

Approaches to Rigorous Monitoring of Cerulean and Golden-winged Warbler Breeding Distribution and Abundance

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This talk represents the synthesis of our knowledge to date contributed by many of the CERW experts, most of whom are in the audience today. I am going to summarize what we know about the status of Cerulean populations including the most current info about distribution, population trend and size, and then summarize our general knowledge of breeding habitats at different geographic scales. In the talks that will follow we'll hear more details about specific habitat relationships and also the little that we know about demographics.

CWTG: *Breeding Season Monitoring*

Goal: Improve monitoring for trends, habitat modeling, and population estimation

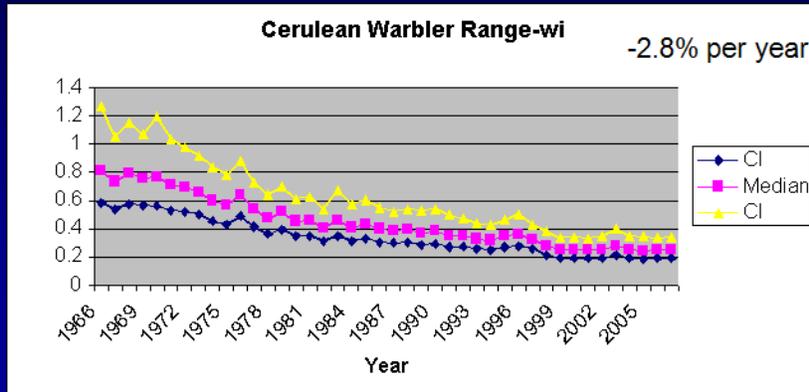
- Run BBS routes regularly; address biases
- Increase monitoring on private lands, off-road, and edge of range – occupancy monitoring?
- Develop and refine range-wide predictive models
- Evaluate parameters for PIF pop estimates
- Establish population goal through CWTG



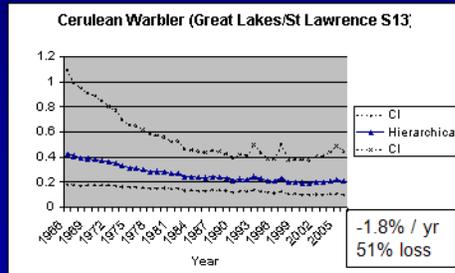
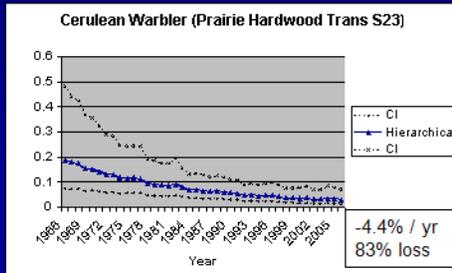
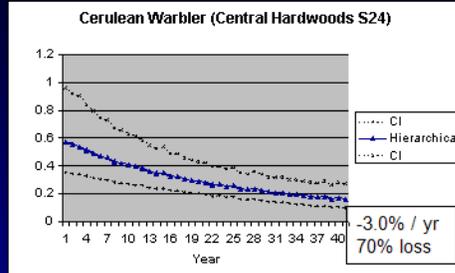
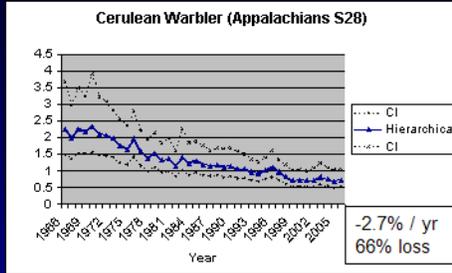
CERW Population Trend

BBS: 1966–2008

N = 405 BBS routes survey-wide



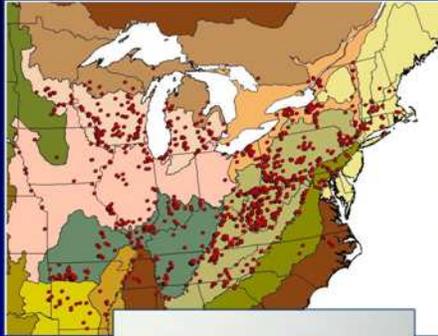
Consistency in Regional Trends



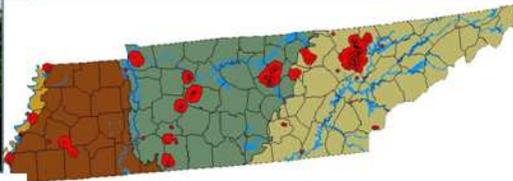
Cerulean Warbler Atlas

(1997 - 2001)

3,000 sites surveyed, range-wide



No. pairs	State/Prov	Site
430	TN	Royal Blue Wildlife Management Area
325	NY	Montezuma Wetlands Complex
300	IL	Kaskaskia River
240	TN	Center Hill Lake, Edgar Evins State Park
200	IN	Big Oaks NWR
200	IL	Shawnee National Forest
200	OH	Queens Univ. Biological Station
175	MI	Kalamazoo River, Allegan St. Game Area
165	WV	Allegheny St. Pk. And vicinity
145	TN	Frozen Head State Park



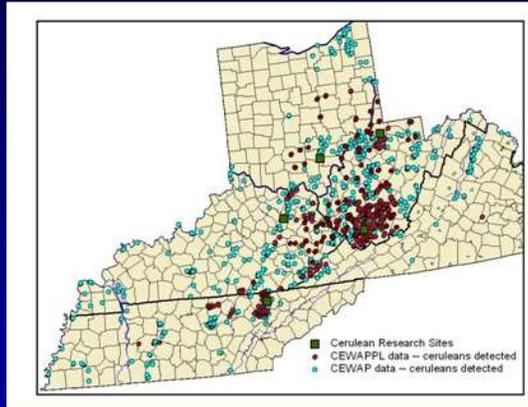
QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

TN-- 1,100 pairs at 530 sites

CERW Surveys (2003-2007)

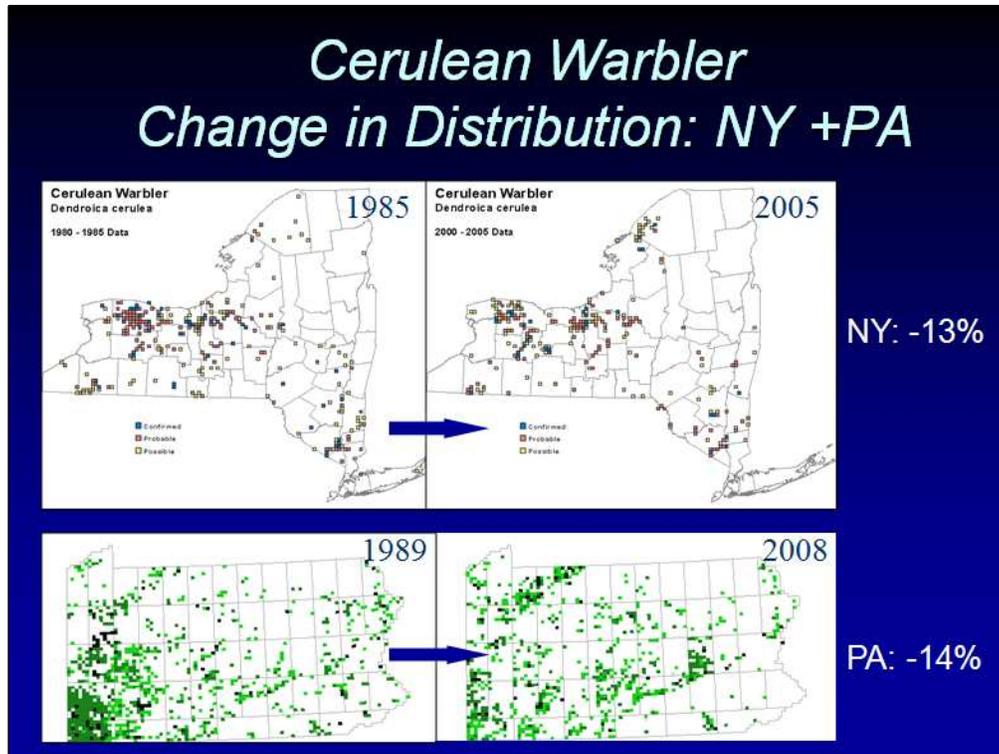
Proactive partnership with industry – NFWF grant to NCASI

- Surveys conducted at about 2,800 sites
- Ceruleans were located at 30% of all sites surveyed
- Fill in gaps in core of range
- Will incorporate results into regional habitat models



To fill in gaps within the core of the range, which includes vast areas of private lands, we have been partnering with forest industry groups and the NFWF to engage private landowners in surveying for Ceruleans in these areas. This work is ongoing and is designed to inform habitat modeling and forest management research that Dave Beuhler will be addressing in the next talk.

Cerulean Warbler Change in Distribution: NY +PA



Amazingly NY has exactly the same percentage decline in number of blocks as ON. Especially disturbing is the shrinking distribution in the stronghold within the state, the Great Lakes Plane and the Hudson Valley. In PA the atlas is not yet complete, but clearly shows a major shrinking of the range around growing urban areas in the SW and eastern part of the state.

So we now believe that the expansion into the NE that took place during the second half of the 20th century stopped and declines are now evident in that same region.

CWTG: Breeding Season Monitoring

Action Plan

- **Develop new monitoring methodologies to supplement BBS in regions where rare**
 - Identify and re-conduct historical surveys
 - Develop site-based monitoring, esp. at hot spots
- **Develop range-wide modeling strategy**
 - Combine basic models of Knudson, Thogmartin, Buehler, Sauer, Dettmers
 - Refine regional models for BCR planning



Golden-winged Warbler Conservation Initiative

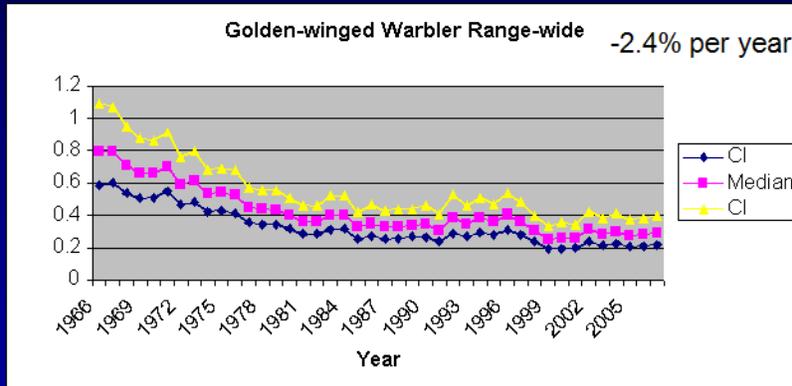


Breeding Season Monitoring Objectives:

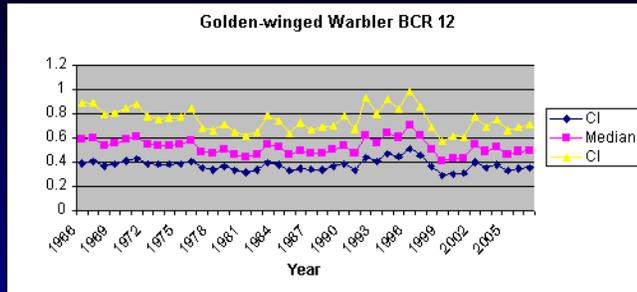
- Assess adequacy of BBS to monitor populations
- Conduct rapid assessment of populations in historic Appalachian region (BCR 28)
- Develop and implement site-based (occupancy) monitoring protocol for patchily distributed populations
- Incorporate habitat covariates to inform regional models and management
- Incorporate genetic assessment and monitoring genetic purity of populations

GWWA: Population Trends (1966-2008)

N = 405 BBS routes survey-wide



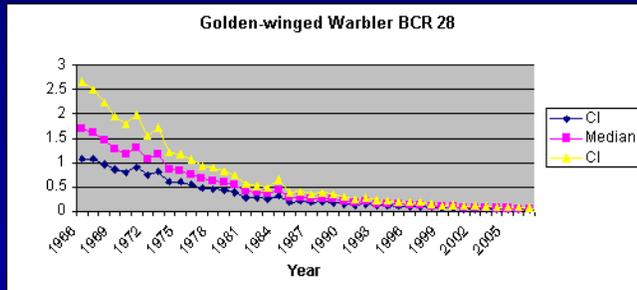
GWWA: BBS Trends (1966-2008)



N = 117

-0.4% per yr

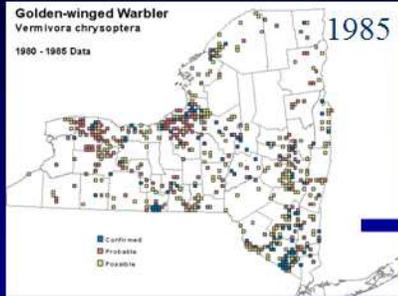
-2.1% (1998-2008)



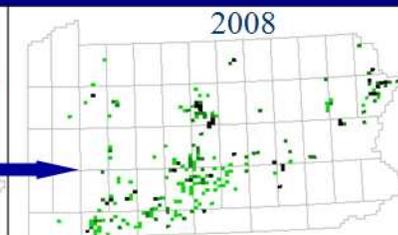
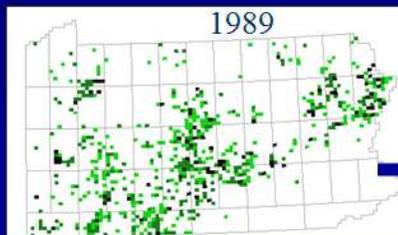
N = 155

-8.2% per yr

Golden-winged Warbler change in Distribution: NY + PA



NY: -53%



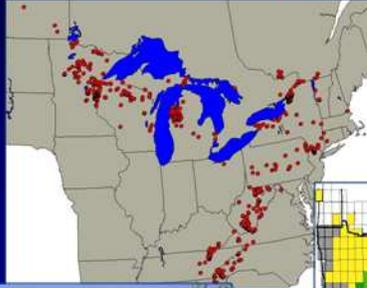
PA: -66%



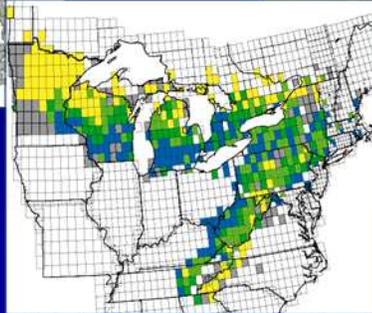
Golden-winged Warbler Conservation Initiative



Range-wide population surveys (1,100 sites)



Habitat covariates

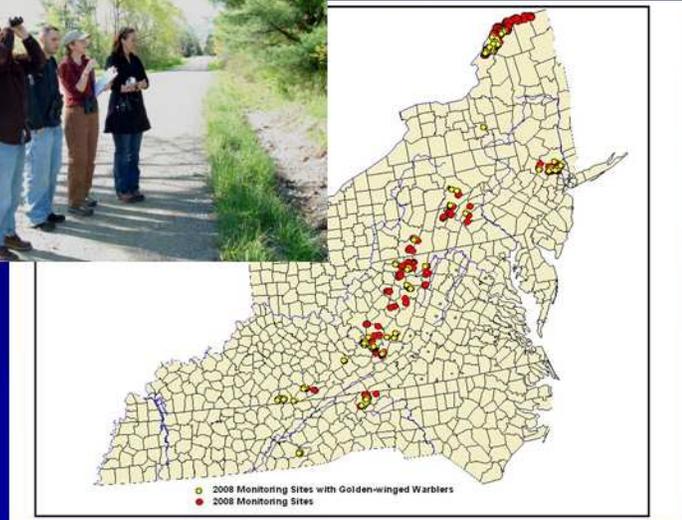


Hybrid-zone and genetic atlas (8,120 pts.)

GWWA Monitoring Sites: 2008



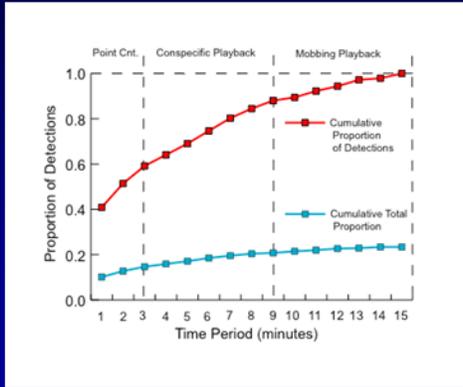
570 points sampled



GWWA: 2008 Surveys

- North Carolina – 9 GWWA at 27 known sites, plus 2 hybrids and 2 BWWA (C. Smalling)
- New Jersey – GWWA nearly extirpated from known sites within last 5-10 years (D. Miranda)
 - Habitat protected, few BWWA in GWWA habitats
- West Virginia – surveyed 142 (119 known) sites:
 - 42 w/ GWWA, 30 BWWA, 5 hybrids (WVDNR)
- PA – tested spatially balanced sampling scheme (CLO)
- 400+ genetic samples from 8 states and 3 Canadian provinces (Rachel Vallender)

Detectability of GWWA using Playback + “mobbing”



- 85% of birds detected after conspecific playback (90% of sites)
- Females detected only during mobbing sequence
- Only 5 new sites with GWWA on second visit (N = 135)
- 2X detections on first visit than second visit (narrow date range)
- NC: no response in 5 known territories (18%)

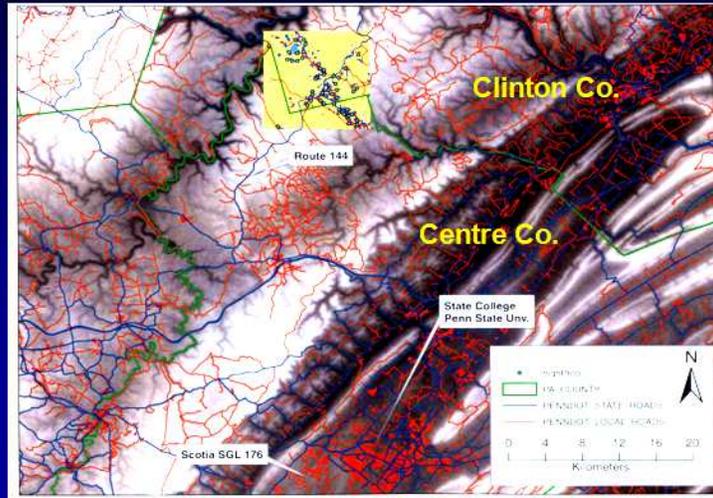
Golden-winged Warblers are difficult to monitor!

Applying Spatially Balanced Sampling Design to GWWA in PA

- **Generalized Random Tessellation Stratified (GRTS) Survey design**
- Use prior knowledge of GWWA distribution and habitat
- Used NLCD, road buffer, and PA-Gap Model for GWWA
- GRTS allows:
 - Intensive sampling in pre-defined strata to address local management issues or track known populations
 - Inferences at multiple spatial scales
 - Flexibility for surveys over time

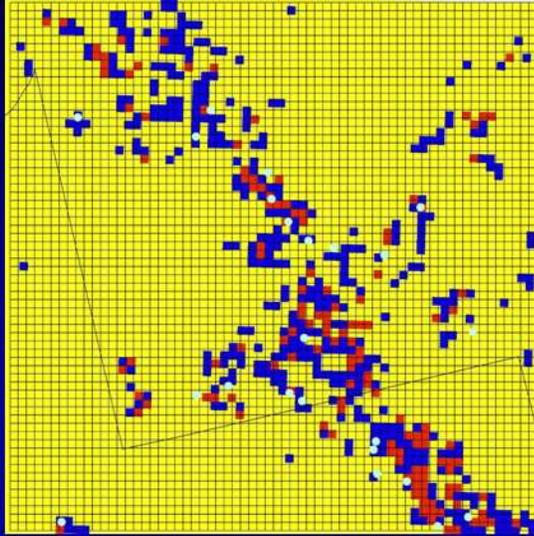


Applying Spatially Balanced Sampling Design to GWWA in PA



GWWA Pilot Study – PA

•RRQRR – Reversed Randomized Quadrant-Recursive Raster – in ArcGIS



- Total area is 11.5km X 11.5km
- Each sample block is 180m X 180m
- 23 of the first 35 sites were sampled

	Primary Habitat
	Secondary Habitat
	Non-Habitat

Applying Spatially Balanced Sampling Design to GWWA

- We were able to sample suitable habitats and found GWWA at 24% of sites surveyed
- Allowed in-field elimination of sample points
 - Due to access, habitat issues
- More challenging than expected!
 - GIS projection inconsistencies across data sets
 - Computationally intense for large areas
 - Difficult to identify GWWA habitat remotely
 - Needed to skip half of selected sites





Conclusions and Next Steps



- BBS adequate for range-wide trend and in core of range for both CERW and GWWA
- GWWA in danger of “blinking out” in Appalachian region; CERW declining in Northeast
- Implement spatially balanced sampling design for GWWA in 2009
- Use patch-based occupancy models for long-term monitoring of GWWA populations
- GWWA monitoring accompanied by genetic sampling
- Apply concepts to CERW monitoring

Grouping sample points must be maintained in order of randomization. RRQRR generates 100 sites to be sampled. We chose, in order the first 50 sites to sample. Group within those first 50 sites to maximize efficiency of field time.