Invasion of Standing Waterbodies by Alien Macrophytes in Ireland

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Invasive Species:

- “alien species which becomes established in natural or seminatural ecosystems or habitat, is an agent of change, and threatens native biological diversity” IUCN, 1999
- Globally few habitats remain free of species introduced by human activity.
- Said to be a leading cause of biodiversity loss.
- WFD requires member states to achieve “good ecological status” of surface waters.




Freshwater Invasive Plant Species in Ireland:

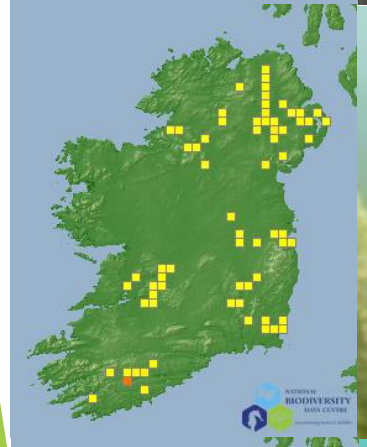
- Risk Assessments (Kelly et al., 2013) used species traits, distribution & invasive status elsewhere to identify "high risk" invasive species.
- 17 High Risk plant species identified in total.

- Nine aquatic (including 2 marine) species.
  - *Hydrocotyle ranunculoides, Myriophyllum aquaticum, Crassula helmsii, Nymphoides peltata, Elodea canadensis, Elodea nuttallii, Lagarosiphon major.*
  - Mc Guire et al., 2007 Also included *Lemna minuta* & *Azolla filiculoides*.

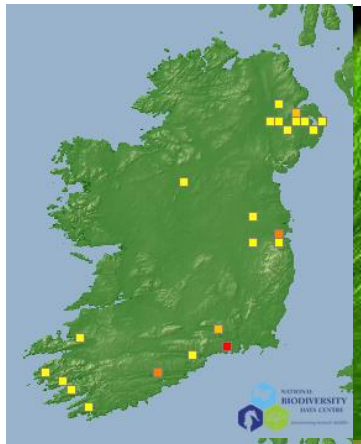
- Four riparian species.
  - *Impatiens glandulifera, Heracleum mantegazzianum, Fallopia japonica, Fallopia sachalinensis*

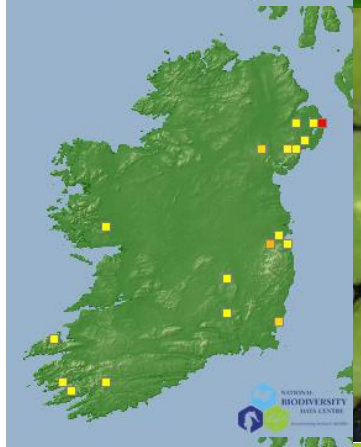
- Since 1980 the greatest rate of increase in in alien introductions has been to the freshwater environment (O'Flynn et al., 2014)

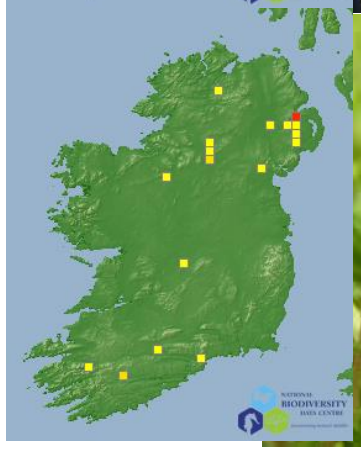






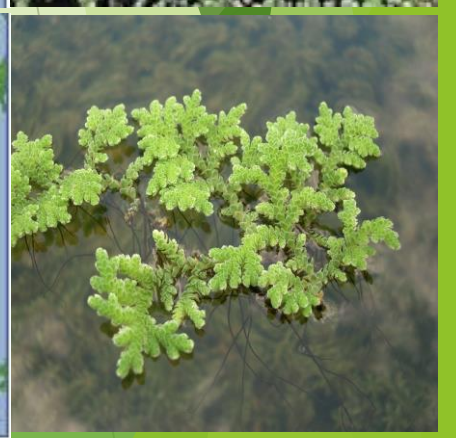








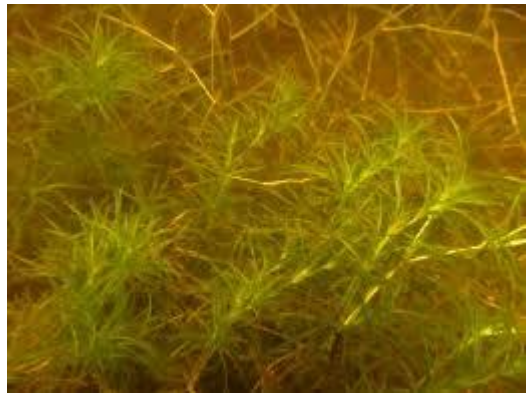


(Maps: NBDC, 2015)

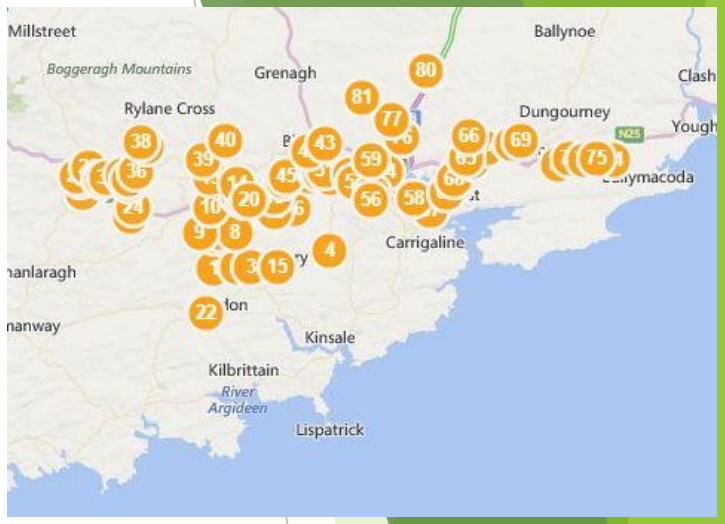
Aims of this study:

- To establish a more accurate representation of distribution in Cork.
- To identify the ecological envelope of these species in Ireland.
  - Including ecological community, habitat type and physiochemical properties
- To identify ecophysiological differences between native and invasive species.
- To identify key ecophysiological/environmental factors leading to success at each stage of invasion.
  - Introduction, colonization, naturalisation, invasion.



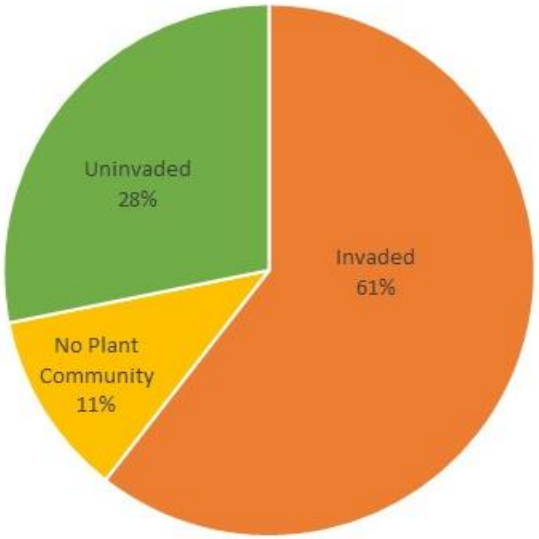
Methods:

- Field Study: 70 discreet Standing Waterbodies, surveyed summer 2014.
- Aquatic & Riparian community inventory established.
- Floating & Submerged community composition quantified:
  - % Biomass of 8 rake hauls for aquatic community.
- Physiochemical properties measured:
  - Drawdown, Substrate, Shade, Temperature, Conductivity, pH, DO, Orthophosphate, Nitrate, Ammonia.
- Occurrence of management, amenity, grazing, wildlife etc. also noted.



Results:

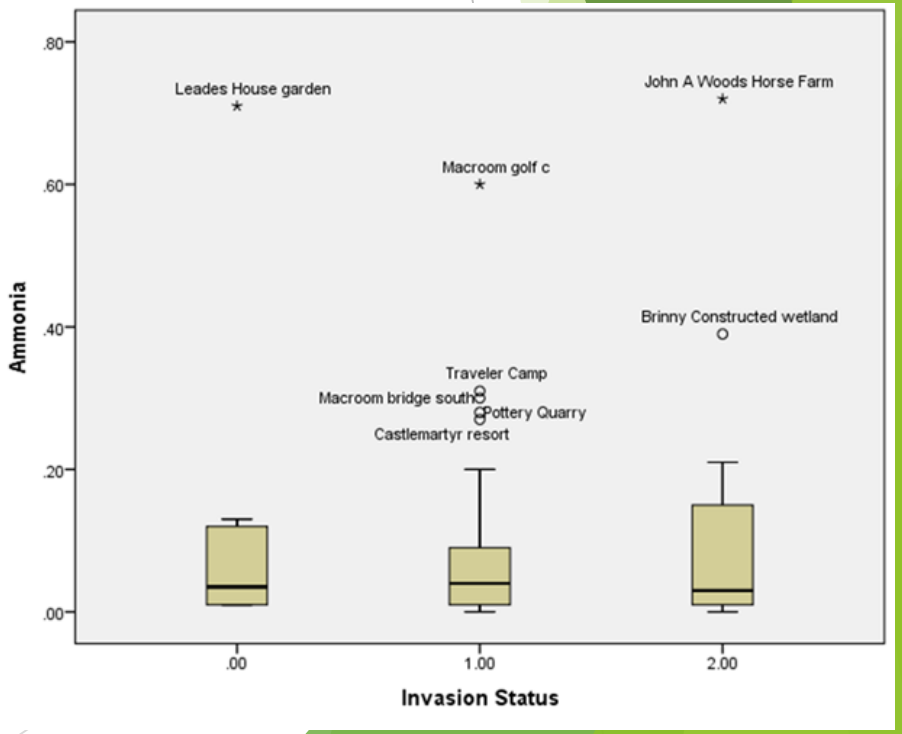
- 35 Macrophyte species identified in the Floating & Submerged community.
  - Many of these were amphibious/emergent species.
  - 28 true floating or submerged species.



- 60.6% of aquatic communities surveyed contained at least one invasive species.

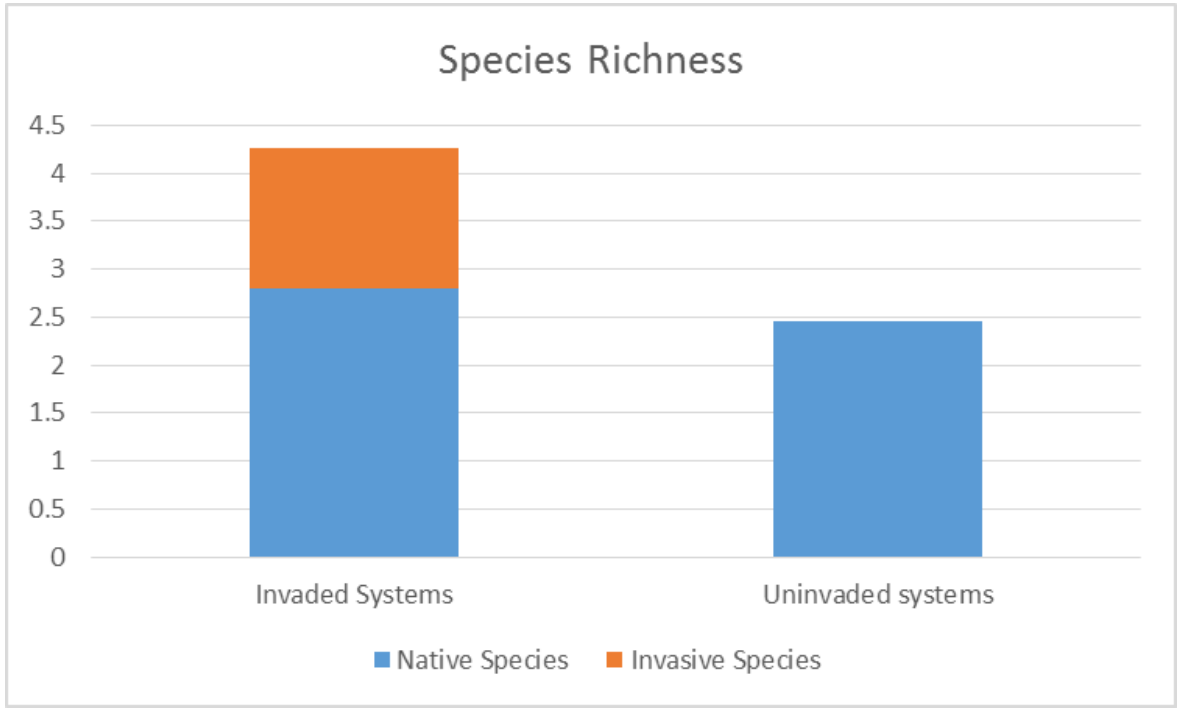
- Half of riparian communities contained an invasive species.

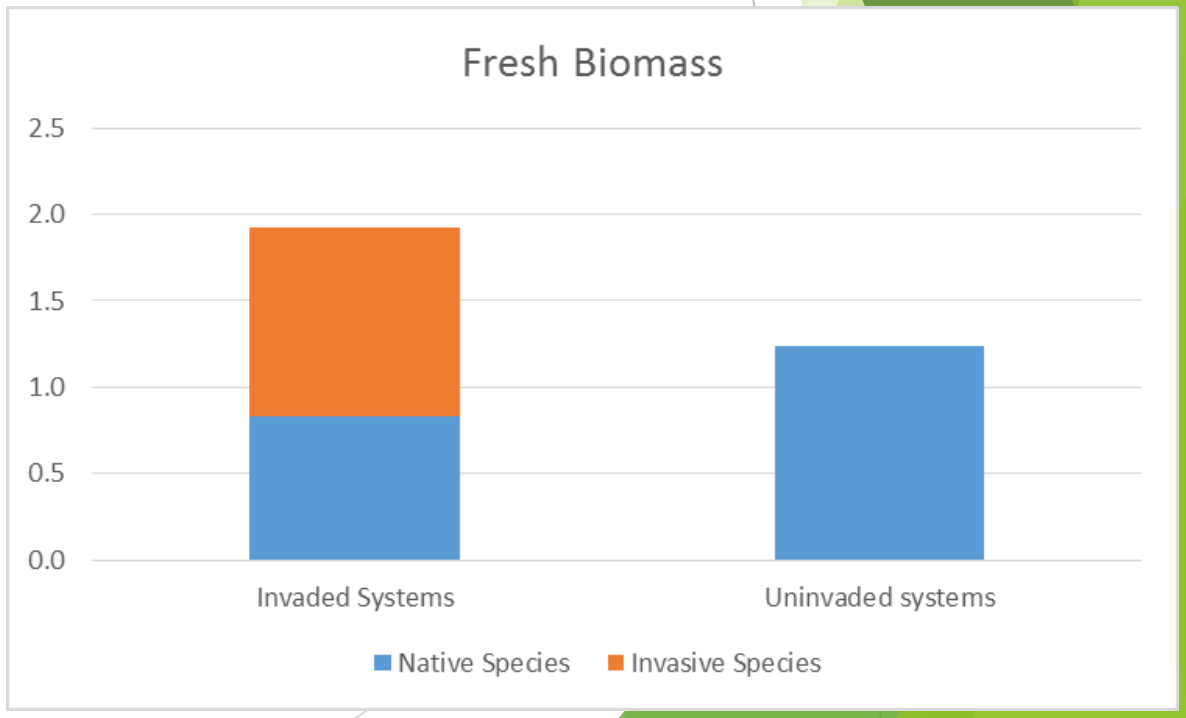
- Most sites surveyed were eutrophic and had similar nutrient ranges.



Results:

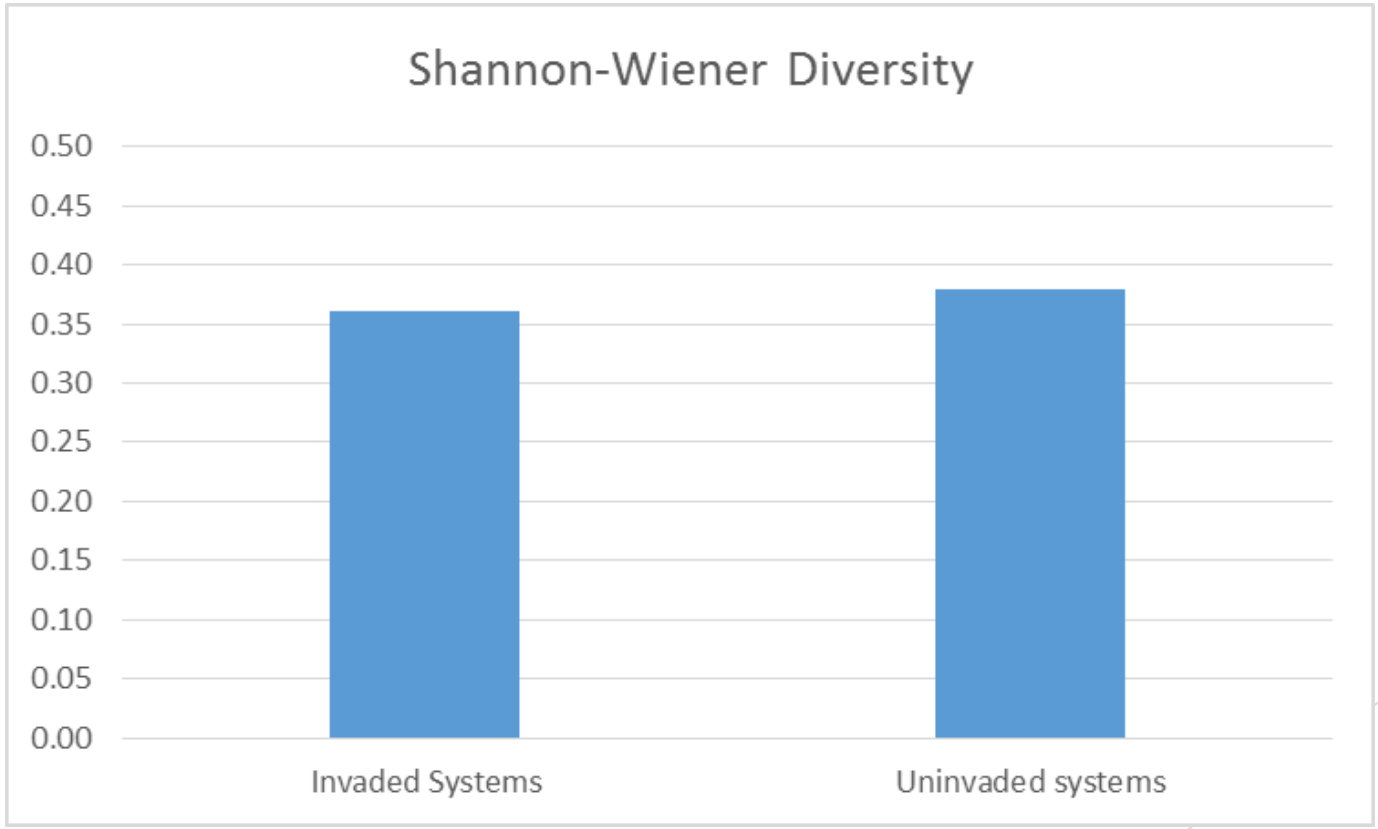
- Species Richness ranged from 0-13 (0-9 excluding invasives).
- Native richness almost equal in invaded and uninvaded systems.
- Native Biomass greater in uninvaded systems (not significantly so).
- Total biomass much greater in invaded systems.



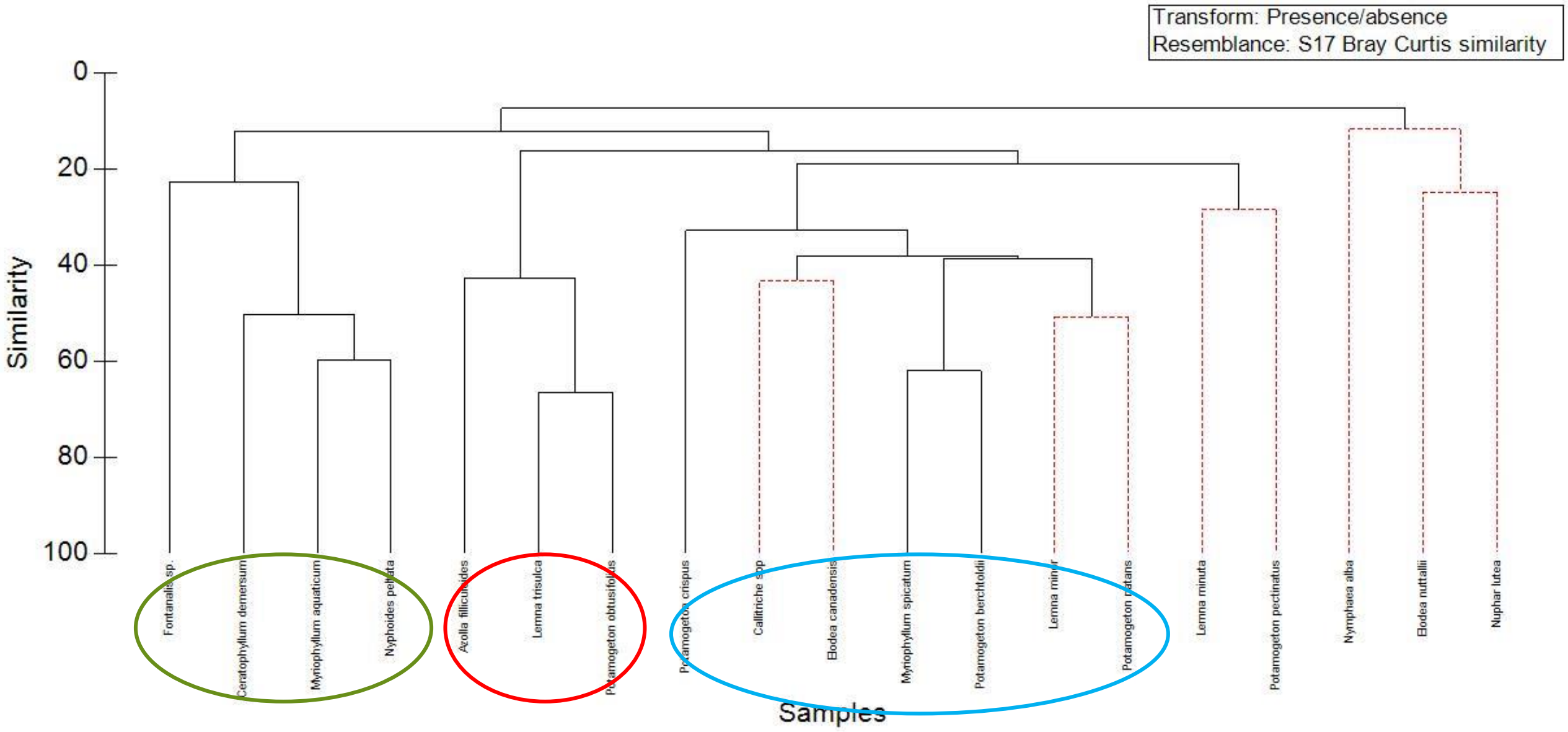


Results:

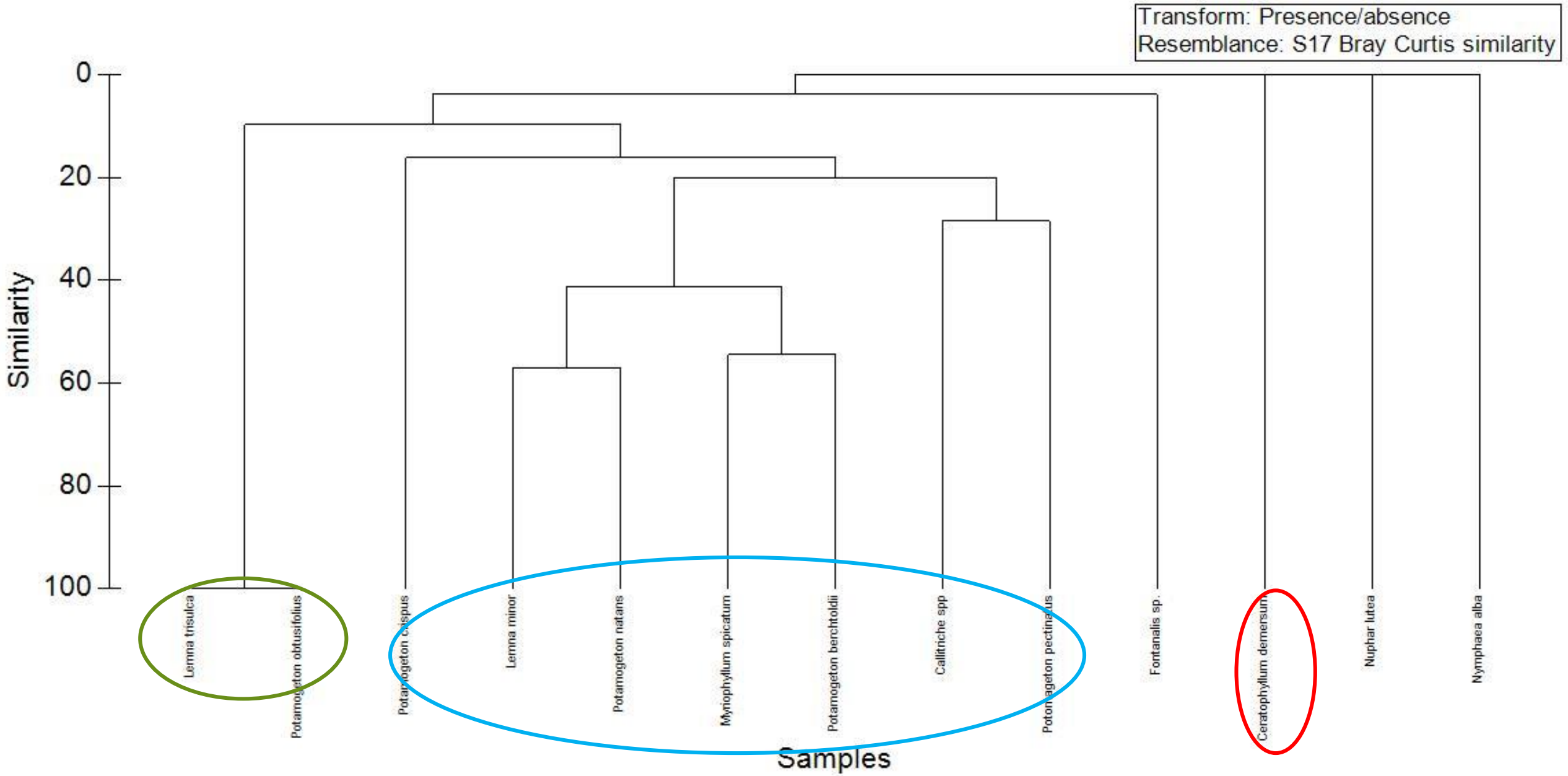
- Shannon-Wiener Diversity Index for native species is not significantly different between invaded and uninvaded systems.
- But does community composition differ?



Invaded Plant Assemblages:



Uninvaded Plant Assemblages

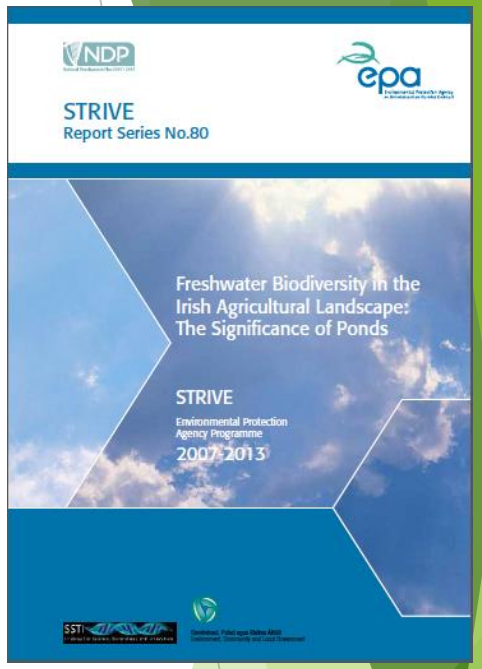


Discussion:

- Native plant assemblages in invaded standing waterbodies appear to be no different to uninvaded systems with regard to:
  - Biomass, Richness, Diversity or Composition.

- Does not imply that invasive species have no impact on biodiversity but context is important.
- Species richness & composition similar to other Irish studies in similar landscapes (Gioria, 2011).
- Greater richness & diversity observed in high quality standing waterbodies along west coast (e.g. Free et al., 2009)

- With regard to achieving “good ecological status”:
  - Will invasives inhibit the restoration of native communities if good water quality is achieved?



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