Appendix S2. WinBUGS code for model 1.

Input data consists of the matrix h_{ij}, the detection/non detection data for site *i*, survey *j*.

In the code, z_i denotes presence ($z_i = 1$) or absence $z_i = 0$) at the level of the sample unit *i*; y_{ij} denotes local presence ($y_{ij} = 1$) o absence ($y_{ij} = 0$) on segment *j*; and h_{ij} denotes detection ($h_{ij} = 1$) or not ($h_{ij} = 0$) on segment *j* of sample unit *i*. Each of these random variable is modeled as a Bernouilli trial, the latter two conditional on occupancy at sample unit and segment scale:

The model parameter *psi* was given a default value of 1 since surveys were conducted in sample units *i* were presence of wolves had been previously confirmed by photo trapping.

The other model parameters *theta* and *p* were given uniform prior distributions, U(0,1).

```
model;
{
  for( i in 1 : 7 ) {
    z[i] ~ dbern(psi)
   for( j in 1 : 27 ) {
      y[i , j] ~ dbern(theta)
      h[i , j] ~ dbern(p)
    }
  }

      psi ~ dbern(1)
      theta ~ dunif(0,1)
      p ~ dunif(0,1)

}
```

Under our sample design, we suspected some degree of positive correlation between detection events on adjacent sample segments. Specifically, we considered the biologically likely scenario that wolves might travel along a trail for several adjacent 1-km segments. We tested a second model by decomposing the detection process into two components. Results and estimates were similar in the two models (p1 = 0.37 and p2 = 0.38 *vs.* p = 0.33, see Table S1), so the model described in the main text is the simplest. However, we provide below the codes for a model taking into account some degree of autocorrelation:

ψ = Pr(sample unit i occupied); $\theta 1$ = Pr(wolf scat present on segment j
sample | sample unit i occupied by wolf species **and species not present on previous segment**) ; $\theta 2$ = Pr(wolf scat present on segment j
sample | sample unit i occupied by wolf species **and species present on previous segment**);
p1 = Pr(detection at a segment j | sample unit
occupied by wolf species and **not detected at previous segment**).
P2 = Pr(detection at a segment j | sample unit
occupied by wolf species and **detected at previous segment**).

Winbugs codes for model 2:

```
model {
  for (i in 1:26) {
    z[i] ~ dbern(psi)
    y[i,1] ~ dbern(theta[1])

    y1[i,1] <- z[i]*y[i,1]+1

    h[i,1] ~ dbern(p[y1[i, 1]])
    for (j in 2:7) {
      y[i,j] ~ dbern(theta[y1[i, j-1]])
      y1[i,j] <- z[i]*y[i,j]+1
      h[i,j] ~ dbern(p[y1[i,j]])
    }
  }

  psi~dunif(0,1)
  θ [1]~dunif(0,1)
  θ [2]~dunif(0,1)
  p[1] ~ dunif(0,1)
  p[2] ~ dunif(0,1)
}
```