Project Narrative
2003 Highlights, Accomplishments and Activities

Project Identifier: 01.PNW.A.4 Fuel moisture mapping and combustion limits
(*Fuel moisture mapping and combustion limits: mechanistic models, remote sensing, and mapping of fuel moisture and combustion potential for all fuelbeds in the United States)*

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Controlling wildfires, and using prescribed fire, requires accurate prediction of fire behavior and fire severity over a wide range of fuel and weather conditions. Fire managers in the United States are extremely well equipped to predict the spread and intensity of well-behaved fires under moderate conditions, but do not have the ability to predict rapid changes of thresholds of fire behavior. Science has not yet developed the understanding or capability to model extreme fire behavior, or the long-term smoldering in heavy organic layers that results in catastrophic fire escapes, ecosystem and soil damage, and air pollution episodes. This integrated program of fundamental research, numerical modeling, and user-friendly product development is revealing the interaction of atmospheric moisture, fuel moisture, flammability, and smoldering potential that is rapidly finding application by fire managers.

We have now developed and tested a model of one-dimensional smoldering that unlocks many of the mysteries about the limits of smoldering and smoldering rates in semi-porous fuels. We are optimistic that we will have a universal theory of residence times and rates for all smoldering that will enable user-friendly product development beginning in 2005.

Another new product has been the design of in-situ moisture sensors that remotely relay hourly data on flammability to managers and scientists through satellite relays and the Internet. Early adopters of this technology from Alaska to Florida are monitoring organic-layer moisture on a daily basis to improve the safety of prescribed fires and to anticipate high wildfire danger.

The PNW Station has designated the Seattle Forestry Sciences Laboratory as the Pacific Wildland Fire Science Laboratory, in recognition of the increasing national and regional emphasis on Core Fire Science. The Principal Investigator of this project is also co-leader of the National Core Fire Science Caucus. The caucus is charged with designing and developing the next generation of fire science and fire behavior models. The PNW will participate in this consortium of Project Leaders from Forest Service Laboratories, fire managers, National Laboratories at Los Alamos and Lawrence Livermore, the National Institutes for Standards and Technology, and the Brazilian Space Agency to align National Fire Plan Research with critical national needs. PNW will contribute especially by modeling and identifying the thresholds of smoldering combustion; by modeling residence times in propagating, flaming, smoldering, and residual combustion stages; and by modeling fire severity.