The use of case studies in establishing feasibility for wetland restoration

Kristine N. Hopfensperger, Katharina A.M. Engelhardt, & Steven W. Seagle
University of Maryland Center for Environmental Science – Appalachian Laboratory, Frostburg, MD 21532

Introduction
Case studies can be used to describe ecosystem structure and functions (Zedler 2001), illustrate principles in the collaboration of restoration projects (Kentula 2000), provide perspectives on approaches to restoration ecology (Kangas 2000), and support the initial design and evaluation of restoration alternatives (Pautzke et al. 1997). Here, we use the latter approach of examining multiple case studies to explore a diversity of restoration projects (alternatives).

We focus on projects that may help establish the feasibility of restoring Dyke Marsh Preserve (DMP), a tidal freshwater marsh along the Potomac River, Virginia (Figure 1). After substantial dredging, a legislative mandate ordered the restoration of DMP. Multiple plans and assessments for restoration have been developed to fulfill the mandate, but none have been implemented.

Results
Two of the five case studies are highlighted below.

Kenilworth Marsh

Problems during restoration:
1. The spread of exotic species
2. Marsh elevations below desired levels in some areas
3. Harbouby by goose

Positive outcomes from restoration:
1. The creation of working tidal guts (Figure 3)
2. The establishment of diverse native vegetation
3. The creation of habitat for wildlife

Hatches Harbor National Seashore

Problems during restoration:
1. Local airport opposed project
2. Concern for spread of exotic species

Positive outcomes from restoration:
1. Gained airport support through hydrologic modeling, completing the project in several time steps, and a mediating agency
2. Treated all concerns seriously
3. Dealt with real and perceived problems ahead of time

Discussion

Commonalities among all case studies
1. Documenting previously existing and historical information about the site to be restored
2. Developing scenarios through hydrologic modeling
3. Studying the materials to be used in the restoration
4. Making best educated guesses for unanswerd questions (Table 1)
5. Strong collaboration among participating governmental and nongovernmental agencies (Table 2)
6. The importance of public support from stakeholders
7. Monitoring after completed restoration

Table 1. How were “best guesses” achieved for information not known to exist prior to restoration of the land?

<table>
<thead>
<tr>
<th>Component</th>
<th>Kenilworth Marsh</th>
<th>Manassas National Battlefield Park</th>
<th>Poplar Island</th>
<th>Fort McHenry National Monument</th>
<th>Hatches Harbor National Seashore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bounded to literature</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Marshes required</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Soils</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Predective modeling</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Drew upon experience</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Maps &amp; aerial photos</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Table 2. Insight to the group dynamics

<table>
<thead>
<tr>
<th>Cooperative</th>
<th>Kenilworth Marsh</th>
<th>Manassas National Battlefield Park</th>
<th>Poplar Island</th>
<th>Fort McHenry National Monument</th>
<th>Hatches Harbor National Seashore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Public concern</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Assistance</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Compromises</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Differences in philosophy</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Role mediator</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Reasons for failing to establish feasibility
1. Safety hazard concerns
   Example – A created wetland attracting birds too close to an airport
2. Engineering conflicts
   Example – A created wetland negatively influencing the function of a flood control channel for a major urban area
3. Territorial disputes
   Example – A state resisting placement of dredge material from a different state
4. Habitat displacement
   Example – An excess amount of dredge material would create a wetland and cover existing swamp forest habitat

Conclusions

The lessons gleaned from the case studies are clearly relevant to establishing restoration feasibility at Dyke Marsh Preserve. Specifically, we have:
1. Collected historical and current condition information on the remaining marsh (Commonality #1), and compiled a workbook reviewed by the National Park Service
2. Gathered information for making educated guesses on factors that cannot easily be measured (Commonality #4), for example using aerial photos to evaluate the extent of shoreline erosion over the last 30 years
3. Formed strong collaborations between organizations and agencies (Commonality #5 and #6) through a workshop mediated by an experienced facilitator

If restoration moves forward at DMP, then detailed hydrologic models need to be created (Commonality #2), dredge material would need to be thoroughly examined, and restored and existing portions of the marsh need to be monitored (Commonality #7).

Objectives
1) Describe case study selection and collection of information
2) Summarize survey results
3) Synthesize the information gained to assist in the feasibility of restoration process

Materials and methods
Selection of case studies was based on location, ecosystem, and managing agency.

The five case studies chosen included (Figure 2):
1. Kenilworth Marsh
2. Manassas National Battlefield Park
3. Poplar Island
4. Fort McHenry National Monument
5. Hatches Harbor National Seashore

Figure 1. Dyke Marsh Preserve, 1959 (left) and 1994 (right)

Figure 2. Location of case studies. Surveys were completed and visits were made to each case study.

Figure 3. Functional tidal gut created in Kenilworth Marsh

Problems during restoration:
1) The creation of working tidal guts (Figure 3)
2) The establishment of diverse native vegetation
3) The creation of habitat for wildlife

Figure 4. Hatches Harbor salt marsh with control structures allowing an increased volume of water to enter anar through several time steps

Problems during restoration:
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Positive outcomes from restoration:
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For further information
Please contact khopfens@al.umces.edu

More information on this and related projects can be obtained at www.al.umces.edu

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Literature cited