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Title: **Winter and Breeding Bird Surveys at Los Alamos National Laboratory Progress Report for 2010 to 2011**

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Executive Summary

LANL initiated a multi-year study of migratory birds in Fiscal Year (FY) 2011 to implement the Biological Resources Management Plan (BRMP), and comply with Federal laws, executive orders and regulations related to migratory birds. The objective of the ongoing study is to monitor patterns of bird abundance, richness, and population trends over time at the Los Alamos National Laboratory (LANL). LANL biologists completed point count surveys beginning in the winter of 2010 and again in the summer of 2011. Four habitat types were surveyed for this project based on the 1/4 hectare physiognomic cover classes in the LANL land cover map (McKown et al 2003). Habitat types included 1) mixed conifer forest, 2) ponderosa forest, 3) wetland/riparian, and 4) pinyon-juniper woodland. Transects were approximately 2.50 to 2.75 km in length and contained 10 survey points spaced approximately 250 meters apart. Winter surveys took place in each of the four habitat types in December, January, and February. The summer breeding bird surveys were conducted in each of the four habitat types between May 2011 and July 2011. The third and final survey in the mixed conifer habitat was cancelled because of the Las Conchas Wildfire.

More than 1900 birds, representing 81 species were recorded during the FY11 surveys. Thirty-one species were detected during the winter surveys and 73 species were detected during the summer breeding surveys. Two of the species detected at LANL, the Willow Flycatcher and Juniper Titmouse, are listed in the Birds of Conservation Concern compiled by the U.S. Fish and Wildlife Service (USFWS 2008). One species detected at LANL, the Virginia's Warbler, is listed in the top 100 birds at risk in North America in the Birder's Conservation Handbook (Wells 2007).

Introduction

As part of implementing LANL's BRMP, a monitoring project to monitor avian use of four major habitat types at LANL during the winter and summer months began in the winter of 2010. LANL biologists used standard point count methodology to record avian density and diversity along transects in these four habitat types. Winter surveys provide information about the presence or absence of migratory bird species using LANL as wintering grounds. Summer surveys provide information about what migratory birds are breeding at LANL. These surveys are most valuable when they are conducted over multiple years, as they provide trend data, which can be correlated with regional and national changes in bird populations, changes in the natural environment at LANL, and with LANL operations.

Laws and Restrictions

The Migratory Bird Treaty Act of 1918 (MBTA) is the primary driver for protection of migratory birds in the United States (U.S.). The original 1918 statute implemented the 1916 Convention between the U.S. and Great Britain (for Canada) for the protection of migratory birds. Later amendments implemented treaties between the U.S. and Mexico, the U.S. and Japan, and the U.S. and the Soviet Union (now Russia). Under the MBTA, migratory birds are defined as all native birds in the U.S., except those non-migratory species such as quail and turkey that are managed by individual states.

On August 1, 2006, a Memorandum of Understanding (MOU) was finalized between the USFWS and the Department of Energy (DOE) regarding the implementation of the MBTA at DOE facilities. Under the MOU, subject to the availability of appropriations and in harmony with the DOE/National Nuclear Security Administration (NNSA) missions and capabilities, the DOE agreed to several actions, including:

1. Integrate migratory bird conservation principles, measures, and practices into agency activities, and avoid or minimize, to the extent practicable, adverse impacts on migratory bird resources.

2. Protect, restore, enhance, and manage habitats of migratory birds to the fullest extent practicable, including (a) reviewing migratory bird lists and/or conducting field surveys to determine which species are likely to occur, (b) developing habitat management plans to benefit migratory birds and other species consistent with individual site programs, (c) preventing and abating the pollution or detrimental alteration of migratory bird habitat, and (d) ensuring that migratory bird protection is considered in NEPA project reviews and notifying USFWS if significant adverse impacts cannot be avoided or minimized before the start of an action.

3. Incorporate migratory bird habitat and population management objectives and recommendations into planning processes.

4. Promote appropriate programs and recommendations of comprehensive migratory bird planning efforts such as Partners In Flight (PIF).

5. Obtain permits from the applicable USFWS Regional Migratory Bird Permit Offices for the take of migratory birds as required by law.

6. Identify where take reasonably attributable to DOE actions, other than permitted activities referenced in paragraph 5 above, could affect migratory bird populations or habitats, focusing first on species of concern, their habitats, and key risk factors associated with DOE activities (e.g., installation of power poles and transmission lines, construction projects, invasive weed species eradication and waste treatment which utilizes settling and evaporation ponds).

b. DOE shall inventory and monitor bird populations and habitats, as appropriate and feasible, to facilitate decisions about the need for, and effectiveness of, conservation efforts.

7. Recognize and promote the ecological, economic and recreational values of migratory birds into outreach and educational materials and activities.

Section 6b of the MOU drives LANL's monitoring activities under the BRMP. *The Migratory Bird Best Management Practices Source Document for Los Alamos National Laboratory, Revision 1* (LANL 2010), addresses how LANL mitigates impacts to migratory birds at an institutional level and also this plan identifies the need to monitor migratory birds to detect trends in migratory bird populations at the Laboratory.

Methods

To monitor patterns of bird abundance and richness, and population trends in the habitats found at LANL, line transect and point count surveys were chosen as the most rigorous method for the fewest number of person hours necessary to complete the job. Surveys were conducted along transects across four representative habitat types based on the 1/4 hectare physiognomic cover classes in the LANL land cover map (McKown et al 2003). The four cover types surveyed for this project are mixed conifer forest, ponderosa forest, wetland/riparian, and pinyon-juniper woodland. Transects were approximately 2.75 km in length and allowed for 10 survey points spaced approximately 250 meters apart. These survey routes and points may change over time due to construction activities or access constraints (Figure 1). The final 2011 summer survey in Los Alamos Canyon (mixed conifer forest) was cancelled because of the June 26 Las Conchas Wildfire.

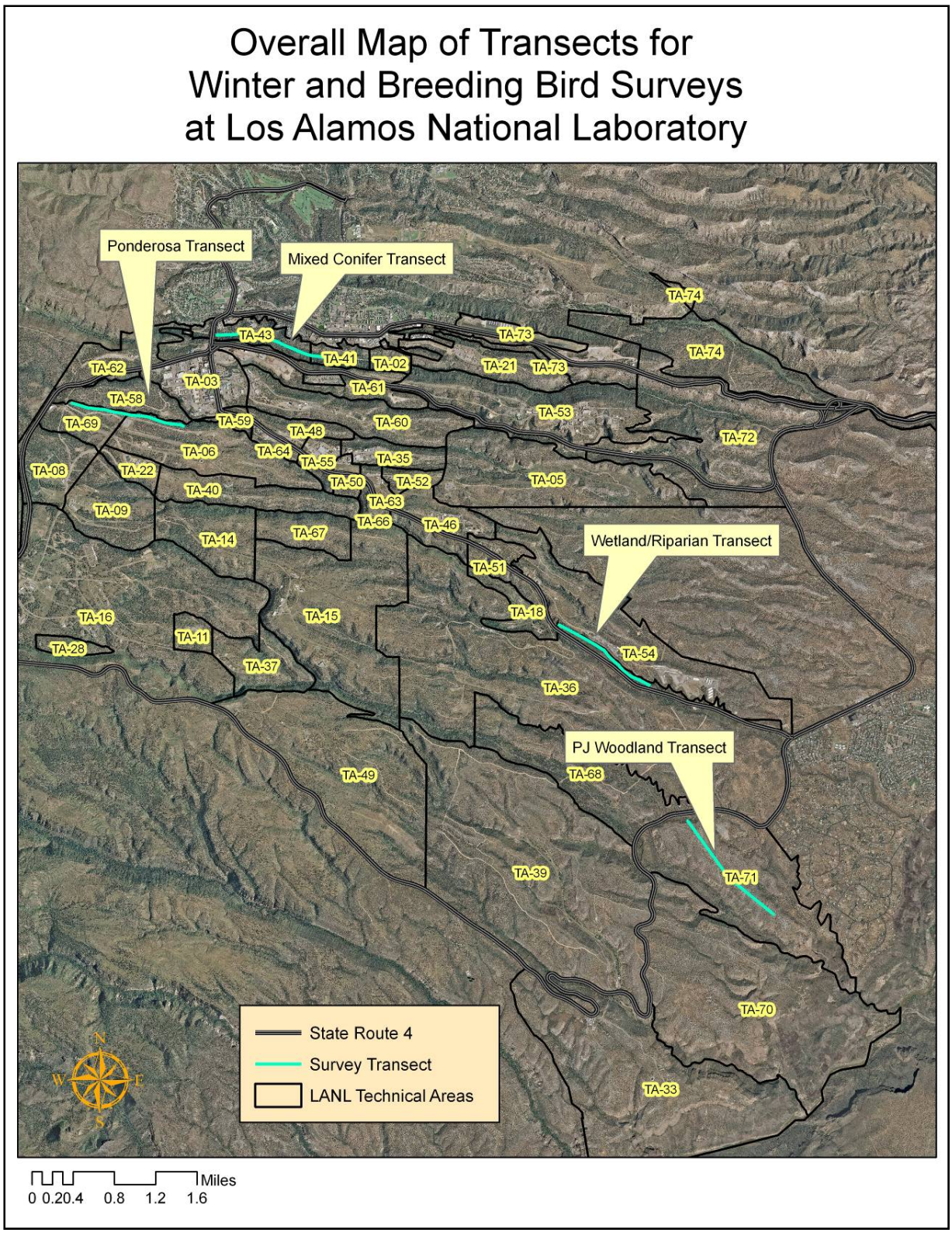

Figure 1. Survey routes at LANL

Replication of transects within each habitat type was not performed because of the difficulty in finding contiguous habitat but it may be added in subsequent years.

Winter surveys are conducted between December 15 and March 15. Winter surveys are approximately every three weeks until three surveys per transect are complete. The time between surveys should not exceed four weeks nor should they be closer than two weeks apart. Ideally, surveys take place in the third week of December, January, and February. Winter surveys are conducted between 0.5 hours after sunrise and 0.5 hours before sunset.

Summer breeding bird surveys are conducted between May 1 and August 15. Breeding bird surveys are approximately every three weeks until three surveys per transect are complete. If only one survey is to be conducted, it should be in the month of June. The time between surveys should not exceed four weeks nor should they be closer than two weeks apart. Ideally, the surveys should take place the third week of May, June, and July. Breeding surveys are conducted between 0.5 hours before sunrise and 3.5 hours after sunrise.

The following steps apply to both winter and breeding bird surveys:

- Each survey consists of 10 points along a transect and each point is approximately 250 meters apart.
- At each point of the survey, the surveyor will look and listen for five minutes, noting any birds encountered or heard. The distance for observations is considered as an "unlimited-distance circular plot"; however, surveyors should note the distance to each bird out to 100 meters. Care is needed to ensure that individual birds are not re-counted from point to point. Use a range finder when possible for measuring the distance.
- While walking between points, any birds encountered that have not otherwise been counted from a previous point or (after reviewing notes) future point should also be noted. However, it should not be the intent for the surveyor to dawdle between points looking for additional birds.
- Surveys should not be conducted during rain or snowstorms or when sustained winds are greater than 15 mph/25 kph.
- Any bird(s) encountered will be recorded on the data sheet (Appendix 1). For each observation, the minimum data collected should include point number, time, species, number of individuals, and distance from the point.
- The "NOTES" section should be used for indicating any potentially important aspects of the survey that may affect the data. Examples include excess noise for nearby equipment, vehicles or aircraft that make it hard to hear the birds. Also, note other wildlife or evidence of wildlife.

Summary statistics will be compiled annually to look at trends in species abundance by season and habitat type. The Shannon's diversity index (*H*) (Shannon 1948) will be used to examine species diversity by season and habitat type. This diversity index is a popular measure in ecology that is used to describe both the species richness and relative abundance of each species in a community. The Shannon's *H* can range from zero to 4.6, where larger values represent increasing diversity and is calculated using the following formula:

$H = -1 (p_i (\ln (p_i))$

Where p_i is a percentage value of a specific species in the total population and ln is the natural log.

Another useful measure is the Shannon's equitability estimate (E_H) which is a measure of evenness in the population. This measure ranges from zero to one where one represents a completely even community in which all of the species' abundances are equal. The Shannon's equitability estimate is calculated using the following formula:

$E_H = H/\ln S$

Where S = species count, ln is the natural log, and *H* is the Shannon's diversity index. The values for each Shannon statistic are averaged by habitat type in each season to give an overall value for each habitat type by season.

The data are maintained by ENV-ES biologists.

Results

Three winter surveys were conducted at each of the four habitat types between December 2010 and February 2011 and three breeding bird surveys were conducted in the summer months at each of the four habitat types between May 2011 and July 2011. The last of the three surveys in the mixed conifer habitat was cancelled due to the June 26 Las Conchas Wildfire.

Bird surveys were completed on the following dates in the winter of 2010 and summer of 2011: December 6 – 9, 2010; January 10, 12, 13, and 18, 2011; February 7, 9, and 10, 2011; May 9 – 12, 2011; June 6 – 9, 2011; and July 11-13, 2011.

Nineteen hundred and seven birds representing 81 species were recorded during these surveys with 31 species detected during the winter bird surveys and 73 species detected during the summer breeding bird surveys (Table 1). Figures 2 and 3 show the breakdown of bird types found in both the winter and summer surveys. Winter surveys were dominated by thrushes and juncos and the summer surveys were dominated by finches and flycatchers. The ten most common species in the winter surveys were Dark-eyed Junco, Western Bluebird, American Robin, Common Raven, Pygmy Nuthatch, Juniper Titmouse, Bushtit, Evening Grosbeak, Townsend's Solitaire, and White-breasted Nuthatch (Table 2). The ten most common species in the summer breeding bird surveys were: Evening Grosbeak, Spotted Towhee, Lesser Goldfinch, House Finch, Western Wood-Pewee, Ash-throated Flycatcher, American Robin, Violet-green Swallow, Virginia's Warbler, Western Bluebird (Table 3). Avian abundances at each transect in each season are available in tables in Appendix 2.

The Shannon diversity indices are detailed in table 4. The mixed conifer transect was the most diverse in both the winter and summer surveys (H = 2.32 and H = 3.38 respectively, Table 4). Evenness values were similar across all habitat types (Table 4).

Table 1. Total Number of Birds Detected by Species and Month

Common Name	Dec 2010	Jan 2011	Feb 2011	May 2011	June 2011	July 2011	Grand Total	Percent of Total
Blackbird							**38**	**1.99**
Brown-headed Cowbird				2	7	10	19	
Great-tailed Grackle				19			19	
Bushtit							**45**	**2.36**
Bushtit	20			1	21	3	45	
Chickadee							**29**	**1.52**
Mountain Chickadee	9	1	3	8	6	2	29	
Crane							**12**	**0.63**
Sandhill Crane	12						12	
Dove							**33**	**1.73**
Mourning Dove				13	11	5	29	
White-winged Dove				1	1	2	4	
Falcon							**1**	**0.05**
American Kestrel					1		1	
Finch							**367**	**19.24**
Evening Grosbeak	8	12		179	2		201	
House Finch			9	28	16	18	71	
Lesser Goldfinch				15	21	26	62	
Pine Siskin	1			17	4	4	26	
Red Crossbill					4	3	7	
Flycatcher							**144**	**7.55**
Ash-throated Flycatcher				10	20	20	50	
Cordilleran Flycatcher				1	2		3	
Dusky Flycatcher					1		1	
Gray Flycatcher				6	7	5	18	
Hammond's Flycatcher				1	4		5	
Say's Phoebe				2	3		5	
Western Kingbird				2	2	3	7	
Western Wood-Pewee					24	30	54	
Willow Flycatcher[1]					1		1	
Gnatcatcher							**6**	**0.31**
Blue-gray Gnatcatcher					4	2	6	
Grosbeak							**17**	**0.89**
Black-headed Grosbeak				2	10	3	15	
Blue Grosbeak						2	2	
Hawk							**2**	**0.10**
Cooper's Hawk	1						1	
Red-tailed Hawk			1				1	

Common Name	Dec 2010	Jan 2011	Feb 2011	May 2011	June 2011	July 2011	Grand Total	Percent of Total
Hummingbird							**46**	**2.41**
Black-chinned Hummingbird					4	3	7	
Broad-tailed Hummingbird				11	12	16	39	
Junco							**172**	**9.02**
Dark-eyed Junco	67	38	33	6	4		148	
Gray-headed Junco	16			4	1		21	
Oregon Junco	3						3	
Kinglet							**9**	**0.47**
Golden-crowned Kinglet	2						2	
Ruby-crowned Kinglet				7			7	
Mockingbird							**1**	**0.05**
Northern Mockingbird					1		1	
Nightjar							**1**	**0.05**
Common Nighthawk					1		1	
Nuthatch							**100**	**5.24**
Pygmy Nuthatch	11	27	14	5	1	8	66	
Red-breasted Nuthatch				2	1		3	
White-breasted Nuthatch	6	8	3	7	2	5	31	
Oriole							**1**	**0.05**
Bullock's Oriole					1		1	
Owl							**1**	**0.05**
Northern Saw-whet Owl				1			1	
Sparrow							**43**	**2.25**
Chipping Sparrow				21	8	3	32	
Song Sparrow				1			1	
White-crowned Sparrow	7	2		1			10	
Swallow							**45**	**2.36**
Violet-green Swallow				4	36	5	45	
Tanager							**11**	**0.58**
Hepatic Tanager				1			1	
Summer Tanager					1		1	
Western Tanager				6	2	1	9	
Thrush							**301**	**15.78**
American Robin	56	10	6	26	19	4	121	
Hermit Thrush				1			1	
Townsend's Solitaire	11	5	2	1		1	20	
Western Bluebird	54	18	42	22	10	13	159	

Common Name	Dec 2010	Jan 2011	Feb 2011	May 2011	June 2011	July 2011	Grand Total	Percent of Total
Titmouse							**43**	**2.25**
Juniper Titmouse[2]	7	8	7	6	7	8	43	
Towhee							**93**	**4.88**
Canyon Towhee	1	1	1	3		5	11	
Green-tailed Towhee				2	4	4	10	
Spotted Towhee	1		1	30	22	18	72	
Vireo							**51**	**2.67**
Plumbeous Vireo				14	10	11	35	
Warbling Vireo				1	15		16	
Warbler							**61**	**3.20**
Audubon's Warbler				6			6	
MacGillivray's Warbler					7		7	
Virginia's Warbler				27	18		45	
Wilson's Warbler				1			1	
Yellow Warbler				1			1	
Yellow-breasted Chat					1		1	
Woodpecker							**71**	**3.72**
Acorn Woodpecker	3	3	4	5	5		20	
Downy Woodpecker	1		1	3	2		7	
Hairy Woodpecker	1	1	2	4	2	3	13	
Red-shafted Flicker	6	2	2	7	6	6	29	
Williamson's Sapsucker				1	1		2	
Wren							**17**	**0.89**
Bewick's Wren					3		3	
Canyon Wren				5	3		8	
House Wren				2		1	3	
Rock Wren				1		2	3	
Corvid							**146**	**7.66**
American Crow			3		3	1	7	
Clark's Nutcracker	1						1	
Common Raven	31	23	17	15	6	11	103	
Steller's Jay		2		3	1		6	
Western Scrub-Jay	4	4		7	7	7	29	
Grand Total	**340**	**165**	**151**	**578**	**399**	**274**	**1907**	**100.00**

[1] Willow Flycatcher listed as species of conservation concern in region 16: Southern Rockies/Colorado Plateau

[2] Juniper Titmouse listed as species of conservation concern in region 16: Southern Rockies/Colorado Plateau

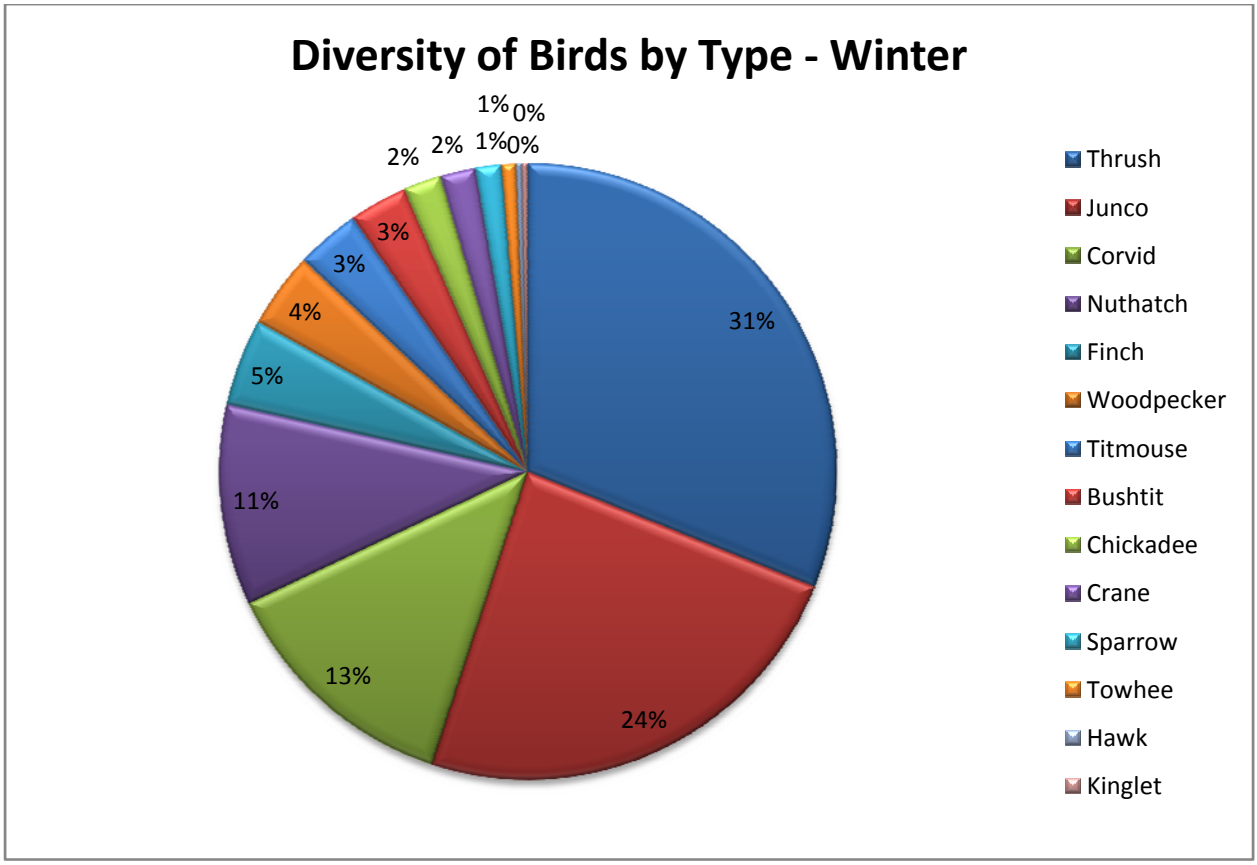

Figure 2. Breakdown of Bird Types in the Winter Surveys

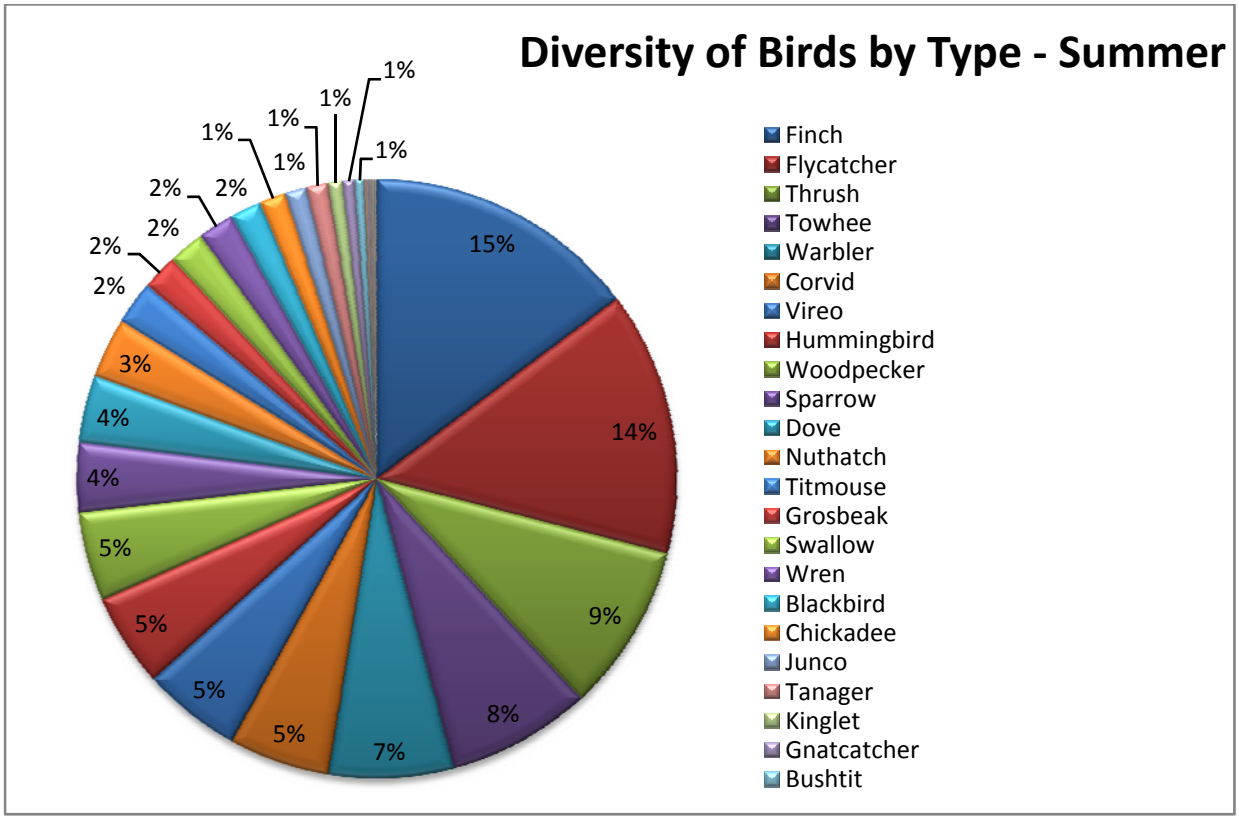

Figure 3. Breakdown of Bird Types in the Summer Surveys

Table 2. Total Number Detected By Species in the Winter.

Common Name	*Detected*
Dark-eyed Junco	138
Western Bluebird	114
American Robin	72
Common Raven	71
Pygmy Nuthatch	52
Juniper Titmouse	22
Bushtit	20
Evening Grosbeak	20
Townsend's Solitaire	18
White-breasted Nuthatch	17
Gray-headed Junco	16
Mountain Chickadee	13
Sandhill Crane	12
Red-shafted Flicker	10
Acorn Woodpecker	10
White-crowned Sparrow	9
House Finch	9
Western Scrub-Jay	8
Hairy Woodpecker	4
Canyon Towhee	3
American Crow	3
Oregon Junco	3
Golden-crowned Kinglet	2
Steller's Jay	2
Downy Woodpecker	2
Spotted Towhee	2
Clark's Nutcracker	1
Red-tailed Hawk	1
Cooper's Hawk	1
Pine Siskin	1
Grand Total	***656***

Table 3. Total Number Detected By Species in the Summer

Common Name	*Detected*	*Common Name*	*Detected*
Evening Grosbeak	181	Red Crossbill	7
Spotted Towhee	70	Ruby-crowned Kinglet	7
Lesser Goldfinch	62	Canyon Wren	6
House Finch	62	Audubon's Warbler	6
Western Wood-Pewee	54	Blue-gray Gnatcatcher	6
Ash-throated Flycatcher	50	Say's Phoebe	5
American Robin	49	Gray-headed Junco	5
Violet-green Swallow	45	Hammond's Flycatcher	5
Virginia's Warbler	45	Downy Woodpecker	5
Western Bluebird	45	White-winged Dove	4
Broad-tailed Hummingbird	39	American Crow	4
Plumbeous Vireo	35	Steller's Jay	4
Common Raven	32	Bewick's Wren	3
Chipping Sparrow	32	Red-breasted Nuthatch	3
Mourning Dove	29	House Wren	3
Pine Siskin	25	Cordilleran Flycatcher	3
Bushtit	25	Rock Wren	3
Western Scrub-Jay	21	Blue Grosbeak	2
Juniper Titmouse	21	Carolina Wren	2
Brown-headed Cowbird	19	Williamson's Sapsucker	2
Red-shafted Flicker	19	Townsend's Solitaire	2
Great-tailed Grackle	19	Common Nighthawk	1
Gray Flycatcher	18	Hermit Thrush	1
Warbling Vireo	16	Willow Flycatcher	1
Mountain Chickadee	16	Bullock's Oriole	1
Black-headed Grosbeak	15	Dusky Flycatcher	1
White-breasted Nuthatch	14	Northern Saw-whet Owl	1
Pygmy Nuthatch	14	White-crowned Sparrow	1
Green-tailed Towhee	10	Yellow-breasted Chat	1
Dark-eyed Junco	10	Yellow Warbler	1
Acorn Woodpecker	10	Song Sparrow	1
Hairy Woodpecker	9	Wilson's Warbler	1
Western Tanager	9	American Kestrel	1
Canyon Towhee	8	Northern Mockingbird	1
Black-chinned Hummingbird	7	Hepatic Tanager	1
Western Kingbird	7	Summer Tanager	1
MacGillivray's Warbler	7	***Grand Total***	***1251***

Table 4. Shannon Values by Transect and Season

Survey	Transect Name	Number of Birds (n)	Species Richness (S)	Shannon's *H*	Shannon's E_H
Winter	Mixed Conifer	128	17	2.32	0.82
Winter	Ponderosa	75	12	1.96	0.79
Winter	Pinyon-juniper	195	16	2.04	0.74
Winter	Wetlands/Riparian	258	20	2.11	0.70
Summer	Mixed Conifer*	343	49	3.38	0.87
Summer	Ponderosa	342	44	3.09	0.82
Summer	Pinyon-juniper	280	37	3.20	0.89
Summer	Wetlands/Riparian	286	43	3.04	0.81

*Only two of the planned mixed conifer surveys were conducted because of the Las Conchas Wildfire.

Discussion

One Willow Flycatcher was detected in June in the wetland/riparian transect. There are five recognized subspecies of the Willow Flycatcher, each of which has a distinct breeding range (USFWS 1995 and Browning 1993). Three of these five could occur at LANL during migration, including the federally endangered subspecies, the Southwestern Willow Flycatcher. The subspecies of the single Willow Flycatcher detected during this project is not certain.

In addition to supporting federally protected species like the Southwestern Willow Flycatcher, LANL lands are important for understanding migratory bird conservation in general. All of the 81 species detected during this project are protected under the Migratory Bird Treaty Act. Additionally, two of the species detected, the Willow Flycatcher and the Juniper Titmouse, are considered Birds of Conservation Concern from Region 16, the Southern Rockies/Colorado Plateau region (USFWS 2008). The primary statutory authority for Birds of Conservation Concern is the Fish and Wildlife Conservation Act of 1980. Another conservation tool used in migratory bird management is the Birder's Conservation Handbook (Wells 2007), which lists the top 100 birds most at risk in North America. One species detected during this study, the Virginia's Warbler, is on the top 100 list. Several other species in the top 100 including the Olive-sided Flycatcher, Mexican Spotted Owl, Gray Vireo, Pinyon Jay, Dusky Grouse, Ferruginous Hawk, Mountain Plover, Brewer's Sparrow, Grace's Warbler, and Bendire's Thrasher that occur or potentially occur at LANL but were not detected during the FY 2011 surveys, but may be detected in subsequent years.

Comparison data from LANL are not available. The most comprehensive breeding bird survey conducted to date was in 2001 (Jewell 2001); however, because this study was not conducted in a systematic manner, comparisons are not relevant. Other project-driven bird surveys have been conducted, but have similar problems (Keller 2003). Over time, this project will provide a long-term dataset on winter and summer bird population trends and diversity at LANL.

The Shannon's diversity indices showed a much larger diversity of birds in the summer months than in the winter months, which is expected because there are many more birds that breed in northern NM than over-winter here. The evenness of the bird communities was similar across seasons and habitats (Table 4). The largest diversity of bird species for both winter and summer was identified in the mixed conifer habitat. This is highlighted by the fact that even though the last mixed conifer survey was

cancelled due to the Las Conchas Wildfire, the mixed conifer habitat still maintained the highest diversity showing the value of this habitat type to breeding birds. The lowest species diversity in the winter was in the ponderosa habitat and in the wetland/riparian habitat during the summer. The extreme drought conditions of 2011 could have affected diversity in some habitats.

Management Recommendations

FY 2011 was the first full year of this effort as part of the BRMP. Continued winter and summer bird surveys will provide a long-term dataset on the ecological health of LANL's avifauna, contribute to meeting DOE's commitments under the MBTA and the MOU, and allow the Laboratory to contribute to national goals in avian conservation monitoring and research. Implementation of the BRMP and the MOU on migratory birds through continued winter and summer bird surveys is inexpensive and provides data that can be tracked annually. In addition to compliance drivers, LANL is beginning the Natural Resource Damage Assessment under the Comprehensive Environmental Response, Compensation, and Liability Act. The damage assessment will determine if any natural resources have been injured because of historical or current work at LANL and baseline ecological data are an important tool in the damage assessment process.

Acknowledgements

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Appendix 1. Survey Form

Winter and Breeding Bird Survey Datasheet

Transect Name: _____

Observer(s): _____

Date: _____ Average Wind Speed: _____ Cloud Cover (%): _____

Point Number	Time	Species	Detected	Distance (Meters)	Notes

Appendix 2. Summary of Species by Transect and Season

Transect and Season	Common Name	Detected	Percent
Ponderosa Transect in the Winter	Common Raven	21	28.00
	Pygmy Nuthatch	18	24.00
	Gray-headed Junco	11	14.67
	Dark-eyed Junco	7	9.33
	White-breasted Nuthatch	7	9.33
	Western Bluebird	4	5.33
	Oregon Junco	2	2.67
	Steller's Jay	1	1.33
	Evening Grosbeak	1	1.33
	Mountain Chickadee	1	1.33
	Acorn Woodpecker	1	1.33
	Hairy Woodpecker	1	1.33
Grand Total Ponderosa Transect in the Winter		**75**	**100.00**
Ponderosa transect in the Summer	Evening Grosbeak	81	23.68
	Western Bluebird	26	7.60
	Plumbeous Vireo	21	6.14
	House Finch	21	6.14
	Western Wood-Pewee	19	5.56
	Broad-tailed Hummingbird	13	3.80
	Red-shafted Flicker	12	3.51
	Chipping Sparrow	11	3.22
	Virginia's Warbler	11	3.22
	Violet-green Swallow	10	2.92
	Pygmy Nuthatch	10	2.92
	White-breasted Nuthatch	9	2.63
	Common Raven	8	2.34
	Dark-eyed Junco	7	2.05
	Pine Siskin	7	2.05
	Ash-throated Flycatcher	7	2.05
	Red Crossbill	7	2.05
	Audubon's Warbler	5	1.46
	Lesser Goldfinch	5	1.46
	Spotted Towhee	4	1.17
	Mourning Dove	4	1.17
	MacGillivray's Warbler	4	1.17
	Steller's Jay	3	0.88
	Western Kingbird	3	0.88
	Bushtit	3	0.88
	American Robin	3	0.88
	Hairy Woodpecker	3	0.88
	Mountain Chickadee	3	0.88
	Ruby-crowned Kinglet	2	0.58
	House Wren	2	0.58
	Williamson's Sapsucker	2	0.58
	Black-headed Grosbeak	2	0.58
	Rock Wren	2	0.58
	Hammond's Flycatcher	2	0.58
	Gray Flycatcher	1	0.29
	Gray-headed Junco	1	0.29

Transect and Season	Common Name	Detected	Percent
Ponderosa transect in the Summer, continued	Western Scrub-Jay	1	0.29
	Red-breasted Nuthatch	1	0.29
	Black-chinned Hummingbird	1	0.29
	Hermit Thrush	1	0.29
	American Kestrel	1	0.29
	Brown-headed Cowbird	1	0.29
	Townsend's Solitaire	1	0.29
	Say's Phoebe	1	0.29
Grand Total Ponderosa transect in the Summer		**342**	**100.00**
Pinyon-Juniper Transect in the Winter	Western Bluebird	81	41.54
	Dark-eyed Junco	23	11.79
	American Robin	19	9.74
	Juniper Titmouse	19	9.74
	Sandhill Crane	12	6.15
	Townsend's Solitaire	8	4.10
	Common Raven	6	3.08
	House Finch	5	2.56
	Evening Grosbeak	5	2.56
	Western Scrub-Jay	4	2.05
	Red-shafted Flicker	4	2.05
	American Crow	3	1.54
	Mountain Chickadee	2	1.03
	White-breasted Nuthatch	2	1.03
	Hairy Woodpecker	1	0.51
	Pine Siskin	1	0.51
Grand Total Pinyon-Juniper Transect in the Winter		**195**	**100.00**
Pinyon-Juniper Transect in the Summer	Ash-throated Flycatcher	29	10.36
	House Finch	25	8.93
	Great-tailed Grackle	19	6.79
	Gray Flycatcher	17	6.07
	Mourning Dove	16	5.71
	Chipping Sparrow	14	5.00
	Western Scrub-Jay	14	5.00
	Spotted Towhee	13	4.64
	Lesser Goldfinch	13	4.64
	Juniper Titmouse	13	4.64
	Western Bluebird	11	3.93
	Evening Grosbeak	10	3.57
	Broad-tailed Hummingbird	9	3.21
	Brown-headed Cowbird	9	3.21
	Western Wood-Pewee	8	2.86
	Common Raven	7	2.50
	Green-tailed Towhee	7	2.50
	Violet-green Swallow	6	2.14
	American Robin	6	2.14
	Western Kingbird	4	1.43
	Canyon Towhee	4	1.43
	Blue-gray Gnatcatcher	4	1.43
	White-winged Dove	3	1.07
	Say's Phoebe	3	1.07
	Black-chinned Hummingbird	2	0.71

Transect and Season	Common Name	Detected	Percent
Pinyon-Juniper Transect in the Summer, continued	Bewick's Wren	2	0.71
	Plumbeous Vireo	2	0.71
	Western Tanager	1	0.36
	Northern Mockingbird	1	0.36
	American Crow	1	0.36
	Summer Tanager	1	0.36
	Red-shafted Flicker	1	0.36
	Bushtit	1	0.36
	Dark-eyed Junco	1	0.36
	Common Nighthawk	1	0.36
	Townsend's Solitaire	1	0.36
	Hairy Woodpecker	1	0.36
Grand Total Pinyon-Juniper Transect in the Summer		**280**	**100.00**
Mixed Conifer Transect in the Winter	Common Raven	34	26.56
	Bushtit	20	15.63
	Pygmy Nuthatch	15	11.72
	Dark-eyed Junco	13	10.16
	Acorn Woodpecker	9	7.03
	Western Bluebird	9	7.03
	Mountain Chickadee	5	3.91
	Gray-headed Junco	5	3.91
	White-breasted Nuthatch	4	3.13
	House Finch	4	3.13
	Townsend's Solitaire	2	1.56
	Golden-crowned Kinglet	2	1.56
	Red-shafted Flicker	2	1.56
	Oregon Junco	1	0.78
	Downy Woodpecker	1	0.78
	Hairy Woodpecker	1	0.78
	Steller's Jay	1	0.78
Grand Total Mixed Conifer Transect in the Winter		**128**	**100.00**
Mixed Conifer Transect in the Summer	Evening Grosbeak	47	13.70
	Violet-green Swallow	23	6.71
	Spotted Towhee	20	5.83
	Virginia's Warbler	18	5.25
	American Robin	18	5.25
	Lesser Goldfinch	16	4.66
	Broad-tailed Hummingbird	16	4.66
	Common Raven	16	4.66
	Warbling Vireo	16	4.66
	Pine Siskin	13	3.79
	Mountain Chickadee	11	3.21
	Acorn Woodpecker	10	2.92
	Plumbeous Vireo	9	2.62
	Canyon Wren	8	2.33
	Western Wood-Pewee	8	2.33
	Western Tanager	7	2.04
	Black-headed Grosbeak	7	2.04
	Western Bluebird	6	1.75
	Brown-headed Cowbird	5	1.46
	Ash-throated Flycatcher	5	1.46

Transect and Season	Common Name	Detected	Percent
Mixed Conifer Transect in the Summer, continued	Gray-headed Junco	4	1.17
	Ruby-crowned Kinglet	4	1.17
	Chipping Sparrow	4	1.17
	Pygmy Nuthatch	4	1.17
	White-breasted Nuthatch	4	1.17
	American Crow	3	0.87
	Downy Woodpecker	3	0.87
	Mourning Dove	3	0.87
	Cordilleran Flycatcher	3	0.87
	Hairy Woodpecker	3	0.87
	Hammond's Flycatcher	3	0.87
	House Finch	3	0.87
	Dark-eyed Junco	2	0.58
	Green-tailed Towhee	2	0.58
	Canyon Towhee	2	0.58
	Red-breasted Nuthatch	2	0.58
	Red-shafted Flicker	2	0.58
	MacGillivray's Warbler	2	0.58
	Bewick's Wren	1	0.29
	Steller's Jay	1	0.29
	White-crowned Sparrow	1	0.29
	Song Sparrow	1	0.29
	Northern Saw-whet Owl	1	0.29
	Black-chinned Hummingbird	1	0.29
	Bushtit	1	0.29
	Dusky Flycatcher	1	0.29
	Wilson's Warbler	1	0.29
	Audubon's Warbler	1	0.29
	Western Scrub-Jay	1	0.29
Grand Total Mixed Conifer Transect in the Summer		**343**	**100.00**
Wetland/Riparian Transect in the Winter	Dark-eyed Junco	95	36.82
	American Robin	53	20.54
	Western Bluebird	20	7.75
	Pygmy Nuthatch	19	7.36
	Evening Grosbeak	14	5.43
	Common Raven	10	3.88
	White-crowned Sparrow	9	3.49
	Townsend's Solitaire	8	3.10
	Mountain Chickadee	5	1.94
	Western Scrub-Jay	4	1.55
	White-breasted Nuthatch	4	1.55
	Red-shafted Flicker	4	1.55
	Canyon Towhee	3	1.16
	Juniper Titmouse	3	1.16
	Spotted Towhee	2	0.78
	Hairy Woodpecker	1	0.39
	Cooper's Hawk	1	0.39
	Clark's Nutcracker	1	0.39
	Red-tailed Hawk	1	0.39
	Downy Woodpecker	1	0.39
Grand Total Wetland/Riparian Transect in the Winter		**258**	**100.00**

Transect and Season	Common Name	Detected	Percent
Wetland/Riparian Transect in the Summer	Evening Grosbeak	43	15.03
	Spotted Towhee	33	11.54
	Lesser Goldfinch	28	9.79
	American Robin	22	7.69
	Bushtit	20	6.99
	Western Wood-Pewee	19	6.64
	Virginia's Warbler	16	5.59
	House Finch	13	4.55
	Ash-throated Flycatcher	9	3.15
	Juniper Titmouse	8	2.80
	Mourning Dove	**6**	2.10
	Violet-green Swallow	6	2.10
	Black-headed Grosbeak	6	2.10
	Western Scrub-Jay	5	1.75
	Pine Siskin	5	1.75
	Brown-headed Cowbird	4	1.40
	Red-shafted Flicker	4	1.40
	Black-chinned Hummingbird	3	1.05
	Chipping Sparrow	3	1.05
	Plumbeous Vireo	3	1.05
	Canyon Towhee	2	0.70
	Western Bluebird	2	0.70
	Mountain Chickadee	2	0.70
	Hairy Woodpecker	2	0.70
	Blue Grosbeak	2	0.70
	Blue-gray Gnatcatcher	2	0.70
	Downy Woodpecker	2	0.70
	Green-tailed Towhee	1	0.35
	White-breasted Nuthatch	1	0.35
	Western Tanager	1	0.35
	Willow Flycatcher	1	0.35
	Broad-tailed Hummingbird	1	0.35
	Hepatic Tanager	1	0.35
	Bullock's Oriole	1	0.35
	Say's Phoebe	1	0.35
	Common Raven	1	0.35
	Yellow-breasted Chat	1	0.35
	White-winged Dove	1	0.35
	House Wren	1	0.35
	Yellow Warbler	1	0.35
	Rock Wren	1	0.35
	Ruby-crowned Kinglet	1	0.35
	MacGillivray's Warbler	1	0.35
Grand Total Wetland/Riparian Transect in the Summer		**286**	**100.00**