Population Status of the Tule Greater White-fronted Goose

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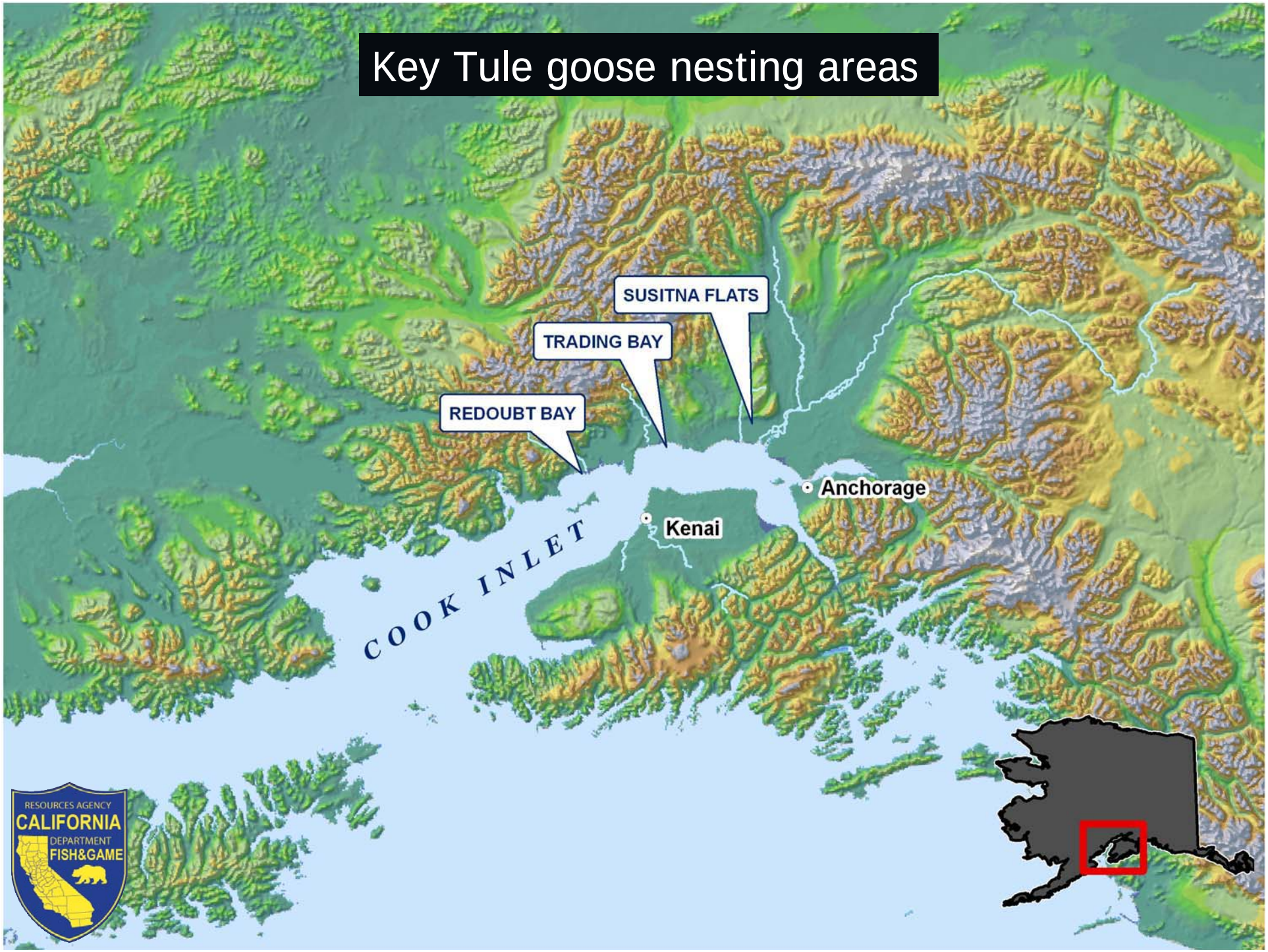
Cooperating Agencies and Organizations

- VHF radios: CDFG, ODFW, USFWS
- Trapping costs: CDFG and ODFW
- Aerial Surveys: CDFG, USFWS and ODFW
- Indirect field data: CDFG, USFWS and ODFW
- Satellite telemetry: CDFG and ADFG
- Pictures:Mike Peters and Gary Kramer (USFWS); Mike Petrula and Tom Rothe (ADFG); Craig Ely (USGS)

Summary of Research and Management

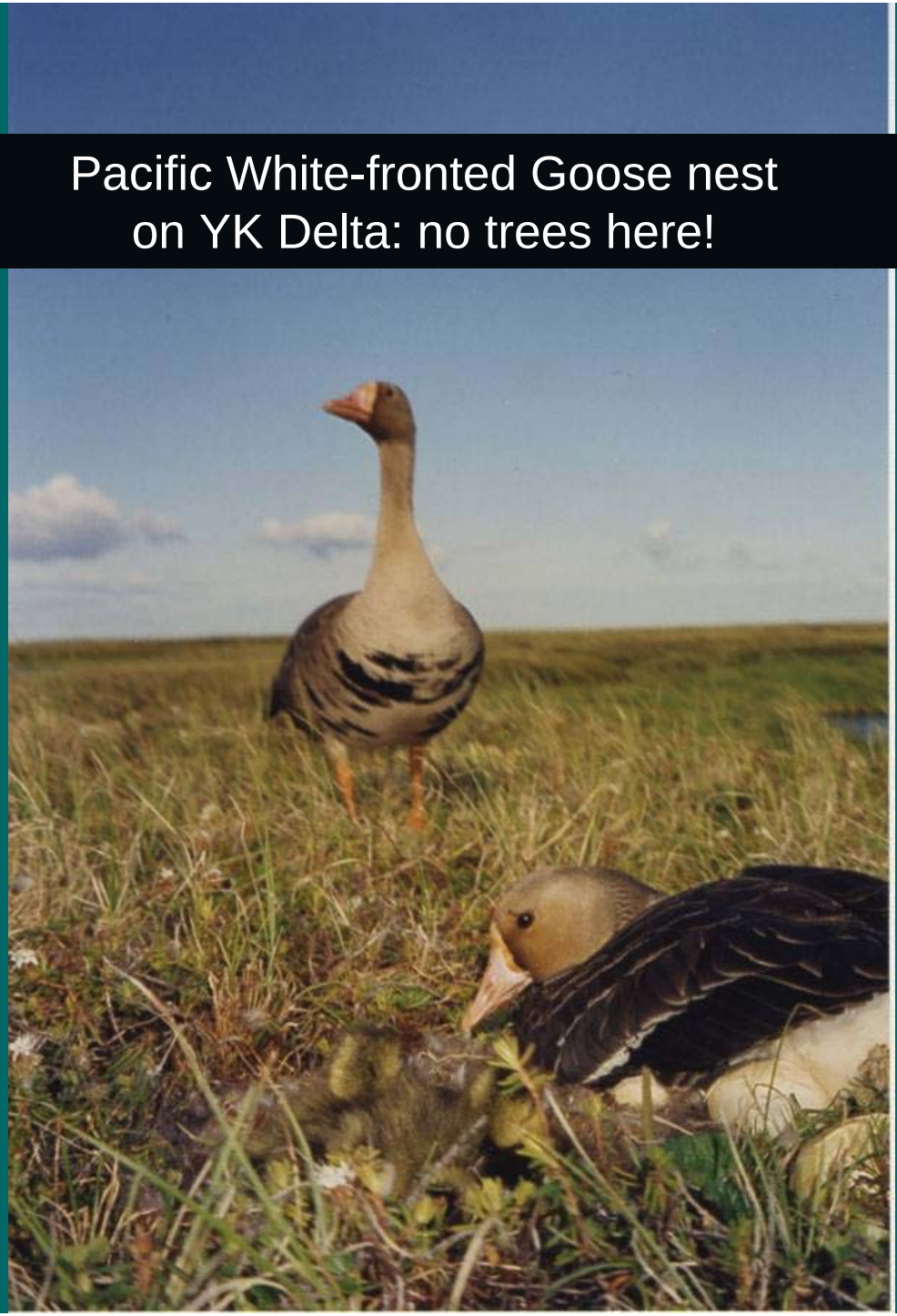
- 1852 – described as a separate form in Texas
- 1917 – described as a separate form in California
- 1931 – AOU recognition as a subspecies
- 1960s – USFWS refuge staff & others conduct wintering field studies, attempts to locate breeding grounds
- 1970s – studies of measurements to distinguish subspecies, first winter counts, attempts to locate breeding grounds
- 1979 – Breeding confirmed in Cook Inlet

- 1991 – Pacific Flyway adopts first management plan, sets management population index goal of 10,000 birds
- 1990s – continued fall population counts and harvest monitoring by USFWS with assistance by ODFW and CDFG; enhanced efforts at population size estimation and more body measurements by USGS; winter distribution work by CSUS, CDFG and USGS; more intensive research and monitoring work in Alaska by USGS and ADFG
- 2000s – continued fall counts, harvest monitoring, population estimations; satellite telemetry work by CDFG and ADFG

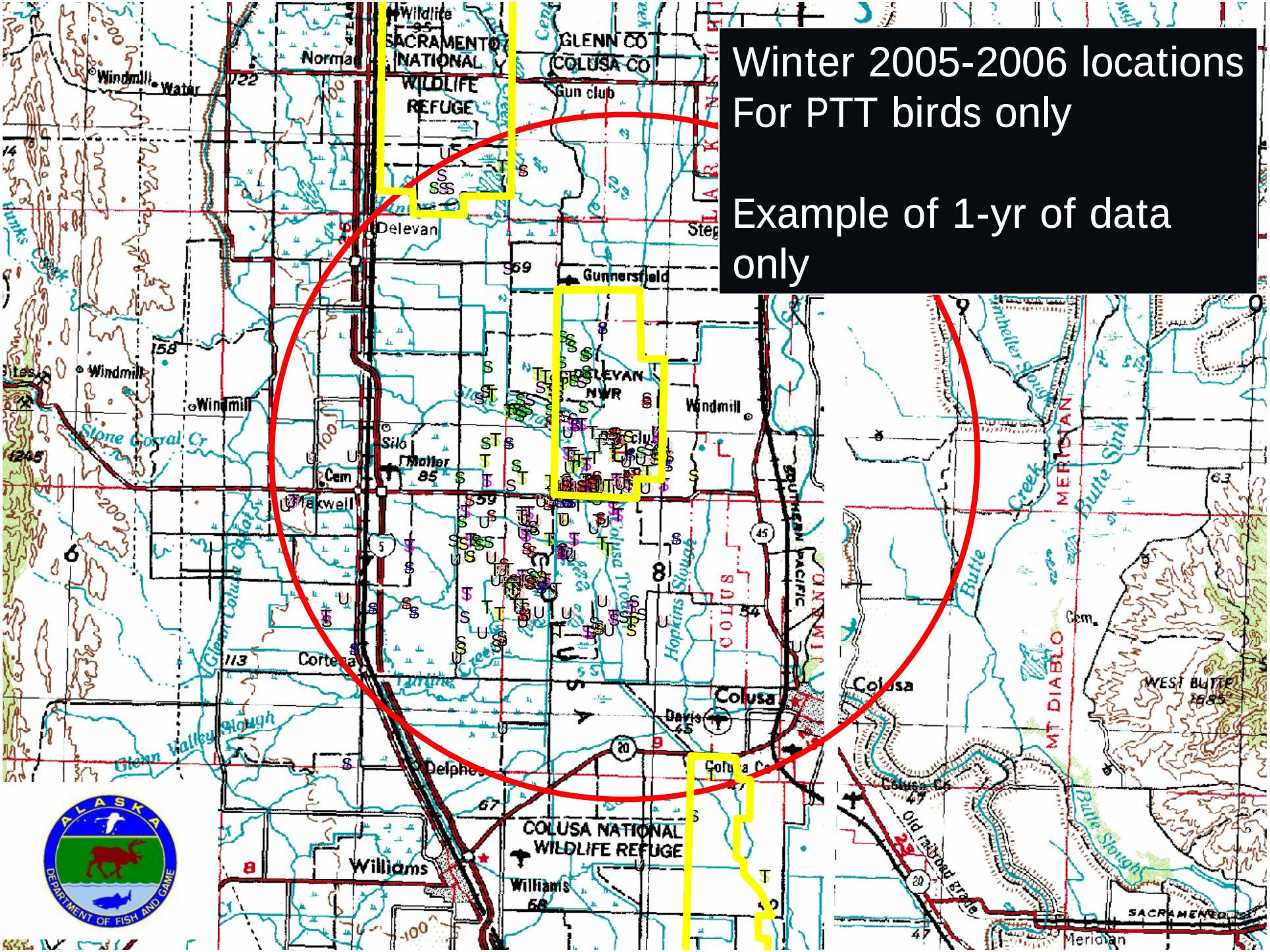

Key Tule goose nesting areas
SUSITNA FLATS
TRADING BAY
REDOUBT BAY
Anchorage
Kenai
COOK INLET
RESOURCES AGENCY
CALIFORNIA
DEPARTMENT
FISH&GAME


Nest Site Location: under the trees!
4 9:47 AM

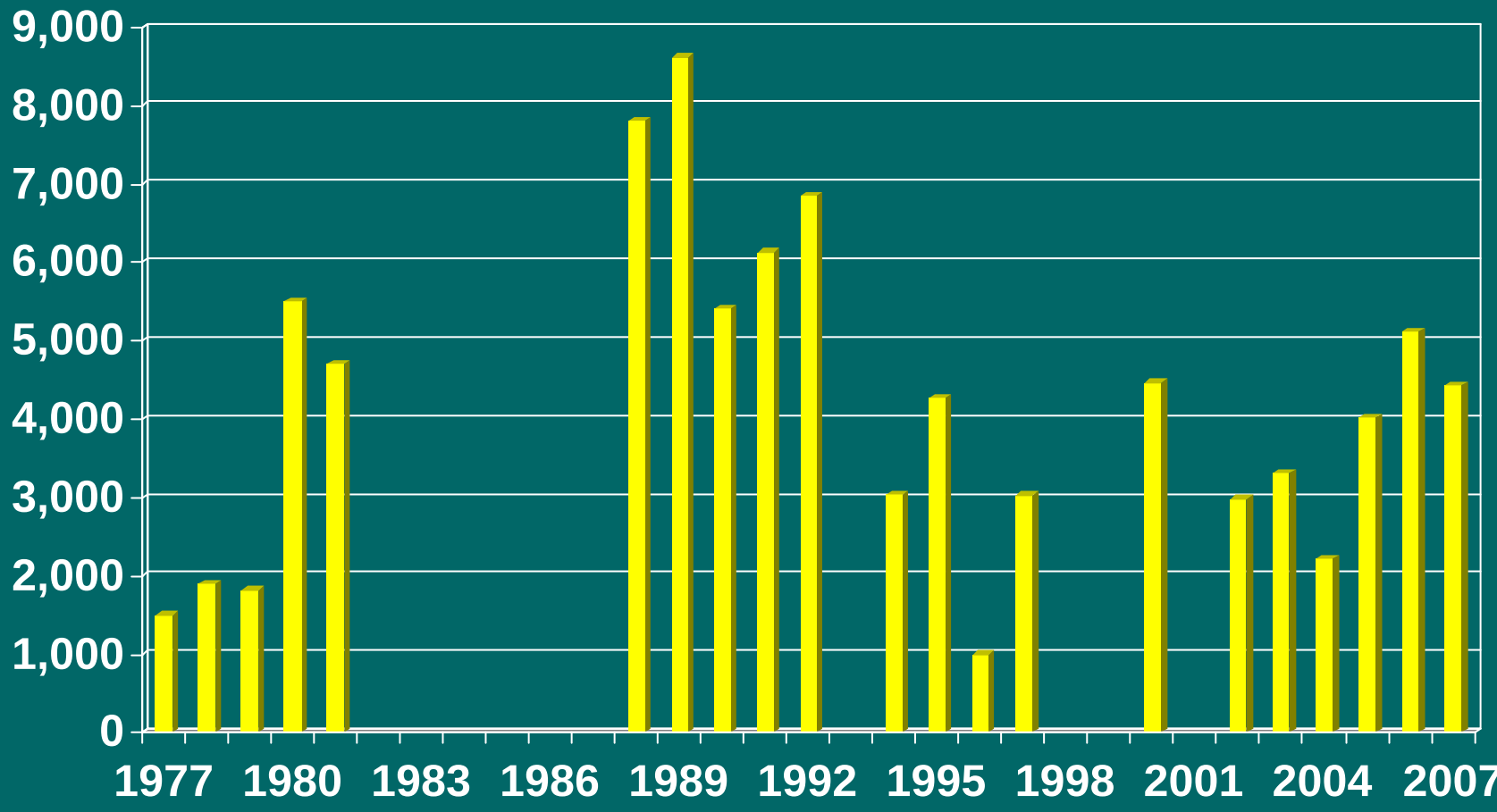
Pacific White-fronted Goose nest
on YK Delta: no trees here!



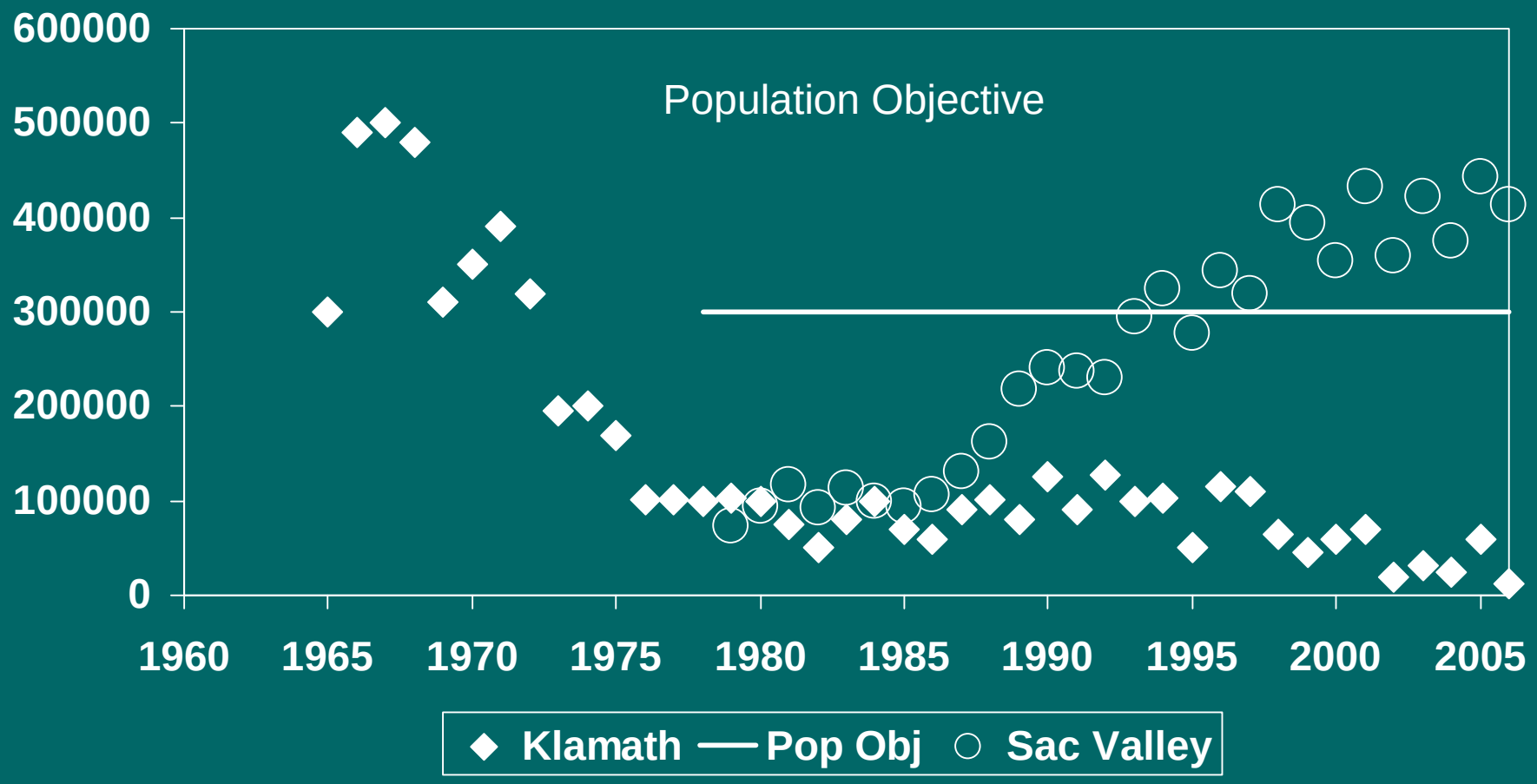

Tule geese with brood in spruce bog forest:
not like Pacific White-fronts on YK Delta
5 11:03 AM

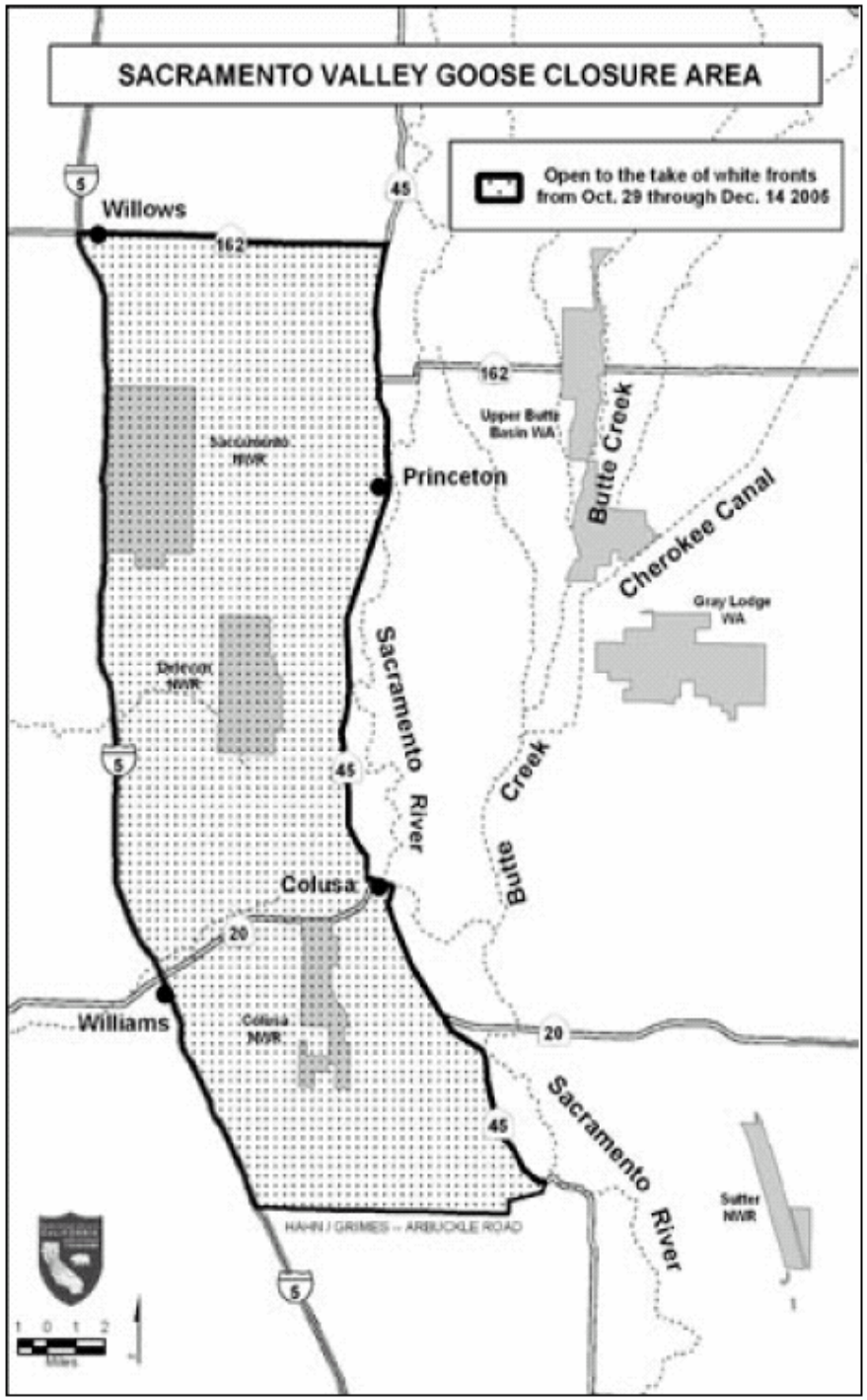

Winter 2005-2006 locations
For PTT birds only
Example of 1-yr of data only
SACRAMENTO NATIONAL WILDLIFE REFUGE
GLENN CO
COLUSA CO
Delevan
Gunnersfield
DELEVAN NWR
Windmill
Maxwell
Cortena
Colusa
Williams
COLUSA NATIONAL WILDLIFE REFUGE
Delphos
Davis
Stone Corral Cr
Glenn Valley Slough
Hopkins Slough
Butte Creek
Butte Slough
Butte Sink
MT DIABLO MERIDIAN
WEST BUTTE
Old railroad Grade
Meridian
ALASKA DEPARTMENT OF FISH AND GAME

“Direct” Counts of Tule White-fronted geese
(Tule geese counted in September)



Fall Indices for Pacific White-fronted geese

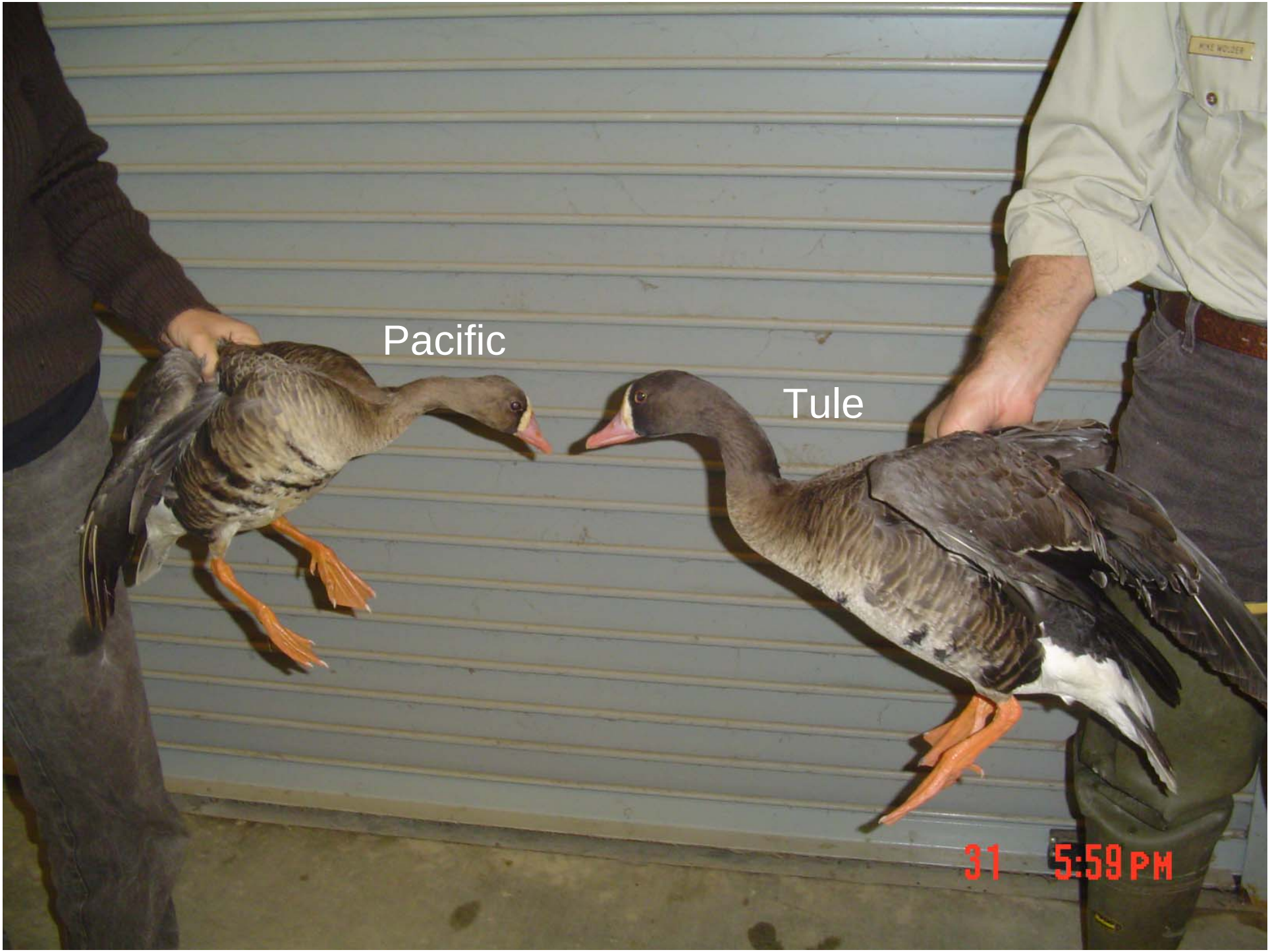




- 1975 – closure enacted for Endangered Aleutians
- 1986 – closure expanded to include white fronts open only through 11/30
- 1994 – Bag limit 1->2
- 1995 – boundaries reduced, white front open season extended through 12/14
- 2004 – Bag limit 2-> 3 (except in closure area)
- 2004 – extended season length to 100 days outside closure area

Study Objectives

- Can indirect surveys, rather than annual counts, provide an appropriate metric for management?
- How many are harvested?


Pacific
Tule
31 5:59 PM


Tule Geese marked in Oregon during migration

Radio-Marking Summary

Year	Month	Location	Number
2003	Sept	SLWA	47
2004	Sept	SLWA	27
2005	Sept	SLWA	25
2005	Oct	Sac NWR	4
2006	Feb	Sac/Del NWRs	6
2006	Sept	SLWA	51
2007	Jan/Feb	Del NWR	8
2007	Sept	SLWA	32
2008	Sept	SLWA	28

Indirect Survey data collection

- Ground survey routes pre-established by WA and NWR staff based on:
  - Likely encounter of Tule geese
  - Access in most conditions
- Aerial telemetry conducted day prior to establish markers available for recapture
- Ground surveys conducted nearly simultaneously all known use areas
  - Movement between survey areas well-documented
- Generally “teams” of observers using a standard protocol
  - Enhanced comfort with subspecific determination
  - Second observer scanning for neck collars

Assumptions, citations

- Marked and unmarked animals have equal capture probabilities
- Population is demographically closed
- Population is not geographically closed
- All unmarked birds are correctly classified
- White, G. C. 1996. NOREMARK: Population estimation from mark-resighting surveys. Wildl. Soc. Bulle. 24(1):50-52.
- Orthmeyer, D. L., J. Y. Takekawa, C. R. Ely, M. L. Wege, and W.E. Newton. 1995. Morphological differences in Pacific Coast populations of greater white-fronted geese (*A. albifrons*). Condor, 97:123-132.

Immigration Emigration Joint Hypergeometric Maximum Likelihood Estimator

$$\mathcal{L}(N^*, N_i \mid T_i, M_i, m_i, n_i) = \prod_{i=1}^{k} \binom{T_i}{M_i} \left(\frac{N_i}{N^*}\right)^{M_i} \left(1 - \frac{N_i}{N^*}\right)^{T_i - M_i} \frac{\binom{M_i}{m_i}\binom{N_i - M_i}{n_i - m_i}}{\binom{N_i}{n_i}}$$

T_i = Number of marked (telemetered) animals in the population at the time of the $_i$*th* survey, i =1,...,k

M_i = Number of marked animals in the population that are on the area surveyed at the time of the *ith* sighting survey

n_i = Number of animals seen during the *ith* sighting survey, consisting of *mi* marked animals and u_i unmarked animals, so that $n_i = m_i + u_i$

Preliminary NOREMARK Estimates of Tule Geese

Areas	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09
All Areas, All Periods	11,956	11,801	11,060	50,956	12,077	13,841
95% CI	7,750 - 20,288	7,307 - 21,469	10,027 - 138,031	46,097 - 360,462	9,439 - 21,083	12,712- 158,083

White-fronted goose harvest on Sacramento, Delevan and Colusa NWRs and the Grizzly Island WA

Season	No. GWFG harvested	Percent Measured	No. Adults	No. Adult Tules	Estimated No. Adult Tules
1999-2000	226	49	42	20	44
2000-2001	480	76	196	91	120
2001-2002	289	69	128	40	52
2002-2003	633	76	247	48	62
2003-2004	812	46	134	17	28
2004-2005	905	59	194	26	44
2005-2006	822	63	153	14	26
Totals	4,167	62			

* This slide is out of date.

Summary

- Population size still not certain, but appears to be about 12,000 with no apparent trend
  - Detection probabilities are low and affect reliability of estimates
  - Next steps include alternative analysis methods and potential changes in survey timing and number
- Relatively small winter distribution helps harvest management decision-making
- Current harvest levels seem prudent
- The Special Management Area will likely remain in some form in the future

Questions?

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