



American bullfrog (*Lithobates catesbeianus*)

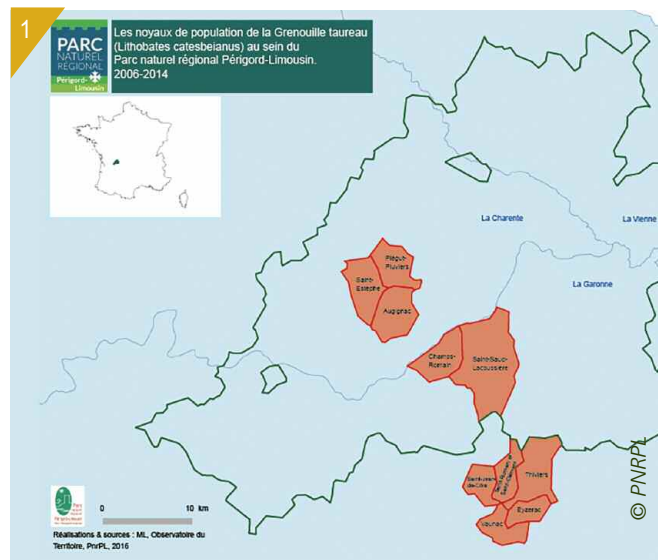
Managing the American bullfrog in the Périgord-Limousin regional nature park

Périgord-Limousin regional nature park

- The park, created in March 1998, covers a surface area of 1 800 square kilometres in two departments, Dordogne (49 towns) and Haute-Vienne (29 towns).
- The park is managed by a board in which are represented all the local governments that have approved the park charter, including ten intermunicipal associations, 78 towns and six “gateway towns”, the Aquitaine region and the Dordogne and Haute-Vienne departments.
- The park is charged with implementing its charter, a sustainable-development territorial project.
- Management of invasive alien species is included in the section on preserving biodiversity in the charter (measure 17 titled “Prevent and effectively counter the introduction and proliferation of invasive alien species”).
- Contact: Frédéric Dupuy, head of the “Management of natural areas” department -f.dupuy@pnrpl.com

Intervention site

- There are many wetlands (peat bogs, wet meadows, megaphorbia, hygrophilic forests) ideal for amphibians in the Dordogne department.
- Since the 1960s, many ponds and pools have been created for recreational purposes, fish farming and watering of livestock. Their number has been estimated at 5 000 and the latest inventories (2001) listed 4 500 larger ponds covering 1 800 square kilometres, i.e. 1.2% of the total area.
- Located in a bocage landscape, these wetlands constitute valuable ecological corridors.
- The American bullfrog was transported to Dordogne toward the middle of the 1990s (first audible indications) by people who used the tadpoles as fishing bait.
- The population centre in Dordogne may be divided into three sub-sections:
 - around the towns of Piégut-Pluvier / Saint-Estèphe;
 - around the towns of Saint-Laud-Lacoussière / Champs-Romain;
 - around the towns of Thivers / Saint-Romain et Saint-Clément (this area lies just outside the park, but given that Thivers is a gateway town, it was included in the management programme).



1. Map showing the population groups of American bullfrogs in the park.

Disturbances and issues involved

- The main management issue concerning the species is the preservation of native amphibians impacted by its presence:
 - large quantities of other amphibians have been found in the stomachs of bullfrogs;
 - high densities of American bullfrogs result in inter-species competition because the animals fill an important ecological niche that is very similar to that of native species, particularly green frogs (*Pelophylax* spp.);
 - they can be a healthy carrier of the fungus responsible for chytridiomycosis (*Batrachochytrium dendrobatidis*), a disease that kills native species. In France, the fungus is present on 33% of the sampled sites. The average prevalence is 6%, but with significant variations ranging from 3.3% up to certain populations where 93% of the animals carry the fungus.
- The Périgord-Limousin regional nature park covers the heads of three river basins. The sectors where the species has been detected lie in two river basins (Dordogne and Charente) and there is a risk that the animals may colonise the entire downstream sections of the two basins. The basin of the Vienne River lies in the immediate vicinity, but has not yet been colonised.

Interventions

■ Eradication programme (2005-2007)

■ Following the launch of a the multi-year programme 2003-2007 to establish a management plan for the American bullfrog in the Aquitaine region by the Cistude nature association (see the management report http://www.onema.fr/sites/default/files/Grenouille_taureau_R1.pdf), the park decided in 2005 to eradicate the species in two sectors in its territory (Piégut-Pluvier / Saint-Estèphe and Saint-Laud-Lacoussière / Champs-Romain), in a partnership with Cistude Nature.

■ Following an inventory in 2005, the eradication programme was conducted over a period of two years (2006-2007).

■ The main objectives were to:

- eradicate the American bullfrog from the colonised sites;
- set up monitoring to detect any new sites that might be colonised and to check the results of the work done on the treated sites;
- raise the awareness of the public and encourage people to report the presence of the American bullfrog.

■ The management technique consisted of shooting the adults and sub-adults in order to eliminate primarily the reproducers.

■ Over the first two years, trapping of tadpoles was also required.

■ Finishing the eradication work (2008-2012)

■ The objective of this second programme was to finish the work to eradicate the American bullfrog from the northern section of the Dordogne department.

■ The work was carried out on the two population groups that were the target of the eradication efforts in 2005-2007, plus a third group in the Thiviers area. Near Thiviers, located somewhat downstream, the species was first detected around the year 2010.

■ The techniques employed comprised night shooting, gathering of spawn and trapping of tadpoles and juveniles.

■ Methods used

Gathering spawn

| Target | Spawn |
|---------------------|---|
| Description | Spawn gathered twice per week from June to August on sites with adult reproducers |
| Human resources | Two people |
| Technical resources | Dip net, container, phenoxyethanol (to kill the embryos in the collected eggs) |
| Equipment costs | 250 euros (reusable equipment) |
| Advantages | Eradication before the frogs disperse |
| Difficulties | The spawn is not always visible or accessible |

Trapping of tadpoles

| Target | Tadpoles |
|---------------------|---|
| Description | Traps laid and checked daily starting in June (prior to metamorphosis). The hoop nets are fully submerged most of the time (this may depend on the depth of the pond) |
| Human resources | Two people |
| Technical resources | Hoop nets with one or two entries |
| Equipment costs | 180 euros per hoop net (single entry) (reusable equipment) |
| Advantages | This technique captures a large number of tadpoles just before metamorphosis (and dispersal) |
| Difficulties | This non-selective technique requires daily checks to release non-targeted species and avoid attracting predators |



2. Juvenile American bullfrog.

3. Tadpole of an American bullfrog.

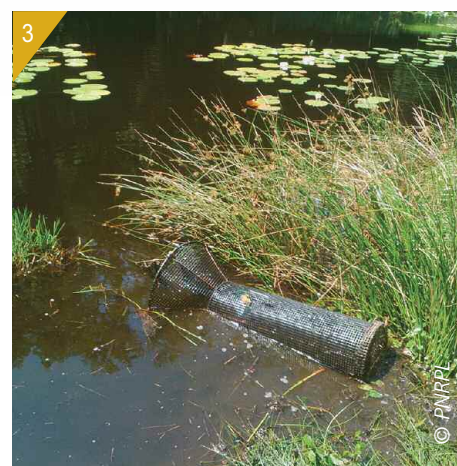


| Daytime shooting | |
|--------------------------|---|
| Target | Juveniles |
| Description | Sites must be inspected to detect the young frogs. One person identifies the frog as an American bullfrog and the shooter eliminates it. The dead animals are collected with a dip net |
| Human resources | Two people, a shooter and a park employee to identify the animals |
| Technical resources | Air rifle (5.5 mm), steel pellets, cooler, dip net |
| Equipment costs | 400 euros (reusable equipment) |
| Advantages | Elimination of juveniles detected visually or by their alert calls |
| Difficulties | Sites are not always accessible (heavy vegetation blocking access to the banks) |
| Night-time shooting | |
| Target | Sub-adults and adults (male reproducers) |
| Description | Sites must be inspected to detect the mature frogs. One person identifies the frog as an American bullfrog and the shooter eliminates it. The dead animals are collected with a dip net |
| Human resources | Two people, a shooter and a park employee to identify the animals |
| Technical resources | Air rifle (5.5 mm), steel pellets, cooler, dip net and searchlight |
| Equipment costs | 450 euros (reusable equipment) |
| Advantages | Elimination of reproducers and limited reproduction in year n+1 |
| Difficulties | This technique targets primarily males (due to their behaviour) and sites are not always accessible (heavy vegetation blocking access to the banks) |
| Draining of water bodies | |
| Target | All development stages |
| Description | The pond is drained prior to the dispersal of the juveniles. Fine screens are placed at all outlets. Tadpoles and juveniles are collected, sub-adults and adults are shot. Barriers and traps may be set up around the pond |
| Equipment costs | 5 000 euros for a barrier and traps around the site (equipment and labour) |
| Advantages | Elimination of all development stages |
| Difficulties | Resource-consuming project |

Results and costs

■ Piégut-Pluvier / Saint-Estèphe and Saint-Laud-Lacoussière / Champs-Romain sectors

- In these two sectors, management work was carried out every year starting in 2006.
- The number of eliminated frogs dropped, which may be interpreted as a drop in the numbers of American bullfrogs.
- The number of males killed is systematically greater than the number of females killed. This is because the males are easier to detect (croaking).
- The number of eliminated juveniles is highly variable and does not accurately reflect population numbers. It depends on their density, weather conditions that may facilitate or hinder detection, and individual behaviour (skill in hiding, in avoiding traps). The spike in numbers in 2011 may be due to spawns that were not detected in 2010 or 2009.
- Out of a total of 205 ponds, only ten were inspected throughout the programme, from 2006 to 2014. Among the ten ponds in 2014, American bullfrogs had no longer been present in four ponds for a year and in two ponds for two years (2014 data).
- In the ponds in the town of Saint-Saud-Lacoussière, no bullfrogs were detected in 2014. In 2015, the environmental DNA technique detected American bullfrogs in only one of the ponds

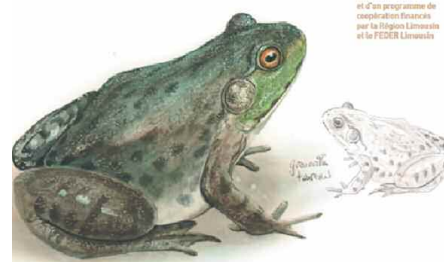


5 Parc naturel régional Périgord-Limousin

1^{er} JUIN 2012 - SEMINAIRE

De la lutte contre la Grenouille Taureau à la mise au point d'une méthode d'étude de la biodiversité

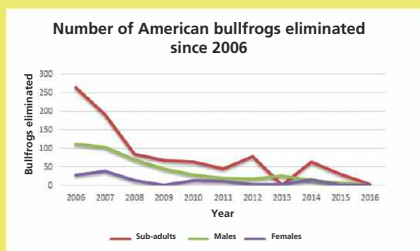
Illustration d'un travail de recherche conduit dans le cadre d'une thèse de doctorat et d'un programme de coopération financée par la Région Limousine et le FEDER Limousin



3. Capturing tadpoles using hoop nets.
4. Shooting American bullfrogs at night.
5. Proceeding of a symposium on American bullfrogs in 2012.

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|-------------|-------|------|------|------|-------|-------|------|------|-------|------|------|
| Juveniles | 1 170 | 358 | 381 | 36 | 859 | 1690 | 11 | 769 | 1 084 | 456 | 26 |
| Sub-adults | 264 | 190 | 86 | 68 | 75 | 46 | 78 | 1 | 64 | 31 | 5 |
| Males | 111 | 104 | 71 | 45 | 29 | 20 | 18 | 27 | 15 | 9 | 1 |
| Females | 28 | 39 | 15 | 2 | 14 | 12 | 2 | 4 | 16 | 1 | 1 |
| Total | 1 573 | 691 | 553 | 150 | 1 101 | 1 768 | 110 | 801 | 1 179 | 497 | 33 |
| Hours spent | 159 | 141 | 134 | 85 | 10 | 55 | 50 | 34 | 47 | 62 | 50 |

Number of American bullfrogs eliminated in the Piégut-Pluvier / Saint-Estèphe and Saint-Laud-Lacoussière / Champs-Romain sectors.



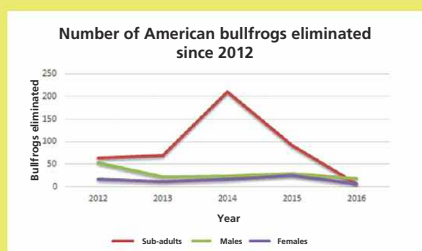
Number and development stage of American bullfrogs eliminated each year in the Piégut-Pluvier / Saint-Estèphe and Saint-Laud-Lacoussière / Champs-Romain sectors.

■ Thiviers / Saint-Romain sector

- Management work in this sector started only in 2012, with the involvement of the Thiviers intermunicipal association.
- A slight reduction in the number of eliminated males was noted from 2012 to 2013.
- The number of eliminated females remained stable over the three years of the programme, with an average number systematically lower than that for males.
- The number of eliminated sub-adults rose sharply in 2014, which may be due to a large number of juveniles not eliminated in 2013.

| | 2012 | 2013 | 2014 | 2015 |
|-------------|-------|-------|------|------|
| Juveniles | 4 343 | 1 237 | 220 | 738 |
| Sub-adults | 64 | 69 | 210 | 92 |
| Males | 54 | 22 | 23 | 29 |
| Females | 16 | 12 | 17 | 25 |
| Total | 4 477 | 1 340 | 470 | 884 |
| Hours spent | 62 | 50 | 40 | 39 |

Number of American bullfrogs eliminated in the Thiviers / Saint-Romain sector.



Number and development stage of American bullfrogs eliminated each year in the Thiviers / Saint-Romain sector.

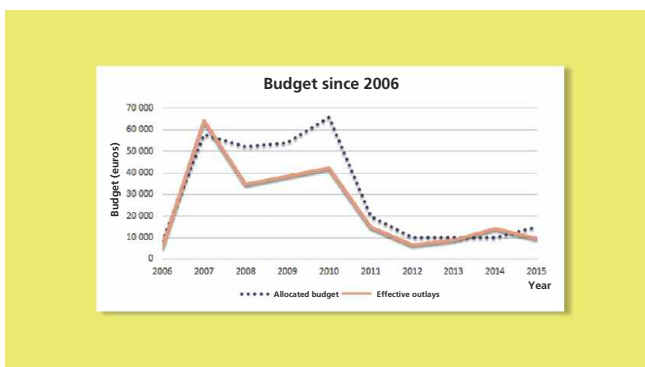


■ Financial aspects

- The budget for the programme varies from year to year, which hinders implementation of long-term activities.
- The sources of funding are the Aquitaine region (40%), the EU (Aquitaine ERDF, 40%) and the park 20% (these data are valid for the year 2016).

| Year | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---------------------------|----------|--------|-----------|-----------|-----------|-----------|----------|----------|-----------|----------|
| Allocated budget (euros) | 8 250 | 57 700 | 52 000 | 54 000 | 66 000 | 20 000 | 10 000 | 10 000 | 10 000 | 15 000 |
| Effective outlays (euros) | 5 447,89 | 64 174 | 34 603,11 | 38 451,92 | 42 126,88 | 14 857,85 | 6 632,82 | 8 927,46 | 14 119,70 | 9 667,27 |

*Budgets allocated and effective outlays for the management programme since 2006.
Source: Périgord Limousin regional nature park.*



Budget allocated for the American bullfrog programme by the Périgord-Limousin regional nature park.

Information on the project

- A symposium on “Eliminating the American bullfrog and establishing a study method for biodiversity” was organised in June 2012.
- The proceedings of the symposium may be downloaded from the IBMA site (<http://www.gt-ibma.eu/wp-content/uploads/2014/05/Actess%C3%A9minaireGrenouilletaureauPnrPL.pdf>).

Outlook

- New management techniques are being developed:
 - light traps for tadpoles (LEDs in waterproof boxes placed in the hoop nets);
 - “frog calls” (a recording of an adult reproducer).
- A sampling project and a new inventory are planned:
 - the inventory procedure will be standardised with inspections of ponds colonised in the years n-1 and n-2 and of all ponds in the vicinity of the latter (within a radius of one kilometre). Non-colonised ponds will be inspected every three years;
 - a complete inventory will be carried out by creating a grid system with sectors measuring 5 km x 5 km. Two points in each sector will be visited to listen for calls. The sectors where bullfrogs are heard will be inspected again, this time in smaller sectors measuring 2.5 km x 2.5 km.
- Samples will be drawn and analysed using the environmental DNA technique.

- Indicators will be developed to assess the effectiveness of the eradication project:
 - number of adults eliminated per hour of shooting;
 - changes in abundance indices for adults on each site;
 - average weight of adults;
 - number of colonised sites discovered each year;
 - number of native species (amphibian and invertebrates) on the managed sites.
- The work done by the Périgord-Limousin regional nature park will contribute to the Life CROAA (Control strategies of Alien Invasive Amphibians in France) programme. The objectives are to update the range data, monitor the invasion front and eradicate the populations of invasive alien amphibians.

Authors: Emmanuelle Sarat, IUCN French committee, and Frédéric Dupuy, Périgord-Limousin regional nature park

For more information

- Internet site of the Périgord-Limousin regional nature park:
<http://www.pnr-perigord-limousin.fr/Le-Parc/Les-actions/Patrimoine-naturel/La-lutte-contre-la-Grenouille-taureau>
- Proceedings of the symposium organised by the Périgord-Limousin regional nature park in June 2012. "Eliminating the American bullfrog and establishing a study method for biodiversity".
<http://www.gtibma.eu/wpcontent/uploads/2014/05/Actess%C3%A9minaireGrenouilletaureauPnrPL.pdf>
- Mandin M. 2015. Bilan du programme d'éradication de la Grenouille taureau (2006-2015) sur le territoire du Parc naturel régional Périgord-Limousin. 39 pp.
<http://www.gtibma.eu/wpcontent/uploads/2015/12/Bilan-programme-2006-2015.pdf>



This management report was drafted in May 2016 by the work group for biological invasions in aquatic environments, set up by Onema and IUCN France, in addition to those already presented in the second volume of the book titled "Invasive alien species in aquatic environments, Practical knowledge and management insights", in the Knowledge for action series published by Onema.

<http://www.onema.fr/sites/default/files/EN/EV/cat7a-thematic-issues.html>

