Threatened and Sensitive Species

Introduction

The Endangered Species Act (ESA) 1973, as amended (16 U.S.C. 1536(c), 50 CFR 402), requires that the Forest Service conserve endangered and threatened species.

In accordance with Section 7(c) of the Act, the USFWS has determined that the following threatened or endangered listed species may be present on the Flathead National Forest: water howellia (*Howellia aquatilis*) and Spalding's catchfly (*Silene spaldingii*) (USDI Fish and Wildlife Service 2007). In addition, a letter was received on December 4, 2001 from R. Mark Wilson, Field Supervisor with the USFWS, identifying these threatened, endangered, and proposed species that may occur on the Flathead National Forest. The letter states that the range of Spalding's catchfly includes the upper Flathead River System and that areas below 5,000 feet are considered within the range of water howellia.

In addition to plants protected under the ESA, the Forest Service identifies plant species for which population viability is a concern as "sensitive species" as designated by the Regional Forester (FSM 2670.44). Currently, 52 plant species are designated as sensitive on the Regional Forester's sensitive plant list for the Flathead National Forest. USDA Forest Service policy requires that activities conducted on NFS lands be reviewed for possible impacts to threatened, endangered, or sensitive (TES) species (FSM 2670.32). The Forest Service has no jurisdiction to protect habitat of sensitive plant species on private lands.

Information Sources

Data sources used for this analysis includes the Montana Natural Heritage Program's (MNHP) Element Occurrence Database; the Flathead National Forest's Threatened, Endangered, and Sensitive Species (TES) Survey Atlas; and the Flathead National Forest's TES Plant Location Database. These databases include data collected from field surveys conducted by the Flathead National Forest Botanist, trained technicians, and other Botanist's contributing surveys and element occurrences to the MNHP. All other sources of information are cited in the text.

Analysis Area

The analysis area for this proposed project is based on the area of the project's influence/impacts on known occurrences or potential habitat for federally threatened/endangered and Regional Forester's sensitive plants within the project area. The project area includes all treatment units and road systems with activity related to this proposed project.

Spatial Bounds

Water Howellia: There are eight known occurrences and six ponds with potential habitat (u-ponds) within close proximity to proposed units or haul routes. Water howellia occurs in glaciated ponds and old oxbows, so the analysis area is limited to the direct, indirect, and cumulative impacts from project activities to these habitats. The analysis area for the direct and indirect impacts to water howellia includes the pond habitat and the surrounding catch basin of the pond. Because the Swan Valley

meta-population is the only location for water howellia in Montana and is the largest known meta-population, the cumulative effects analysis area includes the entire meta-population for water howellia in the Swan Valley. Potential effects to a single pond occurrence or potential habitat may have cumulative affects on the total population numbers for the entire meta-population, potentially affecting species viability.

Spalding's Catchfly: Because there are no known or occurrences or potential habitat for Spalding's catchfly within or near the proposed project area, the analysis area is confined to the project area.

Regional Forester's Sensitive Plants: There are two occurrences of a Regional Forester's sensitive plant, wavy moonwort *(Botrychium crenulatum*) and yellow lady's slipper (*Cypripedium parviflorum)*, known to occur in the project's area of influence. Wavy moonwort reproduces from re-sprouting of perennial rootstock and by aerially dispersing spores. Dispersal of spores is primarily limited to the immediate area, however some spores may be aerially transported for a long distance (i.e. miles) (Don Farrar, personal communication). Because, populations are primarily maintained from resprouting of perennial rootstocks and short dispersal of spores, the analysis area for this species is limited to the project area boundary.

Yellow lady's slipper reproduces by seed and rhizomes. Seeds are very small and are water repellant. This species disperses seed by wind, water, and animals. Dispersal distances of 60 to 900 miles have been reported for some other orchid species. Plants within the project's area of influence are located under closed tree canopy conditions where wind dispersal may limit long distance dispersal. Rhizomes are slow growing and localized to the immediate vicinity of parent plants. Because of the limited seed dispersal distance and the localized short distance of rhizomes from parent plants, the analysis area for this species is limited to the project area boundary.

Temporal Bounds

The temporal bounds are 10 to 20 years after the decision is signed. Vegetation conditions would take approximately 10 to 20 years to return to more closed canopy and understory cover conditions following implementation of the thinning and burning treatments. During this time opening of the canopy and increased soil disturbance from thinning and ground activities may increase the potential for weed establishment possibly resulting in competition with known or potentially occurring sensitive plant species.

Affected Environment

General Surveys for TES Plants

A habitat suitability analysis was conducted to evaluate the potential for sensitive plants occurrences within the project area. Sensitive plants species are grouped into nine habitat guilds (see Sensitive Plants BE) (Project File Exhibit H-6). For each proposed unit surveyed, known vegetation types, aerial photos, elevation ranges, and field surveys of the action area were considered in evaluating potential habitat for sensitive plants. Aerial photos (2005) were used to assist in targeting potential sensitive plant areas that could be discerned from the photos (e.g., wetlands and rock outcrops). Surveys are conducted by walking through units using searches based on knowledge of potential habitat for sensitive plants and aerial photo interpretation. Surveys attempt to visit the varying habitat types and aspects for each unit. Where the surveyor considers habitat potential high, more time is spent searching for sensitive plants for that area. Whereas, less time is spent in other areas

considered having less potential for sensitive plants. A complete species list of plants encountered is assembled for each area surveyed (some smaller units were combined into one survey area). All surveyors are trained and tested in the identification and habitat associations of the Flathead National Forest sensitive plants.

Approximately 2,058 of the 2,909 proposed treatment acres were evaluated for sensitive species habitat and surveyed for TES species in June 2006 and 2007 by the Botanist and Biological Technicians.

Special habitats were mapped (wetlands, seeps, meadows, forested wetlands) during surveys (Project File Exhibit H-3). Design Criteria would avoid wetlands with all ground - disturbing activities, including lakes, ponds, marshes, fens, and streams by establishing buffers around wetlands - 150 feet for areas greater than 1 acre and 50 feet for areas less than 1 acre. Buffers begin where facultative wetland plants end.

Spalding's Catchfly: In 2000, aerial photos of the entire Flathead National Forest were reviewed by Maria Mantas (former Forest Botanist) to locate large expanses of grassland with potential habitat for Spalding's catchfly. Grassland openings were delineated from aerial photos. Potential habitat was identified in small isolated grasslands in the Swan Valley, as well as other areas on the Flathead National Forest. These areas of potential grasslands are not located within the proposed treatments areas.

Water Howellia: Aerial photo interpretation and surveys for water howellia in the Swan Valley have been conducted since 1987. In addition, in 1998, a 10-year monitoring plan was implemented to detect changes in species distribution and abundance. Nine consecutive years of monitoring have been conducted. Project specific surveys within the project area were conducted in the summer of 2006. Aerial photos were used to help locate ponds, and old oxbows, and other wet areas (potential habitat).

Historic & Existing Condition

A. Vegetation and Landform

The Cooney McKay Project is located along the valley floor and foothills of the Swan Valley, bordered to the west by the Mission Mountains and the Swan Mountain Range to the east. The valley runs north/south and is approximately 50 miles long.

Within a matrix of coniferous forest there are thousands of small isolated wetlands of potholes and old river oxbows along the valley floor and foothills. It is theorized that these basins were formed from outwash and tilling by glacial ice chunks which later melted to create an undulating topography. These swales with clay sediment formed thousands of poorly drained basins that fill annually with spring precipitation and melting snow and later dry out during summer months.

A cool and moist pacific maritime climate, in combination with continental air masses, has the largest influence on the growth of vegetation in the analysis area. The south and west facing aspects are warm, dry habitats supporting Douglas-fir (*Pseudotsuga douglasii*) and ponderosa pine (*Pinus ponderosa*). The north and east aspects are cool, moist habitats commonly supporting Douglas-fir, western larch (*Larix occidentalis*), lodgepole pine (*Pinus contorta*), Engelmann spruce (*Picea engelmannii*), grand fir (*Abies grandis*), and subalpine fir (*Abies bifolia*); and less commonly, western hemlock (*Tsuga heterophylla*), western red cedar (*Thuja plicata*), and western white pine (*Pinus*

monticola). The higher elevations are cold, moist habitats supporting lodgepole pine, subalpine fir, whitebark pine, and alpine larch. Deciduous trees such as black cottonwood, paper birch, and quaking aspen are primarily found in moist areas.

B. Federally Threatened Plants

Spalding's Catchfly:

No grasslands with potential for Spalding's catchfly were located within the project area on aerial photos or during 2006 project specific surveys. There are no known occurrences of Spalding's catchfly within the proposed Cooney McKay Project Area boundaries or within the Flathead National Forest, based on information sources and surveys described above. Spalding's catchfly is excluded from further discussion in this document due to the lack of occurrences and potential habitat within or near the project area.

Water Howellia:

No known occurrences or potential habitat occur within the proposed treatment units of all alternatives. However, eight ponds with known occurrences of water howellia (occupied ponds) and six ponds with potential for water howellia (unoccupied = u-ponds) occur in close proximity to proposed units or within 300 feet of haul routes (Project File Exhibit H-3). The prescribed fire areas are located on the west facing slopes of the Swan Range, where there are no ponds or potential for water howellia. In addition, the prescribed fire areas are above 5,000 feet and are not considered within the range of water howellia.

Associated Plant Community: Water howellia is an aquatic plant restricted to small pothole ponds, or oxbows, long since isolated from the flowing surface waters of the adjacent river. These wetland habitats are generally shallow (~1 m deep) (3.28 feet), but the species has occasionally been observed in water up to approximately 2 m (6.5 feet) in depth. The ponds typically occur in a matrix of dense forest vegetation, and are nearly always surrounded in part by a small ring of deciduous vegetation. The bottom surfaces of the wetlands usually consist of firm consolidated silts and clays overlain by 0 to 24 inches of organic sediments. These ponds are generally filled by snowmelt run-off and spring rains, drying out to varying degrees by the end of the growing season, depending on annual patterns of temperature and precipitation. Water howellia occurs between elevations of 3m (10 feet) in Washington to 1,372m (4,500 feet) in Montana; all Montana occurrences lie between 945m (3,100 feet) and 1,372m (4,500 feet), and are found only in the Swan River Valley from just south of the community of Swan Lake, south to the Clearwater/Swan Divide.

In Montana, most water howellia occurrences are in glacially-formed ponds surrounded by diverse coniferous forests. These forests are of mixed composition with various coverages of grand fir, subalpine fir *(Abies bifolia),* western larch, Engelmann spruce Lodgepole pine, western white pine, ponderosa pine, and Douglas-fir. The broadleaf deciduous tree most frequently associated with the pond margins is black cottonwood *Populus trichocarpa,* but quaking aspen *Populus tremuloides* is also often present. In the northern end of the Swan Valley, paper birch *Betula papyrifera* is found near some pond margins. Shrub species bordering the ponds include: gray alder *Alnus incana,* red osier dogwood *Cornus stolonifera,* common juniper *Juniperus communis,* alderleaf buckthorn *Rhamnus alnifolia*, but most commonly, Bebb willow *Salix bebbiana*. Aquatic herbaceous species commonly associated with water howellia are blister sedge *Carex vesicaria,* two headed water starwort *Callitriche heterophylla,* water horsetail *Equisetum fluviatile, variableleaf pondweed Potamogeton*

gramineus, whitewater crowfoot *Ranunculus aquatilis,* hemlock water parsnip *Sium suave,* and small bur-reed *Sparganium minimum*.

TABLE 3-18. WATER HOWELLIA OCCUPIED AND UNOCCUPIED POTENTIAL PONDS WITHIN THE COONEY MCKAY FOREST PROJECT AREA

Element Occurrence #	Unit/Haul Road	Element Occurrence #	Unit/Haul Road
Occupied		**Unoccupied**	
028	Unit 18-16	U-069	Unit 32-5
027	Unit 18-16	U-054	Unit 32-172
029	Unit 18-16	U-043	Unit 18-16
018	Rd 124	U-046	Rd 124A
023	Rd 9815	U-051	Rd 124A
024	Rd 9815	U-085	Rd 124A
025	Rd 9815		
112	Rd 9550A		

Status and Threats: Water howellia occurrences are distributed throughout the Pacific Northwest in scattered clumps across Montana, Idaho, Washington, and California. There are 141 occurrences known to Montana, all in the Swan Valley. This is over half of the total 217 known global occurrences. Water howellia habitat has been subject to various management activities including dredging, draining, road construction, logging, and grazing (Shelly 1988, USDA 1997). Reed canarygrass (*Phalaris arundinacea*), an introduced species, also threatens populations across its range (Lesica 1997b). The National Heritage Program Network has ranked this species as G2, meaning that it is globally imperiled because of rarity, or because of other factors contributing to its vulnerability to extinction throughout its range. The Montana Natural Heritage Program (MNHP) has ranked the species similarly for the state (MNHP 2006).

Baseline conditions were prepared only for the Swan Valley metapopulation. Because water howellia ponds are located in the valley floor in gentle rolling terrain, past activities such as road construction, timber extraction and other development has occurred frequently in areas where ponds occur. A summary of these human influenced conditions, within a 300 feet buffer surrounding water howellia ponds, is displayed in Table 3-19.

TABLE 3-19.
EXISTING CONDITION OF 141 KNOWN OCCURRENCES IN THE SWAN VALLEY
(INTERPRETED FROM 1997 AERIAL PHOTOS)

Timber Management (within 25 years) **	
Adjacent to pond (to the edge of pond)	44
Within 300 ft. of pond (not to edge of pond)	44
No activity within 300 feet of pond	53
Roads	
Open road within 300 feet of pond	24
Closed road within 300 feet	58
No activity within 300 feet of pond	59
Reed canary-grass (*Phalaris arundinacea*)	
Present within ponds*	26 (of 64 ponds monitored annually)
Livestock use in Ponds	
Observed within ponds**	0 detected since 1998 annual monitoring 6 detected prior to 1998

*Harvest is only noted as occurring if it is evident from an aerial photo. A light or partial cut that is undetectable from the photo was not recorded as recent harvest. If the area was previously harvested but the canopy has recovered enough to where harvest activity is undetectable on the photo, then it is not considered recently harvested.
** Surveyed on 2006

In summary, there are 116 ponds that have had either:

1. Timber harvest within 300 feet,
2. Road construction within 300 feet,
3. Are known to contain reed canary-grass, or
4. Have received livestock use.

The remaining 25 occupied ponds have not been affected by these management activities or noxious weed invasions. Four of these “un-affected” ponds may be subject to future timber management or development, as they are located wholly or partially within PCTC or other private lands.

These current conditions are a sharp departure from the range of conditions that historically surrounded ponds. Aerial photo interpretation (1934 photos) of 78 ponds indicated that 25 of the 78 ponds (30 percent) had harvesting or road activities within 300 feet of the ponds. In contrast, 60 of the same 78 ponds (85 percent) now show harvesting or road activities within 300 feet as interpreted from 1997 aerial photos.

All occupied ponds within the Cooney McKay Project Area have been affected from previous management activities (Table 3-20).

TABLE 3-20.
PAST DISTURBANCE OF OCCUPIED WATER HOWELLIA PONDS WITHIN THE COONEY MCKAY PROJECT AREA

Element Occurrence #	Timber Management (1992 photos)	Road	Reed Canary grass at pond
028	Within 300 feet	No road	No
027	Adjacent	No road	Yes
029	Adjacent	No road	Yes
018	Adjacent	Adjacent open road	Yes
023	Within 300 feet	No road	No
024	Within 300 feet	Within 300 feet	No
025	Adjacent	A Within 300 feet	No
112	Within 300 feet	Within 300 feet	No

Presence/absence and abundance monitoring of 68 occupied ponds has occurred for the last 9 years (1999 to 2007). Analysis of trend data has not been completed for this monitoring. Pre-preliminary data indicate that annual abundance levels are influenced by annual precipitation. Percent frequency of water howellia present within ponds ranged from 60 to 97 percent for the first nine years of monitoring. Abundance of water howellia within the ponds also indicates similar fluctuating trends.

C. Regional Forester's Sensitive Plants

Little is known about the historical condition for TES plants in the Swan Valley drainage. Botanical surveys that may have detected rare plants were not initiated in the area before the onset of the Forest's Botany Program in 1991.

Based on the information sources and surveys listed above there are three sensitive plants known within the project boundary (Project File Exhibit H-7); see Table 3-21 below.

TABLE 3-21.
SENSITIVE PLANTS KNOWN WITHIN THE PROJECT AREA

Species	Element Occurrence	Habitat guilds								
		AQ	FM	OW	RP	CS	WF	UF	GF	AS
Plants occurring within Project Area (within Unit 32-172)										
Botrychium crenulatum	30			X	X		X	X	X	
Cypripedium parviflorum	Not yet assigned			X	X		X			
Plants occurring within Project Area, but not within a treatment unit										
Ophioglossum pusillum	03, 04, 14, 24			X						

AQ= Aquatic; FM= Fens and Fen Margins; OW = Other Wetlands (marshes, wet meadows); RP= Riparian; CS = Moist Cliffs, Seeps, and Talus slopes; WF = Wet Coniferous Forest; UF = Upland Coniferous Forest; GF = Grasslands and Forest Openings; AS = Alpine and Subalpine

Wavy moonwort (*Botrychium crenulatum*) occurrence #30, is located within treatment Unit 32-172 in an ephemerally wet forest opening at the southern boundary of Forest Service lands (see Sensitive

Plants Biological Evaluation, Project File Exhibit H-6). This occurrence was located in 1998 and has not been visited again since. Eight plants were observed in 1998. The observation form indicated disturbance from “weedy” species within the forest opening. In addition, the forest opening is adjacent to a clearcut on private lands.

Wavy moonwort is a perennial fern of primitive lineage. Wavy moonwort is a Regional Forester’s sensitive plant, globally ranked as G3 and State ranked as S2S3 by the Montana Natural Heritage Program (MNHP 2006). This species in known from Arizona, California, Idaho, Montana, Oregon, Nevada, Utah, Washington, Wyoming, and Alberta. There are 49 known occurrences of wavy moonwort in Montana sparsely distributed in the Swan and Yaak River drainages, and in the Anaconda Pintlar Ranges (Flathead, Granite, Lake, Lincoln, Missoula, and Sanders Counties) (MNHP 2006). Most of these occurrences were observed within the last 15 years. The majority of the known occurrences are located on federally or state protected lands or other conservation lands (i.e. The Nature Conservancy) with the exception of 4 occurrences on privately owned lands. Eleven of these 49 occurrences are on the Flathead National Forest. Across its distribution in Montana, occurrences range from 1 to 400 plants per occurrence, with approximately 2/3 of the occurrences having between 1 and 100 plants per site and the remaining third occurrences having over 100 plants per site. On the FNF, most occurrences range between 1 to 10 plants per site with one site having 100 to 200 individuals at Ninemile Fen.

Within the associated habitat guilds (Table 3-21), wavy moonwort is found in drier damp meadows, roadsides swales, boggy areas, and marches, either on hillsides or flat lands where there are wet banks or springy spots. The plants are rooted in tussocks or rises around isolated trees or shrubs, in depressions that dry out during the summer, or at the edges of marsh; often on soils influenced by reprecipitated calcium. They may occur either in the sun or shade, but prefer shade. Plants occur between 744 to 2,341 meters (2,440 to 7,680 feet) in elevation.

Yellow lady’s slipper (*Cypripedium parviflorum*) was located during 2007 surveys in the vicinity of Unit 26-91. Areas to the east of Unit 26-91 are forest wetlands of cottonwood and birch interspersed with Engelmann spruce. Plants are dispersed in the understory throughout this forest. Approximately 300 plants were counted during the 2007 survey; however the full extent of the potential habitat was not surveyed.

Yellow lady’s slipper is a perennial herbaceous plant in the Orchid Family which arises from short rhizomes. Yellow lady’s slipper is found in fens, seeps, springs, riparian areas and moist forest-meadow ecotones in the valley to lower montane zones. It is known to occur throughout North America except for Louisiana, Florida, Texas and extreme northern Canada. There are approximately 53 occurrences of small yellow lady’s-slipper in Montana, 15 of these are on the Flathead National Forest. The majority of remaining locations are on private or state lands, with some on other NFS lands. One of the Flathead National Forest locations has not been relocated since it was first mapped in 1970. The remaining Flathead National Forest occurrences were located between 1986 and the present. Number of plants counted within populations range from 1 plant to 200 plants. Four of the 15 occurrences have plants counts of 50 to 200 plants.

Northern adder's tongue (*Ophioglossum pusillum*) occurrences do not occur within any proposed treatment units within the project boundary. This species is an herbaceous perennial that is up to 20 cm high. Northern adder's tongue is Regional Forester’s sensitive plant, globally ranked as G5 and State ranked as S2 by the Montana Natural Heritage Program (MNHP 2006). This species is known from British Columbia to Nova Scotia, Massachusetts, and New Hampshire, south to Ohio, Nebraska,

Montana and Washington. The 22 occurrences in Montana are considered peripheral in its range. Montana plants are located in the Salish Mountains, Livingston Range, Flathead, Kootenai and Swan River drainages. Nine of the 22 occurrences are located within the Western Montana Planning Zone, all within the Flathead National Forest. Northern adder's tongue occurs in wet meadows, margins of fens, and gravelly moist soil in the valley and montane zones from 884 to 1,372 m (2,900 to 4,500 feet).

Potential Occurrences: Based on the information sources and surveys listed above, the project area contains habitat types for sensitive plants associated with all nine of the habitat guild (wetlands; upland coniferous forest; moist cliffs, seeps, and talus slopes; other wetlands; riparian; grasslands and forest openings; wet coniferous forest; fens and fen margins, and alpine/subalpine) listed in Project File Exhibit H-6.

Environmental Consequences

Alternative 1 – No Action
Direct, Indirect and Cumulative Effects

This alternative proposes no ground disturbing activity. Therefore, there would be no direct short-term effects on any listed threatened or sensitive plant species or their habitats. The response of each of the sensitive plant species to management activity varies by species, and in some cases, is not fully known. Local native vegetation has evolved with and is adapted to the climate, soils, and natural processes such as fire, insect and disease infestations, and windthrow. Any management or lack of management that causes these natural processes to be altered may have impacts on native vegetation, including threatened and sensitive plants. Indirect or cumulative long-term effects would depend on natural disturbances.

With the No Action Alternative, fire burning to edges of vernal ponds and other wetlands may have possible effects to sensitive plants associated with wetlands. Natural processes of forest succession would continue recruitment of seedling and saplings in the understory under the No Action Alternative. With these changes in natural forest succession, the likelihood of a fire event occurring in the future is probable. Stand replacing fires could have possible indirect and cumulative effects of altering hydrologic process which could result in both an increase and a decrease in vernal pond and other wetlands inundation levels. Removal of trees by fires that burn to the edges of these wetlands may result in increased inundation of ponds from runoff. Also increased canopy opening near wetlands may increase evaporation of wetlands, effectively reducing water levels earlier in the growing season.

For Regional Forester’s Sensitive Plants associated with wetlands, the indirect effects described above may contribute to cumulative effects for known occurrences (wavy moonwort, yellow lady slipper, and adder’s tongue). These species have evolved and adapted to natural disturbance such as fire on the landscape. Fires primarily occur in mid- to late summer season, when sensitive plants have flowered and set seed. Perennial root-stocks would remain underground and would emerge following the fires. Although wetland hydrologic processes may change due to fire removing the surrounding vegetation, nutrient recycling would also occur, and population expansion (new germination) may be promoted from opening up the forest floor (if there is little weed competition).

For water howellia, lethal fires occurring of the edges of water howellia ponds may have short term indirect effects as described above. Observations of 1934 aerial photos indicate that lethal fires

occurred historically in the Swan Valley and tree mortality from around the water howellia ponds does not appear to be unnatural (USDA Forest Service 2003a). Also, after the Crazy Horse Fire in 2004, four new water howellia ponds were discovered, all with fire burning to the waters edge. The earliest discovery of water howellia occurrences in the Swan Valley was in 1982, so it is only presumed that water howellia was also present in the Valley in early 1900s with the metapopulation surviving lethal fires through the century into present day.

The cumulative effects from fire burning to water howellia pond edges may result in increased number of ponds across the Swan Valley landscape that have been burned. This may result in a trend of shifting back to fire as the primary disturbance factor. Pattern and distribution of seedling/sapling stands in the valley has changed since 1934 (Hart 1994). Interpretations of 1934 and 1992 aerial photos of areas around water howellia ponds indicate that the 1934 heterogeneous patterns in areas near ponds was due to fire, and in 1992 harvest was the reason for areas near ponds to be heterogeneous. This indicates that the primary disturbance factor has shifted from fire to timber harvesting from 1934 to 1992 (USDA Forest Service 2003a). Lethal fires burning to the edge of the eight water howellia ponds within this project area possibly resulting from the No Action Alternative would not decrease the overall population viability of the Swan Valley metapopulation. Presence / absence and abundance of water howellia in individual ponds fluctuate from year to year. It is more important to maintain a stable trend across the metapopulation with heterogeneity of stand classes and disturbance regimes across the landscape.

The No Action Alternative would not increase the potential for establishment and spread of new noxious weed occurrences. Harvest and associated ground disturbing activities would disturb forest habitats and favor the spread or introduction of noxious weeds that could impact threatened and sensitive plant populations. Weed establishment and spread facilitated by ground disturbance and vehicle traffic in and out of the analysis area would not occur in the No Action Alternative. In addition, the potential for weed invasion and competition for nutrients and light with sensitive plant populations and native vegetation would not occur with the No Action Alternative.

Disturbance regime sensitive plants such as Howell's gumweed and some moonworts are occasionally opportunistic, establishing themselves in artificially created roadside habitats. The No Action Alternative would not create roadside habitat for this opportunistic establishment. However, these occurrences are not considered representative of the natural disturbance habitats such as grasslands or rocky outcrops that these sensitive plants more commonly occupy. Conservation of these low quality roadside sensitive plant occurrences/habitats are secondary to those occurring in natural habitats. Disturbance regime sensitive plants are often rare due to the lack of the habitats they occupy and represent. An opportunistic road side sensitive plant occurrence does not replace the habitat it imitates.

Alternative 2
Direct and Indirect Effects

A. Water Howellia

Eight occupied and six u-pond water howellia occurrences occur within close proximity to treatment units or haul routes (Table 3-22). Treatment units do not overlap with occupied ponds or u-ponds and no direct effects are expected for these ponds. All occupied ponds have at least a 300 foot buffer and u-ponds have a 150 foot buffer from the edge of facultative wet plants at the pond's perimeter. No project related activities would occur within the buffered areas.

Thinning Treatments: Thinning in the surrounding uplands of water howellia ponds may alter the hydrologic processes of water howellia ponds for occupied and unoccupied ponds within proximity to the treatment units. Changes to the hydrologic processes of ponds may result in both a decrease and increase in pond inundation levels. Removal of surrounding upland trees may decrease evapo-transpiration of the surrounding upland trees and may result in increased inundation of ponds from runoff. Also, increased canopy openings near ponds may increase evaporation of ponds, effectively reducing water levels earlier in the growing season. Reproductive success of water howellia is directly linked with the fluctuation of water levels both annually and from year to year (Lesica 1990). Water howellia produce seeds underwater early in the growing season when ponds fill up and produce seeds later in the season via above-water flowers. Water howellia requires annual drying of ponds for fall germination on exposed pond substrate. However, repeated annual premature drying of ponds may reduce the ability for water howellia to replenish the seed bank from year to year. In addition, prolonged inundation of ponds in a given year may reduce fall germination and result in reduced seed bank replenishment. The longevity of seed bank viability is not well understood. Some studies indicate that seed can retain viability for up to 2 years (M. Mantas, The Nature Conservancy, and J.S. Shelley, US Forest Service, unpub. data).

In addition, thinning activities may increase ground water and sediment flow in some of the micro-catchments containing water howellia. This may have effects on seed germination if enough sediment were to accumulate and deeply bury the existing seed bank. Increased siltation may also result in shifts in the pond's vegetation composition, supporting emergent vegetation in place of submergent vegetation types (USDI 1996).

Ponds 27, 28, 29, U-069, and U-043 are located within units that are proposed for pre-commercial thinning. These units will be hand treated using non-mechanized equipment to thin stands to average 60 percent canopy cover. There is low potential for hydrological changes, as described above, resulting from the treatment in these hand thinning units. U-pond 054 is located with Unit 32-172 which is proposed for Commercial Thinning. Potential for hydrologic changes to ponds may be moderate to this u-pond.

However, to mitigate these potential effects and in accordance with the Flathead National Forest Forest Plan Amendment 20, all occupied ponds would be avoided with a 300 feet buffer around the ponds. Unoccupied ponds of potential habitat would have a 150 buffer in which no project activity would occur. The respective buffer zones would extend out 300 or 150 feet starting at the edge of facultative wet plant habitat around ponds (e.g. *Alnus incana, Cornus stolonifera, Juniperus communis, Rhamnus alnifolia, Salix bebbiana*). Buffer zones would reduce indirect effects of potential hydrologic alternations and/or siltation within the microcatchment basin of ponds.

Thinning operations within the vicinity of these ponds have the potential for depositing or dispersing weed seeds. Noxious weeds within water howellia ponds may affect plants by competition for light nutrients, and vegetative structural changes within ponds. Reed canary grass (*Phalaris arundinacea*) is known to occur in 35 of the 141 water howellia ponds in the Swan Valley. This grass is highly competitive in moist and aquatic habitats and can form monocultures, displacing other plants (Apfelbaum and Sams 1987). Human-induced activities are potential dispersal vectors for reed canary grass seed and other noxious weeds. However, reed canary grass seeds are not typically wind blown and spread would most likely occur with a vector source (such as water, recreationists, ungulates, bears, or birds) spreading seeds from pond to pond or through water courses, connecting ponds. Occupied ponds 18, 27, and 29 currently have reed canary grass known to occur at these ponds. Potential for spread of reed canary grass from these ponds to adjacent ponds is low to

moderate. This potential effect is reduced by the 300 feet buffering of occupied ponds and the washing of equipment prior to entry into the project area.

Roads: The proposed 1.25 miles of new temporary road construction are not within the vicinity of the occupied or unoccupied ponds. However, several occupied ponds and unoccupied ponds occur within 300 feet of proposed haul routes or closed roads that would be temporarily opened for treatments (Table 3-22).

TABLE 3-22.
POND PROXIMITY TO ROADS

Pond	Distance to Road (feet)	Road	Road Status
023	120	9815	closed year round – would be temporarily opened for hauling
024	30	9815	closed year round – would be temporarily opened for hauling
025	100	9815	closed year round – would be temporarily opened for hauling
018	175	124/899	Open year round
U-046	360	124A	Open year round
U-051	230	124A	Open year round
U-085	400	124A	Open year round

Occupied ponds listed in Table 3-22 are located within 300 feet of haul roads. These roads would be used for hauling or opened for access and may need BMP maintenance before or after project activities. Use of these roads for hauling and associated road maintenance may have potential indirect effects from possible siltation into ponds. Increased siltation into ponds may result in the burying of water howellia seeds too deep for germination or shifting the pond's vegetation composition, supporting emergent vegetation in place of submergent vegetation types (USDI 1996).

Occupied Ponds 23, 24, and 25 occur near Forest Development Road #9815. This road is currently a closed road that would be opened up through the Condon Botanical Special Interest Area for access to two hand treatment units (Project File Exhibit H-3). No hauling would occur within the Condon Botanical Area along portions of Road 9815 adjacent to Ponds 23, 24, and 25. Use of Road 9815 to access the hand treatment units would be limited to vehicle access; no BMP activities are planned for this portion of the road.

Occupied Pond 18 is located near the junction of haul roads 899 and 124 (Project File H-6). If ground disturbing BMP related activities occur within 300 feet to the north and south of FDR #899 junction with #124, then mitigation measures would be applied (such as natural filtration zones, sediment retention structures, or straw bales) to ensure limited sediment deposition into these ponds.

Unoccupied Ponds U-046, U-051, and U-085 are near haul Road 124A (Project File Exhibit H-6). If ground disturbing BMP activities occur in the vicinity of these ponds, mitigation measures would be applied (such as natural filtration zones, sediment retention structures, or straw bales) to ensure limited sediment deposition into these ponds.

B. Regional Forester's Sensitive Plants

Wavy Moonwort (*Botrychium crenulatum)*: Within the project area, one wavy moonwort plant is located at the southern end of Unit 32-172 within a forest opening. The forested opening is ephemerally moist dominated by grasses and forbs with cottonwood and sapling Engelmann spruce as the dominate tree cover. Mechanical thinning activities would avoid the opening that includes the habitat for wavy moonwort. The forested opening would be designated on the ground prior to implementation.

No **direct** effects are expected for this occurrence due to the avoidance of the wavy moonwort occurrence. However, habitat for the wavy moonwort may experience **indirect** effects from the proposed project.

Thinning activities near the ephemerally wet opening may result in changes to the hydrologic processes of the wetland by both decreasing and increasing wetland inundation levels. Removal of surrounding upland trees may decrease evapo-transpiration of the surrounding upland trees and may result in increased inundation of the wetland from runoff. Also, increased canopy openings near ponds may increase evaporation of ponds, effectively reducing water levels earlier in the growing season. Changes in inundation levels at wetland edges may result in shifts in vegetation composition at the wetland/forested ecotone where wavy moonwort habitat occurs. The shifts in vegetation and hydrology are expected to have minimal indirect effects to wavy moonwort and be of short duration. Spores of wavy moonwort germinate underground and can live several years in this stage until conditions are appropriate for above ground emergence to observable plants.

Project activities may also indirectly affect habitat for wavy moonwort from noxious weed invasion. Disturbance from nearby activities may increase the potential for noxious weed invasion into the wetland, where other weed species were observed growing with wavy moonwort. Weed invasion may alter wetland habitat and compete for nutrients and light with wavy moonwort.

Yellow Lady's Slipper (*Cypripedium parviflorum*): Within the project area, yellow lady's slipper is located to the east and north of Unit 26-91. These plants outside the unit boundary will have no direct or indirect effects.

No plants were observed within the unit boundary; however, some plants may have been overlooked during surveys. Roots development after germination may take one to four years before leaves appear above ground (Mergen 2006).

This unit is proposed for a seed-tree treatment, in which tractor logging systems would be used to remove Douglas-fir and all of the lodgepole to facilitate regeneration of western larch and ponderosa pine. Within this unit, use of ground-based equipment would be avoided in the forest wetland stringers and inclusions where yellow lady's slipper may occur. Prescribed under burning is also proposed for this unit.

Undetected plants within units may experience direct effects of trampling and disturbance of soil/mychorrhizal associations during harvest/skidding activities. Indirectly ground disturbance may alter microhabitat, by creating gullies that alter the hydrology or other microhabitat conditions. Plants require soil mychorrizal associations to germinate seed and for plant dormancy.

Some orchids, including yellow lady's slipper may require some degree of local habitat changes to maintain and expand populations (Mergen 2006). Yellow lady's slipper may benefit from successional

management with selective timber management and prescribed burning. Increased canopy openings may increase soil water availability for plants but may also increase competition from other plants. In addition, prescribed burning would promote nutrient cycling.

Similar to wavy moonwort, yellow lady's slipper would have the greatest indirect effects from noxious weed invasion into the forested wetlands. Disturbance from nearby activities may increase the potential for noxious weed invasion into the forested wetlands, where Canada thistle (*Cirsium arvense*), has been observed within and adjacent to the unit. Canada thistle is well adapted to invading wet areas and persisting in closed canopy once established. Weed invasion may alter wetland habitat and compete for nutrients and light with yellow lady's slipper.

Other Undetected/Potentially Occurring Regional Forester's Sensitive Plants: For those potentially occurring Regional Forester's Sensitive Plants listed in Project File Exhibit H-6, the direct, indirect, and cumulative effects for undetected occurrences are unknown and can only be speculative due to lack of known locations. Undetected occurrences may experience mechanical compaction, noxious weed competition/displacement, roadside dusting, and hydrology alteration.

Spread of noxious weeds has the greatest potential for indirect and cumulative effects on potentially occurring sensitive plant populations within the project boundary. Disturbed and exposed soils created from this alternative would increase from existing conditions. These newly created exposed soils may serve as noxious weed establishment and spread centers. Spread of noxious weeds into new areas may alter vegetation composition and community structure of sensitive plants micro-habitats. Equipment associated with this project would be washed prior to entry on the NFS lands to prevent the introduction of weeds into the disturbed area.

Alternative 2
Cumulative Effects

Water Howellia and Regional Forester's Sensitive Plants Associated with Wetlands

Timber Harvesting and Road Construction: It is possible that past and future road construction/maintenance and timber management may have increased groundwater and sediment flow in some wetlands. This may have effects on seed germination as discussed above in direct and indirect effects section for water howellia. Increased siltation may result in shifts in the wetland vegetation composition, supporting emergent vegetation in place of submergent vegetation types (USDI 1996). Timber management and other development activities may also contribute to these same effects to wetland associated sensitive plants and water howellia.

Reed canary grass: Reed canary grass is known in approximately 35 of the 141 water howellia ponds in the Swan Valley. Past, present, and foreseeable activities associated with the proposed action may (have) contribute(d) to the spread of reed canary grass to these ponds. Areas within the project would be actively monitored for invasive weeds and active management of weeds would occur in compliance with the Flathead National Forest Noxious Weed and Invasive Weed Control Decision Notice and Finding of No Significant Impact (Project File Exhibit Q-5). In addition, project Design Criteria for weed treatments along traveled roads for this proposed project would mitigate this potential impact (See Table 2-14).

Meadow Smith Project: Timber harvest, road construction, and prescribed fire activities authorized in the Meadow Smith Project were analyzed in the EIS for that project. There were no Regional

Forester's Sensitive Plants known to occur within the Meadow Smith Project Area, so no effects were expected for sensitive plants. However, several water howellia ponds occurred with the Meadow Smith Project Area, and the project was designed to avoid impacts to water howellia. The EIS concluded that the project would not contribute towards the degradation of the environmental baseline condition. Occupied pond 18 occurs in one of the proposed treatment units in the Meadow Smith Project and also occurs near haul road FDR #124/899 in the Cooney McKay Project and Meadow Smith Projects. Design Criteria for the Meadow Smith Project included a 300-foot buffer around pond 18 and Design Criteria for the Cooney McKay Project include practices to prevent possible siltation from reaching into the pond. The Meadow Smith Project has not been implemented, as of the writing of this document. Monitoring of pond 18 annually since 1998 for presence and abundance indicates an increase in reed canary grass in this pond; however water howellia continues to be present and abundant in this pond.

Chemical Control: Water Howellia and Regional Forester's Sensitive Plants adjacent to areas of chemical weed control may be at risk of exposure to chemicals used in weed control. However, on the Flathead National Forest, sensitive plant surveys are conducted for each site (not previously treated) before any chemical control treatments, as required by the Flathead National Forest Noxious Weed and Invasive Weed Control Decision Notice and Finding of No Significant Impact (Project File Exhibit Q-5). With the exception of some Regional Forester's sensitive plants that occur in "disturbed" environments (Howell's gumweed, pink corydalis, Austin's knotweed, and western moonwort) noxious weeds do not persist with rare plants due to differing habitat requirements. Weed control on State and private lands may have adverse effects to plant viability for these plants that occupy disturbed habitats that may favor weed establishment.

Land Sales: Past, present and future lands sales from PCTC to private development may have had effects and may continue to affect habitat and occurrences of water howellia and Regional Forester's Sensitive Plants. Effects to sensitive plant resources as a result of past development and land clearing on private lands have been significant. Much of the available habitat for plants associated with wetlands has been lost or degraded on private lands. These areas have been used for grazing or building sites and were often cleared of trees or drained. Continued development of lands may reduce potential habitat, alter hydrologic regimes, and increase the likelihood for new weed establishment.

Recreationists: Trails and other areas frequented by recreationists may contribute to the cumulative effects to sensitive plants. Trail maintenance near wetlands may affect sensitive wetland associated plants and water howellia by increased siltation into wetlands or the dispersal of noxious weed seeds from human vectors. However, most recreationists are reluctant to tread in the mucky waters of wetlands.

Noxious Weeds: Spread of noxious weeds resulting from past, present, and future suppression activities, recreation, and this proposed project has the greatest potential for cumulative effects on known and potentially occurring TES populations. Activities have the potential to spread noxious weeds by increasing disturbed areas that are vulnerable to weed infestation, and through increased vehicle traffic. Recreational and logging traffic and equipment, contaminated gravel, livestock and wildlife can transport weed seeds from infested areas to locations not infested. Noxious weeds have a detrimental effect on plant species and other native vegetation by more effectively competing for soil moisture, sunlight, and nutrients. Eliminated noxious weed seed transport mechanisms into populations of plants can reduce these impacts. The Design Criteria (Table 2-14) display measures prescribed to reduce the spread of noxious weeds. Areas within the project would be actively

monitored for invasive weeds and active management of weeds would occur in compliance with the Flathead National Forest Noxious Weed and Invasive Weed Control Decision Notice and Finding of No Significant Impact (Project File Exhibit Q-5).

Summary of Effects

A. Water Howellia:

Cumulative effects only would occur if water howellia habitats were to be impacted resulting from activities identified in the proposed action. Occupied ponds would be buffered 300 feet and unoccupied potential ponds buffered 150 feet. No thinning activities would occur within the buffered zones. Hauling and associated road maintenance on roads with nearby ponds would be mitigated to prevent sediment from reaching the ponds in Table 3-22 Thinning activities outside the 300/150-feet buffers and hauling near the four ponds may have potential indirect effects as described in the indirect effects sections. However, potential indirect effects resulting from this proposed project are expected to contribute minimally towards the cumulative degradation of the environmental baseline described in the affected environment section for water howellia. The total of these effects would not likely reach thresholds where water howellia could not maintain its ability to survive within the Swan Valley.

B. Regional Forester's Sensitive Plants:

The potential for direct and indirect impacts described above for wavy moonwort, yellow lady's slipper, and other potentially occurring sensitive plant species from the proposed activities would not result in cumulative effects that would lead to a trend of Federal listing for any of the Regional Forester's Sensitive Plants.

C. Non-Wetland Associated Sensitive Plants:

Timber Harvesting, Road Construction, Fire Suppression and Development: Timber harvesting, road construction, fire suppression, and development may also have an effect on non-wetland associated sensitive plants. Timber harvesting often increases light level to the understory. This may be a beneficial effect for some sensitive plants, but may have adverse effects for other rare plants requiring greater canopy cover (e.g., clustered lady's-slipper).

Fire suppression has created a denser understory condition in many unharvested stands where historically, low intensity understory fires occurred regularly. These fires that have been eliminated from the understory played a role in reducing fuels and encroaching vegetation (Mantas 1998). Fire suppression resulting in closed-canopy may have effects of reduced light levels to sensitive plants in the understory.

Past, present, and future maintenance of the roads have both adverse and positive cumulative effects on documented and potentially occurring roadside sensitive plant populations. Disturbance of roadsides may benefit those sensitive species that have a competitive edge in disturbed environments (Howell's gumweed, pink corydalis, Austin's knotweed, and western moonwort) and temporarily adversely affect these populations until new seedlings arise in the openings. Maintenance and construction of roads may increase traffic along these roads and thus increase potential for disturbance of plant populations adjacent to roads.

Past and future closures and reclamations of roads would potentially have short-term effects to known and potential occurrences near roads. However, closure and reclamation of roads would reduce impacts overall.

Prescribed Fire: Prescribed fire and underburning may typically have short-term direct effects to potentially occurring sensitive plants from direct burn over for all TES plants. Undetected annual plants disturbed prior to seed set may experience decrease population viability in subsequent years, due to a reduction of the seed bank. Perennial plants burned over may experience short-term direct effects from loss of above ground vegetative loss, however remaining rootstocks (rhizomes, taproots, bulbs, corymbs), would have the ability to re-sprout.

Land Sales: Past, present, and future sales of PCTC lands to private development may have had effects and may continue to affect habitat of sensitive plants. Development of lands may reduce potential habitat and increase the likelihood for new weed establishment.

Recreationists: Non-wetland plants may experience cumulative effects of trampling and collecting from dispersed recreation.

Noxious weeds: Spread of noxious weeds resulting from past, present, and future suppression activities, recreation, and this proposed project has the greatest potential for cumulative effects on known and potentially occurring TES populations. Areas within the project would actively be monitored for invasive weeds and active management of weeds would occur in compliance with the FNF Noxious Weed and Invasive Weed Control Decision Notice and Finding of No Significant Impact (Project File Exhibit Q-5).

Alternatives 3 and 4
Direct, Indirect, and Cumulative Effects

Alternatives 3 and 4 reduce the treatment areas by 119 acres and 76 acres, respectively. Except for yellow lady's slipper, the acres eliminated from these alternatives do no change the direct, indirect, or cumulative effects as described for Alternative 2. The effects from Alternatives 3 and 4 are similar to Alternative 2, but the effects would be reduced due to the decrease in acres treated.

For yellow lady's slipper, Unit 26-91 is not included in Alternative 4. No direct, indirect, or cumulative effects are expected for yellow lady's slipper for Alternative 4.

Regulatory Framework and Consistency

Threatened or endangered status affords a species and its habitat special protection from adverse effects resulting from Federally authorized or funded projects. It is the responsibility of the Forest Service to design activities that contribute to the recovery of listed species in accordance with recovery plans developed as directed by the ESA (50 CFR Part 402). The Flathead National Forest's Amendment 20 to the Forest Plan provides for conservation measures to ensure the protection of water howellia. Amendment 21 to the Forest Plan has a goal to "provide sufficient habitat to promote the recovery of threatened and endangered species and conserve the ecosystems upon which they depend."

Federal laws and direction applicable to sensitive species include the NFMA and FSM 2670. Amendment 21 to the Forest Plan has standards to conduct analyses to review programs and

activities, to determine their potential effect on sensitive species, and to prepare a BE. It also states "adverse impacts to sensitive species or their habitats should be avoided. If impacts cannot be avoided, the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole will be analyzed. Project decisions will not result in loss of species viability or create significant trends towards Federal listing." Future conservation strategies for each species will present direction on maintaining habitat diversity and managing for population viability, as required by the NFMA and Forest Plan Amendment 21. The Forest Service is bound by Federal statutes (ESA, NFMA Act), regulations (USDA 9500-4) and agency policy (FSM 2670) to conserve biological diversity on NFS lands. A goal in Forest Plan Amendment 21 is to "ensure that Forest Service actions do not contribute to the loss of viability of native species."

All alternatives of this proposed project would meet the direction of FSM 2670.3 (sensitive plant species) and are consistent with the Forest Plan direction for sensitive plants. In addition, the proposed project is also in compliance with ESA and Forest Plan Amendments 20 and 21, with respect to Federally listed plants.