

Breeding Season Home Range of Marbled Murrelets in Southeast Alaska

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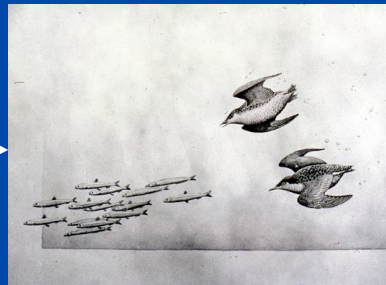
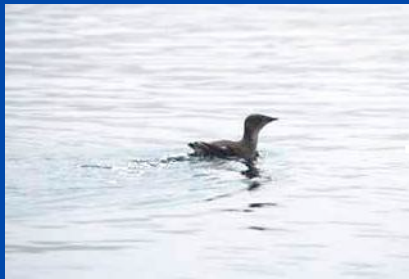
Seabird Research and GIS

- Expensive and labor intensive research
 - Limited by oceanic conditions and funding
- Advances in radio-telemetry methods
 - Satellite-based telemetry (PTTs)
 - Radio-marking techniques
- Improved GIS applications
 - Spatial utilization techniques
 - Home range estimation
 - Core center of activity

The Marbled Murrelet

(Brachyramphus marmoratus)

- Fast flying and pursuit diving seabird
- Preys on small fish and marine invertebrates.



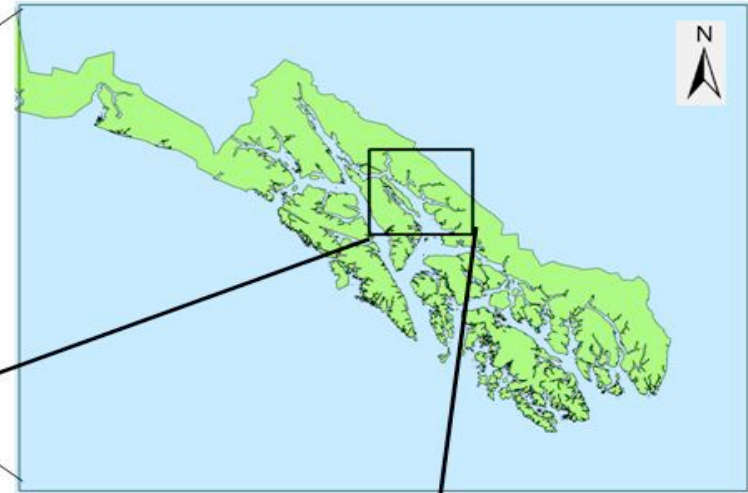
- Species Distribution:

- Pacific coast from Santa Cruz, CA to the Bering Sea with highest density in Southeast Alaska (Nelson 1997)

The Marbled Murrelet con't

- Unique species habitat requirements
 - Needs undisturbed marine and terrestrial habitat
 - Nests inland on moss platforms
- Federally threatened in CA, OR, WA, and BC
- Species of Concern in Alaska but little known about Southeast Alaska population.





Study Area





Juneau

Port Snettisham

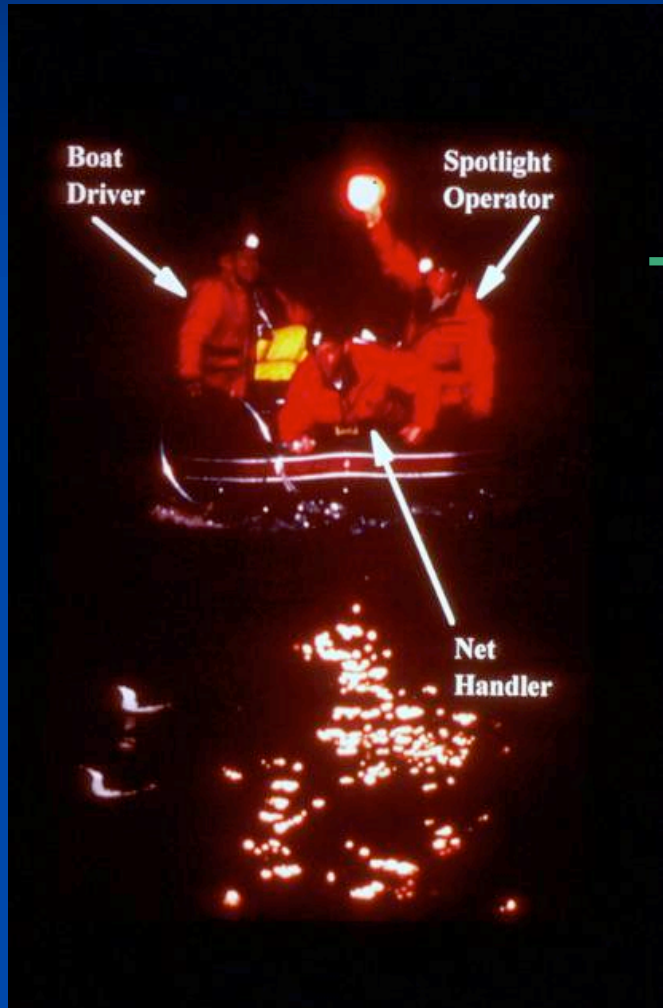
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Spatial Data Collection Methods

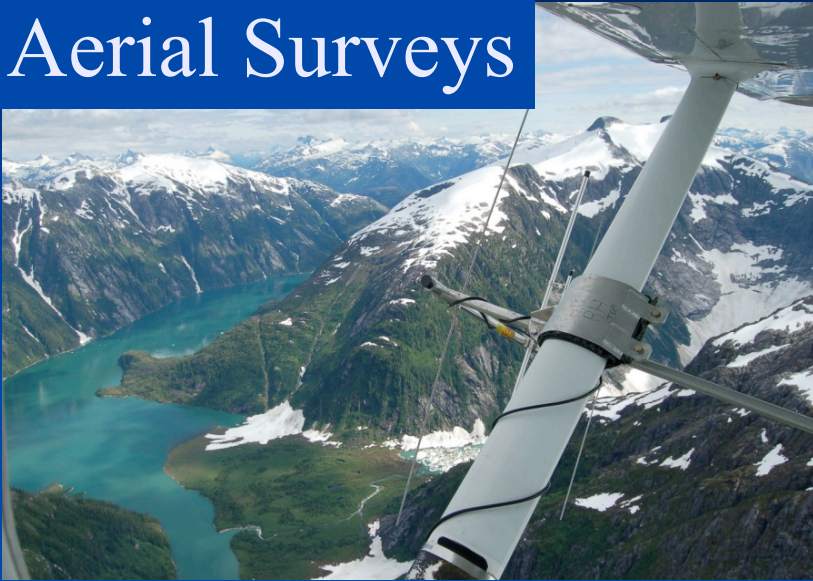
- Radio-mark 40 individuals per year
- Utilize various methods of radio telemetry
 - Collect waypoint locations
- Data management aspect

Capturing Marbled Murrelets



Radio Telemetry Methods

Aerial Surveys



Data Loggers

Boat Surveys



Nest Searching

Home Range Estimation

- Home range: area utilized by an animal during its normal activities of food gathering, mating, and caring for young (Burt 1973)
- Seabirds as sentinels
- Identify productive marine areas for management and protection (Nel et al. 2001)
- Oceanographic characteristics that influence the distribution and abundance of associated prey

GIS Methods

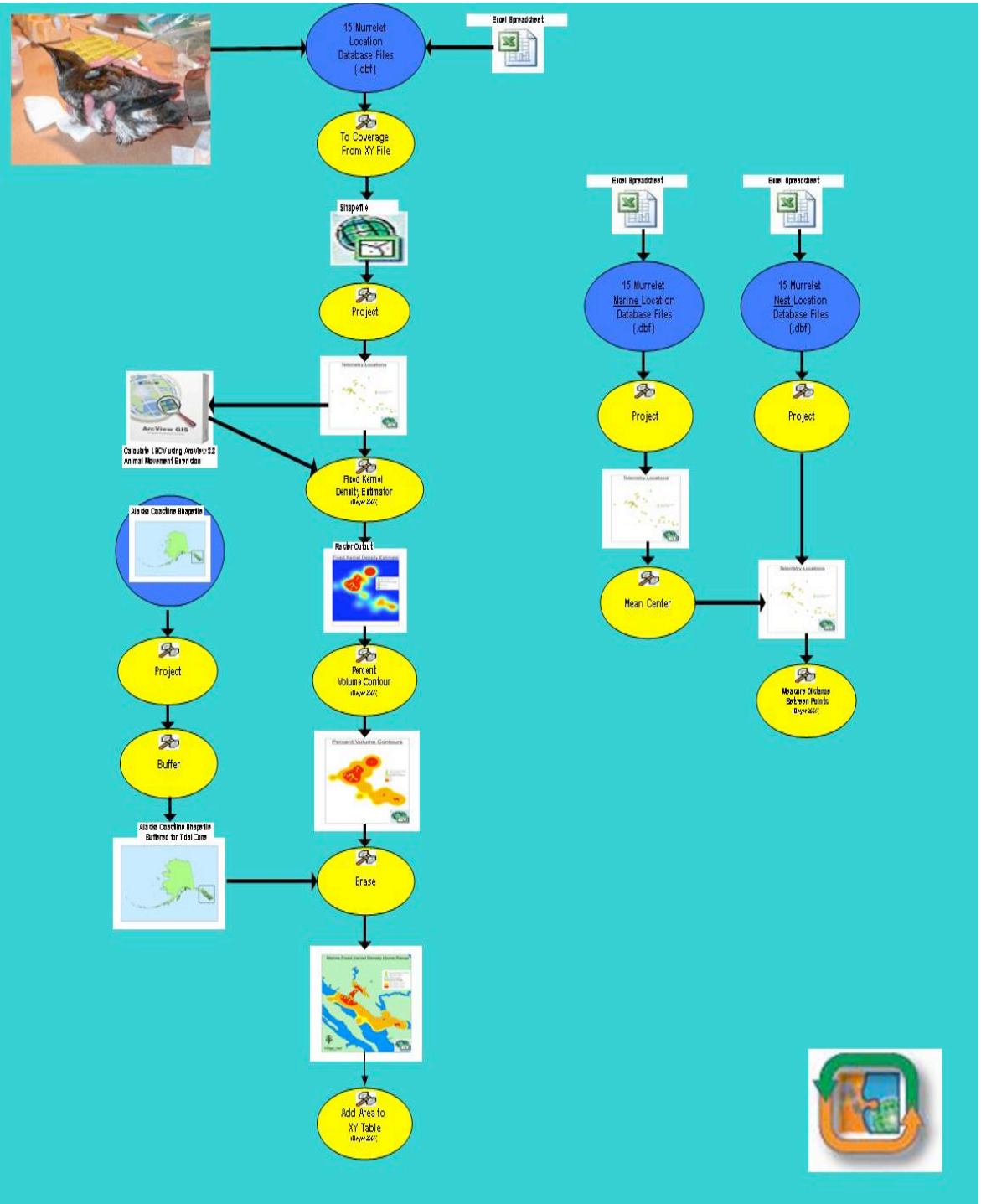
- Fixed Kernel Density Estimation
 - Smoothed, continuous intensity surface based on point locations (Worton 1989)
 - Density estimate calculation for each intersection of a user defined grid
 - Smoothing parameter is key
- Percent Volume Contours
 - Creates contours to delineate a utilization distribution
- Mean Center of Activity
 - Calculates statistical mean center for a group of points

Flowchart

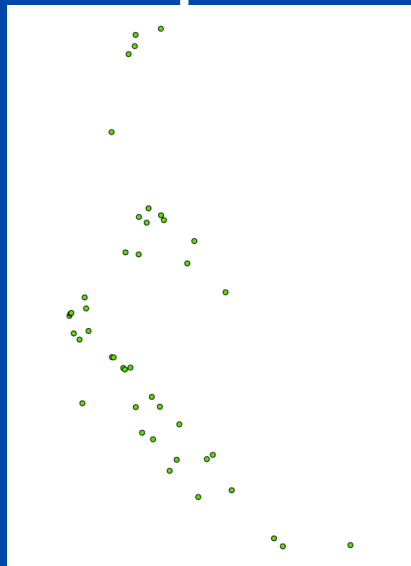
➤ Hawth's Tools

(Beyer 2005)

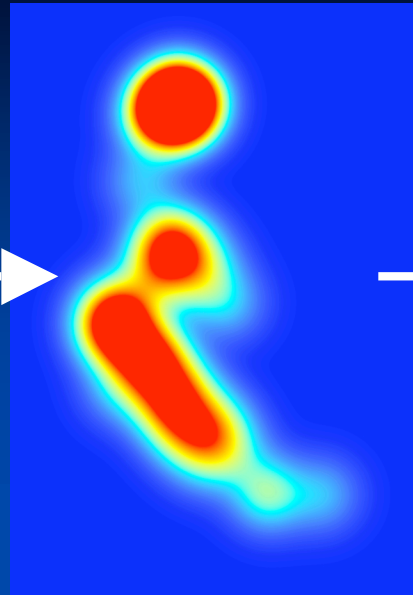
- Fixed Kernel Density Estimator
- Percent Volume Contour
- Add Area to XY Table
- Data Management and Projections Toolset
 - Project
- Spatial Analyst Toolset
 - Erase
 - Buffer
- Spatial Statistics Toolset
 - Mean Center



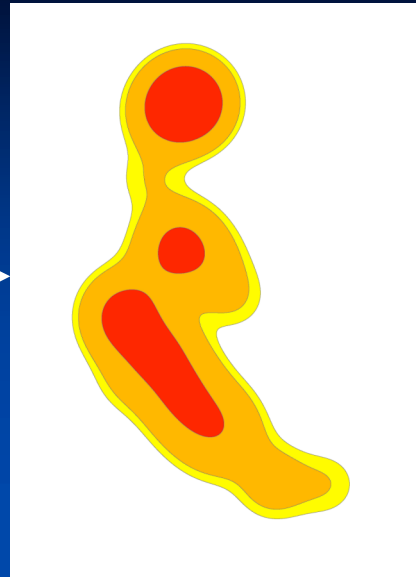
Hawth's Tools
Fixed Kernel
Density Estimator



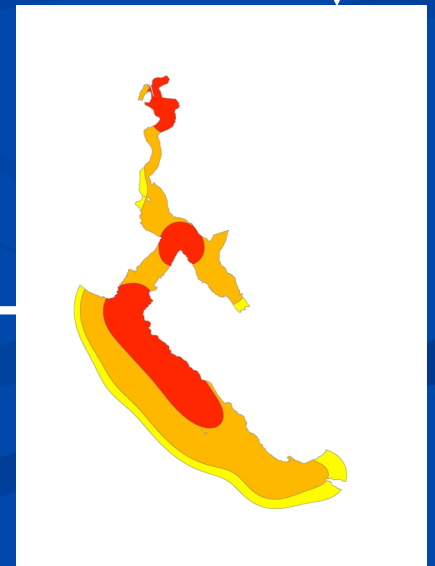
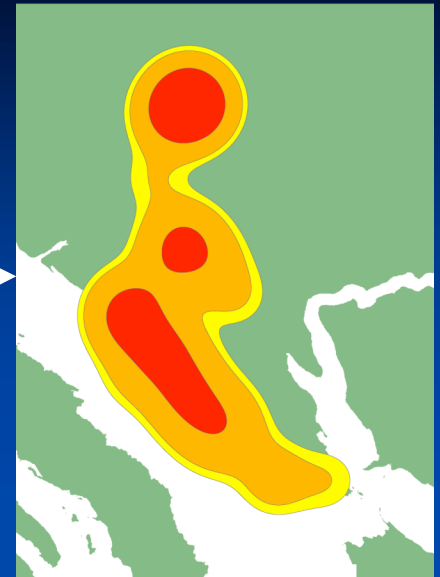
Point.shp



Raster Output



Percent Volume
Contour Polygon



Polygon.shp

Yellow = 95% chance animal is there
Orange = 90% chance of presence
Red = 50% chance of presence

Polygon Area =
Marine Home
Range

GIS Methods con't

- Home Range Estimates
 - Full polygon
 - Marine polygon
 - Marine polygon buffered for intertidal zone
- Comparisons
 - Male versus Female home range
 - Non-buffered versus buffered marine home range

Results

- 15 Marbled Murrelet nest sites located in 2008
 - 35.9 ± 11.7 mean locations/individual
 - 29.5 ± 9.9 mean marine locations/individual
- 45 Home Range Estimates Derived
 - 95% volume contour preferred
 - Non-buffered marine polygon estimate preferred
- Male home range larger than female home range
 - Anticipated result but inference restricted

Results

Marine Home Range Estimates for 15 breeding Marbled Murrelets

	Murrelets	Telemetry Locations	Home Range Area (ha)		
			95% UD	90% UD	50% UD
Total	15	29.5 ± 9.9	3453.9 ± 1639.224	2798.29 ± 1361.22	832.11 ± 433.21
Male	10	32.3 ± 8.9	3505.18 ± 1472.23	2840.62 ± 1213.12	795.88 ± 367.17
Female	5	23.8 ± 10.3	3351.32 ± 2123.24	2713.61 ± 1777.79	904.57 ± 586.25

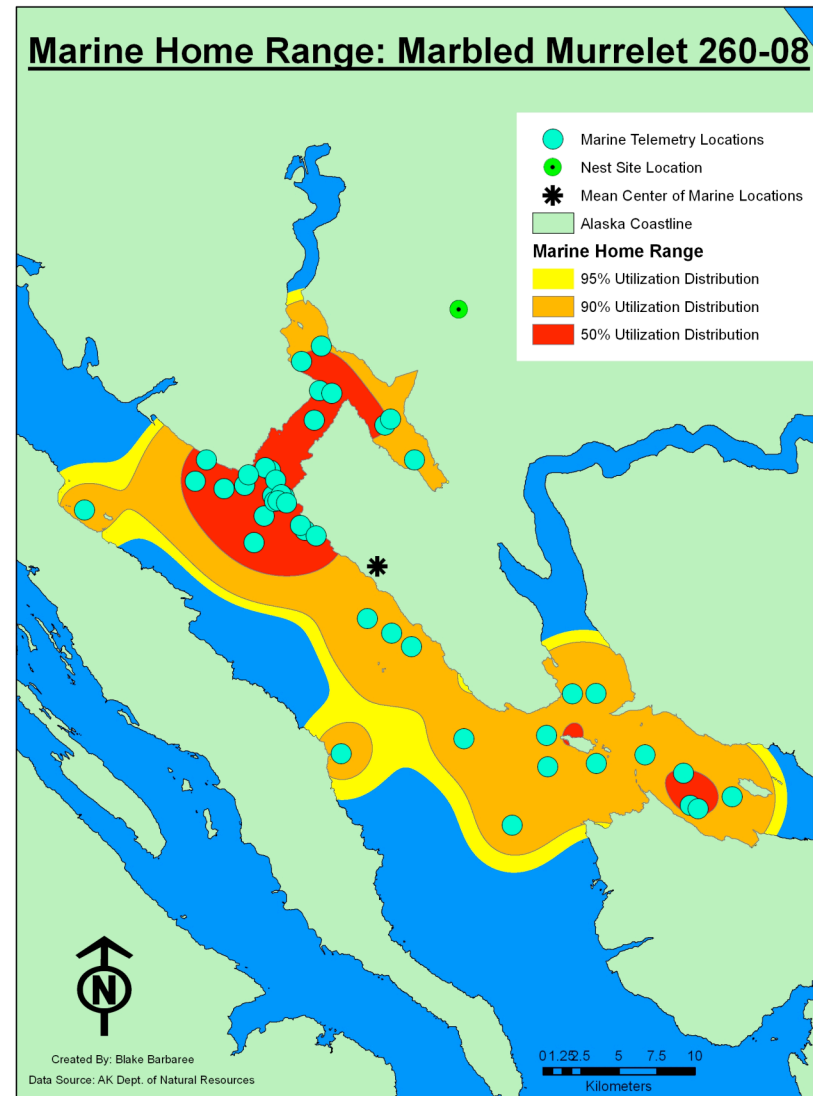
Results

➤ Mean center distance of marine locations over 23 km from nest site.

	Individuals	Locations	Mean Distance from Nest (km)
Total	15	29.5 ± 9.9	23.171 ± 11.631
Male	10	32.3 ± 8.9	20.666 ± 11.857
Female	5	23.8 ± 10.3	28.180 ± 10.490

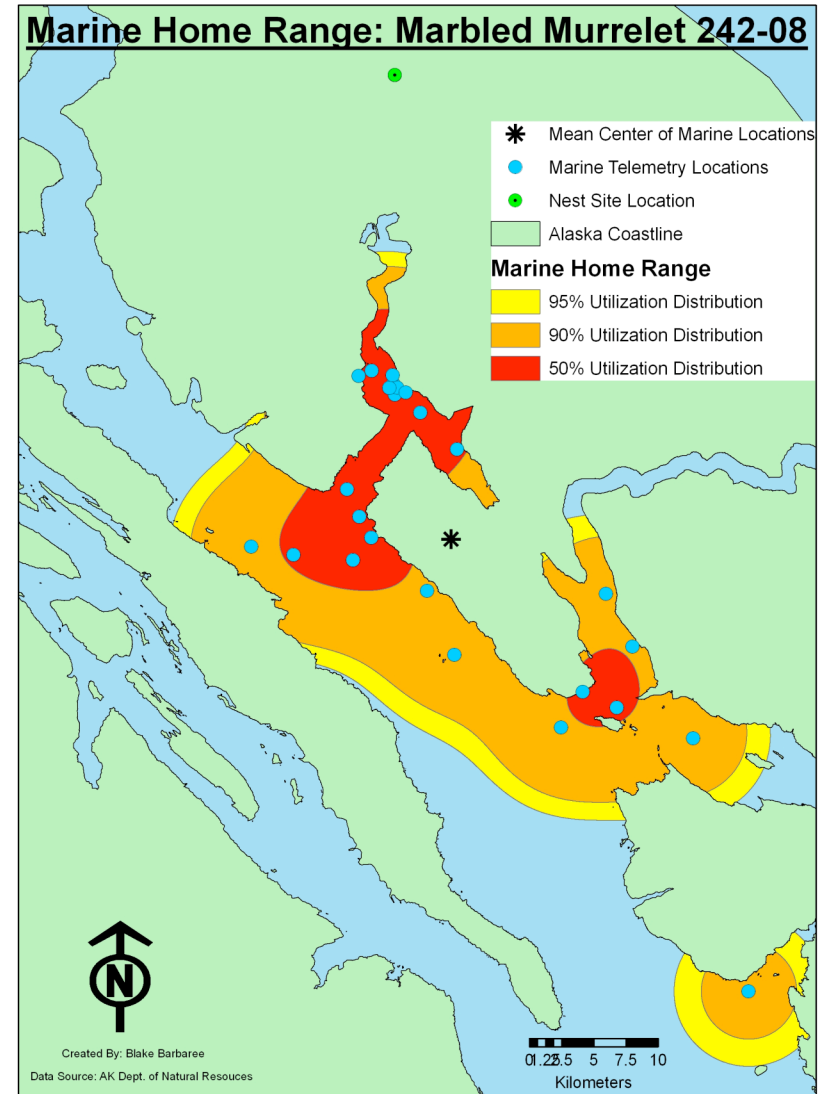
Murrelet 260-08

- Male Marbled Murrelet
- 46 marine locations
- Marine Home Range
4845.79 ha
- Mean center 17.79 km
from nest site
- Only individual left at
end of the breeding
season



Murrelet 242-08

- Male Marbled Murrelet
- 26 marine locations
- Marine Home Range 6168.11 ha
- Mean center 36.24 km from nest site
- Two unsuccessful nest attempts



Future Research

- Expand home range analysis to all 119 radio-marked Marbled Murrelets (2005-2008)
 - Larger sample size will allow for statistical comparisons
- Landscape and seascape variables in relation to home range and core use areas
- Landscape level analysis of Marbled Murrelet nest sites (0.5 and 1.0 km radius)
 - Aerial photographs and Landsat data

References

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Burt, W.H. 1973. Territoriality and home range as applied to mammals. *Journal of Mammalogy* 24: 346-352.

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Nelson, S.K. 1997. Marbled Murrelet (*Brachyramphus marmoratus*). In A. Poole and F. Gill, eds. *Birds of North America*, No. 276. The Academy of Natural Sciences, Philadelphia; The American Ornithologists Union, Washington, D.C.

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Acknowledgements



QUESTIONS?

