The Institute for Bird Populations

Demographic Monitoring on Military Lands: Scales of Uncertainty

Philip Nott, Dave DeSante, and Chris Eberly

U.S. FISH & WILDLIFE SERVICE

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L E G A C Y

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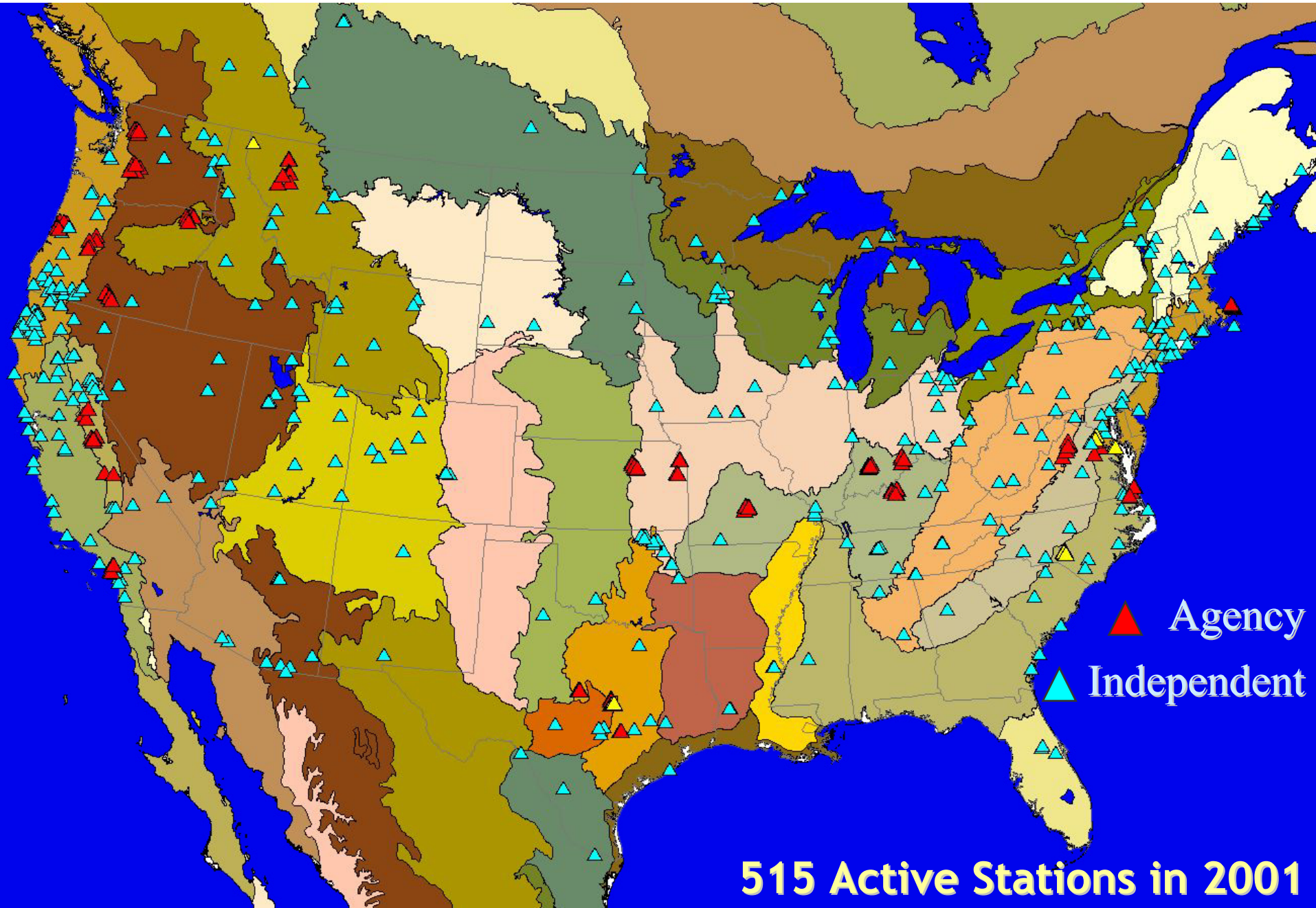
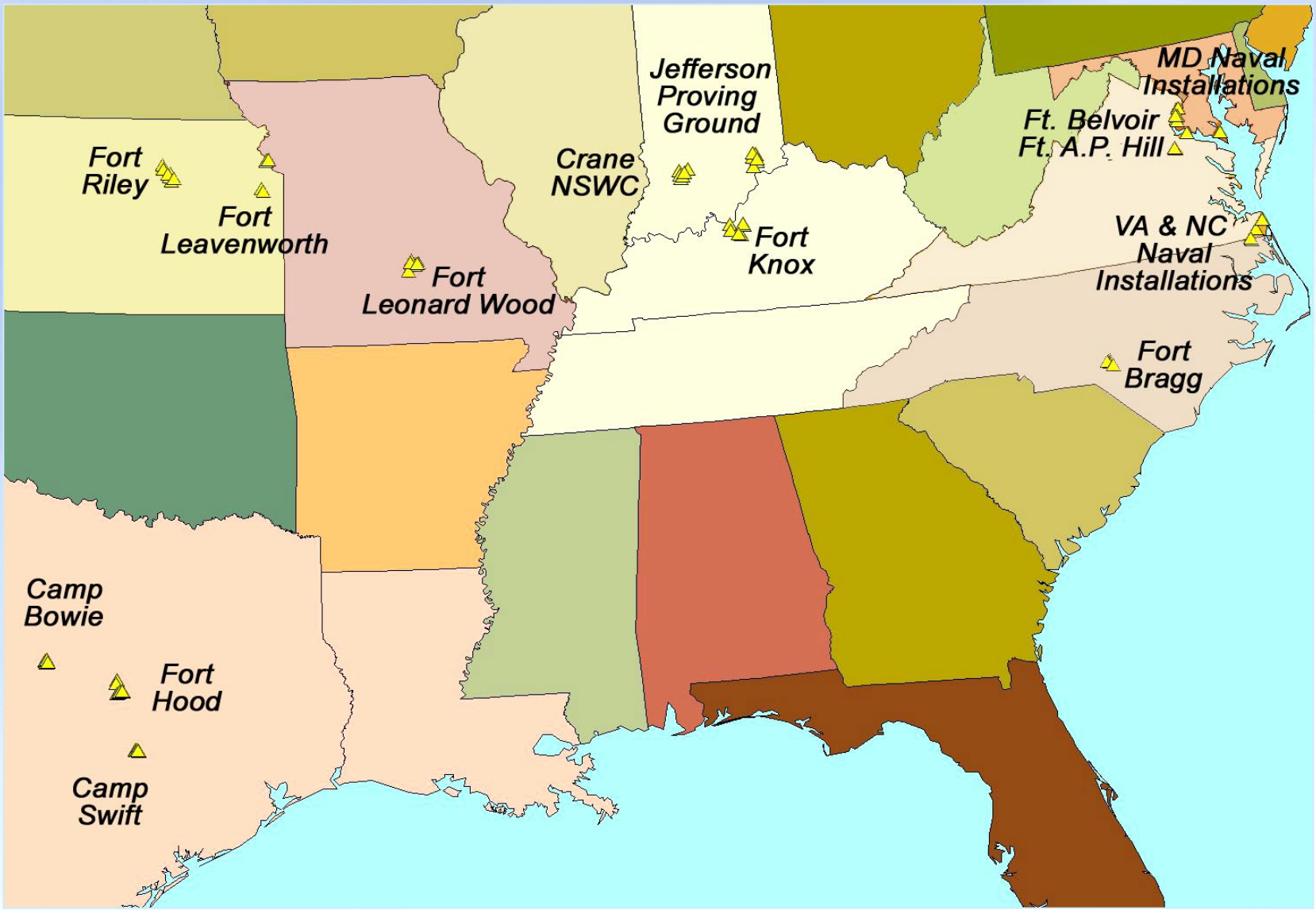
Introduction

- Since 1992 the MAPS program has conducted avian demographic monitoring on military installations.
  - 78 stations on 13 installations (DoD Legacy network)
- Related demographic data to patterns of weather/climate and landscape to model population variability.
  - Patterns affect both survival and reproductive success
- Constructed species-landscape (NLCD) models for a suite of 10 FWS Birds of Conservation Concern
  - Total of 31 species effectively monitored
- Provided management recommendations and decision-support tools for avian conservation management plans.
  - Conducting effectiveness and control monitoring of one or more BCC species using 48 stations on 8 installations

Distribution of MAPS stations (lower 48)



MAPS Locations on Military Installations



Species of Management Concern by Installation

	Forest-woodland					Successional				
Military Installation/complex	ACFL	WOTH	WEWA	LOWA	KEWA	BEWR	BWWA	PRAW	FISP	PABU
Ft. Belvoir	X	X		X						
Navy MD/VA	X	X	X		X					
Tidewater Complex	X	X								
Fort Bragg		X						X		
Jefferson PG (FWS)		X	X		X		X	X	X	
Fort Knox			X	X	X		X			
Crane NSWC							X	X	X	
Ft. Leonard Wood	X		X	X	X				X	
Fort Leavenworth					X				X	
Fort Riley	BEVI									
Camp Swift (TNG)										X
Fort Hood						X			X	
Camp Bowie (TNG)						X			X	X

Birds of Conservation Concern at Ft. Leonard Wood

Neotropical wintering		Temperate wintering	
Increasing	**Decreasing**	**Increasing**	**Decreasing**
White-eyed Vireo	**Acadian Flycatcher ***	*Northern Cardinal*	Downy Woodpecker
Red-eyed Vireo	Black & white Warbler		Carolina Chickadee
Blue-gray Gnatcatcher	**Worm-eating Warbler**		Tufted Titmouse
Wood Thrush *	Ovenbird		*Carolina Wren*
Blue-winged Warbler	**Louisiana Waterthrush**		***Field Sparrow***
Prairie Warbler *	**Kentucky Warbler**		
Yellow-breasted Chat	*Common Yellowthroat*		
Indigo Bunting			

21 landbird species are effectively monitored on FLW by MAPS

- 8 FWS Birds of Conservation Concern are effectively monitored
  - includes 5 forest and 3 successional BCC species
- Five species are declining locally: Neotropical (4), Temperate (1)
- Three successional species of particular management concern

Adult Population Trends by Station

Species	BIPI	LABO	MIPO	MACE	SMRI	MIRI
ACFL	-2.25	**-11.8				
WOTH	*15.8					
WEWA	-2.4					
LOWA	-3.7					
KEWA	1.0	4.0	5.8			-22.6
BWWA	-5.0	3.1	5.1			
PRAW		14.3	*14.7			
FISP		-3.9	5.8	**-32.5		
N(#neg.)	12 (7)	16 (9)	14 (4)	6 (5)	2 (0)	3 (2)

- Forest/woodland species except WOTH declining at Big Piney
- Acadian Flycatcher declining at Laughlin Bottom
- Macedonia site becoming unattractive to field sparrows
- Two upland mature forest stations unsuitable for MAPS monitoring

Field Sparrow - Landscape Model

Variables															
1	2	3	4	5	6	7	8	9	10	q	Rsq	Lackoffit	AIC	ICOMP	ICOMPIFIM
0	0	1	0	0	1	0	0	1	0	3	+0.621	-12.317	-4.317	-8.552	-1.671
0	1	1	0	0	1	0	0	1	0	4	+0.621	-12.327	-2.327	-8.445	-0.392
0	0	1	0	0	1	0	0	1	1	4	+0.621	-12.330	-2.330	-8.072	+0.538
0	0	1	0	0	1	1	0	1	0	4	+0.621	-12.317	-2.317	-8.070	+0.080
0	0	1	0	0	1	1	0	1	1	5	+0.622	-12.337	-0.337	-7.266	+1.762
0	1	1	0	0	1	1	0	1	0	5	+0.622	-12.340	-0.340	-6.660	+0.714
0	0	1	0	0	1	0	1	0	0	3	+0.623	-12.416	-4.416	-6.045	-2.854
0	0	1	0	1	0	1	1	0	0	4	+0.619	-12.211	-2.211	-5.841	-4.096
0	0	1	0	0	1	0	0	0	0	2	+0.462	-6.720	-0.720	-5.783	+3.454
0	1	1	0	0	1	0	1	0	0	4	+0.627	-12.549	-2.549	-5.752	-1.594

Selected model regression coefficients

Dependent variable : FISP (RImean)

FOREST	%Cover	0.0049
GRASS	Core Area	0.0030
AGRI	Edge(m/ha)	-0.0049

Rsq = 0.631 F = 10.823 P = 0.002

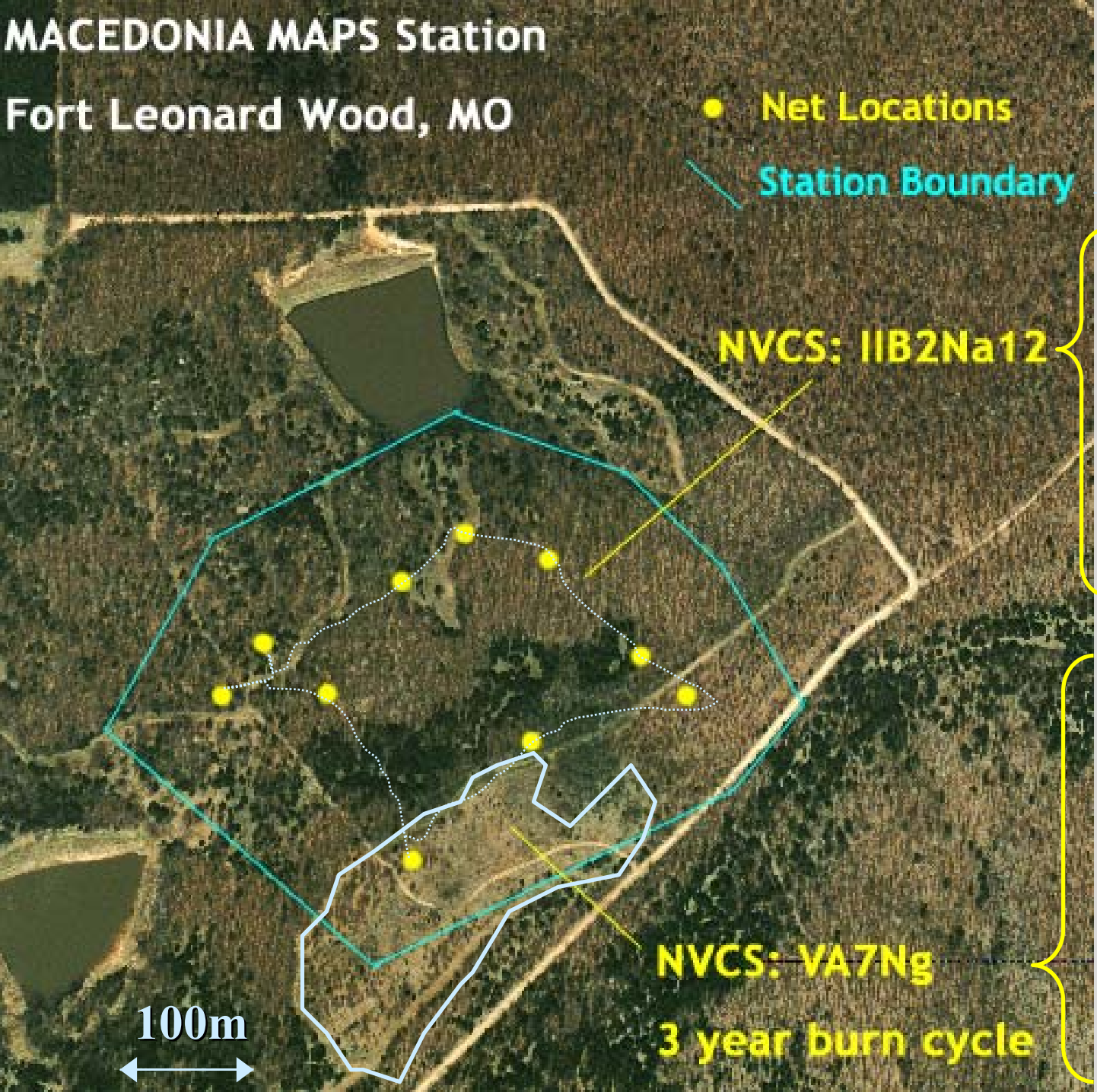
ICOMP

Bozdogan's index of information complexity penalizes models for :

- overparameterization
- covariance and colinearity among "independent variables"

Field Sparrow - Landscape Model

Cover Classification	Classification Attribute	Proportional Contribution
2 : SHRUB	%Cover	0.08
3 : FOREST	%Cover	0.26
4 : FOREST	Core Area	0.00
5 : GRASS	%Cover	0.03
6 : GRASS	Core Area	0.24
7 : GRASS	Edge(m/ha)	0.11
8 : AGRI	%Cover	0.08
9 : AGRI	Edge(m/ha)	0.16
10: FOREST	Edge(m/ha)	0.05



MAPS Habitat Structure Assessment

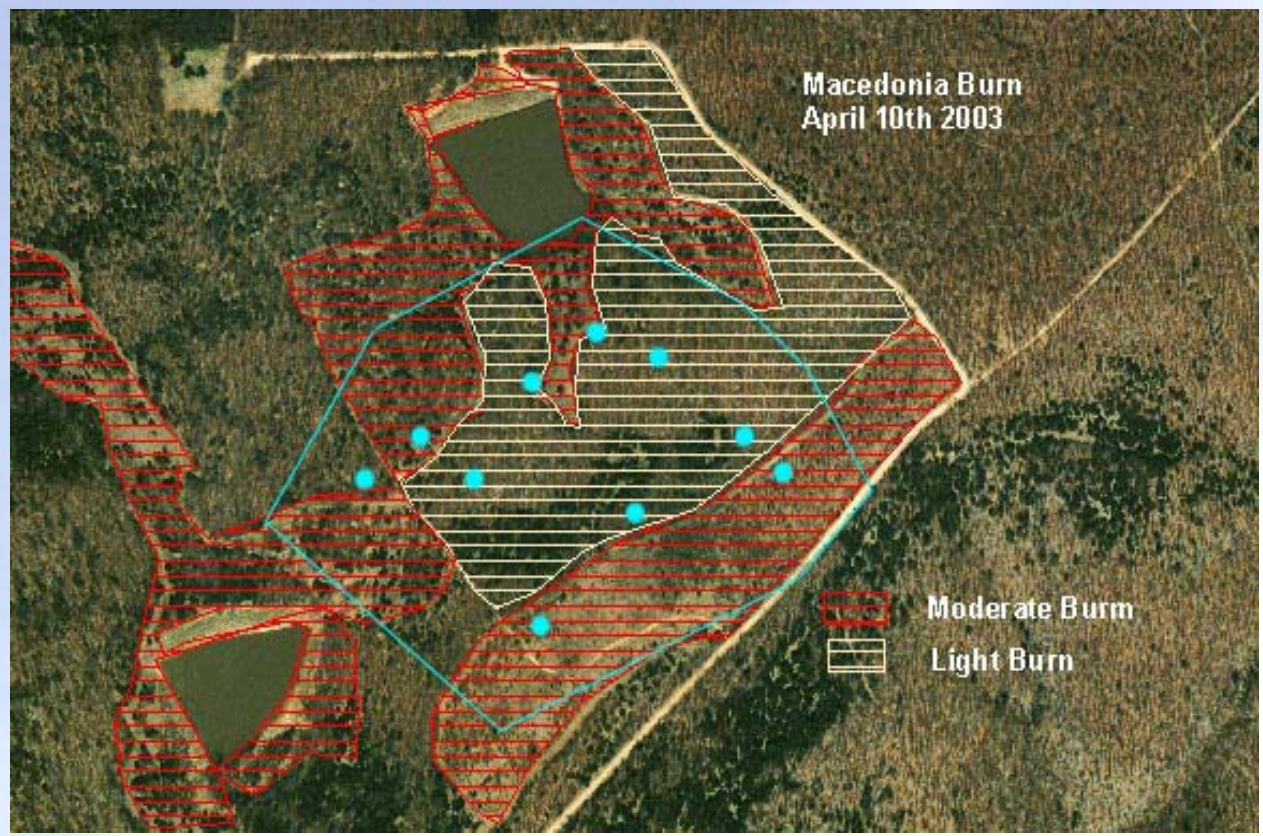
Upperstory 40%:
Quercus rubra
Midstory 80%:
Gleditsia triacanthos
Juniperus virginiana
Understory 30%:
Cornus alternifolia
Sassafras albidum

Midstory <5%:
Quercus stellata
Gleditsia triacanthos
Understory 30%:
Juniperus virginiana
Gleditsia triacanthos
Ground cover 85%:
Daucus carota
Aster spp.

Managing for Field Sparrow in 2003

Extensive springtime fire management of Macedonia area will reduce fire risk from training exercises and produce "disclimax" plant community that is preferred by field sparrows

Attracted migrating LOWA and WOTH, a breeding BGGN (3), and NOPA juvenile



Long term burning of this frequency can produce a community more typical of pre-settlement oak savannah habitat common in this region

Managing Plant Communities with Fire

Spring burn at FLW intended to promote subsequent growth of warm-season grasses :

- little bluestem, big bluestem, switch grass, Indian grass and broomsedge

Forb species are also present :

- goldenrod, brown-eyed susan, asters, and desmodium

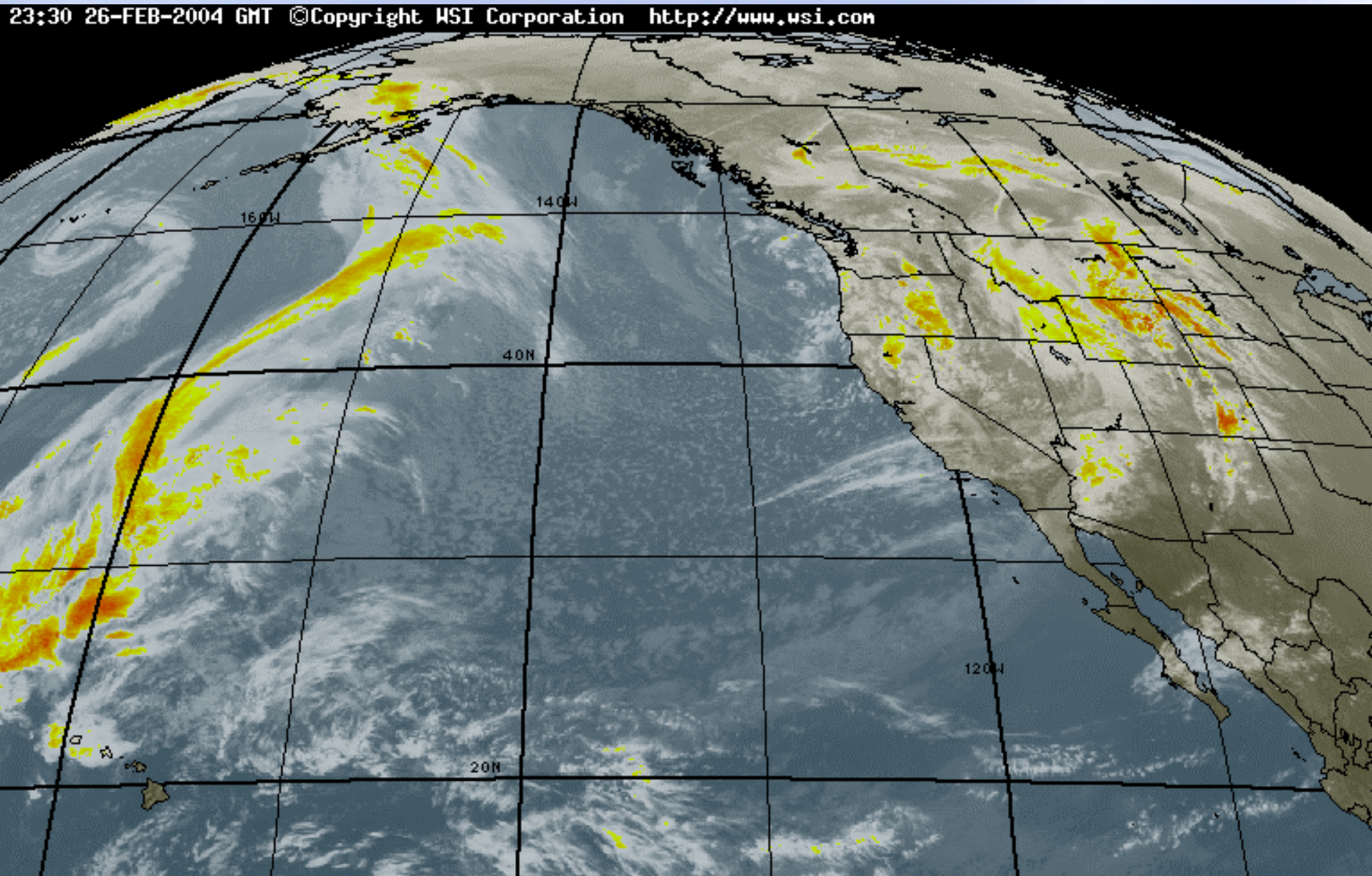
Resetting an oldfield community at Fort Leonard Wood in 2001

Management associated with military range sustainment can produce a mosaic of different aged old field (disclimax) communities that provide suitable breeding habitat for many birds of conservation concern

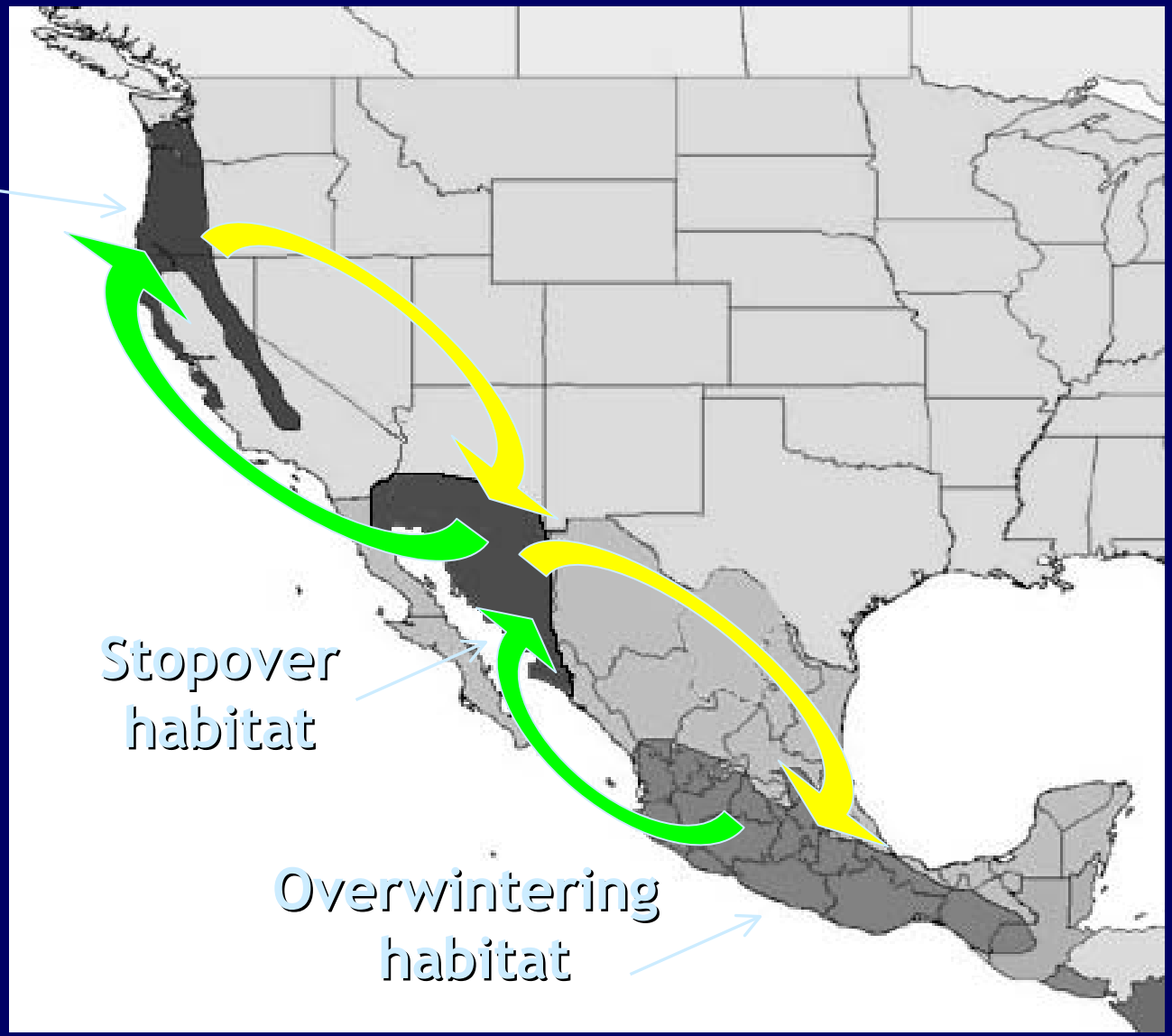
Scales of Uncertainty

- Continental – climate can cause major affects
  - Individual fitness and reproductive potential
  - Phenological variation – timing of migration, arrival and nesting
- Regional – landscape and environmental change
  - Shifting agricultural practices and development
  - Shifting seasonal weather patterns
- Local – land use change and management
  - Adjacent land use not controlled by DoD
  - Managing for military readiness and range sustainment
- Stochastic events – processes lacking predictable scale
  - Disease, pollution, and pest outbreaks
  - Invasive plants and geographic range shift

Climate, Weather, and PNW Bird Populations

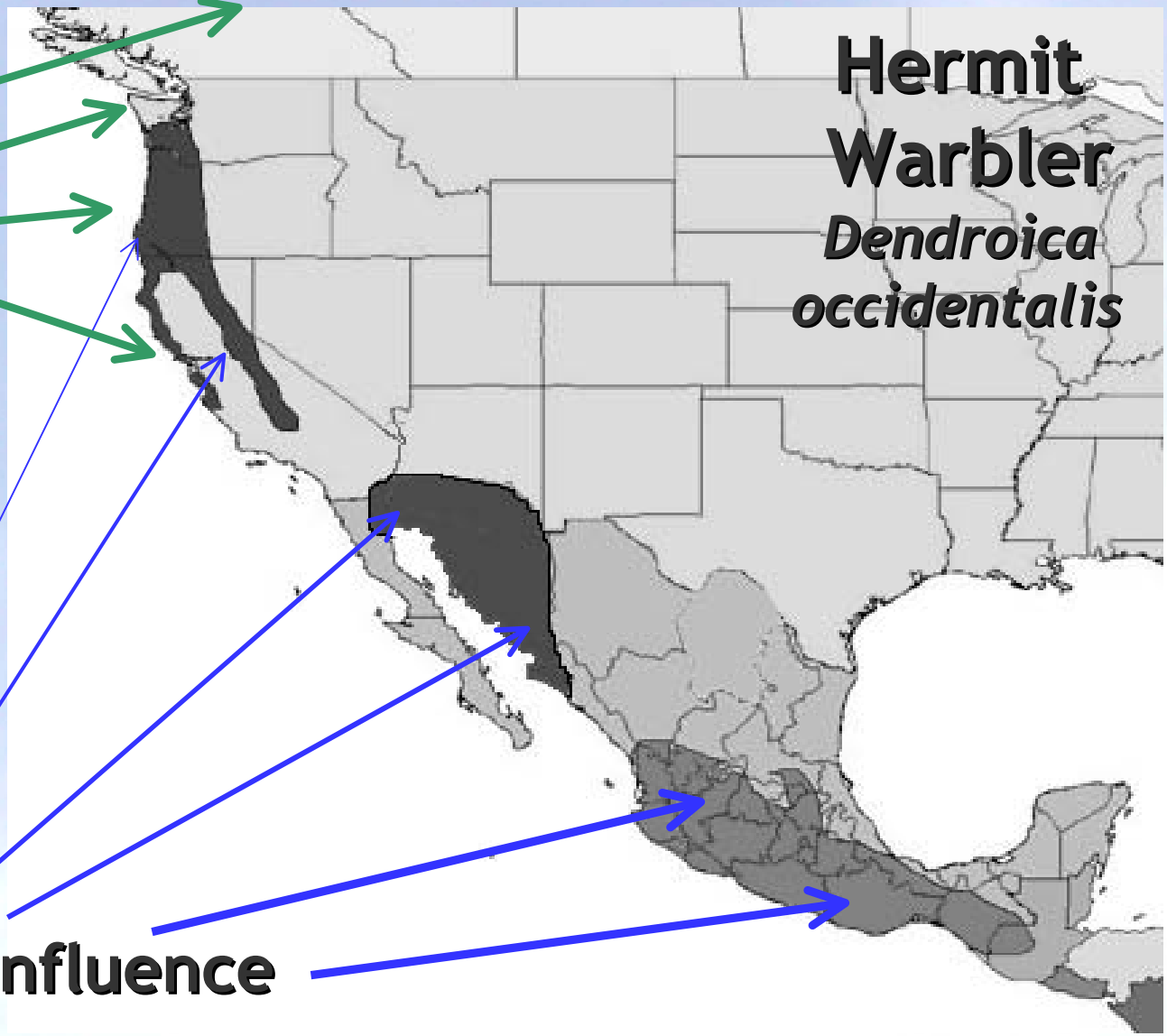


Hermit warbler range dynamics



Hermit Warbler
Dendroica occidentalis

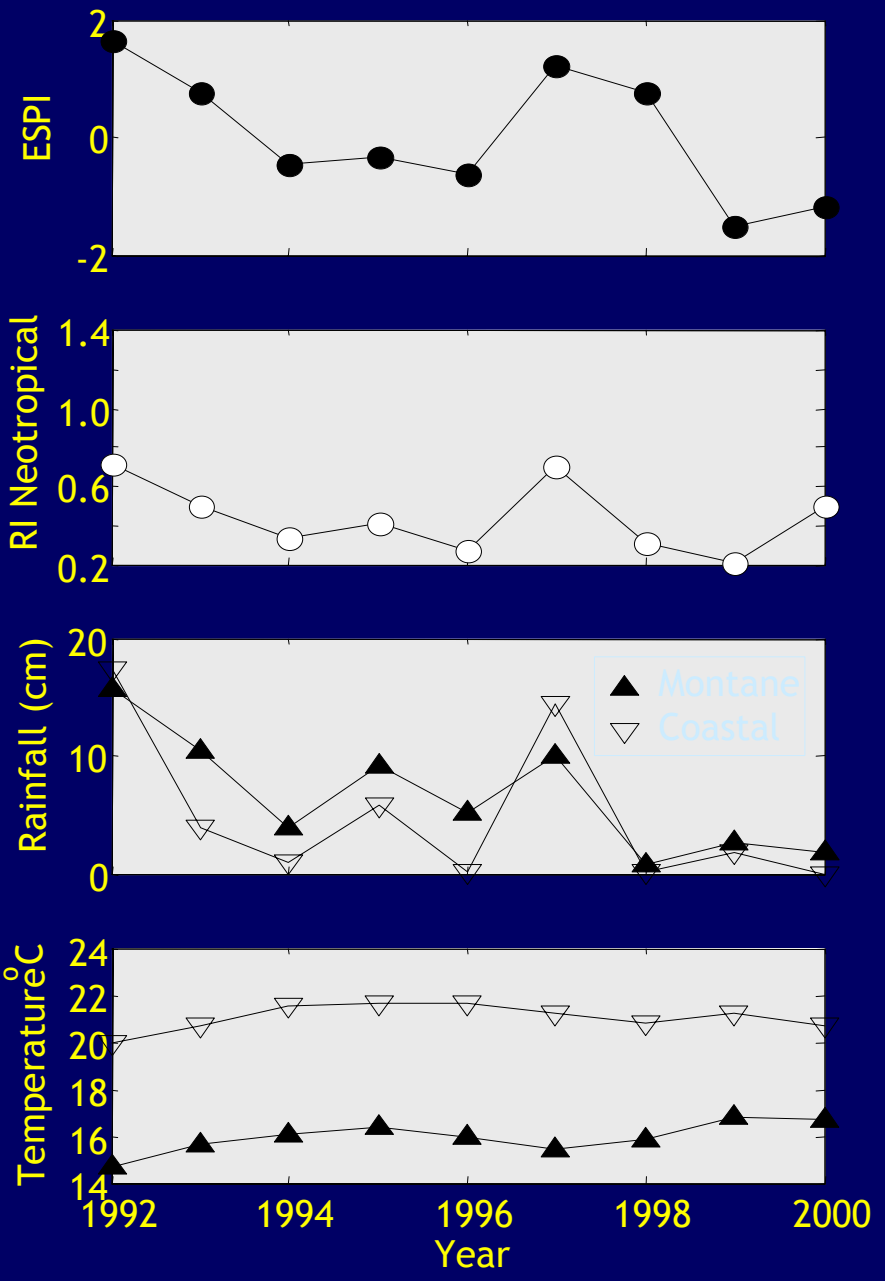
Oceanic influences on Neotropical migrants



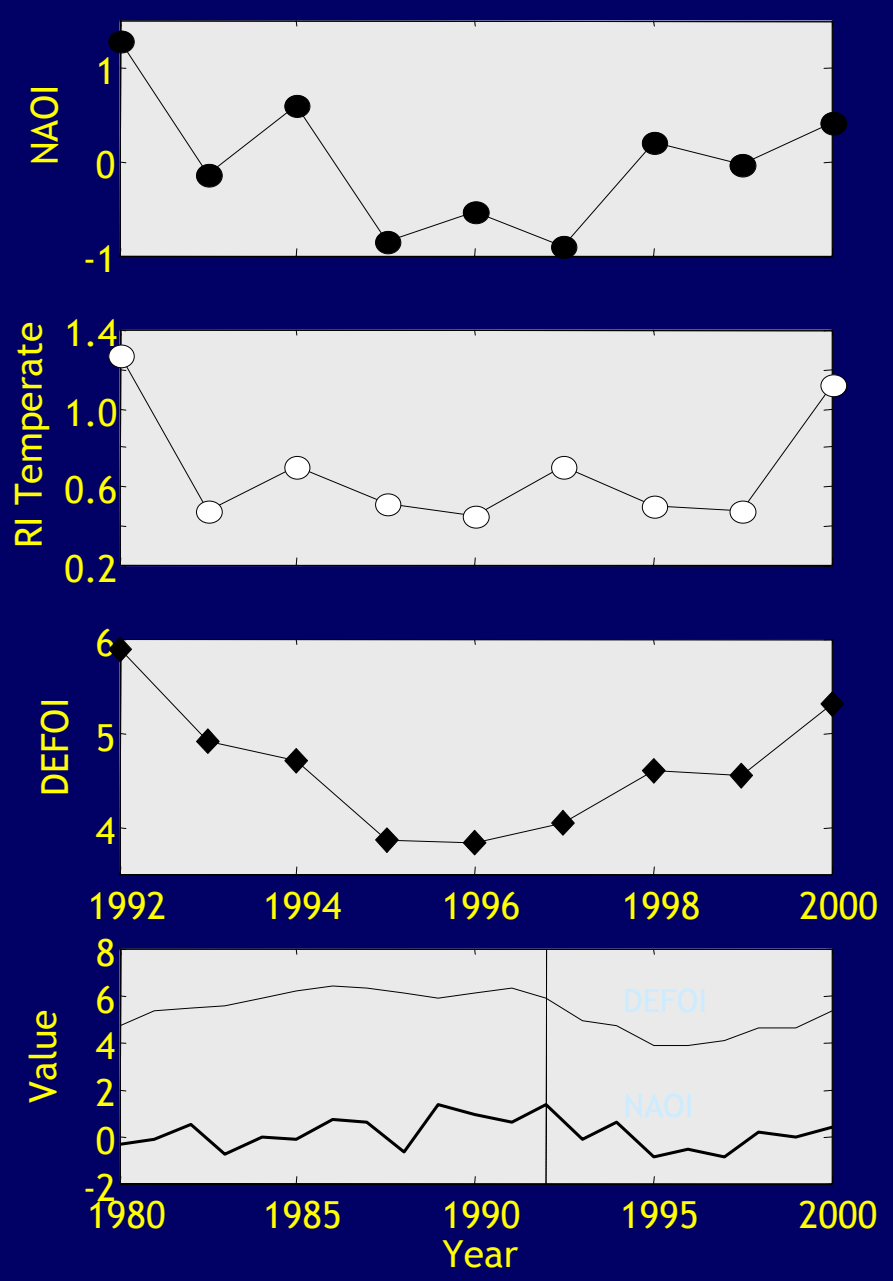
North Atlantic Influence

ENSO Influence

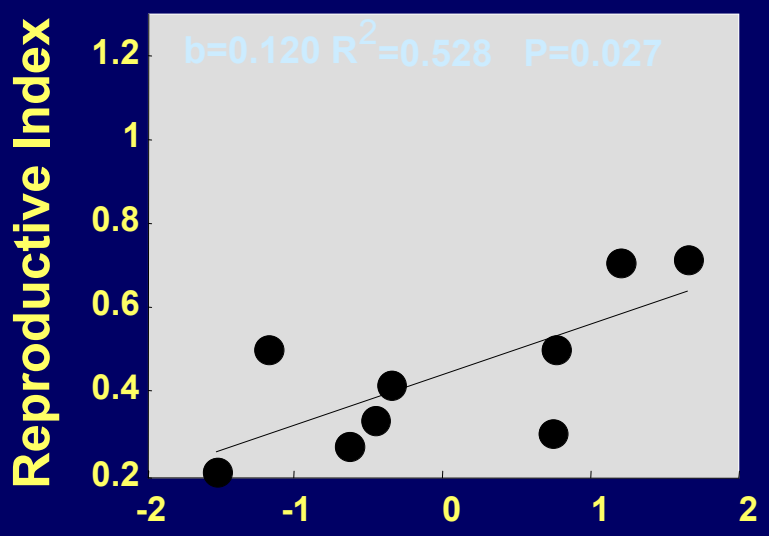
Neotropical Wintering Species

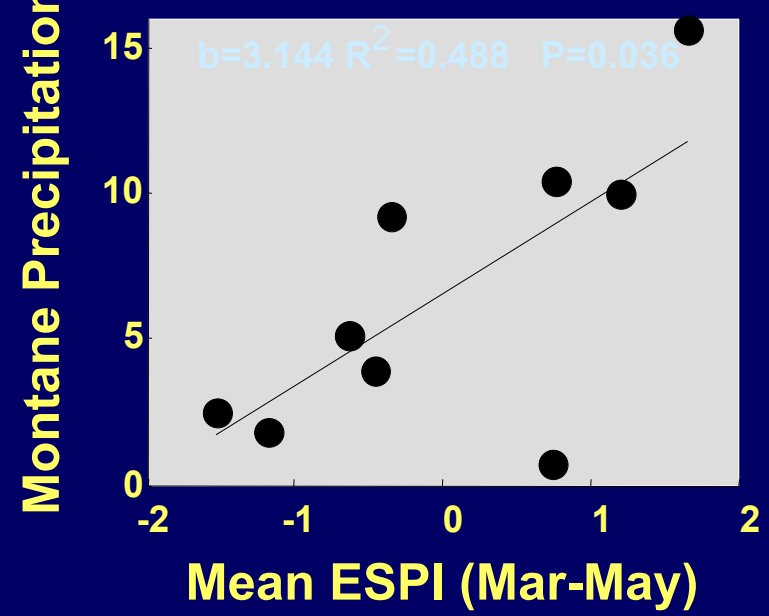


Temperate Wintering Species

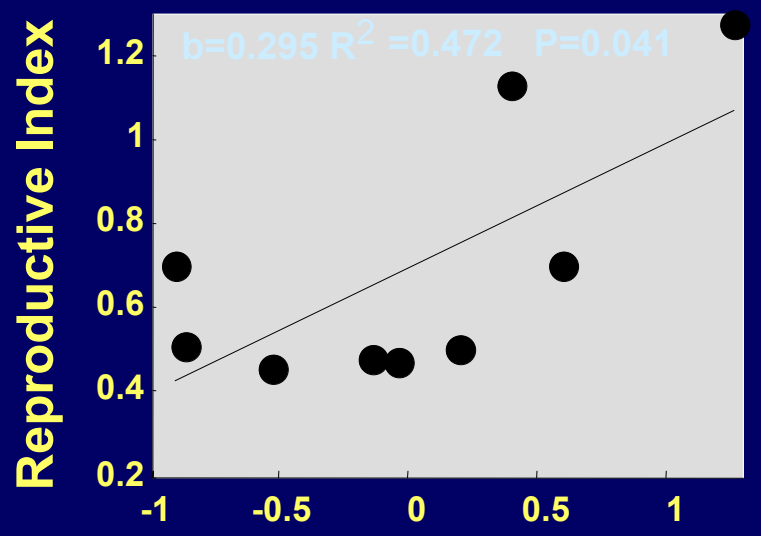


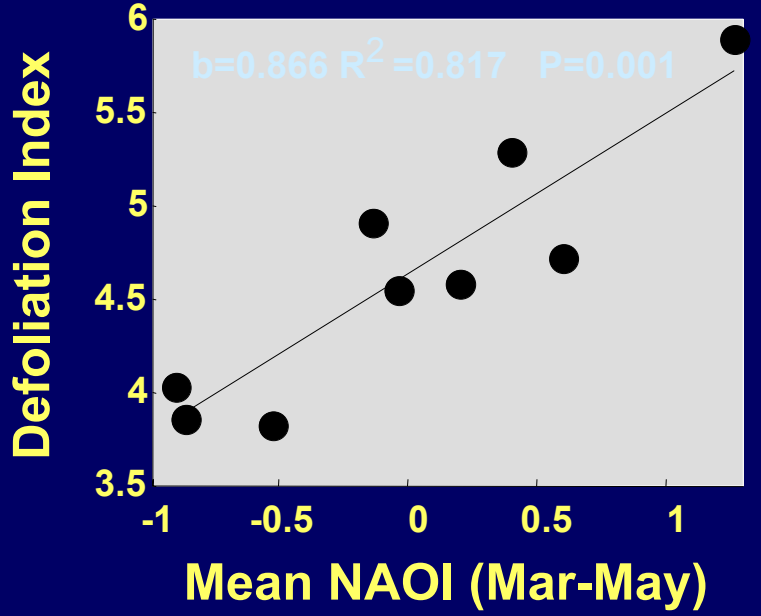
Neotropical Migrants





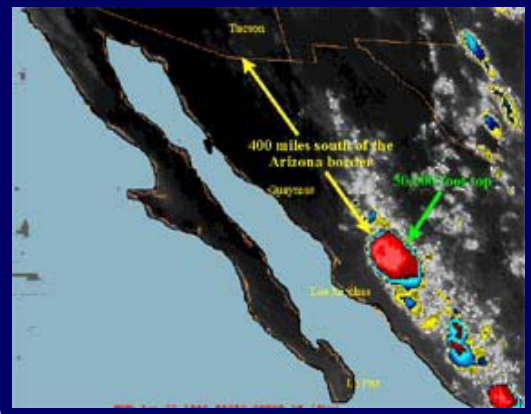
Temperate Migrants





Warm-phase ENSO
(El Niño)

More fledglings
in Pacific Northwest



Higher late winter
rainfall on wintering
ranges in west Mexico

Effects of ENSO on species that overwinter in the Neotropics

Birds migrate
earlier, and/or
arrive in better
physiological
condition ?

More food resources or less stress
for pre-migration conditioning ?

Warm-phase NAO
(NAO+)

More fledglings
in Pacific Northwest

Effects of NAO on species that overwinter in the Temperate zone

Warmer and drier
springtime in the
Pacific Northwest

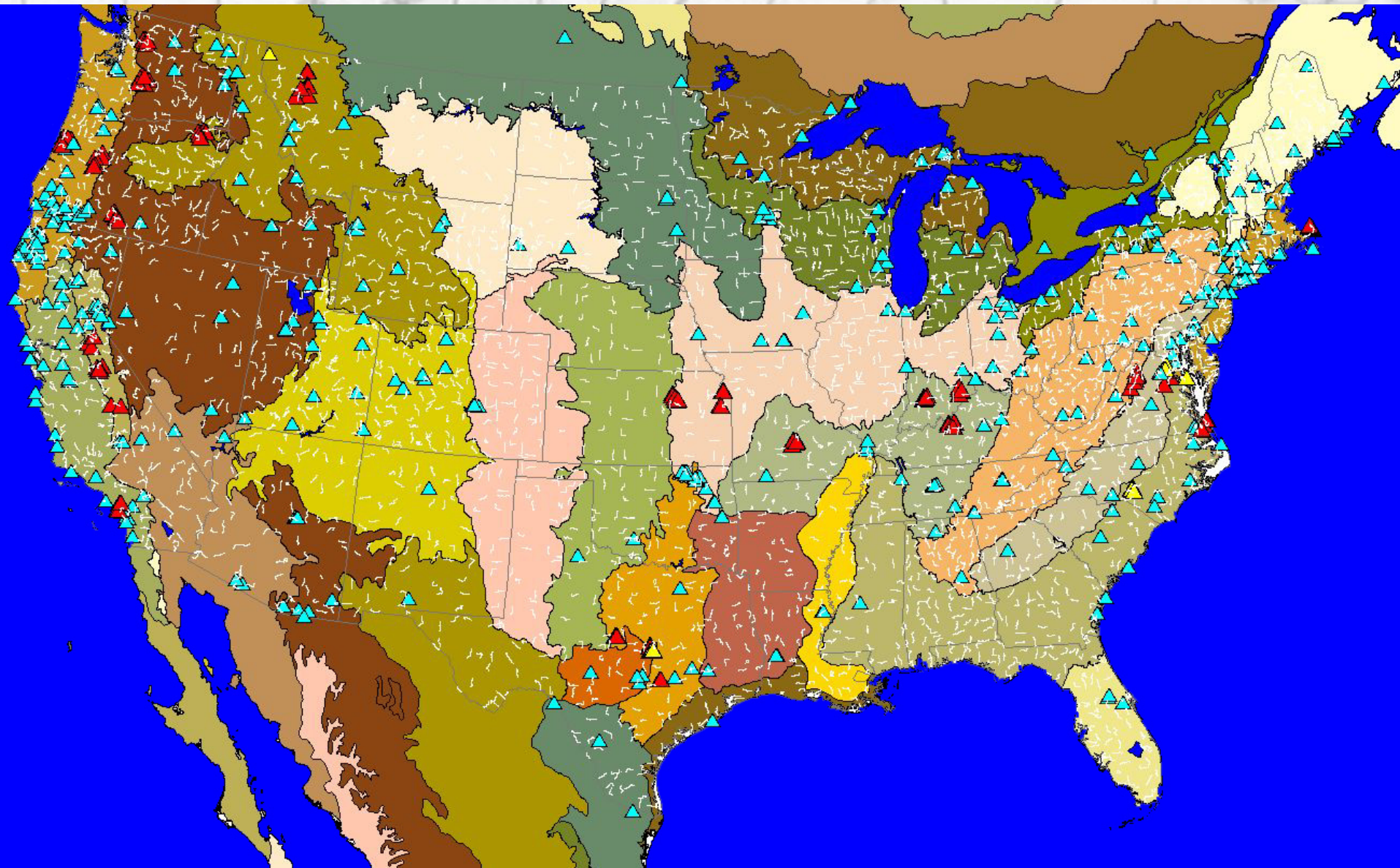
Birds in better
physiological
condition due to
more available
food resources

Conditions
give rise to
more larvae
for food

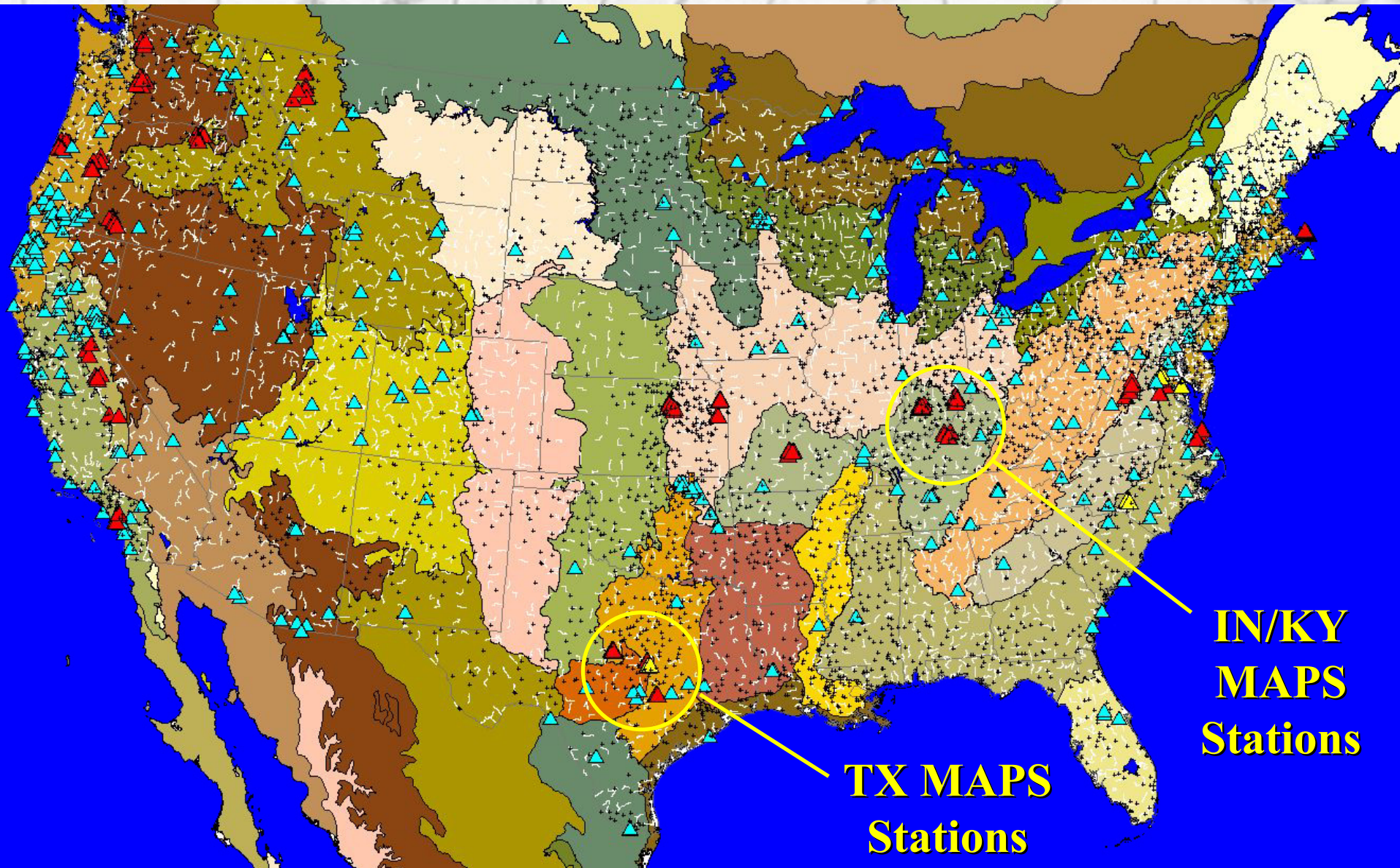
Integrated Monitoring

- Bird monitoring – Breeding Bird Survey of adult abundances can indicate declines
- Weather and climate – various databases available
  - *NOAA Cooperative weather monitoring database*
  - *GPCP historical gridded model*
- Land cover – various databases available
  - *NLCD 1992 NLCD 2000 ?????*
  - *IKONOS 4m resolution stereo multispectral*
- Habitat condition – seasonal greenness indices from AVHRR and other satellite datasets

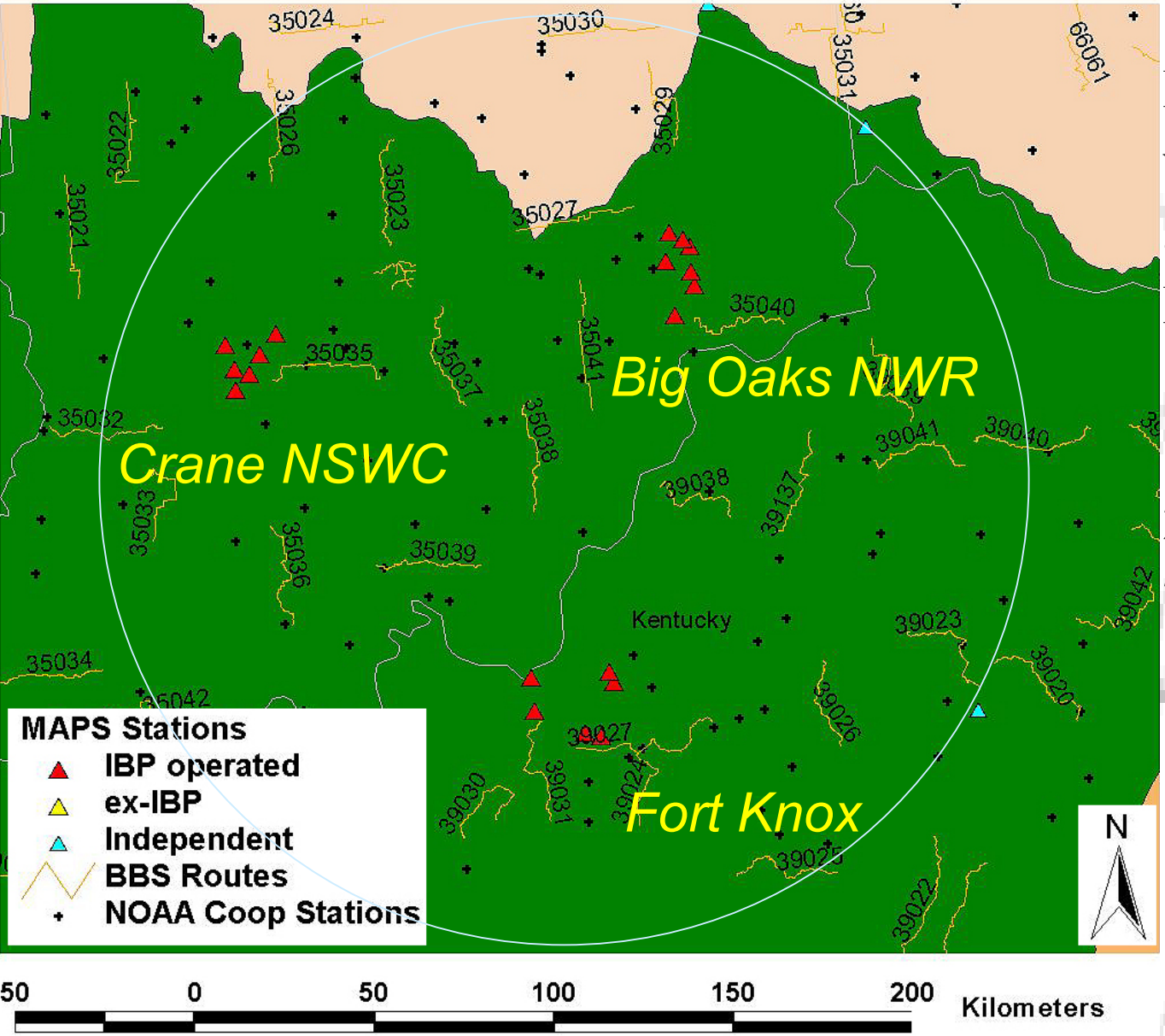
… including BBS routes



… and NOAA Cooperative Stations

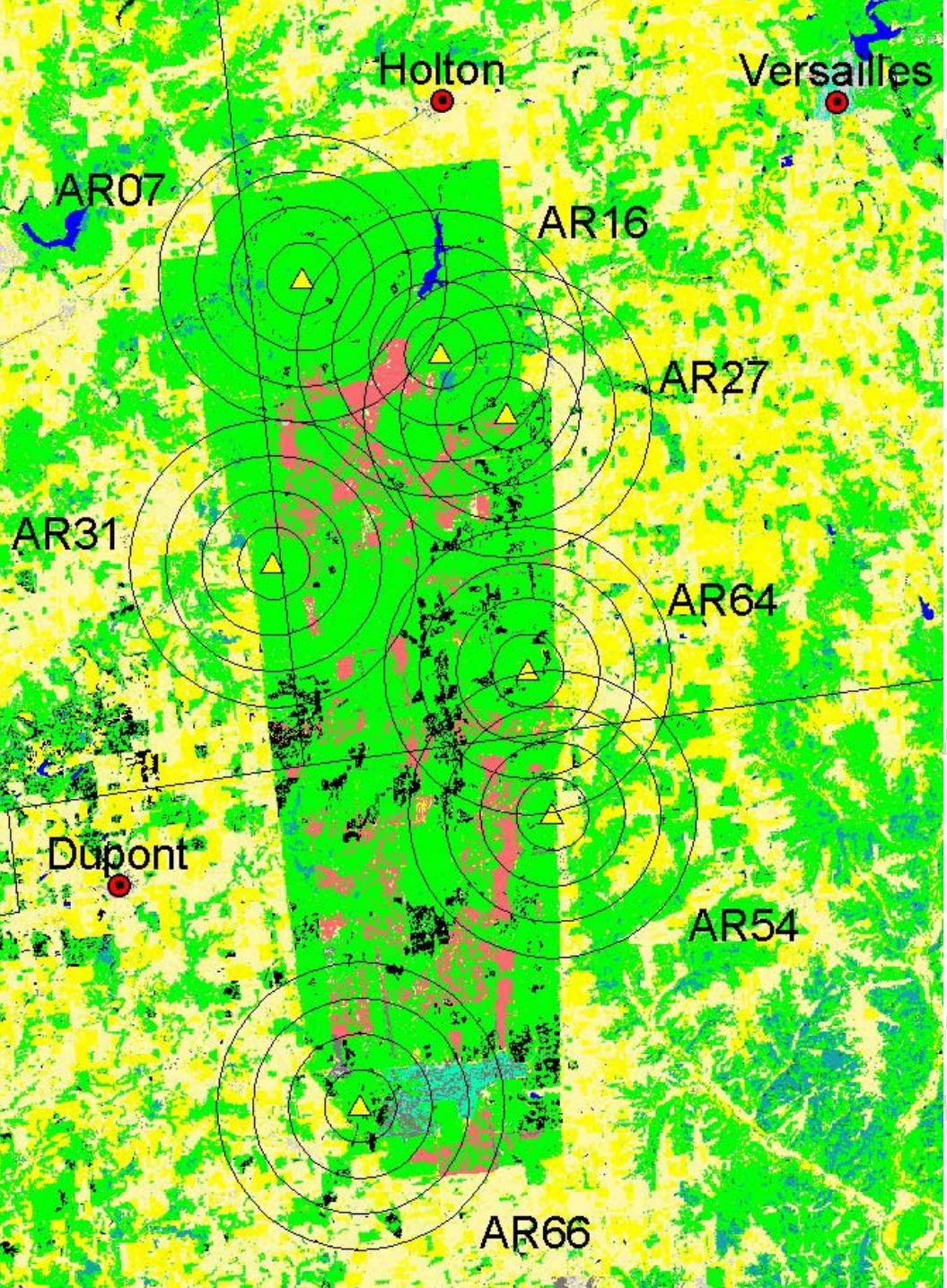


Locations of IN/KY MAPS Stations within NABCI Region #24 (Central Hardwood)



Incorporated within a 50,000km^2 area of NABCI Region #24 are:

18 MAPS stations
24 BBS routes and
75 NOAA stations

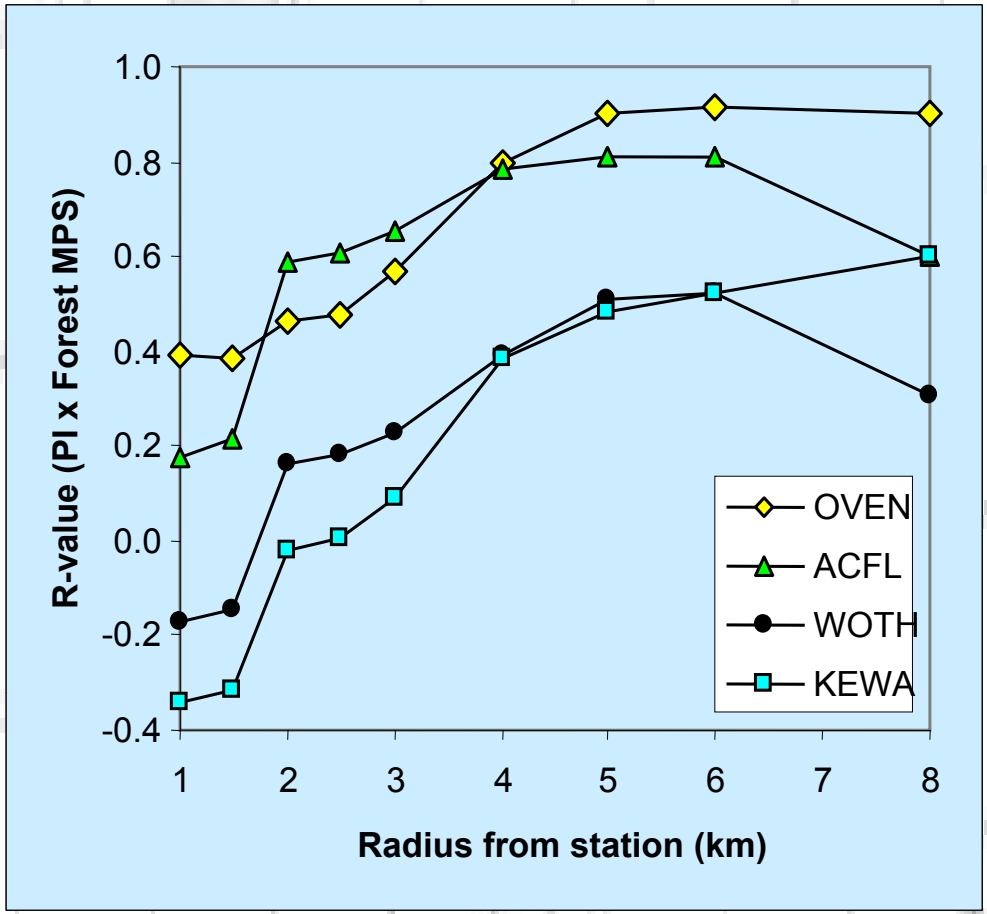


National Land Cover Dataset (NLCD) coverage for Big Oaks National Wildlife Refuge, IN depicting 1- 4km buffers

NLCD Classification

- Open water
- Perennial Ice/Snow
- Residential (Low Intensity)
- Residential (Medium Intensity)
- Residential (HighIntensity)
- Bare Rock/Sand/Clay
- Quarries/Mines/Pits
- Transitional
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrubland
- Orchards/Vineyards
- Grassland/Herbaceous
- Pasture/Hay
- Row Crops
- Small Grains
- Urban/Recreational Grasses
- Woody Wetlands
- Herbaceous Wetlands

Scale of response



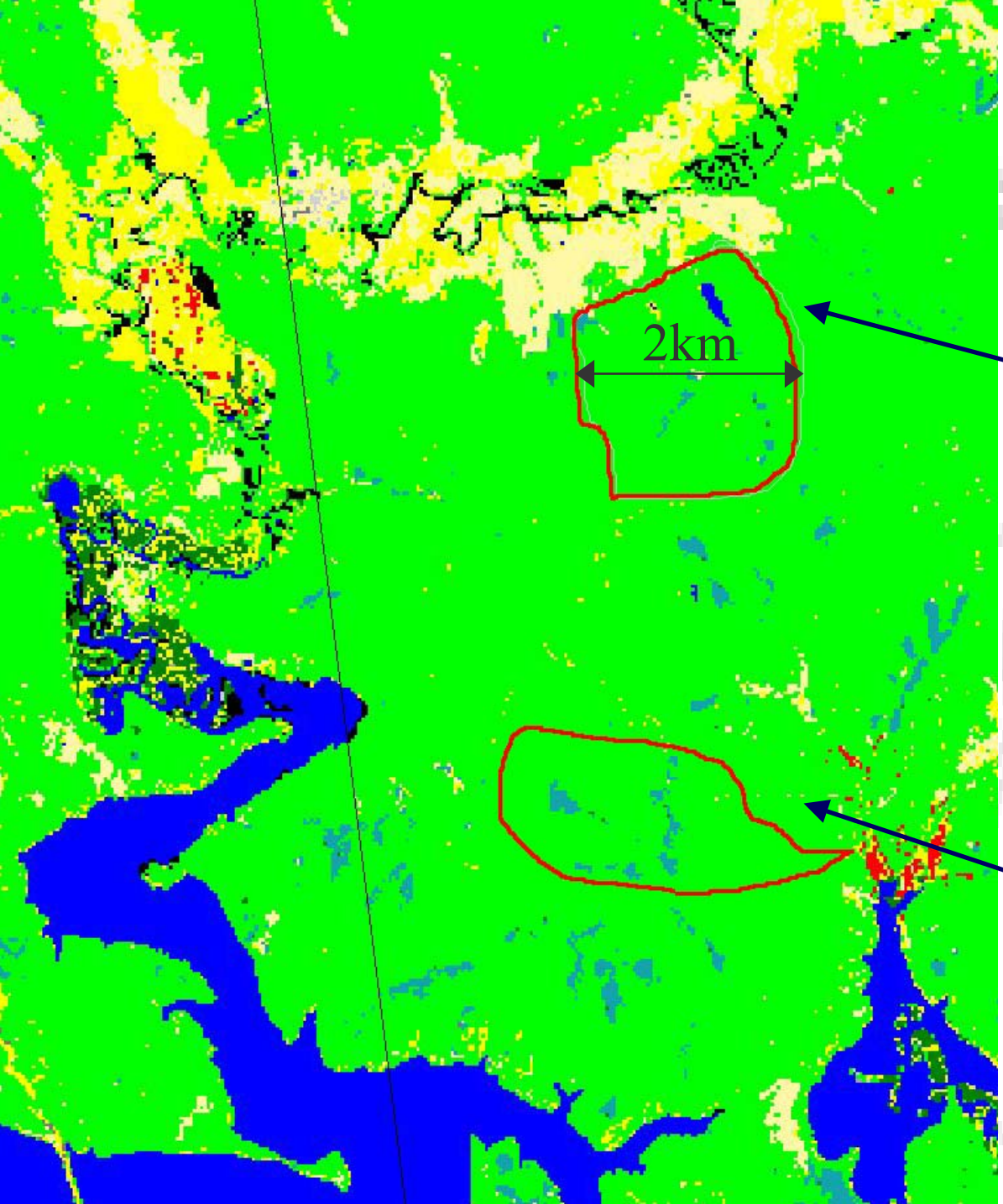
Correlations strengthen as a function of radius from the station

Overall strengths of relationships vary among species

Response curves similar among stations

Landscape Determinants for 9 Species

	ADULTS			YOUNG		
SPECIES	METRIC	*r*	P	METRIC	*r*	*P*
Forest interior species						
Ovenbird	WMPS	0.92	<0.01	WMPS	0.97	<0.01
Acadian Flycatcher	WMPS	0.99	<0.001	WMPS	0.98	<0.001
Wood Thrush	WMPS	0.86	<0.05	WMPS	0.86	<0.05
Kentucky Warbler	WMPS	0.88	<0.05	Crop/Grass%	-0.94	<0.01
Edge/successional species						
Northern Cardinal	DEVEL%	0.88	<0.05	WOFOMNN	-0.84	<0.05
Gray Catbird	WFEDGE	0.92	<0.01	DEVEL%	0.96	<0.005
White-eyed Vireo	WFEDGE	0.96	<0.005	WFEDGE	0.80	*<0.10*
Indigo Bunting	WFEDGE	0.79	*<0.10*	TRAN%	0.83	<0.05
Common Yellowthroat	WFEDGE	0.96	<0.005	WFEDGE	0.96	<0.005



National Land Cover Dataset (NLCD) coverage for depicting study areas of Thomas Ford et al. 2001 in south-central Indiana

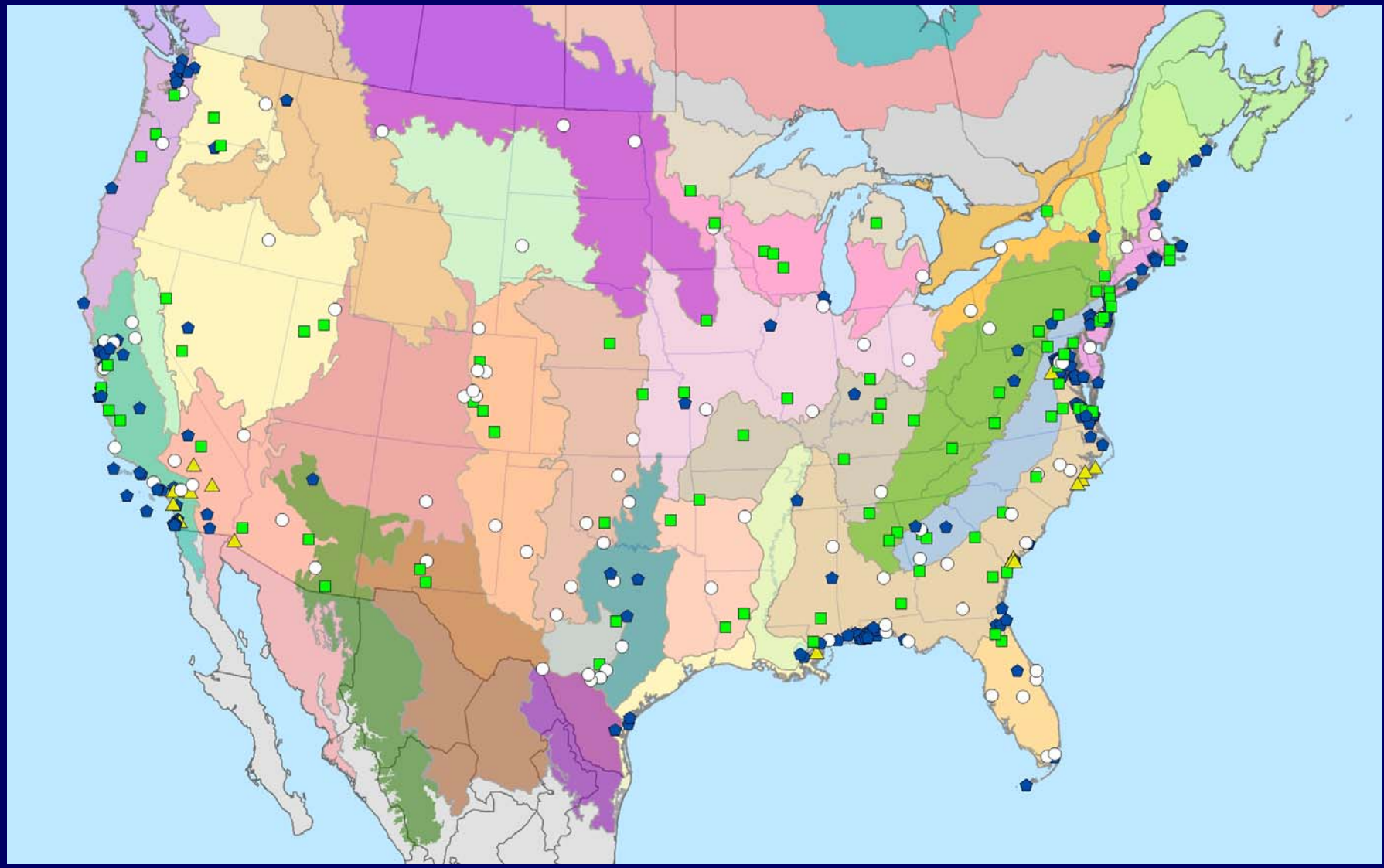
Forested study site
is proximal to agricultural corridor and associated with:

Higher cowbird parasitism and fewer fledglings per nesting attempt than

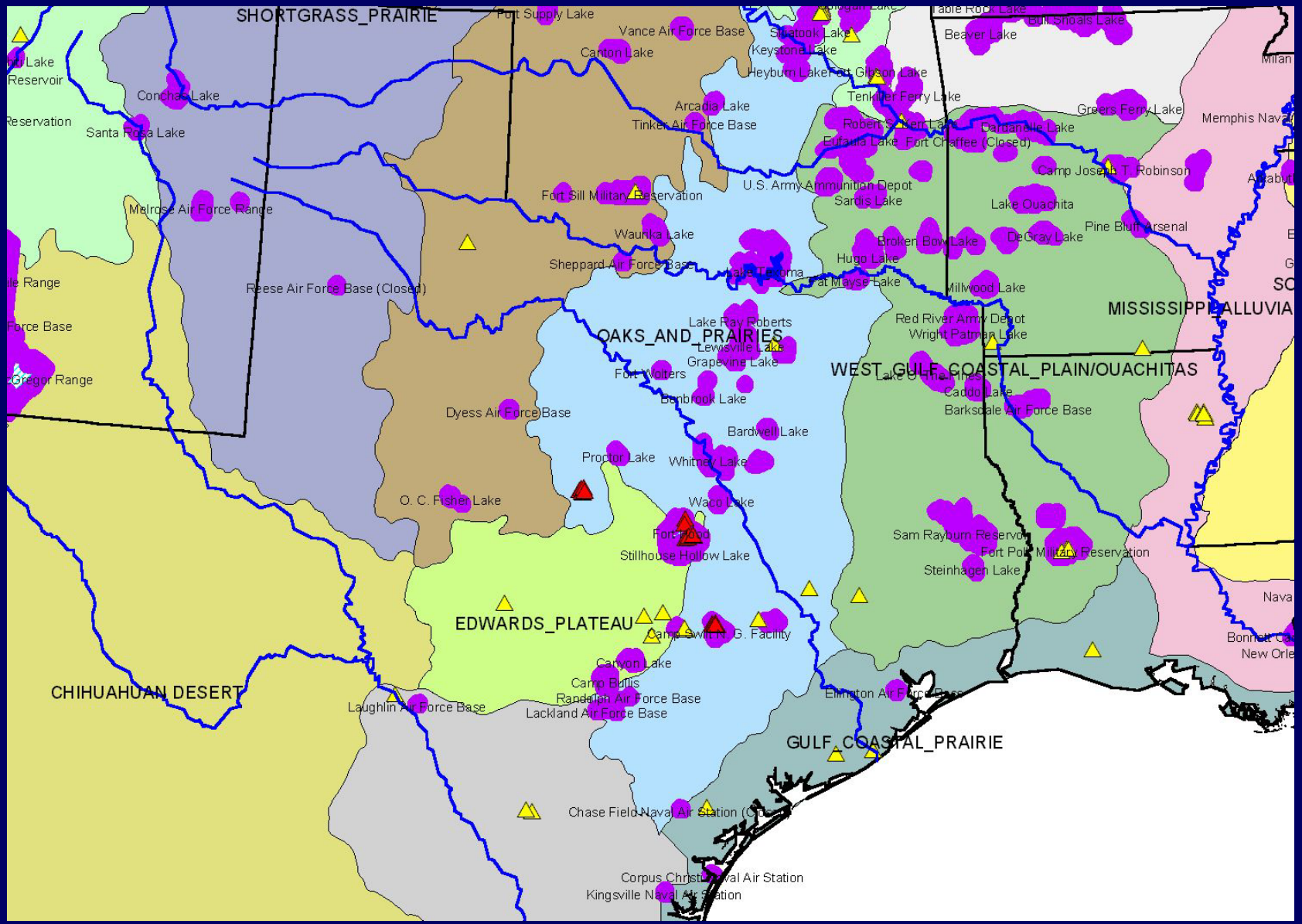
Heavily forested site

for Red-eyed Vireo, Ovenbird, Wood Thrush, and Worm-eating Warbler

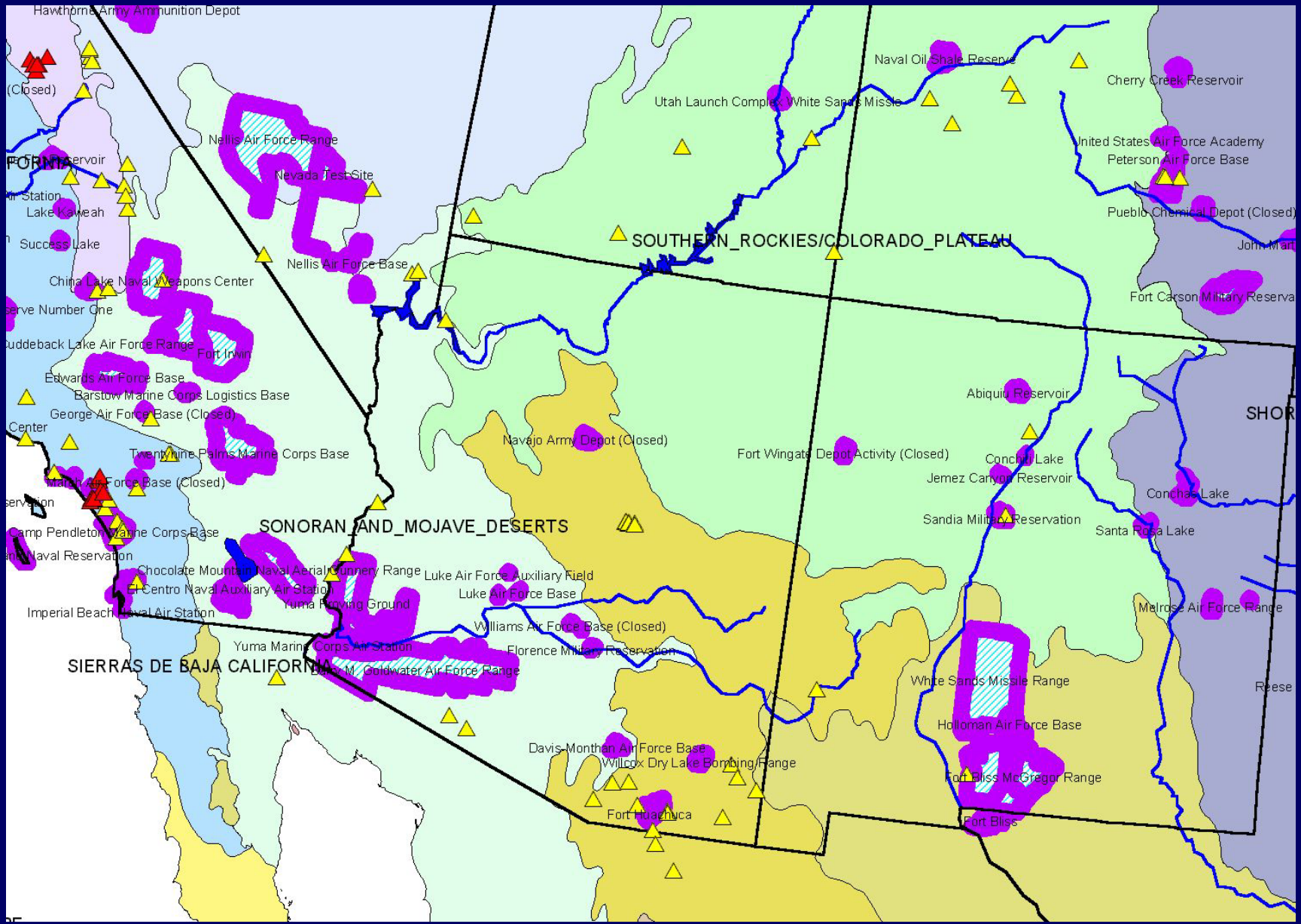
Military Lands and Bird Conservation Regions



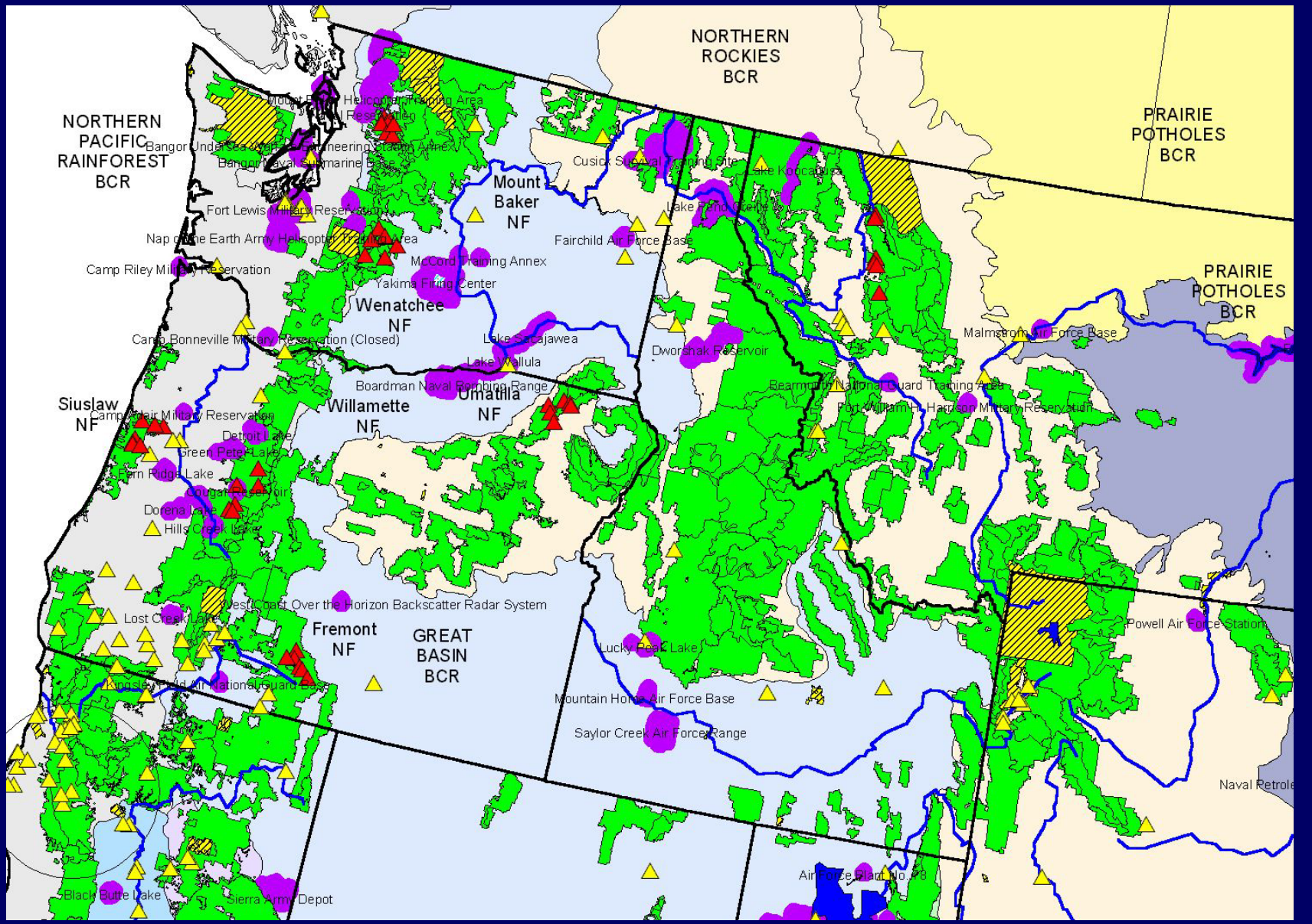
Oaks & Prairies – Edward's Plateau



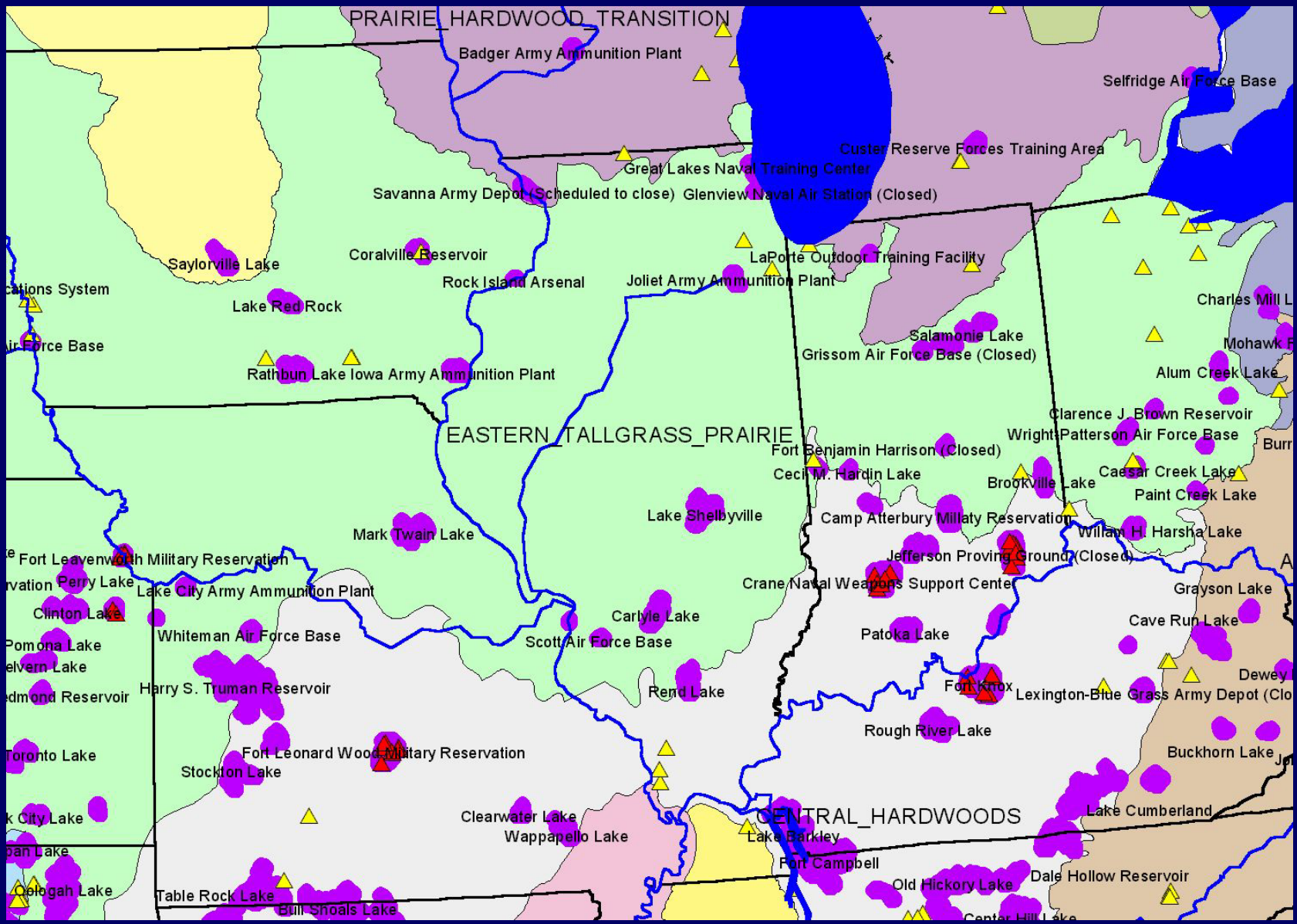
Southwestern Deserts – Stopover Habitat



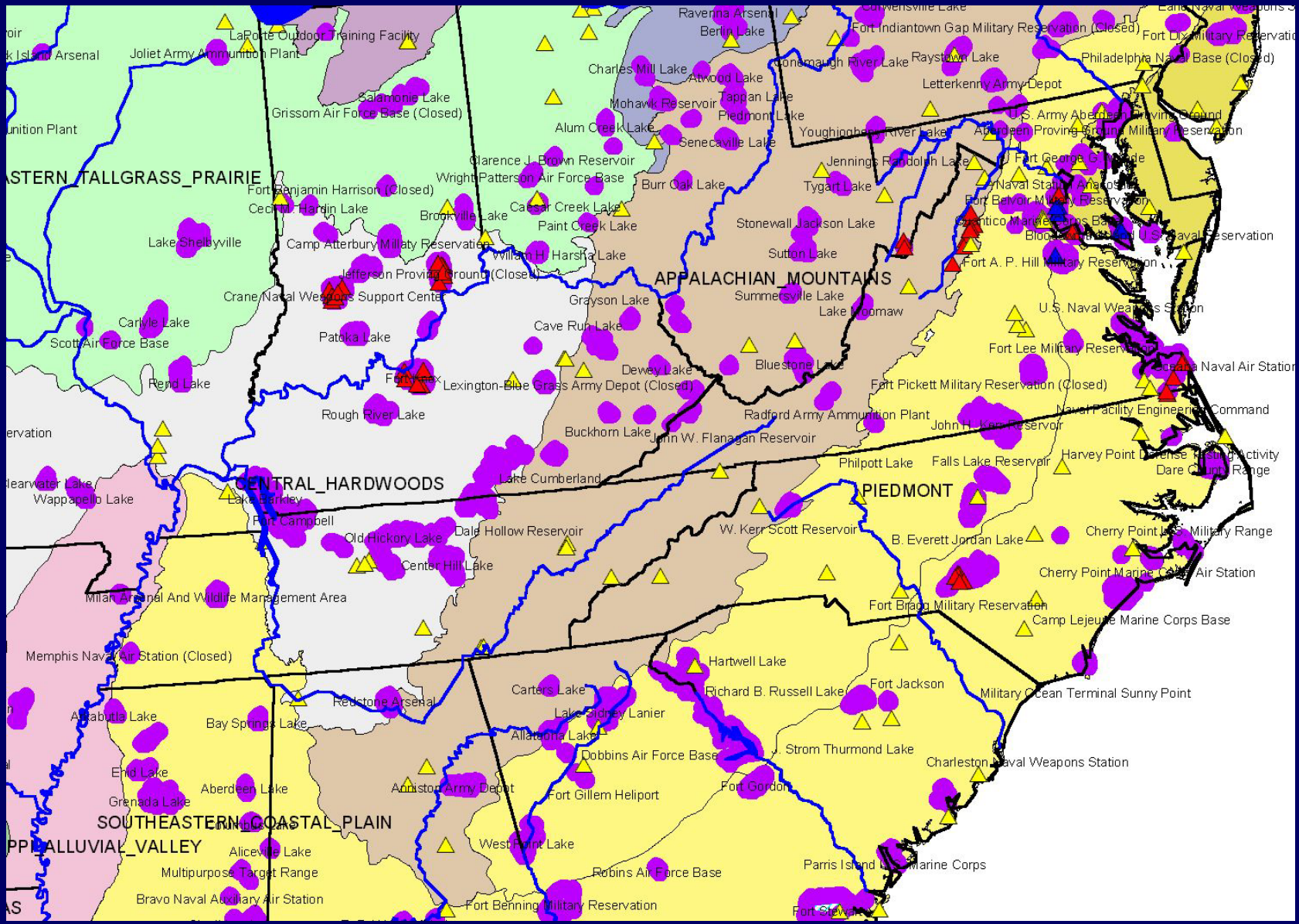
Pacific Northwest – DoD/USFS/BLM/BIA



Eastern Tallgrass Prairie – MAPS ?



Piedmont and Appalachians



Summary

- Demographic monitoring (MAPS) has produced valuable data to enable avian population modeling efforts
  - *Survival rate estimates from spatially pooled data*
  - *Estimates high or low compared to expectations*
  - *Strong links to climate/weather*
- Combining MAPS and USGS NLCD data at regional scales can provide useful land management models for Birds of Conservation Concern
  - *Requires consideration of regional trends and local influences*
- A requirement exists to construct "performance measures" based on data from surrounding region