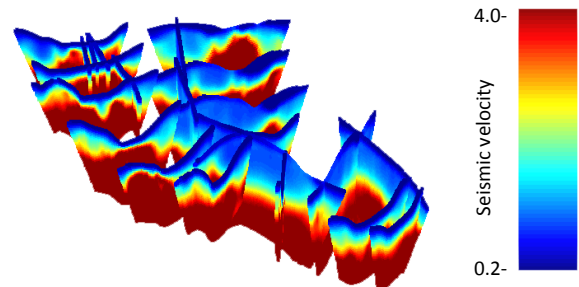


## Water, Computation, and Geophysics



Wyoming has a two complementary RII awards that together make the jurisdiction a powerhouse in computational hydrology. The five-year, \$20 million Track-1 grant awarded in 2012 led to the creation of the Wyoming Center for Environmental Hydrology and Geophysics (WyCEHG), a center of excellence which is transforming science and watershed management in Wyoming and the West by providing cutting-edge knowledge and tools to water resource managers and scientists in the public and private sectors. The multidisciplinary center enables a comprehensive research program linking surface and subsurface watershed hydrology, geophysics, remote sensing, ecology, and computational modeling. The goals of WyCEHG are 1) to improve understanding of mountain front hydrology by characterizing the processes that partition water and snow into streams, soils, plants, rivers and aquifers, 2) to improve understanding of how disturbances affect water flux by studying the effects from climate change, bark beetle infestations, and energy extraction, 3) to improve modeling of the fate and transport of water by creating integrated computer models that provide the scientific knowledge and tools for improved prediction of hydrological processes, 4) to provide cutting edge resources and tools for educators and watershed managers, and 5) to interest young and diverse populations in science through workshops, teacher training, and a comprehensive educational initiative on the Wind River Indian Reservation.



A 3-D rendering of multiple cross-sections in the Laramie Range, Wyoming, shows seismic velocities ranging from slow (blue) to fast (red) differentiating weathered bedrock from "fresh" bedrock. WyCEHG scientists use the above data coupled with resistivity data to study water storage and flow in relation to weathering processes.



Currently in its final year, Cyberinfrastructure to Advance High Performance Water Resource Modeling (CI-WATER), the \$6 million Track-2 grant awarded jointly with the Utah jurisdiction, led to a multidisciplinary effort to increase access to data and to advance computationally intensive modeling of hydrologic systems. CI-WATER has produced high resolution watershed models that offer an in-depth understanding of the interconnectivity of natural and human water resource systems. These models simulate how population growth, shifting land use, and climate variability impact water storage and availability in the Intermountain West.

## Wind Energy

Wyoming recently received a 3-year, \$4.25 million Department of Energy EPSCoR grant to research wind farm modeling, transmission grid modeling, and the economics derived from wind-generated power. "Atmosphere to Grid: Addressing Barriers to Energy Conversion and Delivery" brings together researchers from six departments to look at barriers for penetration of renewables into the electrical grid. Expected impacts include improved placement of wind farms and individual turbines in areas of complex terrain and transient weather; increased efficiency of wind farm generation; a better understanding of how high use of wind power will impact the reliability of the power grid; and development of economic models for diverse and variable energy generation and transmission scenarios allowing managers to understand where and when to send wind generated electricity to maximize efficiency and profits.

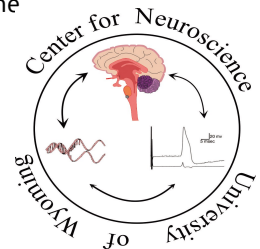


**The IDeA Program in Wyoming-** The IDeA program has been instrumental in developing biomedical research and education capacity, scientific infrastructure, and a statewide network that serves as a national model to include both the University and Wyoming's all seven community colleges. Wyoming has utilized the IDeA program to grow its biomedical education and research infrastructure by supporting initiatives in biomedical research, creating shared infrastructure, attracting and supporting competitive researchers, and implementing innovative programs that support undergraduate students and mentor faculty across the state and graduate students at the University of Wyoming (UW). Since 2009 Wyoming has been awarded over **\$27 million for IDeA program projects** and has leveraged this to receive an **additional \$10.3 million in competitive NIH awards**. In addition Wyoming is a member of the IDeA funded Mountain West Clinical and Translational Research- Infrastructure Network program that provides a range of services and funding opportunities to help investigators develop the skills and experience to conduct clinical or translational research.

Based on results from studies contracted by the Vice President for Research and Economic Development, the IDeA programs (INBRE and COBRE) have had, and will continue to have, a significant economic impact in the state of Wyoming. Investment in research and education resulting from these programs has created human capital, both directly by producing graduates, and indirectly by disseminating knowledge that can be used to further increase human capital. Indirect and direct expenditures attributable to Wyoming INBRE and COBRE funding are estimated to be nearly \$70 million over the life of the projects. As a result, bioscience-related occupations are predicted to generate up to 6% of annual job openings in Wyoming through 2014, which extrapolates to approximately 750-800 annual job openings. The economic impact, while certainly modest relative to other sectors of the Wyoming economy (e.g., energy development, extractive industries), will be persistent and long lasting and assist in economic diversification in the state.

**WYOMING COBRE PROGRAM- Wyoming Neuroscience Core Center (P30 GM103398) 2000-2016-** The

Neuroscience Center was initially funded in 2000 as a Phase I COBRE and has transitioned to the Phase III Core Center Program. The Neuroscience Center has as its scientific objective to understand how experience, during the lifespan of the individual, affects the organization of the brain and how abnormalities in this process is associated with deficits in sensory processing (e.g. vision, touch, neuropathic pain), cognitive development, drug taking, and neuroendocrine regulatory processes (e.g. thirst and obesity). Since its inception the Neuroscience Center has been responsible for the addition of 10 new state-funded, tenure track neuroscience faculty. These faculty were supported by Pilot Projects and this support has led to 7 of the faculty receiving investigator initiated grants from NIH (5- R01, 5- R21, 1-R03), NSF (1-Career Development, 1- NSF-IOS), and the DOD, and promoted the development of their independent research careers. Four junior investigators are developing federal grants. The Neuroscience Center was responsible in developing a Microscopy Core (2000) and the current grant continues to strongly support the scientific support mission of the Microscopy Core and the imaging needs of the biomedical community. The Neuroscience COBRE is integrated into the educational mission of the NIH in developing future scientists and the mission of the University of Wyoming, through its ties with the Graduate (Doctoral) Neuroscience Program.



**WYOMING INBRE PROGRAM-** Wyoming INBRE has focused on building Wyoming's biomedical research and education infrastructure by providing support for faculty and students on the University of Wyoming (UW) and Wyoming community college campuses engaged in biomedical-related activities and partnering on a variety of infrastructure initiatives to enhance access to biomedical equipment, expertise and education. At UW,

INBRE has supported junior faculty to help them develop research programs so they are competitive for external funding and assisted tenured faculty re-directing their research towards biomedical, and in particular, clinical/ translational directions. The INBRE-supported research environment and network at UW has been expanded through the recruitment of 10 new faculty. Good progress has been made in achieving sustainability. Five junior faculty supported during INBRE 2 have obtained extramural funding (four with NIH R-type awards and one with an NSF career development award). NIH awards to UW INBRE supported faculty since 2009 total \$5.31 million. Across Wyoming, INBRE has supported projects at the community colleges and UW at Casper that prepares students for and encourages them to enter biomedical-related baccalaureate programs. Emphases are on working with faculty and administrators to develop research opportunities for freshman and sophomore students and stimulating collaboration between UW and community college faculty to enhance the level of scientific research and create "bridges" to guide students into baccalaureate programs at UW. The INBRE program has had profound impacts on biomedical education and the research infrastructure available to University of Wyoming and community college network partners. *Due to Wyoming INBRE, all seven Wyoming community colleges now have dedicated and adequately equipped space for faculty to mentor undergraduate researchers.* During INBRE 2 approximately 350 undergraduate students across Wyoming had opportunities to engage in mentored biomedical research experiences and 152 graduate students, 36 postdoctoral researchers, and 141 faculty at UW and Wyoming community colleges received support for biomedical research and education activities.