eWater Source

A New Modelling Framework for Integrated River Basin Management

eWater 源模型
一个新的流域综合管理模型框架

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About eWater 关于 eWater

- Operating from 1992-2011 under Australian government Cooperative Research Centres program 从1992-2011是一个澳大利亚政府的合作研究中心项目
- Now an Australian government owned company (federal and state governments) operating on a commercial not-for-profit basis 现在是一个澳大利亚政府拥有的公司(联邦和州政府)，商业性但非盈利
- Independent commercial board and management team 拥有独立的商业理事会和管理团队
- Goal to build, maintain and support new generation water modelling tools and user capability 目的是开发、保持和支持新一代水资源模型平台工具和用户模拟能力

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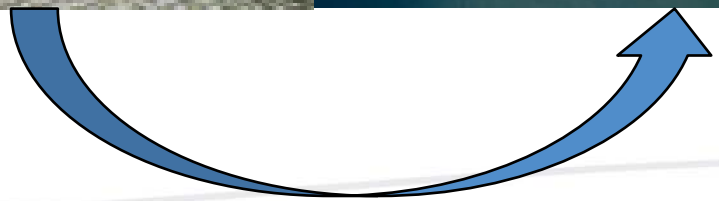
Why a new modelling capability?

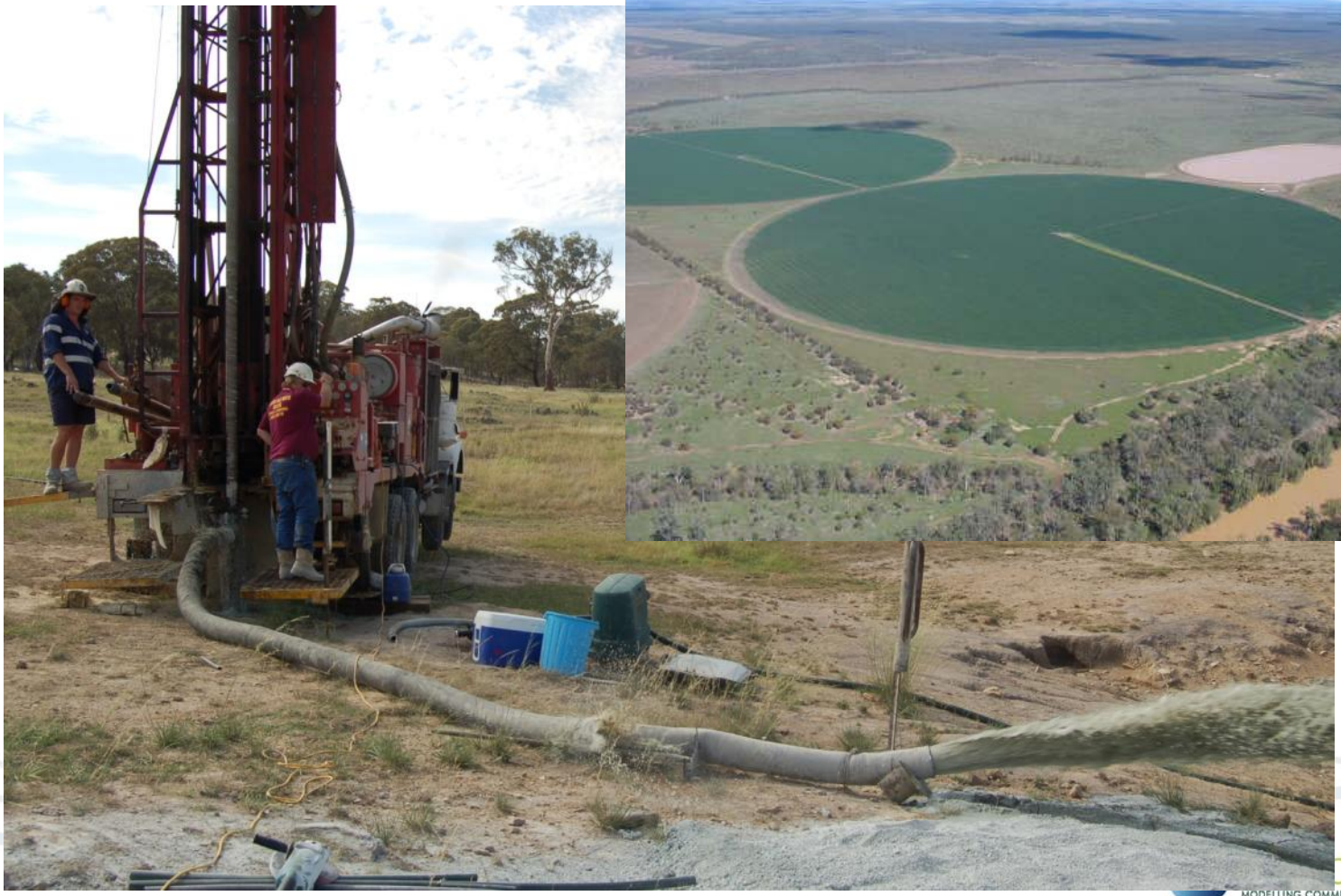
为什么需要新的模型能力？

- Higher expectations for Integrated Water Resources Management Policy and Governance 不断增长的对水资源综合管理的政策和监管的需求
- Greater focus on water use efficiency (eg. tradable rights, growing cities and virtual transfers, environmental water) 注意力转移到用水效率上(水交易权力，增大的城市和增多的输送，环境用水)
- Growing need to address Ecological outcomes and Climate uncertainty 不断增长的解决生态结果和气候不确定性的需求
- Available models could not deal with the complexity 现有的模型无法处理上述问题的复杂性

……rural and urban trading
农村地区和城市的水权交易



Conjunctive surface and ground-water use
一体的地下水和地表水利用



Increased demand for Urban Water use/reuse
不断增加的城市用水和水再利用需求

A Nationally consistent framework was needed, integrating:
需要一个全国一致的水资源分配框架，整合：

- Quantity and Quality 水质和水量
- Urban, rural and environmental needs 城市，乡村和环境用水
- Conjunctive surface and groundwater use 地下水和地表水
- Water use and reuse 水的利用和回用
- Both planning and operational requirements 兼顾计划和运行
- Trading of Entitlements and Allocations 对水分配权进行交易

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Integrated modelling system (IMS) for rural and urban water management

农村和城市水管理的综合模拟系统（IMS）

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Integrated modelling system (IMS) for rural and urban water management 农村和城市水管理的综合模拟系统（IMS）

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High level capability 高水平模拟能力

- 'Catchment to Estuary' modelling functionality 流域到入海口的模拟功能
- Hydrology and Constituent generation (sediment, pollutants) 径流和悬浮物(泥沙，养分，污染物)的形成
- Transport through regulated and unregulated systems 在有管理和无管理河流系统中流动和输送
- Representation of Rural and Urban areas (including new infrastructure eg. recycling, desalination) 能够模拟农业地区和城市环境(包括新基础设施，水循环和回收，海水净化)
- Open framework with easy 'plug-in' of other models 开放式平台环境，非常容易和其他模型连接
- Combining the various strands of eWater product development to enable whole of system analysis 和其他eWater工具模型结合，能够对进行整个系统分析

Flexible Structure – User defined model components

灵活的结构——用户定义

Catchment Filter Models

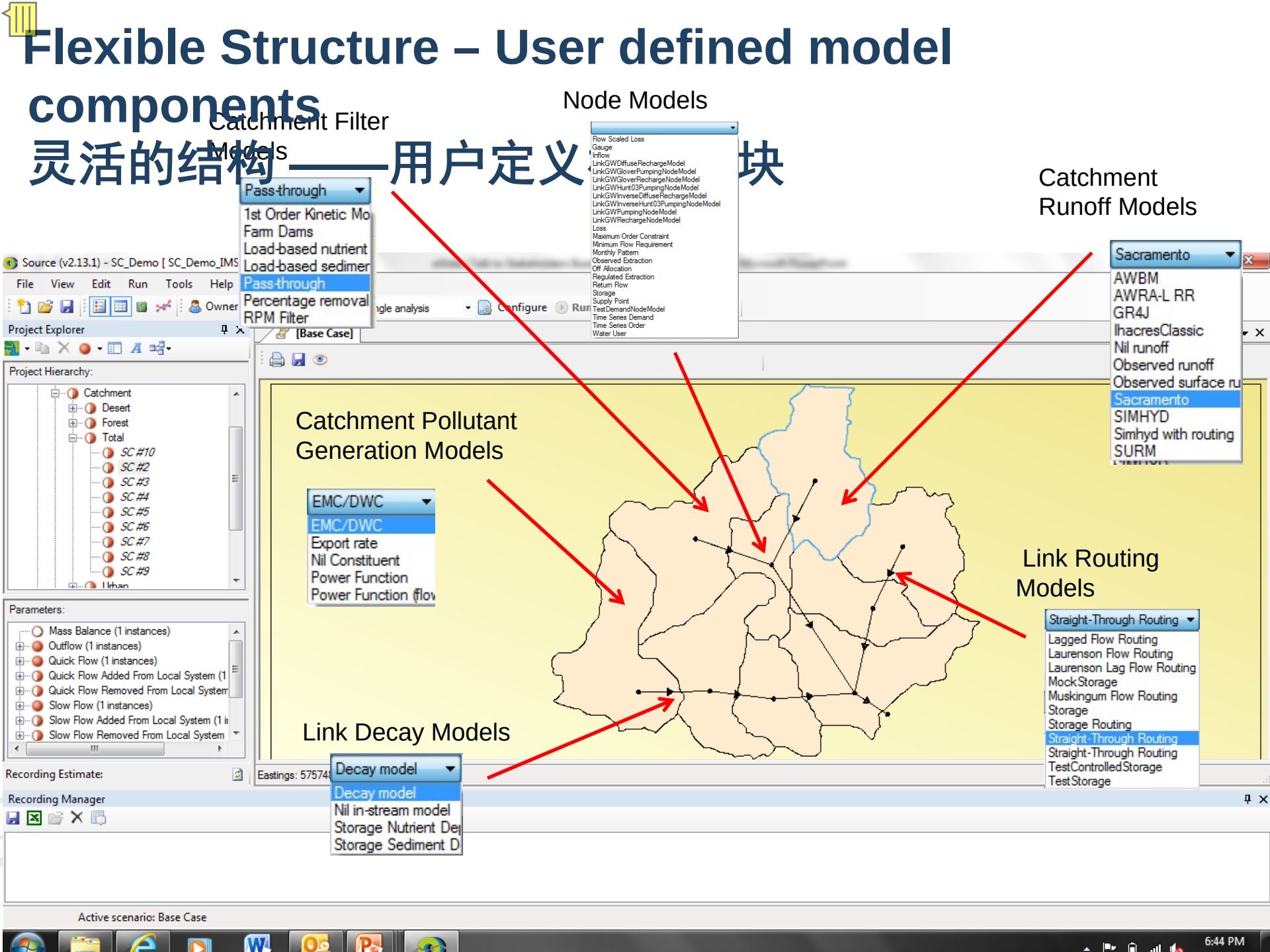
Node Models

Catchment Runoff Models

Catchment Pollutant Generation Models

Link Routing Models

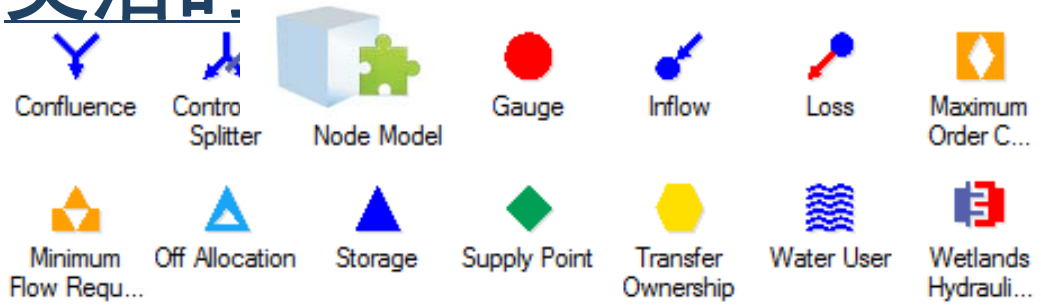
Link Decay Models

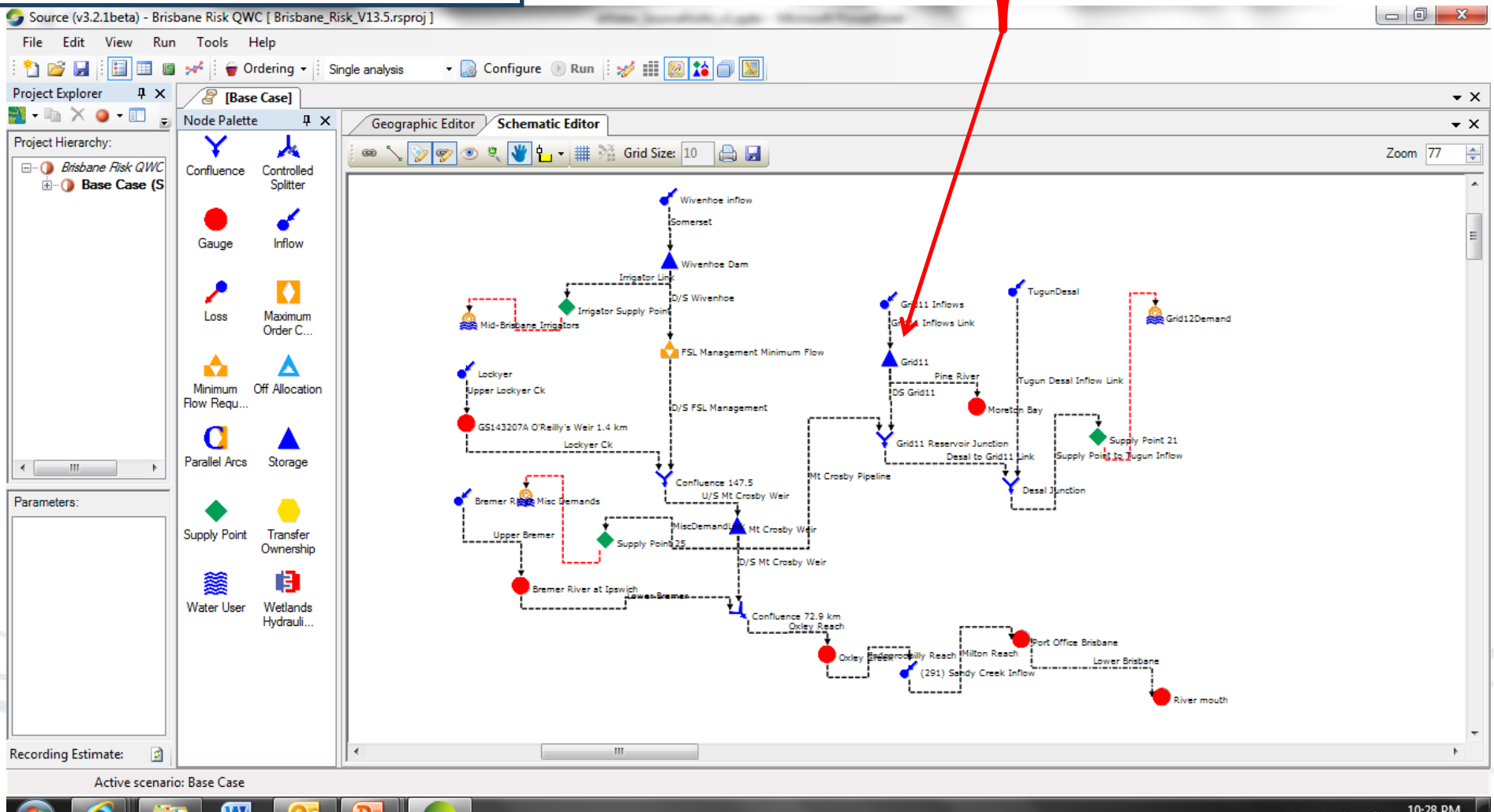


Flexible Structure 灵活的结构

Nodes representing management functions, structures, points of interest

节点代表着管理功能、管理结构和利益关系要点





Options f… 源模型的…

1. Expressi…

Powerful met…

2…

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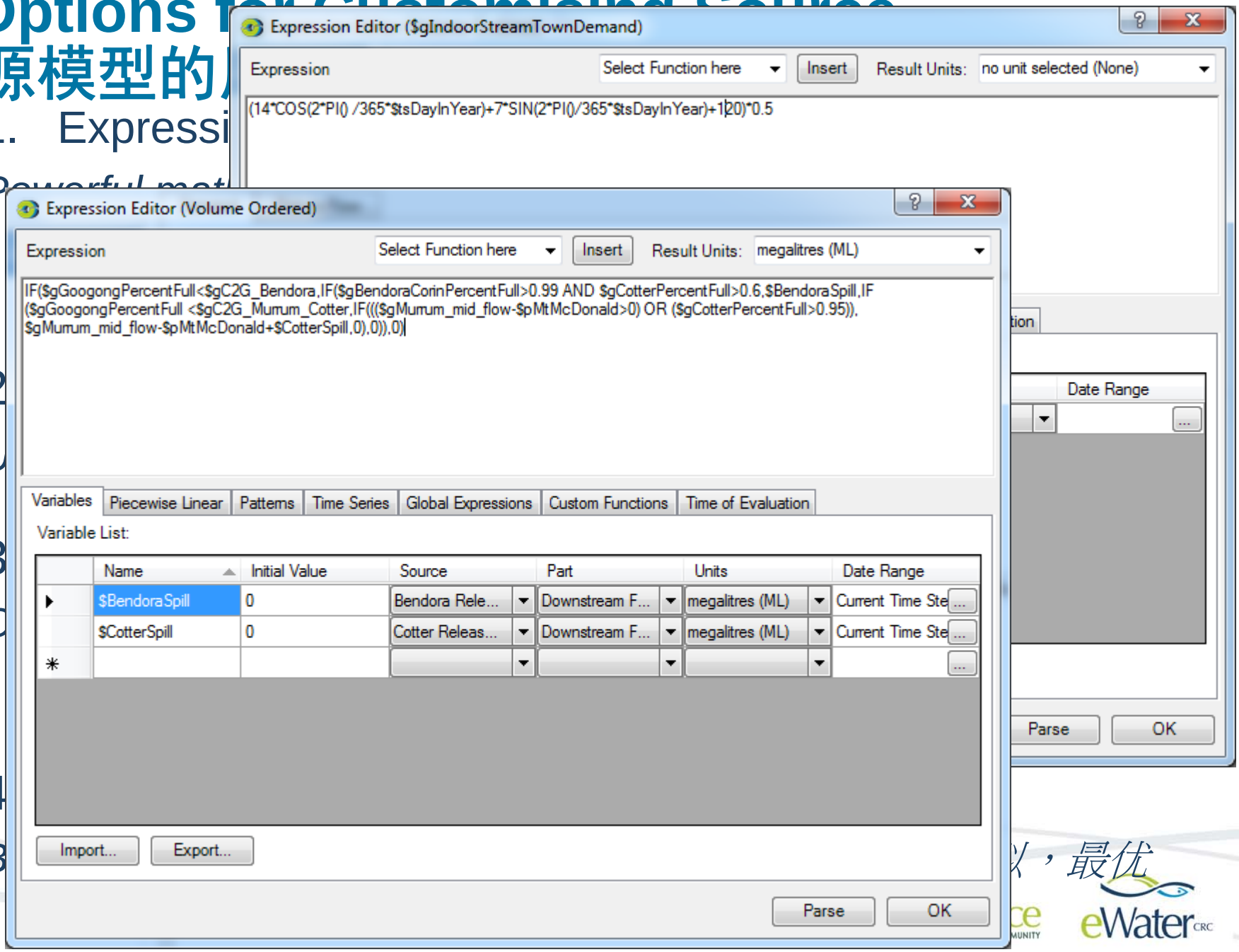

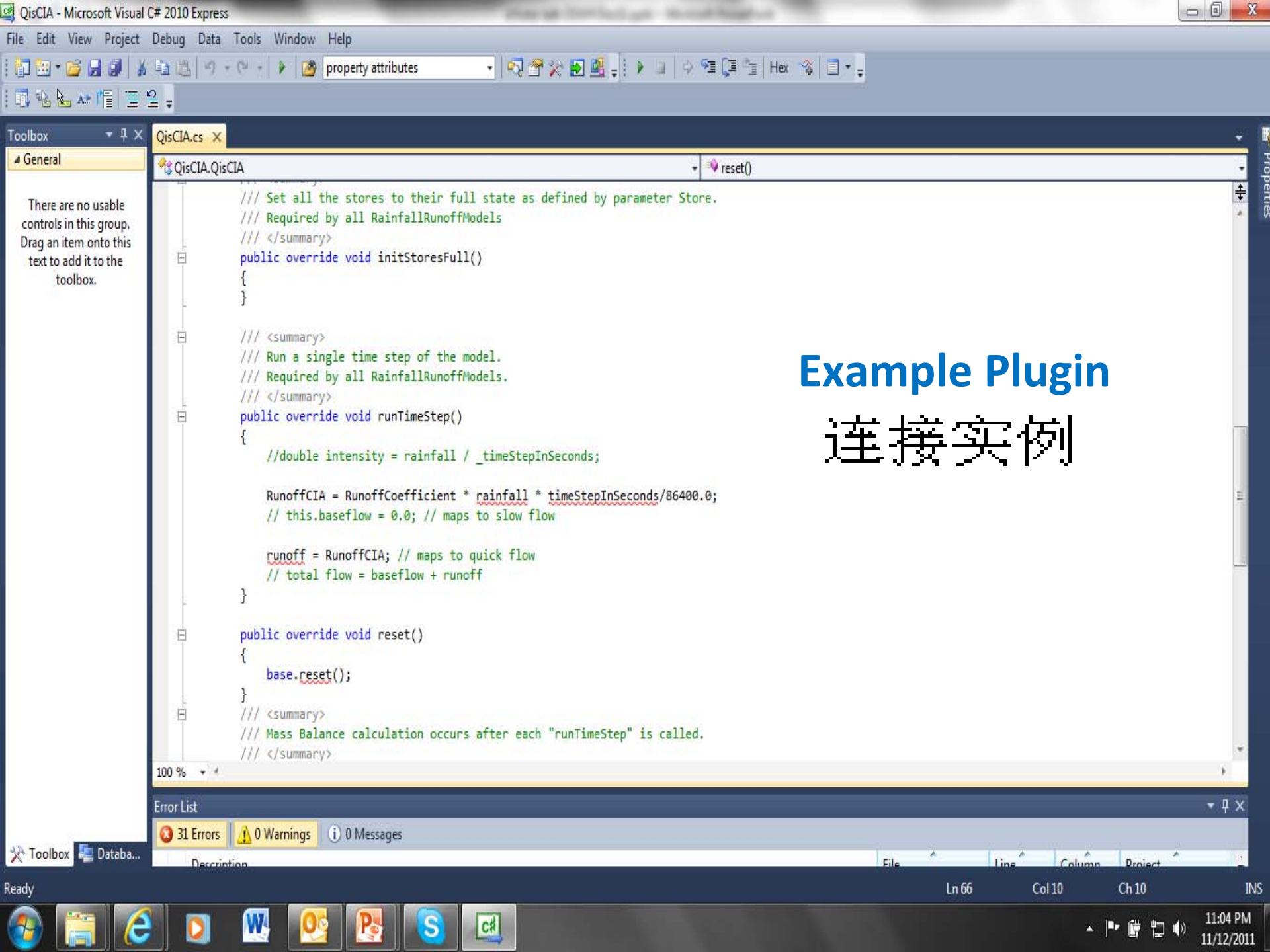

Example Plugin

连接实例

Groundwater Interaction module 地下水互动模块

- **Developed to assess Surface groundwater interactions in a river reach** 为评估一段河流地表水和地下水的互动情况而开发

- **Determines the exchange flux between the underlying aquifer and the river 决定下**层含水层和河流之间的交换通量

Processes: 过程

- **Pumping from Unconfined Aquifer 从非承**压含水层泵水
- **Pumping from Semi-Confined Aquifer 从半承**压含水层泵水
- **Irrigation Recharge 灌**溉回充
- **Diffuse Recharge** 扩散回充

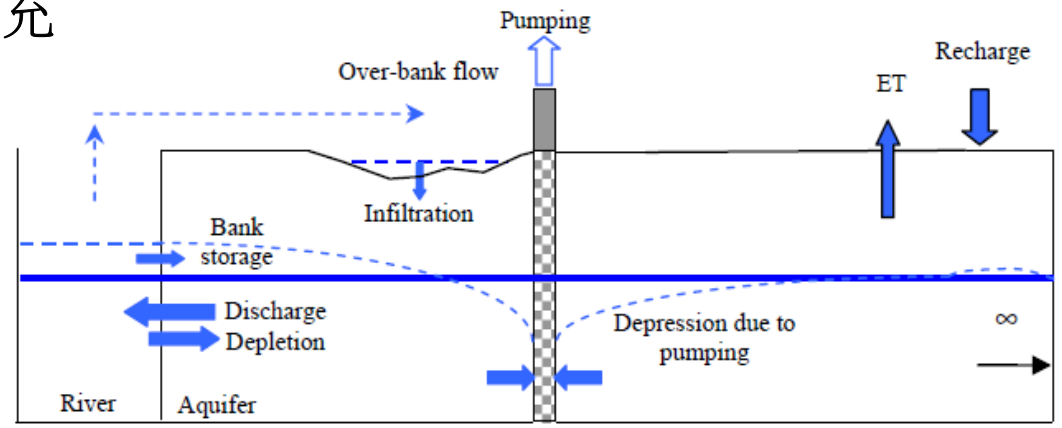

Figure 1. Conceptualisation of the Floodplain Model

Environmental Demand Module
环境水需求模块

- Developed to assess the water demands for environmental assets
  为环境资产评估用水需求
- Demand options can be based on: **用水需求考**虑下面几方面：
  - based on different types of flow characteristics **基于不同河流的特性**
  - multiyear, **多年需求**
  - conditional **条件需求**

You can involve non-hydrologists in the process by developing and testing the environmental demand options. 过程中可以请非水文专业人士加入，确定**并**测试不同的环境水需求。

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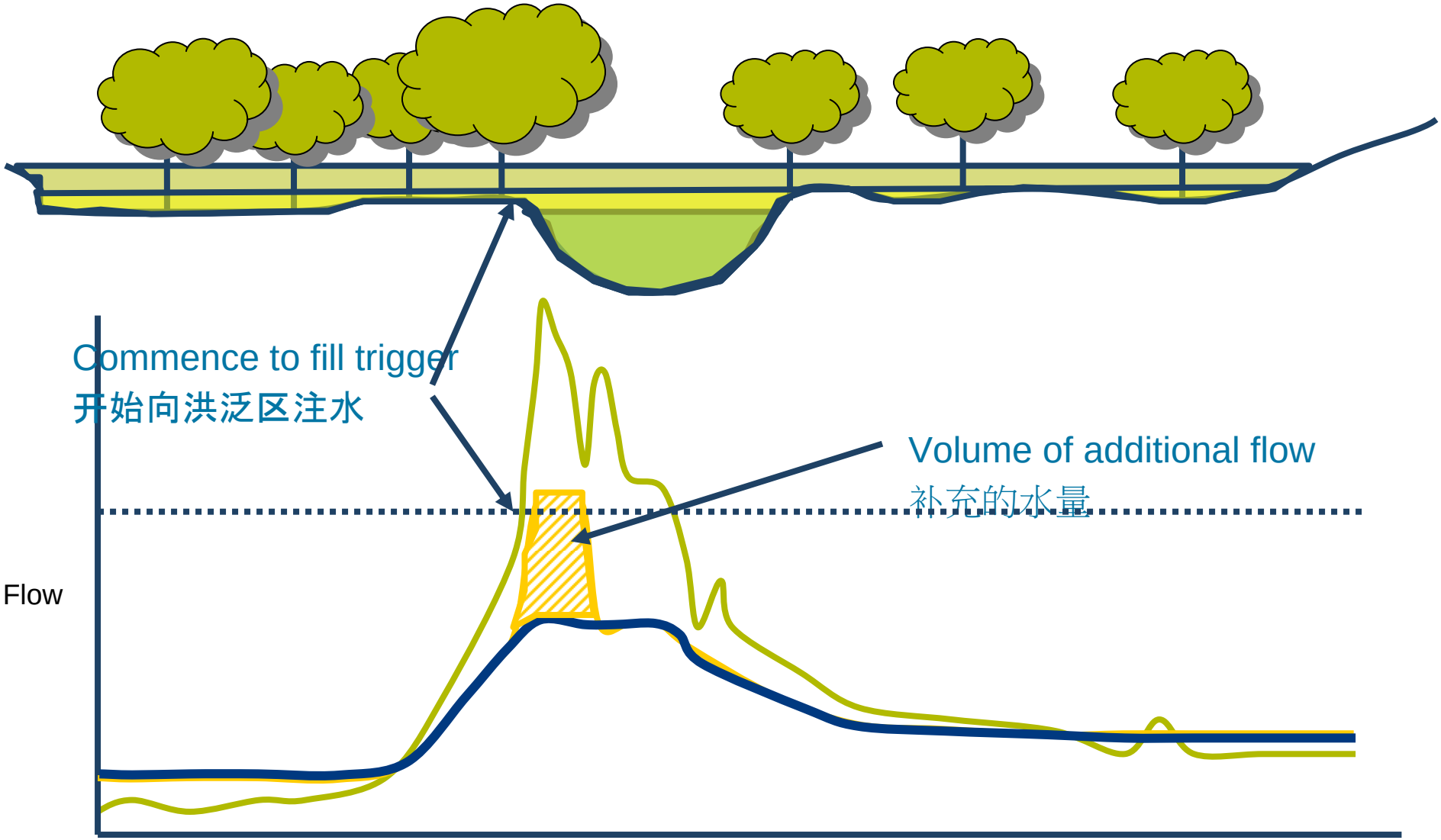


Ecosystem Services Demands 生态系统服务需求

Ecosystem Services Flow pattern rule
生态系统服务流量类型规责

Specify the shape of the flow pattern 细述流量类型曲线形状

Flow pattern rule

Rule description

Rule name: Pattern Rule

Notes:

Dependency: No Rule

Category: default

Set flow rule

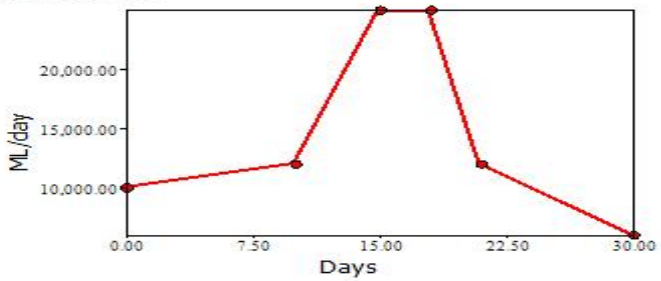
Start day: 01 June

End day: 30 November

Return period: every year

Flow pattern: Edit the flow pattern values in the table below.
Threshold on day 0 defines the start of the event

Days	ML/day
0	10000
10	12000
15	25000
18	25000
21	12000
30	6000



Set flow augmentation strategies

If current < natural: ☑ Use natural frequency

If spell has started: ☐ Extend

If rule not met: ☐ Force after 1 year(s)

When to use this rule

This rule is active when the condition score is below the condition threshold.

Condition threshold: 0

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Decision Support Module – Insight
决策支持模块——洞察力

- To assist managers weigh up and visualise the range of competing objectives and trade offs **帮助管理者**对竞争性用水目标进行可视化评估，取舍得**失**；

- Links advanced decision support capability to eWater models **将先**进的 **决策支持能力和**eWater**模型**结合在一起；

- Allows you to explore thousands of permutations of possible management options best suited to specific management objectives **允**许用户就某个管**理目**标，探索众多可能的管理方案，并选取最佳方案；

- Includes generic capability in multi–objective optimisation, uncertainty, risk and multi-criteria assessment **有**进行多重目标优化、不确定性评价、风险评价和多标准评价的能力。

Software tested across Australia
在全澳洲获得广泛使用的软件

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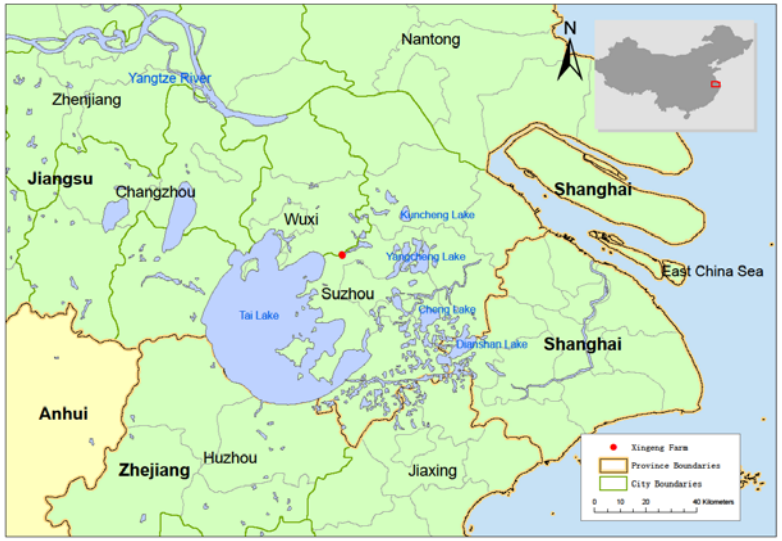
Nutrient Management - Lake Tai, China
营养污染物管理 – 中国太湖

- Developing policies for the management of point and non point source pollution in the Lake Tai basin 为太湖流域的点源和**面源**污染问题，发展并建议管**理政策**



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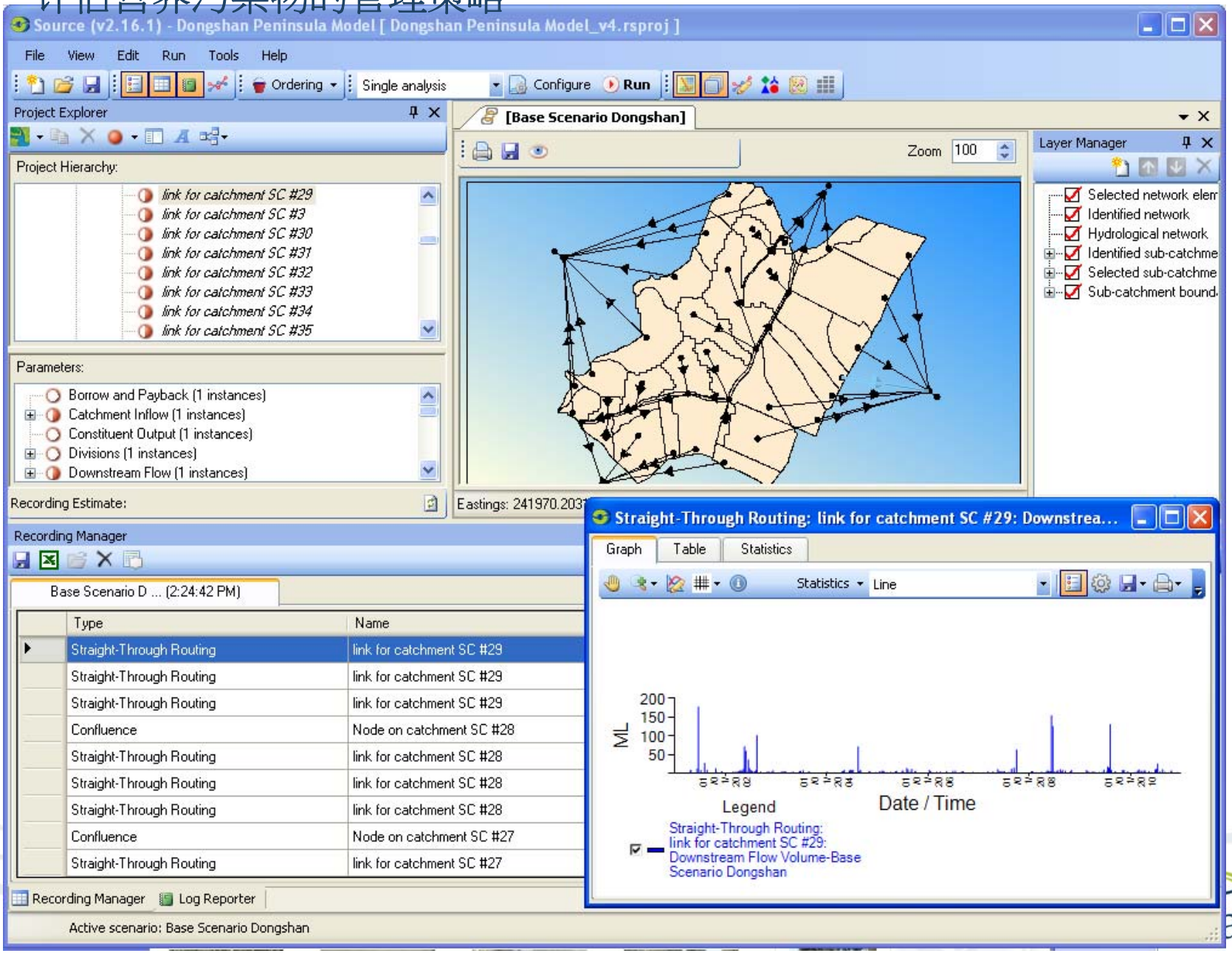
Assessing Alternative Nutrient Management Strategies

评估营养污染物的管理策略



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Making Source widely available through on-line, not for profit modelling community 通过网络使Source模型被更广泛应用，非以盈利为目的，旨在促进建模人员的交流

Communities of Users - Facilitating an active network of organisations, water professionals, researchers and students 使用者社群 -- 形成一个由各种组织、水专业人员、研究者和学生活跃参与的网络

Supporting on-going development and sharing of Source 支持源模型进一步的、持续的发展和分享

Providing user support, training and accreditation 为用户提供技术支持、培训和认证

Promoting best practice modelling approaches and techniques 促进最佳实践模型方法和技术的应用。

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Thank you for your attention

谢谢!

An Australian Government Initiative

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