Report and Minutes of the 2013 NPDRS Workshop
Westin Hotel Tysons Corner, Fall Church, VA
15-16 April 2013

Updates on Federal Agency Activities Relevant to HSPD-9

Russ Bulluck stressed that APHIS and OPMP work hand-in-hand in the development of recovery plans and response guidelines. These two documents are interconnected and overlaps in content but their purposes are different. DHS had been involved in the process of developing agricultural risk assessment tools on the epidemiologic and economic modeling of exotic plant pathogens and pests.

Deb Fravel indicated that more research conducted by USDA-ARS related to NPDRS activities is on the stem rust of wheat, the Ug99 Strain, particularly on breeding for disease resistance of germplasm with Kenya. Host-based oil attractant was identified to lure the redbay ambrosia beetle, an exotic vector in Lauraceae trees including avocado. Other research on exotic and emerging diseases and pathogens include the Powell Butte cyst nematode in potaoes, Chrysanthemum white rust, wheat blast, new strains of potato spindle tuber viroid, Macrophomina in strawberries, groundnut ringspot virus in vegetables. Notable exotic diseases that need research include apple proliferation caused by phytoplasma, grapevine associated red blotch virus and downy mildew of impatiens. Link

Kerry Britton emphasized the importance of eradication as a mitigation and management tool of non-indigenous species in forestry using applied population ecology comprised of ecologists and economists. Strategies to surveillance and control invasive species involve econometric and bioeconomic modeling approaches from invasion to detection (trapping) and eradication (spraying). A case study on the eradication program of gypsy moth in California was presented. Link

Marty Draper communicated the importance of the National Plant Diagnostic Network (NPDN) established by USDA as a network that links plant disease diagnosis facilities across the US. NPDN's mission to protect US agriculture involves early detection, diagnosis, reporting, and surge capacity. Critical activities consist of the establishing a communication system, coordinating a first detector training,

standardizing and certifying diagnostics and providing administrative management. A lot had been accomplished but more challenges experienced such as declining federal support, loss of continuity and expertise, state partnering issues, and other resource limitations. With a shifting landscape, sustainability becomes uncertain. Link

EPA's role in the NPDRS was presented by **Dan Rosenblatt**. Recent registration approvals for use of disease control measures include wheat stem rust, laurel wilt and citrus greening. Approval of a pesticide to a high consequence plant disease considers risk cup, residue data, crop group tolerance, use pattern, fungicide resistance management, US and international tolerances. Link

Neel Barnaby discussed FBI activities related to HSPD-9. US food supply is most vulnerable and least protected. Introduction of a plant disease can cause economic losses and social instability, hence FBI lab links with APHIS Veterinary Services, Plant Protection & Quarantine and Wildlife Services. To enhance response to agroterrorism, FBI partners with DHS, DoD, DoE, USDA, and other national labs. Link

Domestic Programs and Activities to Response & Recovery Plans

Rick Bennett stressed the need for a centralized and coordinated system of plant-associated microbes known as the National Plant Microbial Germplasm System (NPMGS). This robust system entails ex situ culture collections and a library of molecular components in its overall cyberinfrastructure. A US Culture Collection Network was sponsored by NSF to share information nationwide and in an international perspective. From a biosecurity standpoint, NPMGS will facilitate the identification of emerging diseases and provide data essential for forensic investigations. In addition, APS encourages USDA-ARS to expand its efforts in establishing a sustainable, long-term national culture collection network. While we establish a repository of microbial cultures, are select agents accepted to be stored in the NPMGS? Link

Information technology and data management tools used to support US agricultural safeguarding initiatives was presented by **Karl Suiter**. The creation of response and recovery plans requires accessibility to up-to-date information about invasive pest species. The New Pest Advisory

Group (NPAG) uses a database of exotic pest information to support APHIS programs called the Global Pest and Disease Database (GPDD). To manage this information system, use of Self Organizing Maps analyzes distribution of invasive pests. Other data such as interception and trade/economic can also be used in prioritization process. Link

Tim Murray gave a presentation on effective communication and coordination plan for stem rust of wheat Ug99 strain that is limited to East Africa. Enhanced communication with cereal pathologists on monitoring and surveillance from multi-state involves a regionally coordinated education and research activities, scheduled committee meetings, cyberinfrastructure, and results extended to stakeholders (the scientific community, agencies, organizations, and producers). Key identified knowledge gaps include monitoring, detection, molecular diagnostics, barberry survey, and management strategies. How do we expand our efforts to communicate and coordinate the recovery plan broadly to stakeholders? The scientific community including first detector and producers need to be involved in a coordinated communication network. There is a need for good communication within and between agencies, organizations and existing networks. Link

Ray Hammerschmidt gave an overview from the land grant universities (LGUs) on four plant biosecurity programs and infrastructure, namely: the National Institute for Microbial Forensics & Food and Ag Biosecurity (NIMFFAB) of Oklahoma State University, the Biosecurity Research Institute Of Kansas State University, the Emerging Pathogens Institute of the University of Florida, and the National Plant Diagnostic Network (NPDN), a network of 54 LGUs and state department of ag labs including the national data repository at Purdue University. Link

International Programs Relevant to Response & Recovery Plans

From an international perspective, **Joan Webber** shared UK's action plans to respond to introduced pests and pathogens that focuses on: 1) import control in the context of EU plant health controls; 2) practical action; 3) public and stakeholder engagement, and 4) research opportunities and priorities. Current research developments and eradication programs of regulated pests and pathogens (Phytophthora

ramorum, Asian longhorn beetle, chestnut blight, and ash dieback) were presented. With UK experience such as the Chalara Task Force, a proactive approach to review known threats and provision of contingency plans and recommendations under a changing landscape are necessary. The workshop emphasized not only crop bio-security at a national level but towards a greater international cooperation, sharing information especially from the source of threat and improve a global warning network in the long term. Link

USDA-OPMP Recovery Plans

Julius Fajardo briefly outlined the key sections in a typical recovery plan and the general guidelines in developing a plan. One action item that needs to be done is to revise the language in the NPDRS webpage about the utility of the Martyn method. An orientation about the breakout session and discussion questions was provided. A SharePoint portal was created for the participants as a forum to continue discussions, post comments, documents, links and other matters related to NPDRS objectives. There is a need to exhaust and capture web resources from the wealth of information in existing databases and systems especially in updating recovery plans. Link

Ned Tisserat focused on the surveillance of walnut twig beetle, new detection tools developed, epidemiological studies and disease management through genetic resistance in black walnut and use of insecticides for the recovery plan of the Thousand Canker Disease of walnuts. In addition, he emphasized that in the wood utilization of walnuts, disinfection methods and education efforts are critical in firewood movement. Link

In the recovery plan of citrus leprosies virus delivered by **Ron Brlansky**, strict quarantine measures should be in place at ports of entry for production and ornamental citrus and other alternate hosts to the viruses or its mite vectors originating from South America. Critical research needs include host range studies, identification of different mite species as vectors, development and deployment of molecular and serological methods that distinguish various forms of the virus, monitoring, acaricide

control programs, education for awareness, epidemiology, and control measures upon introduction. Link

Recovery plan for rice bacterial leaf blight and leaf streak prepared by **Jan Leach** demonstrated that the USA strain is an undesignated pathovar of Xanthomonas oryzae.   Research needs focused on surveillance and breeding efforts. To develop and adopt an improved field-level detection tools, seed-detection protocols, race structure characterization of the Xoo pathogen population, and certification approaches are important including the incorporation of resistance genes into US varieties. Extension needs identified include the education and training of extension personnel, growers and crop advisors on symptomatology and detection under field conditions as well as the adoption of uniform detection/diagnosis protocols among quarantine agencies worldwide. Link

Barbara Valent indicated that for the recovery plan of wheat blast, key research priorities identified were field testing of US wheat varieties in South America, PCR-based diagnostics, seed treatments and other fungicides, risk from native US ryegrass strains, and forecasting model. Extension and education priorities should cover training farmers and ag professionals of wheat and ryegrass blast, incorporating surveillance into ongoing wheat disease monitoring network, workshops and short courses for wheat stakeholders, disseminating publications on identification and management strategies, and promoting inter-group cooperative activities. Link

Tom Powers pointed out that the newly emerged and highly regulated pale cyst nematode of potato in ID would require an expensive eradication program in large-scale operations i.e., multi-year applications of a nematicide. New nematode species will be introduced into the US and highly likely that new species already exist in the US but undetected. Between nematode introduction and detection, there will be a significant lag period.   For mitigation success, early detection of established infestations is critical. An extension priority is to provide training to first responders and training opportunities are decreasing. A research on the development of nematicides and understanding site-specific nematode management tools including crop genetic resistance and effects of climate change are of higher priorities. Link

Judy Brown elucidated that the cotton leaf curl disease (CLCuD) is caused by cotton leaf curl virus complex belonging to the Begomoviruses and transmitted by whitefly, Bemisia tabaci. CLCuD is of global importance due to the high diversity of the virus complex and its broad host range affecting not only cotton but also vegetables and ornamental crops. The diversity of the invasive whitefly biotypes can also be re-distributed via trade. Link

USDA-APHIS Response Guidelines

Russ Bulluck provided a background and up-to-date information of the organizational structure of USDA-APHIS-PPQ in the current budget landscape. The four elements of a national framework for crop bio-security are prevention, preparedness, response, and recovery. The response element consists of an implementation plan (generic and sector-specific), incident command system (federal and state), e-resource allocation and tracking (human, fiscal and physical resources), adequate survey and timely detection, accurate and timely diagnostics, and timely mitigations such as containment, control and eradication. The recovery element is comprised of NPDRS, prevention, survey and detection, and long term pest control systems. We have learned that recovery plans and response guidelines are interconnected and overlap though their purposes are different. Link

Gary Cave demonstrated that to prioritize the selection the selection of a pest or disease in a response or recovery document, multiple criteria in such a decision making process would be involved. The Analytic Hierarchy Process (AHP) is a three-level problem structure consisting of a goal, criteria and alternatives. AHP, as a decision support tool, can also check for consistency of judgments and for sensitivity due to changes in criteria in selecting the best alternative. Link

The Martyn or Matrix Model

Ray Martyn presented a historical overview in the prioritization of high consequence plant diseases for the development of recovery plans. Initially, the criteria for prioritization began with the use of USDA's Select

Agents and Toxins List. Later, the crop economic value, risk assessment, type of pathogen, type of host, type of pathogen x type of host matrix were considered. Then, the pathogen epidemiology (dissemination/survival), risk or threat factor, and management strategies were added. Using the cluster analysis method, plant diseases tend to cluster around a set of epidemiological parameters dictating similar response and mitigation strategies. To separate or group diseases according to descriptors, a model can be developed, improved and validated statistically. A Working Group for this model was formed and chaired by Ray Martyn, Purdue University with Neil McRoberts (University of California-Davis), Carla Thomas (University of California-Davis), Judy Brown (University of Arizona), Forrest Nutter (Iowa State University), and Jim Stack (Kansas State University) as members. Link

A statistical approach (Procustes analysis for lack of fit) to the validation of the Martyn or matrix model for developing generic recovery plan templates was proposed by **Neil McRoberts**. The Working Group chaired by Ray Martyn designed the model and tested it amongst themselves using a reduced set of variables that differentiate disease types. Results indicated that it shows promise, however further testing on a larger group is needed to determine if it is sufficiently robust. Link

Carla Thomas stressed the potential applications of the Martyn Method can be put into practice. The Working Group demonstrated that in the biology of the pathogen, the host range whether narrow or wide, single or multiple host in a given species, genus or family would be critical. Regarding its spread, dissemination by wind, rain, seed or plant parts, presence of vector(s), or soil including the disease cycle (monocyclic or polycyclic) would be relevant. Geographically, the area at risk especially in an agricultural field is important. Trade and food safety factors will be critical in its economic impact. For mitigation or control measures, exclusion by quarantine and vector management including protection by known efficacious treatment(s) would be significant. Link

Recovery Plan Update

In the presentation of **Charla Hollingsworth** on the updates on citrus greening or huanglongbing, the pathogen (Candidatus Liberibacter

asiaticus, Clas) is an alpha proteobacterium (gram-negative) with plasmid and chromosomally integrated prophage. The female vector, Asian citrus psyllid (ACP), lays about 500-800 eggs in two months requiring an optimum temperature of 29.6C, 40% RH and new flush of leaves. Spread of cLas started in FL in 2005 and has been reported in LA, SC, GA, PR, Virgin Islands, TX, and CA. ACP is attracted to youngert host tissues that produce the volatile methyl salicylate and with increased nutritional content. Diseased plants are known to be deficient in N, Fe, Zn, and P. In FL, October to December had the highest ACP prevalence of cLas. cLas is more prevalent in brown-colored, female ACPs. A MesaTech molecular diagnostic platform is now available for a rapid, sensitive, specific, easy to use, disposable, and handheld device to detect the present of HLB. Novel mitigation and disease management strategies had been effective such as RNA interference and dsRNA technologies, metalized polyethylence mulching, plant thermotherapy, and use of parasitoids. Link

Considerations in Updating Recovery Plans

Jacque Fletcher led the discussion and considered the following important factors in updating completed recovery plans (Link):

A. Frequency and timing

The frequency of updating and reviewing recovery plans will depend on the pathosystem or select agent. Development of recovery plans and response guidelines need to be coordinated between APHIS and OPMP to oversee any overlaps. Recovery and response documents are interconnected and in a continuum although their purposes could be different.

Depending on the pathosystem, two to three years from the time the recovery plan was completed could trigger a plan to be updated. Outcomes and measures including any success stories to these documents when available could qualify for revision.

The participants suggested a near real time online database in developing and updating plans and integrating response guidelines.

B. Review Committee

Depending on the magnitude of complexity in revising the plan, two to three experts would be feasible to initiate a review and complete the revision. There should be an interactive mechanism to collaborate and involve the community, general readers and the stakeholders what current knowledge and facts have taken place.

In addition, revision to the plans should be collaboratively edited by a team of experts and a suggestion that an open structure of updating like the real-time and interactive Wikipedia should be vigilantly corrected by experts. Updates should be founded in science especially in the areas of establishment, spread, survey/monitoring/detection, economic impact/compensation, and mitigation/disease control.

Modifications to the plan either in the form of an update, revision or addendum will depend upon the age of the plan, magnitude of new and changed information or any controversy in the plan.

Composition and functionality of the committee will depend on its membership and size. A manageable number of members based on expertise, ability to work as a team and commitment to meet timeframes are key considerations.

C. Possible Additions to Plans

There is a need to know the timetable expected for producers to recover productive capacity after the introduction of an exotic disease. What are these factors involved that could affect a recovery timetable for such an exotic disease? A communication plan presented by Tim Murray as shown below could serve as a model depending on the pathosystem.

First US Detection Sample Routing, Confirmation, and Communication of Results for New Virulent Wheat Stem Rust (UG99)
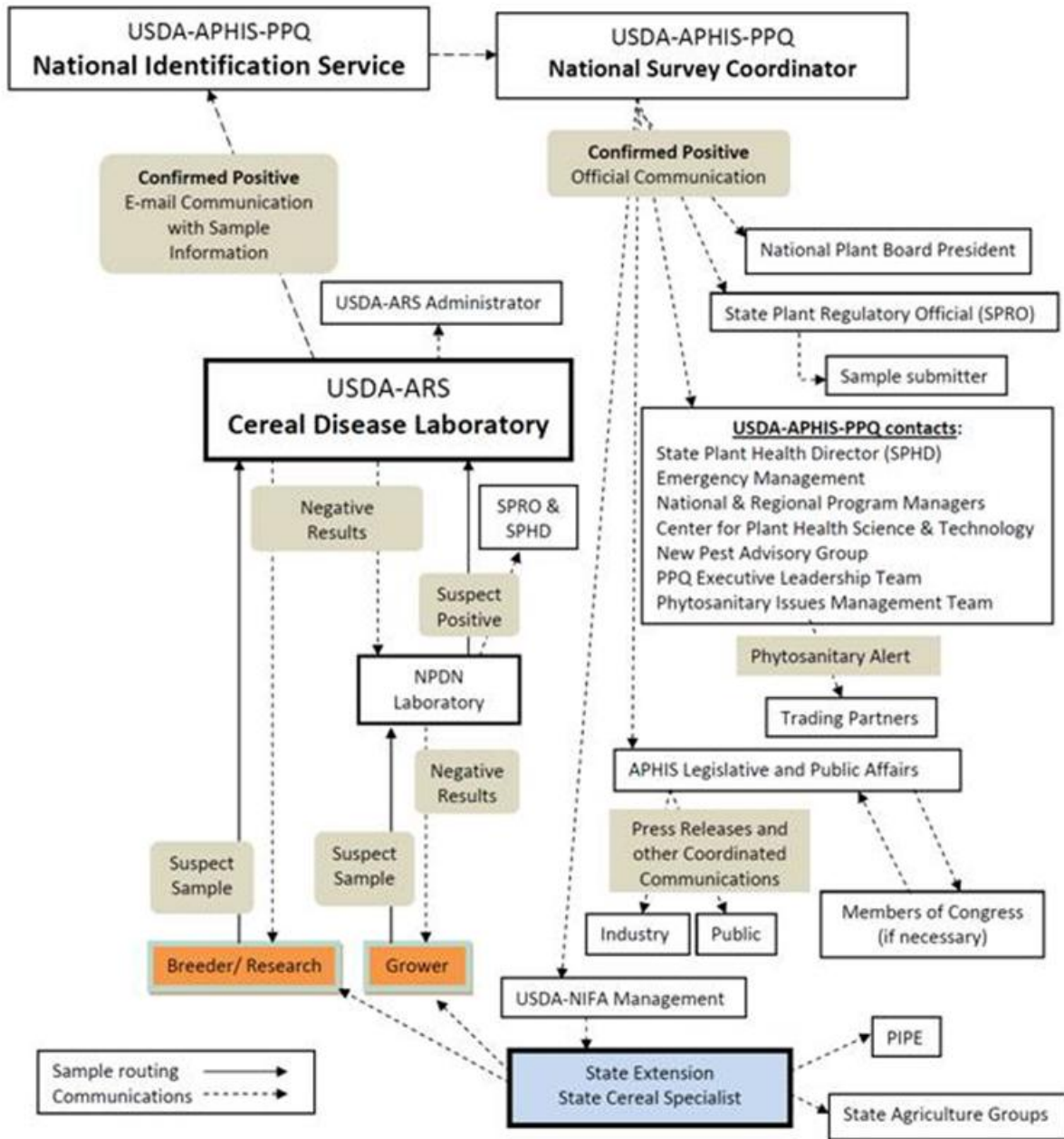
A coordination plan involving a Recovery Plan Coordinator that will work closely with plan authors and contributors should be designated prior to the start of any recovery plan and conveyed to members involved in the planning process.

D. Selection of APS Liaison

Selection of a liaison based on expertise in the areas of emerging diseases and plant pathogens, crop biosecurity, agroterrorism, and invasive pests connected with the academia, industry, state, local or federal agency would be a starting point. Appointment is informal and voluntary and a vice liaison should also be selected to assume position when the chair retires or completed the term of two to three years.

E. Publication of Plans

To credit subject matter experts (SMEs) who contributed to the development of recovery plans, sections of the plan or the whole plan can be published for wider readership in:

1. Diagnostic guides of Land Grant Universities (LGU) and institutions
2. Link to Regional IPM Centers Information System
3. Article to Plant Health Progress of the Plant Management Network.

New Plan Proposals and Prioritization

Session was started during lunch break with PowerPoint presentation by **Doug Luster** (Link) on the history of pathogen prioritization at NPDRS, use of Analytical Hierarchy for criteria application and pathogen selection.

He reviewed pathogen selections from the 2011 NPDRS Dallas meeting, listing pathogens selected and funded for Recovery Plans:

- Bacterial leaf blight/streak of rice (*Xanthomonas oryzae* all pathovars)-funded
- Cotton leaf curl virus-funded
- Root Knot and Cyst Nematodes-funded

against pathogens selected but not funded for Recovery Plans:

- "Zebra Chip" *(Candidatus* Liberibacter solanacearum) on solanaceous crops -<u>not</u> funded
- Citrus black spot (*Guignardia citricarpa*)- <u>not</u> funded
- Cowpea mild mottle virus - <u>not</u> funded

Then, he reviewed the list of pathogens for which there were existing plans that were recommended at the NPDRS 2011 Dallas meeting for <u>update</u> of existing recovery plans:

- *Ca.* Liberibacter asiaticus (Huanlongbin; Citrus Greening) -funded
- downy mildews of grasses (to combine *Sclerophthora rayssiae* and *Perenosclerophthora phillipensis* plans) -funded
- *Ralstonia solanacearum* Race 3 biovar2 -funded
- plum pox –funded
- potato wart –funded

The presentation then shifted to the concept of Pathogen Group Recovery Plans, in order to move toward a philosophy of more inclusive groups of pathogens rather than continuing to generate plans for individual pathogens. This would serve multiple purposes:

- Filling Gaps in Existing Plans
- Pathogen Groups with commonalities in epidemiology, dissemination, control/management
- Merge NPDRS Recovery Plans with APHIS Response Guidelines

The following Pathogen Groups were then presented by APS member attendees J. Fletcher, J. Brown, and S. Tolin for consideration of new NPDRS Pathogen Group Recovery Plans:

- *Ca.* Liberibacter spp. vectored by psyllids- Judy Brown
- Phytoplasmas – Jacque Fletcher (<u>Link</u>)
- Plant Pathogens infecting human hosts-Sue Tolin (<u>Link</u>)
- Viroids- Sue Tolin

The second Pathogen Prioritization Session convened after lunch with a general discussion of the way forward in selecting plans for new Recovery Plans. The selection would presumably include Recovery Plans representing <u>new pathogen groups</u>, and a set of plans representing <u>updates</u> of existing Recovery Plans. After some discussion the group decided that all NPDRS 2013 attendees should be polled and the consensus could be used by the funding agency for decision on which plans to fund.