

# OPW Arterial Drainage Maintenance

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## *Guidance Notes:*

### *Protection and Enhancement for bats*

*November 2010*

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## Office of Public Works (OPW)

Waterways are an important habitat for wildlife including bats. The Office of Public Works (OPW) is the statutory body responsible for river drainage and flood relief (Arterial Drainage Act, 1945 and Arterial Drainage Amendment Act, 1995) in Ireland. The OPW undertakes the maintenance of 11,500km of channel and 730km of embankments which includes 18,500 bridges and 750 ancillary structures such as sluice gates, pumping stations and tidal barrages. In relation to road bridges, the OPW is principally responsible for the flood conveyance while the Local Authority is responsible for structural integrity. Annually, about 2000km of channel is maintained with circa 200 structures repaired.

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### Important roosting sites

- Crevices in stone work of old and modern bridges
- Crevices in stone work of sluice gates, pumping stations and tidal barrages
- Tree holes, spilt limbs and dead wood of mature trees adjacent to water courses
- Trees with heavy ivy growth adjacent to water courses

### Important foraging areas

- Watercourses, especially those lined with hedgerows and treelines
  - Watercourses flowing through wooded areas
  - Watercourses with slow moving water
  - Extensively managed and grazed pasture adjacent to watercourses
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Daubenton's bat foraging over water (© Frank Greenaway)



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Bat droppings can be deposited on stonework below an occupied crevice. Bat droppings crumble to touch and are less than 1cm long ranging from light brown to black in colour.

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## Recognising potential roosting sites for bats

It is often difficult to tell if a structure is used as a bat roost because these small mammals can hide themselves away from obvious sight. Therefore, it is important to be vigilant for suitable roosting sites and for more obvious signs of occupation such as bat droppings (See Insert Below).

Irish bats are very small and a crevice greater than 50mm deep and 12mm wide can be used as a bat roost or allow the bat to access a larger chamber within the structure behind the crevice.



This 3D shape is 12mm high/wide and 50mm long, illustrating the dimensions of a suitable crevice for a single bat.

Other evidence to be aware of are grease stains around access holes. Oil from the bat's fur as they squeeze themselves through crevices can leave dark polished surfaces indicating bat usage. In addition, the lack of cobwebs around a crevice can also indicate that it is used by bats.



Crevices should be checked by using a high powered narrow beam torch light or an endoscope. A single soprano pipistrelle was found in this crevice being illuminated by torchlight.



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## Ireland's bat fauna

Ireland's bat fauna is comprised of nine resident species, forming one third of Ireland's land mammals. Eight species are vesper bats and all vespertilionid bats have a tragus (cartilaginous structure found inside the pinna of the ear). Vesper bats are distributed throughout the country. Nathusius' pipistrelle is a recent addition to the list while the Brandt's bat is a potential tenth species.

Common pipistrelle *Pipistrellus pipistrellus*

Soprano pipistrelle *Pipistrellus pygmaeus*

Nathusius' pipistrelle *Pipistrellus nathusii*

Leisler's bat *Nyctalus leisleri*

Brown long-eared bat *Plecotus auritus*

Natterer's bat *Myotis nattereri*

Whiskered bat *Myotis mystacinus*

Daubenton's bat *Myotis daubentonii*

Brandt's bat *Myotis brandtii*

The ninth resident species, the lesser horseshoe bat *Rhinolophus hipposideros*, belongs to the Rhinolophidea and has a complex nose leaf structure. This species current distribution is confined to the western counties of: Mayo, Galway, Clare, Limerick, Kerry and Cork.

Bats are widely distributed throughout a range of habitats in the Irish landscape. Due to their reliance on insect populations, specialist feeding behaviour and habitat requirements, they are considered to be valuable environmental indicators of state and condition of the wider countryside.

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Above: Natterer's bat (Photo: Tina Aughney).



Below: Daubenton's bat (Photo: Tina Aughney).

## Bats and the Law

Due to increasing pressure on bat populations, all Irish bat species are protected by the 1976 Wildlife Act and 2000 Amendment. They are also protected under the EU Habitats Directive.

Consequently, it is a criminal offence to

- Intentionally kill, injure or take a bat
- Possess or control any live specimen or anything derived from a bat
- Wilfully interfere with any structure or place used for breeding or resting by a bat
- Wilfully interfere with a bat while it is occupying a structure or place which it uses for that purpose

This is a brief summary of the main points of the law. Further details of the Wildlife Act and the Habitats Directive may be found on [www.npws.ie](http://www.npws.ie).

More information about bats and their conservation can be sourced from the following documents:

McAney, K. (2006) A conservation plan for Irish Vesper bats. *Irish Wildlife Manuals* No. 25. National Parks & Wildlife Service, DoEHLG. [www.npws.ie/en/PublicationLiterature/IrishWildlifeManuals](http://www.npws.ie/en/PublicationLiterature/IrishWildlifeManuals)

Kelleher, C. & Marnell, F (2006) Bat mitigation guidelines for Ireland, *Irish Wildlife Manuals* No. 25. National Parks & Wildlife Service, DoEHLG. [www.npws.ie/en/PublicationLiterature/IrishWildlifeManuals](http://www.npws.ie/en/PublicationLiterature/IrishWildlifeManuals)

Marnell, F. & Presetnik, P. (2009) Protection of Overground roosts for bats, *EUROBATS Publication Series* No. 4. [www.eurobats.org/publications/publications\\_series.htm](http://www.eurobats.org/publications/publications_series.htm)

Mitchell-Jones, A.J. & A. P. McLeish [Eds.] (2004) *Bat Worker's Manual*, 3<sup>rd</sup> Edition. Joint Nature Conservation Committee Peterborough.

**If a bat is encountered during operations, please stop works and contact your local NPWS Conservation Ranger. The national helpline number is 1800 405 000.**

## Bat Surveys – Bridges, masonry sections sluice gates etc.

Bridges and similar structures are an essential for roosting bats. Surveys should be undertaken using the methodology described below. The survey methodology follows that of Billington and Norman (1997) and involves a grading system where the bridge or similar masonry sections of structure examined is categorised as follows:

**0 = no potential (no suitable crevices)**

**1 = crevices present may be of use to bats**

**2 = crevices ideal for bats but no evidence of usage**

**3 = evidence of bats (e.g. bats present, droppings, grease marks, urine staining, claw marks or the presence of bat fly pupae)**

To complete this grading, each bridge or structure is inspected using a high-powered, narrow beamed torch or endoscope. The following sections of bridges should be inspected: crevices, holes, cracks and joints beneath bridge arches and abutments, joints within culverts and any external structures that may offer a roosting site for bats. Similar masonry sections of sluice gates, tidal barrages and pumping stations should also be inspected.

Where a bat is recorded but not identified to species level or highly suspected in a structure, a dusk bat detector survey should be undertaken. A dusk survey requires the use of a bat detector (Heterodyne, Frequency Division or Time Expansion). The surveyor should be in position 30 minutes before sunset and survey for a minimum of 2 hours.

Billington, G. E. & Norman, G. M. (1997) *A report on the survey and conservation of bat roosts in bridges in Cumbria*. Kendal: English Nature.

Below: Typical stone masonry bridge which often provides suitable roosting sites for bats (Photo: Hannah Denniston).



Below: An example of a modern concrete bridge. Expansion joints of such bridges may be used as roosting sites for bats (Photo: Ger Stanton).



Above: Brown long-eared bat roosting in a stone crevice (Photo: Tina Aughney).

## Historical Survey Results

Bridges are considered to be important roosting sites for bats, in particular, stone masonry bridges. Irish bat species have been recorded in such bridges in previous independent surveys (Shiel, 1999 and Masterson et al, 2008). Such species include: Daubenton's bat, Natterer's bats, brown long-eared bat, whiskered bat and common pipistrelle bat. Additional surveys commissioned by local authorities have focused on stone masonry bridges because of their heritage value (e.g. Keeley, 2003). Therefore, an inventory of important bridges for bats can provide the OPW and local authorities with information on 'best practice' for future maintenance works

Keeley, B. (2003) An initial examination of Bridges in Carlow and Kilkenny to evaluate the potential for roosting bats and the significance of bridge repairs for bat conservation. Report prepared for The Heritage Council, Carlow County Council and Kilkenny County Council.

Masterson, M., Buckley, D., O'Brien, M. & Kelleher, C. (2008) An investigation into bridge usage by bats within the Sullane & Laney River Catchments, County Cork. Cork County Bat Group.

Shiel, C. (1999) Bridge usage by bats in County Leitrim and County Sligo. The Heritage Council, Rothe House, Kilkenny City.

## Timing of Surveys

Bat usage can be very transitional. Therefore, it is essential that structures with suitable roosting sites are surveyed 2/3 times in a year to document seasonal bat usage.

Winter	Spring	Summer	Autumn
optional	recommended	recommended	recommended

## A BAT'S YEAR (January to December)

J	F	M	A	M	J	J	A	S	O	N	D	
Hibernation – bats go into torpor to conserve fat reserves		Bats hungry and active, move from hibernation		roost to summer roosts	Maternity females gather and give birth to a single young			Bats leave summer roosts, mating takes place, prepare for hibernation				Hibernation



## **Mature trees, treelines and hedgerows**

All Irish bat species feed on insects associated with trees and shrubs, especially native species. The importance of trees to bats varies between bat species. Mature trees offer roosting sites for Leisler's bats all year around while other species such as Daubenton's and Natterer's bat will use them primarily in the summer. Tree species of particular importance include ash, oak, beech and Scot's pine.

Treelines and hedgerows are also very important linear landscape features for commuting bats in the countryside as bats prefer to travel in the shelter of such features to reduce predation. Loss of such habitats affects the ability of bats to travel safely from roosting sites to foraging areas. A gap of as little as 10m may force some species to seek an alternative commuting route and even change roosting sites.

### **Signs of bat roosts in trees, what to look for:**

- obvious tree holes, cavities, spilt limbs, dead wood, loose bark
- dark staining on the tree bark just below a hole
- staining around the outer edge of a tree hole
- tiny scratch marks around a hole from bat claws
- bat droppings below a hole or stuck to the bark
- on warm days, audible squeaking noises can be heard
- on close inspection of a potential roost, bats are visible or there is a musky smell of bat and bat droppings



Above: Leisler's roosts in dead branches of beech and oak trees respectively (Photos: Tina Aughney & Brian Keeley)



Above: Good foraging areas for bats along rivers (Photos: Daniel Buckley and Tina Aughney)

## **Conservation of tree and shrub habitat during works**

Retain mature trees and resist 'tidying up' dead wood and spilt limbs on tree specimens.

Retain treelines and hedgerows adjacent to watercourses.

Confine any management works on watercourses to one side of the channel to minimise damage to the wildlife corridor.

Where trees and shrubs have to be removed to access a watercourse, ensure that mature trees are assessed prior to works to determine wildlife value.

Protect treelines and shrubs to be retained during works.

Operate a tree and shrub management plan where removal of such is replanted with similar species within the same year of works.

### **What does bat urine staining look like?**



This staining (indicated by arrows) is often present in a regularly used roosting site including stone crevices, trees, buildings etc.



### ***Creating roosting sites for bats in bridges and other OPW structures***



*A selection of suitable crevices in stone structures should be retained (similar to those illustrated in the photographs to the left). These can be filled temporarily with timber or bubble wrap while all remaining crevices are re-pointed by hand. Once works are finished, remove temporary filling. Crevices should be at least 25cm deep, by 15cm long and 1-3cm wide.*

*Left: Example of crevices retained for bats in bridge works (Photos: Caroline Shiel)*



*Above: Example of bat tubes incorporated into structures to create roosting sites for bats. Left: Bat tube was built into a new bridge. Right: Bat tube attached to the underside of a culvert. While 2 straps are shown here, it is recommended to use 3-4 straps to ensure long-term attachment. (Photos: Austin Hopkirk & Caroline Shiel)*

*Ready-made roosting boxes or tubes are available and can be easily inserted into structures to provide roosting sites for bats. Where natural crevices are not available or cannot be retained, a bat tube should be attached to the structure. Ensure that the bat tube is located at sufficient height (at least 1m) above winter flood waters to prevent residing bats from being drowned. Bat boxes are also available for attachment to mature trees or buildings*

Below: Lesser horseshoe bat, an Annex II species



While this species is not a crevice dweller like all other Irish bat species and therefore unlikely to roost in bridge crevices, it is a species that is highly vulnerable to poor watercourse management. Uninterrupted treelines and hedgerows are essential for economic commuting by this species.

It is also likely to use stone structures adjacent to rivers as night roosts. Such roosts have an opening into the structure to allow unimpeded flight because this bat cannot land and crawl. It hangs freely from the roof. Buildings or structures used by this species should be retained with the appropriate openings: approximately 15cm by 30 cm in dimensions. This species has also been recorded hanging freely inside culverts and similar structures.

This species is only found in the western counties of Mayo, Galway, Clare, Limerick, Kerry and Cork. Therefore, works on watercourses in these counties must ensure that this species is considered. Please contact your local NPWS Conservation Ranger 1800 405 000.



## Bat potential of typical OPW Structures – how to assess?



Examples of typical OPW culverts that are **not suitable** for the erection of bat boxes or bat tubes. These structures are too low over the water level to erect safe roosting sites for bats as there is a potential of flooding.

Bridges scheduled for maintenance need to be considered for the likelihood of bat roosting sites. Agricultural accommodation bridges and low profile culverts and bridges as shown above have a low bat potential due to the possibility of flooding.



Above left: Large box culverts – fit bat box or bat tube internally at the highest.



Above right: Road Bridge at EREP site – fit bat box to soffit or face of bridge

Minor maintenance works such as wing wall repair or underpinning foundations tend have little or no impact on bats. If in doubt do contact the local NPWS Conservation Ranger (1800 405000) However, larger maintenance (e.g. replacement or strengthening of structures above the water level works do require a bat assessment and contact with the local NPWS Conservation Ranger. Advice from a bat specialist maybe required in such circumstances to ensure that works do not impact on roosting bats.



ABOVE: These trees are too immature to provide roosting sites for bat.



ABOVE: Trees with heavy ivy growth as show in photograph above can provide roosting sites for bats.

### Bat Box Schemes (BBS)

Pilot BBS is recommended, using either bat boxes or bat tubes, with yearly monitoring to determine species usage. Erect on bridges with soffit at least 1m above winter water-levels. This allows bats to safely drop into flight from bat boxes.