Global sensitivity analyses

We used global sensitivity analyses to identify those model parameters with the largest effect on our model outputs. For this, we used a Gradient Boosting regression algorithm as implemented in the R package *gbm*.

The importance of each variable in the simulation model was estimated by ranking them based on their relative influence on the model predictions. The relative influence scores of all variables add up to 100, and each variable receives a percentage based on its importance for the model predictions. The higher the relative influence scores, the highest the impact of the variable on the outcomes. To understand how the response variable changes based on the explanatory variables, we plotted the partial dependence plots. These plots show the average change in the predicted variable as a function of the target-dependent variable while holding all other variables constant.

Model S1

Importance of each variable

|  |  |
| --- | --- |
| Variable | Relative influence |
| number of traps | 61.61 |
| sigma | 36.55 |
| g0 | 0.76 |
| initial density of stoats | 0.66 |
| number of days | 0.22 |
| distance between traps | 0.20 |
| probability of by-catch | 0.00 |

Partial dependence plots

(proportion of stoats exposed to capture on Y axis)

Number of days

99.58

99.60

99.62

99.64

0

5

10

15

20

25

Initial density of stoats (N/ha)

99.35

99.40

99.45

99.50

99.55

99.60

99.65

0.02

0.04

0.06

0.08

0.10

Minimum distance between traps (m)

99.54

99.56

99.58

99.60

99.62

99.64

50

100

150

200

250

Number of traps

97

98

99

100

2000

4000

6000

8000

10000

g0

99.58

99.60

99.62

99.64

99.66

0.02

0.04

0.06

0.08

0.10

sigma

95

96

97

98

99

100

100

200

300

400

500

600

700

Probability of by-catch

99.625

99.630

99.635

99.640

0.006

0.008

0.010

0.012

0.014

Model S2

Importance of each variable

|  |  |
| --- | --- |
| Variable | Relative influence |
| sigma | 59.61 |
| number of traps | 39.53 |
| g0 | 0.38 |
| number of days | 0.29 |
| initial density of stoats | 0.10 |
| distance between traps | 0.05 |
| probability of by-catch | 0.04 |

Partial dependence plots

(proportion of stoats exposed to capture on Y axis)

Number of days

98.5

98.6

98.7

98.8

0

5

10

15

20

25

Initial density of stoats (N/ha)

98.78

98.79

98.80

98.81

0.02

0.04

0.06

0.08

0.10

Minimum distance between traps (m)

98.788

98.790

98.792

98.794

98.796

98.798

50

100

150

200

250

Number of traps

95

96

97

98

99

2000

4000

6000

g0

98.65

98.70

98.75

98.80

98.85

0.02

0.04

0.06

0.08

0.10

sigma

90

95

100

100

200

300

400

500

600

700

Probability of by-catch

98.790

98.792

98.794

98.796

98.798

0.006

0.008

0.010

0.012

0.014

Model S3

Importance of each variable

|  |  |
| --- | --- |
| Variable | Relative influence |
| sigma | 95.20 |
| number of days | 3.84 |
| g0 | 0.89 |
| initial density of stoats | 0.05 |
| probability of by-catch | 0.02 |

Partial dependence plots

(proportion of stoats exposed to capture on Y axis)

Number of days

98.9

99.0

99.1

99.2

99.3

0

5

10

15

20

25

Initial density of stoats (N/ha)

99.190

99.195

99.200

99.205

0.02

0.04

0.06

0.08

0.10

g0

99.05

99.10

99.15

99.20

99.25

0.02

0.04

0.06

0.08

0.10

sigma

92

94

96

98

100

100

200

300

400

500

600

700

Probability of by-cach

99.2015

99.2020

99.2025

0.006

0.008

0.010

0.012

0.014

Model S4

Importance of each variable

|  |  |
| --- | --- |
| Variable | Relative influence |
| sigma | 98.26 |
| g0 | 0.85 |
| number of days | 0.80 |
| initial density of stoats | 0.07 |
| probability of by-catch | 0.02 |

Partial dependence plots

(proportion of stoats exposed to capture on Y axis)

Number of days

99.05

99.10

99.15

99.20

99.25

0

5

10

15

20

25

Initial density of stoats (N/ha)

99.217

99.218

99.219

99.220

99.221

99.222

0.020

0.025

0.030

0.035

0.040

g0

99.10

99.15

99.20

99.25

0.02

0.04

0.06

0.08

0.10

sigma

94

96

98

100

100

200

300

400

500

600

700

Probability of by-catch

99.2180

99.2185

99.2190

99.2195

99.2200

99.2205

0.006

0.008

0.010

0.012

0.014

Model S5

Importance of each variable

|  |  |
| --- | --- |
| Variable | Relative influence |
| sigma | 97.75 |
| number of days | 1.32 |
| g0 | 0.93 |
| probability of by-catch | 0.00 |
| initial density of stoats | 0.00 |

Partial dependence plots

(proportion of stoats exposed to capture on Y axis)

Number of days

90.5

91.0

91.5

92.0

92.5

0

5

10

15

20

25

Initial den sity of stoats

92.039

92.040

92.041

92.042

92.043

92.044

0.020

0.025

0.030

0.035

0.040

g0

91.0

91.5

92.0

92.5

0.02

0.04

0.06

0.08

0.10

sigma

70

75

80

85

90

95

50

100

150

200

Probability of by-catch

92.030

92.035

92.040

92.045

0.006

0.008

0.010

0.012

0.014

Model S6

Importance of each variable

|  |  |
| --- | --- |
| Variable | Relative influence |
| sigma | 78.27 |
| g0 | 5.50 |
| Correlated Random Walk | 4.62 |
| probability of by-catch | 2.93 |
| step length | 2.55 |
| movement time | 2.24 |
| perceptual range | 1.77 |
| initial density of stoats | 1.26 |
| number of days | 0.85 |

Partial dependence plots

(proportion of stoats exposed to capture on Y axis)

Correlated Random Walk

87

88

89

90

0.95

0.96

0.97

0.98

0.99

Step length (m)

88.3

88.4

88.5

88.6

88.7

88.8

88.9

100

150

200

250

300

Perceptual range (m)

88.6

88.8

89.0

89.2

100

200

300

400

500

Movement time (hours)

88.4

88.5

88.6

88.7

88.8

88.9

200

250

300

350

400

450

500

Number of days

88.65

88.70

88.75

88.80

88.85

15

20

25

Initial density of stoats (N/ha)

88.2

88.4

88.6

88.8

89.0

0.014

0.015

0.016

0.017

0.018

0.019

g0

87

88

89

0.02

0.04

0.06

0.08

0.10

sigma

60

70

80

90

50

100

150

200

Probability of by-catch

88.4

88.6

88.8

89.0

0.006

0.008

0.010

0.012

0.014