Restoration of Unio crassus rivers in the Luxemburgish Ardennes LIFE11 NAT/LU/857

March 1st 2017 – February 28th 2018

Progress Report IV

LE GOUVERNEMENT DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère du Développement durable et des Infrastructures
Département de l'environnement

LE GOUVERNEMENT DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère de l'Agriculture, de la Viticulture et de la Protection des consommateurs

LIFE11 NAT/LU/000857

Progress Report III

1st March 2017 to 28th February 2018

Reporting Date

28th February 2018

« Restoration of Unio crassus rivers in the Luxemburgish Ardennes »

LIFE Resto-unio

Project location:	Vallée de l'Our de Ouren à Dasburg Pont LU0001002 Vallée Supérieure de la Sûre / Lac du barrage LU0001007
Project start date:	01.09.2012
Project end date:	28.02.2019
Total budget	2.057.068 €
EC contribution:	1.028.534 €
(%) of eligible costs	50 %

Data Beneficiary

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2 LIST OF ABBREVIATIONS

MA: Ministère de l'Agriculture, de la Viticulture et du Développement rural

MDDI: Ministère du Développement durable et des infrastructures

MIGR: Ministère de l'Intérieur et à la Grande Région

FMCS: Freshwater Mollusk Conservation Society

U. c.: *Unio crassus*

WFD: Water Framework Directive

AGE: Administration de la Gestion de l´Eau

ANF: Administration de la Nature et des Forêts

ASTA: Administration des Services Techniques de l'Agriculture

M.m.: *Margaritifera margaritifera*

PDR: Plan de Développement rural

RDP: Rural Development Programme

AEM: Agri Environment Measures

LIST: Luxembourg Institute of Science and Technology

QD: Qualifizieren-Dimensionieren

3 SUMMARY

3.1 General progress and assessment

Action A1: Localisation des zones à risques d'érosion	
Progress: After the mapping of the main hotspots of sediments a list has been set up.	To realise till next report: The action is finished.
Action A2: Planification des mesures de restauration	
Progress: A restoration measure plan has been set up. It is the base for the measures to be done in the project.	To realise till next report: The action is finished.
Action A3: Planification de la surveillance de la qualité de l'eau et du substrat interstitiel	
Progress: Sampling points were chosen, sampling equipment has been bought and installed on both river basins, Our and Sûre.	To realise till next report: The action is finished.
Action A4: Mise en place de la technique d'élevage pour *Unio crassus*	
Progress: All the permissions are available. The exchanges with American specialists were done. A rearing protocol in German and English has been written.	To realise till next report: The action is finished.
Action A5: Contribution à l'élaboration des plans de gestion Natura 2000 "Our" et "Haute Sûre"	
Progress: The management plans for the Natura 2000 sites Our and Haut-Sûre are definitive.	Publication of "arrêté ministériel" is foreseen in spring 2018
Action B1: Acquisition de terrains le long de l'Our, de la Sûre et de leurs affluents	
Progress: Land purchase of 826,33 are (103 %).	To realise till next report: Continue land purchase.
Action C1: Interventions pour réduire l'apport en sédiments fins dans le réseau hydrographique	
Progress: • 1.615 m have been built, 8 watering places created, 4 cattle passages built. • AEM done: 20 contracts for reduced nitrogen fertilization and about 40 contracts for biodiversity • Installing of water evacuation grids: 63 • Restoration of the riverbed Feierbëch 100 m	To realise till next report: • Installing fence • AEM measures! • Stabilization of the riverbed "Roderbaach" 100 m • Restoration of the riverbeds Houschterbaach and Froumicht

Action C2: Transformation d'obstacles à la migration des poissons sur les cours d'eau tributaires	
Progress: 5 fish obstacles were meanwhile transformed. 2 more are planned.	To realise till next report: Finalise the planning and execute the foreseen measures.
Action C3: Amélioration du substrat par dépôt de gravier	
Progress: Gravel was delivered but not dumped because of bad weather and soil conditions.	To realise till next report: Add 200 m^3 gravel to the river Sûre.
Action C4: Elevage de *Unio crassus* pour la Grande Région	
Progress: 1.740 minnow were infested with *U.* c. larvae, 21.000 juvenile mussels were collected. Older mussels were transferred in the outside rearing channel and in riverwater flow thru systems.	To realise until next report: Start all the necessary preparations for the fish infestation in 2018. Continue culture with the mussels from the previous years, and collect new mussels. Release the mussels from the years 2013-2015.
Action C5: Régulation de la prédation du rat musqué	
Progress: 12 muskrats have been trapped on the river Our, 12 on the river Sûre.	To realise till next report: The muskrats are captured all over the year.
Action D1: Surveillance de la qualité de l'eau et du substrat interstitiel	
Progress: Measuring of water quality and turbidity continues at both catchments and in their tributaries. (690 samples). The piloting committee was informed about problematic points.	To realise till next report: Continue the monitoring of the water quality and the interstitial.
Action D2: Monitoring des poissons hôtes	
Progress: Electric fishing activities in the river Our and Sûre were done in May 2017.	To realise till next report: Electric fishing in the tributaries of the rivers Our and Sûre to evaluate the transformation of fish migration obstacles.
Action D3: Suivi de *Unio crassus* dans son milieu naturel	
Progress: Monitoring of 30 km (95%) on the river Our and 18 km (90%) on the river Sûre. • Mean density: 0,03 ind/m^2 • Monitoring of tagged mussels • Fertility control has been done • For each river one more site with tagged mussels was realized.	To realise till next report: Continue mussel monitoring. Control of the tagged mussels. Sampling and analysis of the sediment fractions on the mussel banks. Release a large amount of cultured animals in both rivers. Supervise the released mussels.

Action D4: Monitoring et évaluation de l'impact des mesures concrètes	
Progress: The success of the restoration measures is evaluated by the following indicators: water quality, quality of substrate and host fish population.	To realise till next report: Continue the monitoring of the impact.
Action D5: Analyse de l'impact socio-économique du projet et de l'effet sur les écosystèmes	
Progress: The socio economic study was outsourced to the LIST. A first draft is available and in the progress of revision.	To realise till next report: Final version with the final report.
Action E1: Information et sensibilisation des acteurs concernés	
Progress: • 2 information events for farmers • 31 meetings with authorities and stakeholder • Water Forum for the catchment of the river Our	To realise till next report: • Organize water forum for the river Sûre catchment • Farmer leaflet (autumn 2018) • Stay in contact with stakeholders
Action E2: Sensibilisation du grand-public	
Progress: • Visit of 604 persons at the mill and 904 people informed during 6 other events • Press release: 11 articles • Film: film footage, animations, audio-tracks, cut done • Installation of 1 notice boards done (Our) • 1 radio interview and participated in a TV-show of the WDR	To realise till next report: • Continue with press releases and visits • Finish project movie (subtitles, music...) • Installation of notice board at the river Sûre • Layman report
Action E3: Création d'un site Web	
Progress: Website fully accessible in all three languages (FR, EN and DE). About 814 visitors per month.	Keep internet site up to date with news and downloads.
Action E4: Organisation de séminaires	
Progress: Organizing and announcement of the second seminar.	To realise till next report: Second seminar on 27.-29. November 2018, Clervaux, Luxembourg.
Action F1: Gestion et encadrement du projet	
Progress: Sixth piloting committee. Writing of the Progress report.	To realise till next report: Seventh piloting committee and final report.

Action F2: Echange du savoir avec d'autres projets: LIFE et autres	
Progress: Constant exchange with colleagues working on mussel-projects by email and phone. • Participation in 2 scientific seminars	To realise till next report: Continue exchange with Life and freshwater mussel projects and others.
Action F3: Plan de conservation After-LIFE	
Progress: In contact with members of the ministry and the Administration of Nature and Forest.	To realise till next report: Preparation an AFTER LIFE plan.

3.2 Problems encountered

- Technical aspect

The removing of the fish obstacle at Houschterbaach is delayed because of the mild winter and the high amount of rain (all authorisations are given). The obstacle will be removed in spring 2018. The planning of the removing of the tube and the restoration of the riverbed of the river Froumicht is behind schedule as well. The planning should be finalised in April 2018 in order for the authorisation to be requested.

The intention of the gravel input is to improve the quantity and quality of the river substratum in both rivers by the creation of clean gravel depots at four sites in each river. The dumping of gravel into the river Our is finished. The gravel input into the river Sûre started one year later. Therefore, 200 m^3 should still be deposit into the river. The gravel was ordered in November 2017and partly delivered. But due to the mild winter we were not able to drop the gravel into the river Sûre. There was a lot of rain and no frost – risk of damage of the meadows.

The gravel will be dumped as soon as possible (see C3).

In early summer 2016 we decided not to release any mussels in 2017, but to organize a larger event with the partners and press in 2018 (see also C4).

- Financial aspect

Tanja Eybe stopped working for the LIFE Unio team since 31.03.2017 but she is still working for natur&ëmwelt. Manou Schirtz joined the LIFE Team in May 2017 (see chapter 4.1 and 5.1.21).

The budget for "other costs" is actually overspent for the following reasons: We spent the money for the study of pesticide analyses in the river Our, Sûre and its tributaries. Furthermore we had high costs for the maintenance of pumps in the mill.

4 ADMINISTRATIVE PART

4.1 Project management

The setup of the project management and composition of the project team is described under Action F1. Meetings with stakeholders or other groups and persons relevant for the project management are always mentioned in the respective description of the action (see chapter 5 and in Annex 11).

4.2 Organigram

- Constitution of the project team:
  - Coordinator 70%: Sonja Heumann Dr. tech.
  - Scientific 1 50%: Frankie Thielen Dr. rer. nat and 50% on another non EU project.
  - Scientific 2 70%: Manou Schirtz, MSc, 20% on LEADER project, 10% on a non EU project.
  - Technician 100%: Léo Klein environmental technician, left in December 2014, is replaced by Karin Michels from January 2015.
  - Secretary/accountancy: Patricia Heinen secretary 40% (LIFE 11 NAT/LU/857), 20% (LIFE 11 NAT/LU/858 till August 2017), 20% non EU project; since August 2017 40% (LIFE 11 NAT/LU/857) and 40% non EU project.
- Allocation of the different missions to each team member:
  - Sonja Heumann is in charge of the project coordination, the water quality survey, the monitoring of the measures and the realisation of measures.
  - Frankie Thielen and Karin Michels are responsible for the rearing station and the tasks related to the mussel breeding.
  - Manou Schirtz principal mission is the realisation of measures in the agricultural context, the preparations of maps and the leaflet for the farmers (measures, monitoring, …).
  - Patricia Heinen deals with accounting, timesheets and correspondence.
  - Each team member contributes in informing the public. Whenever an action needs higher personal input the other members will give the needed support.
- Every Monday 15 minutes team meeting: information about the happenings for the upcoming week (meetings, field work, help needed for special tasks, ...).
- Monthly meeting with the Fondation Hëllef fir d' Natur director (Mr. Gilles Weber): validation of work content and proceeding. Written reports.
- Monthly meeting between the director and the administrative council of Fondation Hëllef fir d'Natur. If necessary aspects dealing with the LIFE Unio project are mentioned. Written reports.
- Meetings with stakeholders or other groups and people relevant for the project management are always mentioned in the respective description of the action (see chapter 5.1).

The project Organigram is the following (see Figure 1):

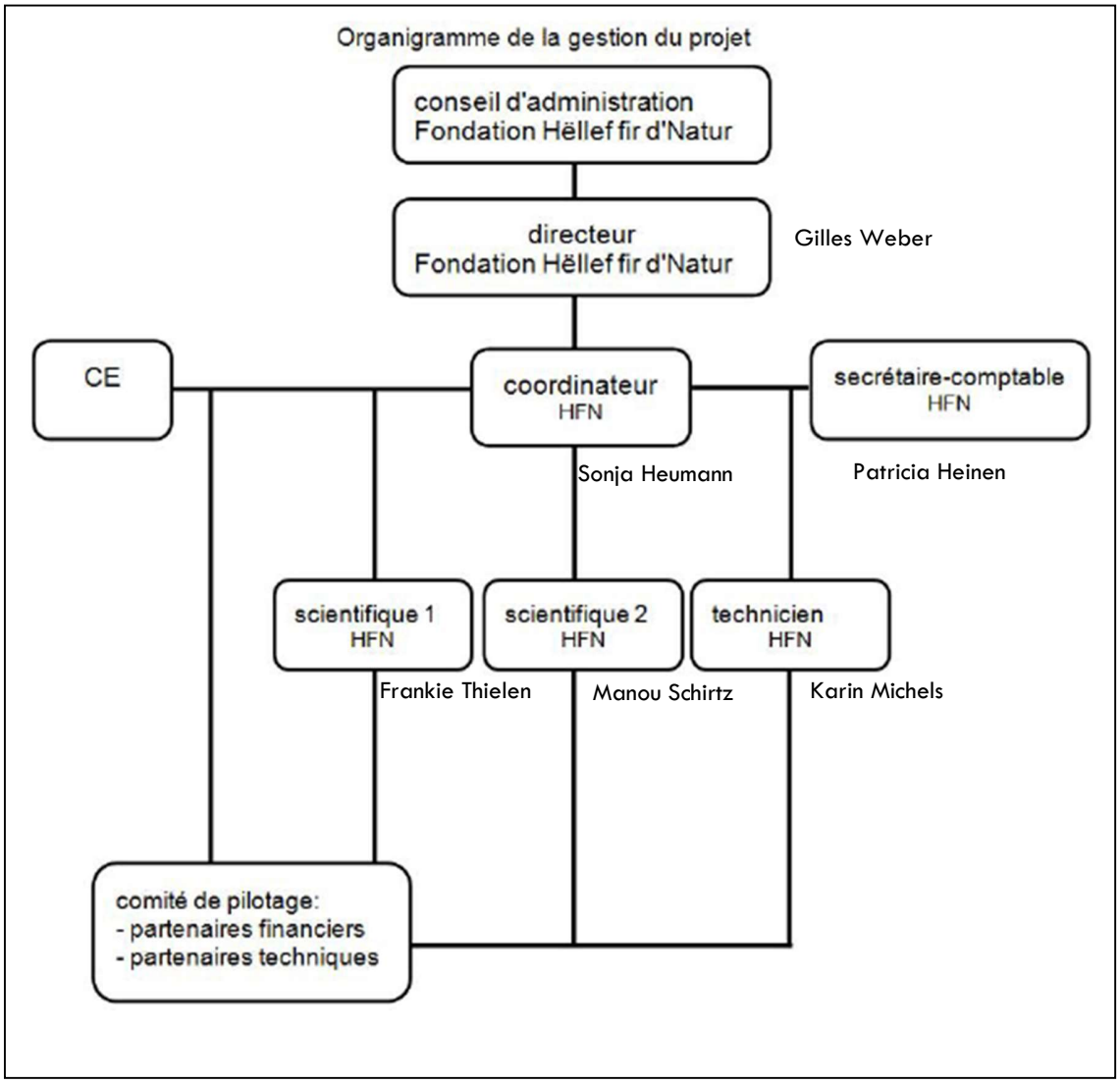


Figure 1 : Project Organigram

- The project submitted on 27/05/2016 a request for prolongation, which was granted by the EC on 21.07.2016. The end of the project is now on the 28.02.2019
- The first of March 2015 natur&ëmwelt-Fondation Hëllef fir d'Natur got a new president, namely Mr. Patrick Losch.
- The Partnership agreements with MA and MDDI have been submitted with the Inception report while the one with MIGR has been submitted with the Progress report I.

4.3 Delivered Reports

The inception report has been delivered on 28th February 2013.

The first progress report has been delivered on 28th February 2014.

The mid-term report has been delivered on 28th February 2015.

The second progress report has been delivered on 29th February 2016.

The third progress report has been delivered on 28th February 2017.

5 TECHNICAL PART

5.1 General progress of the actions

5.1.1 Action A1: Localisation des zone à risques d'érosion

The load of fine sediments and nutriments in the river system is one of the main factors responsible for the decline of *Unio crassus*. Therefore, the project focuses on the reduction of the entrance of fine sediments and nutrients in the water courses, especially in the tributaries of the rivers Our and Sûre. The main intent of this action is to localize the hot spots of erosion.

➢ Progress/results

For both river basins a mapping of the main different entrances of fine sediment into the water courses (erosion of and on farmland, erosion on or beside forestry and rural roads, spruce trees next to the river, cattle trampling, etc.) has been done.

The hotspots have been identified, evaluated, rated and priority lists have been set up for all types of entrances of fine sediment into the water courses (see action A2 submitted with the Mid-term Report).

The action is finished since November 2014.

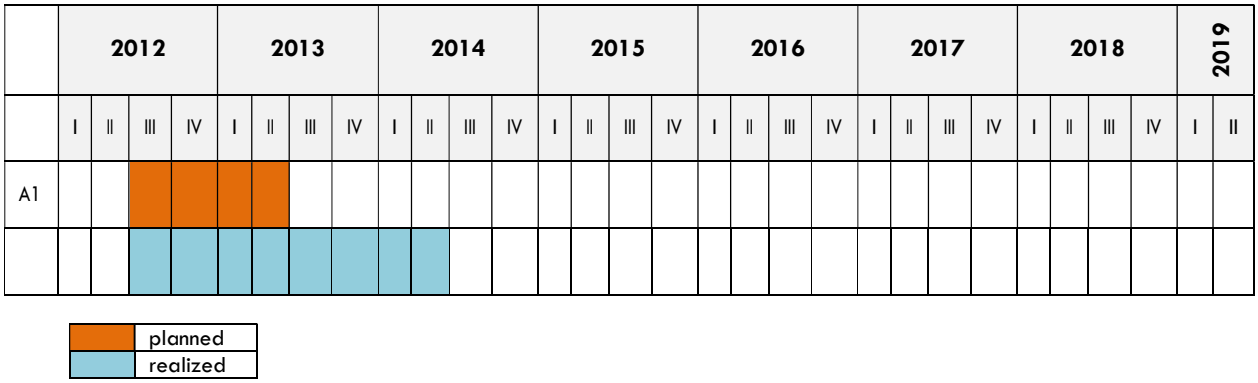
For the final report the list of the hotspots will be revised. The unresolved areas or the ones which still cause problems will be part of the After-Life conservation plan.

➢ Realised

List of hot spots of erosion was send on 30th June 2015 to the European Commission (our "Erosion report", see action A2.

➢ Problems encountered/delays

No major problem.



➢ Complementary action outside LIFE

None.

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5.1.2 Action A2: Planification des mesures de restauration

The initial mapping phase of "hot spots" of erosion, as foreseen under the action A1, will allow decisions where negative points have to be dealt with and will lead to the concrete planning phase of the following restoration measures:

- The installation of 2km of fences, 5 cattle watering installations, 3 bridges for cattle
- Construction of 60 water evacuation systems on agricultural and forestry roads
- 40 agro-environmental measures
- Restoration of a riverbed

➢ Progress/results

A written document called the" Restoration measure plan" with priority lists has been set up and submitted to the CE on 30.06.2015. The priority lists contain detailed information on the detected problems, their localization, a link to www.geoportail.lu and a description of adapted restoration measures that could be done during the project course (see Annex 1)

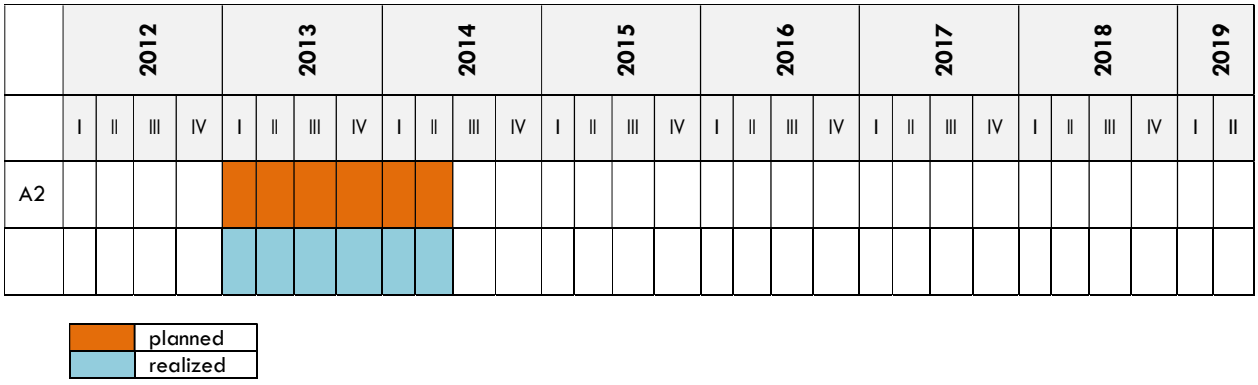
The action is finished.

➢ Realised

Restoration measure planned.

➢ Problems encountered/delays

No others problems or delays encountered.



➢ Complementary action outside LIFE

None.

5.1.3 Action A3: Planification de la surveillance de la qualité de l'eau et du substrat interstitial

The planning of the water measurement stations and other equipment needed for water quality survey is part of this action.

➢ Progress/results

A redox-electrode (Geist & Auerswald, 2007) was delivered in January 2013. In March (04.03.2013) was a meeting in Munich combined with a workshop in order to learn the handling. In July 2014 another workshop was held at the river Our.

In June 2013 the company Hach-Lange installed 4 probes (nitrate, ammonium, chloride and potassium) at our Lab in Kalborn in order to see if the equipment would fit our needs. In August 2013 the whole equipment (nitrate, ammonium, chloride and potassium; conductivity, turbidity, oxygen and pH-value) was ordered and installed in September 2013.

A second system (OTT) was installed in March 2014. This is a mobile monitoring system with several parameters (temperature, pH value, oxygen, conductivity, turbidity and nitrate). It is used for the monitoring of the tributary Syrbaach (Sûre).

➢ Realised

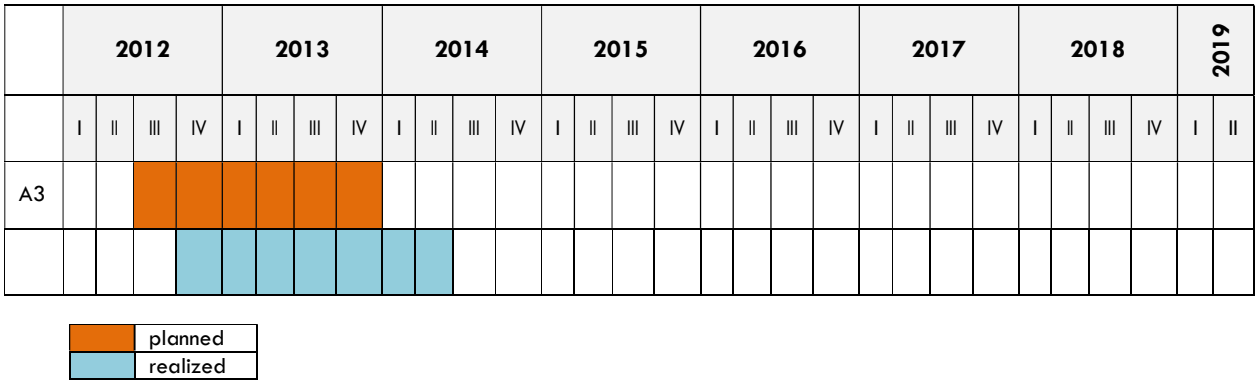
The redox-electrode was delivered. Data are available (Action D1 and D4).

Online monitoring system was installed at the Mill in Kalborn in September 2013. Data are available Action (Action D1).

Mobile monitoring system was delivered in March 2014. Data are available (Action D4).

➢ Problems encountered/delays

No problems or delays encountered.



➢ Complementary action outside LIFE

None.

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5.1.4 Action A4: Mise en place de la technique d'élevage pour Unio crassus

The intent of this action is to plan and organise all the necessary steps to install a culture procedure for *Unio crassus* at the rearing facility at the mill of Kalborn.

➢ Progress/results

Authorisation

All permissions from the MDDI to handle *Unio crassus* in the river Our and Sûre for the original project runtime (2012-2018) were organized (see Progress report 1, Annex 4). A new permission from the MDDI for the remaining project runtime and the After LIFE (February 2018 – February 2023) was requested in January 2018. The new permission is already available, so that all activities dealing with *Unio crassus* and its host fishes can continue in 2018 as planned (see Annex 2).

Developing and writing a rearing protocol

A rearing protocol including all the necessary steps for the culture of *Unio crassus*, including a discussion of the first results was written in German and is available online at our internet site since August 2014 as foreseen.

The rearing protocol in English is available online since 2016. It can be downloaded from our website (http://www.unio.lu/files/72719.pdf).

➢ Realised

- Permission letter for the river Our and Sûre valid until 28.02.2018 (see progress report I, Annex 4).
- Visit of freshwater rearing facilities in the USA (see F2).
- Visit of an expert from the USA in Luxembourg.
- Technical document about rearing method in German (http://www.unio.lu/files/55852.pdf).
- Technical document about rearing method in English (http://www.unio.lu/files/72719.pdf).
- Request of new permission from the MDDI to handle *Unio crassus* for the remaining project runtime and the after LIFE. Already available (see Annex 2).

➢ Problems encountered/delays

No problems encountered so far. The time plan for this action is on schedule.

	2012				2013				2014				2015				2016				2017				2018				2019	
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II
A4																														

planned
realized

➢ Complementary action outside LIFE

None.

5.1.5 Action A5: Contribution à l'élaboration des plans de gestion Natura 2000 "Our" et "Haute Sûre"

Contribution to the management plans for the two Natura 2000 project areas on the river Our and the river Sûre. The LIFE team gave scientific assistance to the consultant office in charge of working out the management plans. During public hearings, the team contributed with details about the aquatic biotope.

➢ Progress/results

Management plan Our: plan de gestion version abrégée.

- Official publication on the ministries internet site www.environnement.public.lu since May 2016
- Publication of the "arrêté ministériel" foreseen in spring 2018.

Management plan Sûre: plan de gestion version abrégée.

- Official publication on the ministries internet site www.environnement.public.lu since January 2017
- Publication of the "arrêté ministériel" foreseen in spring 2018.

With their clearly and precisely defined measures, both management plans will serve as a basis for the After Life Conservation plan.

We were told in our last "comite de pilotage" that a new management system for the NATURA 2000 area should be installed. But at the moment we do not have any further information.

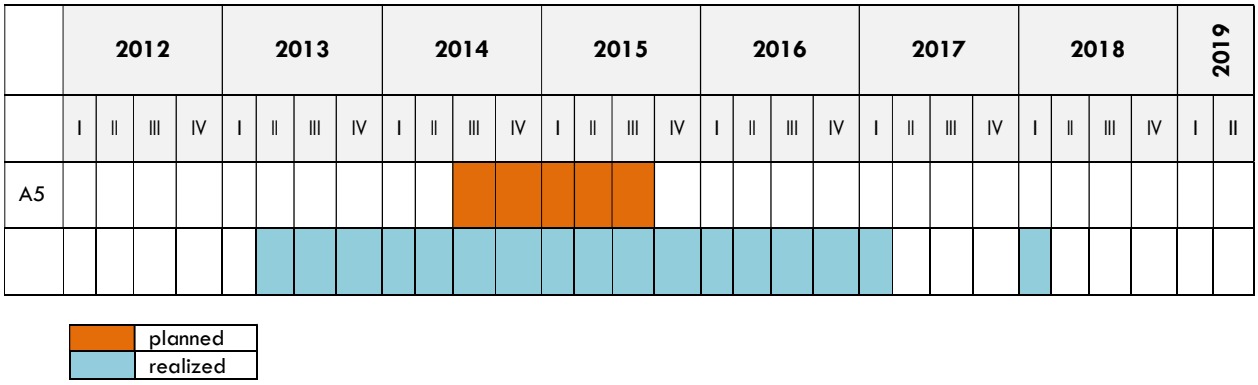
➢ Realised

Management plan Our: plan de gestion version abrégée (definitive version) (see Annex 2, progress report III).

Management plan Sûre: plan de gestion version abrégée (definitive version) (see Annex 3, progress report III).

➢ Problems encountered/delays

No problems encountered so far.



➢ Complementary action outside LIFE

None.

5.1.6 Action B1: Acquisition de terrains le long de l'Our, de la Sûre et de leurs affluents

It is foreseen to acquire 8 ha of land on the catchment area of the river Our and the river Sûre.

➢ Progress/results

Land purchasing has been granted by a notary for 826,33 Are (103,3 %). For 286 Are the notarial acts are under progress, there is already an negotiation with the private owners. 683,43 Are have been bought in the catchment Our, 142,9 Are have been bought in the catchment Sûre. They are bought for a mean price of 82 €/Are (notarial deeds included). This is lower than planned (102 €/Are).

Restoration measures have been done or are undergoing.

We will continue the purchase of land during the remaining project runtime.

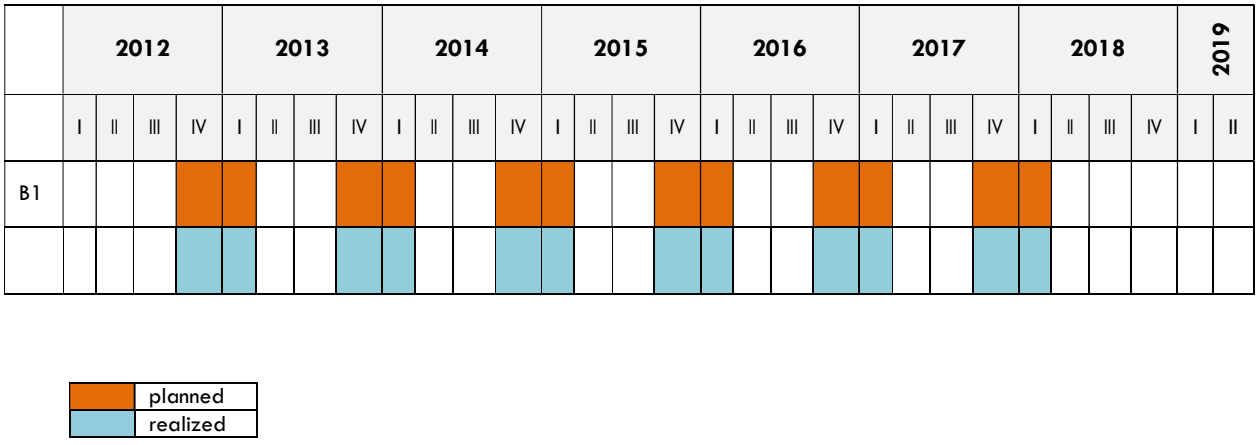
➢ Realised

Detail of land purchase, notarial act, aerial photo with the localisation of the acquisitions, explanation of the QD concept and enumeration of the measures done can be found in Annex 3.

➢ Problems encountered/delays

No problems encountered so far.

The time plan for this action is on schedule.



➢ Complementary action outside LIFE

None.

5.1.7 Action C1: Interventions pour réduire l'apport en sédiments fins dans le réseau hydrographique

This action will lead to:

- Installation of 2 km of fences, 5 cattle watering installations, 3 bridges for cattle
- Construction of 60 water evacuation systems on agricultural and forestry roads
- 40 agro-environmental measures
- Restoration of a river bed

➢ Progress/results

Installation of fence (2.000m), watering tanks (5), cattle passages (3)

81% of the fencing has been done.

The targets will be reached within the foreseen budget without any problem.

Table 1: Measures realized and planned

Catchment	River	Lieu-dit	Fence (m)	watering	cattle passage
Our	Roupelsbaach		380	1	2
Our	Stroumbaach	Folkesbour	650	2	0
Our	Stroumbaach	Enkerich	500	2	2
Our	Bollertsbaach		35	1	0
Sûre	Syrbaach		50	2	0
		Total:	**1.615**	**8**	**4**

Water evacuation grids

In the north of Luxembourg, a lot of new windmills are built and the old ones are remounted. Therefore, a lot of rocks and other material is available and the local communities use this material to reconstruct their forestry roads. Therefore, we were able to install many water evacuations grids on forest roads. The grids on roads next to Ruederbaach, Schwärzerbaach and Huschterbaach were installed in spring 2017.

Figure 2: Water evacuation grids at the forest road next to Schwärzerbaach

110 % (66 of 60) of the planned grids installation has been done.

Table 2: Agreements for water evacuation grids to be installed

Catchment	**River**	**length (m)**	**done**
Sûre	Schwärzerbaach	600	6
Our	Ruederbaach	500	5
Our	Feierbech	1.200	18
Our	Heinerscheiderbaach	1.800	19
Our	Huschterbaach	2.000	18
	Total:	**6.100**	**66**

AEM (agri-environmental measures Mesures agri-environnementales)

The Luxemburgish PDR has been published in spring 2016 and officialised in August 2016. With the support of the national chamber of agriculture, 20 contracts out of this programme were signed since May 2017. Additional about 40 biodiversity contracts (runtime of 5 years) were established or extended by the end of 2017. These contracts have to pass a commission consisting of members from the ANF and ASTA to become valid. The decisions will be published in about 2 months.

Table 3 indicates the lots with AEM that were concluded in cooperation with the national chamber of agriculture. The main goal is to reduce the intensification of agricultural practices in order to protect our streams and rivers.

All the contracts listed above correspond to the catchment of the river Our. There are basically two types of contracts:

- Programme 432 is linked to a reduction of nitrogen fertilization on farmland
- Programme 482 is linked to a reduction of nitrogen fertilization on grassland

The maps and further details are listed in Annex 4.

Further negotiations with farmers and more contracts will follow during 2018 in order to achieve a higher amount of contracts. For 2018, we will also try to get some contracts signed in the catchment of the river Sûre.

Table 3: Agri-environmental contracts reducing nitrogen fertilization

No	FLIK No.	Type of contract	Comment
1	P0790652	432-RN	Lot in the catchment of Laangbaach
2	P0145010	432-RN	Lot in the catchment of Jansschleederbaach
3	P0891013	432-RN	Lot in the catchment of Jansschleederbaach
4	P0145094	432-RN	Lot in the catchment of Jansschleederbaach
5	P0145041	432-RN	Lot in the catchment of Jansschleederbaach
6	P0790793	432-RN	Lot in the catchment of Jansschleederbaach
7	P0790791	432-RN	Lot in the catchment of Jansschleederbaach
8	P0850033	432-RN	Lot in the catchment of Jansschleederbaach
9	P0790853	432-RN	Lot in the catchment of Feierbësch
10	P0790877	432-RN	Lot in the catchment of Feierbësch
11	P0790875	432-RN	Lot in the catchment of Feierbësch
12	P0146012	482-P2	Lot in the catchment of Kënzelbaach
13	P0791183	482-P2	Lot in the catchment of Kënzelbaach
14	P0350575	482-P2	Lot in the catchment of Kënzelbaach
15	P0165635	732-RN	Lot in the catchment of Kënzelbaach
16	P0165571	482-P2	Lot in the catchment of Grondbaach
17	P0149185	482-P2	Lot in the catchment of Huschterbaach
18	P0149192	482-P2	Lot in the catchment of Our
19	P0149246	482-P2	Lot in the catchment of Our
20	P0450231	482-P2	Lot in the catchment of Our

Pilot project Feierbech

Figure 3 shows the pilot project area Feierbech.

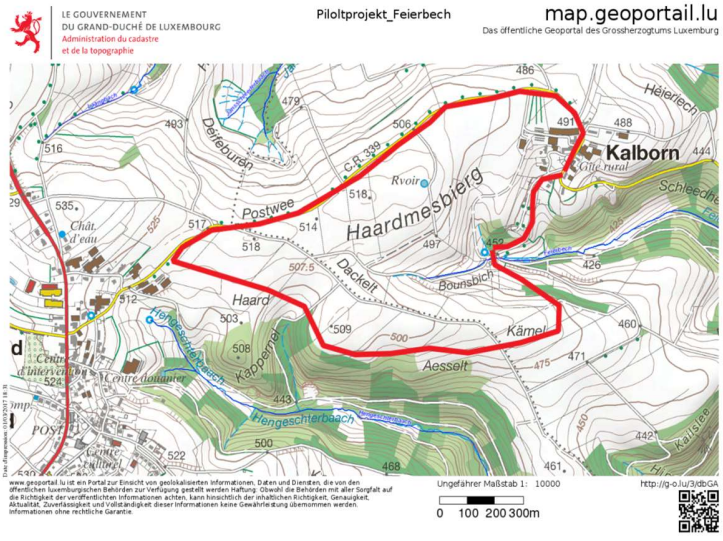


Figure 3: Pilot project area in the catchment area of Feierbech

In the catchment area of the Feierbech, a tributary of the river Our, soil samples were taken in a depth of about 30 cm on 27 lots in 2017. On some lots samples were taken in a depth of about 60 cm. The goal was to know the concentration of mineralised nitrogen. The concentrations were quite high after the harvest (in average 50 kg N-NO_3/ha). The high values were caused by the weather situation in 2017. Till the end of June a lack of rain up to 63% compared to the last decade was observed. Plants were not able to uptake the nitrogen. In the beginning of autumn a lot of rain mobilised the nitrate in the soil. In December, the mineralized nitrogen was found in a depth of 60 cm, in January all the nitrate has gone deeper than our sampled 60 cm. The project team will continue this kind of soil monitoring. The year 2017 is summarized in Annex 5.

We organized meetings in February 2015, March 2016 and July 2017. We informed the farmers about our project and the impact of agriculture on the water.

Restoration of the riverbed

This restoration measures at the stream Ruederbaach started in February 2017. The bridge was built and the river got its new bed. In March 2017 the forest road was reconstructed and the water evacuation grids were installed. Unfortunately, the riverbed became unstable and has to be stabilised as the river bed of Schwärzerbach – with tips of spruce trees.

	
Schwärzerbaach after tube removal (Dezember 2015), riverbed unstable	Schwärzerbaach after stabilisation (June 2016) in January 2018

Figure 4: Schwärzerbaach – riverbed restoration after tube removal

At Huschterbaach and Froumicht, where the last tubes should be removed, the riverbeds will also be restored and stabilised.

Table 4: Riverbed restoration

Catchment	**River**	**length (m)**	**done**
Sûre	Schwärzerbaach	100	2016
Sûre	Froumicht	120	2018
Our	Ruederbaach - planned	90	2018
Our	Feierbech	100	2015
Our	Huschterbaach -plannend	110	2018
Our	Heinerscheiderbaach	Not possible	---
	Total:	**520**	

The restoration of the riverbed of Heinerscheiderbaach is at the moment not possible because of the high time, effort and costs. The riverbed is very steep and there is an income of surface water (high velocity of the water). Special solutions have to be found to restore this bed (see also progress report III).

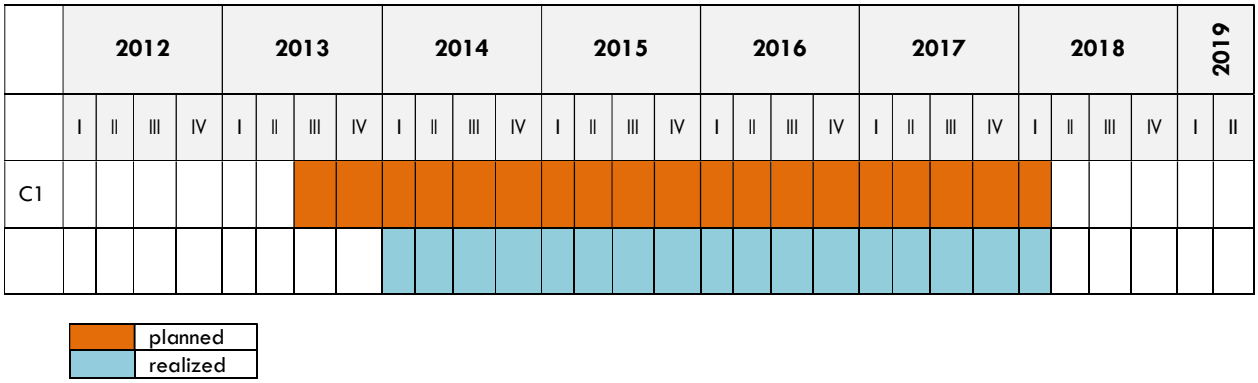
- **Realised**

Pilot Project "Feierbech" (see Annex 5).

Restoration of the river bed on lower part of the Feierbech and Schwärzerbaach were done (see Annex 6, progress report III).

➢ Problems encountered/delays

Slight delay but no problems encountered so far.



➢ Complementary action outside LIFE

Restoration of the riverbed (Feierbech)

The total amount of the restoration of the Feierbech riverbed, the transformation of the fish obstacle and the adaption of the access to the camping "Tintesmillen" were about 55.000 €. The transformation has been finished in December 2016 (Annex 6, progress report III). The riverbed had to be stabilised again in March 2017.

Figure 5: Feierbech – unstable riverbed (February 2017)

Figure 6: Feierbech – stabilized riverbed (April 2017)

5.1.8 Action C2: Transformation d'obstacles à la migration des poissons sur les cours d'eau tributaires

The intention of this action is to remove or transform 6 migration obstacles for fish in order to make them passable again.

➢ Progress/results

Set up of a priority list for the fish obstacles that has been sent to the Water administration to plan the measures. Together with the Administration of Water (AGE), Administration of Forest and Nature (ANF) and the local forest ranger, we decided which obstacles should finally be removed or transformed.

Three obstacles have been removed or transformed the years before (see Table 5). Last year we removed one obstacle at the tributary "Ruederbaach" and we planned two further construction sites in the catchment area of the river Our (Huschterbaach) and Sûre (Froumicht).

We had several meetings with the Administration of Water, the Administration of Forest and Nature and landowners (see E1).

In our proposal, we wanted to remove or restore 3 obstacles in each catchment area but there are now 5 obstacles in the catchment area of the Sûre. Three of these obstacles are at the tributary "Schwärzerbaach". The tributary "Schwärzerbaach" (catchment area Sûre) is one of the cleanest streams in that area. There is very less income of sewage and no farming next to the stream. Most of the meadows are used in a sustainable manner. Therefore we decided go on with the restoration of this stream.

<u>Huschterbaach</u>

Project "Huschterbaach" (catchment area Our) should be already finished but some problems occurred. The forestry road was in a very bad condition and not accessible by trucks. Next to the place of the new bridge there is a forestry road which should be kept for forestry work. This fact, combined to the narrow space makes the planning difficult. In 2016 we were able to buy land and finished the planning of the bridge. In March 2017 the ANF started to reconstruct the forestry road and the work was finished in January 2018. The warm and wet winter caused a delay again. As soon as the weather conditions are better, the tube will be removed and the bridge will be built (see Annex 6).

<u>Froumicht</u>

The removal of the tubes and the renaturation of the stream Froumicht were already planned in 2015. But the stream is polluted by income of high amount of municipal waste water. At the moment the waste water syndicate SIDEN builds a pump station to the waste water treatment plant of Martelange. The income of sewage water will be stopped during the summer months of 2018.

After several meetings with the local authorities, the members of ANF and AGE started the concrete planning. Some money is left and therefore the LIFE project is able to finance the bridge and the renaturation. The place has an historical meaning because of an existing washing house (Waschbur). We plan to arrange meetings with members of the Administration of culture heritage.

The planning is nearly finished (see Annex 6)

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Ruederbaach

The work was done in February 2017.

Table 5 : Obstacle transformation

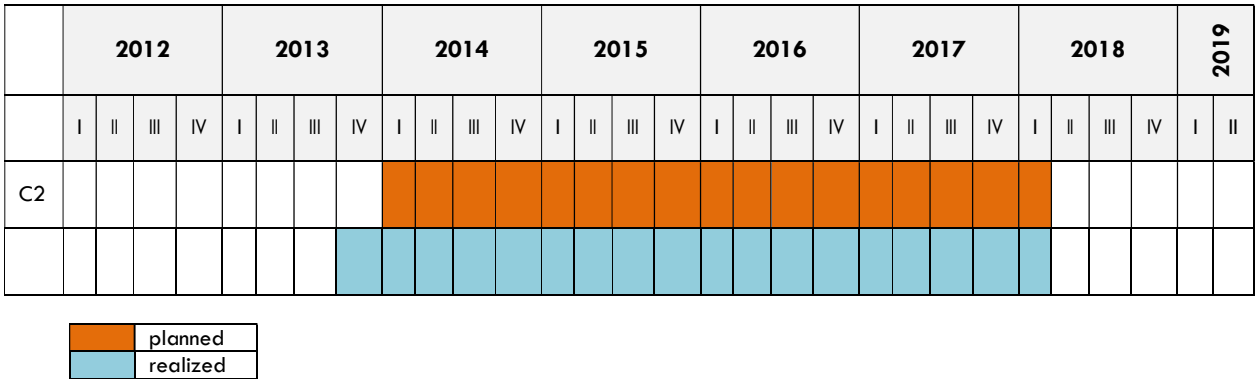
Catchment area	Tributary	Reopened	Planned	Status
Sûre	Syrbaach	2.400 m	100%	June 2015
Sûre	Schwärzerbaach I	700 m	100%	October 2015
Sûre	Schwärzerbaach II	700 m	100%	October 2015
Sûre	Schwärzerbaach III	500 m	100%	October 2016
Sûre	Froumicht	1.500 m	80%	Summer - Autumn 2018
Our	Huschterbaach	1.800 m	100%	Spring 2018
Our	Ruederbaach	1.000 m	100%	February 2017
Our – outside LIFE	Feierbech	1.000 m	100%	December 2016

➢ Realised

Removal of the tube at the Ruederbaach/ Our (Annex 6).

➢ Problems encountered/delays

The action is on time and the success will be controlled within the project.



➢ Complementary action outside LIFE

None.

Progress Report IV

5.1.9 Action C3: Amélioration du substrat par dépôt de gravier

The intention of this action is to improve the quantity and quality of the river substratum in both rivers by the creation of clean gravel depots at four sites in each river.

- **Progress/results**

No gravel was dumped into the river Our in 2017 because the amount of gravel was reached in 2016.

We monitored the redox potential and the distribution of the gravel in the river Our and Sûre (see D4 and Annex 7).

Dumping of 200 m³ of gravel (16-32 mm) in the Sûre at the sites named Eilerhaff (Ferme d'Oeil), Esperbech and Syrbaach were planned in November 2017 (see Figure 7).

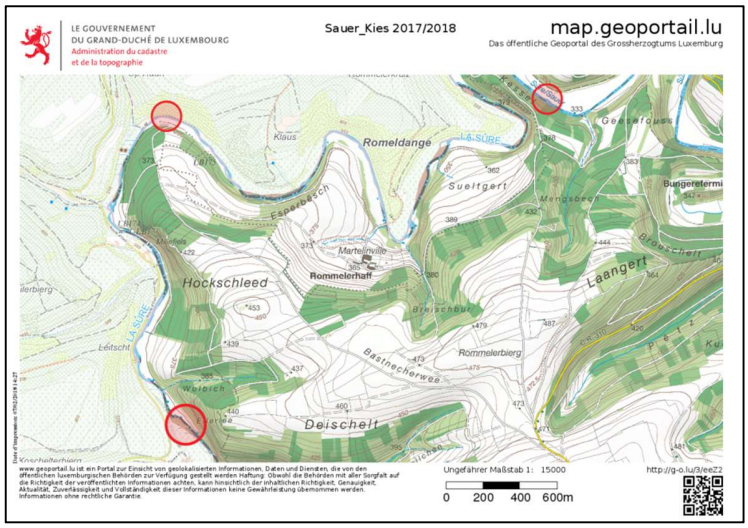


Figure 7: Gravel input in the river Sûre 2017/2018

There was no possibility to dump the gravel into the river Sûre after October 2017 till now because of the high amount of rain and no frost – risk of damage of the meadows.

In case of the deposit of Syrbaach we decided to dump the gravel on another place to avoid a stationary deposit. We plan on dumping the 200 m³ of gravel in 2017/2018 on three sites in the river Sûre (see Table 6)

Table 6: Amount of gravel and forecast

amount gravel (m3)	2012, 2013	2014	2015	2016	2017	2018	sous-total
Our	203,29	127,94	118,59	108,78	closed	closed	558,60
Sûre	0,00	95,98	76,10	116,33	200,00	closed	488,42
						total	**1047,02**

➢ Realised

The gravel input for the river Our was finished in 2016. 558 m³ gravel were dumped into the river.

Till now 288 m³ gravel were dumped into the river Sûre.

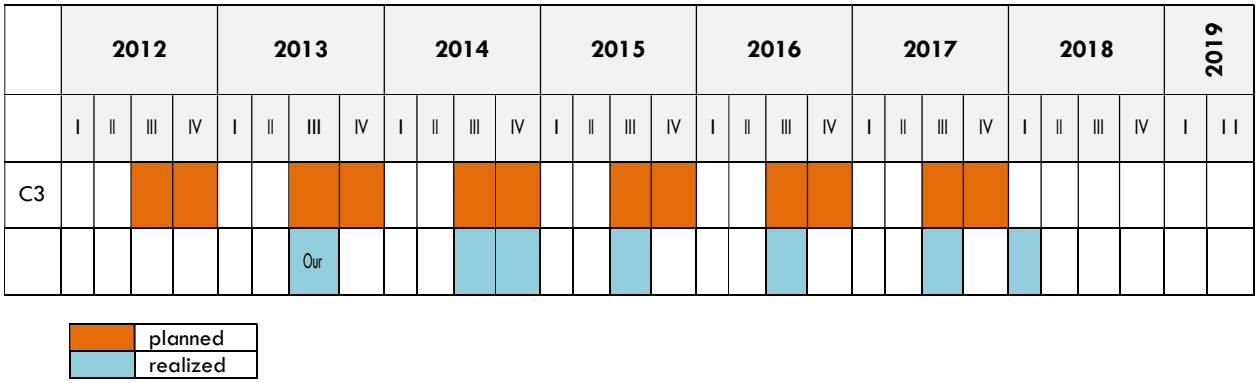
➢ Problems encountered/delays

As we started with the gravel deposition a year later on the Sûre we will also finish a year later which means that the last deposition in the river Sûre will be done in 2017/2018.

The delay at the beginning of the project for the river Sûre will be resolved by adding an additional year for the deposition.

The gravel is already delivered to one site but there were no good weather and soil conditions to dump the gravel into the river.

Figure 8: Delivered gravel at Ferme d´Oeil in February 2018



➢ Complementary action outside LIFE

None.

5.1.10 **Action C4: Elevage de *Unio crassus* pour la Grande Région**

The action deals with all the necessary steps to culture juvenile *Unio crassus* at the rearing facility at the mill of Kalborn.

➢ Progress/results

During the report period, 1.740 minnows were infested with *Unio crassus* larvae and more than 21.000 juvenile mussels could be collected (for details, see Table 7).

➢ Realised

Rearing steps 2016

- 05.04.2017: Transfer of 141 adult *Unio crassus* from the river Our to the rearing facility. 07.04.2017: Transfer of 120 *Unio crassus* from the river Sûre to the rearing facility.
- Between 15.03 - 26.04.2017: Capture of 1.740 host fish *Phoxinus phoxinus* in the river Our.
- Between 27.04.2017 - 06.06.2017: Infestation of 705 fish with river Our mussels. Infestation of 892 fish with river Sûre mussels.
- Between 29.05.2017 and 30.06.2017: Collection of 9.230 juvenile mussels from the river Our and 12.705 from the river Sûre (see Figure 9).

As the years before, the freshly dropped mussels were collected and cleaned and transferred to the different rearing systems (e.g. Detritus boxes, Sand-Aquaria and Sand-Channels).

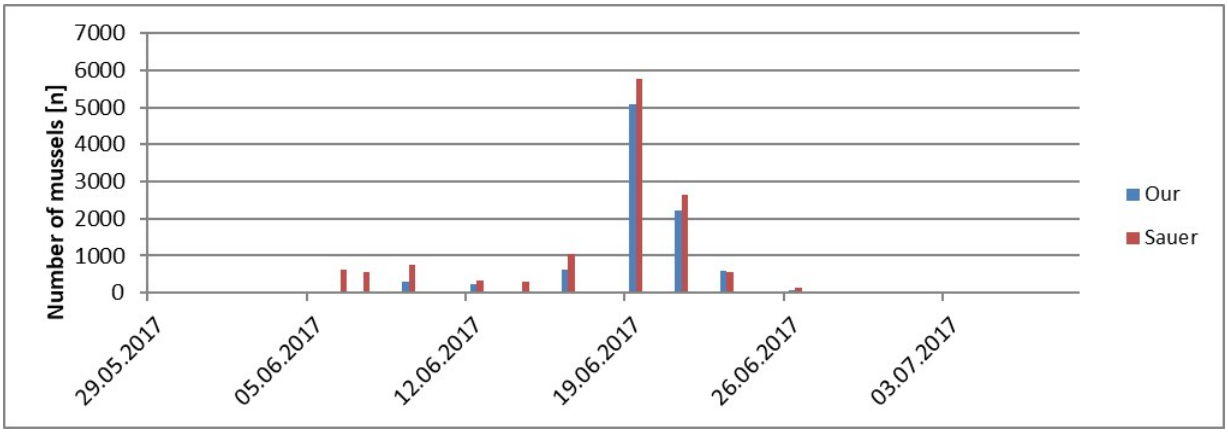


Figure 9: Mussels collected in 2017

As the automatic feeding system, described in progress report III, did not bring the expected results in the period 2016/2017, we switched back to hand feeding in the sand channels in 2017.

However, the other two new systems presented in progress report III, the "Floating upwelling System (Flupsy)"and “River water flow thru” channels showed good results concerning the survival and growth after one year.

In 2016 we installed two Flupsys in our outside tank in front of the rearing facility and released 10 mussels of each river. After the first year, the river Sûre Flupsy showed a survival of 80% and the river Our Flupsy of 100%. Because of these promising first results, we constructed a second Flupsy with four compartments and released (24.07.2017) another 99 river Our mussels and 249 river Sûre mussels (see Figure 10).

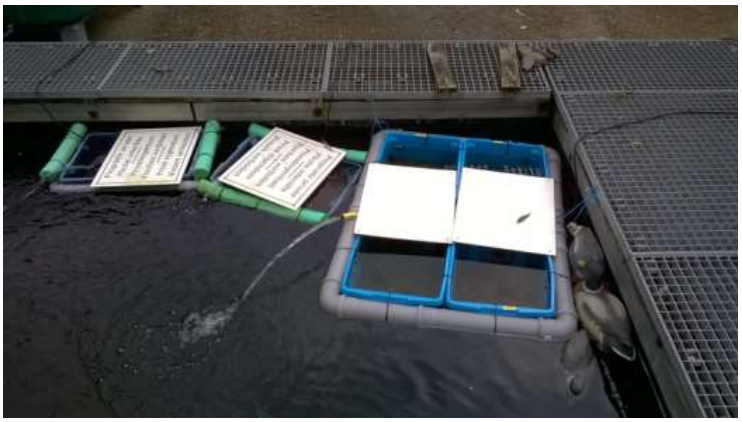


Figure 10: Floating upwelling Systems (Flupsys) with *Unio crassus* from the river our and Sauer

In August 2016 we introduced 104 mussels of river Our and 104 mussels of river Sûre in two "River water flow thru" channels respectively. The mussels were checked on 28.06.2017 and 80 Our mussels and 101 Sûre mussels were recovered alive. This gives a survival rate of 77% for the Our mussels and 97% for the Sûre mussels. In addition, the growth was good. Another 168 Our mussels and 510 Sûre mussels were released in the two channels on 24.07.2017.

As foreseen, two cages with infested minnows were installed in each river system in May and June 2017.

- 29.05.2017: 100 infested fish in a cage in the river Our
- 02.06.2017: 100 infested fish in a cage in the river Sûre

Table 7 : Summary of rearing activities in the seasons 2013 - 2017

	Promised / realized 2013	**Promised / realized 2014**	**Promised / realized 2015**	**Promised / realized 2016**	**Promised / realized 2017**
Fish infestation	400/563 (+320 *S.trutta*)	400 /665	400/1895	400/1784	400/1740
Release in cages	200/100 +170 released without cage	200/0	200/1315 released without cage	200/245	200/200
Fish used in collecting installation	200/523	200/665	200/450	200/1784	200/1597
Juvenile mussels collected	5000/2693	5000/4234	5000/23129	5000/63106	5000/21935

On 26.05.2017, 6 more gravel cages, 4 with river Sûre mussels (393 animals) and 2 with river Our mussel (274 animals), were installed in the outside rearing channel. The new cages from 2017 were checked for the first time on 22.11.2017. 602 out of 667 mussels survived the first summer months. This gives a survival rate of 90%.

On 30.06.2017, all the cages from the years before were checked. Figure 11 gives an overview of the growth and survival of these mussels. As the mussels released in 2016 were also integrated in this figure, we observe a slight increase in survival over time. Overall, the survival stabilized around 70% and the mussels grew faster in the first two years (ca. 7mm /year) and less fast in the third year (ca. 3-4mm/year). Currently 26 gravel cages with 880 U.c. are present in the rearing channel.

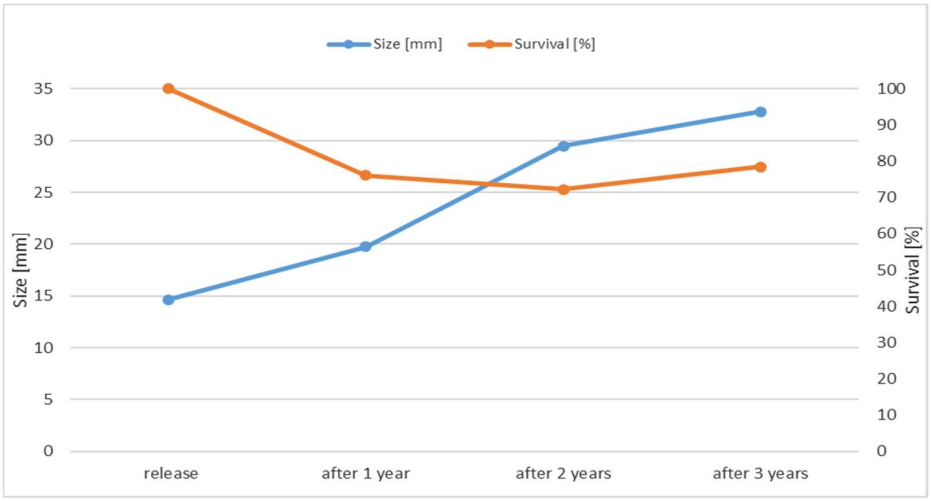


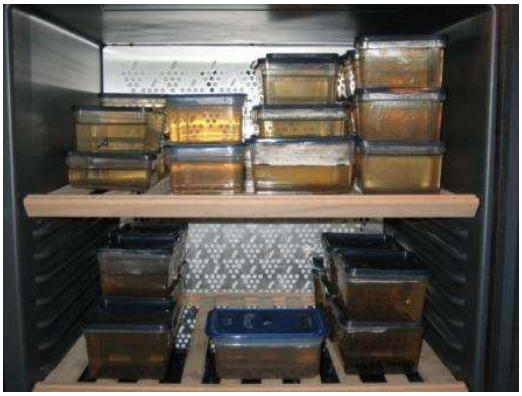
Figure 11: Growth and survival of *Unio crassus* in the rearing channel at the mill of Kalborn

At the moment juvenile *Unio crassus* from both strains, Our and Sûre, are grown like the years before in 6 systems (see Figure 12):

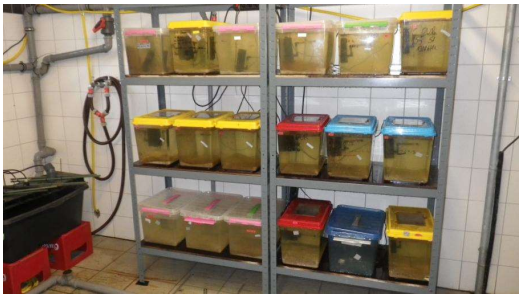
- Detritus Boxes
- Sand aquaria
- Sand channels
- River water flow thru channels
- Gravel Boxes in the outside rearing channel
- Flupsys

At the moment (status January 2018) a total of 2.067 river Our mussels and 2.334 river Sûre mussels from different ages are present in all of the six different systems (see also Table 8). This is the number of mussels counted as accurate as possible (in the different systems). The number of small mussels in the sand channel from 2017 can only be estimated. Most mussels from the outside gravel cages, the river flow thru channels and a number of the Flupsy mussels have reached a size were they can be tagged and released. In the year 2018 (early summer), it is planned to release all these mussels into the river

Our and Sûre. For each river system we will chose at least three release sites were approximately 200 mussels can be released.



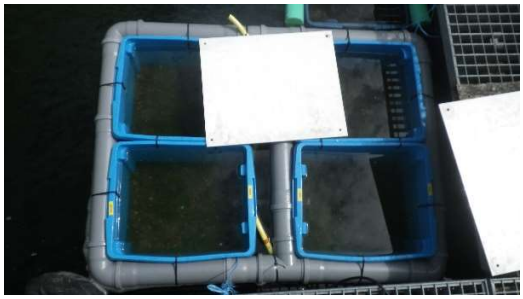
Detritus Boxes



Sand Aquaria

Sand and river water flow thru channels

Gravel Boxes in the outside rearing channel



Flupsys

Figure 12: Different mussel holding systems

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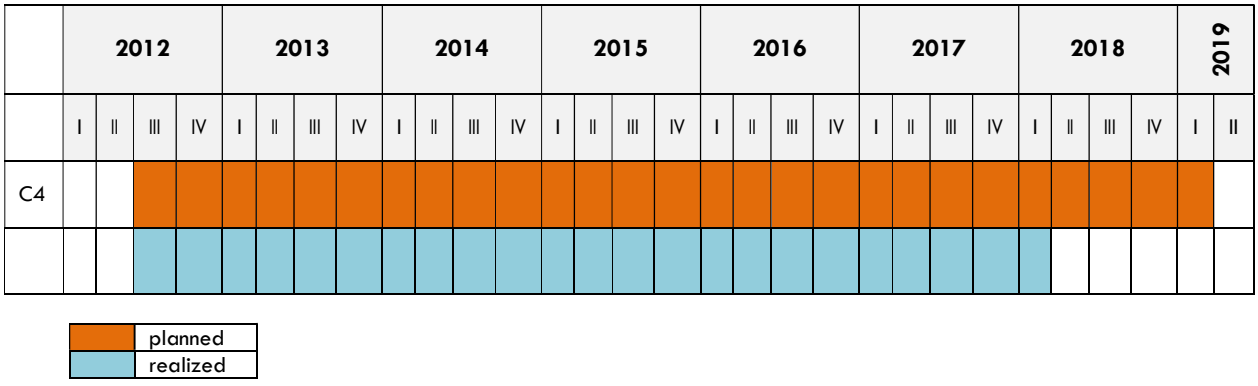
For the river Our release, a larger event with the project partners and the press is planned.

Table 8: Number of mussels of the respective strains in the respective rearing systems

	U.c. Sauer	*U.c.* Our
Gravel cages rearing channel	403	477
Older mussels in sand channel	121	139
Flupsys	257	109
River water Flow thru sand channel	630	248
Younger mussels in sand channel (estimation)	>5000 Outcome? +/- 1000	> 5000 Outcome? +/- 1000
Sand Aquaria (larger mussel counted)	923	1094
Sand Aquaria (estimation)	300	300
Total (only counted ones, without estimation).	2334	2067
Total (counted and estimation).	+/- 3634	+/- 3367

➢ Problems encountered/delays

No problems encountered so far. The time plan for this action is on schedule.



➢ Complementary action outside LIFE

As the years before, we took care of three aquaria with *Unio crassus* mussels from Switzerland for colleagues from the ecological company ecolo-gis.

Contact with many other mussel projects exist and are listed under action F2.

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5.1.11 **Action C5: Régulation de la prédation du rat musqué**

The muskrats are captured twice a year to reduce and/or to maintain the populations at a low level in the mussel rivers.

➢ Progress/results

As in the previous years, two persons from the ANF have done the capturing of the muskrats. As in other wild animal populations, the density and reproduction success of the muskrat changes from year to year. In 2017 the number of muskrats caught in the project area was lower than the years before (Table 9). This is probably due to a loss of adult animals during a longer ice period on the rivers during the winter 2016/17. In addition, the pressure due to the capture activities during the last years helped for sure to reduce the population.

Table 9 : Caught muskrat at the river Sûre and Our

Capturing period/ nb. of muskrats	2012	2013	2014	2015	2016	2017	Total
River Our	8	34	46	78	41	12	**236**
River Sûre	3	19	21	39	26	12	**121**
							357

Since July 2015, two persons from the ANF, in charge of the muskrat trapping, are also trapping *Pascifastacus leniusculus* (Signal-Crayfish). They get support from the LIFE Unio team if time is available during the summer months. In the year 2017, 1.401 (Table 10) crayfish were caught in both rivers. The majority of the animals was caught in the river Our where catching with fykes and the catching by hand was applied. At the end of the crayfish-trapping season, the two hunters confirmed that the number of crayfish in the densest stretch of the river Our is decreasing and that the animals get smaller in size. This confirms that the trapping of this species is successful. The lifting of restrictions is still under discussion with the Administration of Water.

Table 10: Number of crayfish caught during the year 2017 in the river Our and Sûre

River	Number 2016	Number 2017	Method
Our	4017	1171	Fyke + Hand
Sûre	---	230	Fyke
Total	**4.017**	**1.401**	

➢ Realised

24 trapped muskrats and 1.401 trapped crayfishes in 2017.

➢ Problems encountered/delays

No problems encountered so far.

The time plan for this action is on schedule.
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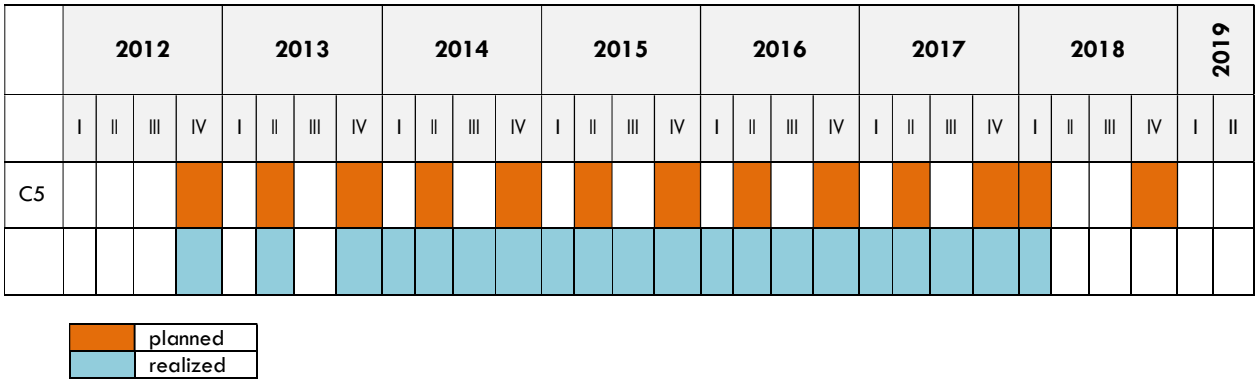

➢ Complementary action outside LIFE

Almost all muskrat, caught during the project runtime so far, were deep-frozen and given to the institute of Zoology (Department of Parasitology at the University of Stuttgart Hohenheim in Germany (https://www.uni-hohenheim.de/organisation/einrichtung/fg-parasitologie#contact).

The animals are used for parasitological investigations in wild animal populations.

5.1.12 **Action D1: Surveillance de la qualité de l'eau et du substrat interstitiel**

The water quality is a key issue for the protection of the thick-shelled river mussel and is monitored within this action.

- **Progress/results**

Once a week a sample from each river is taken and analyzed. The parameters temperature, pH value, conductivity, turbidity, oxygen concentration, ortho-phosphate, nitrite, ammonium, chloride and nitrate were determined.

Water quality and turbidity

The online monitoring system on the river Our worked with minor problems.

The mobile online monitoring system in the river Sûre catchment is working since August 2014 at the river Syrbaach. During wintertime the maintenance of the probe is still difficult because of high water levels that can occur with high velocity. Therefore required calibrations are missing and some of the data cannot be used (see also D4, Annex 10).

The water quality of the tributaries and their springs has been sampled three times in the last period.

690 samples of the rivers, streams and springs were measured in the period between February 2017 to January 2018 - 130 samples of river Our and Sûre, 110 samples of tributary mouths, 224 samples of springs and 30 samples of points of interests (new springs, water of unknown tubes …). Overall, about 210 samples were analysed from points where restoration measures took place, new or interesting points. Table 11 gives an overview of some water parameters from the river Our and Sûre, given as annual mean.

The problems with the hydropeaking at the river Our could be solved. The owner of the mill had to remove all the floating debris (e.g. wood, trash, which was deposit by the river at the dam). After this measure, the peaking decreased.

The hydro peaking at the river Sûre did not stop. We were told by the Administration of Water (AGE) that the possibilities to stop the hydro peaking are limited. The AGE built a fish pass to avoid the peaking in the future. A defined minimum of water passes the channel.

Figure 13: Fish pass in Moulin de Bigonville

Table 11:Annual mean of several water parameters from the river Our and Sûre 2017

Parameter	Our (Kalbermillen) Annual mean			Sûre/ Moulin de Bigonville Annual mean		
	value	water quality class		value	water quality class	
		Luxemburg	Germany		Luxembourg	Germany
Discharge [m³/s]	4,1* (Ouren)	---	---	3,8 (Bigonville)	---	---
Water temperature [°C]	10,0	---	---	10,8	---	---
Conductivity [µS/cm]	160,3	---	---	173,6	---	---
Turbidity [FNU]	7,8	---	---	10,9	---	---
Nitrate [mg/L]	14,8	good	II -III	14,7	good	II -III
nitrite [mg/L]	0,05	very good	I	0,05	very good	I
ammonium [mg/L]	0,08	very good	I	0,10	very good	I-II
chloride [mg/L]	19,8	---	I	22,6	---	I

Sources:
Luxembourg: https://eau.public.lu/actualites/2009/12/plan_de_gestion/Methodenhandbuch.pdf
Germany https://www.umweltbundesamt.de/sites/default/files/medien/1968/dokumente/chemische_guteklassifikation.pdf
* lack of data in February 2017 because of a destroyed measurement station

The physic-chemical data of the rivers are similar to the last years. It has to be mentioned, that all parameters (except nitrate) increased. The year 2017 was very dry with single rainy days. Therefore the annual mean of the concentrations of the different ions were quite high. In September the rainy season started.

The Adminstration of Water took samples where major pollution was observed. The pollution in the tributary Scheelsbach was confirmed but no solution was found. In April 2017 Scheelsbach had more than 4.500 ng/L pesticides and pharmaceutical compounds. The upper limit for drinking water is 500 ng/L.

In July 2017 we collected eleven samples of springs and concentration of several metals and pesticides were determined by the laboratory of the Water Administration (see Annex 8). Degradation products of Metazachlor ESA were found in 10 of 11 samples in concentrations ranging from 35 to 871 ng/L (in average 404 mg/L).

In the last years we did different measures to reduce the income of fine sediment. The efficiency of these measures should be documented and therefore sediment traps were installed. There are still sediments traps in the area of 2 restoration points (see D4).

A turbidity logger was bought in June 2015 and placed in the Schwärzerbaach. In June 2017 the logger was placed at the entrance of the mill channel in order to calculate the time the water needs to get from the river into the mill (see D4).

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Annex 8 shows graphs of the measurements of the rivers, their tributaries and other data dealing with the water quality.

Quality of interstitial

To have an overview of the quality of the interstitial, redox measurements were done (see more details under action D4). Additional the quality of the interstitial next to the mussel bank has been monitored. Therefore, we took water samples from the bed, examined the composition of the river bed and did redox measurement.

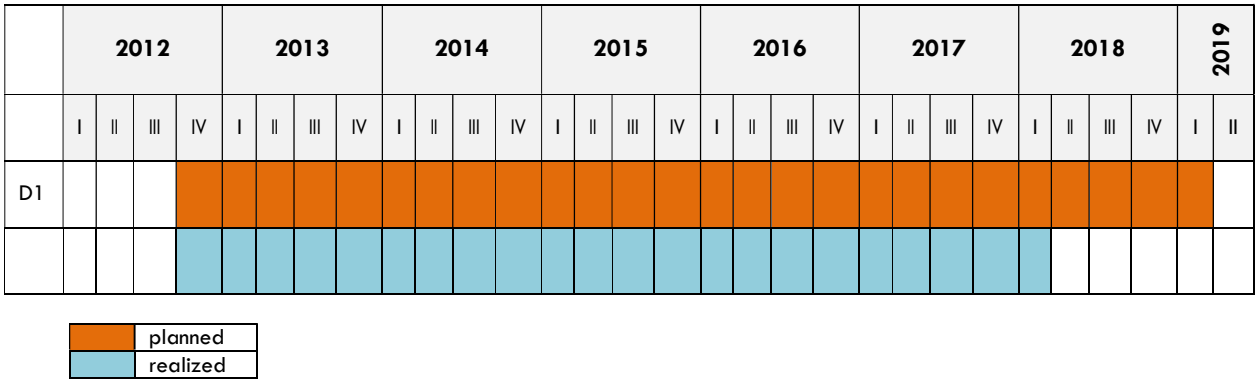
➢ Realised

Monitoring of the rivers and its tributaries

➢ Problems encountered/delays

No problems encountered so far.

The time plan for this action is on schedule.



➢ Complementary action outside LIFE

None.

5.1.13 **Action D2: Monitoring des poissons hôte**

This action should give an overview about the host fish population in both rivers (Our and Sûre) and their tributaries.

➢ Progress/results

The permission from the MDDI (Water administration) to perform electric fishing in the river Our and Sûre is still valid in 2018. A new permission, covering the year 2019 and the after-LIFE has been requested in January 2018 and is meanwhile available.

In 2017 electric fishing activities were foreseen in the main streams of the river Our and Sûre. The same sites as in 2013 and 2015 were chosen. Table 12 summarises the results of the electric fishing activities in the main stream during the years 2013, 2015 and 2017.

Table 12: Summary of the fish fauna in the river Sûre and Our as determined during the LIFE Resto Unio project in the years 2013, 2015 and 2017

River	Sûre							Our							
Site	Bigonville			Esperbësch			∑ Sûre	Grossenauel			Dornaulsmühle			∑ Our	∑ Sûre & Our
Species / Year	**2013**	**2015**	**2017**	**2013**	**2015**	**2017**		**2013**	**2015**	**2017**	**2013**	**2015**	**2017**		
Alburnoides bipunctatus	1	20	2	1	10	82	**116**	7	22	24	13	42	17	**125**	**241**
Barbatula barbatula	322	171	200	104	309	132	**1238**	45	74	112	77	217	319	**844**	**2082**
Barbus barbus	0	0	2	0	0	0	**2**	1	0	0	18	1	5	**25**	**27**
Chondrostoma nasus	5	3	1	0	0	0	**9**	0	0	2	6	0	6	**14**	**23**
Cottus gobio	5	11	53	9	25	48	**151**	48	94	178	14	58	98	**490**	**641**
Gasterosteus aculeatus	0	26	42	0	0	0	**68**	0	0	0	0	0	0	**0**	**68**
Gobio gobio	33	120	273	11	47	130	**614**	8	2	27	3	0	3	**43**	**657**
Lampetra planeri	0	0	2	1	0	0	**3**	0	0	0	0	0	3	**3**	**6**
Pacifastacus leniusculus	0	0	14	18	58	13	**103**	0	3	0	0	0	0	**3**	**106**
Phoxinus phoxinus	126	675	1075	249	476	1170	**3771**	340	382	248	321	196	225	**1712**	**5483**
Salmo trutta fario	1	10	0	10	7	3	**31**	10	24	12	3	63	1	**113**	**144**
Squalius cephalus	0	8	3	0	1	5	**17**	7	0	3	10	0	6	**26**	**43**
Thymallus thymallus	2	0	0	0	0	0	**2**	0	0	4	0	0	0	**4**	**6**
∑	**495**	**1044**	**1667**	**403**	**933**	**1583**	***6125***	**466**	**601**	**610**	**465**	**577**	**683**	***3402***	***9527***
Number of fish species	8	9	10	7	7	7		8	6	9	9	6	10		
Number of crayfish species	0	0	1	1	1	1		0	1	0	0	0	0		

On average 7-8 species were always detected at both sites of each river. The most abundant fish species on all sites in both rivers were the minnow (*Phoxinus phoxinus*) and the stone loach (*Barbatula*

barbatula). Especially the high abundance of the minnow at all sites is positive regarding this project, as this species is the most important host fish for the thick shelled river mussel in these two river systems.

Figure 14 and Figure 15 show two infestation parameters of the minnows in the two rivers in the years 2013, 2015 and 2017:

- mean abundance = the mean number of parasites found in all hosts (involves the zero values of uninfested hosts)
- Prevalence = the proportion of infested hosts among all the hosts examined

In both rivers and in all years always 10 minnow were analyzed.

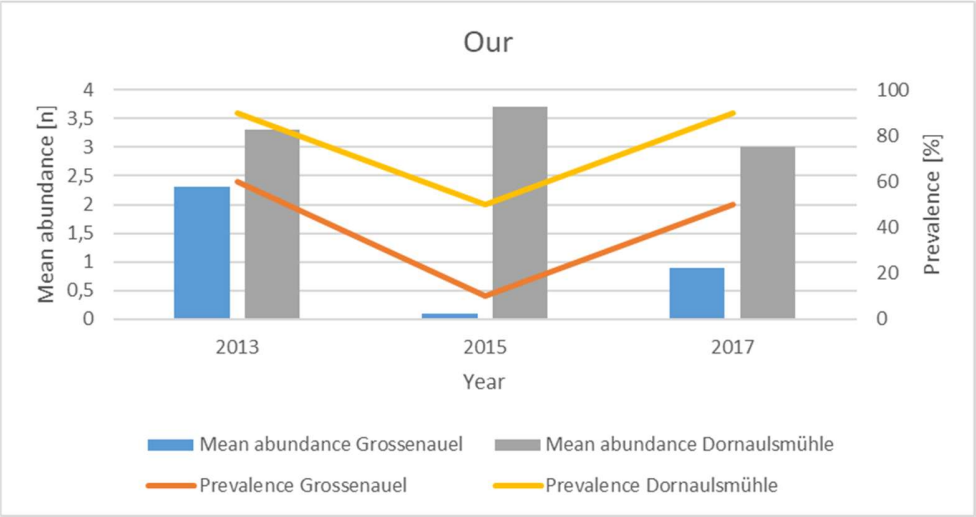


Figure 14: Infestation parameters in the river Our

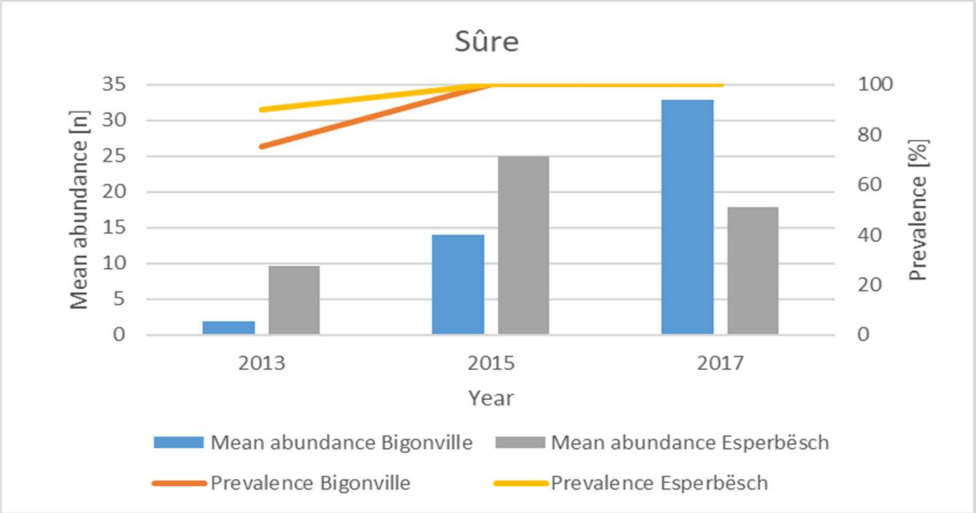


Figure 15: Infestation parameters in the river Sûre

In the river Our between 10 and 80 % of all minnows analyzed were naturally infested with 1-4 larvae of *Unio crassus*. In the river Sûre, especially in the years 2015 and 2017 the natural infestation

parameters are high. In these years, 100% of the minnow analyzed were infested, carrying on average 15-30 larvae of *Unio crassus*. In both rivers, the natural occurring population of *Unio crassus* is still able to infest the principal host fish, *Phoxinus phoxinus*.

➢ Realised

As foreseen under this action:

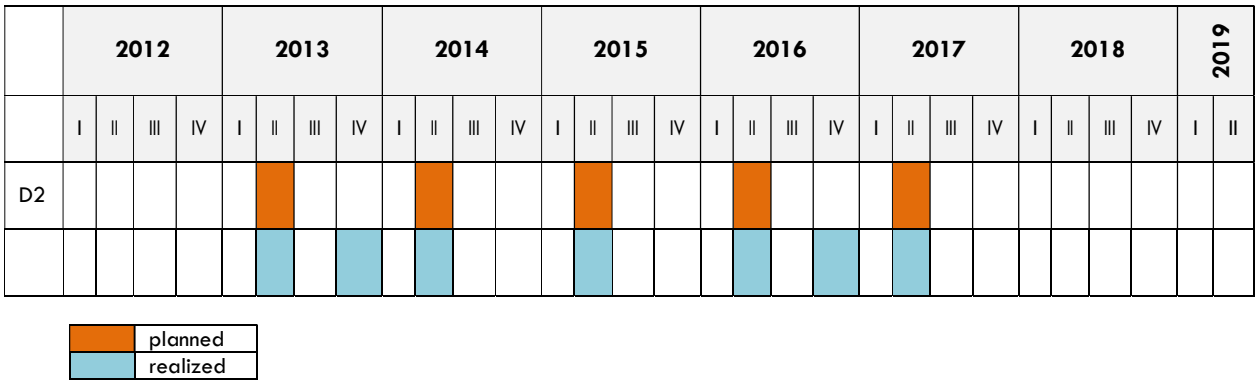
In 2017: Electric fishing in the river Our and Sûre.

In 2017: Electric fishing at the river Our in April 2017 to obtain host fish (*Phoxinux phoxinus*) for the infestations with glochidia from *Unio crassus*.

➢ Problems encountered/delays

No problems encountered so far.

The time plan for this action is on schedule.



➢ Complementary action outside LIFE

We actively participated to the electric fishing event in the river Our done by the water administration in September 2017 at 4 sites.

5.1.14 **Action D3: Suivi de *Unio crassus* dans son milieu naturel**

The status of the *Unio crassus* populations in both rivers (Our and Sûre) was last investigated in 2003. In order to gain new information about the population size, age structure and habitat use, the intent of this action is to monitor the mussel population in both rivers.

➢ Progress/results

Estimation of *Unio crassus* population size and density:

The mussel survey in the river Our was finished in 2017. From the whole distance of 32km, all 64 (500 meter) sections, which were accessible with the bathyscope, were prospected (30,5 km). In the river Sûre one last 500m section will be surveyed in 2018. All other accessible sections (18km from a total of 20km) are finished. Table 13 gives the overview of the mussels alive and empty shells counted during the surveys in the last years.

Table 13:Counted mussels alive and empty shells in the river Our and Sûre

	Our (32 km)	**Sûre (20 km)**
Prospected [km]	30,5	18
Mussels alive [n]	4563	2511
Empty shells [n]	1805	3312
Proportion alive [%]/ dead [%]	71,6 / 28,4	43,1 / 56,9
Mean density [ind/m²]	0,03	0,03

Table 14 shows the recovery rates as determined during the mussels search at sites with tagged mussels in the river Our and Sûre during the last years.

Table 14:Recovery rate of tagged mussels in the river Our and Sûre

Recovery Rate [%]			
River	Our		Sûre
Year / Site	Wehr Kalbermillen	Kohnenhaff	Moulin de Bigonville
2015	20,2	57,7	20,4
2016	11,2	46,9	14,4
2017	8,4	30,0	/
Average	**29,1**		**17,4**

Taking into account these recovery rates and the number of observed mussels alive in the respective rivers, we can estimate the number of *Unio crassus* for the river Our to be around +/-15.000 animals and for the river Sûre to be around +/-14.000 animals. To strengthen and validate the estimations it is necessary to continue the determination of the recovery rates at the three sites with tagged mussels and to add more sites with tagged mussels. This was already done in 2017 as the mussels used for collecting glochida were tagged and released back at their site of origin (see fertility control below).

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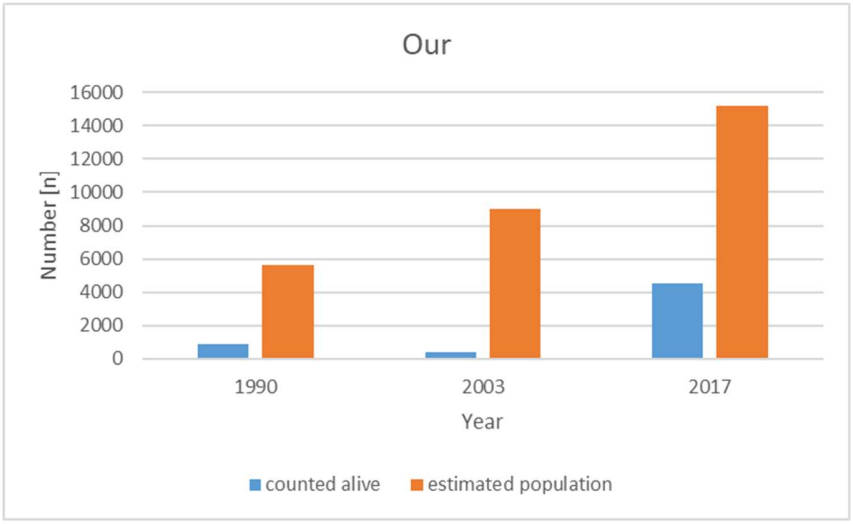

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Figure 16: Development of the *Unio crassus* population in the river Our

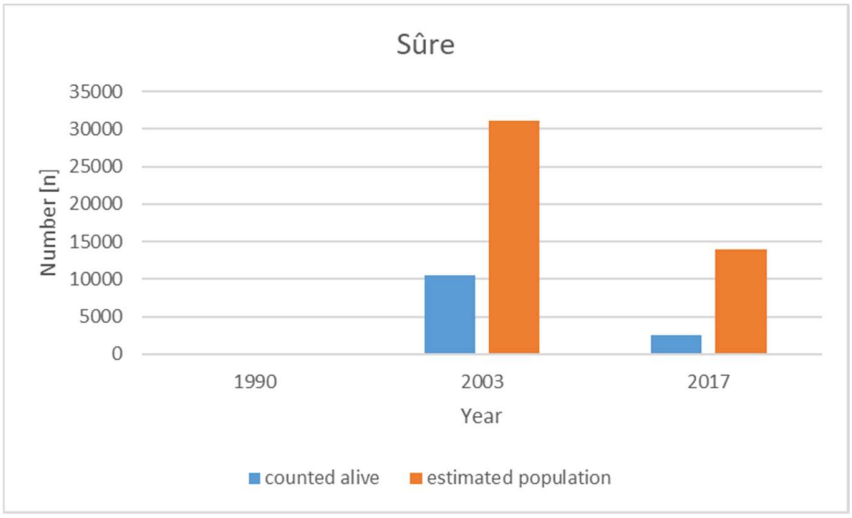


Figure 17: Development of the *Unio crassus* population in the river Sûre

For both rivers, population counts and estimations are available from the past. For the river Our from 1990 and 2003, for the river Sûre only from 2003. As Figure 16 shows, the population in the river Our shows an improvement with an increase of the population during the last years. In the river Sûre however, (Figure 17) we observe a massive decline between 2003 and 2017.

Fertility control

05.04.2017 Transfer of 141 animals for breeding from the river Our (section Tintesmühle) to the rearing station.

07.04.2017 Transfer of 120 animals for breeding from river Sûre (section below Moulin d'Oeil) to the rearing station.

After the release of their glochidia the mussels were measured, tagged and placed back to the same sites in the rivers (09.08.2017 on the Sûre and 25.08.2017 Our). Hence, we have two more tagged groups of mussels which can be evaluated with regard to survival and recovery rate in the future.

Sediment analysis:

Probes (+/-2000g) were collected with buckets (2 litres) on the mussel banks. The grain mixture is quite similar at the 3 locations (Kalbermillen (Our), Kohnenhaff (Our), Moulin de Bigonville (Sûre)). About 90% is formed by the fraction >2mm, whereas between 7 and 2% is >630 µm, about 4% > 630 µm and less than 2% < 63 µm. Two probes were collected on two new mussel bank – Moulin d´Oeil (Sûre) and Tintesmilles (Our). The composition of the sediment was at the location Tintesmillen the same decribed above but at Ferme d´Oeil different. Here 60% were formed by the fraction >2mm, whereas 30% were >630 µm, about 6% > 630 µm and less than 2% < 63 µm (see the details under Annex 9).

Mussel release

In 2017, we released 393 river Sûre mussels and 274 river Our mussels with gravel cages in the rearing channel (See action C4). As already described under C4, the plan is to release a large amount of cultured animals this summer in both rivers.

➢ Realised

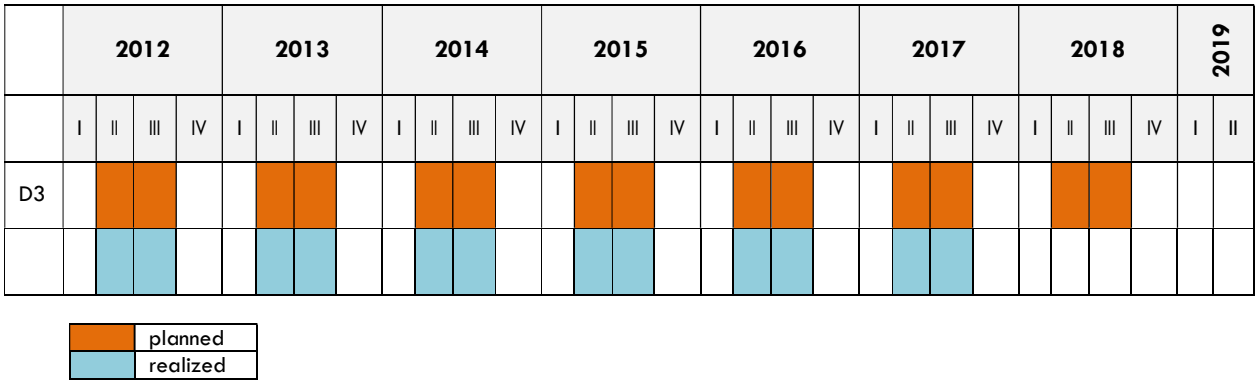
All sections done in the river Our. All, except one section, done in the river Sûre.

Population size estimated with the help of the recovery rate of the tagged mussels.

➢ Problems encountered/delays

No other problems encountered so far.

The time plan for this action is on schedule.



➢ Complementary action outside LIFE

None.

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5.1.15 **Action D4: Monitoring et évaluation de l'impact des mesures concrètes**

The aim of this action is to develop and apply a pre- post-monitoring protocol in order to evaluate the effectiveness of the used restoration methods.

- **Progress/results**

The initial status quo of water quality and population of *Unio crassus* will be used as reference for the evaluation of prospective measures.

The success of the restoration measures is evaluated by the monitoring of concrete parameters (water quality, turbidity, quality of substrate and the host fish population).

On selected places, where we will do or have done measures, (as seen in Table 14 below) an intensive monitoring is done. This means that on these sites a water sample is taken once per week, sediment traps are installed, interstitial quality will be measured and the host fish population is monitored.

The monitoring of the water quality of the rivers Our, Sûre and their tributaries is in operation (see action D1).

The river beds downstream of the gravel input were monitored. Therefore we measured the redox potential in the free flowing water, in the interstitial at 5cm depth and if possible in the interstitial at 10 cm depth. The average ratio between 5 cm depth and the free water was in the river Our about 22% and in the river Sûre about 26%. This means, that it comes to a loss of oxygen of about 78% in 5cm depth in the river Our which is lesser than last year. In the case of river Sûre we had a loss of more than 74% compared to last year with 60%. The average ratio is very low but it fits with the annual mean of the water parameters (see D1). The turbidity in both rivers was much higher than last year, which manifested these redox results. In addition, the debit of both rivers was low till the middle of September 2017. Especially at places with low velocity, the redox potential was quite low because of the deposit of fine sediments during the summer months. The redox potential is strongly influenced by the amount of rain, the debit and the velocity of the water (see Annex 10). Additional we monitored the distribution of the gravel in the riverbeds of Our and Sûre (see C3, Annex 9).

The composition of the host fish population was already monitored at all relevant sites (see D2).

The monitoring of the *Unio crassus* population in its natural environment started in spring 2013 (see D3).

The mussel breeding started in spring 2013 (see C4).

In 2014 first *Unio crassus* were released in gravel cages in the rearing channel at the mill of Kalborn (see also action C4). Also in the following years, 2015, 2016 and 2017 we continued releasing mussels with gravel cages in the rearing channel. As foreseen under this action we checked the survival and growth of the released mussels. Figure 18 shows the results obtained from all cages checked on June 30, 2017. Overall 78% of the mussels had survived, which is a positive development. An average growth of 124% was obtained after 3 years (from 14mm to 32 mm) which we also evaluated as good.

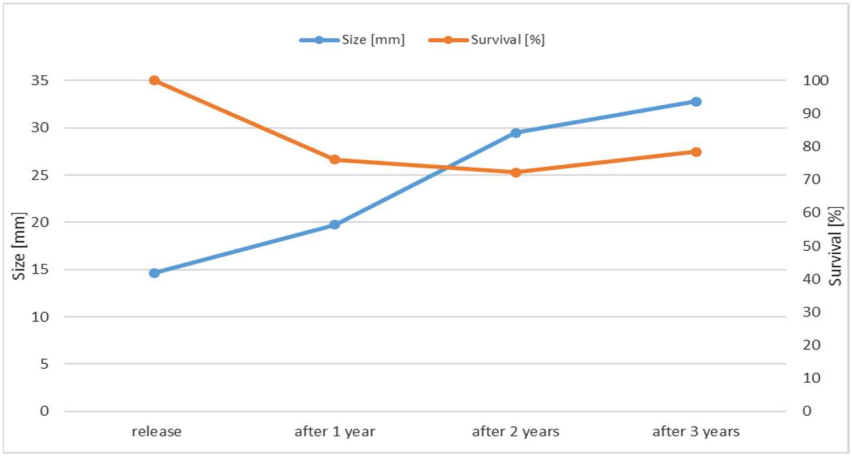


Figure 18: Survival and growth of the mussels released in gravel cages

➢ Realised

A good overview about water quality (D1), host fish population (D2) and *Unio crassus* population (D3) is achieved. For water quality, see for instance Annex 8.

The summary of preliminary evaluations can be found in Annex10.

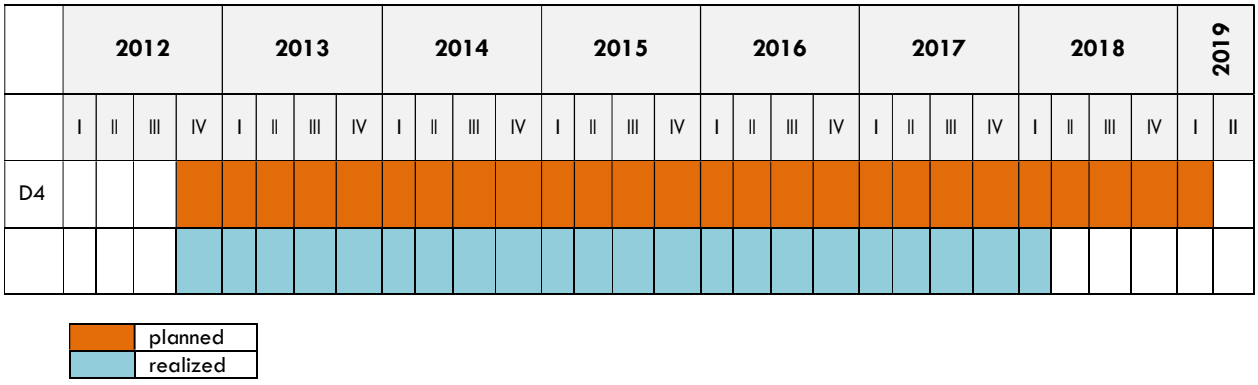
Table 15 : Monitoring restoration sites

River/ Tributary	Measures	Water quality	Sediment traps	Interstitial quality	Host fish population
Sûre - Schwärzerbaach	Remove tube and build a bridge (3 done, see C2)	yes	yes	yes	yes
Sûre - Syrbaach	Restore of a ford (done, see C2)	yes	yes	Planned 2018	yes
Our - Roupelsbaach	Fencing spring and stream (done, see C1)	yes	yes	no	no
Our - Folkesbur	Fencing spring and stream (done, see C1)	yes	yes	Planned 2018	no
Our - Roderbaach	Building a bridge and creating a new riverbed (February 2017)	yes	no – income of waste water	No – problems with the river bed	yes
Our - Huschterbaach	Remove tube and build a bridge (spring 2018)	yes	no	Planned 2018	yes
Our - Feierbech	Pilot project Feierbech (see C1)	yes	no	no	no
Our	Gravel (done)	yes	no – to wide, high velocity	yes	yes
Sûre	Gravel (done)	yes	no - to wide, high velocity	yes	yes

➢ Problems encountered/delays

No problems encountered so far.

The time plan for this action is on schedule.



➢ Complementary action outside LIFE

None.

5.1.16 Action D5: Analyse de l'impact socio-économique du projet et de l'effet sur les écosystèmes

The objective is to assess the impact of the Life Nature project on the welfare of the region and its populations.

➢ Progress/results

The socio-economic analysis with emphasize on the ecosystem services entitled "Analysis of Ecosystem Services in Luxembourgish Natura 2000 sites: results for the "RESTO-UNIO" project" was performed by the Life Cycle Sustainability Assessment (LCSA) team of LIST (Luxemburgish Institute of Technology). This team is well experienced in conducting socio economic studies as well as in the analysis of the impact of ecosystem services. A first draft is available and in the progress of revision. The final report will be available with the final report of the LIFE Resto-Unio project.

The LIFE Unio team was responsible for delivering all the necessary data, maps and information to conduct the study. Therefore, during 2016 and 2017 we had several meetings with the LCSA team and provided already all the information's necessary to conduct the analysis.

- February 2015 first contact with a scientist of L.I.S.T (Luxemburgish Institute of Technology) to get a meeting.
- 20.04.2016: First meeting with the Life Cycle Sustainability Assessment (LCSA) team of LIST
- 20.12.016: Second meeting with the Life Cycle Sustainability Assessment (LCSA) team of LIST and presentation of the student (Alya Bolowich) who will work on the socio economic study.
- 02.02.2017: Field visit with the LCSA-team to present and explain the concrete restoration measures done during the LIFE project.
- 15.06.2017: Third meeting with the LCSA-team at the LIST to discuss the work packages 3 and 4 of the analysis.
- 17.07.2017: Forth meeting the LCSA-team with the new Student Richard Mace who who will do the INVEST simulations within the analysis.
- 07.08.2017: Fifth meeting with Richard Mace from the LCSA-team at the LIST to discuss the first outcome of the INVEST analysis.
- 19.12.2017: We got a first draft of the report from the LCSA-team.

➢ Realised

Several meetings with the sub-contractor and delivering of data.

➢ Problems encountered/delays

No problems encountered so far. The time plan for this action is on schedule.

	2012				2013				2014				2015				2016				2017				2018				2019	
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II
D5																														

planned
realized

➢ Complementary action outside LIFE

None.

5.1.17 **Action E1: Information et sensibilisation des acteurs concernés**

The reduction of the input of fine sediments in the aquatic ecosystem is of great importance in the present LIFE project. This action intends to inform all actors responsible for water quality in the river catchment and tries to motivate them to help to enhance the water quality.

- **Progress/results**

We try to keep a good contact and to have regular exchange with the different authorities and with the farmers of the project area.

In the report period between 01.03.2017 and 28.02.2018 34 (see Annex 11) meetings with stakeholders took place (Local community, Water Administration, Administration responsible for the road constructions, Ministry of the environment, Nature parks, Nature and Forest Administration, Chamber of agriculture...) concerning the topics water quality, restoration measures, Natura 2000, agriculture and AEM etc.

As foreseen under this action, we organized the second meeting on water quality concerning the catchment of the river Our (22.11.2017). The event was very successful with 14 speakers and overall 26 participants from three different countries (Germany, Belgium and Luxembourg) pointing out three major topics:

- Projects of nature parks located within the catchment of the river Our
- Projects from the different national water administrations
- Waste water management within the catchment area

(For further details, please consider the Annex 12)

Another forum on water quality concerning the catchment of the river Sûre is scheduled for April 2018.

An important event during this period was an information evening organized by the LIFE Unio team, in collaboration with ASTA (Administration des services techniques de l'agriculture) and the chamber of agriculture (12.07.2017). We invited local farmers cultivating land within or close to the catchment of the river Our and Sûre. This information event should give an incentive to change the farming practices into a more sustainable direction. Therefore, we pointed out once again, in cooperation with the ASTA and the chamber of agriculture, the PDR program with different agro-environmental measures (20 participants). For our presentation that day see Annex 13.

The last information event for the farmers took place on February 7, 2018 in collaboration with the LAKU (Lanswirtschaftliche Kooperation Uewersauer). The LIFE Unio team gave a presentation about the LIFE Resto Unio project, highlighting the importance of small streams for mussel population and public wellbeing, which problems are present now and what can be done to improve the situation (50 participants, invitation leaflet with the programme and presentation, see Annex 14).

The farmer information leaflet is foreseen for the year 2018 and will pick up the content of the information events for the farmers, which took place during the project period. The distribution of the leaflet is planned for autumn 2018.

Figure 19: Information event for farmers in Heinerscheid on July 12, 2017

Figure 20: Discussion during the 2nd international water forum for the catchment of the river Our

➢ Realised

We had about 34 meetings and contacts with authorities and other actors in 2017 (see Annex 11).

➢ Problems encountered/delays

No problems encountered so far.

The time plan for this action is on schedule. Contact with different stakeholders is constantly and is not only restricted to the periods highlighted in brown in the table below.

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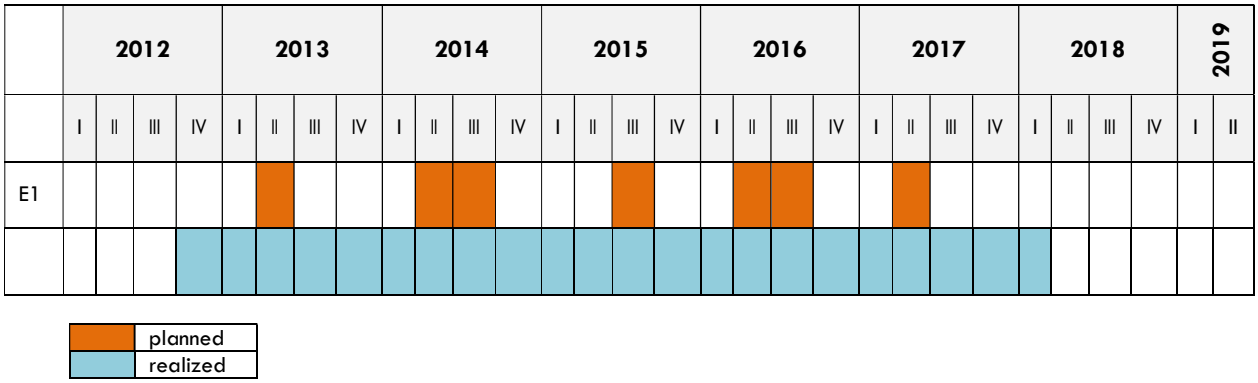


➢ Complementary action outside LIFE

None.

5.1.18 **Action E2: Sensibilisation du grand-public**

This action tries to inform people about the sense of the Natura 2000 network and the overall intent of the project by the following means:

1. Information of the population: 1 session/river at the beginning and end of the project.
2. Press release: 100-150 articles
3. Project Flyer: 1
4. Notice board: 2
5. Film: 1
6. Exhibition: 1
7. Natura 2000 visiting room: 1

- **Progress/results**

1. Information of the population

Groups of people visiting the mill are informed all over the year. In the year 2017 604 people of all ages visited the rearing facility at the mill of Kalborn (see Annex 15).

Furthermore, we participated again in 6 larger information events in 2017 during which 960 people could be educated and informed.

- 19.03.2017: "Waasserfest" - interactive information event from the Naturpark Uewersauer (100 people).
- 05.6.2018: "Millen- a Fëscherfest" - interactive information event at the mill of Kalborn (160 people). Interactive workshop and visits of the mussel rearing facility for all visitors. This activity was also announced for the 25th birthday of LIFE.
- 17-18.6.2018: „Fest vun der Natur" in Kockelscheuer - interactive workshop with children (200 people during the 2 days).
- 06.8.2018: „Naturpark Fest Our" in Hosingen. Interactive workshops with people of all age (250 people).
- 17.9.2018: Open day at the pisciculture (fish hatchery) in Lintgen. Stand, giving information about the LIFE Resto Unio project and interactive workshops with people of all age (200 people).
- 30.9 & 7.10.2018: Exposition and diffusion of information about the LIFE Resto Unio project in the shopping center "Belle étoile" in Bertrange (50 people during the 2 days).

During 2017, 12 school classes with a total of about 324 pupils visited the mill. We educated the children about the importance of freshwater habitats and the Natura 2000 network. Furthermore, they enjoyed from a guided tour through our mussel rearing facility. We also provided them with all kind of information about the LIFE Resto Unio project.

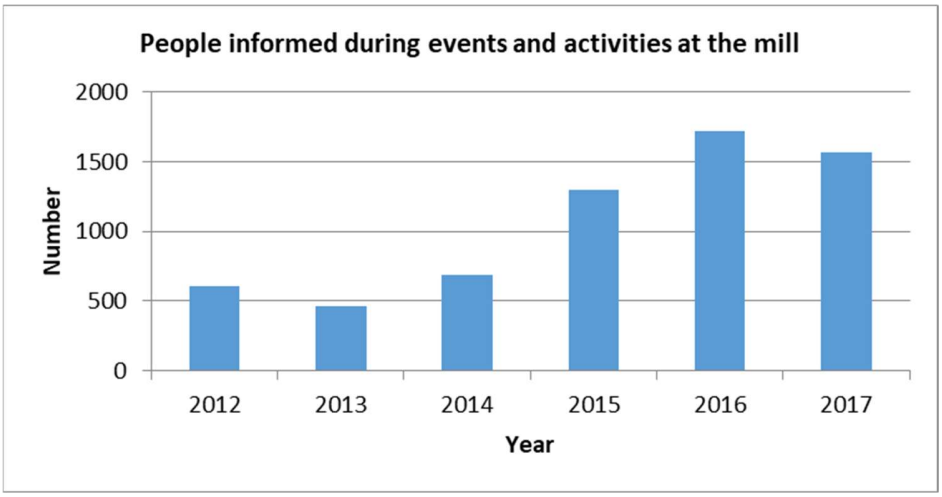


Figure 21: Development of the number of people informed during the LIFE project

2. Press release, Radio, TV: 11 articles, 1 Radio Interview and 1 TV show in 2017 (Annex 16).

Interview at "Radio Essential" 15.09.2017 with broadcasted on 28.09.2017:

http://live.lessentielradio.lu/

The German television station WDR visited us on 06.05.2017 and 11.05.2017 to have and interview and turn footage for the TV show "Wunderschön":
https://www1.wdr.de/fernsehen/wunderschoen/index.html

The show was broadcasted Sunday February 25, 2018.

https://www1.wdr.de/mediathek/video/sendungen/wunderschoen/video-von-aachen-nach-trier---mit-dem-rad-durch-drei-laender-100.html

3. Project Flyer

The Flyer is finished and available in 3 languages (German, French and English).

4. Notice board

The two notice boards were produced and one is meanwhile installed on the outside wall at the mill of Kalborn (see Figure 22). The second notice board will be installed in the river Sûre catchment. We are in discussion with the forest ranger of the river Sûre project area in order to find the best area.

Figure 22: Notice board at the mill of Kalborn

5. Film

Several meetings with the professional communication company (marc wilmes design s.à.r.l.) and the film student Julian Kolb took place in 2017 (e.g. 05.04.2017). During the year, more film footage was collected and the storyboard was finished. The desired animation sequences were developed and included in the film. In the beginning of the year, the audio tracks with the speaker were recorded (12.01.2018). We were able to convince three well-known radio speakers from RTL-Luxembourg to speak the voices needed for our film. The final cut of the film and the subtitles in three languages (FR, DE, EN) still need to be done. The film should be finished by mid-2018.

6. Exhibition:

The exhibition is meanwhile installed permanently at the mill. As more and more people visit the mill this is the best location to attend most interest.

7. Natura 2000 visting room:

The installation of the Natura 2000 room is finished. Since autumn 2016 the room is open for visitors. We do not count the hikers, backpackers and other visitors exploring the exhibition. However, as we see regularly people in the Natura 2000 room and have frequent entries in our guestbook, we suppose that the exhibition is well visited.

- **Realised**

Flyer, 5 exhibition boards, different press articles in printed and online media, Natura 2000 room.

About 6.344 people were informed during different visits and other events during the last years.

In 2017 a total of 1.564 people were informed. (see Table 16 and Annex 15).

Table 16:Number of people informed during different events and during visits at the mill of Kalborn

	2012	2013	2014	2015	2016	2017	Total
Visitors at the mill	46	261	589	624	1052	604	
People informed during other events	300	200	100	675	670	960	
Total	346[1]/ 609[2]	461	689	1.299	1.722	1.564	6.344

1 - during project runtime, 2- in Total in 2012

Figure 23: Millen an Fescherfest 25 year of LIFE, people analyzing mussel shells

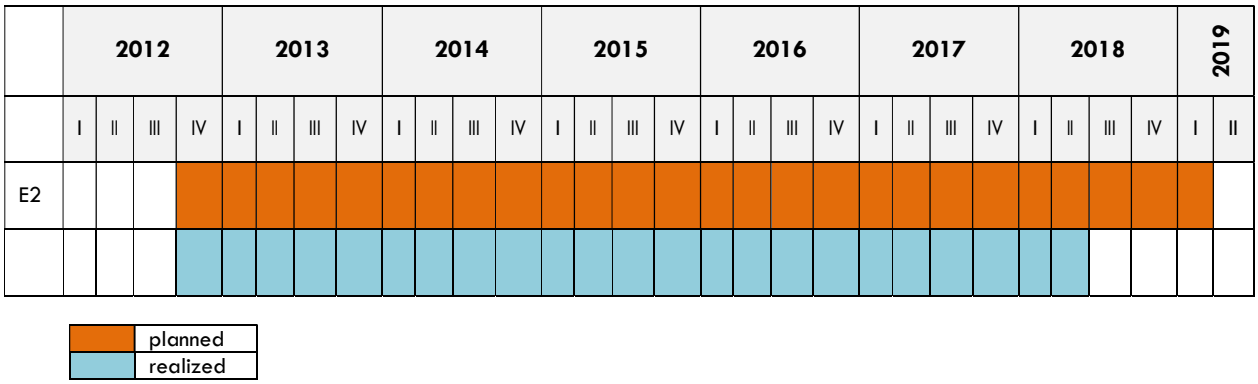
Figure 24: The ambassador of Austria (Mr. Schusterschitz) visits the Natura 2000 room

Figure 25: Information desk during the open door from the fish hatchery in Lintgen.

➢ Problems encountered/delays

No problems encountered so far.

The time plan for this action is on schedule.
Progress Report IV



➢ Complementary action outside LIFE

Already during the year 2015/2016 we had an outside LIFE sponsoring from the HSBC bank, which helped us to equip the "school room" with tables, cupboards and optical material (see also Progress report II). We will have a new sponsoring from the HSBC bank in 2018. This sponsoring will be used to up value the activities with school classes at the mill of Kalborn. Since March 2017 a Leader project called "Wassererlebniszentrum Kalborner-Mühle" is running at the mill of Kalborn. This project was designed to enhance the environmental education at the mill and to target also a new public like university students.

5.1.19 **Action E3: Création d'un site Web**

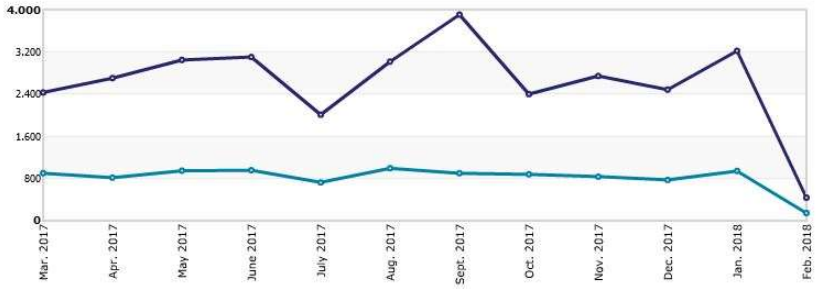
Creation of a website. The project homepage will give the opportunity to inform all interested persons about the progress of project. Furthermore, technical documents provided as download, should help other projects working in a similar field.

- **Progress/results**

Since June 2013 the website is fully accessible in all three languages (English, French and German).

In 2017 we added 10 times content in the news section as planned. Most parts of the Project-Data section were updated. The number of visitors/months is still increasing. In 2017 814 visitors/month, compared to 501 visitor/month in 2016 (see Figure 26).

Overview



General overview of the website frequentation total and average values

INFORMATION	TOTALS	Ø AVERAGE
Hits	46.140 Hits	3.845 Hits / Month
Visits	31.477 Visits	2.623 Visits / Month
Visitors	9.775 Visitors	814 Visitors / Month

Details of website frequentation grouped by date

DATE	VISITS	VISITORS	HITS	TRENDS
February 2018	433	141	1.014	
January 2018	3.219	940	5.205	
December 2017	2.483	768	3.943	
November 2017	2.741	831	3.804	
October 2017	2.396	877	3.632	
September 2017	3.906	897	5.128	
August 2017	3.014	992	4.295	
July 2017	2.006	721	3.145	
June 2017	3.101	953	4.266	
May 2017	3.047	944	4.599	
April 2017	2.703	813	3.567	
March 2017	2.428	898	3.542	

Figure 26: Web statistics

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The language the most used on the website is like the years before German, followed by English and French.

The number of visitors and visits is increasing since June 2013. The mentioning of the website "www.unio.lu" at every event and in every publication will help to increase the number of visits.

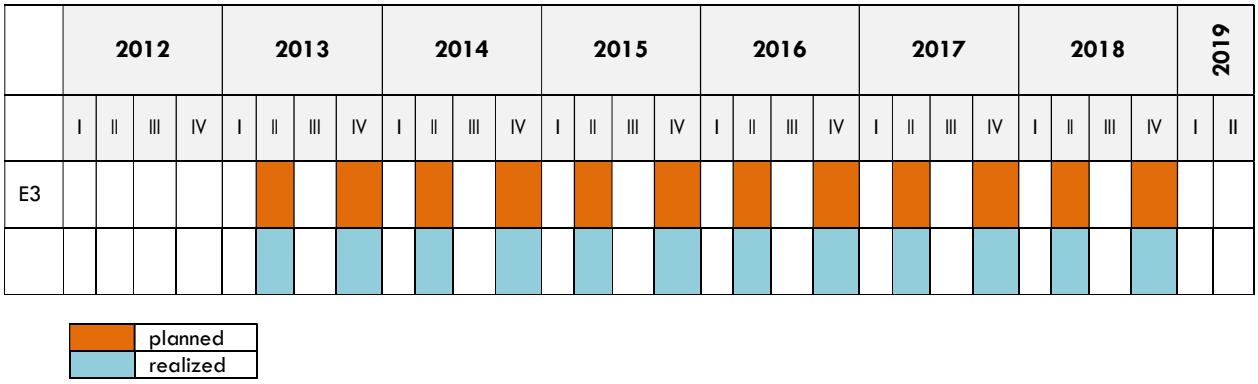
➢ Realised

Website in three languages realised and news or documents added +/- 12 times a year.

➢ Problems encountered/delays

No problems encountered so far.

The time plan for this action is on schedule.



➢ Complementary action outside LIFE

None.

5.1.20 **Action E4: Organisation de séminaires**

To promote the scientific exchange with other LIFE projects or other scientists working in the same field, two scientific seminars are planned within the project.

- **Progress/results**

The first seminar about the rearing of unionoid mussels was organized in the last week of November 2015. The seminar was a success with 81 participants from 20 countries (see progress report II).

The second seminar is scheduled for Tuesday 27th November – Thursday 29th November 2018 in Clervaux, Luxembourg. The seminar was announced on the website (see Figure 27), the EU LIFE Website, FMCS-Site and a first circular was send on January 18, 2018 (see also Annex17).The topic of the second seminar will focus on habitat restoration and monitoring.

Figure 27: Announcement of the 2nd seminar

- **Realised**

The 1st seminar took place as planned in the midterm report.

- **Problems encountered/delays**

No problems encountered so far.

The time plan for this action is changed as discussed in the midterm report.

	2012				2013				2014				2015				2016				2017				2018				2019	
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II
E4																														
																1												2		

1 - 1st seminar, 2 – 2nd seminar

	planned
	realized

➢ Complementary action outside LIFE

None.

5.1.21 Action F1: Gestion et encadrement du projet

➢ Progress/results

Project management staff from January 2017:

Coordinator 70%: Sonja Heumann Dr. tech.

Scientific 1 50%: Frankie Thielen Dr.rer.nat.

Scientific 2 70% Manou Schirtz MSc (since May 2017)

Technician 100%: Karin Michels environmental technician

Secretary/accountancy 40%: Patricia Heinen secretary

Piloting committee

Our sixth meeting of the piloting committee took place on 15.01.2018. The action status has been presented, as well as solved resp. unsolved problems.

Project prolongation

A request for a project prolongation and financial transfer has been introduced to the European Commission in Mai 2015. A project prolongation till 28.02.2019 has been accepted.

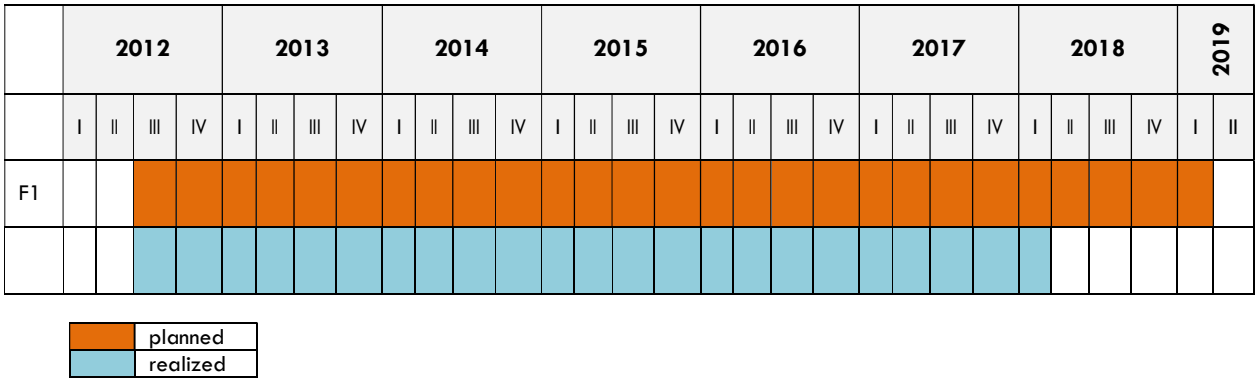
➢ Realised

Report and presentation of the 6th piloting committee (see Annex 18).

➢ Problems encountered/delays

No other problems encountered so far.

The time plan for this action is on schedule.



➢ Complementary action outside LIFE

None.

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5.1.22 **Action F2: Echange du savoir avec d'autres projets: LIFE et autres**

The intent of this action is the regular exchange with all other project (LIFE, but also others) working in the field of freshwater mussel conservation. This achieved by attending scientific meetings and regular email exchange with other experts.

➢ Progress/results

During the report period we attended the following scientific seminars or participated in the following scientific committees.

- **25 - 01.03.2017**: Participation at the 10th Biennial Symposium of the Freshwater Mollusk Conservation Society (FMCS, https://molluskconservation.org/) in Cleveland Ohio, USA. Oral presentation Frankie Thielen: Unio Crassus (PHILIPSSON, 1788), another highly endangered freshwater mussel species in Luxembourg (Europe). How can we save the last remaining populations? On Friday march 31, visit of the freshwater mussel section at the genoa national fish hatchery / U.S. Fish & Wildlife Service in Genoa, WI 54632, USA (https://www.fws.gov/midwest/genoa/) (Figure…). Megan Bradley and Nathan Eckert from the U.S. Fish & Wildlife Service gave us a tour. The EU officially permitted the second travel to the FMCS-meeting and the travel outside the EU with the mail from January 25, 2017 (see Annex 19).

Figure 28: Mobile aquatic rearing system for mussels at the Genoa national fish hatchery

- **20.06.2017:** Participation at the scientific board of the LIFE Haute-Dronne Project (http://www.life-haute-dronne.eu/), Firbeix, France
- **27. & 28.06.2017:** Participation at the LIFE Water Platform Meeting LIFE Living Lahn (http://www.lila-livinglahn.de/start/), Koblenz, Germany. Active participation at the workshops held during this meeting (river restoration and stakeholder involvement workshop and river restoration and ecosystem services workshop).

Figure 29: Participants of LIFE Water Platform Meeting LIFE Living Lahn

- **09. & 10.10.2017:** Inter-LIFE meeting between the Benelux countries in Rossignol, Belgium. Topic of the seminar: "Habitat restoration using species reintroduction". Exchange of knowledge with other LIFE projects and especially the former LIFE Margaritifera project in Belgium.

Figure 30: InterLIFE in Rossignol, Belgium, 2017

- **22. -24.01.2018:** Participation as member of the advisory board of the "Verbundprojekt-Umsetzung regionaler Schutzmaßnahmen und Entwicklung eines neuen überregionalen Artenschutzkonzeptes für die nationalen Verantwortungsarten: Flussperlmuschel (Margaritifera margaritifera) und Malermuschel (*Unio pictorum*) - ArKoNaVera" on the third scientific committee in Dresden, Germany.Participation at the "Conseil supérieure de la pêche" Luxembourg
- **10.02.2017 & 13.12.2017** Participation at the "Conseil supérieure de la pêche" Luxembourg

On September 26, 2017 Post Doc Dr. rer. nat. Bernhard Stoeckle, PhD Students Helmut Bayerl, Sarah Feind and a Student visited the rearing facility at the mill of Kalborn in order to collect *Unio crassus* mussel tissue to be analyzed genetically. The LIFE Unio team provided them with mussel material sampled in the river Our and Sûre. The sampling was not mortally and no mussel individual was harmed All mussel analyzed were tagged and will be returned to the sites of sampling.

Figure 31: Member of the Aquatic System Biology institute of the TUM Munich sampling mussel tissue

Regular email exchange and other contacts were also in 2017 ongoing with the following projects and experts and also two new projects (ArKoNaVera, LIFE Haute Dronne):

- UC for Life Sweden (http://www.ucforlife.se/?lang=en).
- LIFE+ Project Margal-Ulla Galicia Spain (http://margalulla.xunta.es/en).
- LIFE+ France « Rivières vivantes de Bretagne et de Normandie : Mobilisation pour le retour de la moule perlière d'eau douce » (http://www.life-moule-perliere.org/accueilmoule.php).
- Austrian Freshwater Pearl Mussel Project (http://www.flussperlmuschel.at)
- Rachel Mair White Sulphor Springs National Fish hatchery (http://www.fws.gov/northeast/wssnfh/).
- Prof. Dr. Chris Barnhart, Missouri State University (http://courses.missouristate.edu/ChrisBarnhart/home/Default.htm).
- Megan Bradley Aquatic Wildlife Conservation Center, Marion, Virginia, see also action A4 (http://www.dgif.virginia.gov/awcc/)
- Jürgen Geist group TU München (http://fisch.wzw.tum.de).
- Heidi Sehlheim, Charlotte Bontinck and Grégory Motte, Projekt Habitat Euregio + Biologische Station Aachen, Parc naturel hautes fagnes (http://www.euregio-mr.com/de/service/archiv/2010/das-projekt-201ehabitat-euregio201c).
- Arno Schwarzer ECOLOGIS(http://www.ecolo-gis.de)
- Verbundprojekt- Umsetzung regionaler Schutzmaßnahmen und Entwicklung eines neuen überregionalen Artenschutzkonzeptes für die nationalen Verantwortungsarten: Flussperlmuschel (Margaritifera margaritifera) und Malermuschel (*Unio pictorum*) - ArKoNaVera (http://www.flussmuscheln.de)

- LIFE+ Project LIFE - Haute Dronne (http://www.life-haute-dronne.eu/preservation-de-la-moule-perliere)
- We started also a new exchange with the LIFE thick shelled river mussel project in Denmark (http://www.merelivisusaaen.dk/?lang=en) (Bent Hummelmose).
- Regular exchange with colleagues from the finish pearl mussel projects (Panu Oulasvirta).

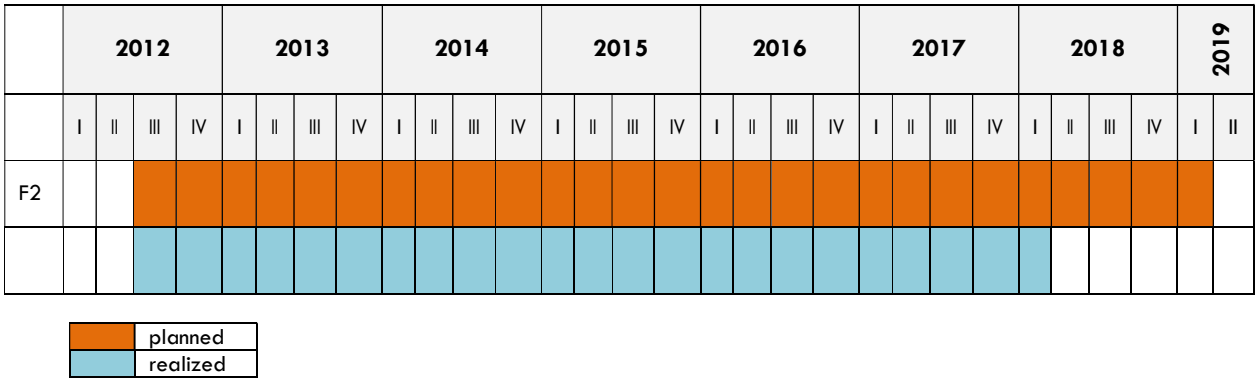
➢ Realised

See above

➢ Problems encountered/delays

No problems encountered so far.

The time plan for this action is on schedule.



➢ Complementary action outside LIFE

None.

5.1.23 Action F3: Plan de conservation After-LIFE

Action to install an Afterlife programme

➢ Progress/results

For both project sites the Natura 2000 areas' priorities and measures are defined very precisely in the management plans worked out under A5 where the LIFE Unio team contributed (see annex under A5/ 7.2.1 Aue &Wasser: Operative Maßnahmen 2016-2026). Clear objectives and figures are given for each section of the rivers and for the tributaries as well, so that this information delivers a good basis for the future After-LIFE conservation plan.

Additional management plans which might help to prepare an After-LIFE plan are:

- Leitfaden zur Bewirtschaftung der nach Artikel 17 des Naturschutzgesetzes geschützten Offenlandbiotope, June 2014 http://environnement.public.lu/content/dam/environnement/documents/natur/biodiversite/cadastre-des-biotopes/guide-orientation-leitfaden-pdf.pdf
- Plan National concernant la Protection de la Nature, January 2017 http://environnement.public.lu/content/dam/environnement/documents/natur/general/pnpn2.pdf
- La stratégie biodiversité de l'UE à l'horizon 2020 - Version française http://environnement.public.lu/content/dam/environnement/documents/natur/general/UE-strategie-biodiversite-2020_FR.pdf
- Bewirtschaftungsplan für die luxemburgischen Anteile an den internationalenn Flussgebietseinheiten Rhein und Maas (2015 – 2021), Dezember 2015 http://geoportail.eau.etat.lu/pdf/plan%20de%20gestion/2.%20Bewirtschaftungsplan%20f%C3%BCr%20Luxemburg%20(2015-2021)_22.12.2015.pdf

In spring 2018 several meetings with members of the Ministry and the Administration of Nature and Forest are planned.

➢ Realised

No deliverables are foreseen for the moment.

➢ Problems encountered/delays

No problems encountered so far.

The time plan for this action is on schedule.

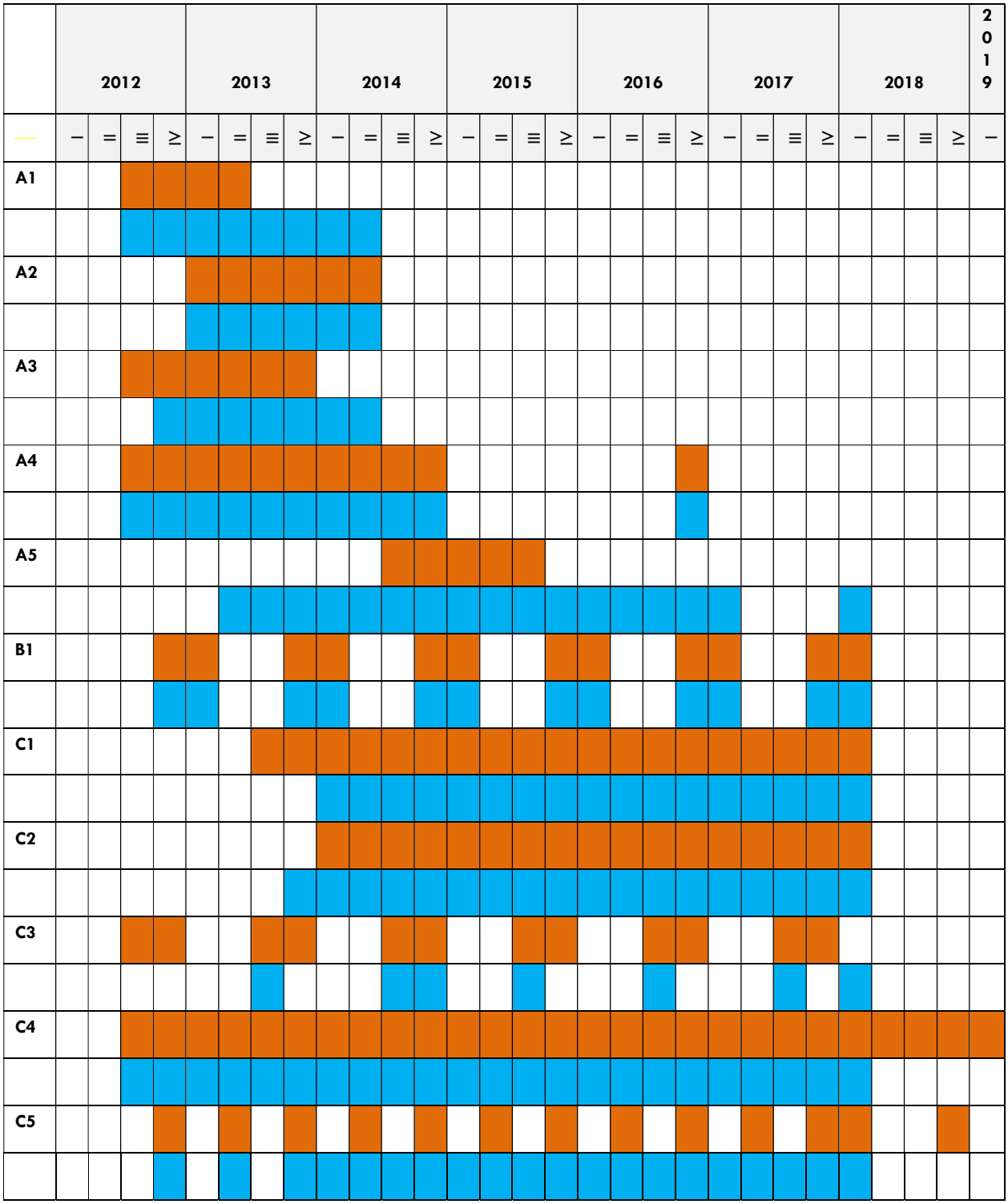
	2012				2013				2014				2015				2016				2017				2018				2019	
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II
F3																														

planned
realized

➢ Complementary action outside LIFE

None.

5.2 Overall Timetable



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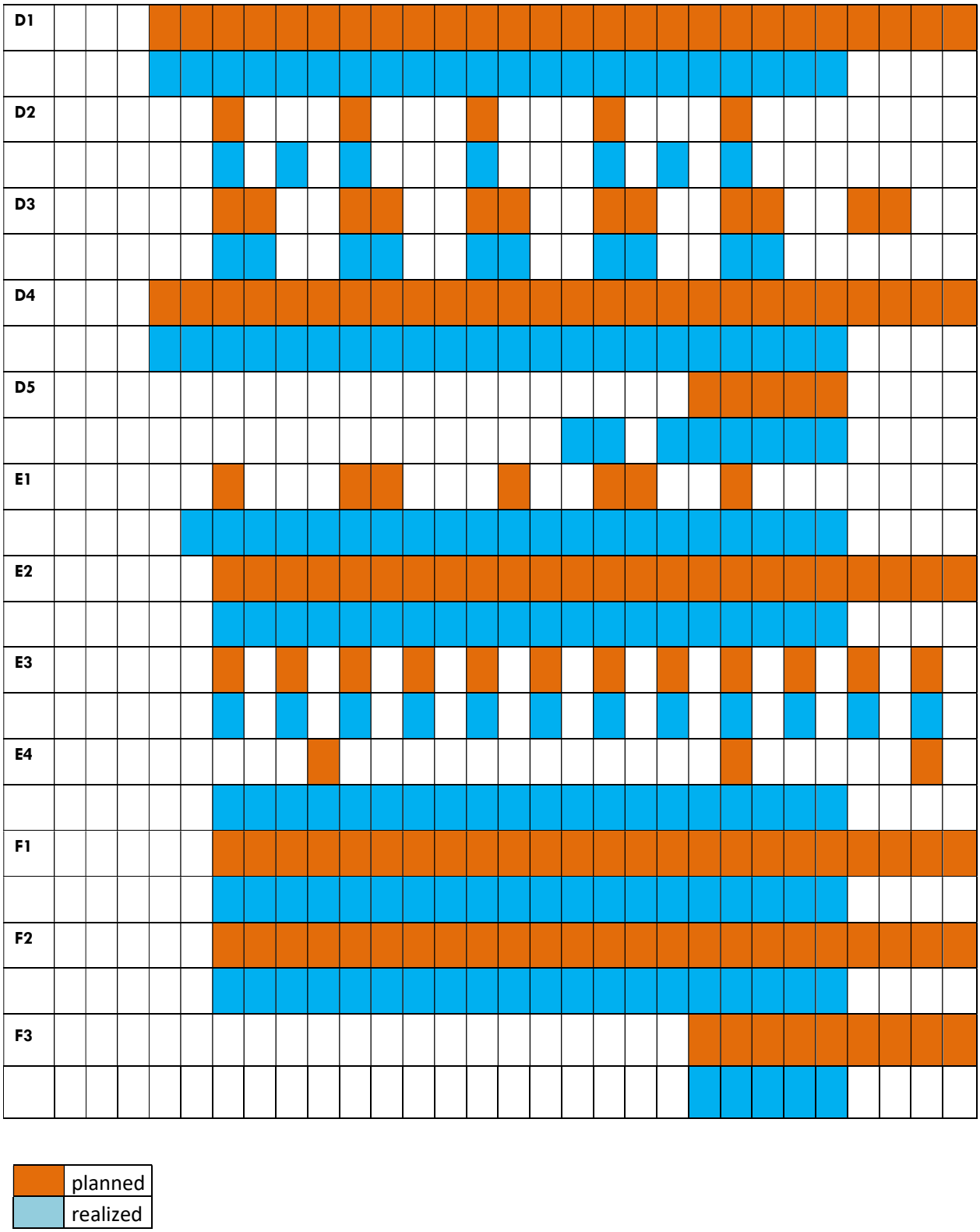
D1
D2
D3
D4
D5
E1
E2
E3
E4
F1
F2
F3
planned
realized

5.3 Impact

Nature & Biodiversity

In the river Our and Sûre valley the fencing activities on the tributaries (1,6 km so far) showed a reduction of the turbidity in the respective streams (Roupelsbaach and Folkesbur, Annex 13). Although these are only preliminary results, this is a positive development as it shows that the amount of fine sediments being washed into the main streams, holding the mussel population, is reduced. Vegetation in accordance to the location can grow and can act as an ecological corridor. On the other hand it is important to reduce the income of animal excrement to prevent high amounts of nutrients and microbes. These leads to problems for the mussels and the well-being of the people (drinking water, recreation, …)

The installation of water evacuation grids reduced the income of fine sediments from forestry roads (5,6 km) into the small streams. As a result, the cleaner interstitial pore system provides a better spawning area for different fish species (e.g. bullheat, borwntrout, minnow).

The removal of one more migrating obstacles in the Schwärzerbaach reconnected the last km of this tributary with the main stream Sûre. The migration of fish could be proved. One obstacle in the stream Ruederbaach was removed and so 1 km stream was reopened for the fish migration. In November 2017 fish migration was observed (during water sampling).

In both rivers the dumping of gravel helped to create new gravel banks in the main streams. During the last electric fishing in the river Sûre a high amount of *Phoxinus phoxinus* was caught on a gravel bank (Esperbesch, see D2). Although redox measurements showed that these newly created gravel banks tend to clog again, they can still be used by the most important host fish as spawning ground. The mapping of the newly formed gravel banks allowed calculating the area. In the river Our more than 1.800 m² and in the river Sûre more than 800 m² were mapped. This area provides a good spawning ground and habitat for fish and other species.

The rearing activity produced so far around 1.200 mussels from the river Our and 1.200 from the river Sûre. If these mussels are released, the "observed" Our population will be increased by 30% and the "observed" population in the river Sûre by 50%. In summer time, one single adult *Unio crassus* can filter up to 20 Liter of water per day. Increasing the populations in both rivers with more than 1.000 individuals will therefore increase the self-purification capacity of both rivers. However we will still be far away from the former strong mussel population. But this is a good start anyway.

The capture of the muskrat (*Ondatra zibethicus*) and the signal crayfish (*Pascifastacus leniusculus*) is still ongoing. This invasive species cause troubles for the mussel population. Since 2015 the numbers of captured muskrats is decreasing, the pressure due to the capture activities during the last years helped to reduce the population.

Since July 2015 *Pascifastacus leniusculus* is trapped by employees of the Administration of Forest and Nature. They get support from the LIFE Unio team if time is available during the summer months. In the year 2017, 1.401 crayfish were caught in both rivers. At the end of the crayfish-trapping season, the two hunters confirmed that the number of crayfish in the densest stretch of the river Our is decreasing ant that the animals get smaller in size. This confirms that the trapping of this species is successful.

Indirect impacts

The good contact with the local municipality from Clervaux and their knowledge about our LIFE Unio project helped to develop a plan to remove and transform the pipe construction under the road entering the camping site at Tintesmillen. This action reconnected the small stream Feierbech again with the river Our and the cost connected to this project are covered outside the LIFE project. The pipe is already removed and a bridge built. There was additional work for stabilisation of the riverbed in March 2017. There were no costs for LIFE Unio.

In our "pilot project Feierbech" we are in close contact with some of the local farmers due to the regular meetings and exchange about the results of the soil and water samples. It is useful for them to know the data about their specific parcel. We provide them data about the mineralized nitrogen and the nitrate concentration in their springs. The farmers get to a greater extent interested in the target species, the thick shelled river mussel (*Unio crassus*) as they ask more and more questions about the well doing of the mussels. We think that this is a good development, as people only tend to protect what they know.

Some local fisherman got motivated to also trap the signal crayfish which might help to reduce the numbers of this invasive species. It is allowed to catch the signal crayfish in the river Our between April 1st and December 31 with a national fishing license. During this time period there are no limitations in number and size to trap the signal crayfish. But it is forbidden to sell these crayfish.

The Administration of Water wants to improve the knowledge in the employment about *Unio crassus*. People of the Administration should know about the specie and their habitat to protect it. They asked for a map where the populations are signed. This should help to plan, organize and to permit construction sites next to the river Our and Sûre.

As mentioned in E2 the amount of visitors is stable. People of all ages are informed about Natura 2000 and the certain species in this area. These people learn about rare species and the possibilities to protect them. Knowledge and information is necessary for the people to be able to change their behavior.

5.4 Outside LIFE

- After removal of the big pipe at Schwärzerbaach the stream damaged the riverbed during a small flood. The Administration of Nature reconstructed the riverbed. Further erosion of the riverbed was stopped.
- The Adminstration of Natures builds another bridge in a tributary of Ruederbaach to remove a ford.
- The Adminstration of Nature and Forest will stabilise the riverbed of Ruederbaach.
- Building of 500 m a fence on a tributary of the brook Traesbech - The measure has been planned by the Biological Station of the Natur Park Our together with the LIFE team and financed by the community Parc Housen, see plan under Annex 7.
- Restoration of the riverbed (Feierbech) - The total amount of the restoration of the Feierbech riverbed, the transformation of the fish obstacle and the adaption of the access to the camping "Tintesmillen" were about 55.000 €. The transformation has been finished December 2016. In March 2017 the riverbed had to be stabilised.
- Sponsoring by Rosport Mineralwater for 5.000€/ 2017 and bottled mineral water for visitors and schools.
- CFL (Chemins de Fer Luxembourgious) – sponsoring of 2.500€.
- With the help of the first sponsoring from the HSBC bank 2015/2016 (see also action E2, progress report II) we were able to buy in 2016 more and better optical equipment and some other didactical material (see also 5.1.18, action E2 point 7). A new sponsoring from the HSBC Bank in 2018 will be used to improve the site of the mill of Kalborn for environmental education.
- Since 2017 the Leader Project “Wassererlebniszentrum” is running at the mill. With the help of this project more school classes can be supervised at the mill. Furthermore the project is also intended to target a new public, like university classes.

6 FINANCIAL PART

6.1 Costs incurred

SUMMARY OF COSTS INCURRED				
Project Costs Incurred (27/01/2017)				
Cost Category	**Budget according to the grant agreement**	**Budget total 09.2012-28.02.2019 after AMENDMENT signed 28.07.2016**	**Costs incurred within the project duration**	**% of total costs**
Personnel	€ 1.089.312,00	€ 1.176.240,00	€ 934.072,04	79%
Travel	€ 38.049,00	€ 38.049,00	€ 20.307,96	53%
External assistance	€ 272.100,00	€ 272.100,00	€ 162.482,25	60%
Durable goods - Equipment	€ 222.100,00	€ 212.172,00	€ 185.6150,39	87%
Land/rightspurchase/lease	€ 81.600,00	€ 81.600,00	€ 67.974,18	83%
Consumable material	€ 31.939,00	€ 31.939,00	€ 14.710,88	46%
Other direct costs	€ 238.413,00	€ 161.413,00	€ 155.284,53	96%
Overheads	€ 83.555,00	€ 83.555,00	€ 83.555,00	100%
TOTAL	**€ 2.057.068,00**	**€ 2.057.068,00**	**€ 1.624.007,23**	79%

Spending rate of cost categories lays between a minimum of 46% (consumable material) and a maximum of 96% (durable goods) and for the total new project runtime of about 79%.

Personnel costs: The transfer of 86.928 € to "Personnel costs" from the categories "Other costs" (77.000€) and "Durable goods" (9.928€) and the prolongation of the project till February 2019 (see amendment 28.07.2016) will allow us to finalize successfully the fencing, the implementation of the AEM and the removing of fish obstacles within the foreseen budget.

Travel: Though the LIFE Unio team visited the FMCS Congress in Cleveland (USA), joined the meeting in Koblenz and the Inter LIFE there is still an underspending of the cost category "Travel".

External assistance: A big part of the budget is dedicated to the transformation of the fish migration obstacles. The costs were lower than estimated as we worked with firms familiar with the type of bridge we needed. There are more construction sites that need to be done. Another expensive measure is the installation of water evacuations grids and fences. If it is within the margin of the

budget possible, we propose to carry out more measures than foreseen (i.e. fencing, removing of a fish obstacle etc.). These measures are essential to improve the conservation status of the target species in a significant way. The external assistance foreseen for the production of the movie was underestimated. We will spend more money than estimated to finish the movie. These additional costs can be carried out within the foreseen budget.

Durable goods - Equipment: The biggest expenditure in this period was again the installation of water evacuations grids next to Ruederbaach and Schwärzerbaach. Because of the construction of windmills the local municipalities were able to reconstruct the forestry roads and we could install the grids. The bill for the evacuations grids next to Huschterbaach has to be sent by the local community.

Land purchase: There is a small underspending in this action because we already purchased 8,26 ha out of 8,0 ha foreseen (103% of the foreseen area) with 83% of the budget. We will continue the purchase of land during the remaining project runtime.

Consumable material: This category is low, but as it is a small budget it can be counterbalanced by other categories if necessary.

Other direct costs: The budget is actually overspend for the following reasons: We spent the money for the study of pesticide analyses in the river Our, Sûre and its tributaries. Furthermore we had high costs for the maintenance of pumps in the mill.

Overheads: This category is balanced.

With 79% of expenditure, we are balanced. In case of financial surplus we will carry out additional measures essential to the conservation status of the target species, following specific actions as mentioned in the Grant Agreement. If some actions are outside the initial scope a prior request will be sent to the EC before implementation.

6.2 Action detail

Action number and name	Foreseen cost according to the grant agreement	Foreseen cost after AMENDMENT signed 21.07.2016	Spent so far	Remaining
Action A: Preparatory actions, elaboration of management plans and/ or of action plans				
A1	21.065,00 €	21.065,00 €	16.276,70 €	**4.788,30 €**
A2	41.679,00 €	41.679,00 €	19.562,34 €	**22.116,66 €**
A3	53.745,00 €	43.817,00 €	40.082,80 €	**3.734,20 €**
A4	27.302,00 €	27.302,00 €	19.489,47 €	**7.812,53 €**
A5	19.999,00 €	19.999,00 €	15.433,06 €	**4.565,94 €**
Action B: Purchase/ lease of land and/ or compensation payments for right use				
B1	99.679,00 €	99.679,00 €	81.882.53 €	**17.796.47 €**
Action C: Concrete conservation actions				
C1	124.578,00 €	128.802,00 €	87.214,60 €	**41.587,40 €**
C2	131.152,00 €	131.152,00 €	96.192,72 €	**34.959,28 €**
C3	58.562,00 €	58.562,00 €	49.068,39 €	**9.493,61 €**
C4	527.770,00 €	522.874,00 €	435.063,34 €	**87.810,66 €**
C5	7.917,00 €	9.837,00 €	8.361,01 €	**1.475,99 €**
Action D: Monitoring of the impact of the project actions (obligatory only if there are concrete conservation actions)				
D1	125.884,00 €	82.580,00 €	83.576,42 €	**996,42 €**
D2	28.802,00 €	28.802,00 €	21.754,66 €	**7.047,34 €**
D3	34.583,00 €	38.999,00 €	33.527,49 €	**5.471,51 €**
D4	27.856,00 €	33.184,00 €	18.656,38 €	**14.527,62 €**
D5	14.107,00 €	14.107,00 €	13.753,21 €	**353,79 €**
Action E: Public awareness and dissemination of results (obligatory)				
E1	36.292,00 €	36.292,00 €	25.434,43 €	**10.857,57 €**
E2	115.422,00 €	121.470,00 €	91.192,37 €	**30.277,63 €**
E3	20.821,00 €	24.277,00 €	20.178,91 €	**4.098,09 €**
E4	28.774,00 €	28.774,00 €	16.239,90 €	**12.534,10 €**
Action F: Overall project operations and monitoring of progress (obligatory)				
F1	348.039,00 €	374.247,00 €	279.121,06 €	**95.125,94 €**
F2	79.485,00 €	86.013,00 €	68.390,43 €	**17.622,57 €**
F3	0,00 €	0,00 €	0,00 €	**0,00 €**
Overheads	83.555,00 €	83.555,00 €	83.555,00 €	**0,00 €**
Total	**2.057.068,00 €**	**2.057.068,00 €**	**1.624.007,23 €**	**433.060.77 €**

7 ANNEXES

All annexes as listed in the text above can be found in the extra Annex document.

Annex 1 - Action A2 : Action A2: Planification des mesures de restauration **(Page 7 – 42)**

- Restoration measure plan

Annex 2 - Action A4 : Mise en place de la technique d'élevage pour *Unio crassus* **(Page 43 – 46)**

- Permission to handle *Unio crassus* and its host fishes 2018 - 2023

Annex 3 - Action B1: Acquisition de terrains le long de l'Our, de la Sûre et de leurs affluents **(Page47 – 116)**

- Land purchase, notarial act, aerial photo with the localization of the acquisitions, explanation of QD concept and small measures

Annex 4 - Action C1: Interventions pour réduire l'apport en sédiments fins dans le réseau hydrographique **(Page 117 – 124)**

- Agro environmental measures 2017

Annex 5 - Action C1: Interventions pour réduire l'apport en sédiments fins dans le réseau hydrographique **(Page 125 – 130)**

- Demonstration Project "Feierbech" 2017

Annex 6 - Action C2: Transformation d'obstacles à la migration sur les cours d'eau tributaires **(Page 131 – 148)**

- Migration obstacles 2017

Annex 7 – Action C3: Amélioration du substrat par dépôt de gravier **(Page 149 – 164)**

- Development of the gravel banks in the river Our and Sûre

Annex 8 - Action D1: Surveillance de la qualité de l'eau et du substrat interstitiel **(Page 165 – 184)**

- Measurements of the rivers, their tributaries and other data of the water quality

Annex 9 - Action D3: Suivi de *Unio crassus* dans son milieu naturel **(Page185 – 190)**

Sediment analysis of the riverbed next to the mussels

Annex 10 - Action D4: Monitoring et évaluation de l'impact des mesures concrètes **(Page 191 – 208)**

- Monitoring of the measures impact

Annex 11 - Action E1: Information et sensibilisation des acteurs concernés **(Page 209 – 212)**

- Meetings with stakeholders

Annex 12 - Action E1: Information et sensibilisation des acteurs concernés **(Page 213 – 258)**

- Water forum, river Our 2017

Annex 13 - Action E1: Information et sensibilisation des acteurs concernés **(Page 259 – 312)**

- Information day for farmers IV (2017)

Annex 14 - Action E1: Information et sensibilisation des acteurs concernés **(Page 313 – 402)**

- Information day for farmers V (2018)

Annex 15 - Action E2: Sensibilisation du grand-public **(Page 403 – 408)**

- List of visitors 2017

Annex 16 - Action E2: Sensibilisation du grand-public **(Page 409 – 432)**

- Press releases

Annex 17 - Action E4: Organisation de séminaires **(Page 433 – 438)**

- 1st announcement seminar 2018

Annex 18 - Action F1: Gestion et encadrement du projet **(Page 439 – 482)**

- Report and presentation of the 6th piloting committee

Annex 19 - Action F2: Echange du savoir avec d'autres projets: LIFE et autres **(Page 483 – 502)**

- FMCS Meeting Cleveland, permission and presentation