

Addressing Stormwater Impacts on Hawaiian Streams



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Mr. Stephen Blanton, PE

14 years experience focusing on water resources, geomorphology, environmental science, civil engineering and planning.

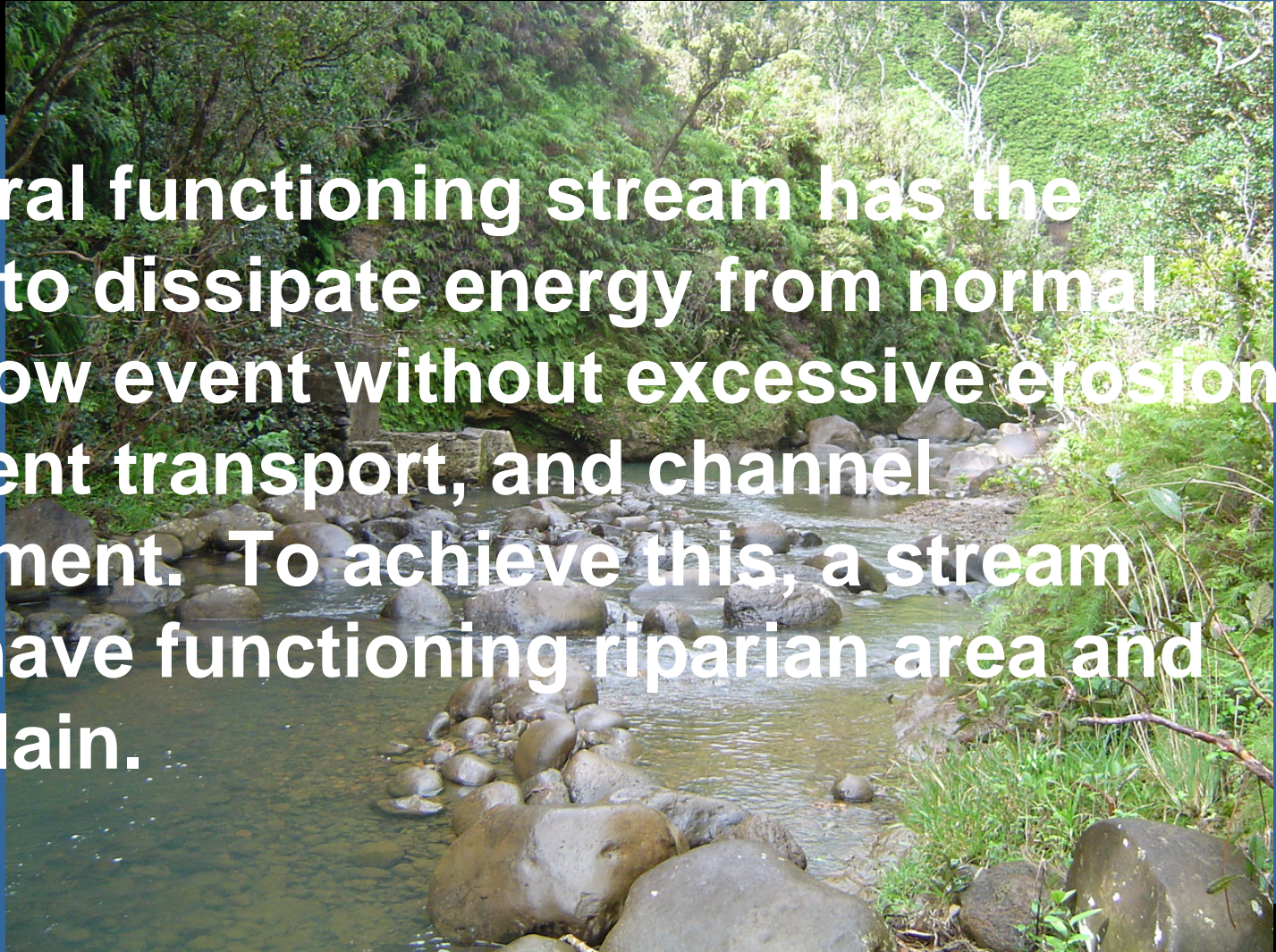
Currently working for ENTRIX, Inc, conducting stream restoration projects aimed at restoring natural function to impacted river/stream systems.

Hawaii work included; TMDL for Nawiliwili, Pearl Harbor, and Kaukonahua. Dam failure analysis for Reservoir 24, Maui. Maui County hydrologic study (West Maui Mountains), and various water quality studies on Maui and Oahu.



Natural Function of a Healthy Stream-

A natural functioning stream has the ability to dissipate energy from normal high flow event without excessive erosion, sediment transport, and channel adjustment. To achieve this, a stream must have functioning riparian area and floodplain.



Functioning Floodplain



Not so much



Healthy Riparian Area and Floodplain

Improves water quality
filters sediment

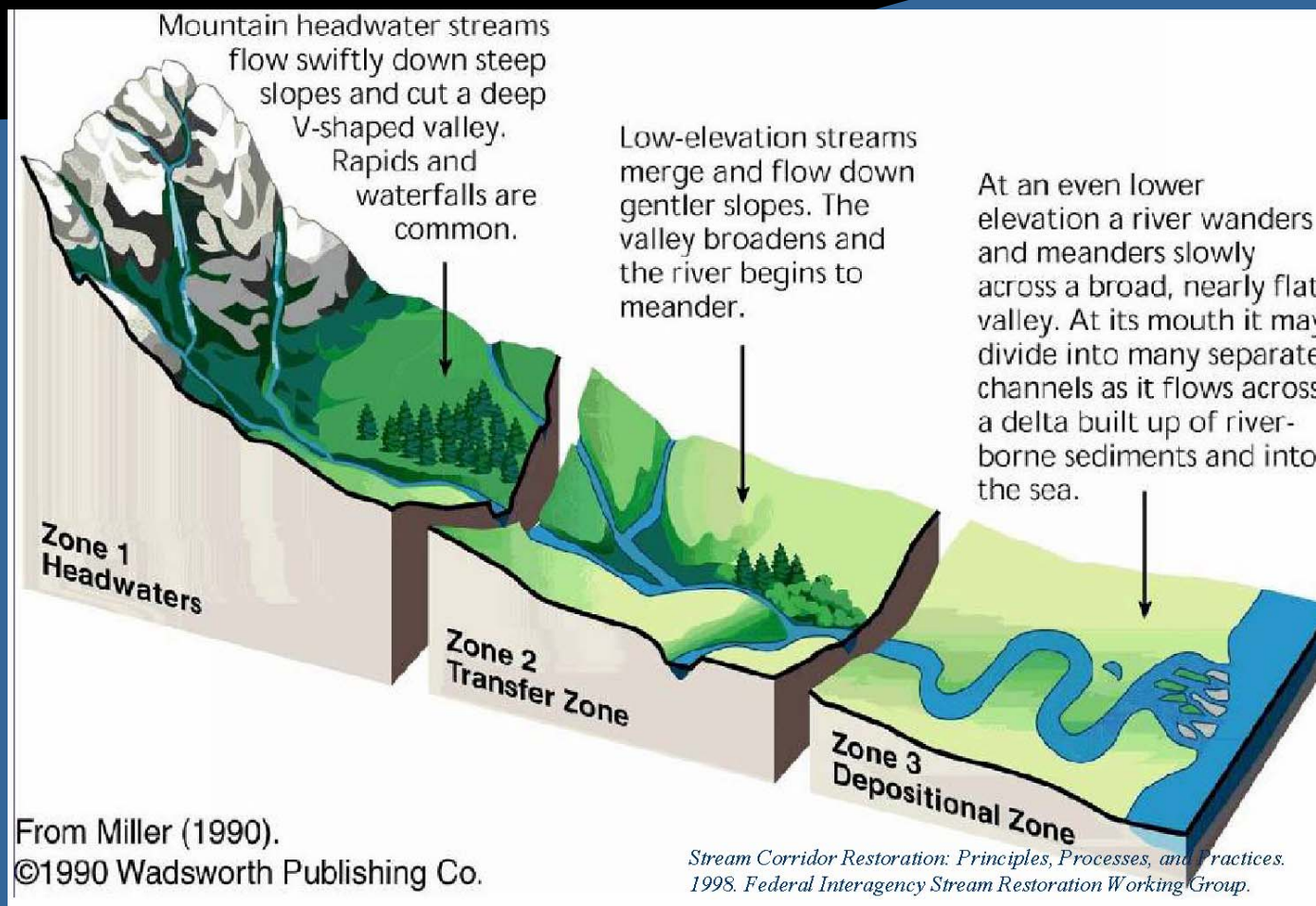
Controls rates and volume of erosion
attenuates flood peak
streambank stability

Aquifer Recharge
dry season streamflow

The key is to keep the water on the land



Typical Stream Profile



Stormwater Impacts

A healthy naturally functioning stream has developed a dynamic equilibrium based on the hydrologic characteristic of the watershed.

Changes to the drainage area's hydrology due to land use changes alter this equilibrium and the stream then starts to adjust to accommodate the conditions.

**Typical land use changes are:
residential/commercial/industrial development, timber harvest, agriculture, fire, and diversions.**



Residential Development



Agricultural Development



Typical Impacts to a Watershed

Increased runoff volumes

Increased peak runoff rates

Increased flow velocities

More frequent channel forming flows

Lower baseflow

Less groundwater recharge

Water Quality

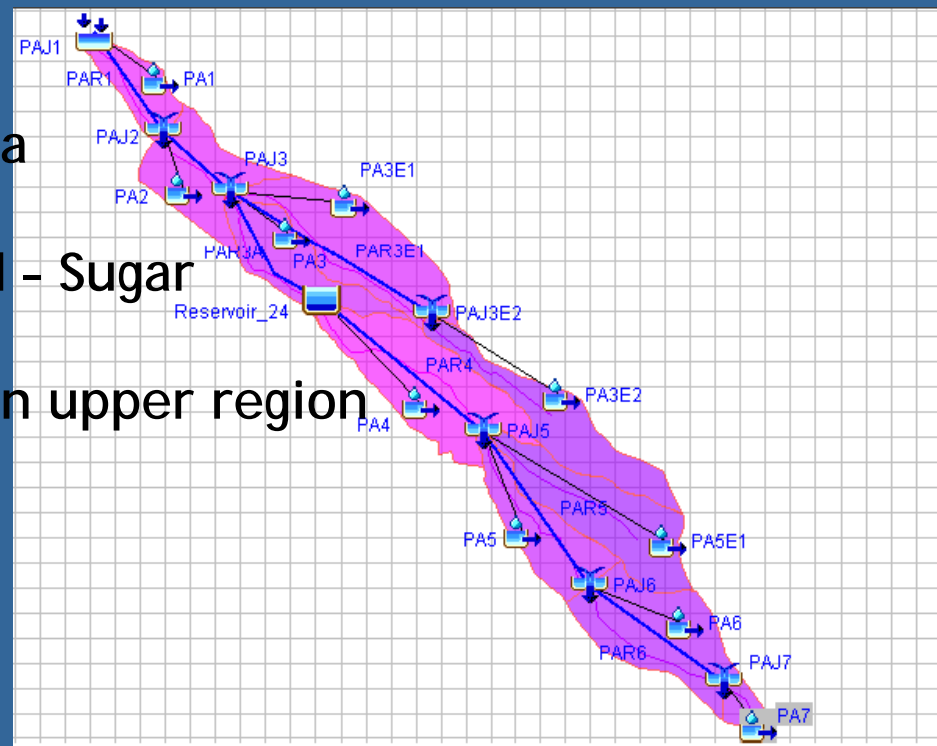


Hydrologic Analysis

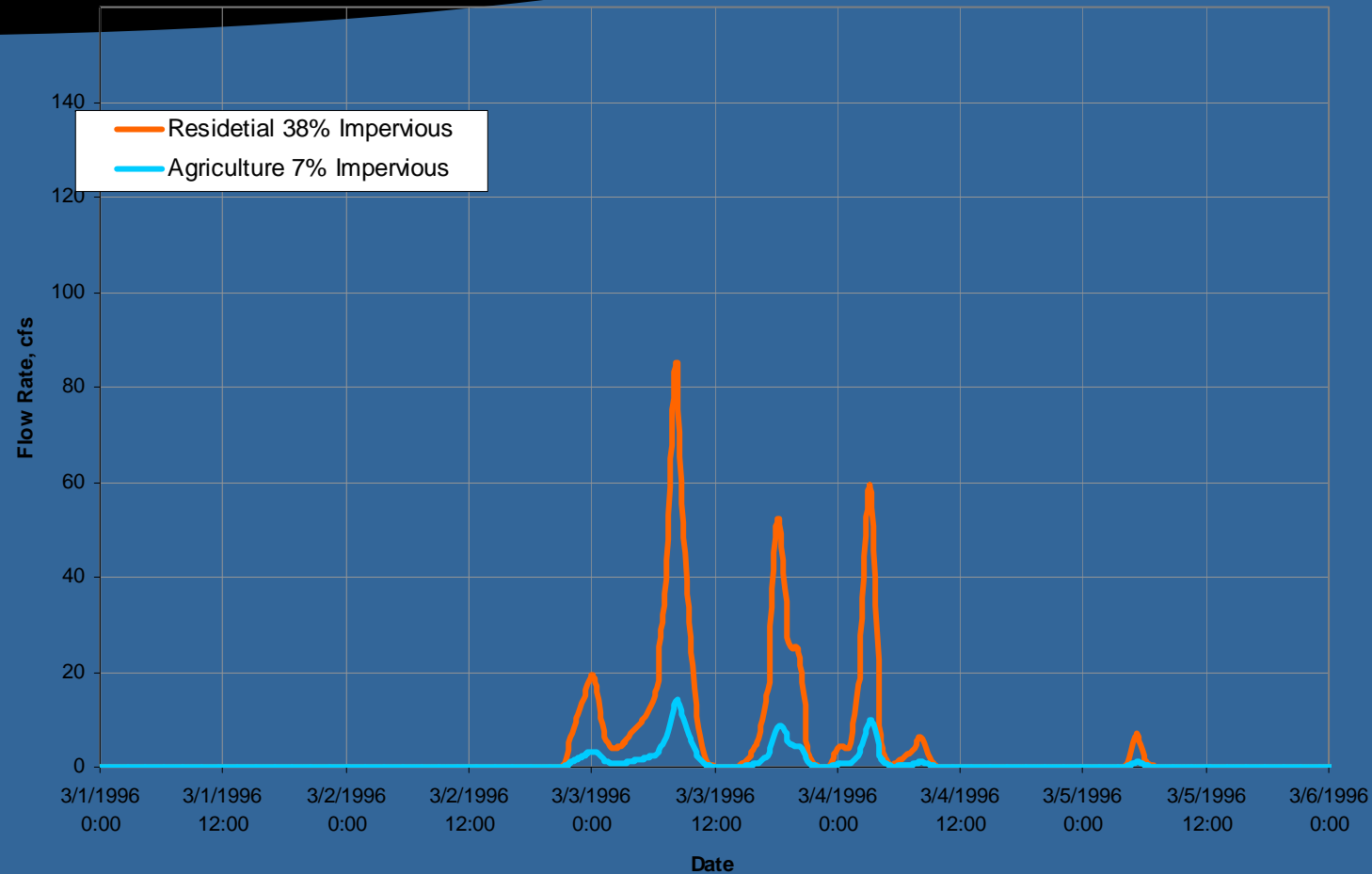
North slope of Haleakala

Mostly Agricultural land - Sugar

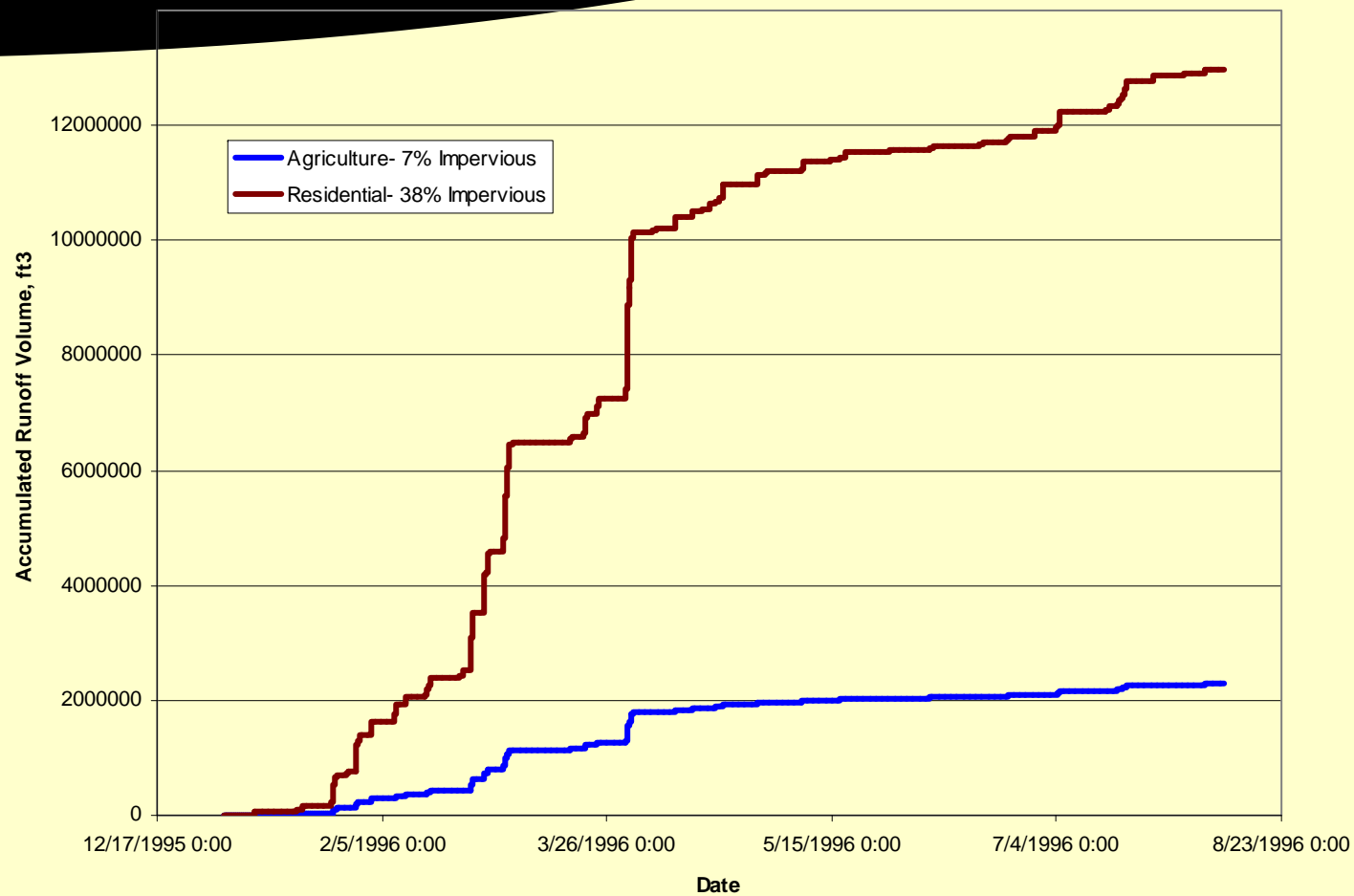
Small Residential area in upper region



Impacts of Impervious Area



Runoff Increase



Water Quality Issues

Increase in:

Nutrients- Nitrogen, Phosphorus.

Sediment load- TSS

Herbicides & Pesticides

Metals- copper, zinc, lead, chromium

Temperature



Adverse Impacts

Native Species of Fish, Shrimp, and Snails

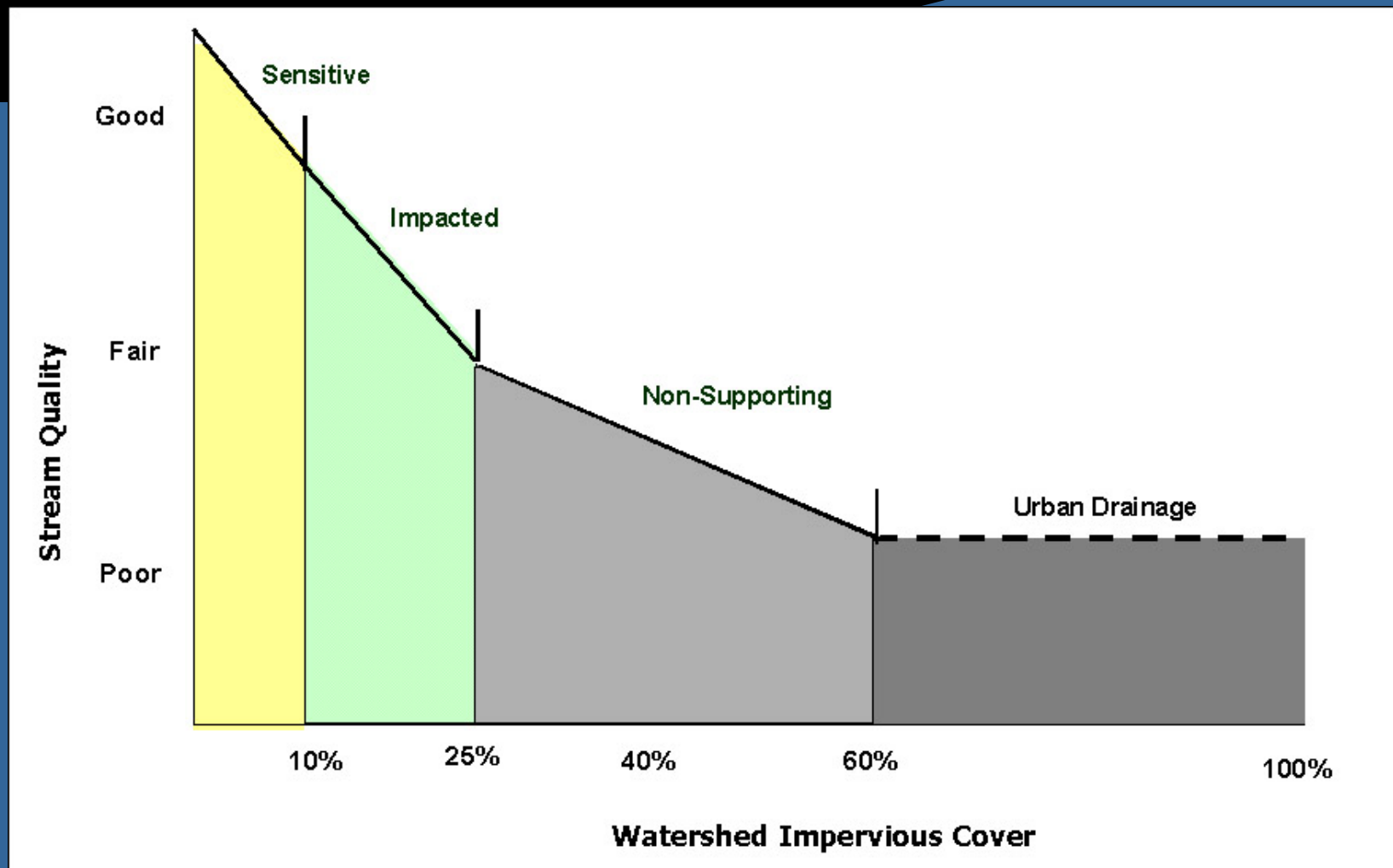
Habitat Impacts Native Survival and Allows Invasive (more tolerant) Species to gain presence and displace natives.

Concrete Channels lack of riparian vegetation create barriers for the amphidromous species to complete natural life cycle.

Lack of natural stream functions impacts coral reef health.



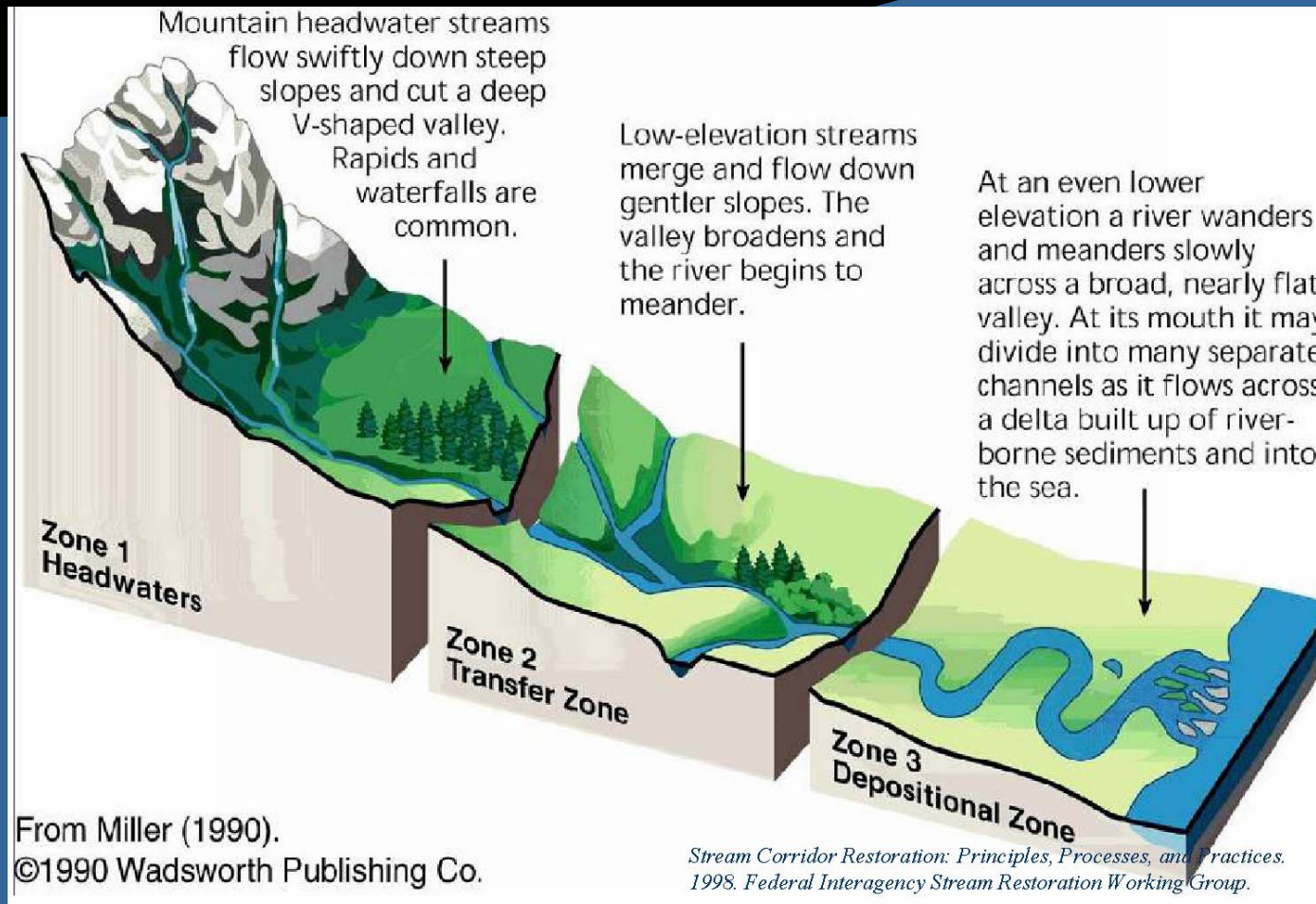
Stream Health Related to Impervious Area



Non-Supporting Urban Drainages



Change so all zones are sources.....



Typical Impacted Stream



Extreme Event



Stormwater Regulations in The State of Hawaii

Counties address stormwater from development using design standards.

The State addresses stormwater quality through the NPDES and TMDL programs associated with the Clean Water Act.



Future of Stormwater and Stream Health

Low Impact Development- The goal is to maintain historic/natural hydrologic conditions.

Restoration Opportunity- Add natural function back to impacted streams.



Mother Nature Conducting Stream Restoration

