The impact of CBSM on birds along the Atlantic coast

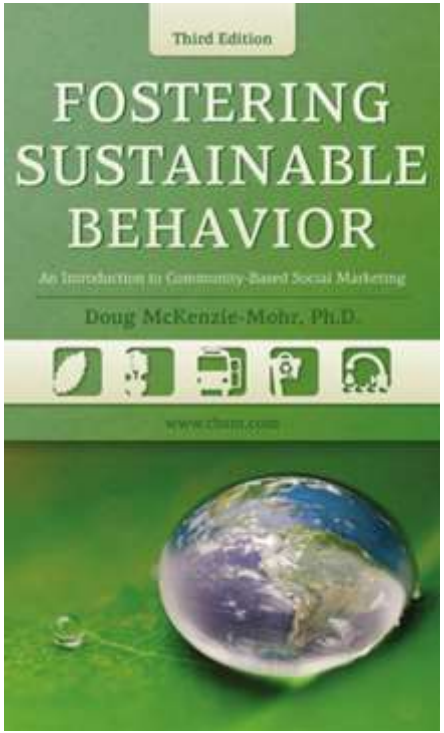
NFWF Phase 4 point counts + behavioral surveys

Sarah Saunders, National Audubon Society
Nicole Michel, National Audubon Society
Sami Livingston, Virginia Tech
Ashley Dayer, Virginia Tech

Shorebirds are at risk along the Atlantic Flyway

Atlantic coast shorebird land managers rated human disturbance as a leading threat to shorebirds (Comber & Dayer 2019)

Canv



Community-based social marketing (CBSM)

CBSM is an approach that uses psychology and marketing techniques to encourage people to change their behavior

What is community-based social marketing?

Select a behavior to promote

Step 1

Identify the barriers and benefits

Step 2

Develop a strategy

Step 3

Pilot strategy

Step 4

Evaluate and implement broadly

Step 5

Outcomes of CBSM

Demonstrated promise in shifting human behaviors in a variety of contexts

Most evaluations of CBSM interventions focus on intermediate metrics

Lack of empirical evidence directly linking CBSM to biodiversity outcomes

Canva

Ardoin et al. 2020; Perez-Mujica et al. 2014;
Schillerstrom 2021; Smith et al. 2019; Thomas et al. 2019

For shorebirds in particular, the lack of direct evidence of biodiversity outcomes poses challenges for **assessing the return on investment** of CBSM strategies, and for **refining campaigns** to produce greater ecological impact.

Canva

Approach

Multi-state monitoring effort to evaluate the **biological impacts of CBSM campaigns** on breeding populations of **six shorebird species**

3 complementary datasets across **16 sites** in 5 states

Evaluate whether **dog-leashing, dog-free beaches, and walk-around-flocks campaigns** influence bird counts, reduce vigilance behaviors indicative of stress, and/or improve reproductive success

Photo by Shelby Casas

CBSM campaigns
*sites included in analysis

St. Simons*
Harbor Island*
Higgins Beach
Cherry Hill NR
Barachois Beach
Cape Cod

Lido Beach*
Monomoy NWR
Sunken Meadow
Gateway National
Recreation Area

Tybee Island*
Folly Beach*
Hirtles Beach
Rockaway Beach
VA Barrier Islands

Parker River NWR
Jones Beach*
Milford Point*
Long Beach*
Banco dos Cajuais

Do CBSM campaigns encouraging dog leashing influence bird abundance?

Point count analysis

Data collection

- 6307 point count observations of 7 species
  - 630 dog-leashing campaign; 5677 no-leashing campaign
- 16 sites in 5 states
  - Excluded dog-free campaign site

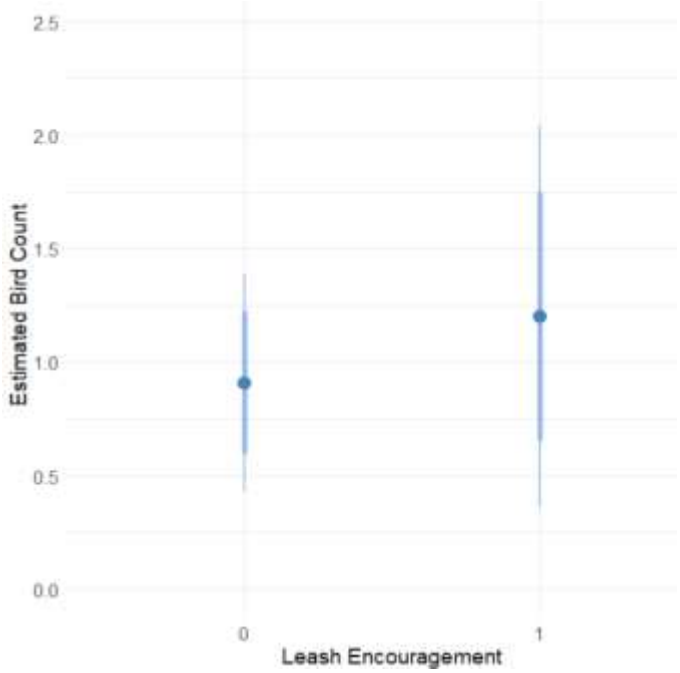
	PIPL	AMOY	REKN	WIPL	SAND	SESA	Peeps
Min./count	0	0	0	0	0	0	0
Max./count	22	108	2	26	232	1025	500
Total	**938**	**1713**	**3**	**197**	**2495**	**4739**	**1175**

Statistical analysis

Goal: Identify how dogs & leash encouragement jointly influence bird abundance

- Generalized Additive Model (GAM)
  - Captures complex, nonlinear relationships
- Negative binomial distribution to account for overdispersed bird counts
- Random effects for state and species
- Key interaction – three-way interaction between:
  - Leash campaign (presence/absence)
  - Leashed dog counts
  - Unleashed dog counts

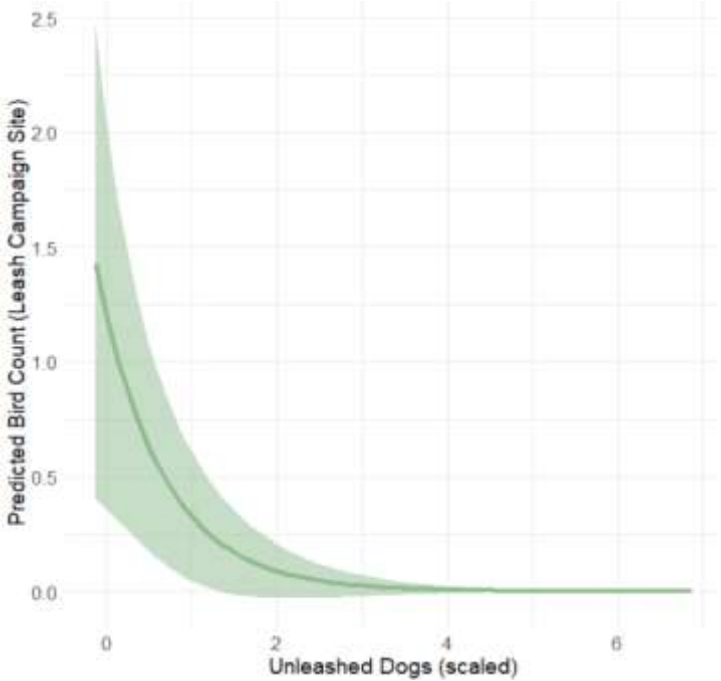
Finding #1: Leash encouragement alone does not increase counts



- Result: Leash campaigns alone don't significantly increase bird counts
- Potential explanations:
  - Compliance &/or campaign effort rates likely variable
  - Leashed dogs can still be a disturbance
  - Limited data at leash sites to detect a significant effect

BUT…

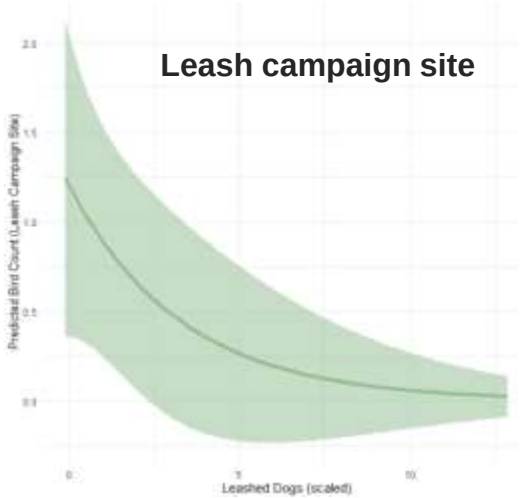
Finding #2: Where leash campaigns exist, unleashed dogs are more disruptive

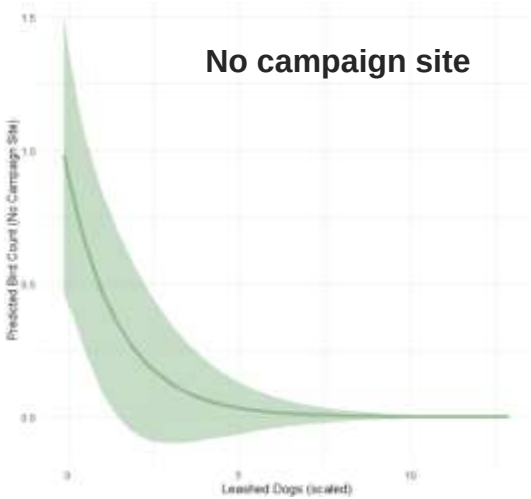


- Result: At sites with leash encouragement, more unleashed dogs are associated with reduced bird counts
- Potential explanations:
  - May be areas where birds are more sensitive
  - Could be selected as leash campaign sites because of unleashed dog issues
  - Possibly rule-breakers allow dogs to be more disruptive

AND…

Finding #3: Leashed dogs negatively affect birds regardless of campaign presence

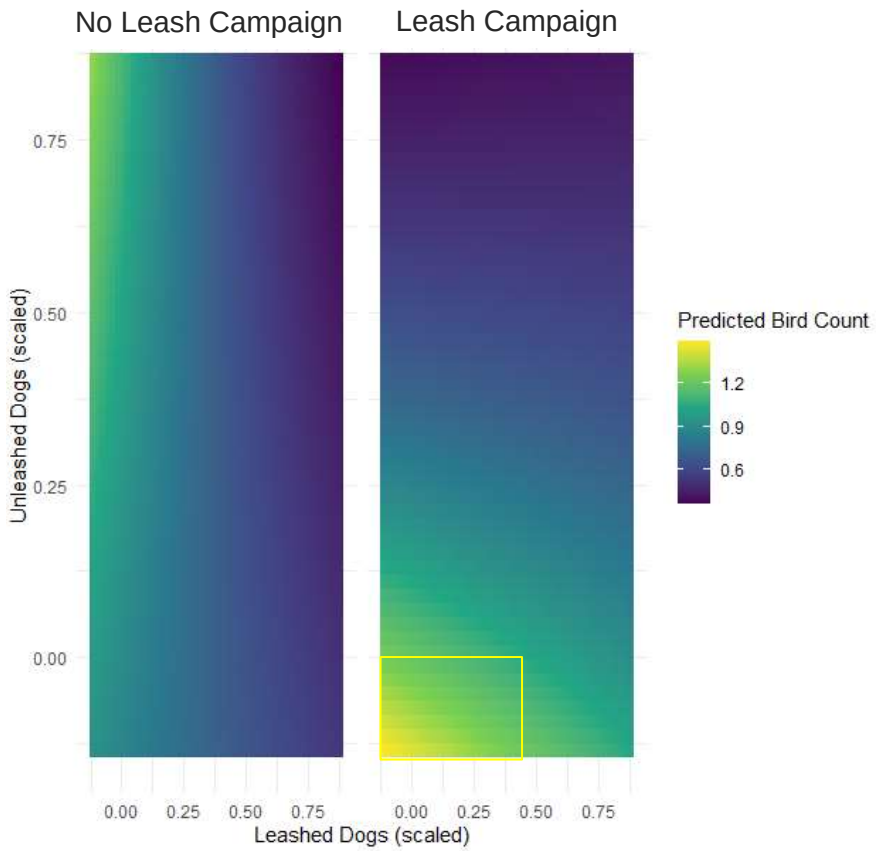




- Result: Leashed dogs consistently reduce bird counts
- Potential explanations:
  - Birds may perceive dogs as a threat even when leashed
  - Possibly due to higher human activity where leashed dogs present

Thus…

Finding #4: Dogs & leash encouragement jointly affect counts



- Result: Sites with leash encouragement **AND** low dog counts had highest predicted bird counts
- Potential explanations:
  - Sites with few dogs & leash encouragement likely have low human activity and/or high compliance → minimal disturbance → high bird use of those sites

CBSM implications

Key Takeaways:

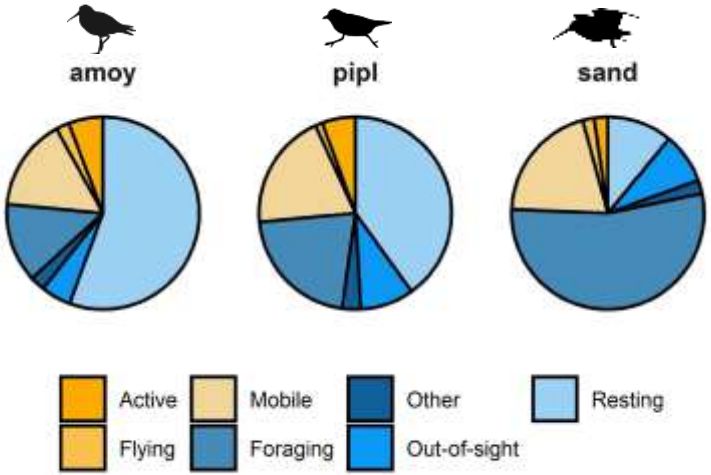
- Promoting dog leashing alone may not be enough – context matters
  - Dog-leashing campaigns may not always lead to conservation benefits (i.e. increased bird counts) unless compliance and/or campaign effort is strong
  - Even leashed dogs can disturb birds; likely associated with higher human activity, which could be indirectly discouraging bird use of sites
- Dog absence & CBSM work in tandem to encourage increased bird use of sites
  - More holistic approaches that limit overall dog presence while addressing human behavior can improve bird conservation outcomes

Do CBSM campaigns influence bird vigilance?

Behavioral analysis

Data collection

- 858 behavior surveys conducted
  - **218** “dog-free”
  - **23** “dog leashing”
  - **279** no campaign
  - **338** “walk around flocks/waterline”
- 3 focal species
  - **370** AMOY
  - **286** PIPL
  - **202** SAND
- Categorized 30-s behaviors as vigilant & non-vigilant

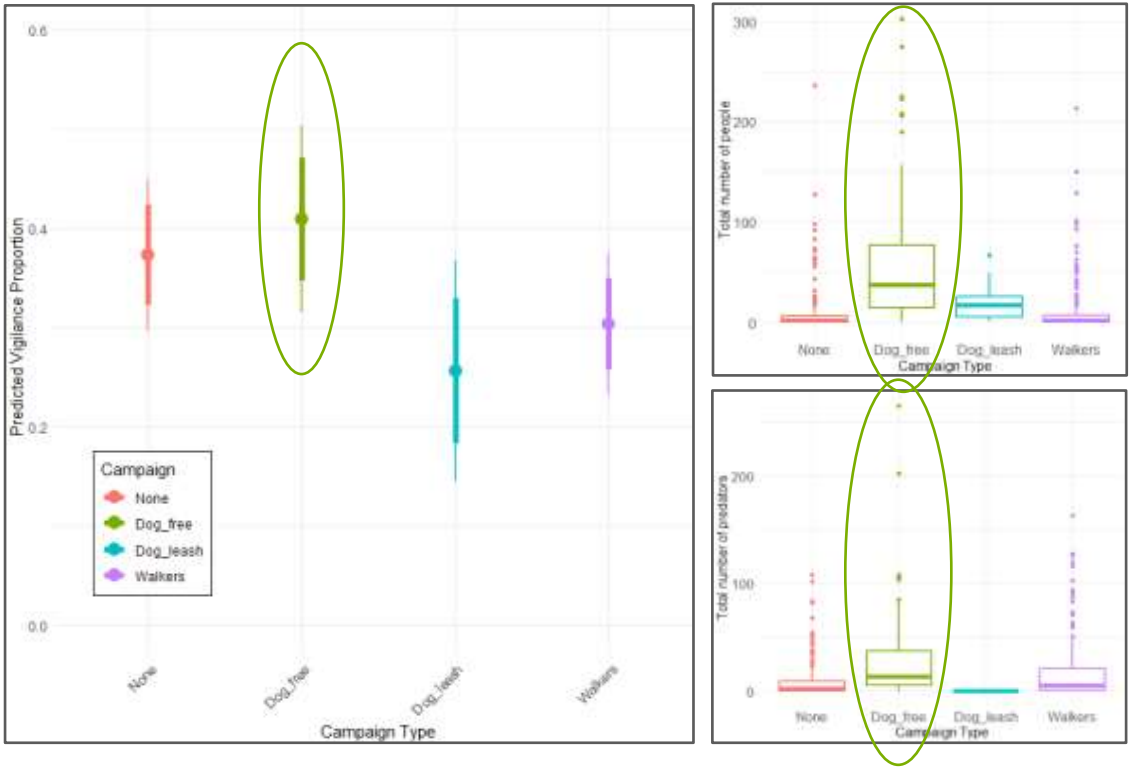


Statistical analysis

Goal: Assess whether different CBSM campaigns influence bird vigilance

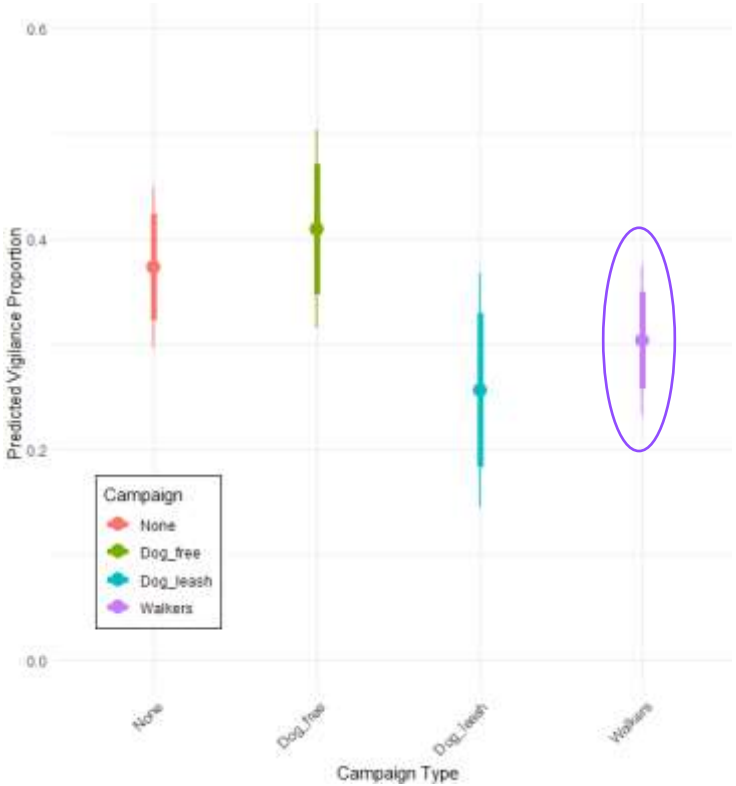
- Generalized Additive Model (GAM)
  - Response: Proportion vigilance (per 3-min interval)
- Beta distribution to account for zero inflation & bounded between 0-1
- Random effects for steward, state & species
- Fixed effect – campaign type:
  - Leash campaign
  - Dog free beach campaign
  - Walk around flocks/waterline campaign
  - None

Finding #1: Dog-free campaign beaches have highest vigilance



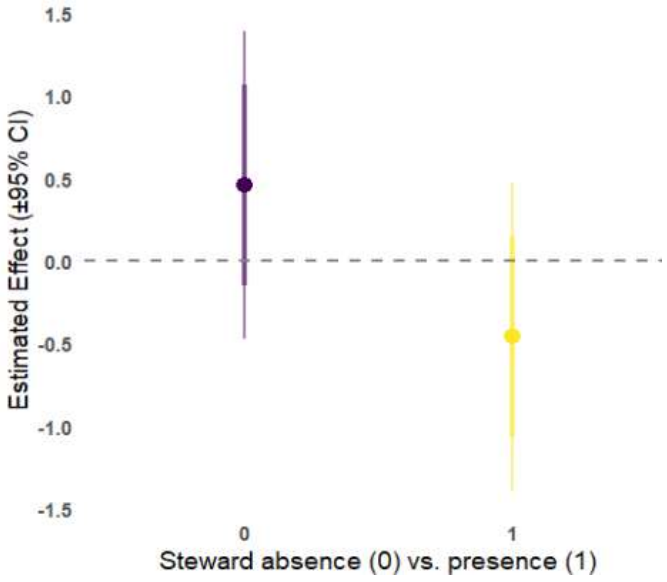
- Result: Birds at dog-free sites are most vigilant
- Potential explanations:
  - These sites also have significantly more people & predators than any other campaign type
  - Birds likely responding to increased human activity & predator abundance (despite absence of dogs)

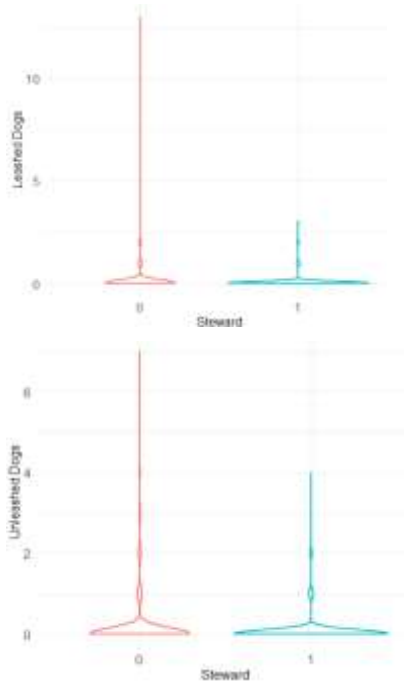
Finding #2: 'Walk around flocks' campaigns reduce vigilance



- Result: Significantly lower vigilance at these sites (compared to no campaign), despite moderate predator abundance
- Potential explanations:
  - Campaign effectiveness: encouraging less direct disturbance → lower vigilance
  - Reduced unpredictability of disturbance: consistency in avoiding flocks → lower vigilance

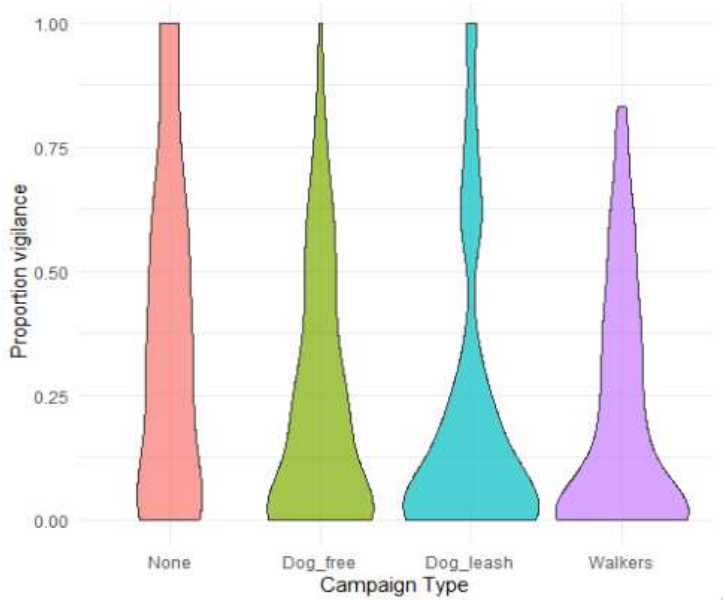
Finding #3: Steward presence also reduces vigilance





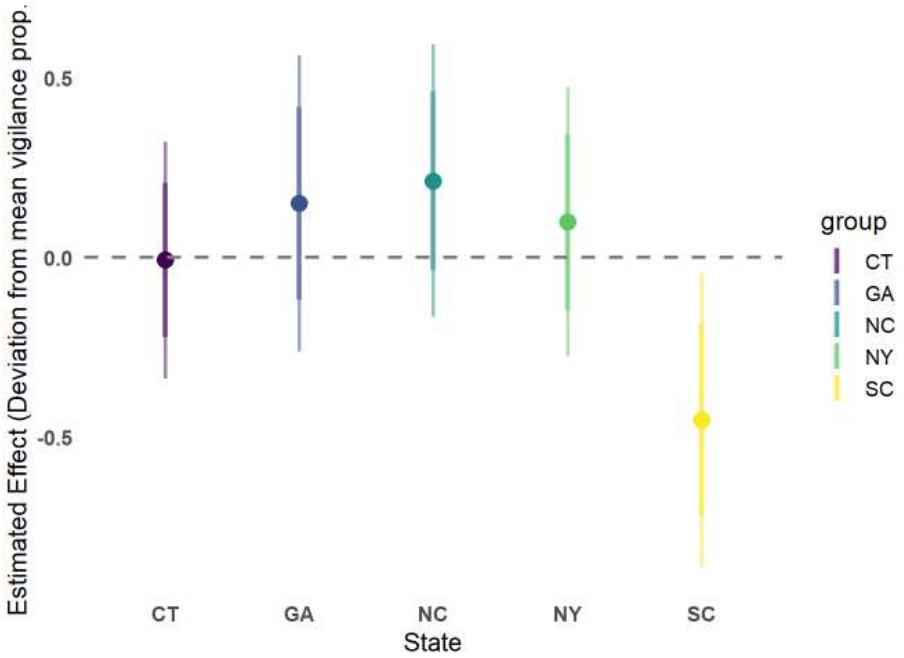
- Result: Stewarded sites have fewer leashed & unleashed dogs, and sig. lower bird vigilance
- Potential explanations:
  - Stewards may help ensure compliance & enforce policies
  - Birds likely experience more predictable conditions, reducing vigilance

Finding #4: Variance in vigilance across campaigns



- Result: Birds at no-campaign sites show the most variance in vigilance
- Potential explanations:
  - Lack of structured human management leads to unpredictable disturbances (human & dog behavior)
  - All campaign sites have lower variance in vigilance than no-campaign sites
  - "Walk around flocks" sites have lowest variance → reinforcing effectiveness of this campaign

Finding #4b: Vigilance varies by state



- Result: Birds in SC sig. less vigilant than average (NC birds somewhat more vigilant)
- Potential explanations:
  - Vigilance may vary spatially due to many factors:
    - Acclimation or long-term adaptation to site-specific disturbances
    - Species composition within sites
    - Habitat & landscape contexts
    - Social/flock dynamics
  - Potentially an artifact of observer effects/sampling bias

CBSM implications

Key Takeaways:

- Effective human behavior management, not just restrictions, can reduce bird disturbance
- ‘Walk around flocks’ campaigns are an effective strategy for reducing bird disturbance/vigilance
- Steward presence likely reinforces positive human behaviors
- Consider site-specific contexts (e.g. disturbance levels, landscape context, flock dynamics) and the amount of effort/frequency that is possible when implementing campaigns

Overall conclusions

CBSM & coastal bird conservation

- **Context matters:** CBSM campaigns promoting dog leashing without enforcement/heavy frequency or complementary strategies may not be enough to minimize disturbance
- **Stewards are valuable:** Sites with stewards see fewer dogs, reduced disturbance & lower bird vigilance, reinforcing the importance of on-the-ground engagement to support CBSM efforts
- **Human behavior management is key:** ‘Walk around flocks’ campaigns effectively reduce bird disturbance & vigilance, suggesting that education-based strategies may be more effective than encouraging leashing alone

Overall conclusions

CBSM & coastal bird conservation

- **Reducing unpredictability helps birds:** CBSM campaigns lead to more stable, predictable environments (less variance in vigilance) than sites without campaigns
- **Integrated approaches are ideal:** CBSM strategies should consider site-specific contexts (e.g. predator presence, human use patterns) and take a holistic approach that combines dog management, consistent human education, and stewardship for the greatest conservation impact on coastal bird populations

Thank you!

Contact us

Audubon

Sarah Saunders

Sarah.Saunders@audubon.org

Nicole Michel

nicole.michel@audubon.org

Virginia Tech

Sami Livingston

sami3@vt.edu

Ashley Dayer

dayer@vt.edu

This project is made possible through a grant from the National Fish and Wildlife Foundation, with support from the U.S. Fish and Wildlife Service and Atlantic Flyway Shorebird Initiative.

Our co-authors

Lindsay Addison

Elizabeth Amendola

Shelby Casas

Allie Hayser

Vandana Menser

Abby Sterling

A special thank you to

Dan Gibson and Kelsi Hunt

Community of Practice members