What ecological effect does hay-scented fern have on the forest? Are there any non-chemical strategies that will control the fern?

Hay-scented fern (*Dennstaedtia punctilobula*) is a native species that is common especially in forests dominated by maple or cherry, although it can occur in other forests. It is usually less abundant in forests that are quite shady, such as hemlock-dominated forest or those with heavy beech cover. Perhaps its most negative effect is the ability to prevent the development of hardwood seedlings. Hay-scented fern is considered a "native invasive" because of its ability to dominate a forest under some conditions. Fern domination will significantly affect the long-term health and sustainability of the forest because the future forest will have fewer and likely different trees.

Dense fern cover has negative effects on the ability of seedlings to establish and develop. There are three likely ways that ferns, in general, inhibit hardwoods. First, the ferns create a dense shade that will limit some hardwood species. Second, the fronds create a heavy organic layer that together with the dense root system of the ferns limits some tree seedlings. Finally, the expansive fronds create a habitat where rodents can effectively forage for seeds with reduced likelihood of predation.

Fern domination of the understory is linked jointly to canopy thinning and prolonged browsing of other species by deer. Even low intensity thinning will create enough light to stimulate fern expansion. However, as your forest matures and upper-canopy trees die, sunlight will likely increase even if you don't cut or thin your woods. Forests without any cutting may also experience an increase in fern abundance. Deer browsing reduces other low-growing shrubs, like raspberry or hobblebush that would shade the fern. Deer, like other livestock, likely avoid browsing of ferns because of an enzyme in the foliage that inhibits the animal's ability to absorb nutrition. Hay-scented fern increased in abundance with canopy openings more quickly than the fern decreased in response to canopy shading. Increased light levels increase photosynthesis, growth and branching of root rhizomes, and production of spores. Rhizomes spread the clones vegetatively while spores allow for the development of new clones.

Now to the second question – what strategies will control the abundance of hay-scented fern? Both chemical and non-chemical strategies have advantages and disadvantages and varying levels of success. The most effective way to control ferns is chemical applications. Typically the chemical glyphosate is quite effective when used in accordance with label instructions. If you decide to try chemical controls, check with your local office of Cornell Cooperative Extension for additional information on the safe use of pesticides. There are also some non-chemical approaches. In all cases, do not disturb the organic layer of the forest floor as this will increase sprouting and abundance of ferns. Remember also that fern abundance increased because of the combined effects of deer and increased sunlight. Thus, you will need a plan to control the impacts of deer on other vegetation. Simply controlling deer is insufficient to reduce the fern and re-establish hardwoods. A recent study evaluated mowing as a control for hay-scented fern. This study, in Massachusetts, found that mowing in June after full expansion of the fern fronds and again in August for two consecutive years significantly reduced the density and height of the ferns and allowed increased light. Mowing can be with any tool (e.g., mower, weed whip, brush hog, etc.) that you can safely get into the woods and not damage the residual overstory trees. In the study, the mowing treatment helped establish raspberry and desired hardwoods. The raspberries shade the ferns but don't typically inhibit hardwood establishment. The mowing treatment presumably depletes the starch reserves of the ferns when they are lowest after frond expansion in the spring and through repetition stresses the plants into a decline. Mowing will likely not eliminate ferns from your woods, but may control them to the point that other more desired species can establish.

There are two other techniques that haven't been thoroughly evaluated and which might have some controlling effect on hay-scented fern. First, liming might have a connection to improving seedling establishment. In one study, when soil calcium was low relative to soil aluminum, the ferns did best. This doesn't mean that liming, which would increase calcium relative to aluminum, will help, but it might be worth trying on a small scale to see the effects. Second and even more speculatively, heavy mulching as done in gardens to control weeds might also be an effective control of ferns in the woods. You could try this in a limited capacity to see if it works.

Considerable work on the effects and control of hay-scented fern has been done by Drs. de la Cretaz and Kelty at the University of Massachusetts. Their research has been published in the Northern Journal of Applied Forestry, Restoration Ecology, and Biological Invasions.

Pictures:
- Dsc02198   hay-scented fern along skid trail will quickly spread to other areas following the harvest.
- Dsc02199   hay-scented fern that is disturbed can spread along skid trails because the rhizomes are able to easily re-establish new plants
- "fern cover PA" ferns can create an attractive open understory, but domination of the ground layer changes the ecological functioning of the forest
- "fern frond"   After fern fronds fully expand, mowing will likely deplete their starch reserves. Repeated mowing will reduce fern abundance.

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