Development of a Reliable Population Index for Pacific Coast Band-tailed Pigeons

Progress Report

March 2002

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Webless Migratory Game Bird Research Program
March 2002

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Executive Summary

Population status of the Pacific Coast population of band-tailed pigeons (*Columba fasciata monilis*) is uncertain, while long-term indices point to a serious decline. Beginning in 1998, we examined existing survey data, including Breeding Bird Survey data, Washington State Call Count Routes, and mineral site survey data from Oregon, Washington, and California to evaluate which survey method would offer the most potential to accurately detect short-term population changes (3-5 years). Results from the first three years of study indicate that mineral site counts offer the greatest potential as a survey method to detect change in the Pacific Coast population of band-tailed pigeons. Thus, in the late spring of 2001, we initiated a follow-up study to evaluate the methods and timing for an operational mineral site survey for band-tailed pigeons along the Pacific Coast and to identify additional sites that could be included in the range-wide survey, primarily in British Columbia. Field biologists were stationed in four key locations including, Corvallis and Portland, Oregon, Olympia, Washington, and Vancouver, British Columbia. The field crew conducted mineral site counts for band-tailed pigeons on a weekly basis from June 1 – September 7. Eight potential mineral sites were identified in British Columbia (BC), with two counted on a weekly basis (Hatzic & Port Moody). Pigeons were counted at 10 mineral sites in Oregon on a weekly basis while biologists also visited other known mineral sites and documented pigeon activity and current land-use at these sites. Oregon counts ranged from very few pigeons to as many as 1257. We counted pigeons at 7 mineral sites in Washington on a weekly basis including a variety of tidal and inland areas. We calculated the daily totals, mean, standard deviations and coefficient of variation over different date and time intervals for

the entire study period. By minimizing the coefficient of variation, we identified ranges of dates during which the pigeon counts appeared most consistent relative to the mean. Results from the first years data indicated that the coefficient of variation (CV) for individual sites was on average lower in July for the Olympia and British Columbia sites, while the period from June 15 – July 14 had the lowest CV for Oregon and southern Washington. Conducting the surveys when variation is low should help to produce a more robust population index. By establishing a suitable time frame and identifying new mineral sites for inclusion in the range wide operational survey we hope to create a powerful population index that is capable of detecting significant population changes over short time intervals (3-5 years). These preliminary results are from a study funded by the Webless Migratory Game Bird Research Program (U.S. Fish and Wildlife Service), the Washington Department of Fish and Wildlife, California Department of Fish and Game, Oregon Department of Fish and Wildlife, Oregon State University and the Western Ecological Research Center of the U.S. Geological Survey.

Acknowledgements

We thank the field crew, Lisa Godina, Scott Nelson, Kathleen Harding, and Marc Johnson for their diligent efforts. Biologists in British Columbia (BC), including Andre Breault, Jack Evans, and Gary Grigg provided a wealth of information and knowledge of band-tailed pigeons in BC as well as help with the logistics of doing research in their country. Don Kraege, Washington Department of Fish and Wildlife, and Brad Bales, Oregon Department of Fish and Wildlife provided critical resources to complete the first year of this study. We thank Robert Jarvis, from Oregon State University and Todd Sanders of the Colorado Division of Wildlife for their invaluable insight into pigeons in Oregon and for much of the known information regarding mineral sites in that state. This project was made possible by a grant from the Webless Migratory Game Bird Program administered by David Dolton of the U.S. Fish and Wildlife Service. This project was also supported by the Western Ecological Research Center of the USGS.

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I. Introduction

We initiated this project to develop a reliable population index for band-tailed pigeons. All recent comprehensive literature dealing with research needs for band-tailed pigeons identify the establishment of a reliable population index for both the Pacific and Interior races as the top priority for research (Keppie & Braun, 2000; Braun 1994; Western Migratory Upland Game Bird Tech. Comm. 1994; Jeffrey 1977; Keppie et al. 1970). A standardized population survey to index band-tailed pigeon breeding abundance across the species range currently does not exist. Only two states estimate band-tailed pigeon numbers using species-specific surveys. Washington uses call-count routes (Jeffrey 1989) and mineral spring counts (Don Kraege, Washington Department of Wildlife, unpublished report 1997) to index pigeon populations, whereas Oregon relies on counts at ten mineral sites (Western Migratory Upland Game Bird Technical Committee 1994). Both of these methods have limitations. Access throughout the breeding range is constrained, making call-count routes difficult to distribute through some important breeding areas. Mineral sites are not used consistently in the Four Corners region by band-tailed pigeons, and timing and intensity of use of these sites may vary widely depending on food availability (Braun 1994). We have focused our work on the Pacific Population of band-tailed pigeons as their use of mineral sites throughout their breeding range has been fairly well documented.

Mineral counts conducted in California in 1998-99 and statistical power analysis of various survey methods (Casazza et al. 2000) indicates the high potential for success of a mineral site survey to index abundance of Pacific coast band-tailed pigeons (Table 1).

Table 1. Estimated power of detecting a 10% per annum change in population over a 3-year term at the 0.1 significance level for Pacific Flyway BBS, Washington Call Count, and Washington/Oregon Mineral Site surveys (Casazza et al. 2000).

# of Sites	Pacific BBS	WA Call Counts	WA/OR Mineral Sites
30	0.13	0.19	0.79
50	0.16	0.26	0.94
70	0.19	0.32	0.98
100	0.21	0.41	1.00

When compared with other surveys currently used, mineral site counts have the greatest power for detecting trends. Sample size requirements determined by power analysis suggest that a mineral site count of between 40 and 70 sites would offer a high probability or power (>0.85) to detect trends in pigeon abundance. Trend estimates for both flyway and regional areas may be possible based on the distribution of mineral site counts. Combining regional trend estimates into a single population index offers the potential of monitoring band-tailed pigeon populations on both a regional and flyway-wide scale.

II. Methods

Mineral Site Counts

We counted band-tailed pigeons at 10 known mineral sites in Oregon and seven known sites in Washington as well as 2 sites in British Columbia. Counts were conducted at mineral sites located in each study area from June 1, through September 7 at a frequency of once each week from one half-hour before sunrise to noon, following similar protocol established in the operational Oregon survey and California survey (Casazza et. al. 2000, Jarvis and Passmore 1992). Counts were made from a fixed, concealed position to maintain consistency and minimize disturbance.

Identify and Document New Mineral Sites:

We attempted to identify previously undocumented mineral sites used by band-tailed pigeons, primarily within British Columbia. We used historical records, communication with local birding groups, as well as local and Provincial biologists to help in identifying potential mineral sites that could be used for counts. Once a site was identified, the location of the site (utm coordinates) was recorded using a GPS unit, as well as the approximate number of birds seen using the area. Land use data was collected at each of the sites to quantify ownership, habitat types, and potential threats to continued use of the mineral site by pigeons. Site specific characteristics were recorded at each mineral site including the number of roost trees, and the proximity of these perch sites to the mineral site.

III. Results

Mineral Site Counts:

We conducted multiple mineral site counts at 19 locations (Figure 1) between June 1, 2001 and September 15, 2001. Counts ranged from 40 pigeons to over 1200 pigeons depending on the site and date of the count (Figures 2-5). The total number of pigeons counted arriving at each site was fairly consistent with counts of pigeons departing from the site on any given day for most locations (Figure 6a-s.). Mean counts, standard deviation (SD's) and coefficient of variation (CV's) were calculated for each mineral site (Table 2-4).

We grouped the mineral sites into two main regions including British Columbia and central and northern Washington as the North region and southern Washington and Oregon as the South region. We calculated mean counts, SD's and CV's for each of these areas during 6 separate time periods (Table 5a-c). Mean counts were highest during the period of 1 August through 31 August for the North region (219) while mean counts were highest for the South region from 15 August to 14 September (504). The mean CV was lowest (25.32) during the period of 1 July – 31 July for the North region while the mean CV was lowest (23.78) from 15 June – 14 July for the South region.

Identification and Documentation of New Mineral Sites:

We plotted current, historic and potential mineral sites over the breeding range of the band-tailed pigeon (Figure 7). Newly discovered mineral sites were located in British Columbia and Oregon. Eight potential sites were documented in BC and are included in Appendix A as well as one additional site located in Oregon (Clatskanie). Detailed habitat descriptions have been recorded for each of the counted sites as well as some of the potential sites listed. Mineral sites were classified as current (having documented use in the past 3 years), historical (pigeons documented using the site but no current evidence of use) and potential (pigeons may be using the site but not fully documented).

Management Implications

The development of a reliable population index for Pacific Coast band-tailed pigeons is critical to the success of the management of this game species. Mineral site counts offer the greatest potential to create a meaningful population index. Mineral site data from California (Casazza 2000), Oregon (Oregon DFW Unpublished Data, Sanders 1999) and Washington (Kraege 1997, Savage 1993) will be combined with new information gathered in this study to produce a protocol for a geographic based index for band-tailed pigeon abundance using mineral site counts.

Mineral sites should be distributed throughout the breeding range and should be counted during a time period which yields the least variation. Mineral site counts conducted in Oregon, Washington and British Columbia during the summer of 2001 indicate that the period from mid-June through July may offer the best time to conduct counts and reduce variation. However, a second year of data collection should offer even greater insight into the correct timing of an operational mineral site survey along the Pacific Coast. The discovery and documentation of several mineral sites in British Columbia will help to distribute counts throughout the breeding range of the band-tailed pigeon. Additional sites on the north and south coast of California will be essential in the creation of a range-wide population index. Land use and habitat data collected at each of the sites will important in determining which sites are included in the operational survey as well as providing a baseline for documenting change that may occur at each site over time.

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Table 2. Mean counts of band-tailed pigeons at each of 19 sites counted in summer 2001 during various 30-day intervals.

Mean Counts for each site	1June – 30June	15June – 14July	1July – 31July	15July – 14Aug.	1Aug – 31Aug.	15Aug. – 14Sep.
Hatzic, BC	91.33	89.00	77.50	80.00	118.25	146.00
Lilliwaup, WA	138.67	115.75	98.50	119.00	184.00	265.00
Mcallister, WA	130.00	117.75	109.00	133.67	131.60	124.33
Mud Bay, WA	96.33	111.20	159.40	212.50	386.67	353.67
Port Moody, BC	173.00	129.50	128.00	309.00	440.67	335.33
Potlach, WA	212.33	161.25	132.50	216.80	275.40	276.00
Red SalmonWA	90.33	81.80	84.33	147.67	143.33	104.00
Sumas, WA	54.00	58.50	65.50	67.33	70.67	73.00
Airlie, OR	108.00	138.50	224.67	398.25	487.80	450.33
Ash Creek,OR	226.00	205.67	192.25	219.25	298.20	299.50
Cedar Creek, WA	210.00	277.00	242.33	208.33	234.33	169.50
Dutch, OR	603.00	455.00	736.00	655.33	612.75	555.00
Fairdale, OR	333.00	271.33	266.75	337.75	410.50	442.67
National, OR	85.00	202.50	227.75	281.00	426.60	505.00
Sykes, OR	182.33	157.67	161.50	190.00	352.33	401.50
Clatskanie, OR	.	479.00	456.33	454.50	654.40	781.33
Crawfordsville, OR	.	166.00	214.00	318.20	459.20	553.67
S. Yaquina, OR	.	.	255.50	403.67	888.00	814.25
Weyco, OR	.	.	337.33	351.25	528.50	573.25

Table 3. Standard deviation for mineral site counts at each of 19 sites counted in summer 2001 during various 30-day intervals.

SD's for each site	1June – 30June	15June – 14July	1July – 31July	15July – 14Aug.	1Aug – 31Aug.	15Aug. – 14Sep.
Hatzic, BC	30.09	21.54	17.75	25.07	48.44	56.57
Lilliwaup, WA	16.74	26.50	35.82	52.36	81.50	.
Mcallister, WA	22.63	27.18	24.27	21.08	22.02	23.69
Mud Bay, WA	47.38	44.75	34.71	73.33	153.29	182.66
Port Moody, BC	33.72	31.10	39.30	274.85	159.90	30.35
Potlach, WA	56.76	42.68	10.28	97.03	55.22	.
Red Salmon, WA	23.46	23.58	31.53	40.51	46.07	2.83
Sumas, WA	16.97	11.56	15.33	18.04	36.23	50.91
Airlie, OR	.	43.13	77.36	176.40	80.40	84.48
Ash Creek, OR	.	69.76	56.41	47.84	55.53	66.52
Cedar Creek, WA	.	57.98	72.71	31.18	15.63	115.26
Dutch, OR	209.30	.	.	137.99	133.73	147.98
Fairdale, OR	.	78.48	59.78	104.04	97.23	33.29
National,OR	.	19.09	73.85	74.64	118.08	69.07
Sykes, OR	36.77	28.88	38.67	55.77	94.30	57.28
Clatskanie,OR	.	.	60.29	49.36	213.38	174.40
Crawfordsville, OR	.	.	91.93	98.88	143.43	119.88
S. Yaquina, OR	.	.	53.03	259.36	258.54	354.36
Weyco, OR	.	.	105.55	90.56	249.62	232.70

Table 4. Coefficient of variation for mineral site counts at each of 19 sites counted in summer 2001 during various 30-day intervals.

CV's for each site	1June – 30June	15June – 14July	1July – 31July	15July – 14Aug.	1Aug – 31Aug.	15Aug. – 14Sep.
Hatzic, BC	32.94	24.20	22.90	31.34	40.97	38.75
Lilliwaup, WA	12.07	22.89	36.36	44.00	44.30	.
Mcallister, WA	17.41	23.09	22.27	15.77	16.73	19.06
Mud Bay, WA	49.19	40.24	21.78	34.51	39.64	51.65
Port Moody, BC	19.49	24.01	30.70	88.95	36.29	9.05
Potlach, WA	26.73	26.47	7.76	44.76	20.05	0.0
Red Salmon, WA	25.97	28.83	37.39	27.44	32.14	2.72
Sumas, WA	31.43	19.76	23.40	26.79	51.26	69.74
Airlie, OR	.	31.14	34.43	44.29	16.48	18.76
Ash Creek, OR	.	33.92	29.34	21.82	18.62	22.21
Cedar Creek, WA	.	20.93	30.00	14.97	6.67	68.00
Dutch, OR	34.71	.	.	21.06	21.83	26.66
Fairdale, OR	.	28.92	22.41	30.80	23.69	7.52
National,OR	.	9.43	32.43	26.56	27.68	13.68
Sykes, OR	20.17	18.32	23.94	29.35	26.76	14.27
Clatskanie,OR	.	.	13.21	10.86	32.61	22.32
Crawfordsville, OR	.	.	42.96	31.07	31.24	21.65
S. Yaquina, OR	.	.	20.76	64.25	29.11	43.52
Weyco, OR	.	.	31.29	25.78	47.23	40.59

Table 5a-c. Mean counts, standard deviations (SD's), and coefficients of variation (CV's) for mineral sites counted in the summer of 2001. (Red =High, Blue = Low)

Table 5a.

Mean counts 2001	**1June – 30June**	**15June – 14July**	**1July – 31July**	**15July – 14Aug.**	**1Aug.– 31Aug.**	**15Aug. – 14Sep.**
Olympia/BC	123.25	108.09	106.84	160.75	218.82	209.67
Oregon/South WA	249.62	261.41	301.31	347.05	486.60	504.18
All Sites Combined	182.22	189.26	219.43	268.61	373.85	380.18

Table 5b.

SD's for counts 2001	**1June – 30June**	**15June – 14July**	**1July – 31July**	**15July – 14Aug.**	**1Aug.– 31Aug.**	**15Aug. – 14Sep.**
Olympia/BC	30.97	28.61	26.12	75.28	75.33	49.57
Oregon/South WA	123.04	49.55	68.96	102.36	132.72	132.29
All Sites Combined	49.38	37.59	49.92	90.96	108.55	100.12

Table 5c.

CV's for counts 2001	**1June – 30June**	**15June – 14July**	**1July – 31July**	**15July – 14Aug.**	**1Aug.– 31Aug.**	**15Aug. – 14Sep.**
Olympia/BC	26.90	26.19	25.32	39.19	35.17	27.28
Oregon/South WA	27.44	23.78	28.08	29.17	25.63	27.20
All Sites Combined	27.01	25.15	26.85	33.39	29.65	27.23

Figure 1. Location of mineral sites counted on a weekly basis, summer 2001.

Figure 2. Mineral site counts of band-tailed pigeons at the British Columbia study area.

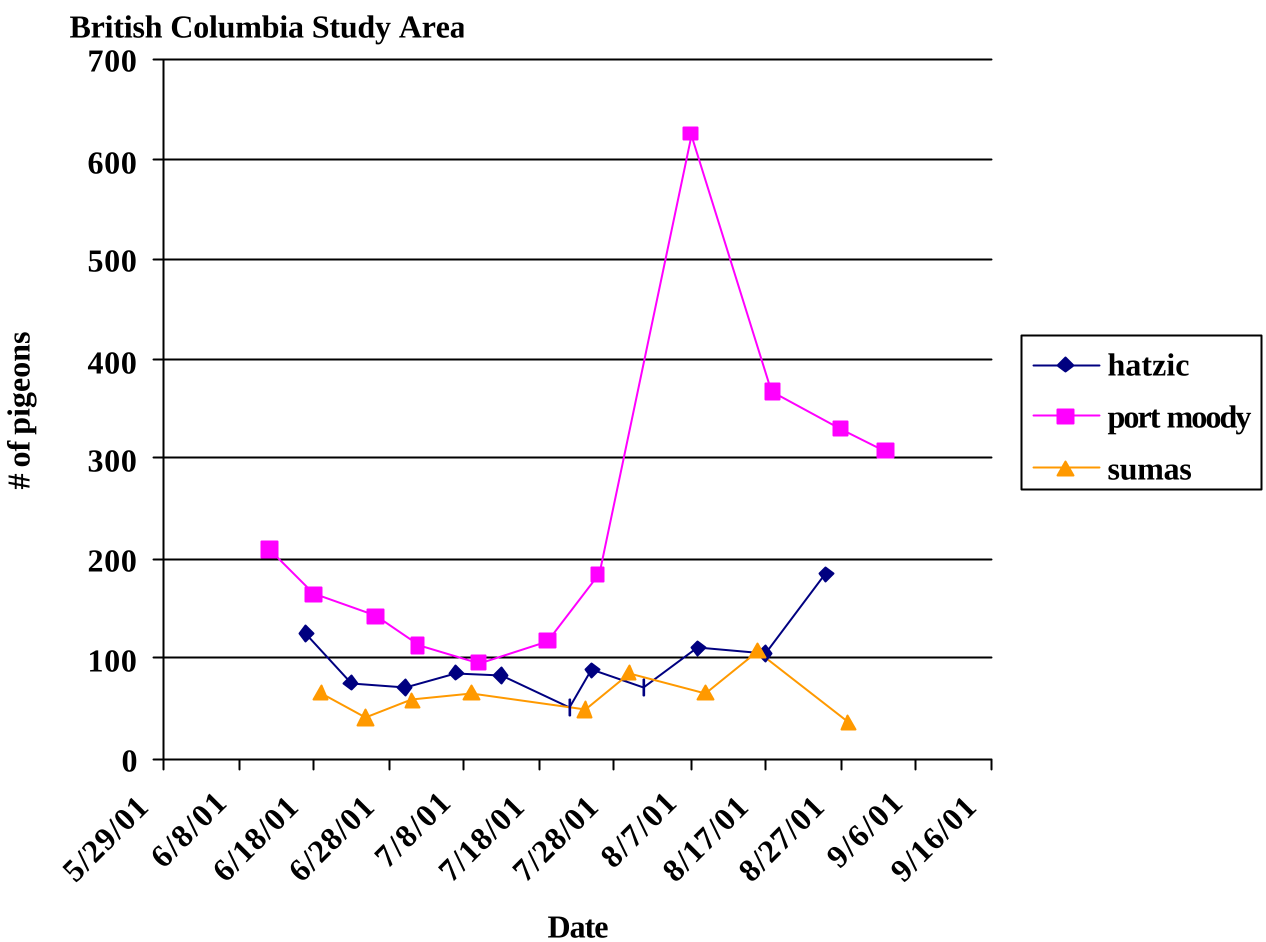


Figure 3. Mineral site counts of band-tailed pigeons at the Olympia study area.

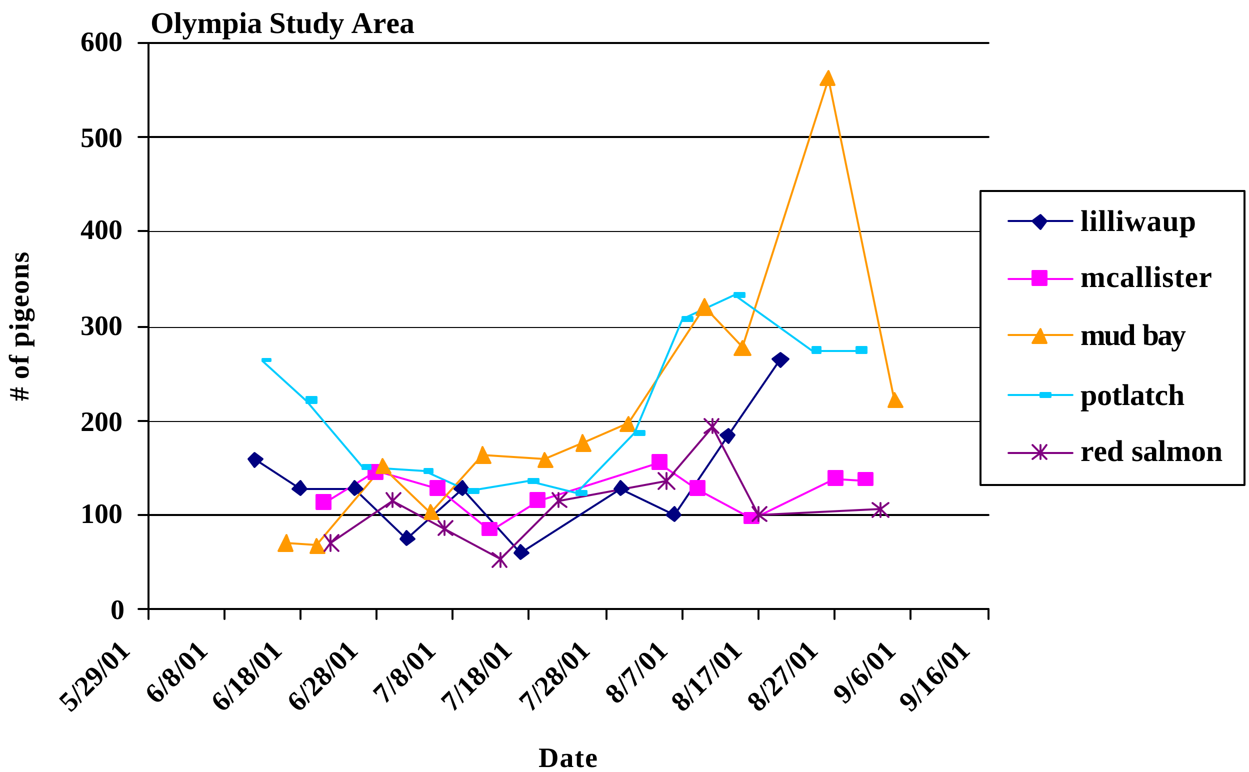


Figure 4. Mineral site counts of band-tailed pigeons at the St. Helen's study area.

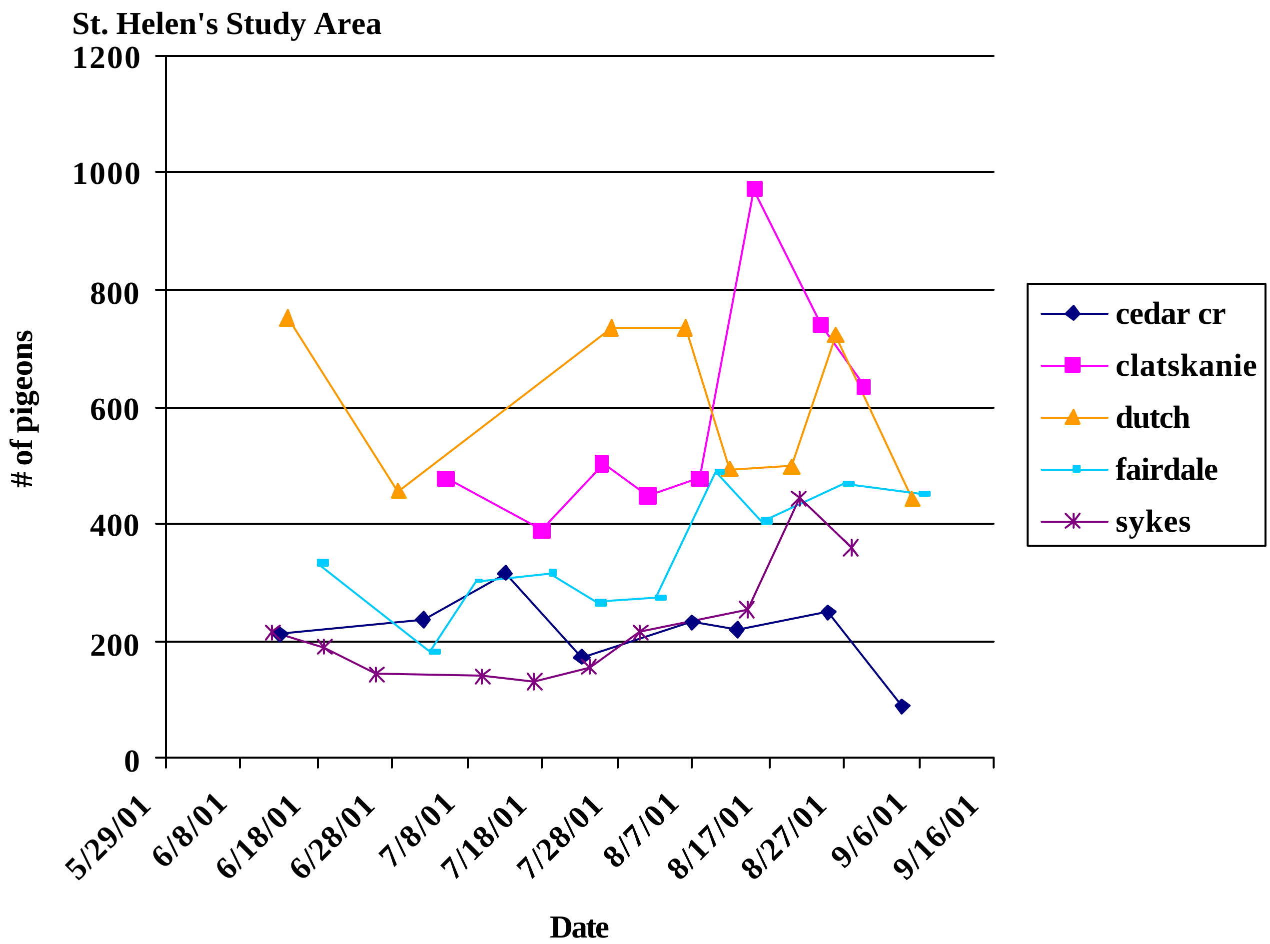


Figure 5. Mineral site counts of band-tailed pigeons at the Corvallis study area.

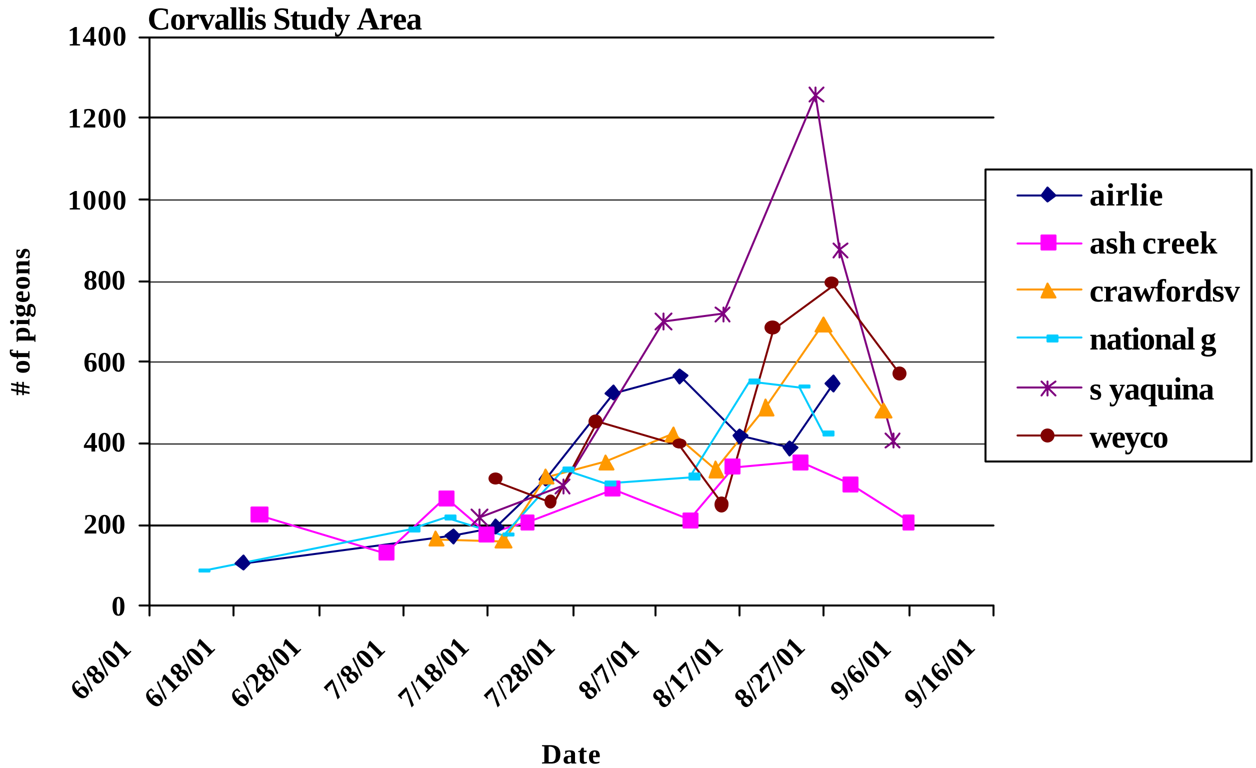
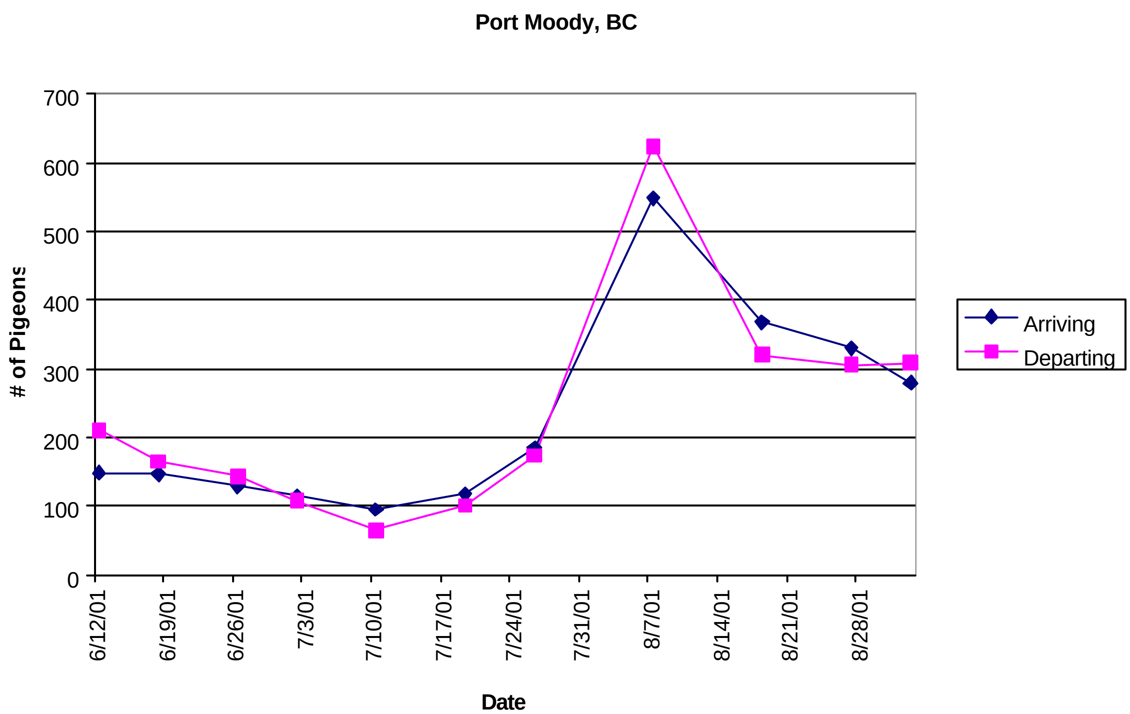
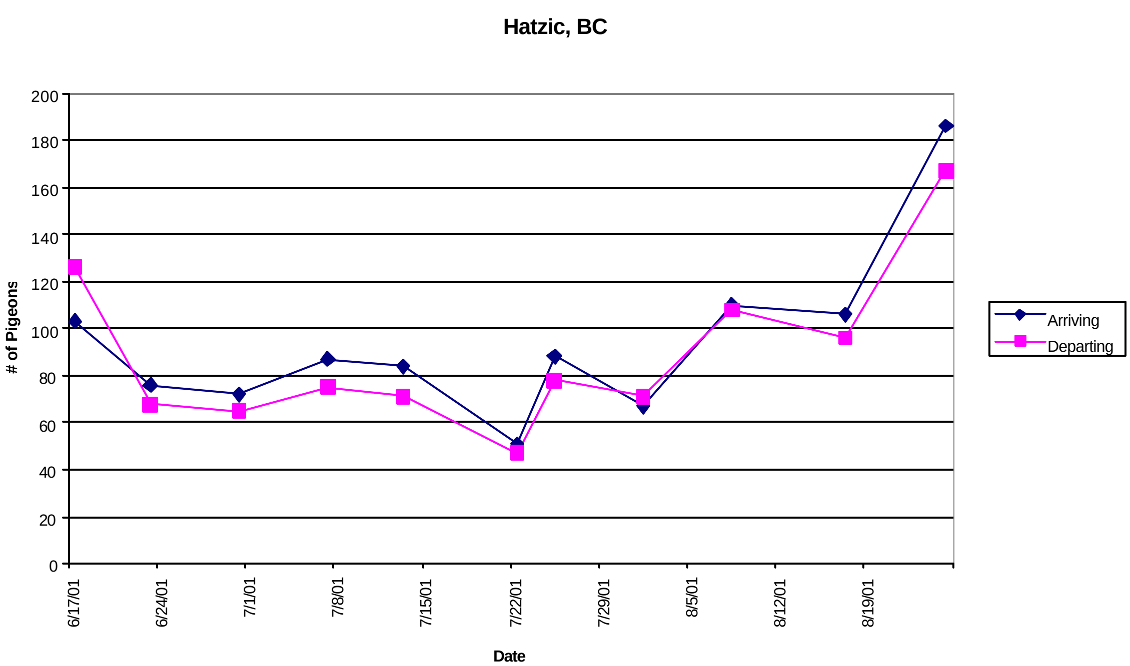
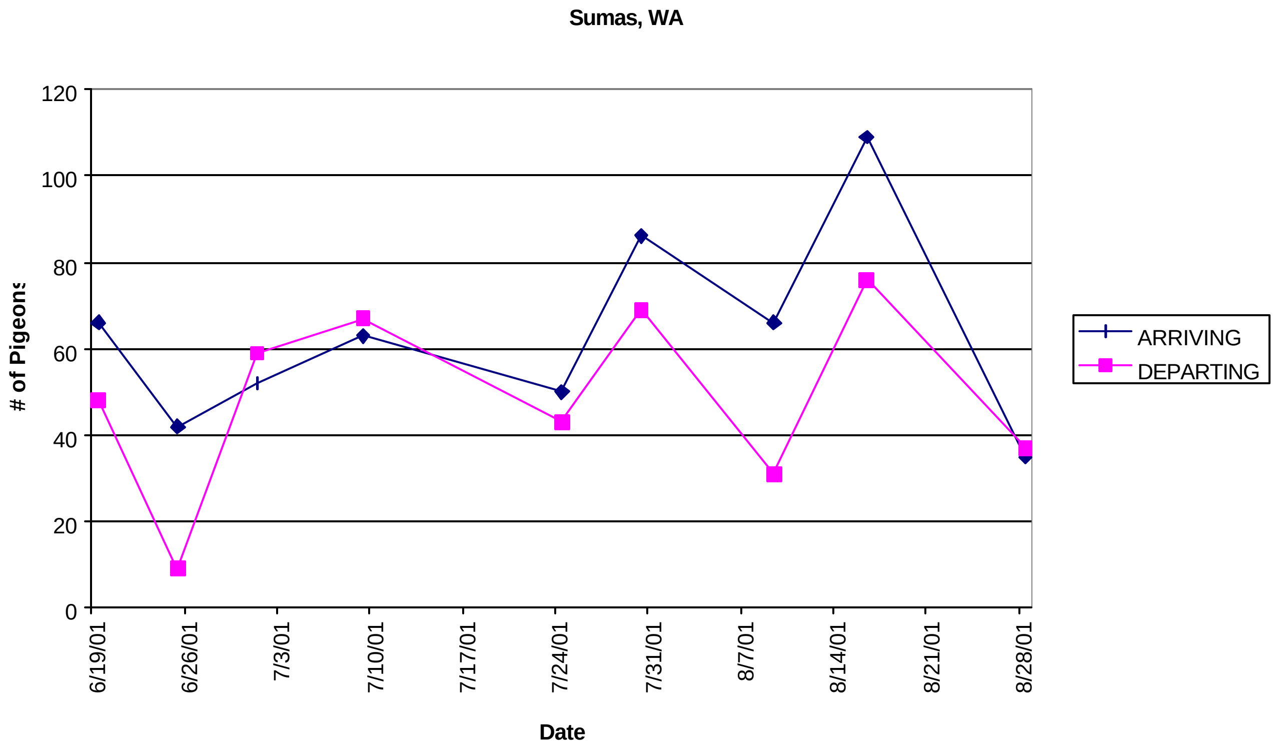


Figure 6a-s. Total band-tailed pigeons arriving and departing at each of the 19 mineral sites counted during the summer of 2001.






Sumas, WA
# of Pigeons
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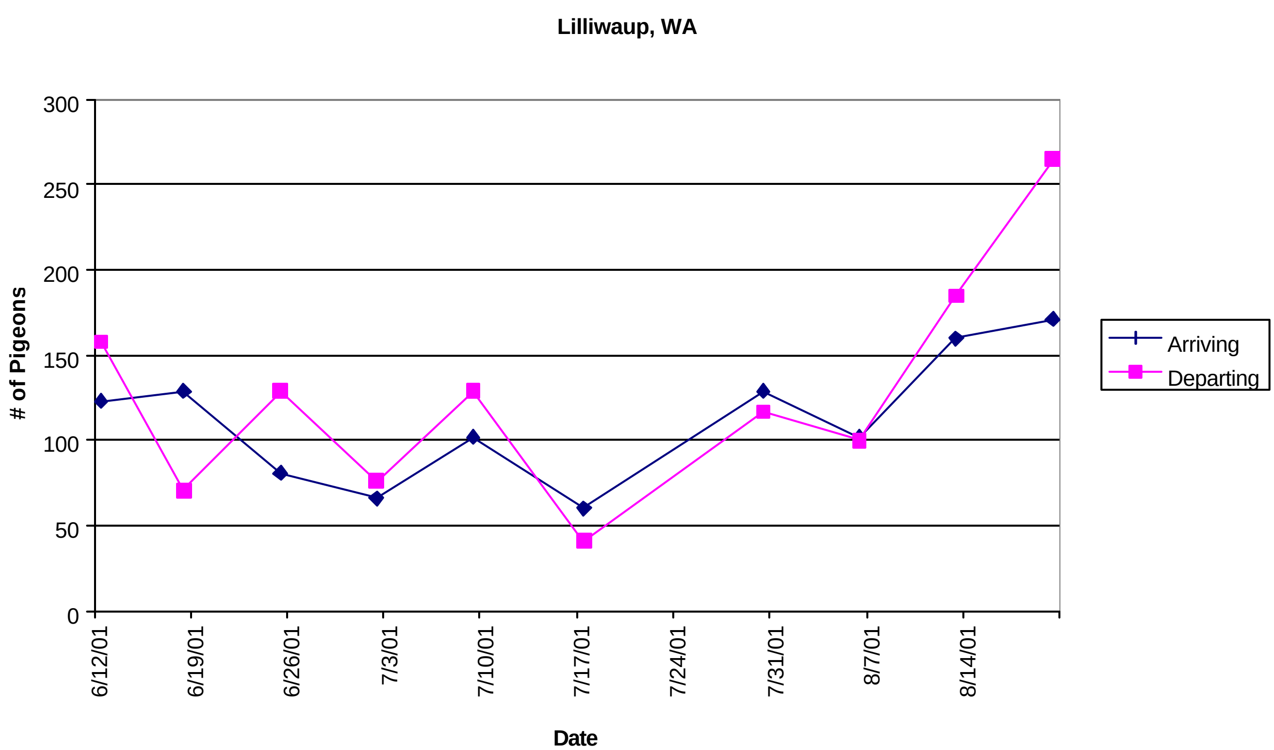
100
80
60
40
20
0
6/19/01
6/26/01
7/3/01
7/10/01
7/17/01
7/24/01
7/31/01
8/7/01
8/14/01
8/21/01
8/28/01
Date
ARRIVING
DEPARTING


Lilliwaup, WA
# of Pigeons
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150
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6/19/01
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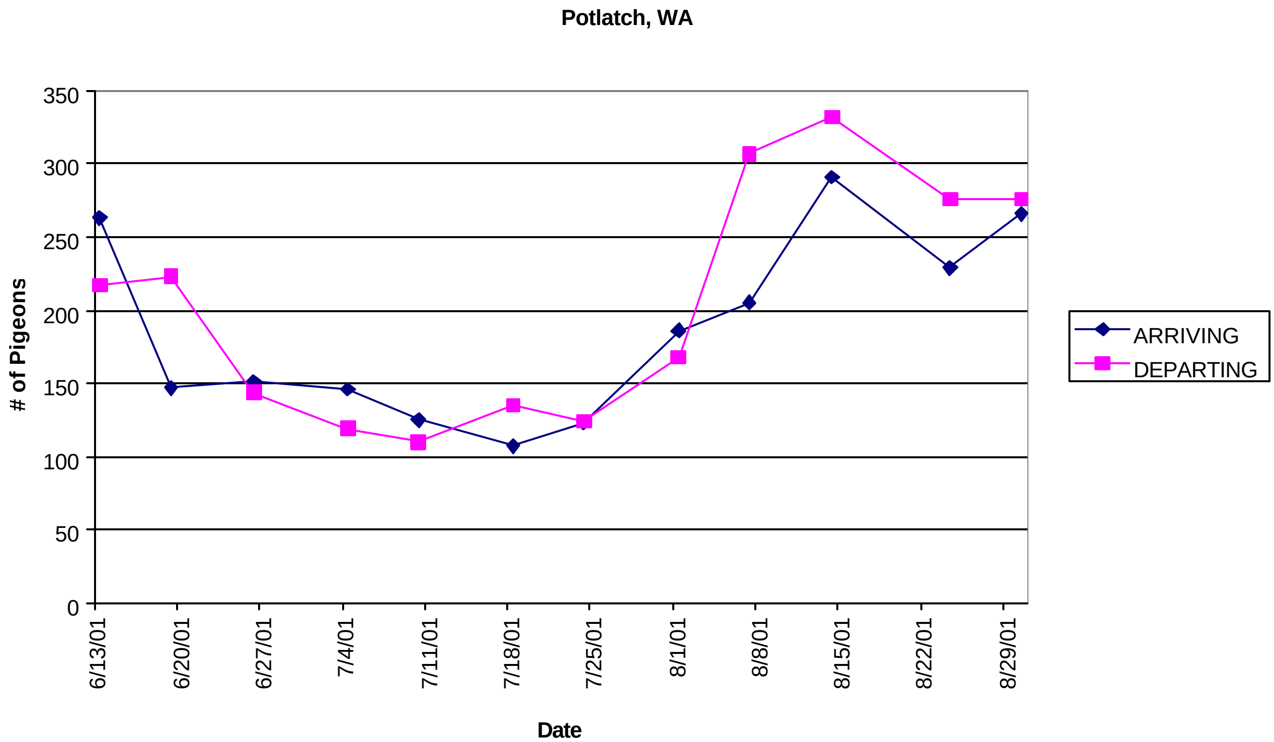
7/24/01
7/31/01
8/7/01
8/14/01
Date
Arriving
Departing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200
150
100
50
0
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7/11/01
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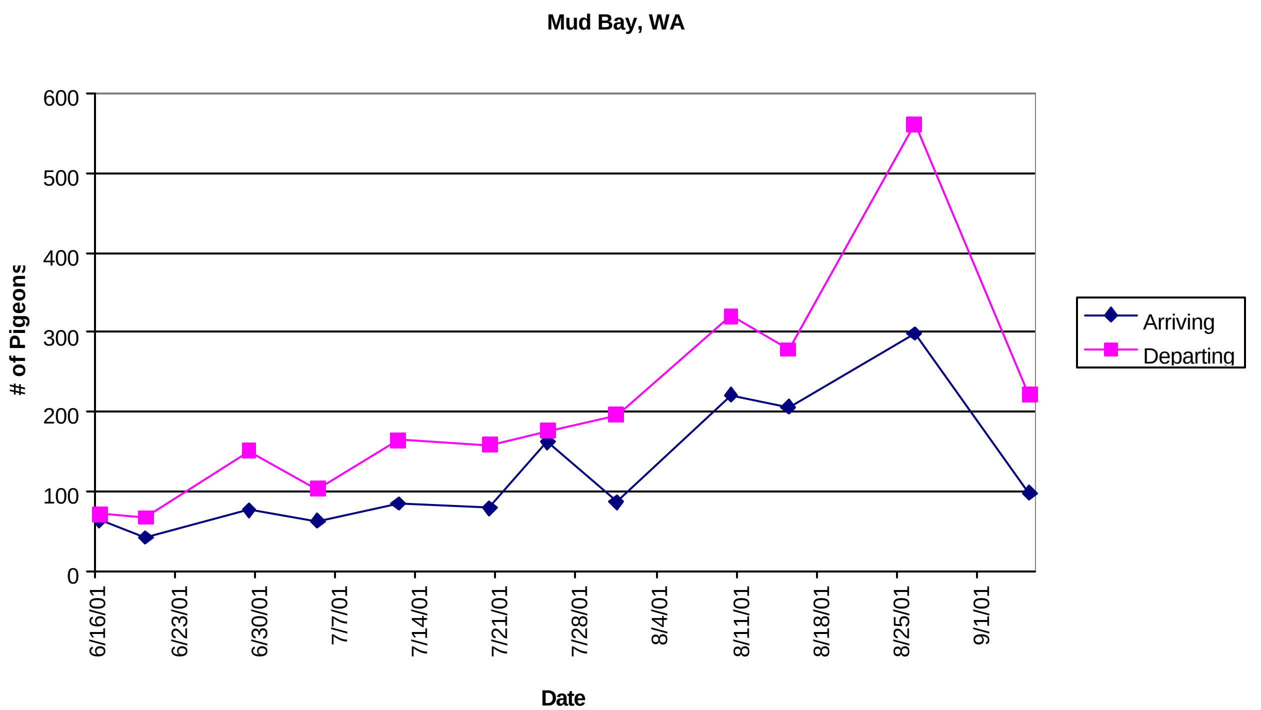
8/29/01
Date
ARRIVING
DEPARTING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400
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200
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7/14/01
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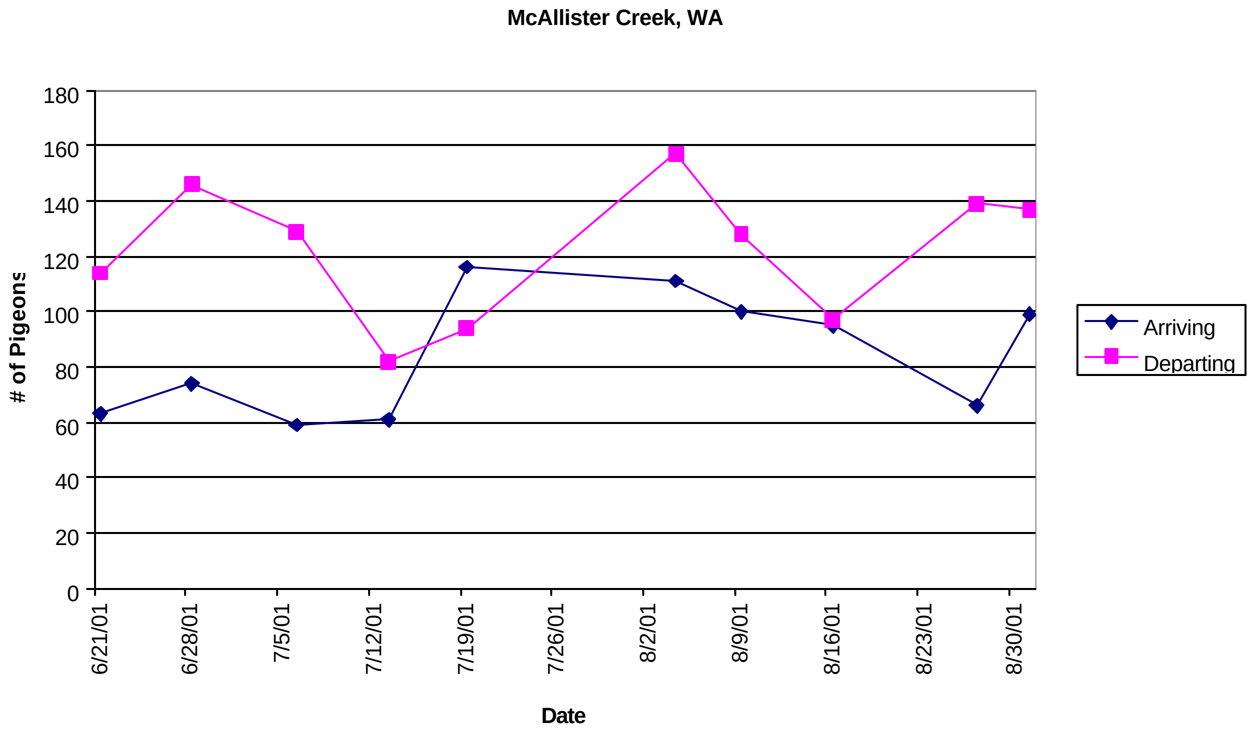
9/1/01
Date
Arriving
Departing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# of Pigeons
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160
140
120
100
80
60
40
20
0
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6/28/01
7/5/01
7/12/01
7/19/01
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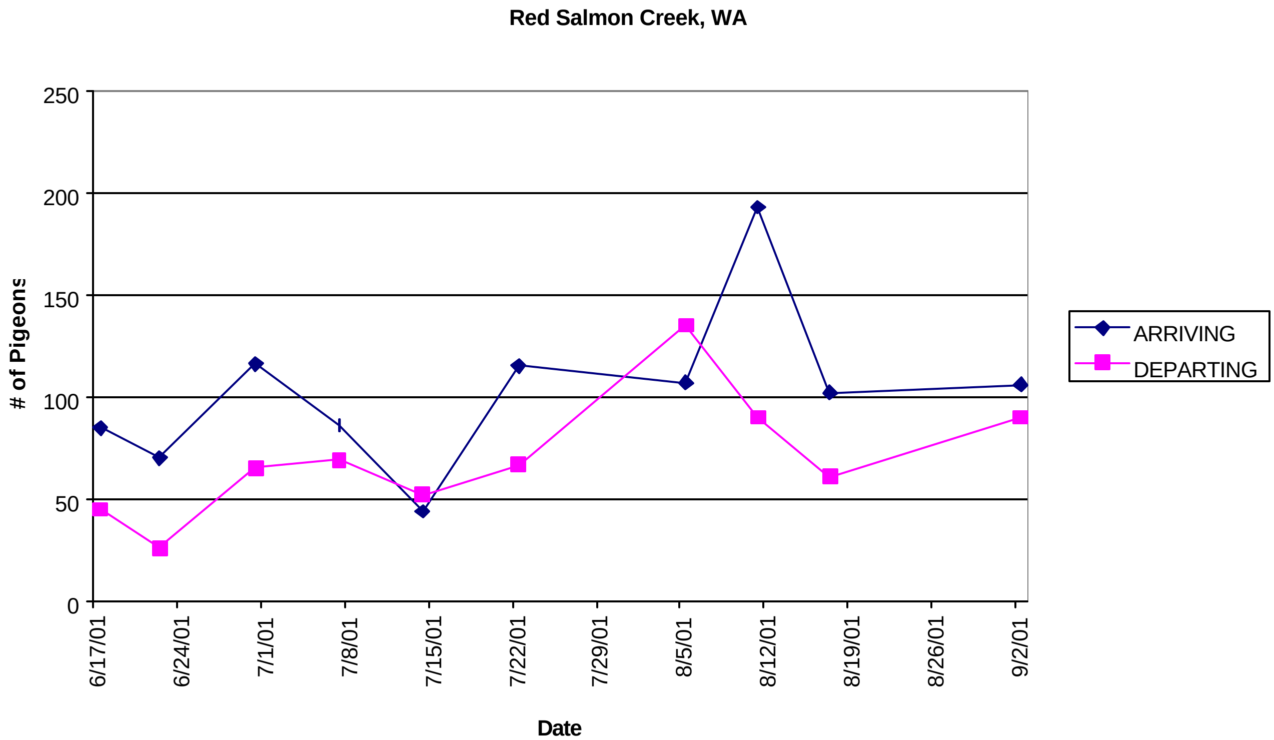
8/16/01
8/23/01
8/30/01
Date
Arriving
Departing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# of Pigeons
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200
150
100
50
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6/17/01
6/24/01
7/1/01
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7/15/01
7/22/01
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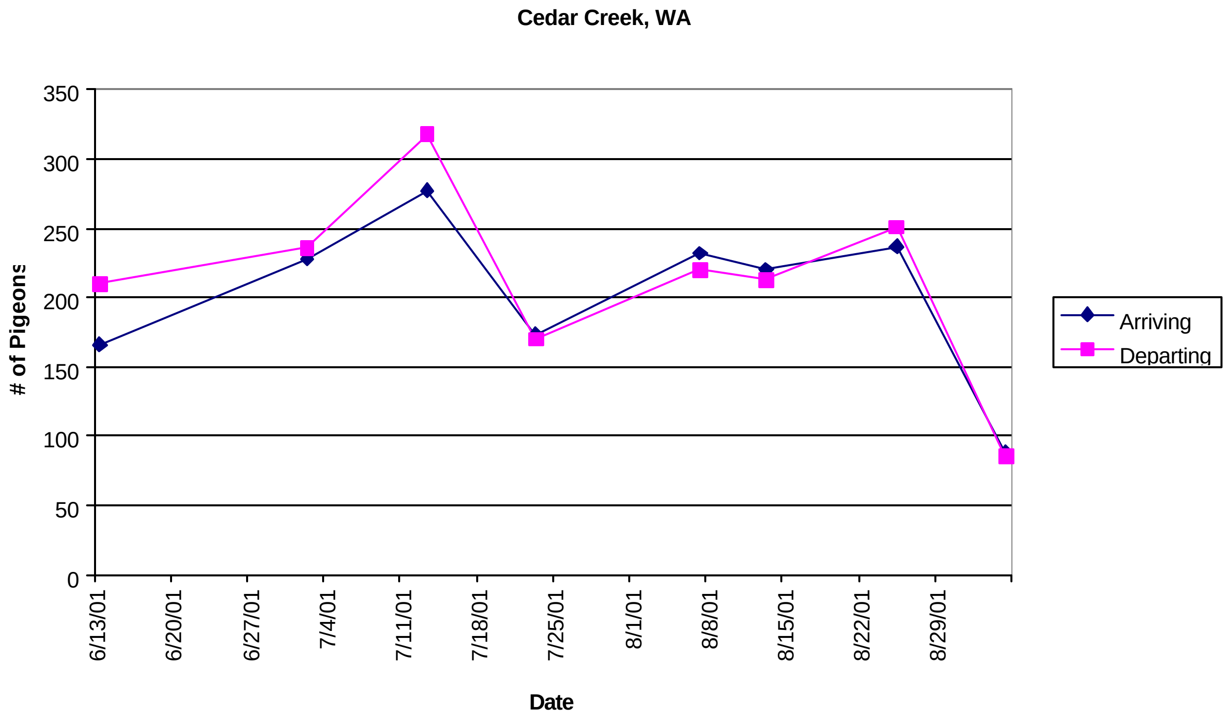
8/26/01
9/2/01
Date
ARRIVING
DEPARTING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0
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7/11/01
7/18/01
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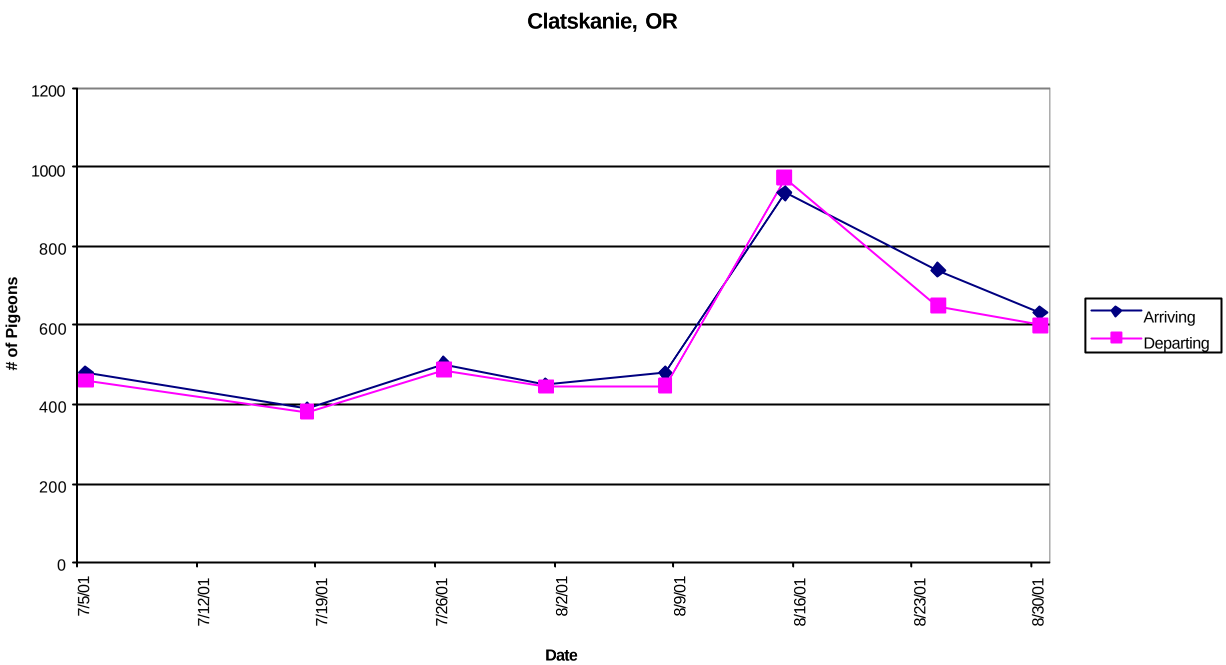
8/29/01
Date
Arriving
Departing


Clatskanie, OR
# of Pigeons
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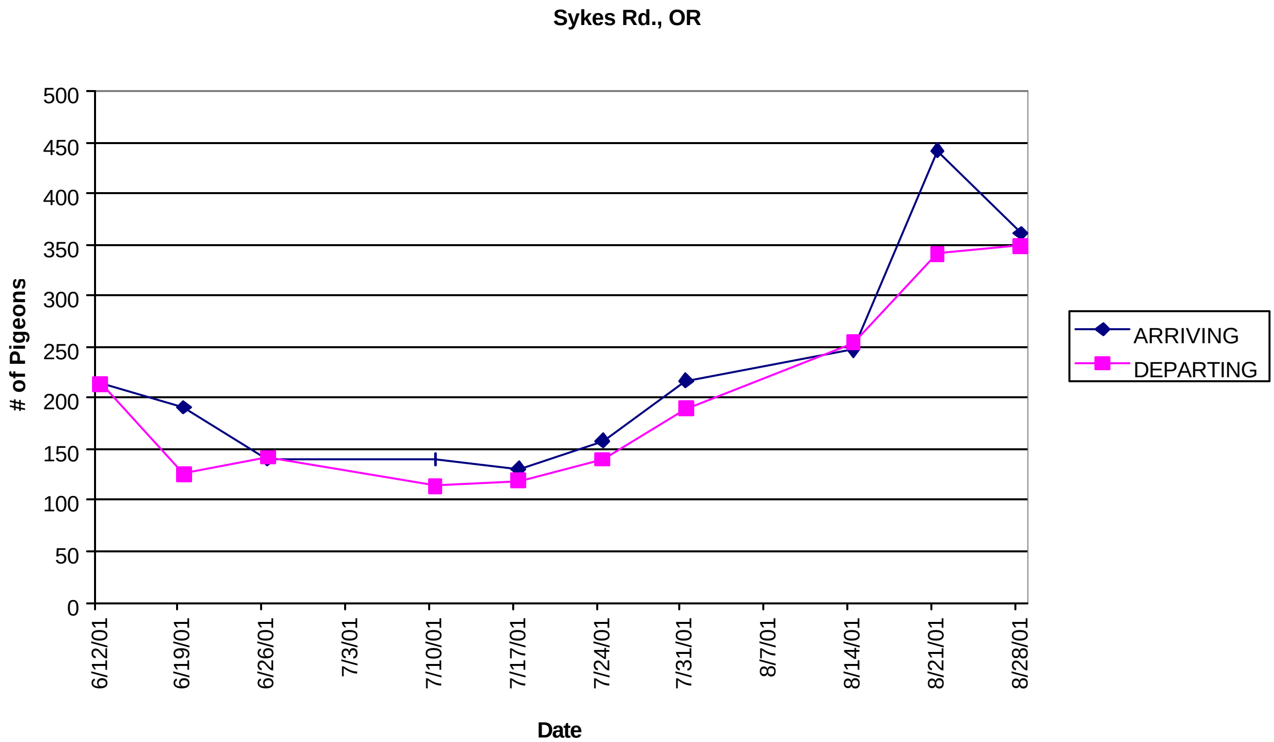
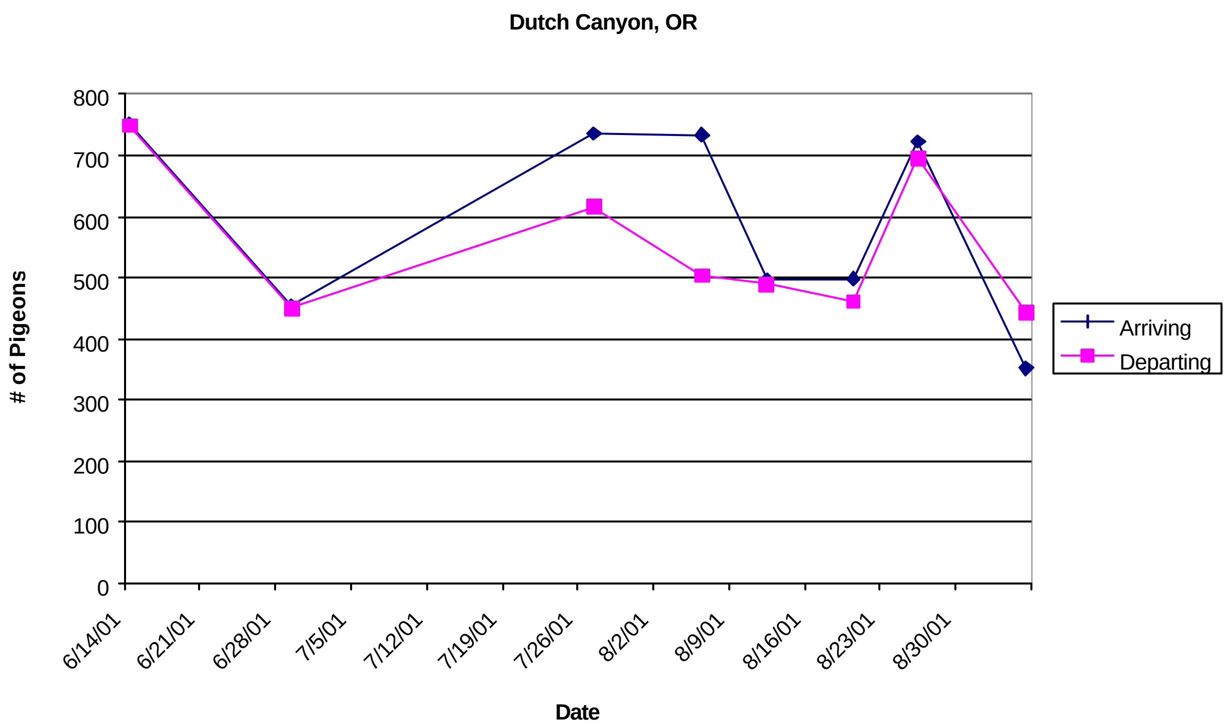
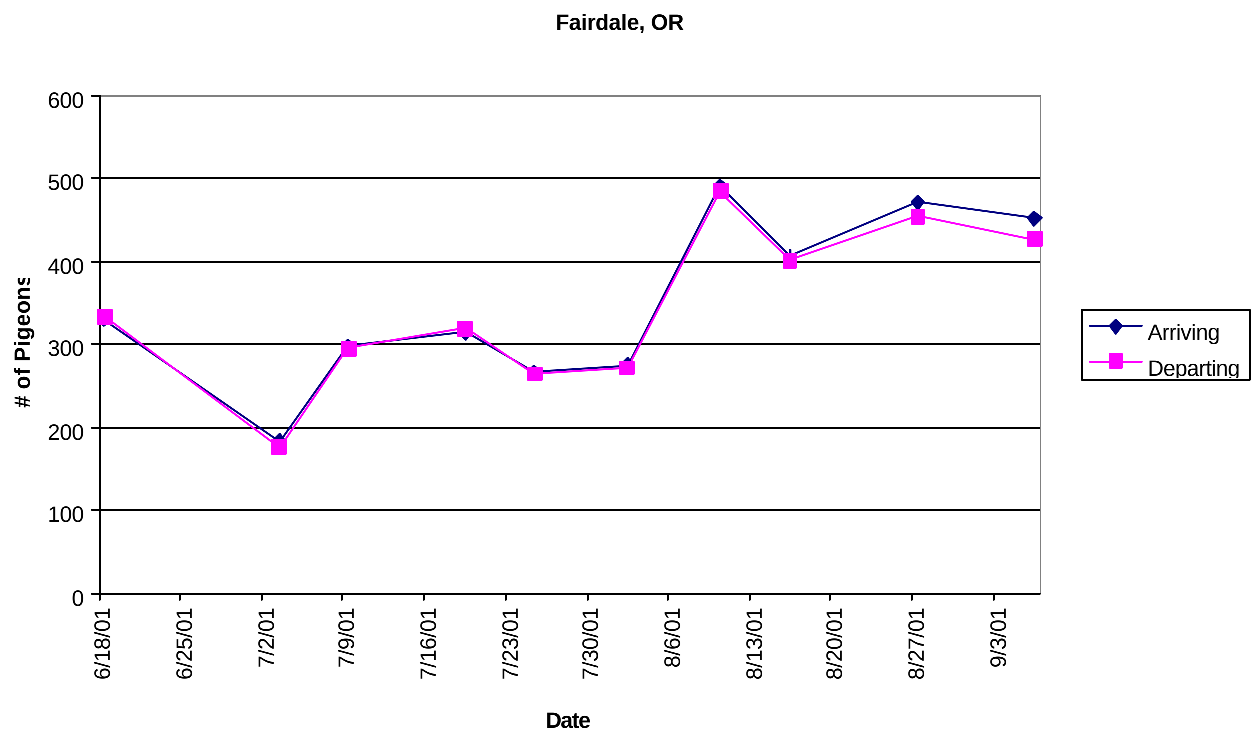
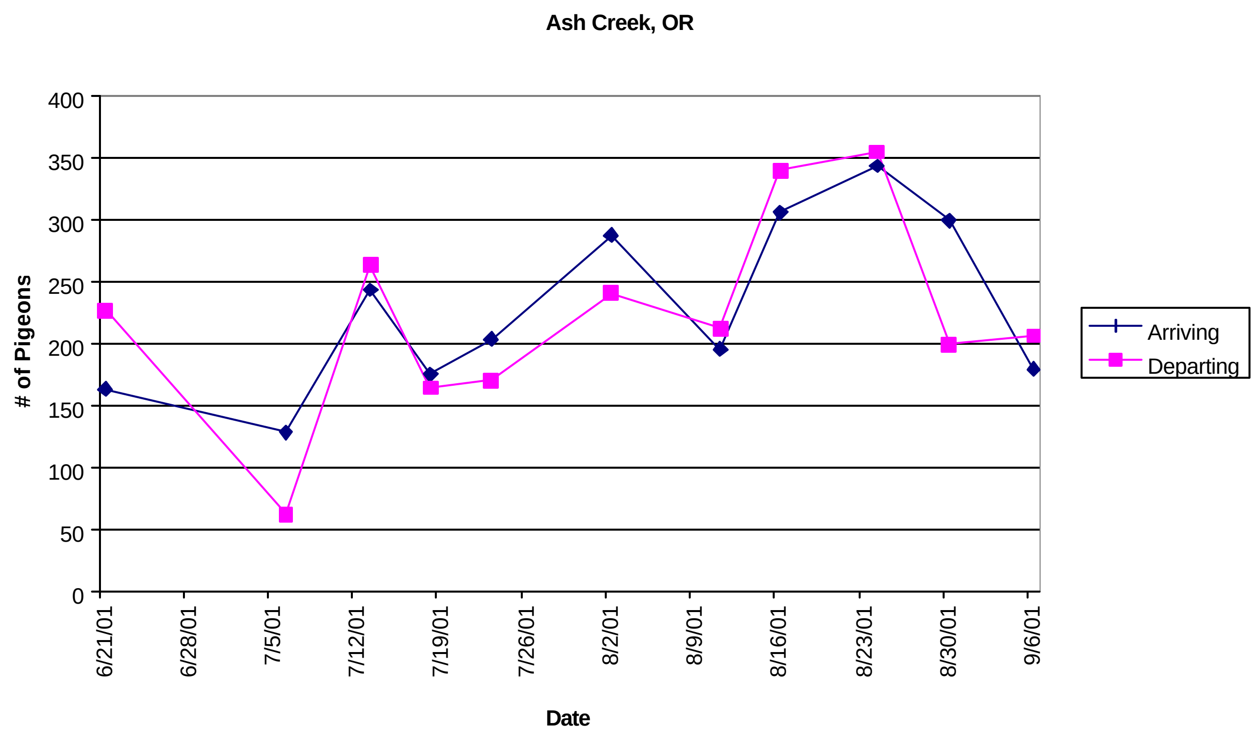
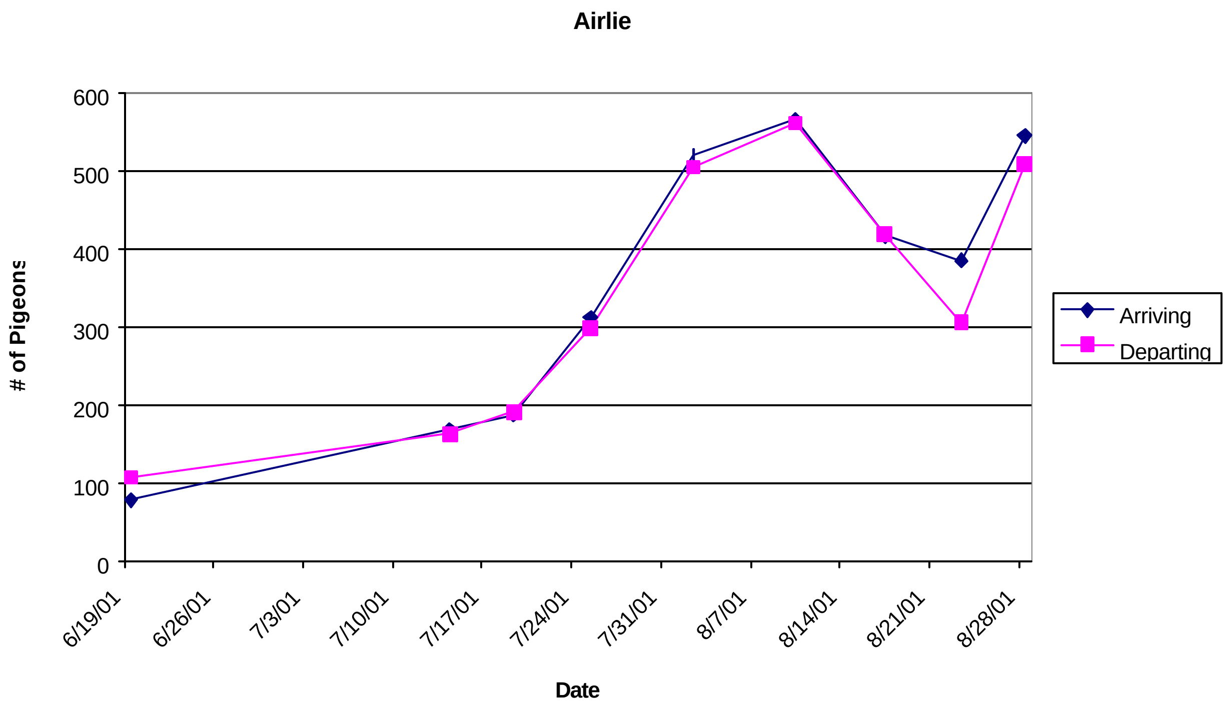
1000
800
600
400
200
0
7/5/01
7/12/01
7/19/01
7/26/01
8/2/01
8/9/01
8/16/01
8/23/01
8/30/01
Date
Arriving
Departing

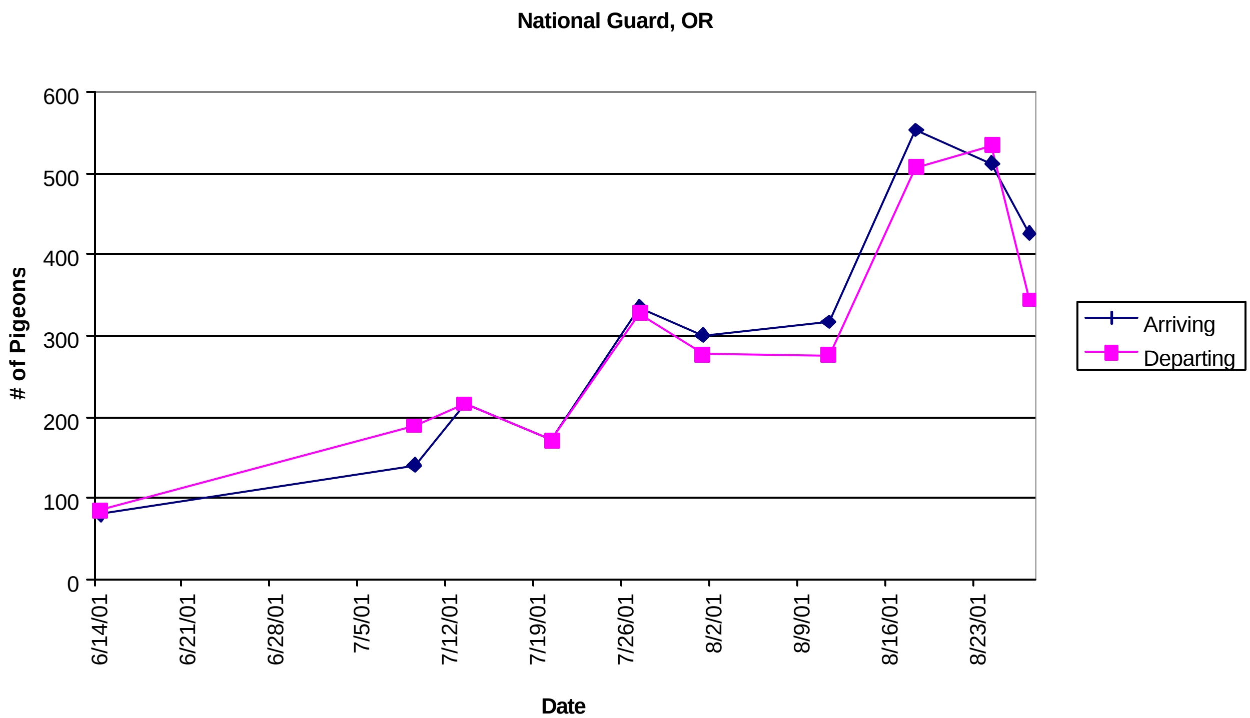

Sykes Rd., OR
# of Pigeons
500
450
400
350
300
250
200
150
100
50
0
6/12/01
6/19/01
6/26/01
7/3/01
7/10/01
7/17/01
7/24/01
7/31/01
8/7/01
8/14/01
8/21/01
8/28/01
Date
ARRIVING
DEPARTING

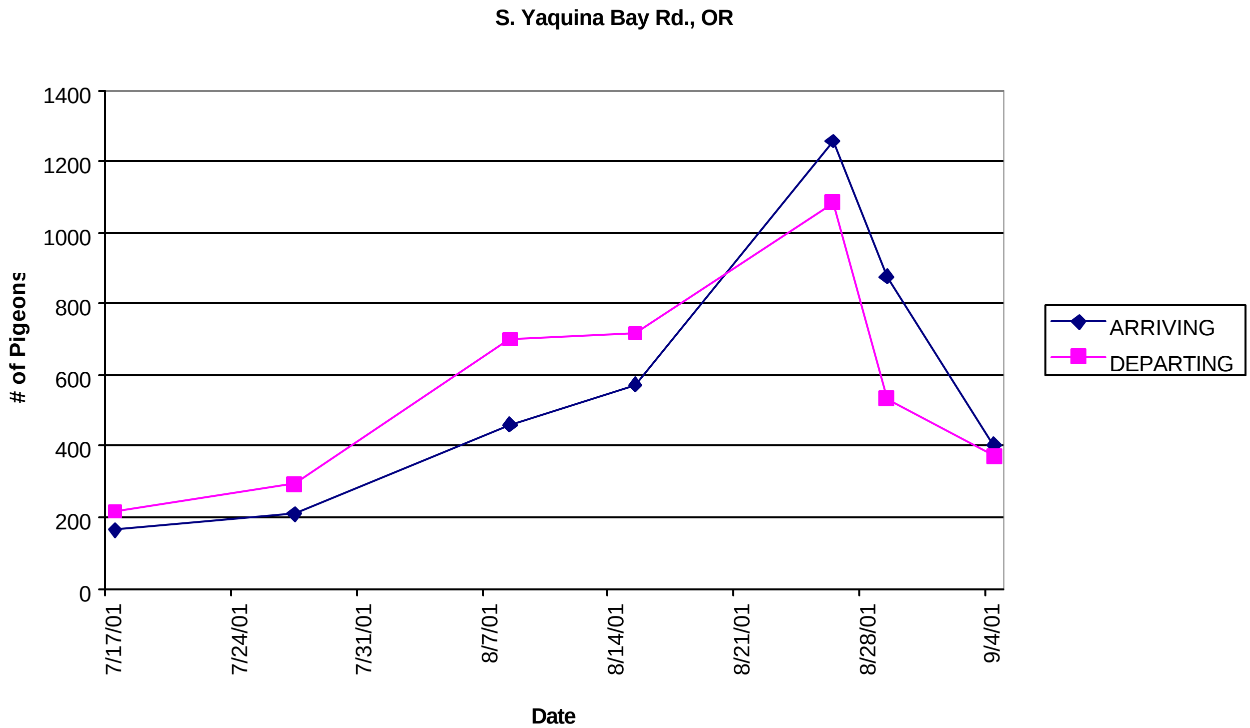

Dutch Canyon, OR
# of Pigeons
800
700
600
500
400
300
200
100
0
6/14/01
6/21/01
6/28/01
7/5/01
7/12/01
7/19/01
7/26/01
8/2/01
8/9/01
8/16/01
8/23/01
8/30/01
Date
Arriving
Departing

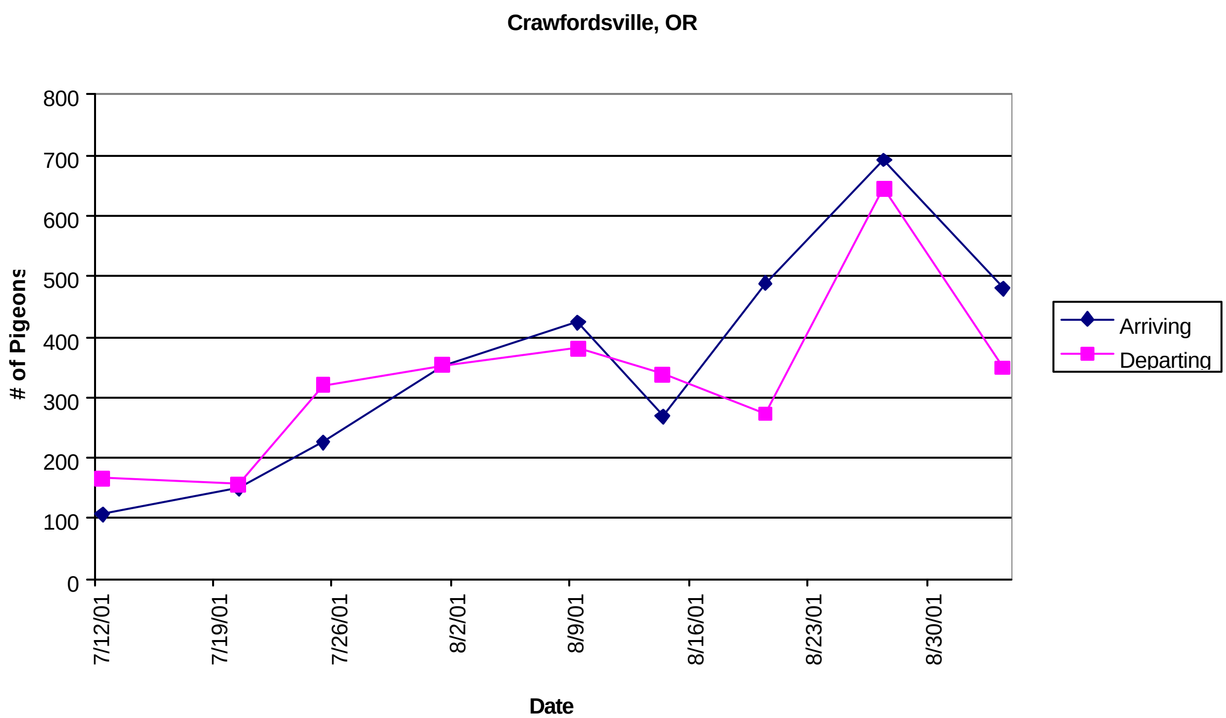

Fairdale, OR
600
500
400
300
200
100
0
# of Pigeons
6/18/01
6/25/01
7/2/01
7/9/01
7/16/01
7/23/01
7/30/01
8/6/01
8/13/01
8/20/01
8/27/01
9/3/01
Date
Arriving
Departing


Ash Creek, OR
400
350
300
250
200
150
100
50
0
# of Pigeons
6/21/01
6/28/01
7/5/01
7/12/01
7/19/01
7/26/01
8/2/01
8/9/01
8/16/01
8/23/01
8/30/01
9/6/01
Date
Arriving
Departing


Airlie
600
500
400
300
200
100
0
# of Pigeons
6/19/01
6/26/01
7/3/01
7/10/01
7/17/01
7/24/01
7/31/01
8/7/01
8/14/01
8/21/01
8/28/01
Date
Arriving
Departing


National Guard, OR
600
500
400
300
200
100
0
# of Pigeons
6/14/01
6/21/01
6/28/01
7/5/01
7/12/01
7/19/01
7/26/01
8/2/01
8/9/01
8/16/01
8/23/01
Date
Arriving
Departing


S. Yaquina Bay Rd., OR
# of Pigeons
1400
1200
1000
800
600
400
200
0
7/17/01
7/24/01
7/31/01
8/7/01
8/14/01
8/21/01
8/28/01
9/4/01
Date
ARRIVING
DEPARTING


Crawfordsville, OR
# of Pigeons
800
700
600
500
400
300
200
100
0
7/12/01
7/19/01
7/26/01
8/2/01
8/9/01
8/16/01
8/23/01
8/30/01
Date
Arriving
Departing

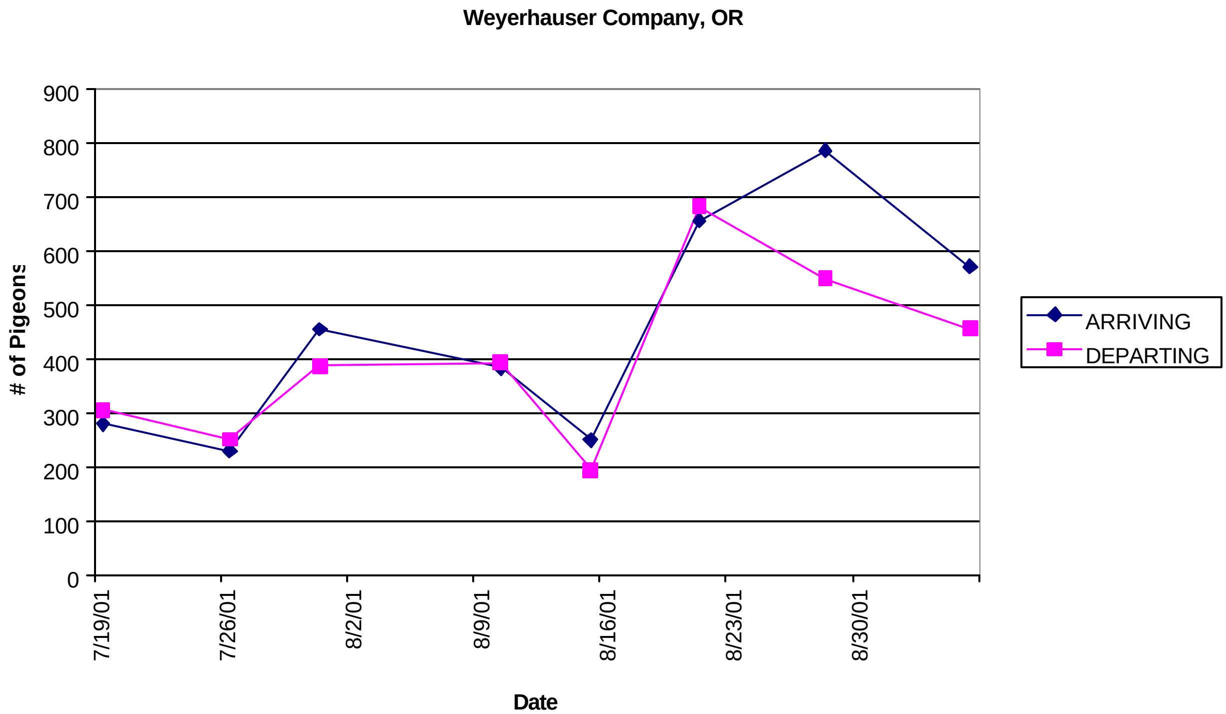

Weyerhauser Company, OR
900
800
700
600
500
400
300
200
100
0
# of Pigeons
7/19/01
7/26/01
8/2/01
8/9/01
8/16/01
8/23/01
8/30/01
Date
ARRIVING
DEPARTING

Figure 7. Distribution of mineral sites across the breeding range of the Pacific Coast population of band-tailed pigeons.