



Best Practice Guide: Monitoring and Surveillance to support Early Warning and Rapid Response in grey squirrel management.

When managing invasive species management actions are best prioritised by prevention first, followed by early warning and rapid response, then eradication and lastly long term management. The invasive grey squirrel population size and distribution in the United Kingdom is too large and widespread for eradication to be considered feasible. However, at a local level the stage of invasion and level of threat greys pose to red squirrels can allow alternative management priorities. In Red Squirrel United project areas we are working towards a range of management strategies. In order to protect the red squirrel in strongholds, reserves or on islands early warning and rapid response approaches are needed to monitor for and act on any incursions of grey squirrels into new areas. This best practise guide sets out some principals and considerations when undertaking monitoring and surveillance to support Early Warning and Rapid Response.

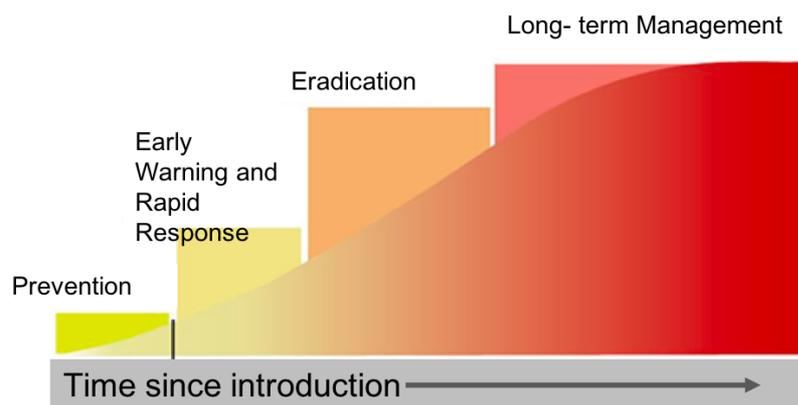


Figure 1: Invasion curve to illustrate the where different management actions may be appropriate

Where do we need Early Warning and Rapid Response?

Early Warning and Rapid Response approaches are not needed everywhere that grey squirrels occur. For Early Warning and Rapid Response to be appropriate management actions for an area or woodland red squirrels should be present but grey squirrels should not be established. If grey squirrels are established in the same area or woodland as red squirrels then eradication or long term management approaches are more applicable. Appropriate areas for early warning and rapid response management actions include red squirrel strongholds, such as Kielder Forest, red squirrel reserves, such as Formby Nature Reserve, or areas where eradications of grey squirrels have been carried but reincursion of grey squirrels pose a threat such as Anglesey in Gwynedd and the Mourne Mountains in Northern Island.

What is the objective of Early Warning and Rapid Response?

The main purpose of Early Warning in squirrel management is to detect grey squirrels entering an area before a population becomes established. Individuals that enter a new



area may be dispersing during the breeding season, searching for mates, or may be part of a population expanding their range from nearby habitat. It is thought that squirrels can travel up to 10 km to disperse into new habitat. Rapid Response is the contingency planning and action that is put in place to remove animals at the point of detection to prevent them from establishing in a given area. The scale and speed of the rapid response will depend on the level of risk (in the case of squirrels the disease risk posed to a red squirrel population by an incursion of grey squirrels) and the resources available.

What tools are available for Early Warning/ Detection?

Monitoring and surveillance for incursions is needed all year round but effort may need to be increased during the autumn when squirrels are likely to be dispersing away from their natal ranges.

Sightings records.

Public records of invasive species are often the first way that new invaders are reported. It is important that a record is made of the date, time and location of sightings. There are many ways to do this, ranging from contacting a local squirrel group or Wildlife Trust or by reporting a sighting through smartphone apps such as Mammal Mapper or iRecord that feed data into national and local databases. Increasing public awareness and community participation are important to increase surveillance and have been very successful in reporting, detecting and responding to incursions of grey squirrels on Anglesey.

Field signs

The presence of squirrels can be inferred by the presence of field signs, such as the presence of dreys or chewed pine cones, however it is often difficult to determine the species from field signs alone. A common way of determining the species of squirrel present from field signs is to obtain a hair sample. This is done by attracting animals to feeders or baited tubes set up to ensure that the animal rubs against some sticky tape to leave behind some hairs. The hairs can be viewed under a microscope to determine the species present.

Camera traps.

Images from motion triggered or infrared detection camera traps provide evidence of species presence at a location with a date and time stamp and can be more beneficial than public sightings alone as they allow for verification. Camera traps are routinely used for systematic squirrel monitoring and have been used in the Red Squirrels United project for Early Warning in the Kielder area. The selection of camera locations should maximise the likelihood of detection. Site selection can be optimised by assessing the suitable habitat and more formally using species distribution modelling and least cost pathways to identify the corridors that squirrels are most likely to use.

What tools are available for Rapid Response?

Targeted monitoring and surveillance:

Capturing an animal after a single sighting or detection can be a challenge and can take a lot of time and effort. Dispersing animals passing through a woodland may not settle in an area. It may be necessary to confirm presence through further monitoring before taking further action. It is important to use methods that increase the chance of detection, this might include the use of bait stations or feeders with camera traps. A cluster of public sightings



will also provide increased evidence of species presence. Increased public awareness through local poster and social media campaigns can be successful in increasing public recording of sightings.

Targeted Capture:

When presence of individuals in an area is confirmed (especially where there is a potential to breed) removal should be prioritised. Using the time stamp on a camera trap can allow targeted trapping and shooting. High-density trapping may be appropriate where there a number of individuals are present, however trapping a few individuals can be very time consuming. Setting alarmed traps (e.g. 'mink police') may be an option in areas with suitable mobile phone signal coverage.

A workflow that has been successful in Northern Ireland has been using the reported sightings/ camera traps to record the behaviour of the squirrels whereby the typical activity patterns of the individuals are noted and shooting or trapping is targeted to these times.

Rapid Response Contingency planning:

When an area has been identified as suitable for monitoring and surveillance a contingency plan for a rapid response should be put in place, specific to that area. During invasions there is a limited time window in which to respond to prevent establishment and spread of the species. Not having sufficient planning in place can hamper responses and this can be a particular issue in remote areas.

A contingency plan should consider:

Risk: Not all sightings need to result in the same level of response. A single one-off sighting may not require any more action other than increased surveillance to verify the sighting. It might be sensible to develop a classification of sightings to prioritise the appropriate response given the resources available. A cluster of sightings in an area should trigger a response to remove the individuals.

Resources: To enable a response to be carried out quickly the appropriate land access should be determined beforehand, consider if permission has been granted/ who should be contacted. There should be an agreed method of response. What methods will be used? Are there cameras traps / traps available? Who is going to respond? Who will coordinate activities? Will volunteers set and check camera traps? Trapping and dispatch should always be carried out by trained individuals.

Results: When will success be declared? Should trapping stop when one animal is caught? Or the alert be downgraded? If an animal is not detected again when should the response return to the early detection phase?