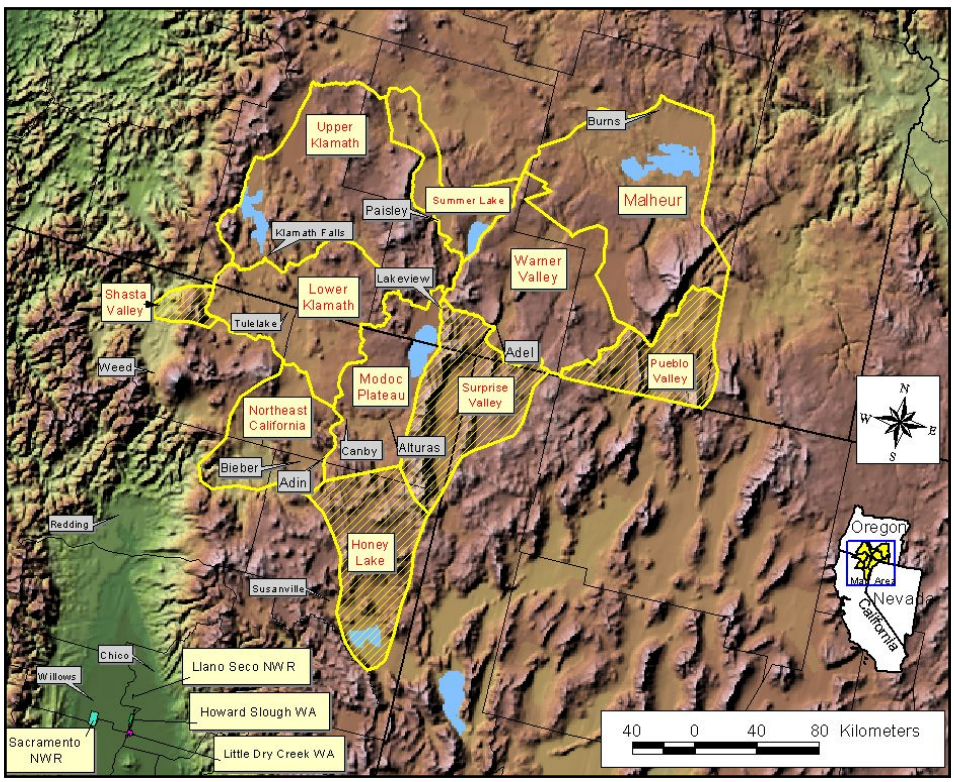
# Northern Pintail Habitat Use and Waterfowl Abundance During Spring Migration in Southern Oregon-Northeast California (SONEC)

Final Report

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U.S. DEPARTMENT OF THE INTERIOR
U.S.GEOLOGICAL SURVEY
WESTERN ECOLOGICAL RESEARCH CENTER
SACRAMENTO, CALIFORNIA

# Northern Pintail Habitat Use and Waterfowl Abundance During Spring Migration in Southern Oregon-Northeast California (SONEC)

Final Report

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Tuscany Research Institute
Ducks Unlimited's Institute for Wetland and Waterfowl Research
California Waterfowl Association
U.S. Department of Fish and Wildlife
Oregon Department of Fish and Game
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## EXECUTIVE SUMMARY

This report summarizes results of a 2-year multi-partner project using radio-telemetry to study habitat use of northern pintails (*Anas acuta*) and aerial surveys to determine abundance of pintails and other waterfowl during spring in Southern Oregon and Northeastern California (SONEC) in the northwest part of the Great Basin. The goal of this project is to provide information to help guide conservation of waterfowl habitats in SONEC, the primary spring staging area for pintails from the Central Valley of California.

Rocket nets were used to capture pintails roughly in proportion to their distribution in the Sacramento Valley, California, during 1-19 December 2001 and 1 December 2002- 22 January 2003. We attached harness backpack VHF radiotags to 128 adult female, 111 immature female, 56 adult male, and 2 immature male pintails (Miller et al., attached satellite transmitters to other adult females from the same captures). Each week during 1 February-31 May 2002 and 2003, we attempted to determine two day and two night locations of each radiotagged pintail in seven core SONEC sub-regions (four peripheral sub-regions that few satellite pintails used were not studied). We used a Land Use Land Cover GIS database to classify SONEC into four landscape types and parsed these into sub-types using other information; we also classified ownership as private or public. On Lower Klamath and Tule Lake National Wildlife Refuges (NWRs), we used vegetation, water management, and treatment (e.g., burned, plowed) data to classify management units. SONEC moisture and temperature during the study were near average.

Of the radiotagged pintails that were alive in Central Valley at the end of hunting season, we detected 71% in 2002 and 66% in 2003 in SONEC. Lower Klamath sub-region was the most visited sub-region both springs, with 35-46% using Lower Klamath vs. 6-17% detected at least once in other sub-regions. Duration-of-stay in SONEC ranged from <1 to 95 days (avg. = 21-22 d), averaged longer for adult (21-23 d) and immature females (20-26 d) than for adult males (17-18 d), and was shortest in Malheur (5-9 d) and longest in Summer Lake (28-39 d) sub-regions.

Marsh was the most-used landscape during day and night both years; flooded upland (e.g., pasture) ranked second, cropland third, and aquatic (e.g., lakes, rivers) last. Use of landscapes varied among sub-regions but flooded upland or marsh usually ranked highest. Use of landscape types was similar during day and night and for all pintail age/sex classes. Types of management units available and used by pintails on Lower Klamath and Tule Lake NWR differed but on both refuges burning greatly increased use of late-successional marsh, flooded cropland was used less than available, and unburned late-successional permanent marsh was used equal to availability. Overall, 57-61% of pintail locations in SONEC and nearly all in Lower Klamath sub-region (day and night both years) were on publicly owned lands. However, <1-14% in Warner Valley and Summer Lake and 14-66% in other sub-regions were on public lands.

Waterfowl (ducks, geese, swans, coots) abundance in the seven core SONEC sub-regions peaked in mid-March in both 2002 (2,095,665) and 2003 (1,681,713). Pintails were the most abundant species both years (689,298 in 2002 and 532,115 in 2003), accounting for 32-33% of peak waterfowl abundance. Lower Klamath sub-region accounted for 56-74%, Upper Klamath 10-21%, Northeast California 3-9%, Modoc Plateau 1-10%, Summer Lake 0.5-6%, Warner Valley 1-5%, and Malheur 0.5-5% of SONEC waterfowl during any spring survey. Although the Lower Klamath sub-region received the greatest overall waterfowl use, distribution among sub-regions varied among species and surveys, and all sub-regions were important during some part of the spring to one or more species.

In addition to information on pintail habitat use and waterfowl abundance that we provide here, data on habitat availability and productivity and waterfowl food habits and energetic requirements during spring are needed to guide conservation planning in SONEC.

## ACKNOWLEDGEMENTS

We thank Mr. Tony Marnell, who through the Tuscany Research Institute of Las Vegas, Nevada, provided most operational funding for this project. The Institute distributed a grant to Ducks Unlimited, Inc. (DU) in Memphis, Tennessee, which dispersed funds to the Western Ecological Research Center (WERC) of the U. S. Geological Survey (USGS) and to California Waterfowl Association (CWA) to conduct the work. In addition, Brad Bortner of the U.S. Fish and Wildlife Service identified critical need for pintail habitat use information in the Klamath Basin and helped gain funding for that portion of this project through the USGS Science Support Program for addressing USFWS research needs.

We thank the rest of the WERC PINSAT research team, including Mike Casazza, Michael Miller, Dr. John Takekawa, and Dennis Orthmeyer (now with CWA) for help in planning this project and capturing pintail for radiotagging. WERC staff Bill Perry, Joan Daugherty, and Stacy Burnett provided GIS support and Dr. Julie Yee and Luke Naylor helped summarize aerial survey results. We also thank Dr. Mark Petrie (DU), Dr. Bruce Batt (DU), Dr. David Anderson (DU), Dr. Fritz Reid (DU), and Greg Yarris (CWA) for help in planning the project. Greg Mensik, Mike Carpenter, Mike Wolder, Joe Silveria, Mike Peters, and other staff of the Sacramento National Wildlife Refuge (NWR) complex and Pete Blake (Upper Butte Basin Wildlife Area), Mike Womak (Graylodge Wildlife Area), and other California Department of Fish and Game staff helped coordinate and conduct pintail trapping on their areas. CWA biologists Dan Loughman, Jim Laughlin, Richard Wright and Jeff Long helped trap in all areas.

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## INTRODUCTION

The Klamath Basin and other areas in the Southern Oregon-Northeast California (SONEC) region (Fig. 1) provide critical spring staging habitat for northern pintails (*Anas acuta*) and other waterfowl in the Pacific Flyway. Miller et al. (2003) reported that 77-87% of female pintails equipped with satellite transmitters during late winter in the Central Valley of California visited the SONEC region on their way to Alaska and Prairie-Parkland breeding areas. Pintails are a species of special concern because of their continued low populations despite improved habitat conditions on northern breeding areas. The spring period may be especially important for early-nesting species such as pintails but little is known about pintail habitat needs during spring migration. Redirection of water supplies once available for wetland management may greatly reduce the area and quality of wetland habitats in the Klamath Basin. Wise future allocation of the limited water supplies in the Klamath Basin and other SONEC sub-regions requires a thorough understanding of the impacts on all resources. Information on abundance and spring ecology of pintails and other waterfowl in SONEC is critically needed to guide conservation efforts in the region.

## OBJECTIVES

1) Measure diurnal and nocturnal habitat use by pintails in SONEC during spring.

2) Estimate abundance and distribution of pintails and other waterfowl in SONEC during spring.

## STUDY AREA

SONEC includes all major wetland complexes in the intermountain reaches of Southern Oregon and Northeast California in the northwest portion of the hydrologic Great Basin (Peterson, http://historytogo.utah.gov/greatbasin.html). SONEC comprises approximately 10% of the Great Basin and encompasses 68,877 $km^2$, although waterfowl habitat covers considerably less area. SONEC is generally “basin and range” topography with major uplift regions running predominantly

north and south. Average basin altitude is 1,200 m (4,000 ft) above sea level. Most wetlands important to pintails and other waterfowl are in these basins with the exception of the marshes of the Modoc Plateau sub-region, which is approximately 1,500 m above sea level. SONEC falls within five climate divisions (High Plateau OR, South Central OR, North Coast Drainage CA, Sacramento Drainage CA, and Northeast Interior Basins CA , http://www.wrcc.dri.edu/spi/explanation.html), but climate in the two Oregon divisions are most representative of SONEC because the majority of the three California divisions lie outside SONEC.

We divided the SONEC region into sub-regions based on roads and topographic features. We originally defined seven SONEC sub-regions, which we included in this study for systematic tracking of radiotagged pintails and aerial survey of waterfowl. However, to be consistent with Miller et al. (2003), who included locations of a few PTT-equipped pintails found in four additional peripheral areas as being in SONEC, we also define these four additional peripheral areas as SONEC sub-regions that were not part of our survey and tracking study (Fig. 1).

**SONEC Sub-regions Included in This Study**

The Lower Klamath sub-region lies south of Highway 140 and is bounded on the east by several forest service roads that roughly form a north-south line between Drews Reservoir and Hackmore, California. The southern boundary is Highway 39 starting at Ambrose, northwest to Highway 10, along Highway 10 to the west, and then Forest Service road 46N21 west to Macdoel. The western boundary of this sub-region lies along the western edge of Butte Valley from Macdoel, north to Keno, Oregon. This sub-region includes Lower Klamath and Tule Lake NWRs, Butte Valley Wildlife Area, Klamath River Game Management Area, Clear Lake NWR, and numerous small reservoirs and wetlands.

The Upper Klamath sub-region is north of the Lower Klamath sub-region and lies north of Highways 66 and 140 between Keno and Lakeview, Oregon. The eastern boundary is Highway 31, with the western boundary to the west of Upper Klamath Lake and continuing south to Keno. The Upper Klamath sub-region includes Upper Klamath Lake, Agency Lake, Sycan Marsh, Klamath Marsh, and the Williamson River Ranch.

The Modoc Plateau sub-region shares its western boundary with the Lower Klamath sub-region but continues southward following Highway 139 from Ambrose, through Canby and Adin to Lonkey Hill. The southern boundary is a straight line from Lonkey Hill northeast to the boundary of the Modoc National Forest near West Valley Reservoir. The Warner Mountains form the eastern boundary of the Modoc Plateau sub-region. The northern boundary is the short stretch of Highway 140 between Drews Reservoir and Lakeview, California, and includes the ranch fields 5 miles to the north of Lakeview. This sub-region includes Goose Lake, Modoc NWR, Fairchild Swamp, and other wetlands in the Devils Garden area of the Modoc National Forest.

The Northeast California sub-region shares boundaries with the Lower Klamath and Modoc Plateau sub-regions to the north and east. The western boundary starts at Highway 10 near Big Sand Butte and follows the Siskiyou-Modoc county line south approximately 10 km where it turns to the southwest then describes an eastward arc ending at the town of Burney, California. The southern boundary extends from Burney eastward to Sage Hen Flat where it turns northeast forming a common boundary with the Honey Lake sub-region, and ends at the Modoc Plateau sub-region near Lonkey Hill. Key waterfowl areas in this sub-region are Fall River Valley, Big Valley and Ash Creek Wildlife Area.

The Warner Valley sub-region lies east of Oregon Highway 395. Highway 140 forms most of the southern boundary, though the very south terminus of the valley is south of the highway and

is included in this sub-region. The north boundary is the line drawn from French Glen, west to Highway 395 just north of Alkali Lake. The eastern boundary is the Steens Mountain range, southwest to the Nevada-Oregon state line. This sub-region includes Hart Mountain NWR but most waterfowl habitat is found within Warner Valley.

The Summer Lake sub-region is roughly triangular and lies primarily east of Highway 31 and west of Highway 395. The southern apex is at the town of Valley Falls, Oregon, while the north boundary starts on the south end of Alkali Lake near Highway 395, extends west to the Diablo mountains, turns north and passes through the Fort Rock Valley, then turns west along Fort Rock Road and ends at Highway 31. The Lower Chewaucan River and Silver Lake basin, which are west of the highway but east of Winter Rim (the most prominent physical feature along the Summer Lake basin), are in this sub-region. Important habitats in this sub-region are the Chewaucan Marsh, Summer Lake Wildlife Area, and Lake Abert.

The western boundary of the Malheur sub-region is Highway 395, from Alkali Lake to Riley. The northern boundary follows Highway 20 from Riley to Burns and then follows the north edge of Harney Valley approximately paralleling Highway 20 to Buchanan. The eastern boundary starts at Highway 20 near Buchanan and extends southward along the eastern edge of the Harney Valley, then jogs east and then south again, and then follows the Harney-Malheur County line south and ends when it intersects the Pueblo Valley sub-region near Wildcat Creek Road. The southern boundary is shared with the Pueblo Valley and Warner Valley sub-regions. Important waterfowl habitats in this sub-region are the Harney Basin, the Silvies, Blitzen River drainages, and Malheur NWR.

**Peripheral SONEC Sub-regions Not Included in This Study**

The following four sub-regions were not surveyed for waterfowl abundance or systematically searched for VHF pintails, and although not part of our study, are considered part of SONEC.

Honey Lake sub-region shares common boundaries with the Northeast California, Modoc Plateau, and Surprise Valley sub-regions to the north. Its western boundary approximately follows Highway 139 south to the Honey Lake Valley, while the eastern boundary follows the Warner Mountains paralleling the Nevada state line. Honey Lake and associated marshes are the main waterfowl habitats in this sub-region.

The Surprise Valley sub-region shares its western boundary with the Modoc Plateau sub-region, and its southern boundary with the Honey Lake sub-region. The western boundary of the Surprise Valley sub-region starts at Post Canyon, south of Surprise Valley, and curves to the northeast through Nevada, ending at the Warner Valley sub-region near Lane Spring. The main waterfowl habitats are the Lower, Middle, and Upper Alkali Lakes in Surprise Valley.

The Shasta Valley sub-region shares its eastern border with the Lower Klamath sub-region. Its northern boundary runs parallel to the Klamath River, from Keno to Montague, then turns back east approximately following Ball Mountain-Little Shasta road until it intersects Highway 97 near the south end of Butte Valley. Shasta Valley Wildlife Area is the main waterfowl area in this sub-region.

The Pueblo Valley sub-region is roughly triangular in shape with its northwest boundary shared with the Warner Valley and Malheur sub-regions. Its eastern boundary follows the Harney-Malheur County line to the Oregon-Nevada state line. From this point, the southern boundary is the

state line running west to the Warner Valley sub-region. Alvord Lake and scattered wetlands in Pueblo Valley are the main waterfowl habitats.

**Climate and Weather**

The complex topography of SONEC results in highly variable and localized climate conditions with some of the most extreme weather in California and Oregon occurring there (Western Regional Climate Center, California Climate Narrative, http://www.wrcc.dri.edu/narratives/CALIFORNIA.htm and Oregon Climate Narrative, http://www.wrcc.dri.edu/narratives/OREGON.htm). Temperatures are highly variable in SONEC throughout the year with summer maximums averaging 33 C° (91 F°) and winter minimums averaging –7.2C° (19 F°) (Appendix 1a-c). Like most dry climates, daily temperatures vary widely with rapid cooling after sunset leading to cold nights and rapid warming producing high daytime temperatures.

Weather conditions in SONEC during the study were similar to the long-term average. In 2002, the Standardized Precipitation Index (SPI) in the High Plateau and South Central Oregon climatic divisions were near normal relative to the 109-year average for the 6 months preceding the tracking season (1 Aug 2001 to 31 Jan 2002) as well as for the 3-month period when most radiotagged pintails were present (1 Feb to 30 Apr) and for the entire 1 August 2001 to 30 April 2002 9-month period. In 2003, the SPI was near normal for the 3- and 9-month periods ending on 30 April but was moderately dry in both climatic divisions for the previous 6-month period (1 Aug 2002 to 31 Jan 2003). Spring temperatures were similar to long-term averages during both 2002 and 2003 for most SONEC sites with the exception of warmer than average January 2003 temperatures throughout SONEC and colder than average April 2003 temperatures in the western portion of SONEC (Appendix 1a-c).

# METHODS

## Objective 1-Habitat Use

### Pintail Trapping and Radiotagging

We used rocket nets over baited and unbaited sites to capture pintails roughly in proportion to their distribution throughout the Sacramento Valley, California, during 1-19 December 2001 and 1 December 2002 - 22 January 2003. We held all pintails in plastic crates, following approved Animal Care and Use guidelines. In all but the last capture each year, Miller et al. (2003) attached PTT (satellite) transmitters to about half of the adult females that had body mass $\geq$840 (2002) or $\geq$880 g (2003) and we attached VHF backpack-harness (Dwyer 1972) radiotags to all other adult females (including the other half of adult females with body mass $\geq$840 or 880 g), all immature females, and (using refurbished radiotags salvaged from earlier studies) randomly selected adult males and two immature males (Table 1). With Miller et al.'s (2003) PTT quota met, we randomly selected adult females, immature females, and adult males for VHF radiotagging at the last capture until our VHF quota was met. We radiotagged pintails at Sacramento NWR, Llano Seco NWR, Howard Slough Wildlife Area, and Little Dry Creek Wildlife Area in both 2002 and 2003 (Fig. 1).

We released all (VHF radiotagged, PTT transmittered, and unmarked) pintails at the capture site within 24 hours after capture; most releases were done at night to allow birds to adjust a few hours before being exposed to diurnal avian predators which were very common in the Sacramento Valley. Approximately 3 weeks remained in the California hunting season after completing radiotagging both years. Hunters shot and reported six VHF pintails (1 immature females, 3 adult females, 2 adult males) in 2002 and four VHF pintails (2 immature females, 1 adult female, 1 adult male) in 2003. One additional immature female VHF pintail died before 1 February 2002, but cause

of death was unknown. Therefore, 144 VHF pintails in 2002 and 146 in 2003 were presumed alive on 1 February and able to migrate into the SONEC region (Table 2).

**Radio Tracking**

Each week during 1 February-1 May 2002 and 2003, we attempted to determine two day (1 hour after sunrise to 1 hour before sunset) and two night (1 hour after sunset to 1 hour before sunrise) locations of each VHF pintail in each of the seven core SONEC sub-regions. We scanned the seven core SONEC sub-regions twice weekly using truck-mounted, dual-yagi, null-peak telemetry systems and searched the SONEC and Central Valley regions at least twice monthly using aircraft. We estimated bird locations with three bearings obtained using the truck systems and entered bearings directly into laptop computers (Gateway Solo5350) that were mounted in each tracking vehicle so that the precision of locations could be determined while in the field. The presence of the computer generated no appreciable radio interference while tracking. We calculated error ellipses to 95% confidence by Location Of A Signal (LOAS) (Ecological Software Solutions v.2.04) triangulation software using a maximum likelihood estimator (Lenth 1981). We set a maximum target error ellipse size at 10 ha, although we relaxed this somewhat as distance from the target increased and/or if habitat was known to be homogenous. We plotted error ellipses in ARCVIEW (ESRI) using available GIS habitat layers to judge whether precision was adequate to distinguish habitat use.

**Habitat Classification**

We classified habitat three ways:

1) Across the SONEC region, we used a Land Use Land Cover (LULC) map (Appendix 2) based on 30-meter thematic-mapper landsat data (http://landcover.usgs.gov/ January 14, 2004) to classify the SONEC landscape. We grouped LULC classifications into 4 broad landscape types:

Cropland, Marsh, Upland, and Aquatic (Appendix 3). In some instances we used additional visual, manager, or GIS information to update or verify the LULC coverage. For instance, if LULC code was open water, we classified the location as "Aquatic" for known lakes, rivers, and other deepwater areas, but as marsh if the open water was interspersed within a marsh.

2) To provide more detailed classification of landscape types, we visually identified habitats used by VHF pintails where available and supplemented the LULC with information from area land managers to parse the habitat descriptions into landscape sub-types (Appendix 3).

3) Managers of Lower Klamath and Tule Lake NWRs provided additional information on vegetation species, water management, and field treatment (e.g., burned, plowed, etc.) of refuge units and we used this information to further classify habitats on these areas into management unit types.

## Objective 2-Waterfowl Abundance

### Aerial Surveys

In addition to the midwinter survey in early January, five aerial waterfowl surveys of potential waterfowl habitat in the seven core SONEC sub-regions were conducted during both 2002, (21-22 Feb, 13-14 Mar, 27-28 Mar, 18-19 Apr, and 2-3 May) and 2003 (20-22 Feb, 12-18 Mar, 1-8 Apr, 14-18 Apr, and 30 Apr-4 May). Abundance was tallied by species (n = 26, Appendix 4), area (n = 52, Appendix 5), and survey date. We grouped areas into sub-regions and summarized abundance and distribution of species among sub-regions by survey. Because surveys required more than one date to complete and dates varied only slightly between years, we standardized survey dates as 5 January, 21 February, 13 March, 30 March, 16 April, and 3 May to facilitate graphic comparison among years.

# RESULTS

## Objective 1 - Habitat Use

### Use of SONEC Region by VHF Pintails

Of the VHF pintails that were alive in the Central Valley at the end of hunting season, we detected 70.8% (n = 102) in 2002 and 66.4% (n = 97) in 2003 in SONEC (Table 2). The first VHF pintails we detected arrived in the Lower Klamath sub-region each year, three on 7 February 2002 and five on 6 February 2003. The Lower Klamath sub-region was the most visited SONEC sub-region during both seasons, with 34.9-45.1% of VHF pintails using the sub-region vs. 5.5-19.2% detected at least once in other sub-regions (Table 2). Pintail use of sub-regions was ± 3% in 2002 vs. 2003 except use of the Lower Klamath sub-region declined from 45.1% to 34.9% (Table 2).

Areas used by multiple radiotagged pintails included: 1) Lower Klamath, Tule Lake and Clear Lake NWRs, Butte Valley Wildlife Area, Klamath River Management Area, Alkali Lake west of Bonanza, and Gerber Reservoir in Lower Klamath sub-region; 2) Wood River Ranch, Agency Lake Ranch, Williamson River Ranch, Klamath Marsh NWR, Wocus Marsh, and Sycan Marsh in Upper Klamath sub-region; 3) Big Valley and Fall River Valley in Northeastern California sub-region; 4) Private lands north and south of Goose Lake, Drews Reservoir, Fairchild Swamp, Boles Meadow, and Reservoirs N, F, and M in Modoc Plateau sub-region; 5) Chewaucan Marsh and Summer Lake Wildlife Area in Summer Lake sub-region; 6) Crump Lake, Adel Hunt Club, and Mark Martin Lease in the Warner Valley sub-region; and 7) Malheur NWR, flooded pasture and other agricultural lands northwest of Malheur NWR, and the Catlow Valley in the Malheur sub-region (Figs. 2 and 3).

Use of SONEC sub-regions by VHF pintails depended somewhat on where they were captured in the Sacramento Valley. However, the only consistent differences in sub-region use

related to capture site were that the lowest percentage (i.e., 0%) of VHF pintails that visited the Northeast California and Warner Valley sub-regions both years were radiotagged at Howard Slough Wildlife Area, the lowest percentage visiting Modoc Plateau both years were radiotagged at Little Dry Creek Wildlife Area, and the highest percentage visiting the Malheur sub-region both years were from Little Dry Creek (Table 2).

We detected a greater percentage of adult females in SONEC than immature females or adult males in 2002 but near equal percentages of all three age/sex classes were detected in SONEC in 2003 (Table 3). The percentages of each age/sex class detected in sub-regions were similar between years except in the Lower Klamath sub-region, where use by adult females declined from 47.5% in 2002 to 30.8% in 2003 and immature females from 46.3% in 2002 to 38.2% in 2003. Adult male use in the Lower Klamath sub-region was similar in 2002 and 2003 (37.9% vs. 40.0%, Table 3). Use of the Upper Klamath sub-region increased from 11.1% to 21.8% for immature females and from 20.7% to 28.0% for adult males but decreased from 18.0% to 13.8% for adult females. Adult males declined in the Malheur sub-region from 17.2% to 4% but increased in the Warner Valley sub-region from 3.4% to 16% (Table 3). A similar percentage of pintails visited more than one SONEC sub-region in 2002 (29%) and 2003 (25%).

Duration-of-stay in SONEC for all VHF pintails ranged from <1 to 95 days (avg. = 22.1 days) in 2002 and <1 to 85 days (avg. = 20.9 d) in 2003 (Table 4a). Average duration-of-stay in SONEC for adult (20.9-23.3 d) and immature females (20-25.7 d) was longer than for adult males (17.6-17.7 d, Table 4b-d). Average duration-of-stay was shortest in Malheur (5.3-9.2 d), longest in Summer Lake (27.5-39.2 d), and differed most between years in the Northeast California sub-region (8.2 d in 2002 vs. 36.3 d in 2003, Table 4a). Annual difference in average duration-of-stay was <12 days for all other sub-regions (Table 4a).

Duration-of-stay by age/sex class of pintails varied between 2002 and 2003. Among females visiting the Northeast California sub-region, average duration-of-stay of adult females increased by 34.9 days (Table 4b) while immature females increased by 16.8 days from 2002 to 2003 (Table 4c); no radiotagged adult male visited the Northeast California sub-region in 2003 (Table 4d). In the Summer Lake sub-region, average duration-of-stay declined by 21.5 days for immature females but only 8.5 days for adult females and 6.8 days for adult males. In the Warner Valley sub-region, the decline in duration-of-stay by adult (-12.7 d) and immature females (-12.0 d) was similar. In all other sub-regions, the annual change in duration-of-stay was similar among all age/sex classes (Tables 4a-d).

Five VHF pintails were still in SONEC (Lower Klamath, Summer Lake, Modoc Plateau, and Warner Valley sub-regions) when we stopped systematic tracking on 10 June 2002. On 6 June 2002, we documented one VHF pintail on a nest of 6 eggs in a hay field north of Goose Lake, Oregon. There were no VHF pintails in SONEC on 28 May 2003, the last day of tracking, and no nesting activity by VHF pintails was noted in SONEC that year.

**Landscape Types Used**

Marsh was the landscape type used most often by pintails in SONEC during day and night both years; flooded upland ranked second, cropland third, and aquatic (e.g. deepwater reservoirs, lakes, rivers) was the least used landscape type (Table 5a). Importance of marsh increased slightly and cropland decreased slightly in 2003 compared to 2002. Importance of landscape types was similar among pintail age/sex classes (Tables 5b-d).

Pintail use of landscape types varied among SONEC sub-regions (Table 5a). Marsh was the most used landscape type in Lower Klamath and Upper Klamath sub-regions both years, but flooded upland (e.g., pasture) was most used by pintails in the Northeast California and Summer

Lake sub-regions both years. In the Modoc Plateau and Warner Valley sub-regions, both marsh and flooded upland were heavily used by pintails both years. In the Malheur sub-region, flooded upland was most used in 2002 but marsh and aquatic landscapes received more use in 2003, because most pastures were not flooded until late April 2003, by which time most pintails had already migrated north. In each sub-region, pintail use of landscape types was similar during day and night and for all age/sex classes (Table 5b-d).

We obtained 2,224 pintail locations in SONEC during 7 February - 10 June 2002 and 1,976 pintail locations during 6 February - 28 May 2003. Nearly all locations were precise enough to allow habitat determination but geophysical features and lack of roads made collecting precise locations in Warner Valley and Malheur sub-regions more difficult so that 47 locations in 2002 and 5 locations in 2003, primarily from these sub-regions, were not used for habitat use analysis.

**Landscape Sub-types Used**

Pintail use of landscape sub-types for day and night combined and SONEC overall was greatest in seasonal hemi-marsh (38.7% in 2002 and 33.2% in 2003) and flooded pasture (21.2% in 2002 and 22.0% in 2003) (Table 6a). Use was similar between years for most landscape sub-types except unknown cereal cropland, which dropped from 11.1% in 2002 to 3.2% in 2003, and permanent hemi-marsh, which increased from 5.2% in 2002 to 17.8% in 2003.

Use of landscape sub-types varied somewhat among SONEC sub-regions and years (Table 6a). Pasture was the most used landscape sub-type in Summer Lake and Northeast California sub-regions both years, in Malheur sub-region in 2002, and in Modoc Plateau and Warner Valley sub-regions in 2003. Seasonal hemi-marsh was the most used landscape sub-type in the Upper Klamath sub-region both years and in Warner Valley and Lower Klamath sub-regions in 2002. In Lower Klamath sub-region in 2003, use of seasonal hemi-marsh and permanent hemi-marsh was nearly

equal (36.0% vs. 38.7%). Open marsh was the most used landscape sub-type in Modoc Plateau in 2002 and lake was the most used sub-type in Malheur in 2003 (although all marsh sub-types combined received greater use than lakes).

Use of landscape sub-types during day and night was similar for SONEC overall but day and night use sometimes differed in a few sub-regions (Table 6b vs. 6c). During 2003, pasture was used more at night (58.3%) than day (38.2%) in the Warner Valley sub-region, and seasonal hemi-marsh was used more at night (43.2%) than during day (26.2%) in the Northeast California sub-region.

**Availability and Use of Management Units at Lower Klamath and Tule Lake NWRs**

The types of management units available (flooded during some or all weeks of spring) at Lower Klamath and Tule Lake differed and changed between years (Table 7). At Lower Klamath NWR, flooded grain cropland, flooded grassland, early successional seasonal (ESS), late successional seasonal (LSS), and late successional permanent (LSP) marsh each comprised 12-24% of available habitat and totaled 80-86% of the available habitats. Availability of unit types at Lower Klamath NWR was similar both years with the largest differences that ESS-flooded marsh increased from 13.6% to 18.7%, LSS-flooded marsh increased from 18.4% to 24.3%, and LSP-flooded marsh decreased from 19.7% to 14.4% of available habitat between 2002 and 2003. On Tule Lake NWR, fewer types of management units were available and one type (variable crop flooded) comprised 54% of available habitat. The only change in habitat availability at Tule Lake NWR between years was that availability of LSP-burned marsh increased from 0% in 2002 to 6.4% of available habitat in 2003 and availability of LSP-unburned marsh decreased accordingly.

With different types of management units available at Tule Lake and Lower Klamath NWR, types of management units used by pintails on Lower Klamath and Tule Lake NWRs also differed (Table 7). On Lower Klamath NWR, LSS flooded marsh received the greatest pintail use during

day and night but five other unit types also received substantial (9-27%) use. On Tule Lake NWR, ≥65% of pintail use was concentrated on ESS-flooded marsh in 2002 and LSP-burned marsh in 2003.

Although types of management units used by pintails on Lower Klamath and Tule Lake NWR differed, a comparison of use vs. availability shows similar trends in pintail selection of unit types on both NWRs. Pintail selection trends on both NWRs included: 1) flooded cropland used less than available; 2) burning greatly increasing same-season pintail use of late successional marsh; and 3) LSP-flooded marsh not burned was used similar to its availability (Table 7). Differences between use and availability unique to Lower Klamath NWR included lower day use but greater night use than availability of flooded grassland both years and greater day and night use than availability of LSS-flooded marsh, especially for areas that were burned the previous year. Differences between use and availability unique to Tule Lake NWR, included the reservoir part of the upper sump being used less than available and ESS-flooded marsh being used much greater than available in 2002 when no burned marsh was available, but used much less than available in 2003 when burned marsh was available (Table 7).

**Use of Private vs. Public Habitat**

Overall, 57.2-61.0% of pintail locations in SONEC were on publicly owned lands (Table 8) but relative importance of public and private lands to pintails varied greatly among sub-region. Ownership of habitat used by pintails over all SONEC was similar by pintail age/sex class and day/night period. Public lands were used almost exclusively in the Lower Klamath sub-region during day and night in both years, but comprised only 0.8-13.9% of use in Warner Valley and Summer Lake sub-regions and 13.9-65.9% of use in other sub-regions. The relative importance of public lands was greater in 2003 than 2002 in Upper Klamath, Northeast California, and Malheur

sub-regions but lower in 2003 than 2002 in Modoc Plateau, Summer Lake, and Warner Valley sub-regions. Except for much greater night than day use of public lands in 2003 in the Northeast California sub-region, relative importance of public vs. private lands within sub-regions did not differ between day and night.

**Objective 2 – Waterfowl Abundance**

The pattern of waterfowl (ducks, geese, swans, coots) abundance in SONEC overall was similar both years but the mid-March peak was greater in 2002 (2,095,665) than in 2003 (1,681,713) (Fig. 4). Except for in the Northeast California sub-region in 2002 and Warner Valley sub-region in 2003, where abundance peaked during the late-February survey, waterfowl abundance peaked during mid- to late-March in all sub-regions both years (Fig. 4).

Waterfowl abundance varied among SONEC sub-regions. The Lower Klamath sub-region accounted for 56-74% of waterfowl during spring (excludes January survey) in SONEC (Fig. 5) and abundance patterns there were more similar to SONEC overall than other sub-regions (Fig. 4). Upper Klamath sub-region supported 10-21%, Northeast California 3-9%, Modoc Plateau 1-10%, Summer Lake 0.5-6%, Warner Valley 1-5%, and Malheur 0.5-5% of SONEC waterfowl during any spring survey (Fig. 5).

Although the Lower Klamath sub-region received the greatest overall waterfowl use, distribution among sub-regions varied greatly among species and survey dates (years were similar), and all sub-regions were important during some part of the spring to one or more species (Figs. 6-8). For instance, Lower Klamath sub-region was usually the single most important sub-region for most dabbling duck species, and supported 70-97% of northern shovelers in SONEC throughout spring. However, other sub-regions supported up to 95% of wigeon and 78% of northern pintails during some surveys and 60-99% of cinnamon teal throughout spring (Fig. 6). Lower Klamath sub-region

was also important for diving ducks, but Upper Klamath was equally or more important during some surveys and for some diver species (Fig. 7). Greater white-fronted and white geese (lesser snow and Ross') occurred primarily in Lower Klamath sub-region but Canada geese were more equally distributed among sub-regions (Fig. 8).

Abundance in SONEC during spring varied among species. Pintails were the most abundant species both years, peaking during the 13 March survey at 689,298 in 2002 and 532,115 in 2003 and accounting for 32-33% of peak waterfowl abundance (Figs. 4 and 9). All other dabbling ducks combined, including (in order of peak abundance) northern shoveler, green-winged teal, American wigeon, mallard, gadwall, and cinnamon teal, peaked at 587,560 in 2002 (13 Mar) and 498,078 in 2003 (30 Mar), comprising 28-35% of total waterfowl on those dates (Figs. 9-10). Diving ducks, including (in order of peak abundance) ruddy duck, scaup, bufflehead, canvasback, ring-necked duck, mergansers, redheads, and goldeneyes, peaked at 242,697 in 2002 (30 Mar) and 153,745 in 2003 (30 Mar), accounting for 11-17% of total waterfowl on those dates (Figs. 9 and 11). Goose abundance peaked at 432,400 in 2002 and 460,594 in 2003 (13 Mar both years) with abundance of Ross' and lesser snow geese peaking at 307,727 (13 Mar) and 293,925 (30 Mar), greater white-fronted geese at 211,997 (30 Mar) and 203,102 (13 Mar), and Canada geese at 18,879 (21 Feb) and 21,801 (21 Feb) in 2002 and 2003 springs, respectively (Fig. 12). Swans peaked at 74,779 and 61,024 and American coots at 121,935 and 120,630 in 2002 and 2003, respectively (Fig. 13).

Abundance patterns in SONEC varied among species (Figures 9-13). Abundance of swans, an early migrant, peaked (21 Feb) and declined earlier than other waterfowl. Abundance peaked during late-February to late-March and then declined for other migrants, including pintails, green-winged teal, American wigeon, canvasbacks, scaup, ring-necked ducks, buffleheads, goldeneyes, white geese, and greater white-fronted geese; white-fronts remained abundant in SONEC later than

white geese. Abundance of northern shovelers, gadwall, cinnamon teal, redheads, and coots peaked (in one or both years) and was maintained later than for other waterfowl species, indicating these species either nest in significant numbers in SONEC or are late nesters elsewhere. Mallards, mergansers, and canada geese were as or more abundant in SONEC during the January "mid-winter" survey than during any spring survey.

## Future Research

In addition to information on pintail habitat use and waterfowl abundance that we provide here, data on habitat availability and productivity and waterfowl food habits and energetic requirements during spring are needed to allow development of energetic models to guide conservation planning in SONEC.

## LITERATURE CITED

*California Climate Narrative*. Western Regional Climate Center. Retrieved January 14, 2004, from http://www.wrcc.dri.edu/narratives/CALIFORNIA.htm

Dwyer, T.J. 1972. An adjustable radio-package for ducks. Bird-Birding 43:282-284.

*Explanation of Terms*. Western Regional Climate Center. Retrieved March, 2 2004, from http://www.wrcc.dri.edu/spi/explanation.html

Land Use Land Cover. United States Geological Survey. Retrieved January 14, 2004, from http://landcover.usgs.gov/

Lenth, R.V. 1981. On finding the source of a signal. Technometrics 23:149-154.

Miller, M.R., J.Y. Takekawa, D.L. Orthmeyer, J.P. Fleskes, M.L. Casazza and W.L.Perry. 2003. Final report: Tracking spring migration of northern pintails with satellite telemetry. "Discovery for recovery: an international pintail research initiative". Unpublished Report. USGS. Sacramento. California. USA.

*Oregon Climate Narrative*. Western Regional Climate Center. Retrieved January 14, 2004, from http://www.wrcc.dri.edu/narratives/OREGON.htm

Peterson, G.B., The Great Basin, in Utah History Encyclopedia. http://historytogo.utah.gov/greatbasin.html

*Western U.S. Climate Historical summaries*. Western Regional Climate Center. Retrieved January 14, 2004, from http://www.wrcc.dri.edu/climsum.html

Table 1. Number of northern pintails (*Anas acuta*) radiotagged by age and sex at each National Wildlife Refuge (NWR) and Wildlife Area (WA) capture site in the Sacramento Valley, California during 1–19 December 2001 and 1 December 2002–22 January 2003 for potential tracking in southern Oregon and northeast California during spring 2002 and 2003.

| Site | Adult Female | | Immature Female | | Adult Male | | Immature Male | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 |
| Sacramento NWR | 21 | 40 | 12 | 45 | 7 | 19 | 0 | 1 | 40 | 105 |
| Llano Seco NWR | 27 | 23 | 12 | 5 | 9 | 4 | 1 | 0 | 49 | 32 |
| Howard Slough WA | 11 | 1 | 14 | 4 | 5 | 3 | 0 | 0 | 30 | 8 |
| Little Dry Creek WA | 4 | 2 | 18 | 3 | 10 | 0 | 0 | 0 | 32 | 5 |
| Total | 63 | 66 | 56 | 57 | 31 | 26 | 1 | 1 | 151 | 150 |

Table 2. Percentage of radiotagged northern pintails (*Anas acuta*) from **each capture site** that were alive in the Central Valley of California at the end of hunting season in 2002 (n=144) and 2003 (n=146) that were detected visiting each Southern Oregon-Northeast California (SONEC) sub-region during 7 February–10 June 2002, and 6 February–28 May 2003. Because 28% in 2002 and 24% in 2003 of pintail visited more than one sub-region, percents do not sum to SONEC total.

| Capture Site | Year | n | Lower Klamath | Upper Klamath | Northeast California | Modoc Plateau | Summer Lake | Malheur | Warner Valley | Any SONEC sub-region | Not Detected In SONEC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Howard Slough WA | 2002 | 30 | 36.7 | 16.7 | 0 | 6.7 | 6.7 | 6.7 | 0 | 56.7 | 43.3 |
| | 2003 | 8 | 62.5 | 37.5 | 0 | 12.5 | 0 | 12.5 | 0 | 75.0 | 25.0 |
| Little Dry Creek WA | 2002 | 30 | 40.0 | 10.0 | 6.7 | 3.3 | 10.0 | 20.0 | 13.3 | 63.3 | 36.7 |
| | 2003 | 5 | 20.0 | 40.0 | 20.0 | 0 | 40.0 | 20.0 | 0 | 80.0 | 20.0 |
| Llano Seco NWR | 2002 | 47 | 42.6 | 8.5 | 12.8 | 10.6 | 12.8 | 8.5 | 4.3 | 74.5 | 25.5 |
| | 2003 | 31 | 35.5 | 12.9 | 9.7 | 6.5 | 9.7 | 16.1 | 6.5 | 67.7 | 32.3 |
| Sacramento NWR Unit 6 | 2002 | 23 | 65.2 | 34.8 | 8.7 | 8.7 | 8.7 | 8.7 | 17.4 | 78.3 | 21.7 |
| | 2003 | 75 | 32.0 | 20.0 | 6.7 | 2.7 | 9.3 | 9.3 | 9.3 | 66.7 | 33.3 |
| Sacramento NWR Unit 8 | 2002 | 14 | 50.0 | 21.4 | 14.3 | 7.1 | 7.1 | 7.1 | 14.3 | 92.9 | 7.1 |
| | 2003 | 27 | 37.0 | 14.8 | 11.1 | 11.1 | 0 | 0 | 3.7 | 59.3 | 40.7 |
| All Capture Sites | 2002 | 144 | 45.1 | 16.0 | 8.3 | 7.6 | 9.7 | 10.4 | 8.3 | 70.8 | 29.2 |
| | 2003 | 146 | 34.9 | 19.2 | 8.2 | 5.5 | 8.2 | 9.6 | 6.8 | 66.4 | 33.6 |

Table 3. Percentage of radiotagged northern pintails (*Anas acuta*) of **each age/sex category** that were alive in the Central Valley of California at the end of hunting season in 2002 (n=144) and 2003 (n=146) that were detected visiting each Southern Oregon-Northeast California (SONEC) sub-region during 7 February–10 June 2002, and 6 February–28 May 2003. Because 28% in 2002 and 24% in 2003 of pintail visited more than one sub-region, percents do not sum to all SONEC total.

| | Year | n | Lower Klamath | Upper Klamath | Northeast California | Modoc Plateau | Summer Lake | Malheur | Warner Valley | All SONEC | Not Detected in SONEC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Adult Females | 2002 | 60 | 48.3 | 18.3 | 10.0 | 11.7 | 15.0 | 10.0 | 10.0 | 80.3 | 19.7 |
| | 2003 | 65 | 30.8 | 13.8 | 10.8 | 7.7 | 10.8 | 12.3 | 6.2 | 67.7 | 32.3 |
| Immature Females | 2002 | 54 | 46.3 | 11.1 | 9.3 | 7.4 | 5.6 | 7.4 | 9.3 | 63.0 | 37.0 |
| | 2003 | 55 | 38.2 | 21.8 | 9.1 | 5.5 | 3.6 | 7.3 | 3.6 | 65.5 | 34.5 |
| Adult Males | 2002 | 29 | 37.9 | 20.7 | 3.4 | 0.0 | 6.9 | 17.2 | 3.4 | 65.5 | 34.5 |
| | 2003 | 25 | 40.0 | 28.0 | 0.0 | 0.0 | 12.0 | 4.0 | 16.0 | 64.0 | 36.0 |
| Total | 2002 | 144[a] | 45.1 | 16.0 | 8.3 | 7.6 | 9.7 | 10.4 | 8.3 | 70.8 | 29.2 |
| | 2003 | 146[a] | 35.6 | 19.2 | 8.2 | 5.5 | 8.2 | 9.6 | 6.8 | 66.4 | 33.6 |

[a]Includes one immature male.

Table 4a. Average duration-of-stay (DOS) (days), DOS standard deviation, maximum and minimum DOS, earliest and latest first detection dates, and total number detected within sub-regions during 7 February–10 June 2002 and 6 February–28 May 2003 in Southern Oregon-Northeast California (SONEC) sub-regions and SONEC overall, for **all** northern pintails (*Anas acuta*) radiotagged December 2001 and December 2002–January 2003 in the Sacramento Valley, California.

| | Year | Lower Klamath | Upper Klamath | Northeast California | Modoc Plateau | Summer Lake | Malheur | Warner Valley | SONEC |
|---|---|---|---|---|---|---|---|---|---|
| Average DOS | 2002 | 26.3 | 11.3 | 8.2 | 20.4 | 39.2 | 9.2 | 31.1 | 22.1 |
| | 2003 | 22.6 | 17.0 | 36.3 | 17.9 | 27.5 | 5.3 | 20.7 | 20.9 |
| Standard Deviation | 2002 | 21.9 | 12.4 | 11.8 | 22.9 | 17.4 | 8.3 | 16.3 | 20.6 |
| | 2003 | 24.8 | 16.6 | 21.9 | 19.2 | 17.2 | 8.6 | 19.2 | 21.7 |
| Max DOS | 2002 | 95 | 41 | 37 | 90 | 70 | 26 | 64 | 95 |
| | 2003 | 77 | 66 | 85 | 53 | 56 | 32 | 63 | 85 |
| Min DOS | 2002 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 3 | 0.5 |
| | 2003 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 3 | 0.5 |
| Earliest First Detection [a] | 2002 | 7 Feb | 10 Feb | 14 Feb | 8 Mar | 13 Feb | 27 Feb | 26 Feb | 7 Feb |
| | 2003 | 6 Feb | 17 Feb | 11 Feb | 7 Mar | 24 Feb | 6 Mar | 15 Feb | 6 Feb |
| Latest First Detection [b] | 2002 | 13 May | 19 Apr | 15 Apr | 25 Apr | 13 May | 3 Apr | 29 Mar | 13 May |
| | 2003 | 5 May | 5 May | 16 Apr | 22 Apr | Apr 10 | 31 Mar | 7 Apr | 5 May |
| n [c] | 2002 | 66 | 23 | 12 | 12 | 14 | 15 | 12 | 102 |
| | 2003 | 51 | 28 | 12 | 8 | 12 | 14 | 10 | 97 |

[a] Date the first radiotagged pintail previously not detected anywhere in SONEC was detected.

[b] Date the last radiotagged pintail previously not detected anywhere in SONEC was detected.

[c] Number of radiotagged pintails detected.

Table 4b. Average duration-of-stay (DOS) (days), DOS standard deviation, maximum and minimum DOS, earliest and latest first detection dates, and total number detected within sub-regions during 7 February–10 June 2002 and 6 February–28 May 2003 in Southern Oregon-Northeast California (SONEC) sub-regions and SONEC overall, for **adult female** northern pintails (*Anas acuta*) radiotagged December 2001 and December 2002–January 2003 in the Sacramento Valley, California.

| | Year | Lower Klamath | Upper Klamath | Northeast California | Modoc Plateau | Summer Lake | Malheur | Warner Valley | SONEC |
|---|---|---|---|---|---|---|---|---|---|
| Average DOS | 2002 | 25.7 | 11.9 | 9.8 | 11.7 | 37.8 | 8.3 | 25.5 | 20.9 |
| | 2003 | 28.1 | 17.0 | 44.7 | 14.7 | 29.3 | 4.8 | 12.8 | 23.3 |
| Standard Deviation | 2002 | 18.1 | 14.6 | 14.1 | 7.2 | 18.3 | 7.5 | 15.1 | 18.2 |
| | 2003 | 26.0 | 18.5 | 19.8 | 16.5 | 14.1 | 5.0 | 11.3 | 22.6 |
| Max DOS | 2002 | 72 | 41 | 37 | 27 | 60 | 20 | 46 | 72 |
| | 2003 | 74 | 66 | 85 | 43 | 50 | 14 | 32 | 85 |
| Min DOS | 2002 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 3 | 0.5 |
| | 2003 | 0.5 | 1.5 | 16 | 0.5 | 5 | 0.5 | 3 | 0.5 |
| Earliest First Detection [a] | 2002 | 8 Feb | 10 Feb | 22 Feb | 8 Mar | 27 Feb | 27 Feb | 25 Feb | 8 Feb |
| | 2003 | 7 Feb | 17 Feb | 11 Feb | 7 Mar | 24 Feb | 6 Mar | 24 Feb | 7 Feb |
| Latest First Detection [b] | 2002 | 8 Apr | 29 Apr | 5 Apr | 25 Apr | 13 May | 25 Mar | 6 Mar | 13 May |
| | 2003 | 19 Mar | 24 Apr | 25 Mar | 22 Apr | 10 Apr | 26 Mar | 7 Apr | 24 Apr |
| n [c] | 2002 | 29 | 11 | 6 | 8 | 9 | 6 | 6 | 48 |
| | 2003 | 20 | 9 | 7 | 5 | 7 | 8 | 4 | 44 |

[a] Date the first radiotagged pintail previously not detected anywhere in SONEC was detected.

[b] Date the last radiotagged pintail previously not detected anywhere in SONEC was detected.

[c] Number of radiotagged pintails detected.

Table 4c. Average duration-of-stay (DOS) (days), DOS standard deviation, maximum and minimum DOS, earliest and latest first detection dates, and total number detected within sub-regions during 7 February–10 June 2002 and 6 February–28 May 2003 in Southern Oregon-Northeast California (SONEC) sub-regions and SONEC overall, for **immature female** northern pintails (*Anas acuta*) radiotagged December 2001 and December 2002–January 2003 in the Sacramento Valley, California.

| | Year | Lower Klamath | Upper Klamath | Northeast California | Modoc Plateau | Summer Lake | Malheur | Warner Valley | SONEC |
|---|---|---|---|---|---|---|---|---|---|
| Average DOS | 2002 | 27.3 | 12.8 | 7.7 | 37.4 | 49.8 | 12.3 | 39.0 | 25.7 |
| | 2003 | 21.5 | 18.1 | 24.5 | 23.2 | 28.3 | 6.9 | 27.0 | 20.0 |
| Standard Deviation | 2002 | 27.3 | 10.2 | 9.0 | 31.9 | 15.0 | 10.6 | 16.0 | 23.6 |
| | 2003 | 25.4 | 18.5 | 19.0 | 22.0 | 27.8 | 12.6 | 8.0 | 22.1 |
| Max DOS | 2002 | 95 | 27 | 21 | 90 | 70 | 26 | 64 | 95 |
| | 2003 | 77 | 66 | 51 | 53 | 56 | 32 | 32 | 77 |
| Min DOS | 2002 | 0.5 | 0.5 | 0.5 | 11 | 33 | 1 | 18 | 0.5 |
| | 2003 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 16 | 0.5 |
| Earliest First Detection [a] | 2002 | 13 Feb | 20 Feb | 1 Mar | 8 Mar | 13 Feb | 28 Feb | 1 Mar | 13 Feb |
| | 2003 | 6 Feb | 20 Feb | 28 Feb | 7 Mar | 12 Mar | 18 Mar | 24 Feb | 6 Feb |
| Latest First Detection [b] | 2002 | 13 May | 11 May | 28 Mar | 13 Apr | 4 Apr | 3 Apr | 21 Mar | 13 May |
| | 2003 | 5 May | 5 May | 16 Apr | 22 Apr | 25 Mar | 31 Mar | 12 Mar | 5 May |
| n [c] | 2002 | 26 | 6 | 5 | 4 | 3 | 4 | 5 | 34 |
| | 2003 | 20 | 12 | 5 | 3 | 2 | 5 | 2 | 36 |

[a] Date the first radiotagged pintail previously not detected anywhere in SONEC was detected.

[b] Date the last radiotagged pintail previously not detected anywhere in SONEC was detected.

[c] Number of radiotagged pintails detected.

Table 4d. Average duration-of-stay (DOS) (days), DOS standard deviation, maximum and minimum DOS, earliest and latest first detection dates, and total number detected within sub-regions during 7 February–10 June 2002 and 6 February–28 May 2003 in Southern Oregon-Northeast California (SONEC) sub-regions and SONEC overall, for **adult male** northern pintails (*Anas acuta*) radiotagged December 2001 and December 2002–January 2003 in the Sacramento Valley, California.

| | Year | Lower Klamath | Upper Klamath | Northeast California | Modoc Plateau | Summer Lake | Malheur | Warner Valley | SONEC |
|---|---|---|---|---|---|---|---|---|---|
| Average DOS | 2002 | 25.7 | 8.6 | 0.5 | 0 | 29.5 | 7.9 | 25.0 | 17.6 |
| | 2003 | 16.0 | 15.2 | 0 | 0 | 22.7 | 1.0 | 27.0 | 17.7 |
| Standard Deviation | 2002 | 16.0 | 9.2 | 0 | 0 | 1.5 | 6.4 | 0.00 | 14.9 |
| | 2003 | 18.3 | 8.9 | 0 | 0 | 13.1 | 1.0 | 25.5 | 17.6 |
| Max DOS | 2002 | 58 | 28 | 0.5 | 0 | 31 | 19 | 25 | 58 |
| | 2003 | 57 | 29 | 0 | 0 | 39 | 1 | 63 | 63 |
| Min DOS | 2002 | 1 | 9 | 0.5 | 0 | 28 | 0.5 | 25 | 0.5 |
| | 2003 | 0.5 | 0.5 | 0 | 0 | 7 | 1 | 3 | 0.5 |
| Earliest First Detection [a] | 2002 | 7 Feb | 25 Feb | 14 Feb | | 23 Mar | 27 Feb | 1 Mar | 7 Feb |
| | 2003 | 6 Feb | 17 Feb | | | 28 Feb | 20 Mar | 15 Feb | 6 Feb |
| Latest First Detection [b] | 2002 | 3 May | 1 Apr | 14 Feb | | 23 Mar | 20 Mar | 1 Mar | 3 May |
| | 2003 | 14 Apr | 18 Apr | | | 12 Mar | 20 Mar | 28 Feb | 18 Apr |
| n [c] | 2002 | 11 | 6 | 1 | 0 | 2 | 5 | 1 | 19 |
| | 2003 | 10 | 7 | 0 | 0 | 3 | 1 | 4 | 16 |

[a] Date the first radiotagged pintail previously not detected anywhere in SONEC was detected.

[b] Date the last radiotagged pintail previously not detected anywhere in SONEC was detected.

[c] Number of radiotagged pintails detected.

Table 5a. Percent of **all** locations by landscape type and day (D) and night (N) in each sub-region and SONEC overall during 7 February–10 June 2002 and 6 February–28 May 2003 for northern pintails (*Anas acuta*) radiotagged in December 2001 and December 2002–January 2003 in the Sacramento Valley of California.

| Landscape | Year | Lower Klamath | | Upper Klamath | | Northeast California | | Modoc Plateau | | Summer Lake | | Malheur | | Warner Valley | | SONEC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | D | N | D | N | D | N | D | N | D | N | D | N | D | N | D | N |
| Aquatic | 2002 | 3.6 | 4.4 | 11.5 | 13.4 | 0.0 | 0.0 | 10.8 | 9.7 | 0.6 | 2.1 | 0.0 | 0.0 | 16.0 | 17.9 | 5.3 | 6.2 |
| | 2003 | 6.2 | 7.0 | 5.0 | 4.2 | 4.1 | 2.3 | 0.0 | 0.0 | 0.0 | 0.0 | 34.1 | 40.0 | 5.5 | 3.6 | 5.8 | 5.6 |
| Cropland | 2002 | 18.7 | 14.1 | 3.4 | 1.8 | 0.0 | 0.0 | 1.2 | 0.0 | 19.4 | 8.6 | 0.0 | 0.0 | 14.9 | 18.9 | 14.8 | 10.4 |
| | 2003 | 5.5 | 2.1 | 2.2 | 0.6 | 9.8 | 3.0 | 0.0 | 0.0 | 24.8 | 11.6 | 5.9 | 0.0 | 7.3 | 9.5 | 7.5 | 3.6 |
| Marsh | 2002 | 69.5 | 67.3 | 74.7 | 75.9 | 35.0 | 32.6 | 45.8 | 58.3 | 11.2 | 13.9 | 16.7 | 27.3 | 45.7 | 39.6 | 53.9 | 53.3 |
| | 2003 | 83.6 | 88.3 | 82.3 | 88.6 | 28.7 | 47.0 | 51.0 | 43.8 | 5.1 | 2.5 | 48.8 | 40.0 | 45.5 | 20.2 | 62.3 | 62.2 |
| Upland | 2002 | 8.2 | 14.2 | 10.3 | 8.9 | 65.0 | 67.4 | 42.2 | 31.9 | 68.8 | 75.4 | 83.3 | 72.7 | 23.4 | 23.6 | 26.0 | 30.2 |
| | 2003 | 4.6 | 2.6 | 10.5 | 6.6 | 57.4 | 47.7 | 49.0 | 56.3 | 70.1 | 86.0 | 12.2 | 20.0 | 41.8 | 66.7 | 24.4 | 28.7 |
| n[a] | 2002 | 551 | 569 | 87 | 112 | 20 | 46 | 83 | 72 | 170 | 187 | 36 | 44 | 94 | 106 | 1041 | 1136 |
| | 2003 | 434 | 383 | 181 | 167 | 122 | 132 | 51 | 48 | 117 | 121 | 41 | 35 | 55 | 84 | 1001 | 970 |

[a] Number of pintail locations.

Table 5b. Percent of **adult female** locations by landscape type and day (D) and night (N) in each sub-region and SONEC overall during 7 February–10 June 2002 and 6 February–28 May 2003 for northern pintails (*Anas acuta*) radiotagged in December 2001 and December 2002–January 2003 in the Sacramento Valley of California.

| Landscape | Year | Lower Klamath | | Upper Klamath | | Northeast California | | Modoc Plateau | | Summer Lake | | Malheur | | Warner Valley | | SONEC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | D | N | D | N | D | N | D | N | D | N | D | N | D | N | D | N |
| Aquatic | 2002 | 4.9 | 5.0 | 9.3 | 12.0 | 0.0 | 0.0 | 3.8 | 0.0 | 1.1 | 2.0 | 0.0 | 0.0 | 16.3 | 16.7 | 5.4 | 5.8 |
| | 2003 | 5.7 | 5.6 | 0.0 | 1.9 | 2.4 | 2.2 | 0.0 | 0.0 | 0.0 | 0.0 | 33.3 | 25.0 | 11.1 | 4.3 | 4.7 | 4.1 |
| Cropland | 2002 | 22.6 | 14.2 | 1.9 | 1.3 | 0.0 | 0.0 | 3.8 | 0.0 | 24.5 | 12.0 | 0.0 | 0.0 | 14.0 | 19.0 | 17.8 | 10.8 |
| | 2003 | 4.7 | 3.4 | 5.5 | 1.9 | 11.9 | 4.4 | 0.0 | 0.0 | 24.7 | 14.9 | 9.5 | 0.0 | 11.1 | 21.7 | 9.3 | 5.8 |
| Marsh | 2002 | 63.0 | 63.8 | 75.9 | 73.3 | 50.0 | 50.0 | 84.6 | 96.4 | 1.1 | 1.0 | 16.7 | 40.0 | 41.9 | 35.7 | 49.8 | 51.7 |
| | 2003 | 85.0 | 88.8 | 89.1 | 92.3 | 26.2 | 44.4 | 44.4 | 44.4 | 6.8 | 1.4 | 38.1 | 40.0 | 38.9 | 21.7 | 56.7 | 58.7 |
| Upland | 2002 | 9.5 | 16.9 | 13.0 | 13.3 | 50.0 | 50.0 | 7.7 | 3.6 | 73.4 | 85.0 | 83.3 | 60.0 | 27.9 | 28.6 | 37.0 | 31.8 |
| | 2003 | 4.7 | 2.2 | 5.5 | 3.8 | 59.5 | 48.9 | 55.6 | 55.6 | 68.5 | 83.8 | 19.0 | 35.0 | 38.9 | 52.2 | 29.3 | 31.4 |
| n[a] | 2002 | 243 | 260 | 54 | 75 | 4 | 8 | 26 | 28 | 94 | 100 | 18 | 25 | 43 | 42 | 482 | 538 |
| | 2003 | 193 | 179 | 55 | 52 | 84 | 90 | 27 | 27 | 73 | 74 | 21 | 20 | 18 | 23 | 471 | 465 |

[a] Number of pintail locations.

Table 5c. Percent of **immature female** locations by landscape type and day (D) and night (N) in each sub-region and SONEC overall during 7 February–10 June 2002 and 6 February–28 May 2003 for northern pintails (*Anas acuta*) radiotagged in December 2001 and December 2002–January 2003 in the Sacramento Valley of California.

| Landscape | Year | Lower Klamath | | Upper Klamath | | Northeast California | | Modoc Plateau | | Summer Lake | | Malheur | | Warner Valley | | SONEC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | D | N | D | N | D | N | D | N | D | N | D | N | D | N | D | N |
| Aquatic | 2002 | 2.4 | 3.2 | 4.5 | 11.5 | 0.0 | 0.0 | 12.5 | 15.9 | 0.0 | 1.6 | 0.0 | 0.0 | 14.9 | 18.2 | 4.8 | 6.1 |
| | 2003 | 8.0 | 9.4 | 9.4 | 6.2 | 7.9 | 2.4 | 0.0 | 0.0 | 0.0 | 0.0 | 29.4 | 53.8 | 7.7 | 4.8 | 8.3 | 8.1 |
| Cropland | 2002 | 21.4 | 17.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.8 | 4.8 | 0.0 | 0.0 | 17.0 | 18.2 | 13.7 | 10.9 |
| | 2003 | 4.6 | 1.3 | 1.2 | 0.0 | 5.3 | 0.0 | 0.0 | 0.0 | 28.6 | 15.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.6 | 1.4 |
| Marsh | 2002 | 67.1 | 65.4 | 90.9 | 88.5 | 33.3 | 27.0 | 28.6 | 34.1 | 21.6 | 19.4 | 13.3 | 12.5 | 48.9 | 45.5 | 52.4 | 40.1 |
| | 2003 | 82.8 | 85.2 | 72.9 | 85.2 | 34.2 | 52.4 | 58.3 | 42.9 | 4.8 | 0.0 | 64.7 | 46.2 | 30.8 | 9.5 | 66.9 | 67.7 |
| Upland | 2002 | 9.0 | 14.3 | 4.5 | 0.0 | 66.7 | 73.0 | 58.9 | 50.0 | 70.6 | 74.2 | 86.7 | 87.5 | 19.1 | 18.2 | 29.1 | 32.8 |
| | 2003 | 4.6 | 4.0 | 16.5 | 8.6 | 52.6 | 45.2 | 41.7 | 57.1 | 66.7 | 85.0 | 5.9 | 0.0 | 61.5 | 85.7 | 20.2 | 22.8 |
| n[a] | 2002 | 210 | 217 | 22 | 26 | 15 | 37 | 56 | 44 | 51 | 62 | 15 | 16 | 47 | 55 | 416 | 457 |
| | 2003 | 174 | 149 | 85 | 81 | 38 | 42 | 24 | 21 | 21 | 20 | 17 | 13 | 13 | 21 | 372 | 347 |

[a] Number of pintail locations.

Table 5d. Percent of **adult male** locations by general landscape type and day (D) and night (N) in each sub-region and SONEC overall during 7 February–10 June 2002 and 6 February–28 May 2003 for northern pintails (*Anas acuta*) radiotagged in December 2001 and December 2002–January 2003 in the Sacramento Valley of California.

| Landscape | Year | Lower Klamath | | Upper Klamath | | Northeast California | | Modoc Plateau | | Summer Lake | | Malheur | | Warner Valley | | SONEC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | D | N | D | N | D | N | D | N | D | N | D | N | D | N | D | N |
| Aquatic | 2002 | 3.1 | 5.4 | 36.4 | 27.3 | 0 | 0 | 100.0 | 0.0 | 0 | 4.0 | 0 | 0 | 25.0 | 22.2 | 6.3 | 7.8 |
| | 2003 | 3.1 | 5.5 | 2.4 | 2.9 | 0 | 0 | 0 | 0.0 | 0 | 0 | 100.0 | 100.0 | 0 | 2.5 | 3.2 | 4.4 |
| Cropland | 2002 | 3.1 | 6.5 | 18.2 | 9.1 | 0 | 0 | 0 | 0 | 24.0 | 4.0 | 0 | 0 | 0.0 | 22.2 | 7.7 | 7.1 |
| | 2003 | 9.2 | 0.0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 21.7 | 0.0 | 0 | 0 | 8.3 | 7.5 | 8.4 | 1.9 |
| Marsh | 2002 | 90.8 | 81.5 | 36.4 | 63.6 | 0 | 100.0 | 0 | 0 | 28.0 | 52.0 | 33.3 | 0 | 50.0 | 22.2 | 72.0 | 69.5 |
| | 2003 | 83.1 | 94.5 | 92.7 | 91.2 | 0 | 0 | 0 | 0 | 0 | 7.4 | 0 | 0 | 58.3 | 25.0 | 68.4 | 60.1 |
| Upland | 2002 | 3.1 | 6.5 | 9.1 | 0 | 100.0 | 0 | 0 | 0 | 48.0 | 40.0 | 66.7 | 100.0 | 25.0 | 33.3 | 14.0 | 15.6 |
| | 2003 | 4.6 | 0 | 4.9 | 5.9 | 0 | 0 | 0 | 0 | 78.3 | 92.6 | 0 | 0 | 33.3 | 65.0 | 20.0 | 33.5 |
| n[a] | 2002 | 98 | 92 | 11 | 11 | 1 | 1 | 1 | 0 | 25 | 25 | 3 | 3 | 4 | 9 | 143 | 141 |
| | 2003 | 65 | 55 | 41 | 34 | 0 | 0 | 0 | 0 | 23 | 27 | 2 | 2 | 24 | 40 | 155 | 158 |

[a] Number of pintail locations.

Table 6a. Percent of day and night (**combined)** locations in each landscape sub-type for each SONEC sub-region and SONEC overall during 7 February–10 June 2002 and 6 February–28 May 2003 for northern pintails (*Anas acuta*) radiotagged in Dec. 2001 and Dec. 2002–January 2003 in Sacramento Valley, California.

| Landscape Type | Landscape Sub-Type | Lower Klamath | | Upper Klamath | | Northeast California | | Modoc Plateau | | Summer Lake | | Malheur | | Warner Valley | | All SONEC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 |
| Aquatic | Irrigation Ditch | 0.7 | 0 | 0.5 | 0 | 0 | 0 | 0 | 0 | 1.1 | 0 | 0 | 0 | 0 | 0 | 0.6 | 0 |
| | Lake | 0.4 | 0 | 9.5 | 2.9 | 0 | 1.6 | 5.8 | 0 | 0 | 0 | 0 | 30.3 | 17.0 | 1.4 | 3.0 | 4.7 |
| | Reservoir | 2.4 | 6.6 | 2.5 | 1.1 | 0 | 0.4 | 4.5 | 0 | 0 | 0 | 0 | 6.6 | 0 | 2.9 | 1.8 | 0.7 |
| | River, Creek | 0.4 | 0 | 0 | 0.6 | 0 | 1.2 | 0 | 0 | 0.3 | 0 | 0 | 0.0 | 0 | 0 | 0.2 | 0.3 |
| | Unknown | 0.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0.1 | 0 |
| Cropland | Cereal Unk. | 14.0 | 1.3 | 1.0 | 0.9 | 0 | 0.4 | 0 | 0 | 13.7 | 18.1 | 0 | 0.0 | 17.0 | 4.3 | 11.1 | 3.2 |
| | Unk.-Fall Crop Dominant | 0 | 1.1 | 0 | 0 | 0 | 0.4 | 0 | 0 | 0 | 0 | 0 | 2.6 | 0 | 4.3 | 0 | 0.9 |
| | Rice | 0 | 0.0 | 0 | 0 | 0 | 4.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.6 |
| | Rowcrop Unk. | 2.4 | 0.2 | 1.5 | 0.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.4 | 0.2 |
| | Wild Rice | 0 | 0 | 0 | 0.0 | 0 | 0.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 |
| | Unknown | 0 | 1.2 | 0 | 0.3 | 0 | 0 | 0.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.6 |
| Marsh | Permanent-Closed | 1.1 | 0.1 | 5.5 | 2.3 | 0 | 0 | 0 | 0 | 0.6 | 0 | 0 | 0 | 0 | 0 | 1.1 | 0.5 |
| | Permanent-Hemi | 8.0 | 38.7 | 3.0 | 7.2 | 0 | 0.4 | 0 | 0 | 2.2 | 0 | 10.0 | 11.8 | 0.5 | 0 | 5.2 | 17.8 |
| | Permanent-Open | 0.2 | 0.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.6 | 0 | 1.3 | 9.2 | 0 | 1.4 | 0.2 | 0.6 |
| | Permanent-Unk. | 0 | 0.1 | 1.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3.9 | 0 | 0.7 | 0.1 | 0.3 |
| | Seasonal-Closed | 0.1 | 0.5 | 0 | 0.6 | 0 | 0 | 0 | 2.0 | 2.2 | 0.4 | 0 | 0 | 0 | 5.0 | 0.4 | 0.8 |
| | Seasonal-Hemi | 55.2 | 36.0 | 65.3 | 66.1 | 0 | 35.0 | 0 | 28.3 | 5.0 | 2.1 | 5.0 | 1.3 | 36.5 | 4.3 | 38.7 | 33.2 |
| | Seasonal-Open | 0.4 | 0.1 | 0 | 0 | 0 | 0.4 | 0 | 14.1 | 0 | 0 | 0 | 6.6 | 1.0 | 7.9 | 0.3 | 1.6 |
| | Seasonal-Unk. | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11.8 | 0.5 | 0.7 | 0 | 0.6 |
| | Unk.-Hydro-Closed | 0.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.3 | 0 | 0 | 0 | 0 | 0 | 0.4 | 0 |
| | Unk.-Hydro-Hemi | 2.1 | 9.3 | 0 | 9.2 | 33.3 | 2.4 | 15.5 | 1.0 | 1.7 | 1.3 | 5.0 | 0 | 1.5 | 10.1 | 3.8 | 6.8 |
| | Unk.-Hydro-Open | 0.4 | 0.1 | 0 | 0 | 0 | 0 | 36.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2.8 | 0.1 |
| | Unknown | 0.1 | 0 | 0 | 0 | | 0 | 0 | 2.0 | 0 | 0 | 1.3 | 0 | 2.5 | 0 | 0.3 | 0.1 |
| Upland | Alkali Flat | 7.1 | 1.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.3 | 0 | 0 | 0 | 0 | 0 | 3.7 | 0.4 |
| | Fallow Bare | 0 | 0 | 3.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0 | 1.3 | 0 | 0 | 0.3 | 0.1 |
| | Grass Hay | 0 | 0.9 | 0 | 3.4 | 0 | 0 | 9.7 | 0 | 0 | 0.4 | 1.3 | 0.0 | 0 | 3.6 | 0.7 | 1.3 |
| | Grassland | 2.7 | 0.7 | 0 | 0.0 | 1.5 | 9.4 | 0 | 1.0 | 0 | 2.9 | 3.8 | 6.6 | 0.5 | 1.4 | 1.6 | 2.3 |
| | Irrigated Pasture | 0 | 0 | 0 | 0 | 3.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 |
| | Pasture | 0.8 | 0.5 | 6.5 | 5.2 | 59.1 | 42.5 | 26.5 | 50.5 | 71.7 | 74.8 | 71.3 | 7.9 | 23.0 | 50.4 | 21.2 | 22.0 |
| | Unknown | 0.7 | 0.6 | 0 | 0 | 3.0 | 0.4 | 1.3 | 1.0 | 0.3 | 0 | 1.3 | 0 | 0 | 1.4 | 0.6 | 0.5 |
| | No. of pintail locations | 1120 | 817 | 199 | 348 | 66 | 254 | 155 | 99 | 357 | 238 | 80 | 76 | 200 | 139 | 2177 | 1971 |

Table 6b. Percent of **day** locations in each landscape sub-type for each SONEC sub-region and SONEC overall during 7 February–10 June 2002 and 6 February–28 May 2003 for northern pintails (*Anas acuta*) radiotagged in December 2001 and December 2002–January 2003 in Sacramento Valley, California.

| | | Lower Klamath | | Upper Klamath | | Northeast California | | Modoc Plateau | | Summer Lake | | Malheur | | Warner Valley | | All SONEC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Landscape Type | Landscape Sub-Type | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 |
| Aquatic | Irrigation Ditch | 0.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.6 | 0 | 0 | 0 | 0 | 0 | 0.4 | 0 |
| | Lake | 0.5 | 0 | 8.0 | 3.3 | 0 | 1.6 | 7.2 | 0 | 0 | 0 | 0 | 26.8 | 16.0 | 1.8 | 3.0 | 4.7 |
| | Reservoir | 1.6 | 6.2 | 3.4 | 0.6 | 0 | 0.8 | 3.6 | 0 | 0 | 0 | 0 | 7.3 | 0 | 3.6 | 1.4 | 0.7 |
| | River, Creek | 0.5 | 0 | 0 | 1.1 | 0 | 1.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.3 | 0.4 |
| | Unknown | 0.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 | 0 |
| Cropland | Cereal Unk. | 16.0 | 2.1 | 1.1 | 1.1 | 0 | 0.8 | 0 | 0 | 19.4 | 24.8 | 0 | 0 | 14.9 | 3.6 | 13.3 | 4.3 |
| | Unk.-Fall Crop Dominant | 0.0 | 1.6 | 0 | 0 | 0 | 0.8 | 0 | 0 | 0 | 0 | 0 | 4.9 | 0 | 3.6 | 0 | 1.2 |
| | Rice | 0 | 0 | 0 | 0 | 0 | 7.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.9 |
| | Rowcrop Unk. | 2.5 | 0.5 | 2.3 | 0.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.5 | 0.3 |
| | Wild Rice | 0 | 0 | 0 | 0 | 0 | 0.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 |
| | Unknown | 0 | 1.4 | 0 | 0.6 | 0 | 0 | 1.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0.7 |
| Freshwater Marsh | Permanent-Closed | 1.5 | 0 | 9.2 | 2.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.5 | 0.4 |
| | Permanent-Hemi | 11.3 | 36.4 | 3.4 | 8.3 | 0 | 0 | 0 | 0 | 2.4 | 0 | 5.6 | 14.6 | 0 | 0 | 6.8 | 17.9 |
| | Permanent-Open | 0.2 | 0.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0.6 | 0 | 2.8 | 7.3 | 0 | 1.8 | 0.3 | 0.5 |
| | Permanent-Unk. | 0 | 0.2 | 2.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4.9 | 0 | 1.8 | 0.2 | 0.4 |
| | Seasonal-Closed | 0.2 | 0.5 | 0 | 0.6 | 0 | 0 | 0 | 3.9 | 2.4 | 0 | 0 | 0 | 0 | 7.3 | 0.5 | 0.9 |
| | Seasonal-Hemi | 51.2 | 36.2 | 59.8 | 62.4 | 0 | 26.2 | 0 | 29.4 | 5.3 | 3.4 | 2.8 | 0 | 41.5 | 7.3 | 36.8 | 32.5 |
| | Seasonal-Open | 0.2 | 0.2 | 0 | 0 | 0 | 0.8 | 0 | 15.7 | 0 | 0 | 0 | 4.9 | 1.1 | 7.3 | 0.2 | 1.6 |
| | Seasonal-Unk. | 0 | 0.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17.1 | 1.1 | 0 | 0.1 | 0.8 |
| | Unk.-Hydro-Closed | 1.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.7 | 0 |
| | Unk.-Hydro-Hemi | 2.9 | 9.4 | 0 | 8.8 | 35.0 | 1.6 | 10.8 | 0 | 0.6 | 1.7 | 5.6 | 0 | 1.1 | 20.0 | 3.5 | 7.2 |
| | Unk.-Hydro-Open | 0.9 | 0.2 | 0 | 0 | 0 | 0 | 34.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3.3 | 0.1 |
| | Unknown | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2.0 | 0 | 0 | 0 | 0 | 1.1 | 0 | 0.1 | 0.1 |
| Upland | Alkali Flat | 4.2 | 1.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2.2 | 0.6 |
| | Fallow Bare | 0 | 0 | 6.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2.4 | 0 | 0 | 0.6 | 0.1 |
| | Grass Hay | 0 | 0.7 | 0 | 1.7 | 0 | 0 | 13.3 | 0 | 0 | 0.9 | 2.8 | 0 | 0 | 1.8 | 1.2 | 0.8 |
| | Grassland | 2.2 | 0.7 | 0 | 0 | 0 | 9.0 | 0 | 2.0 | 0 | 3.4 | 8.3 | 2.4 | 1.1 | 0 | 1.5 | 2.0 |
| | Irrigated Pasture | 0 | 0 | 0 | 0 | 5.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 |
| | Pasture | 0.7 | 0.9 | 3.4 | 8.8 | 60.0 | 47.5 | 28.9 | 45.1 | 68.2 | 65.8 | 69.4 | 7.3 | 22.3 | 38.2 | 19.7 | 20.2 |
| | Unknown | 0.9 | 0.9 | 0 | 0.0 | 0 | 0.8 | 0 | 2.0 | 0.6 | 0 | 2.8 | 0 | 0 | 1.8 | 0.7 | 0.7 |
| | No. of pintail locations | 551 | 434 | 87 | 181 | 20 | 122 | 83 | 51 | 170 | 117 | 36 | 41 | 94 | 55 | 1041 | 1001 |

Table 6c. Percent of **night** locations in each landscape sub-type for each SONEC sub-region and SONEC overall during 7 February–10 June 2002 and 6 February–28 May 2003 for northern pintails (*Anas acuta*) radiotagged in December 2001 and December 2002–January 2003 in Sacramento Valley, California.

| | | Lower Klamath | | Upper Klamath | | Northeast California | | Modoc Plateau | | Summer Lake | | Malheur | | Warner Valley | | All SONEC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Landscape Type | Landscape Sub- Type | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 |
| Aquatic | Irrigation Ditch | 0.9 | 0 | 0.9 | 0 | 0 | 0 | 0 | 0 | 1.6 | 0 | 0 | 0 | 0 | 0 | 0.8 | 0 |
| | Lake | 0.2 | 0 | 10.7 | 2.4 | 0 | 1.5 | 4.2 | 0 | 0 | 0 | 0 | 34.3 | 17.9 | 1.2 | 3.1 | 4.7 |
| | Reservoir | 3.2 | 7.0 | 1.8 | 1.8 | 0 | 0 | 5.6 | 0 | 0 | 0 | 0 | 5.7 | 0 | 2.4 | 2.1 | 0.7 |
| | River, Creek | 0.2 | 0 | 0 | 0 | 0 | 0.8 | 0 | 0 | 0.5 | 0 | 0 | 0 | 0 | 0 | 0.2 | 0.1 |
| Cropland | Cereal Unk. | 11.8 | 0.5 | 0.9 | 0.6 | 0 | 0 | 0 | 0 | 8.6 | 11.6 | 0 | 0 | 18.9 | 4.8 | 9.2 | 2.2 |
| | Unk.-Fall Crop Dominant | 0 | 0.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4.8 | 0.0 | 0.6 |
| | Rice | 0 | 0 | 0 | 0 | 0 | 2.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.3 |
| | Rowcrop Unk. | 2.3 | 0 | 0.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.2 | 0.0 |
| | Wild Rice | 0 | 0 | 0 | 0 | 0 | 0.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.1 |
| | Unknown | 0 | 1.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.4 |
| Freshwater Marsh | Permanent-Closed | 0.7 | 0.3 | 2.7 | 2.4 | 0 | 0.0 | 0 | 0 | 1.1 | 0 | 0 | 0 | 0 | 0 | 0.8 | 0.5 |
| | Permanent-Hemi | 4.9 | 41.3 | 2.7 | 6.0 | 0 | 0.8 | 0 | 0 | 2.1 | 0 | 13.6 | 8.6 | 0.9 | 0 | 3.7 | 17.7 |
| | Permanent-Open | 0.2 | 0.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 | 11.4 | 0 | 1.2 | 0.2 | 0.6 |
| | Permanent-Unk. | 0 | 0 | 0.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2.9 | 0 | 0 | 0.1 | 0.1 |
| | Seasonal-Closed | 0 | 0.5 | 0 | 0.6 | 0 | 0 | 0 | 0 | 2.1 | 0.8 | 0 | 0 | 0 | 3.6 | 0.4 | 0.7 |
| | Seasonal-Hemi | 59.1 | 36.0 | 69.6 | 70.1 | 0 | 43.2 | 0 | 27.1 | 4.8 | 0.8 | 6.8 | 2.9 | 32.1 | 2.4 | 40.5 | 33.9 |
| | Seasonal-Open | 0.7 | 0 | 0 | 0 | 0 | 0 | 0 | 12.5 | 0 | 0 | 0 | 8.6 | 0.9 | 8.3 | 0.4 | 1.6 |
| | Seasonal-Unk. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5.7 | 0 | 1.2 | 0 | 0.3 |
| | Unk.-Hydro-Closed | 0.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 | 0 | 0 | 0 | 0.2 | 0 |
| | Unk.-Hydro-Hemi | 1.2 | 9.9 | 0 | 9.6 | 32.6 | 3.0 | 20.8 | 2.1 | 2.7 | 0.8 | 4.5 | 0 | 1.9 | 3.6 | 4.0 | 6.5 |
| | Unk.-Hydro-Open | 0 | 0 | 0 | 0 | 0 | 0 | 37.5 | 0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 2.4 | 0 |
| | Unknown | 0.2 | 0 | 0 | 0 | 0 | 0 | 0 | 2.1 | 0 | 0 | 2.3 | 0 | 3.8 | 0 | 0.5 | 0.1 |
| Upland | Alkali Flat | 9.8 | 0.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 | 0 | 0 | 0 | 5.0 | 0.2 |
| | Grass Hay | 0 | 1.0 | 0 | 5.4 | 0 | 0 | 5.6 | 0 | 0 | 0 | 0 | 0 | 0 | 4.8 | 0.4 | 1.8 |
| | Grassland | 3.2 | 0.3 | 0 | 0 | 2.2 | 9.8 | 0 | 0 | 0 | 0.8 | 0 | 11.4 | 0 | 2.4 | 1.7 | 2.2 |
| | Irrigated Pasture | 0 | 0 | 0 | 0 | 2.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0.0 |
| | Pasture | 0.9 | 0 | 8.9 | 1.2 | 58.7 | 37.9 | 23.6 | 56.3 | 74.9 | 83.5 | 72.7 | 8.6 | 23.6 | 58.3 | 22.5 | 23.8 |
| | Unknown | 0.5 | 0.3 | 0 | 0 | 4.3 | 0 | 2.8 | 0 | 0 | 0 | 0 | 0 | 0 | 1.2 | 0.6 | 0.2 |
| | No. of pintail locations | 569 | 383 | 112 | 167 | 46 | 132 | 72 | 48 | 187 | 121 | 44 | 35 | 106 | 84 | 1136 | 970 |

Table 7. Availability and day and night use of management unit types by radiotagged northern pintails (*Anas acuta*) on Lower Klamath and Tule Lake National Wildlife Refuges during 7 February–10 June 2002 and 6 February–28 May 2003.

| Landscape Type | Landscape Sub-type | Management Treatment | Lower Klamath NWR | | | | | | Tule Lake NWR | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | % Available [a] | | % Use Day | | % Use Night | | % Available | | % Use Day | | % Use Night | |
| | | | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 | 2002 | 2003 |
| Aquatic | Reservoir [b] | Flooded | 0 | 0 | 0 | 0 | 0 | 0 | 27.8 | 27.8 | 6.3 | 17.5 | 10.8 | 16.7 |
| Cropland | Grain | Flooded | 21.8 | 20.0 | 16.6 | 6.9 | 10.9 | 5.3 | | | | | | |
| | Variable Crops [c] | Flooded | 1.7 | 3.2 | 0 | 0 | 0 | 1.1 | 54.1 | 54.1 | 8.8 | 7.1 | 20.3 | 3.3 |
| Upland | Grassland | Flooded | 12.0 | 12.0 | 7.4 | 9.3 | 20.6 | 27.0 | - | - | - | - | - | - |
| | Hayland | Flooded | 0.6 | 0.6 | 0.7 | 1.4 | 0.0 | 2.1 | - | - | - | - | - | - |
| | Variable Upland | Flooded | 2.1 | 2.1 | 0 | 0 | 0.3 | 0 | - | - | - | - | - | - |
| | Variable Upland | Non-Flooded | 2.6 | 2.6 | 0 | 0 | 0 | 0 | - | - | - | - | - | - |
| Marsh | Early Successional Seasonal | Flooded | 13.6 | 18.7 | 11.8 | 26.4 | 10.8 | 15.3 | 11.5 | 11.3 | 76.3 | 0.6 | 64.9 | 0.0 |
| | Late Successional Seasonal | Burned Same Spring [d] | 6.1 | 0 | 19.9 | 0 | 22.4 | 0 | - | - | - | - | - | - |
| | Late Successional Seasonal | Flooded | 18.4 | 24.3 | 24.3 | 43.1 | 26.8 | 31.6 | - | - | - | - | - | - |
| | Late Successional Seasonal | Plowed | 1.4 | 2.1 | 3.4 | 2.8 | 0.3 | 2.6 | - | - | - | - | - | - |
| | Late Successional Permanent | Burned Same Spring [d] | - | - | - | - | - | - | - | 6.4 | 0 | 74.7 | 0 | 80.0 |
| | Late Successional Permanent | Flooded | 19.7 | 14.4 | 15.9 | 10.2 | 8.1 | 15.3 | 6.6 | 0.3 | 8.8 | - | 4.1 | - |

[a] Flooded some or all weeks during study.
[b] Open water area of upper sump and associated channel.
[c] Previous fall crops were non-grain but may have had earlier grain rotation.
[d] Burned units are flooded post-burn in same spring

Table 8. Percent of radiotagged pintail (*Anas acuta*) locations on **publicly owned land** by age/sex class and day (D) and night (N) during 7 February–10 June 2002 and 6 February–28 May 2003. (100% minus public%=private %)

| Age/Sex | Year | Lower Klamath | | Upper Klamath | | Northeast California | | Modoc Plateau | | Summer Lake | | Malheur | | Warner Valley | | All SONEC | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | D | N | D | N | D | N | D | N | D | N | D | N | D | N | D | N |
| Adult | 2002 | 93.5 | 96.8 | 29.4 | 39.7 | 33.3 | 46.2 | 77.8 | 77.8 | 0 | 0 | 7.7 | 33.3 | 0 | 0 | 54.8 | 57.7 |
| Female | 2003 | 84.5 | 86.0 | 74.5 | 84.6 | 25.0 | 45.6 | 11.1 | 11.1 | 6.8 | 1.4 | 57.1 | 65.0 | 0 | 0 | 52.0 | 55.1 |
| Immature | 2002 | 96.5 | 97.9 | 36.7 | 35.7 | 0 | 5.3 | 12.8 | 13.9 | 30.0 | 27.7 | 15.4 | 22.2 | 16.3 | 9.8 | 62.7 | 61.8 |
| Female | 2003 | 96.0 | 98.0 | 43.5 | 40.7 | 26.3 | 45.2 | 25.0 | 19.0 | 0 | 0 | 76.5 | 76.9 | 7.7 | 0 | 62.9 | 61.1 |
| Adult | 2002 | 96.8 | 95.2 | 47.8 | 23.8 | 0 | 0 | 0 | 0 | 47.8 | 56.5 | 20.0 | 9.1 | 25.0 | 22.2 | 75.5 | 67.8 |
| Male | 2003 | 96.9 | 100.0 | 75.6 | 85.3 | 0 | 0 | 0 | 0 | 0 | 0 | 100.0 | 100.0 | 0 | 2.5 | 61.9 | 55.1 |
| Immature | 2002 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Male | 2003 | 100.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 66.7 | 0 |
| All | 2002 | 95.3 | 97.0 | 36.8 | 35.7 | 25.0 | 28.3 | 41.0 | 45.8 | 13.5 | 13.9 | 13.9 | 22.7 | 11.7 | 13.2 | 61.0 | 60.6 |
| | 2003 | 91.0 | 92.7 | 60.2 | 63.5 | 25.4 | 45.5 | 17.6 | 14.6 | 4.3 | 0.8 | 65.9 | 71.4 | 1.8 | 1.2 | 57.6 | 57.2 |

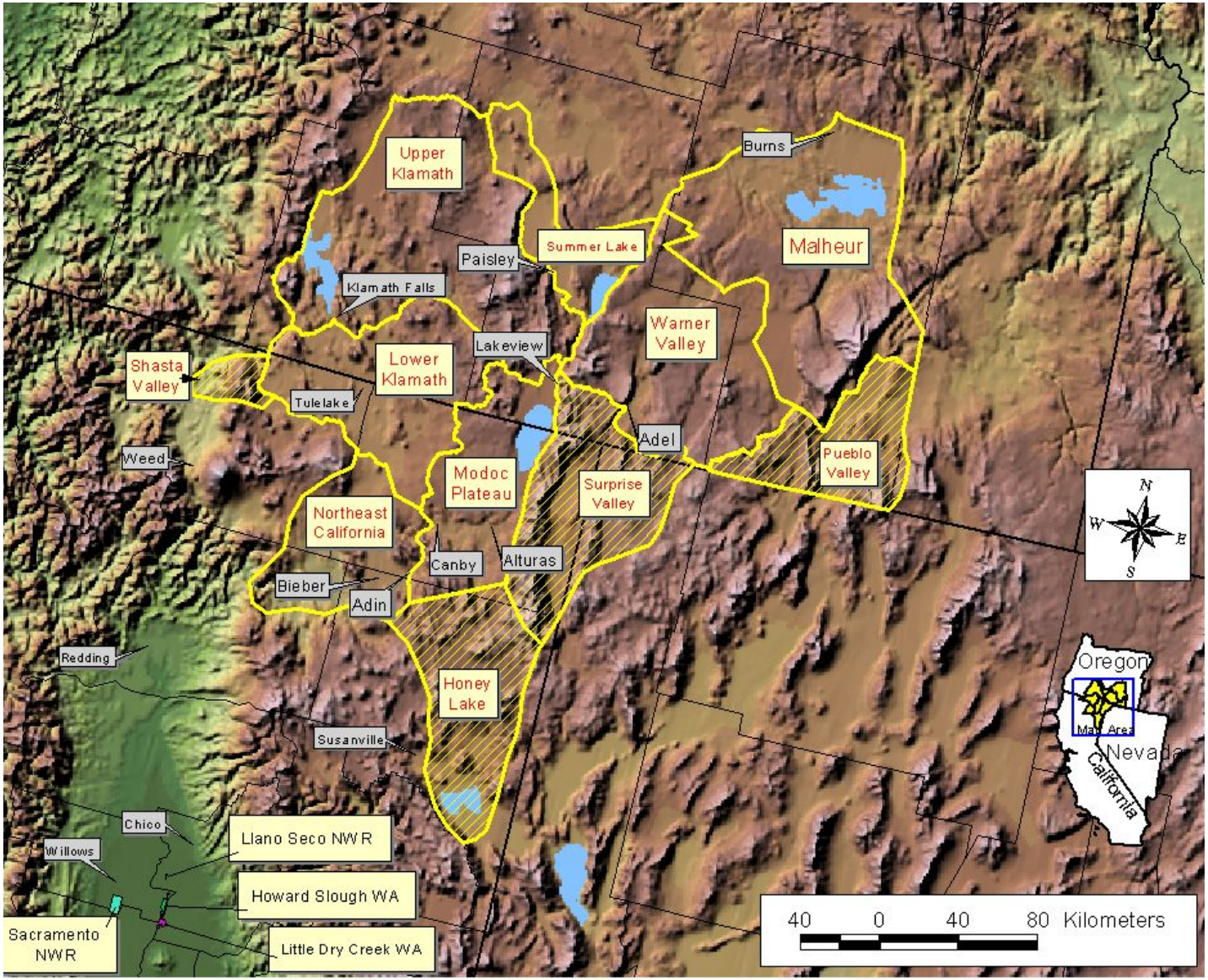



Figure 1. SONEC region in yellow (sub-region names are red-in-yellow boxes, towns in gray boxes). Waterfowl surveys or telemetry searches not done in striated sub-regions. Black-in-yellow boxes are Sacramento Valley trap sites where pintails were radiotagged.

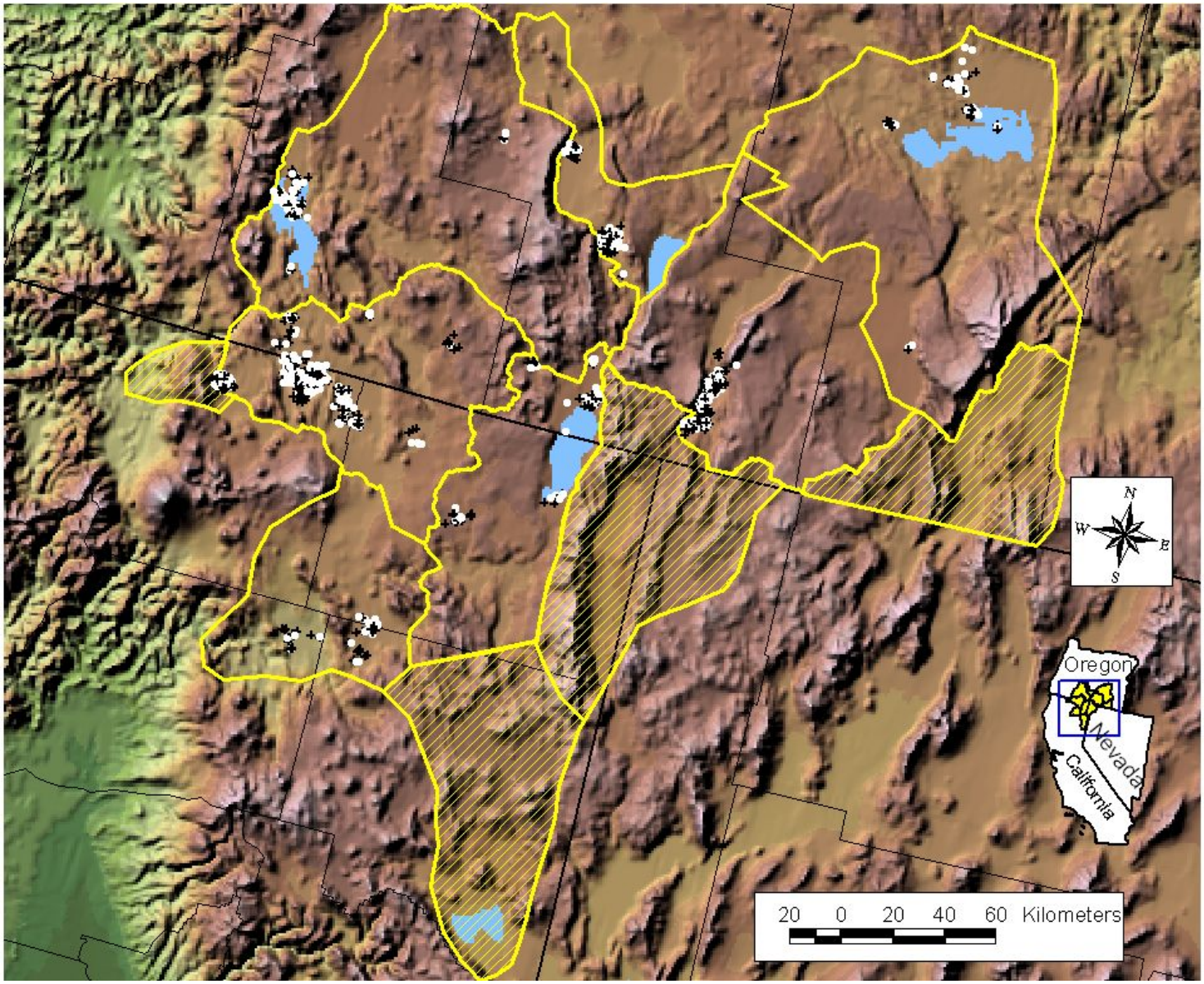


Figure 2. Day (white dot) and night (black +) locations of radiotagged northern pintails in SONEC during spring 2002.

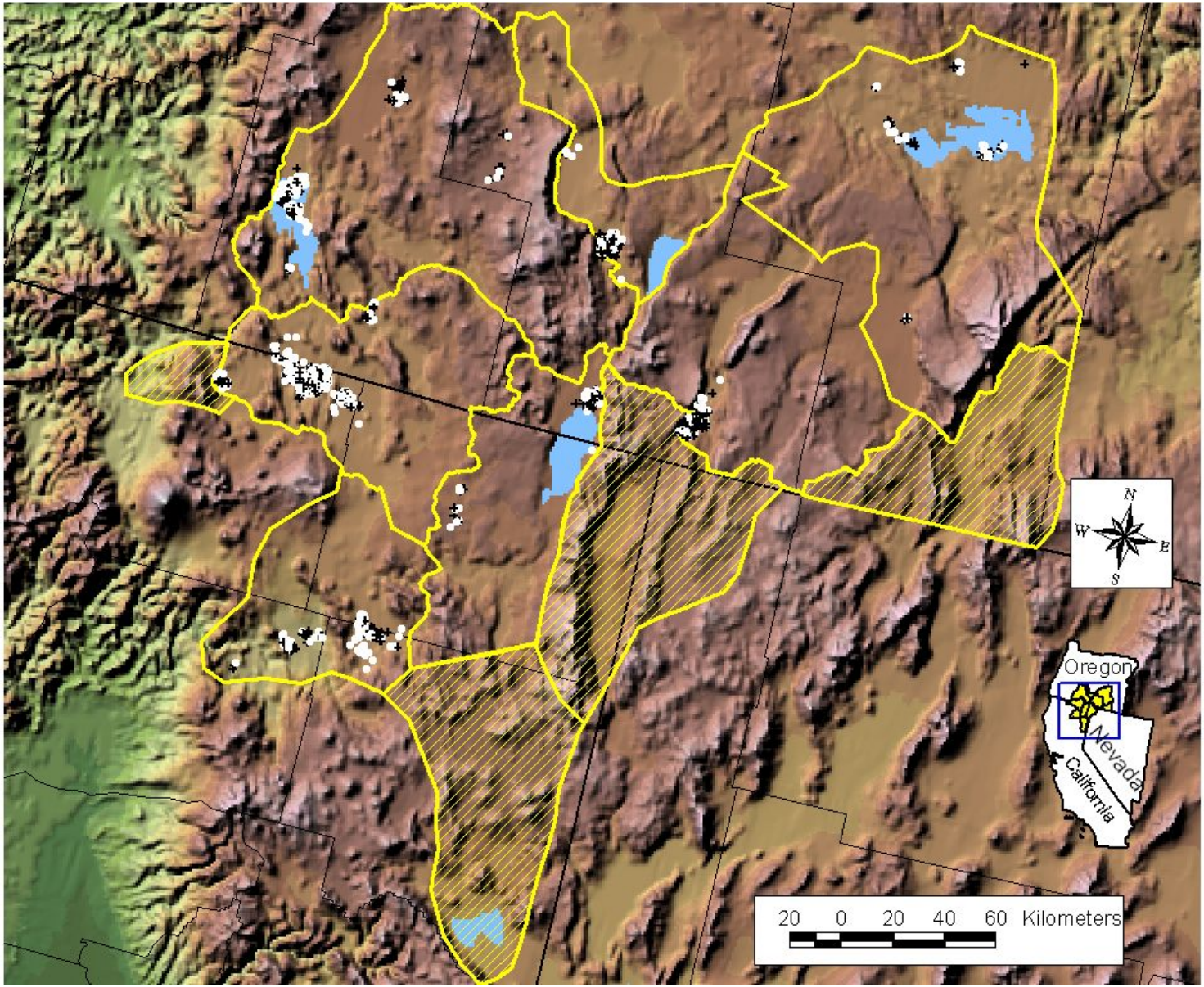
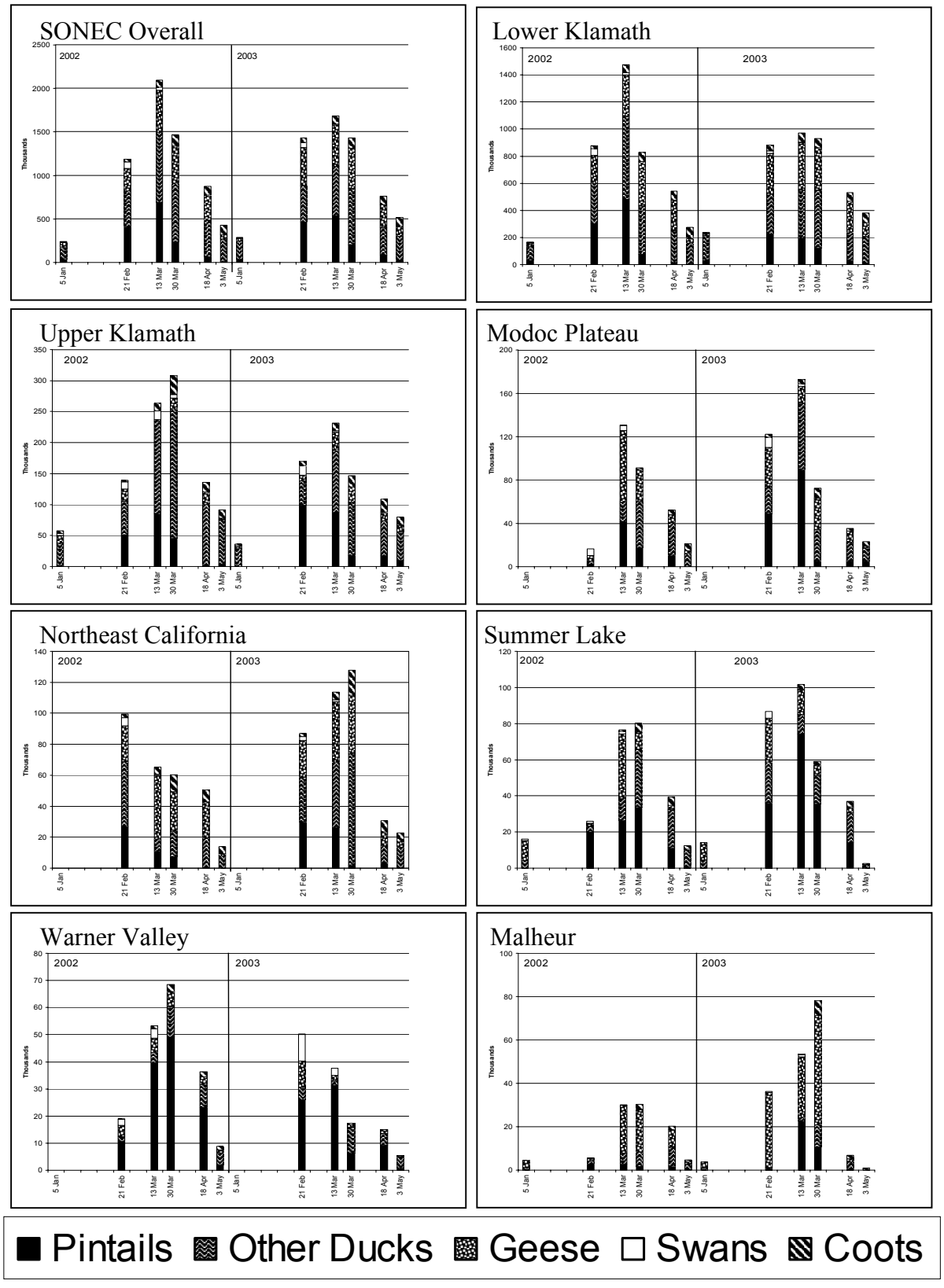
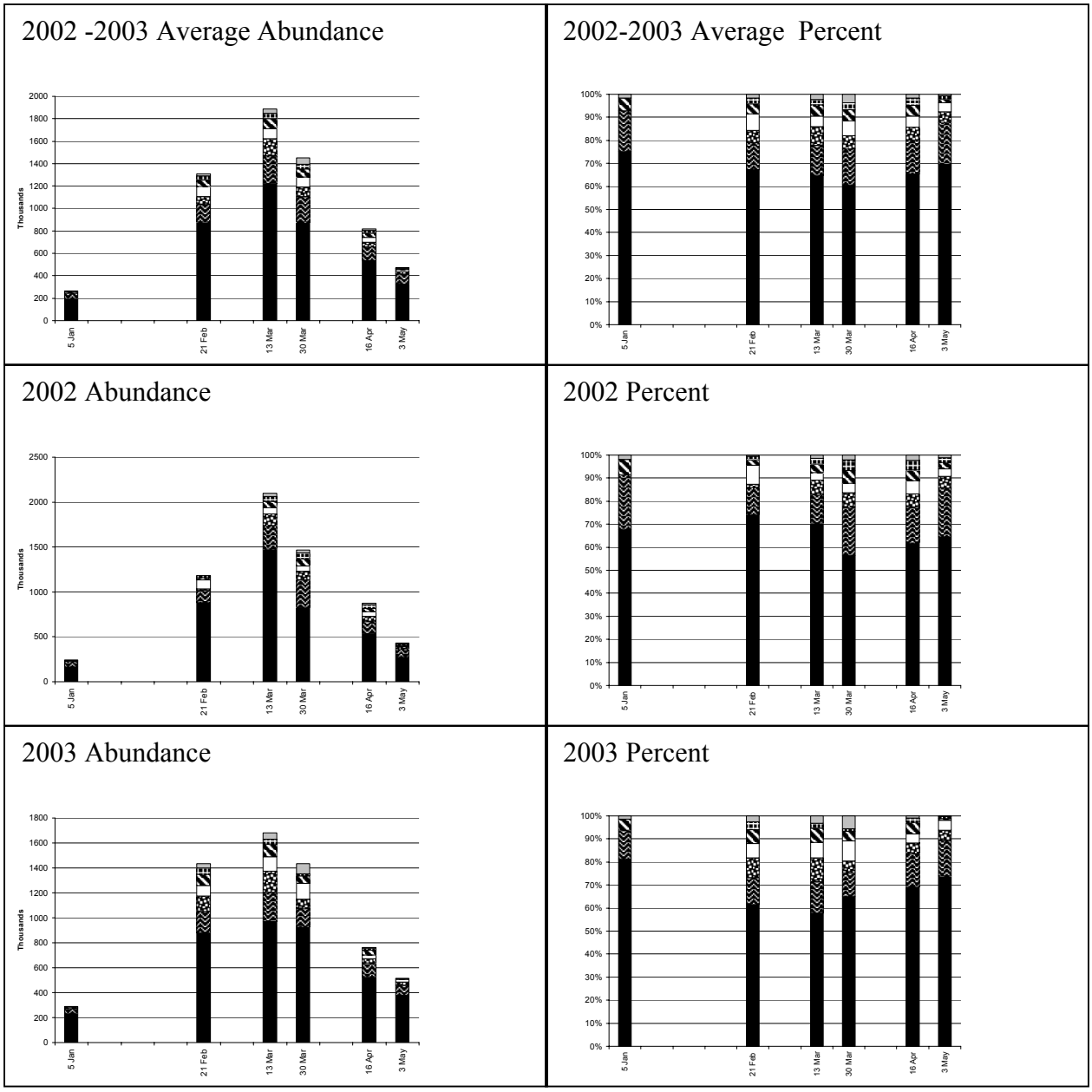


Figure 3. Day (white dot) and night (black +) locations of radiotagged northern pintails in SONEC during spring 2003.

# Figure 4. Waterfowl abundance in SONEC during spring 2002 and 2003



# Figure 5. Abundance and percentage of waterfowl in SONEC sub-regions during spring 2002 and 2003



# Figure 6. Percent of dabbling ducks in each SONEC sub-region by species during spring 2002 and 2003

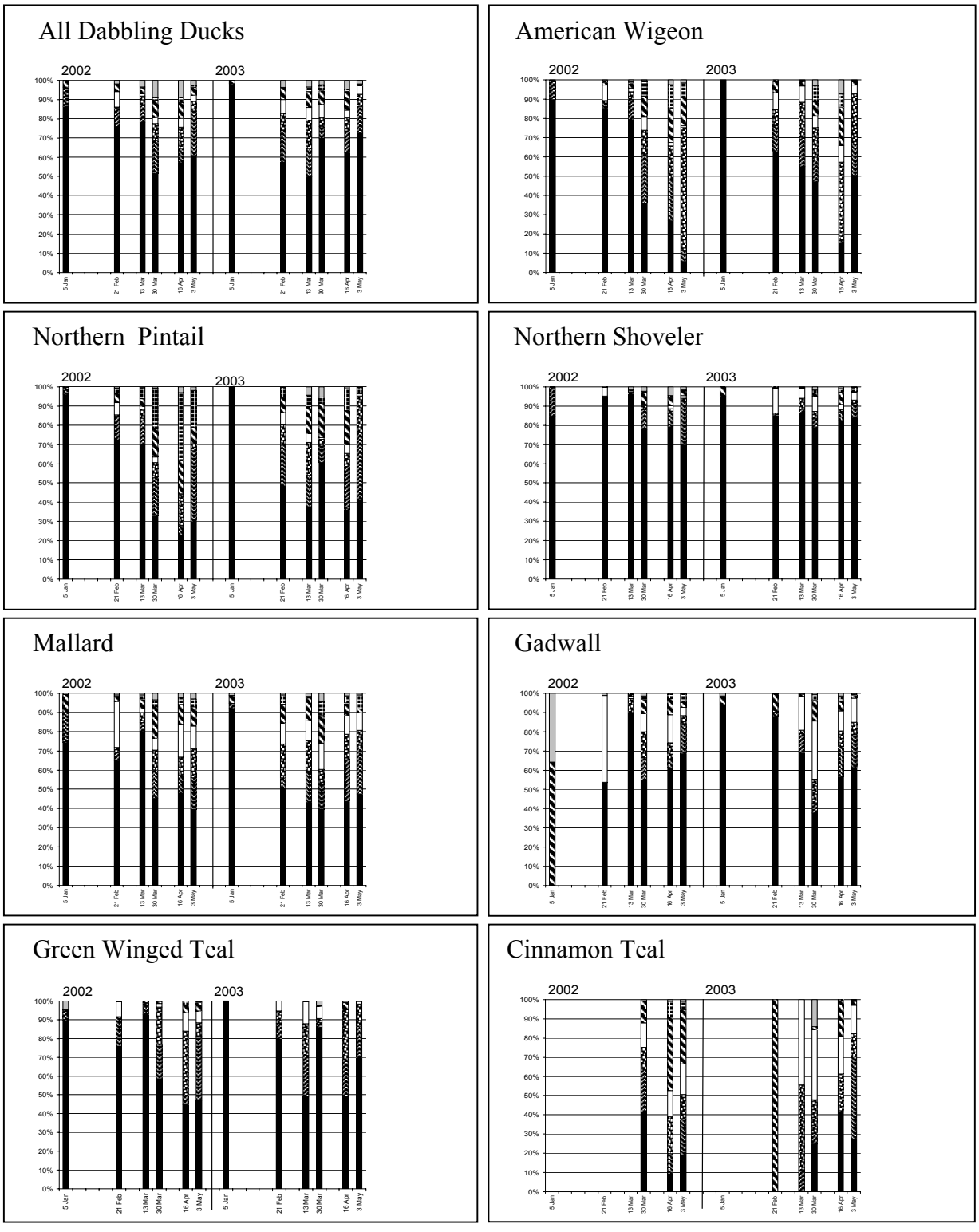
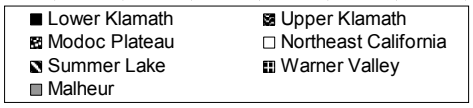
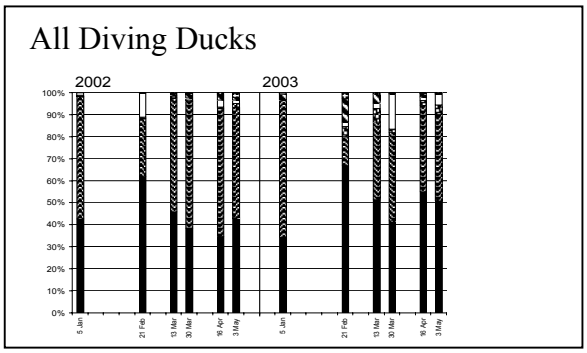
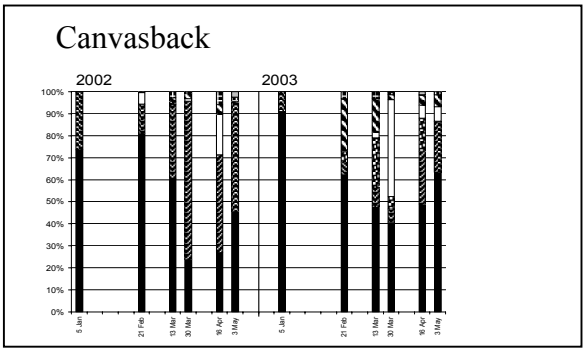
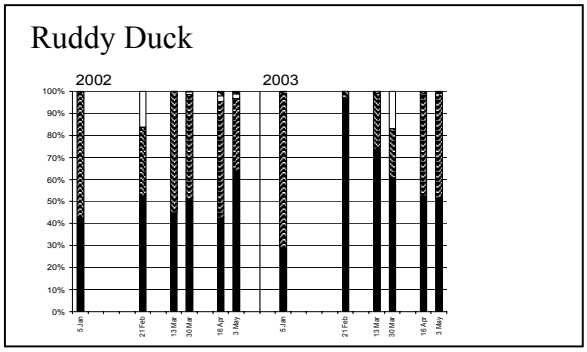


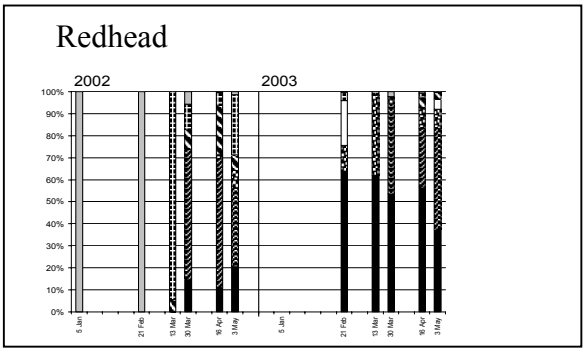
Figure 7. Percent of diving ducks in each SONEC sub-region by species during spring 2002 and 2003

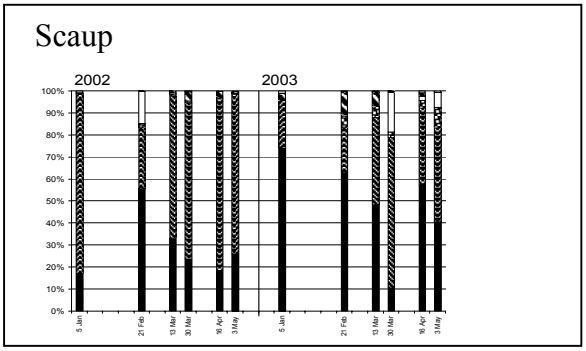


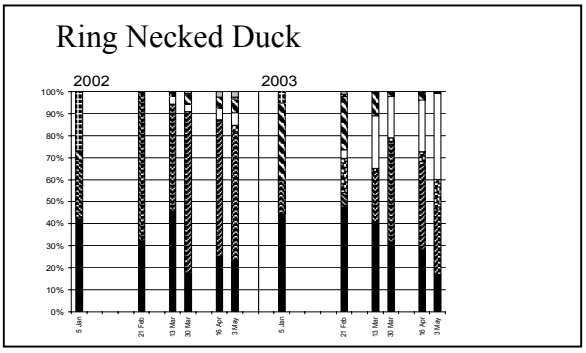



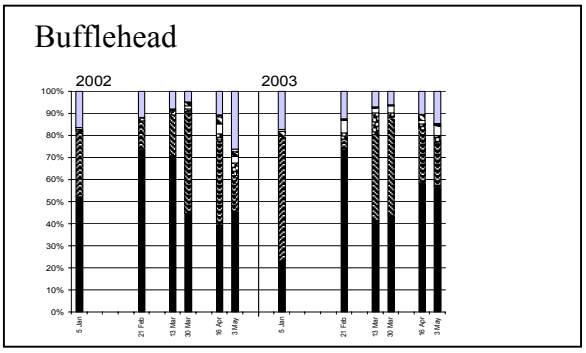



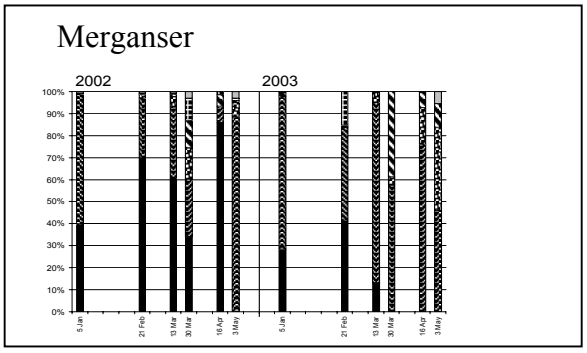



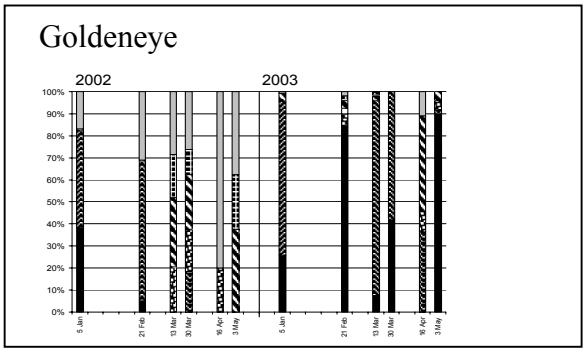
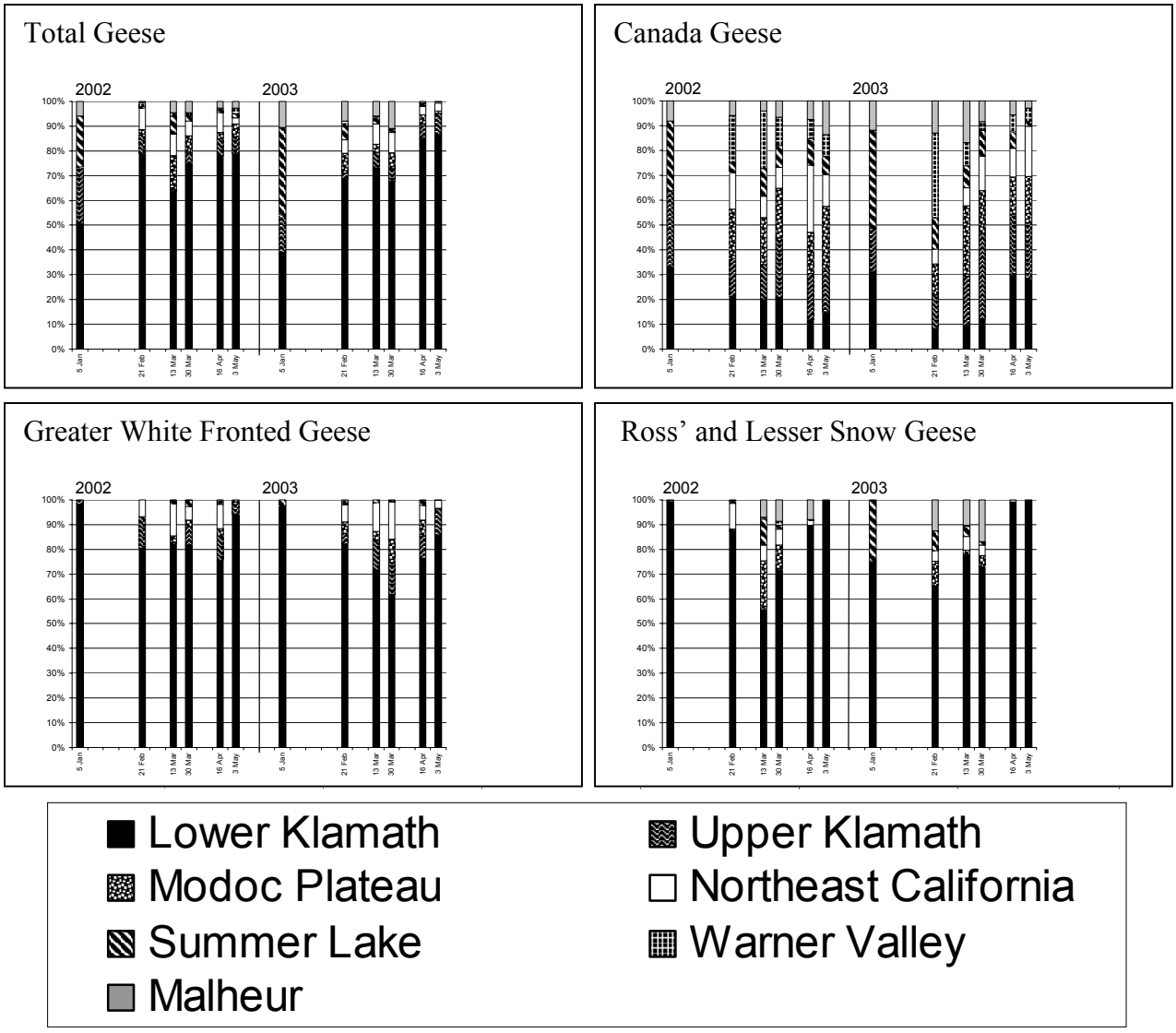
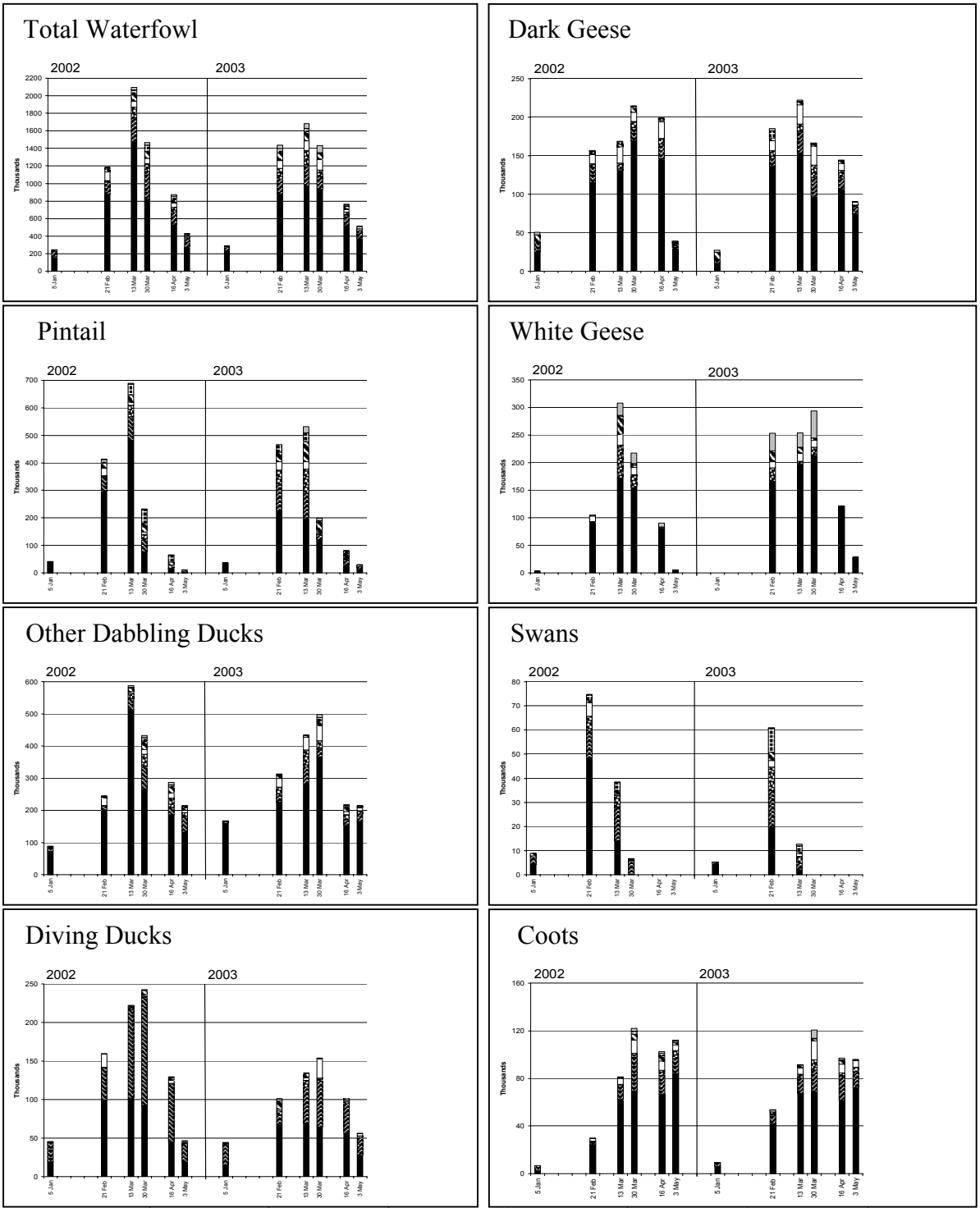



Figure 8. Percent of geese in each SONEC sub-region by species during spring 2002 and 2003



# Figure 9. Waterfowl Abundance in SONEC sub-regions during spring 2002 and 2003



# Figure 10. Dabbling duck abundance in SONEC sub-regions during 2002 and 2003

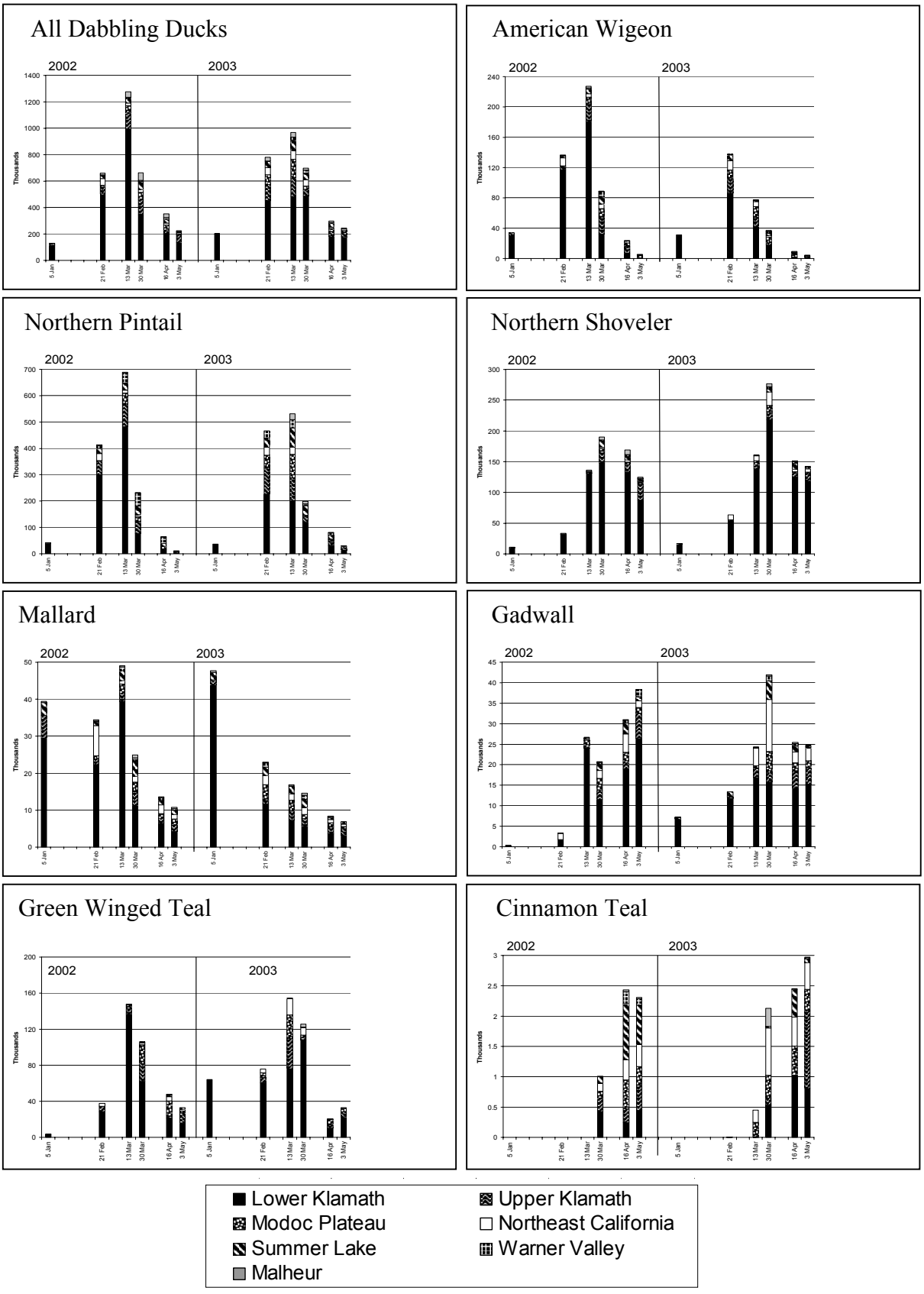
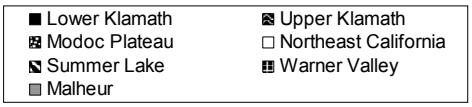
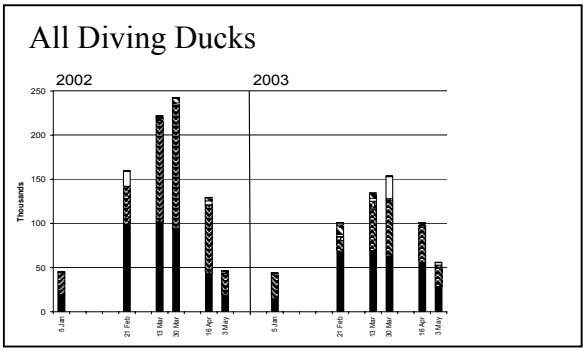
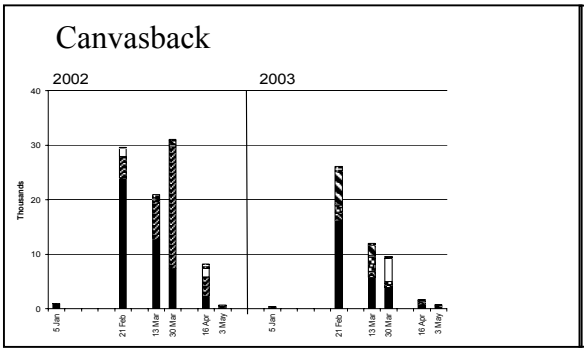
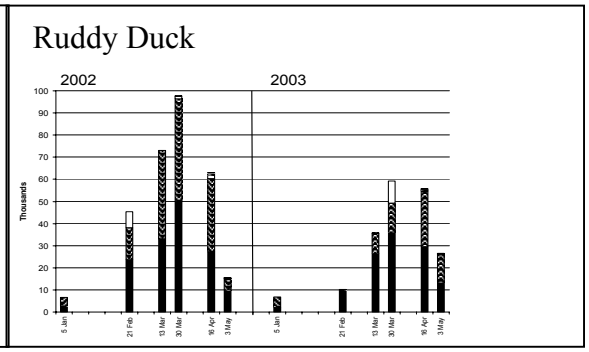


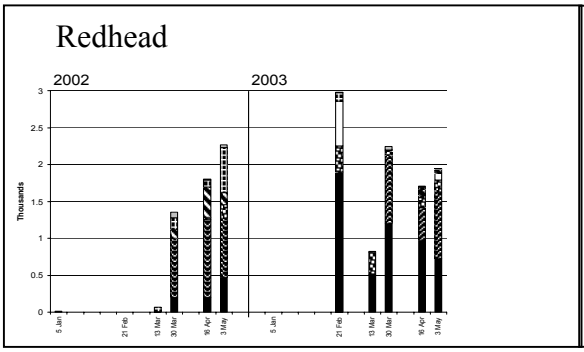
Figure 11. Diving duck abundance in SONEC sub-regions during spring 2002 and 2003

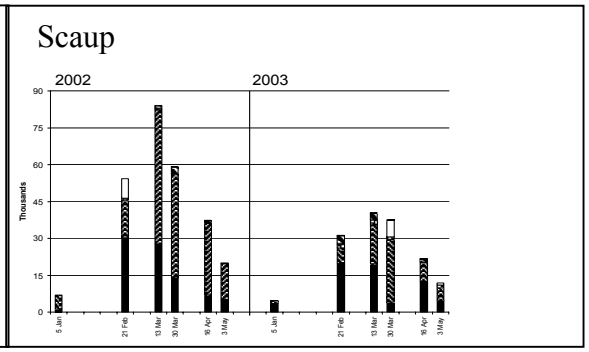


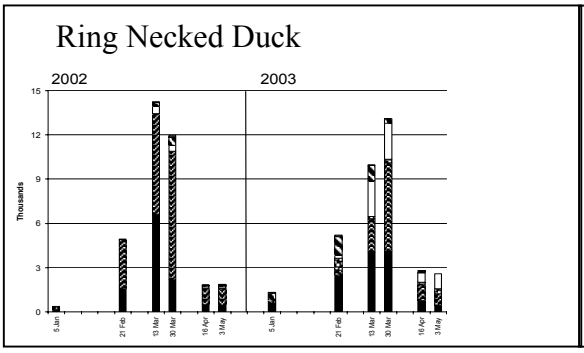



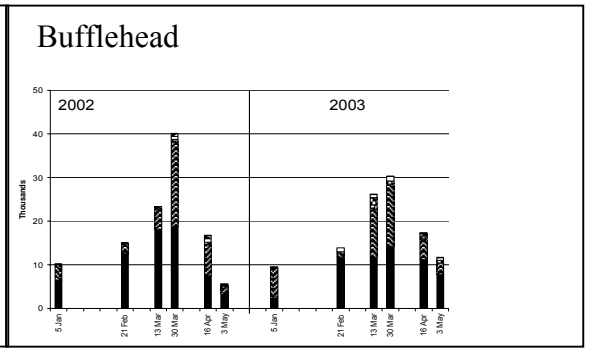



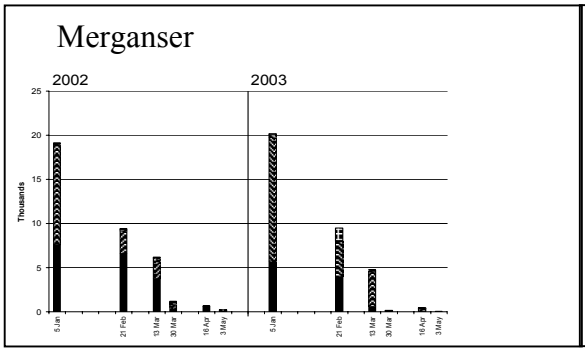



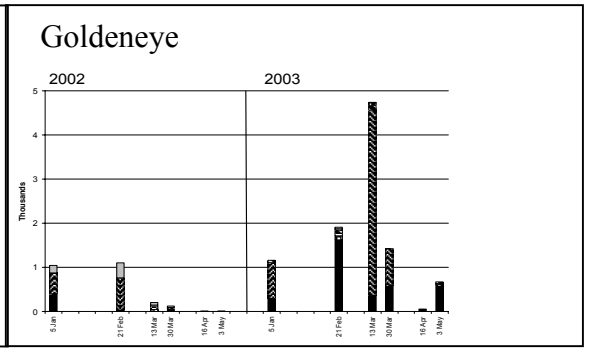



Figure 12. Goose abundance in SONEC sub-regions during spring 2002 and 2003

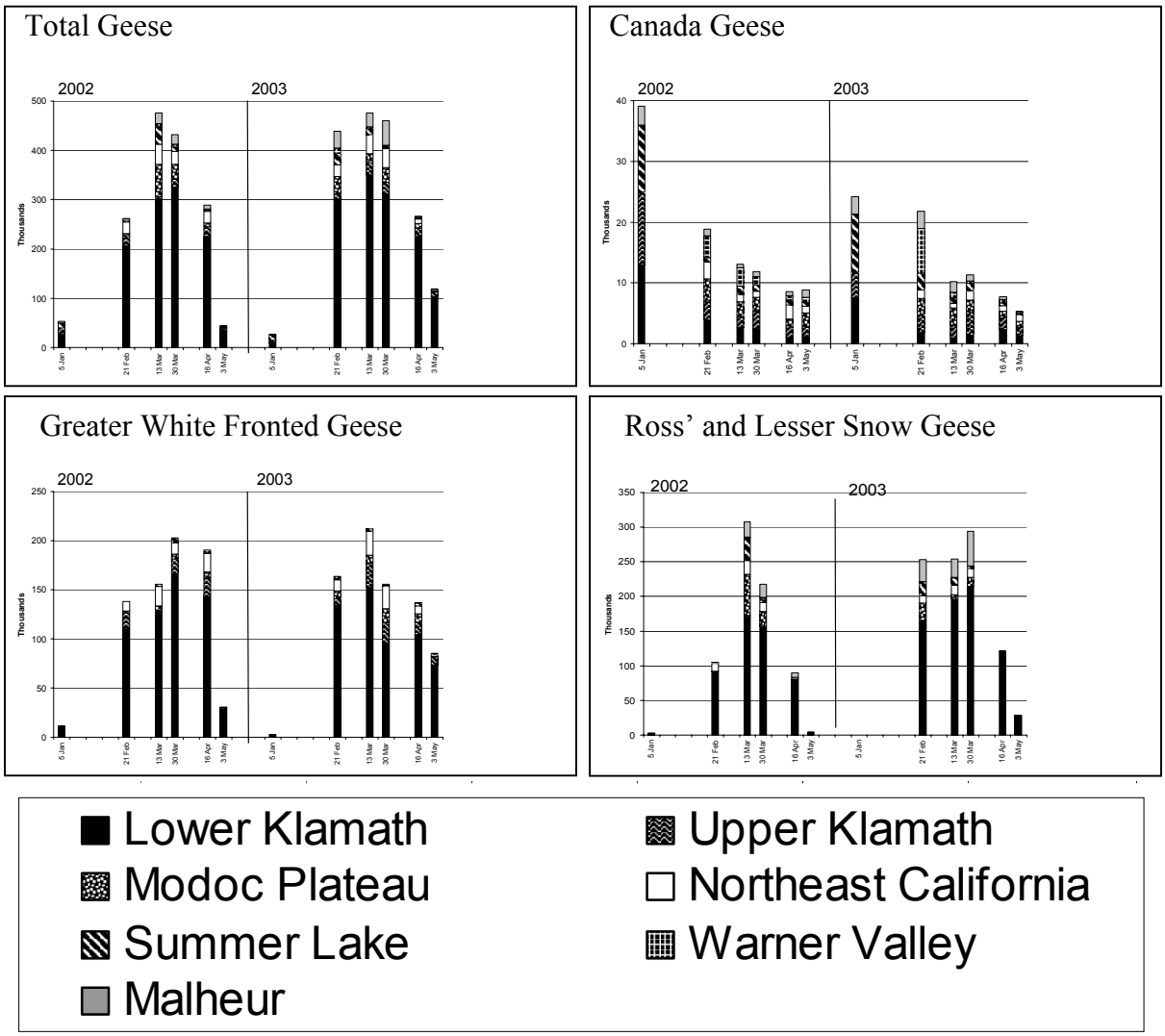
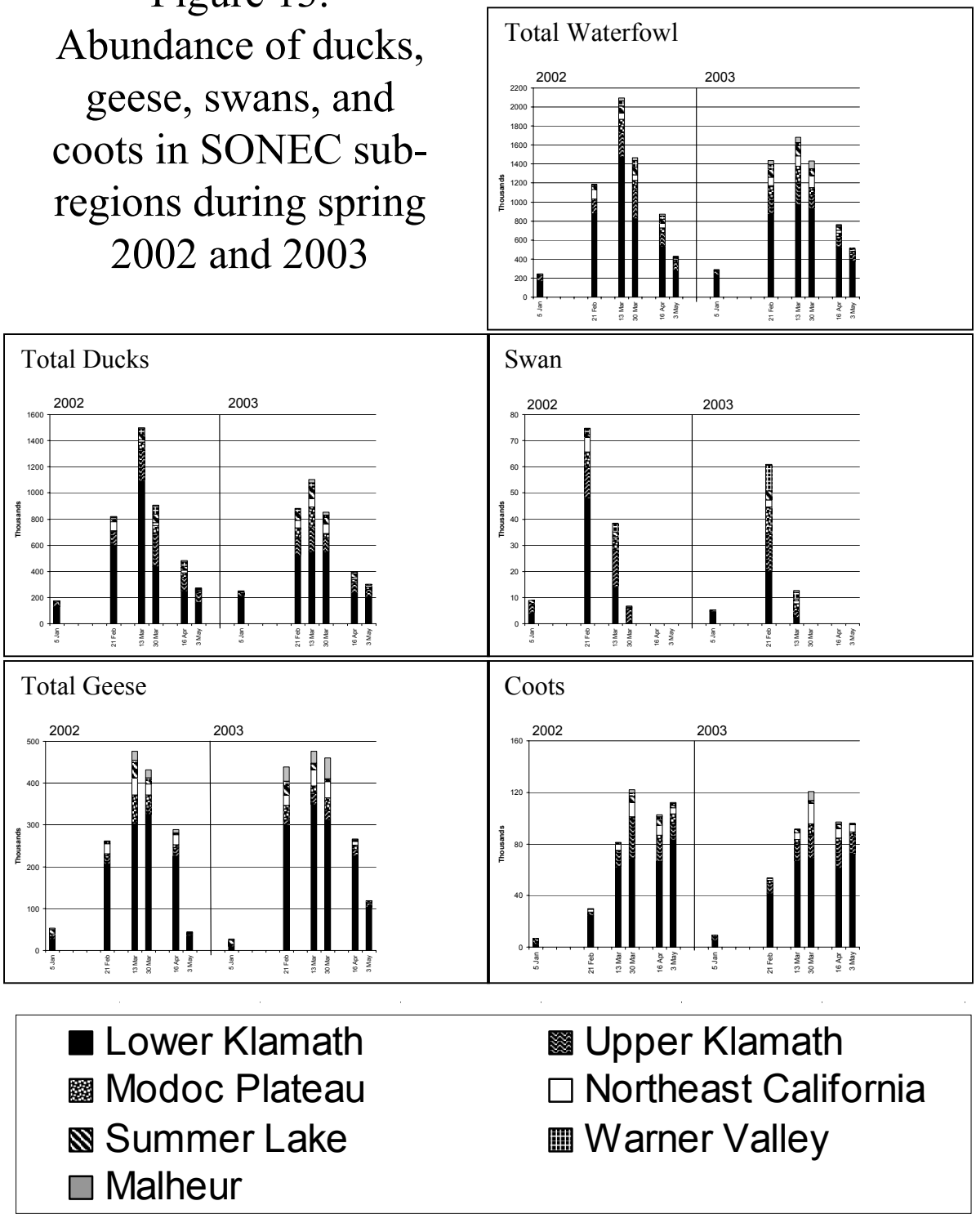


Figure 13. Abundance of ducks, geese, swans, and coots in SONEC sub-regions during spring 2002 and 2003



Appendix 1a. Mean average temperature (C°) at selected SONEC sites. Long-term averages (LTA) range from 23 (Burns, Chiloquin) to 75 (Lakeview) years. Months lacking sufficient data to calculate are indicated as ND. Months lacking more than five days of data are not used in annual statistics. Values are considered provisional starting April 2003. (*Western U.S. Climate Historical summaries*, Western Regional Climate Center, Retrieved January 14, 2004, from http://www.wrcc.dri.edu/climsum.html ).

| State | Site | Year(S) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CA | Alturas | LTA | -1.48 | 0.66 | 3.53 | 6.78 | 10.92 | 15.01 | 18.87 | 17.88 | 14.09 | 8.63 | 2.97 | -0.60 | 8.14 |
| | | 2002 | -1.08 | 2.66 | 2.78 | 8.29 | 11.28 | 16.54 | 21.48 | 17.82 | 14.71 | 7.13 | 3.66 | 1.52 | 8.90 |
| | | 2003 | 4.85 | 0.39 | 5.25 | 4.69 | 11.76 | 17.00 | 21.51 | 17.89 | 14.82 | | | | 10.42 |
| CA | Canby | LTA | -0.17 | 1.33 | 4.04 | 7.23 | 10.87 | 15.39 | 19.06 | 18.43 | 14.57 | 9.33 | 3.24 | -0.68 | 8.25 |
| | | 2002 | -1.73 | 1.64 | 2.47 | 7.53 | 10.41 | 16.79 | 21.47 | 18.10 | ND | 7.16 | 3.61 | 1.68 | 8.20 |
| | | 2003 | 4.56 | 0.21 | 4.86 | 4.21 | 12.42 | 17.22 | ND | ND | ND | | | | 7.33 |
| CA | Tulelake | LTA | -1.02 | 1.22 | 3.72 | 6.82 | 11.23 | 14.91 | 18.41 | 17.41 | 13.97 | 8.86 | 2.83 | -0.77 | 8.23 |
| | | 2002 | -1.18 | 2.74 | 2.66 | 7.84 | 10.95 | 16.56 | 20.33 | 16.78 | 14.38 | 8.71 | 3.74 | 1.14 | 8.72 |
| | | 2003 | 4.25 | 1.29 | 4.98 | 4.76 | 11.53 | 17.09 | 21.36 | ND | ND | | | | 9.32 |
| OR | Adel | LTA | 0.37 | 1.83 | 4.63 | 7.56 | 12.27 | 16.83 | 21.09 | 20.07 | 15.47 | 10.25 | 4.14 | 0.46 | 9.70 |
| | | 2002 | -0.33 | 2.22 | 2.98 | 10.78 | 9.78 | 16.40 | ND | ND | 16.74 | 8.14 | 4.57 | 2.16 | 5.00 |
| | | 2003 | 4.22 | 1.31 | 4.90 | 4.96 | 10.67 | 18.03 | ND | ND | ND | | | | 7.34 |
| OR | Burns | LTA | -3.91 | -1.88 | 3.01 | 6.18 | 10.64 | 14.53 | 18.94 | 18.12 | 13.24 | 6.86 | 0.60 | -4.27 | 6.68 |
| | | 2002 | -5.06 | -4.59 | 0.73 | 6.42 | 9.93 | 15.83 | 21.17 | 16.27 | 13.11 | 4.99 | 1.27 | -1.29 | 6.57 |
| | | 2003 | 0.63 | -0.66 | 4.46 | 4.49 | 11.02 | 15.96 | 21.93 | 19.13 | 14.37 | | | | 10.15 |
| OR | Chiloquin | LTA | -2.01 | -0.13 | 3.14 | 5.99 | 9.59 | 13.36 | 16.82 | 16.59 | 12.87 | 7.69 | 1.75 | -2.01 | 7.03 |
| | | 2002 | -2.83 | -0.33 | 2.12 | 7.39 | 9.44 | 14.92 | 19.02 | 15.68 | 13.74 | 7.03 | 2.67 | 0.24 | 7.42 |
| | | 2003 | 1.30 | 1.32 | 4.18 | 4.19 | 9.31 | 15.04 | 19.20 | 17.38 | 13.04 | | | | 8.99 |
| OR | Klamath Falls | LTA | -1.04 | 1.27 | 3.52 | 6.63 | 10.78 | 14.78 | 18.88 | 18.21 | 14.37 | 8.75 | 2.83 | -0.82 | 8.17 |
| | | 2002 | -1.58 | 1.49 | 2.36 | 7.40 | 9.54 | 15.09 | 19.42 | 16.44 | 13.76 | 6.90 | 3.33 | 1.01 | 7.93 |
| | | 2003 | 3.32 | 1.04 | 4.13 | 4.26 | 10.46 | 16.13 | 20.94 | 18.93 | 16.02 | | | | 10.58 |
| OR | Lakeview | LTA | -2.03 | 0.01 | 2.92 | 6.44 | 10.79 | 14.83 | 19.47 | 18.46 | 14.49 | 8.97 | 2.69 | -0.80 | 7.96 |
| | | 2002 | -3.52 | -0.17 | 1.56 | 6.77 | 9.86 | 15.98 | 20.81 | 17.79 | 14.71 | 7.88 | 3.82 | 0.66 | 8.01 |
| | | 2003 | 3.92 | 0.57 | 4.51 | 3.54 | 10.46 | 17.29 | 20.93 | 18.06 | 14.99 | | | | 9.91 |
| OR | Malheur | LTA | -2.59 | 1.18 | 5.93 | 10.36 | 15.17 | 19.42 | 23.70 | 22.53 | 17.08 | 10.38 | 3.36 | -1.33 | 10.36 |
| | | 2002 | -0.31 | ND | 4.81 | 10.68 | 14.71 | 20.58 | 25.52 | 21.23 | 17.81 | 9.94 | ND | 2.21 | 12.72 |
| | | 2003 | 2.00 | 3.11 | 7.76 | 9.71 | 14.96 | 21.08 | 26.41 | 23.71 | 16.76 | | | | 13.59 |
| OR | Paisley | LTA | -0.16 | 2.06 | 4.17 | 7.54 | 11.87 | 15.83 | 19.67 | 18.99 | 15.04 | 9.63 | 3.60 | 0.13 | 9.07 |
| | | 2002 | -0.50 | 2.64 | 3.57 | 8.04 | 10.99 | 15.63 | 20.94 | 16.36 | 13.89 | 7.26 | 3.65 | 1.71 | 9.32 |
| | | 2003 | 3.56 | 1.73 | 6.14 | 5.16 | 12.41 | 17.26 | 22.22 | 18.97 | 16.05 | | | | 11.62 |
| OR | Summer Lake | LTA | 0.42 | 2.55 | 4.72 | 7.63 | 12.12 | 16.51 | 20.44 | 19.62 | 15.42 | 9.86 | 3.81 | 0.54 | 9.48 |
| | | 2002 | 1.44 | 3.83 | 4.36 | 9.63 | 12.76 | 18.96 | 22.63 | 18.87 | 16.13 | 8.48 | 4.38 | 2.24 | 10.31 |
| | | 2003 | 3.96 | 2.33 | 6.84 | 6.29 | 12.72 | 18.97 | 23.66 | ND | ND | | | | 10.68 |

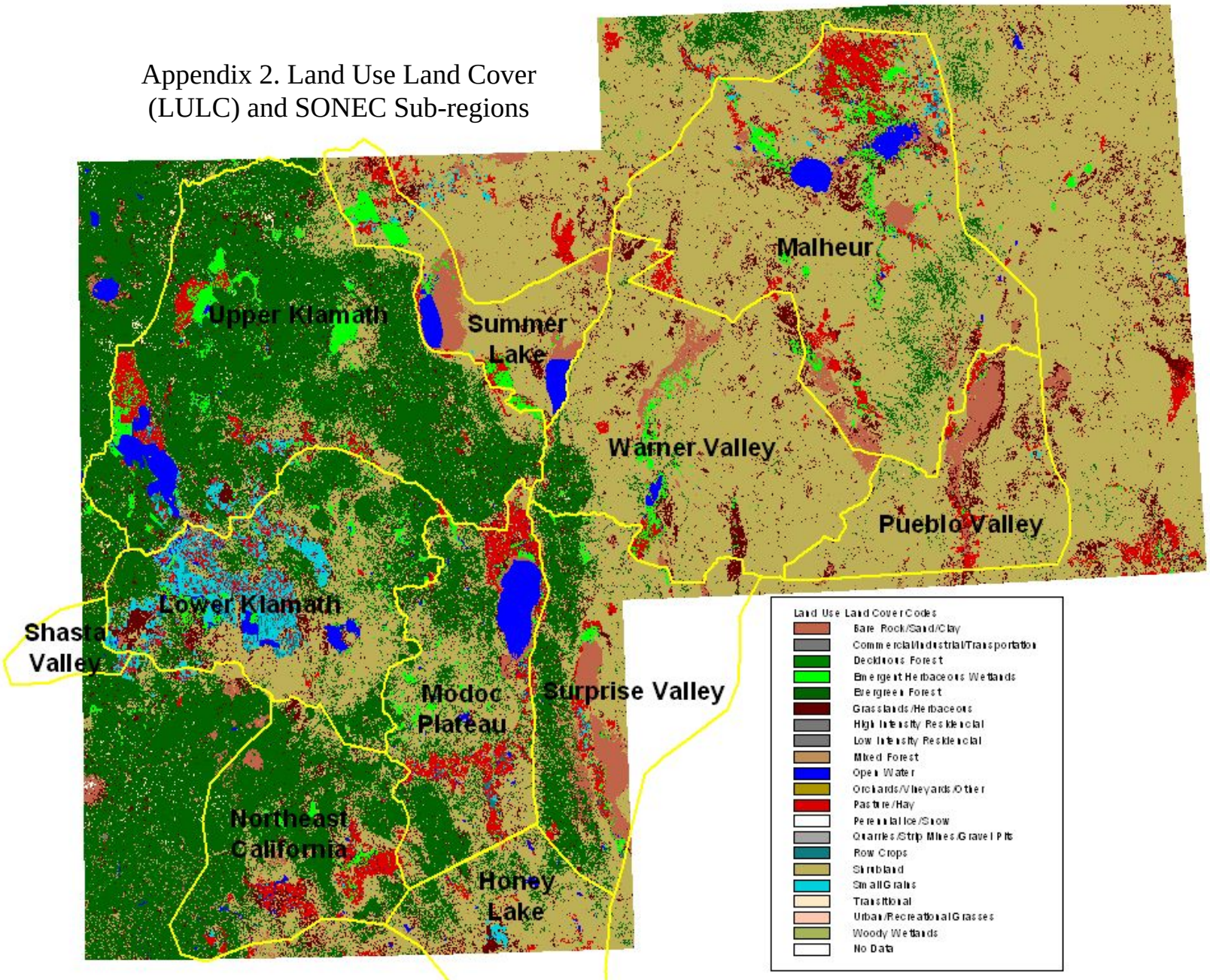
Appendix 1b. Average Maximum temperature (C°) at selected SONEC sites. Long-term averages (LTA) range from 23 (Burns, Chiloquin) to 75 (Lakeview) years. Months lacking sufficient data to calculate are indicated as ND. Months lacking more than five days of data are not used in annual statistics. Values are considered provisional starting April 2003. (*Western U.S. Climate Historical summaries*, Western Regional Climate Center, Retrieved January 14, 2004, from http://www.wrcc.dri.edu/climsum.html)

| State | Site | Year(S) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CA | Alturas | LTA | 5.46 | 7.71 | 11.13 | 15.44 | 20.24 | 25.11 | 30.96 | 30.47 | 26.23 | 19.40 | 11.10 | 6.41 | 17.48 |
| | | 2002 | 5.39 | 10.22 | 11.24 | 17.32 | 21.43 | 28.35 | 34.39 | 30.84 | 27.54 | 19.36 | 12.74 | 6.90 | 18.81 |
| | | 2003 | 11.34 | 7.16 | 12.58 | 11.18 | 21.29 | 29.01 | 34.68 | 29.35 | 27.27 | | | | 19.58 |
| CA | Canby | LTA | 5.97 | 8.09 | 11.77 | 15.84 | 20.08 | 25.51 | 30.31 | 30.07 | 25.96 | 20.26 | 11.56 | 6.12 | 17.26 |
| | | 2002 | 4.78 | 9.84 | 10.68 | 16.09 | 19.52 | 27.52 | 33.48 | 29.86 | ND | 20.13 | 12.71 | 7.08 | 17.16 |
| | | 2003 | 10.84 | 7.80 | 12.29 | 10.69 | 21.44 | 28.46 | ND | ND | ND | | | | 15.70 |
| CA | Tulelake | LTA | 4.73 | 7.52 | 11.08 | 15.20 | 20.09 | 24.31 | 29.20 | 28.68 | 25.22 | 18.78 | 9.89 | 4.96 | 16.79 |
| | | 2002 | 4.53 | 10.24 | 11.08 | 16.72 | 19.68 | 26.35 | 31.45 | 28.28 | 25.96 | 20.07 | 12.13 | 6.08 | 17.72 |
| | | 2003 | 9.62 | 8.49 | 12.26 | 10.76 | 19.78 | 27.54 | 32.13 | ND | ND | | | | 17.23 |
| OR | Adel | LTA | 5.96 | 7.79 | 11.39 | 15.13 | 20.62 | 25.71 | 30.98 | 30.14 | 25.31 | 19.27 | 10.69 | 6.18 | 17.73 |
| | | 2002 | 4.59 | 8.99 | 9.69 | 20.61 | 17.84 | 26.28 | ND | ND | 27.22 | 16.69 | 11.96 | 7.13 | 11.79 |
| | | 2003 | 10.22 | 6.78 | 11.14 | 10.71 | 18.56 | 27.60 | ND | ND | ND | | | | 14.17 |
| OR | Burns | LTA | 1.65 | 3.97 | 9.59 | 13.79 | 18.82 | 23.76 | 29.44 | 29.16 | 23.95 | 16.42 | 7.04 | 1.34 | 14.69 |
| | | 2002 | 0.03 | 1.73 | 7.13 | 14.50 | 18.92 | 25.50 | 32.81 | 27.88 | 24.98 | 16.33 | 10.28 | 4.32 | 15.37 |
| | | 2003 | 4.27 | 5.46 | 11.31 | 10.98 | 19.21 | 26.72 | 33.51 | 30.41 | 25.66 | | | | 18.62 |
| OR | Chiloquin | LTA | 2.85 | 5.51 | 9.50 | 13.60 | 18.36 | 23.06 | 27.48 | 27.55 | 23.43 | 16.93 | 7.49 | 2.71 | 14.93 |
| | | 2002 | 1.42 | 6.03 | 8.58 | 15.41 | 18.28 | 24.93 | 30.52 | 27.01 | 25.57 | 18.35 | 9.91 | 4.48 | 15.87 |
| | | 2003 | 5.16 | 7.54 | 9.68 | 9.87 | 17.33 | 26.09 | 30.43 | 27.86 | 24.17 | | | | 16.74 |
| OR | Klamath Falls | LTA | 4.03 | 6.62 | 9.91 | 14.00 | 18.76 | 23.23 | 28.37 | 27.96 | 23.88 | 17.63 | 9.03 | 4.33 | 15.64 |
| | | 2002 | 4.18 | 8.36 | 10.43 | 16.21 | 18.58 | 25.18 | 31.01 | 28.08 | 25.93 | 18.48 | 11.67 | 6.65 | 17.06 |
| | | 2003 | 8.86 | 8.51 | 11.63 | 10.83 | 17.46 | 26.54 | 31.13 | 27.54 | 25.21 | | | | 18.63 |
| OR | Lakeview | LTA | 3.16 | 5.31 | 8.81 | 13.39 | 18.38 | 23.01 | 28.98 | 28.37 | 24.04 | 17.30 | 8.76 | 4.29 | 15.25 |
| | | 2002 | 1.92 | 5.56 | 8.04 | 14.09 | 18.33 | 24.93 | 31.27 | 28.26 | 25.09 | 17.67 | 11.33 | 5.29 | 15.98 |
| | | 2003 | 8.86 | 6.59 | 10.36 | 8.61 | 17.26 | 26.37 | 30.94 | 27.53 | 24.82 | | | | 17.06 |
| OR | Malheur | LTA | 1.60 | 6.26 | 12.49 | 17.93 | 23.12 | 27.76 | 33.04 | 32.09 | 26.40 | 18.56 | 8.82 | 2.80 | 17.51 |
| | | 2002 | 3.19 | ND | 11.13 | 18.13 | 22.65 | 28.79 | 34.89 | 30.41 | 27.41 | 18.39 | ND | 6.27 | 20.13 |
| | | 2003 | 4.86 | 8.95 | 14.68 | 16.65 | 22.97 | 29.48 | 35.89 | 32.63 | 26.74 | | | | 20.77 |
| OR | Paisley | LTA | 5.34 | 8.09 | 10.86 | 15.17 | 20.10 | 24.51 | 29.67 | 29.02 | 24.99 | 18.49 | 10.03 | 5.62 | 16.78 |
| | | 2002 | 5.11 | 10.62 | 11.49 | 16.24 | 19.71 | 25.29 | 32.09 | 28.12 | 25.29 | 17.99 | 12.02 | 7.60 | 18.54 |
| | | 2003 | 8.55 | 8.31 | 11.53 | 11.17 | 20.46 | 26.59 | 32.29 | 29.28 | 26.17 | | | | 19.52 |
| OR | Summer Lake | LTA | 5.43 | 7.98 | 10.79 | 14.63 | 19.87 | 24.92 | 30.09 | 29.41 | 25.00 | 18.32 | 9.59 | 5.52 | 16.79 |
| | | 2002 | 6.18 | 10.66 | 11.86 | 17.50 | 21.49 | 28.24 | 33.26 | 29.55 | 26.98 | 18.39 | 12.46 | 7.49 | 18.67 |
| | | 2003 | 9.02 | 8.13 | 12.69 | 12.21 | 20.52 | 28.94 | 34.37 | ND | ND | | | | 17.98 |

Appendix 1c. Average minimum temperature (C°) at selected SONEC sites. Long-term averages (LTA) range from 23 (Burns, Chiloquin) to 75 (Lakeview) years. Months lacking sufficient data to calculate are indicated as ND. Months lacking more than five days of data are not used in annual statistics. Values are considered provisional starting April 2003. (*Western U.S. Climate Historical summaries*, Western Regional Climate Center, Retrieved January 14, 2004, from http://www.wrcc.dri.edu/climsum.html)

| State | Site | Year(S) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CA | Alturas | LTA | -8.43 | -6.39 | -4.06 | -1.90 | 1.58 | 4.89 | 6.74 | 5.31 | 1.95 | -2.13 | -5.14 | -7.63 | -1.19 |
| | | 2002 | -7.56 | -4.90 | -5.68 | -0.74 | 1.13 | 4.74 | 8.57 | 4.81 | 1.87 | -5.09 | -5.43 | -3.87 | -1.01 |
| | | 2003 | -1.65 | -6.39 | -2.08 | -1.79 | 2.08 | 5.00 | 8.33 | 6.46 | 2.41 | | | | 1.24 |
| CA | Canby | LTA | -6.31 | -5.66 | -3.47 | -1.32 | 1.66 | 5.31 | 7.82 | 6.79 | 3.17 | -1.58 | -5.03 | -7.53 | -0.76 |
| | | 2002 | -8.24 | -6.55 | -5.73 | -1.04 | 1.31 | 6.06 | 9.46 | 6.34 | ND | -5.81 | -5.48 | -3.73 | -0.76 |
| | | 2003 | -1.72 | -7.39 | -2.58 | -2.27 | 3.40 | 5.99 | ND | ND | ND | | | | -1.04 |
| CA | Tulelake | LTA | -6.71 | -5.09 | -3.62 | -1.57 | 2.37 | 5.53 | 7.62 | 6.13 | 2.71 | -1.06 | -4.21 | -6.46 | -0.33 |
| | | 2002 | -6.90 | -4.76 | -5.75 | -1.04 | 2.22 | 6.76 | 9.21 | 5.29 | 2.79 | -2.65 | -4.65 | -3.80 | -0.27 |
| | | 2003 | -1.13 | -5.91 | -2.29 | -1.24 | 3.28 | 6.65 | 10.59 | ND | ND | | | | 1.42 |
| OR | Adel | LTA | -5.23 | -4.28 | -2.14 | -0.02 | 3.92 | 7.96 | 11.16 | 10.01 | 5.61 | 1.23 | -2.41 | -5.28 | 1.66 |
| | | 2002 | -5.25 | -4.54 | -3.74 | 0.94 | 1.73 | 6.52 | ND | ND | 6.26 | -0.41 | -2.83 | -2.81 | -1.78 |
| | | 2003 | -1.77 | -4.17 | -1.34 | -0.79 | 2.78 | 8.45 | ND | ND | ND | | | | 0.52 |
| OR | Burns | LTA | -9.48 | -7.73 | -3.57 | -1.43 | 2.44 | 5.30 | 8.41 | 7.05 | 2.54 | -2.69 | -5.85 | -9.89 | -1.33 |
| | | 2002 | -10.14 | -10.91 | -5.68 | -1.67 | 0.93 | 6.17 | 9.53 | 4.66 | 1.24 | -6.34 | -7.74 | -6.90 | -2.24 |
| | | 2003 | -3.01 | -6.77 | -2.40 | -2.00 | 2.83 | 5.18 | 10.36 | 7.85 | 3.08 | | | | 1.68 |
| OR | Chiloquin | LTA | -6.88 | -5.79 | -3.22 | -1.62 | 0.83 | 3.66 | 6.16 | 5.63 | 2.32 | -1.56 | -3.98 | -6.71 | -0.88 |
| | | 2002 | -7.08 | -6.69 | -4.36 | -0.63 | 0.61 | 4.91 | 7.53 | 4.36 | 1.91 | -4.28 | -4.57 | -3.99 | -1.02 |
| | | 2003 | -2.56 | -4.90 | -1.33 | -1.48 | 1.29 | 3.98 | 7.97 | 6.94 | 1.88 | | | | 1.24 |
| OR | Klamath Falls | LTA | -6.11 | -4.08 | -2.87 | -0.74 | 2.83 | 6.32 | 9.40 | 8.46 | 4.85 | -0.13 | -3.36 | -5.98 | 0.70 |
| | | 2002 | -7.35 | -5.38 | -5.72 | -1.41 | 0.50 | 5.00 | 7.83 | 4.81 | 1.59 | -4.68 | -5.00 | -4.62 | -1.20 |
| | | 2003 | -2.22 | -6.43 | -3.37 | -2.32 | 3.46 | 5.72 | 10.75 | 10.32 | 6.82 | | | | 2.53 |
| OR | Lakeview | LTA | -7.23 | -5.30 | -2.97 | -0.49 | 3.21 | 6.64 | 9.95 | 8.56 | 4.94 | 0.64 | -3.38 | -5.94 | 0.66 |
| | | 2002 | -8.96 | -5.89 | -4.93 | -0.56 | 1.38 | 7.04 | 10.34 | 7.33 | 4.33 | -1.90 | -3.68 | -3.98 | 0.04 |
| | | 2003 | -1.02 | -5.45 | -1.34 | -1.54 | 3.66 | 8.22 | 10.93 | 8.71 | 5.16 | | | | 2.77 |
| OR | Malheur | LTA | -6.79 | -3.88 | -0.61 | 2.80 | 7.22 | 11.08 | 14.36 | 12.98 | 7.77 | 2.21 | -2.09 | -5.47 | 3.21 |
| | | 2002 | -3.82 | ND | -1.52 | 3.24 | 6.76 | 12.37 | 16.14 | 12.04 | 8.21 | 1.51 | ND | -1.84 | 5.31 |
| | | 2003 | -0.86 | -2.74 | 0.84 | 2.76 | 6.96 | 12.68 | 16.92 | 14.77 | 6.79 | | | | 6.42 |
| OR | Paisley | LTA | -5.60 | -3.92 | -2.56 | -0.14 | 3.66 | 7.08 | 9.67 | 8.94 | 5.12 | 0.77 | -2.81 | -5.42 | 1.32 |
| | | 2002 | -6.11 | -5.34 | -4.36 | -0.15 | 2.28 | 5.96 | 9.78 | 4.61 | 2.46 | -3.48 | -4.72 | -4.19 | 0.08 |
| | | 2003 | -1.43 | -4.84 | 0.76 | -0.85 | 4.37 | 7.78 | 12.15 | 8.66 | 5.93 | | | | 3.69 |
| OR | Summer Lake | LTA | -4.59 | -2.88 | -1.37 | 0.63 | 4.36 | 8.11 | 10.84 | 9.82 | 5.84 | 1.40 | -1.97 | -4.46 | 2.14 |
| | | 2002 | -3.30 | -2.99 | -3.14 | 1.76 | 4.03 | 9.67 | 11.99 | 8.19 | 5.28 | -1.43 | -3.71 | -3.01 | 1.94 |
| | | 2003 | -1.09 | -3.47 | 1.01 | 0.39 | 4.93 | 9.00 | 12.94 | ND | ND | | | | 3.38 |

Appendix 2. Land Use Land Cover (LULC) and SONEC Sub-regions



# Appendix 3. Habitat Classification Scheme for Coding Pintail Location Habitat Data. Corresponding Land Use Land Cover (LULC) Codes Indicated.

**Habitat Type** Habitat Sub-Type

**(C) CROPLANDS (Lands Tilled Annually)**
[Includes LULC categories "small grains", "row crops"]

| | | | |
|---|---|---|---|
| XX- UNKNOWN CROPLAND TYPE | | | |
| (PREVIOUS FALL CROP DOMINANT) | | | |
| CU | CEREAL-UNK | RO | ROWCROP-UNK |
| WH | WHEAT | CO | CORN |
| BA | BARLEY | PO | POTATO |
| BW | BARLEY/WHEA | ON | ONION |
| OA | OATS | SA | SAFFLOWER |
| RI | RICE | SU | SUNFLOWER |
| WR | WILD RICE | MI | MILO/SORGHUM |
| WW | WINTER WHEA | CT | COTTON |
| OT | OTHER FALL CROP DOMINANT | | |
| FX | UNKNOWN FALL CROP DOMINANT | | |
| (GROWING SPRING CROP DOMINANT) | | | |
| GG | GROWING UNKNOWN CEREAL GRAIN | | |
| GR | GROWING UNKNOWN ROWCROP | | |
| GC | GROWING CORN | | |
| GM | GROWING MILO | | |
| GW | GROWING SPRING WHEAT OR BARLEY | | |
| WW | GROWING WINTER WHEAT | | |
| GO | OTHER GROWING CROP DOMINANT | | |
| GX | UNKNOWN GROWING CROP DOMINANT | | |

**(U) UPLAND (Not Tilled Annually)**
[Includes LULC category "Grassland/herbacious", "Bare Rocks-Clay","Pasture/Hay","shrubland"]

| | |
|---|---|
| AL | ALFALFA HAY |
| GH | GRASS HAY |
| PA | PASTURE (UNKOWN IF IRRIGATED) |
| IP | IRRIGATED PASTURE |
| GL | GRASSLAND (NOT IRRIGATED) |
| FB | FALLOW BARE |
| FW | FALLOW WEEDS |
| OR | ORCHARD |
| RP | RIPARIAN FOREST |
| WL | WOODLAND |
| XX | UNKOWN UPLAND |
| AF | ALKALI FLAT |

**HABITAT MODIFIER -HARVEST/VEG**

| | |
|---|---|
| U | UNHARVESTED/UNGRAZED CROP/PASTURE |
| L | HARVESTED-LEFT IN FIELD |
| W | HARVESETD-WINDROWED IN FIELD |
| H | HARVESTED-REMOVED FROM FIELD |
| R | ROLLED RICE (AFTER HARVEST TREATMENT) |
| S | DISKED-CROP STUBBLE SHOWING |
| D | DISKED- NO STUBBLE SHOWING |
| B | BURNED |
| P | PLOWED |
| G | GREEN (Fall crop modifieronly:green sprouts common but not dominant) |
| Z | GRAZED (RECENT PAST OR PRESENT) |
| X | UNKNOWN |

(**XX) UNKNOWN CATEGORY** XX UNKOWN TYPE

**(F) FRESHWATER MARSH**
[Includes LULC categories "emergent herbacious wetland"]

| | | | |
|---|---|---|---|
| XX UNKNOWN HYDROLOGY-UNKNOWNopen/ | | | |
| (UNKNOWN UNDERSTORY PLANTS) | | | |
| PO | PERMANENT-OPEN (>75% Open Water) | | |
| PC | PERMANENT-CLOSED (>75% emergent Veg) | | |
| PH | PERMANENT-HEMI (MixedOpenEmergentVeg) | | |
| PF | PERMANENT-FORESTED (Trees Dominent) | | |
| PX | PERMANENT-UNKNOWN | | |
| SO | SEASONAL-OPEN (>75% Open Water) | | |
| SC | SEASONAL-CLOSED (>75% emergent Veg) | | |
| SH | SEASONAL-HEMI (MixedOpenEmergentVeg) | | |
| SF | SEASONAL-FORESTED (Trees Dominent) | | |
| SX | SEASONAL-UNKNOWN | | |
| XO | UNK HYDROLOGY-OPEN MARSH | | |
| XC | UNK HYDROLOGY-CLOSED MARSH | | |
| XH | UNK HYDROLOGY-HEMI MARSH | | |
| XF | UNK HYDROLOGY-FORESTED | | |
| KNOWN UNDERSTORY PLANTS | | | |
| SL | SEAS-LATE SUCCESSIONAL PLANTS | | |
| SE | SEAS-EARLY SUCCESSIONAL PLANTS | | |
| SM | SEAS-MIX LATE/EARLY SUCC. PLANTS | | |
| SW | SEAS-WATERGRASS DOMINANT | | |
| ST | SEAS-TIMOTHY UNDERSTORY DOMINANT | | |

**(A) AQUATIC (Mostly deep water-no veg)**
[Includes LULC Category "Open Water"]

| | |
|---|---|
| LK | LAKE (NATURAL) |
| RS | RESERVOIR |
| ST | STOCK POND |
| SP | SEWER POND |
| EP | EVAPORATION POND (NON-SEWER) |
| CC | CEMENT CANAL |
| ID | IRRIGATION DITCH |
| RV | RIVER, CREEK |
| XX | UNKNOWN AQUATIC |

**HABITAT MODIFIER-WATER**

| | |
|---|---|
| D | DRY (No Water Present) |
| P | PUDDLED (scattered water, dirt shows) |
| F | FLOODED (Little dirt shows) |
| X | UNKNOWN |
| N | NOT APPLICABLE |

| **Examples**: | |
|---|---|
| Unknown | X-XX-XX |
| Sheetwater in corn stubble | C-CO-HF |
| shallow marsh mostly open wate | F-SO-NF |
| flooded harvested unknown grai | C-CU-HF |
| clear lake NWR | A-LK-NF |
| TLNWR-NE part of sump 1-A | F-PC-NF |
| TLNWR-open part of sump 1-A | F-PO-NF |

Appendix 4. Survey code recorded, common names, and genus-species of waterfowl and other birds counted during spring aerial surveys in Southern Oregon and Northeast California, 2002 and 2003.

**WATERFOWL SPECIES**

| Survey code | Common name | Genus-species |
|---|---|---|
| | **Dabbling Ducks** | |
| AGWT | Green-winged teal | *Anas crecca* |
| AMWI | American wigeon | *Anas americana* |
| | (Possibly also a few Eurasian wigeon, *Anas penelope*) | |
| CITE | Cinnamon teal | *Anas cyanoptera* |
| GADW | Gadwall | *Anas strepera* |
| MALL | Mallard | *Anas platyrhynchos* |
| NOPI | Northern pintail | *Anas acuta* |
| NSHO | Northern shoveler | *Anas clypeata* |
| WOOD | Woodduck | *Aix sponsa* |
| | **Diving Ducks** | |
| BUFF | Bufflehead | *Bucephala albeola* |
| CANV | Canvasback | *Aythya valisineria* |
| GOLD | Goldeneye | *Bucephala clangula, B. islandica* |
| MERG | Merganser | *Mergus merganser, Lophodytes cucullatus* |
| | (Probably also some Red-breasted mergansers, *M. serrator*. COME-Common merganser, *M. merganser*, tallied separately in one survey added into MERG). | |
| REDH | Redhead | *Aythya americana* |
| RNDU | Ring-necked duck | *Aythya collaris* |
| RUDU | Ruddy duck | *Oxyura jamaicensis* |
| SCAU | Scaup | *Aythya affinis, A. marila* |
| | **Dark Geese** | |
| CAGO | Canada goose | *Branta canadensis* |
| GWFG | Greater white-fronted goose | *Anser albifrons* |
| | **White Geese** | |
| LSRG, LSGO | Lesser snow –Ross' Goose | *Chen caerulescens, C. rossii* |
| | **Other Waterfowl** | |
| AMCO | American coot | *Fulica americana* |
| SWAN | Tundra swan | *Cygnus columbianus* |
| | **NON-WATERFOWL SPECIES** | |
| | **Eagles** | |
| BAEA | Bald eagle | *Haliaeetus leucocephalus* |
| GOEA | Golden eagle | *Aquila chrysaetos* |
| | **Other Non-waterfowl** | |
| SACR | Sandhill crane | *Grus canadensis* |
| WFIB | White-faced ibis | *Plegadis chihi* |
| WPEL | American white pelican | *Pelecanus erthrorhynchos* |

Appendix 5. Areas in each SONEC sub-region where waterfowl were tallied during periodic aerial surveys during January – May, 2002 and 2003.

Lower Klamath sub-region
Alkali Lake, Butte Valley Wildlife Area (WA), Clear Lake National Wildlife Refuge (NWR), Indian Tom Lake, Klamath River WA, Lower Klamath NWR units (2, 3A-B, 4A-G, 5A-B, 6A, 6B1-2, 6C, 7A-B, 8, 9A-D, 10, 11A1-2, 11B-C, 12A-C, 13A-B, Straits, Miller Lake, White Lake, Sheepy-East, Sheepy-West, Stearns-Orem), Lower Klamath Off-refuge, Midland Hunt Club, Lost River, Tule Lake NWR units (Upper Sump, Lower Sump, Frog Pond-League of Nations, Hovey Point-SW Sump), Spring-Tingley Lakes.

Malheur sub-region
Blitzen Valley, Bocca Reservoir, Burns Area, Catlow Valley, Double-O Ranch, Harney Lake, Malheur NWR, Mud Lake, Other Harney County

Modoc Plateau sub-region
Azanzino Reservoir, Boles Meadow, Deadhorse Reservoir, Fairchild Swamp, Fletcher Reservoir, Goose Lake, Lakeview, Madeline Plains, Modoc NWR, Pit River-Alturas-Canby, Weed Valley, Wildhorse Valley

Northeastern California sub-region
Ash Creek WA, Beeler Reservoir, Big Valley, Egg Lake, Fall River Valley, White Horse Reservoir

Summer Lake sub-region
Aber Lake, Chewaucan Marsh, Other Lake County, Paulina Marsh, Summer Lake WA,

Upper Klamath sub-region
Agency Ranch (BOR), Tulana Farms (TNC), Circle 5 Ranch, Klamath Marsh NWR, Other Klamath County, Running Y Ranch, Swan Lake, Sycan Marsh, Thompson Reservoir, Upper Klamath-Agency Lakes, Upper Klamath NWR, Upper Williamson River, White Line Reservoir, Wood River Ranch

Warner Valley sub-region
Adel Hunt Club, Crump Lake, Hart Lake, Warner Valley