Critical water needs to sustain freshwater ecosystems and aquatic biodiversity in the Mitchell River

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National Environmental Science Programme

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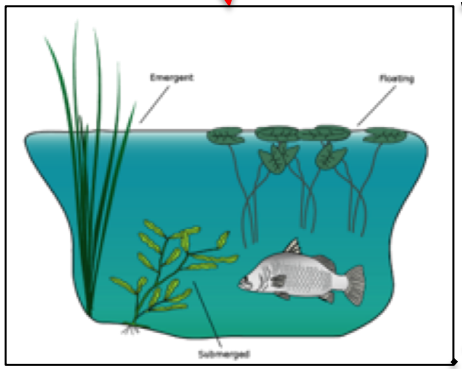
Project overview

Three broad components

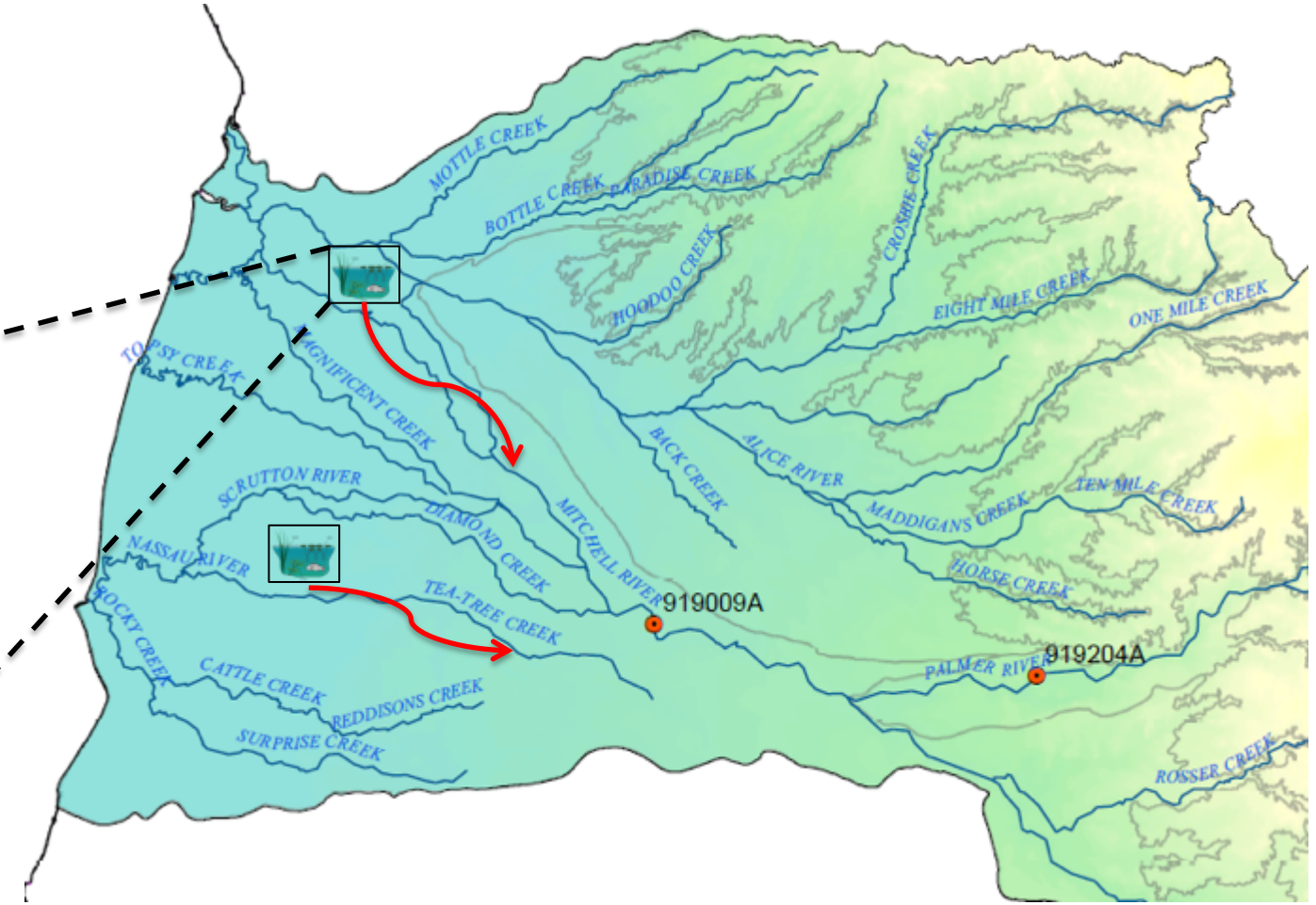
1. Threat assessment of ecological assets in the Mitchell River
   - Identify the key threats from potential water resource development - *completed*
2. Implications of water resource development on flood flows and ecosystem productivity
   - Focus on floodplain productivity and flow needs to maintain seasonally connected wetlands/waterholes
3. Critical flow needs for ecological assets in the Mitchell River
   - Connectivity of the entire Mitchell River catchment and the flow needs to maintain it

Wetlands and waterholes on the floodplain may be a source of high levels of primary productivity

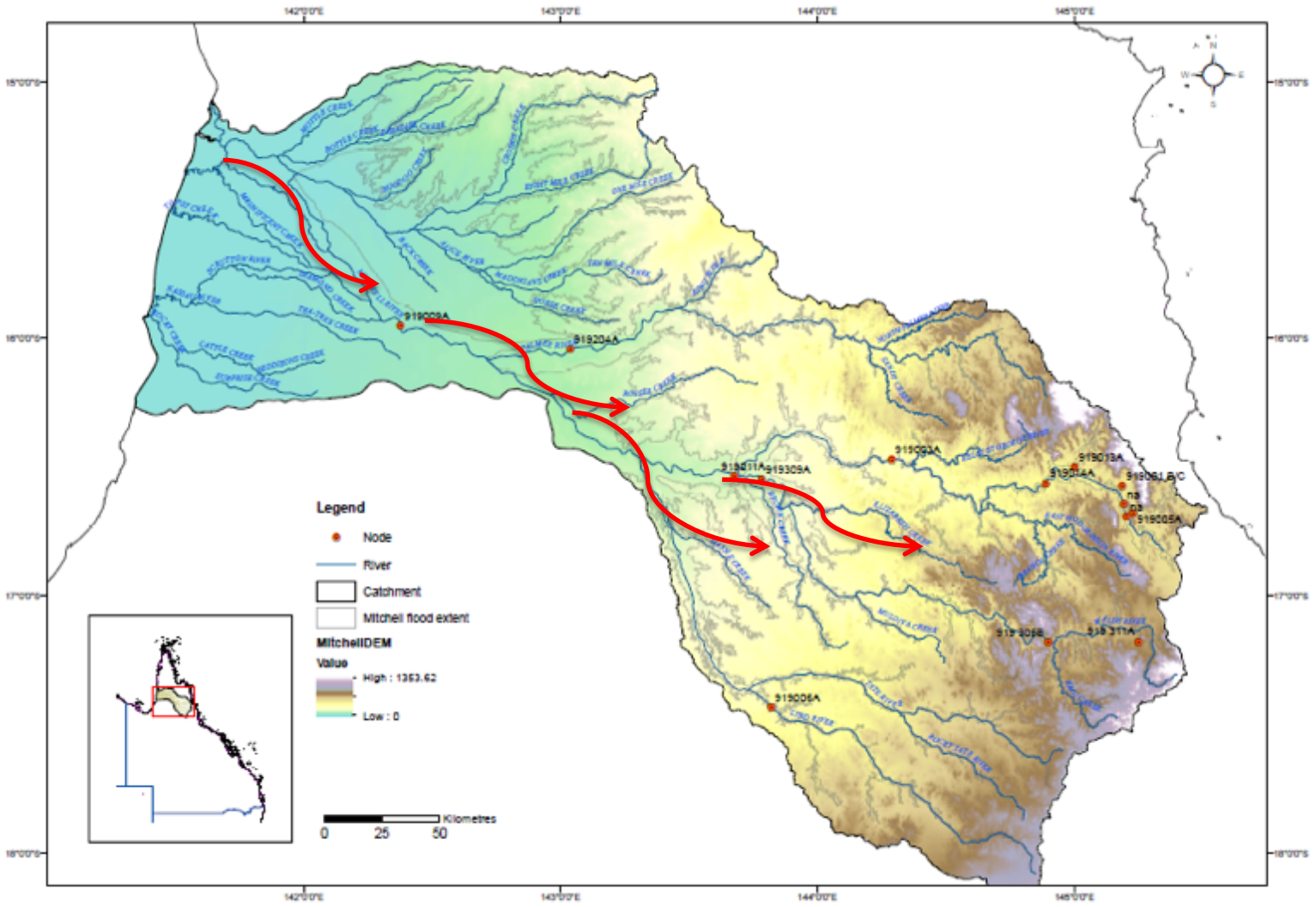
May provide resource subsidies for ecological assets, e.g. barramundi, catfish etc



https://wetlandinfo.ehp.qld.gov.au/



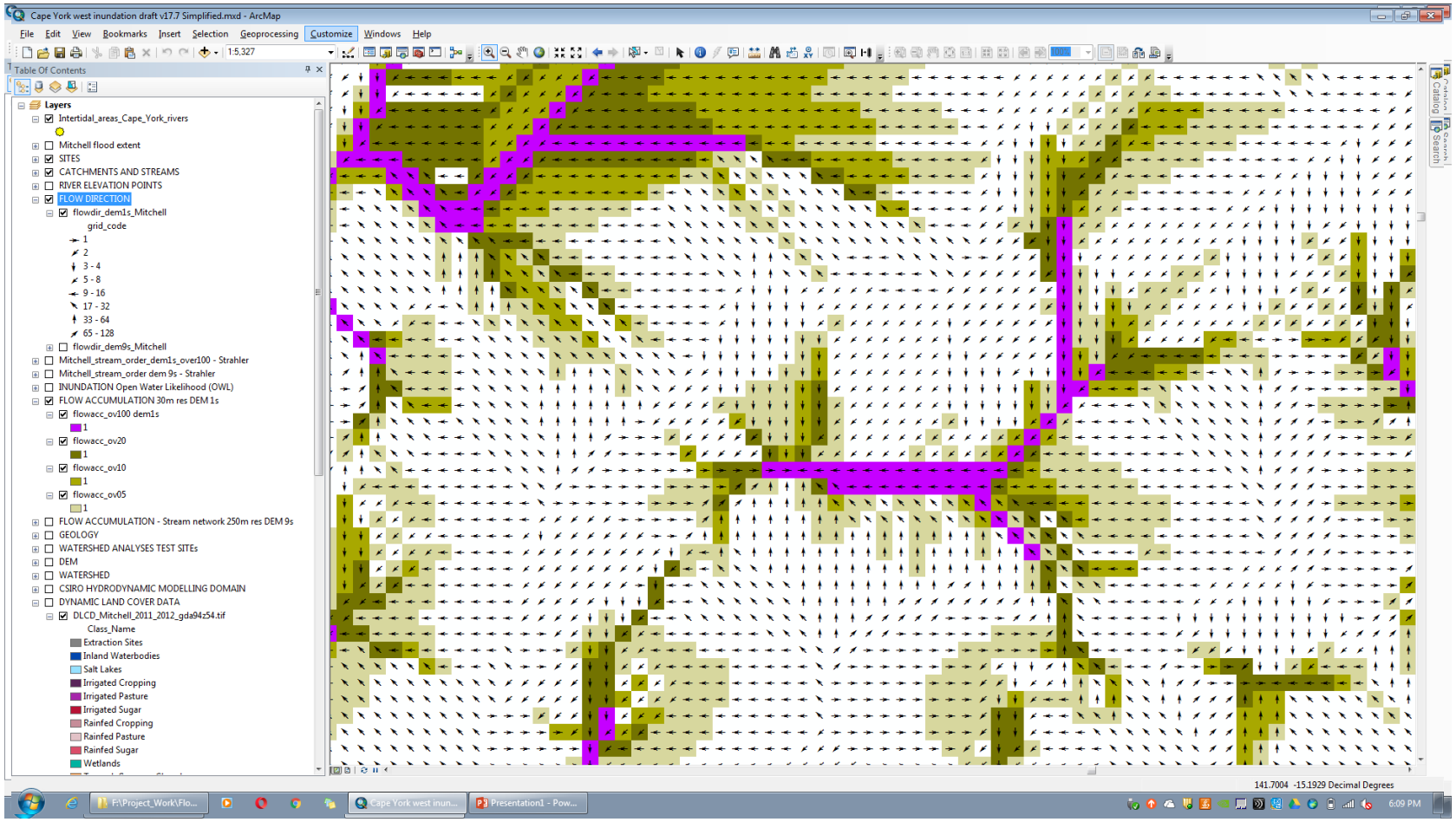
Resources generated from the floodplain may move upstream with migrating fish, thereby subsidising upstream food webs



General approach

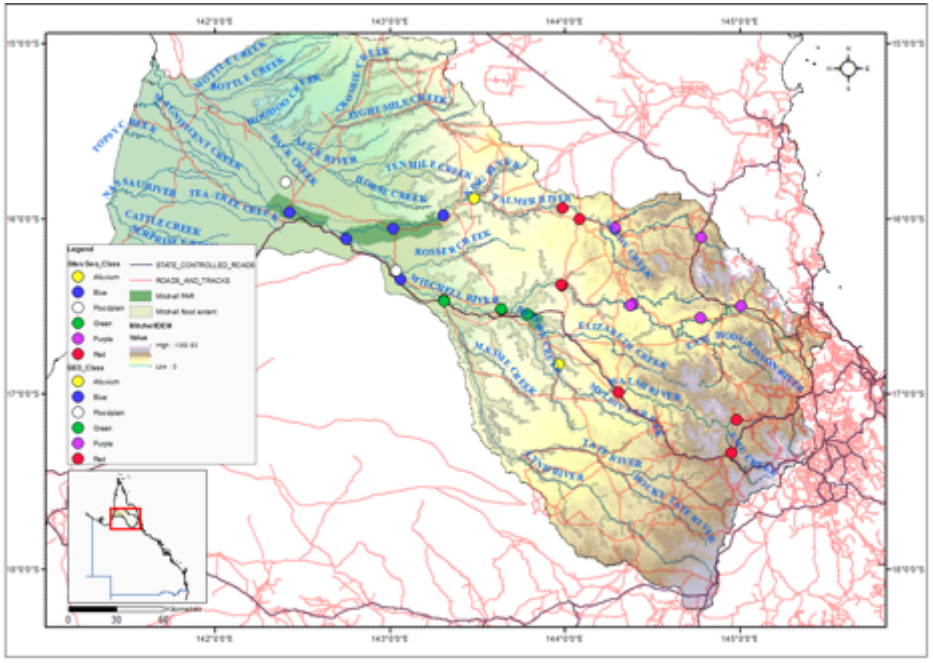
- How does flow mediate the connectivity of the entire catchment, from floodplain to headwaters
  - Does physical connectivity from flow facilitate ecological connectivity in food webs
- Floodplain primary productivity
  - Field measurements to complement and remote sensing and modelling
- Connectivity of the entire catchment
  - Otolith microchemistry
  - Food web analysis
    - Fatty Acids
    - Stable isotopes
- Flow and floodplain inundation models

Progress – floodplain connectivity



Progress - Field work

- Spatial sampling design focused around catchment geology
  - Fish otoliths can tell us where they have been
  - Fish tissue analyses can tell us what they have been eating and where
    it came from
  - Floodplain productivity mapping can tell us where important wetlands may be
- Combining these datasets with models of flow and floodplain inundation will help identify the critical flow needs of functionally important ecological assets



Project outputs

- Map of hotspots of primary production
  - Which locations on the floodplain are likely important sources of food resources?
  - What is the probable connectivity of the hotspots?
- Models of fish movement
  - Where do the fish of the Mitchell River move?
- Models of food sources and quality
  - Where is the high quality food coming from in the system and which fish can access it?

- These outputs will be summarised in research papers and technical reports
  - Quantitative models underpin all results
  - Conceptual models will synthesise key findings

Project outputs - timeline

Some key proposed research outputs

	Research focus	Output	Expected date
1	Hotspots of primary production and connectivity	Research paper/technical report & map	March 2020
2	Large scale connectivity of the catchment - fish	Research paper & conceptual model	Dec 2018
3	Flow and fish movement	Research paper & conceptual model	Sept 2018
4	Flow and barramundi growth	Research paper & conceptual model	Late 2018
5	Barramundi use of marine and freshwater	Research paper & conceptual model	Late 2018/early 2019
6	Evaluation of water resource development scenarios from CSIRO-NAWRA	Technical report	After July 2018
7	Final report on threat assessment of flow dependent assets	Technical report	June 2020

Value of the project to decision making

- Identify the importance of flows to the connectivity of the catchment
  - Which flows are crucial to allowing fish to access key habitats that support the ecosystem, indigenous and commercial harvest?
- Identifying flow dependencies of key ecological assets
  - Where is does high quality food for the ecosystem come from and what kind of flows are required to ensure its availability?
  - Key fish species, floodplain inundation
    - Alteration of flows may alter food webs on which key assets rely

- With this information, it is possible to explore the consequences of water resource development on aquatic biodiversity and fisheries production, through changes in basal food resources.

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