

Bird Monitoring

in the Vermilion Lakes Wetland

**Banff National Park
2005**

**Report prepared for Parks Canada
Aquatics Section, Banff National Park**

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March 2006**

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Introduction

The Vermilion Lakes consists of three major and numerous minor flood plain lakes along the course of the Bow River in Banff National Park. (Bow Valley Naturalists, 1978). They are in the Montane Ecoregion and occupy an area between the river and the slopes of Mt. Norquay a short distance upstream from the Town of Banff. In the Banff National Park Management Plan they are identified as an Environmentally Sensitive Site.

In the fall of the year 2000, the Canadian Pacific Railway (CPR) installed a series of culverts through the ballast along the rail line which traverses the southern edge of the Vermilion Lakes. The project was intended to address operational and safety concerns on the part of the CPR as well as to meet a strategic goal identified in the Banff National Park Management Plan: *"To restore natural water levels and flows in the Vermilion Lakes"*. (p. 25, 3.14.1)

As part of a program to monitor the effects of the project, we were contracted in 2001 to undertake bird surveys at 8 point count locations in the Vermilion Lakes Wetland where water levels were expected to change. These locations are west of Second Lake and west of Third Lake. They are sites at which, as part of a larger bird monitoring study in the Bow Valley, we had conducted surveys in each of the five years from 1995 to 1999. We have been contracted to repeat these surveys at the Vermilion Lakes each year since 2001.

Five of the sites are in wet willow habitats (including two in spruce/willows) on the north side of the railway tracks while the other three are in willow/poplar habitats south of the tracks. It was anticipated that the primary movement of water as a result of the culvert project would be from the north side of the tracks to the south until levels equalize.

Point counts were done twice at each location in June with the surveys sixteen days apart. We present results in the form of tables showing species and numbers of individual birds for each visit to each site. Brief, very general habitat descriptions for each site also are presented. And we have included tables showing the average numbers of species and individuals recorded in the five years prior to the project at each point as well as the numbers recorded in each of the four years since the culverts were installed.

Methods and Selection of Sites

The eight survey sites were selected initially as part of a representative sample of a variety of habitats in the montane ecoregion of the Bow Valley for the purposes of long term monitoring. They offer the best opportunity to compare pre-and-post-project occurrence of birds in the Vermilion Lakes Wetland given that recent years' data are available. The same point count methods were employed as in the previous surveys.

Point counts have been adopted as a standard method for bird monitoring (Ralph et al, 1993). The version of point counts employed for these surveys was modeled on the Forest Bird Monitoring Program which has been on-going in Ontario since 1987 (Cadman, 1994). By situating each survey site in the midst of a specific habitat or forest type, it is possible to derive data on bird populations that is habitat related.

Each point was surveyed for ten minutes on two occasions, approximately two weeks apart, in June. Surveys were conducted between 5:00 and 9:00 a.m. which is the optimal time for doing a bird census during the breeding season at this latitude (Ralph et al, 1993) and only when

appropriate weather conditions prevailed. All birds heard or seen were recorded as to species and number and as inside or outside a 50 m. diameter circle around the point. Birds flying overhead were recorded as outside the 50 m. circle. For more details on methods see McIvor and McIvor (1995).

Results and Discussion

Tables are presented for each point showing numbers of individual birds and species found inside and outside a 50 m. radius circle around the point. Geographic location as well as a UTM grid reference taken with a Garmin GPS unit are shown. Forest types are identified, along with biophysical ecosites as mapped in Banff National Park (Agriculture Canada 1986). The date and starting time for each point count are reported. Temperature, wind and sky conditions (T.W.S.) for each count are indicated using numbers: Temperature in degrees Celsius; wind speed according to the Beaufort Scale; and sky conditions using Weather Bureau code numbers as is done for the Breeding Bird Survey. (explanation of codes is in Appendix 3).

Site descriptions identify the dominant forest type at each point as well as a general estimate of percentage of canopy cover for the dominant tree species. The size of trees for the species which defines the site is presented as a general estimate (small, medium, large) of diameter at breast height (D.B.H.). Major shrubs are listed where applicable and ground cover is noted. The aspect for each site is indicated. Directions to the points are presented in the form of rough field notes to assist in relocating them.

When these point count sites were first established in 1995, every effort was made to find discrete areas of habitat but it must be noted that this part of Banff National Park is extremely heterogeneous. Therefore the most reliable connections between occurrence of bird species and habitats is to be found within the 50 m. circle. In some cases with these eight points, birds reported from beyond the 50 m. circle may have been in more upland habitats which will be unaffected by the change in water levels. However, we have kept our methods and reporting consistent so that comparisons can be made over time.

Water levels were higher than last year and had risen somewhat again by our second visit except at Points 39 and 40 where conditions remained relatively dry and approximately the same both times. (It should be noted that the beaver pond on the other side of the dam from Point 39 was full of water this year.) Each of the actual point count sites in the willows north of the tracks (Points 33,34,35) was dry for both visits but much of the approach to them the second time was through water at least 30 cm. deep. South of the tracks, in the area that has been flooded since the culvert project, water levels were the highest we have seen; in particular, on our second visit to Point 38, there was at least 10 cm. of water at the site itself that was part of a pool extending through the surrounding forest, the first time we have encountered anything other than dry conditions or widely scattered puddles at this location. There was more than 60 cm. of water in some of the deeper areas we waded through to approach these points.

We recorded two species that we had not detected in previous years at any of the sites: Gray Catbird at Point 38 and LeConte's Sparrow at Point 39. At individual sites, some species were recorded for the first time in ten years of surveys: Dark-eyed Junco at Point 33 and Point 35; Common Loon at Point 36 and Point 39; also at Point 36, American Bittern and Yellow-rumped Warbler; and Solitary (probably Cassin's) Vireo at Point 40.

In last years' report we noted that Fox Sparrow at Point 39 was the only case where a species that had not been recorded at a site in the five years before the culvert project, had been found

each year after it; this year continued that trend of occurrence. And the opposite situation prevailed at Point 37 where Savannah Sparrow, after we failed to detect it this year, remains the only species that had been found each year before the project but not once afterwards.

The year to year variability that is such a notable feature of bird monitoring continued with from 6 to 8 species recorded at points where they were not found the year before, and 3 to 8 species not recorded at points this year where they had been the year before. This change over produced a decrease of 1 species at Points 36 and 39, and increases of 1 at Point 33, 2 at Points 34, 35, 37 and 40, and 3 at Point 38.

Number of individual birds decreased by 2 at Points 35 and 38, and 3 at Point 39 while increasing by 1 at Point 33, 5 at Point 34, 7 at Point 37, 9 at Point 36 and 29 at Point 40 (a major proportion of this last number is attributable to a flock of Cedar Waxwing that flew overhead).

When we compared the average number of species per point over the 5 years prior to the culvert project with the 5 year post-project averages, we found a decrease at half the sites by:

- 1 at Point 34,
- 2 at Points 37 and 38,
- 2.4 at Point 36

and an increase at the other half by:

- 1 at Point 40,
- 1.8 at Point 33
- 4.2 at Points 35 and 39.

Conducting a similar comparison with average numbers of individual birds we found a post-project decrease at half the sites by

- 2.6 at Point 38
- 2.8 at Point 39
- 7.6 at Point 36
- 8.6 at Point 37

and an increase at the others by:

- .2 at Point 40
- 2.2 at Point 34
- 3.8 at Point 35
- 5.2 at Point 33

Point 34 showed a decrease of 1 species but an increase of 2.2 individual birds. And Point 39 showed an increase of 4.2 species but a decrease of 2.8 individuals. Otherwise, at 3 sites the post-project average represented an increase both of species and individuals while the average numbers for both decreased at 3 sites. The area south of the railway tracks where more permanent deeper water levels provide the most dramatic evidence of the effects of the project, was the location of all 3 points (36, 37, 38) at which numbers of species and individuals both decreased.

In concluding, as we did last year, we recommend this study continue. This was the final year of our participation in the role of collecting and reporting data but we hope someone else will carry on. There now are 10 years of data that may provide a useful basis for far more intricate or rigorous analysis than we could provide. We trust that analysis will be undertaken. As for further monitoring of these sites, it is not an expensive proposition for Parks Canada. The points are situated in an ecologically rich, dynamic part of the landscape of the park and on a small scale, have much to contribute to a program of bird monitoring. Ten years is a significant start; we sincerely hope Parks Canada will sustain the effort in years to come.

BIRD MONITORING IN THE VERMILION LAKES WETLAND 2005

POINT 33	Location: VERMILION LAKES	UTM: EASTING:597042 NORTHING:5670400
Ecoregion: MONTANE	Eosite: (VL1)	Forest Type: WILLOW

DATE	10/06/05			26/06/05		
TIME	5.04.10			5.04.00		
T.W.S.	1	0	1	5	0	2

	IN	OUT	TOTAL	IN	OUT	TOTAL
CAGO		2	2			
MALL		1	1			
SORA		1	1		1	1
COSN					1	1
ALFL		2	2		1	1
WIFL	1	2	3	2	1	3
AMCR		1	1		1	1
RBNU					1	1
RCKI		1	1		1	1
SWTH		1	1			
AMRO		3	3		2	2
WAVI		1	1		1	1
OCWA		1	1	1		1
YEWB	2		2	1	2	3
TOWA		1	1			
COYE		1	1			
CHSP				1	1	2
CCSP		2	2		1	1
LISP		1	1		2	2
DEJU		1	1			
RWBL		1	1			
# Ind.	3	23	26	5	16	21
# Spcs.	2	17	18	4	13	14
Total species for 2 visits = 21						

IN= INSIDE A 50 M. RADIUS CIRCLE, OUT= OUTSIDE OF CIRCLE

LOCATION:

Cross from the pond west of the Beaver Pond at 2nd. Vermilion Lake to the wide channel running east/west. The point is east of deeper sedge meadow along the channel. A green/pink ribbon is on a tall willow about 18 m. from channel. There are some dead aspens to the north in the trees behind the willow flat as you face Norquay. Cascade Mountain is 10°.

SITE DESCRIPTION:

Open channel 10-20 m. wide on south/east side
 Forest: willow shrubs 1-2 m. high, aspen/poplar/spruce at 40 m. on north edge
 DBH: small to medium
 Tree canopy: open (10%)
 Shrubs: fairly dense willows
 Ground cover: tall (60 cm.) sedges/grasses/herbs
 Aspect: flat

BIRD MONITORING IN THE VERMILION LAKES WETLAND 2005

POINT 34	Location: VERMILION LAKES	UTM: EASTING:596837 NORTHING:5670335
Ecoregion: MONTANE	Ecosite: (VL1)	Forest Type: WILLOW

DATE	10/06/05			26/06/05		
TIME	5.26.40			5.22.00		
T.W.S.	0	0	1	5	0	2

	IN	OUT	TOTAL	IN	OUT	TOTAL
MALL					1	1
SORA					1	1
COSN		1	1			
ALFL		1	1		1	1
WIFL		2	2	1	3	4
AMCR		1	1		2	2
RCKI		1	1		1	1
AMRO					1	1
WAVI		2	2		1	1
OCWA		1	1		1	1
YEWB	2	2	4	2		2
TOWA		1	1		1	1
AMRE		1	1		1	1
COYE	2	1	3			
WIWA		1	1		2	2
CHSP		1	1			
CCSP		1	1		1	1
SVSP		1	1			
LISP				1	1	2
BHCO		1	1		1	1
# Ind.	4	19	23	4	19	23
# Spcs.	2	16	16	3	15	16

Total species for 2 visits = 20

IN= INSIDE A 50 M. RADIUS CIRCLE, OUT= OUTSIDE OF CIRCLE

LOCATION:

Follow edge of channel 200 m. west of Point 33. Green/pink ribbon on fall dead stick beyond a dead tree and a clump of dead willows. The point is 8 m. in from edge of willows on channel side.

SITE DESCRIPTION:

Open channel as for Point 33

Forest: willows up to 2.5 m. high, spruce/poplar on north/west bank just beyond 50m.

Tree canopy: fairly open (20%)

Shrubs: fairly dense willows

Ground cover: tall sedges/grass/horsetail/herbs

Aspect: flat

BIRD MONITORING IN THE VERMILION LAKES WETLAND 2005

POINT 35	Location: VERMILION LAKES	UTM: EASTING:596632 NORTHING:5670227
Ecoregion: MONTANE	Ecosite: (VL1)	Forest Type: WILLOW

DATE	10/06/05			26/06/05		
TIME	5.44.30			5.38.40		
T.W.S.	1	0	1	4	0	1

	IN	OUT	TOTAL	IN	OUT	TOTAL
MALL		2	2			
SORA					1	1
COSN		1	1		1	1
ALFL		2	2			
WIFL		3	3	2	2	4
BBMA					1	1
AMCR		2	2		3	3
BCCH					1	1
MOCH					1	1
RCKI					1	1
SWTH		3	3		1	1
AMRO	1	2	3		2	2
WAVI		1	1		1	1
OCWA	1	2	3		1	1
YEWB	2	2	4		1	1
AMRE					1	1
COYE		1	1	2		2
WIWA					1	1
CHSP	1		1			
CCSP		1	1		1	1
SVSP					1	1
LISP				3		3
DEJU					1	1
RWBL					1	1
BHCO		2	2		1	1
# Ind.	5	24	29	7	24	31
#Spcs.	4	13	14	3	20	22
Total species for 2 visits = 25						

IN= INSIDE A 50 M. RADIUS CIRCLE, OUT= OUTSIDE OF CIRCLE

LOCATION:

Follow edge of channel 200 m. west of Point 34. Green/pink ribbon on tall dead willow with live willow at base, 10 m. from edge of willows on channel side. There is a 3 m. high spruce to the right as you face Mt. Norquay.

SITE DESCRIPTION:

Open channel as for Points 33, 34
 Forest: no trees
 Tree canopy: not applicable
 Shrubs: sparse willows 1 m. high , some birch, many dead stems
 Ground cover: sedges/horsefai/ herbs/grasses
 Aspect: flat

BIRD MONITORING IN THE VERMILION LAKES WETLAND 2005

POINT 36	Location: VERMILION LAKES	UTM: EASTING:595060 NORTHING:5669765
Ecoregion: MONTANE	Ecosite: (VL3)	Forest Type: POPLAR/WILLOW

DATE	10/06/05	26/06/05
TIME	7.05.20	7.04.50
T.W.S.	3 0 2	6 0 1

	IN	OUT	TOTAL	IN	OUT	TOTAL
COLO		1	1			
AMBI	1		1			
MALL		1	1			
COSN		1	1			
RUHU	1		1	2		2
NOFL					1	1
PIWO		1	1		1	1
WIFL	1		1	1	1	2
AMCR		2	2		1	1
CORA					1	1
BCCH	1		1			
RCKI					1	1
SWTH		1	1		1	1
WAVI	1	1	2		2	2
YEWB	1	1	2		2	2
YRWA		1	1			
AMRE	2		2	2		2
NOWA	1		1	1		1
COYE		2	2	1		1
SOSP	1		1	1		1
RWBL		2	2		2	2
PISI					2	2
# Ind.	10	14	24	8	15	23
# Spcs.	9	11	18	6	11	16

Total species for 2 visits = 22
 IN= INSIDE A 50 M. RADIUS CIRCLE, OUT= OUTSIDE OF CIRCLE

LOCATION:

From the end of Verm. Lakes Rd., go to the large beaver pond west of 3rd. Verm. Lake. Cross along dam to the railroad track. Go west on track about 60 m. from small beaver dam by track. Go into the tall willows between 2 pools on south side of tracks. Follow ribbons. The point is on big willow clump 3 m. behind small dead spruce. Large dead log at base pointing to the small standing dead spruce.

SITE DESCRIPTION:

Forest: dominant tall (9 m.) willows. Outside edge of 50 m circle: spruce/poplar. Small clearings between willow clumps
 DBH: small to medium
 Tree canopy: open (10%)
 Shrubs: willows
 Ground cover: grasses/herbs/horsetail . Flooded during surveys
 Aspect: flat

BIRD MONITORING IN THE VERMILION LAKES WETLAND 2005

POINT 37	Location: VERMILION LAKES	UTM: EASTING:595344 NORTHING:5669685
Ecoregion: MONTANE	Ecosite: (VL3)	Forest Type: POPLAR/WILLOW

DATE	10/06/05	26/06/05
TIME	7.32.50	7.32.40
T.W.S.	3 0 2	6 0 1

	IN	OUT	TOTAL	IN	OUT	TOTAL
COSN		1	1			
WO?					1	1
LEFL	1		1	1	1	2
AMCR		2	2			
BCCH	1	1	2		1	1
RBNU	1		1			
RCKI					1	1
SWTH					1	1
WAVI		2	2	1	1	2
TEWA	1		1			
OCWA					1	1
YEWB		2	2		2	2
YRWA					1	1
AMRE	1		1	1	1	2
NOWA		1	1		1	1
COYE		1	1	1		1
CHSP		1	1			
FOSP		1	1	1		1
SOSP		1	1		1	1
BHCO					2	2
# Ind.	5	13	18	5	15	20
# Spcs.	5	10	14	5	13	15

Total species for 2 visits = 20

IN= INSIDE A 50 M. RADIUS CIRCLE, OUT= OUTSIDE OF CIRCLE

LOCATION:

Follow railway tracks east of Point 36 to fence post with page wire at end of clearing (opposite east end of pond on north side of track). Follow ribbon trail (8) through willows as it follows the west edge of a large meadow. The point with green/pink ribbon is a small poplar 15 m. south from west bay of meadow. Large poplar 6 m. to the west.

SITE DESCRIPTION:

Forest: mix of tall willows/poplars, some spruce
 DBH: small to large willows, small to large poplars , small to medium spruce
 Tree canopy: fairly dense (30%)
 Shrubs: scattered willows, some gooseberry
 Ground cover: grasses/herbs/horsetail./sedge . Flooded during surveys
 Aspect: flat

BIRD MONITORING IN THE VERMILION LAKES WETLAND 2005

POINT 38	Location: VERMILION LAKES	UTM: EASTING:595615 NORTHING:5669790
Ecoregion: MONTANE	Ecosite: (VL3)	Forest Type: POPLAR/WILLOW

DATE	10/06/05			26/06/05		
TIME	7.54.10			7.55.0		
T.W.S.	4	0	2	7	0	1

	IN	OUT	TOTAL	IN	OUT	TOTAL
LEFL	2	1	3	1	2	3
AMCR					1	1
BCCH					1	1
RBNU		1	1			
RCKI		1	1			
SWTH					1	1
GRCA		1	1			
WAVI	1		1	1		1
REVI		1	1			
YEWB	2		2		1	1
YRWA	1	1	2	1		1
AMRE	1	1	2	1		1
NOWA				1	1	2
COYE					1	1
FOSP		1	1			
SOSP				1		1
RWBL					1	1
PISI					1	1
# Ind.	7	8	15	6	10	16
# Spcs.	5	8	10	6	9	13
Total species for 2 visits = 18						

IN= INSIDE A 50 M. RADIUS CIRCLE, OUT= OUTSIDE OF CIRCLE

LOCATION:

Go east from Point 37 along railway tracks to the square cement foundation on each side of tracks. Follow ribbon trail south of tracks as if meanders through willows. The point is in the middle of poplar woods. Green pink ribbons on small poplar near 2 broken 6m. high poplars in clearing behind a leaning poplar.

SITE DESCRIPTION:

Forest: tall poplars, some tall willows
 DBH: large
 Tree canopy: dense (40%)
 Shrubs: rose/willows/a few raspberries
 Ground cover: horsetail/grasses/herbs/small shrubs
 Aspect: flat

BIRD MONITORING IN THE VERMILION LAKES WETLAND 2005

POINT 39	Location: VERMILION LAKES	UTM: EASTING:595173 NORTHING:5669944
Ecoregion: MONTANE	Ecosite: (VL1)	Forest Type: SPRUCE/WILLOW

DATE	10/06/05			26/06/05		
TIME	6.43.30			6.35.0		
T.W.S.	2	1	0	4	0	2

	IN	OUT	TOTAL	IN	OUT	TOTAL
COLO					1	1
COSN		1	1			
WIFL				1	1	2
AMCR		1	1		1	1
BCCH		1	1			
RBNU		1	1			
SWTH				1	2	3
SOVI		1	1			
WAVI		1	1			
OCWA		1	1			
YEWB		2	2			
YRWA		1	1			
NOWA		1	1		1	1
COYE	1	1	2	1	1	2
SVSP					1	1
LESP	1		1			
FOSP		1	1		1	1
SOSP		1	1	1		1
LISP	1		1	1	1	2
WCSP					1	1
RWBL	1	1	2		3	3
BHCO	1		1	1	4	5
PISI		1	1			
# Ind.	5	16	21	6	18	24
# Spcs.	5	15	18	6	12	13
Total species for 2 visits = 23						

IN= INSIDE A 50 M. RADIUS CIRCLE. OUT= OUTSIDE OF CIRCLE

LOCATION:

Back along the beaver dam west of 3rd. Vermilion Lake. The point is east of beaver lodge. Watch for green/pink ribbon on tallest dead spruce.

SITE DESCRIPTION:

Forest: willow/spruce in marsh
 DBH: small
 Tree canopy: open (5%)
 Shrubs: willow/birch/a few saskatoon 1.5 m high
 Ground cover: sedges (30 cm.) tall/grasses/moss on hummocks
 Aspect: flat

BIRD MONITORING IN THE VERMILION LAKES WETLAND 2005

POINT 40	Location: VERMILION LAKES	UTM: EASTING:595503 NORTHING:5670283
Ecoregion: MONTANE	Ecosite: (VL1)	Forest Type: SPRUCE/WILLOW/BIRCH

DATE	10/06/05	26/06/05
TIME	6.18.10	6.09.40
T.W.S.	1 0 1	4 0 2

	IN	OUT	TOTAL	IN	OUT	TOTAL
COSN		1	1			
NOFL		1	1			
PIWO		1	1			
WIFL				1	1	2
AMCR		1	1		2	2
RBNU		1	1			
SWTH					2	2
AMRO		1	1			
CEWX		22	22			
SOVI		1	1			
OCWA	1		1			
NOWA		1	1			
COYE	2	1	3	1	1	2
WETA					1	1
CHSP	1	1	2		1	1
SVSP		1	1			
SOSP	2	1	3	1		1
LISP	1		1			
RWBL	2	4	6	1	4	5
BHCO				2		2
# Ind.	9	38	47	6	12	18
# Spcs.	6	14	16	5	7	9
Total species for 2 visits = 20						

IN= INSIDE A 50 M. RADIUS CIRCLE, OUT= OUTSIDE OF CIRCLE

LOCATION:

Cross on the culverts between 3rd. Vermilion Lake and pond on west side. Follow edge of pool and go towards the stunted spruce to the south/west. The point is a 5 m. high leaning dead spruce (pink ribbon).

SITE DESCRIPTION:

Forest: stunted & scattered spruce/some dead tall willow stems
 Tree canopy: open (1%)
 Shrubs: spruce/willow/birch
 Ground cover: wet sedges/grasses/horsefall
 Aspect: flat

TABLE 1. Average numbers of **species** recorded over the five years prior to the project at each point, the numbers recorded in 2001, 2002, 2003, 2004, 2005 and the average numbers of **species** recorded over the five years after the project.

POINT #	5 year average	2001	2002	2003	2004	2005	5 year average
Point 33	19.6	20	23	23	20	21	21.4
Point 34	20.6	17	23	20	18	20	19.6
Point 35	19.0	20	24	24	23	25	23.2
Point 36	22.6	19	19	18	23	22	20.2
Point 37	19.8	18	17	16	18	20	17.8
Point 38	19.0	14	19	19	15	18	17.0
Point 39	19.6	21	23	28	24	23	23.8
Point 40	16.2	14	19	15	18	20	17.2

TABLE 2. Average numbers of **individuals** recorded over the five years prior to the project at each point, the numbers recorded in 2001, 2002, 2003, 2004, 2005, and the average numbers of **individuals** recorded over the five years after the project.

POINT #	5 year average	2001	2002	2003	2004	2005	5 year average
Point 33	44.0	47	57	49	46	47	49.2
Point 34	44.6	41	56	50	41	46	46.8
Point 35	51.2	47	48	58	62	60	55.0
Point 36	46.2	37	31	40	38	47	38.6
Point 37	41.2	30	31	33	31	38	32.6
Point 38	34.4	28	34	33	33	31	31.8
Point 39	48.2	40	42	52	48	45	45.4
Point 40	40.8	31	38	35	36	65	41.0

**APPENDIX 1. ABBREVIATIONS FOR BIRDS (following Federation of Alberta Naturalists,
The Vertebrate Species of Alberta, Vol. 23, # 3 1993)**

COLO	Common Loon	BOCH	Boreal Chickadee
AMBI	American Bittern	RBNU	Red-breasted Nuthatch
CAGO	Canada Goose	GCKI	Golden-crowned Kinglet
GWTE	Green-winged Teal	RCKI	Ruby-crowned Kinglet
MALL	Mallard	VEER	Veery
BWTE	Blue-winged Teal	SWTH	Swainson's Thrush
CITE	Cinnamon Teal	AMRO	American Robin
AMWI	American Wigeon	VATH	Varied Thrush
GBHE	Great Blue Heron	GRCA	Gray Catbird
RNDU	Ring-necked Duck	CEWX	Cedar Waxwing
COME	Common Merganser	EUST	European Starling
OSPR	Osprey	SOVI	Solitary Vireo
BAEA	Bald Eagle	WAVI	Warbling Vireo
AMKE	American Kestrel	REVI	Red-eyed Vireo
BLGR	Blue Grouse	TEWA	Tennessee Warbler
RUGR	Ruffed Grouse	OCWA	Orange-crowned Warbler
SORA	Sora	YEWB	Yellow Warbler
KILL	Killdeer	YRWA	Yellow-rumped Warbler
SDSA	Spotted Sandpiper	TOWA	Townsend's Warbler
COSN	Wilson's Snipe (Common Snipe)	AMRE	American Redstart
RUHU	Rufous Hummingbird	NOWA	Northern Waterthrush
BEKI	Belted Kingfisher	MGWA	MacGillivray's Warbler
RNSA	Red-naped Sapsucker	COYE	Common Yellowthroat
NOFL	Northern Flicker	WIWA	Wilson's Warbler
PIWO	Pileated Woodpecker	WETA	Western Tanager
WWPE	Western Wood Peewee	BHGR	Black-headed Grosbeak
ALFL	Alder Flycatcher	CHSP	Chipping Sparrow
WIFL	Willow Flycatcher	CCSP	Clay-colored Sparrow
LEFL	Least Flycatcher	SVSP	Savannah Sparrow
HAFI	Hammond's Flycatcher	LESP	Le Conte's Sparrow
EAKI	Eastern Kingbird	FOSP	Fox Sparrow
TESW	Tree Swallow	SOSP	Song Sparrow
BRSW	Barn Swallow	LISP	Lincoln's Sparrow
GRJA	Gray Jay	SWSP	Swamp Sparrow
CINU	Clark's Nutcracker	WCSP	White-crowned Sparrow
BBMA	Black-billed Magpie	DEJU	Dark-eyed Junco
AMCR	American Crow	RWBL	Red-winged Blackbird
CORA	Common Raven	BRBL	Brewer's Blackbird
BCCH	Black-capped Chickadee	BHCO	Brown-headed Cowbird
MOCH	Mountain Chickadee	RECR	Red Crossbill
		PISI	Pine Siskin

CODES FOR WIND SPEED AND SKY CONDITIONS

Temperature, wind and sky conditions (T.W.S.) are indicated using numbers: Temperature in degrees Celsius; wind speed according to the Beaufort Scale; and sky conditions using Weather Bureau code numbers as is done for Breeding Bird Surveys.

WIND SPEED CODES:

Beaufort #'s	Wind Speed in miles/hr.	Indicators of Wind Speed
0	Less than 1	Smoke rises vertically
1	1 to 3	Wind direction shown by smoke drift.
2	4 to 7	Wind felt on face; leaves rustle.
3	8 to 12	Leaves, small twigs in constant motion; light flag extended.
4	13 to 18	Raises dust and loose paper; small branches are moved.
5	19 to 24	Small trees in leaf sway; crested wavelets on inland waters.

SKY CONDITION CODES:

- 0 - Clear or a few clouds
- 1 - Partly cloudy (scattered) or variable sky
- 2 - Cloudy (broken) or overcast
- 4 - Fog or smoke
- 5 - Drizzle
- 7 - Snow
- 8 - Showers

LIST OF REFERENCES

- Agriculture Canada. 1986. Maps produced from Banff National Park Biophysical map sheets.
- Cadman, M. 1994. Forest Bird Monitoring Program - 1994 Bird Survey Instructions. Canadian Wildlife Service. 6 pp.
- Federation of Alberta Naturalists. 1993. The Vertebrate Species of Alberta. Supplement to Alberta Naturalist, Vol 23, Number 3. 16 pp.
- Holland, W.D. and G.M. Coen. 1983. Ecological (Biophysical) Land Classification of Banff and Jasper National Parks Vol.'s I and II. Alberta Institute of Pedalogy Publication No. M-83-2. pp. 193 and pp. 540.
- Holroyd, G.L. and K.J. Van Tighem. 1983. Ecological (Biophysical) Land Classification of Banff and Jasper National Parks Vol. III: The Wildlife Inventory. Canadian Wildlife Service report to Parks Canada. 444 pp.
- Mclvor, M. and D. Mclvor. 1995. Bird Monitoring in the Bow Valley, Banff National Park 1995. Report prepared for Parks Canada Heritage Resource Conservation. 91pp.
- Mclvor, M. and D. Mclvor. 1997. Bird Monitoring in the Bow Valley, Banff National Park 1996. Report prepared for Parks Canada Heritage Resource Conservation. 76pp.
- Mclvor, M. and D. Mclvor. 1998. Bird Monitoring in the Bow Valley, Banff National Park 1997. Report prepared for Parks Canada Heritage Resource Conservation. 77pp.
- Mclvor, M. and D. Mclvor. 1999. Bird Monitoring in the Bow Valley, Banff National Park 1998. Report prepared for Parks Canada Heritage Resource Conservation. 79pp.
- Mclvor, M. and D. Mclvor. 2002. Bird Monitoring in the Vermilion Lakes Wetland, Banff National Park 2001. Report prepared for Parks Canada. Aquatics Section, Banff National Park. 21 pp.
- Mclvor, M. and D. Mclvor. 2003. Bird Monitoring in the Vermilion Lakes Wetland, Banff National Park 2002. Report prepared for Parks Canada. Aquatics Section, Banff National Park. 16 pp.
- Mclvor, M. and D. Mclvor. 2004. Bird Monitoring in the Vermilion Lakes Wetland, Banff National Park 2003. Report prepared for Parks Canada. Aquatics Section, Banff National Park. 15 pp.
- Mclvor, M. and D. Mclvor. 2005. Bird Monitoring in the Vermilion Lakes Wetland, Banff National Park 2004. Report prepared for Parks Canada. Aquatics Section, Banff National Park. 15 pp.
- Parks Canada. 1997. Banff National Park Management Plan. 85pp.
- Ralph, C.J., G.R. Geupel, P.Pyle, T.E. Martin and D.F. DeSante. 1993. Handbook of Field Methods for Monitoring Landbirds. Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture. 41 pp.