

Gray Wolves Select Territories Economically

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Estimating wolf (*Canis lupus*) abundance is a key component of wolf management in Montana. Montana Fish, Wildlife and Parks uses a Patch Occupancy Model (POM) to estimate area occupied, from which they estimate abundance based on average territory and pack size. Abundance estimates thus depend on assumptions that territory size is fixed and consistent statewide. In reality, territories vary spatiotemporally, which will affect precision and accuracy of abundance estimates. We developed a mechanistic model of territory selection to better understand territorial behavior and improve abundance estimates from POM. We hypothesized that wolves select territories economically based on the benefits of food resources and costs of competition, travel, and predation risk. Using only simple behavioral rules and limited, readily-available data for food resources, terrain ruggedness, and human density, the model predicted wolf distribution in Montana and the territory sizes and locations for specific packs. It accomplished this without using empirical data for wolves. The model provided evidence for the mechanisms driving empirically-observed patterns in space use by wolves. It demonstrated, for example, how economical behavior will cause territory size to decrease and overlap to increase with greater densities of prey and competitors. Results are consistent with the hypothesis that wolves select territories economically based on the benefits and costs of territory ownership. The mechanistic nature of the model makes it reliable for predicting territorial behavior under a full range of conditions wolves might encounter. This information will help keep abundance estimates from POM calibrated, absent intensive monitoring effort.

