ENVIRONMENTAL BIOLOGY $111,480,000

The FY 2005 Request for the Environmental Biology (DEB) Subactivity is $111.48 million, an increase of $3.22 million, or 3.0 percent, above the FY 2004 Estimate of $108.26 million.

Environmental Biology Funding
(Dollars in Millions)

	FY 2003 Actual	FY 2004 Estimate	FY 2005 Request	Change over FY 2004 Amount	Percent
Environmental Biology Research Projects	108.28	108.26	111.48	3.22	3.0%
Total, Environmental Biology	$108.28	$108.26	$111.48	$3.22	3.0%

The Environmental Biology Subactivity supports fundamental research to inventory life in the biosphere, comprehend its origins and evolutionary history, and understand the interactions and dynamics of biological communities and ecosystems. Studies can address the species of or genealogical relationships among plants, animals, fungi, and microbes; the flux of energy and materials in ecosystems; and the principles or rules by which species function in communities and evolve through time.

In FY 2005, core activities in the DEB Subactivity are increased by $3.22 million to enhance support for research that addresses the continuum of questions from evolutionary processes to ecosystem services, consistent with present community strengths and future science and cyberinfrastructure needs. Priority will be given to leveraging new cyberinfrastructure capabilities and bringing innovative tools into the toolkits of environmental biologists. In order to take the information generated by these investigations and transform it into knowledge – within the scientific community and throughout the citizenry – a high priority will be placed on integrating education with research through activities that engage students at all levels from “K to gray.”

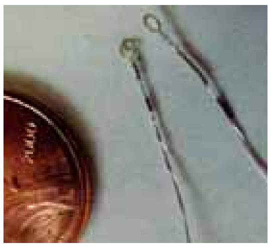
Twenty-first century biology is by its nature anticipatory. Pioneering studies often identify biological questions that later — in the short or long term — become compelling research areas that attract talented investigators across many fields of inquiry. In this context, DEB-supported activities will continue to balance disciplinary and multidisciplinary research needs; focus on what NSF supports uniquely, or uniquely well; provide for ecological and evolutionary synthesis; and diversify and educate the next generation of environmental biologists.

Highlights of areas supported:

Biodiversity Discovery at a Global Scale. With at most one in ten living species known to science, biodiversity inventories are a time-critical research endeavor. A project funded by the new Planetary Biodiversity Inventory (PBI) activity in 2003 brings together more than 200 scientists from 31 countries to inventory the world’s catfishes. Results will enhance fundamental knowledge about the earth’s biota and help decision makers prioritize areas for protection and make informed freshwater management decisions. PBI grants will transform how scientists discover and document the diversity of entire branches of the tree of life.

Endangered Checkerspot Butterfly

CAREER awardee and team develop an Extinction Modeling Toolkit (EMT). This computational modeling toolkit identifies the types of wildlife species and populations at greatest risk of extinction. This allows researchers to investigate the risks of habitat fragmentation, harvest, and deleterious mutations on wildlife populations. Wildlife managers cannot use vast amounts of biodiversity data directly. They require specialized computing tools such as the EMT to focus the data on questions of interest.



Glucose Sensors

New Tool for Soil Carbon Analysis. Ecologists seek to understand the patterns observed in nature. The addition of molecular and genomics tools, new sensors, broad new informatics capabilities and other advanced techniques are helping investigators explain much variation that exists in ecological processes over space and time. For example, one investigator adapted miniaturized glucose sensors (originally designed for diabetics) for use in non-invasive carbon studies in root zones (rhizospheres).

Studies that cross multiple spatial scales as well as disciplines are increasing. One study of how fish and fisheries depend on watershed inputs and human impacts has linked biology with nuclear physics to apply proton-induced x-ray emission analysis to the study of movements and environmental events in a fish's life. This research is addressing whether incremental economic activities at the watershed level can alter the stability of an ecosystem. Unexpectedly, researchers discovered the heavy metal, selenium, in fish from Onondaga Lake in New York. This lake is known for its severe mercury contamination, and the discovery of selenium in the fish suggests that there may be a second element of concern.

Bursera fagaroides

Molecular tools help researchers tease apart plant/insect interactions. For hundreds of millions of years, there has been a coevolutionary "arms race" between plants and the animals that eat them. Recent work on the coevolution of the plant *Bursera* and its herbivores combines chemical, ecological and phylogenetic techniques. Not only is this work the first to use rigorous molecular analyses for highly diverse, subtropical tree and insect lineages, but it also has led to new insights about adaptation and counteradaptations.

Evolution at the molecular level. Genomics is bringing together molecular and evolutionary biologists to tackle big questions in comparative evolution. The technological advances made in DNA sequencing coupled with the development of algorithms for analyzing gene order rearrangements have allowed construction of new family trees for a broad range of organisms. These new analysis tools will be important for making the best use of the large data sets produced by comparative sequencing projects. Studies of organismal relationships are critical to comparative studies of animal evolution, and provide useful models for understanding plant, fungal, and microbial evolution.