

Northern Colorado Estes Park, Fort Collins, and Loveland

June 22–27, 2014



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Connected Systems, Connected Futures: Building for
Resilience and Prosperity

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About the Urban Land Institute

THE MISSION OF THE URBAN LAND INSTITUTE is to provide leadership in the responsible use of land and in creating and sustaining thriving communities worldwide. ULI is committed to

- Bringing together leaders from across the fields of real estate and land use policy to exchange best practices and serve community needs;
- Fostering collaboration within and beyond ULI's membership through mentoring, dialogue, and problem solving;
- Exploring issues of urbanization, conservation, regeneration, land use, capital formation, and sustainable development;
- Advancing land use policies and design practices that respect the uniqueness of both built and natural environments;
- Sharing knowledge through education, applied research, publishing, and electronic media; and

- Sustaining a diverse global network of local practice and advisory efforts that address current and future challenges.

Established in 1936, the Institute today has more than 33,000 members worldwide, representing the entire spectrum of the land use and development disciplines. Professionals represented include developers, builders, property owners, investors, architects, public officials, planners, real estate brokers, appraisers, attorneys, engineers, financiers, academics, students, and librarians.

ULI relies heavily on the experience of its members. It is through member involvement and information resources that ULI has been able to set standards of excellence in development practice. The Institute has long been recognized as one of the world's most respected and widely quoted sources of objective information on urban planning, growth, and development.

Cover: A relief map of the panel study area displayed in the Loveland Museum/Gallery.

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About ULI Advisory Services

THE GOAL OF ULI'S ADVISORY SERVICES program is to bring the finest expertise in the real estate field to bear on complex land use planning and development projects, programs, and policies. Since 1947, this program has assembled well over 400 ULI-member teams to help sponsors find creative, practical solutions for issues such as downtown redevelopment, land management strategies, evaluation of development potential, growth management, community revitalization, brownfield redevelopment, military base reuse, provision of low-cost and affordable housing, and asset management strategies, among other matters. A wide variety of public, private, and nonprofit organizations have contracted for ULI's advisory services.

Each panel team is composed of highly qualified professionals who volunteer their time to ULI. They are chosen for their knowledge of the panel topic and screened to ensure their objectivity. ULI's interdisciplinary panel teams provide a holistic look at development problems. A respected ULI member who has previous panel experience chairs each panel.

The agenda for a five-day panel assignment is intensive. It includes an in-depth briefing day composed of a tour of the site and meetings with sponsor representatives; a day of hour-long interviews of typically 50 to 75 key community representatives; and two days of formulating recommendations. Long nights of discussion precede the panel's conclusions. On the final day on site, the panel makes an oral presentation of its findings and conclusions to the sponsor. A written report is prepared and published.

Because the sponsoring entities are responsible for significant preparation before the panel's visit, including sending extensive briefing materials to each member and arranging for the panel to meet with key local community members and stakeholders in the project under consideration, participants in ULI's five-day panel assignments are able to make accurate assessments of a sponsor's issues and to provide recommendations in a compressed amount of time.

A major strength of the program is ULI's unique ability to draw on the knowledge and expertise of its members, including land developers and owners, public officials, academics, representatives of financial institutions, and others. In fulfillment of the mission of the Urban Land Institute, this Advisory Services panel report is intended to provide objective advice that will promote the responsible use of land to enhance the environment.

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Urban Resilience Panels

WITH A NUMBER OF EXTREME and damaging weather-related events in recent memory, cities around the world are thinking about how to become more resilient in the face of those challenges. Resilience has taken on many meanings in many different contexts. The Urban Land Institute has joined a number of partner organizations to create a shared definition of resilience: the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events. Implied in that definition is the ability not just to recover and bounce back but also to bounce forward and thrive.

With generous funding support from the Kresge Foundation, ULI has undertaken a series of Advisory Services panels to assess how cities can better prepare for changes

deriving from global climate change. Those changes range from rising sea levels and exacerbated drought and air temperatures to more extreme weather events, such as floods and wildfires.

The objective of such panels is to offer advice and guidance to communities that will assist their formulation of plans and policies and that will, in turn, create stronger responses to and recoveries from such events.

Acknowledgments

THE URBAN LAND INSTITUTE wishes to thank the Community Foundation of Northern Colorado, the town of Estes Park, and the cities of Fort Collins and Loveland for their coordinated effort to sponsor this panel. Thank you for inviting us into your communities to share your stories, lessons, and questions about resilience.

ULI also wishes to extend its continued gratitude to the Kresge Foundation, whose generous support of ULI's Urban Resilience Program has made these panels possible. The panel would also like to thank the more than 50 stakeholders from northern Colorado who graciously provided their time and perspectives during the stakeholder interview process. This group of interviewees

included elected officials, local business owners, members of the wider community, and municipal staff. Throughout the week, the ULI panel was continually reminded of the pioneer spirit and the incredible self-sufficiency that made the western United States what it is today.

The panel enjoyed not only the surrounding beauty that is the essence of this place but also the hospitality of everyone whom the panel met—marveling at the region's ability to stare down hardship with tenacity, kinship, and care for one another.



THE KRESGE FOUNDATION

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Background and the Panel's Assignment

WHEN FACED WITH EVENTS such as the floods of September 2013, the spirit of self-sufficiency proved key to Colorado's recovery. Time and again, the panel witnessed stories that evidenced creativity, self-reliance, agility, and kinship in getting the region back on its feet in record time. It could be argued that what the panel heard and saw in the three sponsoring communities was resilience at its best. The true test will be to see if these communities can summon and apply the same strengths in the calm before the next storm to implement long-term physical, financial, and organizational measures of prevention and protection.

The sponsoring communities in northern Colorado foresee a continued trajectory of solid growth—powered by an enviable quality of life; centers of research, innovation, and creative arts; unparalleled access to outdoor pursuits; and a quiet but substantial energy economy. However, the forces that led to the recent floods and wildfires may be a dark cloud over that bright future, as climate change and its related effects increase the frequency or severity of such incidents. Indeed, as became clear in the aftermath of Superstorm Sandy and other recent events, resilience is not about simply going back to the way things were but about coming back stronger; not just bouncing back but bouncing forward. In that context, even a devastating storm can contain a silver lining in presenting the opportunity—or necessity—to think differently about one's future and to bypass the slow evolutionary processes that sometimes prevent building stronger places. In the end, communities should emerge not as if nothing ever happened, but actually stronger and better able to withstand greater shocks in the future.

This report will share a range of the panel's observations, lessons learned, and recommendations, all in the pursuit of a more resilient northern Colorado.



Study Area

Regional map.

About 50 miles north of metro Denver, the panel's study area includes the town of Estes Park and the cities of Fort Collins and Loveland—three distinct geographies found on the northern end of the Front Range of the Colorado Rockies. All three are part of Larimer County, Colorado, defined by the census as the Fort Collins–Loveland metropolitan statistical area, which includes a number of cities, towns, census-designated places, and unincorporated communities. Larimer County's population is projected to grow from roughly 300,000 to 430,000 by 2030. According to the 2000 census, the county has a population density of roughly 97 people per square mile.

The town of Estes Park lies in the Rockies; to its east, in the foothills of the Great Plains, lie the cities of Fort Collins and Loveland. The communities are bound together by a topography that includes a number of natural and

constructed features. The town of Estes Park and the city of Loveland are tied together by U.S. Route 34, which runs along Big Thompson River through the Big Thompson Canyon. Fort Collins, on the Cache La Poudre River, is connected to Loveland by two major highways—Interstate 25 and U.S. Route 287—both with connections to U.S. Route 34.



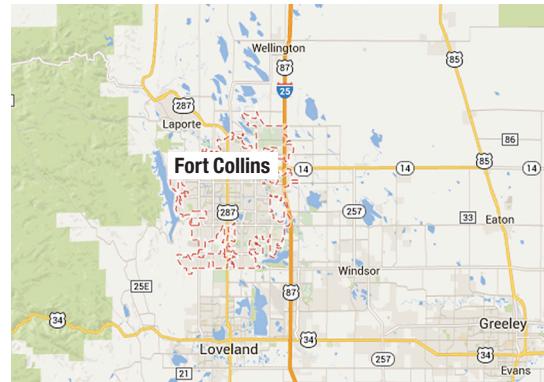
Estes Park

A mountain village by the eastern entrance to Rocky Mountain National Park, the town of Estes Park can be reached from the east by U.S. Routes 34 and 36 and Colorado Highway 7 and from the west by U.S. Route 34, which runs through the city of Loveland. The town is well-known for its recreational activities, watchable wildlife, scenic trails, and panoramic views, which draw an estimated 3 million visitors annually.

Estes Park's population is about 5,900, but it operates under a valleywide land use plan that includes the 7,200 people who reside in surrounding unincorporated areas. Together, they form what is referred to as "Estes Valley." The town is served by 500 citizen volunteers for services in the greater Estes Valley.

Fort Collins

As the fourth-largest city in Colorado and home to 48 percent of Larimer County's population as county seat, Fort Collins is the largest of the three sponsoring communities. The city has a population of 151,000, which



includes about 26,800 students enrolled at Colorado State University (CSU). A number of tech companies, such as Hewlett-Packard and Intel, attracted by CSU resources and research have facilities in the city.

In addition to CSU, Fort Collins is known for "beer, bikes, and bands" and has over 280 miles of pedestrian and bike trails, a thriving culture of microbreweries, and several annual music festivals. The city also recently launched MAX Bus Rapid Transit service, an \$87 million project, which is the biggest infrastructure project in the city's history.

Loveland

The second-most-populous city in Larimer County, Loveland, has about 72,000 residents. Downtown Loveland has a charming mix of small locally owned businesses, restaurants, parks, and open space. Loveland is also known for



its dedication to the arts and is home to three foundries, an art museum, and an annual sculpture show.

Loveland's recent development is focused on the Interstate 25 and U.S. Route 34 interchange on the city's eastern edge. With U.S. Route 34 serving as a principal route to Estes Park and Rocky Mountain National Park, the area receives a significant amount of pass-through traffic, allowing the area to serve as a primary commercial hub for the region. Recent developments near that interchange include Promenade Shops at Centerra, the Budweiser Events Center, and the Medical Center of the Rockies. In addition, Loveland is connected to Fort Collins by the FLEX regional bus route.

The Panel's Assignment

In June 2014, the ULI panel of nine experts in land use, development, finance, design, and community engagement and education was invited by the Community Foundation of Northern Colorado to the town of Estes Park and the cities of Fort Collins and Loveland to conduct an Advisory Services resilience panel. The goal of the panel was to develop optimal regional strategies to reduce the effects of natural disasters, such as the 2013 floods and wildfires, that threaten those communities almost annually and to recover from and adapt to such disasters.

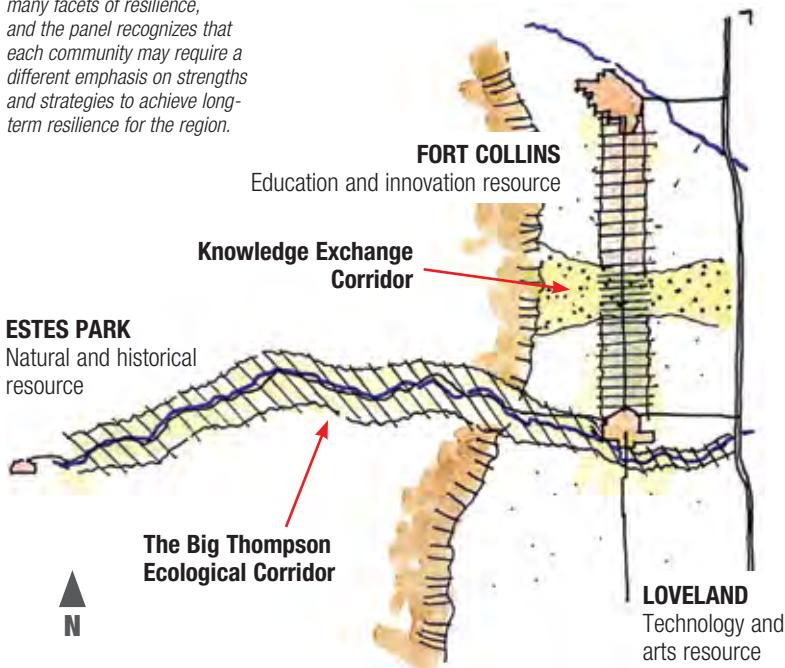
The panel spent five days immersed in a series of site tours, stakeholder interviews, and internal deliberation and developed a comprehensive list of recommendations to address numerous questions provided by the participating communities concerning physical planning, organizational capacity, and public education and engagement as part of a coordinated effort to recover from and adapt to natural disasters. As ULI helps to refine the definition and tools that shape community resilience, the northern Colorado panel process provided a long list of success stories and practical examples of how individuals and communities can work together in the face of significant adversity.

Summary of Recommendations

THE DISCUSSION OF “DISASTER” and “damage” is inevitable when there is a loss of life or property. But floods and forest fires may just be a fact of life and a cost of living at the wildland–urban interface. The spirit of self-reliance and self-sufficiency that is a hallmark of the northern Colorado experience underscores that the high quality of life chosen by residents also brings with it the risk of sudden, natural events that may disrupt lives and economies. Resilience planning starts with recognizing that such events should not be surprising or viewed as stoppable. The larger natural system in which we live will continue to evolve at a scale and speed that are hard to comprehend.

It is critical to understand how we humans fit into those systems properly—living within, not on, the larger landscape so that our actions and settlements do not exacerb-

The graphic illustrates a vision in which each community retains its identity and quality of life while supporting the larger systems that connect each community. There are many facets of resilience, and the panel recognizes that each community may require a different emphasis on strengths and strategies to achieve long-term resilience for the region.



bate the inevitable events. Improvements in land use planning and low-impact development are all targeted toward finding an appropriate balance between human settlement and the larger natural system in which we choose to live. Resilience builds on that concept by helping create the necessary systems to minimize the human impact of those events.

First and foremost, to be successful in designing for resilience, it is important to recognize that we cannot design *against* such events, but must design *with* them. The panel's recommendations for a resilient vision for the future of these communities are united by three guiding observations:

- What has worked to date—small communities operating with rugged individualism—is unlikely to work as the region grows into one that must compete in a changing world.
- The natural and built systems that connect the sponsoring communities to this place, and to each other, require a shared approach to stewardship and funding over the long term.
- Although it is essential to maintain the entrepreneurial spirit and tenacity that are Coloradan traits, the sponsoring communities must find ways to create enduring processes and structures that are more strategic than those that currently exist.

As the panel deliberated the assignment, questions emerged about the region's long-term capacity to deal with disruptions that will not come as a single event but will instead likely come over a sustained period. Climate change and social change will result in immense shifts—some fast and furious, but many slower and unrecognizable until they are too far along. Economic and demographic shifts,

consumer preferences and habits, housing and transportation needs are all changing in ways that, if not addressed holistically, have the potential to slowly erode the economic health and quality of life of the systems natural and constructed that make up the very fabric of the region, and that are at the center of its resilience.

In the face of that potential future, the panel identified a significant opportunity to harness and maintain the unique identities of each community, while fostering a more integrated set of solutions that create regional synergies and financial efficiencies. The panel felt that the effects and powerful connections resulting from the recent events provided a timely call to clarify the vision of the future—for each town and, more important, *the larger region*. That approach is how one creates the solid foundation necessary to be resilient.

For some of the panel's recommendations, the link to resilience is obvious—such as defining redundant emergency exit roads and hardening infrastructure. Other recommendations may seem less connected to resilience—such as workforce housing—but when considering the need for first responders to live in the community they work in, the linkage becomes clear. And finally, some recommendations are tied to resilience because they create the inherent strength to respond effectively to unexpected events. They include those recommendations addressing issues such as economic development.

Using the three overarching themes listed above, the panel's recommendations are organized into three categories: building resilience, financing resilience, and leading resilience. The recommendations serve as a guide to best address issues dealing with the region's resilience to natural disasters in both the near and long term. Those recommendations are summarized as follows:

Building Resilience

- Regional vision and coordination on river land use, infrastructure, and housing
- Aggressive floodplain management

- Designing with nature, not against it
- Resilient water infrastructure
- Use of engineered and natural systems

Financing Resilience

- Reclamation of the floodplain
- Formalized emergency assistance structures
- Infrastructure finance
- Integrated economic development strategy
- Small business preparation and planning

Leading Resilience

- Regional resilience working group
- Annual resilience summit
- Hardened and created redundancies in regional communications infrastructure
- Education and engagement of the public

Building Resilience

DEVELOPMENT TYPE AND DESIGN, land topography, and physical structural forms play an important role in resilient communities. Many physical interventions—from floating buildings and levees to wet floodproofing—can be employed to create resilience, depending on the particular set of risks faced by a community. However, the most successful strategies will work in concert with the natural ecosystem where they are used. In northern Colorado, that means development patterns must be able to respond with agility to the cycles of fire, flood, and drought that strike the region. Regular forest burns and the cleansing and depositional activities of floods are necessary to support important ecosystems that in turn support us and create the beauty that makes this region stand out.

Promoting more green infrastructure while also employing floodgates in downtown Estes Park is a way of modifying current land use patterns to return water to the river and to minimize damage to existing infrastructure, as arrows in the illustration demonstrate.

Land Use and Development

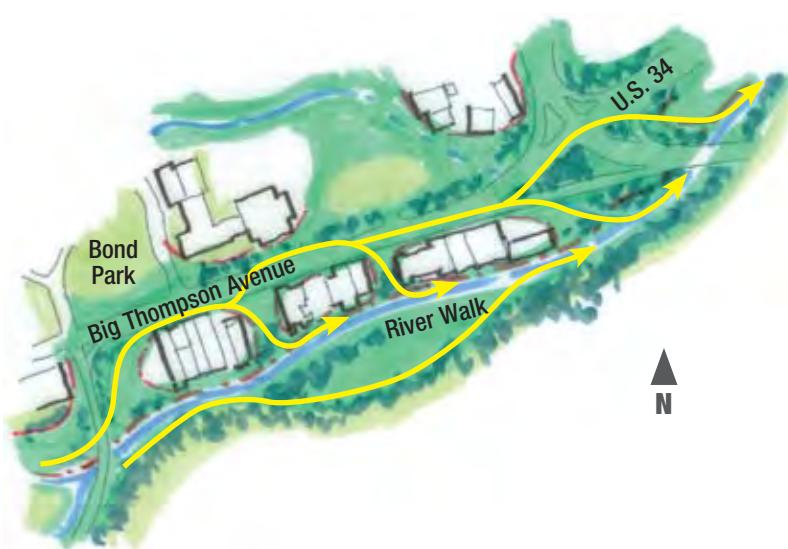
The communities of Estes Park, Fort Collins, and Loveland lie within the Front Range, where the grassland ecosystem of the Great Plains transitions to the predominantly ponderosa pine ecosystem of the Rocky Mountains. The com-

munities of Estes Park and Loveland are tied together by the Big Thompson River, whereas Fort Collins sits on the Cache La Poudre River. Those two watersheds are among the major watersheds of the Front Range, and they define ecological boundaries that influence the microclimatic differences affecting the severity of natural disasters. An understanding of how development patterns fit within the larger watershed will enable their design for resilience. While natural systems boundaries relate to topography and watersheds, development boundaries fit within political jurisdictions. That geopolitical differentiation often creates challenges for coordination at the regional level.

Regional Coordination and Shared Vision

Each of the three communities in the study area has a unique personality and specific local needs, yet together they share many common traits and are connected through the ecosystems where they are located. Because those ecosystems and the sporadic disasters that spring from them do not recognize political boundaries, regional collaboration is critical to respond to the environmental demands that stem from a geographically contiguous landscape that underpins each of the three sponsoring communities.

If a suitable entity does not already exist, the panel recommends that one be created to develop a regional vision for development along the Big Thompson River and to facilitate interactions among river stakeholders. That vision plan can help prioritize land acquisition and easements, work to integrate the river into the green infrastructure for regional resilience, and coordinate funding strategies for implementation efforts. As an example, the Big Thompson River Restoration Coalition could evolve beyond its current mission to act as an agency that provides strategic coordination of preventative measures related to the river.



Big Thompson River Restoration Coalition

The Big Thompson River Restoration Coalition is composed of dedicated volunteers that include professionals, residents, and nonprofit organizations. The group has facilitated productive relationships between public and private agencies. Many civic leaders and individuals have recognized the group's speed and effectiveness, which surpassed geographic and political boundaries to deliver high-quality responsiveness. Those individuals have followed their physical contribution by formulating a long-term vision for river recovery.

Discussions have begun to explore whether the community could benefit from formally organizing the coalition to expand its mission beyond emergency response. Historically, no regional entity has been able to consider

the entire river system and contributing watershed. Opportunities exist for regions to receive significant funding to plan for conserving community assets, such as watersheds, for purchasing open space, and for mitigating hazards.

To that end, civic leaders and interested jurisdictions should partner with the group to explore whether it should formalize as a nonprofit entity. Taking that step would allow the group to receive funding for emergency response, to leverage its considerable cross-sector expertise, and to act as a trusted liaison between government entities and residents. Establishing the group as a fiscal agent could help avoid any potential liabilities or reputational risk that might come from ad hoc funding.

Specific land use recommendations:

■ **Update floodplain maps for 100-year and 500-year floods.** Doing so is key to a comprehensive flood prevention strategy that provides planners and the general public with a better understanding of flood risks. Mapping should also determine erosion buffer limits so that structures along, but not within, the floodplain are protected from vertical and lateral instability. Fort Collins's remapping of the floodplain is a great example of preventative planning.

■ **Prohibit development in the floodplain while adopting stringent planning regulations.** In general, building should not be allowed in the creek corridor or the 100-year floodplain and should be limited in the 500-year floodplain. Where that prohibition is not yet possible, regulations should be introduced that require finished floors to be at least 24 inches above the base flood elevation and any floatable materials on site to be secured. All essential facilities should be located outside of the 500-year floodplain.

■ **Consider surface release planning to protect developed areas.** Flood controls may not always be adequate enough to keep the river within its channel. As such, in cases where flooding does move into developed areas,

patterns of development should be organized to allow floodwaters to move through and return to the river channel with minimal damage to buildings, infrastructure, or other improvements to developed land. Roadways and open spaces may be used to route flood waters, while structures can be flood proofed.

■ **Undertake strategic land acquisition for river enhancement where appropriate.** Strategic acquisition of property or development rights (easements) from willing sellers is necessary to expand the natural water corridors to better mimic their predevelopment footprint. Acquisition or relocation of residences located in the most vulnerable areas should be prioritized. Though some areas of the floodplain may be appropriate for active-use parks and infrastructure, they should generally be minimized in favor of prioritizing natural uses with smaller footprints, including trails, fishing access, or dog parks. To support future acquisition of land or easements, the one-quarter-cent sales tax should be extended to provide ongoing funding, including maintenance and operations.

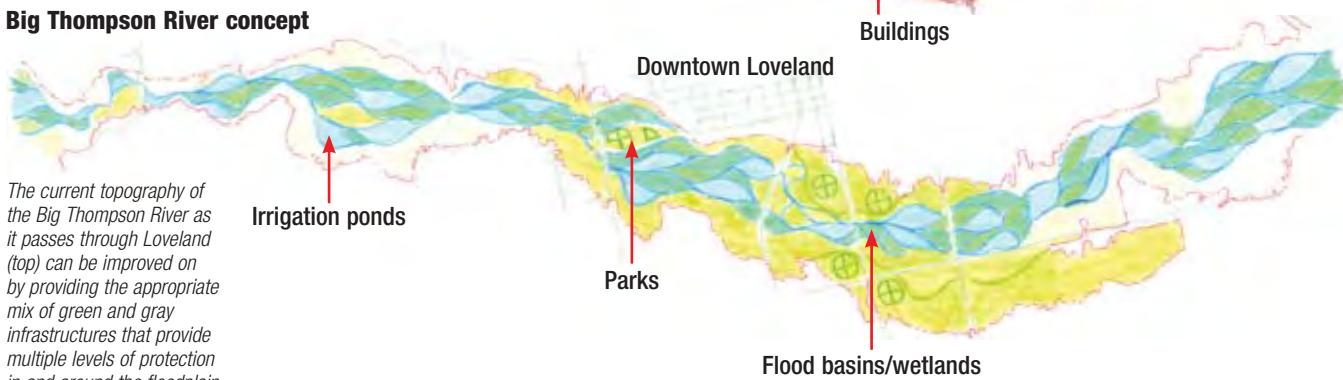
Design With, Not Against, the Natural Landscape

Although it is possible in the short term to engineer ways to subdue natural processes, a much more economical, sustainable, and resilient strategy for the long term is to

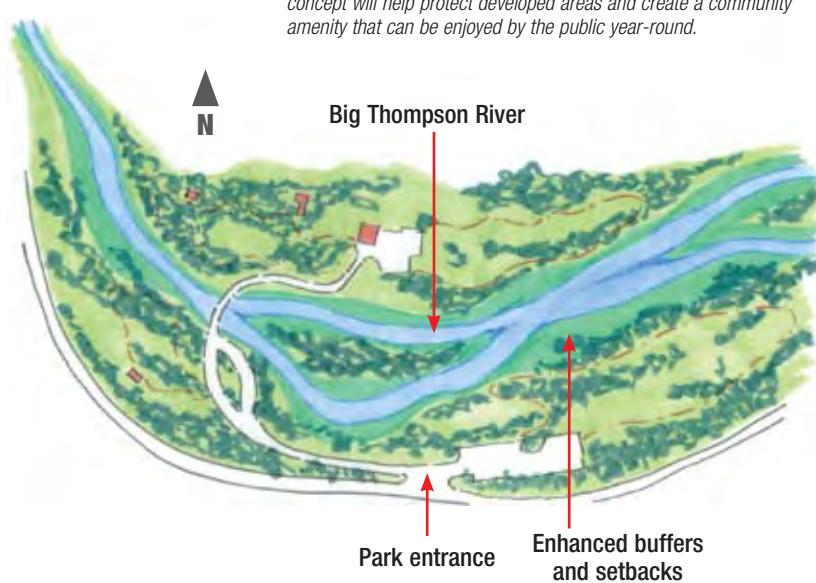
Existing Big Thompson River



Big Thompson River concept



Situated in a floodplain, Viestenz-Smith Mountain Park in Loveland can be improved by incorporating green features that respect river morphology, such as natural buffers and setbacks. Adopting a similar concept will help protect developed areas and create a community amenity that can be enjoyed by the public year-round.



design systems that work with those processes instead of fighting them. Flooding along northern Colorado's Front Range is part of the region's natural cycle, with major floods occurring on average every ten to 20 years. Development pressures, including buildings, infrastructure, and even open space, have constricted floodplains and exacerbate the severity of flooding. Additionally, climate change has resulted in higher seasonal variations in precipitation and temperature than at any other time in recorded history. With a consistent historical record of flooding, development patterns should be shaped to allow rivers to act as rivers, providing reasonable space for flood lands and even the ability for rivers to move within their floodplains. By restoring the ecological functionality of the river, a valuable community amenity is created. Restoration does not necessarily mean returning the river to a naturalized condition; it may also mean engineering the full functionality of the processes of the river within a designed landscape infrastructural system. That design should be strategic—not all areas of the community need to be protected to the same degree. In certain areas, natural or

Hard or Soft Infrastructure?

In the field of resilience, there has been some attention to the distinction between soft infrastructure and hard infrastructure—also known as “green” and “gray,” respectively. Hard systems are engineered solutions that use manufactured materials and technologies and are generally one-purpose solutions. They often, but not always, have lower upfront costs, but their maintenance, operation, and eventual replacement cost is high. Natural systems have intrinsic multifunctional capabilities that address environmental and protection concerns naturally. They may involve a larger scale and higher upfront costs, but they are frequently much less costly to maintain. The region’s wetlands, creeks, reservoirs, and rivers can be resilient forms of infrastructure that provide flood protection, maintain water quality, convey water for potable and farm irrigation use, and provide public access to open space for recreation. Such systems can be highly reliable

if the community is willing to invest in the long-term protection, restoration, and enhancement of the existing natural systems.



STEVE STONER/LOVELAND REPORTER-HERALD

The Slugger in Loveland’s Centennial Park was covered by debris and silt left by the 2013 floods. The baseball field functioned as green infrastructure, buffering nearby development from the flood path.

soft infrastructure (see text box on infrastructure) may be adequate; in others, more robust engineered protection may be warranted. That approach allows natural variations of the river within defined limits while protecting developed areas from the devastation of uncontrolled flooding.

In addition to the threat of flooding, northern Colorado is a region faced with the threat of wildfires. The ponderosa pine ecosystem that covers the mountains of the Front Range is healthiest when it has undergone a natural burn every 15 to 20 years. Burning encourages regeneration of the forest, resilience to insects and disease, and habitat for wildlife. In addition, healthy forests are less likely to burn severely, and although trees may die, the remaining brown needles will mulch the forest floor, protecting the land from soil erosion by up to 60 percent compared with bare soil (source: “Ponderosa Pine Ecosystems,” U.S. Forest Service, 2005).

Specific recommendations:

- Allow rivers to act as rivers.
- Use acquired floodplain land to restore the ecological function of a river as a community amenity.

- Provide soft and hard infrastructure to create different levels of protection within the floodplain.
- Incorporate fire-conscious development.
 - Regularly thin forests to keep them healthy, to protect development adjacent to forests, and to avoid unnecessary natural burning.
 - Establish fire protection zones, clear of highly flammable vegetation, to serve as a buffer between development and adjacent forest.
 - Similar to those requirements that Fort Collins already has in place, require roofs with nonflammable materials, such as metal, and avoid flammable exterior furniture.
 - Ensure adequate fire and safety access and reduce response times through road standards designed for emergency vehicles.

Infrastructure

Infrastructure is fundamental to a community’s ability to endure—the ability to deliver resources that make



TOM FOX, SWA GROUP



TOM FOX, SWA GROUP

Brays Bayou (top) and Buffalo Bayou Promenade (above) in Houston are prime examples of how complementary green and gray infrastructures can restore river morphology to create active space while also providing flood protection.

communities livable and generate economic value. Investment in infrastructure is essential to the region's growth and economic competitiveness in both the near and the long term.

Critical infrastructure protecting life, health, and safety must remain functional. The region already prepares for many events through emergency and disaster planning. However, the recent floods highlight the unpredictable effects and unforeseen impacts, reinforcing the need to understand the region's infrastructure vulnerabilities and to plan for future resilience.

The following can be considered critical infrastructure:

- Emergency communications

- Critical institutions (police and fire departments, hospitals, shelters)
- Essential workers
- Food supply
- Power and fuel supply
- Water supply
- Housing
- Sewage treatment and outflow

Collaborate to Develop a Regional Infrastructure Vision

Infrastructure relies heavily on linked networks; damage to one component or system can have cascading effects on the others. Unpredictable effects caused by that interdependent relationship reinforce why the region as a whole should comprehensively evaluate and prepare plans and systems that reinforce resiliency and swift recovery. An accurate assessment of critical infrastructure, its vulnerabilities, and the snowball effect that catastrophic events can wield on such systems is a strategic part of regional planning and preparedness. All residents expect to have access to critical infrastructure and services that enable continuity of day-to-day life in a return to "normal."

Infrastructure planning and investment must be guided by a shared and a systematic framework, where parts reinforce each other across infrastructure and service sectors. Currently, systems run independently of each other despite a need for their functional interconnectedness. This recommendation goes beyond simple intergovernmental aid agreements. In relation to the wider metropolitan statistical area, the sponsoring communities must have a vision of a comprehensive infrastructure framework related to the growing demand and unique physical characteristics of the region as a coherent whole, not as a series of independent parts.

Access

Transportation is critical for emergency ingress and egress. Provide adequate access for evacuation, for emer-

Redundant and Hardening Infrastructure

Infrastructure type	Definition	Example
Redundant infrastructure	Infrastructure with a backup in place to help mitigate consequences if critical infrastructure fails to perform	When two of Loveland's three separate intakes were damaged at its water treatment plant, the city was able to use the remaining one.
Hardening infrastructure	Physical changes to make infrastructure less susceptible to damage	Loveland encases its water pipes with concrete at creek crossings.

gency service providers, and for continued delivery of other critical infrastructure, including fuel and food. To minimize vulnerabilities to critical infrastructure and to maintain basic access and functionality in the event of a natural disaster, it is important to highlight two types of approaches that can be undertaken to achieve those ends: redundant infrastructure and hardening infrastructure.

Specific recommendations:

- Evaluate U.S. Route 34 access as a critical component of the transportation network. The evaluation should be done by using a cost/benefit analysis of a reconstructed road in its current location versus a new "elevated" roadway. The first option may need to be substantially

rebuilt to minimize the risks from future flood impacts, whereas the latter option would not.

- Identify a redundant route parallel to I-25. The redundant route (most likely U.S. Route 287) should be hardened by elevating the road surface one foot above flood elevation. In addition, bridge and drainage crossings should be improved to ensure adequate hydraulic capacity and to reduce the risks from scour or erosion at abutments.

Resilient Water Infrastructure and Planning

The panel was concerned about addressing water issues in a region fraught with history, politics, and emotion on

Regional Collaboration: The Platte River Power Authority

The Platte River Power Authority is a partnership of the town of Estes Park and the cities of Fort Collins, Longmont, and Loveland. It is a local example of leadership and regional cooperation. The power authority operates the fourth-cleanest coal-fired power plant in the nation, which supplies 70 percent of the region's power, with the remaining energy coming from a natural gas peaker plant. To minimize the effect of potential disruptions to the power supply, the panel recommends prioritizing the following approaches:

- Identify system distribution vulnerabilities.** The single power line in Big Thompson Canyon was successfully relocated through the national forest. A vulnerability assessment should consider exposure of transmission lines to fire and other risks and should consider use of alternate redundant lines, as well as any related risks to collocated telecommunications.

■ Identify system power production vulnerabilities.

Identify and conduct scenario planning for coal storage during rail service disruption, redundancy of gas service to the peaker plant, and other power production risks.

■ Consider demand-side options.

Assess options for an energy demand reduction ordinance to protect life, health, and safety should either the coal or gas plant be unavailable for an extended period.

■ Plan for sustainable growth.

Assess whether the current generation growth plan is consistent with projected regional population growth. Assess the costs and benefits of using efficiency and demand response to reduce or delay investments in new generation capacity. Consider expanding the use of renewables and hydropower to meet additional capacity needs.

the topic. As the panel heard many times, in this region, “whiskey is for drinking; water is for fighting.” Although the topic of water could fill many volumes, and the sponsoring communities have been dealing with those issues for a long time, the panel still felt it was important to address some aspects of the subject where it relates to resilience.

Both water and funds for water-related infrastructure can be limited resources in northern Colorado. As the region grows, water conservation will play a central part in the conversation on resilience. The panel was impressed with the sponsoring communities’ efforts to date on this critical and contentious issue. It is clear that public education endeavors—for both residents and the many visitors—should continue. The dramatic relief map in the Loveland Museum/Gallery (shown on the cover of this report) is a prime example of how to explain a vast and complicated watershed system, and other innovative approaches are suggested later in this report.

Although conservation is valued in the region, the sponsoring communities should continually push to become national leaders in per-capita water consumption through incentives, development requirements, impact fees, and outreach and education. Emergency management ordinances should be considered to enact temporary conservation measures in case of a disaster.

Specific recommendations:

- Determine the total water needed for the region (each community with a water delivery system, including growth projections to supply health and welfare—essentially, January indoor use).
- Identify the likely “wet” water available to the region during the historically lowest water storage volume—the highest-risk scenario.
- Understand how many days of water storage are available under different water supply interruption scenarios.
- Determine a goal (number of months) for water supply storage, and identify sources of additional needed water capacity for emergency events.

- Increase redundancy of critical supply, water and wastewater treatment, and distribution components: intakes, emergency power supply, pumps, and communications.
- Analyze interconnected capacity, and identify improvements to increase flexibility and redundancy of regional water distribution.
- Refine intergovernmental agreements for water supply interconnects for potable water distribution, as needed.
- Create a 50-year master plan to relocate essential water and wastewater facilities out of the 500-year floodplain, or use other mitigations to reduce risk (encase in concrete or install deeper).

Thinking Strategically about Housing

The awareness, energy, and resources that communities bring to recovery from a painful and heart-wrenching disaster can catalyze actions that contribute to broader objectives of livability and sustainability. Those communities that recognize that linkage become stronger, more vibrant, and better able to withstand future events, because they have laid the groundwork for maintaining themselves as healthy, functional, and self-sufficient—they bounce forward.

The critical period in a disaster is within the first five days, and there is strong competition for people and resources. Each community is facing the same needs at the same time. The sponsoring communities showed tremendous ingenuity in responding to the 2013 floods, where people were shuttled in and out of Estes Park by helicopter. But building resilience means planning and being prepared rather than relying on last-minute home-run solutions.

The general themes discussed in this section are applicable across the region—affordability and diversity in housing opportunities. The connection of those themes becomes particularly clear through the lens of Estes Park’s experience with its essential workers during the 2013 floods. Although the recommendations focus on resilience in relation to that event, it is the panel’s hope that the sponsoring communities will see those housing issues in

Estimated Number of Low-Income Renter Households in Larimer County, 2009

HUD designation	Households	Number cost burdened	Percentage cost burdened
Low income	7,788	2,336	30
Very low income	8,651	6,629	77
Extremely low income	13,918	11,065	80

Note: Cost-burdened households pay 30 percent or more of income for rent.

a regional context much as a potential new resident to the region would.

Regional Affordability—Market Scan

Housing affordability remains a challenge throughout the region. Larimer County has a significant housing gap. Vacancy rates across the region have dropped well below 4 percent. A January 2014 Colorado Apartment Association newsletter indicated that rents are on the rise, and vacancy rates are at a 12-year low. The average monthly rent in Fort Collins hit its highest point in at least four years, climbing to \$1,056 in the third quarter of 2013. According to the state Division of Housing's quarterly report on multifamily housing affordability and availability, only 2.9 percent of the units were available at the end of that quarter. Rents in Fort Collins and Loveland have climbed more than 37 percent since 2008. A 2013 study by Compass of Larimer County indicated that the county needs more than 10,000 additional rental units (source: "Report: Larimer County 2013 Affordable Housing").

The combined costs of housing and transportation have swelled since 2000, whereas incomes have failed to keep pace, according to a report from the Center for Housing Policy (source: "Losing Ground: The Struggle of Moderate-Income Households to Afford the Rising Costs of Housing and Transportation," 2012). When factoring in cost-burdened owner-occupied households, nearly 45,000 (or almost 37 percent) of all Larimer County households are struggling to maintain shelter, a basic human need. High housing costs prevent families from building emergency funds and family assets that can help them weather natural and financial disasters. Some research shows that an emergency fund of as little as \$500 can keep a family

from falling into financial instability—which is again, a resilience issue.

For many middle- and lower-income residents, high rents choke spending on other goods and services, impeding the economic recovery. Low-income families that spend more than half their income on housing spend about 33 percent less on food, 50 percent less on clothing, and 80 percent less on medical care compared with low-income families with affordable rents (source: *Out of Reach 2014*, National Low Income Housing Coalition).

From an economic perspective, the existing housing gap and housing losses due to the 2013 floods continue to reverberate through the sponsoring communities. The loss of housing for workers means fewer workers—both seasonal and essential—and increased competition for those remaining workers. Businesses that have relied consistently on the same workers year after year have found that those workers relocated after the floods, either because they could not afford to be out of work for an extended time or because they were unable to find affordable housing. Businesses that rely on seasonal workers stated that they have no place to house staff during the summer months. In Estes Park, the schools saw declining enrollment as a result of families having to relocate after the floods, losing both continuity for their students and critical funding dollars.

Housing Opportunities for Essential Workers

A full range of essential workers must live within their community to make it resilient. Critical first responders generally include firefighters, law enforcement officers, utility workers, nurses, and paramedics. In many communities, especially those driven by tourism dollars, essential workers can also include service workers who are

Housing Affordability, Larimer County

Average rent	\$1,000
Average income (emergency medical technician)	\$2,666/month (\$32,000/year)
Affordability factor (rent as percentage of gross income)	30%
Target total monthly cost of occupancy (rent + utilities)	\$800

Note: 54 percent of renters in Larimer County are paying more than 30 percent of their income for housing.

indispensable to the local economy, such as housekeeping staff, wait staff, and child care providers.

The panel's research determined that many essential workers can neither find nor afford reasonably priced housing in the communities where they work. When factoring in the average 60- to 80-mile daily commute of an essential worker and the cost to the individual worker, the risk to the wider community that relies on those services becomes increasingly serious. Longstanding research holds that the average household should spend no more than 30 percent of its income on total occupancy costs in order to maintain affordability. Anything above that threshold indicates economic distress. However, that goal is increasingly unattainable for middle-income families, as tightening markets push up rents ever faster, outrunning even modest rises in pay.

The rental housing vacancy in Estes Park is exceptionally low—below 2 percent for the past two years. The Compass report, cited earlier, indicated that the need in Estes Park was 230 units. That need has only grown with a rising number of rental units being converted into condominiums, taken off the market, and rented seasonally by owners. On the day the floods hit Estes Park, there was no vacancy in the housing stock. Further exacerbating the acute shortage, 110 renter households were affected by flooding, and much of that housing has not been replaced.

Filling the Gap with the Appropriate Housing Mix

In times of crisis, vital services may be inoperable, and essential workers may struggle to reach their jobs. Complications arise, costs escalate quickly, and the risk to life and property increases. The panel strongly recommends that

the region identify housing needs for essential personnel by geographic location and develop accessible housing for those individuals and their families. Essential personnel are the lifeblood of any disaster response, in addition to the overall health and resilience of a community. Critical first responders, furthermore, should be physically close, ready to preserve life and property. However, much of the northern Colorado communities' prohibitively expensive and limited housing stock has forced those critical community members to commute from outside their service areas.

The panelists believe that it is critical for the sponsoring communities to fill the unmet needs for housing in their respective communities in order to increase both physical and economic resilience. The economic reality of building costs versus value suggests the need to integrate market-rate units with affordable units in order to ensure that the property can support itself. Further, integrating varied income and unit types creates a healthier, more resilient project. Otherwise, any project will likely require some sort of subsidy. For further discussion on financial mechanisms for pursuing the following recommendations, see the next section on Financing Resilience.

Specific housing recommendations:

- Conduct a housing needs assessment with particular focus on essential workers.
- Develop housing opportunities for the following priority sectors:
 - seasonal housing;
 - workforce housing;

Case Study: Estes Park

During the 2013 floods, doctors and nurses who worked at Estes Park Medical Center faced a three-and-a-half-hour, one-way drive from the valley below where most of the medical staff lived. The hospital in Estes Park was forced to helicopter in staff to meet medical needs, notwithstanding those seeking medical assistance who were unable to reach the centers of care. To meet that critical shortage of essential workers, the medical center provided temporary housing along with a food per diem for the 20 percent of its employees who lived out of town.

In a single month, that effort cost about \$700,000. If that investment were leveraged by four, it would equal a \$3 million fund. At a construction cost of \$120 per square foot, that fund could result in 25,000 square feet of multifamily housing. Twenty-nine 850-square-foot two-bedroom units could potentially house 116 people, including essential personnel and school-age children. Contingency plans for temporary housing are not enough: instant disasters such as flash floods, tornadoes, and fire can immediately cut off access to communities.

Further still, the costs of essential workers commuting long distances from home to work extend beyond the community itself and can prove too unwieldy for an individual worker to bear. For example, a firefighter who works in Estes Park, unable to find affordable housing there, chooses to live in Loveland—a 60-mile round-trip to Estes Park. At the federal mileage reimbursement rate of \$0.56, the commute adds another \$30 per day, or about \$600 per month, to his total occupancy cost (housing + utilities + transportation). At an average regional annual salary of \$32,000, our firefighter's combined cost of housing and transportation is about 61



Estes Park, affected most by the 2013 floods, still shows signs of initial destruction. Despite significant progress in cleanup efforts, damage is still visible in many parts of town—from washed-up silt along the banks of the Big Thompson to damaged pipes and roads in residential neighborhoods.

percent of his gross pay, leaving little disposable income that can be used for such things as food, health care, or other basic necessities. That fact would suggest that such households are either cutting corners on essentials or accruing debt.

- housing for young families and midlevel professionals;
- smaller efficiency units suitable for seasonal workers;
- mixed-income multifamily product; and
- single-family starter homes.

Financing Resilience

THE NORTHERN COLORADO REGION is one of the most beautiful places on earth, and living here requires an investment to ensure that it remains livable and beautiful. Floods, fires, cyclical water availability, and fragile air quality are simply a part of living in northern Colorado, and the cost of dealing with those issues is part of the price residents pay for the privilege of living in such an environment. Even a dedicated commitment to resilience can become empty without adequate resources to support investment and rebuilding.

At the same time, the sponsoring communities have exhibited strong fiscal prudence over the years, avoiding using debt for projects and finding ways to stretch shrinking funds even further. When facing uncertain risks from a changing climate, that spirit of creativity and innovation will need to continue as the sponsoring communities explore new financial resources and mechanisms to thrive in the future.

Financial Tools and Funding Strategies

This section describes a number of financial strategies to help create resilience in northern Colorado. Some of

the strategies are specific to recommendations in other sections of this report. Others are suggested as parts of a comprehensive financial strategy for long-term solvency.

Reclaim the Floodplain

Clearly, resilience strategies in the floodplain will require investments. Funding those investments will be a challenge for the sponsoring communities. An ideal funding policy would be fair, consistent, and strategically limited. It would also provide incentives to create a desired market behavior—in this case, removing development from threatened areas. A floodplain occupancy fee could be levied in addition to property taxes and applied to only those properties lying within a designated floodplain district (e.g., the 100-year floodplain). The funds received from the fee could be used to (a) finance the acquisition and demolition of properties within the flood zone, (b) fund incentives such as reimbursement of relocation costs and other tools designed to encourage residents and businesses to move outside the flood zone, and (c) restore the acquired land to a more natural condition. By design, the program would end when the policy objective had been met, and it would affect only those people who are in high-risk zones. In Estes Park, the floodplain occupancy fee program could take on a different character. Because intense development in



The scale of the devastation caused by the 2013 floods is still apparent in the Big Thompson River corridor. The panel witnessed many sites along the corridor and in the floodplain that were still grappling with severe soil erosion and property damage.

high-risk locations is intrinsic to the town's character and its livelihood, the fund would not be designed to encourage relocation. Instead, it could be used to build an emergency reserve fund.

Alternative existing sources of funds should be explored for further funding, including the communities' share of Larimer County Open Lands program funds, funds from open space impact fees, trails land funds, Great Outdoors Colorado grants, and even general fund allocations.

Specific recommendations:

- Consider adopting a floodplain occupancy fee.
- Explore alternative sources of funding for floodplain reclamation.

Provide a Formal Structure and Funding for Emergency Assistance

The sponsoring communities performed a remarkable task after the 2013 floods by assembling relief funds (and materials) from an array of government, nonprofit, and private sources with astonishing speed. Those funds were critical to a quick recovery. Still, many community members told us that they feel there is a need for much more readily accessible funding to address immediate needs for cash to help affected residents and businesses following a disaster. Through quickly organized but effective efforts by the Community Foundation of Northern Colorado, the Bohemian Foundation, the United Way of Larimer County's Small Business Recovery Fund, the Richardson Fund, and others, over \$2 million was assembled, arranged, and distributed, albeit sometimes on an ad hoc basis.

The region could capitalize on its spirit of pragmatic generosity by exploring ways in which it can better leverage human and financial resources. Oftentimes, privately donated funds are duplicative, leaving some residents flush and others struggling to recover. Planning for recovery needs and establishing deposit and distribution procedures before an event could help ensure that resources are deployed in the most efficient and effective manner. Possible sources of funding for emergency assistance could be the floodplain occupancy fee, the insurance programs

described on the next page, or philanthropic resources. In addition, arrangements could be made in advance with local foundations to hold and manage the funds to avoid potential tax liabilities and to provide mechanisms for public accountability of funds. Those organizations are also more likely to have close relationships with high-performing nonprofits and to be able to align missions with resources when a disaster occurs.

Financial resources are important in recovery, but human resources are critical. Another opportunity in pre-disaster planning is to establish a registration platform for citizens who are willing to volunteer in the event of a disaster, inventorying their special skills and equipment, and obtaining waivers of liability in advance. That same platform could be used to help register families or individuals who are most vulnerable in the face of disaster, such as seniors with vision or mobility issues that hinder evacuation or neighbors without reliable transportation or who are remotely housed. Businesses could also use the platform to offer resources in the event of a disaster, such as temporary locations for



Small businesses are crucial components of a well-developed economic development strategy and are essential for the long-term health and resilience of the communities in which they reside.

check cashing, potable water distribution, or hot meals provided to emergency workers by local restaurants.

Although insurance may not be an obvious component of resilience, it plays an important role in any community's recovery process. FEMA and the Colorado Intergovernmental Risk Sharing Agency (CIRSA) provide insurance funding for recovery efforts. Though those programs are beneficial in assisting with long-term recovery efforts, accessing the funds is a long and difficult process and does not satisfy critical emergency needs in the immediate aftermath of an event.

Two alternatives for insurance and insurance-type coverage are worth exploring: parametric insurance and self-insurance. Parametric insurance offers a way to get immediate access to unrestricted funds. Unlike conventional property and casualty insurance, it is acquired on a custom basis. Because the policies are custom tailored, this type of insurance is extremely flexible. It could be a source of funds that an insured entity can use at its discretion to fund immediate critical needs. Under such a policy, the insurer would agree to pay the insured entity an agreed-upon amount immediately upon the triggering event. Funds can be tiered such that there are multiple triggering events, with increasing benefits accruing for each successive triggering event. For example, the first trigger might be the attainment of a prenegotiated river flow rate. The second trigger might be reaching a still higher flow rate or maintaining the first flow rate for 48 hours. With that type of multitrigger policy, the benefits increase in parallel as the event increases in severity or duration. A parametric insurance policy has no deductible and no requirement to prove or quantify damages. As a result, the time between the event and the payment

is greatly shortened, thereby providing funds much more quickly than FEMA or CIRSA.

Under a self-insurance scenario, the sponsoring communities would fund reserve accounts over time that would become available should a disaster occur. Funding for the reserves could come from general property tax revenue or from a potential floodplain occupancy fee. Money from the reserve fund could fund grants or immediate zero-interest anticipation loans to disburse cash for quick recovery while applicants wait for insurance or FEMA claims to be processed and paid. In the case of the loans, the claims proceeds would be pledged so that when they are received, the loans would be repaid and the funds returned to the reserve.

Although insurance is just one financial tool for recovery and resilience, it can provide a necessary bridge between the immediate aftermath and the long-term recovery. With either of the insurance strategies, it would be prudent to plan for allocation and distribution of the funds far in advance of any event. Some flexibility should be left for community priorities and unforeseen circumstances, but advance planning will help in distributing funds more effectively.

Specific recommendations:

- Create a formal structure and funding for emergency assistance.
- Explore parametric insurance and self-insurance products.

Funding Infrastructure

A number of major infrastructure needs were identified during the panel week, including those related to water, transportation, and housing. The greater capital demands of implementing infrastructure replacements and improvements and responsibly accommodating growth need to be met with a reconsidered approach to how they are financed. The panel is aware of and appreciates the desire of some to operate on a "pay-as-you-go" basis. That approach has proved prudent and successful in the past, but it is unlikely to be feasible as the scale of the undertakings increases. The panel believes that in some cases the

Parametric Insurance

A type of insurance that is based on the occurrence of a triggering event, and not the indemnity of losses.

benefits of immediate action require the reasonable use of debt to avoid the negative consequences of delay.

The total amount of the funds needed for infrastructure replacements and improvement can be mitigated. In many of the communities in the region, water rates are tiered depending on consumption and user type. That approach not only encourages conservation but also helps fund infrastructure improvements. Funding for infrastructure initiatives that increase capacity or support elevated levels of consumption should be supported by the demand generators. New development should bear the incremental infrastructure cost of serving the demand it creates.

Many stakeholders identified I-25 expansion as an urgently needed infrastructure improvement. Although no region can solve its transportation indefinitely by simply widening roads—and increasing traffic capacities can frequently exacerbate congestion problems instead of alleviating them—I-25 is indeed a lifeline for the region and expansion is needed. However, funding a widening project for the road has proved extremely difficult. Federal transportation policy has increasingly pushed funding responsibility for road construction and improvement to the states and local governments, which is only partially offset by allowing tolling on some lanes. Arguably, the benefits provided by widening I-25 extend beyond simple economic development, since it is also a critical evacuation route and could be a component of a transit solution if a third lane were dedicated to HOV and a part of a bus rapid transit network.

Infrastructure planning is crucial to maintaining access in the event of natural disaster.



Therefore, the range of potential funding sources might extend to Homeland Security funding or to mass transit funding, although recent federal transportation funding allocations have also decreased the amount of transit funding available. The sponsoring communities have so far been unable to agree with their neighbors on how to share costs for a widening project. Since I-25 is a crucial lifeline to the region, communities may well need to accept a disproportionate share of the cost now rather than find it inaccessible during an emergency.

Evidenced by the recommendations stated earlier in the discussion on housing, the panel views housing as part of the infrastructure for the region. Several interviewees mentioned housing and affordability challenges—challenges that many desirable communities face. Given the growth projections for the sponsoring communities, this issue is likely to be relevant into the foreseeable future. It may be prudent to create a dedicated source to fund workforce and affordable housing. Funds may come from an allocation of developer fees, transfer taxes, mill levies, lodging taxes, or other possible sources. Housing should be viewed as a regional resource, and funding and development should be coordinated as such.

Possible funding strategies for meeting housing needs:

- Provide density bonuses to incentivize development.
- Mandate that a component of each market-rate project incorporates affordable housing.
- Waive or reduce entitlement fees for projects that incorporate workforce housing.
- Establish regulations and deed restrictions.
- Facilitate developer investment by covering a range of infrastructure costs.

Possible funding sources:

- The U.S. Department of Housing and Urban Development's HOME Investment Partnership Program
- Community development block grants (CDBGs)

- CDGB disaster recovery funds—available now for housing
- Low-income housing tax credits
- Community development financial institutions as funding partners
- Bonding authority
- Federal Home Loan Bank grants
- Corporate and philanthropic partners

Possible public/private partnerships for housing needs:

- Ground leases on city-owned land
- Community Land Trust, to facilitate homeownership
- Public asset partnerships (donation to nonprofit that assists in creating housing)

Collaboration to Leverage Public Funding

The state has the power to break down certain regulatory barriers that preclude effectively dealing with natural, eco-

nomic, social, and transportation issues where localities are inevitably the first responders. For example, the state can make bridge loans to assist localities in the immediate period after a disaster. The state also has planning money that could be utilized for responsible land use that the localities have not tapped into effectively.

Any partnerships with the state must be more effective in keeping its member localities resilient. Of immediate concern is the state's not having made FEMA reimbursements to localities. Whether because of insufficient state resources or a local lack of understanding of how to seek reimbursements, the state is the channel for making that aspect of event recovery work.

Although the panel did not review state structural barriers, the sponsoring communities should work with the state to uncover and fix legislative and regulatory barriers to the effective use of financial and human resources.

Specific recommendations:

- Determine whether regional consensus can better leverage state emergency funds and planning resources.

Understanding FEMA

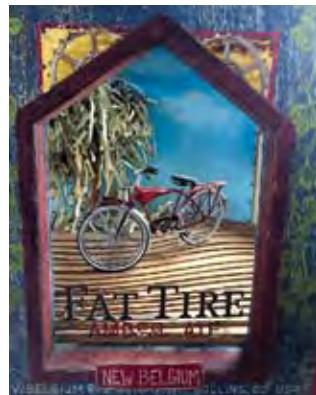
Because the Federal Emergency Management Agency was a key player during the recent flooding and recovery, specific focus is devoted to that federal agency. FEMA's quick responses with team resources to supplement those of the local first responders are appreciated. Although the federal response to the emergency was fast, the response by some 17 separate federal agencies was initially confusing to the local governments. Some FEMA policies frustrate more effective local recovery efforts. The short terms of rotating, onsite teams created a lack of continuity and perceived failure by FEMA to keep certain commitments.

Through better understanding of FEMA constraints and opportunities, localities can make better decisions on recovery and rebuilding. Apparent local misperceptions may be resulting in a failure to maximize federal funding and reimbursements. Awareness of how open space can

address hazard mitigation, the ability to articulate the "alternate project" concept when relocating vulnerable infrastructure, and knowledge of how to match various federal funds with state monies will allow for more leveraging of local public and private funds to build more resilient constructed or natural public infrastructure.

The sponsoring communities can leverage FEMA interest in recovery issues through a regional approach. One goal could be a pilot program that looks at the interrelationship of natural events like fire, flood, and drought with future essential resources for human and business presence in the region and the region's economic resilience.

Local governments must adapt to the fact that FEMA reimbursements are not immediate. Therefore, local governments should plan for a bridge period and, more long term, should plan their necessary hardening or redundancy of infrastructure into the future to be "shovel-ready" to receive any potential reimbursements.



Each of the sponsoring communities retains a distinct character and unique set of cultural offerings—apparent in the scenic mountain views of Estes Park, the host of microbreweries in Fort Collins, and the abundance of public art in Loveland. Those identities not only complement one another but also help create a more vibrant and dynamic region.

- Determine whether the state will support more federal funding to capable regional entity.

of lifestyle options. Yet it functions admirably as a whole—what might be called unified diversity.

Economic Development for Long-Term Strength

A less obvious component of resilience is a healthy, diversified local economy. Communities that are dependent on one or two major sectors for economic prosperity are inherently more vulnerable to a disaster that may disable those sectors. A healthy, diverse economy creates the financial resources and talent pool to respond to and rebound from setbacks more quickly and with less lasting damage. The most important tool for building that attribute is a robust economic development strategy.

It is helpful to step back and look from the outside. What draws visitors and businesses to the northern Front Range region? Simply put, it is the region. The sum is greater than the parts, because no one thing sets the region apart. The region has lots to offer, with a surprisingly diverse set

Complementary Identities and Economies

The economic development programs the panel saw in each of the sponsoring communities are very strong, but because the region is the draw, the region should be marketed first. An uncoordinated regional effort, quite simply, leaves opportunity on the table. The panel heard that efforts have been made to coordinate through formal and informal means in the past, with mixed success, and currently some coordination is occurring through the Northern Colorado Economic Development Corporation. But it is telling that the panel was unable to answer the question, “If I were the site selection officer for a top global technology company, where would I go first if I wanted to put the northern Front Range region on my list?” Employers will look at entire business ecosystems, not single cities, whereas their employees will match where they choose to live with lifestyle preference. The region’s considerable strengths can play very well if it positions itself correctly,

because it can satisfy many diverse preferences. To do so, it needs to sell itself effectively, which means each community needs to also cross-sell its neighbors.

Estes Park, Fort Collins, and Loveland have strikingly distinct characters, each of which contributes to the region's allure. If all the towns were the same, the region would not be nearly as vibrant and desirable to diverse users. Its strength is in those key differences put together in a single region, offering more choices in what an employer or visitor will regard as a single location.

The study area has many advantages, proven assets that have given it buzz as a great place to live. On the commercial front, Loveland has substantial immediately available space, particularly the former Hewlett-Packard site. There is ample support for growing businesses: the incubator and accelerator in Fort Collins and Loveland, access to seed capital, and a strong generator of young talented labor and entrepreneurial support at Colorado State University. Then, of course, there is the range of activities in the area, centered on mountain recreation but extending in many directions from there. An important part of those activities is the arts. A rich arts and culture scene adds character to a region, and programs like Loveland's that work to nurture and promote the arts are particularly noteworthy. Such programs can also be economic generators of their own—the arts and culture industry generates over \$8 million a year in Loveland alone.

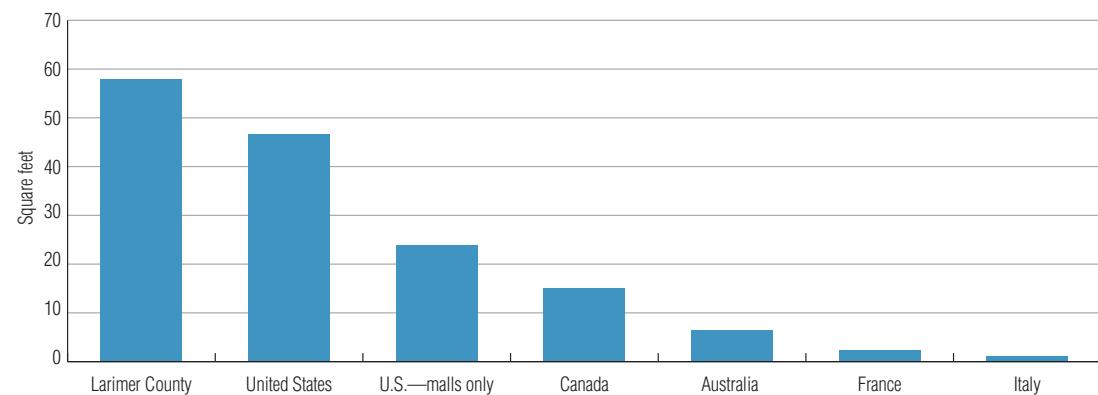
The disadvantages revolve primarily around the lack of regional coordination of economic development efforts. That lack of coordination is due in part to the limited vehicles available for coordination; they may exist but are not being fully used.

As a result, the current efforts are centered on each individual community and, in many cases, pit the communities against one another to compete for the same business. That situation seems to be a rare example of self-interest at the expense of regional strength. Although it may be understandable given the importance of sales taxes for local revenue, the result is a contest in which each community competes for the same prospects.

That circumstance has influenced the retail sector in particular, where there has been something of an arms race of malls. The Centerra development prompted other area malls to spend money to upgrade and to expand, which in turn has prompted yet others to do likewise in search of the same tenant pool. That effect is strikingly illustrated in the graph below.

Most analysts believe the United States is on average substantially oversupplied with retail, at 46 square feet per person. Yet in Larimer County, that figure is almost 25 percent higher than the national average at 58 square feet per person.

Retail Space per Person



Source: International Council of Shopping Centers.

Adopt an Integrated Economic Development Strategy for the Region

The panel recommends an integrated economic development strategy for the region. Cities and towns can generate more business working together than acting separately. A coordinated effort will always lead with the region's greatest strength, getting a commitment to the region first and only then moving on to a specific location. Although that approach applies to larger developments and investments, a simpler example exists in the regional tourism market (see box at right).

To sell to the regional strength first, every prospect should start out as a shared prospect. That means the sponsoring communities need to share leads as well as cross-sell one another. Once a prospect is sold on the region, the focus can shift to the most suitable location within the region, and the communities can decide the basis on which they would like to continue.

Of course, economies of operational scale are also possible here, but the panel advises against replacing what already works. Instead, as has been done in other such areas, Estes Park, Fort Collins, and Loveland should seek sharing where and when it makes sense. Conversations are critical to cooperation. An ongoing dialogue among the individual communities should begin by deciding on the best way to cooperate.

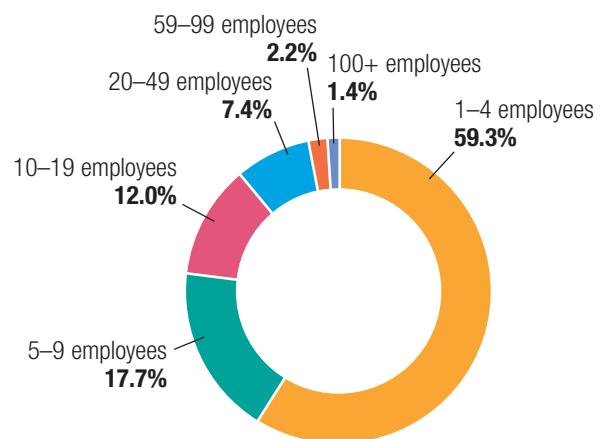
It is important to keep in mind that to be successful, a shared economic development approach will require a dedicated, long-term commitment of both funding and consistent direction with a long-term view. The panel urges the sponsoring communities to consider a final, less obvious economic development issue, which concerns providing regional support for the infrastructure that is needed to make the tourist industry function. All of the points previously mentioned in this report—not only maintaining transportation access and water infrastructure but also particularly ensuring that the region has well-located, affordable places to live—are critical to the long-term health and economic vibrancy of the region.

Leisure and Travel Market

The leisure and travel market is a great example of how an integrated approach could increase the economic benefit to the sponsoring communities. Visitor centers, collateral materials, and the online presence of each community seem to be devoted almost exclusively to the sponsoring communities individually, but they could easily and more effectively market themselves by also marketing one another. A potential visitor to the arts scene in Loveland is also likely to be attracted by the quaint and beautiful mountainous environment of Estes Park and the lively, hip, entertaining environment of urban Fort Collins. A coordinated northern Front Range website could extoll all those virtues, as could the website for each city. That effort should also extend to the gateway tourist websites like TripAdvisor, where the region can work together to manage the message.

The sponsoring communities want their customers to have a great experience, to extend their stays, to go away raving about the region to their friends, saying good things on social media, and planning to come back again and again.

Larimer County Employers by Number of Employees, 2011



Source: U.S. Census Bureau, *County Business Patterns*.

Small Business Assistance

Local small business development organizations have recognized that some businesses, such as those in Estes Park, are geographically and culturally isolated. They demonstrate commitment to those businesses by delivering recovery assistance to those in need. Building on their work, other business alliances in the region could help identify places of risk and help coordinate a preparedness campaign. For a limited time, stationing seasoned counselors at points of business contact (co-staging a one-day-a-week presence at a FedEx store, for example) could help develop trust and lasting relationships for the businesses, which would extend beyond a crisis.

Other opportunities exist to engage committed professionals to help small businesses manage temporary setbacks and return to health. During Super Sunday tax events, state associations of certified public accountants have recruited CPAs to volunteer their expertise. The CPAs work with small businesses affected by disaster to maximize their federal tax deductions related to losses.

Like any other effective network, identifying those most at risk and establishing trusted relationships in advance would help shorten the distress period for small businesses. With northern Colorado's strong sense of commitment to its neighbors, developing support systems and reaching out to small businesses in advance are a natural progression of effective outreach.

Specific recommendations:

- Adopt an integrated economic development strategy.
- Cross-sell communities in leisure and tourism markets.

Role of Small Businesses

According to the U.S. Census Bureau, 98.6 percent of Larimer County employers had fewer than 100 employees, slightly higher than the Colorado average. Small businesses collectively employ the majority of workers, contribute to the sales tax base, and are often actively engaged in civic life and leadership. Small businesses are the thread that sews the community together, not only providing

goods and services tailored to community desires but also enabling residents to gather and share life.

An opportunity exists to strengthen the disaster planning and support system for an unlikely vulnerable population: small business owners who are the backbone of the community. Often in the early stages of recovery, businesses like gas station convenience stores, day care centers, and coffee shops are essential resources. They provide basic daily needs and community interactions so people can rebuild their work and their lives. Since small businesses are vulnerable to a chain of events that can significantly disrupt both cash flow and the fulfillment of their customers' needs, early planning can go a long way toward minimizing those effects. Helping small businesses think through contingencies, establish business continuity plans, and know where to go for guidance and assistance is critical to a community's ability to rebound from a crisis. Several substantial resources exist that can address that need, such as three active chambers of commerce that enjoy close community networks, universities, a small business development center, certified public accountants, retired executives, and other community assets.

Using those strengths, the small business support community should actively seek out vulnerable businesses and encourage their participation in pre-disaster planning. Banks, the U.S. Small Business Administration (SBA), chambers of commerce, and peer networks could harness curriculum from the SBA on disaster preparedness and conduct workshops. Those efforts would seek to establish relationships with businesses before an event, with secondary benefits. By developing trust with counselors, businesses undergoing a review could uncover and address current issues that prevent their maximum performance.

Specific recommendation:

- Work with small businesses to establish business continuity plans.

Leading Resilience

ALTHOUGH DESIGN, LAND USE, and financial resilience strategies are essential tools, the devil is always in the details. As with any decision a community makes, there are many stakeholders, challenges, and considerations. Communities that are able to build resilience frequently have strong leadership—the ability to build consensus, build coalitions, and make tough choices. This section describes some suggestions about how the sponsoring communities might lead resilience.

Decision Making and Organizational Resilience

The region dedicated great human capital to recovery during and immediately after the floods. That willingness to pick up the phone or pick up a shovel needs to be parlayed into new means of reaching more robust and long-term consensus on difficult strategic issues related to the risks of climate change. Regional collaboration has been the key thread running through these recommendations. Planning for investments in resilience—in infrastructure, housing, transportation, and economic development—can be complicated for each of the sponsoring communities individually and may be an uncomfortable and difficult process as a regional approach. This section outlines some of the ways that the sponsoring communities might rise to the challenge.

Regional Resilience Working Group

Coloradan pride in self-sufficiency means that many elected officials and other leaders in the public, nonprofit, and business sectors make critical decisions autonomously, although their interests and effects are linked. Expressing each community's individual nature should not prevent coming together to address long-term and subtle threats to quality of life. To avoid the dangers of fragmen-

tation, connecting decision makers into knowledge-sharing communication networks is critical to a resilient Larimer County. Strengthening those linkages will enhance disaster preparedness response overall and will build capacity for more strategic partnerships.

The panel recognizes that many instances of connecting decision makers already exist. The interlinked governance of Larimer County and Estes Valley Long-Term Recovery Groups with the Colorado Voluntary Organizations Active in Disaster is but one example. The Northern Colorado Nonprofit Resource Center built greater capacity for recovery by connecting local nonprofits. In Loveland, many agencies shared workspaces for effective cooperation. More informally, the Estes Park Library was used for daily morning meetings and volunteer coordination.

Candor about local needs can result in necessary consensus building around long-term resilience planning. Without a forum for consensus building, the shortcomings of the decision-making processes put the region's highly valued quality of life at risk. A distrust of organizing on a regional scale may actually result in more government; ineffective use of public, private, and philanthropic resources; and lower resilience. Regional collaboration and regional consensus will provide an avenue for effective policy advocacy and will strengthen opportunities for outside funding.

Although strong community connections have resulted in mobilization for emergencies, the result has been ad hoc decision making that creates no ongoing resilience for a rapidly growing region. Turnover due to elections, retirement of long-tenured officials, and other factors emphasize the importance of a successor leadership plan to avoid gaps in knowledge, experience, and leadership on regional matters. Those reasons also prompt a need for a more defined process going forward.

The panel recommends that the sponsoring communities create a regional working group on resilience. Regional collaboration has been mentioned several times in this report, and indeed, across the country communities are finding that regional approaches are necessary to deal with risks presented by climate change. The working group would be the lead for coordinating approaches on infrastructure, transportation, housing, river management, funding, and other issues related to resilience. The group should include high-level decision makers from each local government, as well as other key community stakeholders. It should meet regularly to ensure progress and continued communication on resilience issues and on community concerns.

Specific recommendations:

- Form a resilience working group with community leaders and decision makers to ensure collaboration on resilience. This group should do the following:
 - Shape regional collaboration on key resilience issues, like the river, infrastructure, housing, and economic development.
 - Assess and plan for financial strategies for building resilience.
 - Regularly review progress and communicate about new challenges and opportunities.

- Foster regular and informal meetings of sponsoring community leaders with nontraditional partners to strengthen relationships and connections.

Facilitate a Public Resilience Summit

Though key decision makers, stakeholders, and local government officials are critical actors in resilience planning, it is clear that the sponsoring communities could benefit from a shared understanding of risk and resilience among their communities. Fort Collins has been successful in public education on floodplain issues in the aftermath of the 1997 flood. A similar effort should be undertaken with regard to a larger sense of resilience, and how climate change will affect many risks in the community, from extreme precipitation to extreme drought.

The summit should include the following:

- Discussion of regional resilience challenges: land use, infrastructure, economic development;
- Identification of community resources to help build resilience; and
- Feedback from the community on challenges and opportunities.

The summit can be an opportunity to leverage Fort Collins's participation in the White House Task Force on Climate Preparedness and to ask state and federal officials to provide their perspectives and insights on the region's

Organizations like the Wildlands Restoration Volunteers, which worked with the Big Thompson River Restoration Coalition, should be commended for their ability to quickly mobilize cleanup efforts in the aftermath of the floods. Going forward, however, a more formalized structure for decision making can help such groups coordinate and collaborate ahead of disaster.



MARY MYERS/WILDLANDS RESTORATION VOLUNTEERS

long-term preparedness, and how they might better collaborate. One example of such an effort is the Washington, D.C. area's National Capital Region "Region Forward"—a consensus-building exercise about how to identify, service, and protect key activity centers within the region developed from the local governments' comprehensive and transportation plans. More generally, the Metropolitan Washington Council of Governments, also located in the D.C. metro region, has become a recognized resource and forum for similar discussions and sharing of best practices.

Universities often take the role of facilitating such summits. Virginia Coastal Policy Clinic at William and Mary Law School has convened all levels of government on issues related to flooding from rain and sea level rise. Colorado State University and Northern Colorado University are incredible resources for the region and may be ideal facilitators for a resilience summit.

Public Engagement through Education and Outreach

We are living in an environment with an increasingly interconnected web of systems—systems that are becoming more and more unpredictable. Those systems can bolster or tear the fabric of our communities. We cannot control Mother Nature, but we can control and plan our response. Some of those responses are tactical, and some are strategic.

Living at the wildland–urban interface means being in a relationship with natural processes like floods, fires, and droughts. The number and intensity of such events appear to be increasing, making disaster planning an everyday practice. The most resilient communities leverage effective, adaptive, and responsive communication and education programs woven into the everyday life of the community. That is not one-way communication but a conversation, a shared narrative. Over time, such narratives build on existing social networks to convey information and understanding, providing answers and crafting new, innovative solutions.

When the floods came, communication within and between communities also came like a flood. Now that the water has receded, and the first year of recovery is nearly over, how will the region and its parts learn from and build on what has been achieved in light of the challenges coming in this year and beyond?

Harden and Create Redundancies in Regional Communications Infrastructure

A comprehensive communications infrastructure is essential to quickly respond and accurately relay information when the unexpected occurs. Vital services may be down, and alternative means of communication may be necessary.

Although technology is important, true preparation for future events does not come from technology alone. There will always be new challenges that require ingenuity, creativity, and new ways of partnering to preserve and enhance life in Larimer County. Meaningful and ongoing preparation produces an emergency plan of action, and, more important, it does the everyday work of weaving relationships into safety nets.

The panel's research showed that when the September 2013 floods arrived, in many cases, the existing technology worked well, and the emergency response teams moved quickly and cohesively. The can-do spirit of the community burned bright.

Local examples of success:

- When the communication structures failed, members of the Amateur Radio Emergency Services quickly set up systems to communicate.
- Power lines were strung across the treetops to restore power.
- Emergency response volunteers and the government team shared incident information through an online document-sharing system.
- Calls to the 211 help lines were aggregated through Google Docs and downloaded to the volunteer teams regularly, allowing them to assess and prioritize response.

However, their effectiveness was hampered by identifiable breakdowns in the communications infrastructure. Landlines, cellphones, and power failed in some locations. Information from a variety of sources, including social and mainstream media, proved uneven and inaccurate. The sponsoring communities should work to harden and create redundancies in regional communications infrastructure. Such redundancies include not only technological infrastructure but also better organization around news and information in an emergency. An example from New Orleans is the Data Center, which keeps information on the impacts of Hurricane Katrina as well as demographic information on neighborhoods and information on the recovery. The availability of such information can help distribute resources effectively.

Specific recommendations:

- Strengthen technical systems:
 - Separate power and phone lines, and update landline 911 system.
 - Extend and enhance high-speed internet connections.
 - Maintain legacy technologies like amateur radio.
- Create a regional clearinghouse for emergency and ongoing recovery information, similar to the Data Center:
 - Leverage local Voluntary Organizations Active in Disaster.
 - Develop a comprehensive database of physical addresses.
 - Proactively use emergency messaging, such as the Everbridge system in Loveland.
 - Enhance public awareness of existing data sources, such as stream-flow and precipitation gauges at www.fcgov.com/floodwarningsystem.

Foster Public Conversations

Until recently, conversations following natural disasters have tended to focus on environmental protection and immediate disaster response with less emphasis on other planning concerns, such as long-term resiliency. However, a community that is not resilient cannot be sustainable. Communities that engage local stakeholders on their vision for the future can incorporate issues of risk and vulnerability, can gain consensus and support on planning mechanisms, and can take concrete steps to implement mitigation measures.

The panel heard a great thirst and need for public conversations about the future of the area between diverse interest groups that rarely have the chance for civic dialogue. One avenue for such conversations may be through the resilience summit suggested in the previous section. However, public dialogue needs to be more creative, organic, and varied than a structured event. For example,

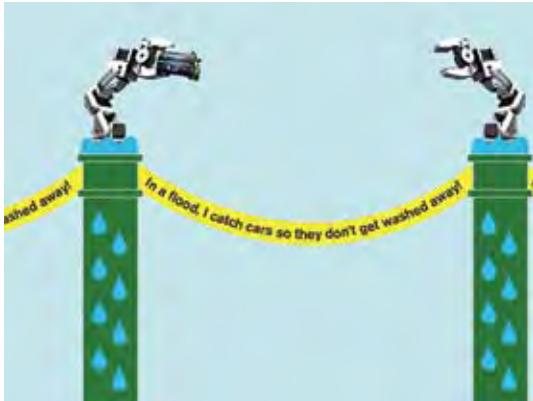
“What If” Scenarios

Provide public, democratic mechanisms to offer education and allow the community to explore “what if” scenarios (source: “Community Participation: How People Power Brings Sustainable Benefits to Communities,” U.S. Department of Agriculture, 2000).

Engage local residents in identifying what matters to them about their communities through a variety of media (art, photography, writing, discussion groups). They allow residents to explore what is at risk and to craft resiliency strategies that result in positive outcomes. By sketching out the gaps in reaching those positive outcomes, the individuals and communities can develop resilient systems and plans that evolve to achieve their goals.

Start with the “what”:

- What do you value about your community?
- What matters to you?
- What is most important to you to know about resiliency?
- What kinds of positive outcomes can you envision?



Informing the public about the threat of natural disaster, including floods, provides an opportunity to get creative. Interactive media not only inform but actively engage citizens in the topic of resilience. New and innovative media like the sign illustrated in the concept sketch (far left) should be at the heart of any public education endeavor focused on resilience.

determine how the following groups can be welcomed into a conversation about the place where they live: retirement community, business community, education community, policy makers, the general public, and primary school, high school, and university students.

The following are wins to build on:

- In Estes Park, the mayor hosted well-attended daily public meetings to update community members on the impacts of the floods.
- In Loveland, the city has painted its utility boxes to engage the public in its vision on art and creativity.

Individual projects can lead to long-term collaborations between government, educators, activists, and the private and nonprofit sectors to create multifaceted educational projects, as well as sustainable partnerships that improve the quality of life in northern Colorado.

The sponsoring communities should actively reach out to all stakeholders, both within the city boundaries and beyond, to invite contribution and engagement. They should not passively wait for a diverse group of citizens to present themselves for involvement. Past discrimination, inexperience, and individual reluctance can hinder full community involvement.

Launch a New Civics Pilot in Each Community

Traditionally, civics education aims to help students understand their place and opportunities in the world, and how people come together to make decisions as communities. The “new civics” builds on that tradition by focusing on the present-day decisions faced by communities, by training

young people to serve as public educators, and by leveraging the energy of place-based activism. The purpose of the new civics is to foster active, informed public participation in civic life by drawing the connections between everyday life and the decisions that give it form. It is not a set method but a group of complementary tools to revitalize opportunities and responsibilities of living in a community.

Engage in Facilitated Dialogues about the Future of the Community through Creative Education and Curricula

Thinking about the future is an important part of building resilience. Through facilitated dialogues, the sponsoring communities may be able to engage with many community groups not traditionally involved in recovery. A good place to start might be the partnerships formed in planning the Social Mixer Recreation Center, bringing together the Estes Valley Medical Center, Larimer Boys and Girls Club, school district, senior center, Parks and Rec Department, and library districts. Using interactive, visual, and 3-D experiences, community members can evaluate their own unique situation. Such tools would provide the ability to analyze a series of scenarios that reflect the range of options for preparation. Those dialogues would create an opportunity to provide outreach and education on flood insurance and fire prevention in the wildland–urban interface.

Other creative possibilities abound. The sponsoring communities could create a program for seniors to learn about the natural world and to explore ideas about natural disaster and resilience planning. Students could take part in educational projects to learn about their place and how to investigate their world. As an example, students could



The panel visited many key sites as part of a comprehensive study tour. Among them were the Horsetooth Reservoir near Fort Collins (left) and the 3-D watershed map in Loveland (right). Both helped the panel better understand the intricacies of the regional watershed system and associated flood risks.



create a vision for the 70 parcels of town-owned land in Estes Park. The panel suggests looking to FEMA's Pre-Disaster Mitigation program for funding for such efforts. Local governments can apply as subapplicants to state applications.

Launch Interactive Media and Projects That Simplify Otherwise Complex Issues

Media like posters, websites, community guides, public art, brochures, and call-in services, among others, can be used to help break down the complicated issues that face the future of northern Colorado. Create appealing and interactive media to educate and engage members of the public about their physical connection to such things as floodplains and fire risk, similar to the 3-D watershed map at the Loveland Museum/Gallery. For example, when updating the floodplain map to include the "sweeping area" within the 500-year floodplain as well as erosion risk areas, commission an artist, scientist, and educator team to design a user-friendly flood map poster and publicize and distribute it around the region, for example, to public offices, schools, grocery stores, and public libraries. A community could also create a public art project on the forces of nature and the risks of the natural world. Educating the public about risks is important, but celebrating successes and the heritage of the region is also important.

The sponsoring communities should consider creating a regional art competition that celebrates the region's resilience in the face of natural events, such as floods, fires, and droughts.

Conclusion

THE REGIONAL FABRIC THAT TIES these three communities together extends beyond the natural topography. The September 2013 floods were a natural disaster that challenged existing political, economic, and environmental structures and brought to life the importance of regional cooperation when it comes to a “bigger picture” view of resilience. Going forward, concentrated policy efforts on any scale should reflect not only the individual nature of each community, but also the complementary relationship they form together—one that makes each invaluable.

Although the direct risks from natural disasters understandably get a lot of attention, resilience is indirectly built through many smaller and less noticed decisions about land use and development. Decisions made on every level can have an amplified effect. Whether they are shared strategies, tools to provide, or a dialogue of

lessons learned, all three communities stand to benefit from ongoing collaboration across platforms. Continued efforts to collaborate and operate holistically not only can help promote each community’s strengths and catalyze a healthy economy but also will make the region more resilient to disruptive events.

About the Panel

Jim Heid

*Panel Chair
Healdsburg, California*

Heid is a land planner, strategic real estate adviser, and sustainable development consultant. He is known for his ability to effectively distill the complex layers of community design and real estate development into understandable concepts that lead to actionable outcomes.

An active member of ULI, Heid has authored numerous articles and publications on the subject of sustainable community development. He is a founding member of the Responsible Property Investment Council; a co-instructor for programs in sustainable community development, mixed-use development, and small-scale development; and an expert adviser to BioRegional's One Planet Living program.

Starting in 1994, Heid has participated in Advisory Services panel assignments spanning all property types and geographies. Most recently, Heid chaired a complex international panel assembled at the invitation of the mayor of Moscow, Russia, to review and advise on the proposed regional expansion strategy for that highly urbanized city.

His firm—UrbanGreen (www.urbangreen.net)—advises legacy landowners, governments, real estate developers, and capital market providers seeking tangible answers to the rapidly evolving discussion surrounding sustainable land development. Current projects include development advisory services for multi-thousand-acre conservation developments in Santa Fe, New Mexico; Calgary, Alberta; and Amador County, California. He is also advising the Queen Lili'uokalani Trust on a large mixed-use, mixed-income community to be developed on the island of Hawaii.

Before founding UrbanGreen, Heid worked as an urban designer/land planner and real estate strategy adviser with Design Workshop (1987–1993) and EDAW (1994–2000), where he also served as chief operating officer.

Initially trained as a landscape architect at the University of Idaho, Heid went on to earn a master of science degree in real estate development from the Massachusetts Institute of Technology as a way to more effectively integrate the realms of economics, development, and design.

Laura Bonich

Murray, Utah

Bonich has worked for Nolte Vertical Five (NV5) since 1995 and has significant experience in the areas of land development processes, regulations, and entitlement/permitting requirements and in the preparation of master plans for large urban infill redevelopment and master plan community projects with an emphasis on the practical implementation of sustainable design practices for infrastructure. She combines a very strong technical background with project management, business development, financial analysis, public presentation, and negotiation skills. Bonich also has significant experience in the U.S. Green Building Council LEED (Leadership in Energy and Environmental Design) certification process and worked directly on the development of the LEED for Neighborhood Development rating system.

As director of the sustainability practice for NV5, she is responsible for incorporating sustainability throughout the company. In that capacity, Bonich works with NV5's engineers to encourage the use of innovative best practices for infrastructure rather than a traditional code compliance design approach.

Bonich has extensive knowledge of the coordination of infrastructure master planning (transportation, water, wastewater, reclaimed water, and drainage) with an integrated approach to the optimization of project infrastructure to reduce construction cost. She has developed numerous infrastructure cost estimates and financing plans and has negotiated development agreements, conditions of approval, and mitigation measures.

She is a full member of the Urban Land Institute (CDC Silver), past branch president of the American Society of Civil Engineers, member of the Institute for Sustainable Infrastructure's National Technical Committee for the Envision rating system, and a member of the Harvard Graduate School of Design Sustainable Infrastructure Advisory Board. Bonich has a BS degree in civil engineering from the University of Washington and an MBA from National University.

Molly McCabe

Bigfork, Montana

McCabe is a pioneer in the field of finance and sustainability. Through her company HaydenTanner, she acts as a management consultant and strategic adviser to nongovernmental organizations, government agencies, and global organizations.

With more than 25 years of experience in commercial real estate, finance, and business consulting, McCabe is a groundbreaker in the monetization of resource efficiency. She has a comprehensive and quantitative understanding of the triple bottom line.

HaydenTanner cultivates practical solutions and strategies to accelerate the emergence of resilient buildings and vibrant, sustainable cities. Her work centers on game-changing innovation—innovation that will change how we live and work and the resources we use.

Using a systems approach, HaydenTanner focuses on identifying future trends in order to recognize technological and cultural shifts, as well as new patterns that can dynamically alter markets. As those themes are charted,

risks are proactively managed with an eye on the big picture and the bottom line. Through thoughtful questions, intuitive listening, and active partnering, McCabe crafts bold and creative solutions to enhance resiliency, community vibrancy, and livability while meeting economic objectives.

McCabe is the author of the book *Practical Greening: The Bottom Line on Sustainable Property Development, Investment and Financing*.

A trained mediator and business coach, McCabe is an active member of ULI's Responsible Property Investment Council and its Climate and Land Use advisory panel. She is an instructor at the Boston Architectural College and a research fellow for the Responsible Property Investing Center. McCabe has an undergraduate degree in economics from the University of California, Davis, and an MBA from the University of San Francisco. Before starting HaydenTanner, she spent several years in banking, real estate, and corporate finance.

Nancy T. Montoya

New Orleans, Louisiana

Montoya is the principal of TTA, a consulting group specializing in developing vibrant and sustainable communities through finance, coalition building, promotion of individual financial capability, microbusiness and small business development, and engagement of other human and capital resources that maximize opportunity.

Recently, she was the senior regional community development manager for the Federal Reserve Bank of Atlanta. Based in New Orleans, Louisiana, she covered the Gulf Coast areas of Louisiana, Mississippi, Alabama, and the Florida Panhandle. Her portfolio of work includes post-Katrina disaster recovery, sustainable real estate finance, neighborhood stabilization and redevelopment, foreclosure prevention and recovery, access to capital for small businesses, and strengthening of alternative credit markets, including community development financial institutions (CDFIs) and flexible lending products. In addition to provid-

ing expertise to community groups and financial institutions on all aspects of affordable housing, she has also worked to promote personal financial stability and asset growth for low-wealth adults and children, community development finance training, support for the development and implementation of financial products that promote savings and equity, and fostering of bank partnerships in her markets.

Montoya began her community development career as a volunteer board member for a community development corporation in her neighborhood supported by the Local Initiatives Support Corporation. Her commitment to community development grew out of that work, and in 1995 she became a community outreach director for Hibernia National Bank.

In her tenure at Hibernia, she developed over \$1.4 million of single-family housing throughout Louisiana and was instrumental in launching the New Orleans Community Development Fund, a CDFI designed to provide financing for blighted housing development.

Montoya holds a master's degree in public administration and a bachelor's degree in marketing from the University of New Orleans and earned a certificate in urban development from the University of Pennsylvania.

Sharon Pandak

Woodbridge, Virginia

Pandak is a partner with the firm of Greehan, Taves, Pandak & Stoner PLLC in northern Virginia. The firm was founded to serve as outside legal consultants and litigation counsel for local Virginia governments. The members of the firm have over 100 cumulative years of experience working on behalf of local governments.

At the firm, she focuses on diverse legal issues facing localities, other public entities, and associations interested in public policy. She litigates in state and federal court. Pandak has worked with regional entities, has appeared before the Virginia General Assembly and regulatory bodies, and has worked on congressional legislation. She is

known for her work on local government operations, land use, zoning, and public facilities.

On behalf of localities, Pandak has provided legal advice on such diverse land use projects as large mixed-use developments, economic development projects, preservation of rural areas, and environmental issues. She has assisted with the development of comprehensive plans and drafted zoning and subdivision ordinances. She frequently presents seminars on land use and other local government issues to elected and appointed officials.

Her current work includes service as general counsel for the Metropolitan Washington Council of Governments in the District of Columbia, where she advises on a variety of regional issues, including the development of regional agreements to provide mutual services.

Pandak served as county attorney for Prince William County, Virginia, for 15 years after serving as the deputy/assistant county attorney, for a total of 25 years as local counsel.

As a gubernatorial appointee, Pandak served on the Commonwealth Transportation Board and on the Chesapeake Bay Local Government Advisory Committee. She participated in former governor Mark Warner's Natural Resources Leadership Summit.

Pandak is a graduate of the William and Mary School of Law and has a BA from the College of William and Mary. She serves on the board of directors of the Prince William Historic Preservation Foundation and is a former board member of the local Habitat for Humanity and the Prince William Parks Foundation. She served on ULI panels in North Carolina in 2008 and in Los Angeles, California, in 2010.

Philip S. Payne

Charlotte, North Carolina

For over 20 years, Payne's primary focus has been the development, acquisition, rehabilitation, and management of middle-market (workforce) multifamily housing.

He is currently the CEO of Ginkgo Residential LLC, which was formed in July 2010. Ginkgo provides property management services for multifamily properties throughout the southern United States and is actively involved in the acquisition and substantial rehabilitation of middle-market multifamily properties. From 2007 to 2010, Payne served as the CEO of Babcock & Brown Residential. Before joining Babcock & Brown Residential, he was the chairman of BNP Residential Properties Trust, a publicly traded real estate investment trust that was acquired by Babcock & Brown Ltd., a publicly traded Australian investment bank, in February 2007.

In addition to his duties at Ginkgo, Payne is a member of the board of directors and chair of the Audit Committee of Ashford Hospitality Trust, a real estate investment trust listed on the New York Stock Exchange that focuses on the hospitality industry.

He is a member of the Urban Land Institute, a member of ULI's Responsible Property Investing Council (founding chair), and cochair of ULI's Climate, Land Use, and Energy Committee. He is also a member of the National Multi Housing Council, Fannie Mae's Green Financing Taskforce, and the Leadership Council for Garrison Institute's Climate, Mind and Behavior Program.

Payne received both a BS and a JD from the College of William and Mary. He has written for various publications and has spoken at numerous conferences on a variety of topics, including real estate investment trusts, securities regulations, finance, and responsible property investing.

Alan Razak

Philadelphia, Pennsylvania

Razak is a principal of AthenianRazak LLC, a Philadelphia-based real estate services company that consults on, creates, and manages real property. He has almost four decades of commercial real estate experience, encompassing development and project management, finance,

architectural design, and consulting. His diverse real estate background includes managing the development process, both as owner and as a consultant as owner's representative and on projects that include residential, office, and commercial, as well as specialized expertise in data centers and other highly technical facilities.

Before merging with Athenian Properties to form Athenian-Razak, he founded and led Razak Company, which was responsible for the development of Jaguar Land Rover Main Line, Pembroke North Condominiums, 5035 Ritter Road for the Administrative Office of Pennsylvania Courts, the Curtis Institute of Music's Lenfest Hall, and other projects. He has also led real estate consulting and development assignments for clients.

Before forming Razak Company in 2003, Razak was a principal with a Philadelphia real estate consulting and investment advisory firm, where he consulted on a broad variety of assignments across the spectrum of real estate issues. Throughout the 1980s, as a partner at developer Rouse & Associates, he managed such high-profile projects as a 400,000-square-foot Washington, D.C., office building and the development of a 20-acre Penn's Landing urban mixed-use project. He began his career as an architect, working on the design of multifamily residential, commercial, and health care projects in the Midwest and Pacific Northwest. And for purely sentimental reasons, he maintains his status as a registered architect in Pennsylvania.

He has served on the Central Philadelphia Development Corporation's board of directors and is a member of the Urban Land Institute, where he developed and currently teaches several workshops for real estate practitioners internationally. He holds a bachelor's degree in arts and design from the Massachusetts Institute of Technology, a master's degree in architecture from the University of Washington, and an MBA with a concentration in real estate from the Wharton School of the University of Pennsylvania.

Damon Rich

Newark, New Jersey

Rich is a designer, planner, and visual artist. As the director of the Newark Planning Office (NPO), he works to make New Jersey's most populous municipality a prosperous, walkable, and environmentally just city. Under his leadership, the NPO's achievements have included completing the city's first waterfront parks, launching the Newark Public Art Program, and drafting the first comprehensive update to the city's zoning regulations in over 50 years. He has led award-winning planning and urban design projects, including Newark's River: Public Access and Redevelopment Plan, recipient of a 2014 New Jersey Future Smart Growth Award; the Box & Beyond: Urban Design Issues for Infill Houses in Newark, recipient of the 2009 Outstanding Community Engagement and Education Award by the New Jersey Chapter of the American Planning Association; and Newark Riverfront Revival, recipient of an Our Town grant from the National Endowment for the Arts.

Before coming to Newark, Rich founded the Center for Urban Pedagogy (CUP), an internationally recognized nonprofit organization that uses art and design to increase meaningful civic engagement, where he served as executive director for ten years. He also served as chief of staff for Capital Projects at New York City Parks, where he led the efforts of 200 architects, landscape architects, and engineers on over \$400 million of investment in the city's public spaces.

Rich has taught architecture and planning at Harvard University, Cooper Union, and Syracuse University, among others, and has written about real estate and architecture for such publications as *Perspecta*, *Metropolis Magazine*, *Architecture*, and *Domus*. His first book, *Street Value: Shopping, Planning, and Politics on Fulton Street*, was published by Princeton Architectural Press in 2010. His design work represented the United States at the 2008 Venice Architecture Biennale and has been exhibited internationally at venues that include the Canadian Centre for Architecture, the Netherlands Architecture Institute, and the MoMA PS1 Contemporary Art Center. In 2009, his

solo exhibition *Red Lines Housing Crisis Learning Center* appeared at the Queens Museum. Rich is a Loeb Fellow in Advanced Environmental Studies at the Harvard University Graduate School of Design, a MacDowell Colony fellow, and a fellow of the MIT Center for Advanced Visual Studies. He is a member of the American Institute of Certified Planners and a licensed professional planner in the state of New Jersey.

Andrew Watkins

Laguna Beach, California

Watkins is an architect, planner, and urban designer at SWA Group in Southern California, with over ten years of professional experience. His current work focuses on large-scale urban design projects that explore the confluence of ecology and urbanism.

He has served as project manager for several community plans on the West Coast, totaling over 3,500 acres and 15,000 dwelling units, as well as urban design and new city planning projects internationally. He is involved in local and national projects and has worked in Botswana, China, Ethiopia, Germany, India, Indonesia, Italy, Mexico, and South Africa, as well as in the United States.

Watkins has researched contemporary urban conditions related to infrastructure and grassroots organization in both developed and developing nations. His past research projects have included "Ecologies of Gold" in Johannesburg, South Africa; "Villages in Development" in the rapidly developing Pearl River Delta in China; "Opportunities of Contemporary Urban Transformations" in eastern Germany; and "Tall Buildings in the City," a research fellowship with Moshe Safdie that explored the potentials of connecting tall buildings. Watkins's research has been published in *Places Magazine*, *306090*, *Immobiliare*, and *Architecture Plus*.

Watkins holds a master's degree in architecture in urban design from Harvard University's Graduate School of Design and a bachelor's degree in architecture from Syracuse University.

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