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Site conservation planning for the Potomac River Gorge: A partnership between two national parks and The Nature Conservancy

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The National Park Service (NPS) and The Nature Conservancy (TNC) are jointly planning for the conservation of natural resources at the Potomac Gorge, located in and near Washington, D.C. The planning process entails the integration of NPS's inventory and monitoring (I&M) program and TNC's site conservation planning (SCP) process.

Conservation importance of the Potomac Gorge

Despite its urban location, the Potomac Gorge is one of the most significant natural areas in the National Park System. It extends for 15 miles along the Potomac River from above Great Falls to near Theodore Roosevelt Island, and incorporates sections of Chesapeake and Ohio Canal National Historical Park and George Washington Memorial Parkway.

Because of its unusual hydrogeology, the gorge is one of the country's most biologically diverse areas, serving as a meeting place for northern and southern species, midwestern and eastern species, and montane and coastal species. The extraordinary diversity of the site is exemplified by the 400 occurrences of 200 rare species that have been found there.

In addition, over 25 discrete vegetation communities have been identified in the gorge. Of particular significance are the scoured bedrock floodplain and terrace communities, which are more extensive and well preserved at this site than anywhere else in the USA. Several of these have been tentatively ranked as globally rare.

Joining forces

TNC's long-standing interest in the rare species and communities of the gorge led it to approach NPS about a cooperative planning process that would provide the strongest possible conservation of the site's natural resources, while meeting the programmatic needs of both organizations. Recognition of this novel approach and the gorge's exemplary biodiversity led to the awarding of an NPS grant in 2000 to support cooperative planning. This project is presently underway and is scheduled for completion in August 2001.

The planning processes

NPS and TNC have similar approaches to planning for the conservation of biological diversity: I&M and SCP, respectively. Here's how the terminology compares:

I&M	SCP
<ul style="list-style-type: none"> • focal resources • system health • stressors • conceptual modeling • indicators / monitoring 	<ul style="list-style-type: none"> • conservation targets • viability assessment • threats analysis • conceptual models • measures of success

I&M and SCP differ in several ways, including the types of focal resources or conservation targets that are considered, and the sequencing of planning. SCP also places a strong emphasis on involving key stakeholders—local governments, nongovernmental organizations, user groups, etc.—in plan implementation. This emphasis was a key factor in the decision to use SCP as the planning model for the Potomac Gorge, where there are many well-connected, vocal stakeholders adjacent to or near the site.

SCP's "Five-S" Framework

TNC's SCP process is built on the "Five-S" framework:

- **Systems.** Systems are the species, communities, and ecosystems, and the natural processes that sustain them, that embody the overall biodiversity of the site. Known as "conservation targets," they organize our thinking about the site and serve as the focus of the plan. We conduct viability assessments of the targets in order to rank their baseline health, against which future changes can be measured.
- **Stresses.** Stresses are factors that degrade the viability of conservation targets. We concentrate on the most important stresses that result directly or indirectly from anthropogenic causes, and which are currently active or likely will be in the next 10 years.
- **Sources.** Sources of stress are the causes of the degradation of target viability. Sources can either be active—expected to deliver additional stress in the future—or historical—having previously caused stress that still persists. We identify both proximate and ultimate sources of stress.
- **Strategies.** Strategies are the types of conservation activities deployed to remove sources of stress (threat abatement) and to diminish or eliminate persistent stresses (restoration), both of which serve to enhance target viability.
- **Success.** Success measures gauge progress towards sustaining or enhancing the viability of conservation targets, as well as progress towards abating threats to that viability.

Systems (conservation targets) at the Potomac Gorge

The systems or conservation targets selected for the gorge—equivalent to *focal resources* in I&M—are as follows:

- **Riparian communities.** These are communities at lower elevations along the river that are flooded more frequently (most having a flood return frequency of less than 25-30 years, with many less than 2-3 years), and are therefore dominated by species typically associated with floodplains. The target consists of both rare riparian communities (e.g., channel shelf xeric savanna, annual herb hydric depositional bar) and plant species (e.g., sweet-scented Indian plantain, *Synosma suaveolens*, and Virginia mallow, *Sida hermaphrodita*).

- **Terrace communities.** These are communities at higher elevations along the river that are flooded less frequently (most having a flood return interval greater than 2-3 years, with many greater than 25-30 years), and are therefore dominated by species typically associated with uplands. The target consists of both rare terrace communities (e.g., bedrock terrace rim xeric forest, riverside bedrock outcrop/cliff community) and plant species (e.g., woolly three-awn, *Aristida lanosa*, and buffalo clover *Trifolium reflexum*).
- **Upland forest blocks.** Five large, intact tracts of upland forest—Great Falls Park, Turkey Run Park, Riverbend Park, Scotts Runs Nature Preserve, and the Gold Mine Tract—are found at the site. These forest blocks provide habitat for a number of state-listed rare plant species, as well as bird species that have been identified as conservation priorities by the Partners in Flight (PIF) program. In addition, these blocks support significant populations of more common forest species that have significantly declined throughout the eastern USA because of the extensive destruction of forests and the fragmentation of much of what remains.
- **Tributary stream systems.** Nearly 25 tributaries flow into the Potomac River within the site. Most are first- and second-order streams that drain small watersheds. As aquatic habitats, these streams harbor fish and invertebrates not found in the river or in wetlands at the site. Their watersheds integrate conditions on much of the land adjacent to the site, which are reflected in the physical, chemical, and biological status of the streams as they flow through the site.
- **Rare groundwater invertebrates.** The site harbors numerous occurrences of rare subterranean groundwater invertebrates, most notably amphipods in the genus *Stygobromus*. These species are rare globally or within the state, and are either endemic or narrowly limited in distribution. Their spring and seep habitats are a distinctive natural component of the site, and the gorge is generally regarded as a rich “hotspot” for this fauna.
- **Anadromous and semi-anadromous fish.** American shad, hickory shad, striped bass, and white perch are species that spawn principally in the main-stems of major rivers at the head of tidal influence, and thus are diagnostic for the lower end of the gorge. They can be considered keystone species in this stretch of the river, where the eggs, fry, and adults serve as an important food source for other fish and for a variety of invertebrates, birds, and mammals.
- **Wetlands.** The Gorge harbors a profusion of wetlands of many types. Depressional wetlands resulting from scouring are especially conspicuous, as are springs and seeps that emerge from both shallow and deeper groundwater sources. Nonetheless, little is known about the site’s wetlands, and as a result they are not being actively developed as a target. Funding is being sought to remedy this information gap.

Stresses and sources of stress

SCP next examines the impacts of stresses on the size, condition, and landscape context of targets. We then rank the severity and scope of impact of each stress on each target to ensure that we concentrate on the most significant stresses. Stresses are equivalent to I&M *stressors*.

The planning process then considers what sources are most responsible for impairment of target viability. We rank each source’s degree of contribution to a stress, and the irreversibility of that stress, to ensure that we concentrate on the most significant sources. Both NPS and TNC use conceptual ecological models to illustrate the relationships between stresses and sources. The consideration of stresses and sources in combination, sometimes known as “threats analysis,” is equivalent to the I&M *stress/response relationship*.

A highly customized spreadsheet application has been developed by TNC to assist in evaluating the complex interplay of stress ranks and source ranks and combining them in various ways. The result is a summary that provides the overall rank of threats and the overall threat status for each target. For the Potomac Gorge, the results are as follows:

Targets	Threat status
riparian communities	medium
terrace communities	medium
upland forest blocks	high
tributary stream systems	very high
rare groundwater invertebrates	low
anadromous / semi-anadromous fish	low
wetlands	—
Sources	Threat rank
roads / utility corridors	high
residential / commercial / office development	high
cultural resources	high
park facilities / operations / maintenance / use	high
deer browsing	high
invasive / alien species	medium
parasites / pathogens	medium
wastewater treatment	low
overfishing	low
municipal water withdrawals	low
agricultural practices	low
pipeline operations	low

Conservation strategies

At this stage, the SCP process goes beyond the bounds of the I&M program. The SCP next considers actual means of managing the conservation targets in order to sustain their viability. For NPS, this step more properly falls under the parks' larger natural resource management programs.

In general, TNC takes three broad approaches to the development of conservation strategies:

1. **Land and water conservation** includes acquisition of full or partial interest in land or water, as well as on-the-ground management of plants and animals and restoration of habitat.
2. **Public policies** include those at the local level, such as zoning; the regional level, such as the Chesapeake Bay Agreement; and the national level, such as the Endangered Species Act.
3. **Compatible economic development** can range from ecotourism to sustainable forestry, fishing, or other forms of consumptive use that still sustain target viability.

Again, these are ranked according to benefits, feasibility, probability of success, and costs of implementation in order to focus on the most significant.

Development of conservation strategies for the Potomac Gorge is currently underway. Among the many strategies being considered are:

- Cooperative land-use planning with local governments to better protect the tributary stream systems.
- Re-routing park trails to avoid impacts on rare plants in riparian communities.
- Logistical support of regional programs to reduce runoff and siltation from residential and agricultural land that affects anadromous and semi-anadromous fish.
- Exclosures to prevent deer browse impacts on upland forest blocks.

We are presently analyzing the activities of other Potomac Gorge stakeholders to determine where their program goals overlap with our conservation goals so that we can help each other meet mutual objectives.

Measures of success

Success is measured by making progress towards sustaining or enhancing the viability of conservation targets, and towards abating threats to that viability. In the long run, this measurement relies on the development of a monitoring program that concentrates on the size, condition, and landscape context of conservation targets, and on the status of the sources of stresses. This necessitates careful selection of monitoring targets from within each of the conservation targets. The monitoring targets are the equivalent of I&M **indicators**. Monitoring targets under consideration for the Potomac Gorge include:

- Forest interior-dwelling birds in the upland forest blocks.
- Invasive exotic plants in the riparian communities.
- Groundwater quality at the seeps and springs with rare groundwater invertebrates.
- Rare plants in the terrace communities.

However, there is often a lag time between implementation of conservation strategies and abatement of threats, and an even longer lag time between strategy implementation and improvements in target viability. As a result, in the short run success is often measured by increased **capacity** to implement strategies. This capacity-building can take the form of additional staffing, funding, or logistical support. These measures are currently being discussed for the Potomac Gorge.

Conclusion

This project appears to be one of the first times—if not the very first—that TNC and NPS have collaborated so closely on site-based planning. Yet this approach probably could be applied at many places throughout the country where NPS and

TNC have similar interests. We strongly encourage interested parties in both organizations to contact their counterparts to discuss possible cooperative planning.

Acknowledgments

TNC wishes to thank NPS for having the vision to support “Conservation Planning for the Potomac Gorge.” This project is funded by an NPS Natural Resource Preservation Program grant. The members of the Potomac Gorge Planning Team are: Melissa Kangas and Dan Sealy (George Washington Memorial Parkway); Dianne Ingram (C&O Canal); Chris Lea (formerly C&O Canal, now Assateague Island National Seashore); Doug Curtis, Ellen Gray, Marcus Koenen, Diane Pavek, Jim Sherald, and Pat Toops (NPS National Capital Region); and Olin Allen, Stephanie Flack, and Doug Samson (TNC Maryland/D.C. Chapter).