As infrastructure systems age, water demands grow, and supply becomes less certain, water managers are tasked with ever-mounting challenges to maintain a reliable source of drinking water for their customers. Whether because of climate change, changing demographics, or upstream activities, individual water providers may have limited resources for adapting, but a move toward regional collaboration can help alleviate individual pressures and allow multiple entities to leverage resources toward shared goals. This article explores several aspects of water system collaborations in the United States, including their formation, governance, decision-making, and implementation in order to better understand how regional collaborations can be successful.

BACKGROUND AND SIGNIFICANCE
There are many benefits to regional cooperation when utilities face common challenges or the shared risk of a significant event such as drought or source contamination that could affect multiple systems using the same water resources.
Many successful partnerships between water agencies have come together around similar goals to develop agreements to share the benefits, costs, and risks of water infrastructure investment. As water managers across the United States strive to create more resilient water systems, regional collaborative agreements may be an appealing, nonregulatory solution to many utilities’ water woes.

For example, the Potomac River watershed extends across five states and supplies over five million people in the District of Columbia, Virginia, and Maryland with potable water. Figure 1 shows the Chesapeake Bay watershed, which supplies water to this region, and within that area, the smaller Potomac River watershed, which is the primary focus for these utilities. The normal river supply sustains withdrawals that satisfy the majority of the region’s water needs, supplemented by several reservoirs in neighboring basins.

The major suppliers in the metropolitan area of Washington, D.C., have operated the water supply system cooperatively for the last 35 years. Cooperative investment in upstream raw water storage projects has protected the water supply since the early 1980s.

Recent studies facilitated by the Interstate Commission on the Potomac River Basin (Washington Metropolitan Area Water Supply Alternatives, published in 2017) and the Metropolitan Washington Council of Governments (the National Capital Region Water Supply and Distribution System Resilience Study, published in 2016) indicate that with future climate change effects, the current system could have difficulty meeting the region’s demands during drought periods as early as 2040. In addition, the potential for a disruptive event due to source impairment has increased with development activity in the large watershed upstream of the water supply intakes. With these risks in mind, options for potential pathways to improve water supply resiliency are constantly considered by utility stakeholders along the river. These options have the potential to bear both high costs and high benefits for multiple regional stakeholders that share the goals of increased water security and resiliency.

To investigate how other partners have approached similar resilience and resource sustainability goals, examples of regional collaboration from across the United States were reviewed to generate a range of approaches that offer potential models of other utilities. In examining the decision-making and governance processes that support these agreements, it was found that they ideally allow for multiple agencies to manage their collective assets cooperatively to make efficient investments in improvements and to maximize public benefits.

The methods for this analysis included an in-depth review of governance documents and interviews with water managers and stakeholders of these collaborative groups. These interviews provide insight on key elements to successes, lessons learned, and compromises made along the way. Looking forward,
these case studies may be used to compare, contrast, and develop other tools and approaches that might be adapted to a basin like the Potomac River and other stressed waterways across the nation.

RESEARCH METHODOLOGY

Potential case studies were generated from a literature review of examples of water sharing agreements and regional coordination efforts, and the leads from projects that fit the study’s criteria were contacted for interviews. Guided by a general list of questions, as well as questions specific to that case study, interviews typically lasted 30 to 45 minutes, and in some cases follow-up interviews were conducted. In total, 12 regional collaborative groups were interviewed for details on their driving factors for collaboration, governance agreements, and cost-share allocation mechanisms. The regional collaborative spanned 18 states that were dispersed across the country, as shown in Figure 2.

TYPES OF COLLABORATIVE EFFORTS

The case studies selected displayed a diverse range of participating water agencies—with service populations ranging from 300 to over 2.7 million customers. The investment values of the collaborative efforts ranged from $90,000 to $980 million. From the diverse range of case studies selected, two distinct types of collaborative efforts emerged, based on their desired outcomes: (1) planning and management partnerships and (2) collaborative projects.

Planning and management partnerships integrate the expertise and concerns of all participating members into a comprehensive approach for regional water management. Some partnerships are delineated by natural boundaries, such as a watershed, and some by county or political boundaries. Common projects pursued by planning and management partnerships include water quality monitoring programs and baseline studies on regional demand and source water quality protection.

Collaborative water quality monitoring programs that operate on a watershed basis can identify and address water quality issues more effectively than individual or localized efforts. Baseline studies allow water managers within the partnership to better understand and make well-informed decisions for the improvement of the entire region. Studies can also quantify regional needs and bring managers together to collaboratively address those needs.

Collaborative projects center on opportunities to begin a new or join an existing project that provides benefits to its partners by leveraging an expanded range of resources. These projects include drinking water treatment facilities and transmission pipes, regional wastewater treatment facilities, and raw water storage infrastructure projects. Agencies that participate in these projects can often reduce their individual costs by forgoing duplicative efforts, leveraging each other’s existing assets, and sharing best management practices. Larger regional projects can also garner greater external funding opportunities such as state or federal grants and loans.

Of the case studies featured in this project, half were planning and management partnerships and half were collaborative projects. The planning and management partnerships varied in jurisdiction, spanning areas from a single county to entire river basins. The collaborative projects contained collective service populations ranging from 40,000 to 6 million people. Table 1 provides an overview of the characteristics of the various planning and management partnerships, demonstrating the wide range of sizes, investment values, and other characteristics. Table 2 shows this information for the collaborative project case studies.

CASE STUDIES

Ohio River Valley Water Sanitation Commission (ORSANCO). In the 1930s, a grassroots movement began to improve the Ohio River because it was visually unappealing and foul-smelling. ORSANCO was formed in 1948 and comprises eight member states within the Ohio River basin—Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, Virginia, and West Virginia—and representatives from the federal government. Together, the members work to improve water quality by reducing...
visible discharge and solids, ensuring that the river can be used for drinking, industry, recreation, and to support a healthy and diverse aquatic community. ORSANCO operates programs to monitor pollutants and toxins that may interfere with these specific uses of the river.

The governing board has three representatives from each of the eight states and three from the federal government, for a total of 27 commissioners. An extensive committee structure includes volunteers in industry, utilities, and other interest groups. This structure represents all uses of water to the commission and provides nuance for issues the river basin may face. Commissioners or committees can bring topics forward to be voted on, with each commissioner having equal weight in the voting process.

Funding for these water quality monitoring and improvement programs comes primarily from states and the federal government. About half of the funding comes from the federal government in the form of grants, while the states’ individual shares are determined by the proportion of each state’s population within the watershed. Because the Ohio River runs along a much longer border with Kentucky, Kentucky has a higher population living within the watershed than New York; thus, it pays a proportionally larger share of the costs. The group incurs relatively stable costs from year to year, with the potential to vary more dramatically in the future, depending on availability of future federal funds.

Because of this collaboration, water quality of the Ohio River has

<table>
<thead>
<tr>
<th>TABLE 1 General demographic information of successful planning and management partnerships</th>
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<tr>
<td><strong>Organization/Project Name</strong></td>
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<tr>
<td>Ohio River Valley Water Sanitation Commission</td>
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<td>Delaware River Basin Commission</td>
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<td>Catawba-Wateree Water Management Group</td>
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<td>Yadkin-Pee Dee Water Management Group</td>
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<tr>
<td>Mid-Rio Grande Stormwater MS4 Compliance Monitoring Cooperative</td>
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<tr>
<td>Municipal Water District of Orange County</td>
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FY—fiscal year, MS4—municipal separate storm sewer system

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<tr>
<th>TABLE 2 General demographic information of successful collaborative projects</th>
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<tr>
<td><strong>Organization/Project Name</strong></td>
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<tr>
<td>Logan-Todd Regional Water Commission</td>
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<td>Alliance Water</td>
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<td>Long Creek Regional Wastewater Treatment Plant</td>
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<tr>
<td>Ship Canal Water Quality Project</td>
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<tr>
<td>Water Infrastructure and Supply Efficiency Partnership</td>
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<tr>
<td>Los Vaqueros Reservoir Expansion Project</td>
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NA—not applicable
drastically improved. There has been tremendous progress in fine-tuning the river’s water quality goals, and the results have led to increased development on the river front. Over the course of the partnership, the Ohio River has transformed from an undesirable blight to a sustainable resource through successful regional planning and management.

**Delaware River Basin Commission (DRBC).** In 1961, President John F. Kennedy and the governors of the four states within the Delaware River Basin—Delaware, New Jersey, New York, and Pennsylvania—created the DRBC. It joined the states and federal government as equal partners, regardless of political boundaries, to plan, develop, conserve, regulate, allocate, and manage water resources within the basin. DRBC’s main programs are flow and drought management, water quality monitoring, project review (permitting), water supply and conservation, and flood loss reduction. Based on a common pool concept, improvements in management of the basin result in overall benefits for the entire region. The creation of the commission changed the Delaware Valley from an area of conflict to a model of federal and state cooperation.

The governing board has equal representation in that there is one member from each of the four states and one from the federal government. The ex officio members are the governors of the four member states and division engineer of the North Atlantic Division of the US Army Corps of Engineers.

In 1988, the commission members agreed to apportion their contributions on the basis of population, land area, and water use within the watershed. The agreement puts the allocations at the following percentages: Pennsylvania (25%), New Jersey (25%), federal government (20%), New York (17.5%), and Delaware (12.5%). In addition to state funding, the DRBC is supported by its project review fees, water use charges, compliance revenues, and grants. Water use/withdrawal charges are associated with the location and vary depending on the salinity of the water received.

**Catawba-Wateree Water Management Group (CWWMG).** The CWWMG was incorporated in 2007 as a 501(c) (3) nonprofit group and a planning and management partnership for the Catawba-Wateree River basin (www. catawbawatereewmg.org/our-work). Its mission is to identify, fund, and manage projects that will enhance the capabilities of the river basin while maintaining its ecological integrity. The partnership includes 18 public water agencies in the basin and Duke Energy, and was the product of the 3½-year stakeholder-involved process around the Federal Energy Regulatory Commission’s relicensing of the Catawba-Wateree Hydroelectric Project.

The CWWMG is governed under equal representation, in which every member is entitled to one vote. This was designed to allow room for earnest collaboration without concern that larger agencies may be guiding the overall direction of the group. Projects are selected by the group and pursued on a timeline that is jointly developed. This process operates similarly to a five-year capital improvement program for a municipality.

The CWWMG operates on a $550,000 annual budget in voluntary dues collected from its members in the basin. Member dues are proportional to the volume of withdrawals from the system, with a 20% surcharge on volume transfers outside of the basin. This is intended to discourage transfers outside of the basin without discouraging wastewater reuse. Dues will be recalculated using this formula every five years to adjust to demand or population changes. Though there is currently no infrastructure component, it may be a future possibility. The budget has been constant since inception but may be revisited on the basis of assessed needs.

**Yadkin-Pee Dee Water Management Group (YPDWMG).** The YPDWMG formed in 2016 and was modeled after the CWWMG. As neighboring watersheds, the two water management groups even share a few member agencies. The YPDWMG jointly manages the Yadkin-Pee Dee River Basin and is made up of 16 water providers and governments within the watershed, along with Cube Hydro and Duke Energy reservoir operators. The larger utilities took leadership of this effort and later opened it up to smaller utilities to participate. The projects funded by this effort have produced studies that summarize regional demand and future projections in the watershed. Understanding holistic demand projections has allowed the region to produce more strategic resource planning.

Each agency is equally represented on the governing board, with one vote per agency. Most decisions have been unanimous, and the group has been deliberate in making sure all agencies are comfortable with direction.

The collaborative projects are funded with annual voluntary dues, collected at an equal rate of $5,000 for most agencies, with an exception of $2,500 in dues for one smaller agency. As projects grow, there may be a voluntary rate increase.

An additional resource that came from this partnership was the formation of regular roundtable conversations. This created a forum for enhanced communication among the watershed managers where ideas, programs, and technology could be readily shared for better overall management.

**Middle Rio Grande Stormwater MS4 Compliance Monitoring Cooperative (CMC).** In 2013, water agencies on the Middle Rio Grande formed a Compliance Monitoring Cooperative around a watershed-based MS4 (municipal separate storm sewer system) stormwater permit. Historically, there were four agencies in the region with separate Phase 2 permits, but when the permits for these small MS4s expired, the US Environmental Protection Agency (USEPA) decided to roll the agencies into a single
watershed-based permit. As a cooperative, the CMC was given additional lead time to structure and implement its monitoring program.

A key benefit of the restructuring of the permit was that sampling for the entire watershed could be done together and directly on the Rio Grande rather than on the Arroyo tributaries. Tributaries were harder to get to, harder to time for sampling events, and more expensive to monitor than the main stem of the Rio Grande. As a cooperative effort, the agencies have reached more people in their communities with their educational campaigns, with less intensive staff travel than if they were to have gone it alone.

Flood control agencies act as the fiscal authority by accepting some of the dues to run the compliance monitoring required by the permit. Proportional dues were calculated with a formula that took population and area served into account.

A main driver for this program’s success is that the USEPA permit allowed for collaboration, with a timeline for the agencies to follow. The structured process made it easy and gave incentive to work together. Agencies were able to save hundreds of hours of staff time, dozens of reports, and hundreds of thousands of dollars with this partnership effort.

Municipal Water District of Orange County (MWDOC). In 2014 and 2015, California passed water loss control legislation that spurred a regional effort in Orange County, Calif. Led by staff from the MWDOC, the county’s 28 retailers and three municipalities developed a two-part water loss control program.

The first part of the program offers contractual access to a technical assistance program to meet compliance standards set by water loss control legislation. The technical assistance services are selected by the participating members on an a la carte or subscription-service basis. Each member agency is part of a master agreement with MWDOC and pays associated costs based on its level of technical assistance/service.

The second part of the regional effort developed a Water Loss Control Workgroup that functions as a forum for regular roundtable conversations and an informal steering group for the region’s efforts. This forum allows water managers from throughout the county to discuss regional needs and form plans to address them if there is sufficient interest. The group is in the process of developing a regional water loss control hub to offer water audit validation, leak detection, customer meter testing, system flushing, and pressure logging services to all Orange County agencies. By consolidating resources, Orange County agencies will continue to reduce duplicative efforts and increase overall management and water efficiency.

Logan-Todd Regional Water Commission (LTRWC). The LTRWC is a consortium of 12 water agencies and serves 40,000 customers in Kentucky and Tennessee. The commission was formed in 1995 to study alternatives to develop additional water supply for the region. As a result of drought, supplies were not as reliable, and there was not enough supply to attract new industry. Though the members of the commission had initial reservations—a contentious relationship rooted in historic rivalries, fear of loss of control, and a sense of unfairness—they were brought together by a shared need and support from regulatory partners and their communities.

Management of the commission was determined by existing Kentucky statutes. The 12-member governing board uses equal representation, with each member system having one representative and one vote.

Funding for the $77.5 million system came from a mix of state and federal grants and loans and from issuing bonds. A key facet of this project’s success is that all agencies pay the same wholesale rate for their water, regardless of location in relation to the treatment facility. The equal rate has maintained a sense of fairness within their partnership and has allowed the commission to put an average of $500,000 into reserves each year. Following completion of the water system in 2003, there has been a great public health improvement through increased access to consistent service of a high-quality drinking water system.

Alliance Water. Alliance Water in Central Texas, formerly known as the Hays Caldwell Public Utility Agency, comprises the cities of San Marcos, Kyle, Buda, and the Canyon Regional Water Authority, which represents four additional water supply agencies. Alliance Water was formed in 2007 and was motivated by the region’s water managers wanting to know more about securing their water future. Rather than govern through a series of local agreements, it decided to form an independent board to develop water projects that treat and distribute higher-quality water to its customers. This allowed Alliance Water to gain more stewardship of its supply and provided independence to share water and facilities with outside entities. The new, unified system is collectively owned by Alliance Water and proportionally owned by the members. There are no individual branches of the transmission system or sections owned by individual agencies, which ensures quality control and maintenance for the entire system.

Conversations to collaborate were initiated by a few members and grew to include all of the regional partners. During these initial talks, there was a mutual desire to maintain a group effort and a reluctance to have a single agency lead the direction of the collaboration.

Alliance Water is governed by a board of directors, with weighted representation determined by each agency’s proportion of the region’s 50-year demand by volume. The 50-year demand is determined by growth projections of the members and determines the number of representatives on the board as well as the cost-share.
allocation for each agency. Being the smallest member, the City of Buda has one seat on the 13-member board, while the largest member, the City of San Marcos, has five members on the board. Most decisions are first screened by a technical committee, with final decisions passed by majority or super majority, though most come to a unanimous vote.

The annual budget is approved by the board, split by the same 50-year demand proportion previously mentioned, and distributed in a separate series of debt to each party, where repayment can be handled on an individual basis.

**Ship Canal Water Quality Project.** In 2013, Seattle Public Utilities (SPU) and King County were separately exploring solutions to comply with their individual federal combined sewer overflow (CSO) consent decrees. The separately planned projects along Lake Washington’s Ship Canal were proving difficult to implement given the high degree of urban density in the area and high potential for adverse community impacts from multiple independent storage facilities and increased construction traffic (information about Ship Canal water quality can be found at [www.seattle.gov](http://www.seattle.gov)). The terms of their consent decrees also required both agencies to work together toward CSO control solutions. For these reasons, SPU and King County decided to explore the feasibility of a joint project in 2016.

By pursuing the joint Ship Canal Water Quality Project, they would be able to optimize operations by forgoing duplicative efforts, operate more as a single system, and reduce overall project costs valued at $570 million.

Terms of the collaborative project were formalized in the 2016 Joint Project Agreement between SPU and King County. SPU is the lead agency in this effort, although there has been a cultural shift in project management that follows the “One Team” principle. This shift seeks to improve project delivery handoffs between stages of project development and bridge gaps in stages of project implementation by increasing staff involvement and responsibility. The One Team principle includes staff members from both agencies, with a goal to push most decision-making down to the staff level, only coming up the chain if there is a disagreement or major budgetary implication. This method can add a little more time to project schedules but results in a higher-quality project.

The cost allocation between the two agencies was determined by the proportion of avoided cost based on the amount each utility would have spent independently to meet their minimum control volume needs. This calculation came out to a cost share, with SPU paying 65% of the cost and King County paying 35% of the costs. The volume capacity apportioned to each agency is 60% capacity for SPU and 40% capacity for King County.

The Joint Project Agreement is set up to contain sufficient protections for each agency. Once constructed and operating, metered data will

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**Collaboration Partners**

These organizations served as case studies in research on collaborative projects in the water industry. The URLs link to information discussed in this article.

- **Alliance Water**—[http://alliancewater.org/what-we-do/](http://alliancewater.org/what-we-do/)
- **CCWD (Contra Costa Water District)**—[www.ccwater.com/706/Los-Vaqueros-Studies](http://www.ccwater.com/706/Los-Vaqueros-Studies)
- **CWWMG (Catawba-Wateree Water Management Group)**—[www.catawbawatereewmg.org/our-work](http://www.catawbawatereewmg.org/our-work)
- **Denver Water/WISE (Water, Infrastructure, and Supply Efficiency)**—[www.denverwater.org/your-water/water-supply-and-planning/wise](http://www.denverwater.org/your-water/water-supply-and-planning/wise)
- **DRBC (Delaware River Basin Commission)**—[www.state.nj.us/drbc/about/faq/](http://www.state.nj.us/drbc/about/faq/)
- **LCRWTP (Long Creek Regional Wastewater Treatment Plant)**—[http://charlottenc.gov/Projects/Pages/LongCreekWWTP.aspx](http://charlottenc.gov/Projects/Pages/LongCreekWWTP.aspx)
- **LTRWC (Logan-Todd Regional Water Commission)**—[www.epa.gov/sites/production/files/2017-05/documents/communicating_to_gain_and Maintain_buy_in_updated_2017slides_0.pdf](http://www.epa.gov/sites/production/files/2017-05/documents/communicating_to_gain_and Maintain_buy_in_updated_2017slides_0.pdf)
- **MWDOC (Municipal Water District of Orange County)**—[www.mwdoc.com/save-water/resources/technical-resources/research-activities/](http://www.mwdoc.com/save-water/resources/technical-resources/research-activities/)
- **ORSANCO (Ohio River Valley Water Sanitation Commission)**—[www.orsanco.org/about-us/](http://www.orsanco.org/about-us/)
- **YPDWMG (Yadkin-Pee Dee Water Management Group)**—[www.ypdwater.org/](http://www.ypdwater.org/)
provide an opportunity to re-evaluate the true costs and benefits each agency has received. If the required volume capacity usage varies from the intended allocation, either agency can be reimbursed if it initially overpaid for its share. This aspect of data transparency has built trust and maintained a sense of fairness throughout the project.

**Long Creek Regional Wastewater Treatment Plant (LCRWTP).** Talks of a regional plant between Charlotte Water, Mount Holly, and Belmont in North Carolina began in the 1980s on the basis of the favorable geography of the area. When nutrient total maximum daily loads were implemented in the early 2000s, this conversation reopened as Belmont and Mount Holly had nutrient allocations that Charlotte Water could benefit from, and the two smaller towns could benefit from Charlotte Water’s nutrient removal capability. Because of increased customer demand, Charlotte Water was also looking to expand the capacity in its wastewater system, but digging up and upsizing existing pipes would be expensive.

Building a new treatment plant could address all three agencies’ treatment issues and allow Charlotte Water to avoid costly upsizing of its current system. The collective benefits of collaboration were so great in 2011 and 2013 that the cities drew up and approved memorandums of understanding and are currently working on executing interlocal agreements to work toward a regional plant, the Long Creek Regional Wastewater Treatment Plant. The LCRWTP is initially planned to treat 15 mgd, with expansion possibilities to provide cost-efficient wastewater treatment for all three agencies.

The Cities of Mount Holly and Belmont will pay some capital for Charlotte Water to build conveyance into Charlotte Water’s system. After construction, Charlotte Water will maintain ownership and responsibility for upkeep of the conveyance, while the cities pay service fees. After budget approval from the Mount Holly and Belmont city councils for funding for the conveyance portion, Charlotte Water will determine key design and implementation decisions.

**Water Infrastructure and Supply Efficiency (WISE) Project.** The WISE partnership includes Aurora Water, Denver Water, and the South Metro WISE Authority, which are a subset of water providers from the South Metro Water Supply Authority in Colorado. This collaboration centers on Aurora Water’s Prairie Waters Project (PWP), which pumps usable water through riverbank wells from the South Platte River, near Brighton, back to the Binney Water Purification Facility in Aurora. When excess water is produced, Aurora Water and Denver Water can sell that supply to the South Metro WISE Authority for direct use or to recharge their aquifer. Through the differences in their reusable water rights portfolios, Aurora Water and Denver Water can switch proportions of water generation through the PWP systems, which allows for cooperative use of the PWP system. Beginning in 2020, Denver Water will have the limited ability to use capacity in the PWP system to convey water for its system during severe drought or emergencies.

The PWP was financed through a series of bonds and state revolving fund loans; it was completed in 2010 and is operated and maintained by Aurora Water. Aurora Water holds 100% ownership of the project. By selling water (8,000–10,000 acre-ft) to South Metro WISE members and capacity in their system to Denver Water, Aurora Water receives additional revenue to stabilize rates and offset Prairie Waters’ construction and operating expenses. Denver Water is also able to generate revenue from selling water and will soon benefit from a more resilient supply for its customers. Though the purchased water is more expensive than their groundwater supplies, South Metro WISE Authority benefits from having a new sustainable surface supply that can augment groundwater supplies.

For this partnership, Denver Water pays according to a proprietary pricing model that includes operations and maintenance (O&M) and capital recovery (to recoup costs for the PWP infrastructure). The South Metro WISE Authority’s rate includes O&M, water cost, and a lower capital recovery rate, since their service is interruptible on the basis of Aurora’s needs during dry or wet seasons.

**Los Vaqueros Reservoir Expansion (LVE) Project.** The LVE Project seeks to complete the second expansion of the Los Vaqueros Reservoir, located in northern California (Los Vaqueros studies were conducted by the Contra Costa Water District [CCWD], published in 2018). The reservoir is owned and operated by CCWD, and this second expansion will increase the reservoir capacity from 160,000 to 275,000 acre-ft. There will also be construction of new interties and pump stations to integrate existing regional systems. This increase in storage capacity and system function can potentially benefit not only CCWD and its customers, but also their many neighbors, consisting of urban agencies, agricultural districts, and wildlife refuges. For these reasons, regional collaboration was a pragmatic approach for the project.

There are currently 14 local agency partners, with additional agencies on the waiting list. Many of these agencies are also members of the Bay Area Regional Reliability partnership, a separate regional effort to study the efficiency potential of these independently operated, but highly collaborative, water management agencies.

The LVE project was recently granted $459 million of a water storage bond (Prop 1) passed by California voters in 2014. Governance and funding structures for this project will be finalized in the next year as the group is currently looking to form a Joint Powers Authority to gain more financial authority and formally incorporate the voices of all potential members.

**Summary of case studies.** As introduced in the case studies and analyzed in the sections that follow, there
is great variety in the drivers for collaboration, benefits, governance, and funding mechanisms. Table 3 summarizes these characteristics for the planning and management partnership case studies. Table 4 presents this information for the collaborative projects case studies.

**DRIVING FACTORS FOR COLLABORATION**

The many benefits of regional collaborative efforts would not have been realized if one or more driving factors hadn’t spurred the conversations that followed. By exploring the motivations for regional collaborations, the context and conditions under which agencies would be more likely to work together to achieve shared goals could be better understood. After interviews were held with stakeholders and managers from the case studies, four common drivers for collaboration emerged:

- Coordinating adaptation to increased or forthcoming regulatory pressure
- Ability to address shared regional concerns or issues
- Potential for cost savings through achieving economies of scale and/or reducing duplicate work
- Increased eligibility for funding awards geared toward larger projects

Legislation and future regulation surrounding water quality standards,
stormwater permits, and water loss reduction created pressure for agencies to improve their operations. The road to compliance can be cumbersome and expensive for individual agencies, paving the way for conversations around regional collaboration. Regulatory drivers are not likely to lessen in the near future. As a result, most of the collaborative efforts surrounding regulation are relationships intended to persist for long periods of time or into perpetuity.

Agencies faced with shared regional concerns—such as limited supply from drought, increased demand from industry, or risk of contamination—have strong motivation to find innovative solutions quickly. Pooling resources with similarly motivated neighbors can address these issues sooner than if they were to go it alone. Leveraging regional resources like existing infrastructure or expertise can increase overall efficiency of proposed solutions.

By working together, agencies can leverage their spending power to negotiate more attractive contracts or services from contractors. Agencies can also leverage each other’s staff on the bases of skills and training. In some cases, regional collaboration allowed agencies to play off of each other’s strengths and reduce the amount of work required by individuals by delegating regional efforts rather than having every agency complete the same task individually.

Some state and federal grant and loan programs are geared toward funding larger projects, with various criteria for cost–benefit ratios, minimum populations served, or available capital that individual agencies may not meet. Regional collaborative efforts can give agencies the opportunity to explore larger joint projects that may qualify for outside funding, further reducing potential costs for individual agencies.

**TYPES OF GOVERNANCE AND DECISION-MAKING**

There were a variety of approaches to leadership and governance of the regional collaborations, including those with a lead agency, those run by a board of representatives, and those that were staff-driven. Lead agencies are those that take on the main administrative role of partnerships, facilitate group meetings, and spearhead the group’s goals. Some partnerships explicitly avoided having a lead agency in order to ensure a sense of equality among the member agencies and maintain the overall group effort. Staff-driven collaborations made it possible for decisions to be made democratically among the staff implementing various stages of the project. A summary of these governance structures is shown in Figure 3.

Lead agencies are often those with greater resources or those that already have a project online that others can benefit from joining. In these collaborations, the lead agencies may build new connections from the other agencies to their existing infrastructure, giving those agencies access to their facilities for some capital to build the conveyance and the cost of service. This partnership can open access to agencies that need the service and generate a new stream of revenue for the lead agency to recoup some of the capital costs of construction. The lead agency typically retains ownership and decision-making responsibility for their facilities and grants the right to use their facilities to partner agencies through interagency agreements or memorandums of understanding.

Because of the larger number of agencies involved, most planning and
management partnerships governed with a board of representatives, where board members represented their states, counties, and agencies in voting and decision-making. The voting weight of each member could be weighted equally or on the basis of a proportion determined by the group. Proportional weights were typically determined by proportion of population within the service area or proportion of projected demand. In partnerships with weighted representation, mechanisms to re-evaluate the proportional weight after a period had passed had sometimes been written into the bylaws or agreements. This allowed for flexible governance in case there was a large demographic shift or change in projected demand over time.

In collaborative projects with fewer agencies involved, it was possible to drive the decision-making process at the staff level, which meant a multiple iterative process of ensuring staff approval from both agencies before moving forward. Both agencies received a nd approved drafts of the project as it progressed, which can be more time- and labor-intensive but can lead to greater satisfaction with the project from the agencies involved.

FINANCIAL STRUCTURES AND COST-SHARE ALLOCATIONS

Once agencies determined the most appropriate governance structure for their collaboration, discussions materialized around how to fund their joint projects as well as the timing of financial discussions. For example, some groups needed potential costs to be addressed immediately, while others noted that financial talks were intentionally withheld until later in the process. Delaying financial discussions may have allowed some groups to coalesce around the idea that something needed to be done, while allowing the costs to be estimated later. Variance among projects depended on how far along collaborators were in defining their shared goal or mission.

The three types of financial structures observed in these case studies were based on service fees or associated costs, equal cost share allocations, and proportion-based cost share allocations. Figure 4 shows the three main categories and several subcategories of cost-allocation structures from these case studies.

Service fees and associated costs were common when there was a lead agency involved. Their partner agencies would typically pay for services as rendered, where the services included providing new water supply, leasing capacity within existing infrastructure, or managing the associated costs of jointly contracted service. New water supply was provided at an agreed-upon rate per volume. Capacity within systems included raw water conveyance and wastewater treatment or storage in constructed combined sewer overflow tunnels. Jointly contracted services allowed agencies to opt in or out of services and pay for the associated costs of the services they used.

Equal cost-share allocations were not common among regional collaborations. This is likely due to the wide range of service areas and resources attributed to different agencies. Because of the wide range of benefits and costs to each participating member, in most cases, finding a fair cost share did not imply that “fair” meant “equal,” but rather “equitable.” Equity factors into the agencies’ existing assets to assess a level of benefit that is relative to the amount contributed. One case study used an equal cost share for their jointly funded watershed studies, though they did make an accommodation of a lesser rate for one of their smaller agencies. The jointly funded watershed studies covered projected regional demand and equally benefited the entire group.

The most common cost-share allocation was proportional, with proportionality calculated differently in each collaboration, using variables such as population within the watershed, area within the watershed, withdrawal volumes, demand forecasts, and proportion of avoided cost. Watershed-based collaborations typically used some formula of population and service area within the watershed to calculate impacts on the watershed and apportioned costs based on that potential impact. Withdrawal and demand-based allocations created a direct link between benefits and costs as agencies essentially paid for what they used. The proportion of avoided costs was based on the amount individual agencies would have if they had pursued separate attempts at meeting a shared goal, and this was used to apportion their final cost share.

COMMON FACTORS IN SUCCESSFUL COLLABORATIONS

Regional collaborations are highly specific to local needs and relationships. Even so, there are common factors from the successful collaborations highlighted here that can be applied to future and existing collaborations.

Beginning the initial conversations around a potential collaboration can be the first hurdle. Opportunities for regional collaboration projects are often born from larger dialogues among diverse groups of stakeholders, many of whom have already established working relationships. A regular forum for group discussion allows agencies to coordinate future management plans on a watershed- or basin-wide scale. In some cases, these plans materialize into shared capital infrastructure plans, taken on by some but not necessarily all members at the table. Roundtable discussions make for more comprehensive water management by fostering ideas and sharing best practices.

Building relationships based on trust is another important factor in collaboration successes. In more than one interview, water managers mentioned that outside of the water space, these agencies might be competitors for talent or to attract businesses to their service areas, so
loose rivalries may be in place. However, managers could put past contentions behind them when they found they shared goals or could tackle issues together that they couldn’t accomplish entirely or as effectively on their own. Shifting from a culture of competition to coordination takes advocacy and action from leadership, but simple approaches such as rotating meeting locations and transparently sharing information help build and maintain relationships, or as a representative from the LTRWC in Kentucky described it, getting together to work through the issues with “lots of fried chicken and cornbread.”

Developing potential improvements for a region requires forethought and data, and successful collaborations often conduct baseline studies to first understand the shared water space before exploring possible collaborations. Obtaining comprehensive participation from all regional stakeholders increases the depth of understanding that can better shape planning and implementation.

From facilitating initial conversations between agencies to setting timelines and pitching in on funding, regulatory agencies have contributed to several collaborative projects. Aside from being a powerful driver for collaboration, regulation can also put in motion the mechanisms and timelines to implement regional plans. Regulatory involvement has been the driver, mechanism, and funding source for regional collaboration.

Successful regional collaborations should be adaptable as conditions will likely change over time. Key elements such as membership, demand, population, demographics, or other needs may fluctuate, so governing documents should include the means to transparently and fairly adapt to the changes of its partners. Some agreements provide mechanisms for “reopeners” or a timeline for periodic recalculations of representation and cost-sharing formulas. This adds flexibility in governance and provides protection of future interests.

SUMMARY
This work provided case studies of 12 successful examples of regional collaboration across a wide range of geographically and demographically diverse water agencies. Though approaches may differ, the need for adaptability was expressed consistently, as previously developed formulas may not be equitable following changes in the distribution of residential and commercial customers, utility service area boundaries, or water demands, leading to modifications in the agreements for the next increment of storage improvements.

The consensus from interviews conducted with utilities across the United States is that groups must anticipate individual and collective future needs if they want to create a lasting organization that ensures the satisfaction of its individual group members, and like the water supply security they hope to achieve, agreements supporting regional collaboration must also be resilient.

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