



THE OHIO STATE UNIVERSITY

COLLEGE OF FOOD, AGRICULTURAL,
AND ENVIRONMENTAL SCIENCES

Temporal and Spatial Assessment of Usable
Space and Cover Type Interspersion for
Northern Bobwhites on Private Farmlands in
Southwestern Ohio

Eighth National Quail Symposium, Knoxville, TN July 27, 2017



- ROBERT J. GATES, *School of Environment and Natural Resources, Ohio State University, Columbus OH 43210, USA*
- MARK J. WILEY, *Ohio Department of Natural Resources, Division of Wildlife, Delaware, OH 43015, USA*
- ADAM K. JANKE, *Department of Natural Resource Ecology and Management, Iowa State University Ames, IA 50011, USA*
- MARJORIE R. LIBERATI, *Wildlife & Fisheries Conservation Center, Department of Natural Resources and the Environment, University of Connecticut, Storrs, CT 06269, USA*



“...habitat compatible with the physical, behavioral, and physiological adaptations of bobwhites in a time-unlimited sense”

Guthery, F. S. 1997. A philosophy of management for northern bobwhites. *Journal of Wildlife Management* 61:294.

“...quantity (ha) of ideal (maximizes fitness) permanent habitat for a species of interest on an area of interest”

Guthery et al. 2005. Quantifying usable space for wildlife with use-availability data. *Journal of Wildlife Management* 61:294.



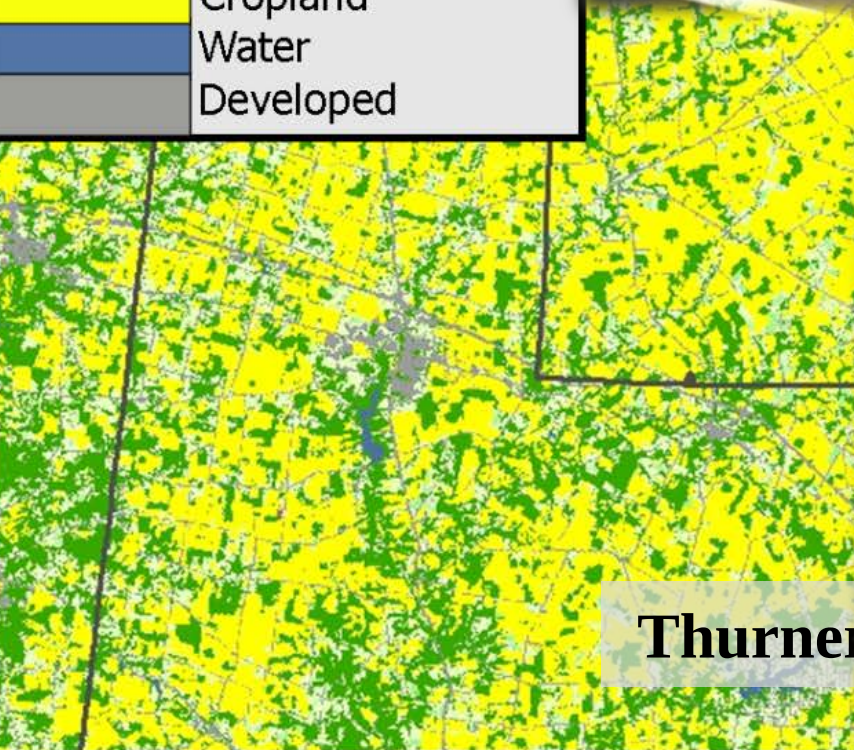
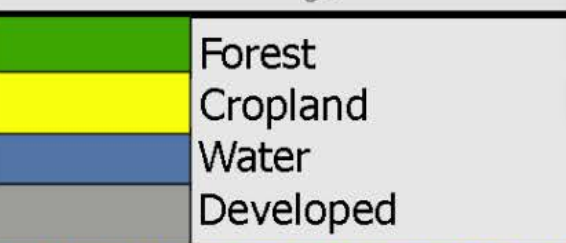
- Quantification of usable space:
1. Typically based on habitat use-availability data.
 2. Accounts for use rates of “avoided” cover types
 3. Applicable to wide range of landscapes.
 4. Crude density should be proportional to usable space.



Goal and Objectives:

Apply the usable space to understand how availability and configuration of cover types affect capacities of 4 study sites to support bobwhites throughout the year;

1. estimate usable space from habitat selection data,
2. determine effects of cover type proximity on usable space,
3. compare usable space between breeding and non-breeding seasons.

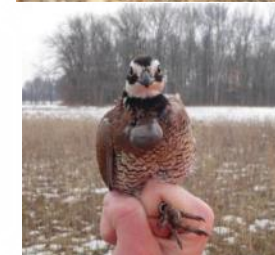


Turner



What we know about this population (2009-2011)

- Covey densities, sizes, and movements estimated with dog searches, covey call surveys, snow-tracking, and radio-telemetry.
- Seasonal movements, habitat use, survival, and nesting productivity from radio-marked birds.





Covey Densities and Behavior:

Densities: $0.25 - 1.63$ coveys/km²
($0.65 - 4.22$ coveys/mi²)

Mean size: 12 birds/covey in Oct
5 birds/covey in Mar

Mean movements: 139 m/day

Mean inter-covey distance: 787 m

6 of 48 coveys merged, 1 of 449 birds switched coveys (temporarily).

(Janke et al. 2013. The Wilson Journal of Ornithology 125:833-840)₈





Population Vital Rates:

Mean survival, (Oct-Mar) = 0.085,
negatively correlated with snow

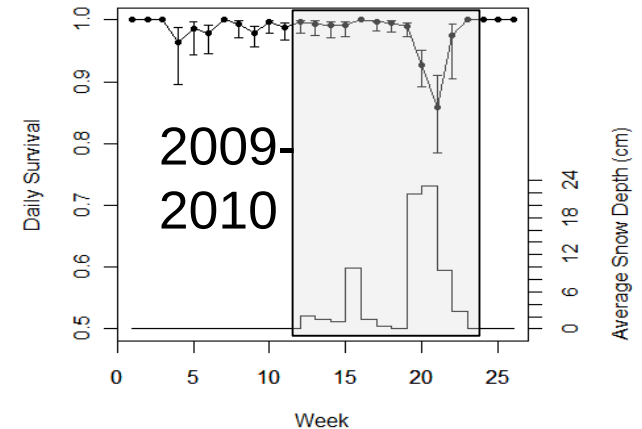
(Janke and Gates 2012. Proceedings.
National Quail Symposium 7:194-201)

Mean survival, (Apr-Sep) = 0.286

(Liberati 2013. M.S. Thesis, Ohio State
University)

Nest survival = 0.289

(Liberati and Gates 2017. In revision,
Wildlife Society Bulletin)





Population Growth Rate:

Mean $\lambda = 0.296$

simulations based on vital rates, 2009-2011.

Fall-winter survival was the dominant vital rate ($r^2 = 0.504$), followed by breeding season survival ($r^2 = 0.083$).

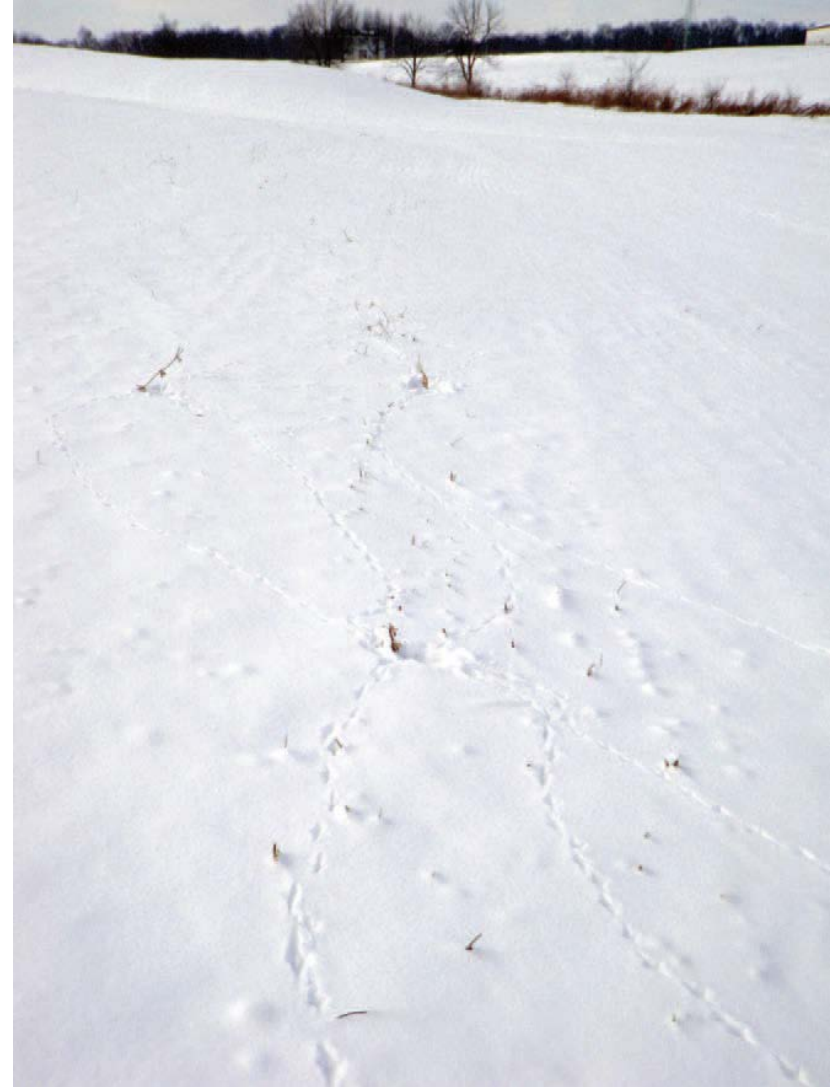
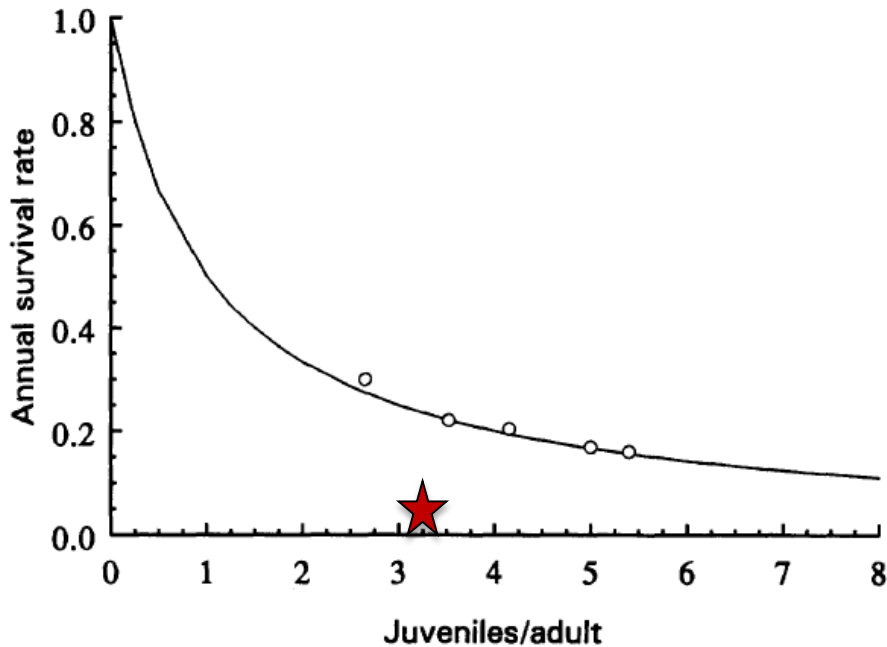
$\lambda = 1$ if fall-winter survival is raised to 0.369

no other single vital rate could raise λ to 1

(Gates et al. 2012, Proc. Nat. Quail Symp. 7:184-193)



Below the age ratio-
survival curve (Guthery
1997) of a stable bobwhite
population.





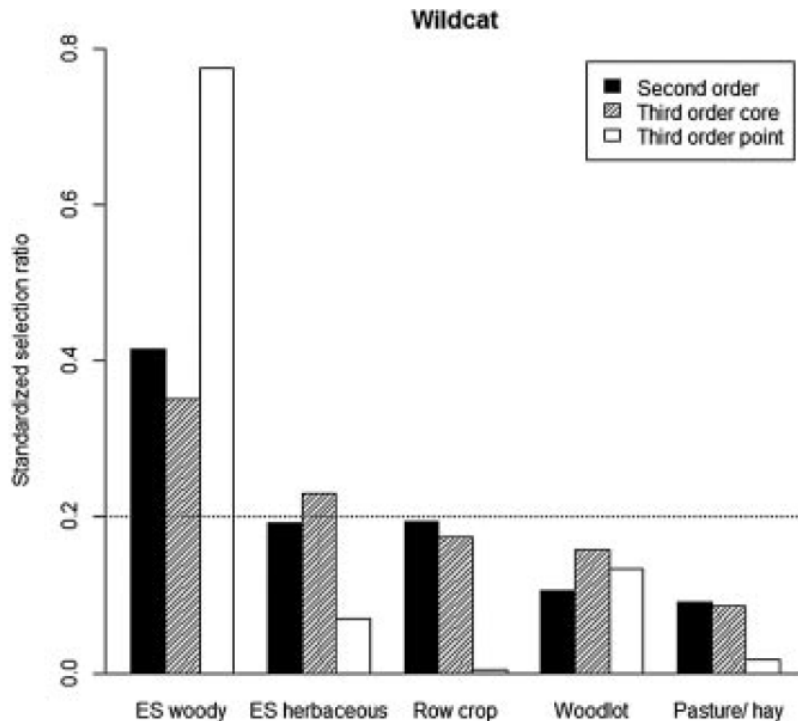
Data Sources:

- 4,930 radio locations from 58 coveys during non-breeding
- 3,940 radio locations from 98 individuals during breeding
 - cover type mapping: ES herbaceous, ES woody, Forest, Pasture/hay, Row crop
 - monthly selection ratios (use / availability)
 - distances between radio-locations in focal cover types to nearest other 4 cover types

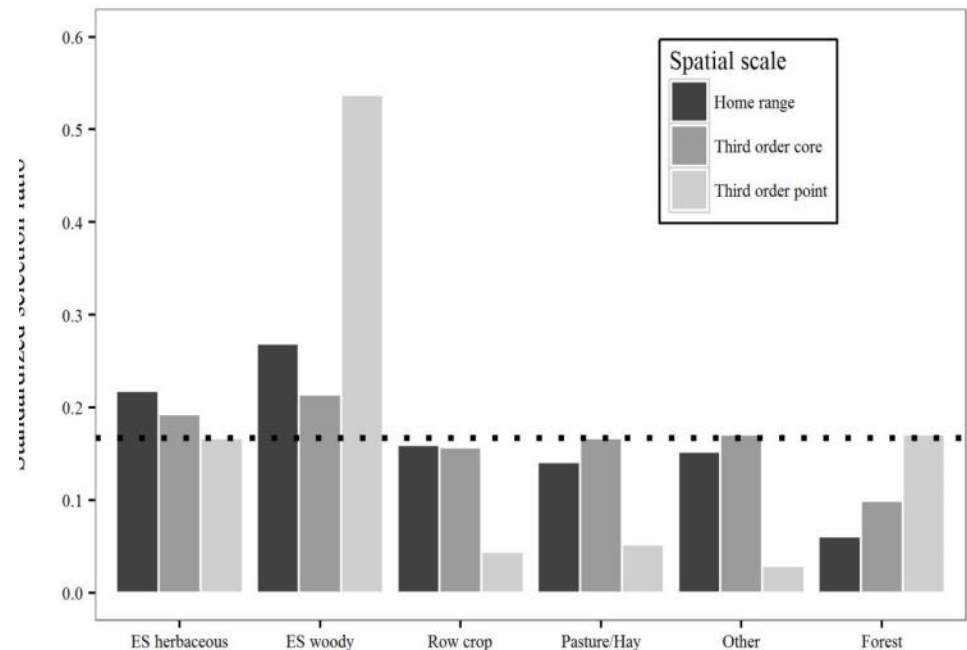


Habitat Selection:

Early successional woody cover is highly preferred during fall-winter (l) and spring-summer (r):



Janke and Gates, 2012, J.
Wildl. Manage. 77:405-413.



Liberati and Gates, 2017. In
revision. Wildl. Soc. Bull.



Usable space calculation (selection method):

Cover Type	Selection Ratio (raw)	Selection Ratio (rel.)	Total Area (ha)	Usable Space (ha)
Row crop	0.280	0.040	1,556	63
Pasture/hay	0.740	0.107	214	23
Forest	1.360	0.196	330	65
ES Woody	6.934	1.000	109	109
ES Herb.	2.434	0.351	349	122
Total	--	--	2,558	382(14.9%)

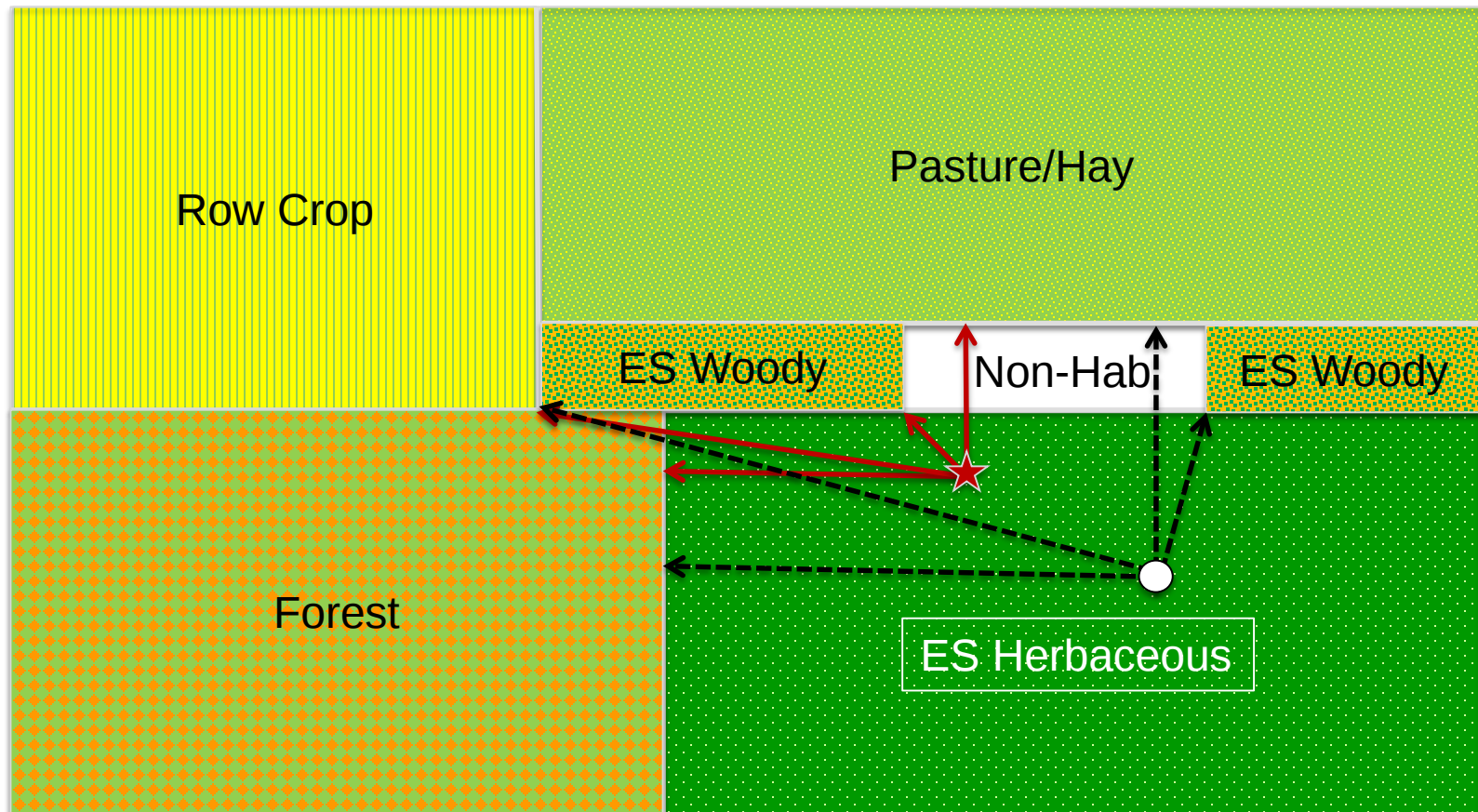


Usable Space Estimation (distance to cover type method):

1. Radiolocations and random points (equal nos.) overlaid on cover type maps.
2. ArcGIS to measure distances from random and radio location points within focal cover types to nearest other 4 cover types.
3. Logistic regression to compare distances from focal cover types to nearest other cover types between radiolocation and random points.



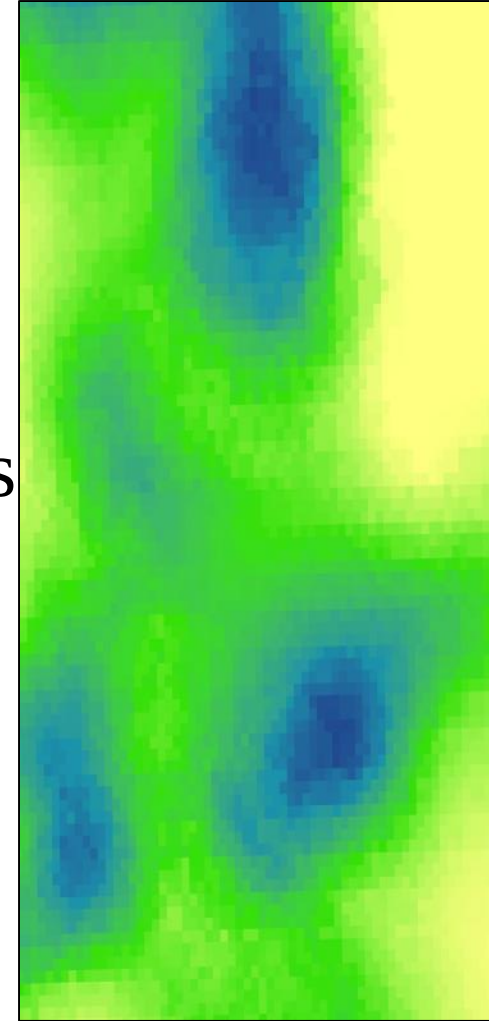
Distance to Cover Type Measurement:

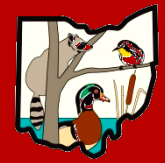




Usable Space Estimation, (distance to cover type method):

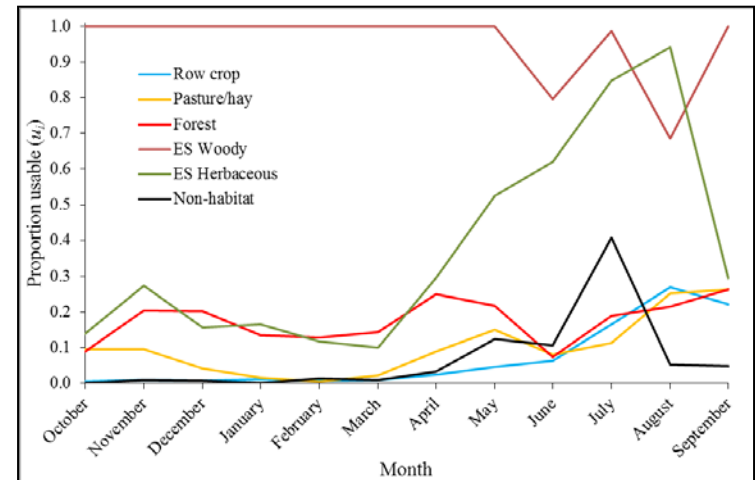
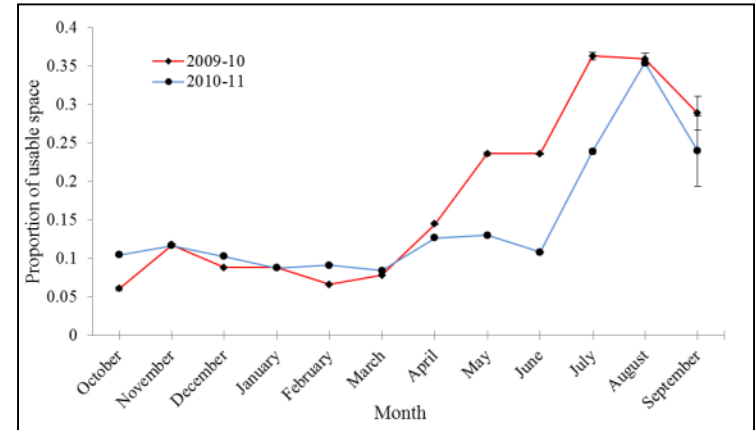
4. Logistic regression to model Pr (use) as function of distances from focal cover types to nearest other cover types (main effects w/2-way interactions)
5. 50 x 50 m grid overlaid on habitat coverages, use predicted at each grid intersection from stepwise-selected
6. (AIC criterion) LR models.
7. Predicted use smoothed to 15-m resolution.





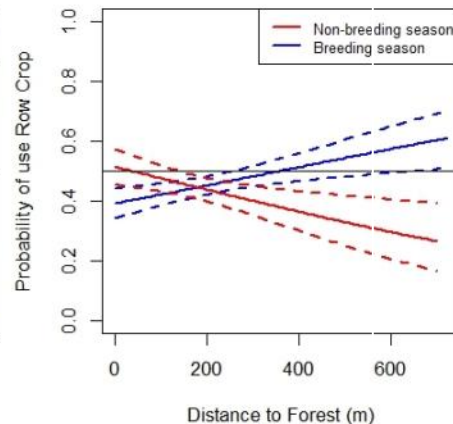
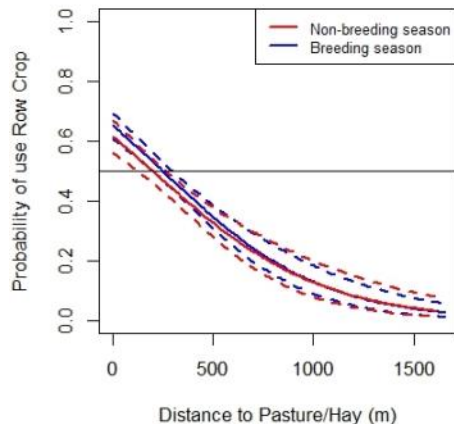
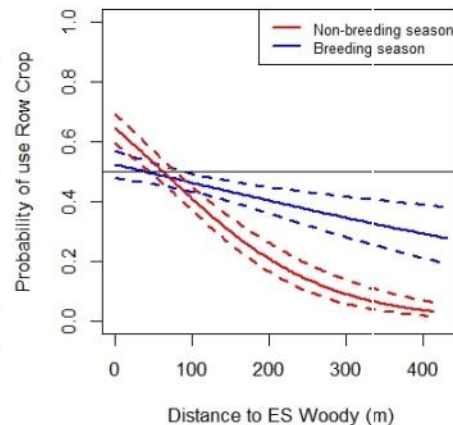
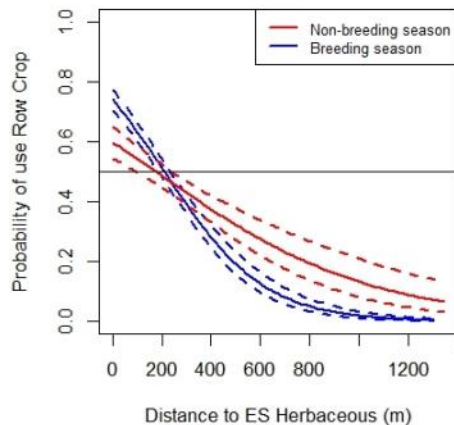
Results – Usable Space (selection method):

- Low proportions of usable space, Oct–Mar (0.06-0.12)
- Increasing proportion usable space, Apr–Aug (0.14- 0.36)
- ES Woody fully usable Oct – May (s. ratio = 4.2 – 16.6)
- Usability proportion of ES herbaceous increased from 0.30 (Apr) to 0.94 (Aug)





Results – Distance to cover type logistic regression analyses

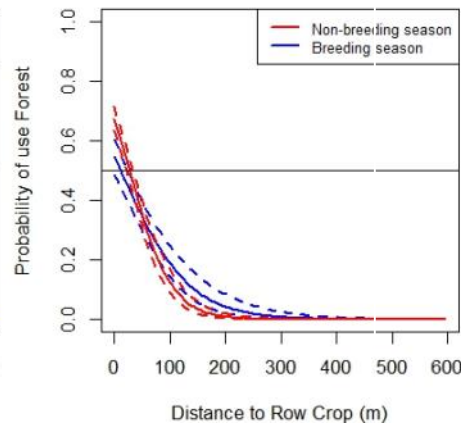
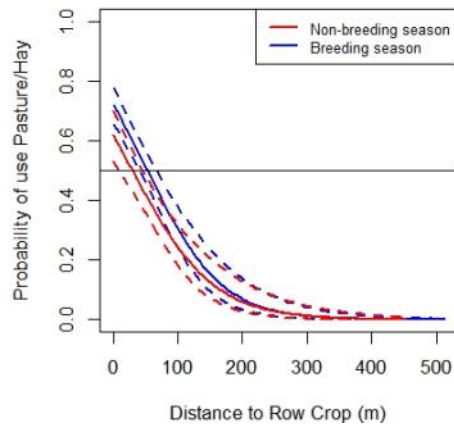
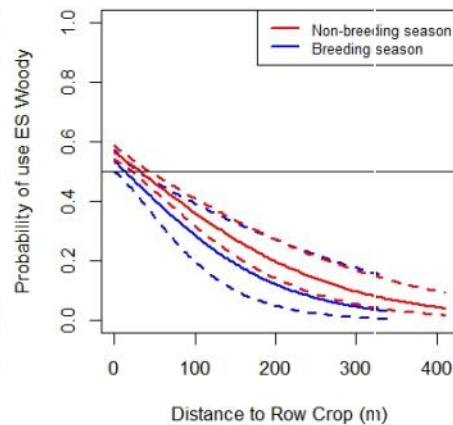
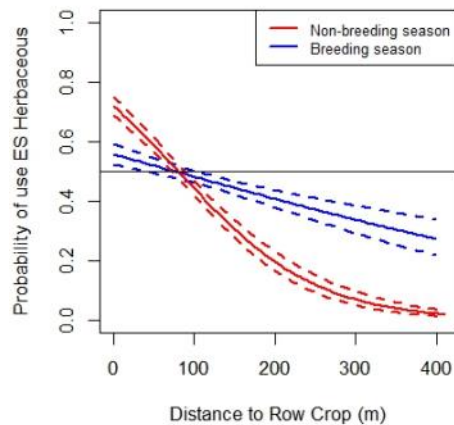


Left to right, top row first:

1. Br: Strongly negative
 $\Pr(\text{Row Crop}) \sim d(\text{ES Herb})$
2. Nb: Strongly negative
 $\Pr(\text{Row Crop}) \sim d(\text{ES Woody})$
3. Br & Nb: Strongly negative
 $\Pr(\text{R. Crop}) \sim d(\text{Pasture/Hay})$
4. Br & Nb: no relationship
 $\Pr(\text{Row Crop}) \sim d(\text{Forest})$

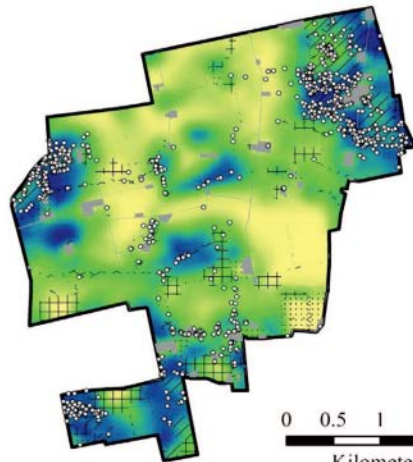
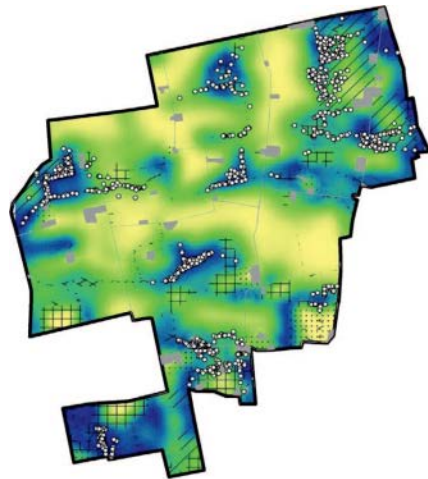


Results – Distance to cover type logistic regression analyses



Left to right, top row first:

1. Nb: Strongly negative
 $\text{Pr(ES Herb)} \sim d(\text{Row Crop})$
2. Br & Nb: Weakly negative
 $\text{Pr(ES Woody)} \sim d(\text{Row Crop})$
3. Br & Nb: Strongly negative
 $\text{Pr(Pasture/Hay)} \sim d(\text{R. Crop})$
4. Br & Nb: Strongly negative
 $\text{Pr(Forest)} \sim d(\text{Row Crop})$



0 0.5 1 2
Kilometers



Non-breeding season

- Site boundary
- Radiolocations

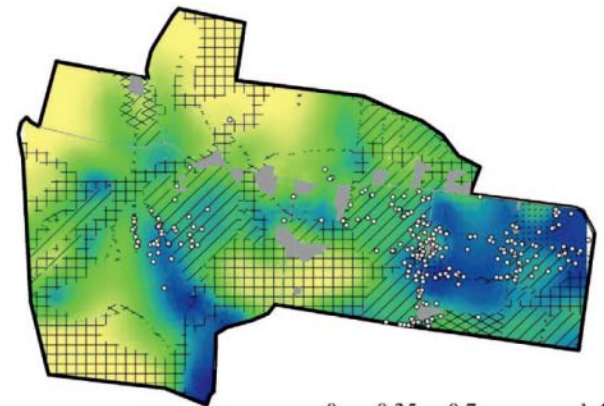
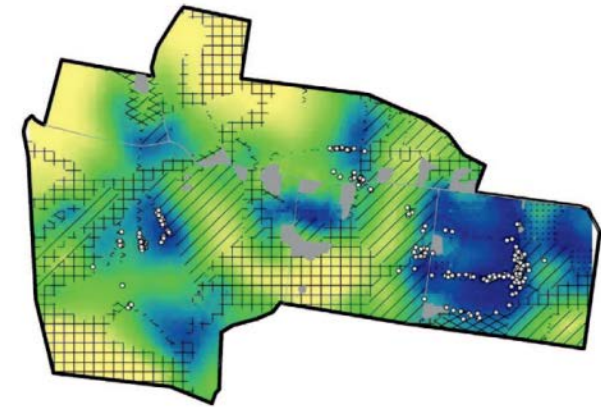
Probability of use



Cover type

- ES herbaceous
- ES woody
- Forest
- Pasture/hay
- Row crop
- Non-habitat

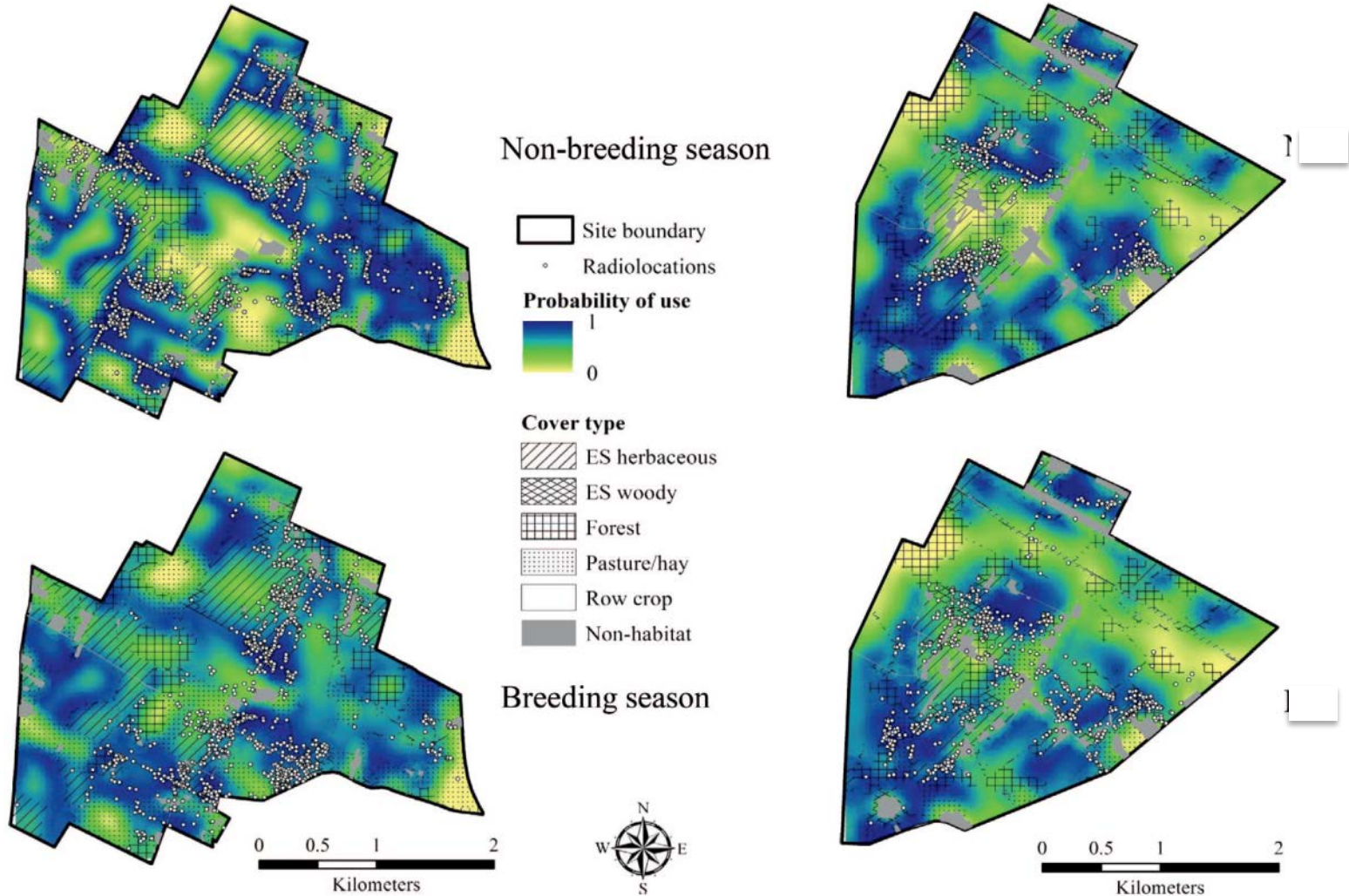
Breeding season



0 0.35 0.7 1.4
Kilometers

Fee Site

Peach Orchard Site 21



Wildcat Site

Thurner Site



Summary and Discussion, comparing selection vs. distance methods of estimating US:

Attribute	Cover type selection	Distance to cover type
Proportion of usable space (Breeding)	0.06-0.12 among months, years and sites combined	0.30-0.53 among sites with years and months combined
Proportion of usable space (Non-breeding)	0.11-0.36 among months, years and sites combined	0.31-0.46 among sites with years and months combined
Correlation, usable space and covey density	None, $r^2 \leq 0.166$ $P \geq 0.316$	Positive rank-order correlation among sites (years combined)
Sensitive/applicable to:	Temporal changes, coarse scale regional conservation planning	Spatial variation, finer scales, targeted delivery of conservation at site scale



Summary and Discussion Points:

1. Covey ranges were established where protective cover was close to food.
2. Bobwhites did not move far into cover types that lacked protective cover.
3. Strong edge associations explain low selection ratios for row crop, forest, and pasture/hay.
4. Usable space was at or below threshold ($\sim 30\%$) where fragmentation becomes a dominant effect.



Some Conclusions:

1. Without woody cover, bobwhites are exposed to high levels of predation during periods of prolonged snow cover.
2. Availability of protective cover (ES woody cover) near food (row crop) is the most limiting habitat factor for bobwhites in southwest OH.
3. ES Herbaceous cover is secondarily limiting, though still important.



Management Implications:

1. Small proportional changes in primary land use can leverage disproportionate increases in US.
2. Conserving whole tracts of agricultural land may not be the most efficacious way to improve habitat on agricultural working lands where opportunities are limited or cost-prohibitive.
3. A more practical alternative is to create and sustain ES habitat edges near row crop and ES herbaceous cover types.



Acknowledgements

Funding and Support

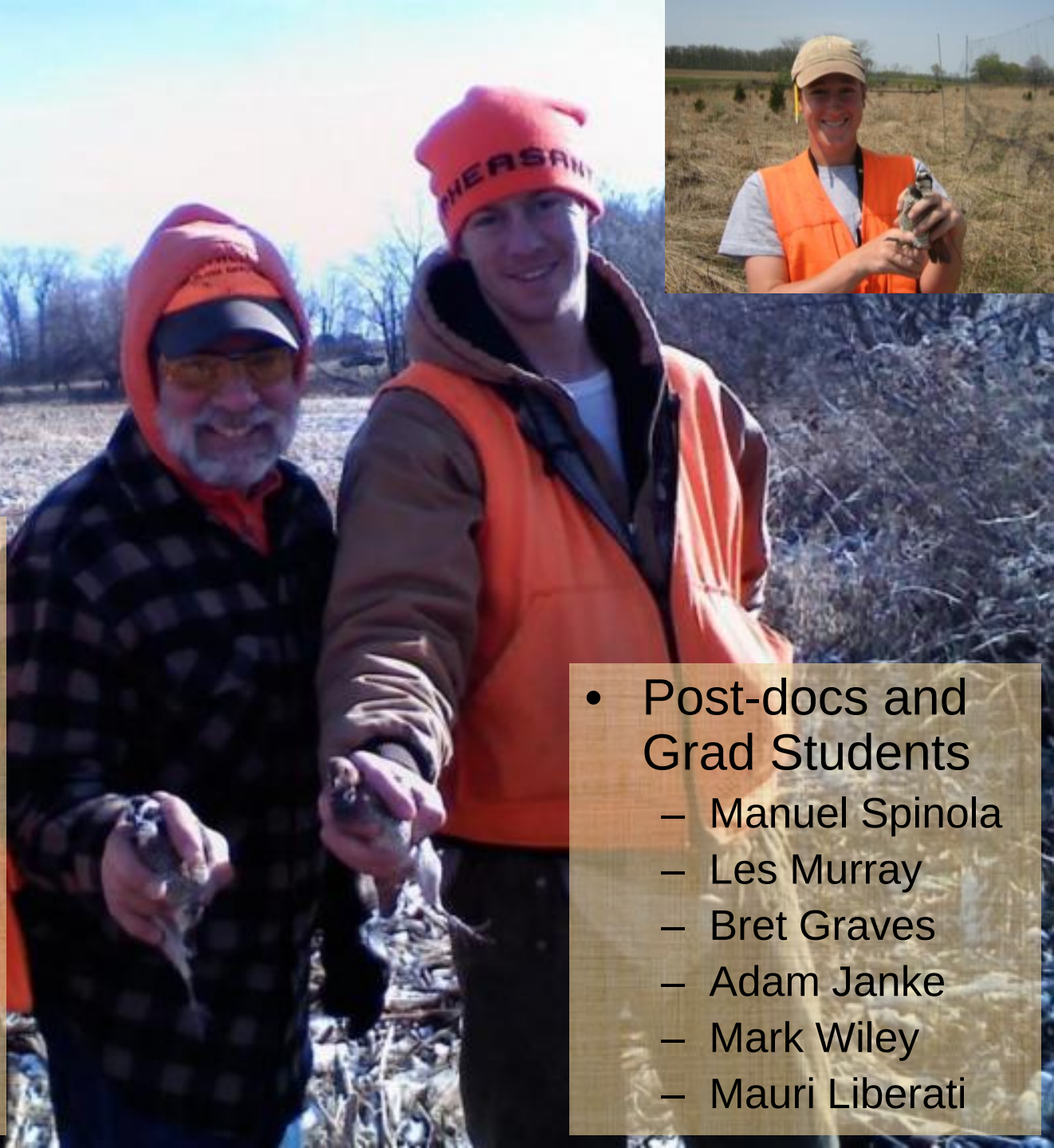
Ohio Division of Wildlife
Federal Aid in Wildlife Restoration
Ohio Agricultural Research and
Development Center
School of Environment and Natural
Resources

Field Assistance and Logistical Support

Research Technicians
Dennis Hull
Heidi Devine
Barb Bauer
George Fee
TWEL Lab Members

Private Landowners





- Field Assistants

- Nan Radabaugh
- Mark Peugeot
- Laura Jenkins
- George Fee
- Chris Grimm
- Matt Crowell
- Bryce Adams
- Jay Jordan
- Hannah Plumpton

- Post-docs and Grad Students

- Manuel Spinola
- Les Murray
- Bret Graves
- Adam Janke
- Mark Wiley
- Mauri Liberati