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Statement of Brian Richter
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Before the Subcommittee on Water Resources and the Environment,
Committee on Transportation and Infrastructure
May 24, 2008

Madame Chairwoman and members of the Subcommittee, thank you for the opportunity to testify on comprehensive water management and watershed planning. I am Brian Richter, co-director of The Nature Conservancy's Global Freshwater Team. My comments today will focus on four areas:

- A natural process-based approach to watershed management
- Comprehensive watershed planning
- Comprehensive management of dams and reservoirs across watersheds
- Watershed-based authorizations

The Nature Conservancy is an international, nonprofit organization dedicated to the conservation of biological diversity. Our mission is to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. Our on-the-ground conservation work is carried out in all 50 states and in 30 foreign countries and is supported by approximately one million individual members. The Nature Conservancy has protected more than 117 million acres of land and 5,000 miles of river around the world. Our work also includes more than 100 marine conservation projects in 21 countries and 22 US states.

The Conservancy owns and manages approximately 1,400 preserves throughout the United States—the largest private system of nature sanctuaries in the world. We recognize, however, that our mission cannot be achieved by core protected areas alone. Therefore, our projects increasingly seek to accommodate compatible human uses, and especially in the developing world, to address sustained human well-being.

As the Conservancy has increased its engagement in a variety of restoration projects ranging from large-scale efforts in the Upper Mississippi River and Everglades to smaller scale projects under continuing authority programs, the Corps has become an important conservation partner. By number of projects, the Conservancy is the Corps' largest non-federal sponsor of ecosystem restoration projects. This expanding partnership is reflected in our Sustainable Rivers Project, a joint effort focusing on dam re-operations in 8 ecologically significant river systems across the country. At another 39 sites we are collaborating with the Corps under the sections 1135 and 206 Continuing Authority Programs (CAPs), and other Corps authorities, to protect and restore areas of critical ecological concern. The suggestions offered in the testimony today draw extensively on our on-the-ground experience of working with the Corps to restore aquatic ecosystems.

I. Watershed Process-Based approach

The idea of a "watershed approach" is becoming more common in the planning and construction of water resource projects. Many Corps districts are already using a conceptual "watershed approach." However, the term watershed approach is poorly defined and does not yet provide detailed guidance for the planning, selection and design of projects. The Conservancy believes the key components of this term and approach need to be better defined and elucidated.

Currently, a watershed approach used when planning a project may involve consideration of a watershed's geographic boundary, but project selection and design rarely accounts for the cumulative impacts on a river's physical processes. This narrow approach to water resource planning even if it is conducted on a watershed scale ignores many of the important natural processes of rivers that link water resource projects in a given watershed. Therefore, if our water resource projects and management activities are going to comprehensively meet multiple needs, such as flood risk management, navigation and ecosystem restoration, the Corps must take a *watershed-process based approach* that treats rivers and watersheds as integrated systems. Such an approach recognizes and accounts for factors such as hydrologic connectivity, role of functioning floodplains, channel evolution and sediment movement along the river corridor as the basis for planning and implementing projects.

A watershed-process based approach also fully incorporates the role of healthy and functioning ecosystems into watershed planning. By narrowly focusing on single project purposes (e.g. flood risk reduction), the current planning process often ignores the services provided by ecosystems (e.g., the flood storage capacity of functioning floodplains). As we become more aware of the ecological impacts of water resource development as well as the benefits that healthy ecosystems provide, it is important to ensure that planning and project selection incorporate a comprehensive analysis of watershed needs, including accounting for the contribution that functioning ecosystems provide.

Use of a watershed-process based approach can bring valuable insight into the planning and design process. For example, often a condition that is seen as a cause of a water resource challenge (e.g., sedimentation) is actually a symptom of a larger watershed process issue (e.g., channel adjustment related to changes in flow regime). Therefore, an understanding of riverine processes should be integral to selecting the appropriate design approach and will result in projects that better accommodate for the natural processes that will inevitably affect all projects and activities within a watershed. A watershed process-based approach that considers factors such as how a project will affect the downstream system, is a result of upstream management actions, and is impacted by land use in the watershed, would be a critical improvement to the current project planning process.

II. Comprehensive Watershed Planning

It is important that our watershed planning efforts place multiple water resource projects and objectives into a broader strategic context than is possible within the confines of the

traditional water resource planning process which focuses on the planning of individual projects from reconnaissance to final design. Instead of planning individual projects from beginning to end, Corps planning efforts should more frequently seek to develop and utilize watershed-based tools that allow the Corps and key stakeholders make critical decisions about water resource management before proceeding to the design of individual projects. Unlike a static study for a single project, watershed-based tools can have the advantage of being dynamic, considering riverine processes, incorporating human and ecosystem goals, and guiding decision-making across entire watersheds.

One example of such a tool is a computer decision-support system being developed for the **Upper Delaware River Watershed**. Here, the Conservancy and the Corps are working to develop an innovative spatially explicit decision support tool that will collaboratively evaluate the impact and viability of potential floodplain/flood storage projects at multiple geographic scales (e.g. site, river reach, watershed). Known as the **Floodplain Reconnection Decision Support System**, this tool is a user-friendly graphical, decision support tool that will allow state and federal agencies as well as stakeholders to model key physical and biological variables, built infrastructure, and hydrologic parameters across the watershed. This information will then be used to model the effectiveness of various strategies (e.g., floodplain reconnection, wetland restoration, levees, and structural elevation) in reducing flood heights in the basin.

Comprehensive tools that can be used to solve water resources issues in a watershed, such as the Floodplain Reconnection Decision Support System just described, are much more useful and result in better project outcomes than individual project based studies which can result in sub-optimal outcomes. In the Delaware Basin the tool being developed will be an improvement over the current ad hoc approach, which has resulted in a series of projects to address flooding and floodplain reconnection that do not necessarily work together to reduce flood risk across the basin because they do not take into account the cumulative impacts and interrelatedness of projects in the watershed.

While the Delaware River example is a model that should be implemented and replicated, we recognize that computer-based decision-support tools are not financially viable or practical in every situation. A related mechanism is the Corps' Comprehensive Watershed Study, which can often achieve similar outcomes to a decision-support tool if the goals of the study are clearly articulated and the study is a partnership-based effort with stakeholder buy-in.

The **Yellowstone River Corridor Comprehensive study** is a good example of an outcome focused Comprehensive Study effort that will provide very useful information for the future management of the river. The goal of the study is to quantify and describe cumulative effects of irrigation projects and riparian degradation on the health of the river and to develop a series of conservation-based management practices along the river's main stem to ensure the survival of endangered fish species and the river valley's characteristic gallery forest system. The critical components that make this a successful effort are that the outcomes of the study are clearly articulated (i.e., restoring endangered fish and riparian habitat) and that the study is being conducted in partnership with a broad

array of stakeholders, including multiple conservation districts along the river, NGOs, state agencies and other federal agencies. Broad buy in to the goals of the study and the subsequent recommendations greatly increase the likelihood that the study will become an important tool for guiding decision-making on the river.

Drawing on our experience in both the Delaware and Yellowstone River basins, the Conservancy believes the focus of water resource planning efforts should be less on static, single-project studies and more on outcome-oriented decision-support tools that take into account watershed-wide processes. To be useful, these products should not only describe current watershed conditions but also adequately incorporate river processes and clearly articulate outcomes up front so that they can serve as a decision-support tool for future watershed projects and management activities.

III. Comprehensively Managing Reservoirs Across Watersheds

A comprehensive approach to the management of dams and reservoirs affords the opportunity to optimize water resource decisions in a way that can't be done when focused solely on a single project or a subset of watershed needs (e.g. purely flood control, water supply, or recreation). By comprehensively analyzing operations on a watershed basis we can move beyond incremental improvements at a single facility to significant changes across entire basins that meet multiple water resource goals.

The benefits of this approach to infrastructure management is illustrated by our efforts on the **Penobscot River in Maine**. The Conservancy is a partner in the Penobscot River restoration project, which seeks to restore hundreds of miles of spawning habitat for endangered Atlantic salmon and numerous other diadromous fish species. In an innovative relationship between the PPL Corporation and the Penobscot River Restoration Trust, three hydropower dams on the mainstem river will be removed, state-of-the-art fish passage will be installed around a fourth, and hydropower production will be increased at other facilities on river tributaries. The result will be one of the largest river and migratory fish restoration efforts in the history of the Eastern United States with essentially no loss to net hydropower production in the basin. By upgrading power production to other areas in the Penobscot Basin area and opening up over 1600 km of additional habitat, the project found ways to maintain hydropower across the system in a way that minimized ecological destruction. Such an outcome was only possible because the project partners were able to take a multi-dam, basin-wide perspective when evaluating future hydropower and ecosystem needs on the river.

Similarly, the Conservancy and the Corps have been working together since 2001 under the Sustainable Rivers Project to improve management of Corps dams. The operating procedures for the hundreds of dams that the Corps owns and operates often seek to optimize inexpensive water supply, power, and flood control, but have largely ignored ecosystem needs downstream of these facilities. Our work with the Corps to date through the Sustainable Rivers Project has already demonstrated at several sites that modest adjustments to existing dam operations to accommodate for a broader array of watershed needs can yield substantial improvements in ecosystem health. These improvements have been achieved while only minimally affecting primary dam functions and keeping

operational changes within the project's authorized purposes. In fact, our work on the **Green River in Kentucky** to comprehensively consider multiple needs in a watershed (e.g. flood control, recreation, *and* ecosystem health) has resulted in some changes in reservoir operations that are not only better for downstream ecosystems, but they also have improved performance for original project purposes such as flood control and recreation.

On the **Willamette River in Oregon**, another Sustainable Rivers Project site, the efforts of the Conservancy and the Corps also illustrate the potential for managing infrastructure systematically and comprehensively to improve ecosystem conditions while still meeting flood control needs. The Corps operates 13 dams on tributaries in the Willamette basin with flood damage reduction as the primary purpose of this system of dams. Unfortunately, operation of the dams has changed the volume and timing of river flow, resulting in the decline of native fish populations, including seven species that are now listed as federally threatened or endangered. Starting on two tributaries that contain 6 of the 13 dams, the Corps and the Conservancy are working cooperatively to quantify environmental flow needs and examine how flow recommendations can be implemented while still meeting the dams' primary purpose of flood control.

Because the dams are operated as a system, there is a relatively high degree of operational flexibility, allowing the Corps to use multiple fill and release combinations to meet the flood control objectives for the river. The initial work to understand ecosystem needs of two of the basin's tributaries lays the foundation for a comprehensive management of the entire system in a manner that improves ecosystem health without diminishing flood risk reduction efforts. The systematic management of these reservoirs offers great potential for comprehensively managing the river to meet multiple water resource goals. We believe that a comprehensive approach that manages the reservoirs for multiple purposes should be implemented on the Willamette and replicated elsewhere in the country.

Another key component of comprehensive management of water resources infrastructure is better accounting for the role of functioning floodplain ecosystems in meeting flood risk reduction goals within a watershed. We must integrate the role of healthy and functioning floodplains and wetlands into our flood management and not rely solely on dams and reservoirs to meet these needs, particularly as hydrological changes associated with climate change makes the other purposes of these reservoirs even more important.

By taking a comprehensive approach to water management and reducing our reliance on dams to provide flood control we can improve use of existing reservoir storage while benefiting ecosystem health. Presently, a tremendous volume of potential storage space is left empty behind dams because that space is reserved to capture incoming floods and protect downstream structures and roads. If those downstream structures could be moved out of harm's way, and if natural floodplain areas could be restored for the purpose of storing floodwaters, the immense volume of usually-empty flood storage in our nation's reservoirs presently being reserved for flood control can be converted into storing water to supply cities and farms, generating hydro-electric power, and releasing improved

environmental flows into downstream ecosystems. Moreover, floods that are allowed to return to their natural floodplains recharge underlying aquifers, which slowly release groundwater back to the river as cool, steady baseflows. Additionally, restoring natural floodplain areas will greatly benefit many plants and animals that have become endangered due to excessive floodplain development.

Through our work on the **Yangtze River in China**, we have developed a proposal – now under serious consideration by the central Chinese government – that calls for large-scale restoration of the Yangtze valley's floodplain and illustrates the potential benefits of using floodplains instead of dams for flood management. This proposal would enable the flood control volume planned for the new reservoirs on the Yangtze to be reduced substantially and would instead use the available reservoir volume to produce much more hydropower from the Yangtze dams. In fact, we estimate that as much as $1 billion per year of additional revenue could be generated from increased electricity production on the Yangtze River, which in turn would be used to fund floodplain restoration and other non-structural forms of flood management. It will also enable the Chinese to produce badly-needed electricity in a relatively clean manner that does not exacerbate climate change.

To replicate projects in the Penobscot and Yangtze Rivers as well as efforts though the Sustainable Rivers Project and to ensure a more efficient and watershed-based method of infrastructure management, we must invest in the research to allow us to gain a better understanding of where there are opportunities to alter reservoir operations to meet broader watershed goals. In particular, this research should include a national assessment to identify locations at which the operating purposes of flood control dams can be modified by shifting flood management to floodplains, by removing or re-locating roads and structures or by removing, or setting back levees that constrain floodplain areas. Undertaking a national effort to analyze the operation of our infrastructure in a watershed context could help to restore thousands of impaired river miles across the country while increasing the reservoirs' operational flexibility and resiliency to future demands and climatic changes.

IV. Regional Authorizations

If we are to move towards a comprehensive watershed-based model for management of our water resources and utilize the innovative watershed-based planning and decision support tools described above, we must examine how water resource projects are authorized and funded. With limited Federal dollars and extensive water resource needs, no longer can we settle for an isolated project by project approach, which the current authorization and appropriation process drives the Corps towards. Instead, we must invest in comprehensive watershed planning efforts to first determine how multiple needs in a watershed, river basin or coastal area can be met and then build on these plans by creating regional and watershed authorities that allow for implementation of projects that comprehensively meet water resource goals.

There are already successful authorities to draw on in developing regional approaches to water resource development. For example, the **Navigation and Ecosystem**

Sustainability Program for the Upper Mississippi River seeks to restore the Mississippi River while providing for navigation system improvements. The Navigation and Ecosystem Sustainability Program (NESP) as authorized under the Upper Mississippi River and Illinois Waterway system in WRDA 2007 is a long-term (50-year), dual purpose program of navigation improvements and ecological restoration that will engage a broad array of federal agencies, industry and non-governmental stakeholders to ensure the economic and environmental sustainability of the Upper Mississippi River System. NESP is the first dual purpose authority that brings together both navigation and environmental interests across a river basin to create and implement a shared vision. It is a critical addition to the Corps' authority because it allows the Corps to manage the system for two purposes and to evaluate river-wide processes and functions as projects are selected and implemented. Furthermore, the process for identifying and selecting projects is built on a strong foundation of scientific input and stakeholder involvement.

Another example of a comprehensive approach that has the potential to be leveraged into a comprehensive watershed-wide effort is the **Hamilton City Flood Damage Reduction and Ecosystem Restoration project in California**. Hamilton City is located on the Sacramento River--the largest river in California, draining approximately 24,000 square miles and supplying 80 percent of the freshwater flowing into the Sacramento-San Joaquin Delta. Historically, the river was lined by 800,000 acres of riparian habitat. Over 95 percent of this habitat has been lost.

Hamilton City and surrounding agricultural lands are only marginally protected from flooding by a degraded private levee (circa 1904) called the "J" Levee. The "J" Levee does not meet any formal engineering standards and provides only a 66 percent chance of passing a 10-year flood. As a result, Hamilton City has mounted flood fights and has been evacuated due to flooding six times in the last 20 years. After 25 years of unsuccessful efforts to secure federal engagement in their efforts to reduce the risk of flooding, project partners, including the city, the Conservancy, and the state of California, collaborated to develop a project that would both reduce the town's flood risk and restore the river floodplain by constructing a new set-back levee and reconnecting 1,500 acres of floodplain to the river.

This dual purpose project has the potential to be a true "win-win"--by meeting the flood-control needs of the local community while restoring riparian habitats and natural river processes. Furthermore, replicating this project elsewhere in the Sacramento river watershed offers an innovative solution to meeting complex flood risk reduction issues in the basin while restoring critical natural resources. Unfortunately, the project has run into multiple hurdles because it does not fit into the traditional single-purpose project model, making replicating multiple projects of the same nature across the watershed nearly impossible. For projects like Hamilton City to become the norm instead of the exception, the Corps would benefit from watershed-based authorities enabling them to more easily implement non-traditional projects that truly meet multiple water resource goals.

To maximize our investment in water resources development by taking a comprehensive approach to water management, replicating regional planning and project implementation efforts like the ones described above will be critical. The authorization and appropriation process should seek to encourage these approaches by creating regional or watershed-based authorities that are focused on comprehensively addressing water resource issues. Activities authorized should be informed by sound science, engage appropriate stakeholders, and seek to achieve multiple water resource goals.

V. Conclusion

Utilizing a watershed-process based approach and comprehensively managing water resources for multiple goals can have enormous benefits. Evaluating operational flexibility of dams and reservoirs to incorporate a broader array of water resource goals results in more efficient management of this infrastructure and improves their resiliency and flexibility to meet future needs. A watershed-process based approach also maximizes the federal investment in water resource projects by increasing the understanding of how projects in a watershed relate to one another and how limited federal dollars can be spent most efficiently to meet multiple goals. Moreover, by improving the planning process for water resource projects and updating authorizations and appropriations to reflect watershed-based decision-making, we can go a long way towards providing for human safety, navigation, water supply and recreation while maintaining and restoring the country's aquatic ecosystems.

Thank you for the opportunity to present this testimony today. I would be happy to answer any questions you may have.