TRIP REPORT – Germany/Switzerland/Romania
August 23 – September 4, 2004

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Purpose: The trip involved several objectives including: (1) meeting Dr. Irmtraut Zaspel (a researcher at Federal Research Centre for Forestry and Forest Products, Institute for Forest Genetics and Forest Tree Breeding, Resistance Research, Waldsieversdorf, Germany) and to discuss with her the logistics of a collaborative blister rust resistance project between her and the USDA Forest Service (via Dorena Genetic Resource Center, Region 6), (2) Oral presentation on field resistance of Port-Orford-cedar to *Phytophthora lateralis*, at the IUFRO meeting on *Phytophthora* in Forests and Natural Ecosystems (see http://www.phytophthora-freising-2004.de/ for meeting details); (3) Discuss issues relating to durability of resistance with Dr. Bruce McDonald (Institute of Plant Sciences/Phytopathology, Federal Institute of Technology ETH-Zentrum); and (4) Visit Dr. Ioan Blada's *Pinus strobus* and hybrid pine trials in Romania to examine blister rust resistance.

Significance: The blister rust resistance project with Dr. Zaspel involves an evaluation of white pine blister rust resistance in *Pinus monticola* to a European race of *Cronartium ribicola.* Several decades ago, rust testing in Germany showed that the *P. monticola* seedlots available at that time were generally very susceptible (Stephan 2004). Information supplied by this collaborative blister rust resistance project will give valuable insights into the potential danger of new accidental introductions of sources of blister rust from Europe as well as insights to long-term durability of resistance of materials developed in R6 and R1 rust resistance programs (knowledge of evolutionary potential of *C. ribicola*). A similar trial has been setup in China, and seedlots have also been sent to groups in eastern Canada and U.S. for testing.

This was the first personal meeting with Dr. Irmtraut Zaspel, the principal cooperator on the joint blister rust resistance project currently underway. The project had originally been setup after numerous email exchanges (starting in fall 2002). Dr. Zaspel would take the lead on the project, with inputs as needed from me as well as others.

This portion of the trip was to visit Dr. Zaspel and confer with her about the trial setup. It would also allow an opportunity to meet with other forest geneticists at her institute, as well as with Dr. Richard Stephan (recently retired forest pathologist). Dr. Stephan had attended the IUFRO Working Party 2.02.15 meeting in Medford in 2001 and had suggested Dr. Zaspel as a contact for this type of work.

The presentation at the IUFRO *Phytophthora* meeting would allow the Forest Service to share progress, discuss limitations, and obtain feedback on one of the fastest advancing forest tree resistance programs in the world.

I was also scheduled to give a seminar on 'Breeding for disease resistance in trees' at Dr. Zaspel's institute, as well in Dr. McDonald's department. Discussions with Dr. McDonald and colleagues would provide potential insights in furthering the resistance breeding work to both blister rust and *P. lateralis*.

Dr. Blada's work with white pines and blister rust is some of the most substantial outside of North America and the exchange of information would be useful. Few current geneticists or pathologists in North America have much first hand knowledge of work in Europe.

7 – 10 Sept.:

I flew out of Eugene, Oregon on 9/7 and arrived in Berlin-Tegel airport on 8 Sept . Dr. Zaspel had arranged to have someone pick me up and take me to my hotel in Buchow. On Sept. 9th, I presented a seminar 'Breeding for disease resistance in trees' and toured the institute.

On Sept. 10th, we toured several older *Pinus strobus* fieldtrials, a black locust trial, and the nursery at the institute (Dr. Stephan was also present) (Figs. 1-4). One of the *P. strobus* trials had been established for 12 years in the field (+ 3 years in the nursery) – most cankers present were near the base (possibly infection from the nursery). Local rust hazard appeared to be relatively low (*P. strobus* is generally susceptible to blister rust, so unless a local 'resistant' land race has developed one would have expected more infection). The second *P. strobus* trial visited was 28 years old, included ~8 seed sources (from Germany) and had perhaps 30% survival. We visited some 50-80 year old black locust plantings – interestingly, the crooked trees are preferred (a playgroup equipment manufacturer uses the species).

Dr. Zaspel had relatively good success in germinating the seed and growing the seedlings of *P. monticola* that will be used for testing blister rust resistance (Figs. 1 & 4). She will grow the seedlings for three years, before attempting inoculation in September 2005.

I also spoke to Dr. Zaspel about collection of blister rust spores (from pines and/or *Ribes*) for a study to examine genetic variation that Paul Zambino (RMRS) and others would like to undertake. I left the necessary permits for sending spores (Paul Zambino had provided those) and Dr. Zaspel was confident that she could collect from sources in Germany and perhaps arrange for collections from colleagues elsewhere. This project might help to finally resolve issues such as the amount of genetic diversity in *C. ribicola* and the geographic origin of the pathogen (still debated).

Dr. Zaspel is also just starting some work to investigate resistance of black alder to the 'new' hybrid *Phytophthora* now common in Germany and some other European

countries (poster presented at IUFRO: Investigation of *Phytophthora* infection and growth of black alder progenies (*Alnus glutinosa* L.) .

On Sept. 11, I flew from Berlin-Tegel to Munich, then took a short bus ride to Freising, location of the IUFRO meeting.

11 – 17 Sept.:
Attended IUFRO conference. I gave a presentation 'Field Survival of *Phytophthora lateralis* resistant and susceptible families of Port-Orford-cedar'. During one of the conference fieldtrips I had a chance to observe numerous *Pinus cembra* in Austria (Fig. 5), none of which showed any sign of blister rust infection. *P. cembra* is very resistant (relative to the nine North American species of white pines). During other fieldtrips, we saw numerous examples of the impacts of the new alder *Phytophthora*. It is likely only a matter of time before this alder *Phytophthora* shows up in our ecosystems and there is merit to having a collection of our red alder genotypes tested (in Europe) for their susceptibility and potential genetic variation in resistance.

18 – 19th Sept.:
Weekend, visited friends.

20 -21st Sept:
Visited plant pathologists (principally, Dr. Bruce McDonald, Dr. Ottmar Holdenrieder) in Zurich at ETH to discuss disease resistance issues and potential collection of blister rust spores for the genetic variation study (I left a sample permit with Ottmar who was confident he could provide spores from *Ribes* (and we saw spores on *Ribes* plants near his home)). Any spores collected would be sent to Dr. Paul Zambino (USFS at RMRS). I presented seminar 'Breeding for resistance in trees' to plant pathologists and breeders at ETH.

22 – 27th Sept:
Flight to Bucharest, Romania on Sept. 22 to meet with Dr. Ioan Blada. Field trips for next four days, to see research plantings of various species of white pines. The first site had a large trial of *Pinus cembra* (1990 sowing, 1996 planting) – excellent survival (Figs. 6-7) early growth, and 0% rust infection. We also visited several other *P. cembra* trials (also no rust present). Additional field visits including sites with other species (and hybrids) of white pines: *P. peuce* seed orchard, *P. strobus* X *P. wallichiana* hyrid trial, *P. strobus* trial, *P. cembra* seed orchard, *P. strobus* X *P. peuce* (and *P. peuce* X *P. strobus*) trials, and *P. wallichana* trial, as well as a nursery (Fig. 8-9). We also visited a large old growth area of beech- possibly largest such stand in Europe (Fig. 10). Dr. Blada has worked extensively with white pine hybrids and white pine blister rust testing. In many trials, the seedlings were inoculated in the nursery and/or *Ribes* were planted near the trials to help ensure moderate to high hazard. Many of the *P. strobus* are dead or have cankers (most are old cankers), but the hybrids do much better.

Return flight to U.S. from Romania via Franfurt.

Trip Overview: The trip successfully accomplished the multiple objectives of meeting Dr. Zaspel and discussing the pending joint blister rust trial of *P. monticola*, presenting information at the IUFRO meeting, sharing resistance breeding information, seeing blister rust impacts in some parts of Europe, and making contacts for collection of blister rust spores to help examine world-wide genetic variation in this pathogen and potentially determine center of origin.

Follow-up: I have maintained contact with Dr. Zaspel, and she hopes to inoculate the *P. monticola* in Sept. 2005. Dr. Zaspel is also in contact with Dr. Zambino and myself regarding spore collections. Dr. Holdenrieder has been in contact with Dr. Zambino on blister rust spore collections. A paper has been submitted for the IUFRO Phytophthora proceedings (estimated proceedings publication date is January 2006).

Figure 1. Dr. Zaspel looking over *P. monticola* & *P. strobus* seedlings for blister rust resistance study in Germany (Sept 2004).

Figure 2. *Pinus strobus* killed by blister rust.

Figure 3. *P. strobus* seed source trial in Germany.

Figure 4. Three year old *Pinus monticola* seedlings (June 2005) for fall 2005 blister rust inoculation.

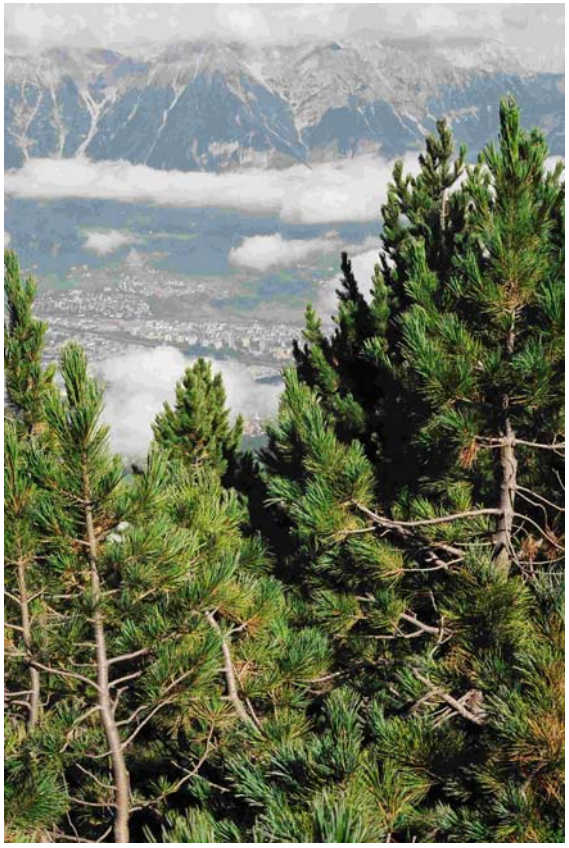

Figure 5. *Pinus cembra* near Igls, Austria.

Figure 6. Dr. Ioan Blada in front of *P. cembra* genetic test in Romania.

Figure 7. *P. cembra* genetic test in Romania. Note excellent early survival.

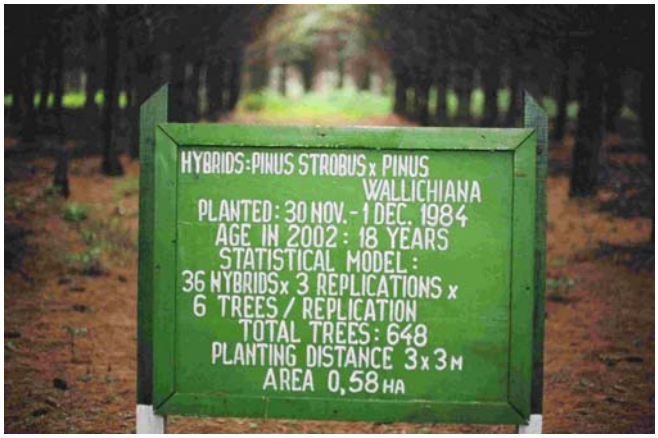

Figure 8. Blister rust resistance trial of *P. strobus* x *P. wallichiana* hybrids.

Figure 9. Dr. Blada overlooking *P. cembra* x *P. monticola* hybrid seedlings in the nursery in Romania.

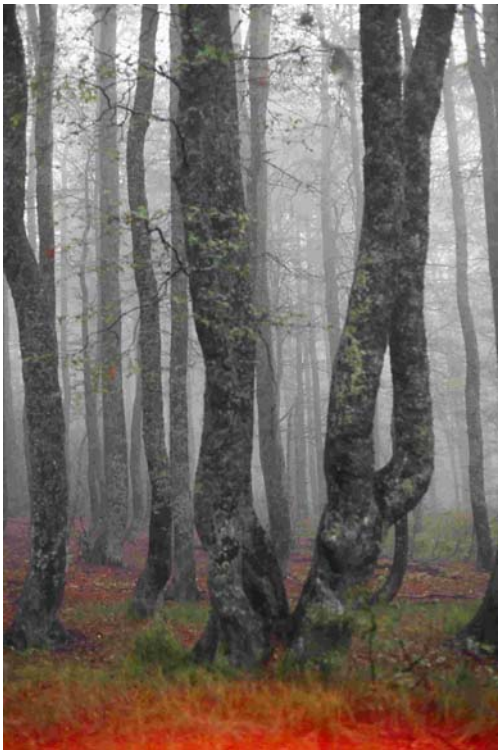

Figure 10. Beech forest in Romania.

Acknowledments

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Literature

Stephan, B.R. 2004. Studies of genetic variation with five-needle pines in Germany. *In* Breeding and genetic resources of five-needle pines: growth, adaptability, and pest resistance; 2001 July 23-27; Medford, OR, USA. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fort Collins, CO. pp. 98–102.