

Interim Forest Management Policy for High Conservation Value Forests
HCV: Ram’s-head lady’s-slipper orchid (*Cypripedium arietinum*)

Table 1. Key Statistics	
Known element occurrences	102 element occurrences in NHIS
Known element occurrences on HCVF (non-STL)	14 element occurrences in NHIS
Known element occurrences on HCVF (STL)	1 element occurrence in NHIS

Source: MNDNR – NHIS database 2018

Status: State-listed threatened

Location: Upland and lowland conifer forest, primarily in the northern half of MN

Brief Description

Ram’s-head lady’s-slipper (*Cypripedium arietinum*) is the smallest and rarest of Minnesota’s lady’s-slipper orchids, and is currently listed as state Threatened. Perhaps the most common habitat of ram’s-head lady’s-slipper in Minnesota is lowland conifer forests. Typically less than 8” in height, the best time to observe this orchid is during its flowering season- late May through mid-June, in an average spring.

Policy for Ram’s-head Lady’s-slipper¹ within High Conservation Value Forests

Due to the range of conditions and population characteristics across a site, it is unrealistic to expect one approach is appropriate for all scenarios where this species is found. Decisions on which management approach is most appropriate need to consider the number, viability, condition, and extent of occurrences of ram’s-head lady’s-slipper present on a site, as well as the silvicultural options available for managing the tree species present.

Process Overview

This policy assumes the Natural Heritage Screen or Review for the proposed Activity determined intersection with a digital ram’s-head lady’s-slipper record in the DNR Natural Heritage Information System. This document helps you from that point forward by outlining site-level steps to verify presence or absence of ram’s-head lady’s-slipper relative to the Activity Impact Area and how to proceed accordingly.

Management Guidance Overview

This policy document outlines the steps necessary to determine the on-the-ground presence of ram’s-head lady’s-slipper, the condition of the site relative to its life history requirements, and associated forest management options. The guidance starts with site visits or field surveys, as needed.

¹ Find key definitions related to the policy on page 5.

Step 1: Site Visits or Field Surveys

After the likelihood of presence of this species on a site has been identified during an NHIS screen, a field survey may be recommended. Survey timeframes will vary year-to-year, depending on phenology and local site conditions, but in general the ideal time to survey for ram's-head lady's-slippers is late May to mid-June, when the plants are most likely to be flowering. Site visits/surveys should begin at least three years before a stand is scheduled on an exam list to ensure there is sufficient time available to make a positive or negative find of the species.

- **Positive finds:** If a field survey relocates the original NHIS record or results in new observations of this species, then at least two additional field surveys in the subsequent growing seasons should be conducted to account for the annual variation in the number and distribution of aboveground plants.
- **Negative finds:** If the original NHIS record is not relocated during the field survey, but the habitat is in a suitable condition for ram's-head lady's-slippers, and/or an **orchid community** is observed on site, then assume ram's-head lady's-slippers may still be present. An additional field survey in the subsequent growing season should be conducted to account for the annual variation in the number and distribution of aboveground plants.
 - If the original NHIS record is not relocated after three field season surveys, but habitat is still in a suitable condition for ram's-head lady's-slippers, and /or an orchid community is present, then base the buffering approach on a combination of the original NHIS record, the extent of potential habitat, and extent of the orchid community on the site.
 - If the original NHIS record is not relocated after three field season surveys, and the habitat is no longer in a suitable condition for ram's-head lady's-slippers, and/or no orchid community is present, then consider the population extirpated from the site.
- Repeated survey efforts may also be necessary in the event of outlier weather conditions (e.g. drought, late frost) during the ideal survey timeframe.

Step 2: Required Management Activities

Once the presence of this species is confirmed on the site, coordinate with Regional EWR staff to determine the appropriate management approach. Activity leads, working with Listed Species Leads, should develop a management approach using one of the options listed below.

- **Management Approach:** Apply Options #1 - #4 described in Table 2 below, depending on site context and the orchid population condition. See Table 2 for further guidance on when to apply each option.
- **Standard Protection Measures:** In combination with the management options described in Table 2, the following protection measures should be used when managing sites containing ram's-head lady's-slippers:
 - Conduct harvest operations during frozen ground conditions (required for lowland sites, strongly recommended for upland sites).
 - Place landings, skid trails and roads outside of OB and PB (when present) areas.
 - Favor silvicultural practices that do not require site preparation, or minimize disturbance to groundlayer if site prep is needed. Additionally, favor silvicultural methods that do not require herbicides, or minimize herbicide use to spot or strip spraying areas outside of buffers only.

- Utilize harvest approaches that retain additional overstory trees to maintain partial shade, or where possible, favor silvicultural systems that create multi-age, multi-strata forest conditions.
- Where site conditions present potential forest health considerations (e.g. Diplodia, mistletoe), management activities should prioritize protecting this species before applying standard forest health practices.

Table 2. Management Approaches for ram’s-head lady’s-slipper within HCVFs	
#	Approach, description and consequences
1	<p>Apply occurrence buffer (OB). No harvest within OB. This approach maintains a no harvest buffer around each observation of orchids within an area. The area beyond the OB would be managed as appropriate for each habitat/cover type, within the guidance included earlier in this document.</p> <p><i>Potential application indicators:</i> Used around small or isolated occurrences where long-term viability is assumed to be low, or surrounding habitat is considered unsuitable. Examples of compromised viability include altered hydrology, extensive canopy openings, significant invasive species presence.</p> <p>Consequences:</p> <ul style="list-style-type: none"> • Additional reduction to economic output by limiting harvest to areas beyond OB. • Impacts to canopy cover and soil disturbance will be avoided within the OB, but would (canopy) or could (soil) be affected across the surrounding habitat/stand. • Direct impacts to orchids would likely be avoided, however some uncertainty remains across habitat/stand.
2	<p>Apply occurrence buffer (OB) and population buffer (PB). No harvest within OB, limited harvest within PB (seed tree/ strip harvest/ shelterwood/ thinning, etc.). This approach maintains a no harvest buffer (OB) around each observation of orchids within an area and applies an additional zone of limited harvest connecting and further buffering those occurrences (PB) when a larger population or orchid community is present. Harvest operations in the PB would be selective in nature, maintain partial shade, occur during frozen conditions, and limit skidding and travel. Beyond the PB, harvest operations could continue as appropriate for each habitat/cover type, within the guidance included earlier in this document.</p> <p><i>Potential application indicators:</i> Used when larger populations or multiple occurrences with higher prospect for long-term viability are present within suitable habitat. Areas within PB are suitable for restorative harvest approaches (e.g. thinning or partial harvest) that focus on maintaining or creating suitable conditions for this species between occurrence buffers.</p> <p>Consequences:</p> <ul style="list-style-type: none"> • This scenario reduces the economic output from the site due to additional considerations for the local orchid population and associated habitat due to limited harvest in the PB and no harvest in the OB. • Impacts to canopy cover and soil disturbance will be avoided within the OB, and limited in the PB, but would (canopy) or could (soil) be affected across the surrounding habitat/stand. • Direct impacts to orchids would likely be avoided, and additional habitat maintained surrounding each occurrence, however some level of uncertainty remains across habitat/stand.

3	<p>Apply occurrence buffer (OB) and population buffer (PB). No harvest within OB or PB. This approach maintains a no harvest buffer (OB) around each observation of orchids within an area and applies an additional no harvest zone connecting and further buffering those occurrences (PB) when a larger population or orchid community is present. Beyond the PB, harvest operations could continue as appropriate for each habitat/cover type, within the guidance included earlier in this document.</p> <p><i>Potential application indicators:</i> Used when large populations or multiple occurrences with higher prospect for long-term viability are present within suitable habitat. Areas within PB are either already currently suitable for this species or harvesting would decrease suitable conditions.</p> <p>Consequences:</p> <ul style="list-style-type: none"> • This scenario further reduces the economic output from the site by avoiding harvest in the OB and PB, while prioritizing consideration for, and reduction of disturbance to, the local orchid population and associated habitat. • Impacts to canopy cover and soil disturbance will be avoided within the OB and PB areas, but would (canopy) or could (soil) be affected across the surrounding habitat/stand. • Direct impacts to orchids would largely be avoided, and additional habitat maintained surrounding each population, however some lower level of uncertainty remains across habitat/stand.
4	<p>Occurrence buffers (OB) occupy majority of manageable stand area. No harvest across stand containing occurrences. When a ram’s-head lady’s-slipper population (and resulting buffering approach) occupies the majority of a stand within suitable habitat, this approach avoids any harvest disturbance across that entire stand. Adjacent areas of unsuitable habitat could continue to be managed as appropriate for each habitat/cover type.</p> <p><i>Potential application indicators:</i> Used when large populations or multiple occurrences with high prospect for long-term viability are present within suitable habitat across enough of a stand that the areas beyond occurrence or population buffers are unmerchantable or make for an infeasible timber sale.</p> <p>Consequences:</p> <ul style="list-style-type: none"> • On sites with large, dispersed orchid populations, the merchantability/operability of a stand will likely be reduced. • This scenario results in the greatest reduction to economic output from the site, while also minimizing harvest disturbance to sites containing large orchid populations. • Impacts to canopy cover and soil disturbance will be avoided across the entire habitat/stand. • Direct impacts to orchids would be avoided, and habitat value maintained across the local population.

Use of Buffers

The use of a harvest buffer ranging from 2 to 4 chains (132- 264’) is appropriate, depending on local habitat conditions and orchid population size and/or distribution. The following examples illustrate some of the factors used to determine an appropriate buffering distance:

- If unsuitable habitat conditions occur beyond the immediate ram’s-head lady’s-slipper occurrence, then a 2 chain buffer is recommended.
- If an orchid community is present, and/or additional suitable habitat extends beyond the immediate ram’s-head lady’s-slipper occurrence, then a 4 chain buffer is recommended.

- If the site management plans for areas beyond the ram’s-head lady’s-slipper occurrence include intensive management activities (e.g. soil disturbance, broadcast herbicide use), then a 4 chain buffer is recommended.

Optional Enhancement Activities

As there are not any specific methods known to enhance a population of ram’s-head lady’s slippers, management activities should focus on maintaining habitat suitability within and beyond the areas currently harboring observations of this species. In place of proposed untested enhancement activities, we suggest encouraging research into the concepts of mycorrhizal fungi and pollinator community health.

Key Definitions

Occurrence buffer: An area around each observation of ram’s-head lady’s-slippers where activities should be restricted to avoid ‘taking’, including but not limited to timber harvesting and equipment travel. Depending on local conditions, these buffers may range from 2-4 chains (132- 264 feet) in distance away from each orchid occurrence.

Population buffer: An area connecting and further buffering adjacent ram’s-head lady’s-slipper observations to ensure population viability. Where occurrence buffers are within approximately 2 chains (~132 feet) of each other, or an orchid community, additional 2-4 chain (132- 264 feet) population buffers are established around each occurrence buffer to connect them or the orchid community. Harvest operations within a population buffer should be avoided, or limited/selective in nature, maintain partial shade conditions, occur during frozen conditions, and limit harvest and equipment disturbance.

Orchid community: Ram’s-head lady’s-slippers often occur in habitat occupied by other orchid species. Other orchids within the genus *Cypripedium* (as well as *Amerorchis*, *Arethusa*, *Listera*, *Platanthera*, among others) also exhibit a dependence upon mycorrhizal fungi and may share pollinator species. The occurrence of multiple orchid species on a site may indicate the presence of a healthy mycorrhizal network and suitable pollinator activity, and can be used to infer an increased likelihood for ram’s-head lady’s-slipper presence. When an orchid community is located beyond an existing ram’s-head lady’s-slipper observation, any buffering approach should be extended to include the outer perimeter of the orchid community as well.

Suitable habitat: While ram’s-head lady’s-slippers can occupy several habitat types or communities, ranging from black spruce/tamarack peatlands and white cedar swamps to upland pine forests and woodlands, there are several overarching conditions that are required for a habitat to be considered suitable for this species. The most readily observable habitat condition is a partially shaded to fully shaded understory light environment (50-95% canopy closure). Two additional conditions relate to an intact mycorrhizal network and pollinator community, both of which are difficult to evaluate at this time.

- For comparison, *unsuitable* habitat can be described as forest conditions that do not provide the appropriate light or soil environment, or mycorrhizal fungi and insect pollinator community health. Examples include non-forested communities or forests regenerating from recent stand-replacing disturbance. Within otherwise suitable habitats, native plant community condition ranking scores of C, CD, or D may help identify areas where conditions may be less suitable for maintaining an orchid population (i.e. invasive species presence, soil compaction/erosion, intensive deer browse).

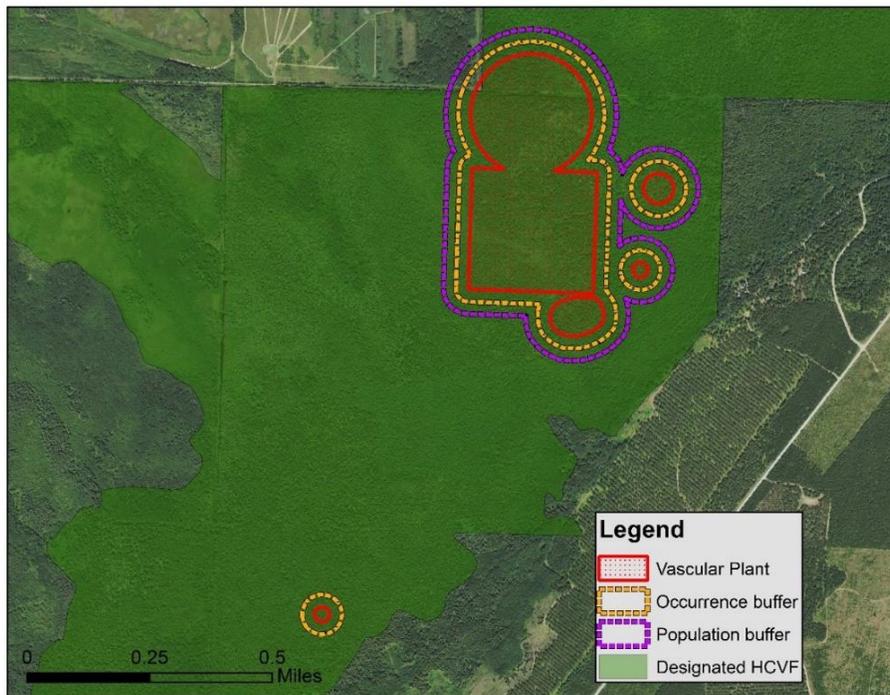


Figure 1. Example of various buffering approaches within an HCVF site. The vascular plant element occurrences (red polygons) in this map are documented locations of this rare species, not additional buffering extents.

Species Description



Figure 2. *Cypripedium arietinum* range in Minnesota.

Ram's-head lady's-slipper (*Cypripedium arietinum*) is the smallest and rarest of Minnesota's lady's-slipper orchids, and is currently listed as state Threatened. Perhaps the most common habitat of *Cypripedium arietinum* in Minnesota is lowland conifer forests. They tend to be dominated by northern white cedar and black spruce, and have a substrate of saturated peat overlain by a carpet of Sphagnum moss. The moss cover will, in places, be broken by shallow, water-filled hollows that have soft, mucky bottoms. The water in these hollows usually marks the top of the water table. Expect to find ram's-head lady's-slipper in somewhat raised mossy areas where its roots are some distance (inches) above the water table. These swamp habitats are usually influenced, to some extent, by subsurface water that has flowed through nearby uplands. That is how water picks up mineral ions, which are plant nutrients that are in short supply in peatlands.



Figure 3. Flowering *Cypripedium*

Upland habitats are also important for ram's-head lady's-slipper, and they vary quite a bit. Some are in mesic broad-leaved forests, but most are in mature pine forests of natural origin, especially those dominated by jack pine or red pine. In this type of habitat, the rooting zone of ram's-head lady's slipper is usually in sandy soil or in thin, mineral soil over bedrock. Although these soil types are considered "droughty", the rooting zone of ram's-head lady's-slipper would, under most conditions, be relatively cool and moist. This is because the tree canopy creates a humid, shady environment, and the ground itself is covered by mosses and lichens. Populations of ram's-head lady's-slipper in upland habitats are typically larger and denser than those in swamps and sometimes contain several hundred stems.

Typically less than 8" in height, the best time to observe this orchid is during its flowering season- late May through mid-June, in an average spring.

Conservation Needs

It appears that the habitat elements of greatest importance to ram's-head lady's-slipper are the health of the mycorrhizal community, the composition of the pollinator community, and the presence of a canopy providing full to partial shade.

Ram's-head lady's-slipper is an obligate mycorrhizal species, at least during some portion of its life cycle. In other words, it obtains its nutrients from soil fungi that have a symbiotic relationship with trees. Maintaining a healthy mycorrhizal community is largely dependent on a stable and healthy population of trees, and healthy soil conditions. Minimum habitat size required to maintain a stable, diverse, mycorrhizal community is not known, and likely varies depending on species and local conditions. It is reasonable to conclude that a minimum habitat requirement includes a functioning, reproducing population of native trees, although quantifying this requirement is difficult.

Maintaining a healthy pollinator community is dependent on maintaining a healthy community of food plants and nesting sites suitable for the pollinators (small, solitary bees, including those in the genera *Dialictus* (Halictidae) and *Megachile* (Megachilidae). Halictid and Megachilid bees nest underground, in rotting logs, or in hollow plant stems, and require up to a year for a full reproductive cycle, overwintering as pupae or prepupae. Dipterans may also be important orchid pollinators, though they haven't received the same degree of research

attention. Delineating such a habitat would be difficult without a careful site evaluation, and even then, it might rely on professional judgement.

The microsites where ram's-head lady's-slipper are found consist of a combination of local environmental conditions, including temperature, humidity, and light- which are all influenced by the condition of the tree canopy above them. Most populations of ram's-head lady's-slipper have been observed growing in lightly-shaded to fully-shaded conditions (50-95% canopy closure).

Management considerations that informed policy development

A population of ram's-head lady's-slipper that contains a favorable demographic structure (including sexually reproducing individuals, juveniles, subjuveniles, emerged seedlings, protocorms and seeds) can be assumed viable as long as the important elements of its habitat remain intact. Stochastic events such as wild fire, drought, insect outbreak or windstorms will likely not affect the long term survival of a population of ram's-head lady's-slipper as long as the habitat remains unfragmented and functional.

However, a single biological population of any plant species cannot be considered permanent. It will, over time, explore previously unoccupied niches (through seed dispersal) and may appear to move. The seeds of ram's-head lady's-slipper are small, airborne and have the potential to travel long-distances on wind currents. However, it is believed that viable seeds of ram's-head lady's-slipper usually travel short distances, rarely more than a few meters. In the case of ram's-head lady's-slipper, residency at any one particular place is likely to be decades or centuries. At least one Minnesota population of ram's-head lady's-slipper that was discovered as much as 100 years ago is known to remain in place and viable (as of 2012).

In the case of a viable population of ram's-head lady's-slipper, no management will be necessary. Enhancement of an existing habitat through artificial means may be impractical and, to the best of our knowledge, has never been successful.

General recommendations for management of a viable population of ram's-head lady's-slipper includes no timber harvest or timber management within the habitat. Any activity that would lead to soil compaction, hydrologic diversion, or canopy removal/thinning would be considered potentially detrimental to the habitat that supports a viable population of ram's-head lady's-slipper. A buffer around the habitat, not just the individual plants, is important to maintaining the integrity of the habitat. The amount of buffer that is needed is not known, and would likely vary with topography, hydrology, canopy composition, and a variety of other factors that must be assessed for each habitat. As previously stated, the habitat of ram's-head lady's-slipper needs to encompass the pollinator habitat and mycorrhizal habitat. Unfortunately, there are no known protocols that allow this to be done with certainty. It would likely require the professional judgement of a botanist, an entomologist and a mycologist.

Concern is sometimes expressed for habitats where the tree canopy is undergoing natural succession, such as from jack pine to white spruce. Although such succession may be of concern from some perspectives, there is no evidence that it is deleterious to a viable population of ram's-head lady's-slipper. Attempts to reverse or forestall such succession, such as employing prescribed burns, should be considered experimental and attempted only when a population of ram's-head lady's-slipper is perceived to be in serious decline and no

other options are available. By all indications ram's-head lady's-slipper is not fire adapted and likely will not survive a hot surface fire.

Summary

- Maintain full to partial canopy cover in areas currently occupied by ram's-head lady's-slipper, while buffering populations from direct disturbance.
- Avoid soil disturbance to ensure mycorrhizal community remains healthy.
- Maintain groundlayer plant diversity to provide orchid pollinators with sufficient habitat.

Next steps and additional needs

- Phase 2 of the HCVF project includes development of monitoring approaches. In this phase, monitoring efforts should focus on the application of various management options to better understand orchid population responses to different disturbance types or intensities.
- Pollinators have been identified as an important aspect of this orchid's life history needs. However, habitat needs and feeding behavior of the pollinators associated with these orchids are still uncertain, so the impacts from various management approaches is also unknown.
- Mycorrhizal associations are another critical factor in *Cypripedium arietinum* viability, and very little is known about these fungal partners. Further research on the life history of these associations would increase our understanding of the conditions necessary to maintain these populations.

Revision Date

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