

Wetlands

A wetland is represented in Source as a complex hydrological unit that allows bidirectional flow between a water source and a water body or storage. Wetlands may have ecological, recreational, cultural or consumptive requirements and, thus, behave in a similar way to some functions of the Water User node. In some systems, wetlands consist of several storages that are connected using wetland links. In others, a wetland can connect directly to a main river channel.

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Cells model

Source uses a cells model that represents each wetland as a wetland cluster, that is, a number of storage cells with the movement of water between them described by a set of functions and boundary conditions.

In Source, a **wetland cluster** consists of one (or more) Storage nodes connected by Wetland links to each other or to Wetlands Hydraulic Connector nodes. The hydraulic components of elements within a wetland cluster interact with each other.

Cells are wetland compartments in which water can be stored. They have a relationship between water surface elevation (reduced level) and surface area that represents the spatial distribution of water in a wetland. In Source, a cell is represented by a **wetland Storage node**, that is, a Storage node that is connected to at least one Wetland link.

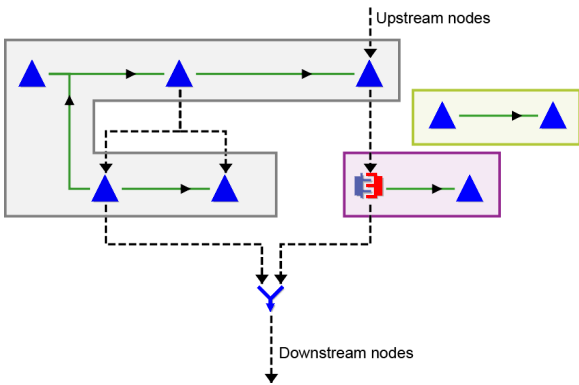
Boundary conditions are points at which water can flow in to or out of the wetland cluster. In Source, boundary conditions occur either at a Wetlands Hydraulic Connector node or at any wetland Storage node with at least one standard inlet or outlet connection.

Figure 1 illustrates some types of wetland that may be represented in Source by nodes in a wetland cluster:

- A wetland without river flow (green box). Examples include upland swamps, or spring fed wetlands on a floodplain.
- A wetland with a single water body (purple box). Examples include billabongs and oxbow lakes.
- A complex wetland with multiple water bodies (grey box). There are multiple paths of river flow through this type of wetland. Examples include the Macquarie Marshes, Hattah Lakes and Menindee Lakes.

Boundary conditions in the Source model shown in Figure 1 occur whenever the clusters (boxes) intersect with a non-Wetland link (dashed line).

Figure 1. Example wetland clusters



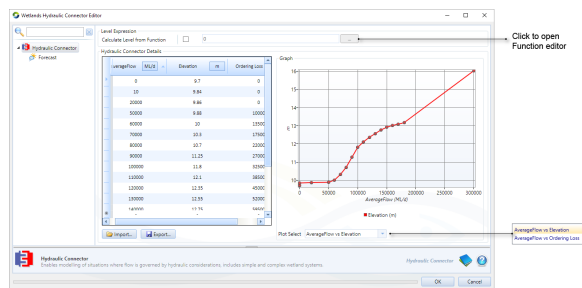
For further information on the Cells model and its use in Wetlands, refer to [Wetlands SRG](#).

Wetlands Hydraulic Connector node

The Wetlands Hydraulic Connector node connects wetlands directly to the main river network (ie. not at a storage), and is used when the flow into or out of a wetland link are too small to have an effect on the water surface elevation in the river. This node distributes flows between the main river system and the wetland system. It represents a boundary condition for the connected wetland cluster with a configured relationship between the river's water surface elevation and flow rate (Figure 2). You can import this relationship as a .csv file or enter it manually.

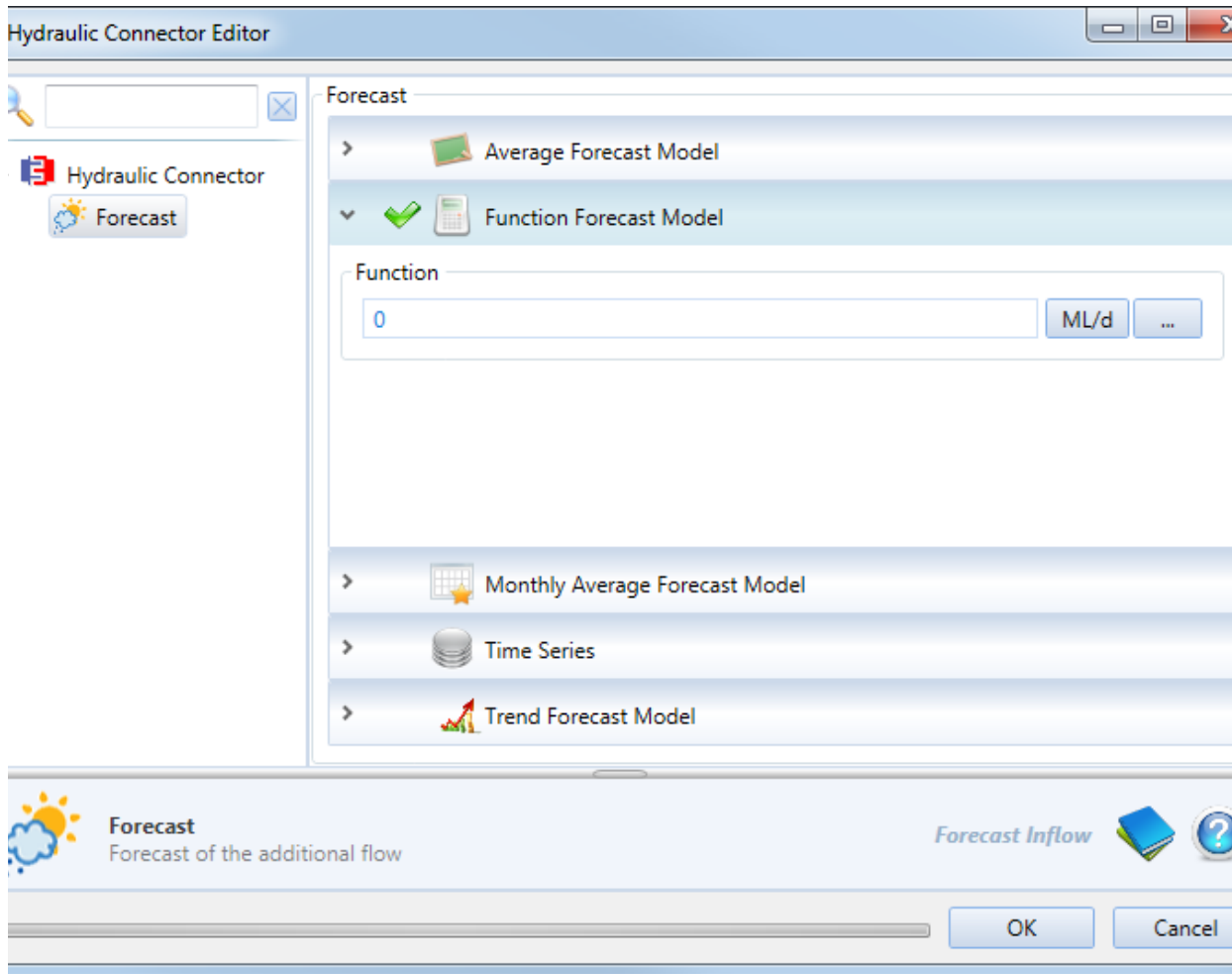


Figure 2. Wetlands Hydraulic Connector node



Just like the [inflow node](#), you can forecast flows in the Wetlands Hydraulic Connector node (Figure 3). In a rules-based ordering system, the forecast, along with the Ordering loss in Hydraulic Connector Details table (Figure 2), calculates the loss of flow to the wetland when orders are passed up through this hydraulic connector. The orders will be increased to ensure orders are satisfied further down the system.

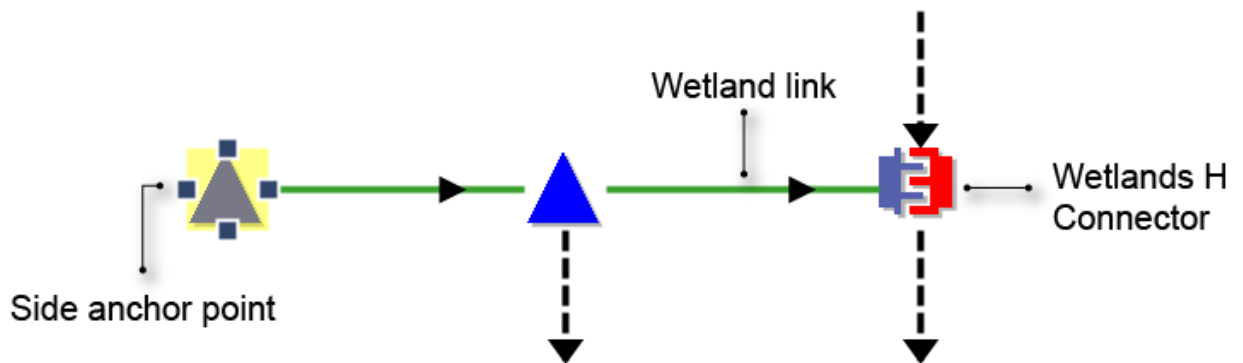
Figure 3. Wetlands Hydraulic Connector node, Forecast



Wetland link

Wetland links use a hydraulic model and are used to connect storages within a wetland, or a wetland to a river. They are represented by a green line with a black arrow, and are created by using the side anchor point from a Storage node or Wetlands Hydraulic Connector node (Figure 4).

Figure 4. Wetland link, Schematic Editor



Note that a conveyance link is the type of wetland link used in Source. The discharge across the link depends on the Modified Conveyance function and the hydraulic head difference between the two ends of the link. The Modified Conveyance is dependent on the hydraulic conveyance and the channel length. The weighting configuration controls the point in the channel at which the hydraulic head difference is applied (see [Wetlands SRG](#)).

Wetland links can be either regulated or unregulated, uni- or bidirectional, and you can configure how the model calculates the water surface elevation (reduced level - RL) used to look up the modified conveyance relationship. Use the Wetland link feature editor to configure each of these parameters.

Configuration

This tab (Figure 5) is used to specify the direction type of flow in the link, weighting, and the Modified Conveyance Relationship.

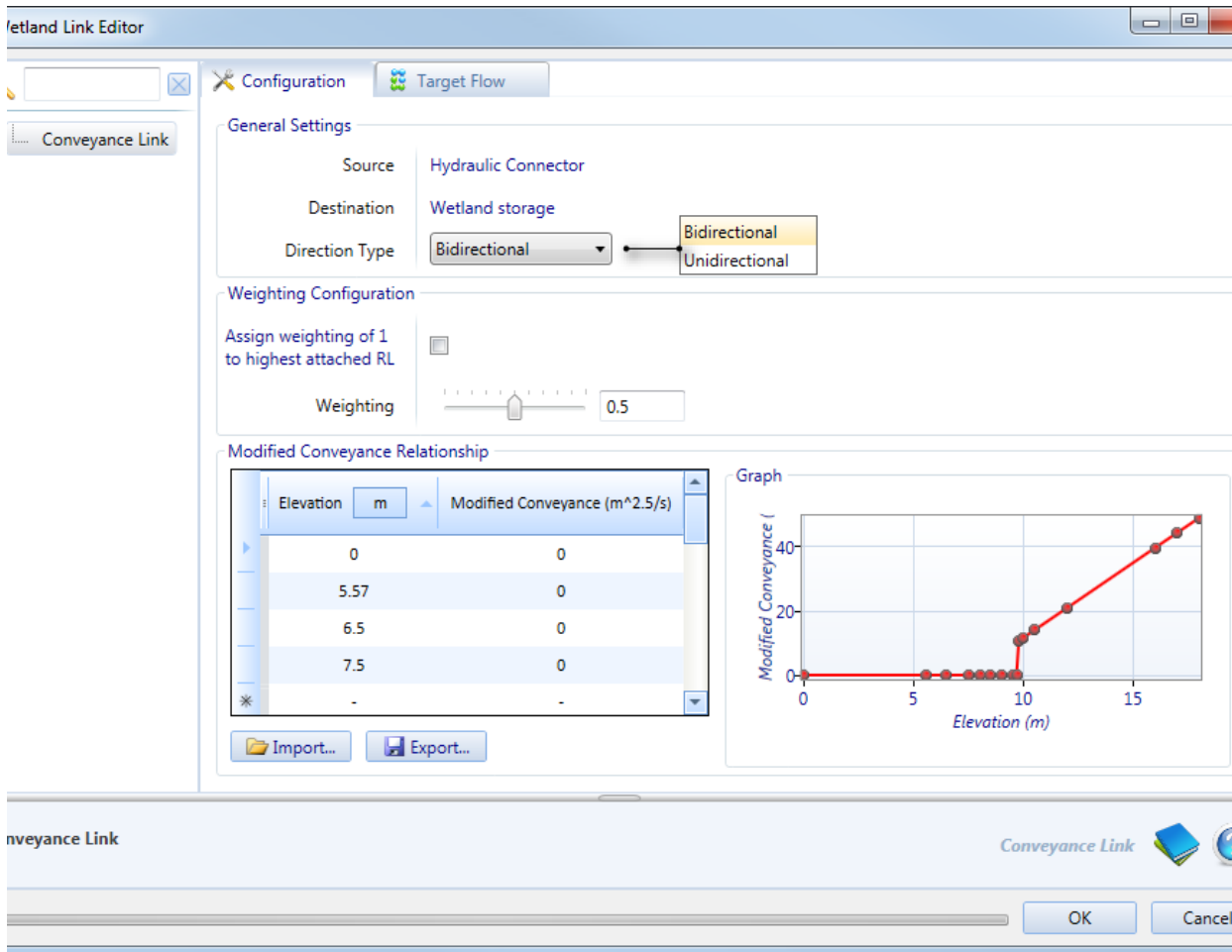
The **Direction Type** allows Wetland links to be either uni- or bidirectional. If unidirectional is chosen, flow along the link will only be in the default direction. The default flow direction is set when the modeller selects one node before the other when creating the wetland link. The flow direction is indicated by the direction of the arrow on the link in the Schematic Editor (Figure 5). When bidirectional is chosen, flow can go in both directions along the link. Flow that moves in the default direction is represented by a positive number, while flow in the other direction is represented by a negative number.

The **Weighting** applies to the head difference between each end of the Wetland link, and adjustments to this value are important if there is a significant head difference between the wetland and river water surface elevations. For example, if there is a Wetland link from a wetland Storage node to a Wetlands Hydraulic Connector node (as in Figure 5), and the water surface elevations of the Storage and Connector are RL1 and RL2, respectively; then a weighting of 0.5 gives a weighted water surface elevation that is the average of RL1 and RL2. If a weighting of 0 were used instead, the weighted water surface elevation is equal to RL1, and if a weighting of 1 were used, the weighted water surface elevation is equal to RL2.

The **Modified Conveyance Relationship** allows the user to enter the relationship between Elevation, which is the weighted water surface elevation, and the Modified Conveyance.

Note: The Modified Conveyance Relationship table requires an entry with a Modified Conveyance of 0. Also, it accepts negative water surface elevations (used to model a wetland link with a weighted water surface elevation below sea level).

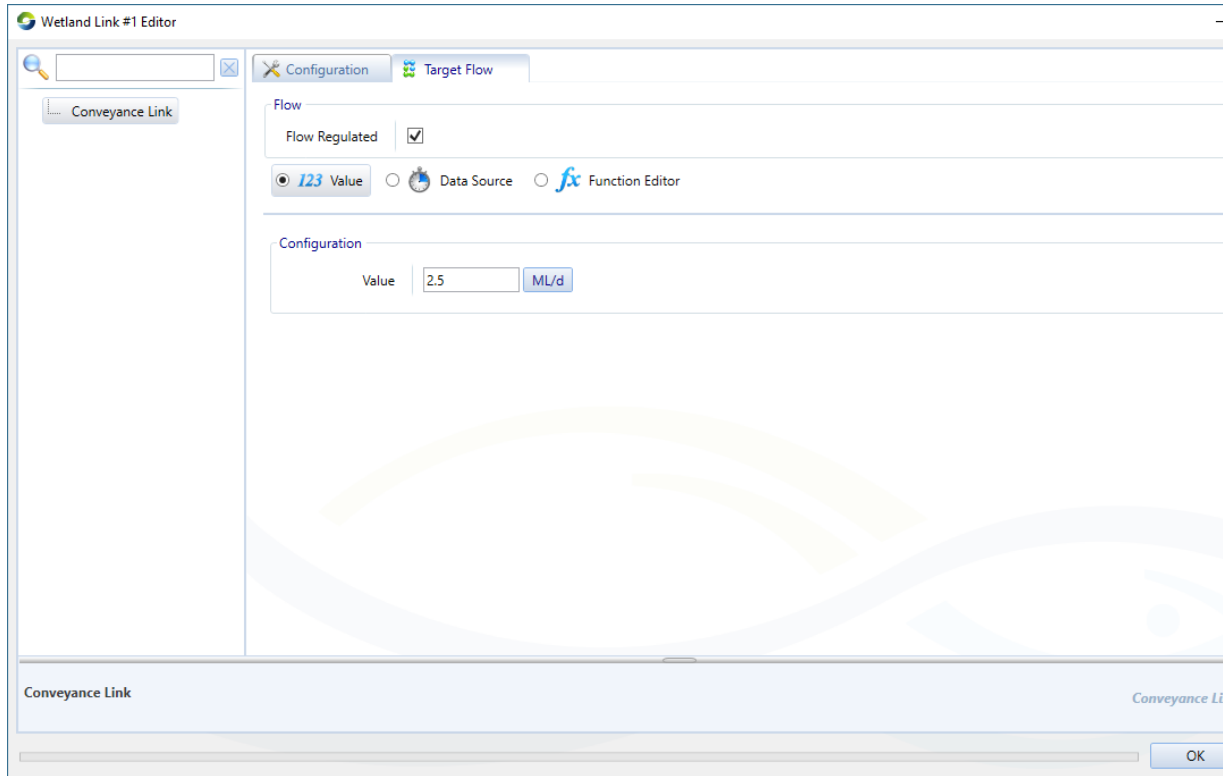
Figure 5. Wetland link, Configuration



Target Flow

This tab (Figure 6) is used to specify whether the link is regulated or not (using the **Flow Regulated** checkbox) and to allocate a function to the flow.

Figure 6. Wetland Link, Target flow



Ordering at wetlands

Orders for wetlands can be modelled in Source by connecting a Water User node with an in-stream demand model to a Supply Point node upstream of the wetland cluster for which the water is to be ordered, and using target flow functions on the wetland links to move the water into the wetland once it arrives.

Each storage in a wetland can have a target level or range and place orders along standard links to ensure the storage remains at the level or within the range.

Storage nodes on the boundary of a wetland cluster may also be used to supply downstream orders. The ordering system will bypass /ignore wetland links.

Viewing wetland results

In the Results Manager, select the following results to view the output of the different components of a wetland:

- Cell: **Storage » Storage Level** for a wetland Storage node;
- Boundary condition: **Wetlands Hydraulic Connector » Average Reduced Water Level** for node-related results; and
- Wetland link ('connector'): **Wetland Link » Average Flow Rate**

Note: There are detailed wetland recorders that can be useful for debugging, which can be turned on in the **Project Hierarchy** under **Miscellaneous » Wetlands**. The individual recorder names do not show up in the **Parameters** window, but the wetland recorder results can be viewed in the **Results Manager**.