Carp River Complex ERA Plan

Figure 1. Carp River Complex ERA plan locator map.

Administrative Information:

- This Carp River Complex ERA Plan is for seven small wetland ERAs that are all relatively close to each other and are near the Carp River watershed area.

- The ERAs are within the Sault FMU, two are in the Mackinac Mix Management Area (MA), and the rest are in the Carp River Red Pine MA. They are found in compartments: 103, 105, 106, 107, 114, 116, 117, and 136.

- The ERAs are located in Mackinac County, with all of them in Moran Township, except one, which is in Hendricks Township. T43N, R07W, section 9; T43N, R06W, sections 10, 21, 22, 33, 34; and T42N, R06W, sections 2 and 3.

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- Two-track woods roads go through the majority of this area, and are close to the ERAs. In addition, motorcycle and snowmobile trails are found near several of the ERAs.

- ERA boundaries are derived from the underling Natural Community EO boundary which are mapped using NatureServe standards. EO Boundaries are informed by vegetation and other site characteristics including soils, landform, and/or historic aerial imagery. As a result, it is not uncommon for EO/ERA boundaries to differ from forest inventory stand boundaries. If these difference result in potential conflicts with proposed forest activities, consult with the Forest Conservation and Certification Specialist to request a boundary evaluation by Michigan Natural Features Inventory.

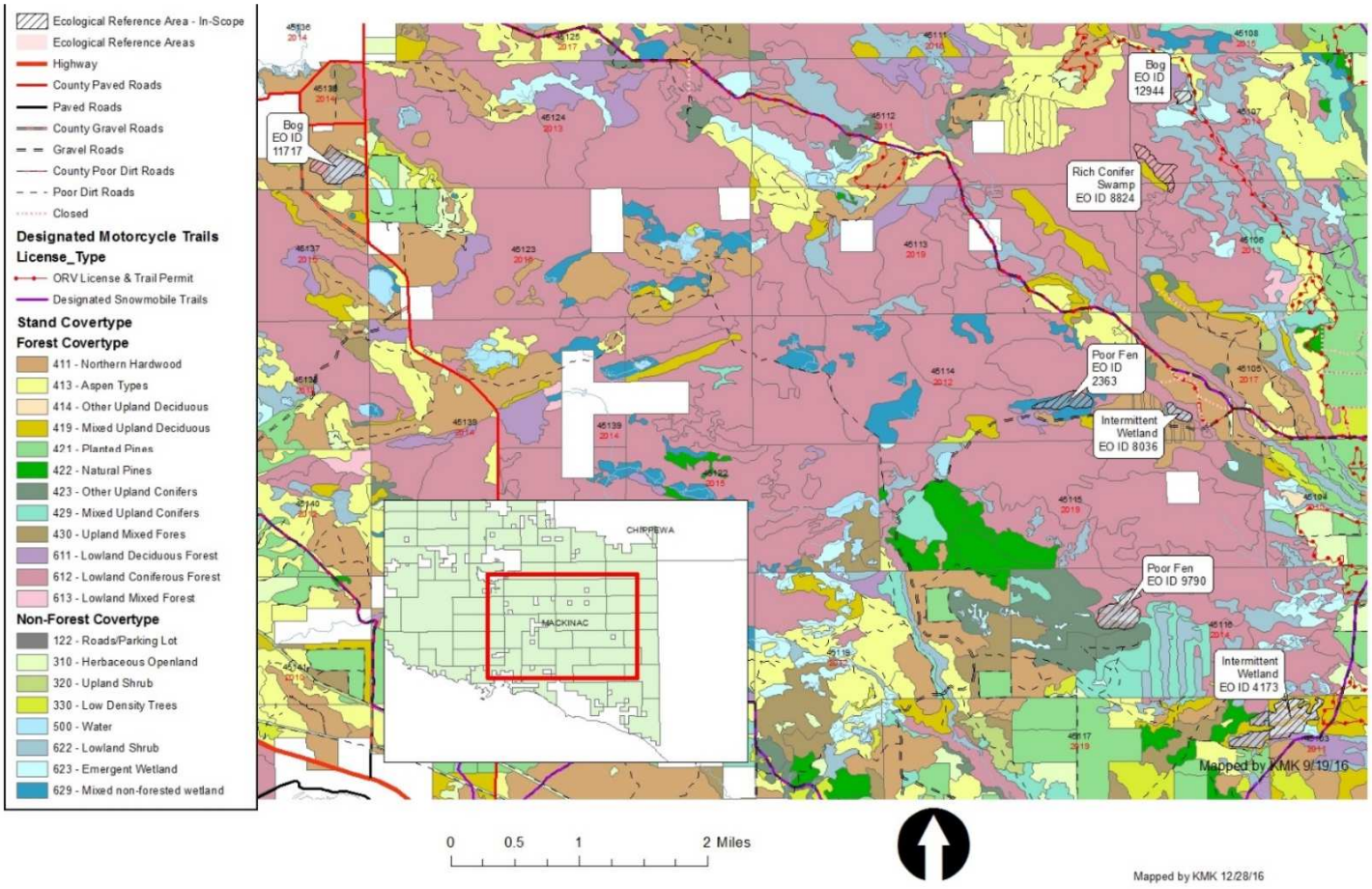

Figure 2. Carp River Complex ERA plan area map with EO ID labels.

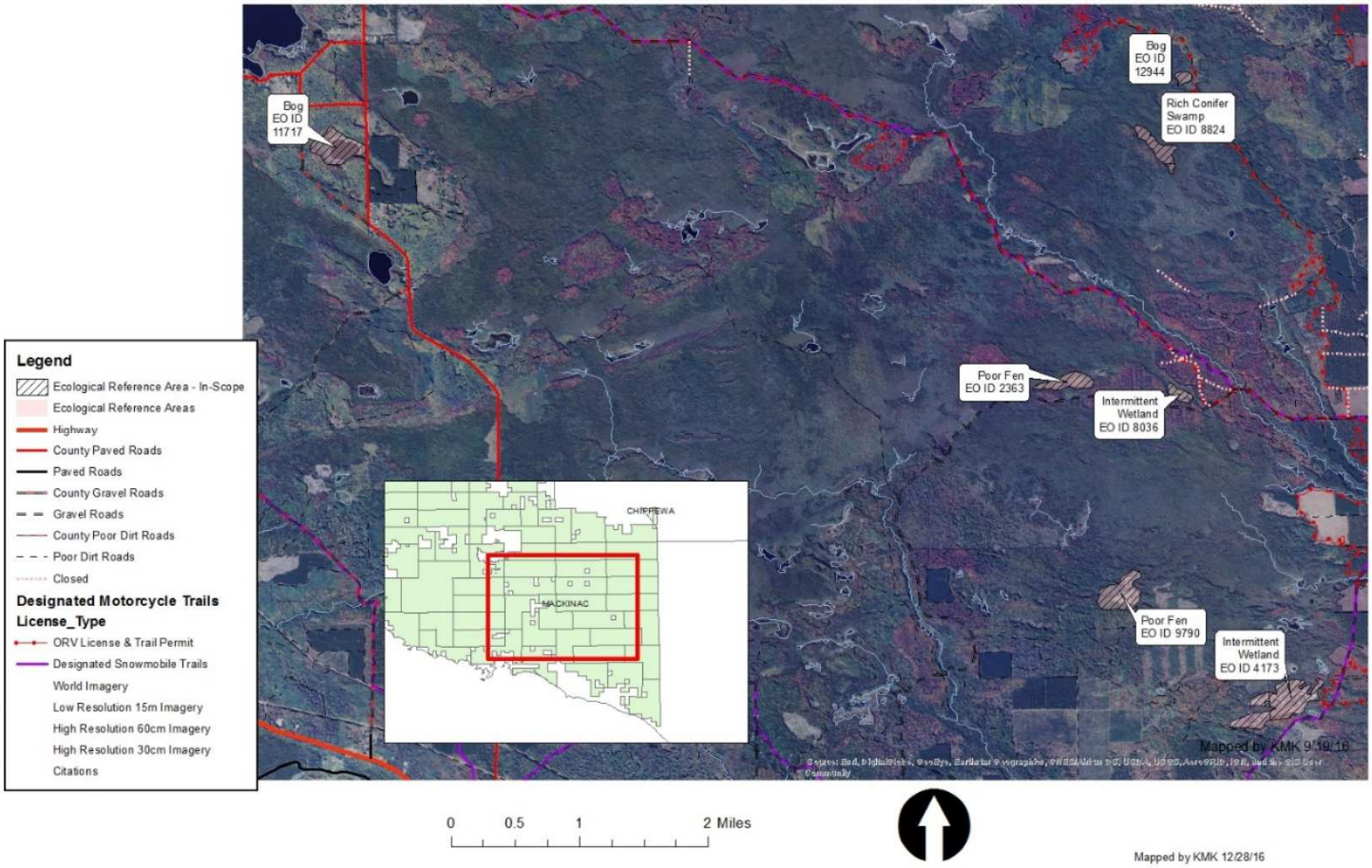

Figure 3. Carp River Complex ERA plan Imagery with EO ID labels.

Conservation Values

This ERA complex encompasses seven individual ERAs found within four natural communities; two examples of bog, two examples of poor fen, two examples of intermittent wetland, and one rich conifer swamp.

Bog

Bogs are nutrient-poor peatlands characterized by acidic, saturated peat and the prevalence of sphagnum mosses and ericaceous shrubs. Fire and flooding are the main natural disturbance factors. High-quality bogs contain characteristic plants and animals and minimal invasive species populations. Hydrology should be unimpeded by ditches, dikes and fill. Viable bogs are also surrounded by high-quality natural communities or with a sufficient upland buffer for minimizing surface water input and sedimentation and to

maintain groundwater regimes. Bog is ranked G3G5 S4, vulnerable to secure globally and apparently secure within the state.

1. **Ryerse Lake Bog:** EO_ID 11717, Last Observed 2006-06-08

   Ryerse Lake Bog occurs on approximately 48 acres of state forest land. It is AB rank, excellent or good estimated viability. This moderate-sized peatland surrounds Ryerse Lake, an alkaline kettlehole lake occurring on a sandy lakeplain. The bog is part of a peatland complex that includes the bog in addition to pockets of poor fen along the lake margin. A quaking mat occurs along the lake margin and is characterized by acidic (pH 5.0-6.0) peats that are 45 to 60 cm deep. Where the bog mat is grounded, sphagnum mounds are more pronounced, fibric peat depths are greater (>100 cm deep), and the peats are more acidic (pH 4.0-5.5). Sphagnum peat increases in depth and acidity with distance from the lake.

   In areas where the sphagnum mounds are well developed, the dominant species include ericaceous shrubs, namely leatherleaf (*Chamaedaphne calyculata*), bog laurel (*Kalmia polifolia*), blueberries (*Vaccinium* spp.), and black spruce (*Picea mariana),* and few-seed sedge (*Carex oligosperma*). Pockets of poor fen occurring along the lake margin support a diversity of species including bog buckbean (*Menyanthes trifoliata*), white beak-rush (*Rhynchospora alba*), large cranberry (*Vaccinium macrocarpon*), pitcher-plant (*Scarracenia purpurea*), round-leaved sundew (*Drosera rotundifolia*), mud sedge (*Carex limosa*), rushes (*Juncus* spp.), tawny cotton-grass (*Eriophorum virginicum*), arrow grass (*Scheuchzeria palustris*), bulrush (*Trichophorum alpinum*), bog clubmoss (*Lycopodiella inundata*), and dioecious sedge (*Carex sterilis*). Over 50 species were recorded during the survey effort. This site was previously classified as poor fen but was re-classified to bog following 2006 surveys.

Figure 4. Ryerse Lake Bog. Photo by Michael A. Kost.

2. **Jackson Tindle Road Bog:** EO_ID 12944, Last Observed 1986-09-15

   The Jackson Tindle Road Bog is C rank, fair estimated viability. It is approximately 6 acres of state forest land. The bog is a broad flat depression on sand lakeplain dominated by sphagnum, few-seed sedge, and woolly-fruit sedge (*Carex lasiocarpa*). Locally dense leatherleaf. Small black spruce (*Picea* mariana) and tamarack (*Larix laricina*) are present. This bog has not been recently surveyed, and the notes in the element occurrence record mention that it needs a midsummer survey for herbaceous diversity. Pine trees have been cut on an adjacent dune ridge.

<u>Poor Fen</u>

Poor fen is a sedge-dominated wetland found on very strongly to strongly acidic, saturated peat that is moderately influenced by groundwater. The community occurs north of the climatic tension zone in kettle depressions and in flat areas or mild depressions on glacial

outwash and glacial lakeplain. Poor fens occur adjacent to other peatland communities, often grading into bog, poor conifer swamp, and muskeg. More minerotrophic systems such as northern fen, northern shrub thicket, northern wet meadow, and rich conifer swamp can occur along the outer margins of poor fens where groundwater seepage from adjacent uplands is prevalent. Upland community types neighboring poor fen typically include fire-adapted communities such as pine barrens, dry northern forest, and dry-mesic northern forest. Poor fen is ranked G3G5 S3, vulnerable to secure globally and vulnerable within the state.

1. **Brevort River Headwaters:** EO_ID 2363, Last Observed 1986-07-30

   Brevort River Headwaters Poor Fen is C rank, fair estimated viability. It occurs on approximately 25 acres of state forest land. This poor fen is small in size, with a relatively small number of species. This is a herb-shrub dominated depression in sandy lakeplain. Species include tussock sedge, wiregrass sedge, sphagnum, leatherleaf, cedar, black spruce, bog birch (*Betula pumila*) and other shrubs, herbs and scattered trees.

2. **Jackson Trail Poor Fen**: EO_ID 9790, Last Observed 2006-06-30

   The Jackson Trail Poor Fen is ranked AB, excellent or good estimated viability. It is located on approximately 44 acres of state forest land. This poor fen occurs on poorly drained, flat, sandy lakeplain with moderately acidic (pH 5.0-6.0), fibric peat and sapric peat overlying acidic sand (pH 5.0-5.5). Areas of groundwater influence along the wetland margins are characterized by more minerotrophic conditions. Numerous shallow pools and old beaver channels occur in the eastern and northeastern portions of the wetland complex.

   Areas of the poor fen are characterized by a scattered and stunted canopy of conifers (2-8" DBH, 6-35 years old) with white pine (*Pinus strobus*), tamarack, black spruce, and northern white-cedar (*Thuja occidentalis*). These species, along with tag alder (*Alnus rugosa*) and mountain holly (*Nemopanthus mucronate*), occur in the tall shrub layer. Patches of low ericaceous shrubs include leatherleaf, bog laurel, Labrador tea (*Ledum groenlandicum*), and bog rosemary (*Andromeda glaucophylla*) with black chokeberry (*Aronia prunifolia*) and bog willow (*Salix pedicellaris*). Few-seed sedge and sphagnum mosses are the ground cover dominants with mud sedge (*Carex limosa*) and wild blue flag (*Iris versicolor*) common. Open graminoid portions of the wetland that are acidic are dominated by few-seed sedge. Lower areas on

more minerotrophic sapric sedge peat support twig-rush (*Dulichium arundinaceum*), wiregrass sedge (*Carex lasiocarpa*), bluejoint grass (*Calamagrostis canadensis*), and spike-rush (*Eleocharis smallii*). Shallow pools and beaver channels with 40-80 cm of water are dominated by yellow pond-lily (*Nuphar variegate*).

Figure 5. Jackson Trail Poor Fen. Photo by Joshua G. Cohen.

Intermittent Wetland

Intermittent wetland is a graminoid- and herb-dominated wetland found along lakeshores or in depressions and characterized by fluctuating water levels, both seasonally and from year to year. Intermittent wetlands exhibit traits of both peatlands and marshes, with characteristic vegetation including sedges (*Carex* spp.), rushes (*Juncus* spp.), sphagnum mosses, and ericaceous shrubs. The community occurs statewide.

Intermittent Wetlands will occur within the context of high quality fire dependent forest communities. If within in a mosaic of ponds, lakes, and other depressions the area should

be managed as a complex because all of these features are likely influenced by the same hydrology.

Water level fluctuations occur both seasonally and yearly within intermittent wetlands. Seasonally, water levels tend to be highest during the winter and spring and lowest in late summer and fall. Yearly oscillations are less predictable. Fluctuations of water level within intermittent wetlands allow for temporal variability of the accumulation and decomposition of organic matter. Stable periods of saturated and inundated conditions inhibit organic matter decomposition and allow for the accumulation of peat. Dam-building activities of beaver can result in blocked drainage and flooding, which facilitate sphagnum peat development and expansion. High decomposition rates within intermittent wetlands are correlated with periods of water level fluctuation, which promote oxidation and the loss of organic material that would otherwise form peat.

Water level fluctuation in intermittent wetlands also facilitates seed germination and seed dispersal, and reduces competition from woody plants. Seasonal draw-downs are critical to the survival of many intermittent wetland species, especially annuals, which readily germinate from the exposed, saturated soils.

Fire is also an important component of the natural disturbance regime of intermittent wetlands. Intermittent wetlands typically occur as small depressions within a fire-dependent landscape and would have likely experienced surface fires along with the surrounding uplands when conditions were favorable. Surface fire can contribute to the maintenance of open conditions by killing encroaching trees and shrubs. In the absence of fire, a thick layer of leaf litter can develop that stifles seed germination and seedling establishment. Intermittent Wetland is ranked G3 S3, vulnerable throughout range.

1. **Brevort River Headwaters:** EO_ID 2363, Last Observed 1986-07-30

   Brevort River Headwaters Intermittent Wetland is ranked C, fair estimated viability. It is on approximately 10 acres of state forest land. This is a pool with extreme water-table fluctuations, small size and low diversity. Dominants include wiregrass sedge, tussock sedge, twig-rush and spike-rush. Other common species include spikerush (*Eleocharis* spp.), pondweeds (*Potamogeton* spp.), sweetgale (*Myrica gale*), meadowsweet (*Spiraea alba*), tag alder, and other herbs and shrubs.

2. **Jackson Trail Intermittent Wetland:** EO_ID 4173, Last Observed 2006-06-27

Jackson Trail Intermittent Wetland is ranked AB, excellent or good estimated viability. It is located on approximately 80 acres of state forest land. This site is a series of large intermittent wetlands occurring on poorly drained, flat sandy lakeplain with muck of variable depth (typically around 5 cm) overlying inundated or saturated sands. The organic and mineral soils are circumneutral (pH 6.5-7.0). The water table within these wetlands fluctuates seasonally and annually with shallow pools of water having 40-80 cm of standing water. The site is characterized by several ecological zones patterned by the fluctuating water levels: submergent marsh, emergent marsh, northern wet meadow, and grounded bog mat.

Ponds in the center of the wetlands support submergent marsh vegetation with pondweeds, pipewort (*Eriocaulon septangulare*), and mermaid-weed (*Proserpinaca palustris*). These ponds are surrounded by an emergent marsh zone that is characterized by shallow waters and dominated by spike-rushes and twig-rush (*Dulichium arundinaceum*). Seasonally inundated areas support northern wet goldenrod (*Euthamia graminifolia*), beak-rushes (*Rhynchospora* spp.), and a native St. John's-wort (*Hypericum* spp.). Along the upland margin is a grounded bog mat zone dominated by leatherleaf with slender willow (*Salix petiolaris*) and characterized by mild sphagnum hummock and hollow microtopography. Several islands of poor conifer swamp with tamarack occur within the wetland complex. Over 40 vascular plant species were noted during the 2006 survey.

Figures 6 and 7. Jackson Trail Intermittent Wetland. These intermittent wetlands occur within a poorly drained lakeplain and are characterized by spring inundation and graminoid dominance. Photos by Joshua G. Cohen.

Rich conifer Swamp

Rich conifer swamp (RCS) is a groundwater-influenced, minerotrophic forested wetland dominated by northern white cedar that occurs on organic soils (e.g., peat) primarily north of the climatic tension zone. The community is often referred to as cedar swamp.

The forest should be mature, and be all aged (exhibiting natural wind throw disturbance and vegetative layering), or older (>120 years) even-aged stands, with large diameter tree species. Natural regeneration and recruitment of the northern white-cedar, and minor components such as hemlock, are occurring and hydrology is intact. Optimally, rich conifer swamp ERA's will be inclusive of unfragmented, large wetland complexes including minerotrophic communities, such as northern fen, northern shrub thicket, northern wet meadow, and hardwood-conifer swamp and acidic communities such as poor conifer swamp where groundwater seepage dissipates. The upland area which feeds groundwater into the rich conifer swamps and maintains quality of groundwater (chemicals, nutrient levels, etc.) is intact, and if possible consists of high quality or restorable upland communities such as mesic northern forest, dry-mesic northern forest, and dry northern forest. Rank G4 S3, apparently secure globally and vulnerable within the state.

1. **Jackson Tindle Road:** EO_ID 8824, BC rank, Last Observed 2007-06-19.

   The Jackson Tindle Road RCS occurs on approximately 25 acres of state forest land. It is BC ranked, good or fair estimated viability. This small rich conifer swamp occurs within a poorly drained depression in a broad lakeplain. Sandy dune ridges occur throughout the lakeplain. The soils are characterized by shallow (18-75 cm), slightly acidic to circumneutral (pH 6.5-7.0) peats overlying sandy clay. The small stand of old-growth northern white-cedar occurs in a matrix of younger, more heavily disturbed conifer- and shrub-dominated wetlands.

   The overstory of the rich conifer swamp is overwhelmingly dominated by northern white-cedar. Canopy associates include black spruce, tamarack, paper birch, and balsam fir. Younger portions of the surrounding swamp are dominated by tamarack and black spruce. Upland rises or dune ridges within the swamp on lacustrine sands support tamarack, black spruce, and paper birch and formerly contained white pine as indicated by the numerous cut and burnt white pine stumps. Prevalent tall shrubs within the rich conifer swamp include tag alder, red-osier dogwood, and wild-raisin. Typical low shrubs include Labrador tea and dwarf raspberry. Characteristic

ground cover species are royal fern, sedges, creeping snowberry, and false mayflower.

Figure 8. Jackson Tindle Road RCS. Photo by Bradford S. Slaughter.

High Conservation Value (HCV) Attributes:

These seven small wetland ERAs are within a large landscape level forest, of relatively contiguous state ownership.

The South Branch Carp River is a cold-water stream Special Conservation Area (SCA), and the Carp River and South Branch Carp River are High Priority Trout Stream SCAs.

Several of these ERAs were noted to have high native species diversity and few non-native species. Ryerse Lake Bog contains Moor rush (*Juncus stygius*, state threatened); and Red shouldered hawk (*Buteo lineatus*), eagle (*Haliaeetus* leucocephalus) and moose (*Alces americanus*) are found near these ERAs.

Threats Assessment

Bog: Threats to bogs include invasive species, possible impacts to hydrology from roads, adjacent agriculture and logging, illegal ORV use; and fire suppression.

Poor fen: Documented threats are from off-road vehicle (ORV) traffic which can destroy populations of sensitive species and significantly alter fen hydrology through rutting. Increased surface water inputs and reductions in groundwater recharge can be prevented by avoiding road construction and complete canopy removal in stands immediately adjacent to fens. Where shrub and tree encroachment threatens to convert open wetlands to shrub-dominated systems or forested swamps, prescribed fire or selective cutting can be employed to maintain open conditions. Employ silvicultural management of poor fens to preserve open canopy during the winter to minimize damage to the peat and impacts to the hydrologic regime.

Hydrology and water chemistry is threatened by upland development, road building, ORVs, quarrying, peat mining, creation of drainage ditches and dams, agricultural runoff and nutrient enrichment, or runoff from logging. Fen vegetation is extremely sensitive to minor changes in water levels, water chemistry, groundwater flow, and nutrient availability. A reduction in groundwater flow and subsequent decrease in nutrients in poor fens can result in the shift to less minerotrophic wetlands such as bog. Lowered water tables from drainage allow tree and shrub encroachment into open fens and the eventual succession to closed-canopy peatlands. Conversion to more eutrophic wetlands has occurred as the result of nutrient enrichment and raised water levels, which cause increased decomposition of peat soils. Eutrophication from pollution and altered hydrology has detrimentally impacted fens by generating conditions favorable for invasive species. Monitoring to detect and implementing control of invasive species are critical to the long-term viability of poor fen.

Intermittent wetland: Currently, intermittent wetlands are threatened by draining, flooding, filling, development, off-road vehicle (ORV) activity, peat mining, logging, and agricultural runoff and nutrient enrichment. Maintaining hydrologic regimes, in addition to controlling off-road vehicle (ORV) traffic, nutrient and sediment inputs, and invasive species populations, is integral to protecting the ecological integrity of high-quality intermittent wetlands.

A serious threat to intermittent wetland hydrology and species diversity is posed by off-road vehicle (ORV) traffic which significantly alters the hydrology through rutting and erosion. Subsequent soil erosion from ORV use may greatly disturb the seed bank, reducing plant density and diversity. Monitoring to detect and implementing measures to control invasive species are critical to the long-term viability of intermittent wetland.

Rich conifer swamp: Direct and indirect threats documented in site surveys of rich conifer swamp Ecological Reference Areas on state forest land in 2006 and 2007 include: timber harvesting on private lands, logging roads, limited cedar recruitment from deer browse, invasive species, some ORV use, historical railroad grades and spurs, development on adjacent uplands and oil and gas development (Cohen et al. 2008). County roads, forest roads, historic railroad grades and trail construction has caused impediments to natural hydrological flow. Natural regeneration of cedar in northern rich conifer swamps is limited by high densities of deer, which rely on cedar as a main winter-staple. Where monitoring indicates impacts on cedar regeneration, species composition and structure, specific wildlife management protocols may need to be implemented. Logging rich conifer swamps causes conversion to hardwood-conifer swamps, hardwood swamps, aspen, and alder thickets.

Invasive species can threaten the diversity and community structure of rich conifer swamp. Monitoring for invasive species followed by prompt and sustained control efforts will help protect the ecological integrity of rich conifer swamp and adjacent natural communities.

Jackson Tindle Road – Non-native species are rare within this swamp, although a localized colonization of lawn prunella (*Prunella vulgaris*) was observed.

General Management of ERAs

ERAs will generally not be managed for timber harvest. Management activities or prescriptions in Ecological Reference Areas are limited to low impact activities compatible with the defined attributes and values of the community type, except under the following circumstances:

i. Harvesting activities where necessary to restore or recreate conditions to meet the objectives of the ERA, or to mitigate conditions that interfere with achieving the ERA objectives. In this regard, forest management activities (including timber harvest) may be used to create and maintain conditions that emulate an intact, mature forest or other successional phases that may be under-represented in the landscape.

ii. Road building only where it is documented that it will contribute to minimizing the overall environmental impacts within the FMU and will not jeopardize the purpose for which the ERA was designated.

iii. Existing and new land use activities should be evaluated in the context of whether they detract from achieving the desired future conditions of the natural community for which the ERA was designated. The acceptability of land use activities within DNR administered ERAs will be evaluated using severity, scope, and irreversibility criteria, as established in DNR IC4199, Guidance for Land Use Activities within DNR Administered Ecological Reference Areas.

iv. Threats such as fire, natural or exotic pests or pathogens may warrant other management measures.

v. Harvesting and other management activities in presently accessible areas located within the peripheral boundary of an ERA that are NOT the natural community of focus and which may or may not be typed as a separate stand or forest type (e.g. an upland island of previously managed aspen within a bog complex) may be prescribed for treatments, contingent upon a determination of no anticipated direct or indirect adverse impact to the defined attributes and values of natural community for which the ERA was designated. The FRD Biodiversity Conservation Program leader shall be consulted regarding the determination of any direct or indirect adverse impact.

vi. Land management activities immediately adjacent to an ERA should consider any anticipated direct or indirect adverse impact to the defined attributes and values of natural community for which the ERA was designated. Management will be adaptive. ERAs will be monitored to determine if implemented management activities are moving the natural communities forward, or maintaining them at their desired future condition. The network of ERAs will be evaluated every five years for their contribution to the overall goal of biodiversity conservation. This review cycle will allow for the potential addition or subtraction of lands from an ERA, designation of new ERAs, or removal of the ERA planning designation.

<u>Management Goals</u>

- Restore ERA where applicable.
- Invasive Species: Ideally, the best goal would be to eliminate invasive species (or maintain an absence of invasive species), but in some areas that may not be possible and a goal that recognizes this may be necessary.
- Reduce other Threats (Encroachment of Woody Vegetation, ORVs, etc.).
- The ERA has representation of native plants, indicator species, and rare species.
- Allow natural processes to occur.
- Reduce fragmentation.

Management Objectives

The following Management Objectives describe the measures necessary to ensure the maintenance and/or enhancement of the ERA site or sites. Objectives and associated management actions will be prioritized and implemented based upon available resources.

All ERAs in this plan:

- Identify and reduce illegal ORV access points.
- Identify and prioritize critical areas within the ERA to treat for invasive species.
- Determine if there are impacts to hydrological system.
- Assess EO quality every 10-20 years.
- Work with adaptation specialist to determine threats associated with climate change.

Bog

- Allow blowdown/windthrow and insect mortality to occur without salvage harvest.

Rich conifer swamp

- Allow blowdown/windthrow and insect mortality to occur without salvage harvest.
- Assess forest regeneration within the planning period.

Management Actions

Suggested actions or series of actions that would help to achieve the above objectives.
(M= Maintenance action, R= Restoration action)

All ERAs in this plan:

- If current data/knowledge are not available regarding the management goals, actions may address needed assessments (i.e. surveys may be needed). (M, R)
- Identify vectors of invasive species and reduce their introduction to the site. (M, R)
- Remove invasive plants using appropriate control methods for that particular species (hand-pull, herbicide, Rx) using partnerships where appropriate, develop FTP's and PAP's. (M, R)
- Close illegal roads and trails where feasible. Consult with PRD Trails Specialist when roads and access points need to be closed. (M, R)
- Install culverts under roads as needed to restore natural hydrological flow and ensure that current culverts are functioning.

- Retain intact, mature forest adjacent to the ERAs to reduce the threat of negative hydrologic impacts and to maintain the functions and integrity of the wetland community (M)
- Minimize clearcuts adjacent to ERAs with existing significant deer browse pressure. (M, R)
- Work with LED to increase patrols for illegal ORV activity and enforce state land use rules. (M, R)
- Work with MNFI and other experts to update EO inventory. (M, R)
- Update plan with additional knowledge as it becomes available. (M)

Poor Fen and Bog ERAs:

- Use periodic burning to maintain presence of native plant species, reduce invasives, and to reduce woody encroachment (M, R)
- To reduce woody encroachment selective cutting can occur in winter using techniques to avoid impacting hydrology. (M, R)
- Minimal Impact Suppression Tactic (MIST) practices should be used for wildfire response in this area if possible. (M, R)
- Avoid creating new roads adjacent to ERA. (M, R)

Intermittent wetland ERAs:

- Where intermittent marsh borders fire-dependent upland communities include prescription burning of the marsh and adjacent uplands when possible. (M, R)
- Avoid creating new roads adjacent to ERA. (M, R)

Rich conifer swamp ERAs:

- Reintroduction of missing associated native plant species (both canopy and ground flora) using local genotypes. (R)
- Land acquisition to reduce fragmented ownership. (R)
- Where forest regeneration is found to be inadequate: (R)
    - In cedar and/or hemlock, determine if lack of regeneration is caused by deer herbivory and if so, consider limiting winter cutting intended to feed deer adjacent to the ERA and explore other potential solutions.

Monitoring

Monitoring approaches and indicators appropriate for the natural community and in line with the objectives and management actions suggested, including appropriate frequency and timing considerations. (Unless otherwise specified, monitoring is expected to occur once every 10-year inventory cycle.)

Metric	Current Status	Desired Future Status	Assessment
Representative and rare species – species occurrences	Baseline EO Records; updated when EO's are updated	No decreases	TBD
Change in EO rank	Various (see above)	No decrease	TBD
Populations of invasive species – number and scope of species	Severity unknown; treatments should be monitored appropriately; detection monitoring opportunistically or every five years' maximum	Eliminated/fewer occurrences	TBD
Illegal ORV activity – number of new instances and number of citations issued	Severity unknown	Eliminated/fewer occurrences	TBD

Additional Resources:

MNFI Natural Community Abstracts: http://mnfi.anr.msu.edu/pub/abstracts.cfm#Communities

Michigan Department of Natural Resources Forest Certification Work Instruction 1.4: http://www.michigan.gov/documents/dnr/WI_1.4BiodMgt_320943_7.pdf