

A Subarctic Fern Trial Garden

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Since 1992, the University of Alaska Fairbanks Georgeson Botanical Garden has been a satellite test garden with the Hardy Fern Foundation. When Guy Huntley contacted our garden about becoming a test site, he was interested in getting the broadest range of temperatures and conditions possible. No doubt, Fairbanks provides one interesting extreme in the mix of satellite test gardens. During the last 17 years, we have watched a lot of ferns die or at the very least, struggle to produce one or two fronds then finally succumb (Table 1). When a fern survives, it is usually approached with a bit of disbelief and a healthy skepticism that it couldn't possibly last another year!

Fairbanks is located in the central interior of Alaska (64°51'N, 147°52'W) and experiences a continental climate with some of the hottest summer and coldest winter temperatures in the state (climatic zones 1 & 2). The average annual temperature is a balmy 32 °F, but daily temperatures can range from the mid 90s in June and July to -60s in winter. Despite these extremes, we are fortunate to have the moderating effect of ample snow cover. The Interior can grow a diversity of perennial ornamentals, many rated in zones 3 and 4 because snow cover buffers the temperature around the roots and crown. In Fairbanks, snow begins the first or second week of October and usually does not melt until April.

Ferns often fail because they do not harden off quickly in the fall after a very short growing season. Many plants do not adapt to our long photoperiods, and they are actively growing when winter arrives. In addition, if sufficient snow has not fallen by the end of October, there will be a lot of death in the garden the next spring. Of course, mulches help, but we don't use any protection in the botanical garden choosing instead, to weed out the wimps from the truly hardy plants. Most winters are characterized by a long, cold season with an average of 50 inches of dry, powdery snow.

Even if a fern survives our brutal winter, summer conditions can prevent growth. The average summer soil temperature in a sunny garden at a 4-inch depth is 50°F. Shade gardens are colder, and it is not uncommon to dig through ice especially in organic soils. Plants may survive winter but cannot grow well because their roots are cold or encased in ice for up to half the growing season! Consequently, our list of hardy ferns is fairly small and includes mostly native Alaska ferns. The frost-free season is about 115 days with less than 10 inches of rainfall. Short growing seasons, cold soils, and dry conditions all combine to make gardening with ferns a challenge.

One surprising survivor in our trial plots has been Braun's holly fern, *Polystichum braunii*. This species is native to coastal Alaska mostly in the temperate

rain forests of the southern panhandle. Our plants were one of the first from the Hardy Fern Foundation trials in 1995. They form beautiful vase-like rosettes from thick fiddleheads. They have not spread but produce abundant spores annually. We will try this species from a variety of sources to learn more about its hardiness based upon plant source.

A more recent surprise is the Branford Beauty fern, *Athyrium* 'Branford Beauty' with its beautiful reddish stipes and silver markings. Our three plants have survived since 2002. They do not emerge until mid June, very late by our standards but not unlike a lot of shade plants such as hostas and bleeding heart probably slowed by cold soils. Every season, we think it is gone, but wait long enough and tiny fiddleheads emerge followed by very ornamental foliage reaching 18-24 inches in height. Even in very low snow years when death reigns supreme in the garden, this little fern has returned.

Only one other plant from the HFF trials remains in our garden: one lone, three-fronded plant of Clinton's wood fern, *Dryopteris clintoniana*. Every year, we expect that poor plant to disappear completely, and every year one of the four originally planted, sends up three fronds. They produce spores that do not mature in our short season. We have moved it twice to find a more likeable site, but it grows no bigger or stronger.

Favorite native ferns include the ostrich fern, *Matteuccia struthiopteris* which is so tough and spreads so well it has been known to break through asphalt sidewalks. Despite its far-spreading habit, Fairbanksans love it because it brings a bit of lush green, almost tropical appearance to shade gardens. Gardeners preferring a less rampant fern choose the northern wood fern *Dryopteris expansa* or the lady fern, *Athyrium filix-femina*. The lady fern is not entirely hardy in the Interior and requires mulching, an upland garden, or warm south-facing slopes to grow well. A shorter fern (12-15 inches) sometimes grown in Interior gardens is the northern beech fern, *Phegopteris connectilis* that spreads slowly into large clumps of crowded, upright fronds. Next to the ostrich fern, we consider this plant nearly indestructible in our shade and semi-shade gardens.

Rock gardeners search rocky ledges for the diminutive (6-8 inch), *Dryopteris fragrans* that requires well drained, gravelly soils and only partial shade, if at all. It is difficult to grow and often dies out after a few years. Some don't like it for the mat of dead fronds that persist at the base of the plant for many years. Not as well known but easy to grow is the fragile fern, *Cystopteris fragilis*, also grown in rock gardens. Most woodland gardens host one or two species of oak ferns, *Gymnocarpium dryopteris* or *G. jessoense*, mostly because the thread-like rhizomes rapidly grow from nearby woodlands and appear in shady gardens. In sunny gardens, the rhizomes are more compact, and the plants form sizeable clumps that spread slowly.

Besides evaluating ferns for gardens, the Georgeson Botanical Garden has contributed to the recovery plan for Alaska's only endangered plant species, the Aleutian shield-fern, *Polystichum aleuticum*. Fewer than 140 plants are known to

exist on Adak Island, Aleutians and their precarious state is believed to be a due to habitat degradation through rock falls possibly triggered by caribou climbing on rocky outcrops. They are tiny ferns, and finding them in the rocky grottos and ledges is difficult. Biologists have searched other islands since at least the 1970s to find more populations with little success.

Through aseptic micropropagation techniques we showed that the fern spores are viable, and DNA and isozyme analysis showed very little variation among individuals. Its closest relative is *P. lachenense*, and scientists have speculated that, like a lot of Aleutian flora, spores were carried by wind from Asia. No one knows if the plants growing on the side of Mount Reed, Adak, are the remnants of a more extensive historic population or part of an Asian populations that never became well established in the Aleutians. We have developed an aseptic micropropagation protocol that will allow for vegetative reproduction as a last resort should the need arise. For now, the populations are monitored, plants are counted, and the search goes on for more wild populations. Once propagated, the plants are very slow to grow, and keeping them alive under controlled conditions is very difficult.

Despite the small number of ferns deemed hardy in Interior, Alaska gardens, they remain very popular in home gardens and public landscapes. Hardiness trials are important, even though most plants die, simply for the list of plants that did not make it. Fairbanks, Alaska hosts many large retailers that import perennial ornamentals including ferns for Alaska gardens. The plants available for purchase have been chosen at corporate headquarters far removed from the realities of a subarctic garden. Our lists, even the long “did not survive” list, provides valuable information to make better informed consumers. These trials have also expanded our knowledge of native ferns and their ability to adapt to gardens. No doubt the list of “don’t bother” ferns will expand, but the few that survive are given a royal treatment.

Table 1. Ferns from the Hardy Fern Foundation since 1994.

Ferns that survived at least one year but eventually died	Ferns that did not survive one winter
<i>Cyrtomium fortunei</i>	<i>Adiantum aleuticum</i> , <i>A. aleuticum</i> ssp. <i>subpumilum</i>
<i>Cystopteris bulbifera</i>	<i>Adiantum venustum</i>
<i>Dryopteris</i> sp. <i>Lacera</i> type	<i>Athyrium otophorum</i> , <i>Athyrium otophorum</i> 'Frizelliae'
<i>Dryopteris affinis</i> 'Crispa Barnes'	<i>Blechnum penna-marina</i>
<i>Dryopteris dilatata</i> 'Jimmy Dyce'	

<i>Dryopteris hondoensis</i>	<i>Blechnum spicant</i>
<i>Dryopteris scottii</i>	<i>Cryptogramma acrostichoides</i>
<i>Dryopteris stewartii</i>	<i>Cyrtomium falcatum</i> 'Rochfordianum'
<i>Polypodium scolopendrium</i>	<i>Cyrtomium macrophyllum</i>
<i>Polypodium virginianum</i>	<i>Dennstaedtia punctilobula</i>
<i>Polystichum aculeatum</i>	<i>Dryopteris affinis</i> var. <i>Azorica</i>
	<i>Dryopteris arguta</i>
	<i>Dryopteris blanfordii</i>
	<i>Dryopteris campyloptera</i>
	<i>Dryopteris celsa</i>
	<i>Dryopteris crispifolia</i>
	<i>Dryopteris cristata</i>
	<i>Dryopteris dilatata</i> 'Lepidota Cristata'
	<i>Dryopteris filix-mas</i>
	<i>Dryopteris lepidopoda</i>
	<i>Dryopteris marginalis</i>
	<i>Dryopteris sieboldii</i>
	<i>Dryopteris sublacera</i>
	<i>Onoclea sensibilis</i>
	<i>Osmunda regalis</i> , <i>O. regalis</i> 'Undulata'
	<i>Phyllitis scolopendrium</i>
	<i>Polypodium interjectum</i>
	<i>Polystichum acrostichoides</i>
	<i>Polystichum munitum</i>
	<i>Polystichum neolobatum</i>
	<i>Polystichum setiferum</i> 'Divisilobum'
	<i>Woodwardia fimbriata</i>
	<i>Woodsia polystichoides</i>

