

A National Oceanographic Partnership Program Award

***Bridge: Ocean Science Education Teacher Resource Center***

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<http://www.marine-ed.org/Bridge>

Long-term goals

The Bridge ([www.marine-ed.org/bridge](http://www.marine-ed.org/bridge)) is a focused web portal site for ocean sciences education resources. The Bridge network of links ties together resources from more than 1,000 websites containing ocean sciences material useful to teachers. The Bridge provides educators with a comprehensive source of accurate and useful information on global, national, and regional marine science topics, and provides researchers with a contact point for their educational efforts.

Objectives

1. Enable educators nationwide to access easily and efficiently a clearinghouse that conceptually organizes useful electronic resources for marine education in a comprehensive, pedagogically appropriate, and user-friendly manner.
2. Enable the ocean sciences research community to more efficiently reach teachers nationally with current informational products and data.
3. Provide educators with quality assurance that they need in order to be confident that the materials and information accessed are produced by credible sources and that they are consistent with the goals of supporting improved scientific literacy, systemic reform of science education, and standards.
4. Improve educators' access to current data and marine information.
5. Develop a broad-based, long-term partnership among National Oceanographic Partnership Program projects, NOAA/Sea Grant partners, the National Marine Educators Association and regional chapters, ocean sciences researchers, providers of oceanographic information, and educators.
6. Create a website and associated internet discussion group which will serve as a focal point for improved communications and exchange among educators and researchers.

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7. Provide sufficient information and professional development opportunities to inform educators nationwide about this resource and enable them to make effective use of it.

8. Provide the research community with guidance in preparing web-based materials that are useful to teachers, and assurance that the materials that they prepare will reach a large audience of educators.

### Approach and work plan

The Bridge is developed and maintained by the Bridge project staff at the Virginia Institute of Marine Science (VIMS), College of William and Mary. Between October 2001 and October 2002, project staff consisted of the two co-principal investigators and three marine science education specialists. This staff oversees design, content, technical elements, and national coordination. A national network of National Marine Educators Association (NMEA) educators and Sea Grant educators, teachers, research scientists, and graduate students assist with material selection and development. The Bridge's partnering network, developed with and through the Sea Grant Education Network (SGEN) and NMEA, provides two-way communication with teachers and science education organizations nationwide. Designated Bridge Regional Coordinators serve as contact points for activities within the Bridge's four regions. We are currently working with NMEA chapters and SGEN to improve linkages among chapter pages, the NMEA site, Sea Grant educational resources, and the Bridge. Fifteen of NMEA's seventeen chapters are currently creating new chapter websites or improve existing ones, in collaboration with the Bridge project.

Research-based information is a key element on the Bridge. Of the Bridge's approximately 1,000 links, 128 originate with actual research data from research facilities. There is a special area on the Bridge featuring data that can be used in classroom teaching, and each month during the school year the Bridge staff produces a Data Tip focusing on the analysis and interpretation of topical on-line data. Forty-two Data Tips have been published. At present, Bridge educators are working with scientists and educators at the Monterey Bay Aquarium Research Institute (MBARI) to develop a new series of data-based activities featuring MBARI's research.

The site selection process is an important part of the Bridge. Both researchers and educators sometimes fear that quality of web-based materials will be poor because "anybody can post anything to the web". While it is true that it is easy to post information on the web, it is also true that reputable research and educational facilities typically approach quality and integrity of on-line publications much as they do paper publications, and it is unusual to find unacceptable content on the websites of such organizations. In order to be included in the Bridge's collection, a site must be processed through a three-step process:

- Scientists, educators, or Bridge staff nominate sites, usually using an on-line form on the Bridge.
- Bridge staff, assisted by the TROLLS (Teacher Reviewers of On-Line Learning) team and researchers as needed, scrutinizes each nomination using the published Bridge review criteria. Sites are most often disqualified due to lack of useful instructional elements or links to adult humor, rather than because of poor scientific information.

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- Questions about scientific content or educational merit are researched by the Bridge office staff. Qualifications include four masters degrees: one marine science, one aquaculture, two science education, and the project has ready access to the faculty and expertise of William and Mary's School of Marine Science as well as the Bridge's STARS (Scientific and Technical Advisory Reviewers) volunteers.

NOPP has sponsored the Bridge since its inception in 1998. The project is now transitioning to support from the National Sea Grant College Program. Bridge objectives will remain unchanged. The Bridge also is partnering with the Consortium for Oceanographic Research and Education (CORE) and the University of South Carolina in creating a Central Coordinating Office (CCO) for NSF's new COSEE (Centers for Ocean Science Excellence in Education).

The upcoming year will largely be devoted to developing these two partnerships, strengthening national linkages among these and other key regional and national elements in ocean science education, and further developing the Bridge's capacity to package and deliver current research information and data.

### Work Completed

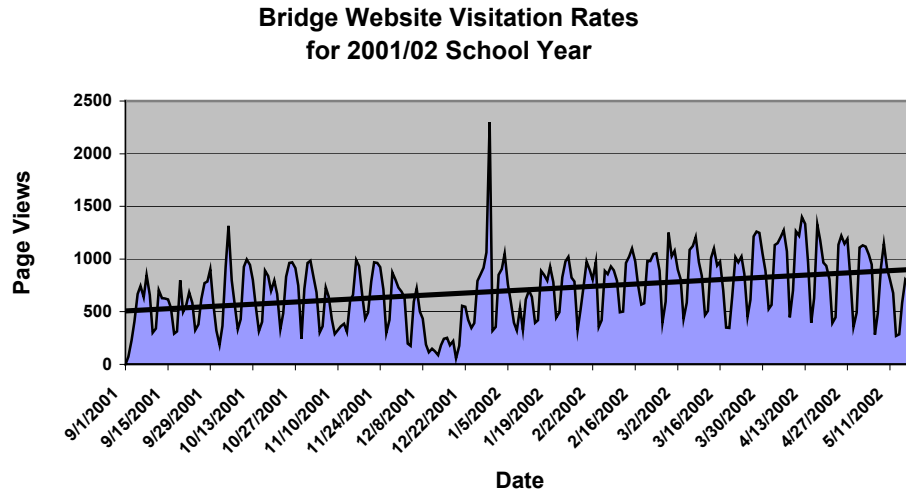
The Data Tip series presents original lessons authored by Bridge staff and collaborators. They focus on authentic data available on-line. Ten Data Tips were published between October 2001 and October 2002: The Goose Is Loose, The Ozone "Hole", A Stellar Animal, Winter Wonderland, More Than Mud, In Full Bloom, Chilean Sea Bass: Off the Menu, Plate Tectonics, and The Scoop on Scallops.

Workshops: National Science Teachers Association; South Carolina Marine Educators Association; NASA; Mid-Atlantic Marine Education Association; Virginia Association of Science Teachers; National Marine Educators Association; "Bottoms Up to the Benthos" teacher inservice program in Hampton Roads, VA (2); VIMS Shark Workshop and MS 548 teacher summer graduate course; EPA Region 6 Resources for Teachers and Students Symposium; UNO Preservice Class; Tidewater Association of Science Educators; OSU Internet Skills workshop for environmental education (Nat Res 691) and Earth Systems Education (Nat Res 814); NSF: Digital and Field Techniques for Coastal Environment Studies; Project Learning Tree; Coastal Explorations; and University of Cyprus graduate course for upper elementary teachers (Integrating the Natural Sciences) and Environmental Education.

Selected Information sessions (posters, exhibits, bookmarks distributed): Maryland Association for Environmental & Outdoor Education; Florida Marine Science Educators Association; Hatfield Marine Science Center, Oregon; Northwest Association of Marine Educators Education; NC Association of Environmental Education Centers; NC EE Institutes; NC Environmental Education

Advisory Council; Project CATCH; Watermen's Expo in Ocean City, MD; National Marine Educators Association; OSU new students demonstration; NAAEE in Boston; and Environmental Education Council of Ohio.

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*Figure 1. Bridge site visitation records (page views) show an upward trend, beginning at just above 500 in September 2001 and almost doubling by the end of that school year.*

Site statistics record from October 2001 – October 2002:

- 242,206 page views annually (928/day average)
- Visitors came from 205 foreign countries
- 83% are Microsoft Internet Explorer users
- 1.8 pages views/session (average)
- Top 5 pages (excluding home page): Lesson Plans, Molluscs, Online Data, Invertebrates, Careers

Bridge TROLLs (Teacher Reviewers of On-line Learning) review sites on a volunteer basis.

- Between October 2001 and October 2002, 38 educators from 12 states and 6 countries applied to become members of the Bridge TROLL Patrol.
- TROLLs submitted over 65 reviews.

As part of the Bridge's regional outreach, the project assists regional chapters of the National Marine Educators Association with the improvement or establishment of chapter websites. Of the 17 chapters, 15 applied for and received mini-grants of \$500 for this purpose. Links to NMEA chapter websites may be found at [www.marine-ed.org/chapters](http://www.marine-ed.org/chapters).

### Results

During October 2001-2002, the Bridge built new connections and strengthened established relationships with NMEA and the 17 NMEA chapters through the website mini-grants as well as through regular communications with the Bridge's team of regional coordinators. Three NMEA

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chapters, Massachusetts, Georgia, and the Oceania chapter (Hawaii and the Pacific Islands) had no website prior to this collaboration, and these grants allowed them to create a new site. All chapter sites except the Georgia site are up and running, and the Georgia site is in progress. The other 10 sites were expanded and improved with new graphics, updated content, and new links. The mini-grants were very well received and the results have strengthened the communications between and within the chapters, the national organization, and the Bridge, as well as providing a new and improved service to educators all over the country.

Bridge activities were shared with the NMEA Board and the chapters via twice-annual formal reports given at the NMEA mid-year and summer Board meetings. The NMEA voted unanimously to provide the Bridge with \$500 annually to support the Bridge TROLL activities. NMEA's peer-reviewed quarterly journal (*Current*) contains a Bridge-authored article in each issue, highlighting web resources that support the articles. *NMEA News*, the quarterly newsletter, and the Scuttlebutt email list also include regular Bridge updates and announcements.

Through numerous teacher workshops across the country, Bridge staff provided experience for thousands of educators in using online scientific data in classroom teaching applications. The Data Tip activities consistently receive excellent evaluations from workshop participants. The combination of mathematics and science analytical skills that the Data Tips require of students seems to be a major factor in teachers' praise of this resource. The Data Tips are consistently among the most popular and most visited pages on the website.

The increased visibility that the Bridge has achieved is resulting in a greater interest among scientists in refining their website content and data specifically for use by educators. Informal and formal contacts with scientists, through conferences and email communications, are building a wider and more productive network between the Bridge and the scientific community.

### Impact and applications

#### Science Education and Communication

Greater connections nationwide between educators and scientists is being accomplished. Bridge staff regularly receive unsolicited requests from scientists for advice on their website construction and for formal collaboration to assist with outreach components of proposals. (VIMS, University of Delaware, MBARI for example) The Bridge served as a model for the ChesSIE website, a regional project linking educators to online resources on the Chesapeake Bay. The Bridge's connection with the COSEE project will lead to new and stronger applications for the use of on line scientific data in science education.

As access to online computer equipment becomes more and more common in schools across the country, the Bridge will have an even wider audience for its resources. It will be important to focus more effort on dissemination and outreach to reach educators who have only recently obtained convenient computer access in their schools. In addition, with the shortage of certified science teachers that exists now (and is predicted to increase), particularly at the middle school level, the Bridge has a large audience that desperately needs assistance in locating teacher-friendly resources.

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### Transitions

#### Science Education and Communication

The Bridge's activities are fundamentally transition-based. Each time a teacher uses information or resources from the Bridge, the Bridge project serves as the transition medium linking researchers and other information sources with teachers. Teachers using that information with students then implement a second tier transition. The Bridge has no mechanism for documenting exact numbers of students impacted, but, assuming a conservative teacher to student ratio of 1/30 (and many teachers have larger numbers of pupils) during the report period, and assuming (also conservatively) that only half of the teachers who visited the Bridge made use of Bridge resources, at least 2,000,000 students should have benefited from this process between October 2001 and October 2002.

Selected comments from educators who use the Bridge:

- "...enjoyed this activity ... nice Web-based exploration that uses authentic data sets."*
- "...my thanks to you ... you folks amaze me with all the links you have in place."*
- "...found it most interesting and useful, I plan on using it ... real good stuff."*
- "...how useful your site was to me... got some great ideas here. Thank you so much."*
- "...will continue to draw on The Bridge as I complete another ocean book..."*
- "...I LOVE your Data Tips; in fact, the entire site is fantastic!"*
- "...thrilled to get the info in a nice useable form."*
- "...your web site is one of the best I have seen....and my job is web searching!"*
- "...This site rocks! It gave me exactly what I was looking for."*

The Bridge also is involved in what might be considered "meta" transitions, in which the Bridge's resources are used by other agencies and organizations in support of their activities. As a partner in the National Coordinating Office for NSF's new Centers for Ocean Science Education Excellence (COSEE), the Bridge's resources will be incorporated into the infrastructure of that important new national project. The Bridge staff will develop the website for the national COSEE site to complement the information and resources found in the Bridge. The COSEE website will be posted later in 2003.

The Bridge has worked collaboratively with a number of projects and programs to bring their information to the attention of science teachers during the October 2001 – October 2002 report period. Among these were NOAA's Deep East expedition and NOAA's Climatic Data Center. The Bridge also initiated linkage to NSF's Digital Library for Earth Systems Education (DLESE) during that time frame, and attempted, unsuccessfully, to secure funding from the COSEE project in support of that effort. However, the Bridge has been entered into the DLESE collection as a resource, and the project is currently indexing individual Data Tips for inclusion.

Project CoPI Vicki Clark served as president to NMEA during 2002. As an NMEA officer, she worked to strengthen linkages among NMEA and its 17 regional chapters. The Bridge has been instrumental in that effort by working with Chapter webmasters in developing and improving

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sites, most of which now contain links to the Bridge, thus providing a broad network of access nationally.

### Related projects

Centers for Ocean Science Education Excellence (COSEE) – this new project incorporates and builds on Bridge resources. The Bridge is a partner in the national coordinating center for COSEE. The Bridge staff will develop the website for the national COSEE site to complement the information and resources found in the Bridge. The COSEE website will be posted later in 2003.

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### Publications

Published October 2001 – October 2002:

Lawrence, L.A. 2001. The Goose Is Loose. Bridge Data Tip. Available: <http://www.marine-ed.org/bridge>

Lawrence, L.A. 2001. The Ozone "Hole". Bridge Data Tip. Available: <http://www.marine-ed.org/bridge>

Lawrence, L.A. 2001. A Stellar Animal. Bridge Data Tip. Available: <http://www.marine-ed.org/bridge>

Lawrence, L.A. 2002. Winter Wonderland. Bridge Data Tip. Available: <http://www.marine-ed.org/bridge>

Lawrence, L.A. 2002. More Than Mud. Bridge Data Tip. Available: <http://www.marine-ed.org/bridge>

Lawrence, L.A. 2002. In Full Bloom. Bridge Data Tip. Available: <http://www.marine-ed.org/bridge>

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Lawrence, L.A. 2002. A New Look for the Bridge. NMEA News 17(3):6.

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Lawrence, L.A. 2002. The Ozone "Hole". NMEA News 17(4):6.

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Musick, Susanna. 2002. Message from the Bridge: Distant Shores and Dwindling Seas. Current: The Journal of Marine Education 18(1):31-32.

Musick, Susanna. 2002. Message from the Bridge: Estuarine Exploration. Current: The Journal of Marine Education 18(2):38-39.

Rudders, D. and L.A. Lawrence. 2002. The Scoop on Scallops. Bridge Data Tip. Available: <http://www.marine-ed.org/bridge>