



## Theme 2.4 - Environmental Impacts – Water

What are the potential impacts of energy crops  
on water resources?

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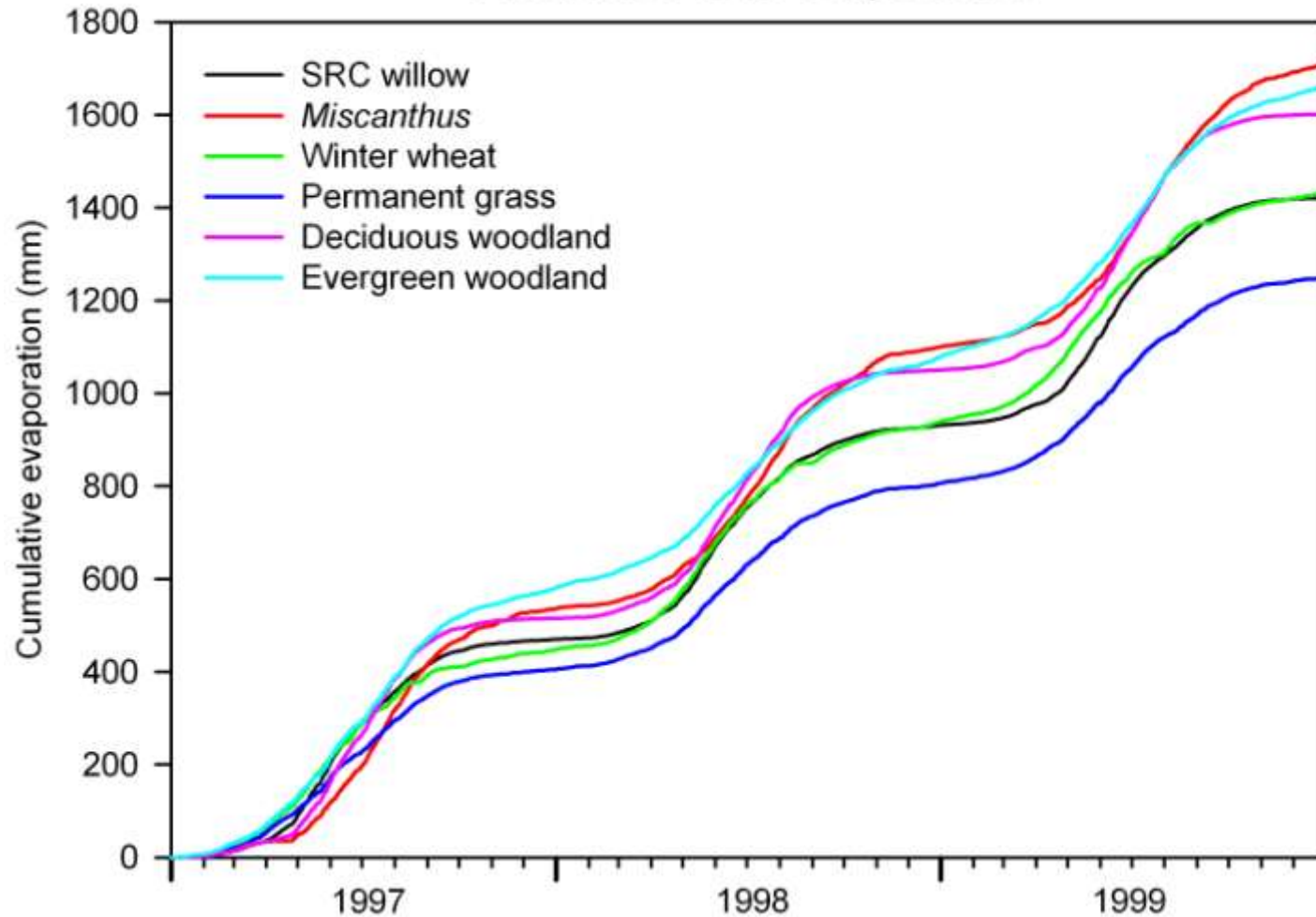
## Background

- Water quality is not a significant unknown:
  - Biomass crops have lower inputs so are positive;
  - Concerns about sediment mobilisation are unlikely to be realised;
  - Biofuel crops = status quo;
- A major concern is water resources:
  - High yield = high water use.

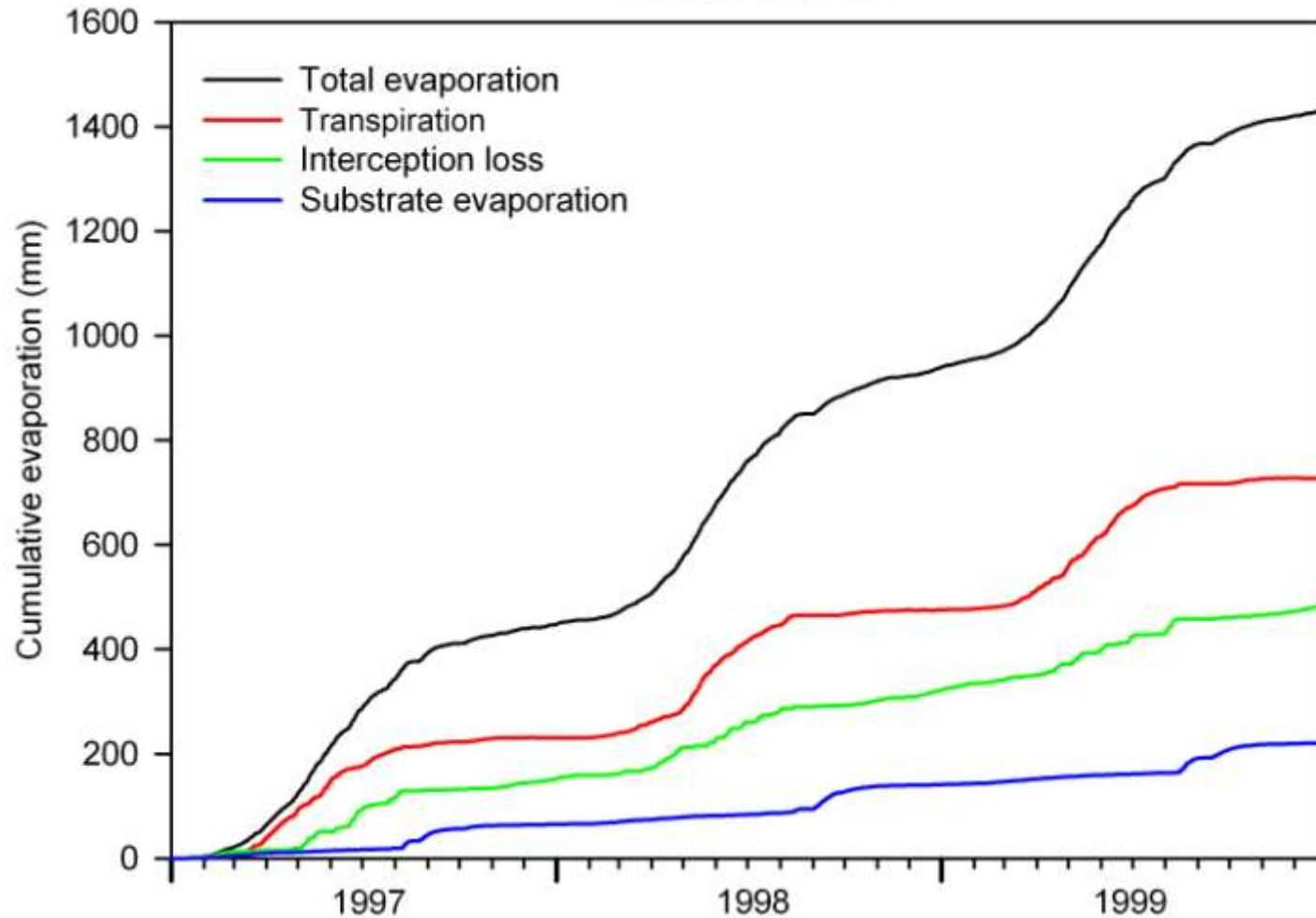
## Numerical model of the land surface water balance

- Simulates the evaporation using a scheme based on a Penman-Monteith type model;
- Interception losses from the canopy explicitly represented;
- Soil water store is included;
- Seasonal variations in leaf area and canopy height simulated using a simple photo-thermal time method.
- Land covers simulated:
  - *Miscanthus*, SRC willow, winter wheat, permanent grass, deciduous woodland, evergreen woodland

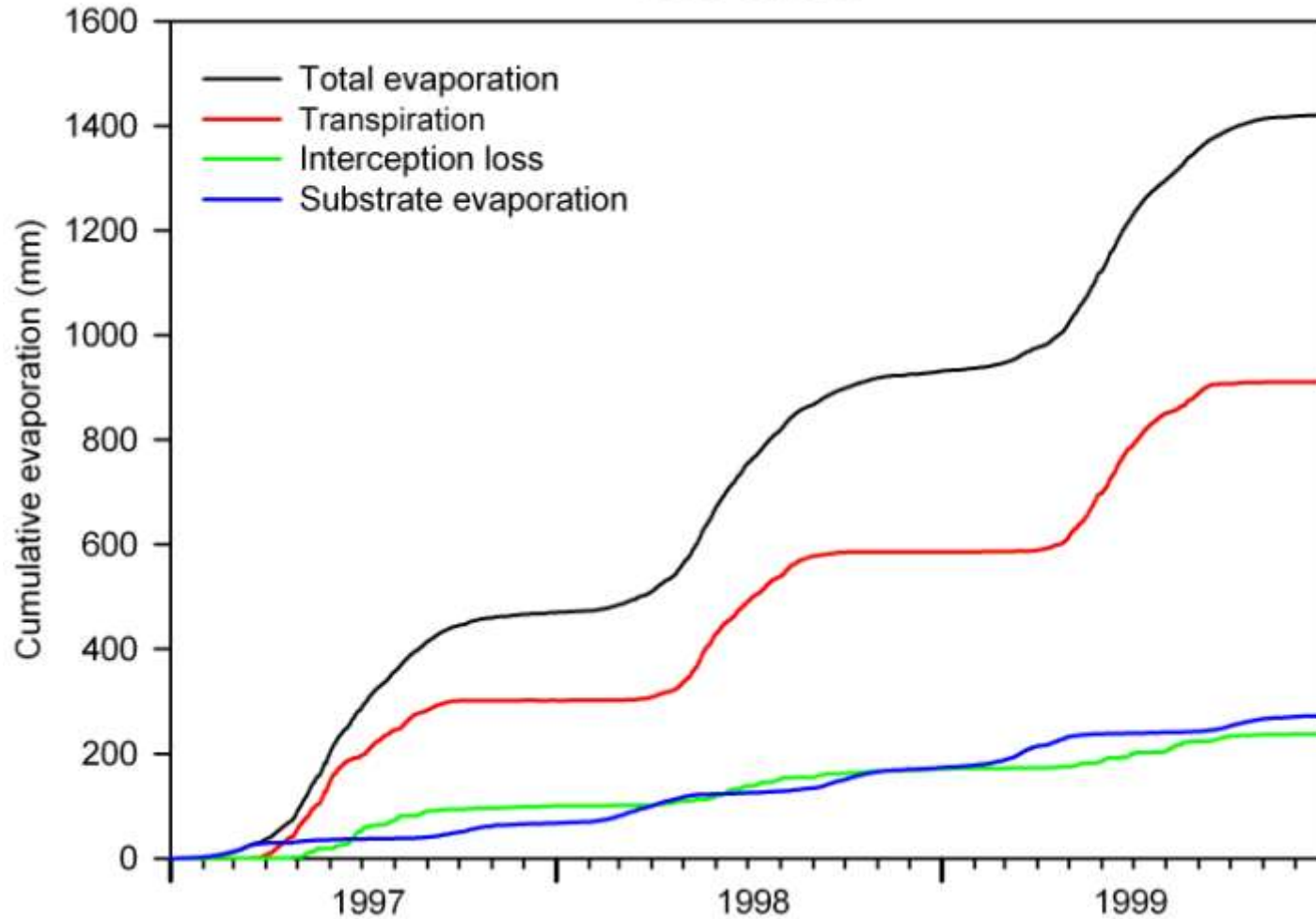
## Cumulative total evaporation



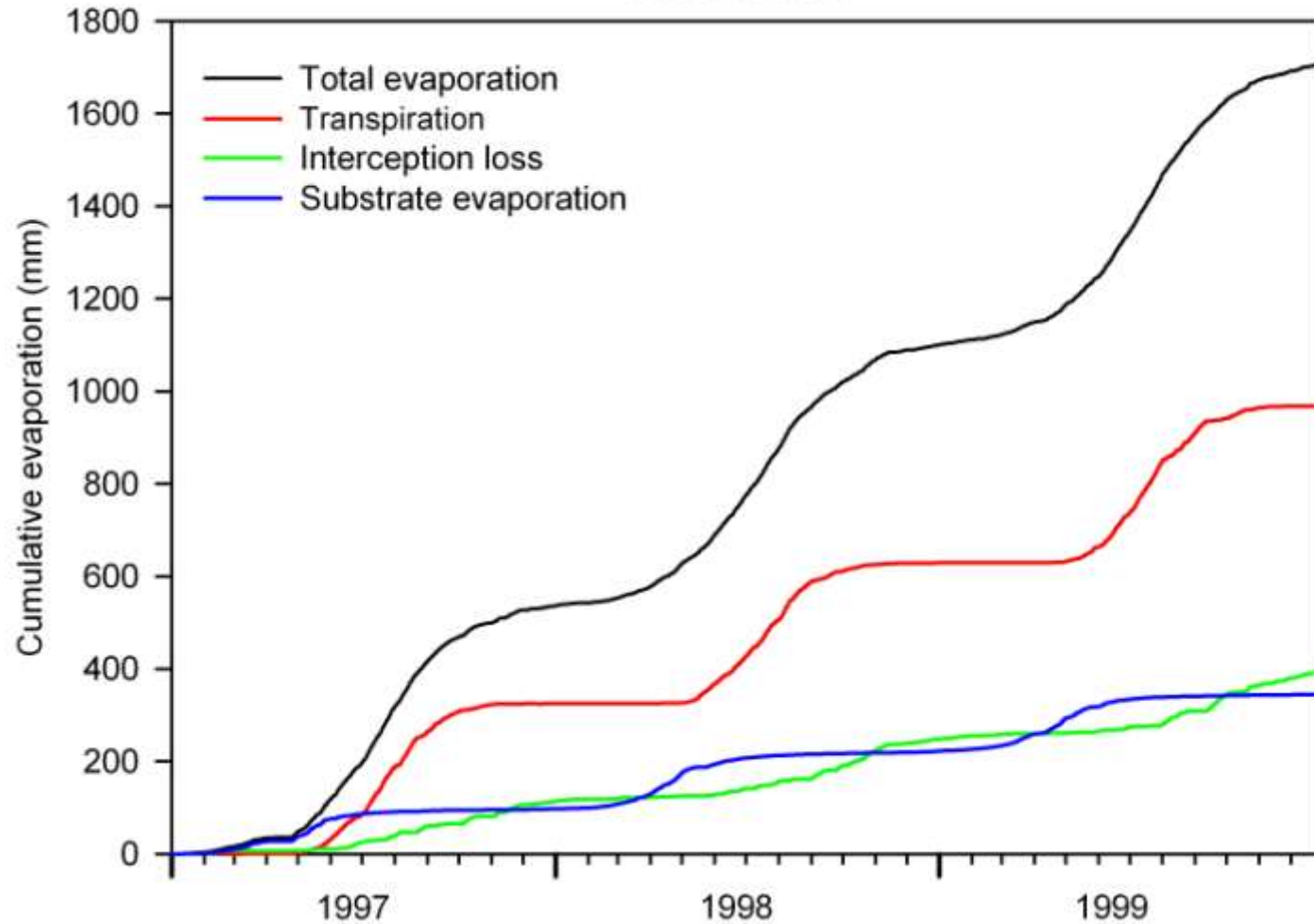
## Winter wheat



### SRC willow



## Miscanthus



## The water use of *Miscanthus*

- The annual harvest leave a period of a couple of months, in the spring, when the substrate is exposed – so evaporation occurs;
- Leaf fall continues into January so there is storage for interception losses;
- The deep roots provide soil water to support transpiration in the summer;
- It seems that it is less sensitive to soil water stress than the other vegetation types.

## Comparison of annual water use

	SRC willow	<i>Miscanthus</i>	Winter wheat	Permanent grass	Deciduous woodland	Evergreen woodland
Transpiration	303	322	242	416	388	434
Interception loss	79	132	162		35	121
Substrate evaporation	91	115	73	N/A	111	N/A
Total evaporation (mm y <sup>-1</sup> )	474	569	478	416	534	555

## Conclusions

For the soil and climatology of the site:

- The annual water use of *Miscanthus* is comparable to that of permanent woodland;
- The annual water use of SRC willow is comparable to that of winter wheat;
- Both are higher than permanent grassland

But

- some more reality checks need to be done;
- Then the model can be run in spatially distributed form for various crop distributions.