Knepp Castle Estate – River Adur – options for restoration

Floodplain biodiversity

David Gowing

Notes from a site visit on 18th April 2005.

Current biodiversity

The floodplain is predominantly well-established permanent grassland with a high diversity of grass species, including:

Alopecurus pratensis	*Phleum pratense*	*Hordeum secalinum*
Festuca arundinacea	*Frestuca pratensis*	*Festuca rubra*
Agrostis stolonifera	*Agrostis capillaries*	*Deschampsia cespitosa*
Holcus lanatus	*Lolium perenne*	*Cynosurus cristatus*

However, the herb component was very small. The only frequent species noted were:

Cardamine pratensis	*Rumex acetosa*	*Rumex crispus*
Taraxacum officinale agg	*Ranunculus repens*	

This combination of grass species richness, paucity of herbs and near absence of sedges (scattered *Carex hirta* only) suggests a high fertility, productive system with adequate surface drainage for the most part. There was significant topographic variation on the floodplain enhanced by the excavation of drainage features. These shallow ditches held wetland species such as:

Juncus effuses	*Juncus inflexus*	*Glyceria fluitans*
Carex acutiformis?	*Oenanthe crocata*	

The only area where the vegetation indicated permanent moisture through the year was a t the base of the embankment containing Kneppmill pond, where *Juncus articulatus* was present.

Much of the river channel was bordered by a linear stand of woody species, the most frequent of which were:

Alnus glutinosa	*Salix cinerea*	*Acer campestre*
Corylus avellana	*Fraxinus excelsior*	*Prunus spinosa*

Soil profile

Four exploratory auger holes were made along the floodplain. All gave similar results. The texture of the soil was overwhelmingly clay with higher silt contents in the surface layers at some points. In two of the four positions, there was a defined A-horizon coloured by organic matter as expected, but this was absent in the other two, suggesting soil disturbance of some kind. Where an A-horizon was present, there was well structured soil to a depth of approx 25 cm. Water will probably move laterally within this layer. The B-horizon showed strong mottling reflecting fluctuating water tables. The predominantly oxic zone typically went to 40 cm depth, then a transition zone between 40 and 60 cm, below which the soil was predominantly anoxic in terms of colour.

Holes were bored to 120 cm and at no location were any coarser sediments found.

Restoration scenarios

The projected maintenance of the site does not include any cutting and therefore hay-meadow or fen communities are not appropriate targets. All vegetation management will be via grazing. The eventual vegetation type in the floodplain is entirely

dependent on the degree of grazing, which in turn will depend on the preference of the grazers for the floodplain vegetation as opposed to that of drier areas of woodland, parkland and arable reversion areas across the remainder of the estate. The possibilities are:

Floodplain woodland: initial colonisation by *Salix cinerea* with gradual succession to *Alnus gutinosa/Fraxinus excelsior* woodland is likely to occur spontaneously, given the proximity of seed source, if grazing pressure is low. Such woodland could dominate the floodplain, except where surface water could be retained on the surface at least into midsummer most years, thereby hampering establishment of woody seedlings.

Swamp communities: Where surface water is retained beyond the end of May in an average year, it is likely that specialist wetland vegetation will be encouraged. Possible dominants are reed canary grass (*Phalaris arundinacea*), large pond sedges (*Carex acutiformis/riparia/acuta*) or flote-grass (*Glyceria fluitans.*) There was little common reed (*Phragmites australis*) on the site – it seems that *Phalaris* is favoured by the nutrient-rich, fine-textured soils with variable water-tables. If grazing pressure is moderate, then the sedges will be favoured over the reeds, if grazing is sustained, then a low flote-grass sward may be favoured.

Grassland communities: High grazing pressure is likely to maintain grassland communities. Increasing flood duration will encourage the rush species (*Junci*) already on site. Floods throughout the year will favour the soft rush (*J. effusus*) whilst floods confined to winter/spring will favour the hard rush (*J. inflexus.*) If the drainage of the floodplain becomes more impeded then the more tussocky species such as tufted hair-grass (*Deschampsia cespitosa*) and tall fescue (*Festuca arundinacea*) are likely to increase in frequency, especially as they are not favoured by grazing animals. Herb richness may increase over time as nitrogen becomes increasingly limiting. One would expect leguminous species such a meadow vetchling (*Lathyrus pratensis*) becoming widespread within the floodplain

Open vegetation: Where grazing pressure is very high (particularly pigs) and flood durations are prolonged, then it is likely that there will be a high proportion of bare mud for most of the year and the vegetation will fall into the category labelled "Open Vegetation" by the National Vegetation Classification (NVC.) These communities are characterised by spawling species that can rapidly recolonise bare mud one surface water has retreated, e.g. creeping bent grass (*Agrostis stolonifera*) and creeping buttercup (*Ranunculus repens*) or by annual species with persistent seed banks such as water pepper (Polygonum hydropiper) and knotweed (Polygonum aviculare).

Additional interest could be engineered into the system by providing areas with constant moisture throughout the year rather than areas reliant on flood events. These areas ideally would have moisture percolating through the more permeable surface horizon. Such hydrology in combination with significant grazing pressure would favour species such as

Carex nigra	*Carex disticha*	*Juncus articultaus*
Carex hirta	*Cardamine pratensis*	*Caltha palustris*
Mantha aquatica	*Eleocharis paulustrius*	*Potentilla anserina*
Polygonum ampibium		

Such systems would be reliant on the water being of appropriate quality. Heavily enriched water would probably result in further flote-grass stands.