



Exploring FEMA’s Community Rating System as a tool for improving flood hazard mitigation and use of natural infrastructure: Initial Summary of an EDF Emerging Issues Workshop, August 9-10, 2017

Prepared by Shannon E. Cunniff, Director, Coastal Resilience

Introduction

On August 9 and 10, 2017, Environmental Defense Fund (EDF), in collaboration with the [Graham Institute of Sustainability at the University of Michigan](#), brought together researchers and practitioners deeply familiar with factors affecting community investment in flood mitigation and, specifically, the Federal Emergency Management Agency’s [Community Rating System \(CRS\)](#). From EDF’s perspective, the overall purpose of the workshop was to explore whether and how the CRS program might be leveraged or altered to get ahead of disasters to reduce flood losses and advance use of natural infrastructure. Three specific goals for the workshop were to:

1. Explore EDF’s idea that expanding and improving FEMA’s Community Rating System (CRS) would be an effective means for reducing flood disaster impacts and expanding protection and restoration of natural infrastructure;
2. Explore whether other innovative means exist to expand investment in protection and restoration of natural infrastructure to reduce flood disaster impacts if flood insurance is further privatized in the future; and
3. Develop a unifying, efficient research roadmap to identify the factors influencing the rate and level of participation in flood hazard mitigation.

The workshop, and the subsequent research we hope it engenders, is a step toward cracking the code for how to best influence effective planning and actions that reduce flood risks and lower the costs of poor decisions and the impacts of flood disasters. By documenting financial and other rewards of taking actions ahead of disasters, EDF believes we can move communities and the nation toward more fiscally sustainable approaches to flooding and break the current disaster response cycle that disproportionately effects socio-economically disadvantaged communities. With information strongly rooted in science and economics, we can design sophisticated outreach campaigns conducted at the community level that motivate individuals, thought leaders, and community decision-makers to implement sustainable and resilient flood hazard mitigation

This paper summarizes initial findings. Workshop participants are listed in Appendix A.

How this Workshop Advances EDF’s Work

EDF’s ecosystems program seeks to meet human needs for food, water and shelter in ways that benefit nature and is considering strategies that would help communities take sustainable actions to decrease their flood hazards and the impacts of floods.

Where disasters result in less property damage, the recovery process is faster, “with lower business and social disruption costs, in turn reducing pressure on the national, state, regional, and local economies and reducing the need for government expenditures, thus reducing tax demands.”¹ Among all natural hazards affecting the U.S., floods impose the most economic disruption and the impacts are increasing despite expanding federal and local policy initiatives to mitigate impacts. The average annual property damage caused by floods has increased approximately 54 times over the last 40 years². Sea level rise and more intense weather events associated with climate change promise to exacerbate flooding and associated economic problems. Populated coastal communities are especially prone to floods due to erosion, sea level rise, storm surge, influxes of waters from upstream rainfall, and urban stormwater runoff. Protection and restoration of natural infrastructure in coastal and riparian floodplains is an effective means of reducing flood hazards and reducing the impact of floods, especially when strategically used in conjunction with traditional flood loss and erosion reduction measures such as building codes, zoning, retention basins and other structural measures.

Workshop Methodology

Participants in the workshop were asked to present a few slides on key research or experiential findings pertinent to CRS. These slides aided informed discussion on key areas of exploration:

- What do we know about how CRS works and in what ways is it effective? How is its effectiveness measured?
- What information is needed to better encourage communities to join and improve their level of participation? Is certain information especially transformative or critical to success?
- What strategic and tactical changes could be made to the program itself to make it more effective?
- Should and how could preservation and restoration of natural infrastructure be more explicitly reflected in CRS?
- What strategic locations/communities might EDF target to enhance risk reduction and restoration of natural floodplain features, functions and values?
- What other means could be used to encourage implementation of hazard mitigation that includes natural defenses?

Throughout the discussions, research questions were captured and organized on flip charts. After thorough discussion, to get a sense of the full group, attendees multi-voted, distributing their four votes (in the form of colored dots) in any manner (i.e., all on one idea, one each on a different idea, and anything in between). Two assignments were given to voting attendees. First they were asked to place green dots to identify the best research ideas. Then they were asked to indicate (with two red dots)

¹ Department of Homeland Security. 2013.

² Brody et al., 2011.

where answering a research question could be “transformative” in terms of improving investment in hazard mitigation.

On the second day of the workshop, with only researchers and an EDF facilitator (Shannon Cunniff) attending, the group revisited their impressions from the first day, provided additional thoughts related to the workshop objectives, and discussed how to further develop a unified research roadmap based on strategic research questions identified during the workshop. Plans are now underway for a second meeting to develop a seminal paper that presents a research roadmap capable of leading to the transformation FEMA’s Community Rating System (CRS) to expand community participation in meaningful planning and flood hazard mitigation activities.

After the workshop, we organized research ideas, combining similar concepts, and tallied results.

Basic Background on the Community Rating System³

FEMA’s CRS is a relatively unknown voluntary program that might be leveraged or built upon to advance the number of communities taking actions that equitably reduce flood hazards, improve quality of life, and increase habitat quantity and value.

The CRS aims to recognize and incentivize community floodplain management activities that exceed the minimum National Flood Insurance Program (NFIP) requirements. Any community in full compliance with the minimum NFIP floodplain management requirements may apply to join the CRS. CRS has three goals:

1. Reduce flood damage to insurable property;
2. Strengthen and support the insurance aspects of the NFIP, and
3. Encourage a comprehensive approach to floodplain management.

While Congress did not set up the NFIP to be actuarially sound, FEMA designed the CRS program to be, in that the discounts in flood insurance rates that FEMA awards are intended to be reflective of FEMA’s expected savings from reduced flood insurance claims. FEMA uses formulas and adjustment factors to calculate credit points for each activity and FEMA’s [CRS Coordinator’s Manual](#) and verification process to provide a CRS Class rating.

CRS’s current point allocation is based on evidence that protection of open space create significantly reduces flood hazards and saves communities money. Floodplain open space – whether its parkland, agricultural fields, forests, or wetlands -- means that homes and other buildings are not in harm’s way and allows floodwaters to spread, taking the peak off the flood height and slowing damaging flood waters. Preservation of natural infrastructure can be counted toward CRS open space preservation,

³ Much of the basic CRS program information in this section is drawn from FEMA’s CRS [website](#) and its CRS [factsheet](#). Additional reference materials on CRS can be found at: <http://crsresources.org>.

and many communities under-identify these points.⁴ Restoration of natural infrastructure can also be counted in other CRS activity areas (e.g., flood protection and stormwater management).⁵

As of May 1, 2017, 1,466 communities participated in the CRS. This represents about 6% of the 22,000 communities participating in NFIP and eligible to participate in CRS, but represents more than 69 percent of all flood insurance policies.⁶ There are some high policy count communities not participating in CRS – for example, approximately 120 communities in coastal states have policy count of over 1,000 but do not participate in the CRS.⁷ Communities not in CRS may have NFIP compliance problems or may have concluded that the CRS discount to a small number of policy holders does not justify the cost of participating in the CRS.⁸

Participating CRS communities receive flood insurance premium rate discounts reflective of the reduced flood risk that results from the community actions meeting CRS goals. Communities choose which activities they wish to receive credits towards their CRS Class, (with two exceptions)⁹ and FEMA audits communities to ensure actions are being taken. Points are awarded for engaging in any of 19 creditable activities which are organized under four categories:

- Public information
- Mapping and regulations
- Flood damage reduction
- Warning and response.

CRS's Class scale runs from 10 to 1, with 10 having no reduction in citizen flood insurance premiums and a 1 demonstrating superior hazard mitigation and having 45% discount. As a community accrues more points, it improves its CRS Class rating and receives increasingly higher discounts. Citizens get a 5% decrease in their flood insurance premiums as their community's CRS rating increases by each level.

Therefore a rating of Class 9 yields a 5% premium discount for a community's citizens holding NFIP policies in the Special Flood Hazard Area (with a few notable exceptions)¹⁰. A rating of Class 1 represents the greatest discount on flood insurance premiums. According to a 2012 FEMA assessment, most CRS communities are a Class 9 or 8¹¹. Informally FEMA staff have indicated a desire to see most CRS communities reach Class 7 - 5 level. Establishing a meaningful national goal is difficult to impossible owing, in large part, differences among communities' size in relationship to the area and population density subject to flood risk.

⁴ Of the 900 Activity Points available for Open Space Preservation the average points earned at 191 (Highfield and Brody, 2017); TNC is working in Dare County, NC, where they have identified approximately 546 open space points that could have been counted by CRS communities there.

⁵ CRS also credits property acquisition and relocation activities which in turn create new opportunities for restoring natural infrastructure and receiving additional points.

⁶ FEMA, 2017

⁷ Molly O'Toole, email pers. comm, October 10, 2017

⁸ Ibid. 31% of the remaining policy base is spread out over more than 20,000 communities. With approximately 5 million NFIP policies, this is an average of about 2,390 policies per CRS community and 74 for non-CRS communities.

⁹ The exceptions are Activity 310 Elevation Certificates and Activity 510 (Sections 501 – 504) Repetitive Loss.

¹⁰ For policies issued in the X- or C-Zones the premium discounts are capped at 10%. The X-Zone is the area of moderate flood hazard area as defined as the area between the limits of the base flood and the 0.2-percent-annual-chance (or 500-year) flood. The C-Zone is the area of minimal flood hazard which are the areas outside the Special Flood Hazard Area and higher than the elevation of the 0.2-percent-annual-chance flood.

¹¹ FEMA, 2012

Levels increase in increments of 500 points with a total of 12,304¹² points for all activities possible. A community needs more than 4,500 points to be rated at as Class 1 to get the highest possible 45% discount. However, the average number of total points awarded is only 1,947, which would imply communities could choose to undertake far more activities to reduce flood hazards. Even fewer communities take credit for protecting natural functions and values of floodplains. For example, only 17 communities currently get a natural shorelines CRS points.¹³ Most communities stay in the program once they've joined and these communities also tend to increase the number of activities they perform over time¹⁴, though sometimes communities' ratings may decrease.

The returns to CRS communities are real:

- Communities that engage in hazard mitigation activities are less prone to flood hazards and recover faster from disaster than those communities that do not.¹⁵
- Flood damage can be decreased by approximately 15% by increasing CRS rating by one class.¹⁶
- The savings associated with a one class increase, via CRS open space preservation, saves on average, \$3,532 per community per year through reduced flood losses.¹⁷

A broad array of organizations are looking at encouraging communities to reduce flood impacts and preserve open space in floodplains as evidenced by the expanding array of CRS tools and guides to help communities simplify analysis, maximize points, and apply to CRS for NFIP discounts. Such efforts include: The Nature Conservancy's [Community Rating System Explorer](#)¹⁸), Climate Central ([Surging Seas CRS Guide](#)), the Association of State Floodplain Managers et al.'s [CRS Green Guides](#)).

Workshop Findings

1. Participants supported EDF's proposition that expanding participation in FEMA's CRS would be an effective means for reducing flood disaster impacts and expanding protection and restoration of natural infrastructure if:
 - The numbers of communities participating in CRS were expanded and doing so at higher levels.
 - CRS was revised to provide points crediting preservation and restoration of ecosystem services provided by natural defenses such as floodplains, and coastal features that reduce flood and erosion impacts.
2. Expanding investment in protection and restoration of natural infrastructure to reduce flood disaster impacts if flood insurance is further privatized in the future could occur if:

¹² [FEMA brochure on CRS. FEMA 2015.](#) https://www.fema.gov/media-library-data/1444398921661-5a1b30f0f8b60a79fb40cefcaf2bc290/2015_NFIP_Small_Brochure.pdf

¹³ Personal communication, Bill Lesser, Aug 9, 2017.

¹⁴ Michel-Kerjan et al. 2016. Learning over time from FEMA's Community Rating System (CRS) and its link to flood resilience measurement. <http://opim.wharton.upenn.edu/risk/library/WP201611-Learning-Over-Time-CRS.pdf>

¹⁵ Landry and Li, 2011, citing NOAA, 2010.

¹⁶ Brody, et al., 2007.

¹⁷ Highfield & Brody, 2013.

¹⁸ <http://coastalresilience.org/project/community-rating-system-explorer>

- Insurance companies recognized the incremental risk reduction benefits of natural infrastructure.
 - FEMA, state, and/or private insurers created a CRS “gateway”, “on-ramp” certification, or other kind of program that attracted smaller and less flood-prone communities’ and communities with fewer NFIP policy holders to implement natural and beneficial floodplain functions and implement other flood hazard mitigation measures.
3. Overall, there was agreement that a stronger body of evidence of the effectiveness of CRS, from which compelling messages could be created, would improve CRS participation and progress on reducing flood impacts. In particular, definitive demonstration of the costs and cost-effectiveness of CRS in lowering risk, reducing damages, and providing other community-wide benefits (as opposed to benefits solely enjoyed by NFIP policy holders) were seen as key.

Four broad thematic areas that would benefit from additional research emerged:

1. Values: Documenting and evaluating the values derived from CRS participation and various hazard mitigation options.
2. Drivers: Understanding the drivers behind decision-making regarding participation in CRS and selection of hazard mitigation options.
3. Outcomes: Improving the efficiency and effectiveness of CRS and adoption of hazard mitigation strategies.
4. Communications: Building sophisticated marketing campaigns with effective messages to expand and increase implementation of hazard mitigation.

The topics deemed by voting participants (see Appendix B) as having the greatest potential to be transformative, in that they received two or more “Transformative Votes,” spanned all four thematic areas and included:

- Determine the various administrative and implementation costs of participating in CRS to the community (e.g., learning curve, staffing capacity, staffing levels, staffing turnover rates, record keeping); including determining the incremental/separable costs over and above NFIP participation, determining the per capita costs of participation, and if it is possible, breaking out costs by CRS rating level; and, how perceptions of costs serve as barriers to buyout, freeboard, etc. (Understanding Drivers, 7 transformative votes)
- Articulate the costs and quantify the benefits of open space compared to developed space (e.g. storm response, clean-up of infrastructure, equipment, etc. for big and small events) (Valuing, 2 transformative votes)
- Create a stronger body of evidence of effectiveness of CRS with points that are easier to communicate; definitive findings on risk and damage reduction, the many benefits of best practices and hazard mitigation. (Marketing/Messaging, 2 transformative votes)
- Determine for localities the minimum open space amount needed to reduce flood effects. (Improve Effectiveness and Efficiency, 2 transformative votes)

- Evaluate how the CRS could be simplified to drive greater investment in measures that reduce flood damages/flood risks, for CRS communities as well as non-CRS and non-NFIP communities. (Improve Effectiveness and Efficiency, 2 transformative votes)
- Document what communities and FEMA perceive are CRS implementation problems and how to overcome them. (Improve Effectiveness and Efficiency, 2 transformative votes)

Research topics upon which the participants most strongly agreed (in that they had the most total votes – i.e., green and red dots):

- Determine the various administrative and implementation costs of participating in CRS to the community (e.g., learning curve, staffing capacity, staffing levels, staffing turnover rates, record keeping); including determining the incremental/separable costs over and above NFIP participation, determining the per capita costs of participation, and if it is possible, breaking out costs by CRS rating level; and, how perceptions of costs serve as barriers to buyout, freeboard, etc. (Understanding Drivers, 15 votes)
- Examining how designs of resilience scorecards and Disaster Mitigation Act plans can be integrated with CRS to create consistent plans and policies, help measure change, and ensure natural infrastructure is included. (Improve Effectiveness & Efficiency, 4 votes)
- Explore how CRS and hazard mitigation planning could be accomplished at the watershed level to more fully reduce flood impacts and articulate the benefits and successes of this approach. Develop improved means for integrating storm water and full hydrology of watershed into flood assessments and mitigation planning. (Improve Effectiveness & Efficiency, 4 votes)
- Build a more complete understanding of why 95% of NFIP communities are not CRS communities and then debunk myths. Identify potential communities for expanding CRS. (Understanding Drivers and Marketing/Messaging, 4 votes)

Conclusion

CRS may be our best barometer for measuring the flood resilience of communities and the nation. Currently, given the relatively low numbers of NFIP communities participating in CRS, and the fairly low ratings of most participating communities, there is a real need to scale up investment in flood hazard mitigation measures. CRS needs to be complemented with other means to measure and encourage flood hazard mitigation measures by smaller and less flood prone communities. Creation of state-level CRS ratings could also be explored.

FEMA has long recognized the natural and beneficial functions of floodplains and tried to incorporate into its programs means to encourage retention and restoration of these values. More recently FEMA has begun to recognize more overtly in its programs green infrastructure and natural infrastructure features that reduce flood and erosion hazards.

Much more is needed to deepen and broaden understanding of the values that natural infrastructure brings to communities – benefits that pay daily dividends, not just during a flood event. A critical first step is developing guidance on the design and evaluation of expected performance of natural infrastructure. Several institutions, including the U.S. Army Corps of Engineers, Partnership for

Ecosystem-based Disaster Risk Reduction, and the World Bank, have organized collaborative efforts to develop guidelines, implement projects, and otherwise scale up adoption of natural infrastructure features into flood and storm risk reduction plans.¹⁹ As natural floodplain functions and values are more explicitly recognized for their defensive nature and as metrics for resiliency to floods are created, these features will be integrated into communities' plans.

It will take more than guidelines and metrics to change complacency about proactively reducing flood damages. We must develop far more compelling information -- about the impacts of floods on the economy, the multiple means to reduce impacts, and the value of building resilience. To encourage appropriate investments that lessen the economic, social and other impacts of flood disasters, we must develop data and build stories about the benefits derived by communities as well as by each citizen, to convince stakeholders to take actions that lessen the impact of floods and enhance resiliency.

Communities also need to review their existing plans – such as community development, transportation, natural resources, emergency management plans – as they likely directly and indirectly address factors relevant to hazards and risk reduction.²⁰ These plans need to be de-conflicted and, ideally, integrated to align decision-making necessary to realize significant reductions in their vulnerability to floods (and other hazards).

The rising costs of flood disasters make it clear that changes to our current tactics for managing flood risks and the costs of flood disasters are needed. The growing economic impacts and social costs of devastating floods are not acceptable. Communities are on the front line. We need to stimulate wiser risk-informed land use planning, building codes, and resource protection to realize a more secure and vibrant future.

¹⁹ EDF is a participant in these efforts.

²⁰ Berke et al. (2015)

References

- Berke, P., Newman, G., Lee, J.; Combs, T., Kolosna, C., and Salvesen, D. 2015. "Evaluation of Networks of Plans and Vulnerability to Hazards and Climate Change: A Resilience Scorecard." Journal of the American Planning Association **81**(4): 287-302.
- Brody, S. D., Highfield, W. E., and Kang, J. E. 2011. *Rising Waters: Causes and consequences of flooding in the United States*. Cambridge, UK: Cambridge University Press.
- Brody, S. D., et al. 2007. "The Rising Costs of Floods: Examining the Impact of Planning and Development Decisions on Property Damage in Florida." Journal of the American Planning Association **73**(3): 330-345.
- Department of Homeland Security. 2013. "[Including Building Codes in the National Flood Insurance Program](https://www.fema.gov/media-library-data/1385728818014-f08e55ee83590650103995b2c66e2285/Incl_Bldg_Codes_NFIP2.pdf)," Fiscal Year 2013 Report to Congress, Impact Study for Biggert-Waters Flood Insurance Reform Act of 2012. Washington, DC. https://www.fema.gov/media-library-data/1385728818014-f08e55ee83590650103995b2c66e2285/Incl_Bldg_Codes_NFIP2.pdf
- FEMA. 2012. The Federal Emergency Management Agency's (FEMA's) National Flood Insurance Program (NFIP) Community Rating System (CRS). Department of Homeland Security. Washington, DC. https://www.fema.gov/media-library-data/20130726-1842-25045-5428/usa_crs_may_2012_508.pdf
- FEMA. 2015. National Flood Insurance Program Community Rating System: A Local Official's Guide to Saving Lives, Preventing Property Damage, Reducing the Cost of Flood Insurance. FEMA B-573. May 2015. https://www.fema.gov/media-library-data/1444398921661-5a1b30f0f8b60a79fb40cefc2bc290/2015_NFIP_Small_Brochure.pdf
- FEMA. 2017. Community Rating System Fact Sheet. June 2017. FEMA, Washington, DC. https://www.fema.gov/media-library-data/1507029324530-082938e6607d4d9eba4004890dbad39c/NFIP_CRS_Fact_Sheet_2017_508OK.pdf
- Highfield, Wesley E. and Brody, Samuel D. 2017. Determining the effects of the FEMA Community Rating System program on flood losses in the United States. *International Journal of Disaster Risk Reduction* **21**. 396-404. <http://doi.org/10.1016/j.ijdrr.2017.01.013>
- Highfield, Wesley E. and Brody, Samuel D. 2013. Evaluating the Effectiveness of Local Mitigation Activities in Reducing Flood Losses. *Natural Hazards Review*. 2013.14:229-236. DOI: 10.1061/(ASCE)NH.1527-6996.0000114
- Landry, Craig. E. and Li, Jingyuan. 2011. "Participation in the Community Rating System of NFIP: Empirical Analysis of North Carolina Counties." *Natural Hazards Review* **13** (3). DOI: 10.2139/ssrn.1848264
- Michel-Kerjan, Erwann, Atreya, Ajita, and Czajkowski, Jeffrey. 2016. Learning over time from FEMA's Community Rating System (CRS) and its link to flood Resilience Measurement. Working Paper # 2016-11. Risk Management and Decision Processes Center, The Wharton School, University of Pennsylvania, Philadelphia, PA, 19104 <http://opim.wharton.upenn.edu/risk/library/WP201611-Learning-Over-Time-CRS.pdf>

Appendix A: Workshop attendees.



Philip Berke, Ph.D., is a professor at Texas A&M University in the Department of Landscape Architecture and Urban Planning and Bush School of Government and Public Service and Director of the Institute for Sustainable Coastal Communities at Texas A&M University at College Station. His current research includes rural community resilience and public engagement as well as measuring participation by socially vulnerable groups in hazard mitigation planning.



Brian Boutin is the Director of the Nature Conservancy's Albemarle-Pamlico Program, where he works on natural infrastructure coastal resilience for North Carolina, including peat soil and oyster reef restoration projects and CRS assistance for Dare County. Boutin previously worked on restoration projects for the Nature Conservancy in Delaware.



Sam Brody, Ph.D., is a professor at Texas A&M University Galveston in the Department of Marine Sciences and Director for the Center for Texas Beaches and Shores (CTBS). His research interests include coastal environmental planning, natural hazards mitigation, spatial analysis and dispute resolution. Recent projects include natural hazard and risk mitigation as well as economic and behavioral factors that influence the adoption of flood mitigation strategies. (*Participated remotely*)



Steve Cochran is the Campaign Director of the 5-group coalition Restore the Mississippi River Delta and Associate Vice President of Coastal Protection at Environmental Defense Fund. Steve also leads EDF's work to apply efforts learned in Louisiana to other coastal areas around the country, which are progressively seeing the same sets of challenges as sea level rise increases. (*Did not vote on research priorities*)



Shannon Cunniff is the Director of Coastal Resilience for Environmental Defense Fund's Ecosystems Program. Building on her 27 years working for the federal government at the intersection of water resources engineering and environmental policy, she develops strategies for expanding and accelerating adoption of natural infrastructure to reduce the impacts of flooding and help communities adapt to climate change. (*Did not vote on research priorities*)



Jeffrey Czajkowski, Ph.D., is the Managing Director of the Wharton Risk Management and Decision Process Center at the University of Pennsylvania, where he focuses on modeling the economics of natural hazard events and mitigation. His research also includes modeling and understanding economic decision making in the presence of natural disasters and the economic valuation of environmental goods.



Doria Gordon, Ph.D., is a Lead Senior Scientist in the Office of the Chief Scientist at Environmental Defense Fund with a focus on the Ecosystems Program. She is also a Courtesy Professor of Biology at the University of Florida. Her research focus is on predicting invasiveness in plant species using risk assessment tools and has collaborated on research efforts to model the effects of sea level rise on coastal habitats. *(Did not vote on research priorities)*



Diego Herrera, Ph.D., is the Mississippi River Delta Natural Infrastructure Economist for Environmental Defense Fund, where he analyzes mechanisms to finance coastal restoration and protection as well as their socioeconomic and environmental benefits. He also researches the relationship between conservation policies, environmental change and human well-being. *(Did not vote on research priorities)*



Wesley Highfield, Ph.D., is an associate professor at Texas A&M University Galveston in the Department of Marine Sciences and Associate Director for Research at the Center for Texas Beaches and Shores. His research utilizes GIS and spatial analysis to determine the effectiveness of local hazard mitigation activities in reducing flood losses and community impacts. He also examines the intersection of social vulnerability, risk and environmental planning and policy.



Bill Lesser, CFM, is the National CRS Coordinator for the in the FEMA Federal Insurance and Mitigation Administration, Mitigation Directorate, Floodplain Management Division. He coordinates the overall operation of CRS through the ten FEMA Regional Offices with the support of the Insurance Services Office, which provides field delivery of the CRS to communities. He previously worked in NFIP Community Eligibility and Compliance and Congressional Affairs.



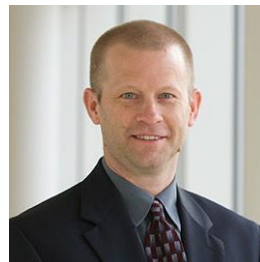
Will McDow is the Director of Habitat Markets for Environmental Defense Fund's Ecosystems Program, leading development for habitat exchange programs for the Greater Sage Grouse and aquatic habitat in the Southeastern U.S.. He has broad expertise on environmental market design, mitigation policy, ecosystem services and working lands conservation. He also serves on the board of the National Mitigation Banking Association. *(Did not vote on research priorities)*



Tom Morey is the State NFIP Coordinator for the Kansas Department of Agriculture, where he provides expert technical advice and consultation regarding the implementation of NFIP. He directs the Kansas Floodplain Management team and coordinates with both state and federal agencies to facilitate community activities and implement state and local floodplain management programs. Also representing the Association of State Floodplain Managers.



Sarah Murdock is the Director of the Nature Conservancy's U.S. Climate Resilience and Water Policy. In this capacity, she develops business plans for climate disaster risk reduction strategies and TNC's position and platform for NFIP improvements and successfully lobbied for the reauthorization of NFIP legislation.



Doug Noonan, Ph.D., is a professor in the School of Public and Environmental Affairs at Indiana University-Purdue University Indianapolis. His research focuses on economic issues related to hazard adjustments and disaster policies that promote community resilience and quality of life, especially in urban environments. One of his current projects examines the effects of CRS and other federal flood mitigation policies on spatial variation in flood management and income inequality.



Richard Norton, Ph.D., J.D., is a professor of Urban and Regional Planning in the Taubman College of Architecture and Urban Planning and the College of Literature, Science, and the Arts' Program in the Environment at the University of Michigan. He studies sustainable development, land use and environmental planning, including coastal area management. He also conducts research on local planning and zoning and state best mitigation practices.



Molly O'Toole, PE, CFM, DWRE, MASCE, is a lead consultant to FEMA's CRS program and has over 25 years of experience in water resources engineering, floodplain management, natural hazard mitigation and stormwater and watershed management. Her work has focused on the development of countywide hazard mitigation and regional stormwater management programs in Illinois.



Rainer Romero, Ph.D., is a Senior Social Scientist for Environmental Defense Fund. His research focuses on the intersection of group membership and identity and environmental engagement. He conducts behavioral experiments to determine the best ways to communicate environmental issues to the public and promote environmentally responsible actions. *(Did not vote on research priorities)*



Abdul Akeem Sadiq, Ph.D., is an associate professor at the School of Public Administration at the University of Central Florida, where he researches natural disaster vulnerability, preparedness, and community resilience to disasters. He also focuses on emergency management and homeland security, terrorism threats, and flood risk management.



David Salvesen, Ph.D., is the Director of the Sustainable Triangle Field Site and a Research Associate for the University of North Carolina at Chapel Hill Institute for the Environment. He conducts research and provides planning and technical assistance to promote sustainable, inclusive and collaborative communities across North Carolina. His research is centered on land use policies and trends and their impact on the environment and quality and character of local communities.



David A. Stroud, CFM, is the Emergency and Hazard Mitigation Lead for AMEC Foster Wheeler Environment and Infrastructure and has over 25 years of experience in hazard mitigation planning, the NFIP and CRS. He provides emergency management and community planning services and is currently assisting and reviewing the CRS program.

Invited, Unable to Attend at last minute



Lindene Patton, J.D., is a Partner at the Earth and Water Law, LLC, where she provides legal and advisory expertise on risk management, insurance law and natural resource management and sustainability. She specializes in risk management instruments and economic and physical damage modeling. Previously, she served as the Senior Advisor for Climate Resilience at the Horinko Group.
(Did not vote on research priorities)

Appendix B: Summary of Ideas Generated

This table presents information needs or questions -- organized by number of total votes -- identified by participants during the course of workshop. Similar ideas were combined after voting (and votes added together). Given the small number of allowable votes (6 total per voter), zeros should not be construed as a lack of interest or support for an idea. Some ideas could be arguably be assigned to one or more topical category categories, however, each was assigned to only one.

General topic	Questions	Total Votes	Trans-formative votes
Understanding Drivers (costs)	What are CRS's implementation costs and how do perceptions serve as barriers to buyout, freeboard, etc.	11	4
Understanding Drivers (costs)	What are the various administrative costs of participating in CRS to the Community (e.g., learning curve, staffing capacity, staffing levels (FTE), and record-keeping)? What are the incremental/separable costs over and above NFIP participation? What are the per capita costs of participation? Is it possible to break out costs by CRS rating level?	4	3
Valuing	Articulate the costs and quantify the benefits of open space compared to developed space (e.g. storm response, clean-up of infrastructure, equipment, big and small events)	2	2
Marketing/Messaging	Create a stronger body of evidence of effectiveness of CRS with points that are easier to communicate; definitive findings on risk and damage reduction, the many benefits of best practices and hazard Mitigation. How valuable are case studies?	3	2
Improve Effectiveness & Efficiency	What is the minimum open space amount to reduce flood results?	2	2
Improve Effectiveness & Efficiency	How can the CRS manual be simplified to drive greater investment in measures that reduce flood damages/flood risks, even for non CRS and non NFIP communities?	2	2
Improve Effectiveness & Efficiency	Understand what communities and FEMA see are CRS implementation problems and how to overcome them.	2	2
Marketing/Messaging	What are the roles of CRS user groups?	1	1

Marketing/Messaging	What are the characteristics of communities that “adopt” open space/natural infrastructure?	1	1
Improve Effectiveness & Efficiency	How can designs of resilience scorecards be integrated with CRS to create consistent plans and policies, help measure change, and ensure natural infrastructure is included? How can we better integrate and balance Disaster Mitigation Act plans and CRS plans to be “good” local plans?	4	1
Marketing/Messaging	Provide meaningful examples of what resiliency looks like	1	1
Improve Effectiveness & Efficiency	Investigate how integrated are community CRS staff into community land use planning. Provide solutions to integrate disciplines/people. What messaging and other means exist to break into the emergency management culture to integrate/connect emergency management discipline with hazard mitigation and land use planning? How can various individuals in a community be better connected and work together cooperatively to reduce hazards.	1	1
Understanding Drivers	What are the key factors affecting participation in NFIP/CRS and capacity to mitigate hazards	1	1
Improve Effectiveness & Efficiency	Is there a way to determine an optimal level for CRS participation? How to guide a community to seek their optimal CRS level? Is there an optimal hazard mitigation portfolio?	3	1
Improve Effectiveness & Efficiency	Can a broader and more balanced set of criteria be used to score CRS communities; e.g. evaluated based on FEMA's 5C's?	0	1
Valuing	Document the effects of CRS participation on flood frequency and intensity	1	1
Valuing	Understand who in community benefits from CRS by looking at insurance penetration study in a CRS community, coverage amounts, and income levels.	2	1
Valuing	Understand value of lands in the Special Flood Hazard Area -- look at riparian zone and community critical infrastructure; Is this why community critical infrastructure is in SFHA?	1	1
Valuing	Quantify the benefits of restored floodplains (vs. parks/soccer fields) by aggregating total risk reduction	2	1

Understanding Drivers	Need more complete understanding of why 95% of NFIP communities are not CRS communities. Debunk myths. What communities should be in the next wave to get involved with CRS?	4	1
Improve Effectiveness & Efficiency	How does the CRS compliance process work? Does it work/could it work better?	2	1
Improve Effectiveness & Efficiency	Where is open space providing flood risk reduction? Where does it change with location?	1	1
Marketing/Messaging	How can participation in CRS be incentivized?	1	1
Understanding Drivers (costs)	If FEMA didn't have cross-subsidization, would the same level of record keeping by FEMA and the Community be required (e.g., to verify credits)?	0	0
Marketing/Messaging	What messages would be effective to keep plans open space aligned with older larger floodplain maps?	0	0
Marketing/Messaging	What messages and means would raise awareness of and attention to the values of open space? What messages would be effective in creating greater pride and passion about open space and hazard mitigation?	0	0
Marketing/Messaging	What factors can be used to determine which communities, neighborhoods ought to retreat and which factors most influence communities, neighborhoods to consider retreat?	0	0
Improve Effectiveness & Efficiency	Explore how CRS and hazard mitigation planning could be accomplished at the watershed level to more fully reduce flood impacts and articulate the benefits and successes of doing such. What are the means to improve integration of storm water and full hydrology of watershed	4	0
Improve Effectiveness & Efficiency	What are the most effective means to build community capacity, especially for planning and handling rare/periodic events, given off-the-shelf info, technologies, and existing capacity (e.g., which may be as simple as a truck and a clipboard)?	0	0
Marketing/Messaging	What is necessary to build political will to pay attention/act on hazard mitigation and natural infrastructure; particularly on such issues as shore hardening concerns, and holding the line on zoning/building maps?	2	0

Understanding Drivers	Does NFIP and disaster responses disincentivize hazard mitigation?	0	0
Marketing/Messaging	What are the factors that build bottom-up public and political will for regulation and hazard mitigation, zoning, and special districts, etc., especially when coastal property owners are influential “grass tops”.	2	0
Understanding Drivers (costs)	Establish a rank ordering of economic effectiveness of CRS activities to influence decision-making at community level.	3	0
Valuing	Demonstrate with updated benefit calculations that include ecosystems services, the values of open space on risk reduction, the social, environmental, economic co-benefits (e.g. public health, heat island effect reduction) to highlight value of CRS participation and hazard mitigation, connect all the benefits, show community gets benefits (not just the NFIP policy holders) and account for any disconnects between who pays and who benefits	3	0
Improve Effectiveness & Efficiency	Review whether the CRS Ratings are proper, i.e., are the point allocations appropriate/correct? Where to change the program?	0	0
Marketing/Messaging	CRS is seen as a certification program, how does outreach marketing affect the function of CRS?	1	0
Understanding Drivers (decision behavior)	Will people actually use economic information to make different decisions?	0	0
Improve Effectiveness & Efficiency	Can CRS be better tailored to communities, e.g. Indexed to a community to incentivize that community?	3	0
Understanding Drivers (decision behavior)	Ascertain why flood risk doesn’t seem to make a difference in CRS participation?	0	0
Understanding Drivers (decision behavior)	What motivates community participation in voluntary federal programs?	0	0
Improve Effectiveness & Efficiency	Determine the best practices; and which CRS practices are additional?	0	0
Understanding Drivers	Do public investments in CRS crowd out private investment?	0	0
Marketing/Messaging	Who are the influencers and thought-leaders in a community?	0	0

Understanding Drivers (buyout)	Methods to identify persons interested in buyouts in advance of floods; and ways to design attractive proactive buyouts or pre-buyout agreements?	2	0
Improve Effectiveness & Efficiency	How can more strategic buyouts be achieved to secure swaths of land and convert to new “uses” (rather than low community value patch works)?	1	0
Valuing	Articulate the costs and benefits to community from buyouts.	2	0
Improve Effectiveness & Efficiency	Establish identified attractive places to move to.	0	0
Understanding Drivers (buyout)	How to avoid community angst over approving a buyout plan?	0	0
Understanding Drivers (buyout)	Identify unintended consequences of buyout especially on floodplain building; identify means to avoid or overcome bad consequences?	0	0
Improve Effectiveness & Efficiency	What is necessary to address capacity challenges (there’s too much data, too many tools); What are local governments doing with all the tools? Can we define key GIS layers for communities to enable participation in CRS (e.g., what parcel level data); who are Right folks to reach out, how can private sector planners help?	0	0
Improve Effectiveness & Efficiency	How can policy dispersion be enhanced with lessons learned?	0	0
Marketing/Messaging	Within communities, above the floodplain manager, what info is convincing decision makers to implement hazard mitigation, participate in CRS, or increase CRS rating?	0	0
Understanding Drivers (costs)	How much does cost of insurance affect CRS participation? Did CRS increase after Biggert-Waters NFIP Reform? (Interest increased, but not participation—then dropped post Grimm-Waters rollback). What is the sensitivity to premium changes?	0	0
Improve Effectiveness & Efficiency	What possible restoration actions are possible for built-out communities?	0	0
Valuing	Costs for restoring open space.	0	0
Valuing	How do folks value protecting open space? Do they want investment?	0	0
Valuing	Do folks see value in protecting open space? Do they want investment?	0	0

Understand Drivers	What are drivers of hazard mitigation & natural infrastructure	0	0
Valuing	Establish appropriate outcome driven measures of success and document whether CRS meets its objectives. (Is it working? Is it effective?) Establish the real “potential” number of CRS communities (to provide context for the 5% of NFIP communities that are in CRS). Should every NFIP community belong?	0	0
Marketing/Messaging	What geographic areas should targeted to improve flood hazard mitigation?	0	0
Improve Effectiveness & Efficiency	How to ensure CRS doesn't have perverse outcomes?	0	0