

## Quality of the Graduate Academic Program

### 1. Course offerings

Purdue University is a land-grant institution, recognized internationally for the quality of its graduate programs in agriculture, engineering and physical sciences, and a previous recipient of GAANN Fellowship Program grants (e.g., Structural Cell Biology). We propose a new GAANN program for mentoring students in basic and applied ecology that blends the multidisciplinary quality of previously separate departmental graduate programs. Purdue faculty in various niches of ecological research are found primarily in FNR and BIOL. Sixteen *teaching-and-research* faculty will participate in the mentoring of GAANN Fellows in multidisciplinary ecology. Nine faculty are from FNR, 6 from BIOL and 1 from the Department of Botany and Plant Pathology (BPP). Summary information of GAANN faculty is listed in Table 1.

**Table 1. GAANN faculty, departmental affiliations and research interests.**

<b>Name (Rank)</b>	<b>Dept.</b>	<b>Research Interests</b>
Shorna Broussard (Asst. Prof.)	FNR	Environmental resource management
J. Andrew DeWoody (Asst. Prof.)	FNR	Molecular ecology; population genetics
John. B. Dunning, Jr. (Assoc. Prof.)	FNR	Landscape and restoration ecology
Kevin D. Gibson (Asst. Prof.)	BPP	Ecology of invasive and weedy plants
Richard D. Howard (Professor)	BIOL	Life-history evolution; sexual selection; risk assessment of transgenic organisms
Morris Levy (Professor)	BIOL	Evolution; genetics of plant-pathosystems
Jeffrey R. Lucas (Professor)	BIOL	Ecological modeling; avian energetics
Dennis M. Minchella (Professor)	BIOL	Host-parasite co-evolution; epidemiology
George Parker (Professor)	FNR	Plant and community ecology; watersheds
Kerry Rabenold (Professor)	BIOL	Community ecology; conservation biology
Olin E. Rhodes (Assoc. Professor)	FNR	Wildlife genetics; conservation biology
Anne Spacie (Professor)	FNR	Aquatic ecology; fisheries biology
Trent M. Sutton (Asst. Professor)	FNR	Population dynamics of freshwater fish
Robert K. Swihart (Professor)	FNR	Biodiversity conservation in agricultural landscapes; vertebrate population dynamics
Peter M Waser (Professor)	BIOL	Behavioral ecology; dispersal dynamics
Harmon P. Weeks, Jr, (Professor)	FNR	Wildlife ecology; restoration ecology

GAANN faculty collectively conduct research on biodiversity and the sustainability of natural resources in human-impacted landscapes; population genetics and dynamics of wildlife populations and of host-parasite systems; conservation and restoration biology; bioenergetics, evolution and modeling of animal behavior; and more. With the additional wealth of scientific expertise throughout Purdue, a multidisciplinary program in ecology will provide highly qualified Ph.D. students with the conceptual skills, analytical tools, and pedagogical experience that is required for success in the next generation of ecological scientists.

The 16 GAANN faculty offer 38 graduate courses (Table 2) that include basic principles of ecology, evolution, population biology, conservation biology and natural resources management; molecular genetic and quantitative methods of analysis, applications for research specialties, and methods for collegiate-level teaching. GAANN Fellows will choose from these and numerous other excellent courses across campus (especially in biochemistry, computer science, mathematics, and statistics) for their individualized coursework.

## **2. Academic requirements**

To provide a common core of training, Fellows will be required to complete at least 4 credits from among the following courses (see Table 2 for details): Advanced Ecology Discussion (1 cr), Advanced Evolution Discussion (1 cr), Philosophy of Biological Instruction (1 cr), Research Methods (FNR 555, 2 cr), and Principles of Academic Success in Ecology. BIOL 695A and BIOL 695C are team-taught and prepare BIOL/FNR students for subsequent examinations to determine their competence for candidacy. BIOL 695D is taught by Dr. Rick Howard, with the participation of master teachers from Purdue and other institutions, and provides students with a variety of teaching and learning evaluation methods. FNR 555 is taught by Dr. Phil Pope, Associate Dean of The Graduate School with a half-time faculty appointment in FNR, and

**Table 2. Graduate course offerings of GAANN faculty. Boldface = core courses.**

<b>Course No.</b>	<b>Course name</b>	<b>Instructor</b>
BIOL 542E	DNA Fingerprinting Laboratory Module	Levy/Minchella
BIOL 580	Evolution	Levy
BIOL 585	Ecology	Howard/Waser
BIOL 590	Theoretical Population and Community Ecology	Lucas
BIOL 591	Field Ecology	Rabenold
BIOL 592	Evolution of Behavior	Waser/Lucas
BIOL 595G	Animal Communication	Lucas
BIOL 597	Sex and Evolution	Howard
<b>BIOL 695A</b>	<b>Advanced Ecology Discussion</b>	All above
<b>BIOL 695C</b>	<b>Advanced Evolution Discussion</b>	All above
<b>BIOL 695D</b>	<b>Philosophy of Biological Instruction (required)</b>	Howard
BIOL 696G	Seminar in Ecology, Evolution & Behavior	All above
BTNY 590E	Topics in Weed Ecology	Gibson
FNR 501	Limnology	Spacie
FNR 502	Watershed Hydrology, Ecology and Management	Spacie
FNR 505	Molecular Ecology and Evolution	DeWoody
FNR 540	Wetlands Ecology	Rhodes
FNR 541	Ecology and Management of Harvested Wildlife	Weeks
FNR 542	Ecology and Management of Declining, Rare, and Endangered Wildlife	Weeks
FNR 543	Conservation Biology	Dunning
FNR 544A	Landscape Ecology	Dunning
FNR 544B	Restoration Ecology	Dunning
FNR 544C	Conservation of Non-wild Populations	Dunning
FNR 545	Fisheries Management	Sutton
FNR 546	Fish Ecology	Sutton
FNR 547	Vertebrate Population Dynamics	Swihart
FNR 548	Wildlife Investigational Techniques	Weeks
<b>FNR 555</b>	<b>Research Methods</b>	Pope
FNR 581	Environmental Impact Assessment	Parker
FNR 598A	Advanced Ichthyology	Sutton
FNR 598B	Advanced Ornithology	Dunning
FNR 598C	Conservation of Biological Diversity	Dunning
FNR 598D	Population Dynamics in Space and Time	Rhodes
FNR 598H	Human Dimensions of Natural Resources	Broussard
FNR 598M	Advanced Topics in Mammalogy	Swihart
FNR 598U	Fishery Stock Assessment and Modeling	Sutton
FNR 634	Forest Ecology	Parker
FNR 647	Quantitative Methods for Ecologists	Swihart
<b>FNR/BIOL</b>	<b>Principles of Academic Success in Ecology</b>	Team taught

provides students with training in the scientific method, philosophy of science and proposal writing. Principles of Academic Success is a new, team-taught course that will be offered for the benefit of GAANN Fellows to provide perspectives on pedagogy, research, service, career enhancement, interviewing, interpersonal relations, and program management. Additional career training is available via courses like BIOL 695Y Seminar Methods, taught by Dr. David Asai, Head of BIOL, which focuses on research ethics as well as seminar and lecture presentation methods.

GAANN Fellows also must successfully complete the following requirements for their doctoral degree as set forth by the Graduate School: 1) select, with mutual acceptance, a Major Professor and graduate advisory committee to oversee the doctoral research; 2) file in a timely manner a Plan of Study for coursework agreed to by the advisory committee; 3) pass a preliminary exam to establish competence for doctoral candidacy in ecological sciences; 4) make satisfactory progress in the doctoral research as determined in annual conferences with the advisory committee; and 5) pass a final public defense of the thesis, marked by filing of the accepted thesis with the Graduate School.

To aid GAANN Fellows in meeting their academic requirements, upon acceptance of a Fellowship offer each student will make an initial selection of a GAANN faculty member as an advisor. Together they will select an appropriate plan of coursework for at least the initial semester. Also in year 1, GAANN Fellows will be required to attend regularly meetings of research groups of other GAANN faculty, fostering a better appreciation for the breadth and nature of approaches to ecological research, and increased familiarity with the interests and personalities of other research clusters. Exploration of collaborative, co-advising relationships that enrich the multidisciplinary experience will be encouraged. Upon final selection of a Major

Professor, an advisory committee will be assembled. Advisory committees will contain at least 1 GAANN faculty member from outside of the student's "home" department. This committee structure is essential in contributing to the multidisciplinary perspectives in the doctoral research, especially by broadening the student's technical and analytical expertise. GAANN faculty are committed to mentoring, not just monitoring, our multidisciplinary ecology students.

### **3. Qualifications of faculty**

The GAANN faculty include 10 Full Professors, 2 Associate Professors, and 4 Assistant Professors. All have productive, well-funded research programs, several of which are nationally and internationally recognized. Collectively, the 16 faculty have produced 139 scholarly publications from 2000-2002 (4.3/yr). They also have an exemplary record in training graduate students, with a total of 23 Ph.D. and 41 M.S. degrees awarded since 1997. Although comprising only 19% of the total faculty staffing in FNR and BIOL, they currently are training 29.8% of the graduate students in the departments. Ten faculty have served or currently serve as Editors or Editorial Board members of scientific journals. Several faculty are major contributors to Purdue's outreach and minority recruitment efforts. Others are involved in international teaching in ecology, including courses for the Organization of Tropical Studies (Costa Rica) and scientific workshops for the conservation and use of genetic resources at The International Center for Tropical Agriculture (Colombia).

### **4. Focus and capacity for research**

The opportunity for a GAANN Fellowship Program in Multidisciplinary Ecology is extremely timely at Purdue, due to technological advances and the University's emphasis on modernizing the infrastructure of learning and discovery. As in other branches of biology, the development of molecular genetic tools and biotechnology have changed the face of ecological

research. All of the GAANN faculty generate or analyze genetic (or physiological) data to characterize the structure, diversity and dynamics of biological systems. This new technological insight into the vitality of natural resources is essential to developing effective strategies for their conservation and sustainable use, and to the education of modern ecologists.

The University's promotion of programmatic, multidisciplinary research efforts is equally important. GAANN faculty and allies have drafted a proposal (now in review) to the University Provost to form an Institute for Sustainable Resources, Populations and Landscapes (ISRPL) to integrate ecological expertise campus-wide. ISRPL will promote collaborative research and training efforts and anchor the search for new faculty hires to complement current strengths.

Ultimately, the capacity for quality research demands quality facilities. The University and participating departments provide GAANN faculty with adequate lab space and excellent equipment, and access to extensive greenhouse and field facilities for experiments.