CONCLUSIONS

Native plants are very important because they are adapted to local environmental conditions, play a vital role in natural ecosystems, and offer numerous ornamental characteristics. Maine nourishes many more native plants with great ornamental potentials. Further research will focus on reproducing these native plants (exploring propagation methods) with commercial feasibility.

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The Green Roof Research Program at Michigan State University©

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INTRODUCTION

As our forests and agricultural lands are replaced with impervious surfaces due to urban development, the necessity to recover green space is becoming increasingly critical for the health of our environment as well as our well being. Vegetated or green roofs are one potential remedy for this problem. Establishing plant material on rooftops provide numerous ecological and economic benefits including storm-water management, energy conservation, mitigation of the urban heat island effect, increased longevity of roofing membranes, as well as providing a more aesthetically pleasing environment to work and live.

The green roof research program at Michigan State University (MSU) was initiated in collaboration with Ford Motor Company during 2000 in an effort to advise them on the installation of a 10.6-acre extensive (shallow) green roof on a new assembly plant in Dearborn, Michigan. The objectives of our ongoing research are to evaluate plant species, propagation and establishment methods, substrates, water and nutrient requirements, and water quality and quantity of runoff. Numerous experiments are currently being conducted on 48 simulated roof platforms at the Horticulture Teaching and Research Center at MSU. The site is equipped with a weather station, thermocouples measuring temperatures at various depths in the

growing substrates, and electronic tipping buckets that record the volume and rate of storm water runoff from the individual platforms. A plant competition study involving combinations of 18 herbaceous species native to Michigan and nine species of *Sedum* is currently in its third year. We are also conducting other plant evaluation studies with over 100 species in the greenhouse and outdoors.

PLANT ESTABLISHMENT, COMPETITION, AND SURVIVAL ON ROOF PLATFORMS

Cuttings of 25 succulent plant species were propagated on platforms with substrate depths of 2.5 cm, 5.0 cm, and 7.5 cm (0.98, 1.97, and 2.96 inches). Parameters measured include propagation success, rate of establishment, growth and survival, groundcover density, ability to exclude invasive weeds, competition among species, persistence over several years, tolerance to low winter temperatures, and drought resistance. Initial rate of establishment and plant growth is being measured by analyzing digital photographs with SigmaScan image analysis software to determine the percentage of plant canopy that can be attributed to each individual species. After initial growth rates are established, a quadrat point-frame will be utilized to measure leaf area index in order to evaluate plant competition. Susceptibility to plant competition will be important to predict the long-term stability of the planted communities as well as preservation of the aesthetic goals of the roof design. Equally critical is determination of the resilience and seasonal fluctuation of each of the selected species over the growth season and after winter dormancy.

GREENHOUSE STUDIES ON DROUGHT TOLERANCE

In the greenhouse, we are examining differences in evapotranspiration rates, substrate moisture levels, and plant performance among seven species exposed to several substrate depths and various levels of drought. Species include individual trays of a native perennial (*Coreopsis lanceolata*), a native grass (*Schizachyrium scoparium*), *Sedum album*, *S. rupestre* (syn. *S. reflexum*), *S. kamtschaticum*, a mixture of seven sedum species, and a control with no plants. Evapotranspiration is measured by obtaining tray weights. Substrate moisture content is being recorded with a Theta Probe Soil Moisture Sensor. In addition, plant stress is quantified with chlorophyll fluorescence (Fv/Fm) measurements taken on randomly selected leaves. Since chlorophyll fluorescence levels are tied to the maximum dark-adapted photochemical efficiency of photosystem II (PSII), they can serve as a general measurement of plant photosynthetic potential.

STORMWATER MANAGEMENT ON ROOF PLATFORMS

Two studies are being conducted to quantify the differences in water retention among (1) roof vegetation types and (2) among combinations of green roof slopes and substrate depths. The three roof types being tested are: (1) An extensive green roof with vegetation, (2) An extensive green roof with substrate only, and (3) A conventional commercial roof with a 2-cm-deep (0.8-inch) gravel ballast. The twelve platforms utilized in the slope/depth study received 2.5, 4.0, or 6.0 cm (1.0, 1.6, or 2.4 inches) of substrate on top of the substrate carrier. The four treatments are a 2% slope with either 2.5 or 4.0 cm of substrate and the 6.5% slope with 4.0 or 6.0 cm of substrate.

THE FUTURE OF GREEN ROOFS IN THE UNITED STATES OF AMERICA

In Germany, it is estimated 12% of all flat-roofed buildings are covered with vegetation, a number that is increasing as the German green roof industry continues to grow 10% to 15% per year. In the U.S.A. the concept of green roofs is just now being introduced and will likely become more common in the future. They represent an entirely new market for landscape designers/architects, nursery operations, and landscape contractors; and the potential market includes all existing and future roofs in the country.

Cultivar Verification Using Molecular Techniques©

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INTRODUCTION

The techniques of molecular biology are increasingly being applied to horticultural research, including cultivar verification and new cultivar breeding. In this poster we summarize two projects conducted at the Arnold Arboretum that demonstrate the application of these techniques to horticultural plants. We envision this area of research will continue to develop, and we foresee a need for collaborative efforts to establish a comprehensive database of different taxa. Such a database should be readily accessible online for the benefit of researchers, the green industry, and the general public.

Stewartia 'Scarlet Sentinel'

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Following is a summary of the description published in *HortScience* 37(2): 412–414 (2002).

Stewartia 'Scarlet Sentinel' is a unique tree that originated as a spontaneous, open-pollinated seedling at the Arnold Arboretum of Harvard University in Jamaica Plain, Massachusetts, U.S.D.A. Hardiness Zone 6A. The plant is a putative spontaneous hybrid between *S. pseudocamellia* Maximowicz and *S. ovata* (Cavanilles) Weatherby f. *grandiflora* (Bean) Kobuski that are growing adjacent to one another in the Chinese Path section of the Arnold Arboretum.

'Scarlet Sentinel' was originally collected in 1982 as one of a group of spontaneous seedlings growing beneath *S. pseudocamellia*. One of the seedlings was cultivated on the private property of author Peter Del Tredici; when the plant flowered for the first time in 1992 at approximately age 12, its hybrid nature became apparent.

The morphological intermediacy of 'Scarlet Sentinel' between *S. ovata* f. *grandiflora* and *S. pseudocamellia* strongly suggests that the cultivar is a hybrid between the two species. In order to verify this supposition, the authors conducted molecular analyses of both species and their putative hybrid. Total genomic DNA of the putative hybrid and the parents was extracted and analyzed using random-amplified polymorphisms of DNA (RAPD). Five of the twenty primers produced one or more