I ka nānā no a 'īke - Stream Channel Restoration

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US Forest Service
Ecology, Restoration, and Management of Hawaiian Streams
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The roots of river restoration in Hawaii
Public Awareness
Harold L. Lyon

http://www.hawaii.edu/lyonarboretum/
Policy

National Environmental Policy Act

Clean Water Act - section 404

Endangered Species Act
National River Restoration Science and Synthesis

1. Measurable criteria
2. Comprehensive watershed plans
3. Track restoration projects

Palmer et al 2007
Cal Fed Ecosystem Restoration Plan

• Many small projects
• But no framework

http://calwater.ca.gov/performancetracking/about program performance.html

>$1,000,000,000.00
Compound channel techniques
Example: Tracking
Compound channel: migration
Compound channel: floodplain depositon
Compound channel: floodplain deposition
Compound channel: floodplain deposition
Example: ““Context””
Complete channelization
Example: “Context”

- System vs. Symptoms
- Classification?
The Key to the Rosgen Classification of Natural Rivers

SINGLE-THREAD CHANNELS

- Entrenchment Ratio
  - Entrenched (Ratio < 1.4)
  - Moderately Entrenched (1.4 - 2.2)
  - Slightly Entrenched (Ratio > 2.2)

- Width / Depth Ratio
  - Low Width / Depth Ratio (< 12)
  - Moderate to High Width / Depth Ratio (> 12)

- Sinuosity
  - Low Sinuosity (< 1.2)
  - Moderate Sinuosity (> 1.2)
  - High Sinuosity (> 1.5)

MULTIPLE CHANNELS

- Very High Width / Depth Ratio (> 40)
- Very Low Sinuosity
- Highly Variable Width / Depth Ratio

KEY to the ROSGEN CLASSIFICATION of NATURAL RIVERS. As a function of the "continuum of physical variables" within stream reaches, values of Entrenchment and Sinuosity ratios can vary by +/- 0.2 units; while values for Width / Depth ratios can vary by +/- 2.0 units.

http://www.fgmorph.com/
LONGITUDINAL, CROSS-SECTIONAL and PLAN VIEWS of MAJOR STREAM TYPES

- **Aa+**: > 10%
- **A**: 4 - 10%
- **B**: 2 - 4%
- **C**: < 2%
- **D**: < 4%
- **DA**: < 0.5%
- **E**: < 2%
- **F**: < 2%
- **G**: 2 - 4%

**CROSS SECTION VIEW**

**PLAN VIEW**

**STREAM TYPES**

<table>
<thead>
<tr>
<th>STREAM TYPES</th>
<th>Aa+</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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http://www.fgmorph.com/
Toward a watershed perspective

• A combination of watershed approaches and riparian buffers.

Toward a watershed perspective

• Treat storm water runoff before discharge from site.
• Runoff not to exceed pre-project rates and durations.
• Cover or control stormwater pollutant sources.
• Maintain in perpetuity.
“Softer” stabilization techniques

http://www.dakotacountyswcd.org/shore_fs.htm
Sediment Load x Sediment Size
Stream Slope x Stream Discharge