URS

LLWR Ecology Framework

Reptile Survey

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1. INTRODUCTION

1.1 Background and Scope

URS Infrastructure and Environment Ltd (URS) was commissioned by Low Level Waste Repository Ltd (LLWR) to undertake a reptile survey on the LLWR operational site, Cumbria. The surveys were designed in part to ascertain the success of a previous *in situ* reptile translocation but also to update an on-going programme of wildlife management and to inform future site development plans.

It is our understanding that future developments may require further translocations of reptiles in to the receptor site. It is therefore important to determine whether there is sufficient remaining capacity within the receptor.

1.2 Study Site

The LLWR site (hereafter referred to as the 'Site') is situated adjacent to the village of Drigg, Cumbria (Ordnance Survey reference SD 055 992). The Site measures approximately 100ha in size and includes parcels of high quality terrestrial habitat considered to be suitable native reptile species (URS, 2011). The Site includes extensive areas of grassland, woodland, scrub and marsh along with parcels of open water. The Site borders Drigg Coast Site of Special Scientific Interest (SSSI), which is known to support populations of adder (*Vipera berus*), common lizard (*Zootoca vivipara*) and slow worm (*Anguis fragilis*).

The LLWR Site lies outside the known range of smooth snake (*Coronella austriaca*) and sand lizard (*Lacerta agilis*) and does not contain suitable habitat. As such, these species will not be considered further in this report.

1.3 Legislation

All widespread species of reptile (adder, grass snake (*Natrix natrix*), common lizard and slow worm) receive legal protection through their inclusion on Schedule 5 (Sections 9(1) and 9(5)) of the Wildlife and Countryside Act 1981 (as amended). It is an offence to intentionally or recklessly kill or injure a reptile; however, unlike European protected species, their habitat does not receive legal protection.

All reptiles are listed as a Priority Species on the United Kingdom Biodiversity Action Plan (UKBAP) and as 'Species of Principal Importance for Conservation in England' under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006. Section 40 of the same Act requires that local and regional authorities have regard to the conservation of biodiversity in England, when carrying out their normal functions.

2. METHODS

2.1 Desk-based Study & Previous Information

In 2007, a large number of reptiles (>1,000 individuals) were translocated from the slab area (circa 1ha.) to a purpose built receptor site, situated in the south of the LLWR Site (Figure 1). Included within the translocation were approximately 17 adders, 815 slow worms and 255 common lizards. To date, no post-translocation surveys have been undertaken to ascertain whether the programme was successful i.e. whether the populations persist and, if so, at what level.

2.2 Field Survey

Natural England released the *Reptile Mitigation Guidelines* in 2011, which describes good practice with regards to reptile survey and mitigation. However, following feedback from consultees, Natural England recalled the guidelines later in the same year. Current advice is that the guidelines should be used as a draft publication in conjunction with standing advice presented in the Herpetofauna Workers Manual (Gent & Gibson, 1998) and Reptiles: guidelines for Developers (English Nature, 2004). The mitigation guidelines are expected to be rereleased in the winter of 2012. As such, all surveys were designed, as far as possible, to be compliant with the guidelines and, as survey effort is generally higher in the guidelines, there will be no risk of insufficient effort.

The reptile mitigation guidelines describe the minimum survey effort required based on species present and month. Historical survey and translocation have identified populations of adder, slow worm and common lizard at the LLWR Site (refer to Section 2.1 above). Table 1 below provides a species score which corresponds to the minimum standard effort per species. Table 2 presents the Monthly Survey Effort Weighting (MSEW), a score that reflects the detectability of the species in any given month.

Table 1: Minimum Standard Survey Units (MSSU) per Species (Natural England, 2011)

Species	MSSU
Adder	30
Slow worm	25
Common lizard	25

Table 2: Monthly Survey Effort Weighting (MSEW) (Natural England, 2011)

	Mar	Apr	May	Jun	Jul
Adder	4	5	4	3	2
Slow worm	2	5	5	5	3
Common lizard	3	5	5	5	4

By dividing the MSSU score by the MSEW, the minimum number of survey visits required per month is generated (assuming all are to be undertaken in a single month); for example, in order to survey slow worms in April, five survey visits would be required (i.e. MSSU (25) divided by MSEW (5) = 5). Incomplete numbers are always rounded up. Where the surveys are to be undertaken over several months, the appropriate monthly weighting should be used. For instance, taking the previous example, the slow worm survey is to be conducted over March and April. Three visits are planned for April (3 x MSEW (which in this case is 5) = 15), which means that a further 10 points are needed from March. Ten points divided by MSEW (in this case is 2) means than a further five visits are required in March. This approach should be repeated for each species likely to be present.

Adders require the greatest survey effort (i.e. MSSU = 30) and the surveys were designed to achieve sufficient survey effort to detect this species. Nine survey visits were undertaken in 2012: one visit was carried out in April, five visits in May, one visit in June and finally two visits in July 2012. Cumulatively, this equates to a score of 32, 45 and 43 for adders, slow worm and

common lizard respectively (refer to Table 3 for calculation). This is considered to be sufficient survey effort under the draft Reptile Mitigation Guidelines (Natural England, 2011).

Table 3: Survey Effort

Species	MSEW x Number of Visits				Total (Minimum Effort Required)
	Apr	May	Jun	Jul	
Adder	5 x 1 = 5	4 x 5 = 20	3 x 1 = 3	2 x 2 = 4	32 (30)
Slow worm	5 x 1 = 5	5 x 5 = 25	5 x 1 = 5	3 x 2 = 6	45 (25)
Common lizard	5 x 1 = 5	5 x 5 = 25	5 x 1 = 5	4 x 2 = 8	43 (25)

Twenty-two distinct areas were identified for survey (Areas A – V, Figure 1). The habitat within each of these discrete areas was assessed according to the criteria presented in Table 4 below (Natural England, 2011).

Table 4: Habitat Assessment

Key Feature	Description
Location within species range	Populations approaching the limits of their geographical distribution are inherently of greater value than those within the core range
Vegetation structure	Diverse vegetation with a complex three-dimensional structure provides reptiles not only with a range of microclimates but also protection from predators and the wind along with a greater diversity of prey.
Insolation	Reptiles are ectothermic and rely on external heat sources to raise their body temperatures. Reptiles require access to areas that receive direct sunlight in order to bask in the open, partially within vegetation (mosaic basking or under cover (cryptic basking). Access to direct sunlight is also important in the production of vitamin D3.
Aspect	South facing slopes are the preferred basking areas for reptiles as they catch the sun for most of the day
Topography	Small scale topographic variations such as gullies and ditches provide reptiles with shelter from windy conditions
Surface geology	Reptiles vary in their preference for ground water levels with grass snakes exhibiting positive associations with open water and slow worms negative. Geology is also important for sand lizards (*Lacerta agilis*), which excavate nest chambers in semi-compacted sand
Site connectivity	Habitat connectivity is important not only between sites but also within sites. Reptile populations are rarely distributed across a site in a uniform fashion and genetic exchange is important for maintaining a viable population

Key Feature	Description
Prey abundance	Common lizard predate upon arthropods including beetles, spiders and soft bodies invertebrates such as gastropods. Grass snakes have a strong preference for amphibians and, to a lesser extent, fish. Prey abundance is a determining factor in assessing the carrying capacity of an area.
Refuge opportunities	Refuges provide reptiles a means of escaping predators and adverse environmental conditions (this can include the sunshine as reptiles are prone to overheating)
Hibernation habitat	To escape the potentially fatal sub-zero temperatures encountered during winter, reptiles enter a period of hibernation. Hibernation sites can include burrows, root systems, large grass tussocks, beneath trees and rubble piles. The hibernaculum needs to remain frost-free and usually is orientated to the south.
Disturbance	Disturbance varies considerable in its form and effects. At the lower end of the spectrum, disturbance is brief and infrequent (a walker passing by) whilst the higher end of the spectrum includes frequent and intense (dog attack, collection and habitat destruction). Higher levels of disturbance can interfere with courtship and feeding.
Egg laying potential	Suitable egg laying strata is important for the oviparous reptiles, namely grass snake and sand lizard. Grass snakes require decomposing material such as manure, compost heaps, grass clippings, cut reeds *etc.*

By combining the confirmed presence of a species with the quality of the habitat, it is possible to estimate the qualitative population size class for each species present within each compartment; it is important to note that each compartment does not support a discrete population of reptiles. Because of the lack of physical barriers and overlapping habitats types, it is prudent to think of a single large population of reptiles occurring within the LLWR Site. However, the idea of compartments does enable a more detailed understanding of reptile distribution and abundance throughout the Site. The size class categories are presented below in Table 5. In reality, there are no physical barriers delineating the boundaries of each Area A-V and populations are likely to overlap.

Table 5: Population Size Class Categories (Natural England, 2011)

Species	Population Size Class		
	Small	Medium	Large
Slow worm	<10 or presence + poor habitat quality	10 – 40 or presence + good habitat quality	>40 or presence + exceptional habitat quality
Adder	<5 or presence + poor habitat quality	5 – 10 or presence + good habitat quality	>10 or presence + exceptional habitat quality
Common lizard	<5 or presence + poor habitat quality	5 – 20 or presence + good habitat quality	>20 or presence + exceptional habitat quality

Reptile surveys comprised a combination of Visual Encounter Surveys (VES) and Artificial Refuge Survey (ARS). The VES involved surveyors slowly walking along predetermined transects scanning the vegetation for reptiles. The transects were designed to include, where possible, a range of suitable vegetation types, south-facing banks and suitable natural refuges. The ARS involved the placement of roofing felt and corrugated tin, measuring 0.5m^2, in areas of good habitat (typically along the VES transects) at densities of between 50 and 100ha^{-1}. Each survey was carried out under suitable environmental conditions i.e. between 10 and 20°C, little to no wind and not raining (refer to Table 6).

2.3 Survey Limitations

The LLWR Site contains extensive areas of high quality habitat, suitable for supporting native reptile species. Within this habitat are abundant natural refuges, which are likely to limit the effectiveness of tins and felts as reptiles have alternative places of shelter. The visual encounter survey included inspection of natural features; however, it proved difficult to approach features within the unmanaged grasslands without creating disturbance and alerting the animals to the presence of the surveyor.

A parcel of grassland, lying between T and G (Figure 1) couldn't be surveyed as it wasn't safe to access. However, surveys were undertaken to the north, east and south of this area, which enabled the presence of reptiles to be extrapolated.

3. RESULTS

3.1 Field Survey

The environmental survey conditions and survey results are presented in Tables 6 and 7 respectively.

Table 6: Survey Environmental Conditions

Visit Number	Date	Air Temperature (°C)	Cloud Cover (%)	Wind Speed (Beaufort)	Ground Conditions*
1	18/04/2012	9.2	75	2	Dry
2	01/05/2012	12.5	95	2	Dry
3	10/05/2012	10.0	70	-	Dry
4	15/05/2012	13.1	50	2	Damp
5	16/05/2012	10.0	10	2	Damp
6	29/05/2012	20.0	90	1	Damp
7	06/06/2012	14.0	90	2	Damp

Visit Number	Date	Air Temperature (°C)	Cloud Cover (%)	Wind Speed (Beaufort)	Ground Conditions*
8	04/07/2012	16.0	100	2	Damp
9	20/07/2012	14.0	100	2	Damp

* Dry, Damp (no standing water) or Wet (standing water present)

Table 7: Summary of Survey Data

Area ID and Number of Refuges	Quality*	Peak Count		
		Slow Worm	Adder	Common Lizard
A (10)	Good	4	2	0
B (10)	Good	4	1	1
C (20)	Good	2	0	1
D (20)	Exceptional	9	0	0
E (10)	Exceptional	10	0	1
F (10)	Exceptional	3	0	0
G (10)	Exceptional	0	0	0
H (10)	Exceptional	4	0	0
I (10)	Good	0	0	0
J (20)	Good	2	0	0
K (20)	Good	0	0	0
L (20)	Good	0	0	0
M (10)	Good	1	0	1
N (10)	Good	0	1	0
O (10)	Good	0	0	0

Area ID and Number of Refuges	Quality*	Peak Count		
		Slow Worm	Adder	Common Lizard
P (10)	Good	0	0	0
Q (10)	Good	0	3	0
R (10)	Good	0	0	0
S (10)	Good	0	0	0
T (10)	Exceptional	10	3	4
U (20)	Good	3	0	0
V (10)	Good	0	1	0

* Based on Natural England (2011): Poor, Good or Exceptional

Table 8: Population Size Class Assessment

Area	Population Size Class		
	Slow Worm	Adder	Common Lizard
A	Small	Medium	Probably absent
B	Small	Small	Small
C	Small	Absent	Small
D	Medium	Probably absent	Probably absent
E	Medium	Probably absent	Small
F	Small	Probably absent	Probably absent
G	Probably absent	Probably absent	Probably absent
H	Small	Probably absent	Probably absent
I	Probably absent	Probably absent	Probably absent
J	Small	Probably absent	Probably absent
K	Probably absent	Probably absent	Probably absent
L	Probably absent	Probably absent	Probably absent
M	Small	Probably absent	Small

Area	Population Size Class		
	Slow Worm	Adder	Common Lizard
N	Probably absent	Small	Probably absent
O	Probably absent	Probably absent	Probably absent
P	Probably absent	Probably absent	Probably absent
Q	Probably absent	Medium	Probably absent
R	Probably absent	Probably absent	Probably absent
S	Probably absent	Probably absent	Probably absent
T	Medium	Medium	Medium
U	Small	Probably absent	Probably absent
V	Probably absent	Small	Probably absent

4. DISCUSSION

4.1 Reptile Distribution and Status

Reptiles were recorded in low densities throughout the site with a small number of exceptions. Larger populations were identified within Areas A (a plot of land to the north of the security building), D and E (the receptor site), Q (adders only, the southeast corner of the trench cap) and T (an enclosed area of brownfield).

Given the extensive areas of suitable habitat, the number of reptiles recorded was considered to be low based on the experience of the author. This suggests that there is either a landscape-scale factor(s) suppressing the population size of all three species, the populations are recovering from some significant adverse impact, or the surveys failed to detect a significant proportion of the population. Based on the results of the recent translocation and the fact that habitats have probably remained fairly stable in recent years, the latter seems more likely. The abundance of suitable habitat is likely to reduce the effectiveness of the artificial refuges; in addition, the dense and unmanaged vegetation also made approaching suitable refuges difficult without causing disturbance thereby dispersing the animals. Because of the contiguous nature of the suitable habitat along with an paucity of significant physical barriers, it would be prudent to infer that reptiles are likely to occur in most, if not all, identified compartments, albeit at low densities.

Estimates of the population density of slow worms have ranged between 600 and 2,100ha^{-1} for 'good' habitats (Smith, 1990; Riddell, 1996; Platenberg, 1999). Common lizards are thought to occur at much lower densities, typically between 100 and 400ha^{-1}, again in 'good' habitats (Strijbosch & Creemers, 1988). Adders typically occur at significantly lower densities of between one and 12 animals per hectare (Beebee and Griffiths, 2000). The results of the previous translocation support these density estimates.

The trench cap supports small populations of common lizard and adder. The regular habitat maintenance, which results in the periodical removal of deep scrub and saplings (which could compromise the integrity of the cap), has resulted in a relatively homogenous habitat more

suited to the slow worm; however, it is likely that the concrete drainage system has restricted access to the less mobile slow worm.

The receptor area continues to support reptiles, presumably arising from translocation, and is likely to be able to support additional animals if a number of habitat management and enhancement measures were implemented. This additional capacity could be used for future translocation programmes, should the need arise. Gorse (*Ulex europaeus*) has become dense in extensive areas, shading the ground and reducing the suitability of the area for basking animals. Selective removal of gorse would increase basking and foraging opportunities for reptiles. The hibernacula are considered to be sufficiently extensive to support additional animals.

4.2 Implications for Site Management and Legal Compliance

Reptiles should be considered when carrying out potentially damaging operations including habitat management (mowing or herbicide application), development (construction and land-use change) and materials storage. Areas of suitable habitat, particularly adjacent to the receptor site, should be managed sensitively following consultation with an ecologist; the mechanism for this is that site management manuals (OI 162) should continue to be reviewed by an ecologist on an annual basis (particularly in light of the current study).

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Legend

- Artificial Refuges
- Donor Site
- Receptor Site

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LLWR Reptile Survey

Figure 1
Reptile Survey Plan

Scale1:10,000 @ A4; Refuge Locations Not to Scale

Drawn by:	Checked by:	Date:
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