

Section 6. Appendices

Appendix A

Forest Certification Standards

The Forest Stewardship Council standards can be found at the following site:

http://www.michigan.gov/documents/FSC_RegionalForestStewardshipStandard_161428_7.pdf

The Sustainable Forestry Initiative standards can be found at the following site:

http://www.michigan.gov/documents/dnr/SFIStandard2010-2014Section2_314055_7.pdf

FINAL DRAFT

Appendix B

Description of Management Area (MA) Boundary Determination Process

The process for the Western Upper Peninsula ecoregion can be found at the following site:

http://www.michigan.gov/documents/dnr/Draft-ManagementAreas-WUP_232151_7.pdf

The process for the Eastern Upper Peninsula ecoregion can be found at the following site:

http://www.michigan.gov/documents/dnr/Management_Areas_for_the_Eastern_Upper_Peninsula_Ecoregion_271770_7.pdf

The process for the Northern Lower Peninsula ecoregion can be found at the following site:

http://www.michigan.gov/documents/dnr/DraftMgtAreas-NLP-SLP_Ecoregions_241968_7.pdf

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Appendix C

Limiting Factors, Integrated Forest Monitoring, Assessment, and Prescriptions (IFMAP) Classifications, IFMAP Classification Rules, and General Silvicultural Rules

| Available for Management | Condition/Description | Definition |
|---|---|---|
| <i>1. Administrative and Legal Factors</i> | | |
| Unavailable | 1A: Federal/State/Local Law | Specify Federal/State/Local law in comments (e.g., Natural Rivers Act) |
| Unavailable | 1B: Non-Department of Natural Resources (DNR) Agency Concerns | Specify agency and their concerns in comments (e.g., United States Forest Service (USFS)) |
| Unavailable | 1C: Other Department or Division Procedures/Practices | Specify department or division (other than Forest Resources Division (FRD)) in comments and describe |
| Unavailable | 1D: Interest Group/Neighbor | Specify decision based on input from interest group(s)/neighbor in comments |
| <i>2. Accessibility Factors</i> | | |
| Unavailable | 2A: Adjacent Landowner Denied Access | Access has been sought and denied |
| Available | 2B: Unknown if Access through Adjacent Landowner(s) is Possible | Access has not been sought yet |
| Available | 2C: Engineered Bridge Needed (Department Portable Bridge Not Available or Inadequate) | Specify type and length of bridge needed |
| Available | 2D: Portable Bridge Needed (Department Bridge will be Adequate) | Specify length of bridge needed |
| Available | 2E: Road Needed | Resources are not currently available to build road and onus may be too much to put on timber sale contractor |
| Unavailable | 2F: Too Steep | Area cannot be operated on with current equipment capabilities without unacceptable damage to the soil. |
| Unavailable | 2G: Too Wet (Sensitive Soils, Year-Round High Water Table, Does Not Include Access Issues) | Area cannot be operated on with current equipment capabilities without unacceptable damage to the soil or water table |
| Unavailable | 2H: Blocked by Physical Obstacle (eg., Upland Stand in a Lowland Area - Marsh Islands) | Area cannot be accessed without crossing an obstacle (e.g., travel through wetlands, topography limitations, etc.) |
| Available | 2I: Survey Needed | Unlikely that current department survey personnel can complete survey as needed |

3. Special Management or Use Designations

| | |
|--------------------|--|
| Unavailable | 3A: Potential Old Growth/Biodiversity Specify in comments |
| Unavailable | 3B: Threatened, Endangered, and Special Concern Species/Communities Specify in locked comments |
| Unavailable | 3C: Designated Quiet Area, Natural Area, or Wilderness Official designations only, specify in comments |
| Unavailable | 3D: Recreational/Scenic Values Specify recreational site or scenic values in comments |
| Unavailable | 3E: Easement/Lease, Non-military Specify easement/lease in comments (e.g., Luce County managed lands, Consumers Power red pine, undivided interests) |
| Unavailable | 3F: Military Easement/Lease Specify easement/lease in comments (e.g., Camp Grayling) |
| Unavailable | 3G: Other Influence Zones - See Comments Specify in comments (e.g., travel or water influence zones, etc.) |
| Unavailable | 3H: Deer Wintering Areas Deer management decisions constrain management of the stand |
| Unavailable | 3I: Historical/Archeological Identify in locked comment box |
| Unavailable | 3J: Water quality/Best Management Practices (BMPs) (Stream, River, or Lake) Management is constrained by concerns over the impact of treatment on the quality of nearby watercourses |
| Unavailable | 3K: Rare or Unique Landforms Identify in locked comment box |
| Unavailable | 3L: Other Wildlife Concerns Wildlife management, other than deer, decisions constrain management of the stand |

4. Markets and Industrial Factors

| | |
|------------------|--|
| Available | 4A: No Merchantable Products (See Product Standards) We can sell everything from small acreage to low volumes, but not unmerchantable products |
|------------------|--|

5. Technological/Ecological Factors

| | |
|--------------------|---|
| Unavailable | 5A: Not Able to Obtain Desirable Regeneration Desired regeneration is hampered by ecological factors (e.g., too much deer browse, etc) |
| Available | 5B: Retention for Regeneration Purposes e.g., shelterwood cuts |
| Available | 5C: Delay Treatment for Age/Size Class Diversity or Exceptional Site Quality Equalizing age/size class diversity within cover types |
| Unavailable | 5D: Unproductive Forest Land Land supporting trees, but not capable of producing more than 20 cubic feet/acre/year of any timber species (e.g., treed bogs, etc.) |

IFMAP Classification List

| | |
|--------------------------------------|-----------------------------------|
| 1 Urban | |
| 11 Low Intensity Urban | |
| 12 High Intensity Urban | |
| 121 | Airport |
| 122 | Roads/Parking Lot |
| 123 | Other High Intensity Urban |
| 2 Agricultural | |
| 21 Herbaceous Agriculture | |
| 211 | Cropland |
| 2111 | Non-vegetated Farmland |
| 2112 | Row Crop |
| 2113 | Forage Crop |
| 2114 | Other Cropland |
| 212 | Non-tilled Herbaceous Agriculture |
| 22 Non Herbaceous Agriculture | |
| 221 | Christmas tree plantation |
| 222 | Orchard/Vineyard/Nursery |
| 3 Upland Openland | |
| 310 | Herbaceous Openland |
| 3101 | Poverty Grass, Cladonia |
| 3102 | Grass |
| 31021 | Cool Season Grass |
| 31022 | Warm Season Grass |
| 3103 | Rubus, Fern |
| 3104 | Degraded |
| 3105 | Mixed Upland Herbaceous |
| 320 | Upland Shrub |
| 3201 | Sweet Fern |
| 3202 | Autumn Olive/Honeysuckle |
| 3203 | Upland Blueberry |
| 3204 | Mast Producing Shrub |
| 3205 | Mixed Upland Shrub |
| 330 | Low Density Trees |
| 3301 | Low Density Deciduous Trees |
| 3302 | Low Density Conifer Trees |
| 3303 | Mixed Low Density Trees |

4 Upland Forest**41 Upland Deciduous Forest**

411 Northern Hardwood

- 4110 Sugar Maple Association
- 4111 Sugar Maple, Hard Mast Association
- 4112 Maple Association
- 4113 Red Maple, Conifer
- 4114 Beech, Hemlock
- 4115 Yellow Birch, Hemlock
- 4116 Mixed Northern Hardwood – Aspen
- 4117 Mixed Northern Hardwood - Pine
- 4119 Mixed Northern Hardwoods

412 Oak

- 4120 Oak, Hickory
- 4121 Oak, Aspen
- 4122 Oak, Pine
- 4123 Red Oak
- 4124 Red with White Oak
- 4125 Black, Northern Pin Oak
- 4126 White, Black, Northern Pin Oak
- 4129 Mixed Oak

413 Aspen

- 4130 Aspen
- 4131 Aspen, Oak
- 4132 Aspen, Jack Pine
- 4133 Aspen, Mixed Pine
- 4134 Aspen, Spruce/Fir
- 4135 Aspen, Cedar
- 4136 Aspen, Mixed Conifer
- 4137 Aspen, Birch
- 4139 Aspen, Mixed Deciduous

414 Other Upland Deciduous

- 4140 Paper Birch

419 Mixed Upland Deciduous

- 4190 Mixed Upland Deciduous with Cedar
- 4191 Mixed Upland Deciduous with Conifer
- 4192 Mixed Southern Upland Deciduous

- 4193 Birch, Aspen
- 4199 Other Mixed Upland Deciduous

42 Upland Coniferous Forest

421 Planted Pines

- 4210 Planted White Pine types
 - 42100 Planted White Pine
 - 42101 Planted White Pine, Mixed Deciduous
- 4211 Planted Red Pine types
 - 42110 Planted Red Pine
 - 42111 Planted Red Pine, Mixed Deciduous
- 4212 Planted Jack Pine
 - 42120 Planted Jack Pine
 - 42121 Planted Jack Pine, Mixed Deciduous
- 4213 Planted Scotch Pine types
 - 42130 Planted Scotch Pine
- 4214 Planted Mixed Pine types
 - 42140 Planted Mixed Pine
 - 42141 Planted Mixed Pine, Mixed Deciduous

422 Natural Pines

- 4220 Natural White Pine types
 - 42200 Natural White Pine
 - 42201 Natural White Pine, Mixed Deciduous
- 4221 Natural Red Pine Types
 - 42210 Natural Red Pine
 - 42211 Natural Red Pine, Mixed Deciduous
- 4222 Natural Jack Pine types
 - 42220 Natural Jack Pine
 - 42221 Natural Jack Pine, Mixed Deciduous
- 4226 Natural Mixed Pine Types
 - 42290 Natural Mixed Pine
 - 42250 Natural Pine, Oak
 - 42260 Natural Mixed Pine, Mixed Deciduous

423 Other (Non-Pine) Upland Conifers

Planted Upland Conifers

- 42300 Planted Larch
- 42301 Planted Larch, Mixed Deciduous
- 42310 Planted Spruce
- 42311 Planted Spruce, Mixed Deciduous

Non-planted Upland Conifers

- 42320 Upland Spruce
- 42330 Upland Fir
- 42340 Upland Spruce/Fir
- 42350 Upland Hemlock
- 42360 Upland Cedar
- 42370 Upland Cedar, Aspen
- 42380 Non-Pine Upland Conifer, Mxd Deciduous
- 42390 Mixed Non-Pine Upland Conifers

429 Mixed Upland Conifers

43 Upland Mixed Forest

- 4310 Pine, Oak Mix
- 4311 Pine, Aspen Mix
- 4312 Hemlock, Mixed Deciduous
- 4319 Mixed Upland Forest

5 Water

50 Water

6 Wetlands

61 Lowland Forest

611 Lowland Deciduous Forest

- 6110 Cottonwood
- 6111 Lowland Balsam Poplar
- 6112 Lowland Aspen
- 6113 Lowland Maple
- 6114 Lowland Oak
- 6115 Lowland Ash
- 6116 Lowland Birch
- 6117 Lowland Deciduous, Mixed Coniferous
- 6118 Lowland Deciduous with Cedar
- 6119 Mixed Lowland Deciduous Forest

612 Lowland Coniferous Forest

- 6120 Lowland Cedar
- 6121 Tamarack
- 6122 Black Spruce
- 6123 Lowland Fir
- 6124 Lowland Spruce-Fir
- 6125 Lowland Black Spruce, Jack Pine
- 6126 Lowland Jack Pine

- 6127 Lowland Pine
- 6128 Lowland Coniferous, Mixed Deciduous
- 6129 Mixed Coniferous Lowland Forest
- 613 Lowland Mixed Forest
 - 6130 Fir, Aspen, Maple
 - 6131 Hemlock, White Pine, Maple, Birch
 - 6132 Mixed Lowland Forest with Cedar
 - 6139 Mixed Lowland Forest

62 Non-forested Wetlands

- 621 Floating Aquatic
- 622 Lowland Shrub
 - 6220 Alder/Willow
 - 6221 Fen
 - 6222 Shrub-Carr
 - 6223 Inundated Shrub Swamp
 - 6224 Treed Bog
 - 6225 Bog
 - 6229 Mixed Lowland Shrub
- 623 Emergent Wetland
 - 6230 Cattail
 - 6231 Phragmites
 - 6232 Wet Prairie
 - 6233 Wet Meadow
 - 6239 Mixed Emergent Wetland
- 629 Mixed Non-forest Wetland

7 Bare/Sparsely Vegetated

- 710 Sand, Soil
- 720 Exposed Rock
- 730 Mud Flats
- 790 Other Bare/Sparsely Vegetated

| Level 3 Code | Level 3 Name | Level 4 Code | Level 4 Name | OI Cross-over Code | Inventory Specific Covertypes Category | RAD Tools output IFMAP/OI Cross-Inventory Covertypes |
|--------------|---------------------------|--------------|-------------------------------------|--------------------|--|--|
| 413 | Aspen Types | 4130 | Aspen | A | Aspen | Aspen |
| 413 | Aspen Types | 4131 | Aspen, Oak | A | Aspen | Aspen |
| 413 | Aspen Types | 4132 | Aspen, Jack Pine | A | Aspen | Aspen |
| 413 | Aspen Types | 4133 | Aspen, Mixed Pine | A | Aspen | Aspen |
| 413 | Aspen Types | 4134 | Aspen, Spruce/Fir | A | Aspen | Aspen |
| 413 | Aspen Types | 4135 | Aspen, Cedar | A | Aspen | Aspen |
| 413 | Aspen Types | 4136 | Aspen, Mixed Conifer | A | Aspen | Aspen |
| 413 | Aspen Types | 4137 | Aspen, Birch | A | Aspen | Aspen |
| 413 | Aspen Types | 4139 | Aspen, Mixed Deciduous | A | Aspen | Aspen |
| 414 | Other Upland Deciduous | 414 | Other Upland Deciduous | B | Paper Birch | Paper Birch |
| 414 | Other Upland Deciduous | 4140 | Other Upland Deciduous | B | Paper Birch | Paper Birch |
| 419 | Mixed Upland Deciduous | 4193 | Birch, Aspen | B | Paper Birch | Paper Birch |
| 611 | Lowland Deciduous Forest | 6116 | Lowland Birch | B | Paper Birch | Paper Birch |
| 423 | Other Upland Conifers | 42360 | Upland Cedar | C | Upland Conifers | Cedar |
| 423 | Other Upland Conifers | 42370 | Upland Cedar, Aspen | C | Upland Conifers | Cedar |
| 612 | Lowland Coniferous Forest | 6120 | Lowland Cedar | C | Lowland Conifers | Cedar |
| 622 | Lowland Shrub | 6224 | Treed Bog | D | Lowland Shrub | Treed Bog |
| 611 | Lowland Deciduous Forest | 611 | Lowland Deciduous Forest | E | Lowland Deciduous | Lowland Deciduous |
| 611 | Lowland Deciduous Forest | 6110 | Cottonwood | E | Lowland Deciduous | Lowland Deciduous |
| 611 | Lowland Deciduous Forest | 6113 | Lowland Maple | E | Lowland Deciduous | Lowland Deciduous |
| 611 | Lowland Deciduous Forest | 6114 | Lowland Oak | E | Lowland Deciduous | Lowland Deciduous |
| 611 | Lowland Deciduous Forest | 6115 | Lowland Ash | E | Lowland Deciduous | Lowland Deciduous |
| 611 | Lowland Deciduous Forest | 6117 | Lowland Deciduous, Mixed Coniferous | E | Lowland Deciduous | Lowland Deciduous |
| 611 | Lowland Deciduous Forest | 6118 | Lowland Deciduous with Cedar | E | Lowland Deciduous | Lowland Deciduous |
| 611 | Lowland Deciduous Forest | 6119 | Mixed Lowland Deciduous Forest | E | Lowland Deciduous | Lowland Deciduous |
| 613 | Lowland Mixed Forest | 6130 | Fir, Aspen, Maple | LM | Lowland Mixed Forest | Mixed Forest |
| 423 | Other Upland Conifers | 42310 | Planted Spruce | F | Upland Conifers | Upland Spruce/Fir |
| 423 | Other Upland Conifers | 42311 | Planted Spruce, Mixed Deciduous | F | Upland Conifers | Upland Spruce/Fir |
| 423 | Other Upland Conifers | 42320 | Upland Spruce | F | Upland Conifers | Upland Spruce/Fir |
| 423 | Other Upland Conifers | 42330 | Upland Fir | F | Upland Conifers | Upland Spruce/Fir |
| 423 | Other Upland Conifers | 42340 | Upland Spruce/Fir | F | Upland Conifers | Upland Spruce/Fir |
| 211 | Cropland | 2111 | Non-vegetated Farmland | G | Cropland | Cropland |
| 211 | Cropland | 2112 | Row Crops | G | Cropland | Cropland |

| | | | | | | |
|-----|-----------------------------------|--------------|--|-----------|-----------------------------------|-------------------------|
| 211 | Cropland | 2113 | Forage Crops | G | Cropland | Cropland |
| 211 | Cropland Non-tilled Herbaceous | 2114 | Other Cropland Non-tilled Herbaceous | G | Cropland Non-tilled Herbaceous | Cropland |
| 212 | Agriculture | 212 | Agriculture | G | Agriculture | Cropland |
| 221 | Xmas trees | 221 | Xmas trees | G | Xmas trees | Cropland |
| 222 | Orchards/Vineyards/Nursery | 222 | Orchards/Vineyards/Nursery | G | Orchards/Vineyards/Nursery | Cropland Herbaceous |
| 310 | Herbaceous Openland | 310 | Herbaceous Openland | G | Herbaceous Openland | Openland Herbaceous |
| 310 | Herbaceous Openland | 3101 | Poverty Grass, Cladonia | G | Herbaceous Openland | Openland Herbaceous |
| 310 | Herbaceous Openland | 3102 | Grass | G | Herbaceous Openland | Openland Herbaceous |
| 310 | Herbaceous Openland | 3103 | Rubus-Fern | G | Herbaceous Openland | Openland Herbaceous |
| 310 | Herbaceous Openland | 3104 | Degraded | G | Herbaceous Openland | Openland Herbaceous |
| 310 | Herbaceous Openland | 3105 | Mixed Upland Herbaceous | G | Herbaceous Openland | Openland Herbaceous |
| 310 | Herbaceous Openland | 31021 | Cool Season Grass | G | Herbaceous Openland | Openland Herbaceous |
| 310 | Herbaceous Openland | 31022 | Warm Season Grass | G | Herbaceous Openland | Openland Herbaceous |
| 350 | Parks and Golf Courses | 350 | Parks and Golf Courses | G | Parks and Golf Courses | Openland |
| 423 | Other Upland Conifers | 42350 | Upland Hemlock | H | Hemlock | Hemlock |
| 43 | Upland Mixed Forest | 4312 | Hemlock, Mixed Deciduous | H | Hemlock | Hemlock |
| 421 | Planted Pines | 42120 | Planted Jack Pine | J | Jack Pine | Jack Pine |
| 421 | Planted Pines | 42121 | Planted Jack Pine, Mixed Deciduous | J | Jack Pine | Jack Pine |
| 422 | Natural Pines | 42220 | Natural Jack Pine | J | Jack Pine | Jack Pine |
| 422 | Natural Pines | 42221 | Natural Jack Pine, Mixed Deciduous | J | Jack Pine | Jack Pine |
| 612 | Lowland Coniferous Forest | 6126 | Lowland Jack Pine | J | Jack Pine | Jack Pine |
| 720 | Exposed Rock | 720 | Exposed Rock | K | Exposed Rock | Exposed R |
| 622 | Lowland Shrub | 622 | Lowland Shrub | L | Lowland Shrub | Lowland Shrub |
| 622 | Lowland Shrub | 6220 | Alder/willow | L | Lowland Shrub | Lowland Shrub |
| 622 | Lowland Shrub | 6221 | Fen | L | Lowland Shrub | Lowland Shrub |
| 622 | Lowland Shrub | 6222 | Shrub-Carr | L | Lowland Shrub | Lowland Shrub |
| 622 | Lowland Shrub | 6223 | Inundated Shrub Swamp | L | Lowland Shrub | Lowland Shrub |
| 622 | Lowland Shrub | 6229 | Mixed lowland shrub | L | Lowland Shrub | Lowland Shrub |
| 629 | Mixed non-forested wetland | 629 | Mixed non-forested wetland | L | Mixed non-forested wetland | Lowland Shrub |
| 613 | Lowland Mixed Forest | 613 | Lowland Mixed Forest Hemlock, White Pine, | LM | Lowland Mixed Forest | Mixed Forest Lowland |
| 613 | Lowland Mixed Forest | 6131 | Maple, Birch | LM | Lowland Mixed Forest | Mixed Forest Lowland |
| 613 | Lowland Mixed Forest | 6132 | Mixed Lowland Forest with Cedar | LM | Lowland Mixed Forest | Mixed Forest |

| | | | | | | |
|-----|------------------------|--------------|--|-----------|------------------------|------------------------|
| 613 | Lowland Mixed Forest | 6139 | Mixed Lowland Forest | LM | Lowland Mixed Forest | Lowland Mixed Forest |
| 411 | Northern Hardwood | 4110 | Sugar Maple Association | M | Northern Hardwood | Northern Hardwood |
| 411 | Northern Hardwood | 4111 | S.Maple, Hard Mast Association | M | Northern Hardwood | Northern Hardwood |
| 411 | Northern Hardwood | 4112 | Maple, Beech, Cherry Association | M | Northern Hardwood | Northern Hardwood |
| 411 | Northern Hardwood | 4113 | R.Maple, Conifer | M | Northern Hardwood | Northern Hardwood |
| 411 | Northern Hardwood | 4114 | Beech, Hemlock | M | Northern Hardwood | Northern Hardwood |
| 411 | Northern Hardwood | 4115 | Y.Birch, Hemlock NH | M | Northern Hardwood | Northern Hardwood |
| 411 | Northern Hardwood | 4116 | Mixed N. Hardwood – Aspen | M | Northern Hardwood | Northern Hardwood |
| 411 | Northern Hardwood | 4117 | Mixed N. Hardwood - Pine | M | Northern Hardwood | Northern Hardwood |
| 411 | Northern Hardwood | 4119 | Mixed Northern Hardwoods | M | Northern Hardwood | Northern Hardwood |
| 421 | Planted Pines | 42130 | Planted Scotch Pine | MC | Planted Pines | Planted Mixed Pines |
| 421 | Planted Pines | 42140 | Planted Mixed Pine | MC | Planted Pines | Planted Mixed Pines |
| 421 | Planted Pines | 42141 | Planted Mixed Pine, Mixed Deciduous | MC | Planted Pines | Planted Mixed Pines |
| 422 | Natural Pines | 42250 | Pine, Oak | MC | Natural Pines | Natural Mixed Pines |
| 422 | Natural Pines | 42260 | Natural Pine, Mixed Deciduous | MC | Natural Pines | Natural Mixed Pines |
| 422 | Natural Pines | 42290 | Natural Mixed Pine | MC | Natural Pines | Natural Mixed Pines |
| 423 | Other Upland Conifers | 42380 | Non Pine Upland Conifer, Mixed Deciduous | MC | Upland Conifers | Upland Conifers |
| 423 | Other Upland Conifers | 42390 | Mixed Non-Pine Upland Conifers | MC | Upland Conifers | Upland Conifers |
| 429 | Mixed Upland Conifers | 429 | Mixed Upland Conifers | MC | Upland Conifers | Upland Conifers |
| 419 | Mixed Upland Deciduous | 4190 | Mixed Upland Deciduous with Cedar | MD | Mixed Upland Deciduous | Mixed Upland Deciduous |
| 419 | Mixed Upland Deciduous | 4191 | Mixed Upland Deciduous with Conifer | MD | Mixed Upland Deciduous | Mixed Upland Deciduous |
| 419 | Mixed Upland Deciduous | 4192 | Mixed Southern Upland Deciduous | MD | Mixed Upland Deciduous | Mixed Upland Deciduous |
| 419 | Mixed Upland Deciduous | 4199 | Other Mixed Upland Deciduous | MD | Mixed Upland Deciduous | Mixed Upland Deciduous |
| 623 | Emergent Wetland | 623 | Emergent Wetland | N | Emergent Wetland | Marsh |
| 623 | Emergent Wetland | 6230 | Cattail | N | Emergent Wetland | Marsh |
| 623 | Emergent Wetland | 6231 | Phragmites | N | Emergent Wetland | Marsh |
| 623 | Emergent Wetland | 6232 | Wet Prairie | N | Emergent Wetland | Marsh |
| 623 | Emergent Wetland | 6233 | Wet Meadow | N | Emergent Wetland | Marsh |
| 623 | Emergent Wetland | 6239 | Mixed Emergent Wetland | N | Emergent Wetland | Marsh |
| 730 | Mud Flats | 730 | Mud Flats | Y | Sand, Soil | Sand, Soil |
| 412 | Oak Types | 4120 | Oak, Hickory | O | Oak | Oak |

| | | | | | | |
|-----|---------------------------|--------------|--|-----------|---------------------|---------------------------------|
| 412 | Oak Types | 4121 | Oak, Aspen | O | Oak | Oak |
| 412 | Oak Types | 4122 | Oak, Pine | O | Oak | Oak |
| 412 | Oak Types | 4123 | Red Oak | O | Oak | Oak |
| 412 | Oak Types | 4124 | Red with White Oak | O | Oak | Oak |
| 412 | Oak Types | 4125 | Black, N. Pin Oak | O | Oak | Oak |
| 412 | Oak Types | 4126 | White, Black, N. Pin Oak | O | Oak | Oak |
| 412 | Oak Types | 4129 | Mixed Oak | O | Oak | Oak |
| 611 | Lowland Deciduous Forest | 6111 | Lowland Balsam Poplar | P | Lowland Deciduous | Lowland Aspen/Bals Poplar |
| 611 | Lowland Deciduous Forest | 6112 | Lowland Aspen | P | Lowland Deciduous | Lowland Aspen/Bals Poplar |
| 612 | Lowland Coniferous Forest | 612 | Lowland Coniferous Forest | Q | Lowland Conifers | Lowland Conifers |
| 612 | Lowland Coniferous Forest | 6123 | Lowland Fir | Q | Lowland Conifers | Lowland Conifers |
| 612 | Lowland Coniferous Forest | 6124 | Lowland Spruce-Fir | Q | Lowland Conifers | Lowland Conifers |
| 612 | Lowland Coniferous Forest | 6125 | Lowland Black Spruce, Jack Pine | Q | Lowland Conifers | Lowland Conifers |
| 612 | Lowland Coniferous Forest | 6128 | Lowland Coniferous, Mixed Deciduous | Q | Lowland Conifers | Lowland Conifers |
| 612 | Lowland Coniferous Forest | 6129 | Mixed Coniferous Lowland Forest | Q | Lowland Conifers | Lowland Conifers |
| 421 | Planted Pines | 42110 | Planted Red Pine | R | Red Pine | Red Pine |
| 421 | Planted Pines | 42111 | Planted Red Pine, Mixed Deciduous | R | Red Pine | Red Pine |
| 422 | Natural Pines | 42210 | Natural Red Pine | R | Red Pine | Red Pine |
| 422 | Natural Pines | 42211 | Natural Red Pine, Mixed Deciduous | R | Red Pine | Red Pine |
| 612 | Lowland Coniferous Forest | 6122 | Black Spruce | S | Lowland Conifers | Lowland Spruce/Fir |
| 423 | Other Upland Conifers | 42300 | Planted Larch | T | Upland Conifers | Tamarack |
| 423 | Other Upland Conifers | 42301 | Planted Larch, Mixed Deciduous | T | Upland Conifers | Tamarack |
| 612 | Lowland Coniferous Forest | 6121 | Tamarack | T | Lowland Conifers | Tamarack |
| 320 | Upland Shrub | 320 | Upland Shrub | U | Upland Shrub | Upland Shr |
| 320 | Upland Shrub | 3201 | Sweet Fern | U | Upland Shrub | Upland Shr |
| 320 | Upland Shrub | 3202 | Autumn Olive/Honeysuckle | U | Upland Shrub | Upland Shr |
| 320 | Upland Shrub | 3203 | Upland Blueberry | U | Upland Shrub | Upland Shr |
| 320 | Upland Shrub | 3204 | Mast Producing Shrub | U | Upland Shrub | Upland Shr |
| 320 | Upland Shrub | 3205 | Mixed Upland Shrub | U | Upland Shrub | Upland Shr |
| 330 | Low-Density Trees | 330 | Low-Density Trees | U | Low-Density Trees | Low-Densit Trees |
| 330 | Low-Density Trees | 3301 | Low Density Deciduous Trees | U | Low-Density Trees | Low-Densit Trees |
| 330 | Low-Density Trees | 3302 | Low Density Conifer Trees | U | Low-Density Trees | Low-Densit Trees |
| 330 | Low-Density Trees | 3303 | Mixed Low Density Trees | U | Low-Density Trees | Low-Densit Trees |
| 43 | Upland Mixed Forest | 4310 | Pine, Oak Mix | UM | Upland Mixed Forest | Upland Mix Forest |

| | | | | | | |
|-----|---|--------------|---|-----------|-------------------------|------------------------|
| 43 | Upland Mixed Forest | 4311 | Pine, Aspen Mix | UM | Upland Mixed Forest | Upland Mixed Forest |
| 43 | Upland Mixed Forest | 4319 | Mixed Upland Forest | UM | Upland Mixed Forest | Upland Mixed Forest |
| 622 | Lowland Shrub | 6225 | Bog | V | Lowland Shrub | Bog |
| 421 | Planted Pines | 42100 | Planted White Pine Planted White Pine, Mixed | W | White Pine | White Pine |
| 421 | Planted Pines | 42101 | Deciduous | W | White Pine | White Pine |
| 422 | Natural Pines | 42200 | Natural White Pine Natural White Pine, Mixed | W | White Pine | White Pine |
| 422 | Natural Pines | 42201 | Deciduous | W | White Pine | White Pine |
| 612 | Lowland Coniferous Forest | 6127 | Lowland Pine | Q | Lowland Conifers | Lowland Conifers |
| 11 | Low Intensity Urban | 11 | Low Intensity Urban | X | Low Intensity Urban | Urban |
| 121 | Airport | 121 | Airport | X | Airport | Urban |
| 122 | Road/Parking Lot | 122 | Road/Parking Lot | X | Road/Parking Lot | Urban |
| 123 | Other High Intensity Urban | 123 | Other High Intensity Urban | X | High Intensity Urban | Urban |
| 760 | Non-stocked Forest Other Bare/Sparsely | 760 | Non-stocked Forest Other Bare/Sparsely | X | Non-stocked Forest | Urban Bare/Sparsely |
| 790 | Vegetated | 790 | Vegetated | X | Bare/Sparsely Vegetated | Vegetated |
| 710 | Sand, Soil | 710 | Sand, Soil | Y | Sand, Soil | Sand, Soil |
| 50 | Water | 50 | Water | Z | Water | Water |
| 621 | Floating Aquatic | 621 | Floating Aquatic | Z | Floating Aquatic | Water |

IFMAP Classification Rules

| |
|---|
| <p>IF GREATER THAN 10% of the land area is covered with man-made structures including parking lots and paved or gravel roads THEN</p> <p>Urban (1)</p> <p>IF URBAN and GREATER THAN >25% of the land area is solid impervious cover from man-made materials THEN</p> <p>High Intensity Urban (12)</p> <p>IF High Intensity Urban within airport grounds including runways THEN</p> <p>Airport (121)</p> <p>IF High Intensity Urban, NOT Airport, but IS road or parking lot THEN</p> <p>Road/Parking Lot (122)</p> <p>ELSE (is High Intensity Urban but not above)</p> <p>Other High Intensity Urban (123)</p> <p>ELSE (i.e. URBAN and LESS THAN 25% is solid impervious cover)</p> <p>Low Intensity Urban (11)</p> |
| <p>ELSE IF land area has > 75% open water THEN</p> <p>Water (5)</p> <p>Water (50)</p> |
| <p>ELSE IF the vegetation is intensively managed for vegetation production excluding forestry THEN</p> <p>Agriculture (2)</p> <p>IF AGRICULTURE and LESS THAN 25% of the vegetation is woody THEN</p> <p>Herbaceous Agriculture (21)</p> <p>IF Herbaceous Agriculture is tilled for crop production THEN</p> <p>Cropland (211)</p> <p>IF Cropland and LESS THAN 25% of land area is vegetated THEN</p> <p>Non-vegetated Farmland (2111)</p> <p>IF Cropland and GREATER THAN 25% vegetated, and vegetation is annual crops planted in rows (e.g. corn, soybeans, etc) THEN</p> <p>Row Crops (2112)</p> <p>IF Cropland, not above, and vegetation is used for fodder production, alfalfa and hay, THEN</p> <p>Forage Crops (2113)</p> <p>ELSE Other Cropland (2114)</p> <p>ELSE IF Herbaceous Agriculture and vegetation is not tilled (includes pasture) THEN</p> <p>Non-tilled Herbaceous Agriculture (212)</p> <p>ELSE (Agriculture and GREATER THAN 25% of the vegetation is woody) THEN</p> <p>Non Herbaceous Agriculture (22)</p> <p>IF woody trees are grown for Christmas tree production THEN</p> <p>Christmas trees (221)</p> <p>ELSE Orchards/Vineyards/Nursery (222)</p> |
| <p>ELSE IF the ground area is LESS THAN 25% vegetated THEN</p> <p>Bare / Sparsely Vegetated (7)</p> <p>IF formed from sand or bare soil THEN</p> <p>Sand, Soil (710)</p> <p>ELSE IF formed from solid rock THEN</p> <p>Exposed Rock (720)</p> <p>ELSE IF periodically flooded THEN</p> <p>Mud Flats (730)</p> <p>ELSE Other Bare/Sparsely Vegetated (790)</p> |
| <p>ELSE IF LESS THAN 25% of the ground is covered by tree canopy AND there is no evidence of flooding during the past 5 years AND NOT supporting lowland indicator plants THEN</p> <p>Upland Openland (3)</p> <p>IF maintained for recreational purposes THEN</p> <p>Parks and Golf Courses (350)</p> |
| <p>ELSE IF GREATER THAN 15% of the ground is covered by tree canopy then</p> <p>Low-Density Trees (330)</p> <p>IF AT LEAST 60% tree canopy is in Deciduous species THEN</p> <p>Low Density Deciduous Trees (3301)</p> <p>ELSE IF AT LEAST 60% tree canopy is in Coniferous species then</p> <p>Low Density Coniferous Trees (3302)</p> <p>ELSE IF low density trees but not above THEN</p> |

Mixed Low Density Trees (3303)

ELSE IF the combination of woody shrubs/trees total GREATER THAN 25% of the canopy THEN
Upland Shrub (320)
IF AT LEAST 25% of the ground is covered by sweet fern THEN
Sweet Fern (3210)
ELSE IF AT LEAST 50% of the ground is covered by autumn olive/honeysuckle THEN
Autumn Olive/Honeysuckle (3202)
ELSE IF AT LEAST 50% of the ground is covered by blueberry THEN
Upland Blueberry (3203)
ELSE IF AT LEAST 25% of the ground is covered by mast producing shrubs
(cherry spp., juneberry, hazel, dogwood, hawthorn, wild plum) THEN
Mast Producing Shrub (3204)
ELSE **Mixed Upland Shrub (3205)**

ELSE IF LESS THAN OR EQUAL TO 25% of the canopy is in woody shrubs or trees THEN
Herbaceous Openland (310)
IF the ground cover is AT LEAST 60% poverty grass, sweet fern, blueberry, and/or
cladonia THEN **Poverty Grass, Cladonia (3101)**
ELSE IF AT LEAST 60% of the herbaceous cover is grass THEN
Grass (3102)
IF AT LEAST 60% of the herbaceous cover is cool season grass/
legume (orchard grass, fescue, timothy, clover, vetch) THEN
Cool Season Grass (31021)
ELSE **Warm Season Grass (31022)**
ELSE IF AT LEAST 60% of the herbaceous cover is bracken fern, strawberry, or
raspberry/blackberry then
Rubus-Fern (3103)
ELSE IF AT LEAST 60% of the ground cover is exposed gravel or sand, spotted
knapweed, St John's-wort, or other invasive exotics THEN
Degraded (3104)
ELSE **Mixed Upland Herbaceous (3105)**

ELSE IF LESS THAN 25% of the ground is covered by tree canopy AND either there IS evidence
of flooding during the past 5 years OR supporting lowland indicator plants THEN

Non-forested Wetlands (62)

IF AT LEAST 60% of the non-water ground cover is floating aquatic vegetation THEN
Floating Aquatic (621)

ELSE IF AT LEAST 60% of the non-water ground cover is shrub THEN
Lowland Shrub (622)
IF AT LEAST 60% of the cover is Alder (*alnus*) or Willow (*salix*) THEN
Alder/Willow (6220)
ELSE IF AT LEAST 60% is Shrubby cinquefoil (*Potentilla fruticosa*),
Dogwood (*Cornus*), Willow (*Salix*), Sedge (*Carex*) and/or Sphagnum/Peat
moss (*Sphagnum*) then
Fen (6221)
ELSE IF AT LEAST 30% is Dogwood (*Cornus*) and/or Michigan Holly
(*Ilex verticillata*) THEN
Shrub-Carr (6222)
ELSE IF AT LEAST 30% Button bush (*Cepalanthus*), Water Plantain
(*Alisma*), Smartweed (*Polygonum*), Cattail (*Typha*) THEN
Inundated Shrub Swamp (6223)
ELSE IF AT LEAST 30% is evergreen shrubs, Sphagnum/Peat moss
(*Sphagnum*) THEN bog
IF AT LEAST 10% of the cover is trees THEN
Treed Bog (6224)
ELSE
Bog (6225)
ELSE **Mixed Lowland Shrub (6229)**

ELSE IF AT LEAST 60% of the non-water ground cover is non-woody vegetation THEN

Emergent Wetland (623)

IF AT LEAST 60% of the cover is cattail (*typha spp*) THEN
Cattail (6230)
ELSE IF AT LEAST 60% *Phragmites* THEN
Phragmites (6231)

ELSE IF AT LEAST 30% native warm season grasses including Big bluestem, Little bluestem, Broom sedge (*Andropogon spp.*), Indian grass (*Sorghastrum nutans*) THEN
Wet Prairie (6232)

ELSE IF AT LEAST 60% is sedges and grasses including Sedge (*Carex*), Bulrush (*Scirpus*), Reed grass (*Calamagrostis*), Reed canary grass (*Phalaris arundinaceae*), native warm season grasses (see above) THEN
Wet Meadow (6233)

ELSE **Mixed Emergent Wetland (6239)**

ELSE **Mixed Non-Forest Wetland (629)**

ELSE IF AT LEAST 25% of the ground is covered by tree crowns - FOREST

IF NO evidence of flooding during the past 5 years AND not supporting lowland indicator plants THEN

Upland Forest (4)

IF AT LEAST 60% of the tree canopy is deciduous THEN

Upland Deciduous Forest (41)

IF AT LEAST 60% is Maple + Beech + Basswood + White Ash + Cherry + Yellow Birch THEN

Northern Hardwood (411)

IF AT LEAST 80% is Sugar Maple + Basswood + White Ash + Cherry THEN

Sugar Maple Association (4110)

ELSE IF AT LEAST 60% is (Sugar Maple + Basswood) AND AT LEAST 10% is (Beech + Oak) THEN

Sugar Maple, Hard Mast Association (4111)

ELSE IF AT LEAST 80% is Maple spp + Beech + Cherry THEN

Maple Association (4112)

ELSE IF AT LEAST 60% is Beech + Hemlock THEN

Beech, Hemlock (4114)

ELSE IF AT LEAST 20% is Yellow Birch + Hemlock THEN

Yellow Birch, Hemlock (4115)

ELSE IF AT LEAST 50% is Red Maple AND AT LEAST 20% is Conifer THEN

Red Maple, Conifer (4113)

ELSE IF AT LEAST 20% is Pine THEN

Mixed Northern Hardwood-Pine (4117)

ELSE IF AT LEAST 20% Aspen spp. THEN

Mixed Northern Hardwood-Aspen (4116)

ELSE **Mixed Northern Hardwoods (4119)**

ELSE IF AT LEAST 60% Oak THEN

Oak Type (412)

IF AT LEAST 15% Hickory THEN

Oak, Hickory (4120)

ELSE IF AT LEAST 30% Pine THEN

Oak, Pine (4122)

ELSE IF AT LEAST 30% Aspen spp. THEN

Oak, Aspen (4121)

ELSE IF AT LEAST 40% Red Oak THEN Red Oak types

IF AT LEAST 20% White Oak THEN

Red with White Oak (4124)

ELSE

Red Oak (4123)

ELSE IF AT LEAST 40% Northern Pin Oak + White Oak + Black Oak THEN
Other Oaks

IF AT LEAST 20% White Oak THEN

White, Black, Northern Pin Oak (4126)

ELSE

Black, Northern Pin Oak (4125)

ELSE **Mixed Oak (4129)**

ELSE IF AT LEAST 40% Aspen Species THEN

Aspen Type (413)

IF AT LEAST 20% Conifer THEN Aspen, Conifer

IF AT LEAST 20% Cedar THEN

Aspen, Cedar (4135)

ELSE IF AT LEAST 20% Spruce or Fir THEN

Aspen, Spruce/Fir (4134)

ELSE IF AT LEAST 20% Pine THEN Aspen, Pine
 IF Jack Pine IS GREATER THAN OR EQUAL TO
 White Pine + Red Pine THEN
 Aspen, Jack Pine (4132)
 ELSE
 Aspen, Mixed Pine (4133)
 ELSE
 Aspen, Mixed Conifer (4136)
 ELSE IF AT LEAST 20% Oak THEN
 Aspen, Mixed Oak (4131)
 ELSE IF AT LEAST 60% Aspen THEN
 Aspen (4130)
 ELSE IF AT LEAST 20% Birch spp. THEN
 Aspen, Birch (4137)
 ELSE
 Aspen, Mixed Deciduous (4139)

ELSE IF AT LEAST 60% any other single species (like paper birch) THEN
 Other Upland Deciduous (4140)
 ELSE
 Mixed Upland Deciduous (419)
 ELSE IF AT LEAST 20% Northern White Cedar THEN
 Mixed Upland Deciduous with Cedar (4190)
 ELSE IF AT LEAST 20% Coniferous THEN
 Mixed Upland Deciduous with Conifer (4191)
 ELSE IF primarily southern michigan species THEN
 Mixed Southern Upland Deciduous (4192)
 ELSE IF AT LEAST 60% aspen spp. and paper birch THEN
 Birch, Aspen (4193)
 ELSE
 Other Mixed Upland Deciduous (4199)

ELSE IF AT LEAST 60% of the tree canopy is coniferous THEN
 Upland Coniferous Forest (42)
 IF AT LEAST 60% of the tree canopy is Pine THEN Pines
 IF Plantation THEN
 Planted Pine (421)
 IF AT LEAST 60% is White Pine THEN
 Planted White Pine
 IF AT LEAST 20% Deciduous THEN
 Planted White Pine, Mixed Deciduous (42101)
 ELSE
 Planted White Pine (42100)
 ELSE IF AT LEAST 60% Red Pine THEN
 Planted Red Pine
 IF AT LEAST 20% Deciduous THEN
 Planted Red Pine, Mixed Deciduous (42111)
 ELSE
 Planted Red Pine (42110)
 ELSE IF AT LEAST 60% Jack Pine THEN
 Planted Jack Pine
 IF AT LEAST 20% Deciduous THEN
 Planted Jack Pine, Mixed Deciduous (42121)
 ELSE
 Planted Jack Pine (42120)
 ELSE IF AT LEAST 60% Scotch Pine THEN
 Planted Scotch Pine (42130)
 IF AT LEAST 20% Deciduous THEN
 Planted Mixed Pine, Mixed Deciduous (42141)
 ELSE
 Planted Mixed Pine (42140)

ELSE non-planted THEN
 Natural Pine (422)
 IF AT LEAST 30% Oak THEN
 Pine-Oak (42250)
 ELSE IF AT LEAST 60% White Pine THEN
 Natural White Pine
 IF AT LEAST 30% Deciduous THEN
 Natural White Pine, Mixed Deciduous (42201)
 ELSE
 Natural White Pine (42200)
 ELSE IF AT LEAST 60% Red Pine THEN
 Natural Red Pine

IF AT LEAST 30% Deciduous THEN
Natural Red Pine, Mixed Deciduous (42211)
 ELSE **Natural Red Pine (42210)**
 ELSE IF AT LEAST 60% Jack Pine THEN
Natural Jack Pine
 IF AT LEAST 30% Deciduous THEN
Natural Jack Pine, Mixed Deciduous (42221)
 ELSE **Natural Jack Pine (42220)**
 IF AT LEAST 30% Deciduous THEN
Natural Mixed Pine, Mixed Deciduous (42260)
 ELSE **Natural Mixed Pine (42290)**

ELSE IF AT LEAST 60% Non-Pine (Other) Upland Conifers THEN
Non-Pine (Other) Upland Conifers (423)
 IF Plantation THEN
 IF AT LEAST 60% Larch THEN
Planted Larch
 IF AT LEAST 20% Deciduous THEN
Planted Larch, Mixed Deciduous (42301)
 ELSE **Planted Larch (42300)**
 ELSE IF AT LEAST 60% Spruce THEN
Planted Spruce
 IF AT LEAST 20% Deciduous THEN
Planted Spruce Mixed Deciduous (42311)
 ELSE **Planted Spruce (42310)**

ELSE non-planted THEN
 IF AT LEAST 50% Hemlock THEN
Upland Hemlock (42350)
 ELSE IF AT LEAST 60% Spruce THEN
Upland Spruce (42320)
 ELSE IF AT LEAST 60% Fir THEN
Upland Fir (42330)
 ELSE IF AT LEAST 60% Spruce + Fir THEN
Upland Spruce/Fir (42340)
 ELSE IF AT LEAST 60% Cedar THEN UPLAND CEDAR
 IF AT LEAST 20% Aspen spp. THEN
Upland Cedar, Aspen (42370)
 ELSE **Upland Cedar (42360)**
 ELSE IF AT LEAST 30% Deciduous THEN
Non-Pine Upland Conifer, Mxd Deciduous (42380)
 ELSE **Mixed Non-Pine Upland Conifers (42390)**

ELSE **Mixed Upland Conifers (429)**

ELSE **Upland Mixed Forest (43)**
 ELSE IF AT LEASE 70% Pine and Oak species THEN
Pine, Oak Mix (4310)
 ELSE IF AT LEASE 70% Pine and Aspen species THEN
Pine, Aspen Mix (4311)
 ELSE IF AT LEASE 40% Hemlock THEN
Hemlock, Mixed Deciduous (4312)
 ELSE **Mixed Upland Forest (4319)**

ELSE IF evidence of flooding during the past 5 years OR supporting lowland indicator plants THEN

Lowland Forest (61)
 IF AT LEAST 60% of the tree canopy is deciduous THEN
Lowland Deciduous Forest (611)
 IF AT LEAST 20% Cedar THEN
Lowland Deciduous with Cedar (6118)
 ELSE IF AT LEAST 20% Coniferous THEN
Lowland Deciduous, Mixed Coniferous (6117)
 ELSE IF AT LEAST 60% Maple spp. THEN
Lowland Maple (6113)

ELSE IF AT LEAST 60% Oak spp. THEN
Lowland Oak (6114)
 ELSE IF AT LEAST 60% Ash spp THEN
Lowland Ash (6115)
 ELSE IF AT LEAST 60% Cottonwood THEN
Cottonwood (6110)
 ELSE IF AT LEAST 60% Birch spp. THEN
Lowland Birch (6116)
 ELSE IF AT LEAST 40% Aspen + Balsam Poplar THEN
Lowland Aspen/Balsam Poplar
 IF Aspen spp % IS GREATER THAN Balsam Poplar % THEN
Lowland Aspen (6112)
 ELSE **Lowland Balsam Poplar (6111)**
 ELSE **Mixed Lowland Deciduous Forest (6119)**

ELSE IF AT LEAST 60% of the tree canopy is coniferous THEN
Lowland Coniferous Forest (612)
 IF AT LEAST 50% Cedar THEN
Lowland Cedar (6120)
 ELSE IF AT LEAST 50% Tamarack THEN
Tamarack (6121)
 ELSE IF AT LEAST 50% Black Spruce THEN
Black Spruce (6122)
 ELSE IF AT LEAST 50% Fir THEN
Lowland Fir (6123)
 ELSE IF AT LEAST 50% Spruce + Fir THEN
Lowland Spruce/Fir (6124)
 ELSE IF AT LEAST 50% Jack Pine THEN
Lowland Jack Pine (6126)
 ELSE IF AT LEAST 50% Black Spruce + Jack Pine THEN
Lowland Black Spruce, Jack Pine (6125)
 ELSE IF AT LEAST 50% Pine THEN
Lowland Pine (6127)
 ELSE IF AT LEAST 20% Deciduous THEN
Lowland Coniferous, Mixed Deciduous (6128)
 ELSE **Mixed Coniferous Lowland Forest (6129)**

ELSE **Lowland Mixed Forest (613)**
 IF AT LEAST 20% Cedar THEN
Mixed Lowland Forest with Cedar (6132)
 ELSE IF AT LEAST 60% Fir + Aspen +Balsam Poplar + Maple THEN
Fir, Aspen, Maple (6130)
 ELSE IF A LEAST 60% Hemlock + White Pine + Maple + Birch THEN
Hemlock, White Pine, Maple, Birch (6131)
 ELSE **Mixed Lowland Forest (6139)**

Stands exceeding the age and/or basal area (BA) ranges listed below for their appropriate cover type are considered as having met 'Generic Silvicultural Criteria'.

| Cross-Inventory Cover Type | OI Cross-over code | Silvicultural Criteria threshold | |
|-----------------------------|--------------------|----------------------------------|---------|
| | | age* | BA |
| Aspen | A | 50 | |
| Paper Birch | B | 50 | |
| Cedar | C | 150 | |
| Lowland Deciduous | E | 80 | |
| Upland Spruce/Fir | F | 54 | |
| Hemlock | H | 150 | |
| Jack Pine | J | 60 | |
| Northern Hardwood | M | -- | 111-140 |
| Oak | O | 80 | |
| Lowland Aspen/Balsam Poplar | P | 50 | |
| Lowland Conifers | Q | 80 | |
| Red Pine | R | 80 | 171-200 |
| Lowland Spruce/Fir | S | 80 | |
| Tamarack | T | 60 | |
| White Pine | W | 100 | 171-200 |
| Local Name | I | n/a | n/a |

| Level 3 / 4 Cover Type | | Silvicultural Criteria | |
|------------------------|--|------------------------|---------|
| code | description | age* | BA |
| MC | 429 Mixed Upland Conifers | 100 | 111-140 |
| MC | 42130 Planted Scotch Pine | 1 | n/a |
| MC | 42140 Planted Mixed Pine | 80 | 141-170 |
| MC | 42141 Planted Mixed Pine, Mixed Deciduous | 80 | 141-170 |
| MC | 42250 Natural Pine, Oak | 80 | 111-140 |
| MC | 42260 Natural Mixed Pine, Mixed Deciduous | 100 | 111-140 |
| MC | 42290 Natural Mixed Pine | 100 | 111-140 |
| MC | 42380 Non-Pine Upland Conifer, Mxd Deciduous | 150 | 111-140 |
| MC | 42390 Mixed Non-Pine Upland Conifers | 150 | 111-140 |
| MD | 4190 Mixed Upland Deciduous with Cedar | 150 | 111-140 |
| MD | 4191 Mixed Upland Deciduous with Conifer | 80 | 111-140 |
| MD | 4199 Other Mixed Upland Deciduous | 80 | 111-140 |
| UM | 4310 Pine, Oak Mix | 80 | 141-170 |
| UM | 4311 Pine, Aspen Mix | 60 | n/a |
| UM | 4319 Mixed Upland Forest | 80 | 111-140 |
| LM | 6127 Lowland Pine | 100 | 111-140 |
| LM | 6130 Fir, Aspen, Maple | 80 | n/a |
| LM | 6131 Hemlock, White Pine, Maple, Birch | 100 | 111-140 |
| LM | 6132 Mixed Lowland Forest with Cedar | 150 | n/a |
| LM | 6139 Mixed Lowland Forest | 80 | n/a |

* During the Inventory process, stands that have an age equal to the Silvicultural Criteria threshold minus two (-2) will be identified as having met Generic Silvicultural Criteria. For example: Aspen types with a First Age of "48" will be flagged as having met 'Criteria'.

Appendix D

Qualitative Description of the Forest Model Used in the Management Area Analyses for the Regional State Forest Management Plans

Introduction

A model was developed to process the Department of Natural Resources (DNR) state forest inventory data contained in this plan to project harvest acres needed to achieve balanced age-class and/or basal area distributions for most forest cover types in each management area. Acres in each cover type are divided into 10-year age class groups, and for those cover types managed by age, a target rotation age was assigned as determined by local forest managers for each management area (see the plan glossary for the definition of rotation age). Managers considered species growth habits, site productivity, forest health, economic timber value and the desired amount and type of habitat based on cover type age to assign a preferred rotation age. For example: bigtooth aspen on a moraine which has higher site productivity may be assigned a 60-year rotation compared to a 50-year rotation on a lake plain or outwash plain. Leaving it for the extra years may maximize timber value due to larger diameter trees and greater volume per acre. Also, the older stand may exhibit greater structure including snags, cavity trees, coarse woody debris and additional tree species and canopy layers. Aspen in other management areas is assigned a shorter rotation age (Midland-Isabella management area in the northern Lower Peninsula ecoregion is assigned a 40-year rotation) because site productivity or forest health issues may make it necessary to harvest before mortality results in a decline in timber value. This will also ensure adequate regeneration before aspen begins to convert to another cover type that may not provide the desired timber or habitat value.

Rotation age and the total manageable acres are used to determine a balanced distribution of acres in each 10-year age class throughout the rotation. This equal distribution level is calculated by dividing the total acres by the number of ten-year age classes in the rotation. Only acres available for management (total acres minus acres that are unavailable for harvest due to management constraints, for example, hard factor limited and minus acres currently prescribed) for each cover type in a management area were factored into the model to calculate the targeted acres for each 10-year age class. For example: if there are 600 manageable acres of aspen and the rotation length is 50 years, there will be 6 age classes in the rotation (note that as these are 10-year age classes, some aspen will not actually be considered to have met the rotation age until it is 59 years old as at the inventory 10 years earlier it would not have met criteria for harvest at the age of 49). This would result in an equal distribution of 100 acres in each 10-year age class.

As most cover types may have one or more 10-year age classes with fewer acres than the age class regulation level, it is necessary to calculate the harvest level needed create 10-year age classes that have a surplus of acres that can be shifted to the 10-year age class with fewer acres than the age-class regulation level. This correction is accomplished by harvesting both age classes at the same time which will regenerate concurrently into a new regenerated age class which is at the age class regulation level. The projected acres needed to begin the process of balancing age class distributions is calculated through the use of a model which uses data inputs from the DNR's forest inventory.

Data used in the model

State forest land is inventoried on a 10-year cycle, whereby about 10 percent of the state forest land is examined in each year - also referred to as a year-of-entry. The dataset used for the regional state forest plans includes forest inventory information ranging from a few weeks old to data collected a decade ago. The snapshot of this combined database was taken in 2012 for use as inputs into the model.

Beginning in 2003-2004, the DNR began to phase in a shift from collecting forest inventory data under the operations inventory system to a new system called Integrated Forest Monitoring Assessment and Prescriptions. The operations inventory system used basal area measurements to classify forest stand cover types with a single letter (up to 26 letters) representing the most prevalent trees in a stand. The current forest inventory system (Integrated Forest Monitoring Assessment and Prescriptions) now has 132 cover types (92 forested types and 40 non-forested types) and is based on canopy coverage to determine stand classification. A major difference between operations inventory and Integrated Forest Monitoring Assessment and Prescriptions is the inclusion of mixed stand types in the Integrated Forest Monitoring Assessment and Prescriptions classification. A crosswalk for core inventory values in both systems was built to enable a combined inventory database that could be used for purposes of analysis. It should be noted that some forest management units have completed the 10-year inventory cycle using Integrated Forest Monitoring Assessment and Prescriptions, while other forest management units are just beginning to use Integrated Forest Monitoring Assessment and Prescriptions for their inventory. This means that the data is a mixture of the two systems and will change as the transition to inventory using Integrated Forest Monitoring Assessment and Prescriptions continues. The cross-inventory dataset combines many of the Integrated Forest Monitoring Assessment and Prescriptions classifications into simplified

cover types, but also includes many mixed types that were not present in the operations inventory list. The result is a combined inventory classification list which contains 35 cover types (22 forested and 13 non-forested). This list can be found in Appendix C.

The core variables from the combined inventory database used in the analysis are:

1. Combined Inventory Adjusted Cover Type (see appendix D1)
2. Basal Area Range
3. Stand Age
4. Site Conditions (see Appendix C)
5. Generic Silvicultural Criteria (see Appendix C)

Basal Area Range

The basal area of a stand is a measurement of stem density in square feet (ft²) and is often used as a general silvicultural criteria to determine the need for harvest in cover types where partial harvests occur (oak, planted red pine and white pine, some mixed types and northern hardwoods). Stands are grouped into a range of basal area values based on an average of three basal area measurement points which may indicate a need to harvest the stand. These partial harvests enable forest managers the ability to enhance volume production, maintain forest health, and improve stand quality. The statistical validity of three sample points is very low; however, the values are placed into basal area ranges which strategically fit into the cross-inventory system at logical breaks for forest management. These ranges are identified and used to determine whether or not a given stand meets general silvicultural criteria (Table 1).

Table 1. Relationship between basal area class and general silvicultural criteria.

| Basal Area Class (Square Feet/Acre) | Relationship to General Silvicultural Criteria (GSC) |
|-------------------------------------|--|
| 0-50 | Does Not Meet GSC |
| 51-80 | Does Not Meet GSC |
| 81-110 | Does Not Meet GSC |
| 111-140 | Meets GSC - Northern Hardwood and some mixed cover types |
| 141-170 | Meets GSC - natural and planted mixed pine cover types |
| 171-200 | Meets GSC - planted Red Pine and White Pine |
| 200+ | |

Stand Age

The stand age attribute in the combined inventory database is captured during the field inventory process and can be derived in several ways. In natural stands, the default method is based on current measurements of age by stand examiners. Selection of the tree(s) to age is left to the judgment of the examiner with the following guidance: “The tree(s) should appear to be representative of the most prevalent species in the canopy, and in the co-dominant class of the canopy” as stated in Chapter 3 of the Integrated Forest Monitoring Assessment and Prescription manual. Other sources of stand age may include: planting record, treatment record, previous inventory or a remote estimate in cases of inaccessibility due to physical barriers or access issues.

Site Condition

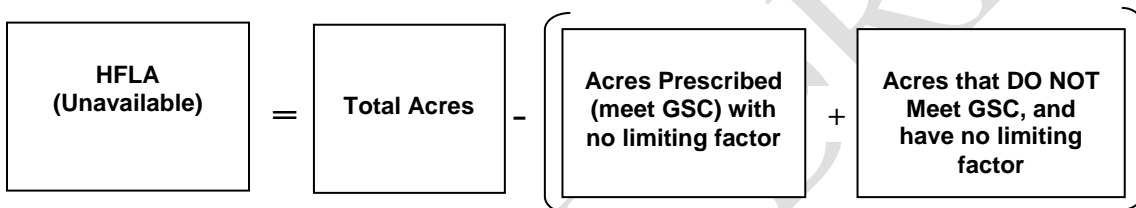
Designation of site conditions (also known as limiting factors) to areas of state managed lands allows forest managers to identify areas that are available for management. In January 2012, the “Site Conditions Module” was added to Integrated Forest Monitoring Assessment and Prescription that provided a new approach to coding site conditions across the landscape. It provides the ability to efficiently analyze the inventory data (cover type/age/basal area), identify forest areas that meet general silvicultural criteria (that not already covered by a harvest prescription), and code any appropriate constraint without being restricted to a stand boundary. In the past, only areas that met generic silvicultural criteria and were determined to be unavailable for management were assigned a site condition. This resulted in site conditions not being designated for cover types with long generic silvicultural criteria thresholds, such as cedar which is usually well below the generic silvicultural criteria age of 150 years old, but may be on sites that are too wet for management. The new module has the ability to code site condition on areas in a compartment regardless of whether they meet general silvicultural criteria. This change in protocol requires all stand examiners to “inventory” site conditions across the landscape regardless of general silvicultural criteria. In addition to assigning a site condition regardless of whether a stand

meets generic silvicultural criteria, the Integrated Forest Monitoring Assessment and Prescription system allows stand examiners to prescribe treatments for portions of stands. However, when a portion of a stand is not covered by a treatment and that acreage still meets general silvicultural criteria, it must now be coded with a site condition. The new module will drastically improve the analysis of site conditions as inventory data are updated across the state forest in the next ten years.

The operations inventory system had eight scenarios regarding site conditions, general silvicultural criteria (GSC) and prescribed harvests:

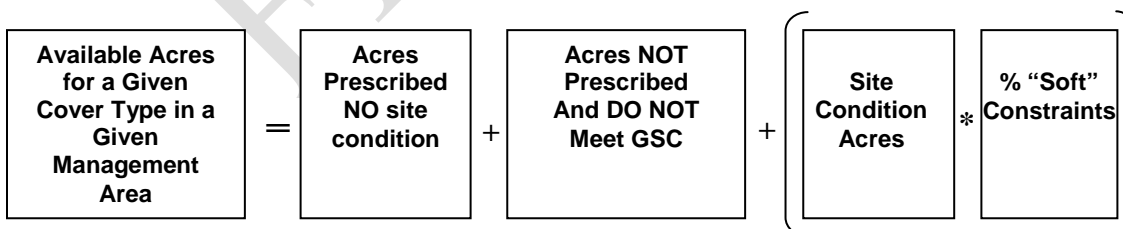
1. A stand meets GSC and it is not prescribed for a harvest - with a site condition
2. A stand meets GSC and it is not prescribed for a harvest - with no site condition
3. A stand meets GSC and is prescribed for a harvest - with no site condition
4. A stand meets GSC and is prescribed for a harvest - with a site condition.
5. A stand does not meet GSC - with a site condition
6. A stand does not meet GSC - with no site condition.
7. A stand does not meet GSC and is prescribed for harvest - with no site condition.
8. A stand does not meet GSC and is prescribed for harvest - with a site condition.

Due to the above-listed scenarios, complete data are not currently available to determine how many acres are “off the table” for active management in the context of forest planning and modeling. To account for this uncertainty in the data, the model considers acres that are unavailable (hard limited factor acres) for management by summing the acres that meet general silvicultural criteria and have no limiting factor with the acres that do not meet general silvicultural criteria and that do not have a limiting factor, and then subtracting that total from the total acres in the cover type as shown below:



A hard factor limited area is permanently unavailable for management due to reasons such as legislation, no access or management primarily for another value. However, some stands coded with a site condition should still be considered available for management, as the constraint affecting management may be able to be resolved. These are considered to be as soft factors which are not permanent given a high probability that there will be resources or means to address the constraint in the near future. Soft factors also include factors used to temporarily defer a treatment for one or two planning cycles due to specific structural characteristics of the stand or other technical reasons.

A trend analysis on the information collected through both forest inventory systems was used and the result is applied as a percentage of acres available for management (soft constraints) multiplied by acres that are captured in all site conditions. This analysis was done at the cover type level stratified by management area to help capture local trends relative to site conditions.



Generic Silvicultural Criteria

Each major forest cover type used in the model has a statewide defined age and/or basal area range, based on the characteristics of that species, which indicates that a suitable threshold for harvest has been met. In general, this may be an age where economic returns are at their maximum, or if managed by basal area, the density at which the rate of growth begins to diminish (Current Annual Increment < Mean Annual Increment).

Modeling Strategies for Cover Types Managed with Even-Aged Silvicultural Systems (Aspen, Jack Pine, Red Pine)

The model calculates the number of acres to final harvest or partial harvest over the next 10-year period to meet the following general objectives:

1. To balance the age-classes over a selected rotation age for a given cover type on the selected management area (calculated values by the model are overridden in the cases where balancing age-classes is not the primary objective, such as in cases as where there is another priority such as reducing older age class stands through immediate harvests to address a forest health issue).
2. To begin balancing the age-classes/basal area distribution over the next decade, rather than delaying for “x” number of years.

The products from the model can be demonstrated by considering an example of the aspen cover type in the Cheboygan Basin Moraines management area, where the cover type is being managed on an even-aged basis and no partial harvests are desirable. The model will first use the input for economic rotation age for the cover type (for aspen the economic rotation age is 50 years as shown in Table 2). The model will generate a red line on an age-class distribution graph (Figure 1) to show the age-class regulation acreage for a balanced age-class structure for aspen with a rotation age of 50 years. Note that the statewide default economic rotation age for each cover type is listed in Table 1. The actual height of the red line (that represents the balanced harvest area) is calculated by dividing the total available manageable acres by the number of 10-year age classes up to and including the upper age class in the rotation age. In this case, there are six age classes and the total acreage is roughly 13,860 acres. With a balanced age-class structure, the model calculates that there would be approximately 2,310 acres in each 10-year age class, as shown by the red line in Figure 1.

The model then projects the harvest acres needed based on the current acres in the regeneration class (those acres currently prescribed) as well as those acres in the 0-9 and 10-19 year age classes. Because these age classes are all below age-class regulation level, the projected harvest acres in this 10-year period will be greater than the age-class regulation level. The model will then project a final harvest of 2,636 acres over the next 10-year period to begin the process of balancing the aspen age-class distribution for the management area. This is greater than the current balanced age-class level of 2,310 acres.

The surplus acres above the age-class regulation level may be harvested later at the same time as those acres in the surrounding age classes that are below the balanced age-class level. The resulting concurrent regeneration will shift acres to bring the acres in these age classes to the level of the age-class regulation. Harvest acres will first be supplied from manageable acres in the oldest age classes above the rotation age that do not have a current prescription or a hard factor limit. Additional acres below the 50-year rotation age including those in the 30-39 year age class on better sites may be included to provide acres needed to begin balancing the age-class distribution.

Each graph displays data, as shown in the legend, for the cover type in the management area. The solid bars represent acres in each 10-year age class that are available for management. Acres currently prescribed with a final harvest in the combined inventory database are displayed in the age-class where they occur. These acres are also represented in the regeneration prescription class as regenerating acres (as they are derived from the results of regeneration harvests). Hard factor limit acres (restrictive site conditions) are also displayed and are shown in their respective age-classes representing the amount of aspen that is unavailable for active management. Partial harvests are not displayed in the example above, but would typically appear in the cover types managed based on basal area rather than age-class distribution (uneven-aged vs. even-aged management).

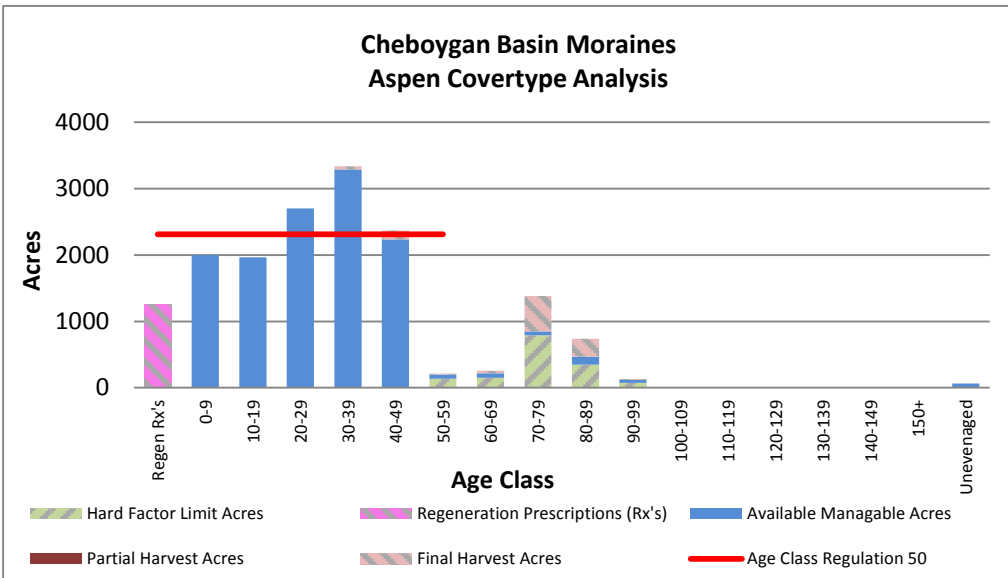


Figure 1. An example of the aspen age-class distribution graph generated by the model for the Cheboygan Basin Moraines management area.

Graphs that illustrate what the age-class distribution will look like in 10 years based on harvesting the projected acres in the current 10-year period are also produced by the model (Figure 2). However, due to the uncertainty of the future data as a result of the continued transition to the Integrated Forest Monitoring Assessment and Prescription system of data collection and the continued refinement of the amount of manageable acres through the new site condition module these graphs have not been included in the plan.

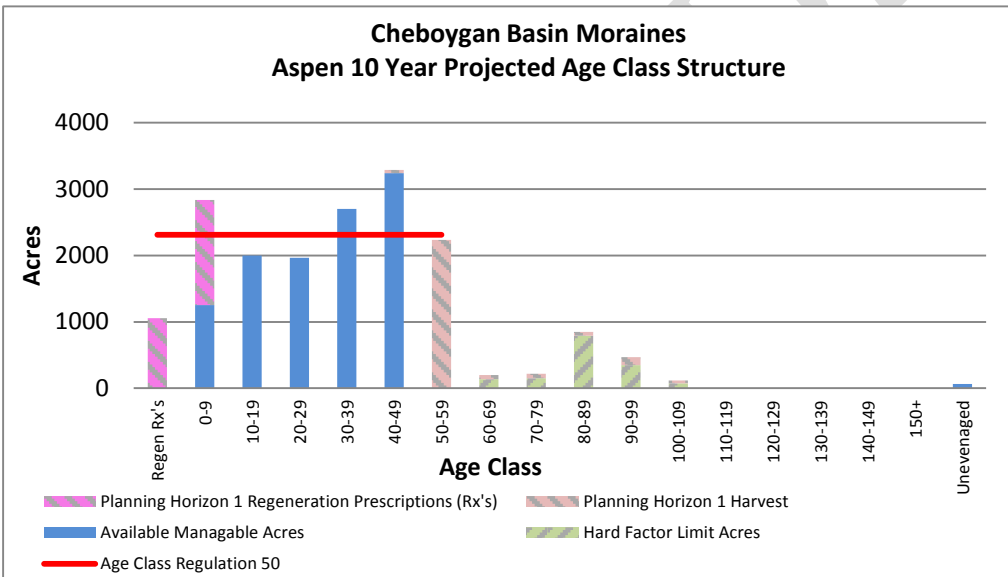


Figure 2. An example age-class structure graph for aspen in the Cheboygan Basin Moraines management area in 10 years.

Model Overrides

The model allows for a manual override from calculated values in response to alternative management strategies. The following examples are meant to illustrate examples of why the outputs from the model may need to be overridden:

Example 1: The model may project a final harvest of fewer than the age-class regulation acres of oak in the next ten years because of an excess of acres over the balanced age class level in the 0-10 age-class. However, the local staff report that the older oak resource may not survive for ten more years. Due to the management decision to maintain these areas as oak, an override value to harvest the acres in these older stands would be entered into the model and would be reflected in the management area plan.

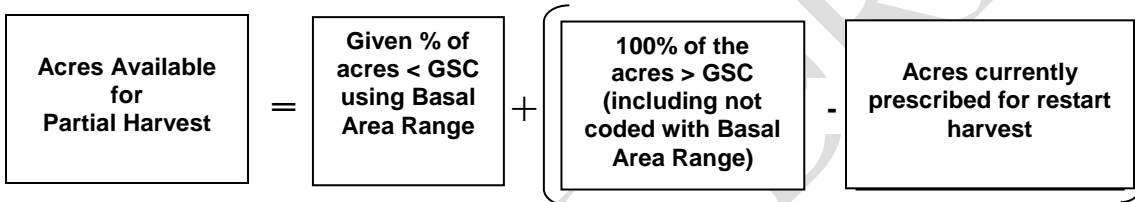
Table 2. Statewide economic rotational age of cover types if managed by age criteria

| Cover Type | Age |
|------------------------|-----|
| Aspen | 50 |
| Cedar | 150 |
| Hemlock | 150 |
| Jack Pine | 60 |
| Lowland Aspen/Balsam P | 50 |
| Lowland Conifers | 80 |
| Lowland Deciduous | 80 |
| Lowland Mixed Forest | 80 |
| Lowland Spruce/Fir | 80 |
| Mixed Upland Deciduous | 60 |
| Natural Mixed Pines | 100 |
| Northern Hardwood | NA |
| Oak | 80 |
| Paper Birch | 50 |
| Planted Mixed Pines | 80 |
| Red Pine | 80 |
| Tamarack | 60 |
| Upland Conifers | 80 |
| Upland Mixed Forest | 80 |
| Upland Spruce/Fir | 60 |
| White Pine | 100 |

Example 2: Red pine in the Emmet Moraines management area is a relatively minor component (8%) and the majority of the acreage is 20 years from rotational age. The model assumes that the objective is to begin balancing the age class now. However, local forest managers determine that it is managerially desirable to hold the red pine until it reaches the rotation age at economic maturity in 20 years. The calculated value in the model is overridden to reflect the desire to delay harvest of the acres until they reach economic maturity.

Model Strategies for Cover Types Managed with Uneven - Aged Silvicultural Systems (Oak, White Pine, Northern Hardwoods, Upland Conifers, Hemlock and some mixed types)

In stands where partial harvests are desirable prior to final harvests, the basal area range is the key attribute controlling acres recommended for treatment. The model calculates acres available for partial harvest with the following strategy:



Because the planning period is ten years and the stand basal area will increase as the stands grow over this period, it is assumed that some percentage of the stands that do not currently meet general silvicultural criteria will grow into a basal area range that meets general silvicultural criteria during the planning period. Due to coding errors, some stands which should have a basal area assigned do not; and these acres are considered as having met general silvicultural criteria.

Table 3 identifies the percentage of all acres in a given basal area range and cover type to be considered available for partial harvest treatment when attempting to balance the basal area distribution. The model also includes an override field in each pertinent cell if the local management unit deems it necessary to deviate from the standard statewide values shown below.

Table 3. Percentage of acres in a basal area class considered available for partial harvest treatment when trying to balance the basal area distribution by cover type.

| Cover Type | 1-50 | 51-80 | 81-110 | 111-140 | 141-170 | 171-200 | 200+ | not coded | Entry Period |
|------------------------|------|-------|--------|---------|---------|---------|------|-----------|--------------|
| Red Pine | | A | A | 50% | 100% | 100% | 100% | 100% | 15 |
| Oak | 25% | 33% | 100% | 100% | 100% | 100% | 100% | 100% | 20 |
| Mixed Upland Deciduous | | | | 50% | 100% | 100% | 100% | 0% | 20 |
| Upland Mixed Forest | | | | 50% | 100% | 100% | 100% | 0% | 20 |
| Upland Conifers | | | | 50% | 100% | 100% | 100% | 0% | 20 |
| Natural Mixed Pines | | | | 50% | 100% | 100% | 100% | 100% | 20 |
| Planted Mixed Pines | | | | 50% | 100% | 100% | 100% | 100% | 20 |
| Hemlock | | | | 50% | 100% | 100% | 100% | 100% | 50 |
| White Pine | | A | A | 50% | 100% | 100% | 100% | 100% | 20 |
| Northern Hardwood | | 0% | 33% | 100% | 100% | 100% | 100% | 100% | 20 |

Incorporating Model Outputs into the Management Area Plans

Table 4 is a summary table produced by the model and is inserted directly into the management area plans. The table shows a summary of forest inventory data from the combined inventory database and outputs generated from the model as the example below shows.

Table 4. Summary of current acreage, hard factor limited acreage, manageable acreage, projected harvest acreage and desired future harvest acreage by cover type for a management area generated by the model.

| Cover Type | Cover % | Current Acreage | Hard Factor Limited Acres | Manageable Acres | 10 Year Projected Harvest (Acres) | | Projected Net Change (Acres) | Projected Acreage in 10 Years | Desired Future Harvest (Acres) | |
|----------------------------------|---------|-----------------|---------------------------|------------------|-----------------------------------|-----------------|------------------------------|-------------------------------|--------------------------------|-----------------|
| | | | | | Final Harvest | Partial Harvest | | | Final Harvest | Partial Harvest |
| Aspen | 37% | 15,361 | 1,501 | 13,860 | 2,636 | | | 15,361 | 2,310 | |
| Red Pine | 11% | 4,652 | 271 | 4,381 | 1,310 | 1,427 | | 4,652 | 487 | 2,216 |
| Northern Hardwood | 7% | 2,816 | 50 | 2,766 | | 1,311 | | 2,816 | | 1,311 |
| Lowland Conifers | 6% | 2,372 | 776 | 1,596 | 177 | | | 2,372 | 177 | |
| Oak | 5% | 1,915 | 878 | 1,037 | 191 | 289 | | 1,915 | 115 | 296 |
| Cedar | 4% | 1,738 | 35 | 1,703 | 106 | | | 1,738 | 106 | |
| Lowland Aspen/Balsam Poplar | 4% | 1,695 | 865 | 830 | 264 | | | 1,695 | 139 | |
| Jack Pine | 4% | 1,684 | 430 | 1,254 | | | | 1,684 | 179 | |
| Lowland Deciduous | 3% | 1,097 | 274 | 823 | 91 | | | 1,097 | 91 | |
| Upland Open/Semi-Open Lands | 6% | 2,579 | | 2,579 | | | | 2,579 | | |
| Lowland Open/Semi-Open Lands | 6% | 2,464 | | 2,464 | | | | 2,464 | | |
| Misc Other (Water, Local, Urban) | 1% | 313 | 0 | 313 | | | | 313 | | |
| Others | 7% | 3,107 | 477 | 2,630 | 451 | 278 | | 3,107 | 302 | 567 |
| Total | | 41,793 | 5,557 | 36,236 | 5,225 | 3,305 | | 41,793 | 3,906 | 4,390 |

In Table 4, aspen acres total 15,361 of state forest in the management area or 37% of the total acreage in the management area. Of that acreage, 1,501 acres are considered to be unavailable for harvest due to site conditions (or hard factor limits) as mentioned above. This leaves the forest managers with 13,860 acres of aspen available and suggests a final harvest of 2,636 acres over the next decade to begin to balance the age class distribution. Harvesting is recommended to start with the oldest aspen and work back toward the younger age classes until the level needed to begin balancing the age-class distribution is reached. However, forest health or other local considerations may result in acres being taken from age classes other than the oldest. Because there are no conversions to other forest cover types prescribed in this management area the Projected Net Change column in Table 3 is blank. The projected acres of aspen in ten years is based on the management objective of treatments coded in the database and likewise is not projected to change. The last columns display the desired future harvest levels per 10-year planning period after this initial planning period has been implemented.

Appendix E

Forest Habitat Type (Kotar) Classifications Systems

Classification systems are needed to effectively manage forest resources. Traditionally, resource classifications have been developed only for specific uses. Forest cover types, for example, traditionally a standard unit for forest management, have serious limitations as an ecological basis for developing management prescriptions. They are based entirely on current dominant, and most often successional, tree species. Thus, stands of a given cover type encompass a wide range of environmental conditions, and therefore have different productivity potentials and respond differently to the same management techniques. Similarly, systems that classify or map landscapes based entirely on physical factors (e.g., physiographic maps or soil surveys) are inadequate for management if they do not include ecological interpretations of communities (e.g., composition, growth, dynamics) that are associated with individual physical landscape units.

A system that delineates and explains some basic ecological units is needed to place management on an ecological foundation. This habitat classification system uses natural vegetation (potential as well as current) to recognize ecologically equivalent vegetation communities and landscape units.

The Forest Habitat Type (Kotar) Classification System is a site classification system based on the identification of repeatable patterns in the composition of the understory vegetation. It is a system based on the study of floristic composition of vegetation that groups communities and their environments into categories useful for management interpretation. The habitat types are developed independently from the current tree species composition and condition, and can be applied to most upland forest stands.

The Kotar classifications for each ecoregion are listed below.

Western Upper Peninsula Ecoregion Habitat Types

| Habitat Type | Name | Primary Landform and Soils |
|---------------------|--|--|
| PVCx/PVDc | White pine/Blueberry – Hairgrass and White pine/Blueberry - Sedge | Excessively drained sandy soils on outwash plains. |
| PQE | White pine – Red Oak/Trailing arbutus | Deep sandy soils on outwash and lacustrine deposits or shallow soils over bedrock. |
| PArV | White Pine – Red maple/Blueberry | Excessively well drained soils of lacustrine deposits. |
| PArV(w) | White Pine – Red maple/Blueberry (Wisconsin variant) | Sands and loamy sands on glacial outwash and moraines. |
| PArVAa | White pine – Red maple/Blueberry – Wild sarsaparilla | Excessively well drained soils of lacustrine deposits. |
| PArVAa(w) | White pine – Red maple/Blueberry – Wild sarsaparilla (Wisconsin variant) | Sand to sandy loam on glacial outwash and moraines. |
| PArV-Co | White pine – Red maple/Blueberry – Bunchberry variant | Excessively well drained sands on lacustrine deposits of sand and gravel. |
| AArAst | Sugar maple – Red maple/Large-leaved aster | Sandy soils formed in coarse till and shallow till over bedrock. |
| AArLy | Sugar maple – Red maple/Stiff club-moss | Loamy soils over deep sands on coarse till deposits and thin till over bedrock. |
| AVVb | Sugar maple/Blueberry – Maple-leaved viburnum | Well drained sandy loams on rolling moraines and glaciofluvial deposits. |
| AVb | Sugar maple/Maple-leaved viburnum | Sandy loams on medium textured end moraines. |
| TMC | Eastern hemlock/Wild lily-of-the-valley – Goldthread | Somewhat poorly drained soils on a variety of landforms. |
| ATM | Sugar maple-Eastern hemlock/Wild lily-of-the-valley | Loamy sand and sandy loam soils on end moraines and outwash covered moraines. |

| | | |
|--------|--|--|
| ATM-Sm | Sugar maple-Eastern hemlock/Wild lily-of-the-valley – False Solomon's seal variant | Loamy sand and sands on medium and coarse texture tills. |
| ATM-O | Sugar maple-Eastern hemlock/Wild lily-of-the-valley – Sweet cicely variant | Sandy loam soils over clay on clay and lacustrine deposits. |
| ATFAs | Sugar maple-Eastern hemlock-American beech/Jack-in-the-pulpit | Sandy soils with subsurface clayey, gravelly or cemented layers. |
| ATD | Sugar maple-Eastern hemlock/Spinulose shield fern | Loamy soils on coarse textured till and loess. |
| ATD-Hp | Sugar maple-Eastern hemlock/Spinulose shield fern-Sharp-lobed hepatica variant | Sandy soils with subsurface clayey, gravelly or cemented layers on medium textured glacial till. |
| ATD-Ca | Sugar maple-Eastern hemlock/Spinulose shield fern-Blue cohosh variant | Loamy cap soils on clay deposits |
| AOCa | Sugar maple/Sweet cicely - Blue cohosh | Well drained loamy till and loess |

Eastern Upper Peninsula Ecoregion Habitat Types

| Habitat Type | Name | Primary Landforms and Soils |
|--------------|--|--|
| PVE | White pine/Blueberry – Trailing arbutus | Excessively drained soils on lacustrine deposits of sand and gravel. |
| PARv | White pine - Red maple/Blueberry | Excessively drained to well drained soils on deep lacustrine deposits of sand and gravel. |
| PARV-Ao | White pine – Red maple/Blueberry – Spreading dogbane variant | Excessively drained to somewhat excessively drained soils on glacial outwash. |
| PARVAa | White pine – Red maple/Blueberry – Wild sarsaparilla | Excessively to well drained sandy soils on deep lacustrine deposits of sand and gravel. |
| ATFD | Sugar maple – Eastern hemlock – American beech/Spinulose shield fern | Well to moderately well drained deep sands and loamy sands on outwash, lacustrine deposits, glacial till and end moraines. |
| AFPo | Sugar maple – American beech/Hairy Solomon's seal | Well to somewhat excessively drained deep sands and loamy sands on a variety of landforms. Gravelly, cemented and mottled layers are common. |
| AFOAs | Sugar maple – American beech/Sweet cicely – Jack-in-the-pulpit | Moderately well to somewhat excessively drained soils on end moraines and till plains. Gravelly, cemented and mottled layers are common. Also, thin till over bedrock. |

Northern Lower Peninsula Ecoregion Habitat Types

| Habitat Type | Name | Primary Landforms and Soils |
|--------------|--|---|
| PVCd | White pine/Blueberry – Reindeer lichen | Sandy outwash plains, very dry/very poor nutrient. |
| PARVHa | White pine – Red maple/Blueberry – Witch hazel | Level plains and gentle slopes, associated with glacial outwash plains, sandy beach ridges and coarse textured moraines, very dry to dry/poor nutrient. |
| PARVVb | White pine – Red maple/Blueberry – Maple- | Beach ridges along Lake Huron, dry to dry-mesic/poor to medium nutrient. |

| | | |
|--------|---|--|
| | leaved viburnum | |
| AFO | Sugar maple – American beech/Sweet cicely | Coarse textured end moraines, ground moraines, outwash plains, till plains and undifferentiated end moraine – ground moraine complexes. Mesic/medium to rich nutrient. |
| AFOCa | Sugar maple – American beech/Sweet cicely – Blue cohosh | End moraine, drumlins and ground moraines. Mesic/rich to very rich nutrient. |
| PArVCo | White pine – Red maple/Blueberry – Bunchberry | Poorly drained outwash sands. Mesic to wet-mesic/poor nutrient. |

FINAL DRAFT

Appendix F

High Priority Trout Streams

| Management Unit | Management Area | Compartment | Stream Name |
|-----------------|----------------------------------|-------------|--------------------------|
| Newberry | 8 Mile Corner | 85 | Tahquamenon |
| Newberry | 8 Mile Corner | 86 | Tahquamenon |
| Newberry | 8 Mile Corner | 90 | Tahquamenon |
| Newberry | 8 Mile Corner | 102 | Tahquamenon |
| Newberry | County Line Hardwoods | 125 | Tahquamenon |
| Newberry | Danaher Kingston Outwash | 93 | Tahquamenon & Manistique |
| Newberry | Danaher Kingston Outwash | 94 | Manistique |
| Newberry | Danaher Kingston Outwash | 95 | Manistique |
| Newberry | Danaher Kingston Outwash | 96 | Manistique |
| Newberry | Danaher Kingston Outwash | 97 | Manistique |
| Newberry | Deer Park | 2 | Sucker |
| Newberry | Deer Park | 3 | Two Hearted |
| Newberry | Deer Park | 7 | Two Hearted |
| Newberry | Deer Park | 8 | Two Hearted |
| Newberry | Deer Park | 15 | Two Hearted |
| Newberry | Deer Park | 30 | Two Hearted |
| Newberry | Deer Park | 31 | Two Hearted |
| Newberry | Deer Park | 34 | Two Hearted |
| Newberry | Deer Park | 35 | Two Hearted |
| Newberry | Deer Park | 36 | Two Hearted |
| Newberry | Deer Park | 37 | Two Hearted |
| Newberry | Deer Park | 38 | Undesignated |
| Newberry | Deer Park | 39 | Undesignated |
| Newberry | Deer Park | 40 | Undesignated |
| Newberry | Deer Park | 41 | Undesignated |
| Newberry | Deer Park | 42 | Undesignated |
| Newberry | Deer Park | 45 | Undesignated |
| Newberry | Fox River Complex | 98 | Manistique |
| Newberry | Fox River Complex | 100 | Manistique |
| Newberry | Sage Truck Trail | 75 | Tahquamenon |
| Newberry | Sage Truck Trail | 76 | Tahquamenon |
| Newberry | Sage Truck Trail | 135 | Tahquamenon |
| Newberry | Tahquamenon Basin Wetlands | 70 | Tahquamenon |
| Newberry | Tahquamenon Basin Wetlands | 73 | Tahquamenon |
| Newberry | Tahquamenon Basin Wetlands | 99 | Tahquamenon |
| Newberry | Tahquamenon Basin Wetlands | 103 | Tahquamenon |
| Newberry | Tahquamenon Basin Wetlands | 104 | Tahquamenon |
| Newberry | Tahquamenon Basin Wetlands | 105 | Tahquamenon |
| Newberry | Tahquamenon Basin Wetlands | 118 | Tahquamenon |
| Newberry | Tahquamenon Basin Wetlands | 120 | Tahquamenon |
| Newberry | Tahquamenon Basin Wetlands | 121 | Tahquamenon |
| Newberry | Tahquamenon Basin Wetlands | 126 | Tahquamenon |
| Newberry | Tahquamenon Basin Wetlands | 128 | Tahquamenon |
| Newberry | Tahquamenon Basin Wetlands | 129 | Tahquamenon |
| Newberry | Tahquamenon Basin Wetlands | 130 | Tahquamenon |
| Newberry | Tahquamenon Basin Wetlands | 131 | Tahquamenon |
| Newberry | Tahquamenon River Patterned Fens | 28 | Two Hearted |
| Newberry | Tahquamenon River Patterned Fens | 84 | Tahquamenon |
| Newberry | Two Hearted Headwaters | 9 | Two Hearted |
| Newberry | Two Hearted Headwaters | 10 | Two Hearted |
| Newberry | Two Hearted Headwaters | 16 | Two Hearted |
| Newberry | Two Hearted Headwaters | 20 | Two Hearted |
| Newberry | Two Hearted Headwaters | 21 | Two Hearted |
| Newberry | Two Hearted Headwaters | 22 | Two Hearted |
| Newberry | Whitefish Vermillion Point | 53 | Undesignated |

| Management Unit | Management Area | Compartment | Stream Name |
|------------------|----------------------------|-------------|-------------------------|
| Newberry | Whitefish Vermillion Point | 54 | Undesignated |
| Newberry | Whitefish Vermillion Point | 55 | Undesignated |
| Newberry | Whitefish Vermillion Point | 57 | Undesignated |
| Newberry | Whitefish Vermillion Point | 62 | Undesignated |
| Newberry | Whitefish Vermillion Point | 63 | Undesignated |
| Sault Ste. Marie | Carp River Red Pine | 102 | Brevoort |
| Sault Ste. Marie | Carp River Red Pine | 103 | Brevoort |
| Sault Ste. Marie | Carp River Red Pine | 104 | Carp |
| Sault Ste. Marie | Carp River Red Pine | 105 | Carp |
| Sault Ste. Marie | Carp River Red Pine | 106 | Carp |
| Sault Ste. Marie | Carp River Red Pine | 107 | Carp |
| Sault Ste. Marie | Carp River Red Pine | 108 | Carp |
| Sault Ste. Marie | Carp River Red Pine | 109 | Carp |
| Sault Ste. Marie | Carp River Red Pine | 116 | Carp |
| Sault Ste. Marie | Carp River Red Pine | 117 | Brevoort & Undesignated |
| Sault Ste. Marie | Carp River Red Pine | 118 | Brevoort |
| Sault Ste. Marie | Huron Patterned Outcrop | 20 | Undesignated |
| Sault Ste. Marie | Lake Michigan Shoreline | 101 | Brevoort |
| Sault Ste. Marie | Lake Michigan Shoreline | 143 | Undesignated |
| Sault Ste. Marie | Lake Michigan Shoreline | 161 | Undesignated |
| Sault Ste. Marie | Lake Michigan Shoreline | 162 | Undesignated |
| Sault Ste. Marie | Mackinac Mix | 111 | Carp |
| Sault Ste. Marie | Mackinac Mix | 112 | Brevoort & Carp |
| Sault Ste. Marie | Mackinac Mix | 113 | Brevoort & Carp |
| Sault Ste. Marie | Mackinac Mix | 114 | Brevoort & Carp |
| Sault Ste. Marie | Mackinac Mix | 115 | Brevoort & Carp |
| Sault Ste. Marie | Mackinac Mix | 119 | Brevoort & Carp |
| Sault Ste. Marie | Mackinac Mix | 122 | Brevoort & Undesignated |
| Sault Ste. Marie | Mackinac Mix | 123 | Brevoort |
| Sault Ste. Marie | Mackinac Mix | 124 | Brevoort & Carp |
| Sault Ste. Marie | Mackinac Mix | 125 | Brevoort |
| Sault Ste. Marie | Mackinac Mix | 135 | Tahquamenon |
| Sault Ste. Marie | Mackinac Mix | 150 | Tahquamenon |
| Sault Ste. Marie | Mackinac Mix | 157 | Undesignated |
| Sault Ste. Marie | Mackinac Mix | 163 | Undesignated |
| Sault Ste. Marie | Mackinac Mix | 164 | Undesignated |
| Sault Ste. Marie | Mackinac Mix | 165 | Undesignated |
| Sault Ste. Marie | Mackinac Mix | 167 | Undesignated |
| Sault Ste. Marie | Mackinac Mix | 171 | Undesignated |
| Sault Ste. Marie | North Rudyard | 46 | Undesignated |
| Sault Ste. Marie | Sage Truck Trail | 128 | Tahquamenon |
| Sault Ste. Marie | Sage Truck Trail | 130 | Tahquamenon |
| Sault Ste. Marie | Sage Truck Trail | 131 | Tahquamenon |
| Sault Ste. Marie | Sage Truck Trail | 132 | Tahquamenon |
| Sault Ste. Marie | Sage Truck Trail | 133 | Tahquamenon |
| Sault Ste. Marie | Sage Truck Trail | 151 | Tahquamenon |
| Sault Ste. Marie | Sage Truck Trail | 152 | Tahquamenon |
| Sault Ste. Marie | Sage Truck Trail | 153 | Tahquamenon |
| Sault Ste. Marie | Strickler Aspen | 137 | Undesignated |
| Sault Ste. Marie | Strickler Aspen | 138 | Undesignated |
| Sault Ste. Marie | Strickler Aspen | 144 | Undesignated |
| Sault Ste. Marie | Strickler Aspen | 145 | Undesignated |
| Sault Ste. Marie | Strickler Aspen | 146 | Undesignated |
| Sault Ste. Marie | Strickler Aspen | 147 | Undesignated |
| Sault Ste. Marie | Strickler Aspen | 159 | Undesignated |
| Sault Ste. Marie | Strickler Aspen | 160 | Undesignated |
| Shingleton | Bullock Ranch | 114 | Manistique |
| Shingleton | Bullock Ranch | 115 | Manistique |
| Shingleton | Bullock Ranch | 118 | Manistique |
| Shingleton | Bullock Ranch | 123 | Manistique |

| Management Unit | Management Area | Compartment | Stream Name |
|------------------------|--------------------------|--------------------|--------------------|
| Shingleton | Bullock Ranch | 125 | Manistique |
| Shingleton | Bullock Ranch | 130 | Manistique |
| Shingleton | Bullock Ranch | 149 | Manistique |
| Shingleton | Bullock Ranch | 150 | Manistique |
| Shingleton | Cusino Complex | 145 | Manistique |
| Shingleton | Cusino Complex | 146 | Manistique |
| Shingleton | Cusino Complex | 147 | Manistique |
| Shingleton | Cusino Complex | 148 | Manistique |
| Shingleton | Cusino Complex | 166 | Manistique |
| Shingleton | Danaher Kingston Outwash | 105 | Manistique |
| Shingleton | Danaher Kingston Outwash | 106 | Manistique |
| Shingleton | Danaher Kingston Outwash | 107 | Manistique |
| Shingleton | Danaher Kingston Outwash | 108 | Manistique |
| Shingleton | Danaher Kingston Outwash | 109 | Manistique |
| Shingleton | Danaher Kingston Outwash | 111 | Manistique |
| Shingleton | Danaher Kingston Outwash | 128 | Manistique |
| Shingleton | Danaher Kingston Outwash | 129 | Manistique |
| Shingleton | Danaher Kingston Outwash | 131 | Manistique |
| Shingleton | Danaher Kingston Outwash | 139 | Manistique |
| Shingleton | Danaher Kingston Outwash | 140 | Manistique |
| Shingleton | Danaher Kingston Outwash | 141 | Manistique |
| Shingleton | Danaher Kingston Outwash | 143 | Manistique |
| Shingleton | Danaher Kingston Outwash | 144 | Manistique |
| Shingleton | Deer Park | 102 | Sucker |
| Shingleton | Deer Park | 103 | Sucker |
| Shingleton | Deer Park | 104 | Sucker |
| Shingleton | Fox River Complex | 2 | Manistique |
| Shingleton | Fox River Complex | 3 | Manistique |
| Shingleton | Fox River Complex | 4 | Manistique |
| Shingleton | Fox River Complex | 5 | Manistique |
| Shingleton | Fox River Complex | 6 | Manistique |
| Shingleton | Fox River Complex | 110 | Manistique |
| Shingleton | Fox River Complex | 112 | Manistique |
| Shingleton | Fox River Complex | 113 | Manistique |
| Shingleton | Fox River Complex | 124 | Manistique |
| Shingleton | Garden Thompson Plains | 86 | Fishdam |
| Shingleton | Garden Thompson Plains | 87 | Fishdam |
| Shingleton | Pictured Rocks Buffer | 132 | Undesignated |
| Shingleton | Pictured Rocks Buffer | 168 | Undesignated |
| Shingleton | Pictured Rocks Buffer | 169 | Undesignated |
| Shingleton | Pictured Rocks Buffer | 174 | Undesignated |
| Shingleton | Pictured Rocks Buffer | 175 | Undesignated |
| Shingleton | Pictured Rocks Buffer | 176 | Undesignated |
| Shingleton | Seney Manistique Swamp | 151 | Manistique |
| Shingleton | Seney Manistique Swamp | 152 | Manistique |