

The PCAST Report

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John L. Schnase
NASA Goddard Space Flight Center

13 December 2004

Presidents Committee of Advisors on Science and Technology (PCAST) *Panel on Biodiversity and Ecosystems*

**Biodiversity and Ecosystems are Natural
Capital Assets**

**Make Use of Current Knowledge in
Managing Biodiversity and Ecosystems
in the United States**

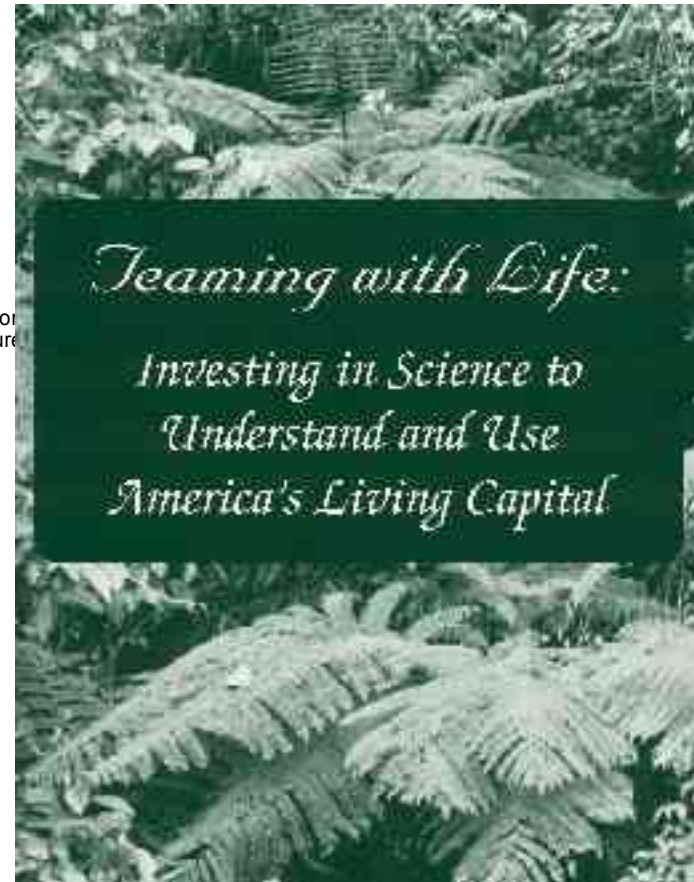
**Assess, Monitor, and Study the Biota and
Ecosystems of the United States**

**Encourage a More Realistic Relationship
between the Economy and the
Environment**

**Build a “Next Generation” National
Biological Information Infrastructure**

**Assure that Environmental Education is
Centered on Science**

- March 6, 1998



PCAST “Findings”

1. Biodiversity and ecosystems are natural capital assets

Agriculture	\$57B US	\$325B Worldwide
Fisheries	\$2.5	\$82
Forest Goods	\$8	\$90
Medicines	\$20	\$84
Ecotourism	\$100	\$225
Arable soil	\$62	\$760
Biocontrol	\$17	\$160
Remediation	\$83	\$881
...	<i>Trillions of dollars ...</i>	

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PCAST “Findings”

Recommended enhancements

Scientific knowledge in service to society

Species discovery

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Ecosystem research and monitoring

Economy and environment links

Education

PCAST “Findings”

2a. The biodiversity and ecosystem enterprise is essentially an information enterprise

Research produces intangible results

Biodiversity & ecosystems research = knowledge construction

Natural resource management decision-making = synthesis

Need a particular type of infrastructure

Support for intellectual activities, exploration and discovery, community communication, and multidisciplinary scientific collaborations ...

PCAST “Findings”

2b. The biodiversity and ecosystem enterprise is a complex information domain

Biological complexity

Millions of species, QuickTime™ and a TIFF (LZW) decompressor. See www.apple.com/quicktime/faq/faq_tif.html high variability, complex attributes, millions of years of evolutionary adaptation

Sociological complexity

Communication and coordination among people, agencies, divergent interests, and constituencies of different regions and backgrounds

PCAST “Findings”

Recommended enhancements

Build NBII-2: A “next generation” biodiversity and ecosystems information service ...

... and focus on: *Information content*
Standards and interoperability
Analytical and synthetic capabilities
Biological informatics R&D

Information Content

- Natural history collections
- Institutional and individual datasets
- Published scientific record

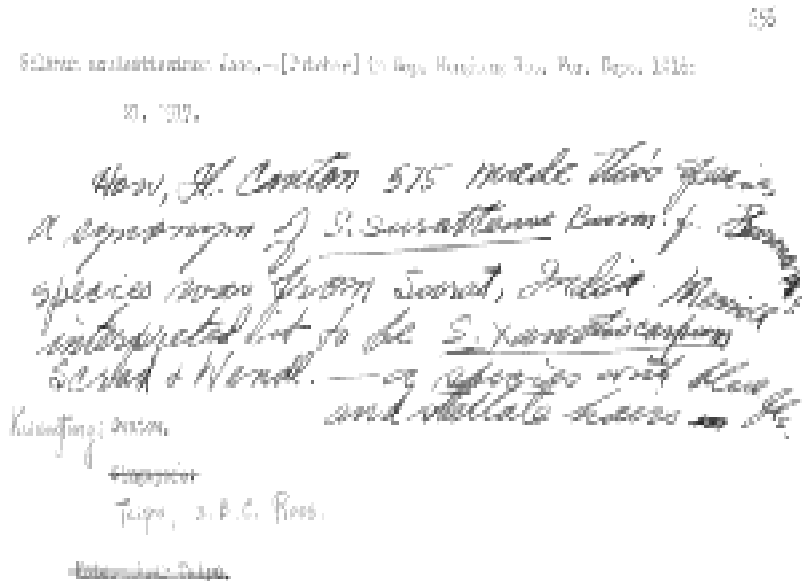


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Standards and Interoperability

- Rich data types
- Petabyte-scale storage
- Standards proliferation
- Weak interoperability

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Analysis and Synthesis

- People as query processors
- Fuzzy questions and approximate answers
- Exploration and biocomplexity

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Bioinformatics R&D

- Bioinformatics as a Bio + CS/IT discipline
- Technology mediation
- Enterprise reinvention



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Presidents Committee of Advisors on Science and Technology (PCAST) *Panel on Biodiversity and Ecosystems*

Seven years later ...

PCAST midway between
HT'91 and now ...

Major trajectories right

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Actual paths and outcomes
surprising

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“Sometimes not easy being
Fearless Leader”

*- Gen. Badenov
Dictator of Pottsylvania*

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