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These comments are submitted on behalf of the Pew Charitable Trusts' Flood-prepared Communities project. This Pew initiative aims to reduce the impact of flood-related disasters on communities and taxpayers by improving federal and state laws and programs that can or should serve to protect people and property from the nation's most frequent and most costly natural disaster. We greatly appreciate this opportunity to share our perspective and recommendations regarding the important work that the Texas Water Board is conducting.

The Texas Legislature has wisely focused the Water Board on two tracks: using state funding to make investments in flood projects and establishing a program of flood planning and management on a river basin or watershed basis. The Board has posed a series of questions specific to the two bills underlying these directives, SB7 "Relating to flood planning, mitigation, and infrastructure projects" and SB8 "Relating to state and regional flood planning." While Pew's comments will attempt to address several of the topics raised, we are suggesting that the choices be reframed.

We understand that the Board will be pressed to make key spending decisions quickly when a first round of applications is accepted, but we recommend that the Board start – not by trying to answer questions about specific project types to favor or to set hard-and-fast cost share rules – but by asking what principles should undergird the State's river basin planning. A carefully derived set of planning principles can then inform initial project selection and support funding decisions as well as the planning framework.

We recommend the following overarching principles be considered. These recommendations, in many instances, echo aspects of the more detailed "principles" proposed in the Board's document under Issue 6.

1. Plan and spend on a watershed basis.

First and foremost, honor the principle that the legislature has set out – approaching both flood risk planning and flood infrastructure investment from a watershed or river basin perspective. And adhere to that principle, even when it becomes challenging. While it may be easier and more familiar to approach issues of flood mitigation on a community-by-community basis, we believe that a program grounded in a broader watershed perspective will provide enhanced and enduring benefits.

A shared watershed means shared vulnerabilities, and what one community within that watershed does or fails to do can impact others, upstream or downstream, for good or for ill. Within any given watershed, multiple actors – including dozens or more local governments, numerous state and federal agencies, as well as individual landowners and businesses – make decisions that can affect flood risk. The lack of coordination, as the General Land Office points out in its report on Hurricane Harvey, can make it “impossible” for a city or county to be successful in preventing or mitigating flood damage.¹

A watershed approach to floodplain management would not seek to usurp those existing decision-making authorities but, instead, would allow for a shared understanding of risk and sensible coordination to achieve the best flood risk-reduction outcomes. Rather than leave each locality on its own to seek ways (and funds) to protect citizens from the threat of floodwaters, a watershed approach can create opportunities for teamwork that will lead to more efficient and effective use of resources overall.

To construct a framework for the State’s flood planning that will retain and reinforce the watershed perspective, we recommend the Board think about lessons learned from Texas’ own water supply planning and also look carefully at ongoing flood management work in other states.

Take Louisiana, for example, which has concluded that a watershed approach will provide the largest, longest-lasting resilience benefits. Louisiana has set up a multi-agency Council for Watershed Management focused on “empowering local jurisdictions and communities to implement regional, long-term solutions that follow watershed boundaries and can cross local political boundaries.”² For purposes of its Watershed Initiative, the State is divided into eight major regions and the Council has announced availability of regional capacity-building grants – an approach that can build support for regional solutions within smaller and under-resourced communities.³ The Council has also identified information gaps within the watersheds and is

¹ Texas General Land Office, “Hurricane Harvey: Texas at Risk,” 2018, <http://www.glo.texas.gov/recovery/files/texas-at-risk-report.pdf>.

² Louisiana Watershed Initiative, “A Long-Term Vision for Statewide Sustainability and Resilience,” August 2018, [http://gov.louisiana.gov/assets/docs/Watershed-Initiative-Vision-White-Paper-8-15-18-\(2\)-.pdf](http://gov.louisiana.gov/assets/docs/Watershed-Initiative-Vision-White-Paper-8-15-18-(2)-.pdf).

³ Louisiana Watershed Initiative, “Frequently Asked Questions: Regional Capacity Building Grant Program,” undated, <https://watershed.la.gov/assets/docs/2019-08-29-RCBG-FAQs.pdf>.

moving to develop new monitoring networks to provide needed data. In addition, the Council is looking to pilot new efforts in comprehensive hydrologic and hydraulic watershed modeling.⁴ Within Louisiana, this long-term approach to flood risk reduction is recognized as a “clear pivot from business as usual” distinct from the practice of “injecting capital into local projects in an often uncoordinated manner....”⁵

In another region that has experienced multiple catastrophic floods, the Iowa Watershed Approach (IWA) is a statewide program aimed at addressing both flood risk and water quality. This program, which boasts a diverse group of participating agencies and stakeholders, was started as part of the the Iowa Watersheds Project (IWP). With financial support from the U.S. Department of Housing and Urban Development (HUD), the IWP focused on 5 of the more than 50 eight-digit hydrologic units (HUC-8s) across the state, supporting activities of Watershed Management Authorities or WMAs⁶ within those areas. The initial success of the IWP multi-jurisdictional partnerships prompted creation of the broader and more ambitious IWA. As of June 2019, some 26 WMAs had been established across the state, and HUD is again supporting work by selected WMAs. Nine WMAs are using available funds to develop hydrological assessments and watershed plans and to implement a variety of projects that will improve water management while supporting the state’s agriculture-dependent economy.

In Washington State, Floodplains by Design is a public-private partnership with leadership from the State Department of Ecology, the Nature Conservancy, and the Puget Sound Partnership. This competitive grant program supports projects along the State’s major river corridors that provide flood management benefits, restore wildlife habitats, improve water quality, and enhance outdoor recreation. With funding guidelines⁷ and a multi-disciplinary team of experts to review and score potential projects, the program invites collaborative efforts and carefully evaluates likely outcomes. Evaluators look for projects based on a macro-scale consideration of the watershed, consistency with existing floodplain management or habitat recovery plans, floodplain ecosystem protection or restoration benefits, cost effectiveness, readiness to proceed, and other key factors.

Such approaches can serve as models and be adapted for a Texas-appropriate ranking of projects and watershed planning.

⁴ Council on Watershed Management, meeting minutes, Thursday, May 30, 2019,

<http://watershed.la.gov/assets/council-materials/2019-05-30-Council-Approved-Minutes.pdf> .

⁵ Louisiana Watershed Initiative, “A Long-Term Vision for Statewide Sustainability and Resilience,” August 2018, [http://gov.louisiana.gov/assets/docs/Watershed-Initiative-Vision-White-Paper-8-15-18-\(2\)-.pdf](http://gov.louisiana.gov/assets/docs/Watershed-Initiative-Vision-White-Paper-8-15-18-(2)-.pdf) .

⁶ Under Iowa law, a WMA established by two or more political subdivisions within a HUC-8 watershed and governed by a board of directors, is authorized to undertake a variety of flood mitigation and water quality improvement projects. See the Iowa Department of Natural Resources’ factsheet on WMAs at http://www.iowadnr.gov/Portals/idnr/uploads/water/watershed/files/publications/WMA_Handout_v2.pdf .

⁷ Washington State Department of Ecology, “Funding Guidelines: Floodplains by Design,” revised May 2018, <https://fortress.wa.gov/ecy/publications/documents/1506019.pdf> .

2. Build and share knowledge of current and future risks.

As the Water Board's own "State Flood Assessment" notes, "Sound science and data are the core elements of effective planning and flood mitigation."⁸ Pew concurs with that statement and the report's conclusion that "...effective planning is based on quality data, robust models, and sound science coupled with a vetting process that is inclusive to all interested parties...." This is particularly important in a state that is so highly vulnerable to catastrophic storms yet has "never conducted a statewide assessment of flood risks and needs."⁹

Our recommendation is to defer – temporarily – questions on preferred project types or standardized funding limits. Instead, we urge the Board to move forward with a broad, high-level review of the available information, continue consultations with experts and citizens, and uncover serious data gaps. This initial scoping effort could identify the need for more intensive work in certain smaller watersheds within the major water basins of the State but still allow progress to be made on project reviews in critical areas.

Related to this principle and the questions posed, we urge the Board not to base its planning and priorities on the Federal Flood Insurance Rate Maps or FIRMs. As the Board's report to the legislature notes, current insurance maps do not exist for large areas of the state. More importantly, even up-to-date and technically credible FIRMs do not necessarily convey the breadth of information that should be considered for planning major flood mitigation investments.

The FIRMs are not predictive tools that identify all future flood hazards. Rather, they depict – sometimes in both height and lateral extent – the general footprint of a large flood that has a specific statistical probability of occurring based on available, largely historical data. In many, if not most, instances, the FIRMs do not capture the risk of local flooding associated with undersized or poorly functioning storm drainage. In addition, only a relative few maps around the country incorporate consideration of future conditions hydrology, based on land use changes or trends in weather patterns or both.

This is not to say that the data underlying the FIRMs should be ignored. On the contrary, the information in (and absent from) the accompanying Flood Insurance Studies will help the Board gauge what it knows and what it needs to know about Texas flood hazards. However, for the Board to determine which flood mitigation projects are most urgently needed and which will provide the greatest enduring protections to Texas communities, a critical first step would be

⁸ Texas Water Development Board, "State Flood Assessment: Report to the Legislature, 86th Legislative Session," January 2019, http://www.twdb.texas.gov/publications/reports/special_legislative_reports/doc/State-Flood-Assessment-report-86th-Legislation.pdf.

⁹ Texas Water Development Board, "State Flood Assessment: Report to the Legislature, 86th Legislative Session," January 2019, http://www.twdb.texas.gov/publications/reports/special_legislative_reports/doc/State-Flood-Assessment-report-86th-Legislation.pdf.

broader-scale, regional level assessments – if not across the state, then for the river basins which have experienced the most or most damaging flood events.

Texas initiatives already underway using base level engineering (BLE) to characterize risk factors on a regional basis should be of significant help in this regard. In addition, it may prove useful to consider assessment work undertaken in other states and communities.

The State of North Carolina, for example, completed studies on three major rivers to better understand risk and inform mitigation priorities. Flood events along the Tar, Neuse, and Lumber Rivers had been among the most destructive in the state's history.¹⁰ Short-duration studies for each of these major watersheds were directed by the State Division of Emergency Management and the Department of Transportation working with River Basin Advisory Committees as well as local governments, various federal agencies, non-profits, and other state agencies and stakeholders.

While these studies were not intended to include the fine-grained detail and sophisticated modeling that might be required to support specific large-scale infrastructure projects, they provided a vision and framework for moving ahead with selecting and implementing mitigation options. The basin profiles include information on topography, hydrography, land cover, natural resources, monitoring locations, stream flow characteristics, existing flood management and water infrastructure, growth rates, and other demographics. Flooding profiles and engineering analyses were used to develop a risk analysis for each basin that will prove useful across the large watershed and on a community-by-community basis.

This work to collect, generate, evaluate, and synthesize data has helped North Carolina to develop an understanding of the flooding risks as well as the mitigation opportunities across each studied river basin. Using a master list of possible flood mitigation strategies,¹¹ the individual reports also examined the value of various strategies and suites of strategies for flood damage reduction. Various action scenarios were evaluated with a consideration of factors such as estimated costs, losses avoided, potential co-benefits, tax revenue implications, and long-term management requirements.

By looking beyond the lines of local jurisdictions and, essentially, following the behavior of water across the basin, and by considering an ensemble of options, decision-makers have identified information gaps and begun to compare the advantages and disadvantages of various solutions. This work is allowing the state to focus on and build support for some of the strategies that are the most promising in terms of implementation timeframe, targeting of

¹⁰ <https://www.rebuild.nc.gov/resiliency/river-basin-studies>

¹¹ There were 12 categories of strategies examined in the North Carolina assessments: new detention structures; retrofit of existing detention structures; offline storage; channel modification; new embankment structures; existing levee repair/enhancement; roadway elevation/clear spanning; large scale wet flood-proofing; buyout/elevation/relocation; land use strategies; river corridor greenspace; and wildlife management. For the most part, these strategies were not evaluated in isolation. Rather, the assessments looked at the potential for various combinations of these 12 strategies to achieve flood reduction benefits.

vulnerable structures and communities, solid benefit-cost ratios, and additional co-benefits beyond flood reduction.

The hydrologic assessments undertaken as part of the Iowa Watersheds Project discussed above, though generally covering smaller land areas, are not unlike the North Carolina basin studies. Hydrologic models created for or fitted to the data on specific watersheds have sparked ideas for good mitigation investments and helped evaluators compare the benefits of proposed projects.

3. Recognize the changing nature of flood risk and identify the drivers of risk.

We urge the Board to create a planning and funding program that will help communities prepare, not for a repeat of the worst storms of the past, but for the flood events of the future. To accomplish this, the Board must use the most recent credible data on current risks, examine changes in weather and development patterns that will influence future risks, and, as necessary, use sensible margins of safety. The State must also help local decision-makers and the public to understand that the geography of flood risk is not stationary.

As the recent update to Atlas 14 rainfall data for Texas¹² demonstrates, precipitation rates in certain areas have increased significantly over the years, making large storms far more likely in some cases. At the same time, dramatic population growth and growth projections for some Texas communities mean not only that more people and assets could be located in at-risk areas, but also that water pathways, velocities, and flood heights could change as well. Neighborhoods that are currently protected may find themselves in jeopardy in the future.

The principles you have laid out in Issue 6 (item 3) recommend changing the risk recurrence interval for flood hazard exposure planning, moving standards from the so-called 100-year floodplain to a 500-year floodplain. While this approach may add something of a margin of safety to current practice, it does not truly re-orient the flood management framework toward future risk, however. Pew is concerned that simply moving the minimum protection requirements to a wider recurrence interval will not be sufficient or ultimately effective.

We recommend an even more fundamental shift in how public officials, floodplain managers, infrastructure planners, and others across Texas think about flood risk and how it may change in the future. Several approaches used elsewhere to incorporate future risks into flood management and mitigation should be considered.

An area that long ago pioneered its own approach to managing changing flood risks and mapping future conditions is Charlotte-Mecklenburg, North Carolina.¹³ Charlotte is North

¹² National Oceanic and Atmospheric Administration, "NOAA updates Texas rainfall frequency values," September 27, 2018, <https://www.noaa.gov/media-release/noaa-updates-texas-rainfall-frequency-values> .

¹³ See brief discussion of Charlotte-Mecklenburg's multi-faceted approach to flood mitigation and management in report prepared by the State of North Carolina, "Safer Development in Floodprone Areas," November 2011, http://www.ncafpm.org/resources/NC%20Higher%20Standards%20Document%2011_2011.pdf .

Carolina's most populous city. Along with the surrounding Mecklenburg County, which includes several other local entities, the Charlotte-Mecklenburg metro area is one of the country's largest urban areas. In the early 1990s, communities in this area formed a joint municipal/county stormwater utility, which today has a noteworthy program to address flooding risk and assure that new development does not adversely impact existing homes and businesses.

After several devastating floods in the 1990s, local decision-makers took a critical look at the traditional approach to floodplain management based on the National Flood Insurance Program (NFIP) mapped flood zones. Concerned that the cumulative impacts of floodplain development were not being appropriately managed, technical experts analyzed the potential footprint of future floods under a scenario that assumed full buildout of the region in keeping with local plans. The study results showed that a policy of adhering to only the minimum requirements of the NFIP would result in larger and deeper floods in the future. The minimal approach, it was determined, would underestimate flood heights by more than two feet.¹⁴

With this information in hand, Charlotte-Mecklenburg educated its citizens and adjusted its floodplain management approach to accommodate new growth and development without creating larger floods. The revised focus has been on protecting the floodplain fringe as well as the floodway, buying out properties in the riskiest areas, creating greenspace, and requiring compensatory water storage for new construction. This approach, notes the City, helps to reduce flood losses and earns discounts on insurance premiums for local policyholders.¹⁵ While the costs of this approach have been significant, the projected savings in future damage, it was determined, "more than offset the investment."¹⁶

Another future-risk methodology comes from Florida. There Broward County officials found that stormwater standards once considered rigorous were proving ineffective, thereby shortening the design life of costly investments in drainage and infrastructure. In response to the problem, the County Commission concluded that it was no longer "...prudent to rely solely upon historic and current environmental conditions as the basis for infrastructure planning, design and permitting"¹⁷ and developed an ambitious plan to use "future conditions" maps and standards.

¹⁴ Association of State Floodplain Managers, "No Adverse Impact Floodplain Management: Community Case Studies, 2004," 2004, https://www.floods.org/PDF/NAI_Case_Studies.pdf.

¹⁵ Charlotte-Mecklenburg Stormwater Services, "Floodplain Regulations Technical Guidance Document," March 2008,

¹⁶ Association of State Floodplain Managers, "NAI How-to Guide for Mitigation," updated 2016, <https://www.floods.org/ace-images/ASFPM-MitigationFinalJuly28.pdf>.

¹⁷ Zygnerski, Michael, "Broward County Future Conditions Map Series," presentation to the South Florida Hydrologic Society, August 22, 2018, http://sfhs.fiu.edu/Contents/Presentations/SFHS_pres_2018_08_22.pdf.

Broward’s modeling and analysis work is focused on the time period from 2060 to 2069¹⁸ and the potential sea level rise, changes in groundwater levels, reduction of soil storage, and greater intensity rainfall over this time period.¹⁹ The resultant future conditions maps will not affect insurance purchase requirements or rates but may be used for making decisions about infrastructure siting and design, stormwater management, and development requirements.

Finally, a very different approach that looks beyond current risk to a particular type of future flood risk comes from the State of Wisconsin, which links its dam safety and floodplain management programs in order to protect life and property from dam failures.²⁰ Each dam owner in the State must engage with the local community and the Department of Natural Resources to ensure that a dam failure analysis is conducted and incorporated into the local floodplain ordinance and local land use requirements. The State’s dam hazard ratings, which are used in setting operational and structural requirements, reflect both the existing downstream development and the level of control over future development. The effort to manage what Wisconsin regulators call “hazard creep” creates incentives for dam owners to support appropriate development rules and promotes widespread public awareness of potential risks.²¹

These examples are offered, not to suggest they be adopted outright, but to illustrate how other states and communities have used the principles of watershed management grounded in sound science to protect against future flood risks.²² The current risk profile and the factors that will drive future flood risk in Texas communities, of course, will differ across the State. Key factors within one basin or sub-basin may be stormwater management or wetlands fill; in another area risk may be driven largely by shoreline erosion or levee maintenance.

¹⁸ National Association of Counties, award background writeup, “Future Conditions Map Series: Groundwater Elevation Map,”

https://members.naco.org/FileUpload/Awards/Storage/2018/107553/Broward_EPCRD_%20NACO_FutureConditionsGroundWaterElevation%20final.pdf .

¹⁹ Jurado, Jennifer L., “Sea Level Rise and Flooding: Planning for Future Conditions,” presentation at the Florida Sea Grant Workshop, November 16, 2017, <https://www.flseagrant.org/wp-content/uploads/Jurado-SeaGrant-111617.pdf> .

²⁰ Wisconsin Department of Natural Resources, “ Dam Failure Analyses and Floodplain Ordinances,” Dam Safety News, Spring 2013, <https://dnr.wi.gov/topic/Dams/documents/DamSafetyNewsSpring2013.pdf>

²¹ Galloway, Meg, presentation for the Planning Information Exchange (PIE) webinar series, May 6, 2016, https://www.floods.org/ace-files/training/Dam_Risk_SLIDES_5.6.2016.pdf .

²² See also the discussion of future conditions analysis in the 2015 recommendations produced by the Federal Emergency Management Administration’s Technical Mapping Advisory Council. The Council’s report notes that even in localities such as Charlotte-Mecklenburg and the Denver Urban Drainage and Flood Control District, which also uses a future land use scenario in floodplain management, the impacts on the hydraulics of future growth can be underestimated. See Technical Mapping Advisory Council, “TMAC: Future Conditions Risk Assessment and Modeling,” December 2015, https://www.fema.gov/media-library-data/1454954261186-c348aa9b1768298c9eb66f84366f836e/TMAC_2015_Future_Conditions_Risk_Assessment_and_Modeling_Report.pdf .

In many cases, these factors that drive future risk will not be adequately reflected in traditional flood maps – even when those maps depict the 0.2 percent annual chance flood. That is why Pew urges the Board to set up a framework that will more rigorously identify the specific risks and the expected trajectory of risk unique to each major watershed. Communities within each basin will then be able to implement the ongoing and iterative watershed management approach depicted in this graphic from the San Antonio River Authority. This will allow Texas communities to address today’s flood problems and continue to manage the risks as they evolve.



Diagram from the San Antonio River Authority

4. Require consideration of alternative solutions, including suites of solutions rather than single projects.

Communities that experience major floods are often able to see, in hindsight, that a mix of factors contributed to the overall damage and suffering: Undersized culverts, poor site selection for critical facilities, lack of appropriate building codes, wetlands loss, levee damage, or development in a high-risk area, might all come together to impact the size and scope of a flood disaster. But just as there may be multiple factors that combine to worsen flood damage, there may be multiple solutions and combinations of projects and policies to make a community more resilient. Multiple solutions may work together for better protection and provide a needed level of redundancy and resilience.

Therefore, Pew recommends that the Water Board, to the extent feasible, make its spending decisions, not only by considering the costs and benefits of individual projects, but also by comparing costs and benefits across projects and suites of projects and policies.

We understand that some communities may already be seeking funding for certain single-purpose, site-specific projects, and that some of these projects may have already been carefully evaluated. While we would respect the need to move some such projects forward, we would also strongly recommend that the Water Board begin encouraging and, at some point, requiring a reasonably thorough examination and comparison of multiple mitigation options. Even in an early round of grant and loan reviews conducted as the regional water planning work is just getting underway, the Water Board may wish to look at projects and mitigation options in linked “packages” that taken together promise even greater or more certain reductions of flood damage.

Again, we would suggest that the Board consider the approach used for North Carolina’s water basin studies, which incorporates a first-level evaluation of suites of actions or “strategies” that could be considered within each basin. The scenarios developed for these North Carolina

assessments were not overly complex, and some simply involved adjustments to placement of or size of a project. The methodology, however, does introduce the important notion of comparing multi-layered flood management strategies.

Where participants in a Texas water basin have good regional-scale information available, it may be useful to take the North Carolina approach a step farther, looking, for example, at the implications of combining buyouts and elevations with stream restorations or enhanced stormwater infrastructure improvements in particular portions of a watershed, considering alternatives sizes or sites for a new reservoir combined with regulations governing stormwater retention for new construction, or evaluating the long-term effectiveness of a new dam or reservoir in combination with a strategy of securing easements or funding fee simple purchase of land.

By running scenarios, not for every possible combination of projects and policies, but for a reasonable set of protection approaches, collaborators within each river basin may uncover the flood protection improvements and adaptations that will yield the most benefit for the most reasonable cost.

5. Prioritize the role of nature in risk mitigation.

Several items in the Board's proposed set of principles allude to the importance of nature-based solutions in flood planning. Items 22 and 25 speak to the natural and beneficial functions of floodplains and Item 26 cautions against approaches that would cause degradation of water quality. We wholeheartedly agree that these principles should be embraced, and we urge the Board to be rigorous in assuring that the full-range of nature-based approaches are evaluated and utilized. Overall, we are optimistic that many so-called "green" alternatives can provide cost-effective and lasting flood reduction benefits.

As the Board recognizes, the long-favored means of coping with floods – not just in Texas, but all around the country – has been to wall off water, collect it, or pipe it away. Such approaches can work, for a given area and for a limited time, but in too many instances, they have not been sufficient or sufficiently maintained to provide protection as communities grow and change. More recently, however, scientists and other experts have come to understand that flood reduction benefits can be found by conserving natural systems or by mimicking the function of those systems.

This does not necessarily translate to an either-or proposition. As projects in a wide range of urban, suburban, and rural areas across the country are now demonstrating, protection or restoration of natural areas and creation of nature-like features can work along with more traditional approaches and "grey" flood infrastructure projects. In many instances, nature-based approaches will, as the Director of Civil Works for the U.S. Army Corps of Engineers notes, broaden our view of potential outcomes and deliver a wider array of services, benefits,

and value from investments made in infrastructure systems.²³ For Texans this can mean improved water quality, augmented water supplies, new recreational opportunities, and enhanced wildlife habitat.

The following are just a few of the many examples that should inspire those working on basin plans in Texas.

The U.S. Army Corps of Engineers studied flooding issues in the Charles River watershed in Massachusetts in the late 1970s and determined that protection of the undeveloped wetlands would be a cost-effective means of flood protection. This large-scale project consisted of acquisition – over multiple years -- of land and easements on more than 8,000 acres of wetlands at a cost of \$8,300,000. Strategically chosen wetland parcels within multiple jurisdictions of the 307-square mile watershed now flood during storms and slowly release water downstream. As of 2016, it was estimated that the project had prevented an estimated \$12 million in flood damages.²⁴ Of the land protected, more than 2,500 acres are now managed by the State Division of Fish and Wildlife, and that land management has allowed for multiple recreational and wildlife benefits, including hunting, fishing, hiking, and canoeing.²⁵

Aimed at improving salmon habitat and reducing flooding hazards, the Countyline levee setback project in King County, Washington removed about 4,500 feet of a constricting levee erected in the early 20th century, re-established a second channel for the river, and reconnected portions of the White River with the natural floodplain. The levee which had historically served in flood control had been overtopped as sediment had built up over the years and dramatically reduced the narrow channel's capacity to carry floodwaters. During storms that occurred as the project was being completed, the County found that the setback was functioning as planned, with floodwaters flowing through the restored floodplain area without damage to homes and businesses.²⁶

Another example of a multi-jurisdictional effort to use nature-based flooding solutions comes from Colorado, where a local flood control district, two cities, and a county have joined together to lay out an ambitious, multi-objective mitigation plan. The Boulder Creek restoration plan covers nearly 24 miles and includes “grey” infrastructure improvements such as bridge

²³ U.S. Army Corps of Engineers, “Engineering with Nature: An Atlas,” 2018, <https://ewn.el.erdc.dren.mil/atlas.html> .

²⁴ U.S. Army Corps of Engineers, “Charles River Natural Valley Storage Area,” draft master plan presentation, April 2017, http://www.nae.usace.army.mil/Portals/74/docs/Civil%20Works/Charles%20River/Charles_River_Natural_Valley_Storage_Area_Presentation.pdf .

²⁵ U.S. Army Corps of Engineers, “Charles River Natural Valley Storage Area,” website information, updated March 2017, <https://www.nae.usace.army.mil/Missions/Civil-Works/Flood-Risk-Management/Massachusetts/Charles-River-NVS/> .

²⁶ King County, Washington, Water and Land Resources Division, “Lower White River Countyline Levee Setback Project,” <https://www.kingcounty.gov/depts/dnrp/wlr/sections-programs/river-floodplain-section/capital-projects/lower-white-river-countyline-a-street.aspx> .

replacements as well as “green” elements, including stream restoration, improvement of fish passages, open space preservation, and vegetation and tree plantings. This project will repair damage from Colorado’s severe 2013 flood and help protect public and private property from future flooding.²⁷

A study, as opposed to a project, that might also inform the Board’s framework and its approach to nature-based solutions comes from the area near the Lower Fox River in Wisconsin. This study illustrates the potential value of non-structural, nature-based solutions and the importance of evaluating different alternatives, as discussed above.

The Lower Fox River watershed had long dealt with both flooding and water quality problems, and local officials were anticipating significant growth in residential, commercial, and industrial land uses across the floodplain over a 15- to 20-year period. As was the case of Charlotte-Mecklenburg, analysis of growth trends indicated that flood damages would likely climb over time, and researchers wished to explore how those impacts might be alleviated or lessened through conservation of agricultural land. A watershed assessment and study undertaken by researchers at Resources for the Future did not simply look at a single “conservation” scenario, however.²⁸ Rather, the study compared the costs and benefits of several strategic conservation options for protecting land in the East River sub-watershed. It demonstrated, again at a broad scale, that protection, through purchase or easements of all the acreage in the floodplain would cost more than the benefits it would achieve. However, because multiple scenarios were evaluated, the data also showed that by strategically selecting portions of that acreage for protection, costs would be reduced dramatically, without significantly impacting the flood-reduction benefits.

We include these examples and note the multitude of small-scale nature-based projects to illustrate how a consideration of watershed-specific flooding threats and local natural assets might inform and improve the flood mitigation projects that the Board supports. Pew recommends that the Board make consideration of nature-based options a clear requirement for the regional water plans. We also recommend that the Board work with experts in the State to evaluate the potential for nature-based solutions to amplify the benefits of any proposed projects that come under review for the first round of funding.

Also related to nature-based solutions, we strongly support financial assistance for property buyouts, particularly for areas that have flooded frequently (Issue 4). We believe that there

²⁷ Urban Drainage and Flood Control District (UDFCD), Boulder County, the City of Boulder, and the City of Longmont, “Boulder Creek Restoration Master Plan,” 2015, <https://assets.bouldercounty.org/wp-content/uploads/2018/04/Boulder-Creek-Restoration-Master-Plan-2015b.pdf> .

²⁸ Kousky, Carolyn, et. al., “Strategically Placing Green Infrastructure: Cost-Effective Land Conservation in the Floodplain,” *Environmental Science and Technology*, April 1, 2013, <https://pubs.acs.org/doi/abs/10.1021/es303938c> ; Liebl, David S. “Mitigation Flood Risk in the East River,” *Wisconsin Academy of Sciences, Art and Letters*, February 24, 2016, <https://www.wisconsinacademy.org/blog/waters-wisconsin/mitigating-flood-risk-east-river> .

should be clear deed restrictions associated with these property buyouts to leave the land in permanent open space or recreational use. Our recommendation is for funding priority to be given to those localities which, on their own or in cooperation with neighboring communities, have identified problem areas and areas which have the greatest potential for restoring the flood-mitigation functions of natural floodplains. This area-oriented approach would be preferable to the swiss-cheese results of individual, unplanned property buyouts.

6. Avoid adverse impacts.

The Board has posed a question on allowing flood mitigation projects that could result in negative impacts to neighboring areas under certain conditions (Issue 5). We caution against projects that will simply shift flood problems elsewhere, and we encourage the Board to adhere to the principle of “no adverse impact” to the fullest extent possible. In any instance where a project could impose negative impacts on other communities, thereby requiring an additional separate project, the Board should support those projects only as a package. To do otherwise would undermine the significant value that can be gained from planning and implementing mitigation strategies across a watershed. We urge the Board to make it clear in its planning principles, funding guidelines or scoring systems, and project assessment methods that projects without adverse impacts across the region will be preferentially funded.

7. Reward collaboration and keep communications lines open and operating.

Pew commends the Water Development Board for initiating its flood work with a series of community meetings. This outreach should broaden the Board’s understanding of the issues and concerns related to Texas floodplain management and, in turn, support the type of “coordinated, coherent and long-term vision for sustainability and resilience” that is imperative to effective flood risk management.²⁹

In order to sustain a high level of coordination and collaboration, we recommend that the Board consider using trusted in-state experts, such as those associated with major universities and the extension service, to assist smaller or under-resourced communities in the basin planning discussions. In addition, the Board may want to allow larger jurisdictions to act as mentors and, perhaps, fiscal agents for projects within smaller jurisdictions that have had little experience with managing mitigation projects. This could be particularly important where federal funding is a part of the mix, and the contracting and review requirements may be rigorous and complicated. Another option that may be worth considering would to establish capacity-building grants, as Louisiana has done.

Overall, Pew believes—with only a few exceptions discussed above— that the Water Board has laid out reasonable principles for its flood planning and selected several important factors to consider in prioritizing funding allocations.

²⁹ Louisiana Watershed Initiative, A Long-Term Vision for Statewide Sustainability and Resilience,” August 2018, [http://gov.louisiana.gov/assets/docs/Watershed-Initiative-Vision-White-Paper-8-15-18-\(2\)-.pdf](http://gov.louisiana.gov/assets/docs/Watershed-Initiative-Vision-White-Paper-8-15-18-(2)-.pdf) .

As a next step, we recommend that the Board simplify its principles for planning (Issue 6) into broader categories and incorporate the finer details on these as well as certain factors listed in Issue 2 into a matrix for evaluating and scoring projects. While the guidelines used by Washington State's Floodplains by Design program would not necessarily fit, the approach of creating a scoring matrix that looks at key outcomes would help the Board keep its funding decisions in line with its long-range goals and objectives. As the experience of river basin flood planning evolves within the State, such a scoring matrix could be re-evaluated and updated on a yearly basis. We recommend this approach over one which would simply borrow from either the existing water plan criteria or the Clean Water Act funding approach (Issue 3).

Again, we thank you for this opportunity to comment and for your consideration of these recommendations. We look forward to working with the Board as it implements this important new program for the State of Texas, and we would be happy to discuss these recommendations or provide additional information as you proceed.

Sincerely,

A handwritten signature in black ink, appearing to read "Velma M. Smith". The signature is fluid and cursive, with a large, stylized initial "V" and "S".

Velma M. Smith
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