

Stream Restoration STAC

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The Chesapeake Nontidal Watershed History and Evolution of Stream Degradation Patterns and Restoration

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Coastal Plain histories

Legacy sediment is standard for Coastal Plain

- Colonial deep water ports now miles from navigation
 - Siltation problem recognized in law by 1750s
- Over 800 land acres were added to Maryland alone between 1845 and 1938 (Gottschalk 1945)
- USGS-BWPR project in Anne Arundel County
 - Floodplains contain meters of legacy sediments
 - Stream beds on top of legacy sediments
 - Precolonial soils deep below ground, invisible
 - Very different floodplain environment, alder-fern wooded swamps, buried bogs. Large wood piles.

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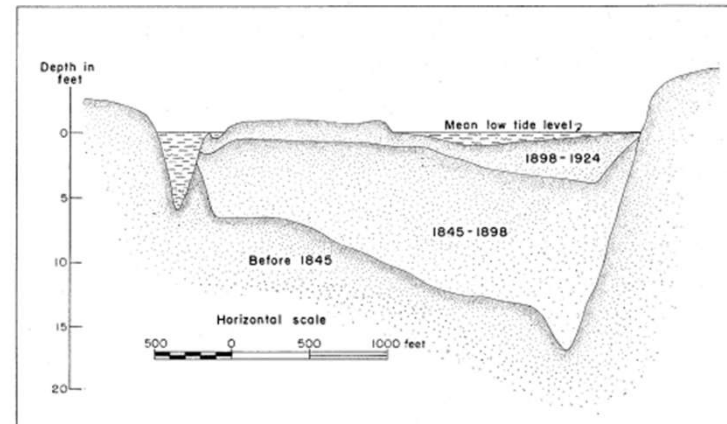
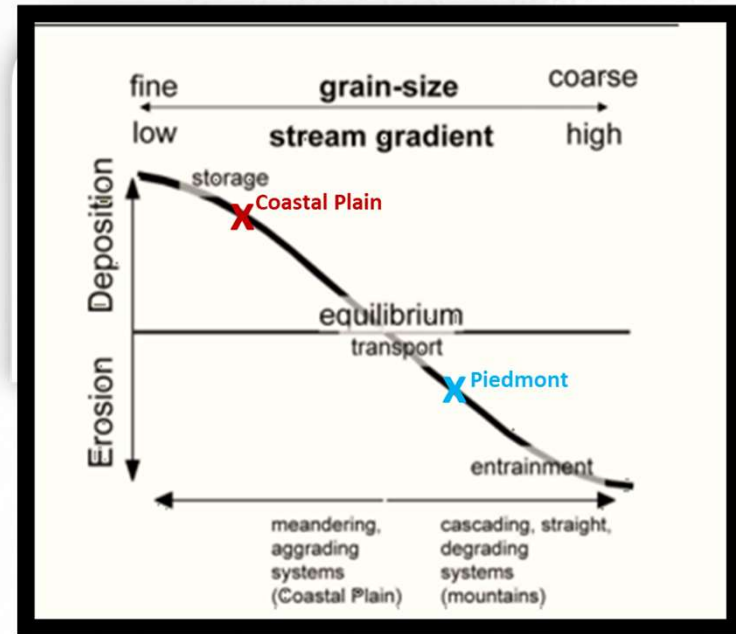
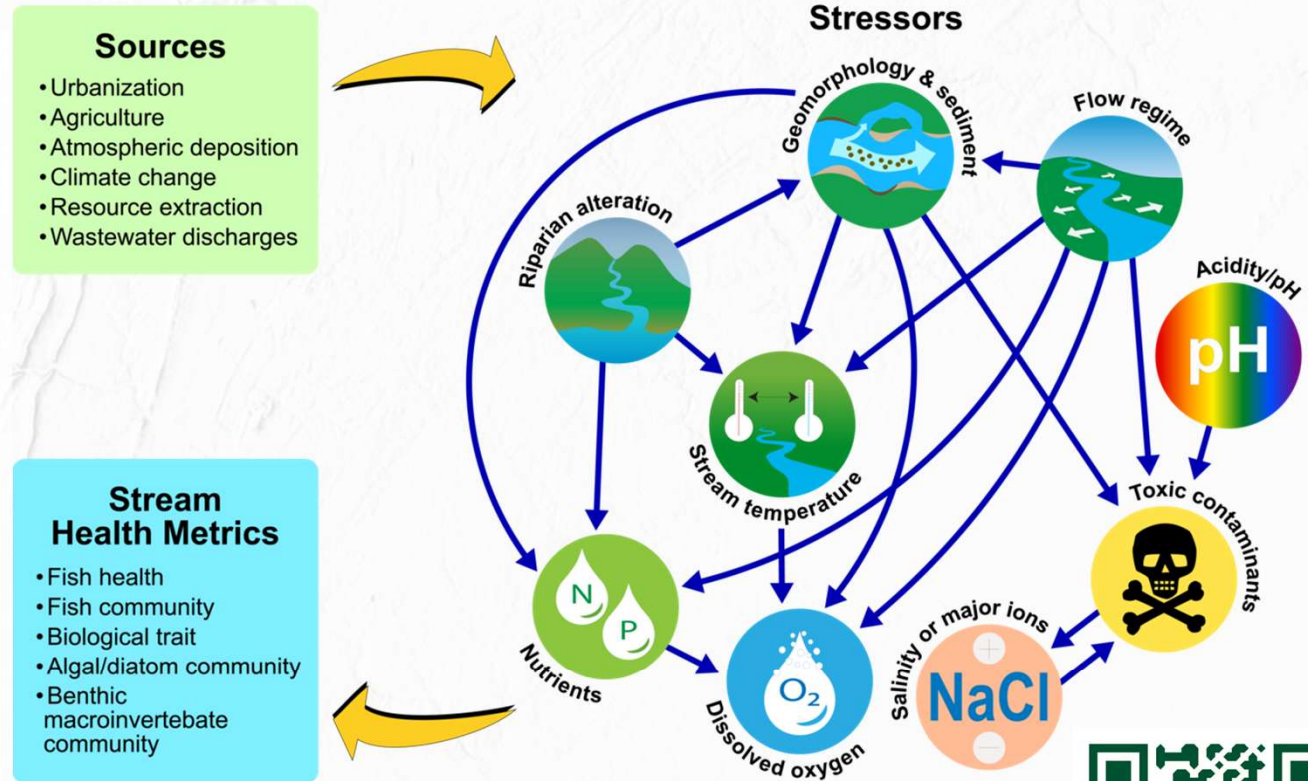


FIG. 5—Sedimentation of the Patapsco River arm of Baltimore harbor near the Hanover Street bridge. (Gottschalk 1945)



Multiple stressors review

- Stream biota are affected by instream habitat **stressors**
- Anthropogenic disturbances alter a mixture of co-occurring stressors
 - e.g. Urban Stream Syndrome
- Biota may be limited by one(+) stressor(s), rather than all present
- Restorations target stressor pathway(s), not source
 - e.g., storm pond does not remove impervious surfaces, it mitigates flow
- Focusing on wrong stressor pathways might limit effectiveness and ecosystem response



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Identifying Key Stressors Driving Biological Impairment in Freshwater Streams in the Chesapeake Bay Watershed, USA

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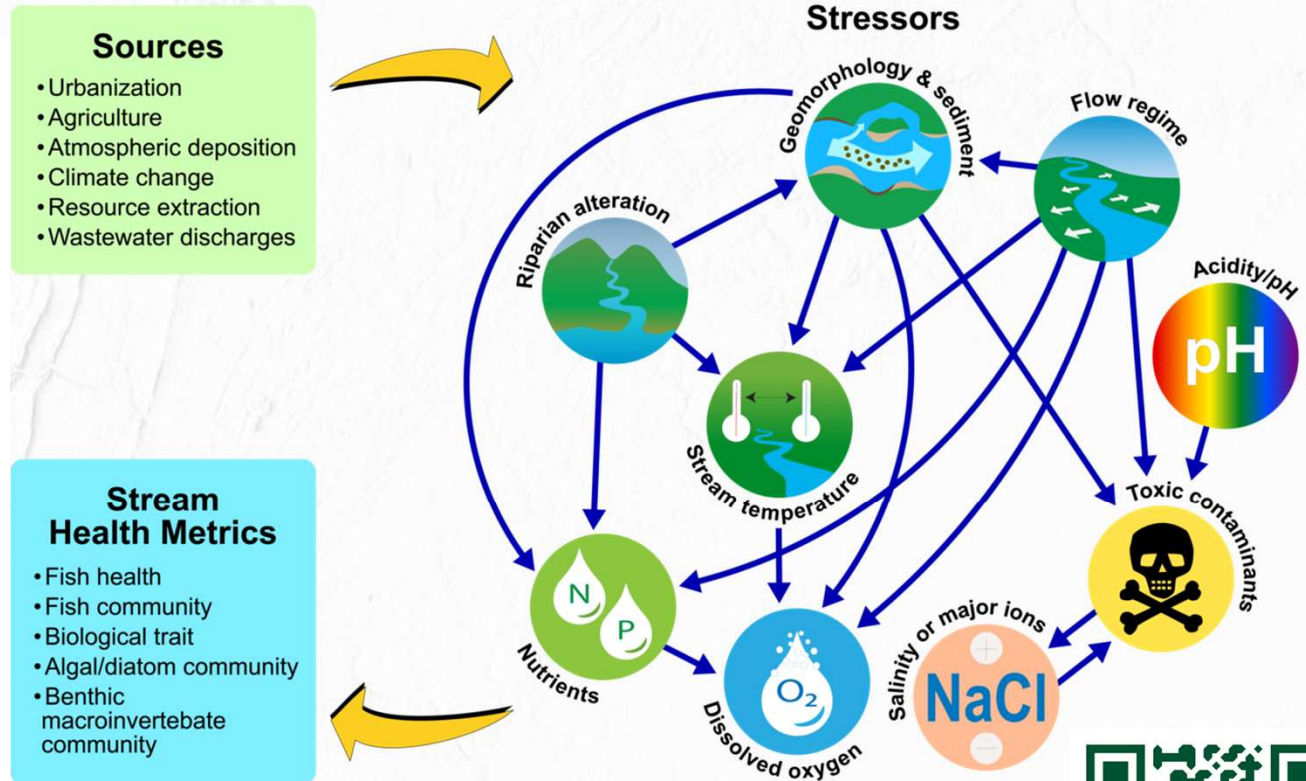
Multiple stressors review

- USGS study published in *Environmental Management*
- Focus on stream macroinvertebrate endpoints

1. Analyzed Scientific Literature for Multiple-Stressor Studies

- Freq. stressor was studied
- Freq. stressor was statistically “important”
- Compared across land-uses

2. Compared to state-reported stream impairments (303d) and listed stressor “cause”



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Multiple stressors review

- Geomorphology (and “sediment”) – Important, studied, and commonly listed
 - **But “sediment,” bed habitat, and geomorphic processes are related, not equivalent.** These topics get conflated in listings, see Flow
- Salinity – **Very important** in urban, industrial, mining
 - **Rarely listed** (except Maryland)
- Nutrients – Lots of focus, but **only occasionally important** to local condition, mainly in ag areas.
- Pesticides and organic contaminants – **Rarely evaluated, but almost always very important.**
 - Critical need for more monitoring to understand extent and severity.
- Flow – Hard to measure, **typically listed under sediment.**
 - Yet erosion controls do not resolve geomorphic function nor direct flow effects.

| Stressor category | Literature review | | Jurisdictional analysis |
|---|---|--|-------------------------------|
| | Frequency of measurement | Frequency of importance | Watershed-wide ranking |
|  Geomorphology & sediment | High | High | High |
|  Salinity & major ions | High | High | High * <i>MD only</i> |
|  Nutrients | High | Moderate | High |
|  Toxic contaminants | Low * * <i>Pesticides & Organics</i> | High * * <i>Pesticides & Organics</i> | Moderate * * <i>Metals</i> |
|  Flow | Low | Moderate | Moderate |
|  Acidity | Moderate | Low | Moderate |
|  Riparian | Low | Low | Moderate |
|  Dissolved oxygen | Moderate | Moderate | Low |
|  Temperature | Moderate | Low * | Low |

