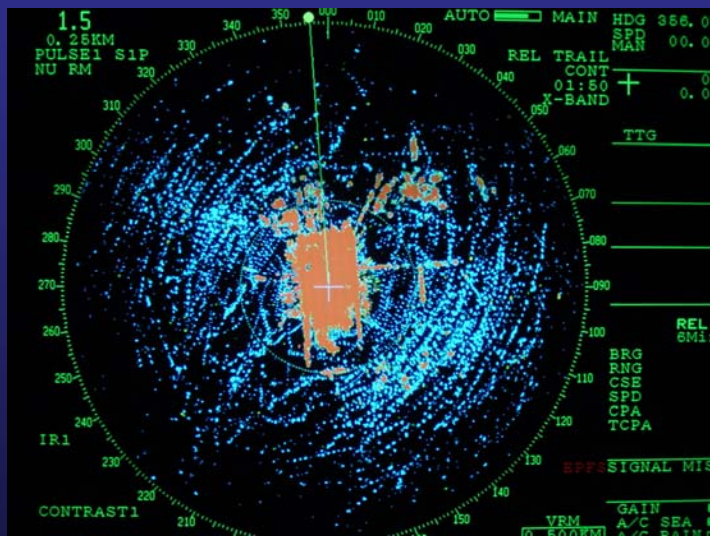


IMPLICATIONS OF BIRD MOVEMENTS FOR WINDPOWER SITES AND POWERLINES

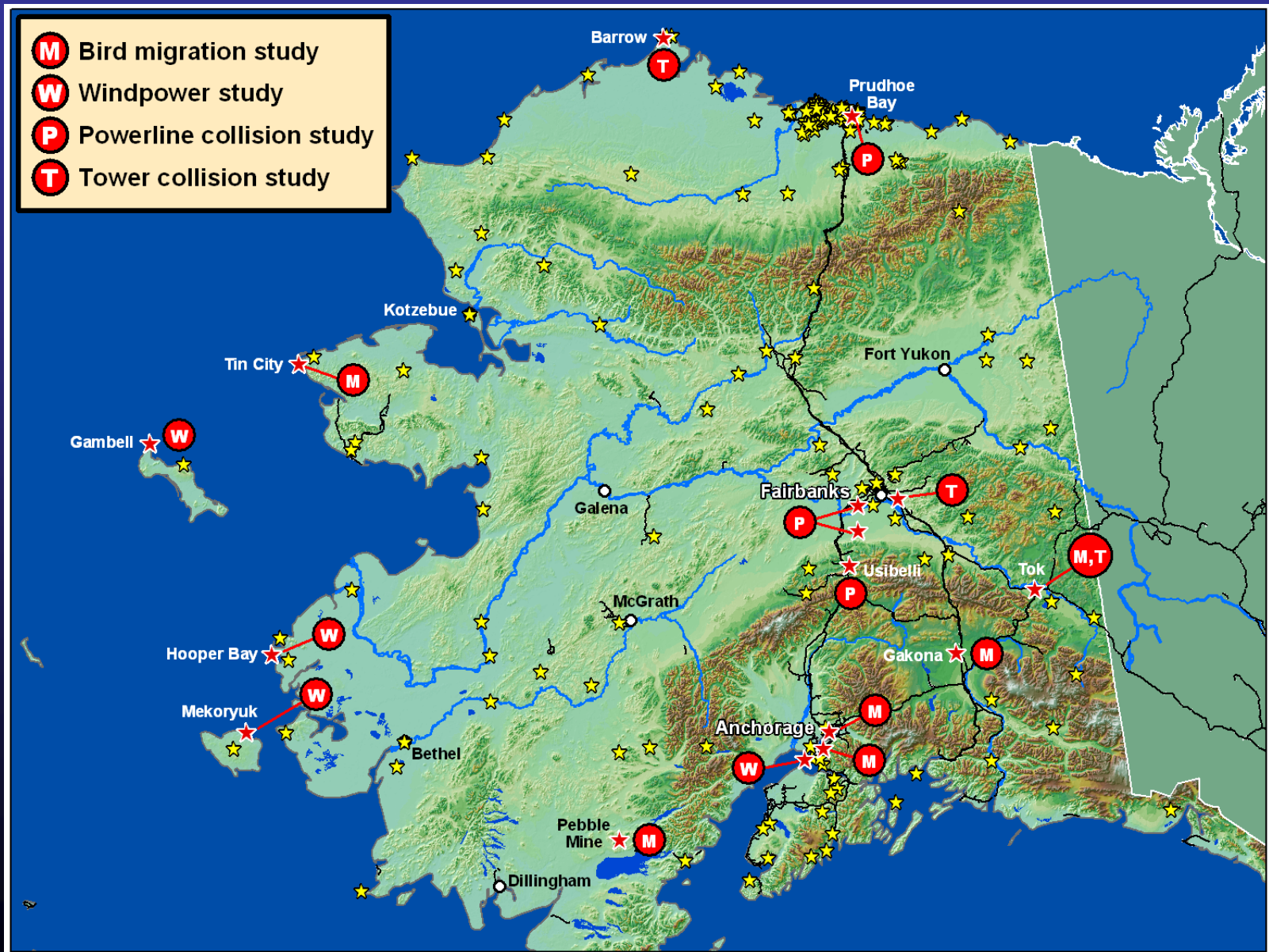


Robert H. Day

ABR, Inc.—Environmental Research & Services

bday@abrinc.com

ABR'S ALASKA STUDY SITES



NOCTURNAL STUDY METHODS

- Radar
- Visual



Bald Eagle



Gambell (AK) Wind Project

X-BAND RADAR



PROS

- Portable
- Can detect individuals within ~1 mi radius for all sizes of birds
- Flight directions
- Passage rates (# targets/km/h)
- Flight altitudes (within turbine height)
- Data suitable for calculating an exposure index (number of targets within turbine height)
- Effective in fog

CONS

- Unable to differentiate birds from bats
- Insects can confound data

FURUNO

SURVEILLANCE MODE

1.5-nm-range

1.5
0.25

MIDDL
H.S

*Chukchi
Sea*

CLUTTER

*Beaufort
Sea*

TARGET

*Brant
Point*

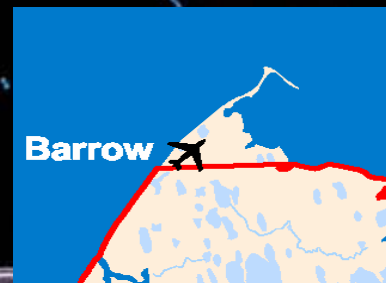
04+30R

IR

1.5
H.S

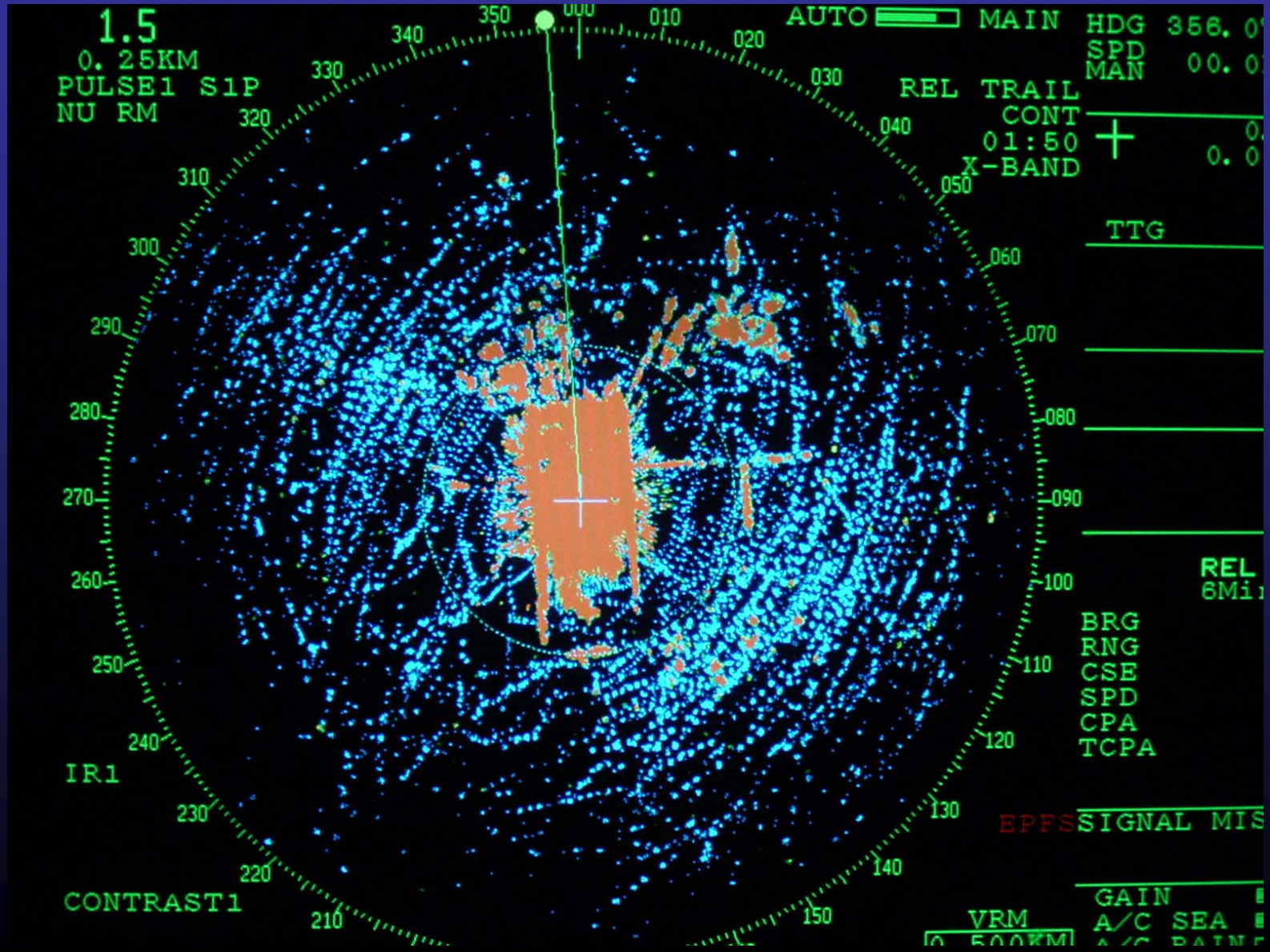
1.92KM

325.0°



SURVEILLANCE MODE

SOMETIMES A LOT HAPPENING!



MOBILE RADAR (VERTICAL MODE)



VERTICAL MODE

1.5-km-range



VISUAL METHODS

- Binoculars
- Spotlight or ceilometer
- Night-vision optics
- Thermal imaging devices

NIGHT-VISION OPTICS

- Night vision goggles effective with spotlights
- Spotlights need IR filter to eliminate attraction bias
- Sample small birds effectively out to 100-150 m
- Cost \$2,500-8,000



NIGHT-VISION GOGGLES WITH SPOTLIGHTS



THERMAL-IMAGING DEVICES

- Eliminates attraction/repulsion bias of lights
- Similar detectability as night-vision optics
- Slightly better than night-vision optics in light fog, but poor in heavy fog
- Cost \$60,000-100,000



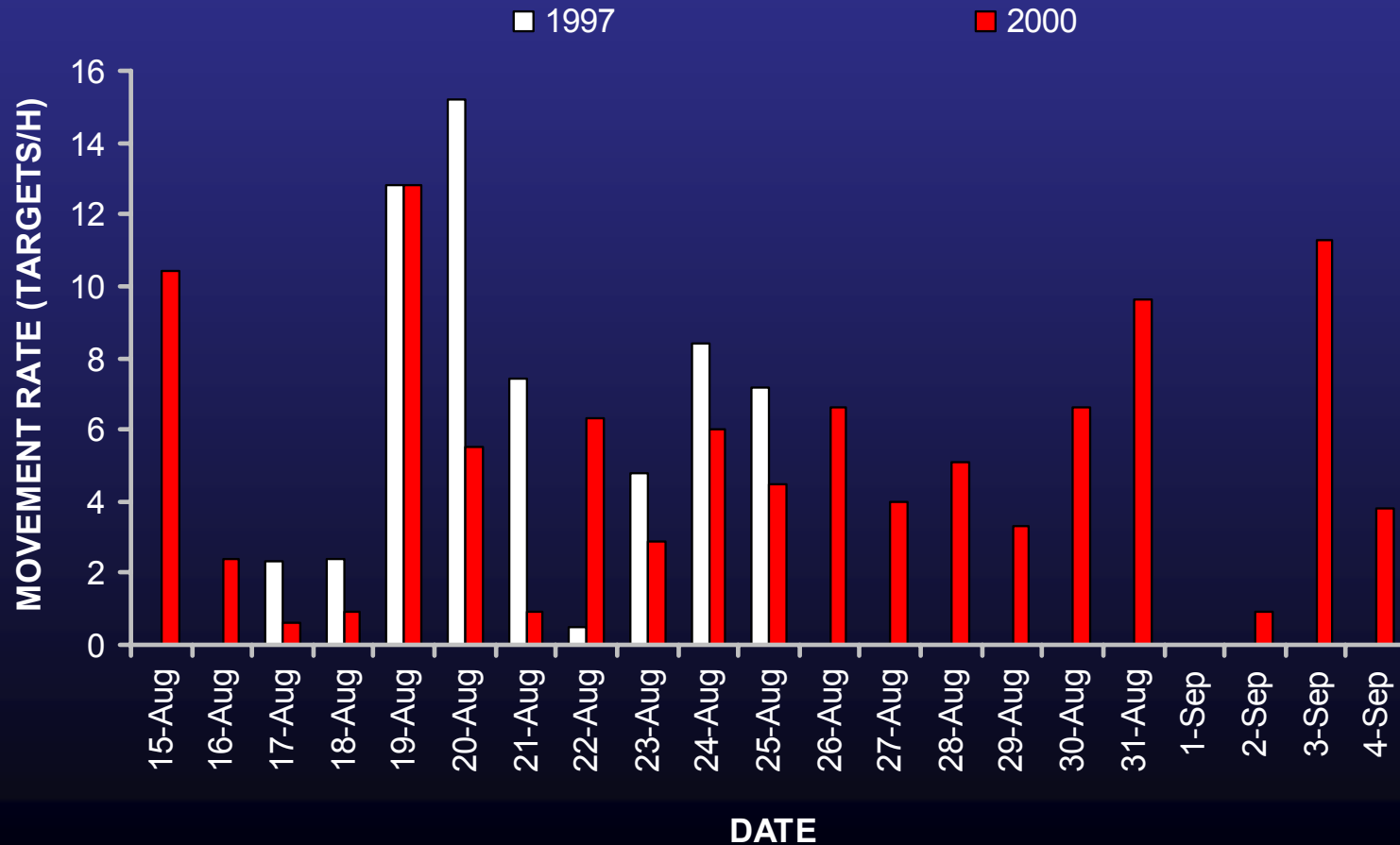
RADAR AND VISUAL DATA

- Flight directions
- Passage rates
- Flight altitudes
- Visual data
- Exposure indices



PASSAGE RATES: AMONG-DAY VARIATION

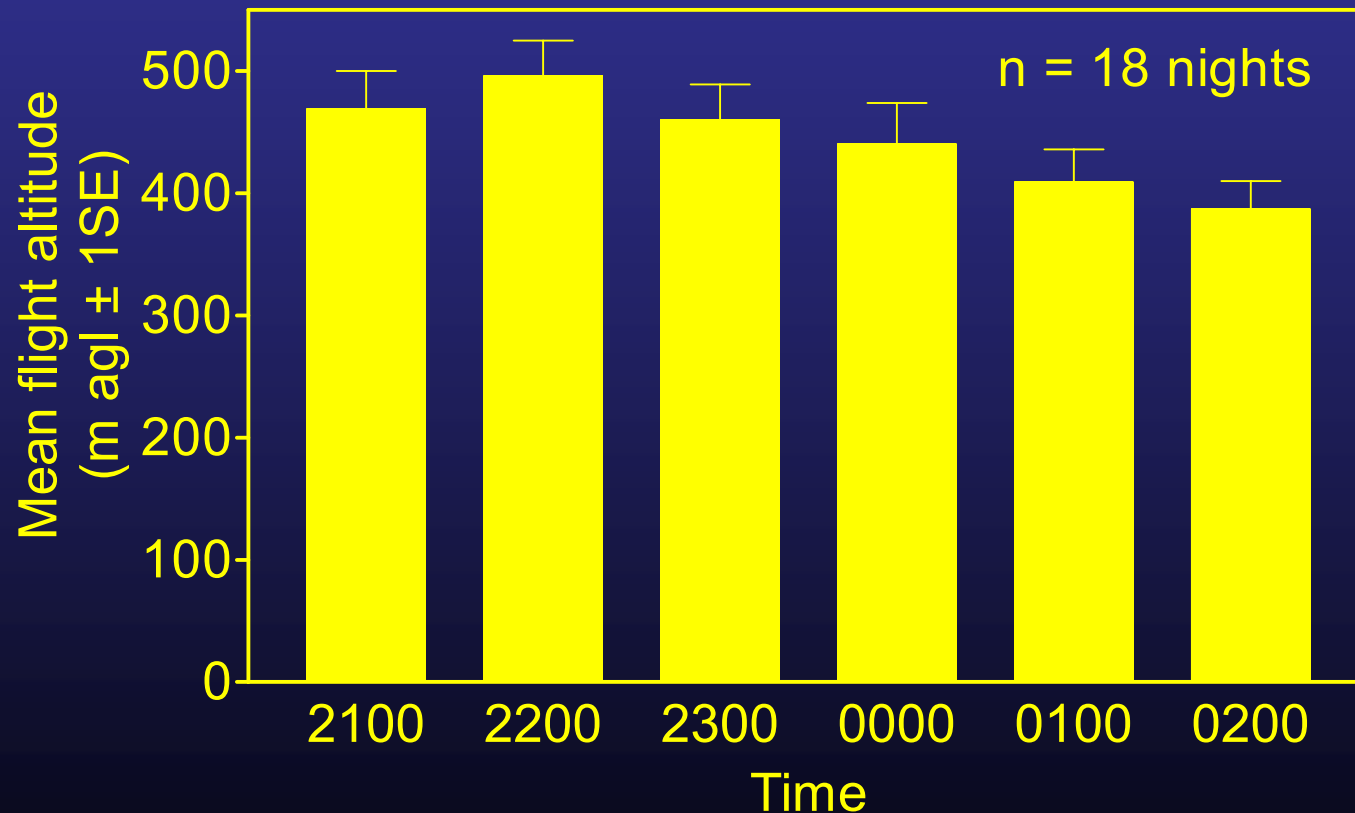
BARROW, AK

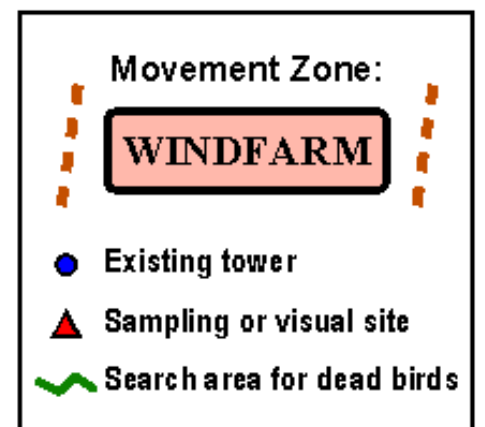
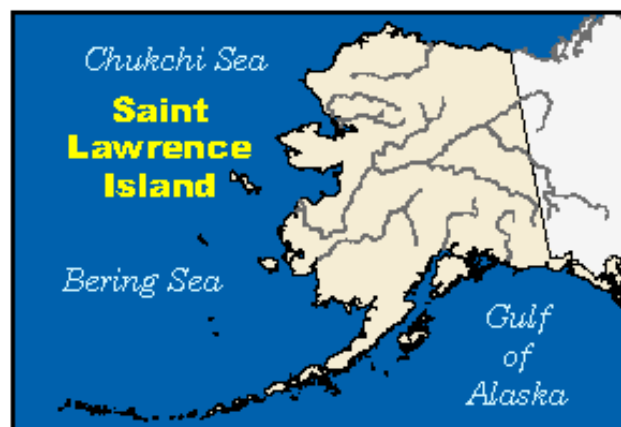
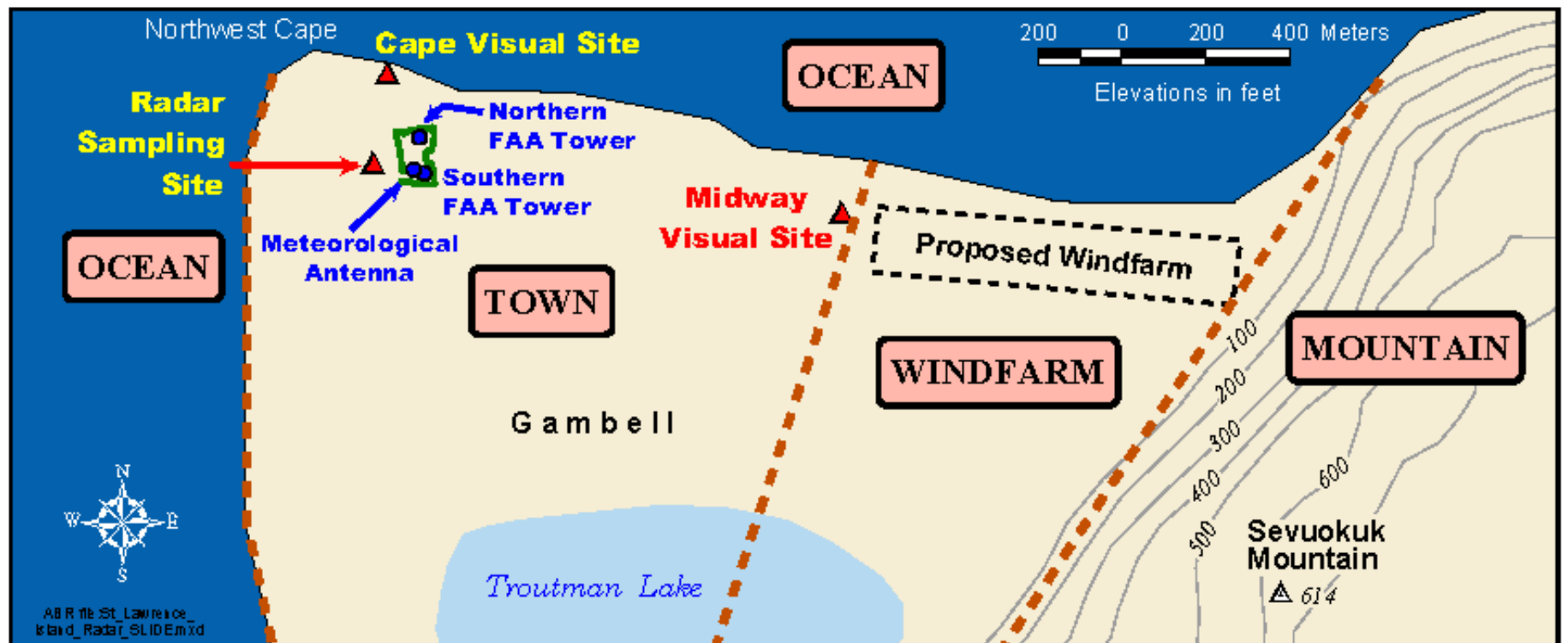


PASSAGE RATES ON RADAR : SEASONAL VARIATION

Year	Location	Spring	Fall
1989	Amherst-S, SD	83	40
	Amherst-N, SD	23	27
1989	Thief River-W, MN	63	83
	Thief River-E, MN	43	108
2001	Hatch Grade, OR	45	22
1994	Copenhagen, NY	170	242
1998-99	Wethersfield, NY	62	180
2003	Chautauqua, NY	395	235
2004	Fire Island, AK	43	21

FLIGHT ALTITUDE: WITHIN-NIGHT VARIATION

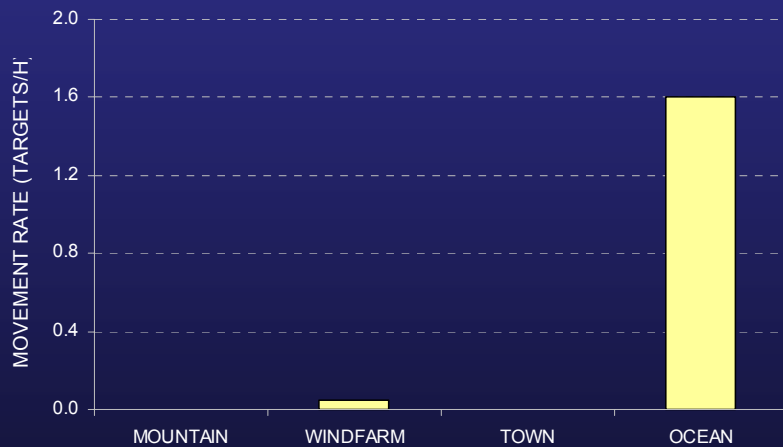




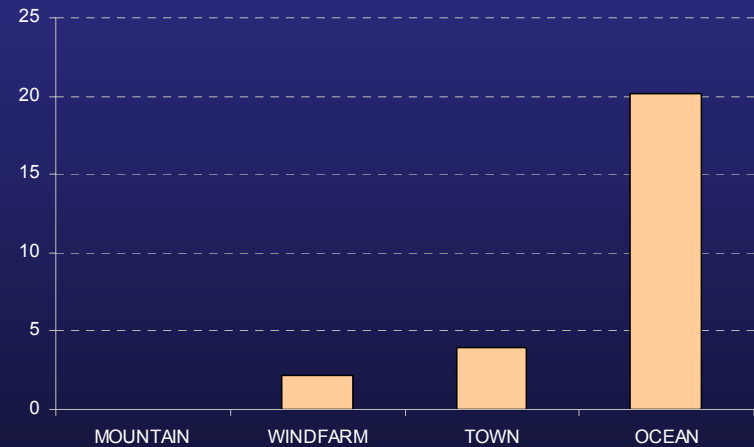
RADAR—RATES BY ZONE

GAMBELL, AK

"EIDERS"

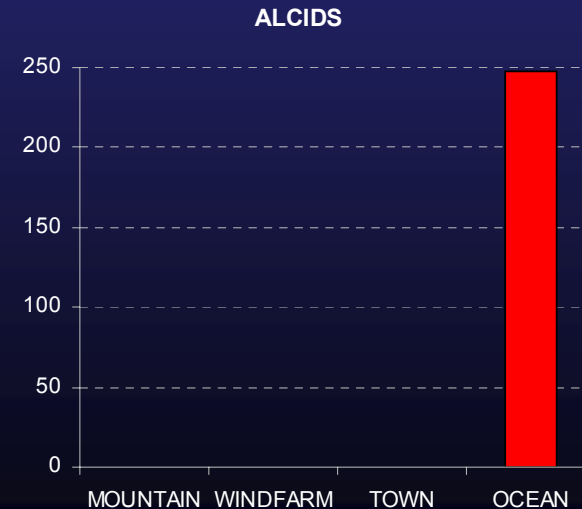
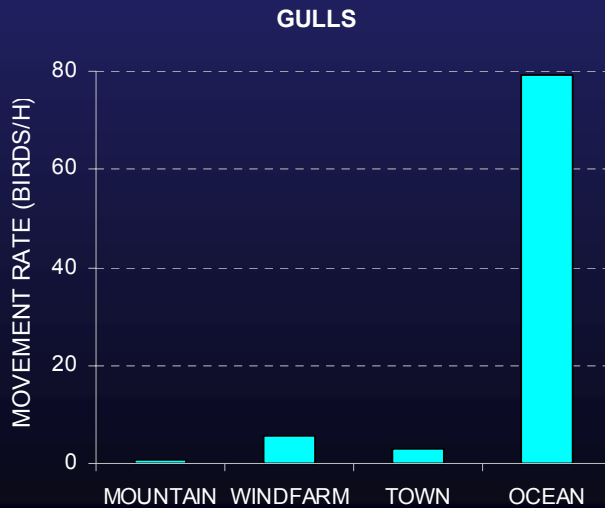
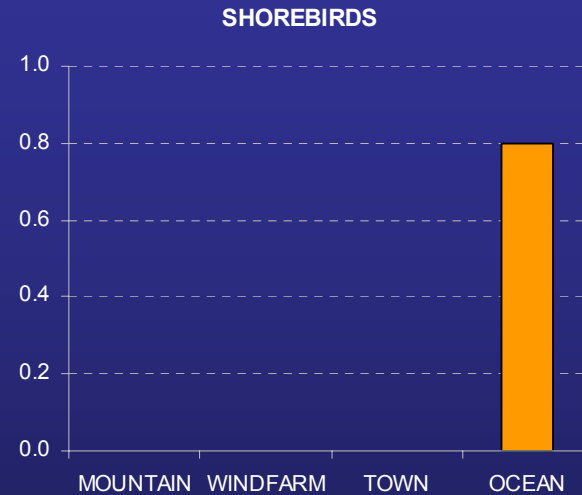
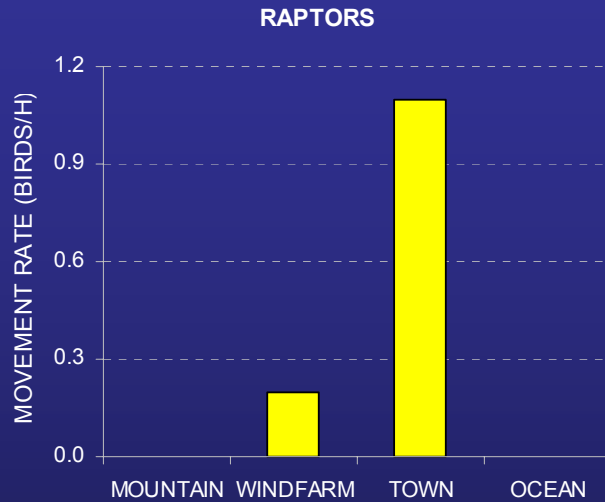


"NON-EIDERS"



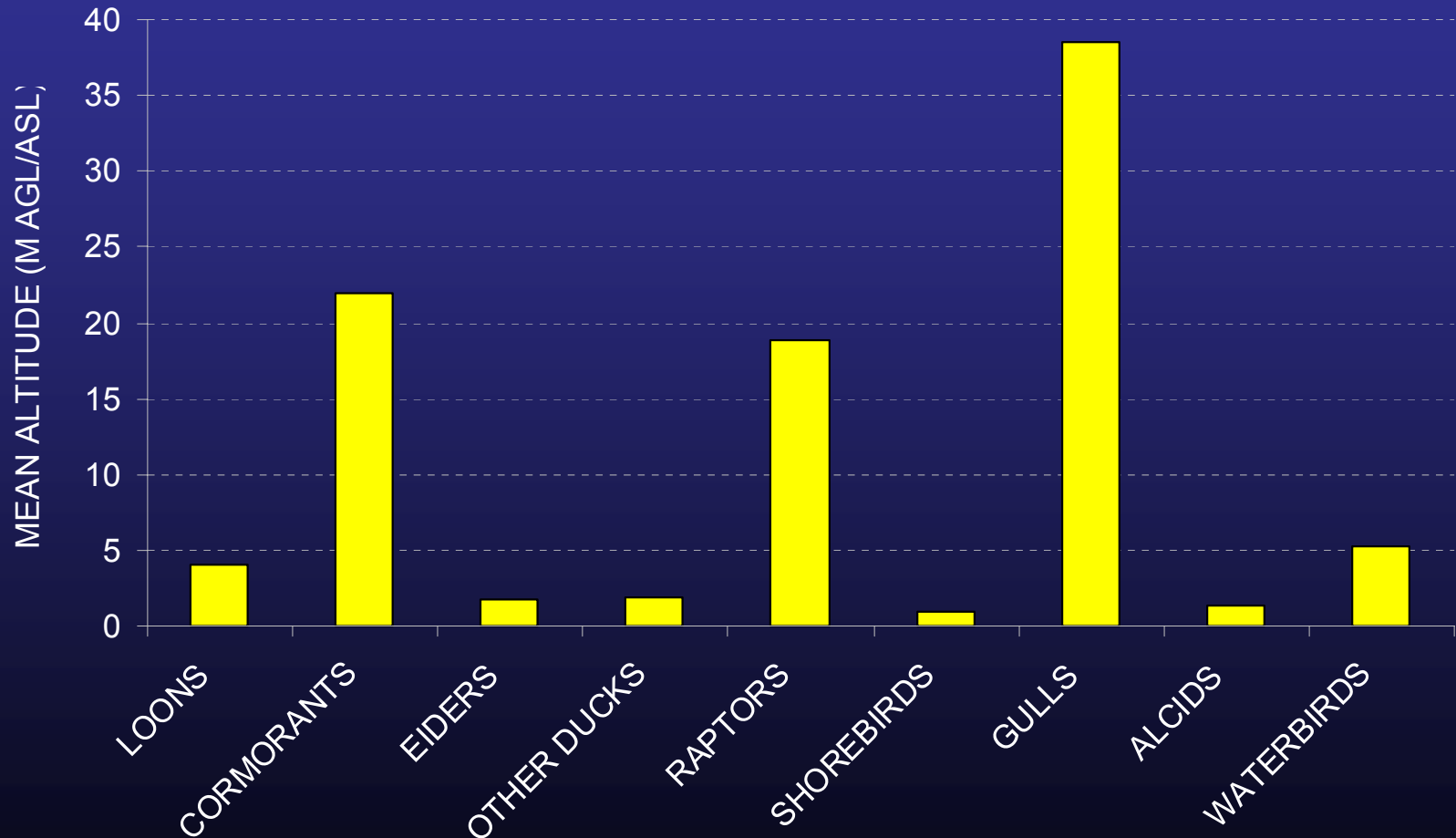
VISUAL—RATES BY ZONE

GAMBELL, AK

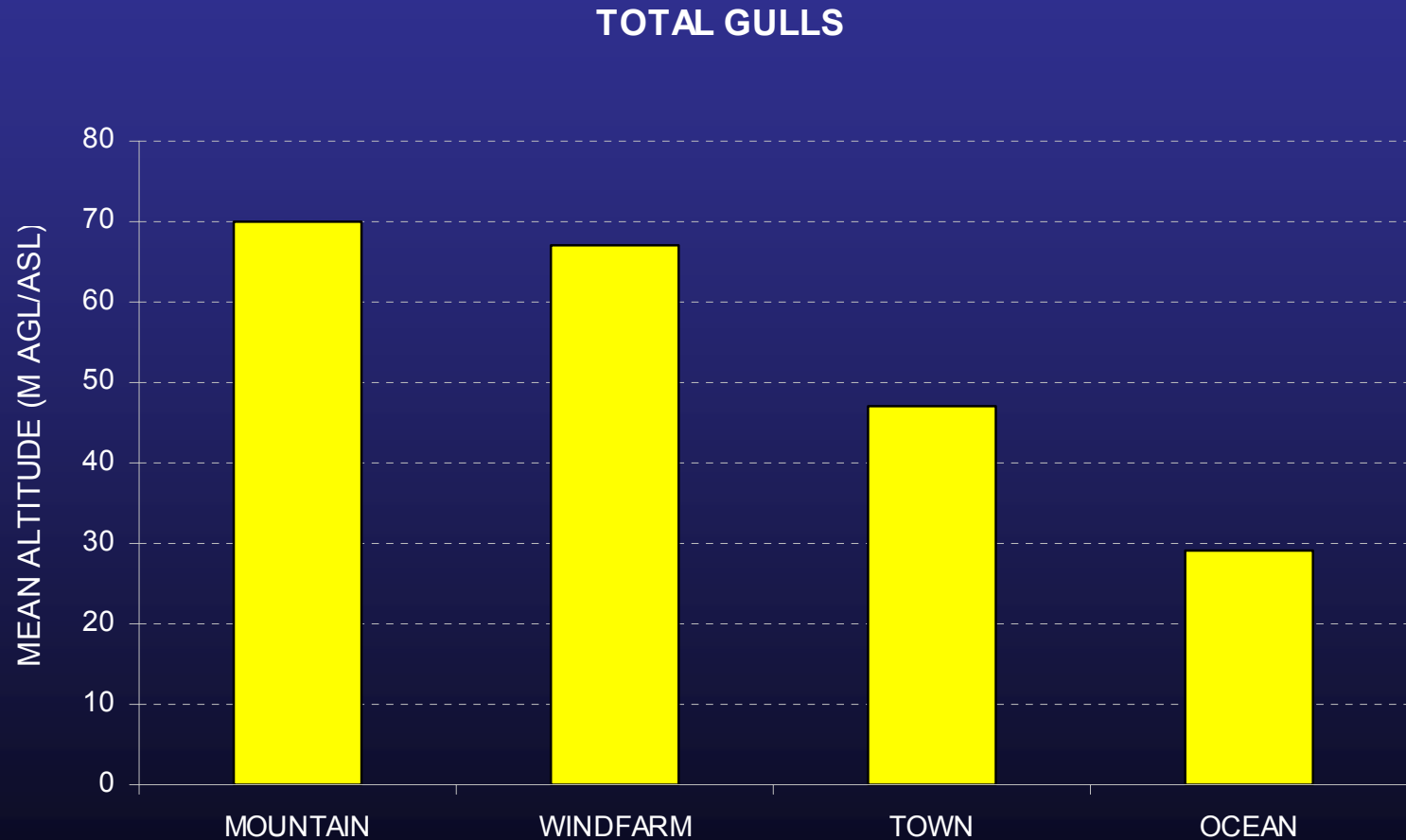


FLIGHT ALTITUDES—TOTAL

GAMBELL, AK



FLIGHT ALTITUDE MAY VARY BY HABITAT OR LOCATION



RISK VARIES WITH SIZE OF TURBINE AND BIRD SPECIES



Oregon



Pribilofs



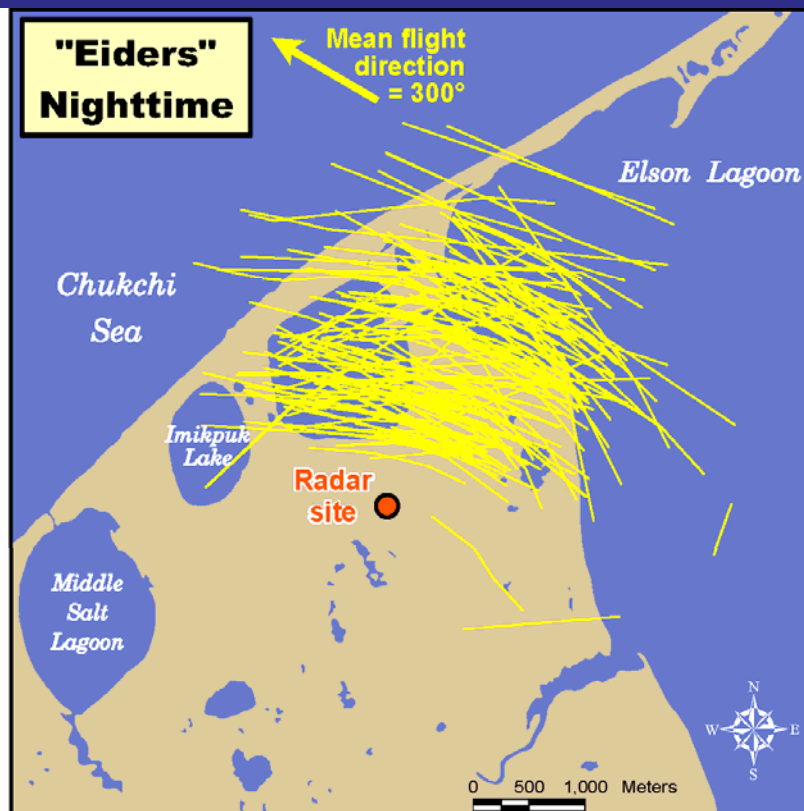
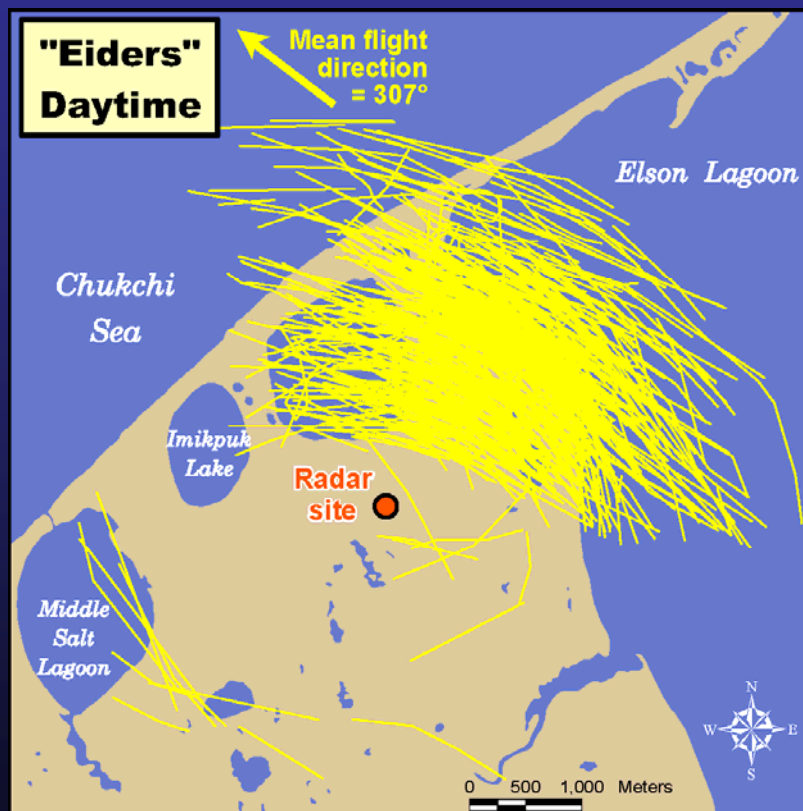
Wales

PERCENT OF TARGETS FLYING AT OR BELOW TURBINE HEIGHT

Location	Spring (%)	Fall (%)
Oregon	13	4
New York	4	4
West Virginia	-	13
Fire Island, AK	83	98
Hooper Bay, AK	96	-
Mekoryuk, AK	-	99

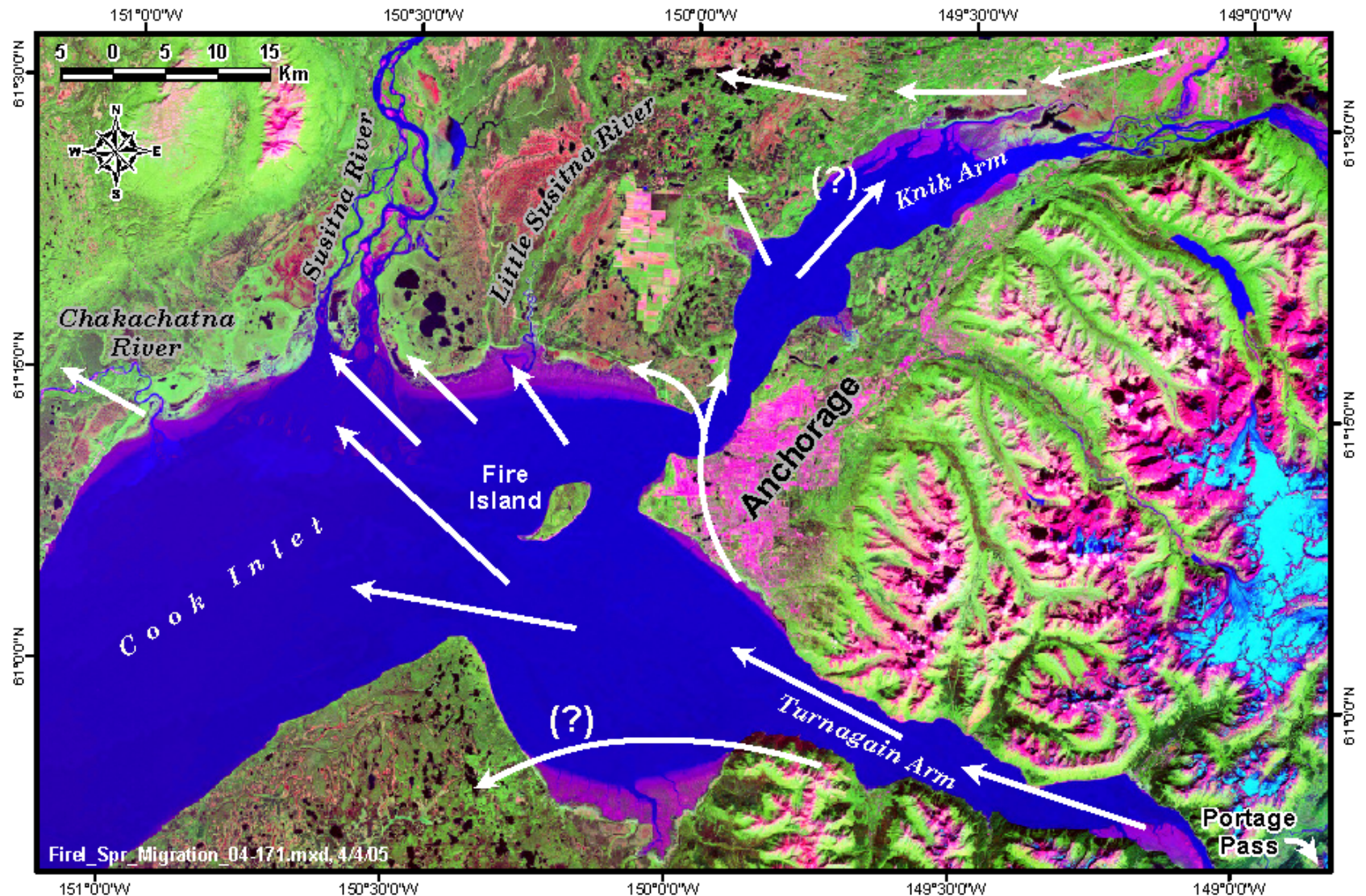
SPATIAL PATTERNS—BIRDS OFTEN FOLLOW THE LANDSCAPE

BARROW, AK



FOLLOWING THE LANDSCAPE

ANCHORAGE, AK



BIRD MIGRATION

Bird migration is a pulsed phenomenon with major variation in passage rates and flight altitudes

- (1) within and among days
- (2) between seasons
- (3) among locations

SUMMARY OF ALASKA ISSUES (I)

- Need site-specific information to help siting minimize impacts to birds
- Some habitats used more than others by birds
- Some habitats used more than others at specific times of the year
- Different species prefer different habitats
- Flight altitudes may vary by habitat

SUMMARY OF ALASKA ISSUES (II)

- Birds in Alaska often fly at much lower altitudes than elsewhere
- Mountain passes, especially in southern Alaska, may be important for bird migration
- Birds often (but not always) follow the landscape
- Windfarms and powerlines may have different effects on birds

ACKNOWLEDGMENTS



Alaska Village Electric Cooperative
Atlantic Richfield Co.
Chugach Electric Association
Golden Valley Electric Association

North Slope Borough
State of Alaska Dept. of Fish & Game
State of Alaska Energy Authority
U.S. Air Force
U.S. Fish & Wildlife Service