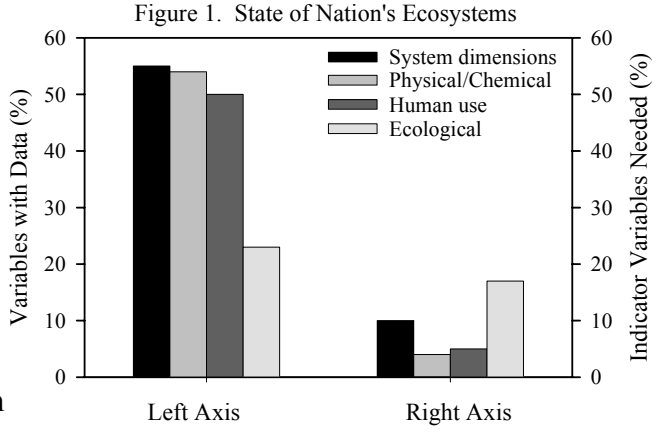
**Extent of Need in Multidisciplinary Ecology**

**1. Identification of problems that form the specific needs of the project**

The well-being of natural systems is dependent on human understanding and management. Likewise, the well-being of humans ultimately is dependent upon maintenance of natural ecological processes. In short, ecological issues are inextricably linked to virtually every facet of daily life. Given the interdependence of humans and ecological systems, it is unsettling that so little is known regarding our effects on ecological processes. A recent analysis (Sanderson et al., 2002) concluded that 83% of the world's terrestrial surface was characterized by one or more of the following factors: human population density greater than 1 person per square kilometer; less than 15 km from a road or major river; occupied by urban or agricultural land uses; within 2 km of a settlement or a railway; and/or producing enough light to be visible regularly to a satellite at night. A recent report on the state of the nation's ecosystems (*The state of the nation's ecosystems*, 2002) highlighted the dearth of ecological understanding in comparison to structural, chemical, and socio-economic aspects of ecosystems (summarized in Figure 1). The report indicated that roughly twice as much data are available for assessment of non-ecological system components compared with ecological components (Left Axis, Figure 1). It also noted that 17% of the ecological variables judged as promising indicators still had not been developed, a level 2-3 times greater than for system, physico-chemical, or human-use variables (Right Axis, Figure 1). Our ability to elevate the understanding of ecological processes and their role in natural and human systems to a level comparable to other disciplines (e.g., chemistry,

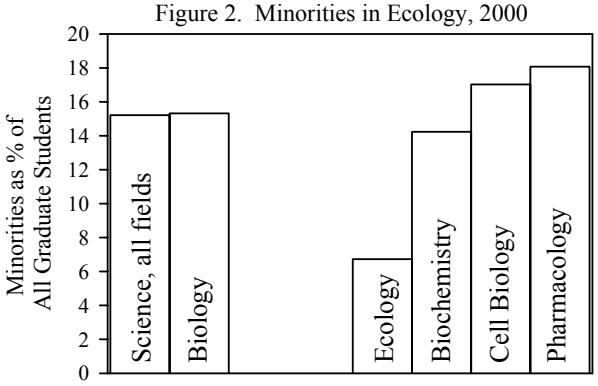
Figure 1. State of Nation's Ecosystems



geology, economics) will depend on training a new generation of ecologists who are capable of articulating teaching and research programs that link basic discoveries with conservation and policy implications. Current graduate (and undergraduate) programs tend to emphasize either basic science or management, even though cutting-edge issues in ecology clearly require professionals with the ability to address both. Further evidence of a national need for integrated graduate training in ecology comes from national funding initiatives, including the USDA Managed Ecosystems Program and the NSF Biocomplexity in the Environment program's topical area, Coupled Natural and Human Systems. NIH also has increased substantially its funding of research into the linkages of human population change and the environment (NICHHD).

Because of the global ramifications of ecology for humans and the environment, contributions to our understanding are needed from individuals of all cultural and ethnic backgrounds. Distressingly, minorities are underrepresented in ecology to a far greater degree than in other areas of biology (Figure 2). Our proposal focuses efforts on graduate recruitment of minorities into ecology by promoting an integrated, multi-disciplinary program that enables graduates to address scientific issues of societal concern.

Figure 2. Minorities in Ecology, 2000




Source: NSF Division of Science Resource Statistics. 2002. Graduate students and postdoctorates in science and engineering.

**2. Specific problems to be resolved by realization of project goals and objectives**

Our departments will recruit retain, and train in multidisciplinary ecology an increased number of well-qualified graduate students from underrepresented groups. Funding by the

GAANN program is instrumental to achieving these goals and will provide the impetus for a flourishing multidisciplinary program.

### 3. Impact of GAANN Fellowships on development of multidisciplinary ecology

A key goal of our efforts is to provide women and minorities with graduate training in multidisciplinary ecology, thereby enabling underrepresented groups to participate in discovery and learning activities that bear directly on the health and sustainability of natural and human systems. Ecology is an increasingly prominent field of science that affects policy, and its growth will increase in direct relation to the diversity of perspectives and backgrounds of practitioners. Our program can make an important national contribution to such enrichment of diversity.