Science Update

Just a Few Queens Started U.S. Fire Ant Population

A study suggests that the current U.S. population of red imported fire ants can be traced back to as few as 9 to 20 mated queens that were introduced into Mobile, Alabama. Individuals from two fire ant populations in South America and six populations across the southern United States were collected and studied using a diverse set of genetic markers. Results suggest that ants collected near Mobile have the closest genetic resemblance to a hypothetical, reconstructed ancestral population and that these ants subsequently spread outward from this purported initial landing spot since their introduction in the mid-1930s.

The data from this study also suggested that there might have been a second introduction at a location 300 miles west of Mobile. Determining the number of founders responsible for the establishment of invasive fire ant populations is important for predicting the invasive potential of this species. Researchers can also use this information to develop an understanding of how the loss of genetic diversity often associated with founder events may influence the evolution of invasive populations. *DeWayne Shoemaker, Center for Medical, Agricultural, and Veterinary Entomology, Gainesville, Florida; phone (352) 374-5942, e-mail dewayne.shoemaker@ars.usda.gov.*

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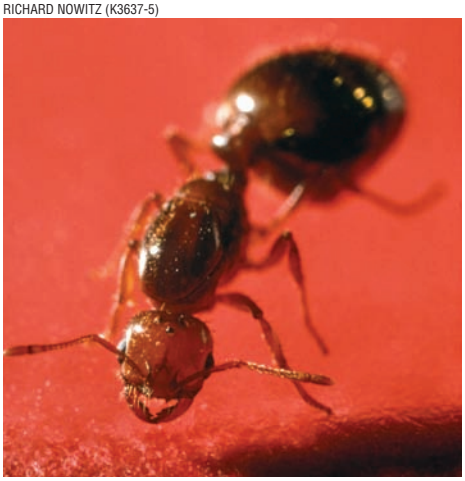

Red imported fire ant.

Paper Mill Waste May Be Just Right for Reclaiming Mineland

Paper mill waste can safely be applied at a rate three times higher than typical rates to reclaim soils of surface-coal-mined areas. Paper mill sludge was applied at rates of 300 tons per acre to steep slopes in southeast Ohio that had been recently surface mined. Researchers compared the 300-ton-per-acre application rates with standard 100-ton-per-acre rates and found that higher rates had many benefits and did not result in major additional negative effects on runoff water quality.

Application of the sludge at both rates greatly reduced runoff and erosion from the plots compared to standard reclamation without paper mill sludge, particularly before grass was planted. But the higher application rate also reduced soil loss eightfold after the grass was planted and the land had stabilized. The high application rate increased soil carbon levels, soil pH, and calcium to a greater extent than the lower rate. This is the first research project to determine the amount of paper mill sludge byproduct that can safely be applied to surface-mined land without harming downstream water quality. *Martin J. Shipitalo, USDA-ARS North Appalachian Experimental Watershed, Coshocton, Ohio; phone (740) 545-6349, ext. 212, e-mail martin.shipitalo@ars.usda.gov.*

Gene-Silencing Technique To Be Deployed Against Soybean Fungus

The soybean rust fungus *Phakopsora pachyrhizi* may meet its match, thanks to a gene-silencing technique that scientists plan to deploy to identify genes that enable plants to naturally resist this fungal foe. Scientists will use gene silencing to discover plant genes that play a role in orchestrating defense responses to *P. pachyrhizi* in resistant soybeans. Gene silencing allows scientists to identify a gene's function by disabling that gene in plants or other organisms, challenging the organism in some way—such as with exposure to a pathogen—and observing the consequences of that gene having been "missing in action."

The gene-silenced plants will be inoculated with spores of *P. pachyrhizi* and monitored for a breakdown in resistance. The ultimate goal of this research is to streamline the development of new soybean cultivars that can withstand *P. pachyrhizi,* which causes a foliar disease that severely weakens the plant and diminishes its seed yields and quality. *Kerry F. Pedley, USDA-ARS Foreign Disease-Weed Science Research Unit, Fort Detrick, Maryland; phone (301) 619-1668, e-mail kerry.pedley@ars.usda.gov.*

Modeling Erosion Damage from Ephemeral Gullies

Ephemeral gullies are common features on agricultural landscapes and can sometimes lead to soil losses that exceed losses from sheet or rill erosion. Scientists have developed a model to evaluate how tillage practices can affect formation and evolution of ephemeral gullies and subsequent soil erosion rates. They used historical precipitation data, on-site field observations, and recently developed watershed-modeling technology to simulate the effect of tillage practices on long-term ephemeral gully growth and evolution.

During a 5-month growing season, tillage activities were simulated using two alternatives: once-a-year conventional tillage and no-till management. The collaborators applied the model to replicate a 10-year production span.

Their findings suggest that, on average, tillage in areas prone to ephemeral gully erosion can produce significantly higher soil erosion rates compared to those same regions under no-till management practices. Simulated cumulative ephemeral gully soil erosion rates for the tilled fields were anywhere from 240 percent to 460 percent higher than soil erosion rates from the untilled fields. *Ronald Bingner, USDA-ARS National Sedimentation Laboratory, Oxford, Mississippi; phone (662) 232-2966, e-mail ron.bingner@ars.usda.gov.*