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

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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.

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

World-class research to support sustainable development in northern Australia
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

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