GULLY POTS, DEATH TRAPS FOR AMPHIBIANS

Report Van Diepenbeek, A & R. Creemers, 2012. Het voorkomen van amfibieën in straatkolken – landelijke steekproef 2012. RAVON report P2011.100.
Overview article, referring to Dutch report Presence and prevention of amphibians in gully pots – countrywide survey, carried out by RAVON in the Netherlands, 2012. RAVON report P2011.100.

Summary

Gully pots are essential for ridding the roads of rainwater but can be death-traps for amphibians. Apart from other small vertebrates each year large numbers of amphibians, both adults and juveniles, fall into gully pots and die through starvation or by being washed away into the sewer system by surges of rainwater. This happens during the entire activity period of amphibians (March - October).
In 2012, RAVON carried out a countrywide survey of gully pots, the roadside catch basins which are a common and important part of the sewerage system and drainage network. The numbers of amphibians discovered by random sampling.
The vastness of the problem is illustrated by the numbers of retrieved amphibians from gully pots in a survey carried out in the Netherlands in 2012. In 36 locations, in three random counts from March to May, a total of 782 vertebrates of which 683 amphibians were collected from 526 gully pots. A rough calculation of the numbers that fall victim to the drainage system came up to an estimate of between several hundred thousand to more than half a million adult amphibians, and many times this number of immature ones, each year alone in the Netherlands (the Netherlands has 7 million gully pots). Surveys carried out in Switzerland, Germany and the UK show that the problem is not limited the Netherlands.
An earlier test (2011) with live amphibians showed that amphibians will find and use climb-out constructions to prevent this additional amphibian mortality. Suggestions are made for different climbing out constructions and possible devices to prevent amphibians from falling into the gully pots. To implement these constructions both water management authorities and market parties are invited to carry out innovations and/or technical adaptations in existing gully pot models. On behalf of local water management authorities a compact overview is given of steps to be taken to tackle the problem.

The research was carried out by RAVON and RIONED *), the Dutch national umbrella organization for sewage and urban water management. RAVON are a Dutch NGO concerned with protecting reptile, amphibian and freshwater fish species and their habitats, and increasing public awareness of these animals.

For the results, see (article in Dutch language)
http://www.ravon.nl/OnderzoekAdvies/Onderzoek/Straatkolken/tabid/1007/Default.aspx

Photo 1.
On the bottom of the gully pot, among leaves and mud, amphibans are very inconspicuous. The picture shows 1 moor frog, 5 common frogs, and (left, partly hidden among leaves) 1 edible frog.
Photo Dick Willems.

What prompted this research and what is its goal?

In recent years, reports of amphibians in gully pots started reaching us from various parts of the country. Research carried out in six locations in 2010 confirmed this; sometimes tens of individuals were found in one pot. Thus, it seems that gully pots, so essential for ridding the roads of rainwater, can be a death-trap for small animals.

The species most affected are the Common Toad (*Bufo bufo*), Common Frog (*Rana temporaria*), Edible Frog (*R.* kl. *esculenta*) and Common Newt (*Lissotriton vulgaris*), although sometimes Red List species are found. However, gully pots in residential areas are the main problem. Animals usually fall into them during the spring migration on their way to the reproduction waters after leaving the place where they hibernated. However, there are as many accidents in summer or autumn.

Photo 2.
A natterjack toad on the brink of falling into a gully pot. Following the kerb, on many locations, every 10 meters the animals pass a a trap.
Photo RAVON, Annemarie van Diepenbeek.

It was clear that we urgently needed to know how widespread the problem was and how many animals were affected. This was reason for the countrywide research carried out in 2012. Obviously, a large number of trapped animals means a great deal of suffering. But apart from the animals lost by this cruel death, many are killed by traffic during the spring migration. Another hazard is that the volume of rainwater in the gutters and consequently, the amount flowing through the gully pots, has been increased through the increasingly popular practice of paving over (front) gardens. These are all factors that can cause a local amphibian population to shrink. We have looked into ways of preventing animals from being trapped without affecting the primary function of the gully pot, that of facilitating the flow of rain water.

Experimental test

Part of the research, preceding the countrywide survey an experimental test of climb-out constructions with live amphibians was carried out. Four different types and depths of gully pots with four different types of covers, considered as representative of the wide range used in the Netherlands, were tested with four species of amphibians, to find out whether the animals could climb out of the gullies, and thus whether constructions could be used to prevent or decrease mortality of the amphibians.
In this experiment, we used three kinds of material from which made climb-out constructions. Perforated aluminum board, a strip of synthetic eave guard (such as used to prevent birds from nesting under eaves) and synthetic open-structured mat (such as used for rooting plants in ponds). Four kinds of amphibians that live in urban areas were used in this experiment: the Common frog (*Rana temporaria*), Edible frog (*Rana* klepton *esculenta*), Common toad (*Bufo bufo*) and Smooth or Common newt (*Lissotriton vulgaris*).

Photo 3.
RAVON experimental test 2011. Four different types of gully pots have been tested with four species of amphibians that live in urban areas.
Photo RAVON, Annemarie van Diepenbeek.

Photo 4.
Two common frogs and one edible frog found the way up. RAVON Experimental test 2011.
Photo RAVON, Annemarie van Diepenbeek.

Photo 5.
Wall of synthetic matting, 90°: some individuals made it in 10 minutes!
Photo RAVON, Annemarie van Diepenbeek.

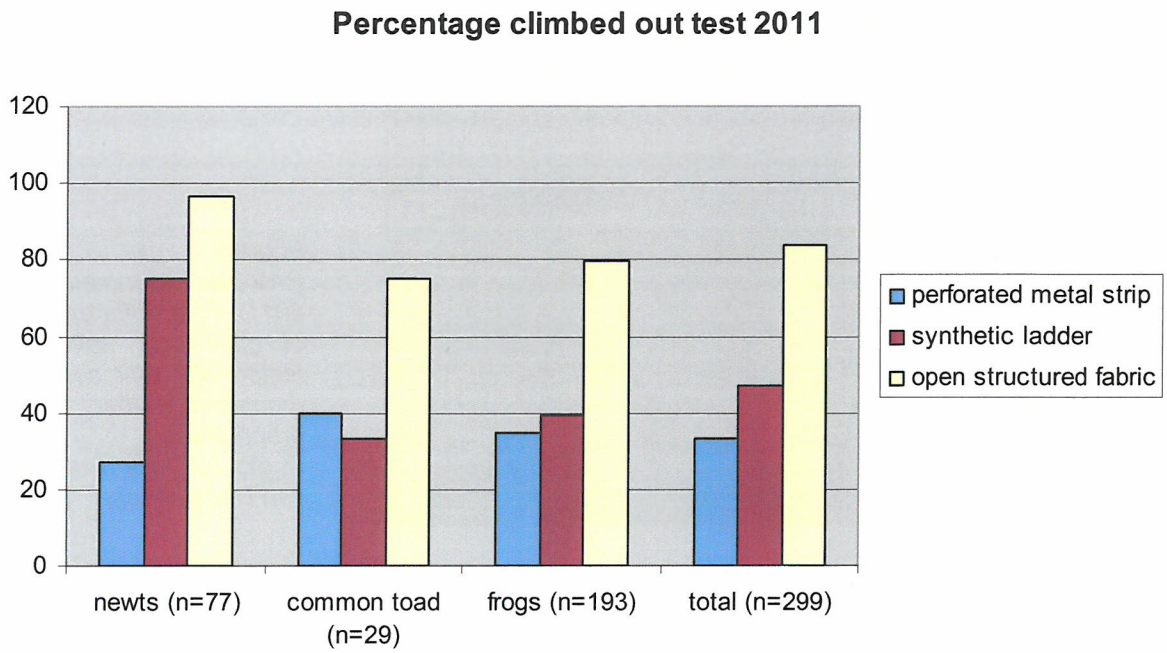

Fig. 1. Results experimental test 2011 with different types of climb-out constructions of materials. The graphic shows the average results of 3 sessions of 20 hours each. Each session the amphibians have been placed into another type of gully pot, different in material, depth, cover and climbing out construction.

Legal obligation to tackle the problem

The amphibian species we find in the gully pots all have a conservation status that legally obliges us to protect them, both according to the Dutch flora and fauna law and European legislation. In the Netherlands, the responsibility to protect these animals lies with the local authorities, who are obliged to prevent avoidable mortality of protected species, wherever this is possible.

Countrywide survey 2012

We carried out our research in 36 locations spread over the whole country, ranging from large towns to small villages; in half of them, animals trapped in gully pots had earlier been reported. We visited each location three times during the period April to June, each time counting the numbers of amphibians and other vertebrates in fifteen gully pots (the same ones). The research was carried out in a standard way by RAVON volunteers with help (permission) from the local authorities.
As well as recording the total number of trapped animals, and whether they were alive or dead, the name of the species and its life stage was noted, together with the type of gully pot and the depth at which the animal was found. A description of the neighborhood was also included. After each count, the trapped animals were released into the nearby surroundings.

(The Netherlands has a land area of about 33,700 square kilometers and about 400 local authorities and approx. 7 million gully pots; each local authority and water authority has autonomy in local water management.

Results

During the three counts in three months (April-June), a total of 782 vertebrates were found in 526 gully pots: 683 amphibians, 95 small mammals and four birds. This amounts to about 1.5 animal per pot. We made a rough calculation of the numbers of animals that fall victim to our drainage system and came up with an estimate of between several hundred thousand to more than half a million adult amphibians, and many times this number of immature ones. This happens each year, just in the Netherlands.

Apart from the amphibians, quite a number of small mammals, such as shrews, mice and voles end up in the gully pots. It is also worth noting that pots situated where no animals were earlier recorded, had nearly as many trapped animals as those in problem locations. We based the calculation on the number found in a random sample during the migration period in 2012. We multiplied this number by the number of local authorities in the country, and this in turn by the estimated number of problem locations in each of them, and the further chance of animals falling into the pots that year. However, this is most probably an underestimation: when we checked gully pots at a number of locations outside the migration period, we found as many animals, if not more, than earlier in the year. Moreover, smaller animals are easily missed during gully pot inspection, as they are difficult to distinguish from the dead leaves and rubbish that falls into the pot. Furthermore, some animals, as they try to find a way out of their prison, move into the pipes of the sewage system, only to be later swept away by the water. Other animals that are not counted are those sucked up by vacuum during the routine cleansing of the drainage system.

Table 1. Rate of species found in gully pots in the countrywide survey 2012.

KOLKENSLACHTOFFERS NAAR SOORT (n=782)		
	number	**%**
Common toad	370	47
Common frog	211	27
Smooth (or Common) newt	76	10
Natterjack toad	11	1
Alpine newt	9	1
Edible frog	4	1
Crested newt	2	0
Mouse or vole spec.	87	11
Greater white toothed shrew	8	1
Bird spec.	4	1
Total survey 2012	782	

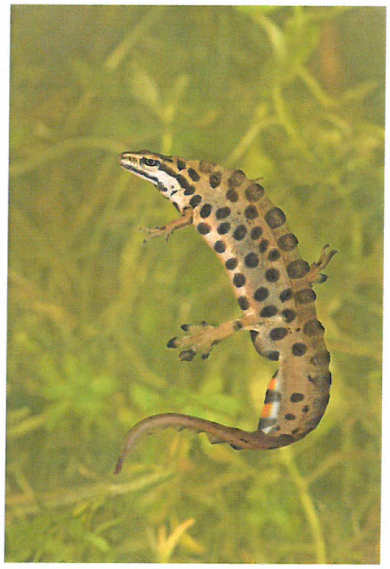

Photo 6.
Next to Common toad and Common frog the Smooth (or Common) newt is found frequently as gully pot casualty.
Photo RAVON, Jelger Herder.

Stakeholders

When looking for a solution to a problem, input is necessary from all parties concerned so that both the economic aspects and the comments of those working with the sewerage system can be taken into consideration. Any solution had to be feasible not only from the technical aspect but also logistically applicable. Thus, in order to realize this project, all stakeholders were invited to form a group. This group comprised representatives from the local authorities concerned with road

management, water boards, as well as suppliers of gully pots and manhole covers, and of the machines used to empty the gully pots.

Preventing the problem or providing a solution

Because the problem is a hidden one and has only recently started to be recognized, there are hardly any ready-made articles for sale that can provide a solution to it. However, RAVON has tried out various ways of preventing animals from falling into pots or for helping them to escape. Tests with live amphibians showed that they will find and use various constructions that help them to climb out of their prison. Our research looked for ways both of preventing animals from falling in to the pots as well as helping them escape, while at the same time not hindering the flow of water.

Local authorities take the initiative

Moreover, a small number of local authorities have taken action in response to people reporting trapped amphibians. Prevention in the form of a vertical grating put in place over the entrance to the pot during the spring and summer was the most popular measure. However, this cannot be left in place permanently because leaves or rubbish accumulate, hindering the flow of rainwater into the drains. The water management body of Amsterdam started an experiment with 400 gully pots in the Vondel Park aimed at helping animals to escape. With success - some amphibians even used the perforated metal strips to climb out of the pot while the strips were being put into place! In the coming years, the local amphibian workgroup will monitor how effective this method is.

Table 2. Ideas for helping trapped animals/ to escape; advantages and disadvantages of climb out constructions

Solution: Preventing measures	Advantages	Disadvantages
In general:	**Sustainable**	**Costs attached (only at installation)**
Modifying kerbs: - lowering kerb over a longer distance (vs short sections of dropped kerb), or - built in designs: wildlife kerbs	Kerb no longer works as a barrier. Special designs such as a wildlife kerb provide amphibians with a safe route around gully pots.	To minimize amphibian mortality, modification of kerbs near gully pots in longer stretches will be necessary.
Short sections of kerb stones sloping (rather than vertical)	Not known; first try-out not effective	Uneven kerb– could lead to accidents
Placing the kerb behind the opening into the gully pot	Effectiveness not yet tested	Still to be investigated.
Vertical grating in front of gully pot opening	Effective and robust; already used in several places// has already proved its worth in several places	Temporary: has to be put in place and removed each year. Accumulation of street litter may hinder drainage into the pot.
Shallow rim around the lid of the gully pot	First try-out not effective	Risk that pedestrians or cyclists trip or fall
Horizontal grating under	Effective	May hinder water draining away. Quite expensive. Temporary measure, leaves summer migrating "toadlets" and autumn migrating (sub)adults unprotected.
('Biodiversitysafe®') Sieve placed under the lid of the gully pot to prevent them falling further with a strip to allow the trapped animal to climb to safety.	Effective; folding mechanism facilitates permanent built-in construction; opened out during migration period and folded up in periods when few amphibians are present	Relatively expensive. Temporary measure, leaves summer migrating "toadlets" and autumn migrating (sub)adults unprotected.
Reduce the size of opening in manhole cover	Adult animals are much less likely to fall in gully pot	Does not prevent small amphibians from falling in to the pot nor sub-adults/ juveniles.

Table 3. Advantages and disadvantages according to by water managers of various measures for preventing animals from falling in gully pots (temporarily experienced)

Construction	Advantage	Disadvantage
Perforated strip of metal	Effective, robust. Can be in place permanently, in combination with discharge flap, then no risk of becoming loose	By gully cleansing can become loose or detached completely, demanding extra attention and time. In time, becomes rusty.
Strips of synthetic material used to prevent birds nesting under the eaves	Effective and flexible - can be used for both round or square gully pots, takes few space	Probably fragile in long term.
metal perforated angle plate (as used in plaster work)	Effective. Oblique or perpendicular placing. Amphibians can climb on model in all directions.	Extra handling when cleansing gully pot: either needs to be pushed aside or removed beforehand and then put in place again.
Synthetic matting (overgrowing mat)	Effective. Attached to wall of gully pot, does not take space and thus no obstruction in gully cleansing.	Robust attachment to gully wall may present problems. Attracts dirt because of its structure. Its durability by cleansing has yet to be tested. May become detached during cleansing.
Amphibian siphon: round or rectangular construction under the cover gully pot to catch the amphibian and prevent falling into the pot.	Effective. Unknown how widely used in Switzerland	Practicality in the Netherlands not tested

Perforated strips of metal or synthetic strips with transverse ridges can be put into position against the walls of the gully pots. Alternatively, strips of synthetic material with a loose, open structure up which the animals can climb to freedom can be attached to the wall of the pot. Pictures of the mentioned constructions in the report, chapter 7:
http://www.ravon.nl/OnderzoekAdvies/Onderzoek/Straatkolken/tabid/1007/Default.aspx .

Photo 7.
Prototype of one of the models of possible climbing out strips mentioned in the report.
Photo RAVON, Annemarie van Diepenbeek.

The next step: ascertain the size of the problem and act!

Research has been carried out to find out how big the problem is and to visualize a hidden problem to the involved authorities. One of the first steps to be taken by responsible authorities is localizing "hotspots" where the problem is most serious. Usually one or more occur in each built-up area. In the

Netherlands, a very useful way of predicting hotspots or finding them is by consulting the national data bank for fauna and fauna. The local natural history group or the ecologist working for the local authority will also be able to provide information.

RAVON will devote a special page to this problem on www.padden.nu , a website *for the volunteer workgroups who help prevent amphibians from becoming traffic victims during their springtime migration (in preparation; to be online november 2013).*
This site can then function as a digital help desk that can provide information to all parties concerned, ranging from the general public, local authorities, water management, not only about the problem but also on possible ways of preventing it.
This site can then function as a *digital help desk* that can provide information to all parties concerned, ranging from the general public, local authorities, to water management, not only about the problem itself, but also on possible ways of preventing it.

A set of photos of amphibians, various types of gully pots and situations together with various ways of solving the problem of trapped animals is available from the author Annemarie van Diepenbeek at Reptile, Amphibian and Fish Conservation Netherlands (RAVON): a.v.diepenbeek@ravon.nl.

Table 4. Compact list of steps to be taken by water management authority to prevent mortality of amphibians in gully pots (refers to the situation in the Netherlands).

Aim / Steps to be taken	**Action / How to carry it out**	**By whom? Where?**
Identification of potential problem spots	1. Look for combination of reproduction waters and land habitat (use topographical atlas and Google maps)	Ecologist
	2. Find out distribution of amphibians from National data bank of fauna and fauna	NDFF (Dutch Nat. Data-bank flora and fauna), Herpetol. Soc.
	3. Find out where there were traffic victims	Ecologist, members of local natural history club, National society for protection/ conservation of amphibians
	4. Involve local people by asking what they have noticed in this respect (Beter-Buiten: in the NL: reporting app for citizens)	Water management authority
Confirm locations are Problem spots	1. Inspect gully pots locally; report findings by recording species found and numbers of each	Ecologist, members of local natural history club, National society for protection/conservation of amphibians
	2. In addition: if possible, data from animals seen by camera of digital application on gully pot cleanser.	Contact with firm responsible for gully cleansing and with supplier of gully pot cleansing machines.

Assess possibility of reducing number of victims	1. Prevention 2. Providing means of escape	Ecologist and firm carrying out gully cleansing should discuss the problem together.
Look at preventive measures. *NB Apply only if the run-off of rainwater is not obstructed. .*	1. Is a gully pot necessary here? Can rain water be absorbed by the vegetation on the verge? Can run-off be absorbed by the verge vegetation (soak away)? 2. Move the kerb to a short distance behind the entrance to the pot. 3. Drop the kerb on each side of the entrance to the gully pot. 4. Temporary grid in front of gully opening/ entrance. Order grid, put in place beginning of March (before the start of spring migration) and remove mid-November. 5. Permanent grid in front of opening (in places where hardly any leaves fall).	Consultation between water manager and ecologist. 2 & 3: To relocate or drop (lower) a kerb, contact the Highways Maintenance Manager.
If prevention is impossible or undesirable, provide a means of escape. *NB Apply only if the run-off of rainwater is not obstructed.*	Choice will often depend on location. Choice may differ according to location: 1. Perforated metal strip 2. Material for preventing birds nesting under the eaves. 3. Metal corner plates used in plastering 4. synthetic matting 5. Give wall of gully pot a rough surface 6. amphibian siphons 7. Sieve to catch animals falling into the pot, with a strip to allow them to climb out. 6. New ideas?	1. Choice of solution by ecologist in consultation with sewerage company manager. 2. Materials can be found at plastic and metal suppliers and builders merchants. 3.Installation either by contractor or by the ? sewerage dept. of local authority
Suppliers of various solutions	In 2012, little available in standard supply but once industry reacts to demand, this can change quickly.	
Water management . *NB. Prerequisite: run-off is not impeded.*	Work plan/ instructions should take account of the presence of this help for amphibians, whether preventive or providing them with a means of escape.	Bring together professionals in the fields concerned to come to a satisfactory solution. Create a forum of the stakeholders in order to come to a satisfactory solution (RIONED,

		CROW, STOWA)
Evaluation of technical solutions for the problem Prerequisite: rainwater can flow away freely	Give feedback to all parties concerned! (RIONED, RAVON)	Road and sewerage management
Evaluation regarding the animals: monitoring	Send in results to parties concerned. Effectivity. Does the chosen solution work? Reduction in the number of victims or no victims at all?	Ecologist, conservation group.
Long-term solutions	Inbuilt adaptations to gully pots would be more sustainable. For example a slight ridge running diagonally across the wall of the pot, or a rough wall would allow animals to climb out.	Sewerage industry Suppliers of gully pots and drains Industrial designers
Influencing policy	Integrate sustainable solutions into building plans so that when streets are renovated, rainwater can be collected separately into open water bodies .	

Photo 8.
In a pilot project carried out in Amsterdam, 400 gully pots were provided with metal climb out strips. The offered escape route was immediately found by some amphibians.
Photo Waternet. Climb out strip, in combination with metal flaps to the drainage system supplied by Struyk Verwo Aqua.

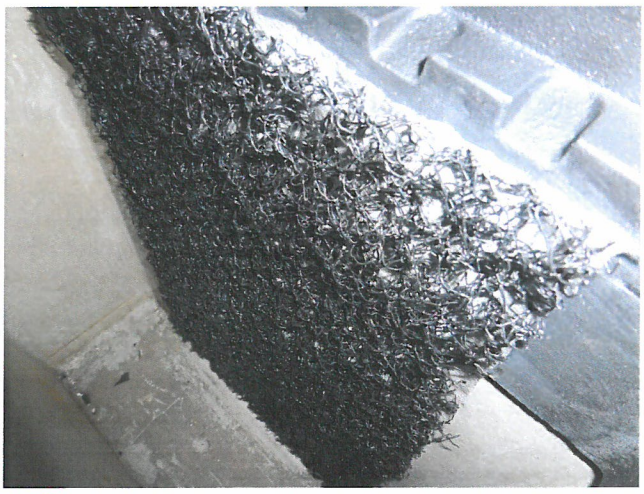

Photo 9.
Open structure synthetic mat, sticked at one side of the gully pot, offers good grip to amphibians and other small vertebrates. Crucial is a proper connection to the openings in the cover. Kit (mat and connecting glue) supplied by ACO-Pro.
Photo RAVON, Annemarie van Diepenbeek.

Recording presence of amphibians through app in cleansing equipment
Gully cleansing firms can make use of an application that enables them to record the presence of trapped amphibians in gully pots during the cleansing procedure. While recording the GPS-coordinates are recorded as well.

Market parties
During the presentation of our research results to the stakeholders, the industrial drainage branch was invited to look for solutions to this problem, emphasizing that inexpensive, sustainable solutions either for preventing the animals from falling into the gullies or for helping them to escape are preferable to temporary ones. Moreover, such an innovation would without doubt give a company a very green image!

Website as Helpdesk

Information on this issue can be found in www.padden.nu, a Dutch website for the volunteer workgroups that help prevent amphibians from becoming traffic victims during springtime migration. This site may function as a digital help desk providing information to all parties concerned, ranging from the general public, local authorities, to water management, not only about the problem but also on possible ways of preventing it. www.padden.nu > Oplossingen > Straatkolken.

***) Initiators of the national survey 2012 in the Netherlands: RAVON en RIONED**

Stichting RAVON (Reptile, Amphibian and Fish Conservation Netherlands) is a non-governmental (NGO)) organization with close to two thousand volunteers and 28 members of staff at the offices in Nijmegen and Amsterdam. Apart from protection programs on behalf of amphibians, reptiles and fish species , main activity is helping to increase public awareness of these animal groups.
RAVON and their volunteers know distribution patterns and migration routes of amphibians. In the Netherlands, in general municipalities are responsible for local water management and public space, For protection programs they may take advantage of the knowledge of RAVON. www.ravon.nl

Stichting RIONED

RAVON

RIONED is a non-governmental (NGO) umbrella organization for urban water management in the Netherlands. In RIONED all parties involved in sewer systems and management participate: authorities (water management, state, provinces and municipalities), industry (suppliers, consultancies, inspection administrators and contractors), and education. Main program is the disposal of water management knowledge to the branch.
www.riool.net (branch related information)
www.riool.info (public information)

Photo 10.
Common frog escaping from gully pot by means of a (prototype) metal perforated strip (field experiment, Delft, 2010).
Photo Florian Reurink.

A set of photos of amphibians, various types of gully pots and situations together with various ways of solving the problem of trapped animals is available from RAVON, the (co-)author of the report made on the survey carried out in 2012: a.v.diepenbeek@ravon.nl , +31 24 7410 603.

References

Diepenbeek, A. van & R. Creemers, 2012. Het voorkomen van amfibieën in straatkolken. Landelijke steekproef 2012. RAVON rapport P2011.100.

Freese, J.L., 2011. Proefopstelling uitklimvoorzieningen voor amfibieën. Stagerapport Christelijke Agrarische Hogeschool. RAVON-rapport S-2010.071.

Perth & Kinross Countryside Ranger Service, Perth & Kinross Council, 2011, 2012 en 2013. Amphibians in Drains Project Reports 2010, resp. 2011 en 2012. Verslagen tellingen amfibieën in straatkolken in de gemeente Perth and Kinross in 2010, 2011 en 2012. http://www.pkc.gov.uk/article/2551/Ranger-Service-Biodiversity-Projects.

Ratzel (geb. Göbel), M., 1993. Strassenentwässerung – Fallenwirkung und Entschärfung unter besonderer Berücksichtigung der Amphibien. Edited by Bezirkstelle für Naturschutz und Landschaftspflege Karlsruhe.

Reurink, F., 2010. Amfibieën in straatkolken. Oriënterend onderzoek naar straatkolken als valkuil voor amfibieën. Stagerapport voor Hogeschool Van Hall Larenstein i.o.v. RAVON. RAVON rapport S2010-01.

More (international) references of amphibians in relation to gullies in the report of the survey 2012 (p. 67-68):
http://www.ravon.nl/OnderzoekAdvies/Onderzoek/Straatkolken/tabid/1007/Default.aspx

UK websites with information about (sustainable) drainage systems or gullies:
http://www.taysidebiodiversity.co.uk/Events/Amphibians%20in%20Drains%20Project%202011%20-%20report.pdf
http://www.wildaboutbritain.co.uk/forums/reptile-and-amphibian-forums/81283-amphibians-and-roadside-drains-gullypots.html
http://www.birmingham.gov.uk/drainage
http://www.defra.gov.uk/environment/quality/water/sewage/sewers/
http://www.dft.gov.uk/ha/standards/dmrb/vol10/section4/ha9801.pdf (protection mitigation gully pots p 17 appendices)
http://www.totalcivils.co.uk/gulleys.php