



## **Goulburn-Murray Water's irrigation assets include:**

- 7,000 km of open channels
- 2,764 km of drains
- Covers 64,000 square kilometres
- 9,000 customers are gravity irrigators
- 6,000 customers divert surface water
- Yearly consumption of water by G-MW customers is 1.8 to 2.5 million megalitres
- The farm gate value of irrigated produce in our region is in excess of \$1.2 billion



## G-MW locality plan



### RURAL WATER SERVICES



## Emerging Weeds threatening MDB and Irrigation Systems

- Arrowhead (*Sagittaria*)
- Alligator weed
- Cabomba
- Egeria
- Nymphaea Mexicana
- Parrots Feather
- Senegal tea

## How did they get here

- Introduced as ornamentals in the aquarium trade
- Escaped from aquaria and causing problems in waterways throughout Australia
- Many of these plants are sold in nurseries: an issue APS are pursuing with DPI and the CMAs.

## Arrowhead *Sagittaria graminea*

- Native to the Americas.
- Declared noxious in SA, NSW, WA and Tas.
- Can be sold and grown in Victoria.
- Distribution:
  - Goulburn-Murray Water's irrigation and drainage channels.
  - River Murray and Tributaries
  - Wetlands



**Costs G-MW in excess of \$1,023,000 per year in chemical, mechanical, contractors, maintenance and research.**



## Arrowhead Profile

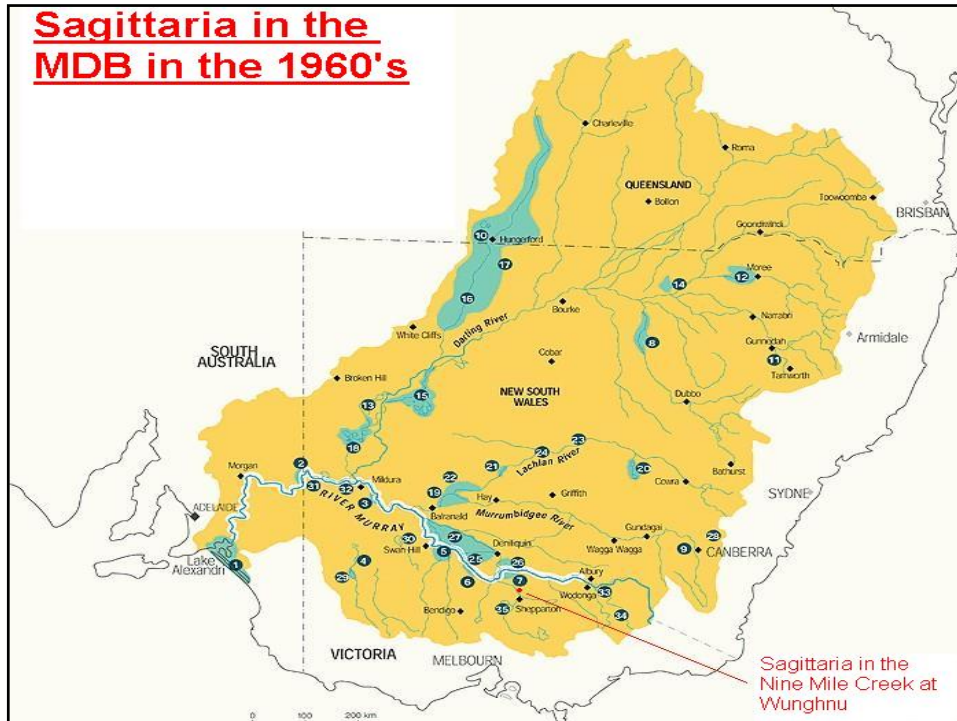
- Arrowhead's entry into the country is not recorded. believed to be introduced as an ornamental aquatic
- First reported in Australia in (Brisbane) 1959
- 1962 naturalised in the Nine Mile ck
- Spreads rapidly, due to its many methods of reproduction
- The Basin an ideal habitat for this plant



## 1962 Observing the first arrowhead infestation



## Sagittaria in the MDB in the 1960's





**Goulburn-Murray  
WATER**

## Propagation

**By seed...**

- **Number of seeds:**
  - Ten to twenty thousand seeds per pod, and ten to fifteen pods per plant.
- **Seed longevity:**
  - Capable of floating for ten days.
  - May be viable for up to ten years.





## Propagation

By submersed form...

### Ribbons:

may remain viable  
underwater for long  
periods of time.



### Rhizomes:

what form this plant  
takes in this condition.



## Propagation

Corms

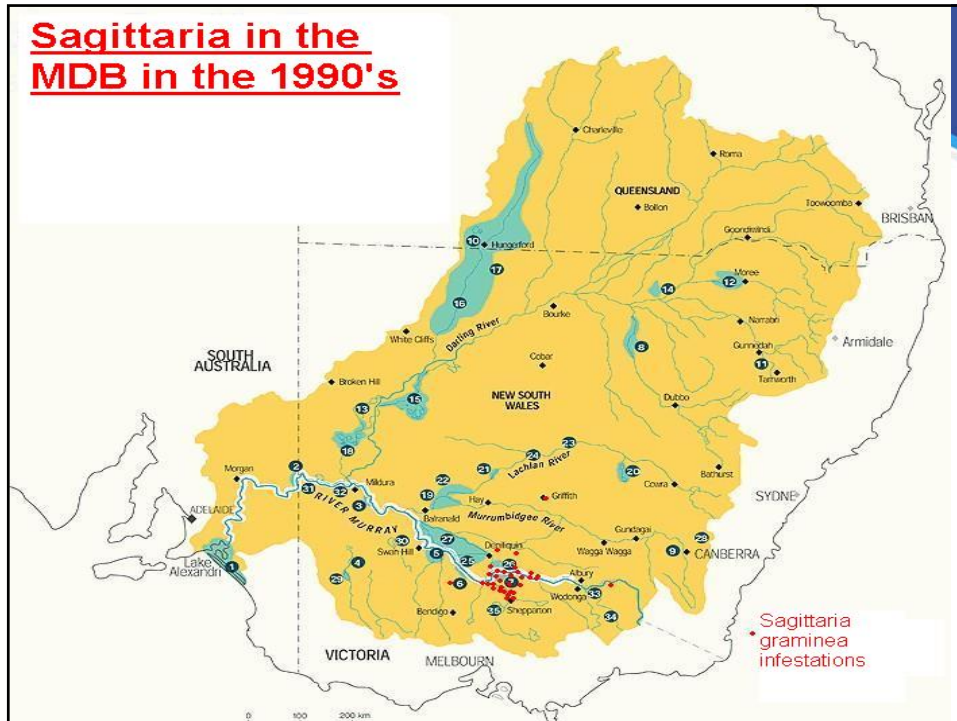


### Stem Fragments

- Fish
- Birds
- Boating
- Mechanical



## Sagittaria in the MDB in the 1990's



GOLDBURN-MURRAY  
WATER

## Research

- Biology
- Herbicides
- Water manipulation
- Seed germination
- **\$700 k**





# Chemical Control

## Registered chemicals:

Nil

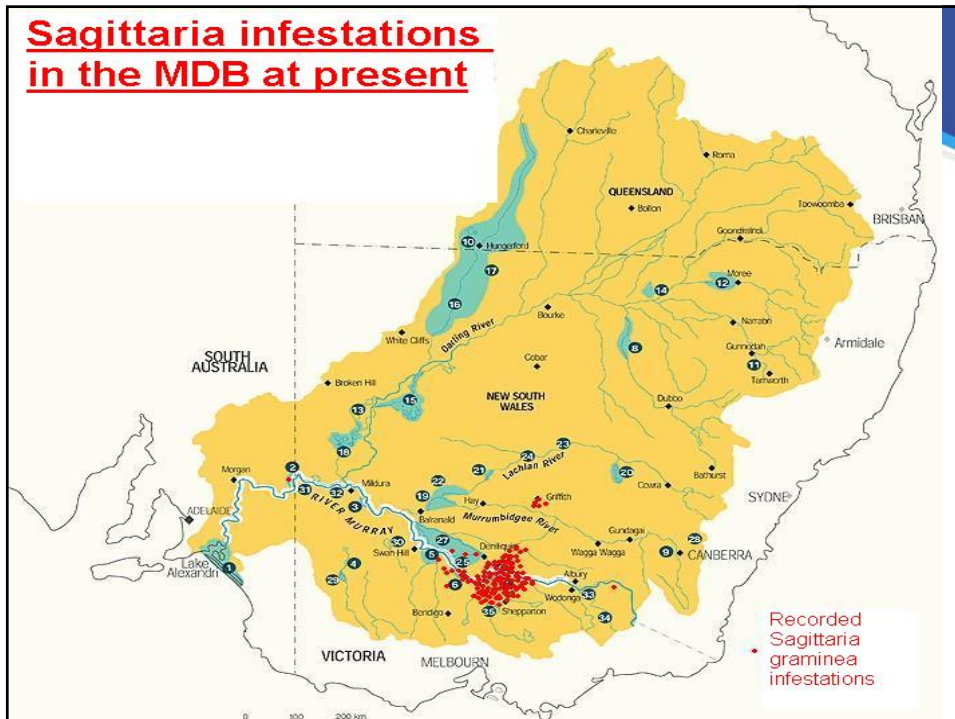
- Arsenal Express
- Glyphosate 360
- 2,4-D amine lo 500
- Results (variable)

## Restrictions:

- Residues in water
- Chemical control areas



## Sagittaria infestations in the MDB at present







## Murray River



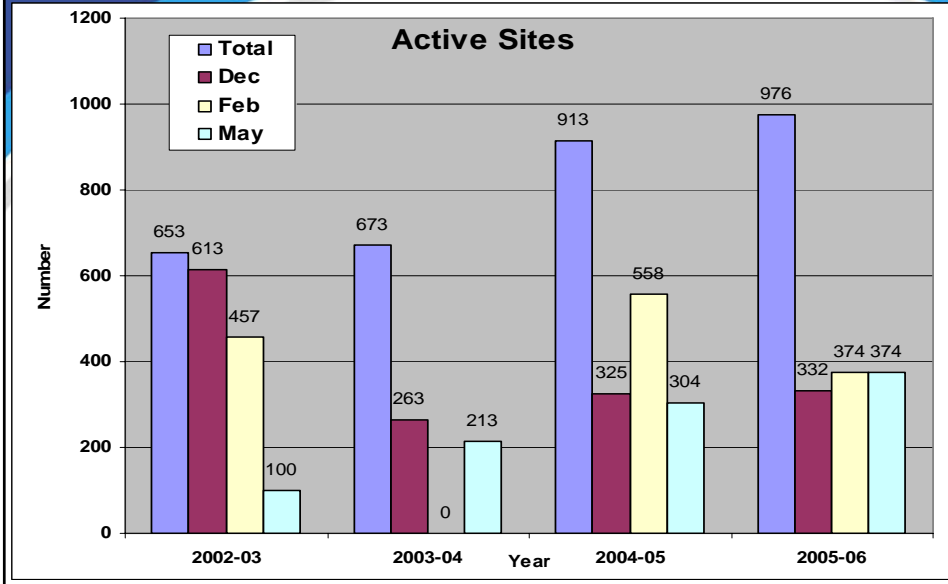
## Murray River

- Echuca to Torrumbarry weir
- Nil sites 1996
- By April 2002 there were 613 sites
- 3.3 ha
- NRA minor use permit to 40 l/ha
- 3 Treatments

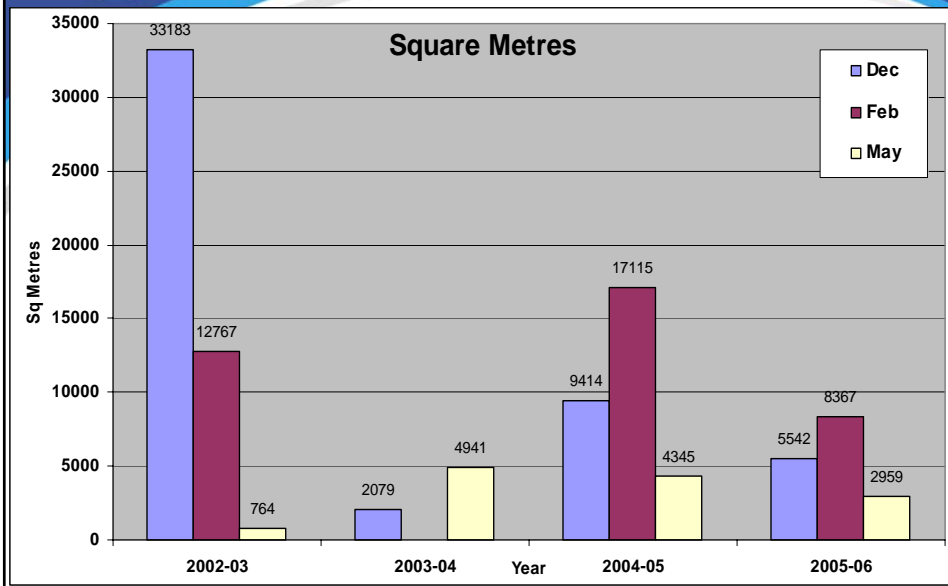




# Murray River



# Murray River





**GOLBURN-MURRAY WATER**

## Alligator weed *Alternanthera philoxeroides*

- Native to South America.
- Declared a noxious weed all Australian states.  
State Prohibited in Vic
- **Distribution:** Melbourne  
Bendigo Creek
- Highly suited to Aust climates.
- Survives in water root attached, free floating, moist soil and dry land pasture.



## Alligator weed Profile

- First recorded in Aust (Newcastle) 1940 dumped ballast water from war time shipping
- No seed forms because the flowers in Australia are sterile
- Stems to 10 metres long \*
- Will survive in 16,000 ec water
- Three forms\*
- Barrenbox Swamp



## Cabomba Fanwort *Cabomba caroliniana*

- Native to the Americas.
- Declared noxious in all states except Vic and SA.
- Can be sold and grown in Victoria.
- **Distribution:** Lake Nagambie and Lake Benalla
- Survives as a free-floating or root-attached plant.
- Does not spread by seed in Australia.





## Cabomba profile

- Recorded in Australia 4 decades ago has quickly become naturalized to our climate and conditions
- Grows to 2 metres or more in length
- Shows remarkable resistance to herbicides
- A significant weed of the States
- **Exclusion of flora and fauna can create a monoculture\***



## Dense Waterweed *Egeria densa*

- Native to Brazil, Uruguay and Argentina.
- Declared noxious in WA, SA & Tas.
- Can be sold and grown in Victoria.
- **Distribution:** Lake Mulwala
- Survives in areas with water temperatures close to freezing.
- Found in depths to 7 metres





## Egeria Profile

- Introduced into Australia as an ornamental in the aquarium trade.
- Confused with *Elodea canadensis*
- Only male flowers in Aust
- Spread by stems breaking into segments becoming root attached down stream
- Control with registered chemicals limited



## *Nymphaea mexicana* Yellow Waterlily

- A native of Europe introduced for its attractiveness and adaptability to the Australia climate
- **Distribution:** Goulburn River, Lake Nagambie, Gunbower
- No noxious classification in Victoria
- Can be grown and sold in Victoria
- Grows in waters up to two metres deep
- Likes water bodies with high nutrient levels
- Spreads vegetatively

Under Review





## Nymphaea Mexicana Profile

- Can exclude other aquatic plants forming a monoculture
- Cultivation of hybrids for the ornamental trade
- Hybrids unknown
- A problem plant of recreational areas



## Gunbower Lagoons 2006





## Goulburn River 1996



## Parrot's feather *Myriophyllum aquaticum*

- Native to the Amazon River in South America
- Declared noxious in Tas and WA.
- Can be sold and grown in Victoria.
- **Distribution:** Lake Nagambie, Gunbower Creek, Broken Creek, Bendigo Creek
- Will survive as a root-attached and free-floating plant.
- Spreads by stem fragments.







## Plants similar to Parrots Feather

**Parrots Feather**



**Common Milfoil**



**Coarse Milfoil**



## Parrots Feather Profile

- Naturalised in Australia in the mid 1960's first recorded Sydney Centennial Park 1908
- Attractive plant that make restricting sales difficult.
- Only female plants in Australia
- Does not over winter\*
- Will out-compete native vegetation.





## Senegal tea *Gymnocoronis spilanthoides*

- Native to Central and South America
- Declared a noxious weed across all states except Victoria
- Can be sold and grown in Victoria
- **Distribution:** Lake Nagambie, Harcourt and Cranbourne
- Can be spread by seed or broken stem fragments



## Senegal Tea Plant Profile

- First recorded in Australia in the late 1970's
- Introduced from India's ornamental trade.
- Naturalised in Australia by the 1980s.
- The 85 Dapto planting\*
- Capable of growing from seed and seedlings develop 15 cm per week





**Goulburn-Murray  
WATER**

## Aquatic Plant Services

### Contacts

- **Mark Finlay: Tatura**
  - **ph 0400 220 644**
  - **[markf@g-mwater.com.au](mailto:markf@g-mwater.com.au)**
- **Roger Baker: Rochester**
  - **ph 0417 345 283**
  - **[rogerb@g-mwater.com.au](mailto:rogerb@g-mwater.com.au)**
- **Ross Gledhill: Cobram**
  - **ph 0429 802 469**
  - **[rossg@g-mwater.com.au](mailto:rossg@g-mwater.com.au)**
- **Tim Nitschke: Kerang**
  - **ph 0417 510 144**
  - **[timni@g-mwater.com.au](mailto:timni@g-mwater.com.au)**