

MONITORING TECHNIQUES

As part of Chester Zoo's conservation work, a wide range of monitoring techniques are used. These are carefully selected depending on their suitability for the species and surroundings.

Below are a selection of the monitoring techniques that may be used:

Monitoring technique	Used to monitor	Method	Advantages	Disadvantages
Camera-trapping	Animal behaviour	Camera traps record short bursts of footage when an animal is present in front of the camera.	May capture evidence of behaviour not normally observed while there is human presence.	Relies heavily on the animal's behaviour taking place in the right location.
	Variety of species found in an area	Camera traps set up around the area to take photos of passing wildlife	Camera traps reduce the need for human presence to monitor wildlife.	Can detect presence but not absence of a species; just because there's no footage, doesn't mean it isn't there.
	Individuals found in an area	Photos found on camera traps are analysed to identify whether it is the same or a different individual by markings or other distinguishing features	Non-invasive way of identifying individual animals.	If the animal is facing the wrong way on a photo it may be impossible to tell if this is the same individual.
	Population occupancy	Individual camera traps are monitored to specifically find where in an area a species visits and therefore how much of the area is occupied.	Does not require animals to be radio-tracked to see their movements.	Requires existing background knowledge on distances travelled by species to form their home-range in order to calculate occupancy.
	Population density	Cameras are randomly set-up in an area to monitor the number of passing members of a species at these sites, and then the population of the whole area is estimated from this information.	Useful for a species that is spread across an area.	Model assumes that animals move randomly throughout the area in order to calculate the population. Difficult to be truly random while determining the position of the cameras, and the locations decided may not be suitable due to terrain or other obstacles.
Drone technology	Population estimates	Drones follow a pre-defined route taking photos and/or video of the area. Members of a species or other indicators found by the images are used to estimate the population.	Allows for huge areas of difficult terrain to be monitored without the need for human presence.	Limitations of drone technology may include the range of the drone being used and image quality. Consideration needs to be given as to whether the species is likely to be obscured on images by obstacles such as trees.
Mark & Recapture	Population estimates and change	Animals are caught in a pre-defined area and marked to allow individuals to be identified at a later date and when they were previously caught (i.e. right back leg indicates May 2017) before being released back to where they were found. An established calculation is used during subsequent counts involving the number of marked and unmarked individuals caught.	Allows for individuals of a species which are hard for the human eye to tell apart to be identified as previously found.	Requires human presence. Animals need to be caught which may cause stress. Marking needs to be carried out in a way which does not harm or hinder the animal's chances of survival.
Flock counts	Population estimates	Birds which are known to regularly pass a location at a certain time (i.e. dawn) are counted, usually over a period of time, and the population of the area is estimated either from the highest number or average depending on species.	A good vantage point allows for large numbers to be spotted and counted to form estimate.	Requires preliminary research to find a spot which is frequently passed by large numbers of birds and offers good visibility. Requires good background knowledge of the species and their behaviour (i.e. do just males fly whilst young are in the nest? What age do the young fledge? etc)

MONITORING TECHNIQUES (CONTINUED)

Monitoring technique	Used to monitor	Method	Advantages	Disadvantages
GPS	Species or individual activity	Co-ordinates are noted on GPS where a member of a species has been spotted or signs of their presence are found.	Accurate recording of locations visited by species. GPS may also be used in recording of other methods (i.e. location of flock counts)	Cost of devices. Requires training of field staff in the technology used.
Radio collars	Individual activity	Animal is fitted with a radio collar which can be found with a tracking system.	Tracks individual animal movements, allowing them to be easily monitored over a period of time.	Requires animal to be captured while collar is fitted, possibly with use of anaesthetic.
DNA	Individual presence in an area.	Samples are collected (hair, feathers, faeces, etc), amplified using PCR and analysed.	Non-invasive method of identifying individuals found within an area.	Time consuming and high cost of equipment. Difficult to preserve samples correctly in field. Consideration needs to be given to cross contamination.
	Monitoring of animal diets	DNA in the faeces is amplified through PCR to identify the dietary composition.	Definitive evidence as to what an animal has been eating.	
Quadrats	Percentage cover and variety of species	Quadrats are randomly distributed around habitat and investigated for what is found within.	Gives a snapshot view of small plants found in an area. Survey becomes more reliable with a greater number of quadrats.	Difficult to monitor animal populations.
Line transects	Variety of species in an area	Continuous - A straight line is followed and checked for animals or plants that are touching the line.	Allows for consistent checking of species found over a short distance.	Captures only a snapshot of species found in an area.
		Interrupted – A straight line is checked at regular intervals for plants and animals touching the line.	Allows for a larger distance to be covered in the time available.	Greater chance of species being missed as part of survey.
Belt transects	Variety of species, population density and percentage cover	Continuous or interrupted similar to the above but with a quadrat or pre-defined distance from line to count everything found in this area.	Detailed survey of everything found within sample area.	May encounter difficult terrain within the survey area, making species harder to find.