Challenges and Opportunities of Adding Non-Standard Data to an Existing Repository

"Driving Square Pegs Into Round Holes"

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GWF Global Water Futures

FLOWING WATERS
INFORMATION SYSTEM

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Context:

- Ontario Stream Assessment Protocol (“OSAP”) is a standard for collecting and recording stream data
  - About 25 years old, fairly widely used across Ontario and growing but not universally adopted by all practitioners
  - Solid science behind each methodology (reproducibility, rigour)
  - Regular reviews by steering committee (practitioners and proponents)
  - Minimal government support
- Flowing Waters Information System (“FWIS”) was created to hold OSAP data
  - Operational, fairly widely used and growing, partner with domain experts
  - One component of iEnvironment (CANARIE project)
  - Built with our “WIDE” toolkit (metadata-driven architecture)
  - Data summarized, shared (researchers, others)

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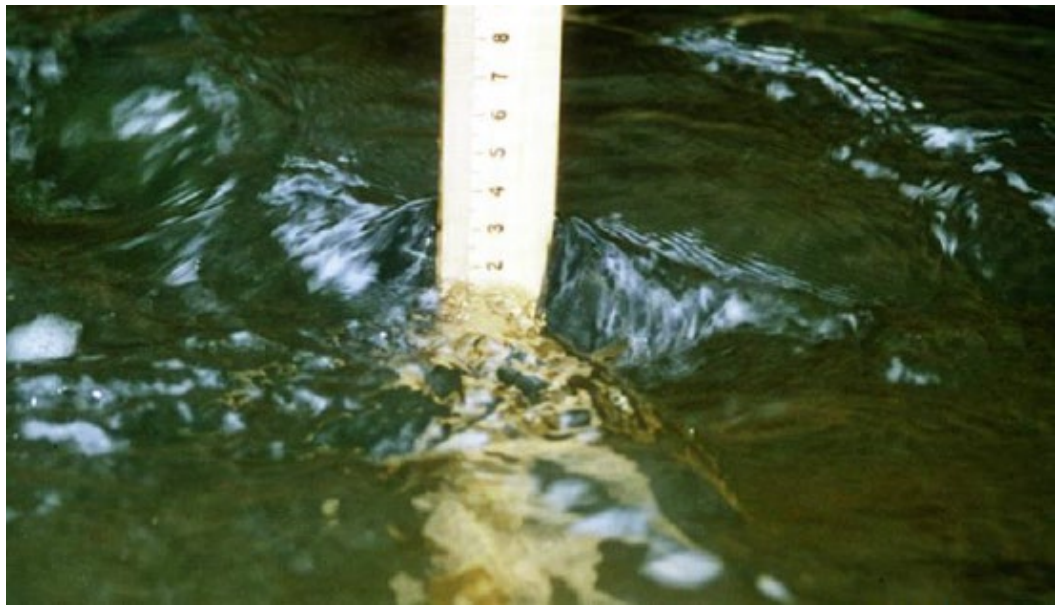
Challenges (1): Minor Variations

- Numerous (1000s) datasets are being discovered that should be “associated” with iEnvironment/FWIS either directly or partially
  - Most are historical using various “flavours” of OSAP
  - E.g., “Hydraulic Head” – measured in mm to closest 5 mm, usually recorded as an integer but stored as a text string; used for calculating “discharge” (aka “flow volume”)



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Challenges (2):

- Some technicians incorrectly record hydraulic head values as cm with decimal points → FWIS generates a warning diagnostic in the report
- One non-standard dataset (valuable historical data) was recently uploaded but included actual flow meter measurements that were converted to decimal hydraulic head values
  - Will add a “Computed decimal value” attribute (checkbox) to the table to suppress the diagnostic
- Most other variations are much more significant
  - E.g., Fish distribution summary query – “what fish (#, species, length, weight, etc.) were found where/when/by whom”
  - Query is generated by database “view” computed in response to request

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Challenges (3): "Data Independence"

- Government collects data from numerous sources, including reports from FWIS
  - Published as "Aquatic Resources Area" ("ARA" map layer/SHP file from OMNRF/"Land Information Ontario" – terms of licence permit republication), updated monthly
  - ARA layer includes "source" attribute (where did this record come from – FWIS, Conservation Authority name, consultant name, …)
- FWIS now includes ARA layer (except FWIS-sourced records) → FWIS also reports record source
  - No source code changes
  - Only the database view for the summary query was adjusted, along with support for ARA table storage and ARA data refreshes

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Challenges (4): "Exploit Some Structures"

- Recently asked about Terrestrial Data – plants, animals, invertebrates, …
  - Will lever existing aquatic locator and project collection strategies (location name, site code, date, project title/code) as well as logging, security facilities and other infrastructure
- Data is "related" to OSAP ("part of the story" – habitat suitability, degradation, …) but not at all like OSAP
- Environmental DNA ("eDNA") – growing popularity for aquatic species
  - Currently suitable for presence/absence but not abundance
- Will build on lessons learned in FWIS
  - Importance of a steering committee, government participation
  - Sustainability plan

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Challenges (5): Very Different Data, Minimal Commonality

- Marine Data – plants, fish in a salt water environment
- Essentially of no interest to freshwater researchers
- Makes use of WIDE facilities and similar features to FWIS but different user groups, data structures, etc.
- Also builds on lessons learned in FWIS, managed in a separate database
- Can be accessed from FWIS if need arises (“proxy” tables – SQL Anywhere database engine supports access to one database from within another)

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Approach (1):

- API and demonstration/utility program extended
  - curl/JSON access to API (R, PHP, VBA, Perl, Python, Java, JavaScript, Google Sheets Javascript, …)
  - Support for table/view create/alter/drop
    - Change data structures without changing any program code
  - Web forms and listings automatically generated
  - Permissions default appropriately (owner access only)
- Special security structure added for access to database structure
- Lever database/metadata-driven testing
  - Automated test generation

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Approach (2):

- Data comparison and synchronization tool
- Declarative software agents
- Manage descriptive metadata publication
  - Data providers routinely change their data, often in response to a user (i.e., researcher) discovering anomalies
- Global Water Futures (“GWF”) Connection: “Linking Stream Network Process Models to Robust Data Management...", Dr. Bruce MacVicar (U. of Waterloo, Civil Engineering)

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Special Concerns: "Vulnerable" Data

- Controversial or politically sensitive areas of study
- Researchers who may be considering retirement or a move to a different organization
- Contact Us

Questions?
Thank You!
Contact Us

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