Project 1.6

Spatial prioritization of waterway management actions for biodiversity outcomes

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This project will develop and implement spatial planning tools that will allow different planning options and their associated outcomes to be evaluated. These tools will inform prioritization of restoration works and protection and scales of investment for next water plan.

Outcomes for waterway management: Tools to help decide where investment in stream protection will provide greatest benefit.

Details: River restoration activities such as stormwater management, riparian and catchment revegetation, fishway construction, weed management and environmental flows, are major areas of investment for Melbourne Water. A fundamental planning question is how to most efficiently allocate this investment to achieve optimal biodiversity and river health outcomes at a whole-of-system level for the Port Philip and Westernport region. Despite the critical importance of this question, robust and systematic tools that take advantage of Melbourne Water's extensive biological and environmental data currently do not exist. This significantly constrains Melbourne Water's ability to justify expenditure in certain activities and locations and provide confidence to the business regarding investment strategies and outcomes.

The primary aim of this project is to implement spatial planning tools so that different planning options and their associated costs and benefits can be evaluated by Melbourne Water and their stakeholders to inform the development of future Melbourne Water waterway management strategies and their implementation (e.g. Strategic Asset Management Plans). These planning tools are underpinned by quantitative ecological models for key biota (e.g. fish, invertebrates, platypus) which generate predicted biodiversity outcomes for a suite of contrasting waterway investment scenarios. This project integrates best-available GIS environmental data with robust ecological models, empirically-derived cost data and well-tested spatial planning tools to provide a sound platform for comparing the performance of alternative planning options.

Collectively, the proposed portfolio of work includes the following main activities:

1. Development of new high-resolution GIS land cover data (imperviousness, vegetation cover) with a comprehensive hydrologic network for the entire Melbourne Water region

   This land cover data forms the base data for many partnership projects. It will include: the production of two new DEMs ("engineered" and "artificial", new subcatchment layers, calculation of flow distances along different classes of land cover and drainage line/stream, refinement of forest cover classification to delineate woody weeds and development and curation of historic land cover datasets.

2. Development of species distribution models (incorporating key environmental variables/management activities) for a range of key aquatic values e.g. fish, invertebrates, platypus.

   These species distribution models represent an advance on qualitative conceptual models by providing the means to quantify expected changes in key values associated with specific management actions, and ultimately, providing a formalised, quantitative assessment of how MW's waterway management actions contribute to achieving Levels of Service for waterways. The predictions provided by these models will provide outputs that will help support the development of SAMPs, including decisions about where to undertake certain waterway management activites as well as associated monitoring and evaluation programs.

3. Identification of potential management investment scenarios and systematic planning to evaluate and cost-effectively prioritise waterway actions across the Melbourne Water region to inform the development of the next Melbourne Water Healthy Waterways Strategy

   These 'Zonation solutions' (see below for details on Zonation) will allow us to see how spatial priorities change when cost-effectiveness is taken into account in the computational ranking process. They will allow us to visually compare the 'solutions' for different investment scenarios and quantitatively evaluate the return on investment provided by each candidate investment scenario. These data-driven outputs can support informed deliberations on investment decision-making within the SAMP process, and provide transparent documentation of the rationale and evidence used to justify expenditure. Will also allow Melbourne Water to evaluate risks associated with certain levels of investment and our defined Levels of Service within the SAMPs.

> ***What is Zonation?*** *Zonation is a software-based prioritization framework that supports spatial planning for biodiversity outcomes. At the most basic level, Zonation takes in species distribution maps (one for each taxa) and ranks (each planning unit in) the entire landscape or stream network in order of its value for biodiversity. Zonation does its computational ranking with regard for the key principles of* ***representativeness*** *(representing the full variety of biodiversity),* ***complementarity*** *(selecting sites that complement or add new species rather than duplicate the species present in sites already selected) and* ***irreplaceability*** *(prioritising unique or near unique species occurrences without which we would fail to achieve representativeness). In the (nested) hierarchical ranking that results, the top 1% is nested within the top 2% and so on.*
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> *Zonation can also take into account the costs of protecting or managing different locations, and potential changes in local biodiversity outcomes under different management options. This requires consideration of not just current biodiversity value, but also how the costs of managing different areas might vary, and how predicted species distributions may change with or without a particular action.*

4. Development of interactive decision support tools for exploring and planning for biodiversity outcomes from management actions under possible climatic and development scenarios to support the implementation of Melbourne Water's future waterway management strategies (e.g. SAMPs).

   These tools will provide the ability for a-priori site-specific desktop assessments of the potential for ecological improvement as a result of management activities or degradation as a result of other catchment activities. By providing quantitative predictions of response, the tools will aid the development of monitoring, evaluation, reporting and improvement programs, which in turn will allow an adaptive feedback to improve the predictions of future models.