Public Abstract
First Name: Sean
Middle Name: Thomas
Last Name: O'Daniels
Adviser's First Name: Dylan
Adviser's Last Name: Kesler
Co-Adviser's First Name: Elisabeth
Co-Adviser's Last Name: Webb
Graduation Term: SP 2016
Department: Fisheries & Wildlife
Degree: MS
Title: Light reflectance patterns of decayed wood with implications for the visual ecology of woodpeckers.

Birds rely on eyesight for many aspects of their behavior and ecology, and a majority of diurnal species have thus evolved complex visual systems that include sensitivity to near ultraviolet (UV; 300-400 nanometers) wavelengths. The benefits of UV sensitivity to birds have been linked primarily to foraging and signaling. Behavioral studies of UV sensitivity have been conducted largely with passerine test subjects. Woodpeckers are a globally distributed avian subfamily (Picidae: Picinae) that is ecologically and economically important. They are considered keystone taxa because the cavities that they excavate are also used by dozens of other species of birds, mammals, and reptiles. Additionally, woodpeckers are responsible for millions of dollars in damage to anthropogenic structures annually. Despite their importance both as primary cavity excavators and nuisance animals, little work on their visual systems has been published. We developed a novel foraging-based behavioral assay designed to test UV sensitivity in woodpeckers, using the Pileated Woodpecker (Dryocopus pileatus) as a model organism. We acclimated 21 wild-caught D. pileatus to foraging for frozen mealworms within 1.2 m sections of peeled cedar (Thuja spp.) poles. We then tested the functional significance of multiple UV-reflective cues by placing frozen mealworms behind increased UV covers (magnesium carbonate), decreased UV covers (magnesium carbonate + UV Killer® or UV Killer), or decayed red pine substrates within the same 1.2 m poles in independent experiments. We recorded four response variables for each experimental substrate presented to study subjects, and analyzed these using generalized linear mixed models. Behavioral responses were greater towards both increased UV and decreased UV substrates in three experiments. Study subjects therefore reliably attended to two distinct UV conditions of a substrate. When we analyzed results from cue-naïve subjects separately (Trial 1 only), those birds showed a preference towards decreased UV substrates, suggesting that woodpeckers may be pre-disposed to foraging from decreased UV substrates. In experiments with decayed wood, study subjects exhibited greater behavioral responses towards decayed wood even after UV reflectance was reduced. This indicates that increased UV reflectance of our decayed substrates was not essential for our subjects to identify decayed from not decayed substrates. Woodpeckers are known to transport spores of decay fungi on their bills, feathers, and feet. Some species exhibit preferences for placing cavities in trees infected by particular species of fungi, however, a mechanism that might allow such a specific level of detection is unknown. In another analysis, we produced aspen, oak, and pine substrates with multiple species of decay fungi and measured light reflectance spectra from the resulting decayed substrates. We then employed an established perceptual model of color discrimination to assess the spectral differences between these substrates as perceived by a hypothetical woodpecker. Two decay fungi known to be associated with woodpecker cavities produced substrates above the threshold of discrimination when compared with control and other decayed substrates. Most decayed substrate comparisons (12 of 14) were also above threshold, which indicates decayed wood appears visually different to woodpeckers based on the fungi responsible for the decay. Together, these studies provide evidence that the UV condition of substrates may be a useful foraging cue for woodpeckers, and that woodpecker-fungus mutualisms may be considerably more complex than previously thought.