

Research Entomologist, GS-414-12/13/14

FACTOR 1 – RESEARCH ASSIGNMENT

A. Assigned Responsibility

Incumbent serves as a Research Entomologist for the USDA-ARS-PWA Pollinating Insect-Biology, Management, Systematics- Research Unit (PIRU) at Logan, Utah. The research will be conducted under National Program NP305- Crop Production, Bee and Pollinators component. The incumbent is primarily responsible as an entomologist for a multifaced research program on critical pollination issues, such as seed production (e.g., alfalfa, vegetable, and land restoration plants), pollination of rare or endangered plants, and improved pollination of fruit and nut crops. The incumbent expands a broad area of research in pollination biology and ecology using multiple species of bees. Incumbent is a team member in bee biodiversity studies and in use of ecological statistical analyses to evaluate changes in bee species and populations in response to factors associated with changing climate, landscapes, and environments. The incumbent transfers technology through scholarly publications and presentations to stakeholders, composed of the general public, scientific groups and industry. The incumbent serves as a consultant to producer groups, non-government groups (NGOs) and industry, as well as scientists, administrators, and field personnel at Universities, State and Federal agencies.

B. Research Objectives and Methodology

The overall objectives of the incumbent's research are to improve pollination of seed and fruit crops and plants in natural ecosystems and to aid in conservation of native bee communities. Specific research objectives include: 1) Aid in development of integrated pest and pollinator management practices in alfalfa seed production to maximize the pollination capabilities of native bees. For the alkali bee (*Nomia melanderi*), this is done at individual and landscape scales for U.S. alfalfa seed production (50.5 million pounds in 2015) for a hay crop valued at least \$8.8 billion. 2) Maximize pollination of fruit and seed crops using multiple species of bees, determining mechanisms underlying synergistic interactions among pollinator species. 3) Determine mechanisms underlying differential attractiveness of pollinators to different hybrids of crops, to identify alternative pollinators, or help identify plant characteristics required for pollination. Goal is to aid in improving pollination of seed and some fruit crops. 4) Experimentally characterize the pollinators and breeding systems of plants in natural ecosystems to maximize seed/fruit production and enable conservation for rare, threatened, or endangered plants of concern and their specialized pollinators.

C. Expected Results

Incumbent's research will lead to improved crop production and profitability through development of tools and pollinator species. For alfalfa seed production, improved integrated pest and pollinator management practices for use of *Nomia melanderi* will help ensure seed production and sustainable production of specialized pollinators. Vegetable seed producers need more effective pollination of selected and hybrid vegetables for seed production, since honey bee pollination is often inadequate. Identification of plant traits required for pollination and identification of alternative pollinators will enable greater seed production. For native plants, many are being grown as seed crops for restoration purposes. In addition, identifying the breeding systems for the plants of concern and their pollinators will enable reliable plant reproduction and conservation of rare plants, aiding numerous land managers for Federal, State, and Tribal governments charged with their protection. Many of these plants are associated with specialized native pollinators that need to be identified and co-conserved with the plants. Through these avenues of research, the incumbent will make

significant contributions towards agricultural and environmental sustainability.

D. Knowledge Required

Incumbent must possess knowledge and expertise in several areas: 1) Professional knowledge and expertise in pollinator and plant interactions, 2) Competency in determining breeding systems in plants and in bee and plant taxonomy, 3) Familiarity with basic and ecological statistical methods; and 4) Ability to communicate results verbally and in writing to non-specialist and specialist audiences. Incumbent must have ability to interact with multiple stakeholder groups for technology transfer of research findings.

E. Supervisory Responsibilities

The incumbent supervises a Biological Technician (GS-0404-07/9) and temporary aides as needed. The incumbent outlines work assignments, provides guidance and procedures and methods to be employed, and reviews work in progress. The incumbent is responsible for making and approving selections for non-supervisory positions and recommending selections for subordinate supervisory jobs, assigning duties, reviewing work, approving/disapproving leave, and evaluating performance. The incumbent assures equal opportunity is extended to all employees supervised and all candidates for employment without regard to race, color, religion, sex, national origin, age or non-disqualifying handicapping conditions. The incumbent assures affirmative implementation of Equal Employment Opportunity plans of action and applicable Civil Rights provisions, which includes full consideration of eligible minority group members and women in filling vacant positions; providing career counseling and orientation; enhancing career opportunities through training and development, job redesign, and/or similar techniques; and ensuring full consideration of these employees in recommending promotions, awards, and other forms of special recognition.

FACTOR 2 - SUPERVISORY CONTROLS

A. Assigned Authority

The incumbent has freedom and authority to conceive objectives, plan and conduct all aspects of research within the general guidelines of the Research Unit's mission and CRIS research project objectives, under the National Program NP305- Crop Production, Bee and Pollinators component. The incumbent has the freedom to apply for extramural funding in support of research project objectives and to develop collaborative research with others outside of PIRU and ARS.

B. Technical Guidance Received

The incumbent is assigned a broad research area and has substantial freedom to determine the most productive approaches. The incumbent receives no technical guidance, and is responsible for conceiving and planning research, defining research approaches, and conducting and directing overall research. The incumbent will also be a team member in understanding the diversity and possible decline of native bees and will work with PIRU team members to develop a consensus on the most appropriate use of PIRU resources.

C. Review of Results

The incumbent has complete responsibility for statistical analysis, interpretation, and publication of their research. Recommendations and interpretations are accepted as technically sound. Manuscripts are reviewed by peers and evaluated for compliance with Agency policy by the Research Leader prior to submission. Incumbent has the authority to communicate research results and their application to professional and non-professional organizations.

D. General Supervision

Incumbent is under the administrative supervision of the Research Leader. The incumbent

functions as a fully independent scientist with responsibility for identifying and solving research problems within the assigned area. The incumbent is responsible for planning and conducting research without direct technical supervision. The incumbent is responsible for formulating hypotheses; developing and carrying out the plan of attack; for coping with novel and difficult problems that may require either modifications of standard methods, or the development of entirely new methods; for analyzing and interpreting results; and for preparing reports and publications of findings. The incumbent manages assigned resources, including personnel, equipment and supplies, and funding. Incumbent is encouraged to gain extramural funding, in addition to use of base funds.

The Research Leader and other PIRU scientists are kept informed of general plans and progress of the work through regular meetings and staff discussions. The Research Leader attempts to create a climate conducive to the generation of ideas through team meetings, all-staff discussions, seminars, etc., and the incumbent is expected to participate actively as a member of a dynamic research team.

FACTOR 3. GUIDELINES AND ORIGINALITY

A. Available Literature

The existing taxonomic literature on bees, pollination, and fruit/seed production spans more than 200 years. These papers are written in many languages and numerous journals. Although this global information base is large, it is also diffuse. Many pollination studies fail to identify native bees, measure bee crop pollination efficiencies, or estimate pollination value. For most pollinator dependent plants, details of crop pollination needs are inadequately known (e.g. pollen deposition thresholds or optimal bee stocking densities). Pollination needs and bee management for wildflower seed crops and native plants of concern are largely unknown, and some may be dependent upon specialized pollinators. Also lacking for many bee species is knowledge of their life history traits and pollination behaviors; combining this information with taxonomic identification will lead to an understanding of evolutionary relationships and traits needed in pollination of crops. Learning how changing ecological landscapes impact wild, native bee species and their distributions is essential to preserving crucial pollination services for both agricultural and natural ecosystems.

B. Originality Required

A high degree of originality is required, since for many plants their reproductive biology has not been fully defined. To reliably quantify individual pollinator value and efficacy, many facets of plant reproductive function and physiology must be examined, such as gender allocation, outcrossing mechanisms, and maternal resource limitation. After identifying bee and plant species, experiments are needed to determine bee biology. Ingenuity is needed to recognize and define underlying questions, pose testable hypotheses, and develop experimental methods for each plant system. To develop improved pest and pollinator management practices, many factors must be evaluated, requiring generation of new data for evaluation of pollination and seed/fruit production, as well as pest and pollinator biologies.