

Recommended research

- Survey wetland bird populations refuge-wide at intervals of roughly every 5 years, and after any large-scale developments.
- Search the wetland fringes for crow nests, concentrating on young spruce stands in uplift meadows. There are indications that crows have declined since the 1986 survey.
- Document the effects on waterbirds of uncontrolled dogs, using the methods of Burger (1986) and Lafferty (2001).
- Document the response of waterfowl to hunting between Sept 30 and Dec 15. Other hunting-related studies could include crop sampling to determine bird diets, and a survey of hunter attitudes toward closed sanctuaries.
- Conduct bird surveys at night (especially foraging waterfowl) and at high tides (especially waterbird resting areas), to fill in gaps that were not addressed in the current study.
- Map areas of intensively clipped vegetation in the sedge low marsh and succulent marsh during late spring and mid fall as an additional measure of where foraging waterfowl are concentrating. In some ways such a survey could be more representative of overall use than actual bird counts, as clippings show cumulative presence better than do isolated observations. (Droppings also show bird presence but are left by resting as well as foraging waterfowl. Goose droppings are easily distinguished from those of Mallard and other ducks.)
- Document harassment of geese on Auke Lake, and if it is occurring, provide enforcement.
- Shorebirds should be re-surveyed at least every few years. Key period is April 26 to May 23. This could be done on a fairly informal basis if local birders were willing to share their counts with an agency or NGO compiler. Large pulses of spring shorebirds probably do not often slip through the refuge without being detected by one or more of Juneau's active birders.
- Conduct study of tidal current and sediment transport, particularly around spoil islands, as a measure of the ability of tidal scour to "grade" certain sloughs and sparsely vegetated surfaces, offsetting the effects of glacial rebound.
- Potential food resources for fish and wildlife on the wetlands are poorly understood. Studies should address these plant and invertebrate foods and their relationship to changing community structure and distribution.
- Identify all undeveloped or lightly developed private properties containing wetlands contiguous to the Refuge. Purchase of such properties should be among the highest ranking options for mitigation.

Acknowledgments

Pauline Strong created the phenology mega-table (Appendix C) and the graphs produced from those data. Gus van Vliet contributed information on banded birds seen on and near the Mendenhall Wetlands. Paul Suchanek let us use all of his records of bird sightings on the Mendenhall Wetlands, which had been already entered into Excel. Richard Gordon gave us copies of his many years of bird observations at the mouth of Mendenhall River. Steve Zimmerman reviewed the phenology table and helped fill in the blanks for the accidental and casual birds. Laurie Craig kindly called us whenever she sighted unusual concentrations of birds on the wetlands. We are grateful to volunteers who assisted with the surveys: Sari Saunders, Jenny Purcell, and Mike Tobin.

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On April 29, 2002, Rusty Yerxa flew us over the refuge and surrounding areas. Many of the oblique air photos in this report were taken during that flight. Jack Hodges took us up in the USF&WS Beaver during a zero-foot tide to get vertical photographs of the mudflats and other key wetland habitats. Michelle Kissling, USFWS, had the original concept for this study. She lent us GPS units and laser rangefinder for our initial mapping of hotspots. Bob Christensen of SEAWEAD gave us training and frequent consultation on ArcView 3.2 and ArcMap 8.2, both of which proved instrumental in data analysis.

Literature Cited

- American Ornithologists' Union. 1998. Check-list of North American Birds.
- Andres, B.A. and R.E. Gill, Jr. 2000. A Conservation Plan for Alaska Shorebirds. Coordinated by U.S. Fish and Wildlife Service and Alaska Biological Science Center.
- Armstrong, R.H. 1994. Alaska's Birds. Alaska Northwest Books, Seattle Washington.
- Armstrong, R.H. 1996. Alaska's Fish. Alaska Northwest Books, Seattle WA.
- Armstrong, R.H. and R. Gordon. 2001. Annotated Checklist of the Birds of Southeast Alaska. Alaska Natural History Association and USDA Forest Service.
- Armstrong, R. and R. Gordon, 2002. Birds of Mendenhall Wetlands, checklist, Juneau Audubon Society.
- Bazely, D. and R. Jefferies. 1985. Goose faeces: a source of nitrogen for plant growth in a grazed salt marsh. *Journal of Applied Ecology*. 22: 693-703.

- Bethers M., K. Munk, and C. Seifert. 1995. Juneau Fish Habitat Assessment. Alaska Department of Fish and Game, Division of Sport Fish, Douglas, Alaska. 128 p.
- Bishop, D., R. Armstrong, and R. Carstensen. 1987. Environmental analysis of lower Jordan Creek and nearby wetlands in regard to planned airport taxiway extension. Environaid, Juneau, AK.
- Buchsbaum, R. and I. Valiela. 1987. Variability in the chemistry of estuarine plants and its effect on feeding by Canada Geese. *Oecologia* 73: 146-153.
- Burger, J. 1981. The effect of human activity on birds at a coastal bay. *Biological Conservation*. 21: 231-241.
- Burger, J. 1986. The effect of human activity on shore-birds in two coastal bays in the northeastern United States. *Environmental Conservation*. vol 13, no 2: 123-130
- Butler, R, 1997. *The Great Blue Heron*, UBC Press, Vancouver.
- Cain, S., J Hodges, and E. Robinson-Wilson, 1988, Bird Use of the Mendenhall Wetlands in Juneau, Alaska. USFWS, Juneau, AK
- Campbell et al. 1990-97. The Birds of British Columbia. Vol. 1-3. UBC Press.
- Carstensen, R. 2000 Tracking western birds: shared migratory landbirds of Southeast Alaska, bay-area California and western Mexico. Discovery Southeast, Juneau, AK. Draft.
- Carstensen, R., M. Willson, R. Armstrong. 2003. Habitat Use of Amphibians in Northern Southeast Alaska. A report to the Alaska Department of Fish and Game by Discovery Southeast.
- Conant, B., and D.J. Groves. 2001. Alaska-Yukon waterfowl breeding population survey: May 15 to June 12, 2000. Unpubl. Rept., U.S. Fish and Wildl. Serv., Juneau, AK 32 pp.
- Dick, M.H. and I.M. Warner 1982. Pacific sand lance, *Ammodytes hexapterus* Pallas, in the Kodiak Island group, Alaska. *Syesis*. 15: 43-50.
- Federal Aviation Administration, 2002. Wildlife Hazard Management Plan for Juneau International Airport, Juneau Alaska.
- Gende, SM, R.T. Edwards, M.F. Willson, and M.S. Wipfli. 2002. Pacific salmon in aquatic and terrestrial ecosystems. *BioScience* 52: 917-928.
- Hicks, S., and W. Shofnos. 1965. Determination of land emergence from sea level observations in Southeast Alaska. *Journal of Geophysical Research*. 70(14): 3315-20.
- Hik, D., R. Jefferies, and A. Sinclair. 1992. Foraging by geese, isostatic uplift and asymmetry in the development of salt-marsh plant communities. *Journal of Ecology*, 80: 395-406.
- Hodges, J.I., J.G. King, and F.C. Robards. 1979. Resurvey of the Bald Eagle breeding population of southeast Alaska. *Journal of Wildlife Management* 43:219-221.
- Hughes and Young, 1979. Foods of American Green-winged Teal, Mallard and Pintails in the Stikine River Delta. Unpublished report.
- Imler, R.H. and E.R. Kalmbach. 1955. The bald eagle and its economic status. U.S. Fish and Wildlife Service Circular 30.
- Iverson, G.C., S.E. Warnock, R.W. Butler, M.A. Bishop, and N. Warnock. 1996. Spring migration of Western Sandpipers along the Pacific Coast of North America: A telemetry study. *Condor* 98: 10-21.
- Kline, T.C., Jr., J.J. Goering, O.A. Mathisen, P.H. Poe, and P.L. Parker. 1990. Recycling of elements transported upstream by runs of Pacific salmon. I.N. and C evidence in Sashin Creek, southeastern Alaska. *Canadian Journal of Fisheries and Aquatic Sciences* 47: 136-144.
- Lafferty, K. 2001. Birds at a southern California beach: seasonality, habitat use and disturbance by human activity. *Biodiversity and Conservation*. 10: 1949-1962.
- Levings, C. and M. Pomeroy 1979. Marsh restoration project at the Fraser River estuary. Salmonid enhancement program. Province of British Columbia. Fish and Wildlife Branch. Annual Report 1978. p 13.
- Lincoln, F.C. 1979. Migration of Birds. Circular 16. U.S. Fish and Wildlife Service.
- Marston, B.H., M.F. Willson, and S.M. Gende. 2002. Predator aggregations during eulachon (*Thaleichthys pacificus*) spawning runs. *Marine Ecology Progress Series*: 229-36.
- Martin, A., H. Zim, and A. Nelson. 1951. American wildlife and plants: a guide to wildlife food habits. Dover Publications.
- Mulder, C., R. Ruess, and J. Sedinger. 1996. Effects of environmental manipulations on *Triglochin palustris*:

- implications for the role of goose herbivory in controlling its distribution. *Journal of Ecology*. 84: 267-268.
- O'Clair, R.M., R.H. Armstrong and R. Carstensen. 1997. *The nature of Southeast Alaska*. Alaska Northwest Books. Seattle WA. 254 p.
- Ofelt, C.H. 1975. Food habits of nesting bald eagles in Southeast Alaska. *The Condor*. 77(3): 337-338
- Pogson, T.H., S.E. Quinlan and B. Lehnhausen. 1999. *A manual of selected Neotropical migrant birds of Alaska National Forests*. USDA Forest Service, Juneau.
- Pojar, J., and A. MacKinnon, 1994. *Plants of the Pacific Northwest Coast; Washington, Oregon, British Columbia and Alaska*. Lone Pine Press.
- Reed, R. and R.H. Armstrong. 1971. Dolly Varden Sport Fishery – Juneau Area. Federal Aid to Fish Restoration Research Project Segment. Project F-9-3, Study R-IV, Job R-IV-C.
- Rothfels, M. and S. Wendt. 1998. *Wild Travelers*. Canadian Wildlife Service.
- Schmidt, A., S. Robards, and M. McHugh. 1973. Inventory and cataloging of the sport fish and sport fish waters in Southeast Alaska. Alaska Department of Fish and Game. Annual Progress Report. Federal Aid in Fish Restoration. Project F-9-5 Job G-I-A. 62 p.
- Terborgh, J. 1989. *Where have all the birds gone?* Princeton University Press.
- van Vliet G., Schwan M., Gordon R., Zimmerman S. 2003. *Birds of Juneau Alaska Checklist*. Juneau Audubon Society.
- Weidensaul, S. 1999. *Living on the wind: across the hemisphere with migratory birds*. North Point Press.
- Willson, M.F. and R.H. Armstrong. 1998. Intertidal foraging for Pacific Sand-Lance, *Ammodytes hexapterus*, by birds. *Canadian Field-Naturalist* 112(4):715-716.
- Willson, M.F., R.H. Armstrong, M.D. Robards, and J.F. Piatt. 1999. Sand lance as cornerstone prey for predator populations. Res. Pap. PNW-RP-521. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. pp. 17-44.
- Willson, M.F. and A. Baldwin, 2003. *Invertebrate surveys on the Mendenhall Wetlands*. Report to the USFWS.
- Yamazaki, Y. 1995. Distribution of the Japanese sand eel during estivating period in the coastal waters of Ibaraki Prefecture. *Ibaraki-Ken Suisan Shikenjo Kenkyu Hokoku*. 33: 59-66.

Appendix A

Common and scientific names

common names for plants used in text follow Pojar and MacKinnon. 1994

Vascular plants

alkali grass	<i>Puccinellia nutkaensis</i>
arrow-grass	<i>Triglochin maritima</i>
ditch-grass	<i>Ruppia maritima</i>
foxtail barley	<i>Hordeum jubatum</i>
goosetongue	<i>Plantago maritima</i>
hair grass	<i>Deschampsia caespitosa</i>
Lyngbye sedge	<i>Carex lyngbyei</i>
rye grass	<i>Elymus arenarius</i>
sea milkwort	<i>Glaux maritima</i>
Sitka spruce	<i>Picea sitchensis</i>

Algae

rockweed	<i>Fucus distichus</i>
“tube algae”	<i>Enteromorpha sp</i>
“mat algae”	<i>Vaucheria sp</i>

Appendix B

Species distribution maps

Section 7 contains distribution maps for groups of birds such as gulls and diving ducks. The maps below show distributions for several individual species within these groups. Among dabbling ducks, only Mallard (Map 7.2) and American Wigeon (below) provided enough records for distribution mapping.

Largest dot on each of the following maps had the highest number of birds counted throughout the study period during full surveys. Remaining dots are scaled proportionately. A fraction beside the species name - e.g. 34/456 - means that a total of 34 records was collected for the species during the 18 full surveys, while the largest dot represents an accumulated count for that species of 456 for that particular survey area. (For resident species this may include individuals counted more than once on successive visits. These are therefore not abundances, but reflect the consistent use of certain areas by the indicated species.)





