The impact of forest management on avian communities in the central pine barrens of Long Island, New York

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Abstract

The **Atlantic coastal pine barrens are a rare ecosystem** that **requires regular fire** to persist. **Fire suppression** has caused large portions of these fire-dependent systems to be **lost or degraded** alongside the accumulation of **excess fuel** in the canopy and understory, **increasing the risk of greater damage should a wildfire occur**. Without fire, the **barrens become more like a dense forest**, which will be less suitable for shrubland birds, a suite of species that is facing decline in the northeast. It is **hypothesized** that fuels **management** regimes for these overgrown barrens will promote shrubland birds and **lead to an overall greater richness and diversity of bird species**. **Bird communities in areas with or without management were compared.** While all the transects surveyed had a relatively similar evenness of species, **the transect with regular management exhibited** a greater richness of species, and thus a **wider diversity.**

Materials & Methods

EPD Point Count Data

Point Counts

- **14 points** along **3 transects** surveyed
- Plots within transects were ~300 meters apart
- Each point count lasted **5 minutes**

South Transect

- 5 points
- **Control** (No active management)
- Mostly pitch pine/mixed oak-heath forest

Forest Management Transect

- 5 points
- **Regular management** (fire/mechanical)
- Mostly pitch pine/mixed oak-heath forest

Z-Path Transect

- 4 points: 3 within and 1 near the perimeter of the **Crescent Bow Wildfire (2012)**
- No management since wildfire
- Mostly pitch/white oak forest

Analysis

- **Shannon Diversity Index**: Used to determine richness, diversity, evenness, and the number of effective species for each transect by year.

Figure 1: Survey point on South Transect.

Figure 2: Recently burned Forest Management unit.

Figure 3: Survey point on the Z-Path Transect.

Introduction

Shrubland birds are a **moderate to high conservation priority** in the northeastern US (Dettmers 2003) and the **Atlantic coastal pine barrens** can provide some of the **highest quality shrubland** habitat that **must experience regular fire** to be maintained (Bried et al. 2014).

The contemporary **removal of fire** allows tree oaks to outcompete the more fire-adapted pitch pines, leading the habitat to homogenize and **transition towards a denser, more mesic forest** as other non-fire-adapted species make their way in (Jamison et al. 2023).

When fire is returned to this system, even for primarily fuel mitigation purposes, the ecosystem can experience a **restoration effect** that helps more fire-adapted species become dominant and open the canopy for shrublands to return. This reversal of the effects of fire suppression helps to create more **suitable habitat for shrubland birds** and thus **increase bird diversity** (Bried et al. 2014). The **management** of these systems **is necessary for safety and conservation** (Jordan et al. 2003).

Table 1: The richness, evenness, Shannon diversity, and number of effective species for FM, ZP, and ST in 2025.

2025	FM	ZP	ST (Control)
Richness	53	43	36
Evenness	0.812	0.768	0.789
Diversity	3.223	2.890	2.829
Effective Species	25.108	17.997	16.925

2011	ZP	ST (Control)
Richness	31	26
Evenness	0.828	0.843
Diversity	2.843	2.747
Effective Species	17.164	15.602
2012		
Richness	30	21
Evenness	0.860	0.836
Diversity	2.925	2.545
Effective Species	18.628	12.749
2013		
Richness	32	29
Evenness	0.853	0.818
Diversity	2.956	2.754
Effective Species	19.225	15.702
2015		
Richness	38	32
Evenness	0.789	0.82
Diversity	2.87	2.841
Effective Species	17.641	17.126
2017		
Richness	37	25
Evenness	0.834	0.857
Diversity	3.011	2.758
Effective Species	20.313	15.764

Table 2: The richness, evenness, diversity, and number of effective species for ZP and ST in 2011, 2012, 2013, 2015, and 2017.

Results

- Even though **FM had values greater** than those of ST and ZP, none of the transects differed too greatly in any category **(Table 1).** There were no statistically significant differences in the species observed between any of the transects.
  - FM vs. ST: p=0.23
  - FM vs. ZP: p=0.27
  - ZP vs. ST: p=0.99
- For 2011, 2012, and 2013, there was **no statistically significant difference** in the species observed **between ZP and ST.** For all three years, both transects maintained high evenness and moderate diversity values **(Table 2).**
  - 2011: p=0.76
  - 2012: p=0.52
  - 2013: p=0.51
  - 2015: p=0.51
  - 2017: p=0.07

Discussion & Conclusions

Sources of Error

- The **FM transect** was just **across the road** from areas that were predominately **non-managed** with **ZP close by** (Schwager 2021). It is highly likely that a bird foraging in a non-managed area could simply fly across the dirt road to forage in a managed area, and vice versa, even if that area is less desirable (Yap et al. 2017). This **could explain some of the similarities** seen in diversity values for each transect.
- **Point count data available for FM only goes as far back as April of 2025**. Several more years of data would be ideal to get a clearer picture of how the bird community may change over time after regular management.
- It must also be noted that the **areas of management are small at BNL**, with only approximately **100 total acres** being **treated** (Schwager 2021).

Takeaways

- The **FM values** still possibly **reflect how management is helping the area become more diverse in its landscape**. As the canopy is thinned out, birds adapted for shrubland conditions might be better able to take advantage of the area, increasing the observed diversity.
- **Long-term and large-scale management is necessary to keep people safe and to restore the landscape mosaic, and thus the biodiversity, of the CPB**. This can be seen in the slight increase in diversity for ZP from 2011 to 2017 (Table 2), likely due to the boom of understory growth following the wildfire. As fire didn't return for 13 years, diversity went back down for this transect (Table 1).

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