Management and Resource usage Summary, related to the reporting period October 1st 2001 - March 31st 2002

(Fourth 6-monthly management report)

FLOodplain Biodiversity And Restoration 2: Integrated natural science and socio-economic approaches to catchment flow management
FLOBAR 2

CONTRACT No.:EVK1-CT-1999-00031 FLOBAR2

PROJECT COORDINATOR: University of Cambridge (UK) (1)

CONTRACTORS: Institute for Regional Development and Structural Planning(D)(2)
Université Joseph Fourier – Grenoble 1(F) (3)
University of Lethbridge (Canada) (4)
Centre National de la Recherche Scientifique –Toulouse (F) (5)
Umeå University (S) (6)

DURATION: 36 months

HOMEPAGE: http://www-flobar.geog.cam.ac.uk

CONTENTS:

1.1 Objectives of the reporting period

The reporting period is October 1st 2001 to March 31st 2002. During this period there were general objectives applying to all partners and research areas and specific objectives outlined for each workpackage.

General project objectives (outcomes discussed in section 1.5)

- Updating of the project website.
- Direct and continuous communication between all partners.
- Communication between members of each partner group
- Communication with other EU projects and organisations
- External review of the project and its management at or near to mid-term.

Workpackage Objectives

Workpackage 1

- Literature searches on European Floodplain Forests.
- Organise workshop in Cambridge for consultation on the work of WP1 between FLOBAR members and European end users.
- Finalise detailed outline of proposed WP1 document called 'The Flooded Forest'
- Allocate and agree writing tasks with FLOBAR members for the 'Flooded Forest' document and design document style.

Workpackage 2

- Experiments on stomatal closure and measurement of stomatal and hydraulic resistances.
- Continued monitoring of environmental parameters.
- Continued measurement of growth rates.
- In Umea, completion of fieldwork, dismounting of measuring equipment and restoration of the study site.

Workpackage 3

- Preparation for monitoring and recording species richness - season 3 at Swedish field site.
- Compilation and analysis of sampled data.
- Monitoring and recording species richness and growth at UK field site.
- Statistical analysis of species richness and other data from UK site.

Workpackage 4

- Quantification of sex ratios in dioecious plant species on floodplains in Sweden.
- Compilation and analysis of sampled field data. Sampling of plant material for greenhouse experiment.
- Rhizopod experiment on cuttings of *Salix myrsinifolia-phylicifolia* in Cambridge.

Workpackage 5

- Collection of additional samples from the River Drome for genetic analysis.
- Analysis of disturbance history in the floodplain using archive air photographs and GIS.
- Micro-satellite genetic studies to explore clonality in more detail (Drome site).
- Preliminary sampling for genetic analysis of riparian species on Garonne.

Workpackage 6

- Continuing flume analysis of artificial woody vegetation.
- Use of 1D step-backwater modelling to assess roughness of woody vegetation in flume.
- Mapping of vegetation structure and roughness on the Isere and Allier Rivers.
- Development of modelling of vegetation, flow structure and sediment transport.

Workpackage 7

- To compile an inventory of institutional mechanisms for floodplain restoration in the U.K., Germany, France and Sweden.
- To prepare and begin work on case studies of the institutional aspects of diverse schemes for restoring floodplains and their woodland in the U.K., Germany, France and Sweden.

1.2 Scientific/Technical progress made in different work packages according to the planned time schedule.

Mid-term review
A mid-term review of the FLOBAR2 project (its scientific content and progress, and its management) was undertaken by an independent expert, Professor Peter Edwards of the GeoBotanical Institute, ETH-Zentrum, Zurich, Switzerland. Professor Edwards attended the Annual Meeting held at Umea from 14th-17th March 2002, and will provide a brief report to Dr Hartmut Barth in Brussels.

Workpackage 1
- A compilation of literature on European Floodplain Forests was completed by the partner in Grenoble. The literature is organised by river basin and thematically. This literature data base covers the major river basins of western and central Europe.
- Meetings were held between the Cambridge and Berlin partners in Cambridge in early December 2001 in order to co-ordinate the work of WP1 and WP7.
- Members of the WP1 sub-committee met in Umea on March 14th 2002 in order to finalise the detailed outline of the guideline document and discuss some key issues identified as problematic in the restoration of floodplain forests.
- The workshop proposed for month 26 has now been organised. It will take place May 16th and 17th 2002 in Cambridge. The WP1 sub-committee of FLOBAR2, the United Kingdom End-User Advisory Committee and some European counterparts will be present. The workshop aims to discuss some of the key issues which have emerged during the preparation of the detailed guideline document outline on the restoration of floodplain forests. The workshop is entitled 'Forests on Floodplains: the European Dilemma'.
- Preparation of contributions to the text of the guidelines document.

Workpackage 2
- In Toulouse modified dendrometers and sap sensors (Granier) have been used at 4 different depths to record water consumption and growth of poplars over the growing season. The aim is to understand the sap flow profile in poplar, and its possible variation around the trunk and from one tree to another.
- In Grenoble, measurements have been made of leaf water potential, and stomatal and hydraulic conductances of black poplar, ash and maple in two habitats (wet and dry). The aim is to understand the drought-acclimation of these trees.
- In January 2002, members of the Toulouse group visited Grenoble to develop joint experiments. This will involve both partners working at the other's field sites, to provide complementary measurements.
- In Umea, the study site has been cleared from measuring equipment and restored. The long-term data on tree growth in relation to hydrological variation in floodplains has been successfully compiled, analysed and presented according to time schedule.

Workpackage 3
- First and second season vegetation and environmental data from the Swedish study site have been compiled and analysed according to the planned time schedule. Vegetation changes following manipulation (turf interchange) have been relatively rapid and large when flooding increased (turves moved from high to low floodplain elevation), whereas changes have been slower and less predictable when flooding decreased (turves moved from low to high floodplain elevation. The effects of litter treatment were weak and varied with elevation).
- The field experiment at the English field site has been conducted according to the plan. Analyses of the results show that seed addition clearly increased plant colonisation and species richness in a wetland plant community but that litter accumulation and vegetation

cover strongly suppressed seedling emergence. Interaction between factors generally explained more than half of the variation in response variables.

Workpackage 4

- Variation in sex ratios along hydrological gradients has been studied in the common floodplain shrubs *Salix lapponum* and *S. myrsinifolia-phylicifolia* in the free-flowing Vindel River and in the regulated Ume River in Sweden. In the Vindel River, significant spatial separation of sexes was observed at two sites for *S. myrsinifolia-phylicifolia* and at one site for *S. lapponum.* In the Ume River spatial separation could not be confirmed at any of the sites.
- To compare sex ratios between the two rivers, 50 individuals of each of the willow species were sexed along 12-17 reaches in both rivers. Females were more common than males at all sites in both rivers, but there was no significant difference in sex ratios between the rivers.
- To study the physiological basis of a spatial separation of sexes along hydrological gradients, a greenhouse experiment was started in Cambridge in January 2002. Cuttings from female and male individuals of *S. myrsinifolia-phylicifolia* were collected from the Vindel and Ume Rivers in October 2001. After transport to Cambridge, dormancy was broken in the cuttings, and they were standardised in size, and planted in rhizopods with soil and hydrological regimes mimicking conditions in their home habitats. This experiment is still continuing.

Workpackage 5

- The molecular analysis of the 400 black poplar individuals collected along the Drôme in months 12-18 began in September 2001. Extraction of DNA was completed by December 2001. A number of microsatellite primers (10) developed in the framework of the EUROPOP project were assessed for their readability, information content (number of alleles) and reproducibility: four were selected for the analysis. All samples have been scored with all 4 microsatellite primer pairs and two primers for AFLP analysis. The laboratory-based part of this work was completed by month 24 (March 2002). Data analysis is expected to be completed by month 26.
- Along the Drôme, geomorphological conditions in a constrained and an unconstrained river reach were compared and related to the frequency of clonal clusters encountered among saplings in either reach type. Along the Garonne river, the frequency of clonal clusters was (i) compared among 'young', 'middle-aged' and 'old' *P. nigra* stands and (ii) related to position on the floodplain.
- A study of land-form changes within the active alluvial zones of the two contrasting river reaches in the Drome using a temporal sequence of aerial photographs, GIS and hydrological flow records is in progress. Preliminary results indicate a trend for most erosion of landforms to occur in the upper parts of in- stream islands and adjacent to main channels, with a greater turnover rate of in- stream islands in the channelised river reach.
- A sampling protocol has been devised for collection of leaf samples in 30 *P. nigra* stands along the Garonne River. Each of these stands has been identified, characterised and leaf samples have been collected (over 450 individuals) and sent off for genetic analysis at the Institute of Grassland and Environmental Research. A number of leaf samples from hybrid poplars growing near field sites and from clumped groups of adult *P. nigra* have also been collected for genetic analysis. DNA has been successfully extracted from more than half of the Garonne leaf samples to date. Microsatellite analyses of these samples have also been completed using 5 microsatellite primers .

Workpackage 6

- River morphology. Studies of flood level and flood-wave propagation have continued on the Isere River to improve understanding of the role of riparian vegetation growth on both phenomena. This initially involved 1D step-backwater modelling for a 50km reach. It

appears that roughness change due to vegetation cannot fully explain the 1m rise in water level, and that vertical and lateral island growth due to sedimentation is also very important. This has necessitated an analysis of the long-term sediment budget of the reach, based on repeated cross-section surveys. This has also raised the issue of island destruction, which is being assessed using 2D modelling to evaluate flows required to erode island banks.

- The roughness of vegetation. Flume experiments are continuing in Cambridge to investigate the effects of different densities and patterns of rigid emergent "stems" on the upstream increase in water level and the flow resistance. Roughness is being estimated by using 1D step backwater models to fit the experimental water surfaces, and good relationships are emerging between stem properties and roughness. On both the Isere and the Allier, field assessments of the roughness of different vegetation community types (in terms of tree sizes and densities) are being undertaken.
- Vegetation effects on flow and siltation. Because of the critical effect of vegetation in encouraging sedimentation, and causing an indirect effect on loss of conveyance, research is progressing in Grenoble on 2D models of flow structure and sediment transport through vegetation. This is being investigated empirically by relating the sedimentary record for the Brignoud Island to the flood history.

Workpackage 7

- *Policy analyses*, documenting and assessing the policies and instruments pertinent to floodplain restoration in the U.K., Germany, France and Sweden, have been completed. The four draft reports are submitted as Deliverable 7.2.
- *Actor analyses*, identifying the actor groups (organisations) relevant to floodplain restoration in each of the countries under study, are currently being updated.
- Short lists of floodplain restoration projects in the U.K., Germany, France and Sweden suitable as case studies in Work Package 7 have been drawn up for each country.
- Ca. 15 expert interviews on institutional aspects of floodplain restoration have been conducted with representatives of major organisations of water management and spatial and environmental planning in the UK and Germany, following earlier interviews in Sweden and France.

1.3 Milestones and deliverables

Workpackage 1

- A meeting of the WP1 sub committee took place in Umea, 14th March 2002.
- The final version of the outline document called 'The Flooded Forest' has been sent out for consultation to all FLOBAR members and UK and European End users involved in the project.
- The WP1 workshop has been organised for May 16th/17th 2002 in Cambridge. A short report on the workshop will constitute Deliverable 1.3 (due in month 26) in the next 6-month management report.

Workpackage 2

- Deliverable 2.1 (Quantification of relationships between water inputs, growth and health of floodplain trees) is the subject of continuing research, but the deliverable at month 24 is met by the publication of four scientific papers based on research work led by Dr L. Lambs and Professor G. Marigo, as listed in section 1.5.
- Deliverable 2.2 (Guidelines on influence of flows on health of floodplain trees) is met by the provision by the participants in WP2 of material for the Guidelines document which is being produced as the main output of WP1.

Workpackage 3

- None during the reporting period.

Workpackage 4

- Deliverable 4.2 will be postponed from month 24 to month 36, since data from the greenhouse experiment will not be available before month 30.

Workpackage 5

- Deliverable 5.1. Quantification of proportions of poplars derived from seed or vegetative sources was to have been completed by month 24. This has been extended to month 26 for the Drôme samples due to the move of Dr Winfield to Milan, and time needed to recruit a technician. A second genetics study to fulfil this deliverable was launched in Toulouse in month 19 (to be completed by month 28) to replace disturbance experiments initially planned. These were not considered feasible because of logistical problems in Toulouse (lack of greenhouse facilities) and the work contract of Dr Barsoum which started outside of the growing season, preventing field experimental work as envisaged during proposal formulation.
- Deliverable 5.3. Determination of the influence of physical disturbance on regeneration strategies was to have been completed by month 24 but awaits the final genetics results due in month 26 for the Drôme field site. Actual measurements of physical disturbance using channel profiles has been completed and data processed on schedule (by month 24). An additional deliverable/measurement of disturbance using GIS has been added for the Drome field sites. It was started in month 8 and is expected to be completed by month 30 with work progressing on a part-time basis.

Workpackage 6

- None for the reporting period.

Workpackage 7

- Deliverable 7.1 is submitted in the Annex to the Detailed Report in the form of policy analyses of floodplain restoration for each of the countries under study: the U.K., Germany, France and Sweden.
- As mentioned in the previous 6-monthly report the comparative model of the institutional framework of water management in the four countries exists in draft form but will require revision and extension following expert interviews conducted in parallel to those for the case studies. It will be completed by Month 30.

1.4 Deviations from the work plan

Workpackage 1

- No deviations.

Workpackage 2

- No deviations.

Workpackage 3

- No deviations.

Workpackage 4

- The timing of the greenhouse experiment has been brought forward to accommodate reconstruction of the greenhouse.

Workpackage 5

- Drôme GIS analysis (D5.3) will continue alongside the Garonne work in Toulouse
- Logistic problems and difficulties in linking the timing of the start of a work contract in Toulouse with appropriate timing for field work has meant that the field disturbance

experiments (D5.3) have been replaced by a study into the frequency of *P. nigra* clones in different aged stands along the Garonne using molecular markers.
- Search for sex linked markers (D5.2) is not to be carried out - the Poplar Genome Project at the University of Washington makes this part of the work unnecessary.

Workpackage 6
- No deviations.

Workpackage 7
- There were no deviations from the work plan during the reporting period. However, the policy and project analyses for Sweden have revealed only very limited interest in floodplain restoration there and no floodplain restoration projects of significant value for case study. For this reason no case studies will be conducted in Sweden under Work Package 7. The resources will be more gainfully used in work on the cases studies in the other three countries.

1.5 Co-ordination of the information between partners and communication activities
- Third project meeting, Umeå, March 2002. Project achievements are continuously reported at http://www.eg.umu.se/river/projekt/projfloodplaineng.html. The meeting in Umeå provided a good opportunity for the group in Toulouse to discuss results of the Drôme study with the group in Milan, following Dr Winfield's move to Milan.
- The central project website has been updated by the coordinating partner and continues to be linked to websites maintained for FLOBAR2 by all the other partners. The FLOBAR2 website has been revised and updated, and can be found at: http://www-flobar.geog.cam.ac.uk.
- Communication between all partners has successfully been achieved through e-mail. Some partners involved in the same workpackage have held meetings outside the annual meeting schedule. Meetings of partners involved in WP2 have taken place to discuss complementary experiments on the respective field sites in the Isere and Garonne. A meeting of several WP1 steering group members took place immediately prior to the third project meeting in Umea.
- Regular meetings have been held between members of each partner group. In Cambridge a group newsletter has been maintained to keep members of the group in touch with progress.
- Exchange of membership has occurred between groups, with Dr Shaoxiong Zhong (Umea) spending a year in Cambridge, and Dr Nadia Barsoum (Cambridge) joining the Toulouse group.
- M. Winfield ran a course for AFLP analysis of tree species at the University of Viterbo, Italy in March 2002.
- Communication with other relevant EU projects has taken place. A representative of the Erkner partner attended an international workshop in Brussels to discuss the results of the EUWARENESS project.
- A meeting took place with the Director of the Floodplain Institute in Rastatt, Germany.
- A meeting with experts of a research project on ecological flood prevention funded by the German Federal Environmental Agency will be held in June.
- Dr Francine Hughes from the Cambridge team was interviewed by the BBC about ecological aspects of flood defence for a programme called *Countryfile*.
- Dr Philippe Belleudy : Le transport solide en rivières : lacunes de connaissance et besoins méthodologiques. Mémoire d'Habilitation à diriger des recherches, INPG
- 'Caractéristique des propriétés hydrauliques et étude de la gestion de la ressource hydrique chez Populus nigra et six espèces d'Acer.' J. Tissier: Rapport de DEA 'Biosciences de l'Environnement ' sous la direction de G. Marigo, Septembre 2001.

A number of publications are published or in progress:

Belleudy, Ph. (2001) Modelling of deposition of sediment mixtures, part 2: a sensitivity analysis. *Journal of Hydraulics Research, IAHR* **39**(1), 25-31

Hughes, F M R, Adams, W M, Muller, E, Nilsson, C, Richards, K S, and 13 others (2001) The importance of different scale processes for the restoration of floodplain woodlands. *Regulated Rivers: Research and Management* **17**, 325-345

Lambs, L. and Berthelot, M. (2002, in press) Monitoring water from the underground to the tree: first results with a new sap extractor on a riparian woodland. *Plant and Soil*

Lambs, L., Loudes, J.-P. and Berthelot, M. (2002) The use of the stable oxygen isotope (^{18}O) to follow the water distribution and absorption in riparian woodlands. *Nukleotika* **47**(1), 115-155

Lambs, L. and Muller, E. (2002, in press) Sap flow and water transfer measurements in poplar and willow. *Annals of Forest Science*

Lemoine, D., Peltier, J.P. and Marigo, G. (2001) Comparative studies of the water relations and the hydraulic characteristics in *Fraxinus excelsior, Acer pseudoplatanus*, and *A. opalus* trees under soil water contrasted conditions. *Annals of Forest Science* **58**, 723-731

Richards, K S, Brasington, J and Hughes, F (2002) Geomorphic Dynamics of Floodplains: Ecological Implications and a Potential Modelling Strategy. *Freshwater Biology* **47**, 1-22

Winfield, M and Hughes, F.M.R. (2002) Variation in Populus nigra clones: implication for river restoration projects in the Unite Kingdom. *Wetlands* **22**

A number of conferences have been organised or attended by representatives of various partner groups where papers on the work of FLOBAR and FLOBAR2 have been presented:

Belleudy, Ph. and Lefort, Ph. (2001) La continuité du transport solide et sa rupture. *Colloque de la Société Hydrotechnique de France* "La gestion des sédiments : de la source à la mer " Lyon 28-29 March 2001

Muller, E. et Lambs, L. (2001) Flux de sève et transfert hydrique dans la ripisylve garonnaise. Colloque Eau et Forêt, Nancy, 26-28 Septembre 2001.

1.6 Difficulties encountered at management and co-ordination level

- The genetic analysis of Drôme leaf samples has been delayed by the time needed to find and employ a technician to work with M. Winfield in Milan. However, time lost has been recovered.
- Among the Drôme leaf samples, not all have yielded sufficient DNA to carry out molecular analysis. An attempt will be made to extract from these samples again.
- The move of N. Barsoum to Toulouse in October 2001 and the commencement of a new project there, has delayed the GIS analysis of aerial photographs along the Drôme River as well as the processing of Drôme field data collected in the summer of 2001.

1.7 Participants Information table

See next page (no changes since the last Report).

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