

Executive Summary

The significance of biodiversity resources, and the need for planning to deal with them, is recognised in a suite of international and national policies and statutes. These provide a framework within which regional and local planning must take place, and a mandate for such planning to be carried out, with the aim of ensuring that biodiversity resources are managed in a sustainable way.

The study provides a basis for the development of a biodiversity management framework, identifying land which achieves the biodiversity goal and objectives for the Georges River catchment and providing key recommendations on the management of terrestrial biodiversity values in the catchment. The study consisted of five major components that provided the basis for the conservation assessment of land within the catchment:

1. Mapping of remnant patches of vegetation on the Cumberland Plain using Aerial Photograph Interpretation (API) techniques and selective site-based assessment;
2. Predictive modelling of the pre-1750 distribution of vegetation communities;
3. An assessment of the fauna and floristics of specific sites;
4. Studies of the locations of selected species of flora and fauna; and
5. Habitat modelling for selected species for which sufficient information was gathered.

Maps have been produced for the pre-1750s and current distribution of vegetation communities within this area. These communities are primarily influenced by the distribution of shale (Cumberland Plain) and sandstone (Woronora Plateau) geologies. Analysis of these communities to refine and standardise the classification of ecological communities occurring in this area identified 22 communities occurring on or adjoining the Cumberland Plain and four communities associated with the Woronora Plateau. While the existing classification for the Cumberland Plain was refined with additional communities described and mapped, communities previously described for the Woronora Plateau had to be amalgamated for presentation at an equivalent scale. In terms of species richness, vegetation communities on shale-derived soils recorded fewer species than those on sandstone-derived soils, while shale/sandstone transitional areas were intermediate in species richness. Species richness in communities on alluvial soils on the Cumberland Plain tended to be slightly lower than in the surrounding shale communities. The floristic composition of communities associated with the Cumberland Plain was most strongly correlated with local scale environmental variables including ruggedness, slope and solar radiation. Regional scale environmental variables such as maximum temperature, annual rainfall and elevation were also strongly related to floristic composition in the Cumberland Plain. In contrast, floristic patterns on the Woronora Plateau were most strongly correlated with regional gradients in rainfall and temperature, as well as a suite of variables defining topographic variation at a local scale. These correlations between floristic composition and environmental variables formed the basis of modelling and mapping of the pre-1750 distribution of vegetation communities of the Cumberland Plain and the Woronora Plateau, establishing the extent of native vegetation and the extent of depletion up to November 1997. This data has emphasised the increasingly well-documented decline of ecological communities in the Georges River catchment. This is especially evident

for those communities of the shale-derived soils of the Cumberland Plain and transitional soils in the vicinity of the Georges River corridor itself. With this in mind, there is a need to concentrate economic and social resources on those patches that are both viable and in good condition, but also to identify the critically endangered areas with a view to protecting these from extinction.

Surveying to assess the diversity of vertebrate species within the Georges River catchment examined 308 sites, selected to adequately sample the range of environmental variables and vegetation remnants within the catchment and resulting in a final total of 10 686 individual records for this area. Fauna habitat models were developed for selected species to describe and map their habitat, illustrating the potential distribution of each species. Each model was developed based on presence/absence records for each species and on the distribution of key habitat requirements in the catchment. Potential habitat for each species is then further classified according to the suitability of that area based on the quality of that habitat. Maps associated with these habitat models were produced. In order to facilitate integrated management responses that embrace the role of fauna in ecological processes, the fauna of the Georges River catchment were also considered in terms of assemblages including bird, reptile, bat and frog assemblages. These assemblages have been mapped and described.

Seven species of flora were selected to represent the threatened flora of the Georges River catchment during survey work and to be subjected to predictive modelling processes with a view to improved habitat identification and management. These species were selected because they are known or are likely to occur in the Georges River catchment, and are either threatened by land use changes within the catchment or rare, and therefore a good surrogate of species diversity. Predictive modelling for these species consisted of review and identification of their occurrences within the Georges River catchment, systematic field survey and the development of computer-based models of the species habitat distribution within the catchment. Predictive modelling for the selected flora species, including the detailed habitat models for six of the species, indicates that there is potential habitat for these species within the catchment. Maps have been produced illustrating the potential distribution of habitat for each species. The results present a bleak picture for the state of those threatened flora as they suggest that the known populations of many of these species are likely to represent most of the remaining populations in existence. The conservation implications are therefore more pressing for the known populations and emphasise the need for site-specific survey work associated with new development and local environmental survey work to target rare flora.

A conservation assessment of the Georges River catchment was undertaken to identify land which achieves the aims and objectives for biodiversity management in the catchment. These aims and objectives have been developed by DIPNR in consultation with the Georges River catchment Section 22 Committee and relate to the maintenance and protection of significant ecological species, populations and communities, the maintenance and protection of common or widespread species and communities, the maintenance and enhancement of linkages between significant habitats and the maintenance and protection of sensitive natural areas. The methodology of this assessment consisted of firstly identifying biodiversity features that represented each of the five objectives for biodiversity management. Secondly, the land occupied by these features was assessed for their conservation value using standard criteria. Finally and as a result of this assessment, land occupied by the biodiversity features was assigned to one of four land management classes. Three of these management classes have been termed Regional Management Areas (RMAs) (Core, Support and Biodiversity Enhancement). The fourth and lowest land class in this hierarchy is termed Other Area.

The conservation assessment resulted in a substantial area of vegetation in good condition in the Core Area classification. On the Cumberland Plain, the presence of

Endangered or regionally significant vegetation communities drove this selection. In general, remnants of 10 ha or greater in size were included as Core Area, with remnants of 0.5 ha selected where Critically Endangered communities were present. The majority of contiguous vegetation on the Woronora Plateau was also included as Core Area, driven by the features that included high-quality Koala habitat, habitat for other species requiring large habitat areas or vulnerable to fragmentation, as well as the ecological value of the undisturbed catchments on the Plateau. Biodiversity Enhancement Areas have been used to identify land that provides a strategic opportunity for rehabilitation and habitat linkage with minimal land use conflict. Eleven regional corridors were identified within these areas to provide benefits for the maintenance of vegetation and fauna populations within the catchment. Key components of this corridor network include a major north–south corridor, linkages between this corridor and the Woronora Plateau using riparian lands and utility corridors and additional interregional corridors linking habitat within the catchment to habitat in other catchments. Together, the three Regional Management Areas incorporated the majority of modelled and known habitat for targeted species throughout the catchment with over 90% of the habitat and records of these species included within Core Areas. These RMAs form a basis for the establishment of a network of secure conservation lands that are subject to long-term management agreements in order to achieve the long-term aims and objectives for biodiversity management in the catchment.

The results of this study are but one component of the framework required for management of biodiversity in this region and can be applied to:

- develop a regional planning framework within which to manage biodiversity values at the regional scale to complement higher scale initiatives (international, national, state-wide and metropolitan)
- inform local strategic planning, including providing guidance for the consideration and development of strategies and local plans that address biodiversity management issues
- inform site-based planning, including planning associated with development proposals and environmental management
- findings presented in this report should be considered during all land use (and species) management and planning processes associated with the Georges River catchment
- translating conservation priorities identified in this report into regional strategies and plans to protect regional biodiversity values, including the implementation of a regional network of areas for the management of biodiversity values outside the reserve system
- prioritising the allocation of economic and social resources to conservation efforts to protect and manage Critically Endangered communities and species, and communities that are currently in good condition
- taking specific habitat protection measures as set out in this report, in relation to the management of regionally significant species, including those that are considered to be threatened under State and Commonwealth legislation.

This study has focused on providing accessible, adaptable and understandable data to ensure that access to this information is not limited. A number of data user communities were identified as important users of this study including the scientific community, the land management community and the general community. Information has been provided for these communities in the form of a written report summarising the background, methodology, results and detailed information about the biodiversity of the Georges River catchment, and in the form of maps identifying areas of regional conservation significance made available both in both hard copy and online.

About this report

The final report of *Biodiversity of the Georges River* catchment is presented in three parts, as summarised in Table 1 below. This is the second part of this report and details the methodologies and results of a study of terrestrial biodiversity in the Georges River catchment (see Figure 1). This study was conducted between 1998 and 2001 as a cooperative initiative of the NSW Department of Infrastructure, Planning and Natural Resources (DIPNR), the NSW Department of Environment and Conservation (DEC—formerly NPWS & EPA) and NSW Fisheries. It includes a discussion of the findings of the broader catchment analysis, and provides key recommendations on the management of terrestrial biodiversity values in the catchment.

Table 1 Summary of the contents of the *Biodiversity of the Georges River catchment* Final Report

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| Context for regional biodiversity planning | Introduction, synthesis and discussion of issues: <ul style="list-style-type: none"> • Concept of biodiversity • Overview of biodiversity conservation frameworks • Introduction to the studies and reports. |
| Terrestrial biodiversity of the Georges River catchment | Details the study of terrestrial biodiversity resources in the catchment, including: <ul style="list-style-type: none"> • Introduction and background • Methodologies • Results • Discussion of results and • Key recommendations. |
| Aquatic biodiversity of the Georges River catchment | Details the study of aquatic biodiversity resources in the catchment, including: <ul style="list-style-type: none"> • Introduction and background • Methodologies • Results • Discussion of results and • Key recommendations. |

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FIGURE 1**

Figure 1 The Georges River catchment showing soil landscapes

1 Introduction (A Bryant & D Steller)

The terrestrial component of the *Biodiversity of the Georges River catchment* report was conducted by DEC (then NPWS). Commissioned late in 1998 the survey work began in earnest early in 1999 and was largely completed by mid-2000. In October 2000 DIPNR and DEC hosted a series of workshops with key stakeholder groups to translate biodiversity information into an effective planning framework. This exposure of the data allowed stakeholders to identify problems and comment on findings, as well as to contribute to possible solutions for the ongoing management of biodiversity in the catchment.

The study consisted of five major components:

1. mapping of remnant patches of vegetation on the Cumberland Plain using aerial photograph interpretation (API) techniques and selective site-based assessment
2. predictive modelling of the pre-1750 distribution of vegetation communities
3. an assessment of the fauna and floristics of specified sites
4. studies of the locations of selected species of flora and fauna
5. habitat modelling for selected species for which sufficient information was gathered.

i) Complementary surveys—Cumberland Plain and the Georges River catchment

The NPWS has been carrying out a similar study throughout the Cumberland Plain as the first step in preparation of the Cumberland Plain Endangered Ecological Communities Recovery Plan. As the Georges River catchment includes a significant area of the Cumberland Plain there is significant overlap between these two projects. As a result the survey planning and fieldwork were executed in two separate phases.

The first phase covered the greater western Sydney area between the latitudes 33°30'S and 34°30'S, and longitudes 150°30'E and 151°30'E comprising the Cumberland Lowlands (Bannerman & Hazelton 1990), an area that stretches from Wilberforce (north) to Thirlmere (south), and east of the Nepean River to Parramatta. East of Parramatta the lowlands are truncated by the Hornsby Plateau in the north and by the Woronora Plateau in the South. The study area boundary in this phase was defined by the extent of soils derived from three main geological units:

- Wianamatta Group shales,
- Tertiary Alluvium, and
- Holocene Alluvium (in areas draining Wianamatta Group shales).

The second phase of the survey extended the study area to include the whole of the Georges River catchment, incorporating the geological transition from Wianamatta Shale to Hawkesbury Sandstone. This area includes the Woronora Plateau north of latitude 34°30'S and east of longitude 151°05'E.

ii) Campbelltown Local Government Area

Additional sampling in the Campbelltown LGA was concentrated along the geological transition from Wianamatta Shale to Hawkesbury Sandstone between Long Point and Wedderburn.

NOTE: The data collated by these reports provides the primary basis for regional planning and to guide refinements at the local scale, however they do NOT replace the need for site-specific surveys with regard to requirements under state and commonwealth threatened species legislation.