Eeglens? At Wolfs Road to Halswell River mouth. NB covers two Maps M36 & M37, E672 to 756, N152 to 210	417
	Harts Creek	M36	578-130	Along boardwalk North to South + use of hide. Access off Timber Yard Road	133
	Lake Ellsmere -	M36	820-130	Parked vehicle at both ends and walked along old rail embankment.	514
	Lake Forsyth	M36	920-120	Started from top end of bay near Kinlock? Homestead; round bay to little river; through rushes & swamp & willows along eastern embankment to settlement and to outlet.	130
	St Annes	O33	253-320	Walked around the North Side from the entrance to Rentoul Park, to a point where the Western end of the water could be seen. Southern side not walked as ewes lambing.	203
	The Sister	O32	306-347	Walked around Southern end of main pond to be able to see all of the water area. NB the pond on the North side of the Sisters Rd alongside the entrance to the main pond was viewed from the road.	204
	Woodend	M35	860-645	Gladstone Road, then walk 400m to lagoon. NB Cannot walk around shore.	132
Region	Northland				
	Site	Map No	Grid Ref	Access Details	Ref No
	Ararua	Q08	152-707	12.4 km on Ararua Rd from SH 12. 10 Ha irrigation lake on	428

			edge of road Jackson's	
Aupouri Forest	N03		Travelled 5km North of Lake Bullrush to un named lake . Situated in D.O.C RESERVE. Just North of Swan Lake.	153
Aupouri Forest	NO3	051-072	Access on foot at end of Road	152
Borrowcut	QO6	026-021	Turn left off State Highway 1 next to Hikurangi and follow Jordan Valley Rd until the Wairua River bridge is reached . Cross bridge and turn right then follow stopbank Rd until wetland is reached on the right hand side.	155
Dargaville	PO7	091-085	Turn left off State Highway 14 just over bridge prior to entering Dargaville. Follow road to pondes.	147
Flaxmill	PO7	089-087	Located off Waihue Rd, Northwest of Dargaville (5km). Observed from town end (Southern Pond)	533
Hikurangi	QO6	026-021	Turn left into oxidation ponds off Jordan Valley road from state Highway 1 near Hikurangi. Ponds situated at the end of the raceway.	138
Hokianga	O05	056-043	Short drive from township. (Western side of bight) Clear. Bino observation.(7x50)	143
Kaikohe	PO5	050-083	Take TePua road off state highway 1. The whole lake has a road in close proximity to the lakes periphery. Bordering landowners are very helpful.	142
kaikohe	P05	853-415	Accessed of Cumbers Road, South of Kaikohe on Mangakahia Road.	503
Kauri Dairy	QO6	018-029	Access is via Dairy farm raceway prior to Dairy Company entrance when heading North.Follow race until settling pond is reached.	139
Kawakawa	P05	062-448	Off Mill Road near Kawakawa on SH1	504
KeriKeri	PO5	004-060	Access is via Te Wairoa Rd near Haruru Falls.Check Topo for details.	150
Lake Manuwai	P04	893-691		531
Lake Omapere	P05	819-493	6 km North of Ohaewai on SH	426

Lake Ora	Q06	011-027	Able to walk around lake. Lake area approx 7 acres.	506
Lake Owhareiti	P05	964-455	Accessed off Ludbrook Road off SH 1 at Pakaraka	425
Marua	Q06	035-025	Private irrigation dam. Access through farm.	141
Matakohe	Q08	065-014	Turn right off State Highway 12 when heading to Ruawai into Oparakau Rd. Follow Rd till Ball Rd is reached . Follow Ball Rd, then take the first left into Murphy Rd. Irrigation dam is 12 Hectares in size on private property.	149
Mimiwhangata	Q06	403-103		502
Opahi Swamp	P06	038-335	Off Motatau Road near Maromaku from SH1	505
Pouto	Q09	135-387	Turn right just before road bridge on Pouto road. Bridge is approx 2.5km before the end of the road. Follow road until Lake is sighted on the right hand side.	144
Pouto	PO9	042-042	Turn right off Pouto Peninsula onto Ari Ari Rd, follow road until the first track on the left is encountered. Follow track until lake is spotted.	146
Pouto	PO9	004-049	45 KMS from Dargaville on Pouto Rd. Lake is visual from road on right hand side heading South.	148
Pouto	Q09	014-038	Same as Lake Rotokawau except lake is on the left hand side of the road as one proceeds.	145
Red Hill	R08		Off Red Hill Cemetery Road on Leith McKenzie property	427
Ruakaka				424
Smiths Irrigation	Q06	214-222	Private Farm Race Leading from Tanekaha Road, Off Jordan Valley Road	552
Souther	P05	908-595	Access on foot from Wiroa Road Past Kerikeri Airport.	415
Waipu	Q09	040-078	Situated near township.	135
Waitangi	PO5	003-064	Check topo for access via KeriKeri township.	151
Waro Lake	Q06	274-230	Go into Hikurangi township, drive past recycling/rubbish station down side road (east of main road). Lake at end of side road.	570

	Wellsford	Q09	487-425	First turn right off State Highway 1 past Golf Course. Oxidation ponds situated at end of road.	134
	Whakapara	Q06	024-027	Access off state highway 1 where the road crosses the Whakapara river. Follow Southern river bank.	140
	Whangarei	Q07	005-030	Aprox 1km down RewaRewa Rd off State Highway 1 when entering Whangarei. Easy access from road edge through gates. District Council owned	154
Region	Otago				
	Site	Map No	Grid Ref	Access Details	Ref No
	Balclutha			Through gate of sewage pond turn right approximately 250m to point where all of the pond can be seen.	163
	Big Boggy				202
	Blakelys Dam	H42	783-568	#188 off Gimmerburn/ Waipata Rd	188
	Blueskin Bay			Viewed from vantage point approximately 500m past railway on route to Warrinton?	173
	Borrow Pits	I45	912-677	View from main road	569
	Carr's Oxbow	H42	736-445	From gate 1/2 way down hill on Pateroa - Puketoi Road	423
	Creamery RD	H42	803-543	From Creamery Road	183
	Diamond Lake	E40	446-981	Old day use picnic area midway off Gly/Paradise Road	192
	Duffys Lane			Drive along fence line from Duffys lane to end of willow view driveway	182
	Finegand WR			Walked flood bank on SW	164
	Flood Free				165
	Frankton Arm	F41	737-668	Kawarau Falls Motor camp pier south side at outlet	191
	Glenorchy	E41	461-860	Elevated above lagoons midway on road eastern shore	194
	Hawksbury	j43	321-146	Waikouaiti - Walked along the stop bank in the centre of Hawksbury Lagoon	176
	Hoopers Inlet	I44	290-800	Glassed area from Kohuka (outlet) to Hoopers Inlet Road along Hoopers inlet Road to Allans Beech Road, and along road to Murray Farm Point?	171
	Inch Clutha			Drove along road next to main	161

			ponds	
Kaikorai			From standing next to bridge on main road.	169
Kaitangita	H46	663-300	From Road	159
Kidds Rd			Standing on Southern side of pond	180
Kirkpatrick	E41	614-665	Outlet North end of lake	189
Kogans Bridge				181
Lake Dunstan				197
Lake Hayes	F41	802-725	Bendmeer Reserve and Aslo counted GR 797-737 Mill creek confluence reserve north	190
Lake Johnson	F41	736-695	Elevated position above lake on east shore	196
Lake Tuakitoto	H46	647-379	Stationary from anglers access gate at NE corner of main lake	158
Lake Waiholo	H45	855-620	From Titi Road (GR 855-620).	166
Lake Waipori	H45	852-677	From Bert O'Briens front lawn	168
Lone Pine	I42	080-357	Off Golden Point Road?	547
Mathias Dam	H42	840-500	Access through Anglers Access point off Patearoa - Waipiata Road. From hill behind shooters hut.	184
Matukituki				200
McSkimmings	h41	657-803		571
Merton Arm			Walked 3/4 length of estuary along SH1	174
Middlemarch			From access road.	179
Minaret Station				199
Moke Lake	E41	612-685	Elevated point off track SE corner	195
Old River			Walked NW side from Sth to Nth mouth of Clutha	160
Paddock Bay				198
Palmerston	J43	325-235	Walked length of pond (West Shore) adjacent to Horse Range road	178
Papanui Inlet	J44	310-820	Glassed from Inakays? Road over entrance area, then along Cape Saunders? Road, Papanui Inlet Road to Dicks? Road, then along edge of inlet to	172
Patersons Dam	H42			564
Ranfurlly Sewage	H42	823-591	Behind Ranfurlly Township	187
Reid Lake	E40	455-947	Along high terrace, east side	193

			midway?		
	Rutherfords Dam	H42	863-578	Off Waipata - Naseby Road. From dam wall at SW corner	186
	Sinclair Wetland	H45	835-645	From Road to SW at top of the hill (GR 835-645) and from boat ramp	167
	Stirling	H45	621-342	From gravel Road at GR H46 621 342	162
	Stoney Ck			walked along the Southern	177
	Taieri Lake	H42	894-548	From high ground at GR H42 895-545	185
	Tomahawk	I44	191-755	Glassed area from Tomahawk Road	170
	Tomahawk	I44	198-656	From behind hall and Northern carpark and track	365
	Waikouaiti	I43	270-076	Counted birds by standing on the north shore	175
	Wanaka				201
Region	Southland				
	Site	Map No	Grid Ref	Access Details	Ref No
	Acton Downs	E44	453-994	Adjacent Acton Downs Homestead	98
	Big Lagoon	E46	530-455	Through Tony Riegers	543
	City Lagoon	E47	520-095		523
	Daffodil Bay	E47	487-048	From Sandy Point track to Daffodil Bay - walking track to North and grassed area to	568
	Dawson City	D43	107-157	Via Wilderness Road	106
	Gore Oxidation	F45	962-464	Located on southern outskirts of Gore	93
	Invercargill	E47	524-095	From Bluff Rd, on new walking track	538
	Invercargill	E46	520-100	Via city tip	102
	Lake Murihiku	E46	457-120	Via Mark Sutton's paddock	103
	Lake Te Anau	D43	944-163		521
	Lake Te Anau	D43	955-163	Shoreline adjacent Te Anau Golf Course	105
	Little Lake	F47	770-965	Via eastern end Lake Waituna	92
	Lumsden	E44	552-857	Located via .5km SW of Lumsden via NS Transport access road	96
	Mataura	F46	896-348	Located 1 km south of Mataura on true right of Mataura River	94
	Outlet Area	D43	015-135	Via public right of way though O. Buckingham farm.	107

	Peter	E44	523-761	At Caroline adjacent State Highway 6	97
	Riversdale	F44	760-723	Located on Dunn and Cody Road 3kms west of Riversdale	95
	Ryan's Pond	E44	379-780	Via Castle Downs Road	99
	Te Anau	D43	982-207	Adjacent left bank lower Upukeroa River	104
	Waimatuku	E46	375-173	Adjacent mouth of Waimatuku Stream	100
	Wallacetown	E46	482-187	Adjacent Makarewa Stream	101
Region	Taranaki				
	Site	Map No	Grid Ref	Access Details	Ref No
	Geary Road	Q21	299-678	Southern side of Manutahi Raod at the Geary Road corner. Go into paddock on LHS of	45
	Hawera	Q21	189-762	Off Fairfield Road off SH3 or Manawapou Road	41
	Hawken's	R22	536-503	Off the end of Hawken Road, follow track round to the right and along fence line. Climp to top of highest mound.	52
	Ihupuku Road	R22	522-557	Ihupuku Raod opposite the end of Lennox Road	50
	Julian's Lake	P21	870-902	Off SH45 just north of Watino Road	40
	Kaitoke Lake	R22	871-360	Kaitoke Road. From Pritchard property, top of farm track	56
	Lake Grassmere	S22	929-333	SH3, From drive way track shown on topomap	60
	Lake Herengawe	R22	503-555	From Ihupuku Road	49
	Lake Kohata	R22	876-350	Kaitoke Road. Access track from road	57
	Lake Marahau	R22	656-497	Waitotara. Marahau Road, 'Marahau'. Follow tracks to southern and northern ends of lake	54
	Lake Oturi	Q22	490-572	On RHS of Waverley Beach Road heading toward the sea. Entry on lake front (drives birds to far side of lake), then enter Dairy No.90, go into left hand paddock at the second set of gates (the one with a single pine tree in it), go to far bottom corner of paddock, across stile, out on boardwalk to maimai	48
	Lake Pauri	R22	895-343	Pauri Road. At east end of lake, from road	59
	Lake Ratapiko	Q19	248-213	Ratapiko Rd	537

Lake	S22	940-326	SH3 Ken McDowall's place	61
Lake Waiau	R22	540-548	Off Ihupuku Road, walk from southern end half way up the north-western side	51
Lake Waikato	R22	628-513	Russell Road, stables entrance. Roger Handley 3074 SH3 to access Northern end of lake follow race.	53
Lake Waipu	S23	940-269	Rangatahi Road. Through gate with railway irons down to below woolshed	63
Lake Westmere	R22	810-436	Rapanui Road. Enter at Westmere Refuge sign	55
Lake Wairua	R22	884-346	SH3&Kaitoke Road. North arm accessed from Campbell's property (SH3), view points also ski club and Scoutlands	58
Lower Ball Road	Q21	305-664	Up farm race by cowshed and onto gravel track to centre of crescent shaped lake	46
Lower Taumaha	Q21	278-697	Through gate on RHS near lower end of lower Taumaha Road, Manutahi	44
Milne's Lake	Q21	208-757	Left hand lake at the end of Nowell Road off Manawapou Road Hawera	43
Nowell's Lake	Q21	204-760	Right hand lake at the end of Nowell Road off Manawapou Road, Hawera	42
Patea	Q22	372-590	From gate on Motor Camp Road	536
Ratana	S23	949-272	Rangatahi Road, 2 ponds	62
Spence Road	Q21	325-652	RHS by old dairy shed. Park by shed and walk across concrete crossing and then left to centre of crescent shaped lake	47
Waverly	Q22	492-583	Turn right over railway line 700m down Waverly Beach Road from Waverly.	546

Region

Wellington

Site	Map No	Grid Ref	Access Details	Ref No
Barton's Lagoon	S27	041-018	Form Featherston via Murphy's Line and Lake Domain Road. Barton's Lagoon is immediately north of the toilet block situated under pine trees at Lake Domain, it is immediately west of the adjacent count sites at Lake	526
Carterton	S26	203-154	Turn off SH 2 onto Dalefield Road. Entrance to sewage ponds is sign posted.	497

Edwards	S24	232-966	Owner: Mike Edwards 06 329 0847	232
Featherston	S27	077-949	Turn off State Highway 53 onto Donald Street and then turn right onto Viles Road. Entrance to sewage ponds is the first turn on the left along	528
Foxton 3	S24	014-838		495
Foxton 4	S24	014-845	Nigel Sexton 06-329-9797. turn off main road by water tank drive along farm track as far as possible Gap between 3 & 4 on left.	562
House Lake	S24	016-865	1st lake on LHS of Rd, En route to Lake Koputara. Mr Sexton 06-329-9797	563
Kaikokopu	S24	022-898	Owner Charlie Pederson, Access via Himitangi Beach Road 404. Combination Lock	566
Kourarau Dam	T27	371-093	From Gladstone via Tupurupuru Te Wharau Road	243
Lake Domain	S27	044-012	From Featherston via Murphy's Line and Lake Domain Road. To avoid any confusion the count site is not the Lake Domain Lagoon but the wetland immediately adjacent to Simmonds Lagoon at the far eastern boundary of Lake Domain.	238
Lake Koputara	S24	018-869	Owner: Tom Willis 06 327 7397	228
Lake Omanu	S24	009-816	Owner: Wellington Fish and Game	229
Lake Omanuka	S24	077-949	Owner: Cameron McKelvie 06 324 8526	226
Lake Pukekura	S24	140-816	Contact: Richard and/or Geoff George, 06 363 8576	230
Lake	S25	945-635	Off Hokio Beach.	235
Lake Rotowhero	S23	087-165	Owner: Jim McDonald 06 327 5566	225
Lake Wairarapa	S27	041-014	From Featherston via Murphy's Line and Lake Domain Road. Count site is immediately in front of the stand of Radiata Pine at Lake Domain camping	239
Lake Wairarapa	S27	004-940	Off Parera Road then along the stop bank on the south side of the Oporua Spillway. Count is made from the end of the stop bank.	241
Lake Wairarapa	S27	039-990	From Featherston via SH53 and	240

			Diversion Road, then access property of Jane Gillett to the mouth of the Otakura Stream.	
Lake Wairarapa	S27	935-964	From Featherston via Western Lake Road. Count is made from the road side adjacent to the	242
Lake	S25	910-528	From Main Street in Otaki, turn onto Te Rauparaha Street, and continue along Convent Road, and then past the Otaki Golf Course onto Wairongomai Road. The Lake lies to the west of the end of Wairongomai Road across farm land.	234
Lakeview Farm	S25	985-668	Turn off Hokio Beach Road onto Moutere Road. Farm managers residence is at the end of Moutere Road, from this point lagoon can be reached via farm tracks. Contact Lindsay or Wendy Smitt, farm	236
Masterton	T26	355-202	Entrance to sewage ponds is sign posted on Manaia Road just south of intersection with Homebush Road.	496
Matthews	S27	003-913	Turn off Kahutara Road onto Parera Road. From Parera Road walk down the access track to the edge of Matthews Lagoon and then follow the eastern shore of the lagoon south past to row of poplars until a clear view of the lagoon can be	498
Middle Lake	S24	016-868	This Lake is Between Koputara and House Lake	565
Otaki Sewage	S25	902-473	Turn off SH 1 onto Riverbank Road, the entrance to the sewage ponds is signposted.	500
O-Te-Pua	S25	938-498	Turn Off Statehighway 1 just before reaching the Forest Lakes Road turn-off on the left heading north. Contact landowner Graham Booth to arrange access (04 476 9603 or	527
Pounui	R28	878-803	Turn off Western Lake Road and travel along the stop bank that forms the northern shore of Lake Onoke.	499
Pukepuke	S24	024-936	Dept Conservation, PNth, 06 350 9700	227
Smiths	S23	101-021		494
Voss Lagoon	S24	215-843	Owner: Max Voss 06 329 6835	231
Waikanae	R26	827-377	Off State Highway 1, via	233

				Moana Road, turn left at Waikanae Bowling Club onto Ono Huiawa Street, then onto Field Way and William Street, turn left off William Street onto Rutherford Drive, entrance to Sewage Treatment Plant is at the end of Rutherford Drive, contact Kapiti Coast District Council on 04-9045700 to arrange entry.	
	Waitawa Lake	S25	935-513	Off Forest Lakes Road	567
	Waiterere	S25	985-682	Via the McKay property off Waiterere Beach Road	237
Region	West Coast				
	Site	Map No	Grid Ref	Access Details	Ref No
	Blaketown	J32	615-594	Count from Raleigh street and from Floodwall pump station	122
	Hokitika	J32	492-241	View from road.	516
	Lake Brunner -	K32	857-419	Boat 150m from shore along western shores of bay to end of Stormy Point	127
	Lake Brunner -	K32	854-448	Count via centre of Lagoon looking to both edges.	431
	Lake Ianthe	I34	160-920	Motor from jetty across lake to Raupo then anticlockwise around lake edge (150m off shore) 100m down outlet also.	120
	Lake Poerua	K32	865-315	Boat ramp to lake outlet 150m offshore then down middle of lower lake to outlet stream.	129
	Lake Rotokino	I34	010-800	Up outlet creek then into western arm of lake. Count from outlet of that lake. Around southern lake edge 150m off shore to White heron lagoon. Then go into arm with hut at	121
	Lake Ryan	J31	625-629	Counted from access road to farm and from main road to Pt Elizabeth.	124
	Mahinapua	J33	385-214	Anticlockwise around lake 100m off shore - up mirror creek 100m and down lake outlet	430
	NE Shore Lake	K32	855-465	Start at yacht club ramp travel around Molloy, Howitt and Pah Bays 150m from edge. Stop at entrance to Iveagh Bay (separate count /survey line).	432
	North Cobden	J31	620-614	Counted from tiphead road then from Jellyman Park for northern end.	125
	Pheonix Meat	K32	763-579	Counted from dumping platform	128

			just through gate	
Runanga	J31	661-672	Off Bathhouse Road to oxidation pond outlet.	123
South Cobden	J31	620-613	Off stopbank along road edge	126