

Position Classification Flysheet for Ecology Series, GS-0408

Table of Contents

SERIES DEFINITION.....	2
BACKGROUND	2
REQUIRED KNOWLEDGES	3
MAJOR DUTIES AND FUNCTIONS	4
SERIES RELATIONSHIPS	5
BASIC QUALIFICATION REQUIREMENTS.....	5
TITLES	6
EVALUATION NOTES.....	6

SERIES DEFINITION

This series includes positions that involve primarily advisory, research, analytical, or other professional work in the science of ecology. Ecology utilizes a systems approach to study the interrelationships of organisms with each other, with their physical and chemical environment, and with society. Such relationships are considered primarily at the levels of individuals, populations, communities, and ecosystems. Ecologists analyze biological components and processes in the context of ecosystems including environmental factors, physical-chemical relationships, and social relationships. They use quantitative and systems analysis techniques to predict effects of planned or natural changes in ecosystems and to develop understanding of and solutions to ecological problems.

BACKGROUND

Ecologists investigate patterns of interactions between organisms and physical environment factors primarily at the levels of individuals, populations, communities and ecosystems. Regardless of the level of study, ecologists must relate their understanding of particular processes or components to the structure and dynamics of the total system. A unique property of this discipline is that its practitioners study biological and physical processes and components within the context of ecosystems.

Ecology is concerned with effects and processes that originate from organisms, physical forces, and human activities that strongly influence ecological relationships in ecosystems. The various forms of life metabolize and obtain energy from either solar or chemical sources in order to survive. The flow of such energy begins with producers (photosynthetic plants) and transfers to primary consumers (herbivores) and to secondary and tertiary consumers (carnivores). This energy is ultimately transferred from these organisms through decomposers to the physical part of ecosystems. In addition to organisms' dependency on energy for life, they have a need for a variety of nutrients (elements and compounds) that circulate cyclically through the biosphere. In part, ecologists study interactions by focusing on the flow of energy through organisms and the cyclical movement of nutrients. Such work measures the productivity and efficiency of transfer, as energy and chemical elements move from one component to another in particular populations, communities, and ecosystems.

Ecologists also study the distribution and density of organisms that live in ecosystems and changes that occur over time in this distribution and density. These studies are coupled with investigations of the physical-chemical nature and changes occurring in the environment factors of ecosystems. Observations of these changes over time, before and after specific human activities, enable ecologists to predict "environmental (ecosystem) impacts."

Ecologists devote comparable emphasis to studying numbers of organisms, their demographic characteristics, factors limiting growth and development of species, allocation of resources, and the survival and adaptation of organisms in ecological systems.

Ecologists may study terrestrial, aquatic, or marine habitats. This study may be conducted at different levels of organization, as defined below:

Autecology: the scientific analysis of relationships between individual species and their environment. Such work may study the relationship between environmental gradients and success and productivity of a particular species, and the effects of species activity on various ecosystem features and on its overall operation and productivity.

Synecology: the scientific field analyses of characteristics of communities, their activities, behavior gradients, and reactions, and the obligatory interactions of populations and environmental factors that comprise these structural units of the landscape. The most sophisticated investigations utilize qualitative and quantitative modeling and systems analysis.

Population ecology: primarily concerned with quantitative attributes of population (e.g., density, birth rate, spatial distribution, age structure, demands on resources, etc.), and characteristically uses empirical studies and mathematical models. Such work may investigate the effects of biotic and abiotic factors on population size, distribution and density.

Community ecology: analyses of the organization and dynamics of communities (the biotic component of ecosystems). Such work may investigate the structure and interactions between populations of one or more species in a community. The study of community dynamics is based on the concept of succession (the progressive sequence of species and physical changes of environment factors in the area and their cumulative alteration of the physical environment) and climax. The latter refers to areas that have become relatively stabilized, where a group of species maintains a dynamic equilibrium in which individuals may come and go, but the general composition and environmental conditions stay much the same.

Ecosystem ecology: description and analysis of landscape systems that are homogeneous recognizable units of the landscape composed of organisms, environment factors, and the interactions among them. Examples are tidepools, salt marshes, grasslands, and deciduous forests. Ecosystem ecology is concerned with processes between populations and environmental factors as components of a total action system within which occur homeostatically controlled transfers of energy and minerals. The ecosystem is the logical unit for study of systems dynamics and effects of changes on the system. The application of methods of systems analysis to investigations of natural and man-dominated ecosystems provides improved experimental design, potential power of prediction, and improved tools for long-range resource management.

REQUIRED KNOWLEDGES

Required knowledges result from cross-disciplinary training in several fields of biological science that underlie ecology. Biology must be augmented by training in the relevant physical sciences (such as geology, organic chemistry, and physics) and mathematics. Some positions require training in the social sciences (such as economics, psychology, anthropology, sociology). Ecologists apply a broad understanding of living organisms (their geographic distribution,

characteristics, life processes, adaptations and relations to the environment) and of the principles and dynamics of productivity, consumption, energy relationships, mineral cycles, community organization, successional processes, and population dynamics, as well as comprehension of human activities and their needs, to the requirements and practices of natural resource conservation, to ecosystem processes, development, and productivity, and to population alteration. Some ecology positions include functions that require understanding of the cultural and social sciences.

MAJOR DUTIES AND FUNCTIONS

The work of an ecologist is directed toward scientific understanding of the structured organization and dynamics of ecosystems and their components as well as toward the significance to humans of changes in structure and function of ecosystems. This understanding is central to establishing the scientific premises for such purposes as: prediction of alterations of various environments and their significance to humans; solution to various environmental problems; preservation of the productivity of living natural resources; devising more efficient means for conserving and utilizing nonliving natural resources; amelioration and minimization of human impacts on ecosystems; and maintenance of quality in human survival, lifestyles, and civilizations.

Ecologists in the Federal service participate in a broad spectrum of assignments in such areas as environmental protection (e.g., pesticide testing and control, energy source and technology analysis and development); water resources development (e.g., construction projects impinging on natural habitats); analysis of conditions in urban systems (air, water quality control, transportation flows, living conditions, etc.); fish and wildlife protection; and agricultural and land management (e.g., forest and range management, land suitability, etc.); and other activities.

Ecological research and development involves inventing and testing research methodologies and conducting studies to contribute to the existing body of ecological knowledge, both basic and applied. Ecologists emphasize quantitative research of populations, communities and ecosystems that is based on the observed responses of ecosystems with and without experimental manipulations. Such research may provide empirical information that leads to developing and/or revising regulations and management practices.

Regulatory and control work involves the assessment of changes in ecosystem processes (e.g., testing pesticides, determining pollution levels, and predicting the impact of planned construction) to insure that legal standards and other requirements are correct and implemented in the most ecologically sound manner.

Management research analyzes existing policies and practices in light of current ecological information and recommends adjustments in management policy and practice to enhance the maintenance and productivity of the living resources (e.g., analyzing forest productivity and regrowth under various management procedures, observing range responses to various grazing practices, applying current basic ecological findings to management situations).

SERIES RELATIONSHIPS

By definition, ecology is an interdisciplinary science that incorporates knowledge of the biological and physical sciences into a framework from which to study relationships between living organisms and their environment. Because of the interdisciplinary nature of ecology, scientists of related disciplines may at times perform work that utilizes principles and methodologies of ecology. Such principles and methodologies are most commonly employed in various biological sciences as well as a few physical sciences. Most ecologists are also competent in at least one other biological science discipline. Many positions involving ecological work have been classified in series such as [General Biological Science, GS-0401](#); [Microbiology, GS-0403](#); [Plant Pathology, GS-0434](#); [Forestry, GS-0460](#); [Wildlife Biology, GS-0486](#); [Oceanography, GS-1360](#); etc.

The task of distinguishing ecology from closely related professions is most easily resolved by considering (1) the paramount purpose and emphasis of the work, (2) the approach utilized in the work, (3) the knowledges and skills required, and (4) the incumbent's professional training, experience, career ladder, and recognition. The methodologies used for the above occupations typically adhere to those particular disciplines. The ecologist employs a holistic systems approach, integrating concepts and data of several disciplines to study ecological relationships. For example, an ecologist may investigate the social and biological behavior of a particular species of animal to understand the interactions of the species with its environment and the role of the species as a component within an ecosystem. A wildlife biologist may study the same species to gain knowledge about its adaptability to a particular milieu where concern about species interactions is focused on learning about and managing the species itself vis-a'-vis the ecologist's focus on the interrelationships within the ecosystems.

BASIC QUALIFICATION REQUIREMENTS

Work in ecology requires in-depth professional education and experience in ecology and knowledge of the ecological principles, ecosystem processes and the procedures, techniques and methods utilized in investigating, analyzing and understanding ecological relationships. The required knowledge and experience is of such an advanced nature that most positions require a Ph.D. in ecology or equivalent education and training. However, some developmental or limited assignment positions may be filled by persons with less formal education and experience.

TITLES

The basic title for all positions in this series is "Ecologist." Positions at the lower levels in this series are typically trainee or developmental levels. An organizational title of "Ecology Intern" is appropriate for these positions at the GS-5 and GS-7 levels. The title "Supervisory Ecologist" applies to those positions that involve supervisory duties and responsibilities as defined in the [General Schedule Supervisory Guide](#).

Ecologists may specialize in a variety of ways, such as by particular habitat (e.g., aquatic, terrestrial, estuarine, forest, or tundra), by particular groups of organisms (e.g., plants, fish, wildlife) or by function or purpose of the work (e.g., research, resource development, pollutant effects, or regulatory policy, etc.). The required specialized knowledge may be considered, as necessary, in selective placement and other personnel actions.

EVALUATION NOTES

This series-coverage standard does not include grade level criteria. Research positions should be evaluated by reference to the [Research Grade Evaluation Guide](#). Positions primarily concerned with evaluating and recommending approval of ecological research grants and contracts should be evaluated by reference to the [Research Grants Grade Evaluation Guide](#). The [General Schedule Supervisory Guide](#) should be used to evaluate supervisory positions. Other types of ecologist positions should be evaluated consistently with published standards by cross series comparison.