

Evaluating the Importance of the Teshekpuk Lake Special Area Within the National Petroleum Reserve – Alaska: Predicting Shorebird Occurrence and Abundance



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**U.S. Fish and Wildlife Service
Migratory Bird Management**



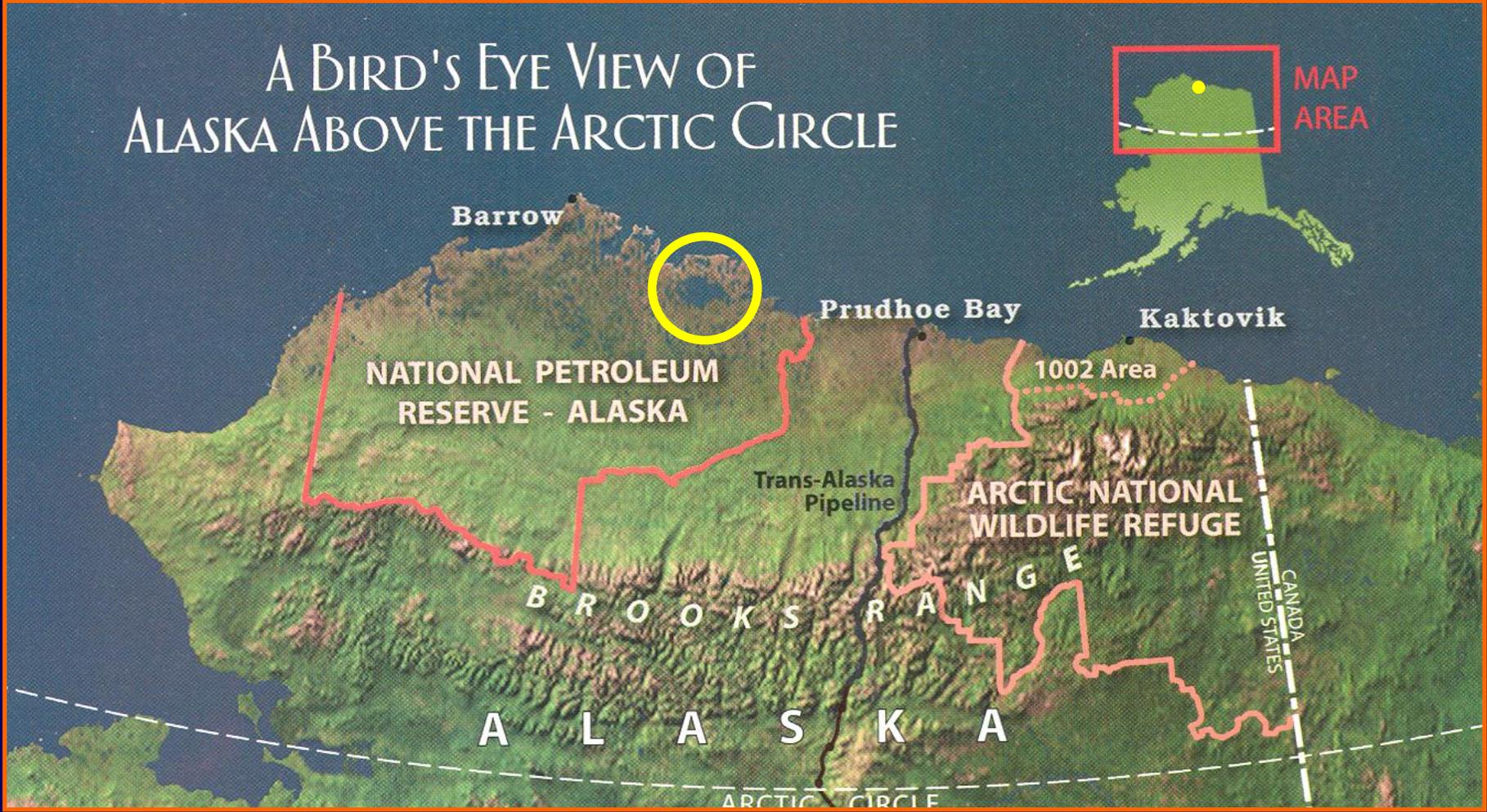
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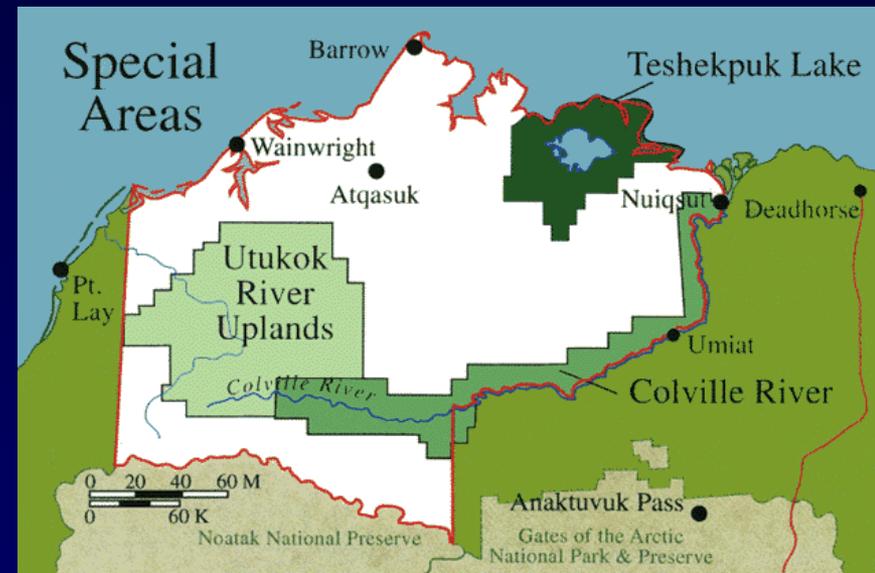
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Part of the National Petroleum Reserve – Alaska



History of Teshekpuk Lake Special Area (TLSA)

- 1923 – Congress established the National Petroleum Reserve – Alaska (NPR—A), designated for use by the military during emergencies
- 1976 – Congress directed that “special areas” be created within NPR—A
- 1977 – Created the TLSA to protect the extensive wetlands surrounding Teshekpuk Lake



Tshekpuk Lake Special Area is a Special Area!

- Important area for wildlife, subsistence hunting, and cultural values
 - Up to 90,000 geese (Black Brant) molt primary feathers
 - Up to 46,000 caribou use the area for calving and migration

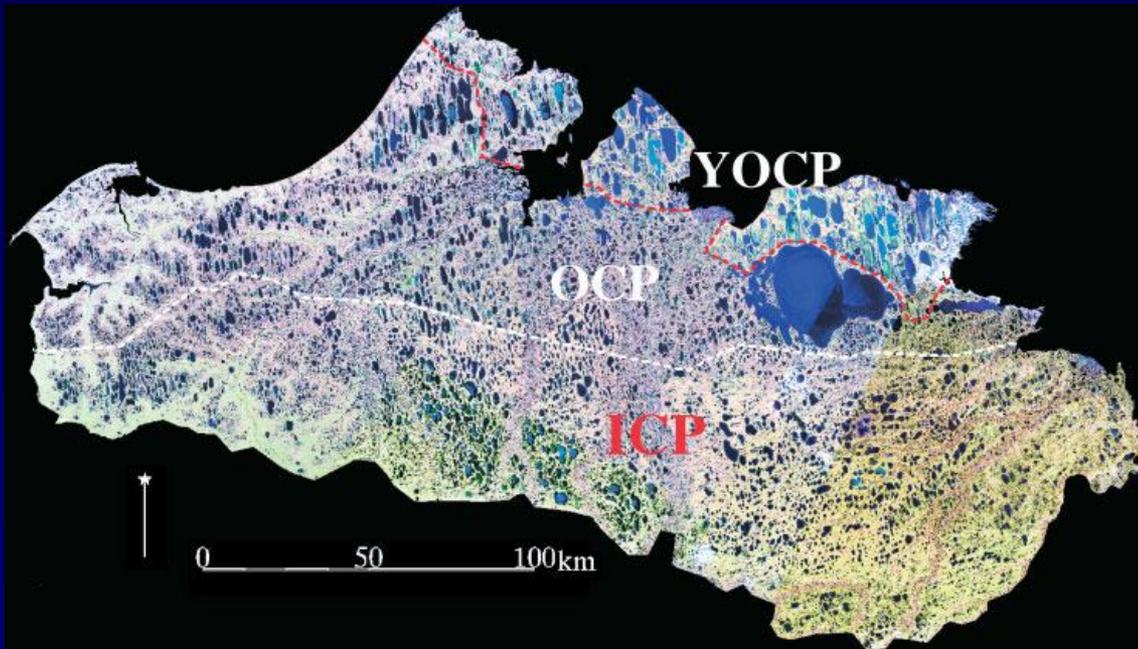


Project Objectives

- Estimate density and determine abundance of breeding shorebirds using ground surveys
- Use geographic and vegetation variables to identify important areas
- Make data available for land use management planning efforts currently underway at the Bureau of Land Management

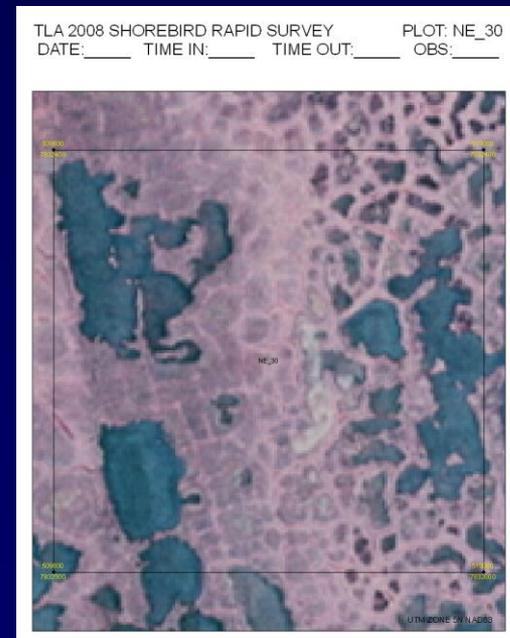
Sampling Design - 1

- Partitioned sampling area to ensure representative geographic coverage (young outer and outer, and inner coastal plain)
- Sampled more intensively near the coast



Sampling Design - 2

- Random selection of 16 ha (400 x 400 m) plots with constraint of $\leq 50\%$ water on plot
- Surveyed plots in 2006, 2007, and 2008
- Access plots with helicopter, surveyed each 16 ha plot for 1.25 hours





Plot Locations within TLSA



ARCTIC OCEAN

Teshkepuk Lake

Total Land Area
= 4,550 Km²

Total 167 plots
(2006 plots not shown)

-  Plots - 2007
-  Plots - 2008
-  TLSA

0 25 50 Kilometers

Survey Approach - 1

- Tallied all individuals of all species, but excluded flyovers
- For monogamous species, we used an individual's behavior (territorial male) and presence of nests to determine number of pairs
- For polygamous species, we considered 2 birds to be present for each nest, probable nest, and pair visually observed, and then added the number of single birds to this total



Survey Approach - 2

- Use double-sample survey approach that relies on rapidly surveyed plots and intensively surveyed plots (Bart and Earnst 2002)
- Used a compound ratio estimator to estimate density from raw counts and adjusted them for imperfect detection, where appropriate
- Estimated ecoregional and total population sizes by using the non-water vegetation types in the TLSA

Count Method and Detection Ratio

| Species | Count Method | Detection Ratio | SE |
|-------------------------|-----------------|-----------------|------|
| Black-bellied Plover | Pairs | 0.85 | 0.17 |
| American Golden-Plover | Pairs | 0.88 | 0.26 |
| Bar-tailed Godwit | Pairs | 0.75 | 0.26 |
| Ruddy Turnstone | Pairs | 0.83 | 0.00 |
| Semipalmated Sandpiper | Pairs | 0.75 | 0.13 |
| Baird's Sandpiper | Pairs | 0.84 | 0.14 |
| Pectoral Sandpiper | Corrected Total | 1.00 | 0.14 |
| Dunlin | Pairs | 0.90 | 0.16 |
| Stilt Sandpiper | Pairs | 0.61 | 0.11 |
| Buff-breasted Sandpiper | Corrected Total | 1.00 | 0.14 |
| Long-billed Dowitcher | Pairs | 1.00 | 0.14 |
| Red-necked Phalarope | Corrected Total | 1.00 | 0.14 |
| Red Phalarope | Corrected Total | 1.00 | 0.14 |

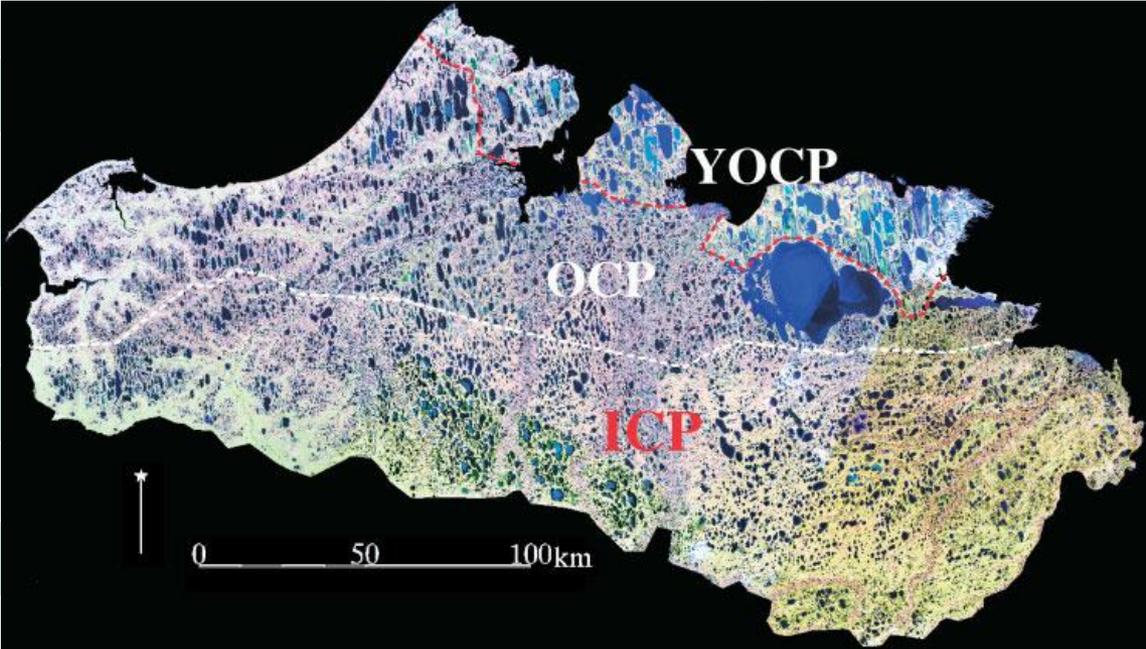
Sample Representation

| Veg Class | Subclass | Entire Area (%) | Sample Area (%) |
|----------------|-----------------------|-----------------|-----------------|
| Water | | 34.2 | 11.7 |
| Aquatic | | 5.3 | 8.5 |
| Flooded tundra | | 13.8 | 21.5 |
| | Low Centered Polygons | 10.2 | 16.4 |
| | Non-pattern | 3.6 | 5.1 |
| Wet tundra | | 6.0 | 9.0 |
| Moist tundra | | 36.0 | 45.5 |
| | Sedge/grass | 14.7 | 19.4 |
| | Tussock tundra | 17.4 | 20.7 |
| | Moss/lichen | 3.9 | 5.3 |
| Shrub | | 1.9 | 1.9 |
| Barren Ground | | 3.2 | 2.1 |

Mean Density and Abundance on TLSA

| Species | Density (birds/km ²) | Abundance |
|-------------------------|----------------------------------|------------------|
| Black-bellied Plover | 5.85 ± 1.14 | 26,623 ± 5,165 |
| American Golden-Plover | 3.98 ± 1.12 | 18,113 ± 5,079 |
| Bar-tailed Godwit | 0.22 ± 0.16 | 998 ± 730 |
| Ruddy Turnstone | 0.44 ± 0.19 | 2,016 ± 887 |
| Semipalmated Sandpiper | 32.94 ± 4.93 | 149,889 ± 22,443 |
| Baird's Sandpiper | 0.26 ± 0.19 | 1,200 ± 874 |
| Pectoral Sandpiper | 15.11 ± 1.92 | 68,732 ± 8,736 |
| Dunlin | 20.93 ± 3.69 | 95,245 ± 16,785 |
| Stilt Sandpiper | 1.19 ± 0.41 | 5,394 ± 1,860 |
| Buff-breasted Sandpiper | 0.28 ± 0.14 | 1,258 ± 635 |
| Long-billed Dowitcher | 7.18 ± 1.04 | 32,678 ± 4,725 |
| Red-necked Phalarope | 15.19 ± 1.91 | 69,103 ± 8,711 |
| Red Phalarope | 22.42 ± 2.96 | 102,026 ± 13,478 |
| All Species | 125.99 ± 8.51 | 573,274 ± 38,718 |

Inner versus Outer Coastal Plain

| Species | Outer (density) | Inner (density) | P-Value | | | |
|-------------------------|---|-----------------|---------|-------------|-------------|------|
| Black-bellied Plover | 5.12 ± 1.31 | 6.99 ± 2.06 | >0.1 | | | |
| American Golden-Plover |  | | | | | |
| Bar-tailed Godwit | | | | | | |
| Ruddy Turnstone | | | | | | |
| Semipalmated Sandpiper | | | | | | |
| Baird's Sandpiper | | | | | | |
| Pectoral Sandpiper | | | | | | |
| Dunlin | | | | | | |
| Stilt Sandpiper | | | | | | |
| Buff-breasted Sandpiper | | | | 0.18 ± 0.11 | 0.42 ± 0.32 | >0.1 |
| Long-billed Dowitcher | | | | 7.25 ± 1.39 | 7.08 ± 1.53 | >0.1 |
| Red-necked Phalarope | 17.58 ± 2.68 | 11.46 ± 2.57 | 0.1016 | | | |
| Red Phalarope | 33.83 ± 4.68 | 4.67 ± 2.05 | 0.0001 | | | |
| All Species | 154.96 ± 11.88 | 80.91 ± 11.47 | 0.0001 | | | |

Inner versus Outer Coastal Plain

| Species | Outer (density) | Inner (density) | P-Value |
|-------------------------|---------------------|--------------------|---------|
| Black-bellied Plover | 5.12 ± 1.31 | 6.99 ± 2.06 | >0.1 |
| American Golden-Plover | 1.79 ± 0.71 | 7.40 ± 2.63 | 0.044 |
| Bar-tailed Godwit | 0.14 ± 0.14 | 0.34 ± 0.34 | >0.1 |
| Ruddy Turnstone | 0.73 ± 0.32 | - | 0.024 |
| Semipalmated Sandpiper | 36.89 ± 6.93 | 26.80 ± 6.54 | >0.1 |
| Baird's Sandpiper | - | 0.67 ± 0.49 | >0.1 |
| Pectoral Sandpiper | 21.08 ± 2.96 | 5.80 ± 1.69 | 0.0001 |
| Dunlin | 29.94 ± 5.87 | 6.92 ± 2.36 | 0.0004 |
| Stilt Sandpiper | 0.43 ± 0.26 | 2.36 ± 0.96 | 0.0575 |
| Buff-breasted Sandpiper | 0.18 ± 0.11 | 0.42 ± 0.32 | >0.1 |
| Long-billed Dowitcher | 7.25 ± 1.39 | 7.08 ± 1.53 | >0.1 |
| Red-necked Phalarope | 17.58 ± 2.68 | 11.46 ± 2.57 | 0.1016 |
| Red Phalarope | 33.83 ± 4.68 | 4.67 ± 2.05 | 0.0001 |
| All Species | 154.96 ± 11.88 | 80.91 ± 11.47 | 0.0001 |

Does vegetation explain differences in density of grouped species?

- Used regression tree analysis

| | Inner Coastal Plain | | |
|---------------|---------------------|--------------------|-------------|
| | Vegetation Feature | | |
| Species Group | Mean \pm SE | Mean \pm SE | P-value, DF |
| All species | Wetlands \leq 43% | Wetlands $>$ 43% | 0.0061, 13 |
| | 60.26 \pm 7.62 | 219.17 \pm 47.93 | |
| Coastal | Flooded \leq 17% | Flooded $>$ 17% | 0.0147, 17 |
| | 10.63 \pm 3.0 | 44.80 \pm 12.22 | |
| Inland | Flooded \leq 6% | Flooded $>$ 6% | 0.1212, 33 |
| Widespread | Aquatic \leq 8% | Aquatic $>$ 8% | 0.0004, 18 |
| | 27.95 \pm 5.20 | 141.54 \pm 25.82 | |

How important is TLSA to shorebirds?

| | Density | | % of population | | WHSRN Status |
|------------------------|---------|-------|-----------------|------|--------------|
| | ANWR | TLSA | ANWR | TLSA | |
| American Golden-Plover | 2.46 | 4.32 | 4.6 | 9.1 | R |
| Ruddy Turnstone | 0.33 | 0.45 | 4.6 | 3.1 | R |
| Semipalmated Sandpiper | 6.87 | 30.05 | 1.3 | 7.5 | R |
| Pectoral Sandpiper | 8.04 | 20.76 | 7.0 | 13.8 | I |
| Dunlin | 0.67 | 23.26 | 0.3 | 12.8 | I |
| Stilt Sandpiper | 1.53 | 1.23 | 0.8 | 0.7 | R |
| Long-billed Dowitcher | 0.79 | 8.87 | 1.7 | 8.5 | R |
| Red-necked Phalarope | 5.49 | 16.96 | 1.0 | 2.8 | R |
| Red Phalarope | 2.05 | 25.07 | 0.3 | 8.2 | R |

Arctic NWR data from Brown et al. (2007) and world population data from Morrison et al. (2006)

Acknowledgements

■ Funders

- U.S. Fish and Wildlife Service

 - Region 7, 9, Avian Influenza Program

- Bureau of Land Management

- Manomet Center for Conservation Sciences

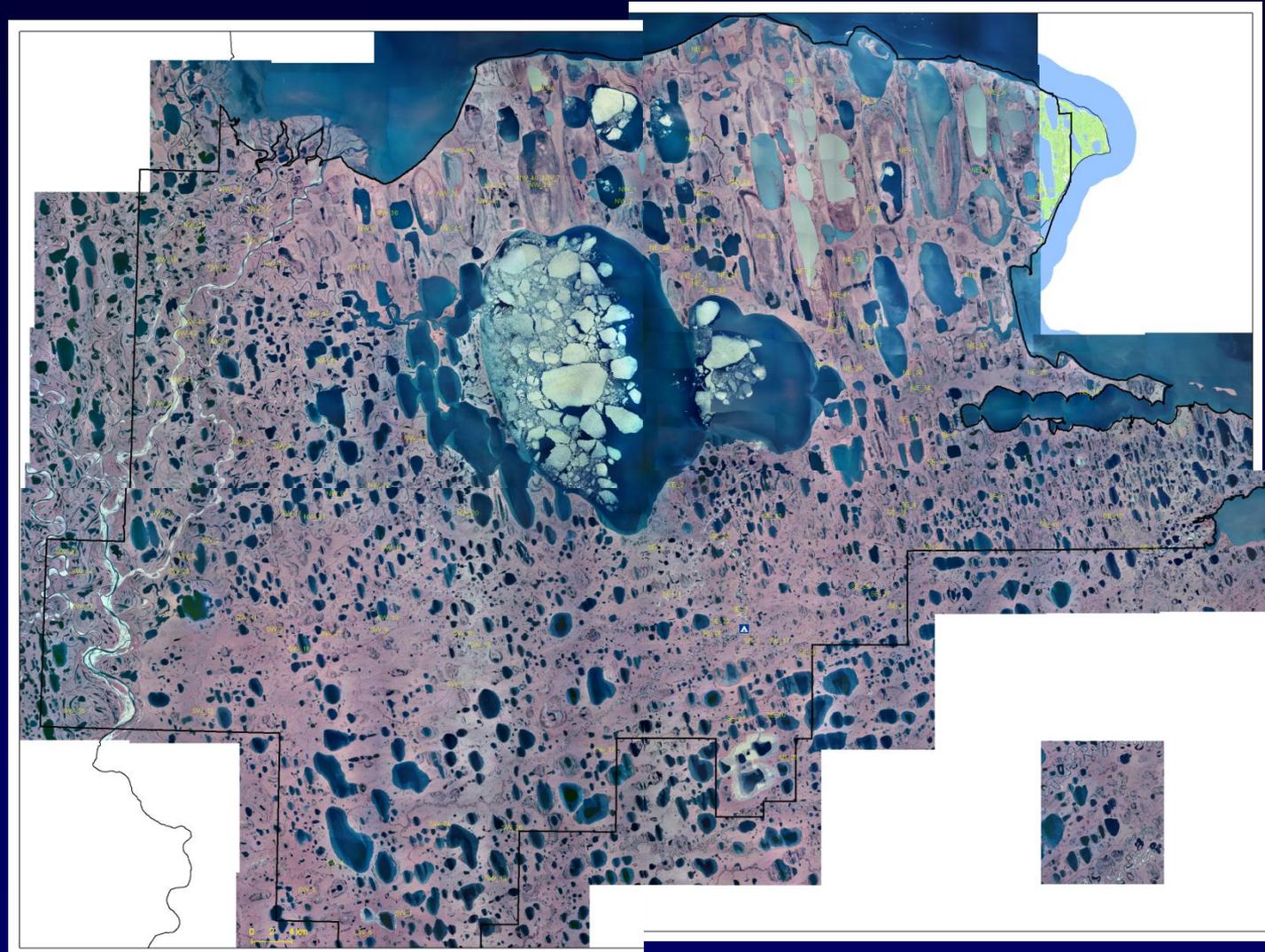
- Thanks to many other project participants who helped design the study or carry out the work in the field!

**Extra slides follow –
not part of
presentation
currently**

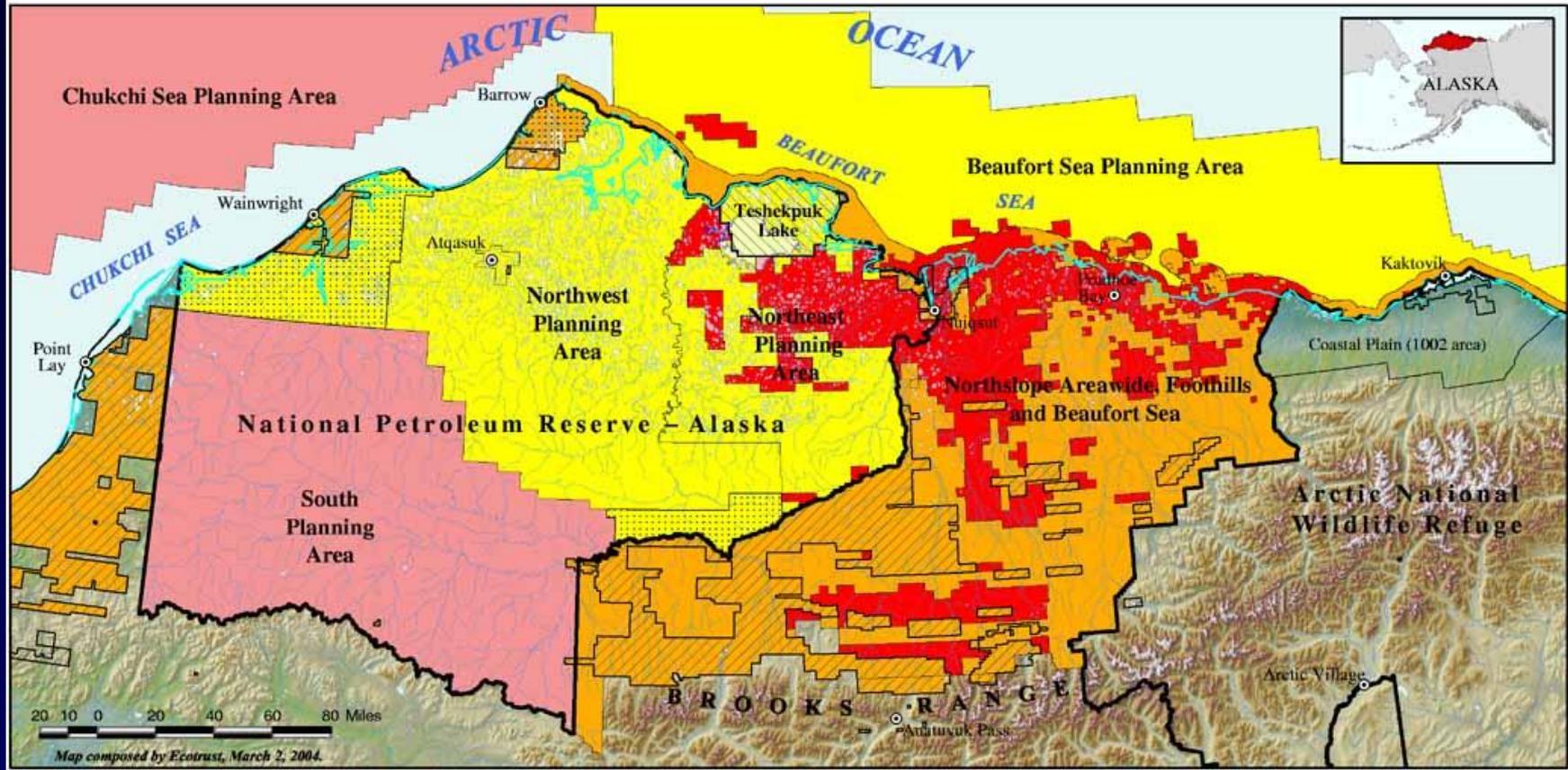
Percentage of Vegetation Cover types on the Outer and Inner Coastal Plain Ecoregions of the TLSA

| Coastal Plain region (km ²) | Water / Ice | Aquatic | LCPs, Flooded tundra, Moss- lichen | Wet tundra | Sedge meadow | Tussock tundra/ Dwarf shrub | Other |
|--|----------------|---------|--|---------------|-----------------|--------------------------------------|-------|
| Outer (4,600) | 40 | 6 | 22 | 6 | 13 | 10 | 4 |
| Inner (2,283) | 22 | 4 | 9 | 5 | 18 | 37 | 5 |

Plot Locations within TLSA



Current and Proposed Oil & Gas Leases on Alaska's North Slope



- Oil lease sales have occurred in the NE portion of the NPR—A, currently oil lease sales around TLSA are on hold but part of new environmental planning process



Buff-breasted Sandpiper
lekking, variable number across time



Pectoral Sandpiper
Polygynous, variable number across time



Red Phalarope
Polyandrous, non-territorial



Long-billed Dowitcher
Secretive, hard-to-find nests



White-rumped Sandpiper
Polygynous, hard-to-find nests