



# Water Quality Monitoring with Citizen Scientists since 1999

Joel Green, Streamkeepers Coordinator



# Who are we?



## Part of Clallam County Department of Community Development

# What funds us?

## Combination of:

- County general funds
- Grants
- Contracts





## Mission:

Enhance involvement  
in stewardship of local streams.



## Goals:

- Monitor local streams, and gather quality data to guide management decisions.
- Report the information to a variety of audiences
- Facilitate public involvement in stream monitoring & watershed stewardship.

# Streamkeepers is part of a bigger picture:

The Clean Water Act (1972) has a comprehensive goal...

"...to restore and maintain the **chemical, physical, and biological integrity** of the nation's waters."

*-- Clean Water Act (CWA) Section 101(a)*



# Clean Water Act in WA State:

## WA Dept. of Ecology must:

- Collect data statewide—its own and credible data from others (**like us!**).
- Compile “303(d)” list of impaired water bodies.
- Require restoration of impaired streams.

# **Goal 1:**

## **Monitor local streams, and gather quality data to:**

- **Describe current stream conditions**
- **Identify trends**
- **Track known problem areas**
- **Screen for emerging problems**
- **Relate problems to causes**
- **Help regulators and restorers**



# Monitoring by Streamkeepers

## Chemical and physical characteristics of stream water

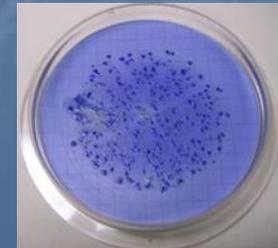
- pH
- Dissolved Oxygen
- Turbidity
- Temperature
- Salinity
- Conductivity



# Monitoring by Streamkeepers

## Grab Samples

- Bacteria
  - Fecal coliform
  - Escherichia coli
- Nutrients
  - Phosphate
  - Nitrate
- Toxics
  - Metals
  - Pesticides
  - Etc.



# Monitoring by Streamkeepers

## Stream Flow (Discharge)



# Monitoring by Streamkeepers

## Wildlife observations



# Monitoring by Streamkeepers

## Sampling Benthic Macroinvertebrates



# Assessing Stream Health: The Benthic Index of Biotic Integrity (B-IBI)

- Assess a living system by the things that live in it!
- B-IBI calculates a stream's health by counting and categorizing its populations of benthic invertebrates.
- Relies on the fact that invertebrates vary in their tolerance of poor conditions.



**Green stonefly nymph**

Breathes directly through its exoskeleton; requires extremely cool, oxygen-rich water.



no gills

**Flat-headed mayfly nymph**

Clings to the tops of rocks; heavily impacted by excessively high flows and fine sediment.



small gills

**Prong-gill mayfly nymph**

Burrows into the leaf litter; more resilient against high flows and fine sediment.



branched, larger gills

**Red midge larva**

“Bloodworm”—stockpiles oxygen in its body and thrives in muck.



The red color is hemoglobin, which stores oxygen in blood

← Less tolerant of poor conditions

More tolerant of poor conditions →

# Monitoring by Streamkeepers

## Monitoring Large Woody Debris (LWD)

- LWD slows down the water and reduces erosion,
- Creates pools and riffles,
- Provides food and shelter for juvenile fish



# Quality Assurance

- Monitoring follows strict protocols.
- Quantitative measures minimize judgment calls.
- Quality Assurance Project Plan specifies procedures and protocols.

# Goal 2:

## Report the information to a variety of audiences

- *State of the Waters 2004*
- State Water Quality Report (biennial)
- Reports to watershed planning groups & agencies
  - E.g. *2021 Annual Report to City of Port Angeles*
- Public events and presentations
- Website

# Goal 3:

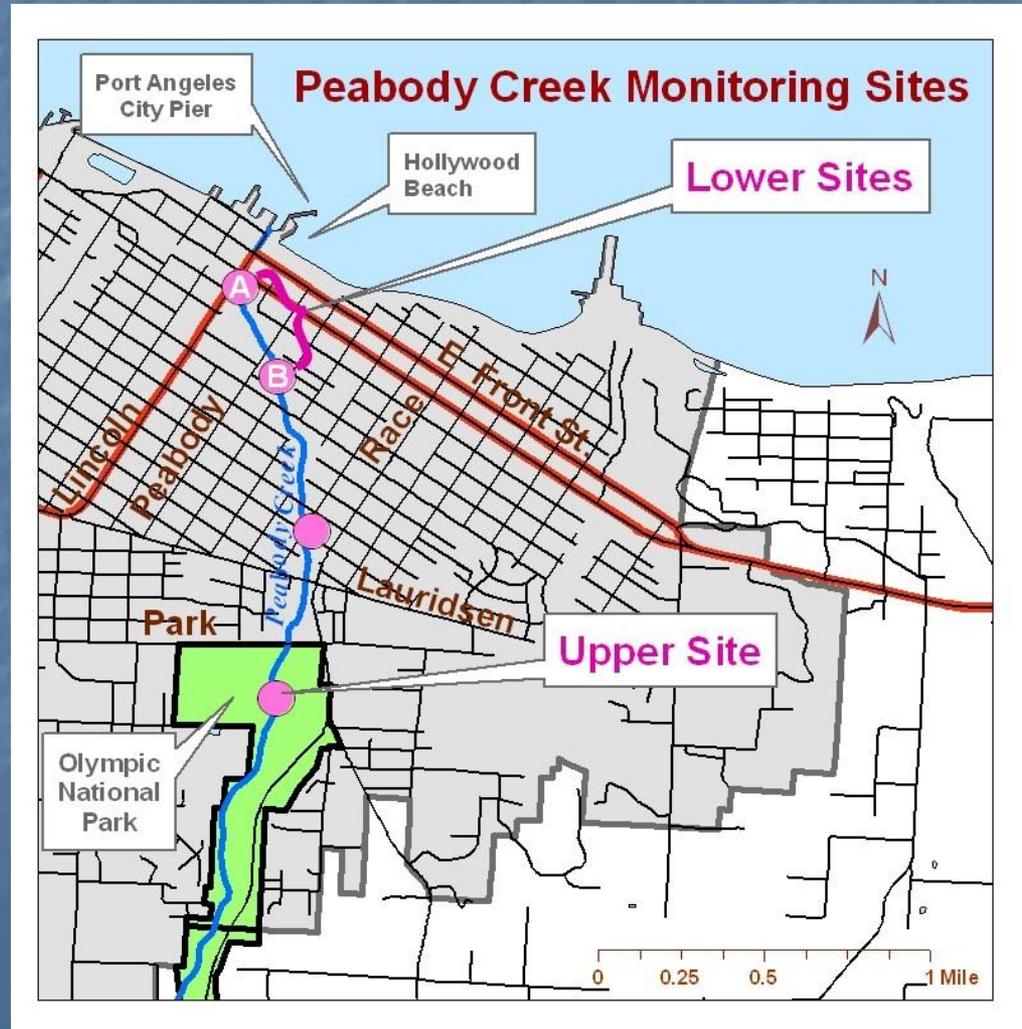
**To facilitate public involvement in stream monitoring & watershed stewardship.**



- **Over 400 volunteers to date**
- **Hundreds more reached through schools (elementary through college)**
- **Outreach at public events**
- **Presentations to community groups**

# Case Study: Peabody Creek

A healthy stream becomes impaired as it flows through an urban area—why?



# B-IBI Scores Upstream⇒Downstream

*Peabody 1.4, @ ONP Visitor Center*

2008     **73**     **Good**

*Peabody 1.0, @ 9<sup>th</sup> St.*

2009     **31**     **Poor**

*Peabody 0.2, @ 2nd St. above final culvert*

2009     **19.5**     **Very poor**

**Lower site RM 0.2**



**Middle site RM 1.0**

**Inputs to stream**

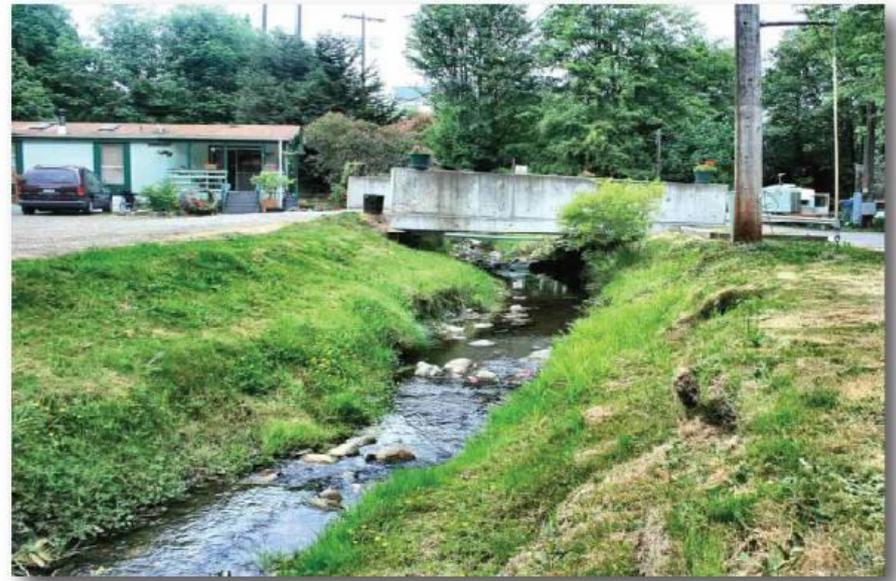
**Upper site RM 1.4**





Upper site RM 1.4  
(at Olympic National  
Park Visitor Center)

Riparian (streamside)  
trees and fallen logs  
naturally slow down and  
filter storm runoff.

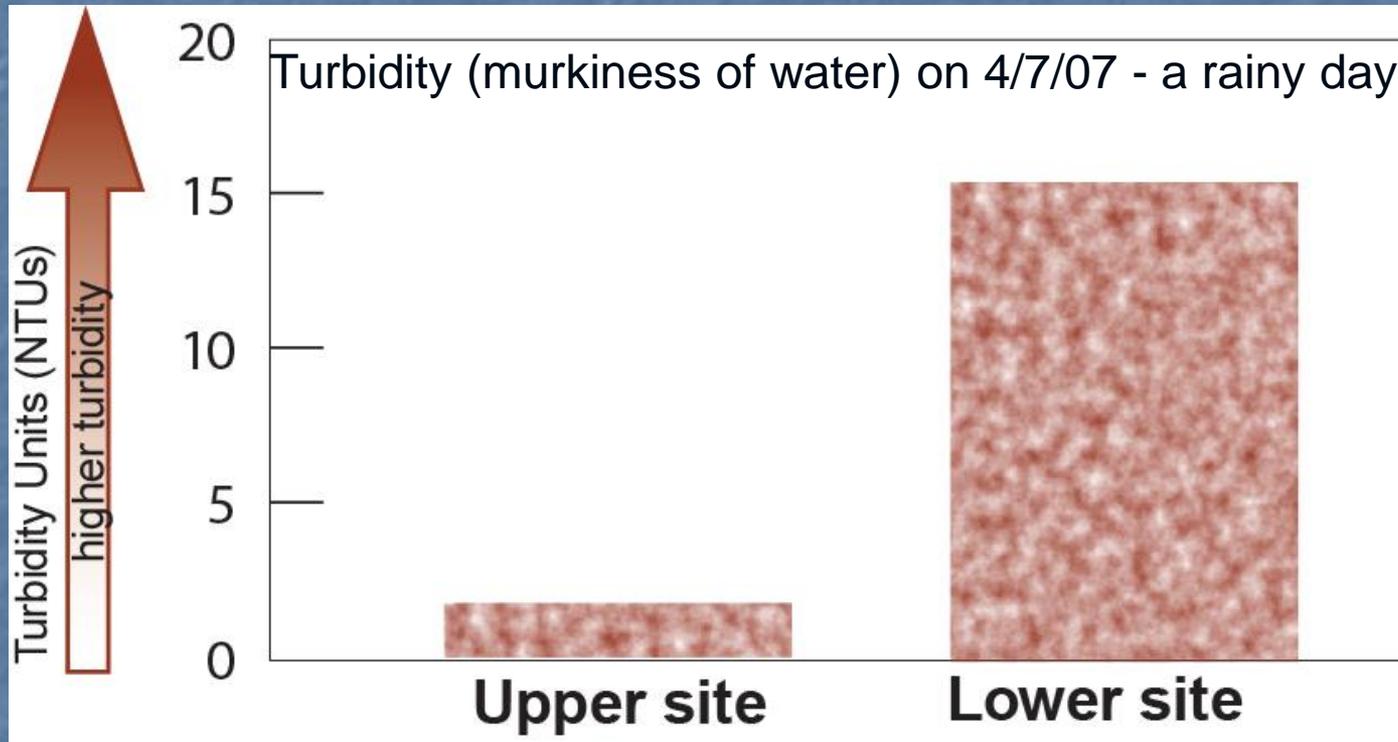


Lower site RM 0.2  
(at Peabody RV Park -  
2nd & Lincoln)

Streams are less able to  
absorb storm runoff when  
channelized and lacking  
standing or downed trees.

# ***Water Quality:***

**Stormwater can quickly pollute streams**

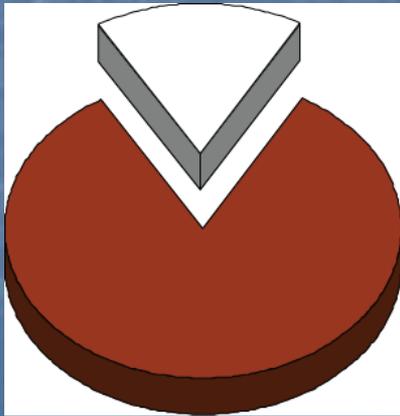


Urban stormwater, when not absorbed, rushes into streams, causing a dramatic rise in fine sediment and increased mortality of aquatic creatures.

# *Physical Habitat:*

Development often leads to a lack of LWD

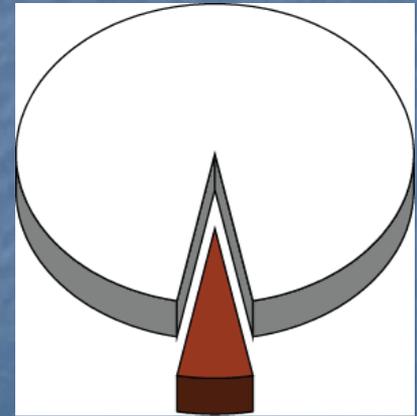
Upper site



LWD = 83%  
of target

The "target" is the expected value for a natural landscape (per UW research)

Middle site



LWD = 6% of  
target

# Overall Stream Health Ratings (based on multiple indicators)



# The big picture:

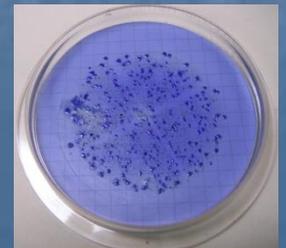
## How does SK fit in?



- **Data is used by many entities in Clallam County:**
  - **ID's & tracks problems**
  - **Helps plan cleanup & restoration projects**
- **Data is used by Dept. of Ecology under the Clean Water Act:**
  - **Identify impaired waters**
  - **Impaired waters will get cleanup plans**

# Types of Monitoring Projects:

- **Streamkeepers quarterly monitoring**
  - **Water chemistry, flow, habitat**
- **Macroinvertebrate sampling (B-IBI)**
- **Partner projects**
  - **Bacteria, nutrients, stormwater, etc.**



# The Clallam County Water Resources Database

- **Includes data from multiple sources**
  - Streamkeepers
  - Partner projects
  - Other data sets gathered in Clallam County
- Managed by Streamkeepers staff and volunteers



# Who are Streamkeepers?



## Anyone!:

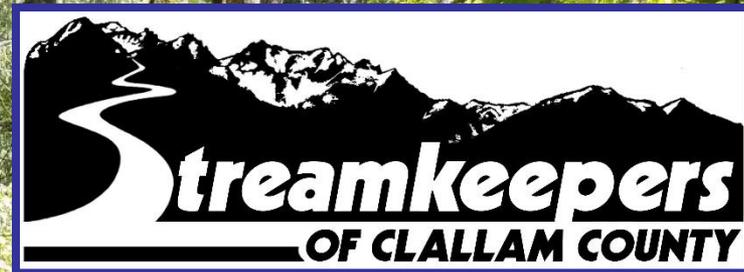
- All ages & walks of life.
- Expertise none to lots.
- Active to cerebral to clerical to logistical to educational

## Team concept:

- Join existing teams.
- Get mentoring.
- Part of a larger scientific enterprise.



# Get Involved!



## We welcome your participation

- [www.clallam.net/SK](http://www.clallam.net/SK)
- (360) 417-2281
- Streamkeepers Coordinator Joel Green's cell #:
  - (360) 325-3979
- [streamkeepers@clallamcountywa.gov](mailto:streamkeepers@clallamcountywa.gov)