Development of a Monitoring Framework for the KC River and Floodplain Management Section

King County Water and Land Resources Division

Spring 2010 Science Seminar
Has program and project implementation:

1. Reduced the risk of flood and channel migration hazards?
2. Avoided or minimized the environmental impacts of flood hazard management?
3. Reduced the long-term cost of flood hazard management?
RFMS Monitoring Framework

Recurring Data Collection → Special Investigations

Data Storage → Synthesis/Analysis

Interpretation → Reporting/Dissemination

Program Implementation

Adaptive Management
RFMS Monitoring Framework

Recurring Data Collection → Special Investigations

Data Storage

Synthesis/Analysis

Interpretation

Reporting/Dissemination

Program Implementation
Reach/River Scale Monitoring

Adaptive Management
Reach/River Scale Monitoring

• Corridor-scale implementation and effectiveness monitoring

• Channel and sediment monitoring

• Large wood studies
# Corridor-Scale Monitoring

(example: White River, Segment 1)

<table>
<thead>
<tr>
<th>River Segment</th>
<th>Corridor Condition</th>
<th>Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>King/Pierce County Line to River Mile 10</td>
<td>FHMP: Developed floodplain, constricted channel, depositional</td>
<td>FHMP: Acquire land or easements, modify levees and revetments to reconnect channel to floodplain</td>
</tr>
</tbody>
</table>
## Corridor-Scale Monitoring

*(example: White River, Segment 1)*

<table>
<thead>
<tr>
<th>River Segment</th>
<th>Corridor Condition</th>
<th>Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>King/Pierce County Line to River Mile 10</td>
<td><strong>FHMP:</strong> Developed floodplain, constricted channel, depositional</td>
<td><strong>FHMP:</strong> Acquire land or easements, modify levees and revetments to reconnect channel to floodplain</td>
</tr>
<tr>
<td></td>
<td><strong>WRIA:</strong> Reduced flows and wood supply, low habitat diversity, limited rearing habitat</td>
<td><strong>WRIA:</strong> Setback levees, floodplain reconnection, riparian restoration, LWD redistribution from MMD, flow modification.</td>
</tr>
<tr>
<td>River Segment</td>
<td>Corridor Condition</td>
<td>Strategy</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>King/Pierce County Line to</td>
<td><strong>FHMP</strong>: Developed floodplain, constricted channel,</td>
<td><strong>FHMP</strong>: Acquire land or easements, modify levees and revetments to</td>
</tr>
<tr>
<td>River Mile 10</td>
<td>depositional</td>
<td>reconnect channel to floodplain</td>
</tr>
<tr>
<td></td>
<td><strong>WRIA</strong>: Reduced flows and wood supply, low habitat</td>
<td></td>
</tr>
<tr>
<td></td>
<td>diversity, limited rearing habitat</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>WRIA</strong>: Setback levees, floodplain reconnection,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>riparian restoration, LWD redistribution from MMD,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>flow modification.</td>
<td></td>
</tr>
</tbody>
</table>

Are the identified strategies being implemented, and if so, are they having the intended effect?
Channel & Sediment Monitoring

White River cross section 5.621 [Old RM 5.52; W70]

Elevation (feet) NAVD 1988

Distance (feet)
Large Wood Studies

Goals:

• Characterize historical changes in amount & distribution of large wood,

• Evaluate the effects of KC river management policies on current large wood conditions,

• Anticipate how the amount and distribution of wood can be expected to change under current policies.
RFMS Monitoring Framework

Recurring Data Collection

Special Investigations

Data Storage

Program Implementation
Reach/River Scale Monitoring
Facility Data & Monitoring
  Baseline Info
  Annual Inspections
  Flood Damage
  Facility Condition

Reporting/Dissemination

Interpretation

Synthesis/Analysis

Data Sharing

Basin Scale Monitoring

Adaptive Management
Standard Project Monitoring

transect

Photo: John Koon
Standard Project Monitoring

Source: Roger Peters, USFWS

Source: Ruth Schaefer
Enhanced Project Monitoring

Tolt River Floodplain Reconnection
Countyline Project Construction

**Phase I**
- Project area
- Setback levee
- Biorevetment and riparian buffer
- Engineered log structures

**Phase II**
- Levee and revetment removal
RFMS Monitoring Framework

Recurring Data Collection
- Program Implementation
- Reach/River Scale Monitoring
- Facility Data & Monitoring
  - Baseline Info
  - Annual Inspections
  - Flood Damage
  - Facility Condition
- Project Monitoring

Special Investigations
- Ecological
- Engineering
- Geomorphic
- Interdisciplinary

Data Storage

Synthesis/Analysis

Interpretation

Reporting/Dissemination

Adaptive Management

Basin Scale Monitoring

Data Sharing
Special Investigations
An example of an interdisciplinary study...
Special Investigations
An example of an interdisciplinary study...

Do Trees On Levees:

• Improve bank stability?
• Improve the quantity and quality of fish habitat?
RFMS Monitoring Framework

- Recurring Data Collection
- Special Investigations
- Data Storage
- Interpretation
- Reporting/Dissemination

- Program Implementation
- Reach/River Scale Monitoring
- Facility Data & Monitoring
  - Baseline Info
  - Annual Inspections
  - Flood Damage
  - Facility Condition
- Project Monitoring

- Ecological Engineering Geomorphic Interdisciplinary

- Program Data
- Facilities Inventory
  - Excel Spreadsheets
  - Facility Database
    - Baseline Data
    - Monitoring Data
    - Maintenance
    - CIP Projects
    - Property/Easements

- Other Monitoring Data
- Synthesis/Analysis
- Data Sharing
Validation Monitoring

Has implementation of Rivers Section management alternatives had the expected effects?

Requires coordination with other monitoring efforts
Coordination/Collaboration

- LIDAR
- Fish In/Fish Out
- Basin Status and Trends
- Project Effectiveness Monitoring
  (e.g. SAC, Rainbow Bend, Countyline)
- Other opportunities?
**Figure 4-6: KC Flood Hazard Management Plan**

**Channel Monitoring**
- Ongoing Monitoring:
  - survey the channel periodically
  - hydraulically model the effect of sediment accumulation on water levels and flooding

**Sediment Management Actions**
- Identify a Specific Flood Risk Reduction Goal
  - which is a desired condition regarding sediment levels and flooding
  - such as "continued protection from a 50-year flood"

- Characterize Existing Conditions
  - use channel monitoring results

- Is Flood Risk Reduction Goal Being Met?
  - yes
  - use channel monitoring results
  - no

- Identify Potential Action Alternatives, e.g.:
  - No action
  - Levee setback; floodplain reconnection
  - Buy out and remove structures at risk
  - Gravel removal

- Evaluate the Action Alternatives
  - Analyze long-term flood risk reduction benefits
  - Analyze potential adverse effects
  - Evaluate alternatives relative to the flood risk reduction goal and other relevant evaluation criteria

- Establish a post-project monitoring program and restoration effort if needed

- Select an Appropriate Action Alternative and Implement It
Facilities Maintained by the Rivers Section

- 500 levees and revetments covering 119 miles
- Property acquisitions (>400 acres and “growing”)
DATA COLLECTION

Baseline Data

Routine Facility Inspections

Condition Assessments

Maintenance, Project Monitoring, Property Management

Monitoring Program Data

THE INVENTORY

Facilities Database

USERS

Slide courtesy of Deborah Scheibner & Kyle Comanor