Lessons Learned from California Urban Stream Restoration Projects

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BACKGROUND

PROJECT
National River Restoration Science Synthesis (NRRSS)

PHASES

I. Comprehensive database of river restoration projects (complete)

II. Survey-based database of restoration practices (complete)

III. Post-project appraisals – California only (in progress)
DEFINITION OF POST-PROJECT APPRAISAL (PPA)
Evaluation of the effectiveness of restoration projects based on systematic data collection.

PPA INQUIRIES
Was it built as designed?
Did it achieve its objectives?
Should steps be taken to address unanticipated effects?
How can we improve future restoration design?

(Downs & Kondolf 2002; Skinner 1999 adapted from Sadler 1998)

PROJECT DOCUMENT COLLECTION
I. Success criteria
II. Baseline surveys
III. Design rationale
IV. Design drawings
V. Post-project monitoring surveys
STUDY AREA

PPAs (2005-2007)
Total PPAs: 40
Urban PPAs: 22

Urban PPAs
Other PPAs
WHY RESTORE & APPRAISE URBAN STREAMS?

I. 75% of population lives in cities

II. Habitat for potentially diverse and productive biota

III. Water and materials conveyance

IV. Air purification

V. Adaptive management feedback


SIZE OF PROJECT REACHES

• 61 – 343 meters
• Median = 213 meters
• Mean = 220 meters

PROJECT COMPLETION

• 1995 – 2006
<table>
<thead>
<tr>
<th>I. Success criteria?</th>
<th>0</th>
<th>No</th>
<th>Review project docs &amp; interview stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>II. Pre-project surveys?</td>
<td>2</td>
<td>No</td>
<td>Reconstruct conditions with maps, aerials, etc.</td>
</tr>
<tr>
<td>III. Design rationale stated?</td>
<td>4</td>
<td>No</td>
<td>Reconstruct construction of goals by interviews &amp; doc review</td>
</tr>
<tr>
<td>IV. Design drawings?</td>
<td>10</td>
<td>No</td>
<td>Reconstruct design features by interviews &amp; doc review</td>
</tr>
<tr>
<td>V. As-built drawings?</td>
<td>1</td>
<td>No</td>
<td>Reconstruct by ground photos, site evidence, comparison to design</td>
</tr>
<tr>
<td>VI. Reproducible monitoring?</td>
<td>2</td>
<td>No</td>
<td>Evaluate value of new monitoring program to evaluate performance</td>
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</tbody>
</table>

**FIELD SURVEY PARAMETERS**

<table>
<thead>
<tr>
<th>I. Interviews with project managers, designers, etc. (10)</th>
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</thead>
<tbody>
<tr>
<td>II. Cross-section and long profile surveys (10)</td>
</tr>
<tr>
<td>III. Photo documentation (10)</td>
</tr>
<tr>
<td>IV. Facies/feature maps (9)</td>
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<tr>
<td>V. Vegetation cover/composition (5)</td>
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<tr>
<td>VI. Hydrologic analysis (3)</td>
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<tr>
<td>VII. Stakeholder surveys (3)</td>
</tr>
<tr>
<td>VIII. Interpretation of aerials and historic maps (2)</td>
</tr>
<tr>
<td>IX. Topographic survey (1)</td>
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<tr>
<td>X. Substrate analysis (1)</td>
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<tr>
<td>RESTORATION OBJECTIVES</td>
</tr>
<tr>
<td>----------------------------------------</td>
</tr>
<tr>
<td>Bank stabilization</td>
</tr>
<tr>
<td>Channel reconfiguration</td>
</tr>
<tr>
<td>Stormwater management</td>
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<tr>
<td>Aesthetics, recreation, education</td>
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<tr>
<td>Water quality management</td>
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<tr>
<td>Riparian management</td>
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<tr>
<td>In-stream habitat improvement</td>
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<td>Floodplain reconnection</td>
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<tr>
<td>Dam removal/retrofit</td>
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<tr>
<td>Fish passage</td>
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<tr>
<td>In-stream species management</td>
</tr>
<tr>
<td>Land acquisition</td>
</tr>
</tbody>
</table>

* Multiple responses allowed

<table>
<thead>
<tr>
<th>DESIGN TRENDS</th>
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</thead>
<tbody>
<tr>
<td><strong>ACTIVITIES (COMMON)</strong>*</td>
</tr>
<tr>
<td>Bank/channel reshaping (10)</td>
</tr>
<tr>
<td>Revegetation (9)</td>
</tr>
<tr>
<td>Grading - plan form (9)</td>
</tr>
<tr>
<td>Grading banks (9)</td>
</tr>
<tr>
<td>Grading floodplain (7)</td>
</tr>
<tr>
<td>Boulders (5)</td>
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<tr>
<td>Meander creation (5)</td>
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<tr>
<td>Wiers (5)</td>
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</tbody>
</table>

* Multiple responses allowed
POSITIVE OUTCOMES
• Successful vegetation establishment
• Stable channel geometry
• More complex channel features
• Increase of site use and/or stewardship

NEGLIGIBLE OR ADVERSE OUTCOMES
• Banks not as stable as desired
• Limited access or poor project reception
• Upstream/downstream constraints

INDIRECT OUTCOMES
• Grade control from US/DS culverts
• Shopping carts acting as boulders and/or LWD
• Demonstration project

LESSONS LEARNED
• Projects did not have quantitative objectives
• Lack of documentation and monitoring data restricts evaluation opportunities
• Projects had incompatible project objectives
• Projects did not set objectives in context of altered watershed
• Is a PPA ever “complete?”
• Who is charged with maintenance of project?
• More research needed on channel geometry and flow regime for urban streams (Brown 2000)
• If you build it, will they come? (Palmer et al. 1997, Bond & Lake 2003)
• Restoration projects should be linked to nearby intact reaches (Palmer et al 1997, Brierley and Fryirs 2000, Morley and Karr 2002, Findlay et al. 2006)
• Consider watershed context for restoration planning
• Include stakeholders in the restoration process
• Deal with uncertainty through adaptive management
“Every increment is significant. Any restored habitat will provide a focal point for a few individuals or a few taxa that would not otherwise be present in the system.” — Iannuzzi and Ludwig 2005

“The success of any attempt to improve the ecological condition of streams in urban areas will largely depend on human attitudes and behaviors within the catchments.” — Booth 2005

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