

Attachment A

Protect Stream Health - A Road Map for Integrated Watershed Management

In 1996, the Center For Urban Water Resources Management at the University of Washington (in Seattle) published a seminal paper by Richard Horner and Chris May. They synthesized a decade of Puget Sound research to identify the factors that degrade urban streams and negatively influence aquatic productivity and fish survival. They demonstrated that the four factors limiting stream health are, in order-of-priority:

1. **Changes in Hydrology** – Greater volume and rate of surface runoff caused by increased impervious area and road network densification.
2. **Disturbance and/or Loss of Integrity of the Riparian Corridor** – Clearing and removal of natural vegetation in riparian (streamside) areas.
3. **Degradation and/or Loss of Aquatic Habitat within the Stream** – Caused by erosion and sedimentation processes, bank hardening, and removal of large organic debris; aquatic habitat degradation is a direct result of ‘changes in hydrology’.
4. **Deterioration of Water Quality** - Increased sediment load due to more runoff volume causing channel erosion. Pollutant wash-off from land uses, deliberate and accidental waste discharges.

The limiting factors and order-or-priority identified by Richard Horner and Chris May provided a ‘road map’ for rainwater management in a watershed sustainability context. In BC, the Horner and May findings provided a springboard from which to “reinvent urban hydrology” and develop ***Stormwater Planning: A Guidebook for British Columbia***.

Performance Monitoring Framework for Maintaining Stream Health

The goal of managing drainage from an ecological perspective relies on a stream health monitoring program that is sensitive to changes in hydrology and habitat. Thus, the desired outcome for an integrated monitoring program is to determine how well actions at the site scale are maintaining or restoring a healthy catchment.

The Guidebook states that an adaptive management program that is comprehensive in scope would include three types of monitoring:

- **Effectiveness Monitoring** – Determines the extent to which the completed actions have achieved the management objectives (for example, monitor the volume and frequency of overflow from an on-site facility and compare with the performance targets).
NOTE: At the catchment scale, Effectiveness Monitoring encompasses Hydrologic Indicators (i.e. streamflow), Water Quality Indicators (i.e. turbidity and TSS) and Ecological Indicators (i.e. benthic invertebrate community).
- **Compliance (Attainment) Monitoring** – Identifies whether or not the implementing parties have completed the actions they agreed to complete in the planning phase (for example, confirm that developers are incorporating properly sized on-site storage and infiltration facilities).
- **Validation Monitoring** – Measures the extent to which completion of the objectives (actions) has been successful at achieving the goal (for example, monitor annual watershed runoff volume and compare with the performance target established for runoff volume reduction).

The Guidebook emphasizes that *Effectiveness Monitoring* is the key to learning from experience and constantly improving accepted practices.