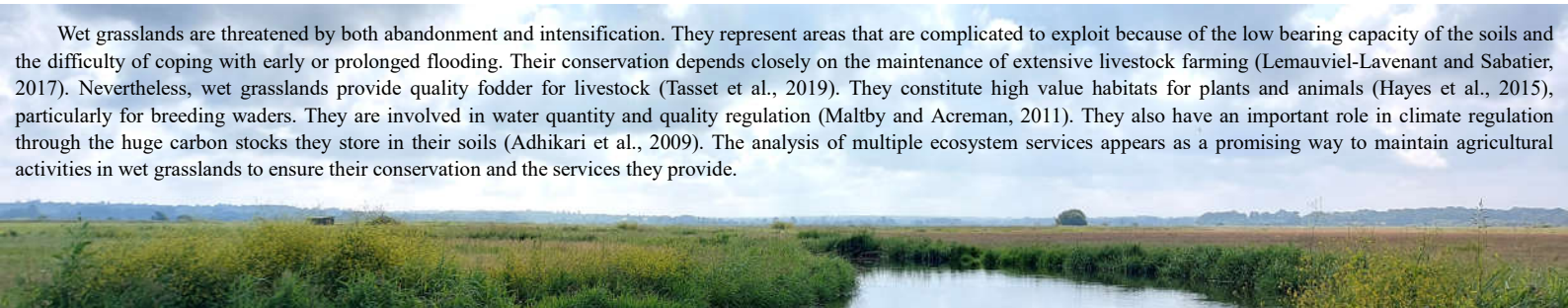


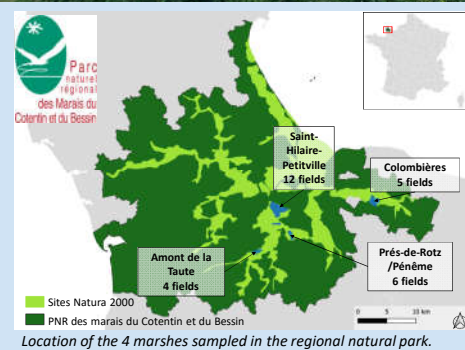
Ecosystem services provided by wet grasslands through extensive livestock farming

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Wet grasslands are threatened by both abandonment and intensification. They represent areas that are complicated to exploit because of the low bearing capacity of the soils and the difficulty of coping with early or prolonged flooding. Their conservation depends closely on the maintenance of extensive livestock farming (Lemauiel-Lavenant and Sabatier, 2017). Nevertheless, wet grasslands provide quality fodder for livestock (Tasset et al., 2019). They constitute high value habitats for plants and animals (Hayes et al., 2015), particularly for breeding waders. They are involved in water quantity and quality regulation (Maltby and Acreman, 2011). They also have an important role in climate regulation through the huge carbon stocks they store in their soils (Adhikari et al., 2009). The analysis of multiple ecosystem services appears as a promising way to maintain agricultural activities in wet grasslands to ensure their conservation and the services they provide.



➤ 27 fields (9 habitats x 3 replicates)

Floristic composition (4x1m² quadrats)



- Diversity indices
- Patrimonial value (heritage value & specificity to wetlands)

Biomass samples (3x400cm², cut at 5cm)

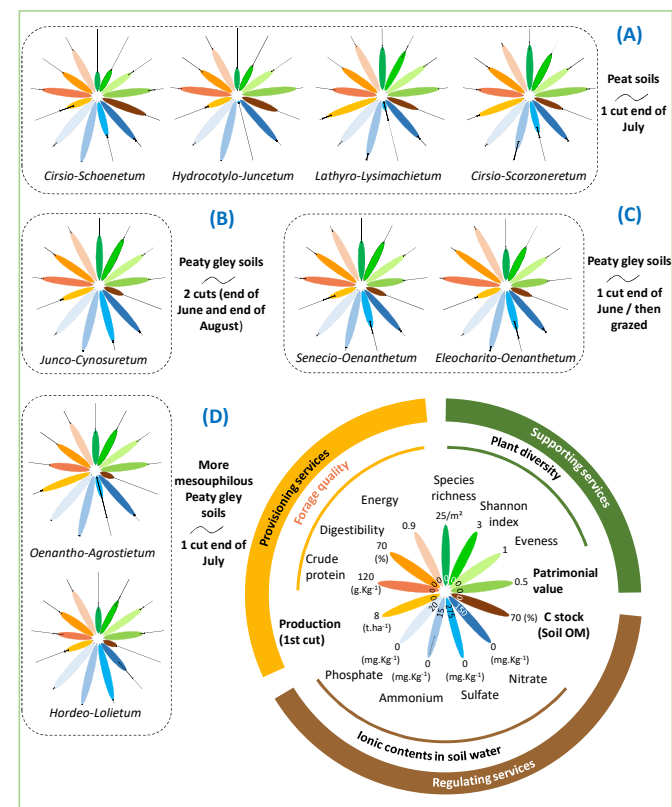


- Production
- Forage quality (energy, digestibility, crude protein)

Soil samples (4x754cm², 0-15cm)



- Organic matter (OM) content
- Soil water quality (ionic contents)



- Peat habitats with 1 late cut (A):

- ✓ Characterized by the highest C stocks (OM reaching to 52 %).
- ✓ High patrimonial value but not always high diversity: stresses, mainly anoxia and oligotrophy, act as a filter which only allows specialists species to develop, reducing diversity which is consistent with the humped back model theory (Grime, 2001).
- ✓ High sulfate contents in the soil water: may indicate the mineralization of the soil organic matter and thus the loss of C stocks which generally appears when the water levels decrease in peatlands (Blodau et al., 2004).



- Peaty gley soil habitats twice mown (B) or mown then grazed (C):

- ✓ The highest forage quality but the lowest first cut production (only a part of the annual production).
- ✓ The lowest supporting services.

- More mesophilous peaty gley soil habitats with 1 late cut (D):

- ✓ Lower indices of ecosystem services.
- ✓ Higher contents of either nitrate or sulfate in soil water indicating OM mineralization.

An interesting **synergy between plant diversity and forage quality** was highlighted by significant positive correlations with all the floristic diversity indices and forage digestibility and energy :

	Species richness	Shannon index	Evenness
Digestibility	r=0.46 (p<0.05)	r=0.43 (p<0.01)	r=0.56 (p<0.01)
Energy	r=0.52 (p<0.05)	r=0.53 (p<0.01)	r=0.48 (p<0.01)

Higher diversity is here associated with a higher proportion of forbs which are characterized by higher digestibility than grasses in the late cut situations encountered in marshes (Tasset et al., 2019).



Bundles of ecosystem services provided by a set of different habitats of wet grasslands. Each « petal » corresponds to an index of ecosystem service (mean, se, n=3 per habitat). NB: As high ionic contents may be considered as dis-services, the graduation of these petals is reversed.

Neither of the habitats can provide a perfect bundle of services as trade-offs exist among services. Each habitat is the result of edaphic conditions, water constraints (partly driven by the management of water regulation structures) as well as a long history of management. Maintaining extensive management and a high water level, which condition the conservation of specific habitats providing high levels of certain services, appears essential.