

MDA Horticulture Fund 2007 Final Report

Project Title: Evaluating the biological characteristics of ornamental plant species and selected cultivars for invasiveness

Project MDAH# 97529

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Reporting Period: 2007-2008

Several horticultural crops have been identified as being invasive. In addition, the invasive label of the species has been transferred to all of its cultivars without consideration for individual plant traits. There are a number of factors that contribute to a plant's invasive potential including reproductive methods and rates, growth rates, and dependence on or response to disturbances. Environmental factors also affect invasiveness and may vary among eco-regions or geographic boundaries. The primary objective of this proposal is to document plant characteristics of several landscape plant species and their cultivars that could support or reject being classified as invasive. The documentation will be based on both literature and field data collection. Results will be published in appropriate journals to provide an established printed record for subsequent reference. A second objective is to evaluate these plants through the Michigan Plant Invasiveness Assessment System. This information will also provide governmental agencies and the state legislature with credible information on plant species when addressing the invasive plant problem in our state. It will also aid in developing an outreach strategy that both preserves environmental health and the economic growth of the industries relying on the production and sale of plant and plant products.

Accomplishments:

Project start date was July 1, 2007 and continued through the 2008 growing season. Permission to conduct the research using prohibited and restricted species was approved by the Michigan Department of Natural Resources in accordance with Transgenic and Invasive species regulations (Part 413, of P.A. 451 of 1994). Although this is the final report for the 2007-2008 funding cycle, these experiments are part of a multi-year project and will continue for two additional years.

Objective 1) Identify populations of ornamental plant species in natural areas around the state in collaboration with state and federal agencies and assess plant behavior, the extent of infestation, history of land use, dispersal mechanisms and pathways of introduction.

Flowering characteristics on *Fallopia japonica*, F. j. 'Compacta' and F. j. 'Variegata' and F.j. 'Variegata Nana' were monitored in landscape settings throughout the state. Landscape sites with *Fallopia japonica* were monitored in Lansing, Farmington, Grand Rapids, Spring Lake, Cadillac, and Beulah, Michigan. Other sites within the state have been identified and plant specimens will be collected at the end of the 2008 season. Data

on flower parts and seed development was recorded in the fall of 2007 and will again be recorded in 2008, 2009, and 2010. Seeds were found on one population of *Fallopia japonica* out of three at a site in Lansing. These three populations were separated by approximated 75-100 feet. There were no seeds produced on *Fallopia japonica* at any of the other monitored sites in 2007. Two landscape sites with *F. j.* 'Compacta' were found in Grand Rapids and Spring Lake. Seeds were present on *F. j.* 'Compacta' at both sites. The sites adjacent to and surrounding these landscape sites did not have seedlings present. No seeds were found on *F. j.* 'Variegata' and *F.j.* 'Variegata Nana' in the 2007 season.

Collected seeds of *Fallopia japonica* and *F.j.* 'Compacta' from landscape sites in October of 2007 were processed, stored at 5 degree C and sown in the greenhouse to monitor germination rates and percentage survival. Seed were sown on 2/29/08 and 4/7/08.

Germination rates are as follows:

Collection	2/29/08	4/7/08
<i>Fallopia japonica</i> Lansing 1	22%	50%
<i>Fallopia japonica</i> Lansing 2	29%	59%
<i>Fallopia japonica</i> 'Compacta' Grand Rapids	0%	0%
<i>Fallopia japonica</i> 'Compacta' Spring Lake	17%	43%

All seedlings survived under controlled conditions.

Seeds will be collected again in fall 2008, 2009, and 2010 and sown in both greenhouse and field plots. Germination rates will be recorded.

Stem samples of *Fallopia japonica*, and *F. j.* 'Compacta' were collected from landscape sites. The intent of the sampling is to compare the stem characteristics between species. Ten fully formed stems were collected from random locations within each overall plant mass. This data will aid in determining growth rates and potential rate of spread.

Preliminary data on stem caliper at the crown, number of lateral branches and total stem height was recorded for plants at several sites in 2007.

Data is as follows:

Collection	Stem caliper (mm)	# of Lateral Branches	Total Height (inches)
<i>Fallopia j.</i> Lansing 1	23.66	12.3	107.75
<i>Fallopia j.</i> Lansing 2	23.84	15	98.6
<i>Fallopia j.</i> Lansing Br1	22.93	11.6	90.42
<i>Fallopia j.</i> Lansing Br2	24.68	13.6	105.7
<i>Fallopia j.</i> Cadillac	19.63	11.4	97.3
<i>Fallopia j.</i> Beulah	23.43	14.1	112.0
<i>Fallopia j.</i> Compacta GR	9.34	7.6	31.17
<i>Fallopia j.</i> Compacta SL	8.43	9.3	35.00

Stem characteristics will be taken at the end of the 2008, 2009, and 2010 growing seasons. A significant difference is observed between *F.j.* straight species and the cultivar Compacta. Once the data is completed, we will evaluate the relationship between stem characteristics and potential rate of spread.

Objective 2) Document plant parameters for these species and a selected group of cultivars.

Due to the prohibited and restricted status of these species, it was difficult to find available plants in July of the 2007 season. All plants were received in the spring of 2008 and arranged in the following experiments.

Fallopia japonica, *Fallopia japonica* 'Variegata' and *Fallopia japonica* 'Compacta' were obtained in 4" inch pots and 1 gallon containers from nurseries in accordance with Michigan DNR approval. These plants were held in containers until planted in the field. Two experiments were established in soil cells at the Horticulture Teaching and Research Farm, Michigan State University. The first experiment was established using 3 - 7' x 7' cells each with 5 plants for a total of 15 plants. The objective of this experiment is to determine the rate of spread of each of the 3 plant selections. Data on growth characteristics will be taken at the end of the growing season in three consecutive years (2008, 2009, 2010). The first season data will be completed in October 2008. A second experiment was established as a complete randomized block design using the three *Fallopia* selections and 8 blocks. Two plants of each selection were arranged in 8 - 7' x 7' soil cells for a total of 16 plants per selection. Data will be collected on flowering characteristics, seed set, and vegetative growth characteristics for three seasons starting with 2008. Plants are being monitored on a weekly basis for noted vegetative or flowering characteristics. A subsequent progress report of the first season data will be submitted in January 2009.

An experiment to determine the ability of stem segment to root and produce shoots was conducted with *Fallopia japonica*, *Fallopia japonica* 'Variegata' and *Fallopia japonica* 'Compacta'. Stem segments were taken as follows: Terminal shoot with one node, Terminal shoot with two nodes, 1 node mid section, 3 node mid section, 5 node mid section, 1 node stem segment from the crown and 2 node stem segment from the crown. Three cuttings per segment size were arranged in a complete randomized block design using 8 blocks for a total of 24 samples per segment size per plant. No shoot emergence was observed to date. Excavation to determine root initiation will be conducted in October 2008. This experiment will be repeated in 2009.

Two experiments were established in the soil cells for *Phragmites australis* and *Phragmites australis* 'Aurea'. The first experiment was established using 3 - 7' x 7' cells each with 5 plants for a total of 15 plants. The objective of this experiment is to determine the rate of spread of each of the 3 plant selections. Data on growth characteristics will be taken at the end of the growing season in three consecutive years starting in 2008. A second experiment was established as a complete randomized block design using the two *Phragmites* selections and 8 blocks. Two plants of each selection were arranged in 8 - 7' x 7' soil cells for a total of 16 plants per selection. Data will be collected on flowering characteristics, seed set, and vegetative growth characteristics for three seasons. Plants are being monitored on a weekly basis for noted vegetative or flowering characteristics. A subsequent progress report of the first season data will be submitted in January 2009.

Myriophyllum aquaticum and *Egeria densa* were obtained as cutting in the spring 2008 from nurseries in accordance with Michigan DNR approval. Similar experiments were conducted throughout the summer and a third is planned for fall 2008.

The first experiment focused on shoot elongation and root development on stem fragments. Tip sections of 2.5, 5.0, 10.0, and 15 centimeters were cut from terminal stems. No roots or lateral shoots were present at the beginning of the experiment. In addition to the appropriate segment length, initial measurements were taken on the the number of nodes per segment and the caliper (mm) at the butt end. Data was collected for 8 weeks on shoot length; number of nodes with shoots; length of lateral shoots; number of nodes with roots; length of roots. Separate experiments were conducted for each species as a complete randomized block design. Three tip sections for each initial size of *Myriophyllum aquaticum* and 4 tips sections per size of *Egeria densa* were placed in 8 barrels/tubs representing eight blocks. Measurements were taken at two week intervals. These experiments will be overwintered to monitor freeze injury on the stem segments. The growth data on these experiments are being analyzed and will be reported a January 2009 progress report. Freeze injury data will be collected in April 2009.

The second experiment on *Egeria densa* consisted of node segments. One, two, three, four and five node segments were cut from behind the terminal nodes. Initial caliper measurements were taken from the top and bottom section of 12 cutting for each segment. Data was collected for 8 weeks on shoot length; number of nodes with shoots; length of lateral shoots; number of nodes with roots; length of roots.

A third experiment is planned for fall 2008, 2009, and 2010 to determine cold hardiness of *Myriophyllum aquaticum* and *Egeria densa*. Stem segments and fully rooted plants will be overwintered in tubs sunken into the ground. Data on survival will be collected in April 2009.

Objective 3) Assessment of the invasive potential of the selected species and their cultivars through the Michigan Plant Invasiveness Assessment System (MPIAS). The assessment of the plants in this project will expand the species list and include cultivars. Literature was reviewed and collected for inclusion in the Michigan Plant Invasiveness Assessment System. The literature review and results from the experimentation will be combined and use to evaluate these species under consideration through MPIAS.

Planned activities for the next reporting period:

Although this is the final report for the 2007-2008 funding cycle, these experiments are part of a multi-year project. Subsequent reporting will follow MDA Horticulture Fund guidelines with data reported in January and June of each year while the experiments are still in effect.

Field experiments for all species and cultivars established at the Horticulture Teaching and Research Center in the spring 2008 will continue to be monitored through the 2009 and 2010 growing seasons. Data monitored include: flower characteristics (reproductive parts); fruit characteristics and set; seed number; seed viability (under controlled

conditions) and in situ (in the field under natural conditions); and vegetative growth characteristics. These parameters will also be collected at identified natural areas and landscape settings throughout the state.

Other funds or contributions related to the project:

The information gained through this project has been used to expand our research project on the documentation of the invasive characteristics of several aquatic and terrestrial species. A proposal was funded in the 2008 funding cycle by the Michigan Nursery and Landscape Association. A companion proposal has been submitted to the Horticulture Research Institute (May 2008). Proposals for the continuation of the project will be submitted to Project GREEN and the Michigan Nursery and Landscape Association in 2009.

Publications/outreach activities related to the project:

The information received to date was incorporated into presentations given at the 2008 Ohio Nursery Short Course in Columbus, Ohio and discussed at a recent meeting of nursery representatives at the 2008 MidAm Trade Show, Chicago, IL. A progress report was submitted to the Michigan Department of Natural Resources in accordance with the permit to conduct research on these prohibited and restricted aquatic species. Analyzed results from 2008 seasonal experimentation will be reported in January 2009.