Adept stewardship of our water resources requires knowledge of the relative roles of natural processes and human activities on water quality and water quantity. For many important aquatic resources, influential processes play out at a broad range of spatial and temporal scales, including scales that are poorly captured by existing monitoring datasets. As a consequence, perceived cause-effect relations may be misinformed, conflict can escalate among stakeholders, and effectiveness of our surveillance systems, policies and governance may be impaired. Based on studies conducted by our research team at the Peace-Athabasca Delta (northern Alberta) during the past 12 years, I will illustrate how datasets spanning broad spatial and temporal scales are fundamental to understand influential processes that determine hydrological and ecological conditions of this water-rich floodplain landscape. Contrary to widespread perceptions that hydroelectric regulation of the Peace River and expansion of Athabasca oil sands mining and processing since the late 1960s have lowered water levels and increased supply of organic contaminants to the Peace-Athabasca Delta, long-term records provided by analyses of lake sediment cores identify that natural processes continue to dominate the delivery of water and contaminants to this downstream Ramsar Wetland of International Significance. This knowledge is key to inform policy that ensures appropriate water use and resource development.