



# THE WOODS HOLE RESEARCH CENTER

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## Studying Climate Change in the Arctic: Scientists and Students Working Together

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The Arctic is undergoing tremendous changes related to global warming. It is a key component of Earth's linked physical, biological, and cultural systems, and climate change is both impacting the functioning of the Arctic and altering feedbacks from the Arctic to the global climate system. Scientists at the Woods Hole Research Center, in concert with collaborators from several other institutions in the U.S. and internationally, are creating an innovative program to further research and to educate children – those living in the Arctic and others around the world – about these changes.

The Student-Partners Project (SPP), funded through a grant from the National Science Foundation, will unite students, teachers, and scientists to advance scientific understanding of the role of major arctic rivers in the changing arctic and global systems. By partnering with K-12 grade students and teachers living near the mouths of the largest arctic rivers in Russia, Canada, and Alaska, researchers will obtain the high frequency river water samples that are needed to understand seasonal dynamics and annual biogeochemical fluxes in the river systems. Through involvement in sampling, sample analysis, and data interpretation, students and teachers at the study sites will come to appreciate the pivotal role "their" rivers play in the Arctic System. The data generated will greatly advance scientific understanding, but a final objective – to excite kids about science – is perhaps most important because it is an essential step for creating the next generation of scientists and scientifically-literate citizens.

According to R. Max Holmes, an associate scientist at the Woods Hole Research Center and the lead investigator for the SPP, "These are huge rivers - each comparable in size to the Mississippi - flowing into the Arctic Ocean and their discharge is increasing as the Earth warms. It is critically important that we better understand these changes so that we can more accurately predict how continued warming will impact the Arctic in the future. By partnering with schools at our remote study sites along the rivers we are able to obtain samples with a frequency that otherwise would be unimaginable."

A great diversity of students and teachers will be involved in the SPP. Minority participants will include Nganasan, Nenets, Entsy, Evenki, Dolgan, Sakha, Khanty, and Komi students in Russia, Inuvialuit and Gwich'en students in Canada, and Yupik and Inupiat Eskimo students in Alaska. In addition to the arctic sites, researchers will also involve schools in the "lower 48" as partners. The Roxbury Preparatory Charter School, a sixth through eighth grade, 100 percent minority school in Boston, will sample the Charles River. Salisbury Community School in Vermont, a first through sixth grade school where SPP coordinating committee member Amy Clapp teaches, will sample the Otter Creek. Other schools will be added as the project develops. By facilitating communications and collaboration among students and teachers at the different study sites, the SPP will foster an appreciation of the cultural links among students.



**Max Holmes (center) with school children in the Siberian village of Zhigansk. Photo by Amy Clapp.**



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**Anya Suslova collecting Lena River water samples. Photo by Max Holmes.**

The idea for SPP emerged from a research expedition along the Lena River in northeast Russia in 2003. While on board, Holmes saw that the boat captain's 13-year old daughter was very interested in the process. Communicating primarily through translators, he explained the work being done and she quickly mastered the basic sampling protocols. At the end of the trip, he explained to her how more frequent sampling would help scientists learn more about the Lena River, and that if she wanted to continue she could be a big help. Anya agreed, so Holmes provided her with sample bottles and instructions on how to take samples from the Lena throughout the winter. Since September 2003, she has collected samples at 2-week intervals, often taking a snowmobile driven by her father out to holes in the ice and occasionally in temperatures as low as -55 degrees Celsius (-67 degrees Fahrenheit). Anya's samples are already proving to be highly valuable, as her high frequency samples have captured temporal variability that otherwise would have been missed.

Because of Anya's interest, in May and June 2004, Holmes, Clapp, and Alexander Zhulidov, a Russian scientist who had been on the Lena trip, visited her school in Zhigansk, Siberia, to talk about science and the environment. Before leaving, they supplied the school with additional sampling kits, and now other students and teachers are involved in sampling the Lena River for a wide range of chemical constituents. According to Holmes, "I've been incredibly impressed with the students and teachers in this remote Siberian village. The school has very little in terms of supplies and conveniences (for example, there is no running water), but the quality of the students' education is extraordinary. Students, teachers, and the school's principle have been extremely enthusiastic about participating in the Student-PARTNERS Project. "

All student collected data and images will be regularly posted to the SPP website, along with data from analyses conducted at the Woods Hole Research Center. Data will be available to all – schools, the scientific community, and the general public. Project data will also be provided to established data archives such as the National Snow and Ice Data Center and the data management program established for the upcoming International Polar Year. In essence, students will be learning about scientific inquiry and scientific concepts at the same time they are participating with scientists in the process of inquiry. Inquiry in the SPP will be focused through consideration of the a few key questions:

1. How does "my" river compare to the other rivers in the SPP?
2. How do the rivers change over the seasons – physically, chemically, and biologically?
3. How might the rivers change in the future with continued global warming?
4. How might future changes in the river impact arctic and global systems?

Holmes says, "These are big questions that scientists are actively grappling with now. It's been a real eye-opener for me to realize that partnering with local communities could be so beneficial in terms of the science, and at the same time it adds an exciting new educational dimension to the project. And it's been a lot of fun!"