



Use of models to inform integrated assessments and planning in the Murray- Darling Basin

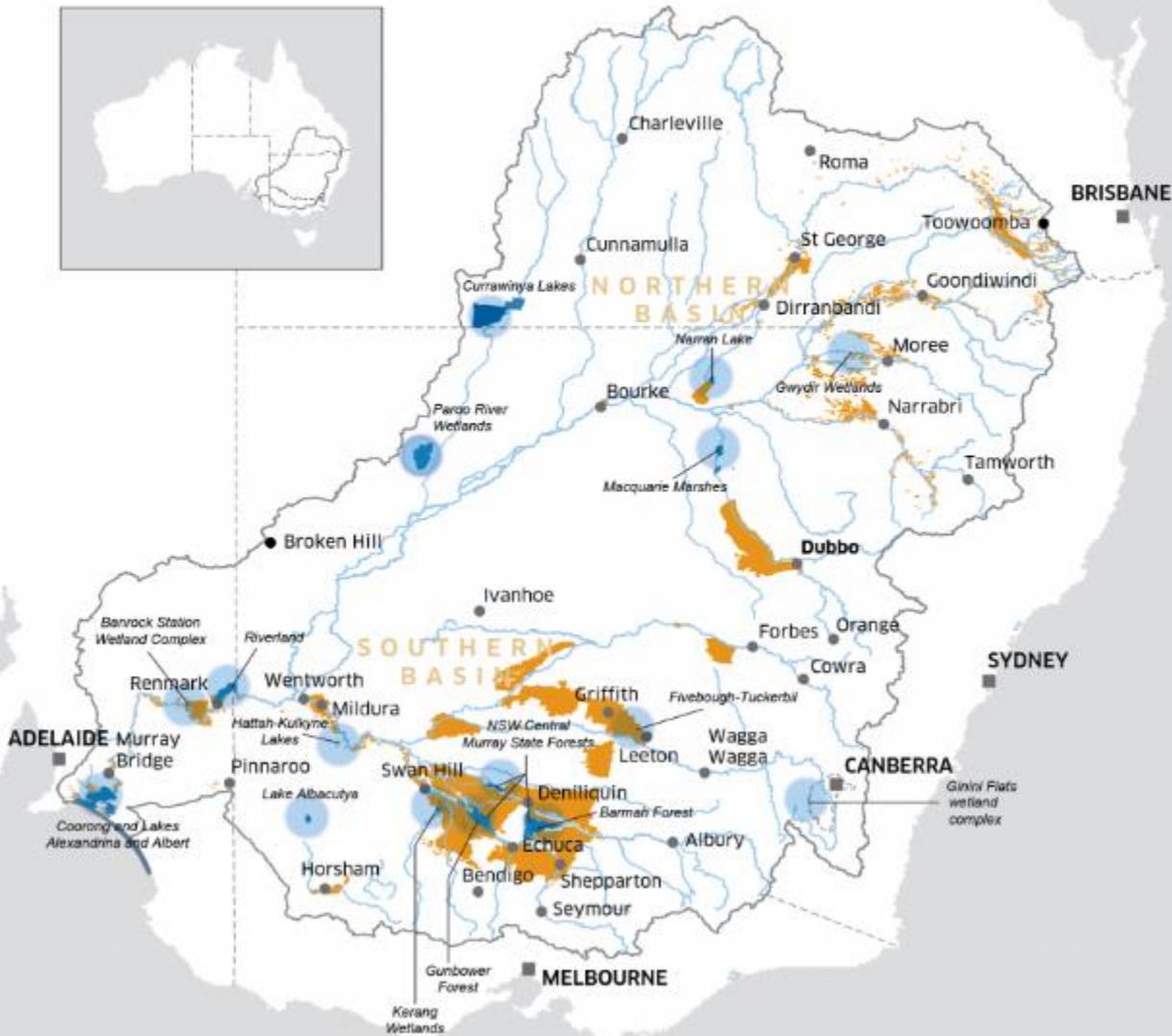
Dr Geoffrey Adams

A decorative graphic at the bottom of the slide consisting of several overlapping, wavy blue lines that create a sense of movement and depth.

Why model the water resources in a river system?

We don't do water policy without modelling it first!

Consider Australia's River Murray



Water use in the 1,000,000 square km Murray-Darling Basin

MDB average long-term annual inflow and water use

Surface water GL

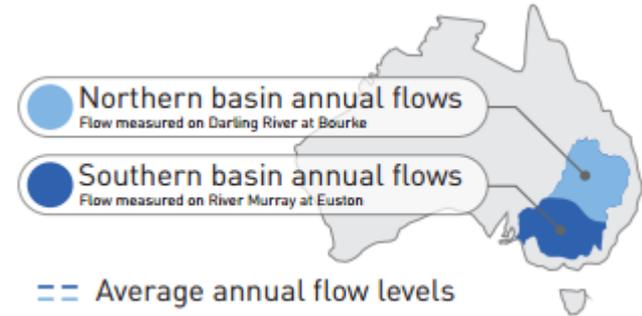
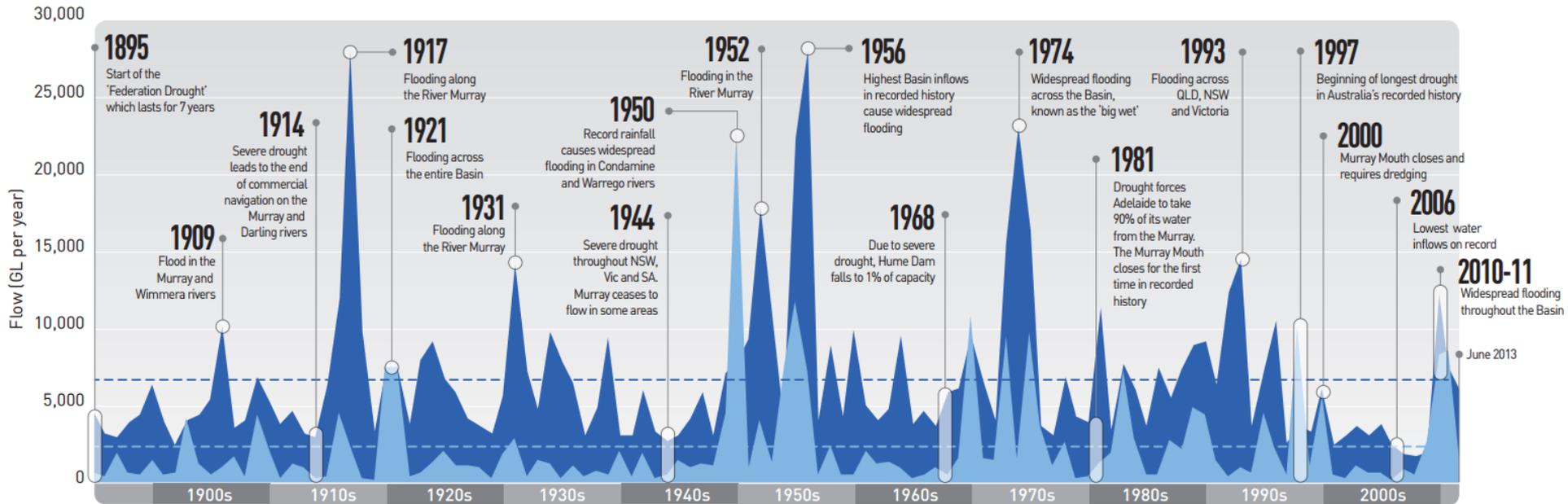
Inflows

Inflows to the Basin	31,599 GL/year	31.6 km ³ /year
Transfer into the Basin	954 GL/year	1.0 km ³ /year
Total	32,553 GL/year	32.6 km ³ /year

Water Use

Watercourse diversions	10,903 GL/year	10.9 km ³ /year
Interceptions	2,720 GL/year	2.7 km ³ /year
Water used by the environment & losses	13,788 GL/year	13.8 km ³ /year
Outflows from the Basin	5,142 GL/year	5.1 km ³ /year
Total	32,553 GL/year	32.6 km ³ /year

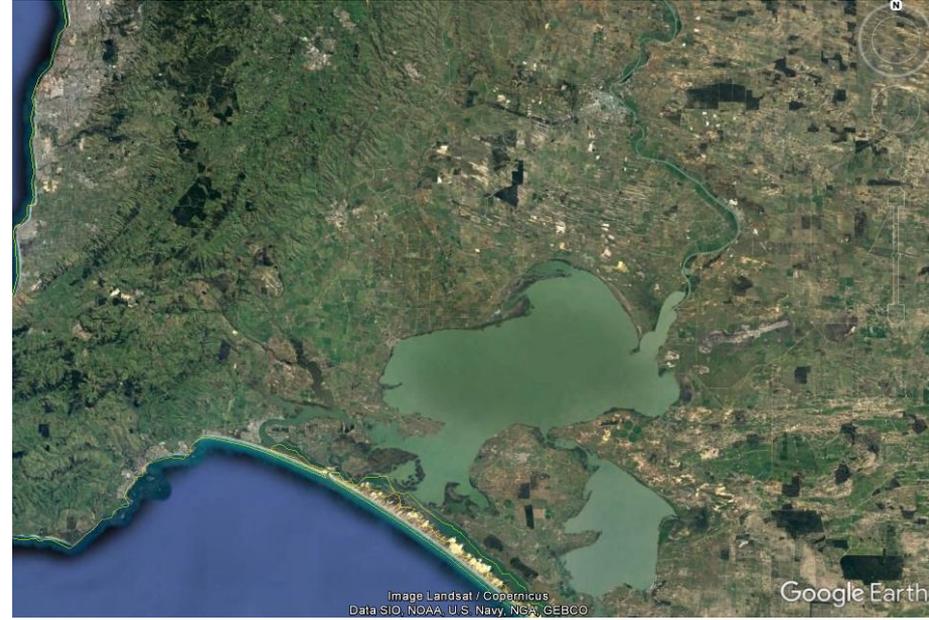
Consider Australia's River Murray



A little history of declining river health:



MDBA.gov.au



SMH.com.au

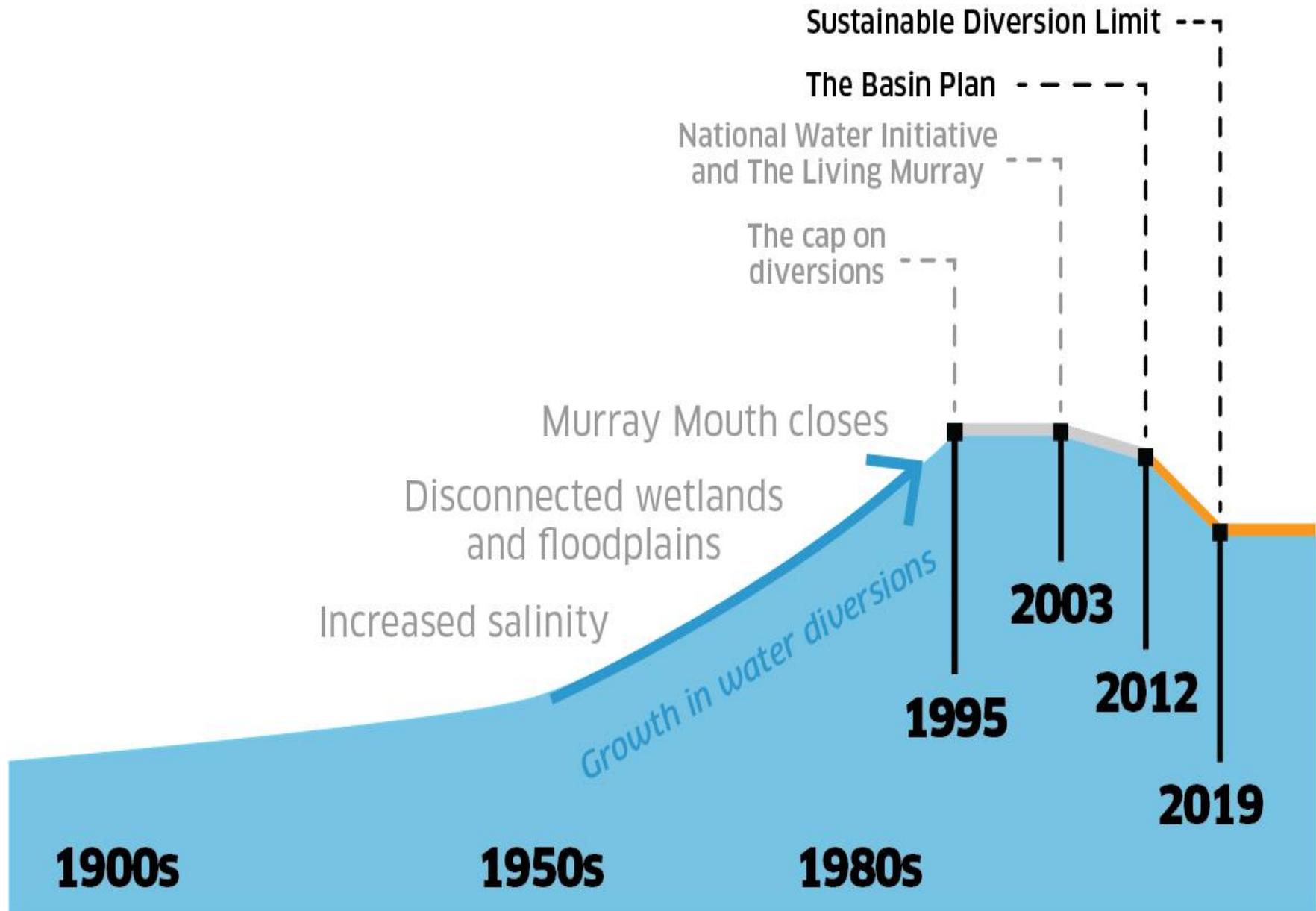


What can the hydrological system model tell us?

We can observe and monitor the current status, but the model helps us understand it,
And then:

Comparing scenarios with baseline conditions ->

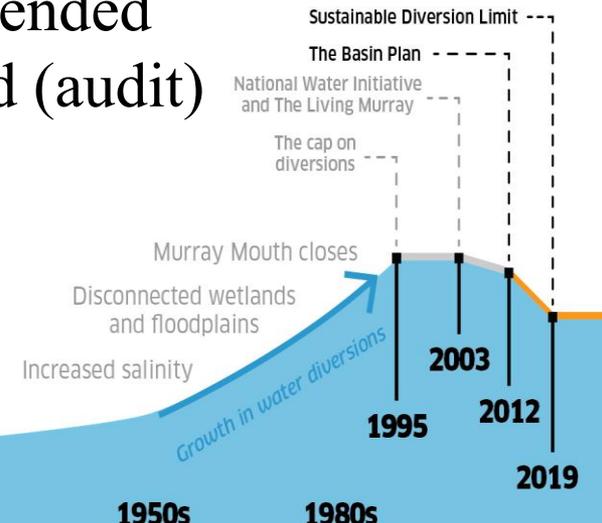
- Primarily statistics on water supply-see later
- Data on agricultural production
- Changes in expected flood behaviour
- Hydro generation
- Broad sediment behavior
- Supplies to environmental assets
- In Myanmar, navigation



What do we use the model for?

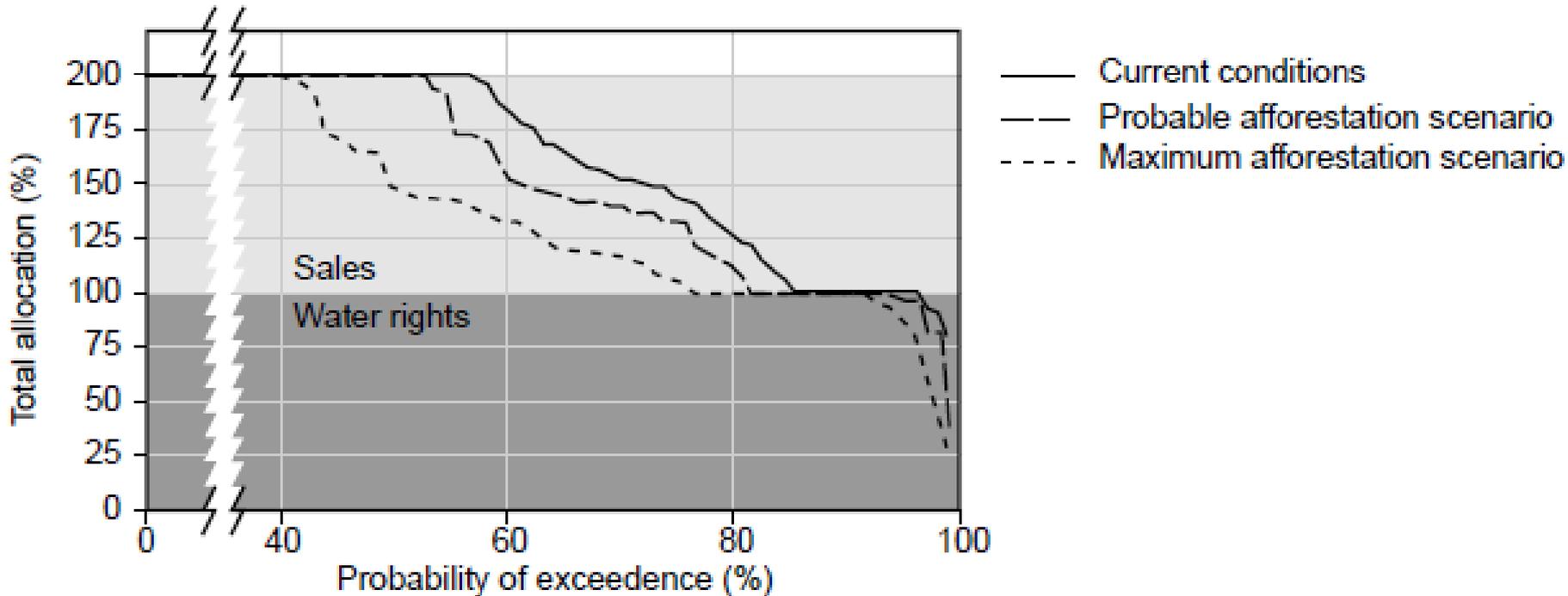
Different modes of use:

- Planning
 - Inform development of water sharing plans
 - Trade off analysis
 - Policy analysis
- Review
 - Is the water sharing plan working as intended
 - Is the water sharing plan being followed (audit)



What does the model tell us?

For water sharing plans we want to know reliability of supply:



Zhang L, Dowling T, Hocking M, Morris J, Adams G, Hickel K, Best A, Vertessy R., 2003. Modelling the effects of large-scale plantation on streamflow and water allocation: A case study for the Goulburn-Broken catchments. In: D.A. Post (Editor), MODSIM 2003, International Congress on Modelling and Simulation. Modelling and Simulation Society of Australia and New Zealand Inc, Jupiters Hotel and Casino, Townsville, Australia, pp. 702-707.

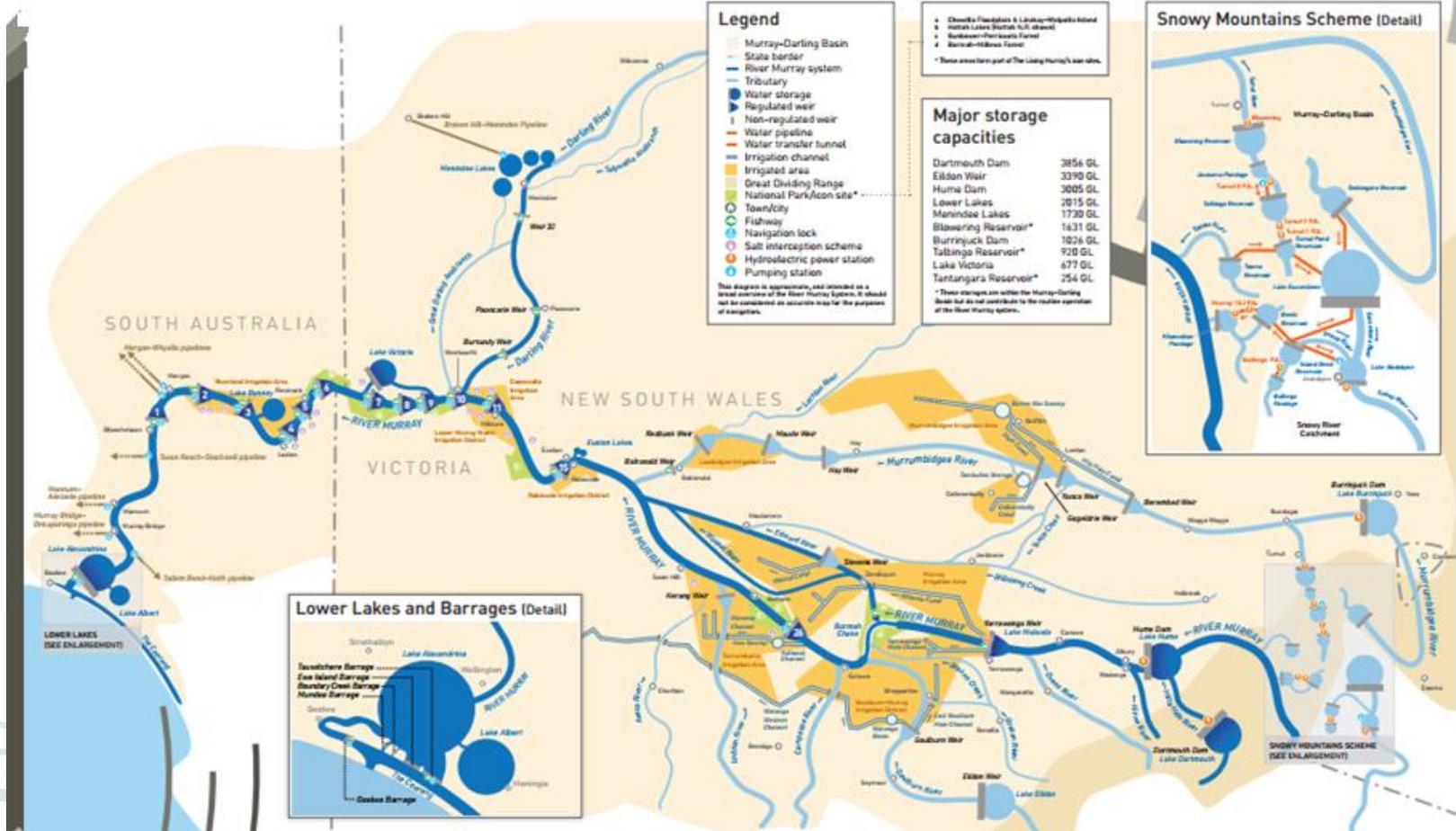
What does a model look like?

River Murray System

Sharing the water resources of the River Murray



www.mdba.gov.au



The Murray Model

Inflow and Storage



MDBA.gov.au

Storage Information

Dartmouth Dam (401224) Editor

Storage

- Operating Targets
- Dimensions
 - Static Storage Dimensions
 - Gauged Level
- Gauged Releases
- Outlets
 - Default Link #40
 - Dartmouth Spillway
 - Lower Valve
 - Upper Valve
- Rainfall
- Evaporation
- Seepage
- Ordering
- Upstream Reach
- Ownership

General

Hydropower generation: Don't generate from spill

Storage Details

	Level	Volume	Surface Area
Full Supply	485.996 m	3856000 ML	65.878 km ²
Initial Conditions	483.137 m	3671000 ML	63.625 km ²
Dead Storage Capacity	365.1 m	71236.98 ML	5.036 km ²
Node elevation	0 m		

Modelling crop water use, and production

NSW IIRRI MIL Mulwala Editor

The screenshot displays the NSW IIRRI MIL Mulwala Editor interface. On the left is a navigation tree with the following items: Water user, Demand Models, Irrigator #0, Ordering Configuration, Evapotranspiration, Rainfall, Fallow, Rice (selected), Planting Decision, Minimum Pond Level, Runoff, Deep Percolation, Economics, Winter Crop, and Summer Crop. The main area is divided into three sections: General Configuration, Soil Configuration, and Crop Factors.

General Configuration

Crop	Rice
Crop Type	Annual
Planting Window	15 d
Planting Margin	1 d

Soil Configuration

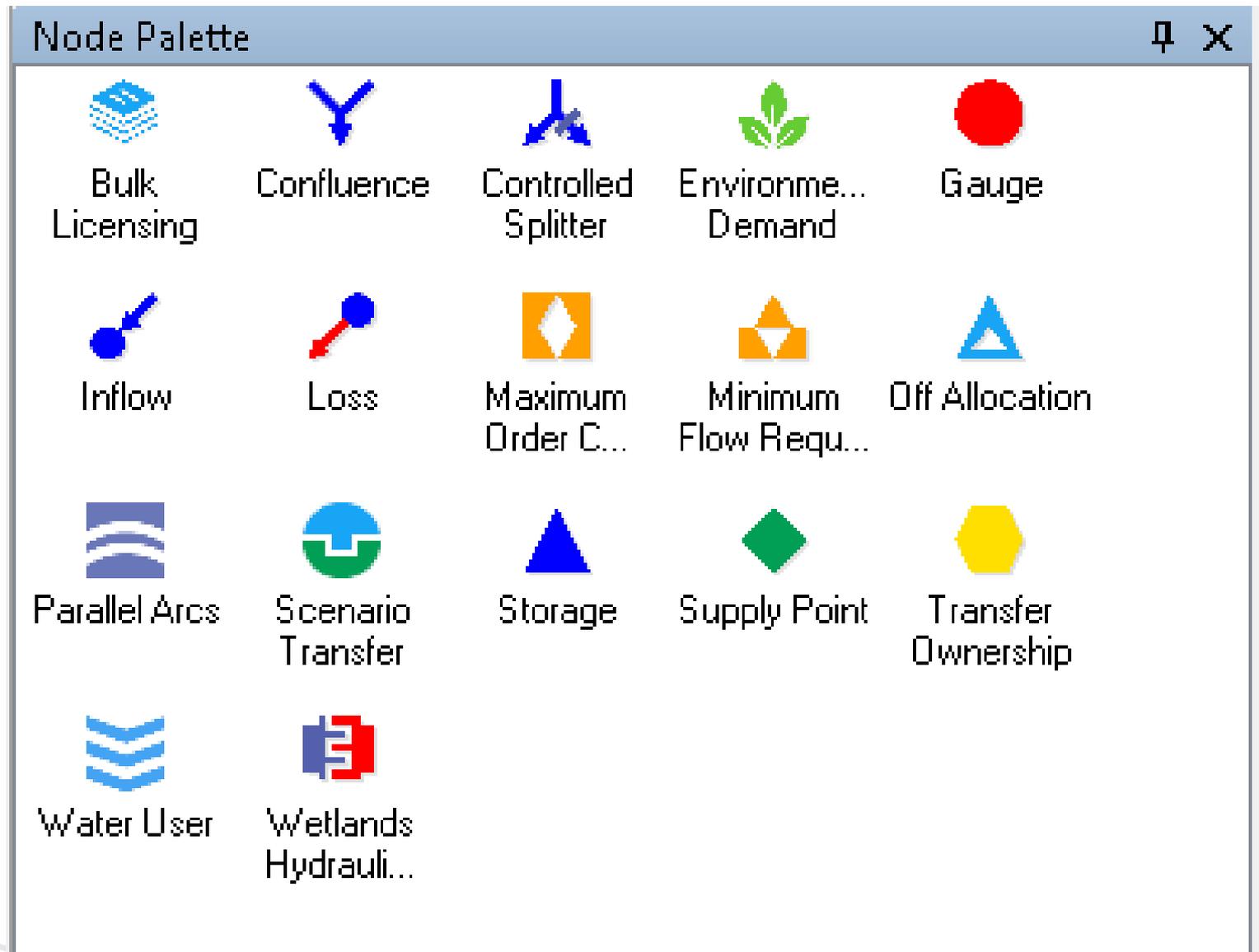
Depth of Root Zone	600 mm
Depletion Factor	50 %
Initial Depletion	0 mm
Fallow Factor	0

Crop Factors

10			
8			
6			
4			

Many node types

Node Palette

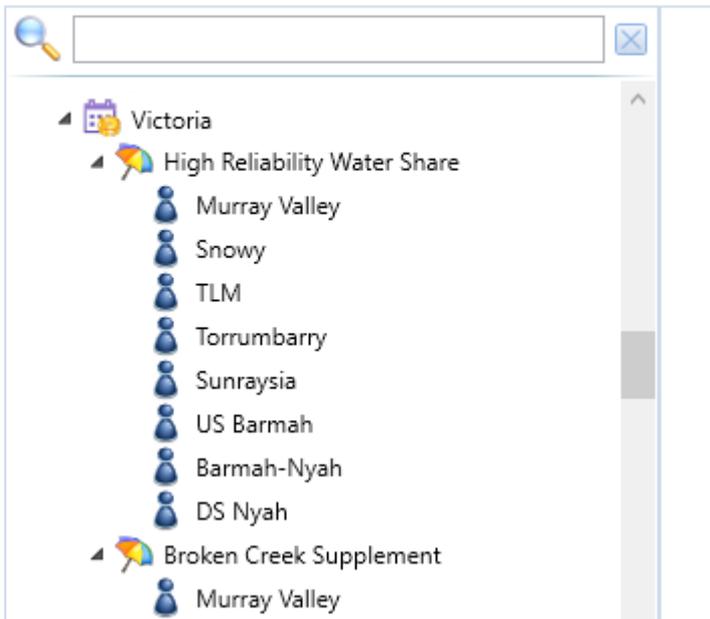


The Node Palette window displays 20 different node types arranged in a 4x5 grid. Each node is represented by a unique icon and a text label. The icons include: a stack of blue books for Bulk Licensing; a blue Y-junction for Confluence; a blue T-junction with a gear for Controlled Splitter; a green leaf for Environment... Demand; a red circle for Gauge; a blue key for Inflow; a red key for Loss; an orange diamond with a white center for Maximum Order C...; an orange triangle with a white center for Minimum Flow Requ...; a blue triangle for Off Allocation; a blue wavy line for Parallel Arcs; a green circle with a white center for Scenario Transfer; a blue triangle for Storage; a green diamond for Supply Point; a yellow hexagon for Transfer Ownership; blue wavy lines for Water User; and a blue and red structure for Wetlands Hydraul...

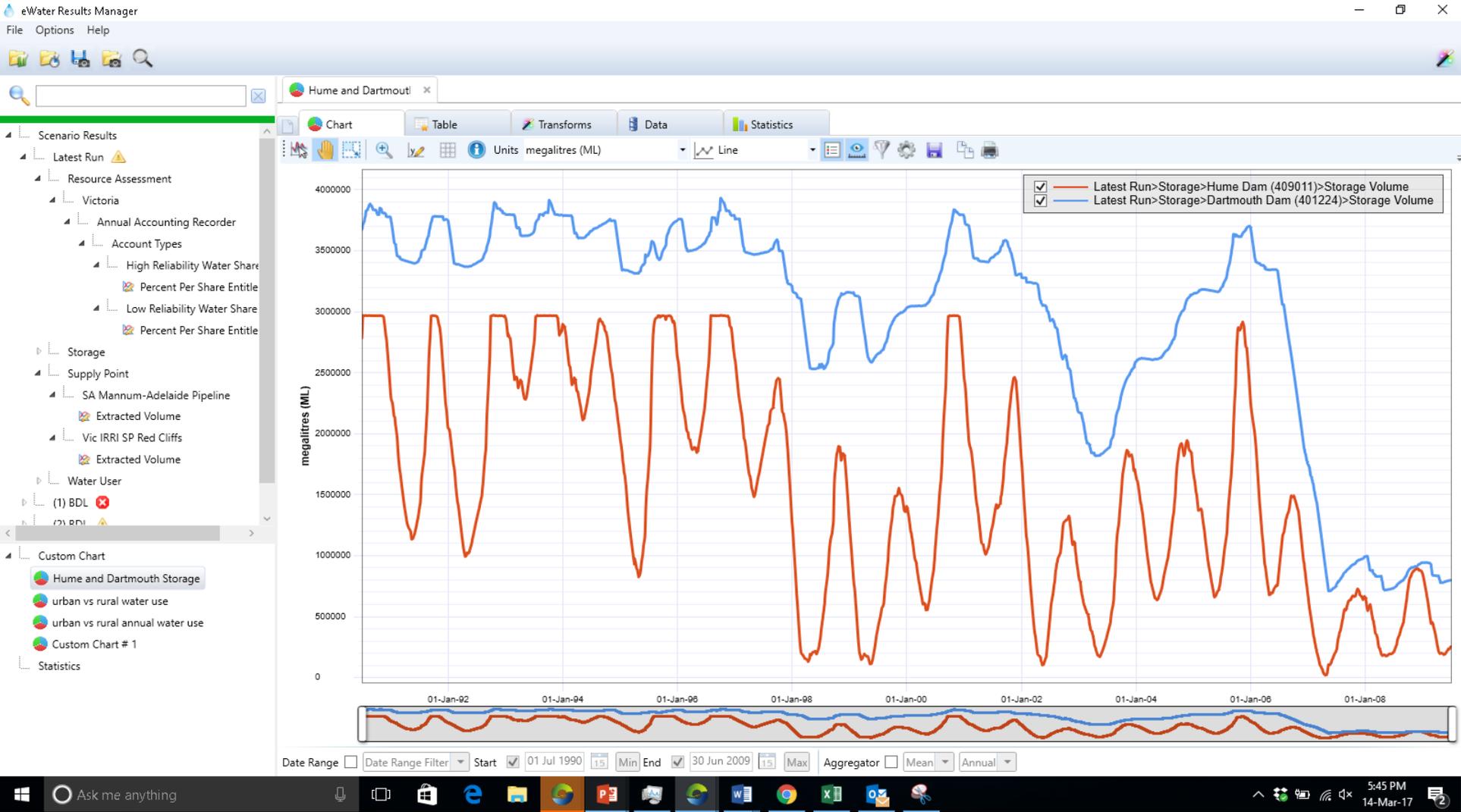
				
Bulk Licensing	Confluence	Controlled Splitter	Environment... Demand	Gauge
				
Inflow	Loss	Maximum Order C...	Minimum Flow Requ...	Off Allocation
				
Parallel Arcs	Scenario Transfer	Storage	Supply Point	Transfer Ownership
				
Water User	Wetlands Hydraul...			

Water assessment and accounting

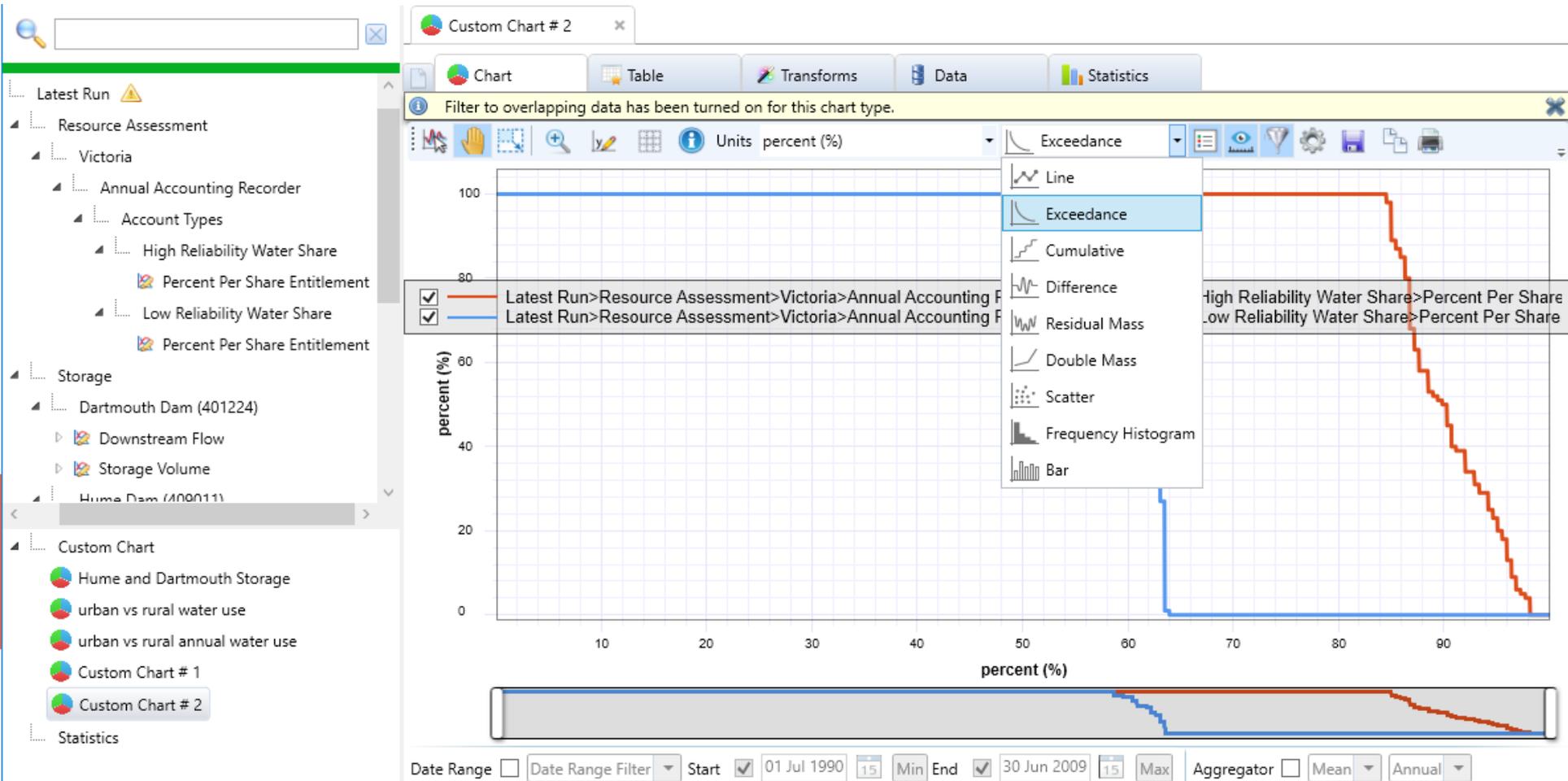
Resource Assessment Explorer



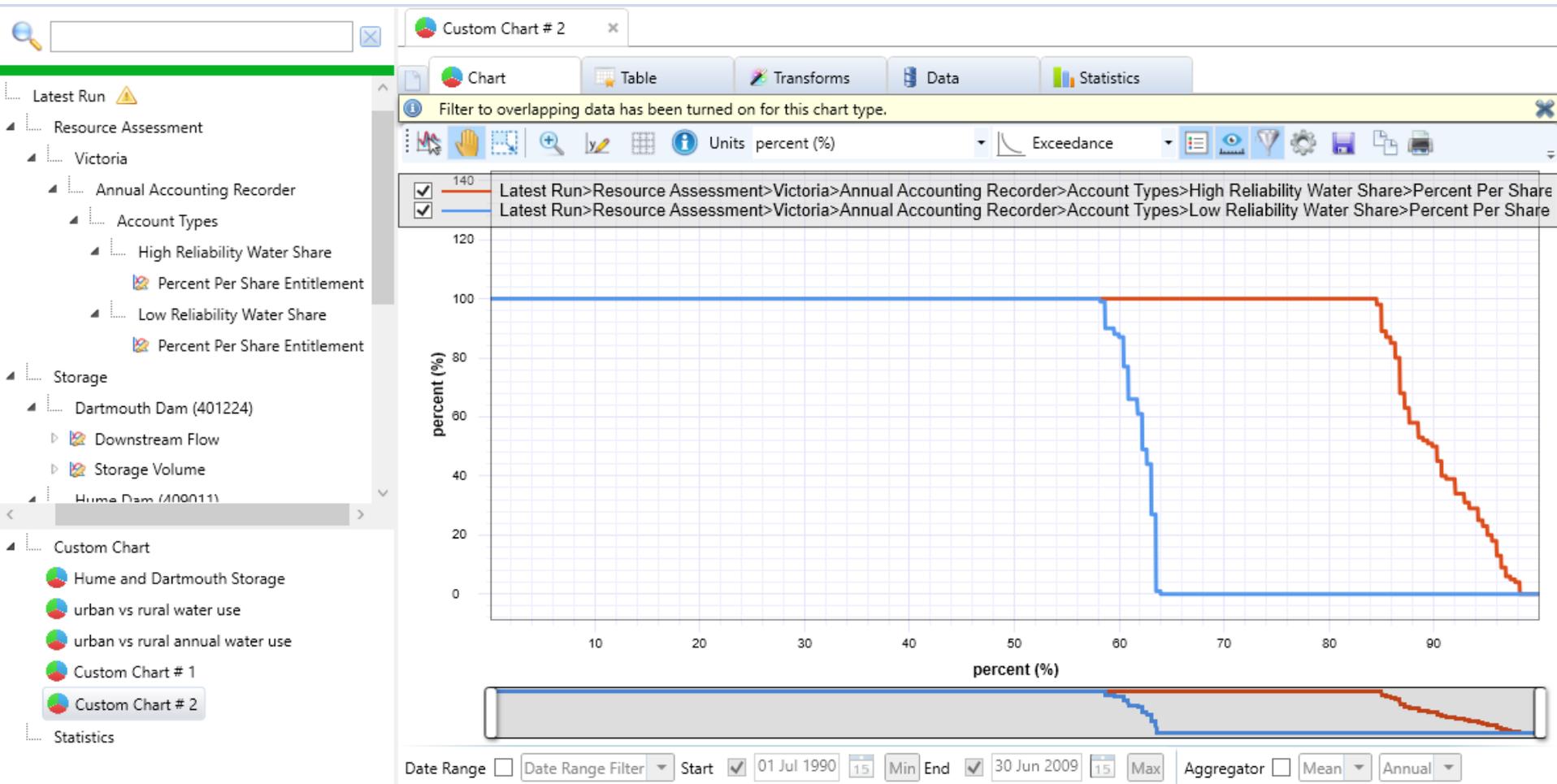
Output



Output



Output



In conclusion, what can we use the model for?

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