PART TWO

FLOODPLAIN MANAGEMENT IN TULSA AND OKLAHOMA

ROOFTOP TO RIVER: TULSA'S UNIFIED LOCAL PROGRAM FOR FLOODPLAIN AND STORMWATER MANAGEMENT

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Introduction

This paper gives an overview of Tulsa's floodplain and stormwater program, including our strengths, weakness, and some of the lessons we have learned. Additional papers in this volume describe specific elements of the City's program. This is not a perfect program, and I want to discuss our weak points and what we are trying to do about them, with a glimpse of what we think the future may hold.

From Worst to Best

Tulsa's floodplain and stormwater program has come a long way. We have learned some hard lessons. Our program is not perfect, and we are still learning. We have survived some stormy times. The remarkable thing about Tulsa's program, as a local editorial writer once wrote, is that it exists at all.

Less than 20 years ago, we had virtually no program to manage floodplains or stormwater. We were racking up arguably the worst flood record in the nation. From 1970 to 1984, Tulsa County was declared a federal flood disaster area nine times—more than any other community in the nation. Houses could be flooded with no more than 2" of rain.

Twenty years later, our citizens are enjoying the nation's lowest flood insurance rates, because the federal government has ranked our program tops in the nation. The Association of State Floodplain Managers has twice given us its coveted local program award. Most importantly, our community has survived nearly a decade without serious flooding—an unprecedented period of relief that shows our system can now handle many small-to-moderate rains without flooding. When the next major rain hits, we will still have flooding—make no mistake about it. Our program is still being built, and even our completed projects have a finite level of protection. But we have made significant progress.

Tulsa's improvements did not occur accidentally. With the Federal Emergency Management Agency's (FEMA) help we have produced both a video and booklet (*Rooftop to River*) that describe the evolution of our program. A

second booklet, *From Harm's Way: Flood Hazard Mitigation in Tulsa, Oklahoma*, goes into more detail about our floodplain acquisition projects.

We are told that nothing about Tulsa's program is particularly unique, but that few other communities have been able to sustain the political support to put these pieces together into a comprehensive whole. It is fitting, then, that the program this week is called "Nania—All Together." We have learned the hard way that piecemeal, occasional projects cannot manage urban floodplains and stormwater. Each element of the program must support and strengthen the whole.

Lessons Learned

We have learned much, flood by flood, and they have been costly lessons.

We learned to appreciate the support base of the National Flood Insurance Program (NFIP). Tulsa joined the NFIP in 1970, and reaching compliance with regulations took many years of heated debates. Without the NFIP, Tulsa would probably have made little progress over the past two decades. We will always be grateful for the vision and support of the NFIP. But before too many years elapsed, we realized that, in an urban area like Tulsa, it is necessary to go beyond the NFIP standards.

We believe strongly that the NFIP's national standard, which is necessarily a compromise, is insufficient for an urban area. We advocate managing beyond NFIP floodplains, throughout entire watersheds, with floodplains mapped to take into account future basin urbanization.

We learned to preserve the valley storage functions of a stream, to require compensatory storage when someone fills in a floodplain, to install stormwater detention basins throughout watersheds.

We are learning, increasingly, humility in the face of nature. More and more, our program is based on respect for natural laws.

We are learning to emphasize mitigation before, during, and after disasters. We advocate greater national emphasis on predisaster planning and mitigation, and we applaud the considerable progress being made in national mitigation policies.

We have learned to value partnerships. We enjoy particularly effective working relationships with the U.S. Army Corps of Engineers and FEMA. Local governments need to recognize that no one else can do it for us, so we have got to accept local responsibility. But none of us can do it alone, either.

Broad-based planning is key. An important link in our program is provided by our Stormwater Drainage Advisory Board, made up of volunteers who provide citizen advice and guidance to the Tulsa program. They are truly

unsung heroes who have stayed with us through tough times, helping us through numerous controversial community issues.

Program Assessment

As I said earlier, this is not a perfect program. We are still learning, still experimenting, still growing. For example, we have learned a great deal from preparing for this conference. It has forced us into a critical self-assessment and, interestingly, we have learned from the nation's experiences during the Midwest flooding. Frankly, we realized that we had, to some extent, grown complacent, during a necessary period of local program consolidation. We had identified hundreds of millions of dollars worth of needed capital projects, and we were concentrating on implementation. But the Midwest floods reminded us that we still have areas with fragile levees and finite flood protection that may provide a false sense of security, similar to flooded areas along the Mississippi River.

We were reminded that some of the same kinds of problems could occur here, and we are not fully ready. We had an emergency management system that was light-years ahead of the non-system we had 10 years ago, and we had a plan on the shelf for post-flood mitigation, but a 15" rain could still wreak havoc in our community. We had completed master drainage plans for all our watersheds, and we were implementing the priority projects as quickly as possible. But we realized that our plans missed a vital component: what would opportunities and priorities be after our next flood? Now we are trying to develop updated mitigation plans.

We were out of touch with national policies. Without current knowledge of changing federal policies, how could we plan effectively for recovery from our next flood? We were less than effective in coordinating with our state people and programs.

We were working to marry structural and nonstructural projects, and without a doubt we were making tremendous progress. We had a few showcase projects that included recreation, environmental elements, and community beautification. But we were missing the mark in making the most of the tremendous community assets that stormwater and floodplains offer. We had made great strides in water quality and wetlands management, but we were far from a leader in the environmental field.

In short, we discovered that we must redouble our efforts. And we are trying to do that.

Future Directions

What does Tulsa's future hold? We are working on documenting our program, conducting an ongoing self-assessment, and still trying to learn and improve.

We are embarking on a new cycle of contingency planning, looking at problems and possibilities that could arise in our next flood, hoping to map out ways to make the most of mitigation opportunities before, during, and after future disasters—from whatever cause.

We are exploring new avenues of multiobjective management, including new community trails, greenways, recreation, and environmental projects in conjunction with flood and stormwater programs.

We are trying to strengthen our links with emerging state and federal policies and programs.

Much of our successes and our new horizons rest on lessons we have learned from others. To the extent that we can repay this debt by sharing our own lessons, we are pleased to do so.

ROOFTOP TO RIVER: TULSA'S FLOODPLAIN AND STORMWATER MANAGEMENT STORY

Federal Emergency Management Agency, Region VI[1]

This is the story of Tulsey, the "gathering place," as the Creeks tribe named it. It is the story of their "nania"—the Cherokee word for "all together"—and the spirit of the people here to overcome disasters. It was those disasters that, many decades later, spawned an evolution for Tulsa's floodplain management.

Tulsa was born in Indian Territory, the cradle of the Five Civilized Tribes, in the Arkansas River valley, now in northeastern Oklahoma. The town flourished during the early twentieth century oil boom and proudly claimed the title "Oil Capital of the World."

Like oil, water was also crucial to the area. Early in the century, Tulsans constructed a reservoir that furnished 20 times their daily needs. Water attracted industry and people. Later, an inland port gave Tulsa a direct waterway link to the seas.

But Tulsa's water history has another, darker side. It is the frightening picture of a torrent of water surging through the community, ripping up homes and smashing mobile homes, swirling away trees, cars, and furniture, twisting and flashing its muddy way through the city like a wet tornado, sucking the very life from its victims, crushing dreams as rains become ravaging floods.

Throughout Tulsa's history, headlines have announced floods as the "greatest rampage in history," "Tulsa's worst flood," or "the Arkansas River hit its highest stage in history today." Tulsa had accepted these unfriendly torrents as tricks nature plays on a community so blessed with natural resources.

Historically, Tulsa's rivers and streams have provided food and water, transportation, power, protection, and beauty. So people built homes and settlements in the broad, flat plains of the lowlands. And Tulsa grew, ever closer to the river and the creeks that feed the river—waterways that normally handle the annual rainfall of 37 inches. But a 15-inch overnight downpour can send water gushing through the floodplain like an avalanche careening down a mountainside.

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[1]This is the script of a videotape shown at the 1994 conference. It was produced by FEMA's Region VI office, and was written by Billy Penn of FEMA, with assistance from Ben Frizzell of FEMA, and Carol Williams and Ann Patton of the City of Tulsa.

For many years, this proud Midwestern city with a thriving pioneer spirit did little to interfere with that pattern, partly because frontier people believed you have a right to do what you want with your land.

Nature had other ideas. During three months of flooding in 1957, some fought the water to a standstill only to be flooded again three days later. The floods of the 1940s, 1950s, and 1960s prodded the Army Corps of Engineers to build levees in portions of Tulsa and the Keystone Dam upstream.

Without a master plan, each project solved only part of a much bigger problem. It was like trying to stop a leaky sieve by plugging one hole at a time. With one hole plugged, another gushed, often with greater force.

The wet years continued, bringing multiple floods in single years. A baby drowned in 1961. More flooding occurred in 1962. In 1963, it rained almost 9 inches in an hour and a half—an inch every 10 minutes.

Still Tulsa grew, ever closer to the river and the creeks that feed the river. Developments fanned out more and more into the lowlands, building near the smaller, flashy streams that overflowed and became the focus of floods that occurred every other year or so.

Once, those streams flooded with little notice. Now, some of the homes built there would be flooded as many as 10 times. Yet few people seemed to notice, so Tulsa did little to regulate floodplain use or protect floodprone structures.

The Mother's Day flood of 1970 brought people together as no previous flood had. Tulsa entered the National Flood Insurance Program and began, slowly, using Federal Insurance Administration models to regulate land use, although regulations were often ignored. The city favored a wave of growth and territorial expansion that was moving them even more rapidly down into treacherous floodprone areas.

A 1971 Labor Day flood reminded the city to use bonds approved in the 1960s that were voted to fund channels and buy up land in the floodplain.

June 1974's $18 million flood triggered a community debate, dubbed Tulsa's "Great Drainage War." Opinions ran wild. As flooding increased, it became more difficult to ignore the impact on the community, and 1974 became known as "The Year of the Floods." Some people took sides to assign blame. With enough sin to go around, the consensus was, "Whoever is at fault, there is no excuse for this water in our homes."

In south Tulsa, the city and the Army Corps of Engineers began developing channels on Joe Creek. Meanwhile, citizens demanded more. They wanted the floodplain cleared. The cumulative damages to some homes exceeded their value, in some cases threefold. Victims appealed to the Federal Insurance Administration. The city responded with a combination of stopgap public and private channel projects. They cleared 33 houses for right-of-way to build a three-mile channel mid-stream on Mingo Creek. But floodplain issues were far from resolved.

The Great Drainage War picked up momentum. Flood victims mobilized and engaged in hot political skirmishes with developers. City leaders formed a partnership with the Federal Insurance Administration and the Corps of Engineers to search for better ways to solve the problems of flooding.

On Memorial Day, 1976, 10 inches of rain fell in three hours. Three people died, 4,000 structures were flooded, and there was $40 million in damage.

Flood fears hit an emotional peak, touching off a revolution in floodplain management. Debate intensified and activity increased. Together, voters approved several flood-control projects. The city broadened its vision. This time, master drainage plans covering entire watersheds called for a Tulsa partnership with the Corps of Engineers to construct channels and stormwater detention basins.

New development was finally being regulated throughout the city. They also used $1.7 million to acquire 30 houses and used those properties to construct detention ponds upstream on Mingo Creek.

Then some dry years came. When the water dries out, so does the commitment. The program lost momentum and progress slowly eroded. Even with the floods of 1979, 1980, and 1981, the city could not shake the lethargy of the dry years. A 1982 report warned, "Tulsa-area creeks will flood again." The report predicted that damage on Mingo Creek alone would average $20 million annually. It concluded that urbanization in the watersheds would increase both the frequency and severity of flooding.

It seemed to Tulsans that holidays meant celebration and anguish: Mother's Day, Labor Day, Memorial Day, and now Memorial Day again. This time, Memorial Day 1984, the disaster that finally brought Tulsans all together, as the Cherokees would say, a time for their "nania."

People woke up and found disaster everywhere, and all together, decided to come to terms with flooding. Flooding that killed 14, left $180 million in damage, and swamped 7,000 homes and businesses. Flooding that brought nine federally declared disasters in a 15-year span, with the cost of a generation of floods topping $300 million!

Legends from Indian Territory days tell of a Creek tribal chief who once said, "No man could remain chief of my tribe who would place an overnight camp in these bottomlands."

With this thought and the knowledge of history, Tulsans cemented their commitment. People in the hills joined those in the lowlands to demand leadership that would move them to safer ground and put parks in the floodplains. Finally, after years of anguish, Tulsa reached its watershed point in floodplain management.

After the flood of 1984, Tulsa leaders created a strong flood and stormwater management program and levied a service charge on utility bills to finance its work. Tough but fair criteria—by far the toughest in Tulsa's history

and even tougher than federal standards—would guide growth. Major new development would have to hold excess stormwater on site and release it slowly downstream. A network of federal, state, and city agencies cooperated to establish and enforce these new policies.

The city used proceeds from the sale of flooded houses and interest from sales tax revenue bonds to purchase more than 300 flooded homes and 200 mobile homes after the 1984 disaster. Insurance claims and a Section 1362 mitigation grant from the Federal Emergency Management Agency (FEMA) supplemented city funds. The land was dedicated for open space or nonstructural works.

With this new start, Tulsa developed 14 master drainage plans and spent nearly a quarter of a billion dollars on flood control projects. In cooperation with the Corps of Engineers, they improved creek channels and constructed detention basins. And a local newspaper raised donations to pay for hiking and biking trails in those special areas.

In a cooperative effort by the city and the local news media, Tulsans are exposed to flood awareness information. The effort includes promoting the purchase of flood insurance and provides that people in flood hazard areas receive regular warnings.

Tulsa extended its vision for floodplain management in the fall of 1986 when rains upstream pushed Corps releases from Keystone Dam to 300,000 cubic feet of water per second. Tulsa's $3 million in damage was low compared to neighboring communities, and everyone realized that more homes could have been saved with a regional plan. So, Tulsa leaders grabbed the chance to make their programs better. Least terns now nest in a natural detention basin that replaced a swampy pocket of flooded homes along the west bank of the Arkansas River, still another example of extending the vision.

Mother's Day again, this time 1993. A weather system dumped rain on the city's watersheds similar to the Mother's Day deluge of 1970, the storm that launched Tulsa on its way toward better floodplain management. This time their efforts paid off. In areas where flood control work had been done, there was no flood damage. More than two-thirds of Oklahoma's counties, including every county in the Tulsa region, received a federal disaster declaration. Yet the city escaped having to relive the watery nightmare of the ghosts of holidays past.

All of this new development is not without responsibility during severe weather situations. To ensure the safety of Tulsans, including those who use these facilities, the Emergency Management and Public Works groups have combined weather forecasting with the city's warning systems to get people out of harm's way.

The program has accomplished much for the people of Tulsa. Since new regulations were adopted in the late 1970s, Tulsa has no record of flood damage to any structure built according to those regulations. Several storms have challenged the new systems and, in each case, without significant damage.

Tulsa stands today as a model of community floodplain management. Perhaps no city in the country had a more frequent record of flooding. Certainly no other city has come such a long way, from having nine federally declared disasters in 15 years to having the lowest flood insurance rates in America.

The work here has done much to improve Tulsa's quality of life and has received recognition from many quarters. In recent years the Association of State Floodplain Managers twice awarded Tulsa top honors. In 1992, FEMA's National Flood Insurance Program gave Tulsa its highest rating, making flood insurance premiums for the city the lowest in the nation—an award that saves Tulsans a quarter of a million dollars annually. The same year, FEMA presented Tulsa its Outstanding Public Service Award in recognition of all Tulsans have done in floodplain management.

Outside government, the national media has held Tulsa as the standard for floodplain management across the country. From CBS News and the *New York Times*, to the *Des Moines Register* and the *Kansas City Star*, reporters and critics alike are impressed with the accomplishments Tulsans now enjoy.

Tulsa will flood again. It is inevitable. But it will not hurt as much the next time, because of the "all together" Tulsa spirit of "nania"—a commitment by all to strive for the best possible quality of life in one of America's most liveable cities.

JUMPING HURDLES IN PROJECT IMPLEMENTATION: MINGO CREEK LOCAL FLOOD PROTECTION PROJECT

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Introduction

Starting with reconnaissance studies in the early 1970s, the Tulsa District of the U.S. Army Corps of Engineers (Corps) has been working diligently to develop a flood control project along Mingo Creek, Tulsa, Oklahoma. On November 17, 1986, P.L. 99-662 was passed authorizing construction of the Mingo Creek Local Protection Project. This project consists of 23 stormwater detention sites and seven miles of creek channelization. The authorized project cost estimate was $169 million. The City of Tulsa is responsible for a cash contribution of 5% of the total project cost and providing all lands, easements, rights-of-way, and waste disposal areas and relocations.

In January 1988, the City of Tulsa signed the Local Cooperation Agreement (LCA) with the Corps for construction of the project. One major advantage of the LCA is that the federal government pays 95% of the construction cost; the biggest disadvantage is the "red tape" that the city must go through to accomplish the project.

The LCA provided for a Memorandum of Understanding (MOU) to be developed by the Corps and the City of Tulsa to define the specifics of how the Corps and the city would communicate during the construction of the project. The MOU established procedures for the city's review of and comments on Design Memoranda, construction plans and specifications, and construction contract administration. A significant provision of the MOU was the establishment of biweekly coordination meetings. As a result, representatives of the Corps and the city meet biweekly to discuss topics relating to the overall project or technical matters.

The project team was multi-disciplined. Not only were design engineers used, the team also consisted of experts in accounting, the law, maintenance, public relations, planning, landscape architecture, traffic engineering, and parks and recreation. In these meetings, the city's personnel established their credibility in floodplain management and significantly affected the course of project design.

However, projects of this size create a number of hurdles that must be cleared in order to be successful. We would like to discuss four major hurdles and how we turned them into project successes for our award-winning team. We offer these examples of our experiences and challenges in implementing the Mingo Creek Flood Protection Project to benefit other floodplain managers who are interested in developing flood control projects with the Corps of Engineers.

Working with the Public

The first hurdle was overcoming apathy and accommodating citizens' needs. While making everyone happy all the time is impossible, we still try. Our record flood occurred 10 years ago in May 1984, and memories are fading or flood victims have moved away. Flood control projects are easy to explain to a flood victim, but they become more difficult to justify as time passes. That is why the city has implemented an aggressive program of public meetings and citizen contacts to "sell" our project. We hosted public meetings during different project phases. Often, the first one is right after conceptual design to show the city's intentions and foster discussion. Sometimes we have meetings right before construction to explain the process and describe some of the inconveniences that we expect and how we will deal with them. Our public speaking as well as our customer orientation skills are well tested at these meetings. The city has developed several aesthetic design features that make the project more "park-like" and encourages multipurpose use. Examples of these are curvilinear trickle trails and perimeter berms, varying side slopes, jogging/maintenance trails, permanent water features, and landscaping. When photos and renderings of these features are shown at the public meetings, some citizen concerns are reduced and they are more receptive to the project.

Right-of-way Acquisition

According to the LCA, the city is responsible for purchase of lands for the entire Mingo Creek project. The second hurdle was to minimize right-of-way (ROW) costs and avoid project delays caused by litigation; as a result we have adopted three approaches: negotiation, minor redesign, and redesign. When these approaches failed, condemnation was used as a last resort. Examples of the three approaches are discussed below.

Negotation

We have a site currently under construction that we obtained under a "win-win" negotiation with the land owner. He owned 83 acres of land, much of it in the floodplain. We negotiated with him to donate 23 acres to the city for our stormwater detention facility. In exchange, the excavated soil was used to

regrade the remainder of his land. He now has 60 acres of land ready for development, which will eventually expand the city's tax base. The city saved money on land acquisition, and the Corps saved money on hauling the excavated material. Another negotiation was convincing the Park Department to use an existing city park for stormwater detention. The city saved money on land acquisition and was able to replace and upgrade the 20-year-old park in accordance with the neighborhood's wishes.

Minor Redesign

The project includes two channel improvements in existing easements. On one channel minor redesign changes were made to stay inside the existing easement, and ROW costs were saved. For the other channel, the addition of a retaining wall instead of a sloped bank minimized ROW requirements and maintained the manufacturer's access for his semi-trucks. The savings in ROW cost far exceeded the cost of the retaining wall.

Redesign

The city saved ROW costs by completely redesigning one facility. It was a challenge to get the Corps to consider a major design change so late in the project. The city is paying the Corps $20,000 to redesign the facility, but will recover this cost 10 times over in ROW cost savings. Not everything the city requests is redesigned; actually design requests were made on two sites but the city elected to proceed with only one based on costs.

Coordination within the City

Working with departments that have not been involved with Public Works capital projects is another hurdle. Our Engineering Department used the expertise of other city departments to improve project design. For example, we involved the Maintenance Department in plan review. At their suggestion, we modified projects to improve access for maintenance vehicles and equipment. They suggested entrance ramps, turnarounds, and the unique trickle trail design (Figure 1). This helps to establish "buy-in" from field personnel and, in the end, improves maintenance efficiency and results in lower operation and maintenance costs—long term costs borne solely by the city. The Park Department was involved in developing passive and active recreational uses in the detention facilities during dry times. In Tulsa, detention facilities create large green spaces that people are clamoring to use. The city has leased these facilities to several non-profit soccer and softball associations, who will maintain them at their own expense. We also used Park Department expertise in vegetation and tree planting to develop of project revegetation and landscape plans.

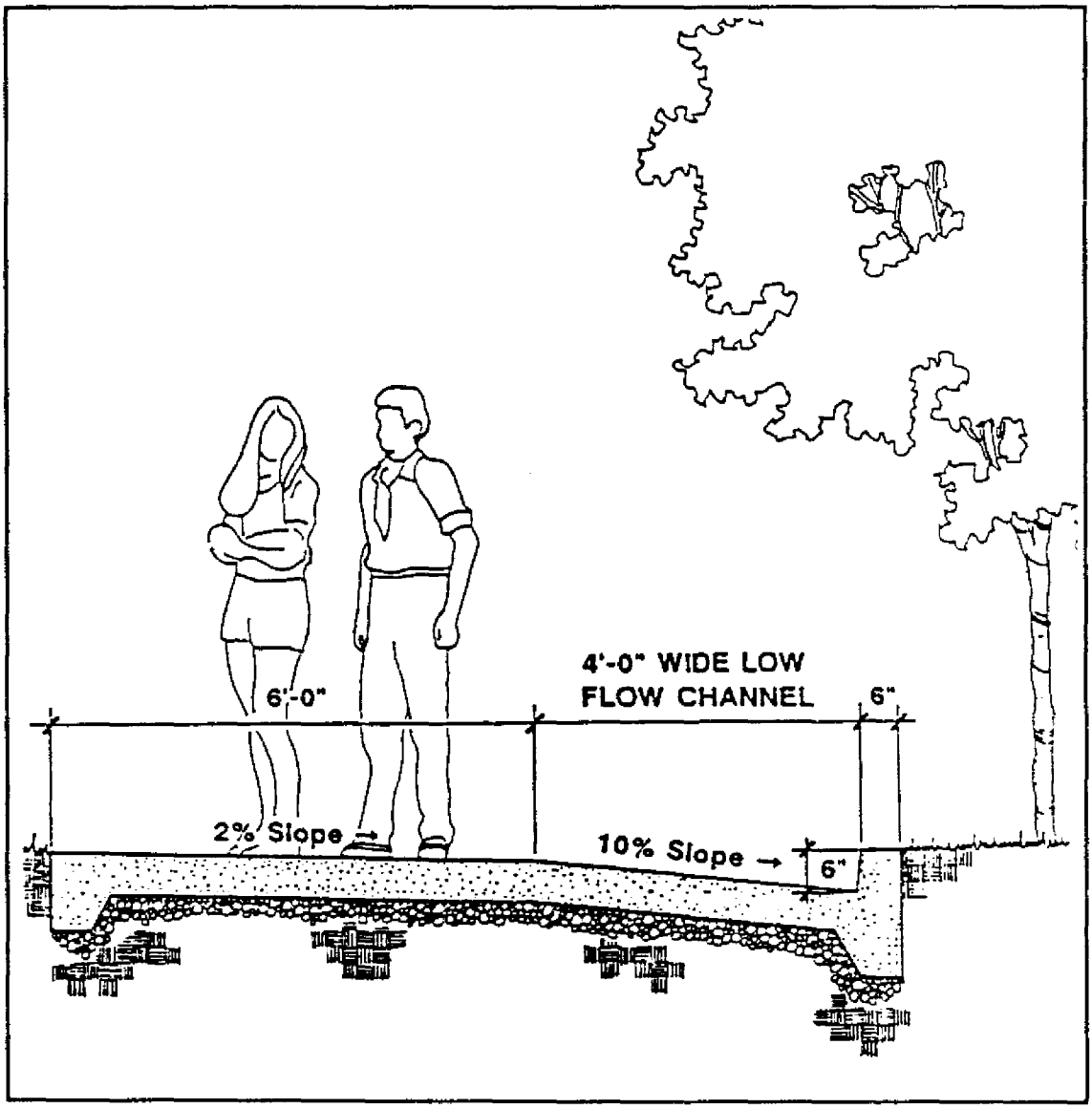

Figure 1. Typical cross-section of reinforced concrete trail and trickle channel.

Working with the Corps of Engineers

Another hurdle was to have the Corps, traditionally a "big" project organization, treat Mingo Creek as 30 "local" projects. Several key elements were critical to the project's success. While the city needed to make the Corps more sensitive to local problems, we also needed to learn the way the Corps runs a project. We have taken Corps team members to city public meetings and meetings with interested citizens, so they can see up front the issues and

concerns facing the city. The Tulsa District team is more sensitive to our local concerns for many reasons. One is that the project is literally in their backyard; their office building overlooks two project sites. One of these sites has been adopted by the Corps and named after their recently deceased project manager, Larry Redford. Corps employees use this site to walk or jog during lunch and have picnics. In addition, many Corps team members live near the Mingo Creek basin. They therefore have a personal interest in this project.

The city has learned, to our advantage, the "Corps" way of accomplishing a project. When we started planning we asked the Corps to install jogging trails in the projects. The Corps stated that recreational facilities were, according to the LCA, a nonparticipating cost. When the city explained that many of these also serve as essential maintenance roads, the cost was approved as part of the project. Compromise on both sides is essential to success. Examples are the Corps compromise on the aesthetic design features and the city compromise on the riprap channels. Our maintenance personnel consider riprap channels hard to maintain, but when the Corps agreed to place a 10-foot-wide concrete road in the bottom, it eased maintenance concerns.

The final element to a successful project is mutual respect for each of our roles and capabilities. We all realize how everyone can contribute to the project. We have some lively "discussions," at times, but we all know that the project is only improving as we work to complete it.

Conclusion

The city has been successful in overcoming these hurdles. Citizens, for the most part, feel they have an ownership in what is going on. Recently one maintenance crew was driving along the maintenance road (jogging trail) doing routine maintenance. A jogger stopped them and requested that the vehicle not be driven on "their" jogging trail.

Because the city was willing to modify plans and use sound reasoning with individual owners, the necessity to enter condemnation has been minimized.

Our willingness to include other departments in our review process has led to more efficient use of the flood control facilities and has saved the city money.

We have not used the word "partnering," but the Mingo Creek project is an excellent example of a successful partnership. According to the Corps project manager, "It takes a lot of effort on everyone's part to work so closely together throughout such a large project; and, at times, the stress factor and frustration levels are very high. It is a lot harder to do it this way, but we are reaping the benefits now, and everybody likes that." The results are award winning. Two of the sites produced by this partnership were recently recognized among 1994's ten Outstanding Engineering Achievements in the United States

by the National Society of Professional Engineers. We noted with pride that we were the only public-public partnership among the award recipients this year.

Through our mutually effective design efforts, the authorized project estimate has been reduced from $169 million to $143 million.

STORMWATER PLANNING AND CAPITAL IMPROVEMENTS IN TULSA, OKLAHOMA

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Introduction

The City of Tulsa, Oklahoma, experiences frequent, severe flooding. By the 1980s, Tulsa County had been declared a federal flood disaster area nine times in 15 years, more than any other community in the nation. A devastating flood on Memorial Day weekend 1984 left 14 people dead, 7,000 structures flooded, and $180 million in damages. The shock of the event forced Tulsa to develop a comprehensive stormwater program. One of its major components is a planning and capital improvement program that has resulted in over a $200-million investment to date, with millions more planned.

Planning

Basin Drainage Plans

Tulsa consists of up to 30 or 40 (depending on how they are subdivided) small urbanized watersheds. Master drainage plans for the individual basins began in 1977 and proceeded fairly slowly up to 1984. The basin planning process accelerated dramatically after the 1984 flood, resulting in plans for most of the basins being completed by 1994. These basin plans are the foundation of the city's entire stormwater program. Floodplain maps are developed using city criteria, which are more stringent than that of the Federal Emergency Management Agency (FEMA). City criteria evaluate ultimate development conditions and extend down to 40-acre drainage areas. Flood problems are identified through hydrologic and hydraulic studies, as well as discussions with residents. Different alternatives are evaluated to address the problems and a single, comprehensive plan is adopted that recognizes the complexity of the drainage system and ensures against piecemeal projects that may simply move problems from one location to another.

Citywide Master Drainage Plan (MDP)

As the city approached completion of the many individual basin drainage plans, it became apparent that these plans should be consolidated into a true citywide master plan. This would provide compilation of data to provide a citywide perspective on the magnitude of problems and resources required to

address them. It would also standardize data and criteria used by the many different engineering consultants over several years. The end product of the City of Tulsa Flood and Stormwater Management Plan, 1990-2005, was a citywide list of prioritized projects based on an adopted rating formula that includes economic benefits, street flooding, number of structures affected, and project cost. These needs were balanced against potential funding to provide some general scheduling of when different projects might be constructed.

Capital Improvement Program

Results from Citywide MDP

The Citywide MDP identified approximately $300 million in additional funding needs beyond those already appropriated to address existing flood problems. An analysis of potential funding indicated about $168 million as a reasonable amount over the 15-year period of the plan. The remaining $132 million in needs had to be deferred beyond the plan period. The projects become a part of Tulsa's overall Capital Improvement Program, and therefore must compete with streets, water, wastewater, and other public facilities for funding.

Funding

Major stormwater projects are funded primarily by a temporary one-cent sales tax, enacted in 5-year periods since 1980, that includes other city capital projects, and by general obligation bond issues. Some projects are funded from "fee-in-lieu of" accounts, which allow private developers, under certain circumstances, to contribute fees toward construction of regional detention sites, rather than providing on-site detention. The city's stormwater utility fee is not used for major capital projects, although some small local projects are funded by it. Since 1980, over $200 million has been committed to the city's stormwater capital program, including about $80 million in federal funds for the Corps of Engineers' Mingo Creek Local Flood Protection Project.

Types of Projects

The projects cover a wide range of size and complexity. Small local projects, as small as $10,000 to $20,000, addressing localized problems, are an important part of our program. Many citizen calls, City Counselors' referrals, and calls to the Mayor's Action Center are related to these problems. Many FEMA repetitive losses are also related to local problems. These projects can be simple inlets and storm sewers. On a larger scale, we construct large storm sewers; concrete and grass-lined channels; single purpose regional detention basins; and complex, large-scale, multipurpose detention basins.

Mingo Creek

The most complex project underway is the joint City of Tulsa/Corps of Engineers Mingo Creek Local Flood Protection Project. This project is currently estimated to cost $143 million and consists of 23 regional detention sites and about 9 miles of channelization. The project was authorized as a federal project in 1986 and will be completed around 1996, taking 10 years to design and construct. The cost sharing will be about $80 million federal and $63 million local. It will solve most of the major flood problems in the 61-square-mile Mingo Creek watershed, which drains roughly the eastern one-third of the city and represented about two-thirds of the damages in the 1984 flood.

Nonstructural Measures

Tulsa has become more serious about considering nonstructural solutions to many problems. The basin drainage plans evaluated nonstructural solutions to some extent but probably do not consider special circumstances such as mitigation after a flood event. The city undertook such a mitigation effort after the 1984 flood in an effort to break the rebuild-and-reflood cycle. A series of moratoria was adopted to prevent rebuilding of some of the worst flooded structures until a plan could be developed. An acquisition program was developed using FEMA Section 1362 funds, which the city matched on a 50% basis, flood insurance payments, and other local and post-disaster funds. About 300 single-family residents and a mobile home park with 228 pads were acquired. Other acquisition to date has brought the total number of structures acquired close to 1,000. In the last bond issue, the city funded a pilot floodproofing/acquisition program that is still being developed. One report has been prepared developing criteria for prioritizing future acquisition. The goal of the pilot program is to incorporate nonstructural mitigation, before and after a flood event, as a strategy with equal importance to structural projects. A good comprehensive program should give full consideration to all strategies that can help solve the problems.

Partnership Planning

Citizen Participation

The most basic level of partnership planning begins with citizen involvement. Throughout the basin drainage planning process of the last 10 years, and even in project design, the city held hundreds of public meetings and workshops. These meetings can be frustrating to engineers and other staff; the meetings are often emotional, and people can appear irrational to our frame of reference. However, public support is essential; and ideas developed at many of these meetings resulted in significant changes in plans and projects. Often, in

retrospect, the changes resulted in significant improvements. One result of this partnership has been voter approval of every stormwater funding issue since 1980.

City Departments and Other Agencies

At another level, departments and agencies such as the Park and Recreation Department, Public Works Maintenance Division, the Tulsa Public School System, the Oklahoma Department of Transportation, and the Oklahoma Turnpike Authority, have been important partners on many projects. Often in fully developed, older parts of the city, the only vacant land available is park or school land. We have completed several successful projects on each. The Park Department was initially concerned that Public Works would show proper sensitivity to its concerns. After one or two major successful projects, confidence in the partnership concept was well established. The partnership with the school system has been more businesslike, with some difficult negotiations related to value of school property needed for detention projects. Even with the tough negotiations, there has been a good partnering relationship with benefits to both sides.

Corps of Engineers

One of the city's most successful and long-standing partnerships has been with the Corps of Engineers. A legal document, the Local Cooperation Agreement, was signed in 1988 after the Mingo Creek project was authorized, defining responsibilities of the two parties; and a memorandum of understanding spelled out procedures in more detail. In addition to the formal aspects of the partnership, the City of Tulsa and the Corps have developed an excellent informal, day-to-day working relationship. The fact that the Tulsa District is located in the same city undoubtedly enhances the partnership. The Corps is one of the city's most valuable partners in solving Tulsa's flood problems.

Characteristics of Partnerships

A true partnership involves tradeoffs and benefits to all parties. The partnership reaches maturity when all parties truly adopt ownership, and it becomes "our project" rather than "we'll do you a favor to help your project." When adjoining residents start questioning city maintenance crews about what they are doing to "their (the residents') project," that is a sign of ownership. When the Park Department approaches Public Works about expediting joint projects so park facilities can be developed at these sites, that also is ownership. As another example, the Corps "adopted" one of the Mingo Creek sites adjacent to their new office building and dedicated it as a memorial to Larry Redford, a

long-time, highly respected Corps' employee who was their project manager on Mingo Creek when he died suddenly in 1993.

Multi-Objective Management

Floodplain Resources

The value of floodplains as resources has been widely extolled in the environmental community. Floodplains provide wildlife habitat, flood control, water quality, and numerous other functions. In urban areas, they often provide less "natural" but equally important functions such as active recreation (soccer, softball), passive recreation (walking, biking), open space for psychological refreshment, and park development. In urban areas, open space is usually at a premium, and floodplains often constitute a major source of open space. Any stormwater project has to be evaluated as an opportunity to enhance, or degrade, these valuable resources. Natural floodplains and engineered detention storage sites are generally used less than 1% of the time for actually storing floodwaters. To be so extravagant as to allow any valuable resource to lie idle and unused 99% of the time simply does not make sense. The demand to use these sites will develop, so it is only prudent to plan for this usage from the beginning.

McClure Park Detention

McClure Park was one of the city's earliest, high-visibility, multipurpose projects. In an older, existing park, a plan was developed that first carefully evaluated the facilities and resources of the site. Existing facilities (including the swimming pool and recreation center and stands of mature trees) were excluded from any construction. Other facilities including tennis courts, a parking lot, and a baseball field were in a deteriorated condition; so they were removed and those areas, along with some open space, were lowered by excavation to provide storage. New, improved facilities were constructed, along with numerous maintenance/walking trails. Extensive landscaping more than mitigated the loss of a relatively few trees that were removed during construction. The result was a much improved park facility, in addition to a stormwater detention basin.

Turner Park-Rogers High School Detention

Another example of multipurpose development is the Turner Park-Rogers High School Detention Basin. Part of the facility is on Turner Park, where storage is provided by a berm at the downstream end that enhances existing floodplain storage in the park. This avoided any significant construction in the main part of the park, which had numerous trees, tennis courts,

playground equipment, and a recreation center (which is above flood stage). The portion on school property required removal of an older running track and baseball field and extensive excavation. Using money paid by the city to the school for purchase of an easement, the school built a much-improved new running track in the bottom of the excavated area and a new baseball field on another part of the school property. The entire project is heavily used by the school's athletes and park users.

Putting It All Together—Mingo Creek

The Mingo Creek Project provided the greatest opportunity to impact a large region of the city—positively, if done right, negatively, if done wrong. The heart of the project is about a 2.5-mile stretch that contains several of the largest detention facilities. Initial designs were of functional but single-purpose flood control facilities. Realizing the opportunity, the city formed a team of engineers, planners, and landscape architects to develop concepts that would preserve its functions but also create community amenities. These concepts included such things as curvilinear designs and varying side slopes for a more natural appearance; extensive landscaping; combination maintenance/walking trails; permanent ponds; some open spaces sized for active recreation like soccer and softball; and good access with parking lots. These concepts are being incorporated to some degree in all of the detention sites, with great success and positive community acceptance.

The Mingo Creek Project is a textbook example of all the elements discussed above: comprehensive planning; extensive partnerships at all levels, including public involvement; nonstructural approaches; and multipurpose use as a basic element in every individual project. One acknowledgement of the success of this approach occurred earlier this year when the City of Tulsa and the Corps of Engineers received recognition from the National Society of Professional Engineers for a portion of Mingo Creek as one of the top 10 outstanding engineering projects in the nation.

Conclusion

The City of Tulsa has developed a comprehensive program of stormwater planning and capital improvements as a part of its overall stormwater management. The capital improvement program has been successful because it includes, in addition to technical engineering expertise, the elements of comprehensive planning; partnership planning at all levels, beginning with citizen involvement; nonstructural approaches; and multi-objective management. The success is reflected by the ongoing funding support of Tulsa residents and the acceptance of the multipurpose projects as assets to the community.

FINDING LOCAL VISION, LEADERSHIP, AND POLITICAL COURAGE

Kathryn B. Hinkle
City of Tulsa Stormwater Drainage Advisory Board

Introduction: Recipe for Stormwater Success

This paper describes the City of Tulsa's quest to find the kind of vision, leadership, and political courage necessary to make a local floodplain and stormwater management program work.

Through trial and error, Tulsa has concocted a recipe for stormwater success that includes several essential ingredients that are hard to quantify. They cannot be bottled or bought. But without them, Tulsa would still have no floodplain or stormwater program.

Taken together, they have strengthened and broadened our community base. They have helped sustain our program through its turbulent early years. Today, our program is largely accepted. It is a recipe that has worked for Tulsa, and I believe it can work elsewhere.

Key Ingredients

Tulsa has learned that planning and programs go better, in the long term, with generous shares of involvement by a broad cross-section of interested citizen and community groups. Some of the key ingredients are described below.

Grassroots Citizens

At the grassroots level, many individuals, such as many first-time flood victims, may not be involved in government at all. Yet these are the citizens closest to the problems. They will tell you—and I agree—"Nobody knows my neighborhood better than I do."

They are essential as problem-identifiers. And they may also offer possible solutions. Ultimately, these are the people who must approve funding and political leaders at the polls, so grassroots support is critical.

Citizen Leaders

Grassroots people who have risen to positions of some influence could be called citizen leaders. These are the citizens who are members of neighborhood associations, city committees, boards, planning districts, special-

interest groups, and the like. They also may have considerable knowledge about the government process.

An excellent Tulsa example is Tulsa's City Councilor Robert Nelson. He was a flood victim, then a flood protestor, then chair of a homeowners' association, then a member of the stormwater advisory board, and now a member of the City Council.

Citizen leaders may be willing to spend a great deal of volunteer time becoming educated about specific issues. They can be helpful in identifying both problems and options for solutions. Some may well become community-opinion shapers.

Business Leaders

This category includes individual businessmen and women, corporations, and Chambers of Commerce. Keep in mind that they may be critical of regulations and additional taxes or fees, and that is often an understatement.

Business leaders can often lend invaluable fiscal or technical expertise. And they certainly can help shape community opinion.

Technical Staff

The backbone of any stormwater program is the technical staff. At a minimum, they are the implementers, the people who must toil day in and day out to make things work.

If you are as fortunate as we are in Tulsa, they can also bring vision, creativity, energy, and sound judgment to the task. In Tulsa, the list of staff talent is too long to cite. Some you have already met at this conference, including Charles Hardt, Michael Buchert, Dale Reynolds, and Carol Williams. These are the kinds of people who have brought the program together and who make it work.

Political Leaders

Politicians are often held in low regard in this country, but the political art of public policy is a noble calling. Tulsa is fortunate to have been blessed with a long line of able politicians who have functioned not only as consensus shapers but also as leaders. They are the lightning rods for community opinion.

In the beginning, Tulsa's political leaders had to be able to withstand a lot of flak over this program and they were willing to do what they considered the right thing, regardless of political cost. They have not just followed public opinion. They have mustered the political courage and vision to lead this community, in the best sense of those words.

We have many examples, such as Susan Savage, current mayor, and J. D. Metcalfe, who was the city's elected Street Commissioner from 1984 to

1990, during the formative years of our program. Commissioner Metcalfe could well be called the father of Tulsa's floodplain and stormwater program.

Without such political courage and leadership, Tulsa would still be flooding every year.

Outside Help

This category includes national experts, such as your group, the Association of State Floodplain Managers. We have also received stalwart help from state and federal agencies such as the Oklahoma Water Resources Board and Department of Civil Emergency Management, the Federal Emergency Management Agency (FEMA), and the U.S. Army Corps of Engineers. We have also received generous help over many years from private consultants, such as Tulsa's Ron Flanagan and others.

They have been essential to the success of our program. Especially in the beginning, we had to pull in expertise from around the country, until we could develop our own. Many national leaders, such as Gilbert White, have generously shared their expertise, ideas, and resources.

We are fortunate to enjoy particularly effective partnerships now with FEMA and the Corps of Engineers.

Critics

It is imperative in developing a workable process to include your critics. It is hard to love your critics, sometimes even hard to listen to them.

But critics can be agents for change, and you are smart to listen to them carefully, and try to evaluate their ideas objectively. Some of your most valuable critics may be community idealists and visionaries, those rare individuals whose talents need to be nurtured and protected. Remember, a former critic can become your biggest supporter.

News Media

In Tulsa, the news media have been through repeated disasters, and they are remarkably sophisticated about the issues. That does not mean they have always been supportive, but they are an essential element—and often the most critical one—in our chain of communication with the public.

Whatever you do, do not underestimate the value of having an informed and involved news media.

Combining the Ingredients

Now, how do you put it all together? Tulsa's program has combined planners, engineers, lawyers and other staff; elected officials; city board

volunteers and former adversaries turned into supporters. In many respects, Tulsa has just been remarkably lucky in the quality of its leaders and their vision, integrity, and courage. And the public really has been involved. From the beginning, we believed in public participation in this program. You cannot just talk the game, you have got to believe it. We have held literally hundreds of public meetings, at diverse locations such as picnics, creek banks, and detention basins.

When possible, we go out to the citizens. We do not want to make them always come to us. We have held meetings before, during, and after the planning process and at critical policy points and we are still doing so.

One of the things we have learned on the Stormwater Drainage Advisory Board is to include both developers and citizens who are experiencing flooding problems first hand, so we can keep in touch with the broad spectrum of opinions.

We have also learned that just one person can really make a difference, even in a community this size. And one *program* can make a difference. Our stormwater program has been a catalyst for progress in other areas.

For example, in 1924 Tulsa leaders developed the city's first plan, which envisioned a system of recreational trails along creeks, such as Mingo Creek. The 1924 plan urged Tulsa to become the "Park Paradise of the Southwest" by preserving "hundreds upon hundreds of almost-undiscovered, picturesque acres at her very doors, unchanged since first trod by the Osage and the Pawnee braves."

Years later, stormwater leaders rediscovered that plan, and now we are implementing some crucial parts of it: building maintenance trails along drainageways that are also used as recreational trails. They are popular with joggers, hikers, bicyclists, horse riders. The Tulsa Trails are slowly but systematically being built, networking throughout this community on a backbone of creeks and rivers.

Dedicated stormwater funding is the base that has given the program a chance to prove itself. It is allowing us to help provide school sports complexes, better park facilities, seed money for soccer fields, and a wide range of enhancements—all on the foundation of flood and stormwater projects.

Conclusion

Once you have such a program, your floodplains and stormwater can become resources, and people will congregate there just as they do at our River Parks along the Arkansas River floodplain.

As it turns out, the Tulsa philosophy on community service and leadership was set out well in that 1924 Tulsa Plan I mentioned earlier:

> Your city—its growth, enterprise, cleanliness, beauty, and prosperity—is your responsibility. Are you working at it?
>
> A city, like a tree, grows as it is trained, straight or crooked. If selfishness dominates it, it will not thrive, and no one will love it. If generous men and women with vision are its cultivators, it will grow and flourish, and the stranger at its gates will enter and ask for a chance to work for it.

That is the spirit, the essential ingredient, and the key to vision, leadership, and political courage necessary to make a floodplain and stormwater program work.