Research Area Review Group Conducts Annual Review of FRM R&D Statements of Need

Elood Risk Management Newsletter

Remembering William R. Curtis, Jr.

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Coastal Resilience: The Role of Dune Vegetation

Inventory And Review Of Our Nation's Levees





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Jason Glazener describes his experience, and what to expect if you find yourself in the role of IS-RSF Field Coordinator for the first time.

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On the Cover

FRM RARG Conducts Annual Review of FRM R&D Statements of Need, April 18-19, 2017

The FRM RARG was held at the Engineer Research & Development Center's Coastal & Hydraulics Laboratory (ERDC-CHL) in Vicksburg, MS, where participants discussed ongoing R&D, ranked Statements of Need, and toured ERDC's research facilities.

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The Theme of Change Continues

By Mark Roupas, Deputy Chief, Office of Homeland Security



The year of change continues as we move into the summer season. First, let me take the opportunity to thank Mr. David Dale, from our Great Lakes and Ohio River Division, who served as our Chief of Homeland Security and Director of Contingency Operations (DCO-HS) from January through mid-May. We also welcome Mr. José Sánchez, who comes to us from the Engineer Research and Development Center. Mr. Sánchez will continue to fill this position until a permanent selection can be made. We appreciate the leadership and guidance Mr. Dale provided to the National Flood Risk Management Program (NFRMP) during his tenure here, and look forward to the perspectives that Mr. Sánchez will bring to the position. In addition to these leadership changes close to home, we continue awaiting changes in leadership across the Army, including the position of Assistant Secretary of the Army for Civil Works. Filling this position is critical to ensure that Administration policy guidance and support for USACE's Civil Works programs and activities, including flood risk management, continues to enable important desired National and Regional results and outcomes. As we wait for a permanent DCO-HS and a

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new ASA(CW), we remain thankful for the continued support and stability provided to us by Mr. Doug Lamont, Senior Official Performing the Duties as the Assistant Secretary of the Army (Civil Works), as well as our Deputy Commanding General for Civil and Emergency Operations, MG Ed Jackson, and our Director of Civil Works, Mr. James Dalton. They continue to provide their strong support for and guidance to the Flood Risk Management Program and team.

In the past two editions, I've written a lot about change: the impacts it can have, the opportunities it can open, and the importance of being able to adapt with it. As I contemplate the last few months and anticipate the months to come, it is apparent that adapting to change remains as critical to our business as ever. As mentioned above, there are ongoing changes in our leadership, as well as changes in our agency policy and guidance to consider as we evolve and work to meet new realities regarding the business of emergency and flood risk management.

This office is always looking for opportunities to enhance the programs it is responsible for overseeing. This includes the Emergency Management (EM) Program, which is pending some evolution as I write this. We conducted a survey of field practitioners within EM approximately one year ago to gain insight on the current and future

challenges, opportunities, and needs. We have nearly completed development of a concrete list of recommendations to move forward, and from these findings there are a few interesting recommendations that I think are relevant not just to EM but also to the NFRMP. First, it's important, both within the agency and with external partners, to develop an understanding of various relevant missions and activities, so the variety of programs we execute are complementary and leverage each other's abilities. Second, the importance of strong and active communities of practice cannot be overstated. And third, Leadership support for professional development, career progression and robust training opportunities is crucial to our success. These recommendations apply just as well to the NFRMP as they do to the EM Program, and they are findings that we are working to incorporate to enhance both programs.

These findings will be incorporated as appropriate into revised NFRMP program guidance currently under development. Key staff from the NFRMP, with support from other functional areas across USACE that play a role in flood risk management, have been working since late 2015 to develop revised program guidance. This will include a revision to the 2009 Program Guidance Memo that established the NFRMP and the Silver Jackets program as a starting point. Additional guidance documents, to include a revised program management plan, and a revised communications strategy, will be developed as the next step of this effort. One of several new features of the revised guidance products will be an enhanced focus on the internal and external partnerships needed to assure USACE is providing program outcomes that help to position our communities and natural landscapes to withstand,

Continued on page 2.

recover and adapt to ever changing flood risks. The purpose of this new guidance will be to ensure that those within the NFRMP better understand and can articulate the many resources and tools available internally and collectively with our partners to support achievement of flood risk reduction and management. After all, having such resources available does no good if they are not accessed and utilized by communities at risk.

As we work to improve these critical programs, we remain mindful of anticipated changes in USACE doctrine and guidance. I anticipate revisions to the USACE Campaign Plan and the Civil Works Strategic Plan should be released in coming months. Though neither revised document has been finalized and published yet, I do think we can safely expect some slight modifications that will impact how we meet the agencies' flood risk management mission. I expect we will continue to see a focus on increasing resilience and decreasing disaster risk, perhaps with increased emphasis on improving the nations flood risk management capabilities broadly. I think we can also expect to see a continued emphasis on our roles throughout the disaster risk management life cycle, particularly in how we respond to, recover from, and mitigate against disasters. As we continue to develop NFRMP program guidance and look to incorporate feedback for EM activities, we will be considering how we can best meet new agency goals and objectives outlined in the revised Campaign Plan and Strategic Plan, and will outline metrics and milestones that we can use to track our progress and hold ourselves accountable over the coming years.

Thank you for your continued support and efforts to make our programs relevant and timely. **M**

FRM in the Spotlight: Interagency Success in Louisiana By Jennifer Dunn, Institute for Water Resources



The State of Louisiana is known for having a number of complex flood risk management challenges. The magnitude of the flood risk and the variety of sources of that risk across the state make it an area that can particularly benefit from an interagency partnership-based approach to flood risk management. This interagency approach has been successful, in large part, over the last few years thanks to the dedicated efforts of USACE Silver Jackets Coordinator Mr. Chris (Nick) Sims. Mr. Sims' experience in executing the Mississippi River and Tributaries Mississippi River Levee Project as well as managing the Floodplain Management Services program and Planning Assistance to States program in New Orleans District have provided him with valuable experience, relationships, and trust that have served him well as the District Silver Jackets Coordinator.

With Mr. Sims' assistance, the State Silver Jackets team has made great strides reducing risk in communities and communicating risk with numerous stakeholders. Over the past several years, the team has also executed a wide variety of interagency projects, noteworthy in their breadth and inventiveness. These projects include flood risk and vulnerability assessments, nonstructural analyses, emergency preparedness and communication plans, development of recommended ordinances, and investigation of a living mitigation "bioshield" to buffer against surge and wind from the Gulf of Mexico. Through these projects, the team has demonstrated a focus on more innovative nonstructural approaches that bring USACE technical expertise. Critical to the success of these projects has been the close relationships formed with the various Parishes and local government entities affected by the projects.

Louisiana experienced two significant flood events in March and August 2016. Mr. Sims was able to utilize the relationships he'd developed over the years to initiate coordination with officials of the impacted areas on comprehensive watershed drainage studies to assess the causes of the flooding and evaluate the feasibility of various flood risk management measures to reduce future flood risk. The leadership shown by Mr. Sims in initiating these post-flood comprehensive watershed drainage studies, as well as support to FEMA on its state resiliency study, demonstrates his commitment to a broader lifecycle orientation working in conjunction with other partners.

Mr. Sims' collaborative efforts with local, state and Federal representatives to reduce risk are commendable and a model for others to follow.

FRM RARG Conducts Annual Review of FRM R&D Statements of Need, April 18-19, 2017

By Julie Dean Rosati, Ph.D., P.E., Engineer Research & Development Center - Coastal & Hydraulics Laboratory



FRM RARG participants had three demonstrations on the tour, including a physical model study of the Burlington Northern Santa Fe Railway Bridge, Santa Ana, California (SPL), in which excessive local scour at bridge piers threatened integrity of the structure as well as impacted five endangered species in the area. Pier nose extensions tested in the physical model reduced scour by as much as 60%.

Each year, new research is prioritized to address emerging needs within the Flood Risk Management (FRM) business line as identified by Districts and Divisions through their Communities of Practice (CoPs), Technical Committees (TCs), Working Groups (WGs), and Centers of Expertise (CXs). These new research needs - Statements of Needs, or SoNs are refined and ranked by CoP leadership at the annual Research Area Review Group (RARG) meeting. This year, the FRM RARG was held at the Engineer Research & Development Center's Coastal & Hydraulics Laboratory (ERDC-CHL) in Vicksburg, MS. Participants discussed ongoing R&D, ranked the SoNs, toured ERDC's research facilities, and christened a research vessel to Bill Curtis, former CHL Technical Director for FRM R&D, who passed away November 4, 2016 after a battle with cancer. Bill's family was also in attendance for the

vessel christening, and signed a plaque which was used to officially dedicate the William R. Curtis, Jr. Conference Facility the following week. The FRM community also honored Dr. Cary Talbot, CHL, who provided leadership in directing research in FRM R&D from 2015 to 2017 during Bill's illness.

Eight different CoPs, two TCs and one CX were represented by 17 voting CoP leads or delegates in addition to representatives from the field from across the Corps, a total of 46 in all. The 2017 FRM RARG considered 62 SoNs, 43 of which were submitted in FY17. Each CoP lead presented priority 3-6 SoNs within their CoP technical area and described why the research is critical to their technical area and discussed other SoNs that could be leveraged or combined with the priority research. Some CoPs were in agreement in recommending prioritization of some SoNs. Overall, a total of 17 SoNs were ranked as top priorities by the CoPs/ TCs/CX and ranked by voting attendees. The FRM RARG's rankings will be revised with strategic R&D needs as identified by the Civil Works R&D Steering Committee, leveraged with high-priority SoNs in the Navigation and Environmental business lines, and finalized later in the summer. The exact number of SoNs that will be started in FY18 will depend on R&D funding levels after the FY18 budget is passed.

The RARG provides vital input to the R&D process and helps to ensure that FRM R&D is able to deliver on the goal of being a requirements-driven program. Our thanks to all who participated in this year's RARG and we look forward to everyone's continued participation in the R&D process through identification and submission of SoNs and by discussing R&D needs with CoP leaders. Im

Remembering William R. Curtis, Jr., former CHL Technical Director for Flood Risk Management R&D

By Julie Dean Rosati, Ph.D., P.E., Engineer Research & Development Center - Coastal & Hydraulics Laboratory

The Flood Risk Management (FRM) Business Line lost a leader in the field last fall when William "Bill" R. Curtis, Jr., died 4 November 2016 after a brave battle with cancer. The FRM Communities of Practice, colleagues of Bill, and Bill's family honored him at the 2017 RARG meeting by christening a research vessel. Bill's family also signed a plaque which was used to officially dedicate the William R. Curtis, Jr. Conference Facility the following week.

The FRM community will remember Bill as Technical Director for FRM R&D at the Engineer Research & Development Center, Coastal & Hydraulics Laboratory, and his leadership for multidisciplinary teams of experts from the Corps and other agencies. Prior to being Technical Director for FRM, Bill worked on many research and applied projects including the National Shoreline Erosion Control Development and Demonstration Program, the Shore Protection Assessment initiative that evaluated how shore protection projects in Florida performed in the wake of the 2004 Hurricane season, and the demonstration of a beach dewatering demonstration project at Nantucket, MA. This project constructed and monitored a multi-segmented dewatering system for accreting beach sand in a high wave energy environment.



Bill will be greatly missed in the FRM community. He was a leader at the Coastal and Hydraulics Laboratory, applying his knowledge of coastal processes and inland systems, and his talents in engaging experts from broad disciplines to projects across the Corps. He was unique in his ability to bring warmth, humility and humor to the most challenging problems and situations.

Top: Jeff Lillycrop, Lead Technical Director for Civil Works R&D, unveils plaque which the Curtis family signed and was used to dedicate the William R. Curtis, Jr, Conference Facility the following week; Bottom: Curtis Family and FRM RARG members christen research vessel for Bill Curtis.





Coastal Resilience: The Role of Dune Vegetation

By Duncan Bryant, Ph.D. P.E., Engineer Research & Development Center – Coastal and Hydraulics Laboratory

Following Hurricane Sandy in 2012 and Hurricane Matthew in 2016, efforts to include dunes in coastal planning were renewed as their value in protecting ever-growing coastal communities was observed. While management guidelines for constructing dunes identify vegetation as necessary to trap and accrete sediment, the potential for vegetation to mitigate dune erosion during severe events remains unaddressed due to a paucity of data. Currently, little data exist that systematically explore the effect of vegetation on dune erosion and overwash during tropical and extra-tropical events. This lack of mechanistic understanding makes it difficult to quantify the possible value and services rendered by vegetation in the stabilization of dunes under wave attack.

Beginning in FY16, a research and development effort using physical model testing was undertaken to investigate the role of vegetation in reducing dune erosion. This physical model study is the first to quantify the isolated effects of belowground biomass and aboveground biomass, as well the combination of above and belowground biomass, on dune erosion. Prior to designing the experiment, a literature review of dune vegetation species and characteristics was undertaken to build a representative physical model. Plants in the Family Poaceae, characterized as flowering grasses, have adapted to the harsh conditions present on coastal foredunes. These plants endure salt spray, occasional submersion, porous and poor soils, sand burial, and extended droughts. Additionally, dune vegetation is characterized by its abundance of belowground biomass, both roots and rhizomes.

Along the Gulf and Atlantic Coast of the United States, three grass species, Uniola paniculata, Ammophila



Fig. 1. 1 to 15 scaled laboratory dune showing wooden dowels representing the aboveground biomass and coir in the eroded section presenting the belowground biomass.

breviligulata, and Panicum amarum, are among the pioneer species of coastal foredunes. Foredunes along the Pacific Coast are often colonized by Leymus mollis, Poa macrantha, and Poa douglasii, also of the Family Poaceae. Each species is found to be specialized for different portions of the coastal United States, with Ammophila breviligulata and its European counterpart, Ammophila arenaria, invasively spreading along the Pacific Coast. In established dunes, the roots associated with these species are often in a symbiotic association with arbuscular mycorrhizal (AM) fungi. The AM fungus provides nutrient absorption benefits to the plants in exchange for carbohydrates via hyphae and also serves to bind sand into larger, macro aggregates.

To explore the effect of vegetation on dune erosion, a 1 to 15 scale dune model with simulated vegetation was constructed in ERDC's 63 m long by 1.5 m wide wave flume. Aboveground biomass (e.g., stems and leaves) was approximated with wooden dowels and belowground biomass (e.g, roots) was approximated with coir (coconut husk fiber) (Fig. 1). A full LiDAR scan of the entire nearshore was used to measure the change in dune profile before and after a series of wave bursts, with linescan LiDAR providing instantaneous water levels and dune erosion during each wave burst. Both collision (scarping events) and overtopping (intermittent overwash) dune wave attack regimes were studied in this physical model.

The results show that aboveground and belowground plant structures affect the erosion of coastal dunes. Under identical overtopping wave conditions, the aboveground biomass resulted in a 4.2% average reduction of erosion when compared to a dune with no aboveground biomass. The aboveground biomass reduced the dune erosion by an average of 4.6% for the wave collision regime. In comparison, belowground biomass reduced dune erosion by 25% and 18% for the overtopping and collision wave attack regimes, respectively. This reduction is hypothesized to be a result of the belowground biomass ability to bind sand into larger aggregates that have a higher resistance to erosion than single sand grains, thus providing increased stabilty under wave attack. The combination of above and belowground biomass had the greatest effect, with an average reduction in dune erosion of 42% for overtopping regimes and 31% for collision regimes. The effectiveness of the above and belowground biomass to reduce dune erosion was nonlinear, sugguesting that interaction between the above and belowground biomass, and its sandy soil, in resisting dune erosion requires further investigation.



Fig. 2. Starting and final dune profile after wave attack for the four tested dune conditions (control, belowground biomass only, aboveground biomass only, and the combination of aboveground and belowground biomass).

Louisville District's Lynn Jarrett Receives Sendlein Award for Outstanding Contributions in Water Resources Practice



(Left to right) Recipients: Lynn Jarrett, James Kipp, Dr. Lindell Ormsbee, Director of KWRRI to 2017 awardees continuing with Amy Sohner.

The Kentucky Water Resources Research Institute recently presented Lynn Jarrett (Louisville District) with the 2017 Lyle V.A. Sendlein Award for Outstanding Contributions in Water Resources Practice. Mr. Jarrett is an aquatic ecosystem modeler in the Louisville Dstrict Planning Branch. His selection for this prestigious award was based on pioneering work in development and application of watershed models, including reservoirs and stream models calibrated to highfrequency time-steps (5 to 15 minute increments). Lynn is a star among us who has continued to focus on advancing science to improve characterization and management of ecosystem processes through the use of high intensity data, technology and models. 🖬

Inventory And Review Of Our Nation's Levees

By Jamie McVicker, P.E., PMP, Mississippi Valley Division

The U.S. Army Corps of Engineers (USACE) Levee Safety Program recently completed an inventory, inspection and risk assessment of all levees (Figure 1) within its portfolio which constitutes approximately 15,000 miles. The program relies on a visual field inspection to assess the condition of the infrastructure and uses risk assessment methodology to evaluate levee-related flood risks to those who live and work behind these levee systems. There are three distinct factors of levee risk: hazards, performance, and consequence. (Figure 2).

Much has been learned from inventory and review of levees within the USACE portfolio. Inspections are an integral part of the inventory and review of levee systems; they provide a foundation for risk assessment, risk management and risk communication activities associated with the levee system. For the USACE portfolio, inspections have indicated that the most common levee deficiencies include unwanted vegetation, encroachments, animal burrows, and deteriorated culverts/drainage pipes through or under the levee. These deficiencies have a potential to impact the performance and operation of the levee. (Figures 3 - 6)

Risk assessments use inspection information to further evaluate leveerelated flood risk to include hazards, performance, and consequence. Based on the risk assessments completed for the USACE portfolio, the most common risk factors impacting levee risk to people and communities behind them are:



Figure 1: Levee Embankment



RISK = f (HAZARD, PERFORMANCE, CONSEQUENCE)

Figure 2: Risk Equation

- Poor levee performance due to overtopping of the levee system, seepage through and beneath the levee, and/or surface erosion of the levee causing breach and inundation of the leveed area
- Poor levee performance due to inadequate operational plans and procedures for levee system closures
- High consequences due to the amount of population, property, and environmental resources behind levee systems that may be subject to deep flood inundation
- High consequences due to inadequate community emergency preparedness and flood warnings during flood events

Although inspection and risk assessment of the USACE portfolio of levees was a success, tens of thousands of miles of levees across the United States have yet to be reviewed. To date, inventory data has been obtained for nearly 30,000 of those levee miles and, as described above, approximately 15,000 miles have undergone review. On a national scale, we currently do not know how many more miles of levees there are, where they are located, their condition or the possible consequences of potential poor performance. Authorized through the Water Resources Reform and Development Act of 2014 to conduct an inventory and one-time inspection and risk assessment of the nation's levees, USACE is leading the effort learning more about the benefits and risks associated with the infrastructure. USACE is confident that the resulting flood risk information will be valuable to owner/operators, local, regional, tribal and state governments.

Critical levee information collected through this effort will be stored in the National Levee Database (NLD). The NLD serves as the nation's repository for levee-related data and contains information about many of the nation's levees. Capturing detailed information about additional levees not already in the NLD is a goal of the effort. The information collection process will be most effective with a coordinated federal, tribal, state and local effort. Therefore, USACE teams are partnering with state agencies, tribal nations and their levee operators/owners, on a volunteer basis, to identify the location, condition, benefits and risks associated with their respective levees. The level of partner involvement may range from USACE conducting the inventory and review to providing



Figure 3: Encroachments

technical assistance that enables owners/ operators to complete the work on their own.

USACE teams are initiating conversations with states and tribes, inviting them to participate in a partnership with USACE to accomplish this work. USACE outreach teams will start with an introduction about the effort, explaining the methodology used by USACE to inspect and assess the basic condition of a levee and how this information is used to determine if the levee is providing its intended benefits. Prospective partners will be presented with information about known levee data within their state or on their lands including miles of levees, population living behind known levees and critical infrastructure behind known levees. The USACE teams will also be working with states and tribes to identify levee systems which are not in the NLD and adding them to the inventory. Once voluntary partners are identified, levee systems will be prioritized for inspection and risk assessment, a technical USACE team will be assigned to lead the work and activities will begin. Implementation plans are currently under review and it is anticipated that levee inspection and risk assessment activities will be initiated this fall. Throughout the levee review process, USACE tools and methodology for field data collection and risk assessment will be used. These tools include a GPS-enabled



Figure 4: Pipe Deficiencies

levee inspection system which is a handheld tablet to capture field data and a web-based levee screening tool that will house information populated by the team focused on the likelihood of flood loading, the anticipated performance of the levee and the consequences if the levee does not perform as intended. Throughout the life of the partnership, USACE will be collecting lessons learned and best practices.

Levee Inventory and Review Value to States/Tribes – USACE will

- Help identify the location of levees and their operators;
- Conduct a free, one time inspection and risk assessment on levees that are identified;
- Provide results of inspections and risk assessments to assist with hazard mitigation planning and budget prioritization; and
- Offer training and technical assistance on best practices in levee safety for interested partners.

Levee Inventory and Review Value to Levee Owner/Operators – USACE will

- Conduct hands-on training for levee inspections including the development of inspection/condition ratings;
- Conduct basic level risk assessments and show how that information helps identify and characterize risks



Figure 5: Unwanted Vegetation



Figure 6: Animal Burrows

associated with levees;

- Provide direction on how to input location, inspection and risk information into the NLD; and
- Share other technical information about best practices and tools that help build awareness about levees.

A better understanding of this basic levee information may help identify: previously unknown risks, repair and rehabilitation needs, partners for flood risk management, investments, flood fighting and emergency management activities, and the ability to describe "what is at stake" to residents and businesses.

For more information on inventorying, inspecting and conducting risk assessments on non-USACE levees, please contact us at <u>DLL-CEERD-</u> <u>NLD-General-Support@usace.army.mil</u> or 1-877-LEVEEUS (1-877-538-3387). A local USACE team member will be available for assistance in these efforts.

For more information about the National Levee Database, please visit: <u>http://nld.</u> <u>usace.army.mil/</u>

My Experience as an Infrastructure Systems Recovery Support Function (IS-RSF) Field Coordinator

ByJason Glazener, USACE Wilmington District



IS-RSF Field Coordinator Jason Glazener (at left) with several fellow Federal RSF Field Coordinators at the Joint Field Office in Durham, NC

Disasters can happen anywhere in our nation at any time. That means that you may be called upon to perform the Corps' role of IS-RSF Field Coordinator when you least expect it, as I was in North Carolina following Hurricane Matthew. The reason that it could be YOU is that, if you are a Corps employee with Silver Jackets experience, you may be perfectly suited for this FEMA mission assignment (more on that in a moment).

When I was asked to fill the role of the IS-RSF Field Coordinator, it was a new acronym for me. Aside from some online orientation training, I wasn't quite sure what to expect. Being immersed in the FEMA culture was a new experience and somewhat different than the USACE. However, there are a variety of resources you can lean on for guidance. The Corps has a national cadre of IS-RSF Field Coordinators with previous experience, as well as a national IS-RSF coordinator. It took some time to get my bearings, but it turned out to be an experience for which I am very thankful. If you find yourself in the Field Coordinator role for the first time, remember that it is essential to establish relationships early on with both your federal counterparts but particularly with state contacts. Build as many state relationships as possible; they will be very fruitful for when you need to determine unmet needs from the state's perspective and ultimately produce a useful report that will be valuable to the state. Here is one area where you may be ahead of the game with your Silver Jackets experience. The IS-RSF Field Coordinator role is a natural fit for a Silver Jackets coordinator. The role of IS-RSF Field Coordinator aligns perfectly with the Silver Jackets philosophy of interagency collaboration to address unmet needs (in this circumstance, in relation to disaster recovery and resiliency).

The direct products you will produce during this FEMA mission assignment are a Mission Scoping Assessment (MSA) report and, ultimately, a Recovery Support Strategy (RSS). IS-RSF Field Coordinator will be responsible for the Infrastructure Systems component of these reports.

A significant professional benefit of serving as an IS-RSF Field Coordinator is the deeper understanding you develop of other agencies' resources and programs. I feel that this has made me a better public servant when interacting with the public or potential customers. Rather than only considering what the Corps can do, I now have deeper ingrained knowledge of dozens of other potential avenues of assistance for a variety of agencies. The experience also provides frontline exposure to potential Corps projects.

From my experience, I learned that the essence of what FEMA is trying to do with the RSF role is the embodiment of what Silver Jackets strives for – all condensed into several months. If you have already established good working relationships between state and federal partners within your state, you are probably an ideal candidate to serve as an IS-RSF Field Coordinator if and when a disaster strikes your state.

Other Important Information

Events

This listing is for information only and is not a complete list of FRM-related meetings. These meetings are not endorsed by the Corps of Engineers unless specifically stated. If we have failed to list a conference/meeting/symposium that would be of interest to the Flood Risk Management community, please forward the conference details to us.

5-7 Sept 2017 - 7th International Conference on Flood Management - Leeds, UK - http://www.icfm7.org.uk/

5-9 November 2017 - Annual American Water Resources Association Conference - Portland, OR - http://awra.org/index.html

7-11 January 2018 - 98th American Meteorological Society Annual Meeting - Austin, TX - https://annual.ametsoc.org/2018/

26-29 March 2018 - National Hurricane Conference - Orlando, FL

17-22 June 2018 – Association of State Floodplain Managers 42nd Annual Conference – Phoenix, AZ – <u>http://floods.org/index.</u> asp?menulD=223&firstlevelmenulD=181&siteID=1

8-13 December 2016 – 9th National Summit on Coastal and Estuarine Restoration and Management – Long Beach, CA – <u>https://www.estuaries.org/2018-summit-general-info</u>

Be sure to check out floods.org for the dates of state conferences and training opportunities: <u>http://www.floods.org/n-calendar/</u>calendar.asp?date=3/12/2016

FRM Statements of Need: Submitting "Statement of Need" is the first step in the process of a concept becoming a requirement for research and development. If USACE District personnel have problems or situations they feel should be addressed by research, the Flood Risk Management Gateway, <u>http://</u> <u>operations.usace.army.mil/flood.cfm</u>, is the place to submit these research Statements of Need (SoNs).

Past issues of this newsletter, various links, news items, and presentations, are all available on the Flood Risk Management Gateway, <u>https://</u> <u>operations.erdc.dren.mil</u> Check it out! This newsletter is a product for and by the Flood Risk Management Community. The views and opinions expressed in this unofficial publication are not necessarily those of the U.S. Army Corps of Engineers or the Department of the Army.

If you would like to submit an article or an idea for an article for the next edition of the newsletter, or if you have any comments or questions about articles in this edition, please email **Stephanie.N.Bray@usace.army.mil.**





US Army Corps of Engineers