Position Classification Standard for Entomology, Series, GS-0414

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SERIES DEFINITION

This series includes positions the duties of which are to advise on, administer, supervise or perform professional and scientific work in the field of entomology which requires a fundamental knowledge of the principles of the biological and physical sciences which underlie the field, and a specific knowledge of the application of these principles to the solution of entomological problems.

This standard supersedes and is to be substituted for the standard for the Entomology Series, GS-0414, which was published in September 1947 under the code P-430-0.

BACKGROUND INFORMATION

Entomology is that branch of science which deals with the characteristics and life processes of insects, the interrelationships between insect species, their relationships to other living forms, their reactions to and influence on the environment in which they are found, and their impact on man's welfare. Professional entomologists may conduct research for the purpose of increasing the store of fundamental knowledge relating to insects per se, or may be concerned with insects of economic or medical importance and with the development, test, or application of methods for their propagation or control.

The science of entomology may be arbitrarily divided into two broad but not mutually exclusive categories: (1) general entomology which involves fundamental research to expand the store of knowledge regarding insect taxonomy, morphology, cytology, embryology, physiology, genetics, etc.; (2) economic or applied entomology, which deals with (a) the life history, habits and control of insects which transmit plant diseases or attack forest, fruit or shade trees, field and cultivated crops, greenhouse or ornamental plants, or stored products, etc., (b) methods for the propagation of beneficial insects such as bees, and (c) the study of insects which transmit the diseases of, parasitize, or cause discomfort to man and other animals.

SERIES DETERMINATION

Entomologists in the Federal service are employed in a wide variety of research or nonresearch programs. Individual work assignments are highly diversified and may require substantially different specialized knowledges, skills and abilities. However, regardless of their particular area of endeavor, or the highly specialized nature of their individual assignments, all entomologists must possess a common core of basic knowledges of the biological and physical sciences. These core knowledges, which include basic general entomology, basic insect taxonomy, physiology and ecology, as well as a good knowledge of one or more of the "tool sciences," i.e., chemistry, physics, mathematics or statistics, mark the perimeters of this series.

PROFESSIONAL VS. TECHNICIAN POSITIONS

The distinction between positions performing entomological work requiring full professional knowledge and scientific competence and those which do not, is not always obvious. The determination as to whether a given position should be classified to this series or to an appropriate technician series should be based on consideration of (1) whether the organizational context and career pattern in which the position exists permit and require professional staffing, and (2) whether the position requires (a) the application of an academically acquired knowledge of the fundamental principles and theoretical concepts of the biological and associated physical sciences, (b) the ability to apply such knowledges to theoretical and practical entomological problems with versatility, judgment and perception, (c) the ability to organize, analyze, interpret and evaluate and report on biological and ecological data and to assess or predict their interactions under varying combinations of conditions, and (d) the ability through study to keep abreast of developments in research relating to the field and to exercise selective judgment and ingenuity in the development, test and application of the results of research to the solution of day-to-day operating problems. Positions which, at full performance levels, require the application of professional knowledges and abilities of the type described above should be included in this series.

In some situations, the decision as to whether a given position requires professional knowledges and skills may involve consideration of the responsibility of the position for protection of the public interest. Positions which are finally responsible for action programs and related decisions, and include accountability for the adequacy and accuracy of the scientific knowledges applied, require the application of professional knowledges and abilities as an inherent matter of public policy in the delegated responsibility for the protection of life, health, natural resources, agricultural crops and other property.

It should be noted that the possession of academic training in the field of entomology on the part of the incumbent of a particular position does not, in and of itself, assure that the position is professional. Some positions are restricted to the practical resolution of conventional entomological problems for which solutions have been developed and effective methods and techniques established and standardized. While fundamental scientific principles and theoretical concepts may have been involved in the development of these methods or techniques, their application to conventional operating problems is typical of technician positions, even though the knowledge of these solutions, methods and techniques and the circumstances in which their application is appropriate, may have been academically acquired. In short, the critical distinction as to whether a given position is "professional" or "technical" centers on the inherent requirement for the manipulation of ideas and concepts deriving directly from the fundamental principles of the biological and physical sciences involved.

INTERDISCIPLINARY POSITIONS

Some work in the field of entomology is, by its very nature, interdisciplinary. Research in the development or evaluation of insecticides may be carried out (1) by chemists who are highly knowledgeable in the specific properties of such chemical compounds, (2) by physiologists or toxicologists, who are similarly knowledgeable in the physiological responses induced by such chemicals, or in the toxic properties of such compounds, or (3) by entomologists who are specialists in the physiology, morphology, life history and habits of the particular species of insects to be controlled or eradicated. Similarly, some activities, such as those involving the prevention detection, evaluation and suppression of forest insects, may be undertaken (1) by foresters who have received specialized education in the field of entomology and are particularly well informed regarding the silvicultural practices associated with, and the growth characteristics of, host trees (as well as with the insects that affect them), (2) by other scientists who are specialists in the physiology or pathology of the host plants and in the impact of particular insects on host health, or (3) by entomologists who are well acquainted with the identity, life history, ecology, and habits of the insect itself and with the various means for its control. When positions are interdisciplinary in nature, the proper series may be determined by applying the principles pertaining to the classification of interdisciplinary positions described in the Introduction to the Position Classification Standards.

RELATIONSHIP TO PLANT QUARANTINE AND PEST CONTROL SERIES, GS-0436

In many respects the work described herein is closely akin to work which is also included in the Plant Protection and Quarantine Series, GS-0436. The primary distinction between positions identifiable with this series and those in the Plant Quarantine and Pest Control Series, GS-0436, centers on the nature of the academic preparation required for the work. Entrance level positions in the Plant Quarantine and Pest Control Series may be filled by employees possessing academic training in a variety of fields in the biological sciences. This broad and diversified academic background (which may or may not include training in entomology) is required as the basis for subsequent specialized training in the functional, administrative and regulatory aspects of plant quarantine and pest control work. On the other hand, positions in the Entomology Series require employees to possess a specific and fairly intensive academic background in entomology to serve as a basis for subsequent professional development and training in the field and for developing solutions to entomological problems. Thus, the key to the distinction between positions which are properly identified with the Plant Quarantine and Pest Control Series and those which belong in the Entomology Series rests on the breadth and generality, on the one hand, versus the depth and specificity, on the other, of the academic preparation required for successful performance of the work at full performance levels.

SPECIALIZATIONS AND TITLING

Approaches to the resolution of entomological problems are many and varied. As a result, the concepts of specialization within the profession and the patterns of specialization found in nonsupervisory positions are not standardized. For example, entomologists may specialize (1) by species or type of insect, with emphasis on their taxonomy, life cycle, population, geographic distribution and similar matters, (2) by biological approach, i.e., anatomy, physiology, cytology, genetics, etc., (3) by environmental approach, i.e., ecology, (4) by type of control technique, i.e., chemical, biological, physical or cultural, (5) by host-pest relationships, i.e., pests of forest, fruit or shade trees; field or cultivated crops; ornamental or greenhouse plants; raw, manufactured or stored products; pests or disease vectors of animals or man, or (6) by combinations of the above. Thus, a great variety of specializations could be established which would be valid from one standpoint or another. However, to do so would needlessly complicate the processes of personnel management, without offering material compensating advantages. The need for highly specialized knowledges and skills in specific individual positions can be met through the appropriate use of established selective certification procedures. Accordingly, no specializations are established in this series.

The basic title for all positions in this series is "Entomologist." Those positions which are engaged in research work are to be titled "Research Entomologist." Positions which include supervisory responsibilities of such significance as to require supervisory qualifications will be identified by the addition of the prefix "Supervisory" to the basic title. Entomologist positions charged with “team" leadership in the accomplishment of a particular research or operational project may not necessarily include continuing supervisory responsibilities of such magnitude as to influence the basic qualifications requirements. In such circumstances a supervisory title will not be used.

STANDARD COVERED

Entomologists in the Federal service engage in a broad spectrum of research and nonresearch assignments. These assignments range from fundamental research in insect physiology, morphology, pathology or taxonomy, or in the role of insects as vectors of plant or animal disease, through applied research in such areas as the development or improvement of methods for surveys, to work in the prevention of outbreaks, or in the detection, evaluation, and suppression of such outbreaks once they have occurred. For purposes of grade-level determination, entomological work falls into two broad but highly interrelated categories, i.e., research and nonresearch. The essential difference between these categories lies in the objectives of the work and the breadth versus the intensity of the knowledges required. Positions primarily concerned with research in the field of entomology should be evaluated by reference to the Research Grade-Evaluation Guide. Positions primarily concerned with the resolution of operational entomological problems are discussed below, and should be evaluated by reference to the criteria contained herein.

OCCUPATIONAL INFORMATION

Entomologists engaged in nonresearch work typically are involved in the prevention of outbreaks of noxious insects, or in the detection, evaluation and suppression of outbreaks once they have occurred. Such positions may be concerned with (1) the protection of the economic, recreational or natural values of public and private forest and range lands, (2) the protection of manufacturers and consumers against insect infestation or contamination of manufactured, processed, or stored foods or other products, (3) the protection of farmers, other producers and consumers against insect damage or destruction to crops, (4) the protection of the general public against the importation or spread of insects which relate to human health or economic values, or (5) the protection of the physical welfare of military personnel and the facilities and inventories held by various components of the military establishment.

The functional responsibilities of professional entomologists in nonresearch situations typically include the following:

1. Prevention of insect infestations. -- This involves (1) analyzing those conditions inherent in the physical environment which are conducive to the propagation of insect pests and (2) selecting, recommending or applying practices, procedures or techniques designed to modify conditions in such a way as to prevent outbreaks.

   In the agricultural environment preventive measures may include, but are not limited to, (a) changes in kinds of crops grown either through a shift to different crops or through the introduction of insect resistant strains of the same crop, or (b) modification of crop cultivation practices or soil conditions through the introduction of different patterns of planting and ways of irrigating crops, or of cultivating or fertilizing the soil. In the forest environment such measures may include but are not limited to (a) changes in practices of forest management which will prevent the creation of insect hazards or to reduce existing hazards; (b) alterations of the composition, age and stocking of forest stands; (c) thinnings and prunings; (d) selective logging of defective and susceptible trees; and (e) early harvest of susceptible stands.

   In the case of crops or commodities in transit, or being processed, packaged or stored, prevention may involve changes in methods and conditions of shipping, handling, packaging or storing through (a) the control or manipulation of such environmental conditions as temperature, humidity or light, (b) the introduction of preservatives or repellants, or (c) changes in packaging, warehousing or storage practices. Preventive measures may also include (a) the inspection of commodities moving in interstate or international commerce for the presence of noxious insects and the imposition of quarantines, or the prescription of appropriate measures for the destruction of the insect, the host, or both, or, (b) the fumigation or other de-infestation of aircraft, military or agricultural equipment, or of freight cars, ships holds, etc. In the case of insects transmitting disease, parasitizing or causing discomfort to man and other animals, such measures may include (a) manipulation of the environment by drainage, filling, periodic changing of water level, eliminating breeding medium or changing composition of

vegetative cover, (b) improvement of sanitation, and (c) selective application of insecticides. In the military establishment such measures may also include (a) the modification of practices employed in the long-term storage of military supplies, (b) the application of measures to prevent or control damage to wooden structures or lumber stocks by insects or marine organisms, and (c) the application or aerial dispersal of pesticides under military conditions.

2. Detection of insect infestations. -- This involves establishing the criteria for and planning for the systematic inspection of the physical environment (forests, fields, greenhouses, warehouses, etc.), for evidence of significant increases in the insect population, or for conditions which may be conducive to outbreaks. Inspections may involve (a) aerial or ground surveys of forest or agricultural lands to locate problem areas as manifested by defoliation or discoloration of trees or crops, and to delimit the scope of infestations through egg-mass counts, insect trapping, or other detection survey techniques, or, (b) sampling of processed, manufactured or stored products for evidence of insect infestations.

3. Evaluation of insect infestations. -- This involves an assessment of the current and potential significance of infestations and determination of the need, feasibility, and biological soundness of control. Evaluation includes the careful consideration of (a) the biology and ecology of the insect, (b) the role of parasites, predators, pathogens, or other biological and environmental factors which may exert natural controls on the growth of the population, (c) the availability and efficacy of chemical, cultural, biological or other artificial control measures, (d) the current or potential threat to health, economic, natural or other values posed by the outbreak, as opposed to the pesticidal hazards, and (e) the feasibility of control in terms of available funds, manpower, etc., and the potential for success.

4. Suppression or control of insect infestations. -- This involves planning, organizing and carrying out a systematic program for the suppression of an insect infestation employing one or more of the control measures outlined below, and the subsequent survey of residual insect populations to assess the effectiveness of the control effort. Control measures include (a) insecticides such as stomach poisons, contact poisons, fumigants, and attractants or repellants, (b) physical controls, i.e., heat, light, electricity, radio waves, centrifugal force, mechanical traps, etc., (c) cultural controls, i.e., manipulation of the environment through changes in agricultural or silvicultural practices, introduction of resistant strains or varieties of plants or trees, modified drainage, etc., (d) biological controls, i.e., the introduction of parasites, predators or pathogens of insect pests, or the sterilization of insects by irradiation or use of chemo-sterilants, or (e) regulatory controls through the imposition and enforcement of quarantines.

In carrying out these functional responsibilities entomologists should possess or obtain a thorough acquaintance with the physical environment of their area of assignment, its biota (i.e., flora and fauna) and ecology. In addition, they must possess, or obtain, a comprehensive knowledge of (a) the biology, ecology, and distribution of pest species, (b) their relationships to their primary and alternate hosts, and to their natural enemies in the area, (c) effective control

methods, and (d) the impact of these methods both on the insect and on the total environment. Further, entomologists must maintain familiarity with current research being carried out in Government laboratories, universities, or by private industry, as it relates to these matters, in order that they may integrate the research results into their operating programs, or apply them in the solution of specific problems. Characteristically, nonresearch entomologists work in close collaboration with their research counterparts in the pilot testing and evaluating of proposed or new control methods, or in devising new, or modifying existing, methods for control or for modifying or developing new methods for preventing, detecting and evaluating insect infestations.

In the furtherance of their functional objectives, nonresearch entomologists frequently are responsible for devising and conducting extensive training programs for non-entomologists who participate in insect pest prevention, detection, evaluation or suppression work. In this phase of their work they use their professional knowledges and skills in developing training material and instructing others in the techniques of identifying particular noxious insects, or recognizing evidence of insect damage, and in the application of established methods for their prevention or suppression. They may, as circumstances demand, be responsible for instructing non-entomologists in specialized survey or control techniques, and in the proper methods of reporting on field observations and findings.

They may also provide advisory services to other Federal agencies and to persons representing State or private agricultural or forest interests, or private processing, manufacturing, shipping or storage interests, or attempt to persuade representatives of such interests to undertake one-time, or continuing, independent or cooperative detection and evaluation surveys or prevention or suppression practices.

EVALUATION OF NONRESEARCH ENTOMOLOGIST POSITIONS

There are two fundamental classification criteria (each composed of several elements) which, when taken together, provide a means for measurement of the relative grade value of operational entomological work. These are (1) the nature of the assignment and (2) the level of responsibility of the position. Discussion of these criteria and their component elements follows:

Nature of the assignment. -- This factor incorporates those elements of complexity inherent in the nature of the entomological problems to be solved, including their actual or potential seriousness, as distinguished from the nature or extent of the individual's responsibilities for resolving such problems, the supervision he receives, the nature of his decisions or recommendations or any other performance element. The other components of this factor include the knowledges and skills which the entomologist must possess in order to accomplish the work, and the mental demands involved.

Operational entomological problems represent a range of complexity from the simple to the highly involved. Measures of problem complexity include (1) the current state of knowledge of the biology of the pest insect or insects involved, (2) the biological and ecological variables to be

considered, (3) the current state of development of effective and appropriate measures for the prevention and control of such outbreaks, and (4) the level of scientific knowledge and "practical" judgment which must be employed in devising optimum solutions to operating problems.

Level of responsibility**.** -- This factor includes consideration of the nature and extent of the supervisory control exercised over the work, the nature and extent of the entomologist's responsibility for personal contact work and for making recommendations and decisions, and similar matters. The degree of authoritativeness with which the work of an entomologist is viewed by his agency and by his professional fellows, and the extent to which his opinion is sought and given weight within his area of competence are also indicators of the level of his responsibility. These elements are treated in some detail in the grade-level discussions which follow.

NOTES TO USERS OF THIS STANDARD

1. The breadth and depth of scientific knowledge and experience, and the judgment and ingenuity which an entomologist brings to his work typically have a direct effect on the kind and complexity of the assignment which he receives and the degree of authoritativeness which attaches to his recommendations and judgments. The classification criteria contained herein are intended to measure these considerations. In order to insure that the influence of this relationship is considered in its proper perspective the evaluation of an entomologist's position should be based on a sufficient span of time to reflect the norm of his current assignments rather than on an isolated or atypical project.

2. The classification criteria contained herein relate to the evaluation of the entomological problems to be solved, since this function is common to all nonresearch entomologist positions and is the grade-determining element in most of them. However, some entomologist positions combine responsibility for professional problem solving with continuing (as opposed to project) responsibility for the development, administration and management of prevention, detection, evaluation and control programs. The professional entomological aspects of such positions should be evaluated by reference to this standard. The program management responsibilities of such positions should be evaluated by comparison with other appropriate standards and guides and by the application of sound classification judgment.

3. This standard does not include grade-level guides for positions above the GS-13 level because of the small number and highly individualized nature of such positions. The absence of such guides does not preclude the evaluation of operating entomologist positions to a higher level by extension of the criteria discussed in this standard and by application of general classification principles.

4. The grade-level guides do not describe criteria for the evaluation of entomologist positions at bureau or departmental levels that operate in a staff capacity in planning or in

providing policy direction, guidance and review to operating entomological programs at lower organizational echelons. Criteria covering these types of positions are not included because of the diversified nature of the organizations and programs in which such positions are found. However, the criteria provided in this standard can be used as a general classification guide for the professional entomological aspects of such positions.

ENTOMOLOGIST, GS-0414-05

Nature of Assignment

Entomologists at this level utilize their professional training in the basic biological principles underlying the field of entomology in carrying out work assignments which are diversified but are limited in complexity, with a view to broadening the entomologist's experience and training for more difficult assignments as he demonstrates he is able to assume them. Typically, assignments consist of such tasks as (1) making identifications of specimens of relatively well-known species of insects, and searching available literature to secure current information regarding their life history and habits, etc., or known preventive or control measures, (2) serving as a member of a survey party, observing, recording and reporting specific evidences of insect infestations, (3) collecting field data for use by entomologists of higher grade in deciding for or against the need for control, or in evaluating effectiveness of control operations, (4) performing simple statistical computations in accordance with general instructions, and (5) performing other similar supportive duties.

Level of Responsibility

This is the basic trainee level. Work assignments are preselected to provide practical experience and training in such matters as (1) the identification of particular species of insects, (2) the location of source materials in the scientific literature, trade publications and agency or other government publications or manuals, (3) the methods and practices employed in the prevention, detection evaluation, or control of particular insect pests, and (4) agency policies, procedures and practices. An entomologist of higher grade provides specific and detailed guidance in, and substantive review of all aspects of the work. Typically, personal work contacts are restricted, and usually are confined to obtaining information and receiving instructions.

ENTOMOLOGIST, GS-0414-07

Nature of Assignment

GS-7 level assignments typically require broader or more intensive application of basic scientific knowledges than at the preceding level. In addition, they involve the application or use of a variety of standard procedures and techniques.

Entomologists at this grade level utilize their professional training in the fundamental principles underlying the field of entomology and related biological and physical sciences in carrying out their work assignments. Typically, the assignments, which are diversified and somewhat limited in complexity, are screened to eliminate difficult or unusual issues, and consist of such tasks as: (1) make responsible identification of the more important species of insects and maintain current knowledge of their life history, habits, etc., and of known preventive or control measures; (2) serve as a member of a detection survey party in observing, recording, and reporting insect infestations; and (3) assist in planning and conducting systematic detection surveys by (a) assembling maps of areas to be covered, (b) plotting lines for aerial and ground inspections of forest or agricultural lands, (c) annotating maps to indicate areas infested and degree of infestations, (d) making procedural arrangements for and serving individually or as a member of a survey team in inspecting, recording, and reporting on evidences of insect infestation in manufactured, processed, or stored foods or other products, (e) computing acreages of forest or crop lands under insect attack, and (f) performing other similar types of duties.

In prevention evaluation and control activities characteristic of this grade level the entomologist may: participate in the development of new or improved control practices or in the pilot testing of new insecticidal materials and dosages; record environmental data such as temperature and humidity in relation to the buildup and decline of pest populations; utilize simple statistical sampling techniques in estimating the density of predators and parasites of the pest species; apply standardized statistical methods in estimating the effectiveness of control applications; and report on results.

Level of Responsibility

This is the advanced trainee level. Work assignments are selected to combine performance of productive entomological work with supervised on-the-job training in both the judgmental and methodological aspects of the work. Assignments become progressively more difficult as the incumbent's knowledge and experience advance. Typically, assignments are accompanied by a discussion of the purpose and scope of the work and of the scientific and methodological issues which may be anticipated. Within this framework the incumbent plans the approach to the assignment and applies established standard methods in the accomplishment of the work. The incumbent is expected to produce competent, effective work, under supervision. An entomologist of higher grade is available to provide guidance as questions are encountered in the course of the work, and may, depending on the nature of the assignment, check the methodology or review the judgmental aspects of the work through discussions at various stages of completion. Completed work is reviewed in detail for adherence to instructions,

completeness, accuracy, and thoroughness in the application of established methods and in the reporting of field observations or results. Work is particularly reviewed for evidence of understanding of the appropriate uses and limitations of the various prevention detection, evaluation or control methods and techniques, and for grasp of the fundamental scientific concepts of the field, as an essential to further professional development.

At this level the work may include contacts with representatives of private interests who are cooperating in prevention, detection, evaluation or control operations. Such contacts usually are confined to the exchange of information relating to a specific assignment or project. Incumbents also attend professional meetings and conferences for training purposes.

ENTOMOLOGIST, GS-0414-09

Nature of the Assignment

Assignments at this level differ from those at GS-7 in that they require (1) a substantially greater knowledge of the life history, habits, and host relationships of the most important pest insects, and of the biological, ecological, and environmental factors which tend to regulate their abundance, and (2) a fundamental knowledge of standard methods and techniques used for detecting actual or potential insect infestations, and established methods and techniques for their prevention, suppression, or eradication. GS-9 entomologists integrate these knowledges and employ initiative, imagination, and sound professional judgment in carrying out such assignments as (1) planning, organizing, and outlining the substance of technical training to be presented to others who are responsible for maintaining surveillance over areas subject to insect infestations and applying standard preventive or control practices; (2) providing routine advisory services to representatives of public or private organizations or to individuals in the identification of insects, or in the application of specific control measures; (3) serving as team leader in planning and carrying out systematic surveys to detect and report on the scope and severity of infestations, and determine the need for control operations, such as the fumigation of rail cars, nursery beds, warehouses, military stores, or the treatment of fields or forests by aerial or ground control measures; or (4) conducting post-control surveys to evaluate the effectiveness of results achieved in control action programs, and to record any adverse effects of pesticidal chemicals on food, food crops, fish and wildlife, and on humans.

Assignments of the types described above present some problems in the selection of the sampling or statistical techniques for use in developing accurate information regarding the current or potential significance of infestations, or in selecting the kinds and dosages of insecticides which will achieve the necessary level of control with minimum risk to host plant health, fish and wildlife, or the ability of associated populations to survive or reestablish themselves.

Entomologists at this level also participate in the evaluation of actual or potential outbreaks of the more common insects by (1) reviewing the scientific literature, and consulting with entomologists who are specialists in the biology and ecology of the species involved, (2) ascertaining the influence of such natural factors as parasites, predators, and pathogens,

unusual weather, soil moisture, or other biological or environmental factors which tend to exert an influence over the population levels of the pest species, (3) assessing the relative effectiveness of known control measures and their suitability for use in relation to the biota of the infested area, and (4) drawing conclusions and formulating recommendations as to the need, feasibility, and justification of control, including a determination of expected damage and loss without control, and the expected benefits by prescribed control action.

Entomologists at this level are required to exercise a working knowledge of the biology and ecology of particular pest insects, their host relationships, the environmental elements which affect their abundance, and methods for their control. However, at this level much of the research relating to these assignments has been completed. Problems center around the tangible and intangible values involved, the cost of suppression, the time availability for control treatment, and the need for cooperative support.

Level of Responsibility

Typically, assignments are accompanied by definition of the entomological problem involved and discussion of the objectives to be met, but are not accompanied by detailed preliminary instructions regarding sources of information or the techniques or methods to be employed. Incumbents of positions at this level are expected to plan their own work and follow established techniques in its accomplishment. However, the supervisor or other entomologist of higher grade is available to provide guidance should problems not previously encountered arise in the course of the work. Project plans are reviewed in detail for completeness, adequacy of planning, appropriateness of the methods and techniques to be employed, reasonableness of scheduling, or, in the case of control projects, appropriateness of the pesticide and dosage selected and similar matters. "Project leader" type assignments are occasionally reviewed by the supervisor as the project is in process.

Recommendations relating to the need, feasibility and justification of control projects are reviewed for evidence of completeness, thoroughness of consideration of the biological and ecological evidence, and for logic and reasonableness of the recommendations in the light thereof.

At this level personal work relationships assume increasing importance. Contacts with representatives of other public or private interests in carrying out day-to-day work assignments are not susceptible of review. Incumbents of positions at this level are relied upon to recognize and refer to their supervisors, or entomologists of higher grade, those questions which are beyond the scope of their own knowledge. Contacts with other entomologists, plant pathologists, toxicologists, or representatives of other fields of science are for the purpose of exchanging information and opinions regarding the scientific substance of the assignment or consulting on the solution to operating problems of the types described above. Contacts also include participation in professional conferences and seminars, for further training purposes.

ENTOMOLOGIST, GS-0414-11

Nature of the Assignment

GS-11 positions differ from those at the preceding level primarily in the shift in emphasis from the selection and application of established techniques in predefined problems to the analysis, evaluation and solution of entomological problems having the characteristics described below.

At this level entomological problems are complex in that they involve consideration of a number of biological and environmental variables. However, they are conventional in the sense that most of the scientific data required for assessment of the interaction of these variables and for control of the pest insect are available in the professional literature. Typically, the biology, and predator or host relationships of the pest insect, and their distribution and behavioral patterns have been determined through field observation and laboratory testing. The influence of changes in biological and environmental factors such as degree of parasitism or predation, temperature, humidity, soil conditions, etc., on population levels can be predicted with some reliability. Infestations can be detected and estimates of their severity can be developed using established statistical and survey techniques. Usually, one or more control measures of known effectiveness are available but may require substantial modification in order to be suitable for application in the specific circumstances involved in a particular outbreak. Typically, the economic or other values threatened by infestations are significant in that failure to take effective and timely control action could result in considerable damage, or loss to crops and timber or to products in shipment or storage.

The assignment patterns of individual positions at this level may diverge widely. Some positions include the full range of detection evaluation, prevention, or suppression activities for a variety of well-known pest insects. In this situation the assignments may include responsibility for establishing and maintaining pest prevention and control activities, including the identification and professional appraisal of current and potential problems, and the development, or modification and prescription of preventive or suppressive measures. Other positions may be mainly concerned with detection and evaluation surveys or with prevention and suppression problems. Assignments of this type include adapting scientifically valid methods and systems for (1) the surveillance of agricultural crops, forest lands, and manufactured and stored products for evidence of insect infestations; analyzing surveillance findings; planning and carrying out systematic detection surveys; evaluating the significance of infestations to determine the need, feasibility, and justification for initiating or continuing a pest suppression project; (2) based on ecological observations, selection and adaptation from known methods means of manipulating the environment through change in cultural practices (i.e., thinning, pruning, cutting, harvesting, crop rotation, improved drainage, etc.) or changes in shipping or storage practices so as to create an environment unfavorable to the buildup of insect populations; or (3) based on biological and ecological considerations, selection, modification, and technical guidance in the application of appropriate chemical, cultural, biological, or regulatory controls and the subsequent post-control survey to assess the effectiveness of the control effort. Incumbents also plan or conduct training of professionals of lower grade.

GS-11 entomologists employ (1) a thorough fundamental knowledge of entomology and a substantial acquaintance with current research efforts and insect control practices in their particular areas of concern; (2) a working knowledge of the principles of such related fields as

botany, forestry, insect, and plant pathology, toxicology, and taxonomy; and (3) a working knowledge of a variety of standard statistical methods in resolving the scientific problems presented by the assignment. They exercise sound professional judgment in managerial practices and in evaluating and "balancing off" the scientific and practical considerations involved and reaching conclusions as to the appropriate course of action to recommend or follow.

Level of Responsibility

Within the framework of agency policies and procedures and such budgetary, staffing, or other limitations as may be pre-established, GS-11 entomologists typically function with professional independence. They are responsible for developing their own working plans, taking into account such considerations as seasonal influences, stages in the life cycle of the insects involved, and weather or other conditions which may have a bearing on the scheduling of their work. Typically, only those working plans which involve questions of agency policy or which may require substantial modification of expenditures are discussed with the supervisor, or with a staff specialist at a higher organizational level. The supervisor or entomologist of higher grade may or may not be readily available for consultation as the work progresses, though arrangements for such consultation are possible if significant problems are encountered. The effectiveness with which insect survey and control work is planned and carried out is subject to periodic observation and evaluation by the supervisor, and is appraised in terms of results obtained. Results of biological evaluations and resultant determinations relating to the need, feasibility, and justification of control are reviewed for adequacy of consideration of the biological and ecological variables involved, and of the scientific soundness of the conclusions drawn and recommendations made.

The personal contact work of entomologists at this level is important both to the scientific effectiveness and public acceptance of survey and control operations. They may include, but are not limited to the following: (1) contacts with professionals in their own or related scientific fields for purposes of (a) consultation regarding research projects relating to their area of operational responsibility; (b) collaboration, as responsible staff members, in the development, field testing, and evaluation of new or improved survey or control methods and techniques; or (c) cooperation in the collection and reporting of biological data for research purposes; (2) contacts with management officials of Federal, other public agencies, or private organizations for the purposes of (a) explaining survey and control programs and problems and (b) eliciting understanding and acceptance, or active support and cooperation in establishing and carrying out joint survey or control programs; (3) contacts with agriculturalists, foresters, manufacturers, shippers, etc., (a) to exchange information and advice in the resolution of mutual problems or (b) to persuade them to undertake or to suppression techniques, and (4) active participation in professional meetings and conferences to advise them in appropriate prevention, detection, and evaluation.

ENTOMOLOGIST, GS-0414-12

Nature of the Assignment

Assignments at this level are characterized by substantial scientific complexity and significant economic, health or other implications. They are distinguished from those described at the preceding level primarily in that there are significant gaps in the scientific data required for evaluating the biological or ecological variables and for the selection, modification or development of optimum detection, prevention, evaluation, or suppression measures. These variables may include, but are not limited to the number of insects and hosts encountered, the wide geographic dispersion of insect populations, the economic importance of the areas, crops, and products infested, and complicated ownership patterns of the area involved. Typically, at this level significant aspects of the life history and habits, predator or host relationships, distribution and behavioral patterns of the pest insect are either unknown or not fully understood, thus complicating (1) the selection or modification of techniques best suited for sampling or measuring the scope, severity, intensity, and trend of infestations, (2) the assessment of biological and environmental factors regulating population levels or behavioral patterns, (3) the appraisal of the potential effectiveness of alternate methods for the prevention or suppression of outbreaks, and (4) the assessment of the feasibility of action programs for control.

Typically, the values threatened, damaged, or destroyed by insects are of major importance. Ineffective or untimely survey and control action could result (a) in substantial damage or losses to the tangible and intangible values of forest or agricultural lands, (b) in major loss or damage to products in shipment or storage, or (c) in substantial hazard to human health or the health of domestic animals.

The general patterns of GS-12 assignments parallel those described at the preceding level. They differ primarily in the greater breadth or intensity of entomological knowledge required for their accomplishment, and in the requirement for a greater knowledge of the fundamental principles of associated fields. GS-12 entomologists maintain current familiarity with developments in their own and associated fields, with particular emphasis on that research work which relates to, or may have a bearing on, the solution to operating problems in their particular areas of interest. They exercise scientific judgment of a high order in analyzing and evaluating the actual or potential seriousness of insect infestations or in recognizing and appraising the potential hazards posed by the introduction of foreign insects into the environment. They employ substantive scientific insight, initiative and ingenuity in evaluating research results to identify those which may have applicability to the solution of current operational problems, and in further developing, modifying, or adapting them to solve the problem at hand. They exercise sound practical judgment in analyzing cost or other considerations against the potential benefits to be gained in the application of new methods or techniques to the solution of survey or control problems.

Collaboration with their research counterparts in the field testing and evaluation of laboratory research is a common characteristic of positions at this level. This may take the form of (1) arranging for or conducting tests and validating new or improved survey and control methods, or (2) laboratory-reared or imported predators, parasites, or pathogens into the field environment and subsequently determining the degree to which they establish themselves and fulfill their role in the natural control of pest species, (3) field testing of new insecticides, fumigants, etc., with responsibility for evaluating their effectiveness and their impact on crops, trees, manufactured products or associated beneficial insects, or the degree to which the pest species becomes resistant to new formulations.

Level of Responsibility

GS-12 entomologists operate as mature professionals in their particular areas of assignment. The nature of their responsibility is essentially the same as that described at the preceding level. Their responsibility, however, is enhanced by the seriousness of the problems they are called upon to solve, the greater diversity and complexity of the scientific subject matter involved, and the greater breadth and depth of knowledge which they must employ in resolving the problems presented by their assignments.

Typically, the recommendations of entomologists at this level are accepted as being sound in light of current scientific information. They are reviewed primarily for conformance with overall agency programs, policies, and procedures, and for feasibility in relation to the nature or seriousness of controversial matters, or to available financial or other resources when viewed in the context of competing demands on those resources.

In addition to contacts of the types described at preceding levels, entomologists at this level may serve as spokesmen for their program in contacts with their counterparts both within and outside Government, such as with military representatives, community leaders, State officials, private landowners or land managers, manufacturers, shippers, foresters, agriculturists or others in meeting regarding such matters of mutual interests, as (1) cooperative agreements for the financial or other support of cooperative projects, (2) plans for joint project operations, (3) gaining public acceptance of Federal programs, or (4) enforcing regulatory controls. Some of these relationships are complicated by the necessity to impose unpopular restrictions on private interests or to persuade other public or private interests to undertake and finance costly control projects. Incumbents also participate actively in professional meetings, and may conduct seminars.

ENTOMOLOGIST, GS-0414-13

Nature of the Assignment

Assignments at this level are distinguished from those described at GS-12 in that in addition to substantial scientific complexity they are concerned with biological and ecological conditions which are conducive to potential or actual insect infestations which could result in critical economic or health problems, or involve highly specialized skills in the field of entomology. Ineffective or untimely containment or control action could result in (1) potential or actual crop or timber losses of such magnitude as to adversely affect not only growers but others (i.e., shippers, processors, manufacturers) who are dependent on the crops or forest resources for their economic livelihood, or consumers who would be adversely affected through significantly higher prices or shortages of the end product, (2) the possibility of widespread deleterious effects on human health or the health of domestic animals of critical economic importance (i.e., livestock, poultry, etc.) through the unchecked transmission of insect-borne diseases, (3) loss of manufactured or stored products of such magnitude as to adversely affect market conditions, or

(4) affecting the manpower, material, facilities and supply readiness of important components of the military establishment.

Entomological problems usually are concerned with epidemics, chronic infestations, newly introduced species of explosive potential, varieties of strains newly resistant or immune to orthodox controls, or those requiring large-scale mobilization of insect control knowledges and resources.

While the general pattern of assignments at this level parallels those previously described, the magnitude and complex nature of the problems presented by the assignments are such as to demand that entomologists at this level possess (1) a comprehensive grasp of the principles of entomology, (2) an intensive knowledge of the "current state of the art" as it relates to the biology, ecology, behavior and control of the particular species of insect involved, and (3) a thorough understanding of the principles of associated scientific fields such as botany, zoology, chemistry, forestry, etc. These knowledges are essential to the timely detection and accurate evaluation of the nature and implications of insect infestations having the hazard potential described above, and to their prompt and effective containment or control. Solutions to the complex problems posed by an epidemic typically require careful and penetrating analysis of a variety of control methods or techniques including those still in their experimental stages. Typically, the methods or techniques involved require substantial modification, or it may be necessary to blend several methods or techniques in order to adapt to the biological and ecological conditions prevailing, or require extreme precision in application or modification of dosage levels to achieve maximum control effectiveness with minimum adverse effects on associated plant or animal life.

In addition to mature and authoritative scientific judgment, entomologists at this level are required to exercise practical judgment of equal maturity and soundness in recommending or taking timely and appropriate action, since containment or control projects characteristic of this level may involve the commitment of large numbers of men and the expenditures of large sums of money.

Level of Responsibility

Entomologists at this level are viewed as professionally mature technical authorities in their particular areas of assignment Their recommendations regarding operating problems are considered as representing optimum technical solutions in light of current scientific information. Their recommendations relating to survey and control programs or project urgency or priority are given substantial weight by entomologists and other program officials at higher organizational levels, and are reviewed primarily in relation to the financial or other resources required for their accomplishment.

At this grade level personal work contacts assume particular importance, both because of the recognized standing of the entomologist as an authority in his area of competence, and because of the critical and often controversial nature of the problems involved. Entomologists at this level establish and maintain continuing consultative relationships with their professional counterparts both within and outside Government and with program managers for the purpose of

exchanging scientific information of mutual interest and concern. They develop and foster mutually advantageous working relationships with researchers and other scientists in their own and other governmental agencies, the academic community, and private organizations and individuals, in pursuit of new or improved solutions to particular survey and control problems of major consequence. They frequently work in collaboration with their counterparts in State or private organizations in planning and carrying out major cooperative programs in resolving critical problems of mutual concern. They may be responsible for negotiating cooperative working agreements, and for recommending approval of such agreements to their administrative superiors. Positions at this level also include substantial responsibilities in gaining understanding and acceptance of control programs by special interest groups or the general public. These contacts occur in circumstances when misunderstanding and controversies regarding the nature and objectives of control programs exist, and public support is essential to the successful accomplishment of the project. Other contacts include extensive participation in professional societies and seminars as recognized specialists, and participation as a consultant in professional activities.