

# **Evaluation of the First Ten Years of the Monitoring Avian Productivity and Survivorship (MAPS) Program in Alaska and Adjacent Boreal Canada**

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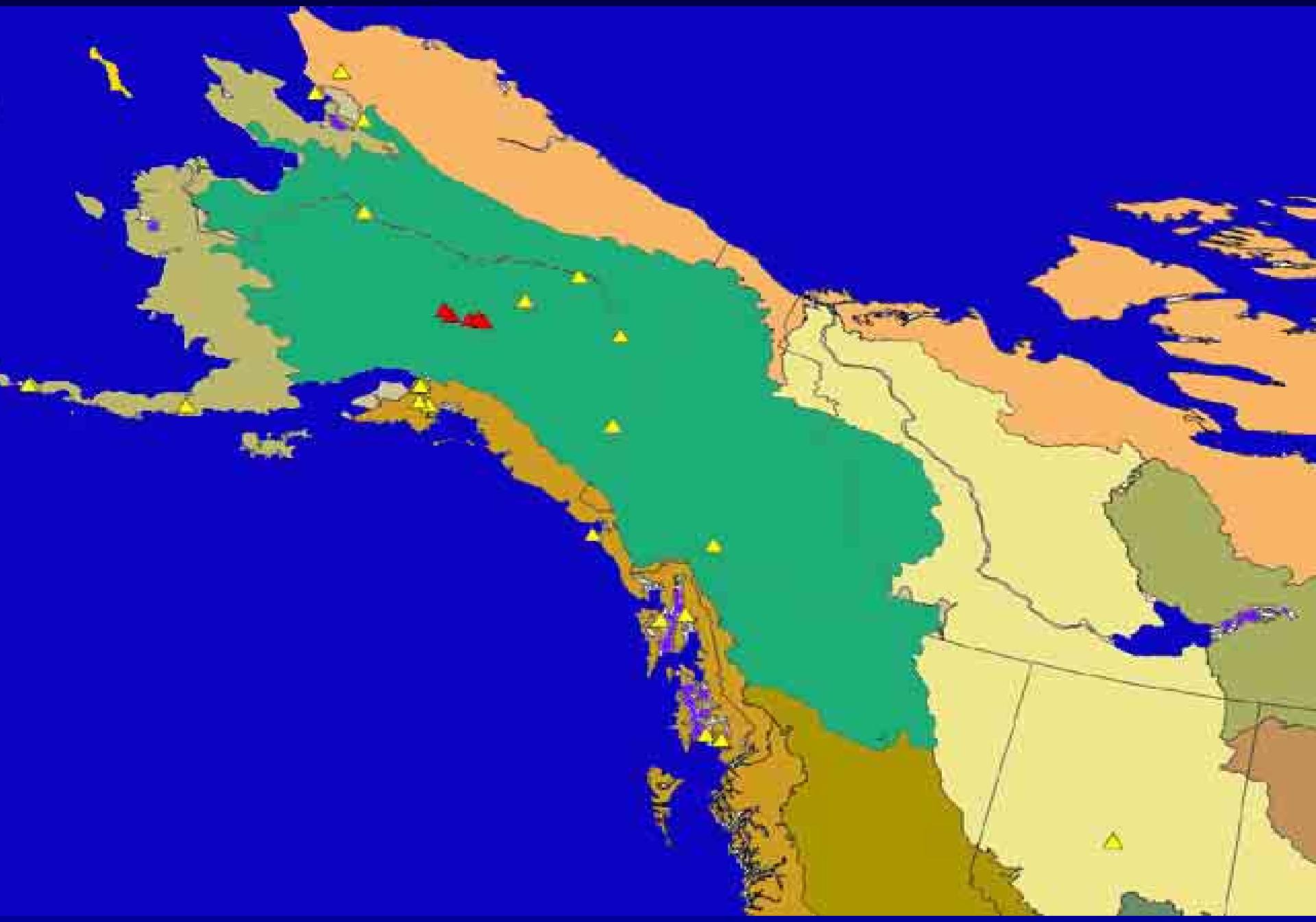
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# **BPIF MAPS Operation 1991-2001**

# 12 species analyzed

Species	Adults	Young
Wilson's Warbler	3107	4846
Orange-crowned Warbler	1602	1693
Yellow Warbler	1091	716
Hermit Thrush	848	770
Dark-eyed Junco	724	1423
Yellow-rumped Warbler	667	776
Swainson's Thrush	653	372
Alder Flycatcher	584	102
White-crowned Sparrow	564	1166
Fox Sparrow	378	550
Black-capped Chickadee	244	535
Gray-cheeked Thrush	215	107

# Survival Models

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## Modified Cormack-Jolly Seber (CJS)

- Adjusted for transient birds

## Survival and recapture probabilities

- Geographic Models: sex, time, geographic stratum
- Habitat Models: sex, time, habitat

## Effects of time

- Each individual year ( $t$ )
- Linear function of year ( $T$ )

## Geographic stratum

- Cluster
- AK-region (BC, NW, IN, SC, SW, SE)
- super region (Interior, Maritime)

## Habitats (Shrub, Deciduous Forest, Coniferous Forest)

# Survival Models

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**Geographic Analyses: 71 models evaluated**

**Habitat Analyses: 35 models evaluated**

**Models compared using QAIC<sub>c</sub>**

- **Models with low AIC are “best”.**
- **Models with AIC that differ by 2 or more units are considered different.**

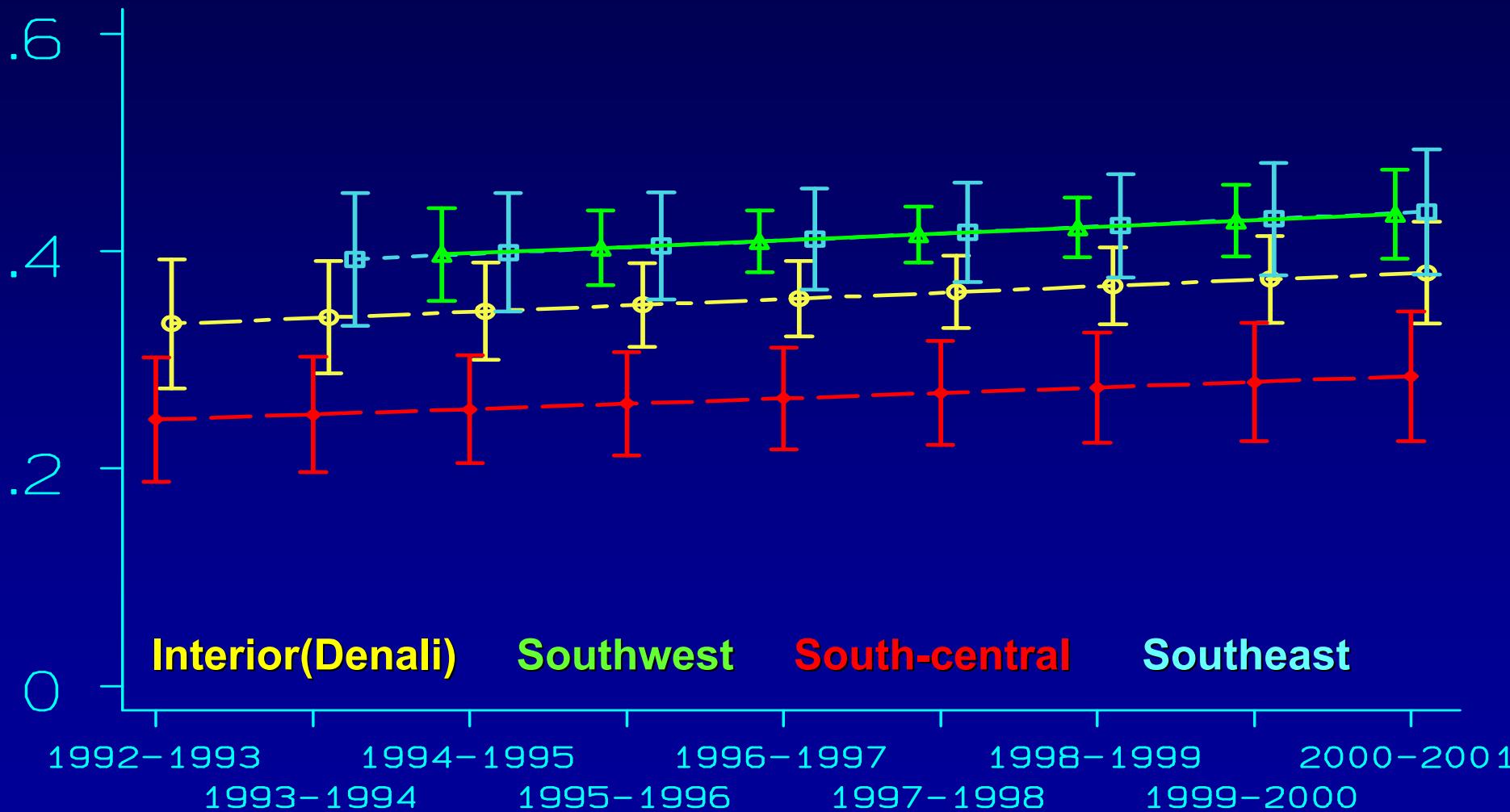
**AIC weights – weight of evidence**

- **AIC weights of all models compared sum to 1.**
- **Most weight given to models with low AIC.**
- **Examine weight of evidence for models or factor effects.**
- **Estimate survival using weighted averaging.**

## Top 10 Wilson's Warbler survival and recapture models

Model	QAICc	Delta QAICc	QAICc Weight	No. Par.
Phi(T+akreg) p(sex)	1996.07	0.00	0.569	9
Phi(T) p(sex)	1999.57	3.50	0.099	6
Phi(T*akreg) p(sex)	1999.85	3.78	0.086	18
Phi(T+sex) p(sex)	2000.40	4.33	0.065	11
Phi(T+sreg) p(sex)	2000.53	4.46	0.061	11
Phi(t+akreg) p(sex)	2000.60	4.53	0.059	22
Phi(T*sreg) p(sex)	2002.10	6.03	0.028	10
Phi(T*sex) p(sex)	2002.55	6.48	0.022	10
Phi(t+sex) p(sex)	2006.03	9.96	0.004	20
Phi(t+sreg) p(sex)	2006.28	10.21	0.003	20
Phi(.) p(.)	2043.23	47.17	0.000	3

# Wilson's Warbler survival rates (1992-2001) from the best model $\Phi(T+akreg)$ p(sex)



$T = 0.93$

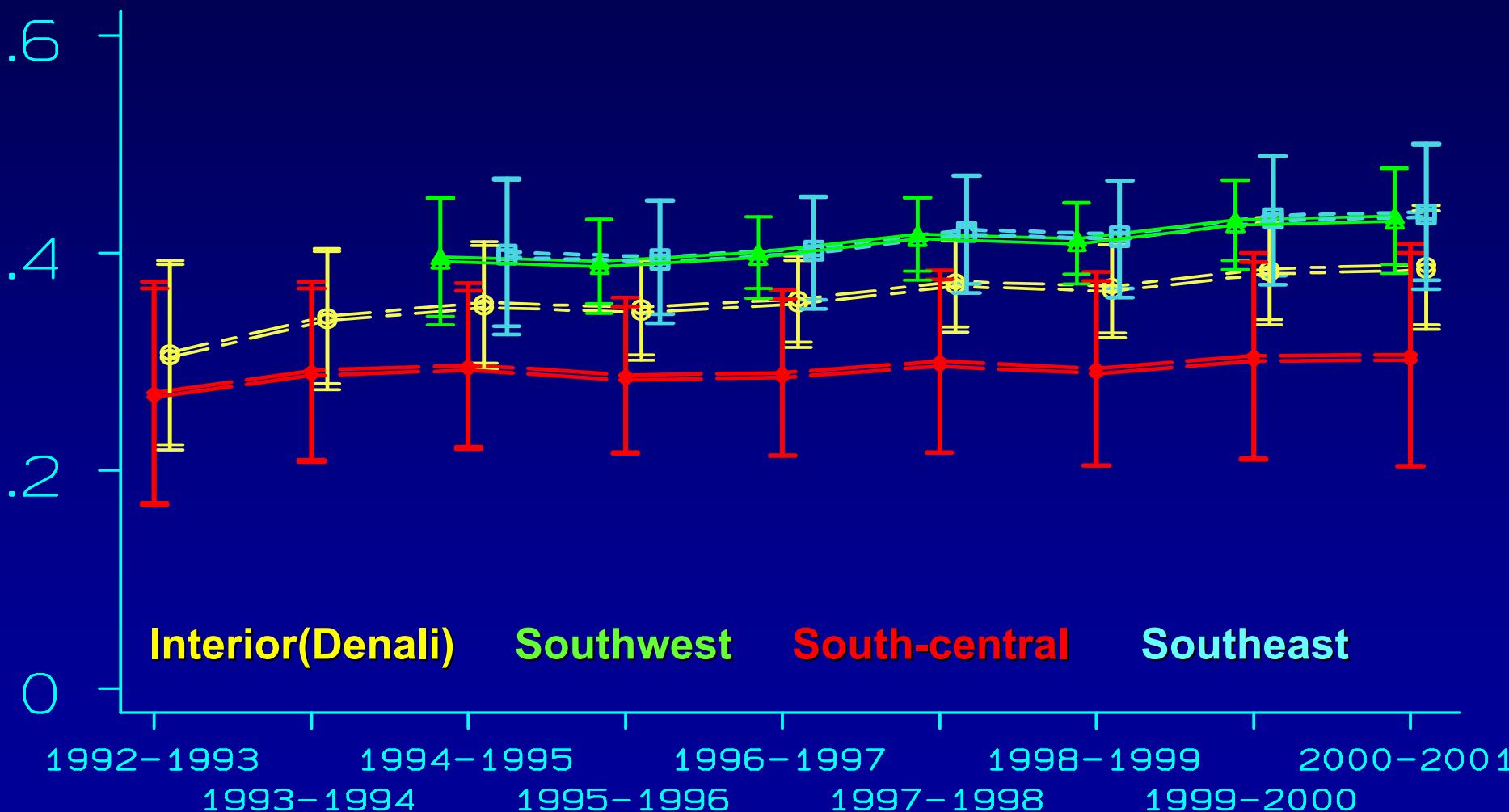
$t = 0.07$

$Ak-reg = 0.71$

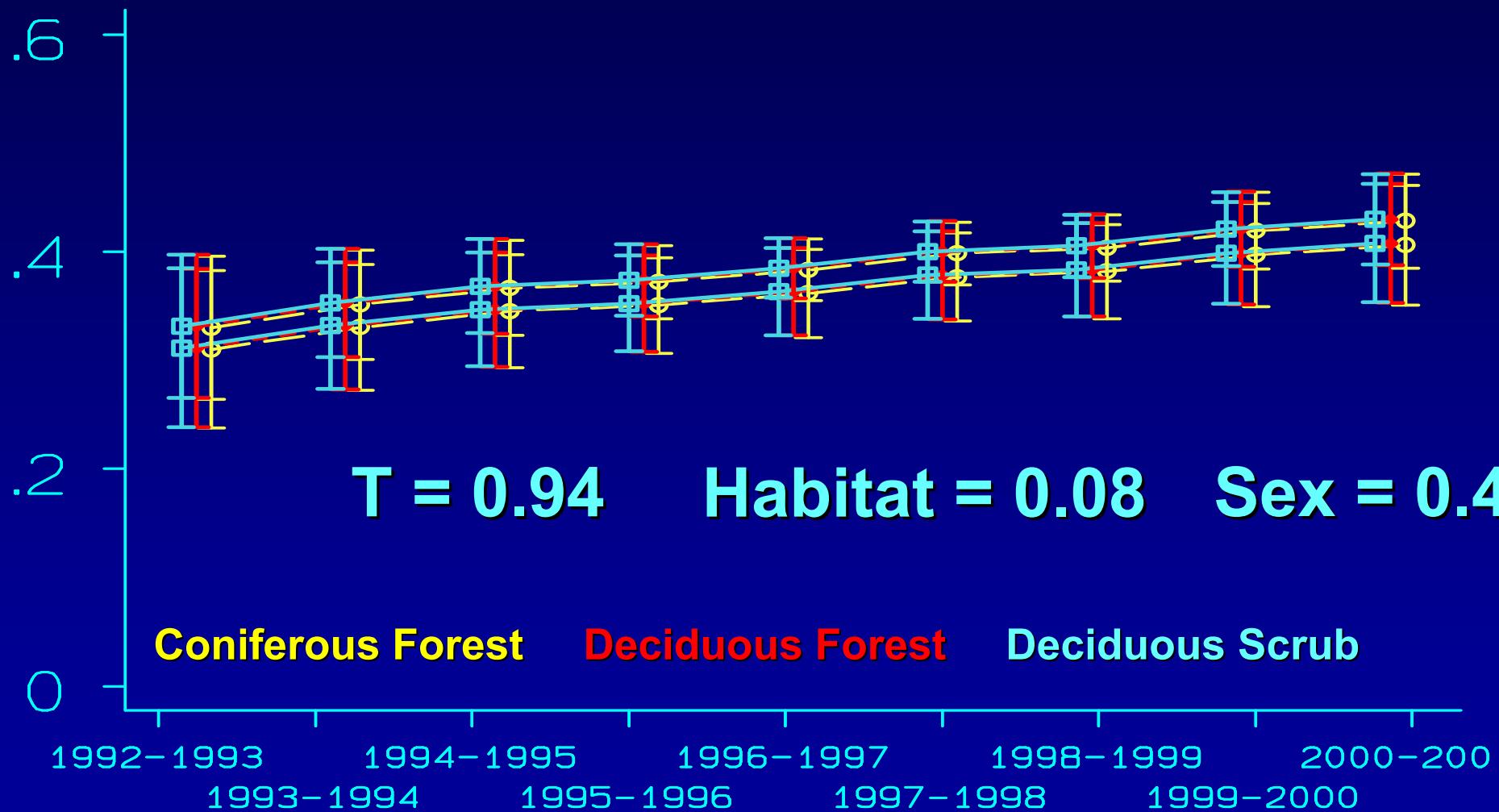
$Sex = 0.0$

Model	QAICc	Delta QAICc	Delta	QAICc	No.
			QAICc	Weight	Par
hi(T+akreg) p(sex)	1996.07	0.00	0.569	9	
hi(T) p(sex)	1999.57	3.50	0.099	6	
hi(T*akreg) p(sex)	1999.85	3.78	0.086	18	
hi(T+sex) p(sex)	2000.40	4.33	0.065	7	
hi(T+sreg) p(sex)	2000.53	4.46	0.061	7	
hi(t+akreg) p(sex)	2000.60	4.53	0.059	22	
hi(T*sreg) p(sex)	2002.10	6.03	0.028	10	
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hi(t+sreg) p(sex)	2006.28	10.21	0.003	20	
hi(.) p(.)	2043.23	47.17	0.000	3	

# Wilson's Warbler survival rates (1992-2001) using the top 20 models weighted by QAIC<sub>C</sub> weights



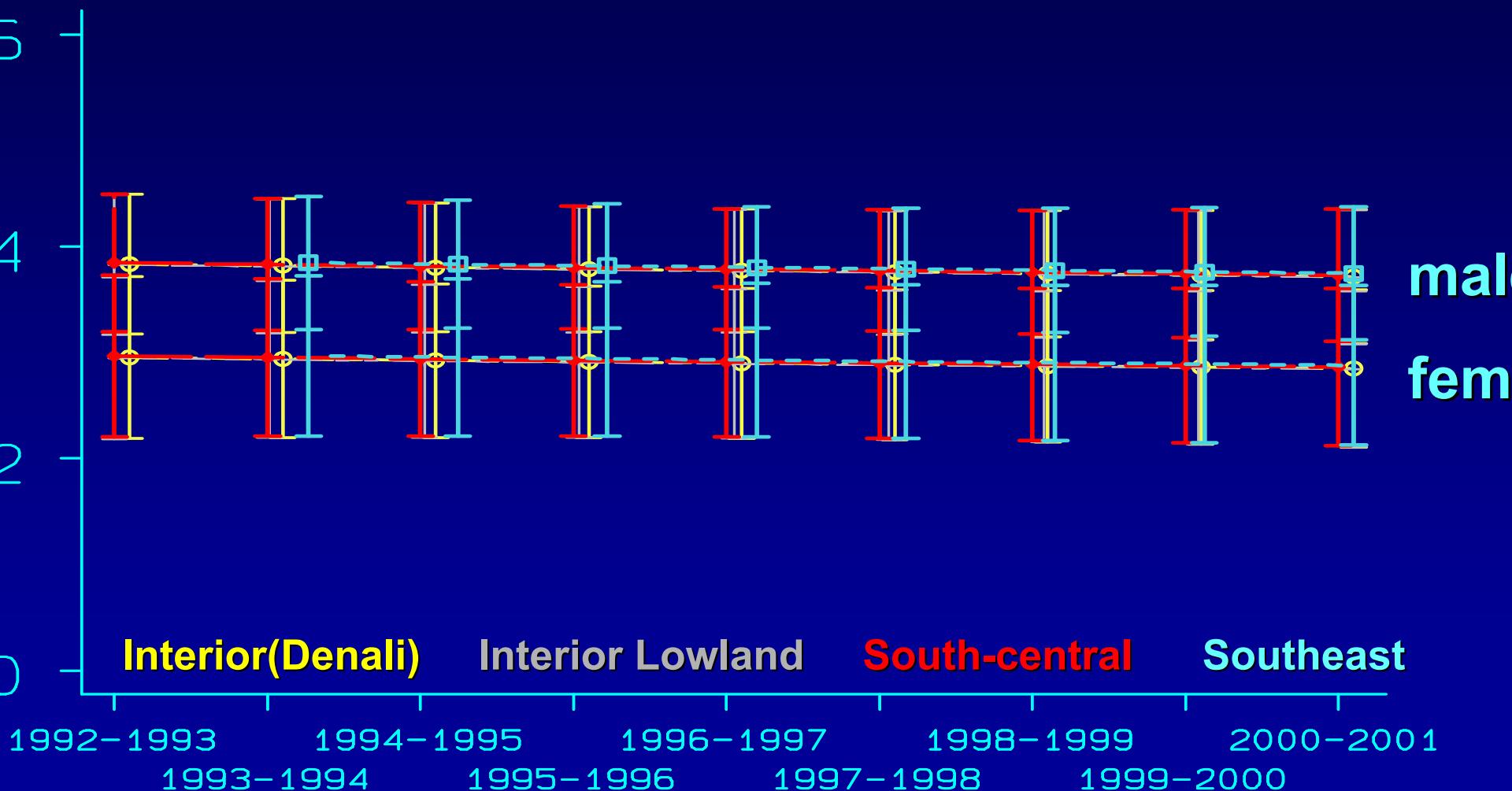
# Wilson's Warbler survival rates (1992-2001) using the top 10 habitat models weighted by QAIC<sub>C</sub> weights



# Weight of evidence for factor effects on Survival: Geographic Models

Species	Time	Geo	Sex
Alder Flycatcher	0.141	0.185	
Black-capped Chickadee	0.162	0.158	
Gray-cheeked Thrush	0.140	0.125	0.308
Swainson's Thrush	0.171	0.169	0.318
Hermit Thrush	0.262	0.109	0.134
Orange-crowned Warbler	0.196	0.174	0.484
Yellow Warbler	0.143	0.105	0.086
Yellow-rumped Warbler	0.062	0.049	0.127
Wilson's Warbler	0.999	0.807	0.092
Fox Sparrow	0.148	0.147	0.141
White-crowned Sparrow	0.345	0.200	0.217
Dark-eyed Junco	0.120	0.050	0.618

# DEJU survival rates (1992-2001) using the top 19 models weighted by QAIC<sub>C</sub> weights



# Weight of evidence for factor effects on Survival: Habitat Models

Species	Time	Habitat	Sex
lder Flycatcher	0.093	0.218	
ack-capped Chickadee	0.219		
ray-cheeked Thrush	0.134		0.495
Vainson's Thrush	0.234	0.043	0.309
ermit Thrush	0.245	0.232	0.127
range-crowned Warbler	0.200	0.096	0.489
ellow Warbler	0.224		0.246
ellow-rumped Warbler	0.050	0.030	0.133
ilson's Warbler	0.997	0.084	0.442
ox Sparrow	0.122	0.147	0.182
hite-crowned Sparrow	0.420	0.388	0.202
ark-eyed Junco	0.127	0.009	0.734

# **Summary of results on survival on the 12 species analyzed**

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## **Time**

- Strong support for 1 species (Wilson's Warbler).
- Weak support for 1 species (White-crowned Sparrow).

## **Geographic**

- Strong support for 1 species (Wilson's Warbler).

## **Habitat**

- Weak support for 1 species (White-crowned Sparrow).

## **Sex**

- Strong support for 1 species (Dark-eyed Junco).
- Weak support for 3 species (Gray-cheeked Thrush, Orange-crowned and Wilson's Warbler).
- Recapture prob. for 10 species that could be sexed.

# Productivity models

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Productivity modeled using logistic regression:

- probability that an individual bird is a juvenile bird (vs. adult)

Productivity modeled relative to:

- time and geographic stratum;
- time and habitat

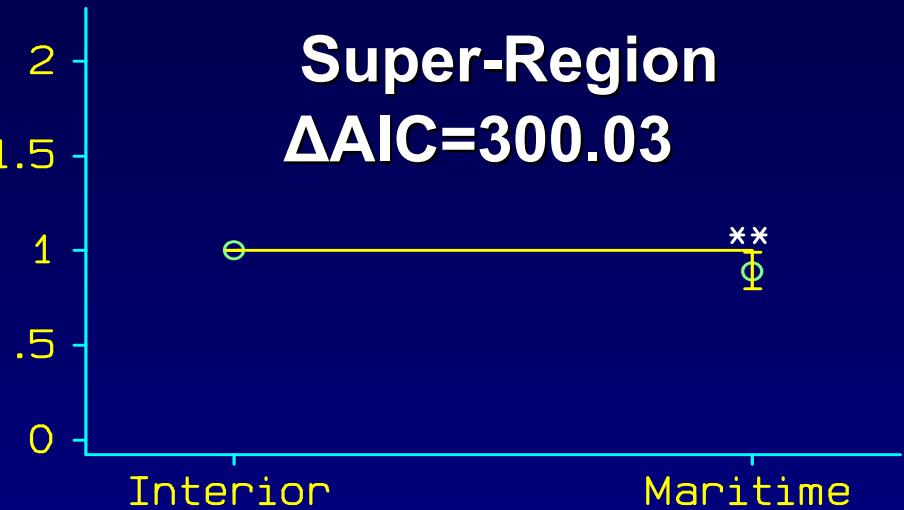
Geographic variation modeled at four spatial scales:

- individual station
- cluster
- Ak region
- super region

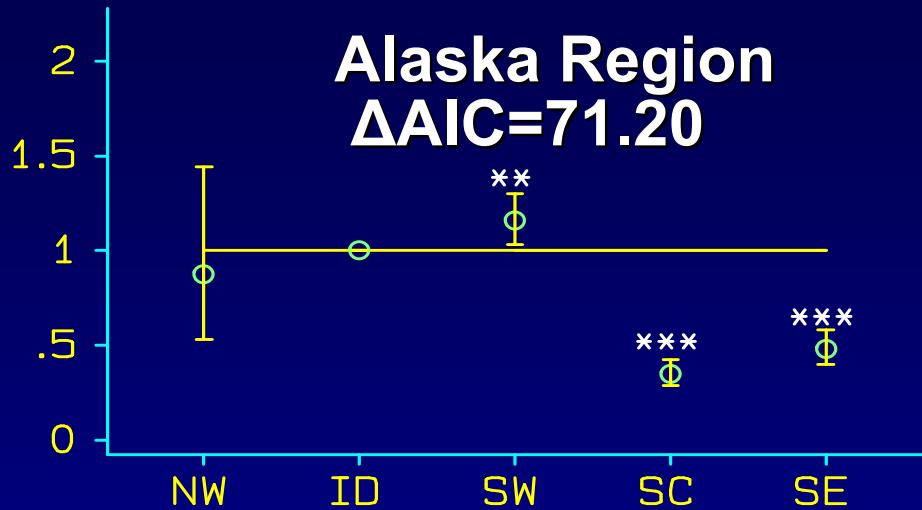
Inferences based on model selection criteria (AIC)

# WIWA productivity indices by location at four geographic scales

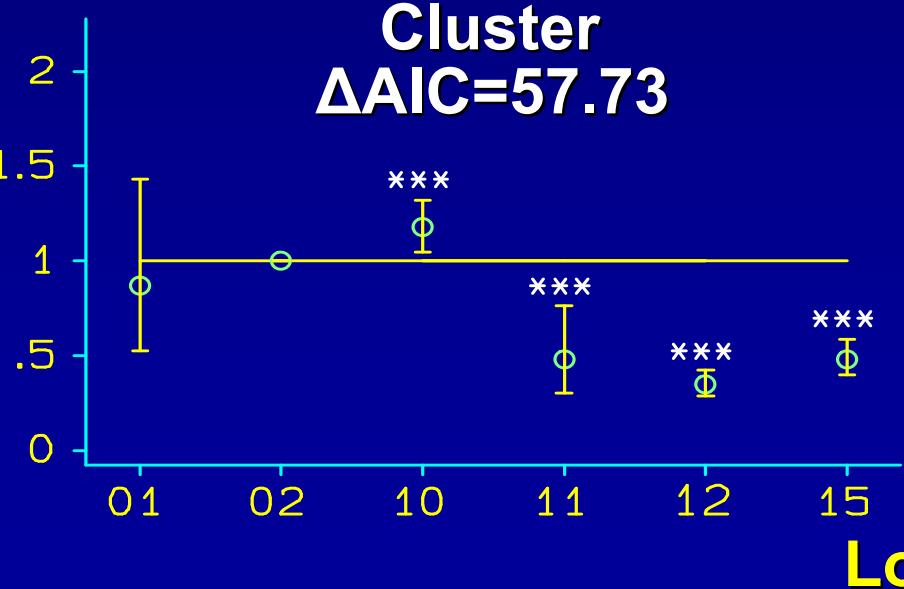
**Super-Region**  
 $\Delta AIC = 300.03$



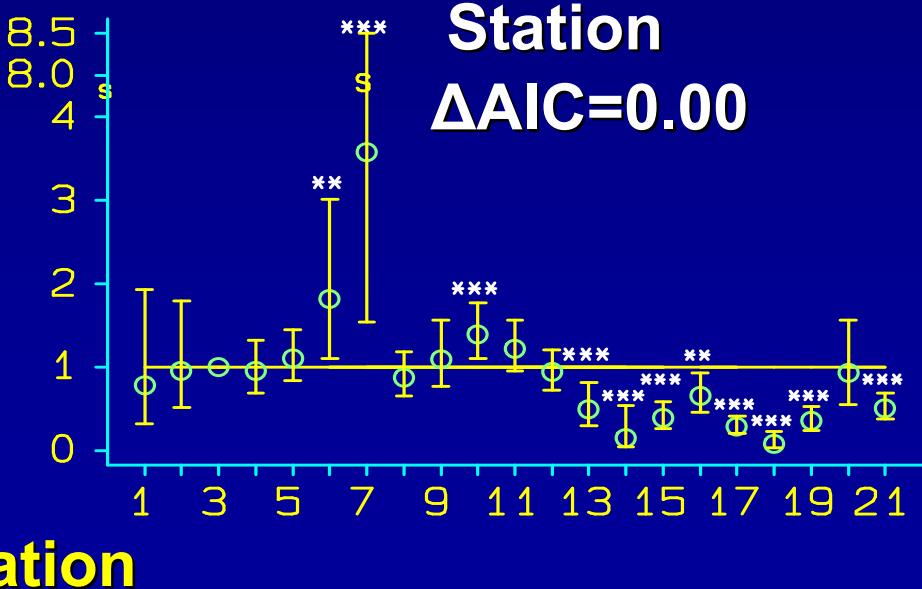
**Alaska Region**  
 $\Delta AIC = 71.20$



**Cluster**  
 $\Delta AIC = 57.73$

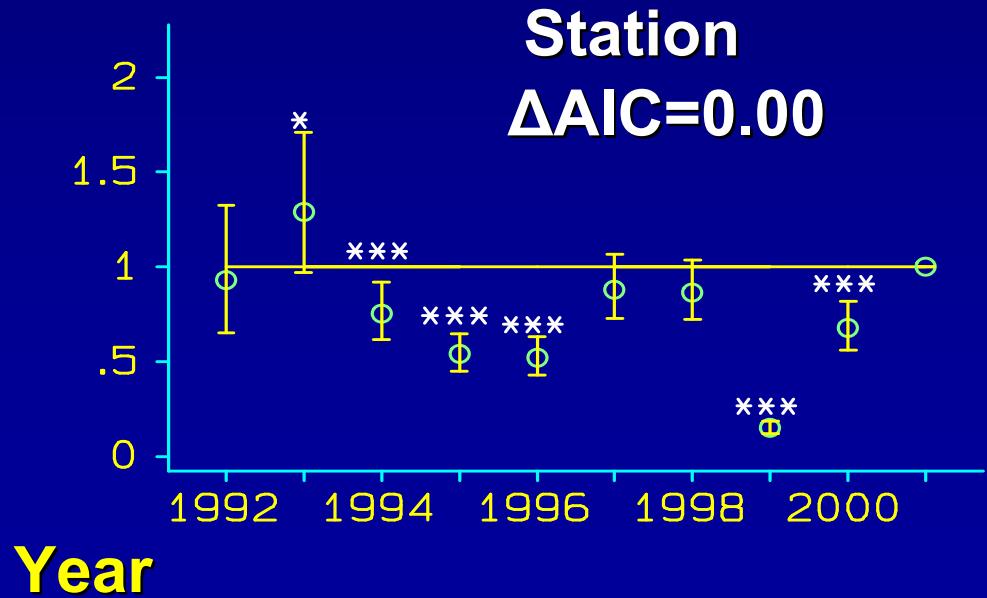
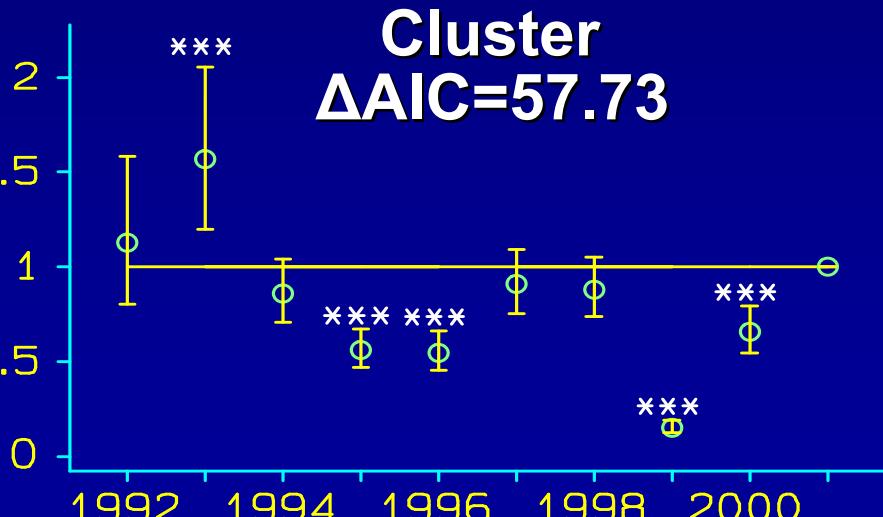
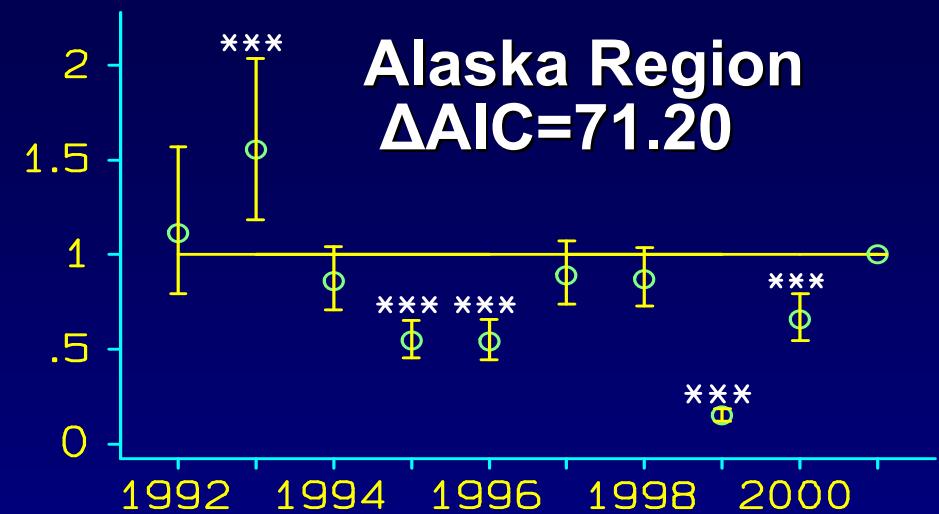
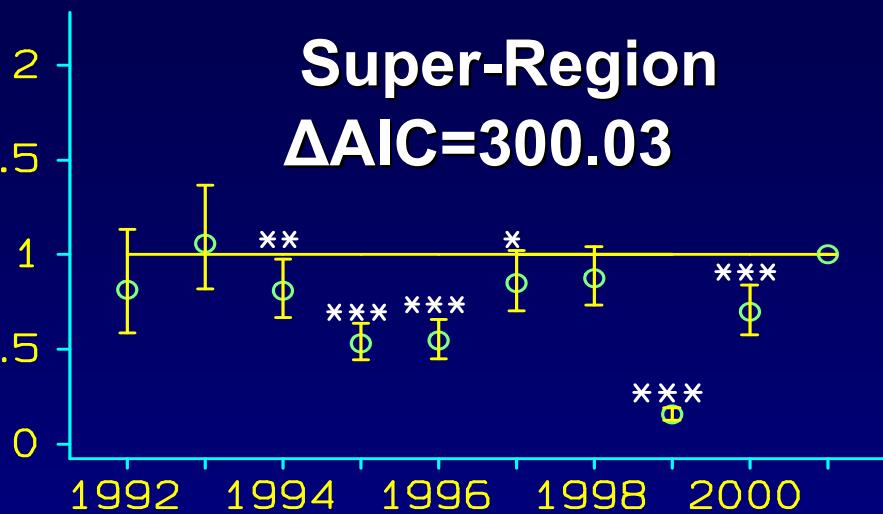


**Station**  
 $\Delta AIC = 0.00$

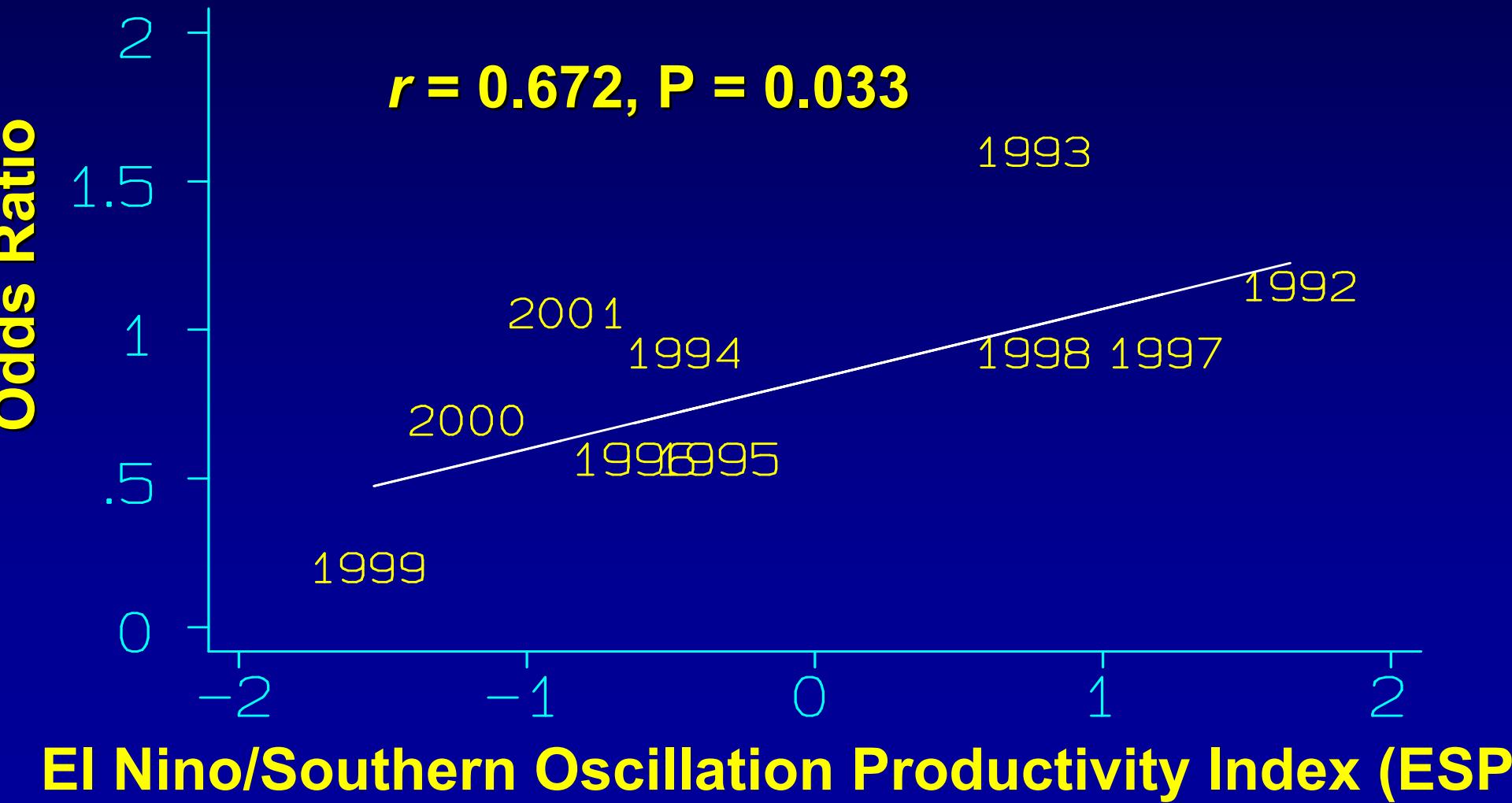


**Location**

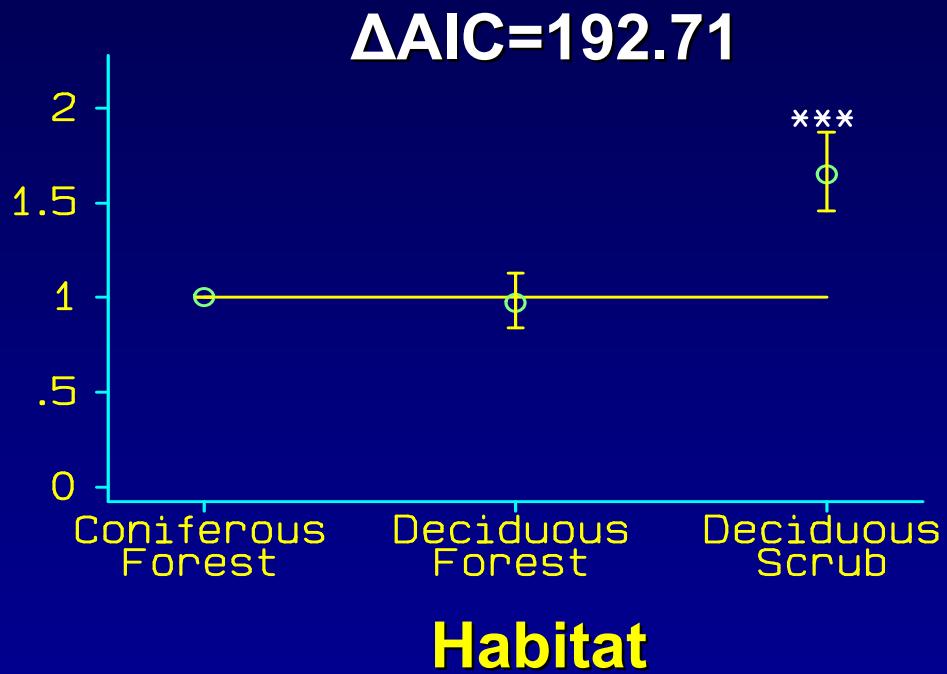
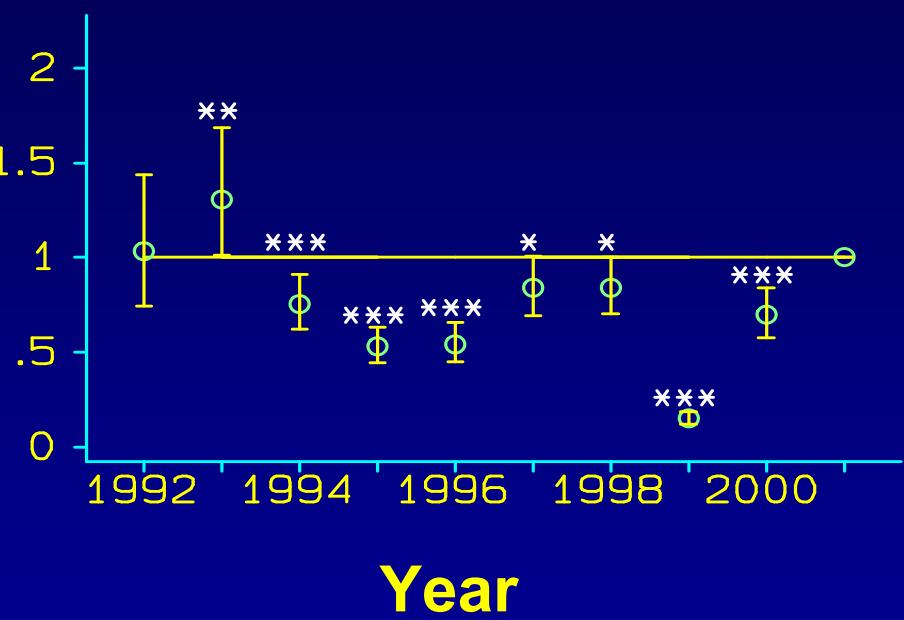
# WIWA productivity indices by year at four geographic scales



# WIWA productivity indices as a function of ENSO (1992-2001)



# WIWA productivity indices by year and habitat



# Factor effects on Productivity

Species	Time	Geo	Habitat
Ilder Flycatcher	x	Ak-reg	
ack-capped Chickadee	x	Ak-reg	x
gray-cheeked Thrush	x	x	
wainson's Thrush	x	x	x
ermit Thrush	x	x	x
range-crowned Warbler	x	x	x
ellow Warbler	x	x	
ellow-rumped Warbler	x	Ak-reg	
ilson's Warbler	x	x	x
ox Sparrow	x	x	
hite-crowned Sparrow	x	x	
ark-eyed Junco	x	x	x

# **Summary of results on productivity on the 12 species analyzed**

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## **Time**

- Support for all species.
- Productivity high across species in 2001, low in 1999.

## **Geographic**

- Support for all species.
- Productivity tended to be higher in Interior vs. Maritime.

## **Habitat**

- Support for 6 species
- Shrub > Forest (Swainson's and Hermit thrushes, Orange-crowned and Wilson's warbler, and Dark-eyed Junco).
- Forest > Shrub (Black-capped Chickadee).