

## **2015 WSSA NIFA Fellow report—submitted by Donn Shilling**

I have been the WSSA NIFA Fellow for about one year. My host (Mike Fitzner) and I have worked to develop a plan that will hopefully culminate in an enhanced view of Weed Science within NIFA that will result in a more sustained increase in funding to our discipline. I have and will continue to visit NIFA one week each month. Our overall plan follows:

1. Obtain security clearance.
2. 3 part plan:

### **Networking**

- a. Meet and greet
- b. Specific groups where relationships with NIFA could be helpful
  - i. AHIPS
  - ii. ARS
  - iii. Office of Pest Management Policy
  - iv. Stakeholder input

### **RFA process-how things work**

### **Weed Science funding history**

- a. Topics
- b. Impacts
- c. Amounts
- d. Number of applications and success rates

**Goal-I/we** hope this relationship will help enhance NIFA's perception of Weed Science resulting in future positions and more sustainable Weed Science funding. I now believe that simply establishing relationships with USDA scientists will have positive impacts.

### **Other activities:**

- 1.Submitted Weed Science research priorities to NIFA (**see attached**).
- 2.Reviewed 5 grant programs for relevance to Weed Science (**see attached**).

### 3. Additional projects:

- Determine the process for gathering stakeholder input and other sources of information that will become the basis for the development of RFA's.
- Assessing what is presently/has been funding programs (RFA's) for Weed Science including impacts and recommendations for future research/actions
- Review Crop Protection and Pest Management RFA's
- Develop a justification for a NIFA Weed Science NPL.
- Help NIFA and REE develop strategies for effectively addressing weed resistance problem. Prepare responses to congressional/other questions, prepare outreach materials/strategy (web, Twitter, etc.), NIFA portfolio, NIFA RFAs.
- Assist in the planning, preparation and review of NIFA's food security, climate change, and environmental systems portfolios as they relate to weeds and invasive species.
- Work closely with other NPLs and program specialists to manage the "Controlling Weedy and Invasive Plants" Program. Possibly serve as program manager or panel manager.
- Assist in the compilation of data and the preparation of reports requested by USDA, the White House and Congress.
- Represent NIFA at major stakeholder group meetings to strengthen partnership and collaboration with stakeholders.
- Work with industry (Monsanto, Pioneer, CropLife, and Dow) to coordinate private-public research efforts, to guarantee that NIFA programs are forward-looking with regard to technological advancements, and identify areas where there are mutual interests for joint programming. This could involve the incorporation of recommendations from the USDA Advisory Committee on Biotechnology and 21<sup>st</sup> Century Agriculture (AC21) report on "Enhancing Coexistence" into the AFRI Weed and Invasive Plant and/or the Biotechnology Risk Assessment Grants (BRAG) Programs.
- Review applications for capacity funding (Hatch, Smith-Lever, and McIntire Stennis) and help provide liaison to Hatch Multi-state Committees in the area of weedy and invasive plants and provide scholarly input to applicants/committees.
- Assist with post-award management of some CAP projects that involve weeds and invasive species, and the 40 or so projects funded under the old "Biology of Weedy and Invasive Species" and the new "Controlling Weedy and Invasive Plants" Program. This would include reviewing progress reports for adherence to RFA requirements, organizing and conducting annual project director meetings, and working with project directors to identify significant outcomes for reporting to congress and stakeholders.

- Work through the Invasive Species Working Group of the OSTP's CENR Ecological Systems Subcommittee, help coordinate the current and future Federal efforts in efforts to understand interactions between, climate change, invasive species, native pests and disease. Ultimately, the goal would be an on-going assessment process to identify those issues (such as human health, water borne diseases, wildlife disease, challenges to agriculture, natural resources, water availability, food safety, food security, etc.) that might be included in the U.S. Global Change Research Programs' National Climate Assessment.
- Provide NIFA liaison to eXtension communities of practice that have a substantial weed or invasive species component including Climate, Forest and Woodlands, Invasive Species, and Rangelands.

**Visitation schedule:**

**April 26-28**-first visit: talked with Mike Fitzner and developed plan for Fellow program

Also visited with several NPL's

**May 27-30**-Visited with Mike, Jill Schroeder-Office of Pest Management and Policy, Tom Bewick and Rob Hedberg

**July 22-25**-visited APHIS and OPMP staff

**August 24-26**-visited with NIFA, Invasive Species Council and Forest Service staff

**October 7-9**-visited with NIFA staff

**Dec 2 – 5** –obtained USDA security pass, visited several congressional offices and was a panel member for a congressional workshop on herbicide resistance.

## Comments on NIFA RFA related to Weed Science

submitted by Donn Shilling (WSSA Fellow) to Mike Fitzner

### 1. Foundational programs–

Controlling Weedy and Invasive plants (see page 11 of the RFA) -the 3 focus areas our OK but I believe 2 broad categories would be better with some specificity:

#### **1. Weed Biology: Understanding weeds as biological organisms, particularly at the sub-organismal level**

- physiology and biochemical aspects (e.g. strigolactones in *Striga spp.*)
- seed bank biology (e.g. “suicide germination” techniques)
- reproduction and spread (e.g. invasion biology of Palmer amaranth)
- population dynamics (e.g. milkweed patch dynamics in cropped and non-cropped areas)
- genetics (e.g. RNA interference mechanisms, herbicide sequestration and detoxification pathways)
- herbicide resistance (e.g. species differences in rapidity of resistance evolution)
- environment weed interactions (e.g. CO<sub>2</sub> effects on poison plants)
- resource competition (e.g. crop effects on fitness and fecundity)
- systematics (e.g. differences between monoecious and dioecious hydrilla)

#### **2. Integrated Weed, Invasive, and Aquatic Plant Management Systems: Understanding weed population responses to management inputs**

- weed management technologies (cultural, chemical, physical and biological)
  - \*planting dates
  - \*crop rotations
  - \*cover crops
  - \*tillage/no-tillage systems
  - \*row spacing
  - \*herbicides (e.g. differences in the rate of resistance evolution among different modes of action)
- resistance management (e.g. community based incentive programs)
- area-wide management (e.g. reducing *Bromus tectorum* infestations that fuel Western wildfires and degrade sage grouse habitat)
- precision ag–decision support systems (e.g. application of unmanned aerial vehicle (UAV) technologies)

**2. Crop Protection and Pest Management** - This program reads as though it was intended for insects and diseases. Although weeds are mentioned once in the RFA most Weed Scientists will assume this RFA is for insects or diseases. Many types of weed management systems are considered by weed scientists to be integrated—eg., herbicide used with narrow rows. This incorporates crop competition into the weed management strategy. The question is, would a classic IPM scientist see this approach as IPM?

I think we could add some additional text to convey a more “weed friendly” RFA.

**3. Organic Agriculture Research and Extension Initiative** - Although weeds are mentioned in one of the 8 initiatives, it is in relation to the other pests. If you talk with organic farmers they will tell you that weeds are their biggest problem. But because of the lack of alternatives to herbicides they are resigned to physical removal including cultivation which results in erosion and loss of soil quality.

Most weed scientists that would be interested in non-chemically based weed management could feel that diseases and insect based proposals would get priority. I think a separate initiative focused on organic weed management could enhance interest.

**4. Specialty Crop Research Initiative** - Weeds are not even mentioned in this program. The closest inference is in focus #2 ( Efforts to identify and address threats from pests and diseases, including threats to specialty crop pollinators). I think specialty crop farmers have established weed management tactics so they don't discuss a research need. However, as we have come to realize, reliance on traditional methods can have negative consequences (eg., erosion from tillage and resistance from over use of herbicides). Without funding to support weed research in these commodities there will never be viable alternatives.

**5. SARE** - These regional programs have opportunities for weed research; however, the focus area that is most appropriate is IPM. Although most weed scientists promote integrated weed management practices (albeit a heavy reliance on herbicides), IPM is thought to favor insect research. I submitted a proposal years ago to develop an integrated weed management strategy for cogongrass. I proposed using native plants as a biological component of an integrated weed management system. One of the comments (the proposal was rejected) was plant to plant competition was not biological control and therefore not part of an IPM program.

I think mentioning weed specifically would again help develop interest.

# Fundamental and Applied Weed Science Research Priorities

Submitted to Bob by Nowierski by Donn Shilling, WSSA NIFA fellow

October 27, 2015

The Weed Science Society of America (WSSA) believes that there are many challenges that weedy plants pose for sustainable agricultural production and natural ecosystems. USDA-NIFA funding is essential to support the fundamental and applied weed research needed to help meet those challenges.

Weeds are the most impactful, persistent, and economically damaging pests across America. Seventy percent of the pesticides applied in the United States are herbicides, representing an annual cost of \$7 billion for farm, land, and water managers. Weeds threaten our food security by reducing agronomic crop yields 20 to 40 percent on average, and result in a total loss in many horticultural crops. Aquatic and invasive weeds threaten our natural ecosystem, degrade endangered species habitat, reduce water quality, and impede water movement in streams and irrigation canals.

Weeds in agricultural ecosystems have repeatedly evolved to persist by evading different control methods. Herbicides have been the principal means of weed control over the past 50 years because they are both economical and effective, and significant funding has been provided by the agricultural industry. However, widespread evolution of herbicide-resistant weeds threatens the utility of these tools. Many weed species are already resistant to multiple herbicide sites of action, and economical, alternative tools for their control have yet to be identified.

Solutions to the expanding herbicide resistance problems will require new weed management technologies. This will only be attained through research that will provide fundamental knowledge of weed biology and how integrated weed management practices interact with the ecosystem. WSSA believes that funding from USDA-NIFA will diversify weed science research that can help maximize crop yields and preserve natural areas for future generations.

Weed research should be focused on two broad categories:

## **1. Weed Biology: Understanding weeds as biological organisms, particularly at the suborganismal level**

- physiology and biochemical aspects (e.g. strigolactones in *Striga spp.*)
- seed bank biology (e.g. “suicide germination” techniques)
- reproduction and spread (e.g. invasion biology of Palmer amaranth)
- population dynamics (e.g. milkweed patch dynamics in cropped and noncropped areas)
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## **2. Integrated Weed, Invasive, and Aquatic Plant Management Systems: Understanding weed population responses to management inputs**

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- precision ag–decision support systems (e.g. application of unmanned aerial vehicle (UAV) technologies)

WSSA reference documents:

1. [Insight and Advice for the Foundation for Food and Agricultural Research](#). 2015
2. [Recommendations for USDA-ARS Crop Production and Protection Program \(NP304\)](#). 2014
3. [Weed Science Research and Funding: A Call to Action](#). 2009. *Weed Sci.* 57:4. Pp 442-448.