

The effects of exurbanization
on the food and habitat of
Pileated Woodpeckers
(*Dryocopus pileatus*)

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Exurbanization

- Low-density residential development in the midst of mostly natural surroundings. Beyond the suburban fringe and not associated with metro areas (Marzluff et al. 2001, Brown et al. 2005, Hansen et al. 2005).
- Increased 5 to 7-fold between 1950 and 2000 and by 2000 encompassed 25% of lower 48 states (Brown et al. 2005).
- Increasing overall species diversity and richness at intermediate development levels. Beyond intermediate levels, overall species diversity and richness decreases (Blair and Launer 1997, Blair 1999, and Germaine and Wakeling 2001).

Exurbanization and Birds

- Bird abundance and species richness increases with habitat heterogeneity and thus exurbanization (Fraterrigo and Wiens 2005, Haskell et al. 2006, Bock et al. 2008). Exurbanization may negatively affect native bird species (Hansen et al. 2005).
- Bird abundance increases, but species richness decreases with urbanization (Beissinger and Osborne 1982, Chace and Walsh 2006).
- Cavity nester abundance and richness decreases with increasing exurbanization possibly due to less downed wood (Fraterrigo and Wiens 2005). Cavity nester density decreases with increasing suburbanization (Blewett and Marzluff 2005).

Pileated Woodpeckers (*Dryocopus pileatus*)

- Mature forest indicators (Bull et al. 1995), management indicator species (Aubry and Raley 2002a, Bull and Holthausen 1993).
- Keystone habitat modifier for large secondary cavity-nesting species (Aubry and Raley 2002a, Bonar 2000).



Fig. 2. Adult Pileated Woodpecker



Figs. 3-5. Pileated Woodpecker in my study area (photo credits: M. E. Wilson)

Pileated Woodpecker habitat requirements

- Use large downed wood for foraging and large trees for nesting and roosting. dbh = diameter at breast height.
- Forage mostly on trees that are larger (>28-38 cm diameter) and more decayed than randomly available in the Pacific Northwest (PNW) and southern Canada (Bull and Holthausen 1993, Flemming et al. 1999, Hartwig et al. 2006, Lemaire and Villard 2005).
- Active nest trees in PNW and southwest Canada averaged from 82-101 cm dbh and 39-22 m tall (Aubry and Raley 2002*b*, Hartwig et al. 2004).
- Roosting trees in PNW averaged 149 cm dbh and 36.5 m tall (Aubry and Raley 2002*b*).

This Study

- Cumberland Plateau
 - found in the Southern Appalachian region
 - very biologically diverse and of high conservation priority (Haskell et al. 2006)
 - heavily forested, mostly deciduous oak- hickory matrix, pine plantations
 - much of land privately owned, not under any zoning or growth restrictions
 - threatened by ever increasing exurbanization

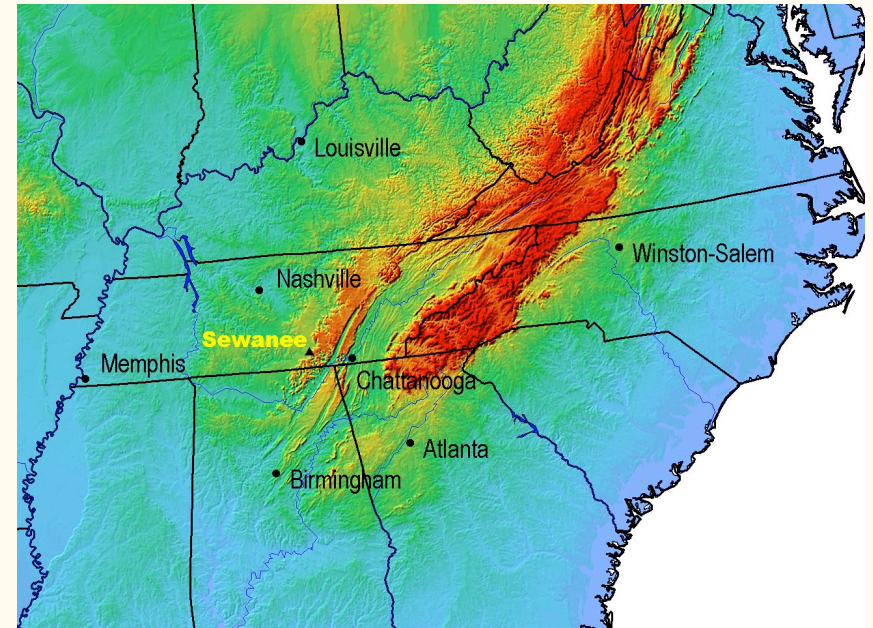


Fig. 1. Cumberland Plateau (map credit: N. Hollingshead).

- Sewanee, TN
 - small college town in an exurban area
 - surrounded by several thousand acres of mature secondary forest

Hypotheses

- Using proportion impervious cover as a proxy for exurbanization, the following characteristics of Pileated Woodpecker habitat will decrease as exurbanization increases:
 - Tree diameter
 - Number of large diameter trees
 - Volume of dead wood
 - Degree of dead wood decay
 - Abundance of ants and beetle larvae in soil and on ground
- Pileated Woodpeckers will more likely be found in forested areas.

Methods-

Point selection and vegetation

- Point selection
 - Manifold System, GIS
 - Stratified-random between exurban areas and surrounding forest = 15 exurban, 15 forest
 - 400m apart
 - 100m from bluff
 - Corrected for elevation and nearness to water and bluff
- Tree diameter
 - dbh = diameter at breast height
 - 100 m transects in each cardinal direction
 - Every tree >10 cm dbh ~1 m from transect
- Volume of dead wood
 - 100m transects in each cardinal direction
 - Every piece of dead wood either standing ~1m from transect or lying across transect
 - Rot class A, B, C, or D

Methods-

Abundance of ants and beetle larvae

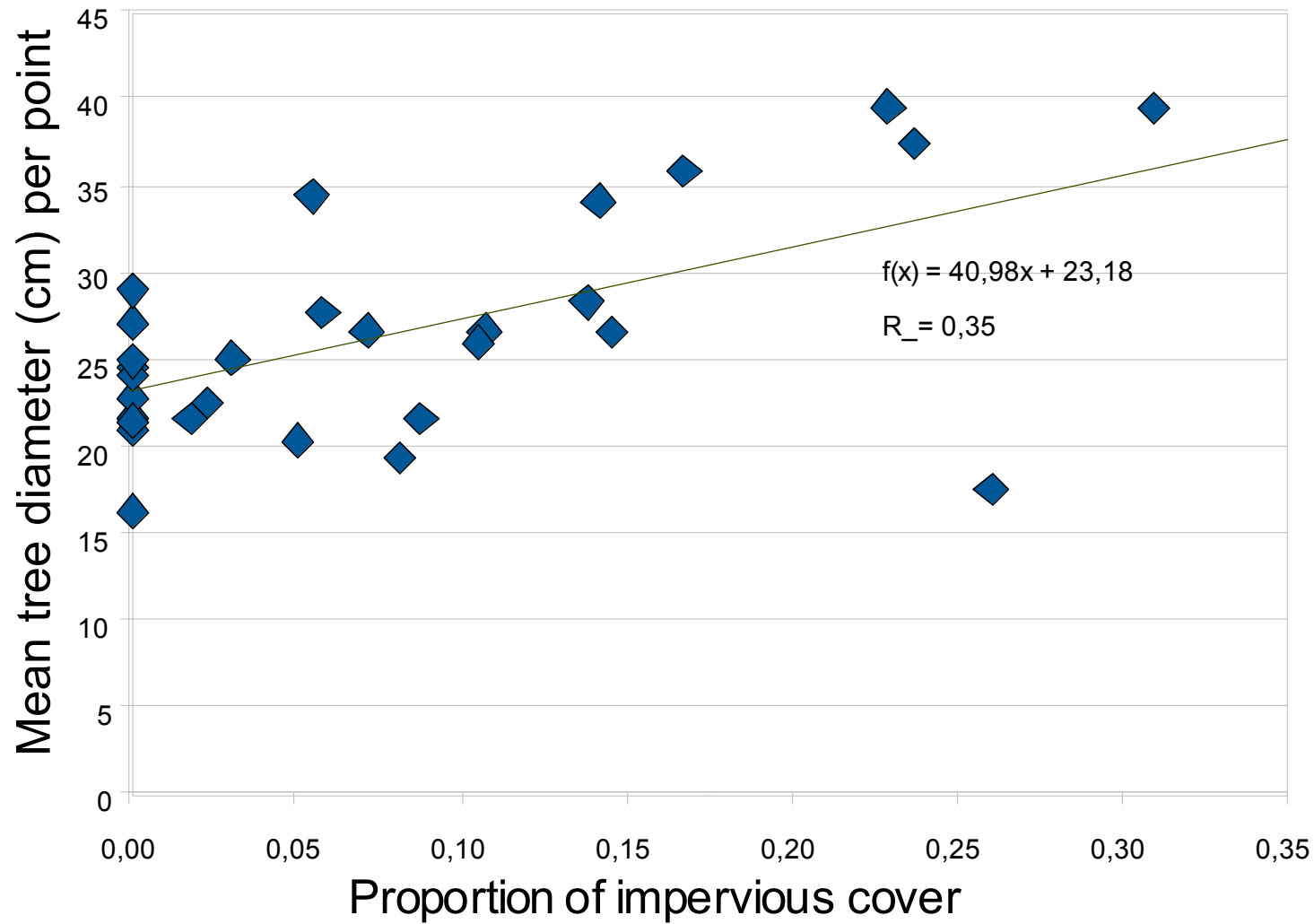
- Soil cores
 - 2 per cardinal direction
 - ~5 and 10m from point
 - Garden borer
 - Soil cone placed in 3-layer sieve with 2 and 4 mm mesh
 - Layers explored for 60, 90, and 120 seconds respectively from top to bottom
 - Specimens identified in field
- Pitfall traps
 - 2 per cardinal direction
 - ~5 and 10m from point
 - 270-ml waxed paper cup in hole created by soil core
 - 120-ml water and 0.5 oz unscented liquid soap
 - Left out for ~48 hours
 - Specimens identified in lab

Methods-

Pileated Woodpecker detection

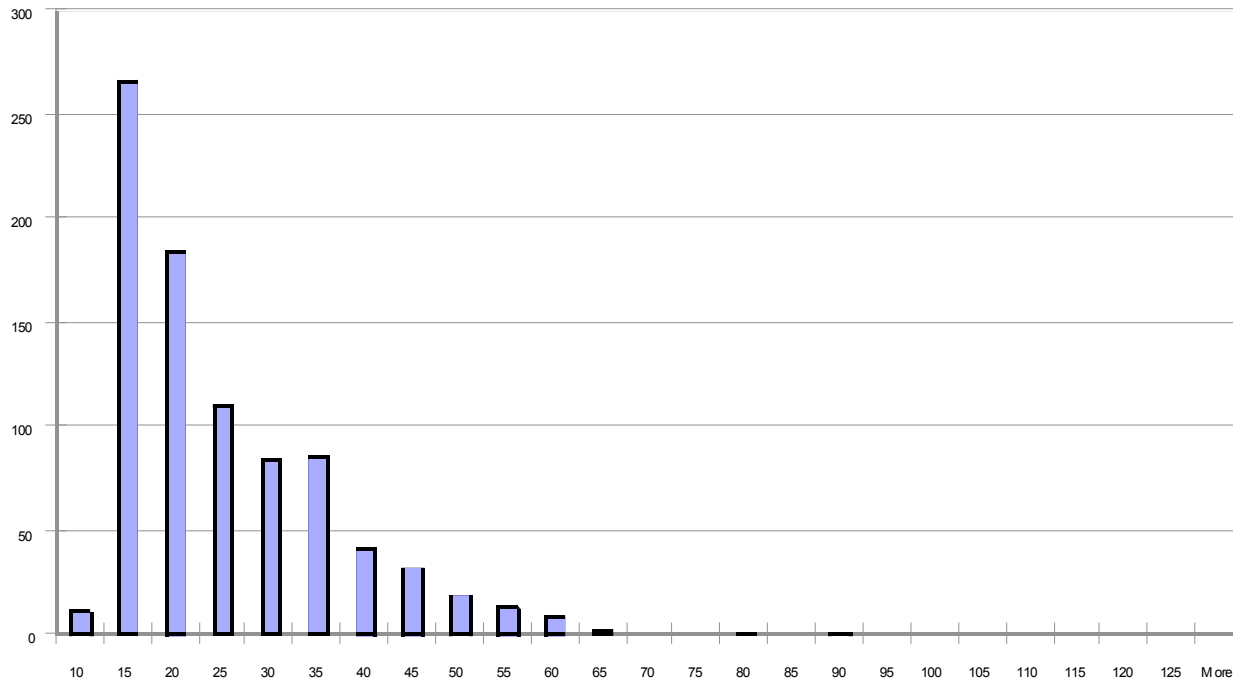
- Call counts
 - 5-8:30 am May 27- June 5, 2008
 - Not when raining or wind above 3 on the Beaufort scale
 - Playback created from Birding By Ear, Eastern/Central, Disc 1
 - 1 min playback, 3 min silence, 1 min playback, 3 min silence, 1 min playback, 1 min silence
 - Also during other data collection

Results – Mean tree diameter



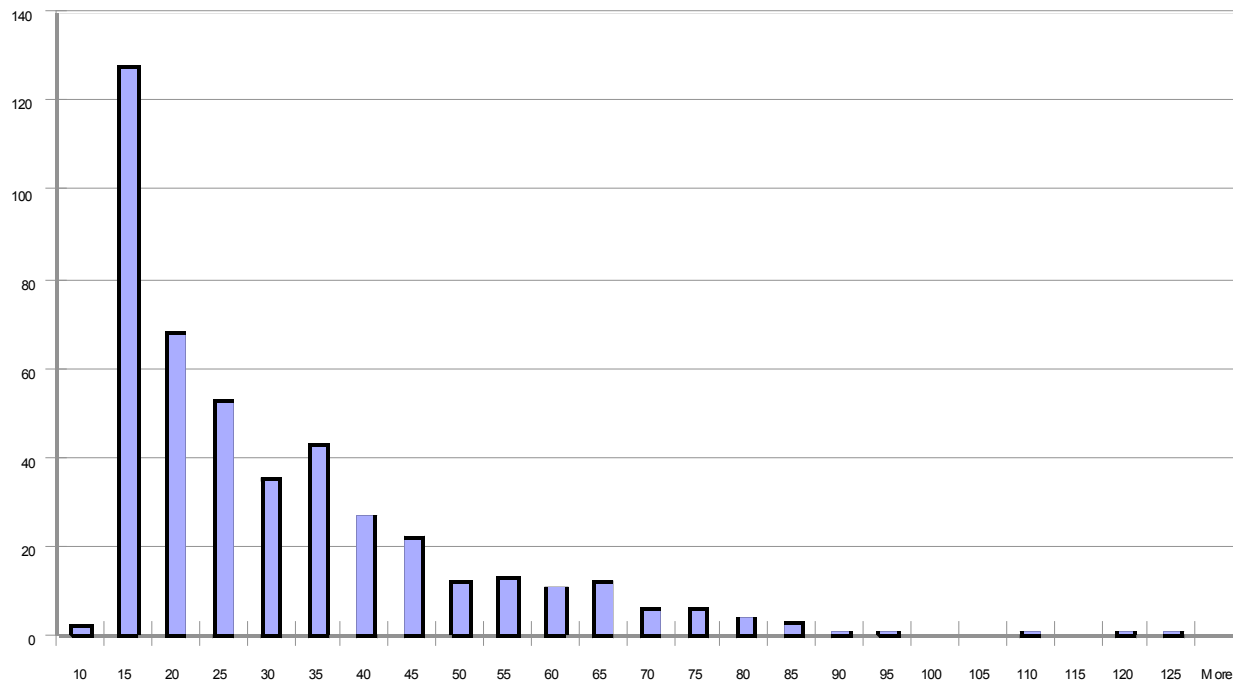
$p =$
0.001

Wilson, M. E. Undergraduate Honors Thesis. 2009.
Sewanee: The University of the South.



Forest

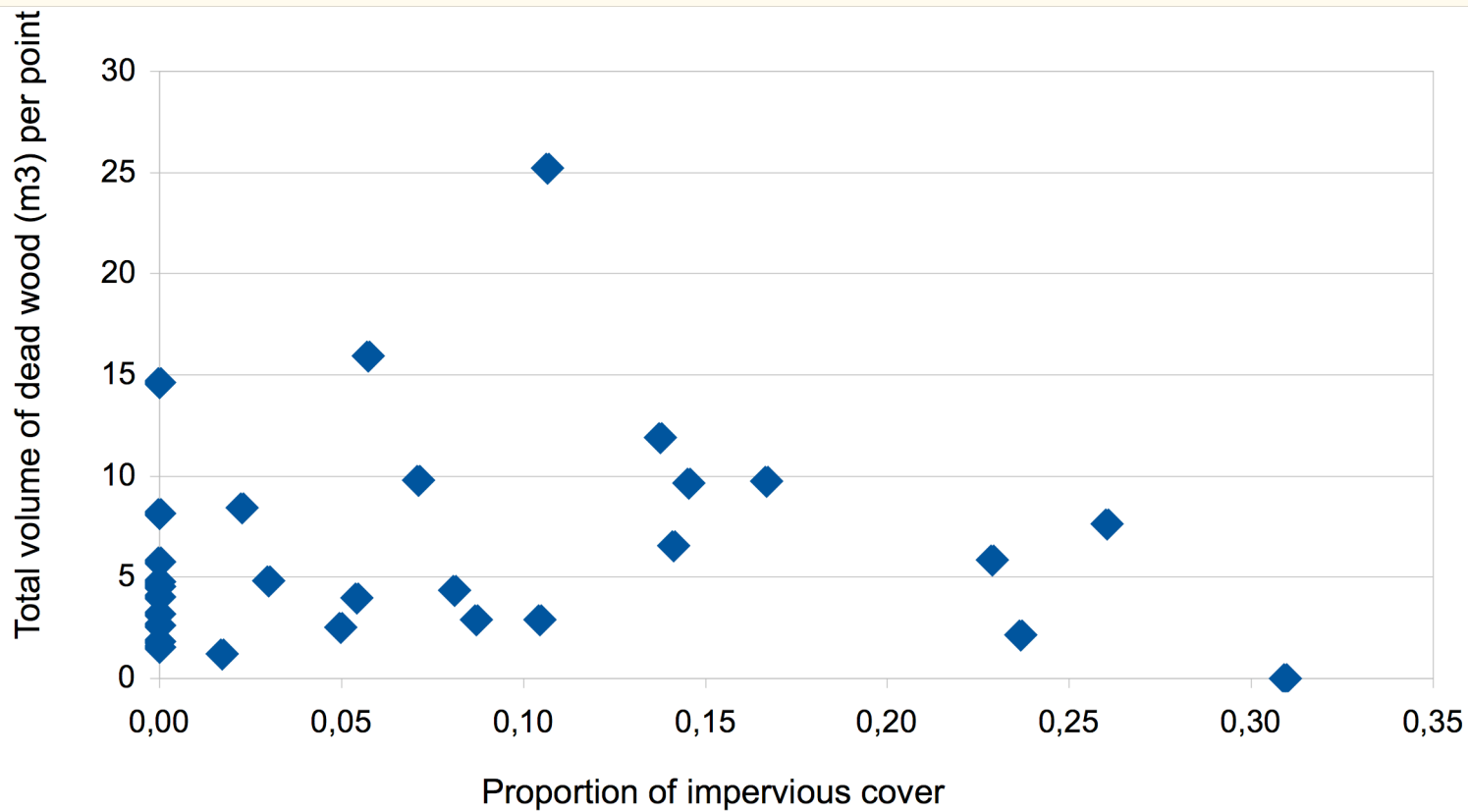
Results – Tree size class distribution



Exurban

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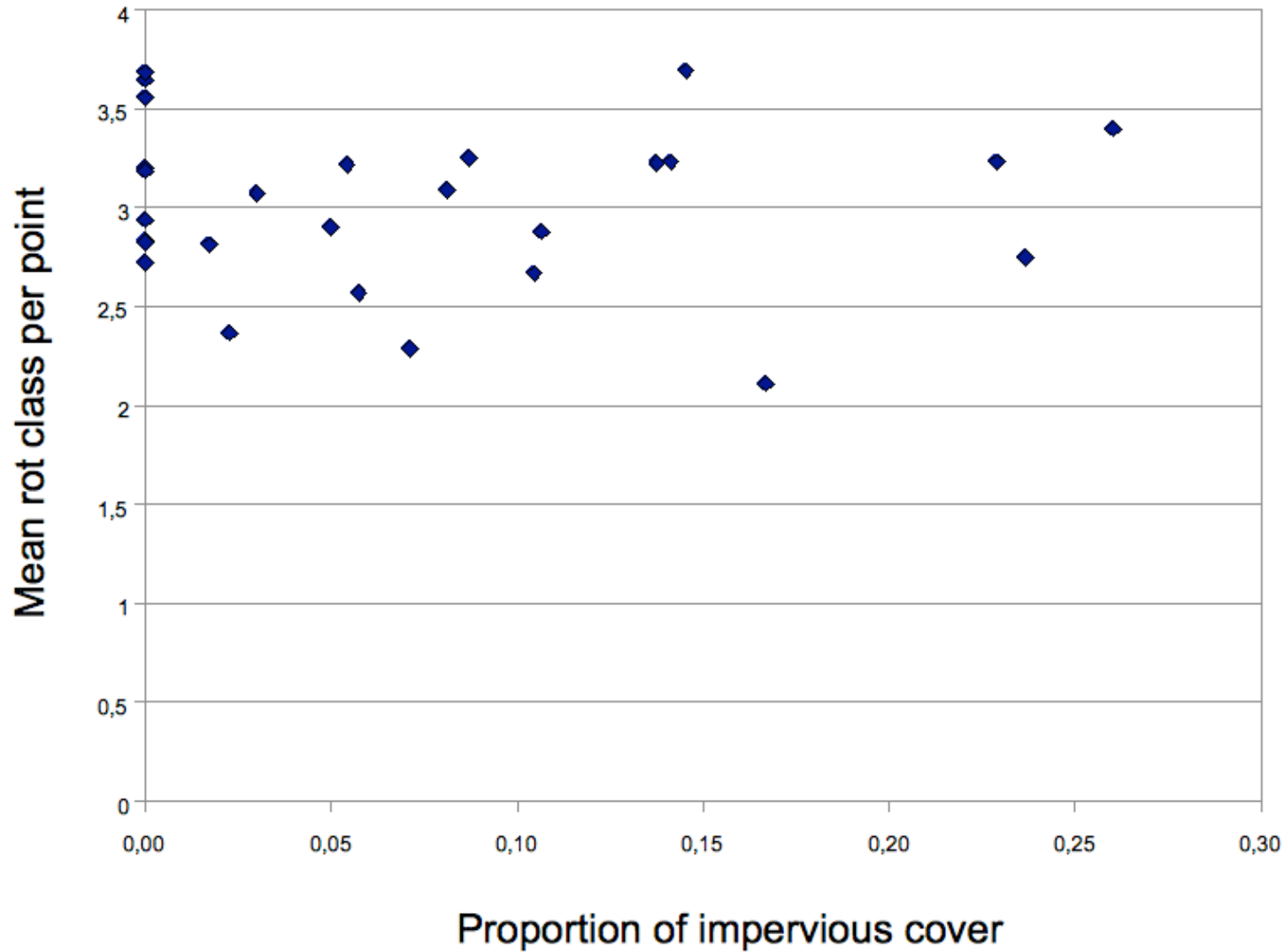
Results – Volume (m³) of dead wood



p =
0.852

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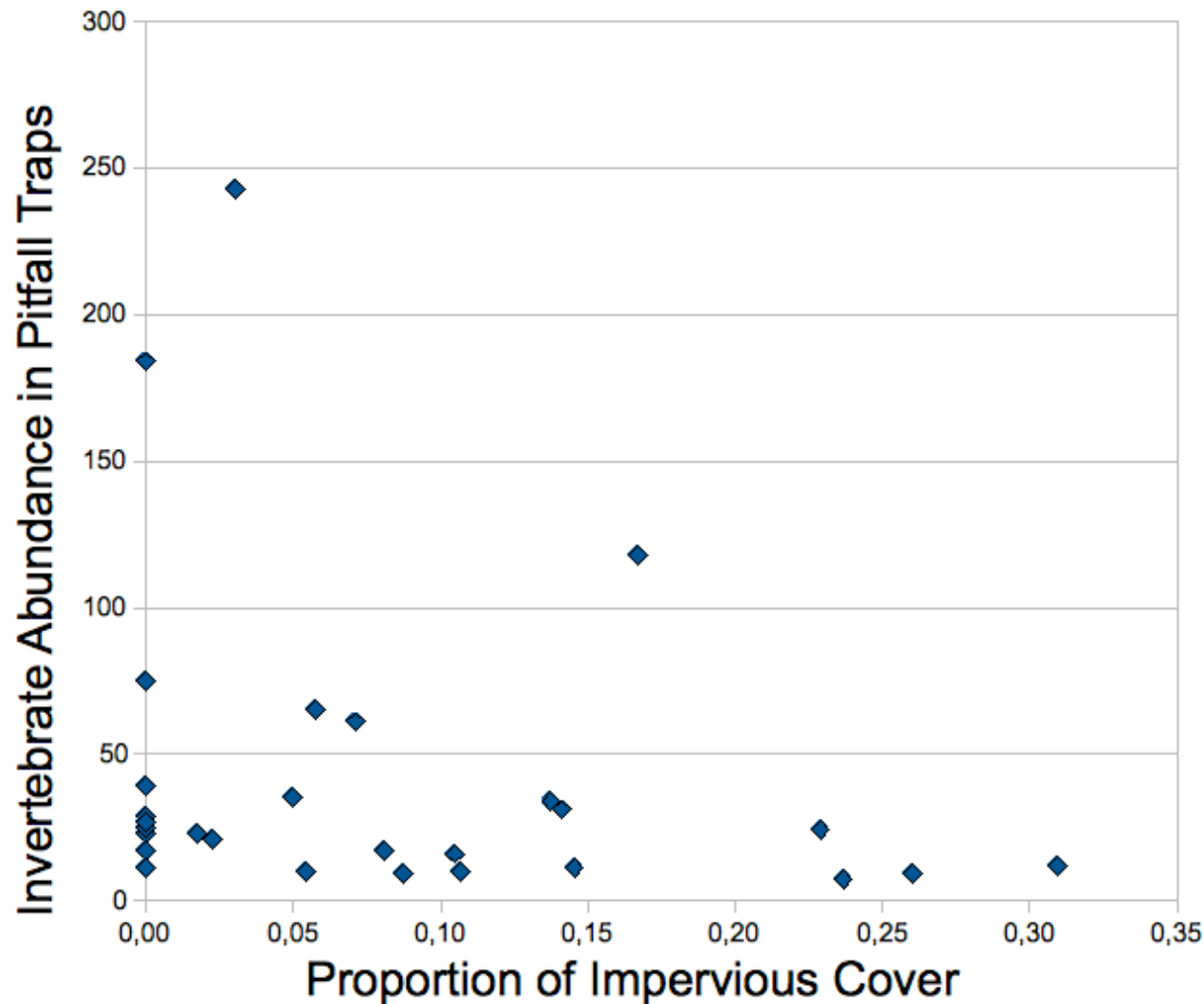
Results – Rot class of dead wood



$p =$
0,996

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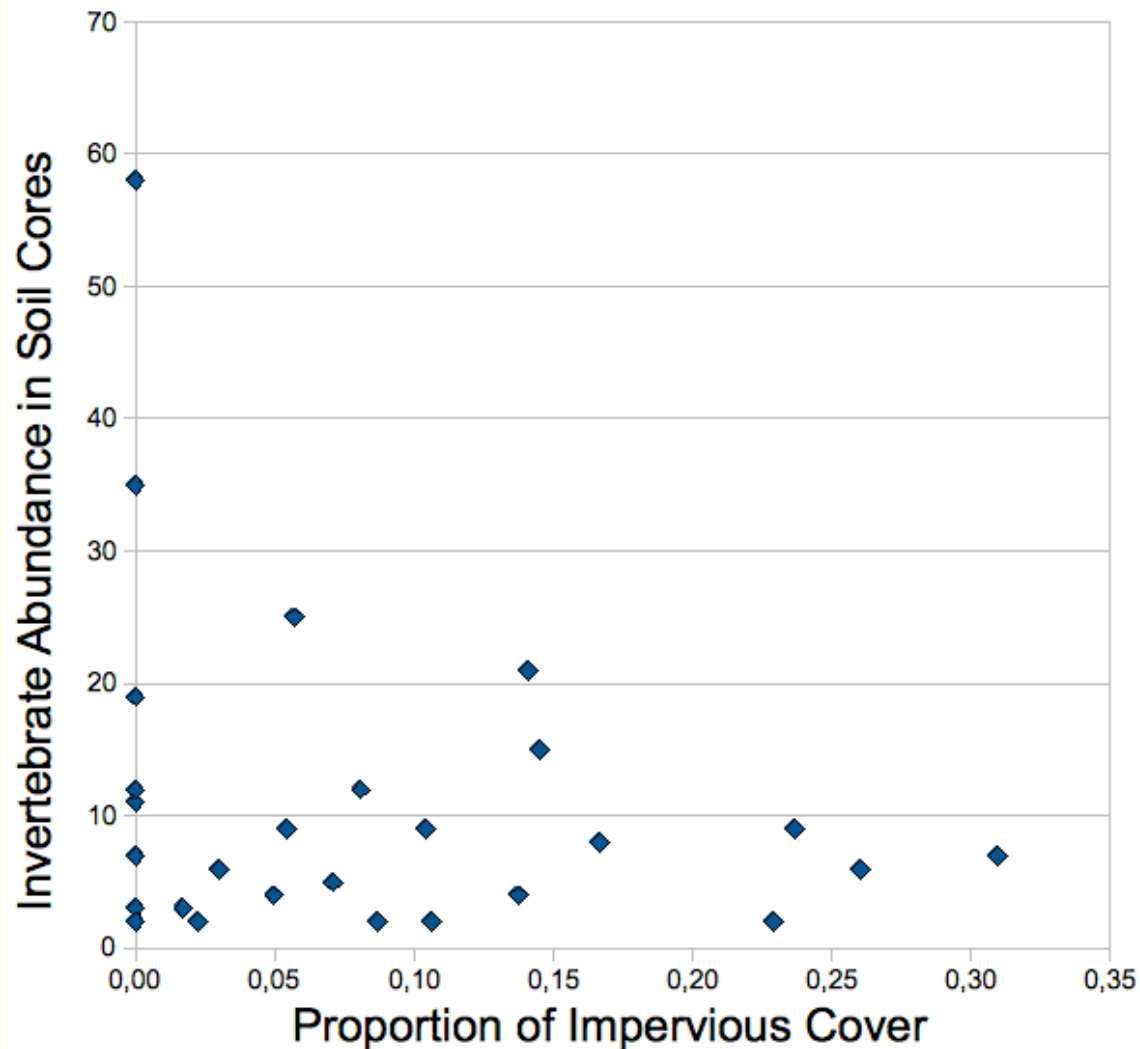
Results – Abundance of ants and beetle larvae in pitfall traps



$p = 0.296$

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Results - Abundance of ants and beetle larvae in soil cores



$p = 0.295$

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Results – Pileated Woodpecker presence

Habitat	Presence	Absence
Exurban	7	8
Forest	7	8

Logistic
regression
 $p = 0.584$

Discussion

- Exurban areas have larger trees on average. Human preference and lack of logging selects for large diameter trees.
- No trend for downed wood and rot class.
- No trend for ant and beetle larvae abundance.
- No trend for macro-invertebrate abundance (Casey, J. M. Undergraduate Honors Thesis. 2009. Sewanee: The University of the South.)
- No trend for Pileated Woodpecker presence.

Conclusion

- Exurban areas appear to provide at least some of the characteristics needed by Pileated Woodpeckers. All hypotheses have been rejected as we found no difference between exurban and forested areas (except for tree diameter).
- Studies on survival and breeding success must be conducted to ensure exurban areas are not ecological traps.
- Habitat for other mature forest indicator species should be quantified along an exurban gradient.
- Actual effects on secondary-cavity nesters should be studied as well.

Acknowledgements

- I would like to thank
 - Yeatman Summer Research Internship for funding
 - My co-authors for assistance
 - University of the South for all of its support



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