“Lag-Times in the Watershed and their Influence on Chesapeake Bay Restoration”

STAC Workshop

October 16-17, 2012

Annapolis, MD

Steering Committee

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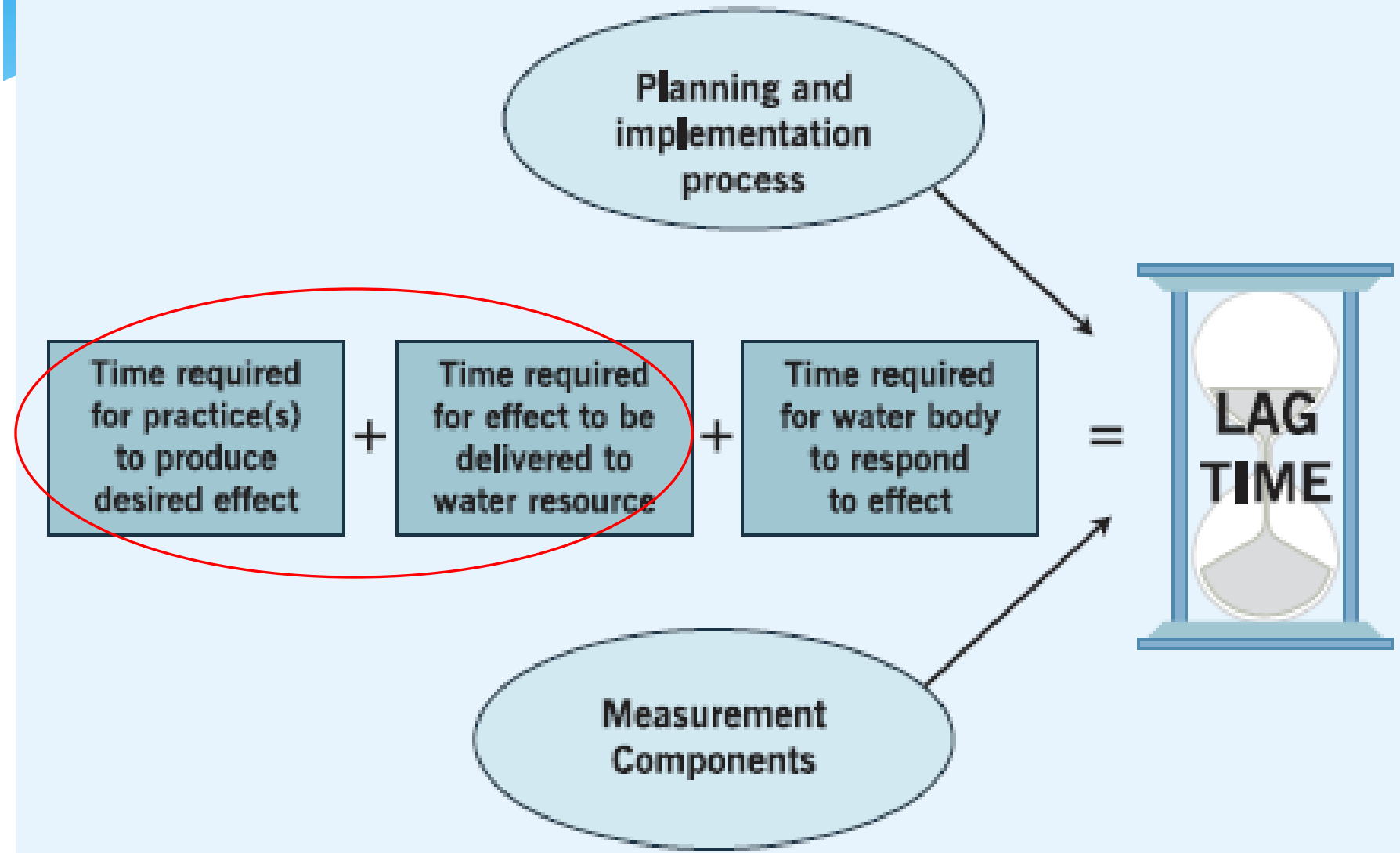
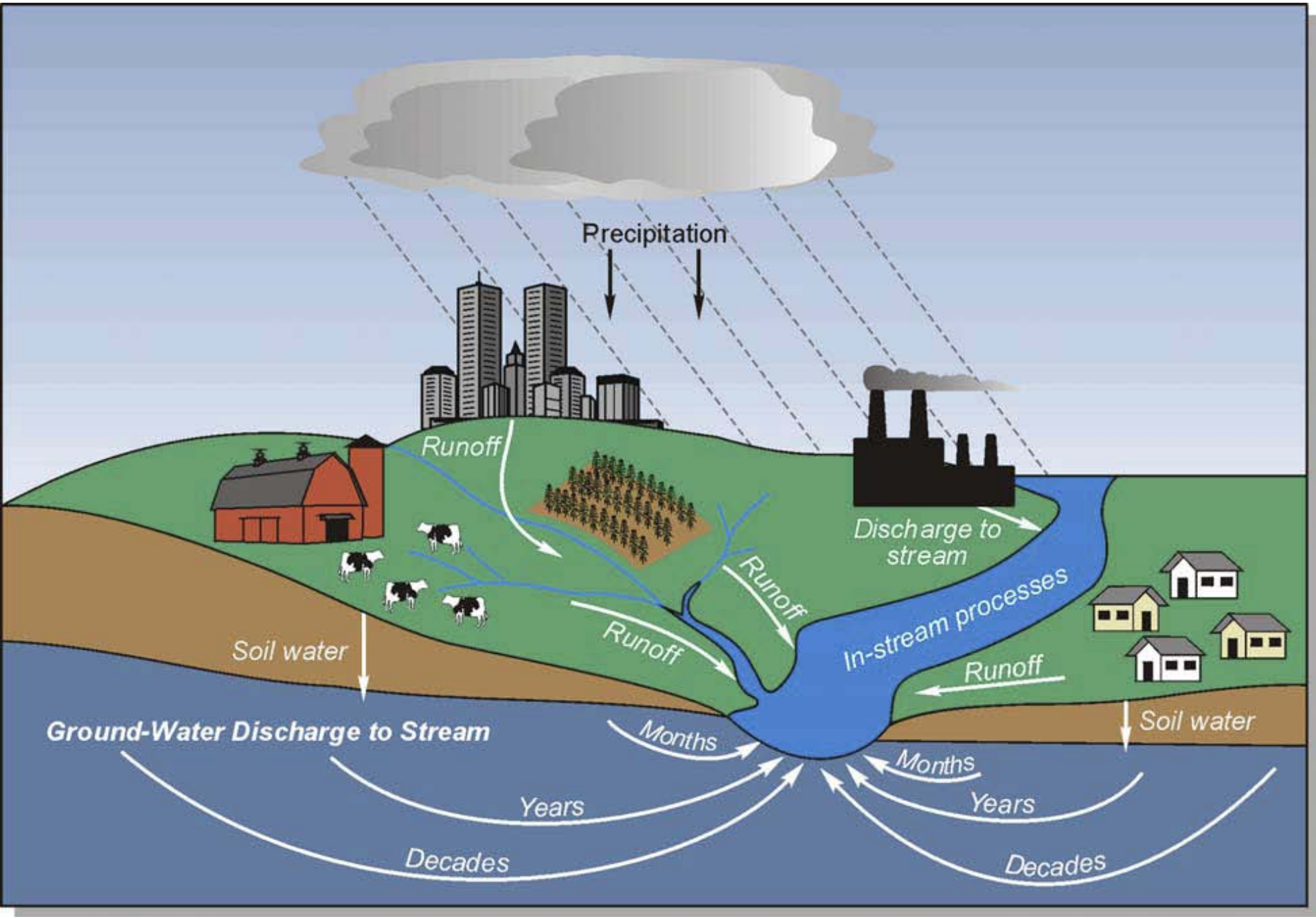
Context of the Workshop




Precipitation
Runoff
Discharge to stream
Runoff
Runoff
In-stream processes
Runoff
Soil water
Soil water
Ground-Water Discharge to Stream
Months
Years
Decades
Months
Years
Decades

Draft Recommendations

* Expand our conceptual modeling framework to encompass interactions between floodplains, stream channels, and sediment storages in a manner that enables comprehensive sediment budgeting.
* Improve the accounting of sediment and attached nutrient storages either within the CBWM (lower order streams, stream channel erosion, groundwater dynamics, and reservoir dynamics), and/or through the use of supplemental models.

Recommendations (cont.)

* Comprehensive local inventory of all agricultural and urban BMPs, including performance characteristics.
* Expedite data sharing agreements, account for previously unaccounted for practices, and standardize local accounting methods and procedures.
* Expand site-specific data collection efforts to include particle size distribution and soil P in the top few cm of soil.
* Design new monitoring efforts to explicitly evaluate hypotheses needed to guide restoration, BMP implementation, and land planning in a holistic manner.
* Expand regional research efforts to include inflow-outflow monitoring of major reservoirs and delineation of province-specific groundwater flow path delivery mechanisms.

Recommendations (cont.)

* In order to mitigate the effects of lag-times, existing trading programs should be revised to incorporate forward markets to efficiently allocate reductions over time.
* Additional ecosystem benefits that are delivered more quickly need to be highlighted to foster public support for the program.
* Information about lag-times can be used to inform the adaptive management process, to educate the public about setting realistic restoration expectations, and to assist local managers in more appropriate selection of control measures that will produce the desired short-term and long-term effects.

Develop General Statements about Lag-Time for the Public

* Prepare a scenario(s) that contrast current CBWM output with and without lag times for hydrology, BMP maturation, and sediment storage to inform the public when the implemented practices will produce the detectable improvements in WQ that we expect.
* Simulation of BMP implementation requires the use of *best professional judgment* which includes a degree of uncertainty. Additionally, real-time changes in flow, major weather events, and politics affect the expected changes in WQ, so that adaptive management is key in accommodating lag-time during implementation.

Example of Management Practice, Structure, or Upgrade Process	Time for Practice to be Installed and for Effect to reach Water Body (Component 3 and 4 of Fig. 1)		
	Nitrogen (N)	Phosphorus (P)	Sediment
Non- Point Source			
Livestock Exclusion	Short	Short	Short
Grass Buffers	Medium	Short	Short
Riparian Forest	Medium	Medium	Medium
Grass Cover Crops	Long	Long	Long
Conservation Tillage	Long	Long	Long
Stream Bank Stabilization	Short	Short	Short
Agriculture Nutrient Management	Long	Medium	NA
Soil Conservation Plan	Long	Long	Long
Urban Nutrient Management	Long	Medium	NA
Urban Sediment Pond	Short	Short	Short
Point Source			
Treatment Plant N Upgrade	Short	NA	NA
Treatment Plant P Upgrade	NA	Short	NA

Lag Time class: Short = 1-3 yrs, storm flow near stream for P and sediment; Medium = 2-10 yrs, longer installation time or moderate distance from stream; Long = 7-50 yrs, base flow transport of soluble nutrients or located in upper half of watershed; NA = not applicable

Effect on N or P or Sediment: Green = major effect ; Blue = secondary effect ; Red = minor effect

Implications

* Since lag-times are associated with most agricultural BMPs, modeled results will not be consistent with WQ observations, and WQ standards and TMDL reduction goals will not be met as soon as the CBWM projects.
* If lag-times are accounted for, and point source WQ permits must still be met annually, the economics driving the decision of point source permit holders, about whether to participate in nutrient trading or to install advanced treatment technology, will favor the advanced treatment technology.