The American Chestnut Foundation
Spring Committee Meetings
Remote via Zoom
April 8-9, 2021

Science & Technology Committee Meeting
April 8, 2021, 9:30am-12:30pm

Committee Members in Attendance
Steve Barilovits (Chair), John Dougherty, Carolyn Keiffer, Bruce Levine, Laurence Grossman, Thomas Klak, Tracey Coulter, Lewis Lobdell, Gary Carver, Brian McCarthy, Kim Steiner, Greg Miller, Debby Delmer, David Morris, Fred Paillet, John Hempel, Dana Nelson, Brad Stanback, John French, Don Willeke

TACF Staff Members in Attendance
Jared Westbrook, Sara Fern Fitzsimmons, Kendra Collins, Tom Saielli, Jamie Van Clief, Dan Mckinnon, Eric Jenkins, Lily Kingsolver (minutes), Jim Tolton, Brandon Yanez, Lisa Thomson, Cherin Marmon-Saxe, Jules Smith, Judy Antaramian, Shana Zimnoch

Guests of the Committee
Dragan Galic, Hope Yandell, Anonomouse, Yvonne Federowicz, Betty Allison, Ken Darnell, Dennis Liu, Mandy Cromwell, Scott Merkle, Todd Jones, Warren Laws, Tyler Riendeau, Glenn Kotnik, Al Faust, Jay Cude, Jack Swatt, Mark Double, John Scrivani, Doug Gillis, Douglas McClane, Bruce Wakeland, Jim Searing

Review and Approval of Prior Minutes
Minutes from previous meeting were reviewed and approved by committee. The motion was made, seconded by David Morris. The motion carried with no disagreement.

Update on Federal Regulatory Oversight of Darling 58
Andrew Newhouse, Doctoral candidate, SUNY-ESF

Andy presented an overview of the current regulatory process for planting of the Darling 58 tree. He shared progress toward deregulation, which will require approval by USDA-APHIS, FDA, and EPA. The USDA-APHIS has accepted the petition for deregulation and has completed a first 60-day public comment period. Current work is being focused on Plant Pest Risk Assessment and the Environmental Impact Statement, before another 30-day public comment period will take place. FDA will require Biotech Consultation and Allergenicity Waiver prior to deregulation. EPA considers Oxalate Oxidase a pesticide and as such Darling 58 must pass registration, which grants temporary deregulatory permission to plant, unless Darling 58 is accepted for an exemption. Andy shared his belief that exemption from registration is the most likely path to restoration.

If we obtain regulatory permission to distribute trees, we will continue to increase diversity through out-crossing of Darling 58, currently on its 3rd generation of offspring. Distribution of pollen will be more effective than distribution of seedlings as we seek to distribute Darling 58. Improvement of OxO gene would include targeted expression rather than constant expression. Continued exploration of genetic modification to move and enhance genes will be important.

Andy answered questions on the possibility of further transformations, the approval process, gene makeup, allergenicity, and phytophthora resistance.

History of Development of Somatic Embryogenesis System at University of Georgia
Dr. Scott Merkle, Professor of Forest Biology at University of Georgia

Dr. Merkle presented an overview of the history of his work in somatic embryogenesis and the evolution of its protocol and research application through the years. Dr. Merkle explains shortcomings and benefits of this process. The more Chinese there is in a backcross line, the less likely this process is to be successful. Entire process takes ~2.5 years. Internodes of trees grown through somatic embryogenesis are short but taller growth can be stimulated by cutting trees back to stump sprouts.

Dr. Jared Westbrook coordinated collection of different chestnut founder lines throughout native range to be cultured. Some genotypes will work well for gene transformation; others will work better for somatic embryogenesis. Dr. Merkle explained the microprojectile bombardment method for gene insertion and transient versus stable expression of American chestnut lines.

Dr. Merkle fielded questions regarding his embryogenesis process and seed fertilization.

Propagation of American Chestnut from Cuttings
Dr. Dragan Galic, The Canadian Chestnut Council

Dr. Galic presented a summary of the optimal conditions for propagating American chestnuts from cuttings. He explained his protocol for encouraging growth in American chestnut cutting, taking into account the obstacle of trying to stimulate new vegetative growth. He also explained his research with various methods of grafting, including using etiolated tissue, and the importance of the scion/rootstock relationship.

Dr. Galic responded to questions regarding advantageous growth in American chestnuts and the physiology of juvenility.

Meeting the Challenges of American Chestnut Restoration
Dr. Jared Westbrook, Director of Science, The American Chestnut Foundation

Jared addressed the inherent challenges of the mission and urged the committee to be optimistic while also being both cautious and realistic about the process. He spoke about how patience, curiosity, humility, and courage should be our keystones. Jared outlined the current priorities of the TACF Science program, which include increasing the stringency of genetic selection and also of breeding Darling 58 with LSA trees, backcross trees, and Phytophthora resistant trees. He updated the committee on the status of the backcross program and rogueing on the Meadowview research farm.

Jared explained that many backcross trees have intermediate resistance and outlined some possible reasons for this development. Genetic testing has shown that we had misinformation on the heritage of many backcross trees including some founder lines. Jared spoke on the spectrum of polygenetic inheritance when considering blight resistance. He made recommendations for the future of the breeding program. He also updated the committee on the progress of the landscape genomics project.

Jared answered questions about the heritability of Phytophthora and the selection process.

Projection of Germplasm Production and Distribution
Sara Fitzsimmons, Director of Restoration, The American Chestnut Foundation

Sara explained that there are three kinds of germplasm that can be distributed: pollen, scion, and seeds/seedlings. She detailed the methods and goals of germplasm production and distribution, as well as the challenges of each method. Sara outlined the history and future of the pollination program at TACF and explained some of the goals for germplasm production that we hope to achieve in order to effectively distribute Darling 58.

Sara introduced Jamie Van Clief, who will be the new Southern Regional Science Coordinator.

Sara compared controlled to open pollination in the Meadowview seed orchards and shared plans for increased nut production and improved conditions for transgenic germplasm production. Even if nut production increases massively, nuts will still need to be tested for OxO status because only 41% of nuts will inherit gene. Sara explained ways to increase diversification across chapters. Our overall germplasm goal for the next decade is to eventually produce and distribute >100,000 transgenic nuts.

Sara answered a question on the future of chapter responsibilities.

Other Business
Steve Barilovits spoke about directed research grants vs. small grants. Jared spoke about the evolution of blight resistance and what information that might hold for the result of our breeding efforts. Jared also mentioned establishing new founder lines for OxO.

Lisa concluded the meeting by thanking the speakers for presenting and the committee for attending.

The meeting was adjourned at 12:07pm.