6.0 INNOVATIONS

The application of scientific findings to a regulatory framework is typically less than a pure exchange of information from one venue to another. Depending on the nature of scientific research, scientific studies either provide precise answers to very specific questions or they result in the establishment of general conclusions built upon deductive reasoning from a set of observations. For example, studies designed to find the toxicity threshold for a specific chemical and species can be accomplished by well-designed laboratory studies. However, the transfer of such information into a regulatory context is not necessarily direct. This outcome occurs because outside the laboratory in the natural ecosystem factors unrelated to water quality can greatly influence expectations.

There are many chemicals that are toxic and certainly these pollutants must be controlled, minimized, and, if possible, eliminated from the environment. However, there are many other factors that influence the ecosystem, especially urban ecosystems, and focusing on only the most obvious water quality pollutants can be short-sighted given the multiple stressors that are likely influencing attainability of designated uses.

Water quality regulations and the myriad of programs developed to implement these regulations since 1972 have achieved considerable success in addressing the most important and most apparent water quality management issues. However, as we move into the second generation of implementation of environmental programs (Chertow and Esty 1997), there are many remaining water quality issues that can be solved only by finding innovative solutions. The call for innovation is increasingly being vocalized from many directions, and interestingly, a review of existing environmental control strategies shows that many of the tools needed to implement innovation are already available. What is needed is the will to use these tools individually or in various combinations to address the management of effluent-dependent waters.

This chapter first provides examples of where innovative ideas are being generated by groups charged with planning for the future of environmental management. Following these examples, existing or developing regulatory programs, methods, or ideas are discussed that can be used as a springboard for developing an alternative approach to water quality management in effluent-dependent waters.

6.1 EMERGING INNOVATION

Thirty years of Clean Water Act program implementation will be realized in the year 2002. Considerable progress has been achieved in controlling pollution sources to the nation's surface waters, especially pollutants discharged from point sources. However, inherent in the implementation of any program is a limitation on the number of problems that a given program can address. This limitation occurs because programs are created and implemented to deal with problems with common solutions. However, once the specific problems with common solutions are addressed, a ceiling is reached where the program is no longer effective in resolving problems it was established to address - either because unique solutions are required or further efforts to implement the program will yield only minor improvements relative to the cost expended. When this ceiling is reached, it becomes necessary to identify new, innovative approaches to achieve additional desired benefits or outcomes.

With regards to effluent-dependent waters, the development of the 10 case studies for this report illustrates the need for identifying new, innovative approaches to manage water quality in these systems. Point source controls appear to be achieving only limited improvement in aquatic communities. Yet at the same time, while only limited improvements to the aquatic community have occurred, significant benefits in the form of enhanced riparian systems have been achieved, especially at the study areas in the most arid regions of the West. However, it is believed that even these gains may be lost as the demands on arid West water resources increase in the coming years.

Chapters 4 and 5 of this report discuss the findings of the Habitat Characterization Study within the context of the existing regulatory framework and identify issues of concern regarding continued management of effluent-dependent waters under the status quo (e.g., economic concerns). To address these concerns it will be necessary to address the link between water resource management and water quality in the West. Currently, the status quo means categorizing water resource issues into separate compartments for water quality, water quantity, endangered species, flood control, water storage, and other categorizations. However, the reality in the arid West is that these issues need to be considered comprehensively. Fortunately, other organizations have already recognized that a more holistic strategy for environmental management is needed, and we believe that effluent-dependent waters provide an especially good place to start implementing such ideas. Following are some examples of the nature of holistic thinking that is occurring in the environmental arena.

Western Water Policy Review Advisory Commission (WWPRAC) – Congress established this Commission "to make recommendations about the proper role of the federal government in western water management for the next 20 years." The final report of the executive summary published by the Commission states:

> "Part of the impetus for our Commission's formation was the Congress's finding that current federal water policy suffers from unclear and conflicting goals implemented by a maze of agencies and programs. This finding was reinforced and documented by the Commission's investigation. Lack of policy clarity and coordination resulting in gridlock was a consistent theme of public testimony and scholarly research. We have concluded that these problems cannot be resolved piecemeal but, rather, must be addressed by fundamental changes in institutional structure and government process. Moreover, our work led us to an even more basic conclusion: that the geographic, hydrologic, ecologic, social and economic diversity of the West will require regionally and locally tailored solutions to effectively meet the challenges of the 21st century of water management" (WWPRAC 1998).

The Commission argued that the following "forces" will require that new, innovative approaches be implemented in the coming years (WWPRAC 1998):

- "The tremendous increase in the number of local watershed initiatives and groups, and the great energy and creativity they bring to resolving resource problems.

- The value of driving regional and even basin-level programs through a bottom-up expression of values, goals, and commitments, generated by people's concerns about their local resources and communities.

- The increasing need for federal, state and tribal partnerships to manage collaboratively at the river-basin level to avoid legal gridlock and provide direction for comprehensive programs and expenditures.

Water Quality Standards in the West

The water quality of western rivers presents issues that are often different from those in the eastern United States. There is little recognition of this in the Clean Water Act or in the programs of EPA.

The Commission recommends the following regarding water quality standards:

- EPA, USGS, and states should "broaden their water quality monitoring to enable them to knowledgeably assess the condition of western (and the nation's) aquatic ecosystems."

- Western ephemeral streams in arid areas, dry many months of the year, with aquatic ecosystems that can be vastly different from year-round water bodies, present a unique challenge under the Clean Water Act. The Commission supports EPA's effort to find ways to treat these aquatic ecosystems as a separate type of water use and to develop a more appropriate, though equally protective, set of water quality criteria that states and tribes may use in setting water quality standards that protect these ecosystems and their species and habitats. The Commission also encourages states to develop biological criteria to help define the biological integrity of the state's waters.

- Hydrologic modification activities are increasingly a source of concern in western aquatic ecosystems, ranking third nationally as a source of water quality impairment for rivers. Water quality criteria and best management practices should be aggressively developed that encourage states to pursue in-stream flow and other standards for protection of the physical and biological aspects of in-stream water quality as appropriate."

Source: WWPRAC 1998.

- The diminishing federal budget, creating the need for better priority setting, coordination and efficiency in expenditures for all agencies and the need to leverage federal funds with new sources of financing.

- The need to manage more on an ecosystem or watershed basis, recognizing the consequences of many programs and actions within the watershed. The growing need for high-quality municipal supplies, and the importance of protecting the watersheds that provide them.

- The growing need for efficient processes of planning and conflict resolution to address issues that involve interests across many jurisdictions."

Embedded in many of the "forces" described above are issues related to the effective management of effluent-dependent waters.

Environment.gov – Since 1993 at the request of Congress, the National Academy of Public Administration (NAPA) has been analyzing trends and efforts in environmental protection by EPA. The third and final report from this effort, *Environment.gov: Transforming Environmental Protection for the 21st Century*, challenges leaders from all areas of the public and private sector to work together "to address the remaining environmental challenges facing the country" (NAPA 2000). Among its numerous recommendations is a call for Congress to authorize EPA and states to "use the tools they need to tackle the big problems." To accomplish this recommendation, the report recommends the following:

- "Authorize EPA and the states to implement allowance-trading systems to reduce pollution in air and water, explicitly liberating such systems from the constraints of traditional facility-based permitting, provided that trades would not result in unacceptable risks in local areas.
- Empower EPA to let states try new approaches to address water quality and related problems in watersheds, including alternatives to total maximum daily loads (TMDLs) where those alternatives appear likely to improve the environment more effectively or efficiently than TMDLs could.
- Authorize and encourage state experiments with performance-track systems that replace traditional permits with whole-facility agreements or "beyond compliance" strategies.
- Work with the administrator to create a statutory basis for continued experimentation and innovation in the nation's environmental system. Support innovation through the appropriations process" (NAPA 2000).

The Next Generation Project, Yale University – The Next Generation Project (NGP) was founded to develop a blueprint to guide efforts at environmental protection into the next generation. The NGP recognizes that the establishment and implementation of environmental laws including the National Environmental Policy Act, Clean Air Act and Clean Water Act have resulted in great improvements in environmental quality in the United States; however, the "prospects for further progress on the same path are limited" because many of the environmental problems society faces today are different from the problems addressed in past years (Chertow and Esty 1997). The NGP was formed to develop ideas regarding how to address this concern:

> "Although the statutory requirements and legal test cases of the 1970s and 1980s brought improvements on a number of fronts, this approach to environmentalism has limitations that are now evident. It compartmentalized problems by environmental media – air, water, waste – and set up a complex structure of separate (and sometimes conflicting) laws and very detailed and often rigid regulations to deal with each new problem uncovered. It encouraged litigation, created incentives for moving with deliberate speed and no faster, and implied a level of absolutism in pursuit of environmental purity that cannot be squared with the public's express and tacit desire for other social goods…[NGP] argues for a

next generation of policies that are not confrontational but cooperative, less fragmented and more comprehensive, not inflexible but rather capable of being tailored to fit varying circumstances. We see a need for a 'systems' approach to policy built on rigorous analysis, an interdisciplinary focus and appreciation that context matters" (Chertow and Esty 1997).

6.2 INNOVATIVE PROGRAMS, POLICIES, AND TOOLS FOR ENVIRONMENTAL MANAGEMENT

The above-quoted excerpts from organizations evaluating the state of environmental policy in the United States have a common theme among them: the need to tailor environmental protection programs to specific issues and situations. While these discussions have not specifically addressed effluent-dependent waters, the thoughts and ideas behind them can be applied to these waters. Interestingly, while there appears to be considerable thought being given to the need to develop innovative approaches to regulatory issues, examples of the types of tools that can be useful for implementing innovative ideas already exist.

A prime example of the use of innovative ideas to address unique water quality problems is captured in the recently released EPA guidance for combined sewer overflows (CSOs) (EPA 2001a). This guidance was developed to address a significant water quality standards issue unique to urbanized areas: the effect of sewer overflows that occur during storm events on water quality standards attainment. Sewer overflows of this nature are common in urbanized areas where the infrastructure was developed in a manner where stormwater and sewage conveyance systems commingle during large runoff events. Modifying this infrastructure to prevent the commingling of stormwater and sewage bears a significant

From: Guidance: Coordinating CSO Long-Term Planning With Water Quality Standards Reviews (EPA 2001a)

"There are a number of water quality and non-water quality factors that affect the attainment of natural aquatic communities in urban areas, including the amount of impervious surface, human activity resulting in permitted and non-permitted discharges, and the type and extent of hydrologic modifications. Some recent literature suggests the full restoration of natural aquatic life communities may not be feasible in small watersheds with heavily urbanized areas. Schueler (1994) found significant impairment of aquatic life where levels of impervious cover in urban areas were in the range of 8-percent to 20-percent. Yoder *et al.* (1999) found this threshold level is also influenced by other factors such as pollutant loadings, watershed development history, riparian buffers, CSOs, and types of land use. More sensitive aquatic life, such as brook trout, may be unable to survive in watersheds with as little as 1- to 2-percent impervious land cover. However, states that base their aquatic life use classification systems on biological criteria and on a range of use subcategories which lead to the appropriate aquatic life goal for a water body, have a framework for evaluating attainability of improvements in urban aquatic life ecosystems."

"EPA recognizes the need for additional guidance to better define the factors to consider in designating and protecting appropriate aquatic life uses in urban areas. Such guidance would address a variety of urban stressors that might prevent attainment of an otherwise expected aquatic community, cover a broad range of geographic areas, and consider the full range of imperviousness in urban areas. This guidance would help states adopt subcategories of aquatic life uses and water quality criteria that more accurately and precisely define actual and attainable aquatic communities. Once this information is developed, states, watershed organizations, and local communities will be able to identify the recovery potential of the aquatic communities, adopt appropriate water quality standards, and design affordable restoration and protection strategies."

economic cost. To address this urban concern, EPA developed a guidance document that recognizes that where such corrective action would bear significant cost, urban communities could consider implementing an alternative water quality management strategy that could include establishing alternative designated uses and/or water quality standards.

Of particular significance in the EPA CSO guidance is the recognition of the limitations urbanization imposes on the aquatic communities of urban streams and rivers (see inset). Recognizing the uniqueness of the urban environment and the limitations urbanization can place on the expectations for aquatic communities is an important step forward in the development of our understanding of what is attainable in these communities. The results from the Habitat Characterization Study provide additional support to the developing thought process that urban stream systems have unique water quality issues associated with them. However, the results from this study not only support the notion that urban systems are different, but that effluent-dependent stream systems are a particularly unique type of urban system.

The discussion contained in the EPA CSO guidance focuses on the refinement of uses and the modification of water quality standards. However, we believe that other options exist where the focus is not directly on the designated use or the water quality standard. Instead, the focus is on implementation (i.e., determining what constitutes an acceptable outcome from the implementation of actions intended to achieve a specific result). Interestingly, all of these options either already exist and are in use in other venues or they are currently under development to address unique environmental regulatory problems. We present these options below to illustrate how innovation could be brought to bear on the unique situation resulting from the creation of effluent-dependent waters.

6.2.1 Adaptive Management

Since the 1970s adaptive management has been used as a tool to implement environmental management programs where clear steps in the management process or the expected result of the implementation of environmental management programs is unclear. Adaptive management presupposes that goals exist, but that there are competing theories about the most effective way to achieve the stated goals. Adaptive management has been termed "learning by doing," and it has become a useful tool in practicing ecosystem management, especially in large river systems (e.g., the Columbia and Colorado rivers) (Walters 1997).

Using adaptive management techniques to address water quality issues under the Clean Water Act has already been suggested by EPA under its recently developed Community-Based Environmental Protection (CBEP) program (EPA 1999). CBEP is "EPA's term for a holistic and collaborative approach to environmental protection," and is an approach that uses input from public and private concerns within the community or watershed. It is a program that was developed as part of EPA's effort to establish a means to resolve environmental issues requiring innovative approaches, where the traditional "command and control" approach to environmental regulation cannot effectively address "existing and emerging causes of environmental pollution and ecological degradation." As an adaptive management tool for environmental protection, EPA states:

> "CBEP is an iterative approach that recognizes the value of innovation and risk-taking. Therefore, projects and partnerships need to be monitored for effectiveness and CBEP efforts need to be revised and refined when necessary to incorporate lessons learned from experience, new data, and advanced technology."

The principles of adaptive management could be applied well to the implementation of water quality programs on effluent-dependent waters. Under this approach, all elements of the effluent-dependent water ecosystem would be managed systematically to maximize established performance outcomes. For example, the focus of environmental management programs, including NPDES permitting, could shift from an emphasis on only wastewater treatment to habitat restoration if it was believed that the latter would yield greater environmental benefit. Similarly, public expectations for water resource management could be factored into the equation to determine what the best approach would be for managing the created ecosystem. In the most effective form envisioned for an adaptive management program, the water quality management program implemented on the effluent-dependent water would be designed so that it could be experimentally evaluated to compare selected policies or practices. Those policies or practices yielding the best ecological outcome would be pursued, while policies or practices yielding no results or even negative results would be phased out or replaced. At a time when it appears that existing environmental programs are achieving minimal gains in the aquatic community of effluent-dependent waters, but riparian communities are achieving unrecognized benefits, implementation of an adaptive management approach to these waters could help support these benefits.

6.2.2 Habitat Conservation Plans

The Endangered Species Act, established in 1973, was amended in 1982 to include the concept of Habitat Conservation Plans (HCPs) (amended at Section 10(a)(1)(B)). HCP were incorporated into the Endangered Species Act to address the impact of private land development on species protected under the Act. The use of HCPs proliferated during the 1990s and by 1999 more than 230 HCPs had been established nationwide, covering more than 12 million acres (USFWS data cited in Ostermeier et al. 2000).

The purpose of establishing HCPs is simple—it provides a means to allow economic development to continue within the confines of the Endangered Species Act. As such, it has become the primary conservation planning tool in use today (see inset for example of HCP). Although HCPs were established to address unique problems associated with implementation of the Endangered Species Act, the principles and potential uses of HCPs are applicable to the unique situation represented by effluent-dependent waters.

In their review of the HCP process through the examination of 31 case studies, Ostermeier et al. (2000) found that, although there were problems associated with the development of HCPs, most participants characterized the HCP process in a positive manner. Moreover,

> "This [generally positive finding] suggests an important positive base on which to foster HCP process improvement. These processes integrate economic and conservation decision making, and as such are part of a new – perhaps more

sustainable – dimension of resource use and stewardship. As interpreted from Thoreau [*It is not enough to be busy. The question is what we are busy about* – Henry David Thoreau], it is simply not enough to be busy; focus should be on process improvement. More effectively functioning in a 'shared power' world will require increased attention to the paradoxes and conflicts inherent in integrating economic and conservation decision making. It will also require increased attention to process design and management; how things are done will be increasingly as important as what is done. Addressing these issues represent tomorrow's challenges we all share" (Ostermeier et al. 2000).

Sonoran Desert Conservation Plan (SDCP): An Innovative Habitat Conservation Plan (Huckelberry, 2001; Pima County 2000)

In 1998 the Pima County Board of Supervisors initiated efforts to consider land use planning and conservation in a comprehensive fashion using an approach that has been called bio-planning or natural resource assessment and evaluation. The need for this type of planning arose from the increasing conflict between rapid population growth and resource protection. Mindful of the impact of growth on the loss of natural resources, the SDCP "places emphasis and gives high priority to preserving and protecting our most important natural resources." The SDCP will be an integrated plan that has the following key elements:

- Ranch Conservation – Protection of historical and cultural land to promote preservation of natural open space and protect natural resources.
- Historical and Cultural Preservation – Preserve the past in order to protect the future.
- Mountain Parks – Protect open and scenic beauty by preserving tracts of mountain lands.
- Riparian Protection, Management and Restoration – Protection and restoration of riparian areas where 60 to 75% of all Arizona species rely on a riparian environment at some point in their life cycle.
- Critical and Sensitive Habitat; Biological Corridor Conservation – Identification and protection of unique Sonoran Desert habitat associations.

Two of the elements of the SDCP emphasize protection and restoration of biological communities, especially those associated with riparian areas. To accomplish this goal, project participants are considering the role of treated effluent in the support and restoration of riparian areas. Currently, the plan calls for the establishment of an "effluent pool" of 10,000 acre-feet, which will be available for the restoration and maintenance of riparian habitat. Examples of the types of projects under consideration include recharging effluent to the groundwater to elevate groundwater tables to support riparian vegetation and habitat restoration activities to restore lost riparian

The applicability of an HCP-type process to effluent-dependent waters should be apparent. Just as there are competing interests for the use of resources associated with the protection of endangered species, there are competing uses for water resources in the arid West. As discussed in **Chapter 4**, economic drivers associated with the cost of treatment coupled with the value of water are determining how these resources are used. An HCP-type process where all uses could be considered and potential benefits and detriments of discharge could be evaluated in a manner that allows decision makers to consider a range of options for the management of the created ecosystem may be an option worth considering for the future.

6.2.3 Watershed Trading

In its draft watershed training framework, EPA (1996) described the concept of watershed trading in the following terms:

> "Trading is an innovative way for water quality agencies and community stakeholders to develop common-sense, cost-effective solutions for water quality problems in their watersheds. Community stakeholders include states and water quality agencies, local governments, point source dischargers, contributors to nonpoint source pollution, citizen groups, other federal agencies, and the public at large. Trading can allow communities to grow and prosper while retaining their commitment to water quality. The bulk of this framework discusses effluent trading in watersheds. Remaining sections discuss transactions that, while not technically fulfilling the definition of 'effluent' trades, do involve the exchange of valued water quality or other ecological improvements between partners responding to market initiatives."

Although EPA published its watershed trading framework in a draft form in 1996, there has been little movement forward with the concept. However, recently the EPA began working again on this concept stating that the "EPA supports implementation of market-based strategies to achieve the goals of the CWA and establish economic incentives for greater water quality and environmental benefits than those required by or achievable under existing federal regulations" (EPA 2001b). Moreover,

> "The purpose of this policy and implementation strategy is to promote implementation of water quality-based trading programs and the development of other market-based strategies that establish economic incentives for voluntary pollutant reductions, provide greater regulatory flexibility, reduce the cost of improving the quality of the nation's waters and realize ancillary benefits beyond those that have been achieved under the Clean Water Act" (EPA 2001b).

Definition of Watershed Trading (EPA 2001b):

"exchange of pollutant allocations or reduction credits between sources in the same watershed or trading area to meet a regulatory obligation."

Areas where watershed trading could be implemented under the current draft policy are varied (see inset). Fundamental areas where trading would most likely serve as an important tool for implementing water quality management programs would be where the relative importance of economics and environmental benefits are important drivers. As documented in earlier chapters of this report, a general finding from the effluent-dependent water case studies is that the physical characteristics of effluent-dependent waters, as well as limitations placed on these systems by urban stressors, may greatly limit expectations for the aquatic community of these waters. However, while the in-stream aquatic community may be limited, the benefits derived from the effluent flow as manifested in the functioning riparian community can be significant. This scenario, where unintended environmental benefits are achieved because of the discharge of effluent, could form the basis for consideration of watershed trading.

EPA supports trading for all of the following purposes (EPA 2001b):

- Reducing the cost of compliance with water quality-based requirements;
- Offsetting growth and maintain water quality to support existing and designated uses;
- Achieving early reductions and reasonable further progress towards water quality standards pending development of total maximum daily loads (TMDL) for impaired waters;
- Providing greater flexibility and reduce the cost of achieving reductions required under a TMDL that has been approved by a State or Tribe and the EPA;
- Establishing economic incentives for voluntary reductions from all sources, especially non-point sources; and
- Achieving greater environmental benefits than those under existing regulatory programs.

For example, if it is determined that the economic cost of upgrading treatment to achieve a water column standard will achieve little or no benefit to a designated use (e.g., an aquatic life use), then an alternative could be implemented such that the cost of treatment is traded for the cost of habitat improvements that may yield more important watershed benefits.

Clearly, the application of watershed trading concepts to effluent-dependent waters would have to meet specific EPA requirements For example, EPA states that watershed trading must be accomplished within the following framework: "Individual trades and trading programs must be consistent with water quality planning and management regulations, NPDES permit requirements, federal anti-degradation policy and water quality standards" (EPA 2001b). We would argue that using trading as an implementation tool provides the opportunity to support the development of alternative performance outcomes that could be recognized as an approach for achieving environmental compliance in effluent-dependent waters (see additional discussion in **Chapter 5**).

6.2.4 Ecological Risk Assessment

Ecological risk assessment is not routinely practiced as a tool for implementation of state and tribal water quality standards programs. However, ecological risk assessment methodology may be an approach for comparing and weighing relative risks and benefits associated with chemical concentrations and physical stressors (see for example EPA 1998). A risk assessment could determine whether more restrictive or even less restrictive water quality is irrelevant given the presence of physical stressors in the watershed.

This ecosystem-based approach of recognizing tradeoffs between water quality and habitat and riparian conditions is not clearly authorized under the Clean Water Act as related to restoration but may be justified under the concept of enhancement of the waters under the jurisdiction of the Clean Water Act. In any case, EPA's watershed and ecological restoration ideas expand the focus from water quality to physical habitat and that in turn expands to riparian characteristics, land use, and terrestrial inputs. How that mix is integrated and balanced to attain stream uses and supporting water quality standards is uncertain. However, given the obvious terrestrial benefits associated with the creation of effluent-dependent waters, the use of tools that can evaluate where the best of resources can be applied (e.g., upgrading treatment versus improving habitat) could be beneficial to the implementation of water quality programs in these created ecosystems.

6.3 EFFLUENT-DEPENDENT WATERS: OPPORTUNITIES FOR INNOVATION

Effluent-dependent waters are by definition created ecosystems, that is, without the regular discharge of effluent, the ecosystem would look considerably different from what would be present on a day-to-day basis. As described in **Chapter 3** of this report, fundamental to how these created ecosystems function is the relationship between the discharge and the physical template receiving this discharge. Because this relationship is physical and related to the dynamics of flow, this relationship can be modeled and predictions can be made as to how the physical template of the created ecosystem will function with the addition of the effluent discharge. Under these circumstances the opportunity exists to "design" effluent-dependent water ecosystems to achieve specific outcomes that are holistically based. That is, rather than looking at the dry riverbed receiving the effluent as simply a means to move effluent, this dry riverbed can be viewed as the foundation upon which a functioning aquatic and terrestrial ecosystem can be designed. Realistic goals can be set that go beyond or replace routine focus on the water column. Such goals could include the creation of a functioning riparian ecosystem or sites with important local public values.

The concept of creating a functioning ecosystem has been the challenge of wetland system design for many years. Initially, the focus of the design was simply on manipulating the created system in a manner that led to the greatest reduction of pollutants in the created system. However, over time as wetland processes became better understood, the focus on design has shifted to creating aesthetically pleasing wetland habitats to take advantage of the net environmental benefits gained by creating the wetlands systems. Examples of these benefits have included the construction of hiking trails, educational areas, and bird-watching areas (see for example EPA 1993b).

It is understood that from a regulatory standpoint there is a key difference between a created effluent-dependent water and a created wetland system. The latter is typically created outside of a surface water jurisdictional under the Clean Water Act, thus freeing

Innovative Solutions: Ed Pastor Kino Ecosystem Restoration Project

The Ed Pastor Kino Ecosystem Restoration Project is a joint effort between Pima County, Arizona and the Army Corps of Engineers to restore the Tucson/Ajo Detention Basin, a 127-acre flood control project built by the Corps in 1966. Located in the southern part of Tucson, Arizona, the basin is part of a system that ultimately discharges stormwater to the Santa Cruz River via Julian Wash. Prior to construction in 1966, the site had abundant wildlife and vegetation. As partners in the restoration project, the County and Corps have designed and constructed an extensive restoration project that will result in the development of significant riparian habitat, while at the same time allowing the site to still be used for its original mission - flood control.

The restoration project was designed to support a variety of environmental and community needs, both educational and recreational. However, while there was strong public support of the project, innovation was required to address significant regulatory issues that arose because of Clean Water Act regulations. The project was designed to commingle stormwater and reclaimed water, and because the basin is designed to send stormwater to the Santa Cruz River during high flow events, the commingling of reclaimed water with that stormwater raised regulatory issues. However, through the cooperative efforts of state and federal regulatory agency staff an innovative approach was developed that allowed the project to be successful. The result will be a facility that not only recognizes the multiple uses for reclaimed water in an urban environment, but also provides basic protections as required under the Clean Water Act. These protections will be implemented as best management practices and examples of the beneficial uses that will be protected include recreation, ecosystem rehabilitation, turf irrigation and flood protection.

it from limitations imposed by interpretation of the Act and its implementing regulations. Free of this constraint, the creators of these systems have seized upon the opportunity to design the systems to maximize public benefits. In contrast, effluent-dependent waters are typically created in dry riverbeds that are jurisdictional under the Clean Water Act. As such, concerns regarding compliance with water quality regulations has been the primary focus, as demanded by existing water quality programs. However, as this chapter has attempted to indicate, we believe that it is time to reevaluate how water quality programs are implemented in these systems so that all potential uses are considered including support of riparian systems and public values. As discussed in **Chapter 4**, if such a shift in thinking does not take place, the economics of water quality compliance will drive water resource decisions rather than thoughtful discussion by public bodies.