

BIOSYLVAN News

Loblolly Pine Genome Project

A science committee has been active since 2003 in developing a genomics research program for loblolly pine. Led by Dave Neale, University of California at Davis, the program has a five-year vision of funding at \$25 million/year with the goals to develop: (1) a national genomics infrastructure, and (2) a basic understanding of the complexity of the pine genome and the function of all expressed genes. In the ensuing five years, with comparable funding as for the first five years, the goal is to obtain a complete genome sequence of loblolly pine. Specific objectives of the first five-year program would include initiatives on gene discovery, gene function, map development from genotype to phenotype, comparative genomics and genome database and genetic stock center. Scientists from the universities of California (Davis), Florida, Georgia, Institute of Paper Science & Technology (Georgia Tech), Mississippi State, NC State, and Texas A&M in addition to the US Forest Service have been involved in the project. Separate NSF grants to Mississippi State and to the Science Committee have been awarded to further the initiative.

The progress of the Science Committee has attracted the attention of potential sponsors of the initiative. On April 29, 2005 a special meeting was called by the US Forest Service in the Washington, DC area to determine the future of the project. Organized by Sam Foster and

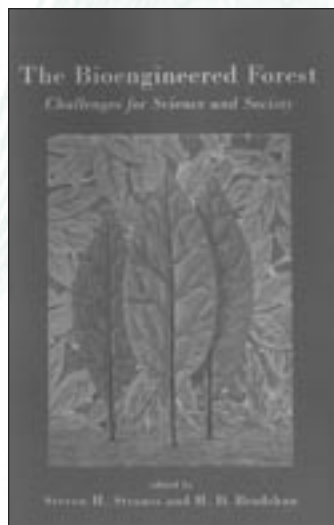
Check out our website
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versions of recent
meeting proceedings,
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BOOKS IN REVIEW

The Bioengineered Forest: Challenges for Science and Society

The Bioengineered Forest: Challenges for Science and Society, edited by Steven H. Strauss, Oregon State University and H.D. Bradshaw, University of Washington, is the outcome of a conference held in Stevenson, Washington in July 2001. The conference was organized by the editors to give a balanced view of the status of forest biotechnology, inclusive of its benefits and limitations. The result is a two part book: Part I, *Economic and Technological Choices* and Part II *Ethical, Social and Ecological Caveats* that was published in 2004.



In Part I, the case is made about the burgeoning human population and the disappearing native forests. Plantation forestry that now constitutes 5 percent of the world's closed forests is contributing 34 percent of the annual industrial wood supply in the world; yet, native forests continue to disappear at more than 12 million hectares annually. The prognosis is made that about 50 percent of industrial wood usage will be from plantations by 2025 and up to 80 percent by 2050, but without major policy changes the world's native forests will continue to disappear.

Industrial usage is only one

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Books in Review

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of the demands on the world's wood supply. Of the 3.6 billion cubic meters of wood collected annually less than half is for industrial use; the remainder is for cooking, heating and peripheral uses of households and communities. More than 90 percent of the wood harvested in some sub-Saharan counties is for domestic uses.

History has verified that per capita wood consumption will increase as economies develop in addition to increases related to human population growth. If a semblance of native forests is to be managed sustainably and another portion is to be preserved, greater reliance will have to be devoted to plantation forestry. The projections are that 10 to 15 percent of the world's closed forests will have to be in high-yielding plantations¹ to meet that goal. The timeline for the goal is 2050. For high-yielding plantations to make the desired impact, intensive management that includes soil management, competition control, pest control and the use of the best genetic stock available is required. The best genetic stock available will be inclusive of genetically engineered traits for growth rate, pest control, wood properties, and adaptability to environmental extremes. Additional benefits to be obtained from genetic engineering are soil bioremediation, carbon sequestration, and restoration of trees that are threatened, endangered or have special ecological, economic and social value.

The book's contributors, inclusive of some of the leading forest biotechnologists in the world, show the impact that genetic engineering can have on forest productivity. In the process they also acknowledge the environmental limitations of genetically engineered forest crops. Chief among the potential limitations are gene stability over the relatively long life of a forestry rotation, escape of bioengineered traits into native ecosystems, creation of trees with altered wood properties that are potentially subject to pests and environmental extremes, and potential effects on biota from ingestion of transgenic-tree parts. Preliminary evidence is presented to suggest that none of these events

¹High-yielding plantations, as defined by the Food and Agricultural Organization of the United Nations, are those growing at least 15 m³ /ha/yr.

will come to pass, but the data are too limited to make such claims with confidence. A recurring theme of the book was the need for flowering control to prevent the occurrence of unwanted consequences in natural ecosystems.

In Part II of *The Bioengineered Forest*, the reader is cautioned that no compelling case has been made to justify the existence of bioengineered trees, and that the existence of plantations of such trees does not assure salvation of native forests. Further, the accusation is made that challenges to bioengineering are often met with silence or, worse yet, that the challenger is accused of scaremongering. The recommendation is for both sides of the issues to engage in dialogue. One prognostication was that the public and private sectors will make critical decisions in the next 5 to 10 years about the use of genetically engineered trees, but the decisions will be made on the cultural, environmental and economic risks and benefits rather than on the science itself.

The need to involve society in the decision to deploy transgenic trees is paramount. Failure to do that could result in a rejection of the products by the potential customer, much as we saw in Europe in the late 1990s with the rejection of transgenic food crops.

Nearly all countries that support forest plantations have regulations specific to transgenic crops, but the regulations can vary greatly between countries. In the US, three regulatory agencies will be involved in the deployment of any transgenic forest tree crop:

- Animal and Plant Health Inspection Service (APHIS) has jurisdiction over any introduced or genetically engineered plant or plant part that could become a plant pest.
- Environmental Protection Agency (EPA) becomes involved when a chemical is part of the evaluation process, such as would happen in a plant engineered for herbicide tolerance or one used in bioremediation.
- Food and Drug Administration (FDA) is the least likely of the three regulatory agencies to become involved in transgenic forest crops because of the general absence of edible fruit from genetically engineered trees.

Even though APHIS had general oversight of transgenic forest crops along with its primary objective of being alert to introduced plants that could become invasive, it received the dictum in 2001 from the White House Office of Science and Technology Policy (OSTP) to specifically receive public comment on transgenic trees. A public hearing was held in June 2003 to get input on the procedures for testing and deployment of bioengineered trees. Since then the guidelines have been in the developmental stage and are to be released in 2006.

The release of herbicide-tolerant transgenic trees of black poplar in China in 2003 is a case in point of differences in regulatory issues from one country to another. Other countries, and particularly certain members of the European Union, where food biotechnology remains a contentious issue, will take a more precautionary approach than even the United States.

The scientists, ecologists, economists and policy makers contributing to *The Bioengineered Forest* conclude that there is no justifiable reason to refrain from conducting bioengineering research of forest trees. Failure to do so would distance the forestry sector from the advances being made in biotechnology research in crop and animal breeding and in the chemical, medical and pharmaceutical industries. However, caution is emphasized in deployment of transgenic trees because of their long life compared to other plants, and their propensity to distribute reproductive parts (pollen, seeds, vegetative segments) over long distances.

The recommendation is for anyone involved in forest bioengineering, either in an advocacy or reactionary position to the theme, to read *The Bioengineered Forest*. Its topics that cover the science, economics, acceptance, rejection, regulation, law and ethics are superior for discussing the benefits and limitations of forest engineering than any similar publication that we have encountered. The editors have taken to heart the admonishment by one of the contributing authors that scientists are smug in their research, and have produced a document that will stand the test of time.

For a balanced treatment of forest biotechnology for those with an inquiring mind, *The Bioengineered Forest* is highly recommended.

IFB Personnel Activities

Bob Kellison

Within the last several months Bob has been on the conference tour. Presentations made were:

- *Impacts of Tree Improvement on the Forest Products Industry*. 28th Annual Tree Improvement Program. June 21, 2005. Raleigh, NC. (Manuscript available).
- *Technology to Aid Forest Productivity*. Southern Regional Meeting. National Association of Air and Stream Improvement. June 29, 2005. Asheville, NC. (Manuscript available).
- *A Forestry Perspective to Year 2020*. Western Forest Genetics Association, 50th Anniversary. Corvallis, OR. (Abstract only)
- *Tree Farmers to Benefit from Forest Biotechnology*. Annual Meeting, American Tree Farm System. Asheville, NC. October 12, 2005. (Abstract only).
- *Effects of Forest Biotechnology on the World's Forests*. Annual Meeting, North Carolina Forestry Association. October 13, 2005. Asheville, NC. (Abstract only).
- *The Role of University-Industry Research Cooperatives in Diffusing New Technology*. Society of American Foresters 2005 National Convention. October 20, 2005. Fort Worth, TX. (Manuscript available).

Susan McCord

In addition to all of her many other duties, Susan is being recognized for her abilities to organize and conduct meetings and, more importantly, to get the proceedings published in a timely fashion. That recognition stems largely from the successful conference on *New Century, New Trees* that was held in Research Triangle Park, NC in November 2004. That led to her being recruited to co-chair the IUFRO Tree Biotech Conference that is being held in Pretoria, South Africa in November 2005 (See page 4). She is also the general chair of the conference being held in Vancouver, BC, Canada that is scheduled for March 19-21, 2006. (See page 7).

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2005 IUFRO Tree Biotech Conference

Pretoria, South Africa, November 6-11, 2005

Maud Hinchee, ArborGen, and Susan McCord, Institute of Forest Biotechnology, served as co-chairs of a symposium for this

conference entitled *Forest Biotechnology Adoption and the Impact of the Economic, Scientific and Societal Value Chains*. Forest biotechnology has the potential to generate improved productivity, new high-value products, and socio-ecological benefits. This will create a paradigm shift in how the forest industry values tree genetic improvement and peripheral technology opportunities. The impact of this technology will touch multiple businesses in the industrial value chain: timber, paper, chemical, energy, planting stock, landowners, and downstream users. In addition, the exponentially expanding scientific knowledge base generated from biotechnology research will create new insights that will fuel the development of new scientific advancements. The potential benefits of forest biotechnology will accrue to multiple sectors through reduced costs, improved products, increased forest restoration, reclamation and preservation, and increased environmental sustainability. Society adopts new technology based on the balance of perceived benefit versus perceived risk. A historic view of technology adoption can provide insights into how industry, scientists and society might accept and implement forest biotechnology.

The symposium included talks on:

- *How Biotechnology will Impact the Forest Products Industry: the economic value chain* Peter Farnum, Weyerhaeuser Company
- *The Benefit of the Applications of Forest Biotechnology* Maud Hinchee, ArborGen, LLC
- *An Association Genetics and Functional Gene Testing Pipeline for Tree Improvement* Timothy Strabala, Scion Research
- *Unblocking the Obstacles to Open Use* Marie Connett, CAMBIA
- *Adoption of Forest Biotechnology Worldwide: Process, Implications, and Societal Issues* Steven Burke, North Carolina Biotechnology Center



PHOTOS BY SUSAN MCCORD

Board Members

The two board members acknowledged in this issue of *Biosylvan News* are Dr. Hal Salwasser and Dr. Chad Oliver. They were each elected for three-year terms at the May, 2005 meeting of the Board of Directors.

Chad Oliver

Dr. Oliver is a native of Camden, South Carolina. His formal forestry education includes an undergraduate degree from University of the South (Sewanee, Tennessee), and Master's and Ph.D. degrees from Yale University. His work experience includes stints with his father's forestry consulting business in South Carolina, USDA Forest Service, University of Vermont, Harvard University, University of Washington and Yale University. His present positions at Yale University are Pinchot Professor of Forestry and Environmental Studies, and Director, Global Institute of Sustainable Forestry.

His many accomplishments include being named a Fulbright Visitor to Germany, with additional forays into France and Switzerland, and a one-year Fulbright Senior Lecturer at Middle East

Technical University, Ankara, Turkey. He returns to Ankara for one month each year to teach and do research and, also, to visit his wife's family.

In addition to being a teacher of outstanding quality, Chad has guided the degree programs of 25 Masters and 10 Ph. D. students. Being an advisor to graduate students is where teaching and research complement one another, and it caused him to co-author a book on *Forest Stand Dynamics* (1990). The thesis of the book is how stands develop and respond to manipulations. Lest there be confusion, Chad is more than an ecologist, he incorporates forest policy and economics in his research and teaching. The computer model he has developed for forest management includes each of these components separately and in combination. As a result of that expertise and his ability to communicate to any forestry group has made him an attraction as a public speaker. That acumen has identified him as a reasoned voice at legislative sessions at the state and national level. With that background, Chad is a natural for board membership of the Institute of Forest Biotechnology.

Hal Salwasser

Dr. Salwasser had a distinguished career with the USDA Forest Service before being named Dean, College of For-



Hal Salwasser

estry, Oregon State University, Corvallis on July 1, 2000. With degrees from California State University (Fresno) and University of California, Berkeley, he joined the Pacific Southwest Region as Regional Wildlife Ecologist in 1978. That was followed by being named National Wildlife Ecologist, and a six-year stint in Washington, DC as Senior Analyst for Natural Resources for the President's Commission on American Outdoors, and then as Director of Wildlife and Fisheries, and as Director of New Perspectives.

The Washington, DC experience was followed by employment at the University of Montana as Boone and Crockett Professor of Wildlife Conservation. Those six years were followed by another assignment with USFS as Regional Forester of the Northern Region, Missoula, Montana, and from there to Oregon State.

IFB Personnel Activities

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Carlton Owen

Within the year, IFB engaged Carlton Owen on a part-time basis to help with development as a Partnership Consultant. Carlton is the only employee of his consulting firm, Environmental Edge, which is located in Greenville, SC.

Carlton's most recent endeavor was a visit to Finland where, aided by board member Dr. Risto Sepälä, contact was made with various companies with headquarters in and around Helsinki. Additional efforts of engagement are envisioned with com-



Carlton Owen

panies in Europe, Asia/Pacific and Latin America.

Carlton, with on-site collaboration from Bob, organized a meeting in Fort Worth, TX, in conjunction with the SAF 2005 National Convention, October 20, 2005, with interested University Forestry programs to gain their collaboration with IFB. Representatives from eight universities were present at the breakfast session, and three other universities expressed interest in the endeavor even though they had conflicts in scheduling. A one-page document is being circulated to the interested parties detailing the results of that meeting.

In a session "Lunch with the Leaders" on the SAF 2005 National Convention, Carlton delivered a stirring speech on the qualities necessary to become a leader in the forestry profession, or any profession for that matter. He used his career ladder to exhibit his accomplishments, as well as his mistakes.

The Lighter Side

After every flight, Qantas pilots fill out a form, called a “gripe sheet,” which tells mechanics about problems with the aircraft. The mechanics correct the problems; document their repairs on the form, and then pilots review the gripe sheets before the next flight.

Never let it be said that ground crews lack a sense of humor. Here are some actual maintenance complaints submitted by Qantas’ pilots (marked with a P) and the solutions recorded marked with an S) by maintenance engineers. By the way, Qantas is the only major airline that has never had a fatal crash....



PHOTO COURTESY OF QANTAS

P: Left inside main tire almost needs replacement
S: Almost replaced left inside main tire.

P: Test flight OK, except auto-land very rough
S: Auto-land not installed on this aircraft.

P: Something loose in cockpit.
S: Something tightened in cockpit

P: Dead bugs on windshield.
S: Live bugs on back-order.

P: Autopilot in altitude-hold mode produces a 200 feet per minute descent.
S: Cannot reproduce problem on ground.

P: Evidence of leak on right main landing gear.
S: Evidence removed

P: DME volume unbelievably loud.
S: DME volume set to more believable level.

P: Friction locks cause throttle levers to stick.
S: That’s what they’re for.

P: IFF inoperative.
S: IFF always inoperative in OFF mode.

P: Suspected crack in windshield.
S: Suspect you’re right.

P: Number 3 engine missing.
S: Engine found on right wing after brief search.

P: Aircraft handles funny.
S: Aircraft warned to straighten up, fly right, and be serious.

P: Target radar hums.
S: Reprogrammed target radar with lyrics.

P: Mouse in cockpit.
S: Cat installed.

And the best one for last...

P. Noise coming from under instrument panel. Sounds like a midget pounding on something with a hammer.
S: Took hammer away from midget.



Loblolly Pine Genome Project

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Dave Neale for Ann Bartuska, Deputy Chief for Research and Development, US Forest Service, the participants were leading authorities of R&D for major universities, private organizations and potential funding agencies. The outcome of the meeting was agreement that the project was viable, and that an implementation and policy committee be formed to help move the project forward. Eight organizations were identified that should be represented on the committee: US Forest Service, Institute of Forest Biotechnology, American Forest & Paper Association (industry), Forest Landowners Association (non-industrial private forest landowners), National Association of Professional Forestry Schools and Colleges,



National Association of State Foresters, university-industry cooperatives, and conservation/environmental agencies. The committee is being assembled and a first meeting is envisioned before the end of 2005.

A further development from the Science Committee in their meeting on September 23, 2005 was that the project would be called the **Pine Genome Project**. That latitude allows collaboration between scientists working on other genera and species within the conifer family. That name change does not necessarily

affect the initiative of the Implementation and Policy Committee of LPGP. Their name will be guided by the audience and the potential funding agency.

Growing Trees & Stemming Risks Conference Planned

Careful assessment and management of ecological risks are prerequisites to realizing potential ecological benefits associated with specific products of forest biotechnology. Ecological risks may originate from the impact of engineered tree species upon forest biodiversity and dynamics, the impact of transgene flow to non-engineered species, and trait-specific impacts upon wildlife and ecosystems. The ecological benefits of forest biotechnology are unproven, yet significant and diverse.

A 1.5 day conference will explore important topics related to these risks with a goal of identifying priority research needs and promising approaches. The venue is Vancouver, British Columbia, March 20 – 21, 2006. This conference will take an in-depth look at several potential products of forest biotechnology and 1) identify specific environmental impact issues for each product, 2) discuss the current state of risk assessment

research, 3) identify research and knowledge gaps, and 4) make recommendations for needed research.

IFB Hosts BioAg Center Leadership Conference

The BioAg Center coordinates education and training activities to help ensure North Carolina has a well-trained agriculture biotechnology workforce. The Center has four areas of focus: plant manufacturing pharmaceuticals, agriculture technologies, marine biotechnologies, and forest biotechnologies. IFB hosted a half-day program on October 18, 2005 for 40 attendees from

the Community College system, US Forest Service, foresters, and farmers. Participants head talks on

research being conducted in the Tree Improvement and forest biotechnology programs at NC State University. They also toured the GIS remote sensing facilities and the Rooted Cutting project.



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INSTITUTE OF FOREST BIOTECHNOLOGY

2005 IUFRO Tree Biotech Conference Held

The conference featured a symposium on *Forest Biotechnology Adoption and the Impact of the Economic, Scientific and Societal Value Chains* which the Institute of Forest Biotechnology helped to organize. Read more about the conference inside this issue of the *BioSylvan News*.

Also Read About

- Forest biotechnology books in review
- A community Pine Genome Project
- BioAg Center Leadership Conference
- Growing Trees & Stemming Risks Conference

Check out our website for downloadable versions of recent meeting proceedings, *www.forestbiotech.org*.