Incorporating Headwaters into Subwatershed Planning

Lessons Learned from North Markham
Presentation Outline

1. North Markham Subwatershed Study
   • ROPA3 Future Urban Area
   • Subwatershed study process

2. Headwater Guidelines in Practice
   • Subwatershed study integration
   • Submission process

3. Lessons Learned
   • Field preparation
   • Data collection
   • Policy considerations
   • Implementation
North Markham Subwatershed Study
ROPA3 Future Urban Area

York Region OP
- 422,000 residents
- 240,000 jobs

Markham OP
- Future Urban Area
FUA Statistics

- Size: approx. 1,288 ha
- Population: approx. 38,000 people
- Dwelling units: approx. 12,000 (mainly low-rise)
- Jobs: approx. 19,000
North Markham Subwatershed Study
Subwatershed Study Process

Conceptual Master Plan

• Supporting Studies:
  • **Subwatershed Study**
  • Transportation Study
  • Servicing Studies

• Secondary Plans

• Development Approvals
Four Subwatersheds:

• Berczy Creek
• Bruce Creek
• Eckardt Creek
• Robinson Creek
Phase 1
Existing Conditions

Phase 2
Impact Analysis

Phase 3
Management Strategy and Implementation

Phase 4
Long-term Monitoring Plan

Subwatershed Study Process

- Initiated in 2013
- 2 Steering Committees
- Landowner Driven
- 8 Consultant Teams
- Terms of Reference Approved in 2014

WE ARE HERE
Headwater Guidelines in Practice

**Research and Development**
- Watershed scale
- Low density
- Limited access
- Site-based sampling
- Quantitative (OSAP)
- Independent

**Land Use Management**
- Subwatershed to Site Plan scale
- High density
- Unlimited* access
- Reach-based sampling
- Semi-quantitative (OSAP)
- Integrated
Headwater Guidelines in Practice
Subwatershed Study Integration

Pre-Consultation

- Information sharing
- Mapping
- Field protocols
- Timing
- Submission process
Headwater Guidelines in Practice
Subwatershed Study Integration

Information Sharing

Digital Data
- TRCA
- Landowners

MNRF
- Redside Dace occupied and recovery habitat

Headwater Feature Mapping
Headwater Guidelines in Practice
Subwatershed Study Integration

Mapping

- Segments numbered upstream to downstream
- Zero segment (S0) = no HDF (waypoint)
- BE1-H15-S1
  - Main branch (Stream Code)
  - Reach (Feature)
  - Segment
Headwater Guidelines in Practice
Subwatershed Study Integration

Field Protocols

- Reach/segment scale
  - Land ownership

- OSAP Headwater Module (S4.M10)
  - Data codes
  - Flow conditions
  - Flow measurement - > 0.5 l/s
  - Fish utilization
  - Barriers to migration
Headwater Guidelines in Practice
Subwatershed Study Integration

Field Protocols

- Sediment
  - Input
  - Transport
  - Deposition
- Substrate
- Feature roughness
- Feature and bankfull dimensions
- Flow estimates
Headwater Guidelines in Practice
Subwatershed Study Integration

**Field Protocols**

Supporting Studies

- Hydrogeology
- Wetland evaluations
- ELC
- Aquatic habitat assessments
- Wildlife/terrestrial habitat surveys
- Amphibian surveys
Headwater Guidelines in Practice
Subwatershed Study Integration

Timing

Site Visit #1 (March-April)

- Snow pack absent
- Frost free condition
- Segment delineation
- Feature type
- Flow condition
Submission Process

Site Visit 1
Screening Submission

- Limited Function
  - Dry/standing water + swale/no defined feature
- Consultant team coordination
- Agency consultation
- Site walks
Headwater Guidelines in Practice
Subwatershed Study Integration

**Timing**

Site Visit #2 (April-May)

- Melt/thaw interflow ceased
- Ideally no major storm event prior
- Before leaf-out
Submission Process

Site Visit 2

Gap Analysis

- Confirm limited function
- Tile drains
- Direct fish habitat
- Suspected seepage points

Consultant team coordination
Headwater Guidelines in Practice
Subwatershed Study Integration

Timing

Site Visit #3 (July-August)

Confirmation:

- Hydrology
- Fish presence
- Groundwater indicators
Headwater Guidelines in Practice
Subwatershed Study Integration

Integration

- Wetland evaluations
- ELC
- Aquatic/terrestrial habitat
- Amphibian surveys
- Species at risk
Submission Process

Site Visit 3

- Coordination
- Consultation
- HDFA Submission
  - Cover letter
  - Screening submission
  - Photo log
  - Management recommendation table
  - Mapping

Headwater Guidelines in Practice
Subwatershed Study Integration
Headwater Guidelines in Practice
Subwatershed Study Integration

Submission Process

1. Protection
2. Conservation
3. Mitigation
4. Maintain recharge
5. Terrestrial Linkage
6. No Management Required
Lessons Learned
Field Preparation

Desktop Review

- Google Earth®
- LiDAR / topo
- Landowner knowledge
Lessons Learned
Field Preparation

Historical Imagery
Lessons Learned
Field Preparation

Mapping

- Air photo
- Contours
- Drainage feature codes
- Bar scale
- UNIQUE CODES

Also…..

Photo log (site visit 2/3)
Lessons Learned
Data Collection

Data Redundancy

- Documentation
- Photos
- GPS waypoints
- Organization
- Cross-reference data
Lessons Learned
Data Collection

This is portable....

.. this is not
Lessons Learned
Data Collection

“The headwater drainage features should be walked from end to end to determine where it is no longer a headwater drainage feature.”
Lessons Learned
Policy Considerations

- Greenbelt
- PSWs
- Significant Woodlands
- Species at Risk
Lessons Learned Implementation

- Grading
- Servicing
- Infrastructure
- Transportation
North Markham Subwatershed Study
Complex and Integrated Process

Headwater Guidelines in Practice
Timing is EVERYTHING
Application and Interpretation
Consultation and Coordination

Lessons Learned
Data Management
Guidelines: a Tool in the Management Toolbox