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Le service écosystémique de séquestration du carbone lié aux stratégies de gestion de la ripisylve sur le vieux Rhône

Résumé :

Ce projet concerne la caractérisation de la séquestration du carbone dans la ripisylve. Nous documentons les stocks de carbone contenus dans la biomasse et dans les sols des forêts en régénération associées aux casiers Girardon du Rhône. Les travaux visent à produire les données de base pour mieux comprendre les répercussions des actions de gestion sur le puits de carbone qu'est la ripisylve, et aussi à estimer les revenus escomptés provenant des crédits de carbone. Cette année nous avons accompli nos travaux de terrain. Nous avons pris des échantillons de sol aux sites âgés de 30-125 ans, où nous avons précédemment fait une analyse forestière, ainsi qu'aux sites non-végétalisés, dont les sédiments viennent de la dernière crue de l'Isère en 2015. Ceci nous permet de calculer la croissance des stocks de carbone à travers les décennies de végétalisation de la plaine d'inondation.

Objectifs du projet et mise en contexte

Riparian forest constitutes a potentially substantial carbon sink, especially in water-limited regions where grasslands or other non-forest vegetation types predominate. However, because it occupies comparatively little land area compared to forests traditionally exploited for timber, this forest carbon sink has been virtually ignored by foresters and by policymakers, and the impact of river management strategies on its size and dynamics is largely unknown.

Riparian forest stands along the highly managed Vieux-Rhône, which have resulted from fine sediment infill between Girardon structures and the former channel margin, are of considerable conservation and scientific value to many stakeholders in the Rhône Basin. Management of these forests balances needs for flood security, ecological benefits from biodiversity at different successional stages, and (potentially) carbon sequestration. Changes in management strategy (e.g. dike removal, sediment reintroduction, channel widening) should be evaluated, in part, for their impacts on the riparian carbon sink.

In this project, we seek to measure the carbon stocks contained in soil and biomass of forest plots at different stages of vegetation development, with the aim of characterizing the size of the riparian forest carbon sink in anticipation of changes that may occur in the future. In 2015, we collected soil samples at sites ranging in successional age from 1-125 years and analyzed them for their carbon concentration.

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Méthodologies :

We contracted with the firm GéoPeka to conduct the field sampling. Forest inventory sampling took place in 2014 and collection of soils in the field took place in August 2015. To add to sites already sampled for the forest analysis, Géo-Peka identified 6 sites very recently sedimented by deposits from the last flood on the Isère, in May 2015. In all, 37 sites were sampled to a depth of 45 cm, except a few where a gravel layer was reached at around 30 cm depth.

Sediment Age Range	Number of Samples
1891-1902	11
1947-1960	5
1972-1986	12
2015	6

Distribution of site ages by year of initiation of vegetation.

Soil samples were taken in a trench dug to 60 cm depth and cleared of organic debris at the surface. Three cores were removed, representing the 0-15 cm, 15-30 cm, and 30-45 cm depths, for quantitative bulk density measurements and carbon concentration. Soils were sieved to remove the gravel fraction and air dried before weighing. The dry mass and the gravel-corrected volume are used to calculate bulk density.

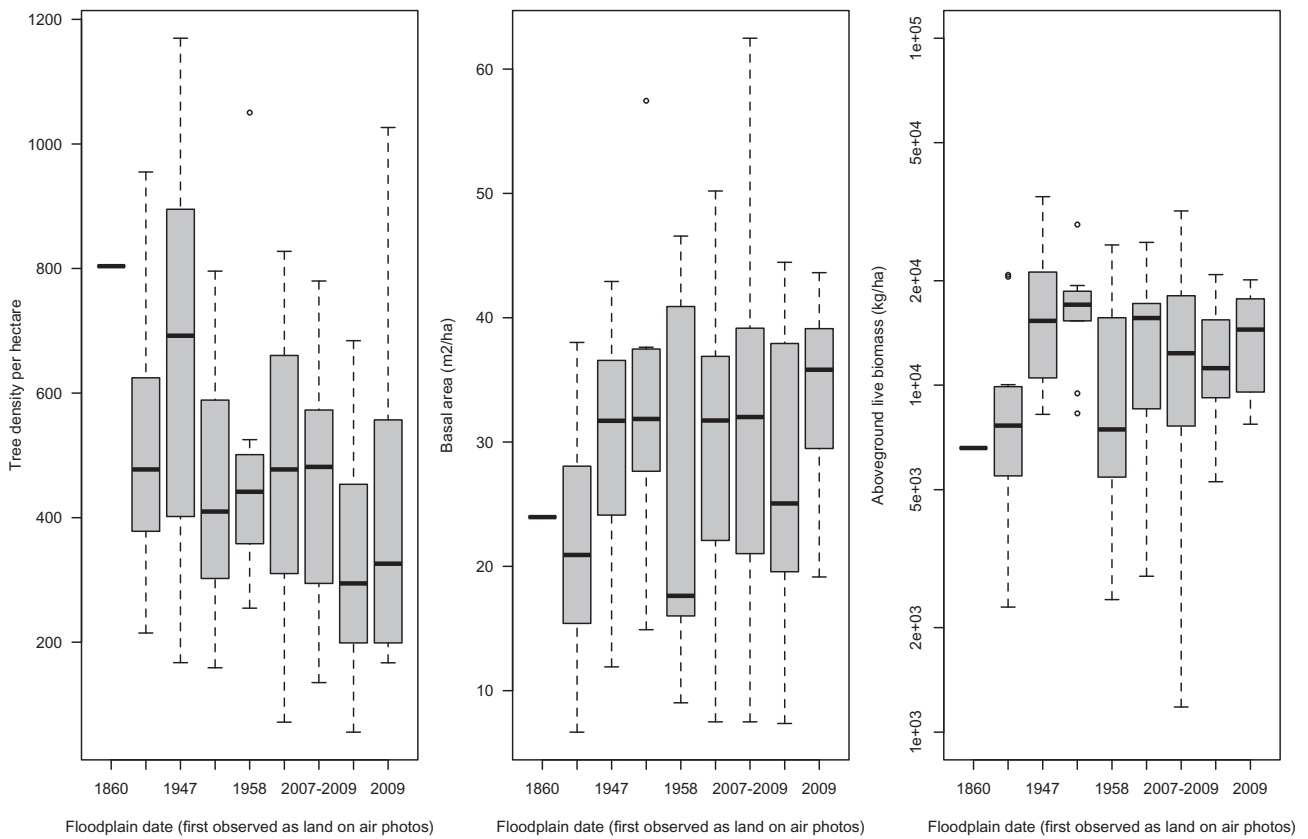


Aliquots of each soil core were shipped to the United States for C concentration analysis. Soils were pulverized and subjected to flash combustion analysis on a CHN analyzer at Chapman University (Orange, California).

Previously, we measured characteristics of the forest biomass by stratifying the floodplain into different zones across the Girardon structures and using sampling plots following the procedures of the National Forest Inventory (IFN, <http://www.ifn.fr>). In each plot we measured the species' diameter at breast height and converted this to biomass using allometric equations.

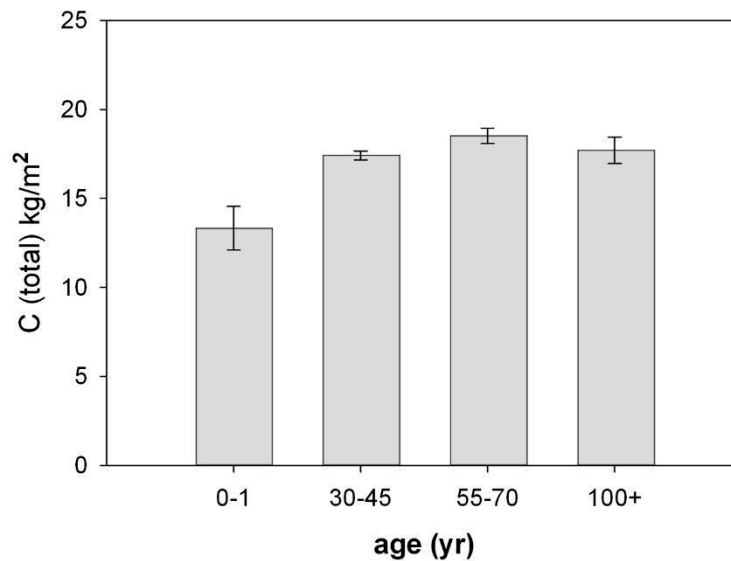
Principaux résultats :

A definitive set of allometric equations for the species that inhabit the Rhône floodplain does not exist, and we found that calculations of biomass were highly sensitive to the allometric equation chosen when several were available. We also found some differences among site ages depending on which metric of vegetation dominance was used. The results reflect the larger size of individual trees on older floodplain ages, but no large age-related differences in the post-1947 period.



Site age differences in stem density (Left panel), basal area (Center), and aboveground biomass (Right).

Carbon stocks increased greatly in soils in the first few decades of vegetation development, but not later. (NB: these carbon measurements are tentative as they have not been adjusted for carbonate content.)



Carbon stocks in soil over time.

Plus-value pour les praticiens :

Current and future practices on the Rhône, including forest management, rewatering the floodplain, and changes to flow and the mobilization of carbon-containing sediments, may alter carbon stocks.

Our analysis permits an understanding of how carbon stocks increase over time, and shows that the most critical increases in carbon stocks come in early floodplain development, suggesting that a dynamic Rhône floodplain could have the biggest impact on carbon sequestration.

We anticipate being able to calculate the carbon credits obtainable from encouraging young forest development after we finish the soil carbon analyses, settle on a reliable and robust set of allometric equations, and adhere to a carbon accounting protocol.

