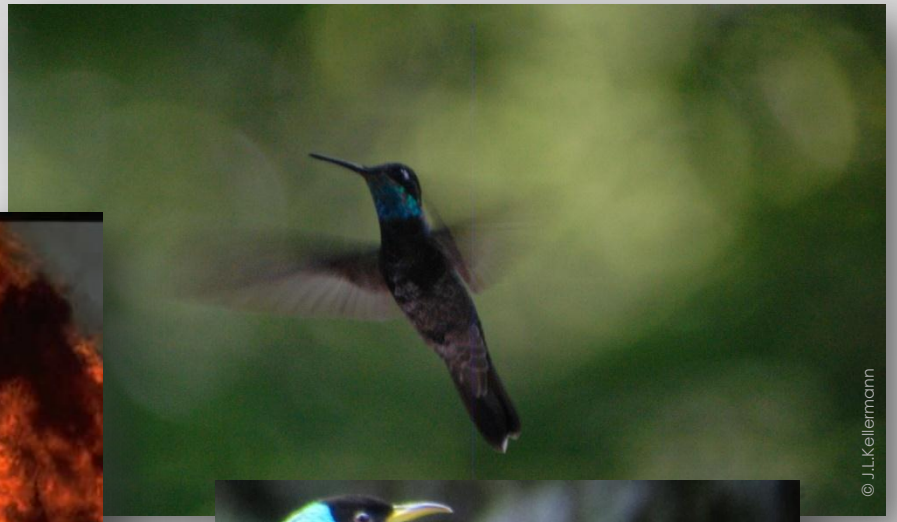
# Avian Fire Ecology





# Avian & fire ecology involve different ecological processes and mechanisms depending on SCALE!

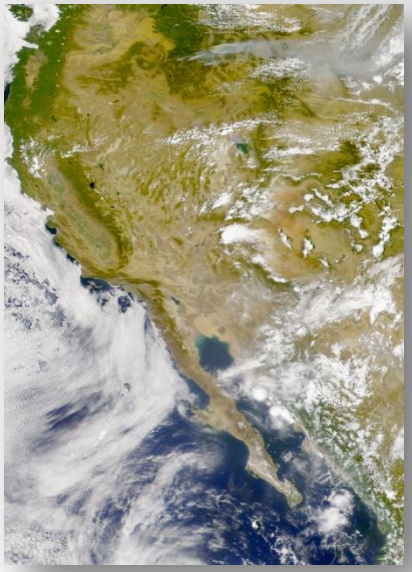
## Global

Climate

Phylogeny
&
Drought

## Continental

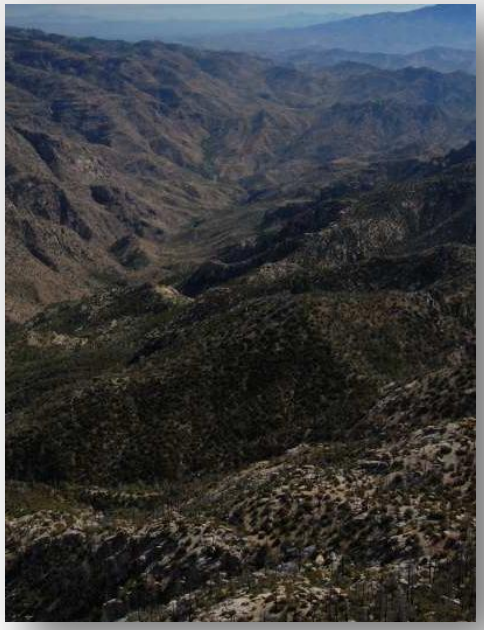
Climate
Topography



Flight capacity
&
Fire spread

## Regional

Climate
Topography
Habitat mosaic



Physiological tolerance & fire tolerance

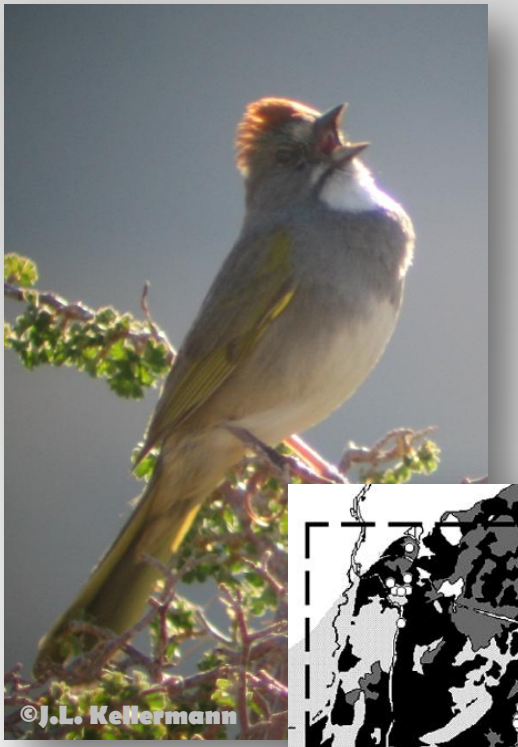
## Local

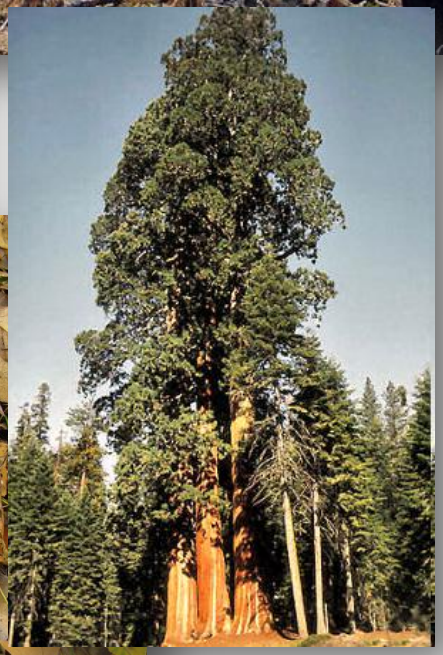
Climate
Topography
Habitat mosaic
Phenology

Food availability & Competition

# Fire Ecology & bird habitat

1) Fire severity
2) Time since fire
3) Fire frequency
4) Fire mosaic
5) Fuels & components
6) Fire tolerance
7) Pre & Post Fire Conditions



# Avian Fire Ecology

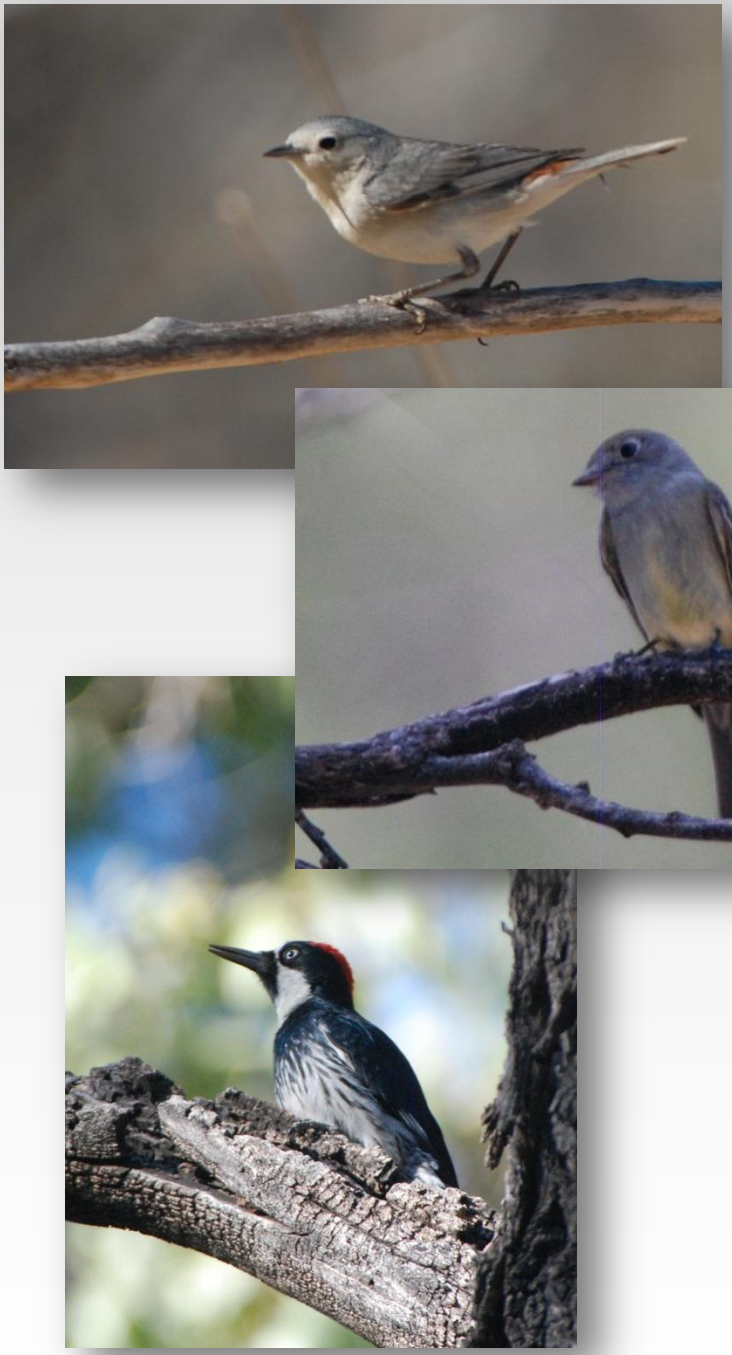
1) Short- vs. long-term

2) Phenological period (Breeding, wintering, migration)

3) Life history

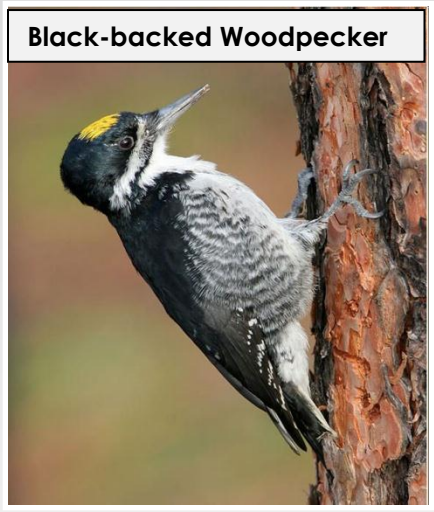
4) Phenotypic plasticity

5) Population & Community dynamics



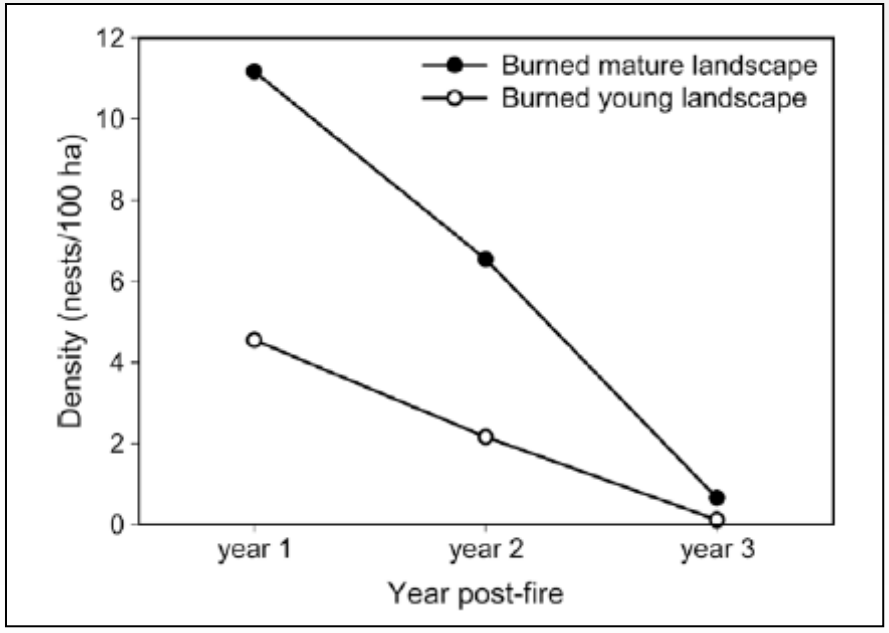
# Avian Fire Ecology 1) Short- vs. long-term Responses

Boreal Spruce Forest



Black-backed Woodpecker

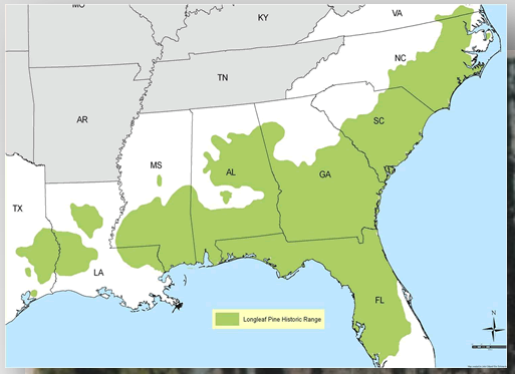

**Severe Fire** → **Temporal Constraint** ← **Saproxylic insects**




(Nappi & Drapeau 2009 Bio. Cons.)

# Avian Fire Ecology

## 1) Short- vs. long-term Responses








Red-cockaded Woodpecker

**Longleaf Pine (*Pinus palustris*)**

- <3% original range - Logging
- < 400 ha in old growth
- Highly fire resistant
- Fire kills competition
- Fire suppression
- Harwood mid-story encroachment

- Old trees – cavities
- Red-heart fungus
- Sap flow
- Cooperative excavation
- Open forest - foraging

# Avian Fire Ecology

*Phenology* – timing of life cycle events

## 2) Phenological Period

### Breeding

- Nest strata
- Competition
- Predation
- Fecundity
- Survival

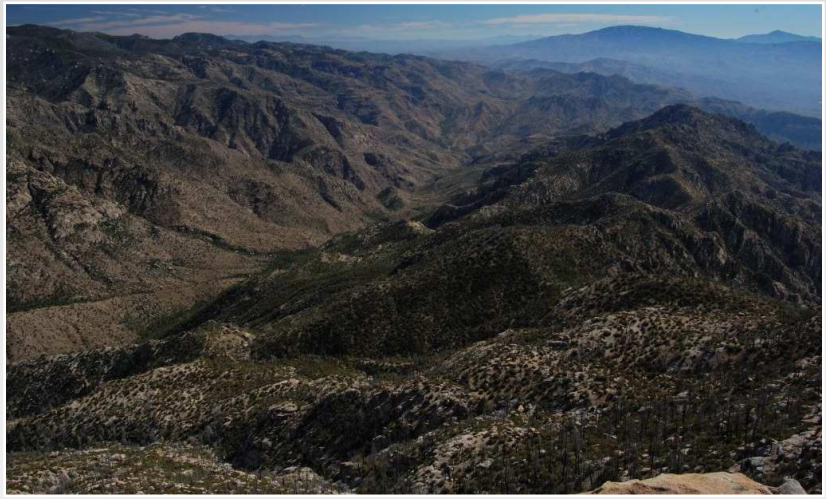
### Migration

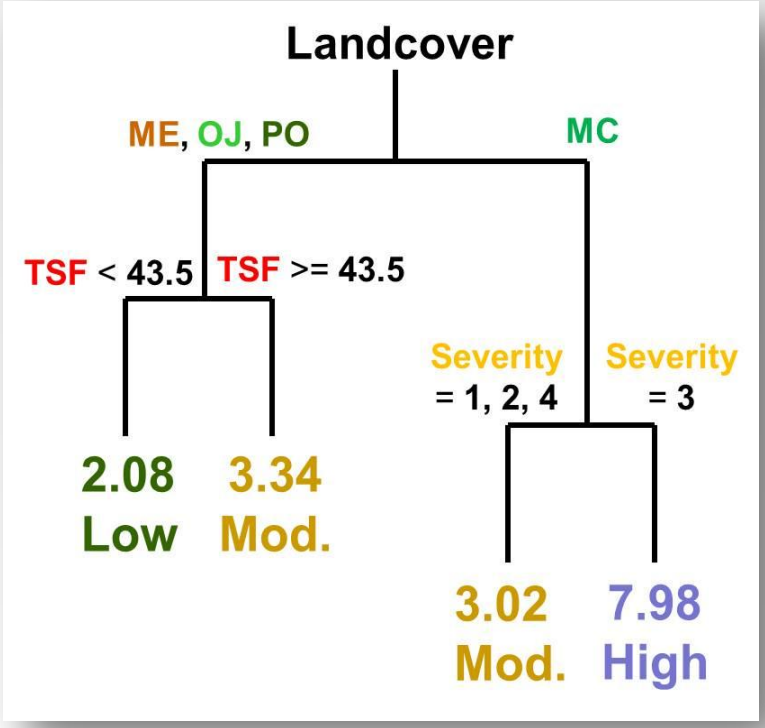
- Migration route
- Habitat use
- Fat accumulation
- Competition
- Predation
- Arrival timing
- Survival

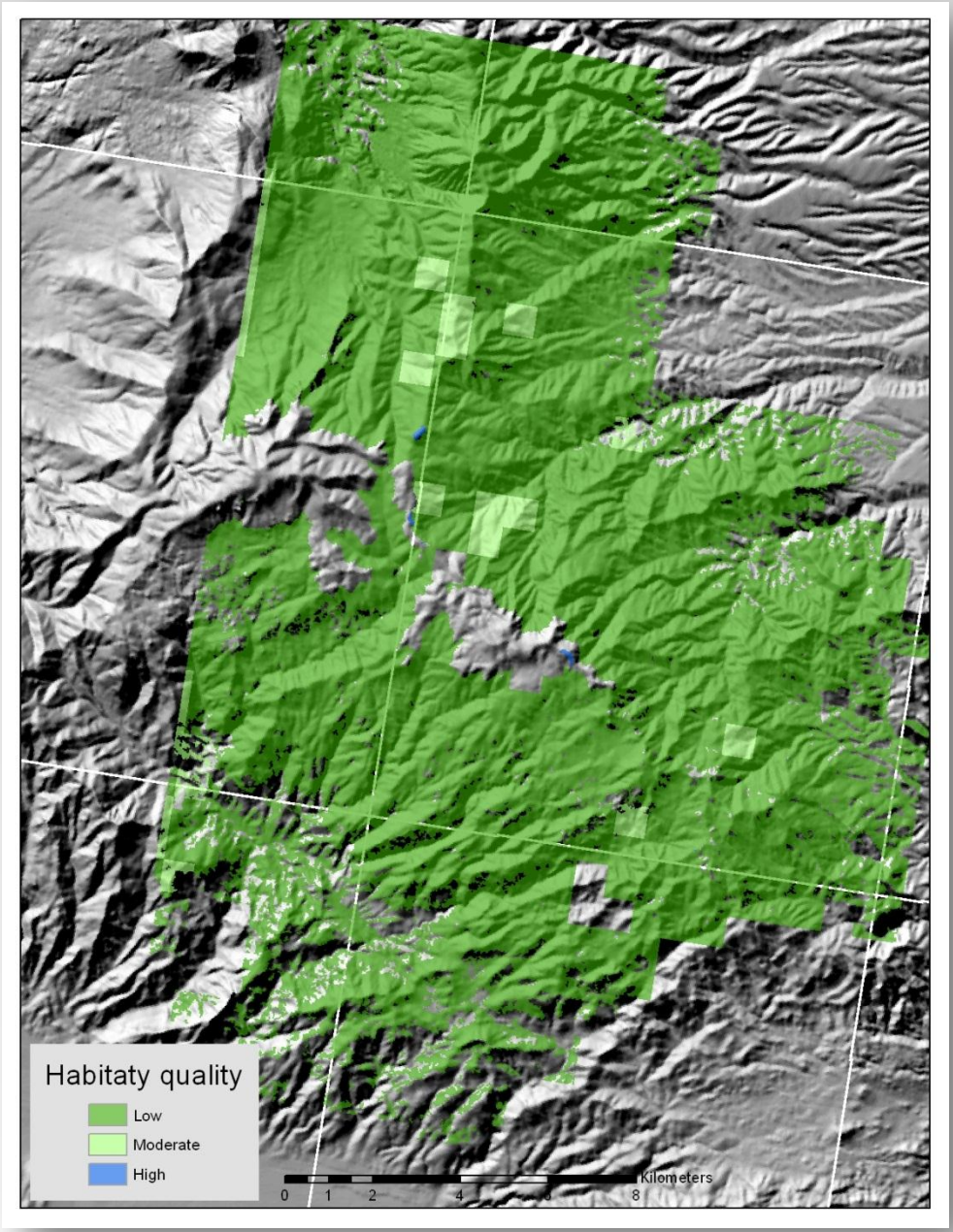
### Wintering


- Habitat use
- Fat storage
- Competition
- Predation
- Arrival on breeding territory
- Survival

# Migration patterns and fire mosaic





# Avian Fire Ecology

## 3) Life History (Guild)

| | N[a] | Positive | Negative | No response | Mixed response |
|---|---|---|---|---|---|
| Nest Type | | | | | |
| Closed nesters | 244 | 36 | 18 | 40 | 5 |
| Open nesters | 544 | 29 | 23 | 39 | 9 |
| Cowbirds | 6 | 50 | 0 | 50 | 0 |
| Nest layer | | | | | |
| Ground nesters | 215 | 35 | 21 | 37 | 7 |
| Shrub nesters | 150 | 25 | 33 | 35 | 7 |
| Canopy nesters | 423 | 31 | 18 | 42 | 9 |
| Cowbirds | 6 | 50 | 0 | 50 | 0 |
| Foraging guild | | | | | |
| Aerial insectivores | 90 | 48 | 9 | 34 | 9 |
| Bark insectivores | 103 | 34 | 20 | 38 | 8 |
| Ground insectivores | 120 | 31 | 22 | 39 | 8 |
| Foliage insectivores | 164 | 17 | 30 | 47 | 5 |
| Carnivores | 17 | 35 | 18 | 41 | 6 |
| Nectarivores | 4 | 50 | 0 | 25 | 25 |
| Omnivores | 296 | 32 | 21 | 37 | 9 |

[a] Number of species-study combinations.

(Saab & Powell 2005)

# Avian Fire Ecology

## 4) Phenotypic Plasticity

Low → High

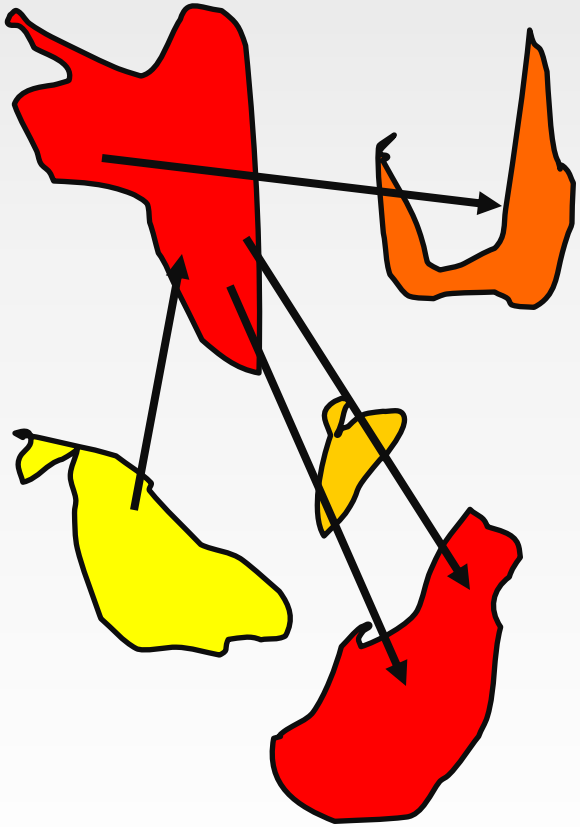
- Behavioral: Foraging, Competition
- Habitat: Vegetation structure, Plant species
- Diet: Food type, size
- Morphological: Bill size, plumage

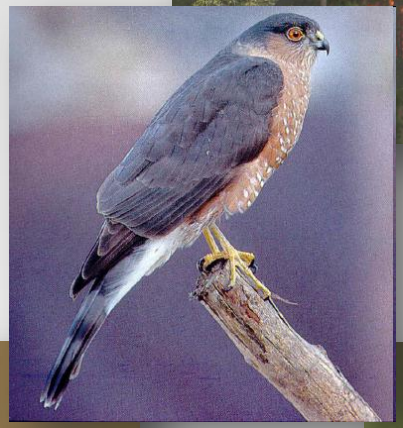
# Avian Fire Ecology

## 5) Population & Community dynamics

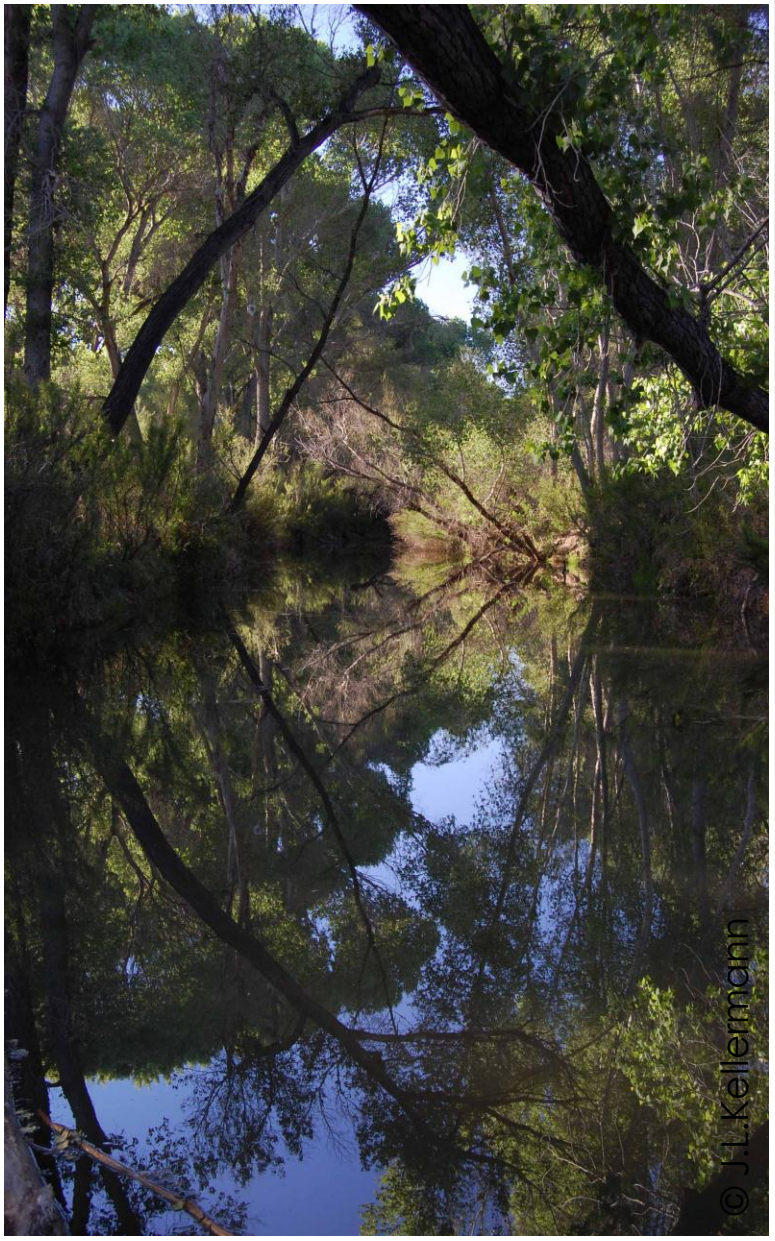
**Source–sink dynamics**

**λ < or > 1**





# Ecological community examples



# Dessert Grasslands

**Historic Fire regimes:** 7-10 yrs

**Grassland – Desert – Shrub/woodland boundaries**

**Decrease grass cover**

**Increase forb cover & diversity**

**Increase seed production**

**Reduce woody cover**

## Interactions:

Grazing

Invasive species

**Maintain Mosaic**

# Riparian/Aquatic

**Historic Fire regimes:** ?

Flow regimes

Turbidity

Ph, $O_2$

Channel morphology

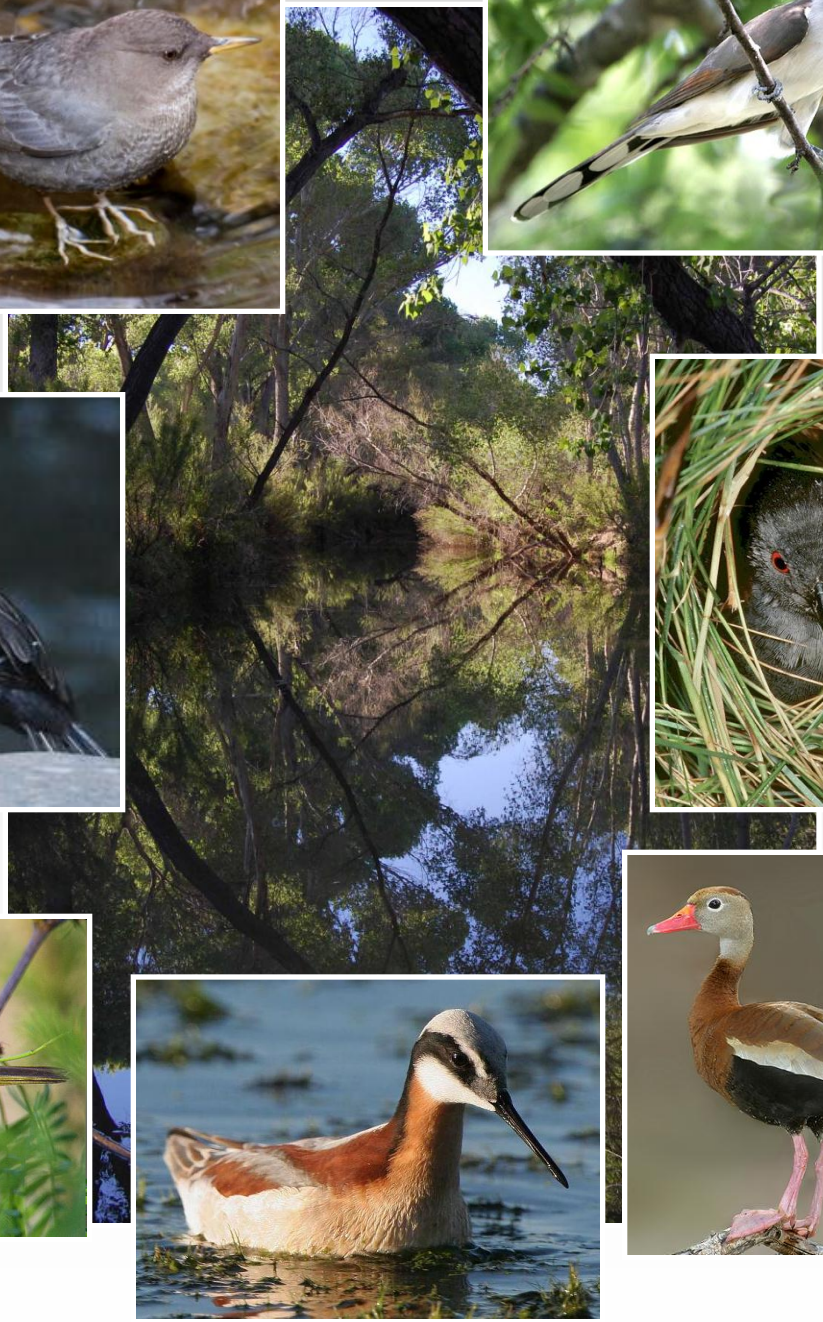
**Aquatic invertebrates**

**Fish & herptofauna**

**Wetland loss**

**Stopover habitat**





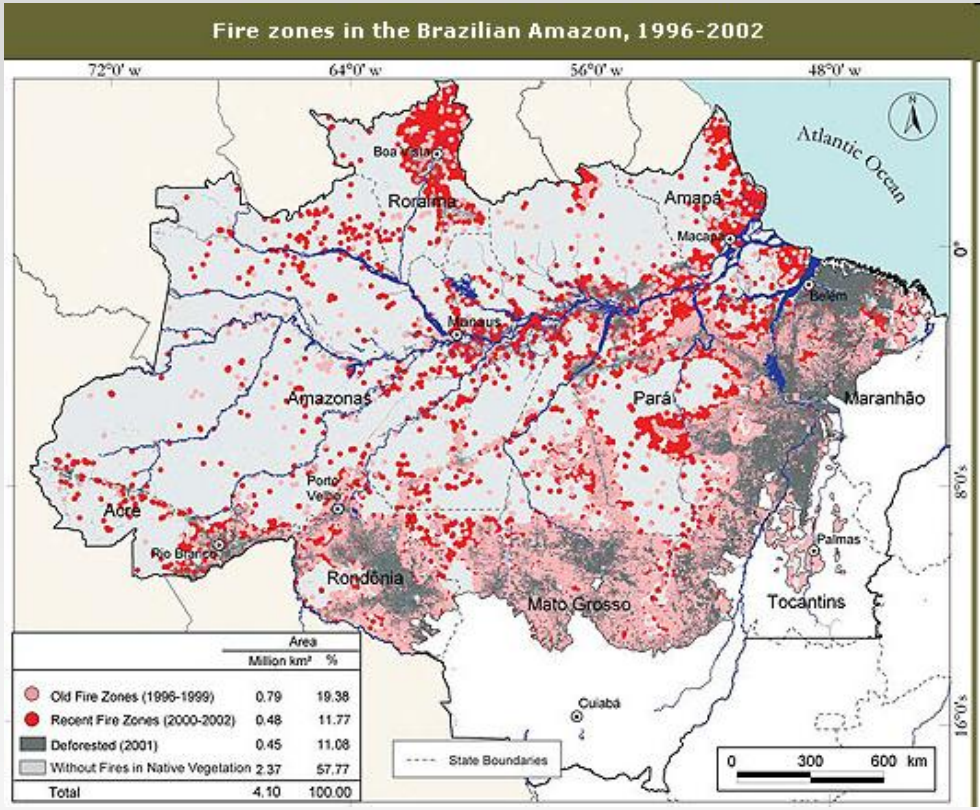

# Tropical rainforest

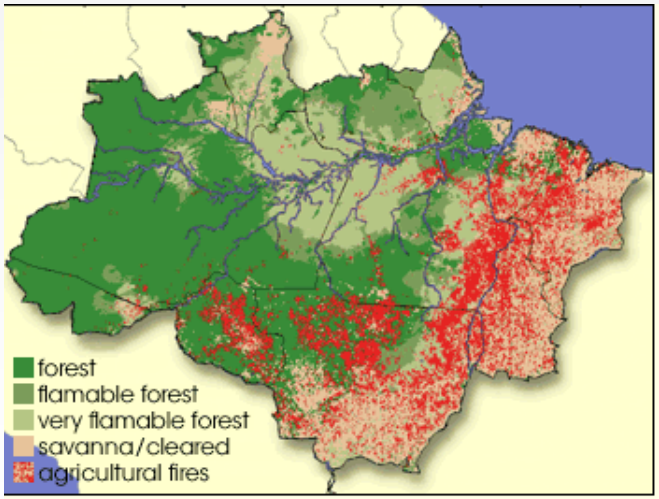
Low:
Frequency
Severity

High:
Diversity
Endemism

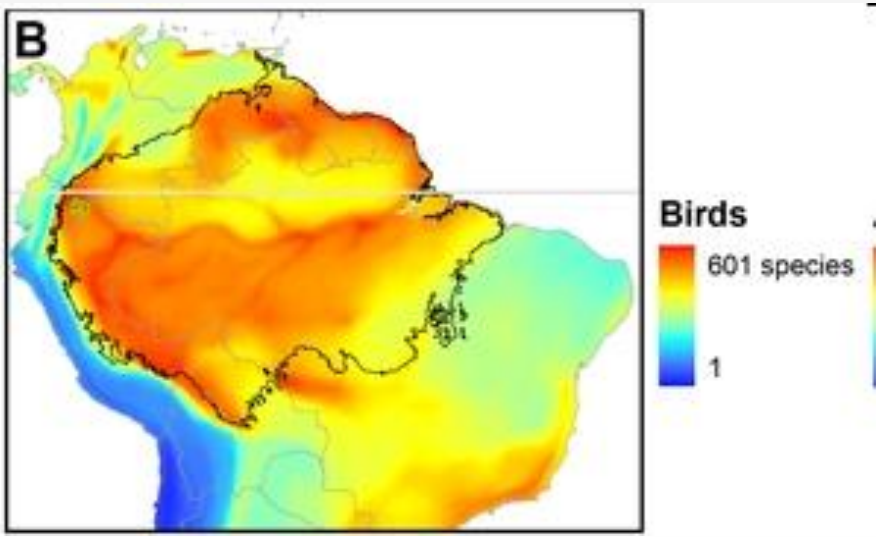
Understory
species

Chestnut-crowned Antpitta



from the Earth Observatory-NASA website (link in text)



# **Case Study –** Kirtland's Warbler

**Long-distance migrant**

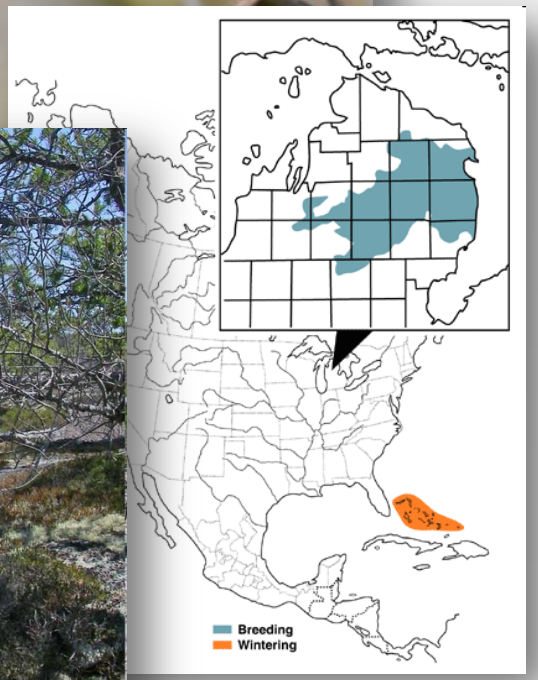
**Ground nester**

## Jack Pine Habitat

**Dense tree clumps interspersed grass**

**Max tree ht. ~5m**

**Grayling sand substrate**




## Fire & Jack Pine

**Fire removes old trees**

**Serotinous cones**

# Conclusions

**Adaptive plasticity**

**Life history traits**

**Life cycle stages**

**Intensity and Time since fire**

**Habitat Mosaics**

**Interactions:**

- Grazing
- Drought
- Human development
- Invasive species
- Resource extraction





## Climate Change

# So you want to be an ornithologist?


http://www.osnabirds.org/jobs.aspx

## ECOLOG-L

https://listserv.umd.edu/archives/ecolog-l.html

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Department of Wildlife and Fisheries Sciences

http://wfscjobs.tamu.edu/job-board/

Society for Conservation Biology

http://www.conbio.org/jobs/