

Appendices

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Appendix A.—Sustainable Forestry Act

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Act No. 125
Public Acts of 2004
Approved by the Governor
May 28, 2004
Filed with the Secretary of State
May 28, 2004
EFFECTIVE DATE: May 28, 2004

**STATE OF MICHIGAN
92ND LEGISLATURE
REGULAR SESSION OF 2004**

Introduced by Reps. Casperson, Stahl, Pastor, Sheen, Walker, Pappageorge, Shackleton, Amos, Nofs, Meyer, Huizenga, Nitz, Palsrok, Palmer, Emmons, LaJoy, Voorhees, Moolenaar, Ward, Bisbee, Hune, Farhat, Mortimer, Hummel, Caswell, Robertson, Shaffer, DeRoche, Julian, Taub, Richardville, Vander Veen, Brandenburg, Acciavatti, Drolet and Bradstreet

ENROLLED HOUSE BILL No. 5554

AN ACT to amend 1994 PA 451, entitled "An act to protect the environment and natural resources of the state; to codify, revise, consolidate, and classify laws relating to the environment and natural resources of the state; to regulate the discharge of certain substances into the environment; to regulate the use of certain lands, waters, and other natural resources of the state; to prescribe the powers and duties of certain state and local agencies and officials; to provide for certain charges, fees, and assessments; to provide certain appropriations; to prescribe penalties and provide remedies; to repeal certain parts of this act on a specific date; and to repeal certain acts and parts of acts," by amending the heading to part 525 and section 52501 (MCL 324.52501), as added by 1995 PA 57, and by adding sections 52502, 52503, 52504, 52505, and 52506.

The People of the State of Michigan enact:
PART 525 SUSTAINABLE
FORESTRY ON STATE FORESTLANDS

Sec. 52501. As used in this part:

- (a) "Breast height" means 4.5 feet from highest ground at the base of the tree.
- (b) "Certification" means a process where an independent third party organization assesses and evaluates forest management practices according to the standards of a certification program resulting in an issuance of a certificate of compliance or conformity.
- (c) "Certification program" means a program that develops specific standards that measure whether forest management practices are consistent with principles of sustainable forestry.
- (d) "Conservation" means the wise use of natural resources.
- (e) "Diameter class specifications" means a classification of trees based on the diameter at breast height.
- (f) "Plan" means the forestry development, conservation, and recreation management plan for state forests as provided for in section 52503.
- (g) "Reforestation" means adequate stocking of forestland is assured by natural seeding, sprouting, suckering, or by planting seeds or seedlings.
- (h) "Residual basal area" means the sum of the cross-sectional area of trees 4 inches or greater in diameter measured at breast height left standing within a stand after a harvest.
- (i) "State forest" means state land owned or controlled by the department that is designated as state forest by the director.
- (j) "Sustainable forestry" means forestry practices that are designed to meet present and future needs by employing a land stewardship ethic that integrates the reforestation, managing, growing, nurturing, and harvesting of trees for useful products with the conservation of soil, air and water quality, wildlife and fish habitat, and visual qualities.

Sec. 52502. The department shall manage the state forest in a manner that is consistent with principles of sustainable forestry and in doing so shall do all of the following:

(a) Manage forests with consideration of its economic, social, and environmental values by doing all of the following:

(i) Broaden the implementation of sustainable forestry by employing an array of economically, environmentally, and socially sound practices in the conservation of forests, using the best scientific information available.

(ii) Promote the efficient utilization of forest resources.

(iii) Broaden the practice of sustainable forestry by cooperating with forestland owners, wood producers, and consulting foresters.

(iv) Plan and manage plantations in accordance with sustainable forestry principles and in a manner that complements the management of and promotes the restoration and conservation of natural forests.

(b) Conserve and protect forestland by doing all of the following:

(i) Ensure long-term forest productivity and conservation of forest resources through prompt reforestation, soil conservation, afforestation, and other measures.

(ii) Protect the water quality in streams, lakes, and other waterbodies in a manner consistent with the department's best management practices for water quality.

(iii) Manage the quality and distribution of wildlife habitats and contribute to the conservation of biological diversity by developing and implementing stand and landscape-level measures that promote habitat diversity and the conservation of forest plants and animals including aquatic flora and fauna and unique ecosystems.

(iv) Protect forests from wildfire, pests, diseases, and other damaging agents.

(v) Manage areas of ecologic, geologic, cultural, or historic significance in a manner that recognizes their special qualities.

(vi) Manage activities in high conservation value forests by maintaining or enhancing the attributes that define such forests.

(c) Communicate to the public by doing all of the following:

(i) Publicly report the department's progress in fulfilling its commitment to sustainable forestry.

(ii) Provide opportunities for persons to participate in the commitment to sustainable forestry.

(iii) Prepare, implement, and keep current a management plan that clearly states the long-term objectives of management and the means of achieving those objectives.

(d) Monitor forest management by promoting continual improvement in the practice of sustainable forestry and monitoring, measuring, and reporting performance in achieving the commitment to sustainable forestry.

(e) Consider the local community surrounding state forestland by doing both of the following:

(i) Require that forest management plans and operations comply with applicable federal and state laws.

(ii) Require that forest management operations maintain or enhance the long-term social and economic well-being of forest workers and local communities.

Sec. 52503. (1) The department shall adopt a forestry development, conservation, and recreation management plan for state owned lands owned or controlled by the department. Parks and recreation areas, state game areas, and other wildlife areas on these lands shall be managed according to their primary purpose. The department may update the plan as the department considers necessary or appropriate. The plan and any plan updates shall be consistent with section 52502 and shall be designed to assure a stable, long-term, sustainable timber supply from the state forest as a whole.

(2) The plan and any plan updates shall include all of the following:

(a) An identification of the interests of local communities, outdoor recreation interests, the tourism industry, and the forest products industry.

(b) An identification of the annual capability of the state forest and management goals based on that level of productivity.

(c) Methods to promote and encourage the use of the state forest for outdoor recreation, tourism, and the forest products industry.

(d) A landscape management plan for the state forest incorporating biodiversity conservation goals, indicators, and measures.

(e) Standards for sustainable forestry consistent with section 52502.

(f) An identification of environmentally sensitive areas.

(g) An identification of the need for forest treatments to maintain and sustain healthy, vigorous forest vegetation and quality habitat for wildlife and environmentally sensitive species.

Sec. 52504. (1) After the plan is adopted under section 52503, the department shall harvest timber from the state forest and other state owned lands owned or controlled by the department in compliance with the plan and any plan updates.

(2) Unless otherwise dedicated by law, proceeds from the sale of timber from the state forest and other state owned lands owned or controlled by the department shall be forwarded to the state treasurer for deposit into the forest development fund established pursuant to section 50507.

Sec. 52505. (1) The department shall seek and maintain third-party certification that the management of the state forest and other state owned lands owned or controlled by the department satisfies the sustainable forestry standards of at least 1 credible nonprofit, nongovernmental certification program and this part.

(2) Beginning January 1, 2006, the department shall ensure that the state forest is certified as provided for in subsection (1).

(3) Beginning the effective date of the amendatory act that added this section, the department shall commence a review and study to determine the appropriateness of certifying parks and recreation areas, state game areas, and other wildlife areas on state owned lands owned or controlled by the department. Not later than 1 year after the effective date of the amendatory act that added this section, the department shall report and recommend to the legislature the appropriateness and feasibility of certifying those lands.

Sec. 52506. By January 1 of each year, the department shall prepare and submit to the commission of natural resources, the standing committees of the senate and the house of representatives with primary jurisdiction over forestry issues, and the senate and house appropriations committees a report that details the following from the previous state fiscal year:

(a) The number of harvestable acres in the state forest as determined by the certification program under section 52506.

(b) The number of acres of the state forest that were harvested and the number of cords of wood that were harvested from the state forest.

(c) The number of acres of state owned lands owned or controlled by the department other than state forestlands that were harvested and the number of cords of wood that were harvested from those lands.

(d) Efforts by the department to promote recreational opportunities in the state forest.

(e) Information on the public's utilization of the recreational opportunities offered by the state forest.

(f) Efforts by the department to promote wildlife habitat in the state forest.

(g) The status of the plan and whether the department recommends any changes in the plan.

(h) Status of certification efforts required in section 52505 and, beginning in 2006, a definitive statement of whether the department is maintaining certification of the entire state forest.

(i) A description of any activities that have been undertaken on forest pilot project areas described in section 52511.

Enacting section 1. This amendatory act does not take effect unless all of the following bills of the 92nd Legislature are enacted into law:

(a) Senate Bill No. 1023.

(b) Senate Bill No. 1024.

This act is ordered to take immediate effect.

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**Appendix B.—Excerpts of planning principles
from the FSC standards**

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Principle 7—Management Plan

A management plan -- appropriate to the scale and intensity of the operations -- shall be written, implemented, and kept up to date. The long-term objectives of management, and the means of achieving them, shall be clearly stated.

7.1. The management plan and supporting documents shall provide:

- a) Management objectives.**
- b) Description of the forest resources to be managed, environmental limitations, land use and ownership status, socio-economic conditions, and a profile of adjacent lands.**
- c) Description of silvicultural and/or other management system, based on the ecology of the forest in question and information gathered through resource inventories.**
- d) Rationale for rate of annual harvest and species selection.**
- e) Provisions for monitoring of forest growth and dynamics.**
- f) Environmental safeguards based on environmental assessments.**
- g) Plans for the identification and protection of rare, threatened and endangered species.**
- h) Maps describing the forest resource base including protected areas, planned management activities and land ownership.**
- i) Description and justification of harvesting techniques and equipment to be used.**

Applicability Note: The management plan may consist of a variety of documents not necessarily unified into a single planning document but which represents an integrated strategy for managing the forest within the ecological, economic, and social limitations of the land. The plan includes a description and rationale for management elements appropriate to the scale, intensity, and goals of management, and may include:

- Silvicultural systems
- Regeneration strategies
- Maintenance of structural and species diversity
- Pest control (disease, insects, invasive species, and vegetation)
- Soil and water conservation
- Methods and annual rates of harvest, by species and products
- Equipment and personnel needs
- Transportation system
- Fire management
- Prescribed fires
- Wildfires
- Fish and wildlife and their habitats (including nongame species)
- Nontimber forest products
- Methods and annual rates of harvest, by species and products
- Regeneration strategies
- Socioeconomic issues
- Public access and use
- Conservation of historical and cultural resources
- Protection of aesthetic values
- Employee and contractor policies and procedures
- Community relations
- Stakeholder notification
- Public comment process
- For public forests, legal and historic mandates

- American Indian issues
- Protection of legal and customary rights
- Procedures for integrating tribal concerns in forest management
- Management of sites of special significance
- Special management areas
- High Conservation Value Forests
- Riparian management zone
- Set asides of samples of representative existing ecosystems
- Sensitive, rare, threatened, and endangered species protection
- Other protected areas
- Landscape level analyses and strategies

7.1.a. Management objectives

7.1.a.1. A written management plan is prepared that includes the landowner's short-term and long-term goals and objectives (ecological, social, and economic). The objectives are specific, achievable, and measurable.

7.1.a.2. The management plan describes desired future conditions that will meet the long-term goals and objectives and that determine the silvicultural system(s) and management activities to be used.

7.1.b. Description of forest resources to be managed, environmental limitations, land use and ownership status, socioeconomic conditions, and profile of adjacent lands

7.1.b.1. The management plan describes the timber, fish and wildlife, harvested nontimber forest products, soils, and noneconomic forest resources.

7.1.b.2. The management plan includes descriptions of special management areas; sensitive, rare, threatened, and endangered species and their habitats; and other ecologically sensitive features in the forest.

7.1.b.3. The management plan includes a description of past land uses and incorporates this information into the vision, goals, and objectives.

7.1.b.4. The management plan identifies the legal status of the forest and its resources (e.g., ownership, usufruct rights (see Glossary), treaty rights, easements, deed restrictions, and leasing arrangements).

7.1.b.5. The management plan identifies relevant cultural and socioeconomic issues (e.g., traditional and customary rights of use, access, recreational uses, and employment), conditions (e.g., composition of the workforce, stability of employment, and changes in forest ownership and tenure), and areas of special significance (e.g., ceremonial and archeological sites).

7.1.b.6. The management plan incorporates landscape-level considerations within the ownership and among adjacent and nearby lands, including major bodies of water, critical habitats, and riparian corridors shared with adjacent ownerships.

7.1.c. Description of silvicultural and/or other management system

7.1.c.1. Silvicultural system(s) and prescriptions are based on the integration of ecological and economic characteristics (e.g., successional processes, soil characteristics, existing species composition and structures, desired future conditions, and market conditions). (see also sub-Criterion 6.3.a)

7.1.c.2. Prescriptions are prepared prior to harvesting, site preparation, pest control, burning, and planting and are available to people who implement the prescriptions.

7.1.d. Rationale for the rate of annual harvest and species selection

7.1.d.1. Calculations for the harvests of both timber and nontimber products are detailed or referenced in the management plan and are based on net growth, yield, stocking, and regeneration data. (see also 5.6.b)

7.1.d.2. Species selection meets the social and economic goals and objectives of the forest owner or manager and leads to the desired future conditions while maintaining or improving the ecological composition, structures, and functions of the forest.

7.1.d.3. The management plan addresses potentially disruptive effects of pests, storms, droughts, and fires as they relate to allowable cut.

7.1.e. Provisions for monitoring forest growth and dynamics (see also Principle 8)

7.1.e.1. The management plan includes a description of procedures to monitor the forest.

7.1.f. Environmental safeguards based on environmental assessments (see also Criterion 6.1.)

7.1.g. Plans for the identification and protection of rare, threatened, and endangered species. (see also Criterion 6.3.)

7.1.h. Maps describing the forest resource base including protected areas, planned management activities, and land ownership.

7.1.h.1. The management plan includes maps of such forest characteristics as: relevant landscape-level factors; property boundaries; roads; areas of timber production; forest types by age class; topography; soils; riparian zones; springs and wetlands; archaeological sites; areas of cultural and customary use; locations of sensitive, rare, threatened, and/or endangered species and their habitats; and designated High Conservation Value Forests.

7.1.i. Description and justification of harvesting techniques and equipment to be used. (see also Criterion 6.5)

7.1.i.1. Harvesting machinery and techniques are discussed in the management or harvest plan and are specifically matched to forest conditions in order to minimize damage.

7.1.i.2. Conditions for each timber sale are established by a timber sale contract or written harvest prescription and accompanying timber sale map.

7.2. The management plan shall be periodically revised to incorporate the results of monitoring or new scientific and technical information, as well as to respond to changing environmental, social and economic circumstances.

7.2.a. Operational components of the management plan are reviewed and revised as necessary or at least every 5 years. Components of the long-term (strategic) management plan are revised and updated at the end of the planning period or when other changes in the management require it. (see also Criterion 8.4)

7.3. Forest workers shall receive adequate training and supervision to ensure proper implementation of the management plans.

7.3.a. The forest owner or manager assures that workers are qualified to implement the management plan (see also Criterion 4.2).

7.3.b. The management plan is understandable, comprehensive, and readily available to field personnel.

7.4. While respecting the confidentiality of information, forest managers shall make publicly available a summary of the primary elements of the management plan, including those listed in Criterion 7.1.

Applicability Note: Forest owners or managers of private forests may withhold proprietary information (e.g., the nature and extent of their forest resource base, marketing strategies, and other financial information). (see also Criterion 8.5)

7.4.a. A management plan summary that outlines management objectives (from sub-Criterion 7.1.a.), whether on private lands or the land pool under a resource manager, is available to the public at a reasonable fee. Additional elements of the plan may be excluded, to protect the security of environmentally sensitive and/or proprietary information.

7.4.b. Managers of public forests make forestry-related information easily accessible (e.g., available on websites) for public review, including that required by Criterion 7.1.

**Appendix C.—Excerpts of planning objectives
from the SFI standards**

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Objective 1. To broaden the implementation of *sustainable forestry* by ensuring long-term harvest levels based on the use of the *best scientific information* available.

Performance Measure 1.1. *Program Participants* shall ensure that long-term harvest levels are sustainable and consistent with appropriate *growth-and-yield models* and written plans.

Indicators:

1. A long-term resource analysis to guide forest management planning at a level appropriate to the size and scale of the operation, including
 - a. a periodic or ongoing forest *inventory*;
 - b. a *land classification* system;
 - c. soils *inventory* and maps, where available;
 - d. access to *growth-and-yield modeling* capabilities;
 - e. up-to-date maps or a *geographic information system (GIS)*;
 - f. recommended sustainable harvest levels; and
 - g. a review of nontimber issues (e.g., pilot projects and economic incentive programs to promote water protection, carbon storage, or *biological diversity conservation*).
2. Documentation of annual harvest trends in relation to the sustainable forest management plan.
3. A forest *inventory* system and a method to calculate growth.
4. Periodic updates of *inventory* and recalculation of planned harvests.
5. Documentation of forest practices (e.g., planting, fertilization, and thinning) consistent with assumptions in harvest plans.

Objective 12. To broaden the practice of *sustainable forestry* by encouraging the public and forestry community to participate in the commitment to *sustainable forestry* and publicly report progress.

Performance Measure 12.3. *Program Participants* with forest management responsibilities on *public lands* shall participate in the development of *public land* planning and management processes.

Indicators:

1. Involvement in *public land* planning and management activities with appropriate governmental entities and the public.
2. Appropriate contact with local stakeholders over forest management issues through state, provincial, federal, or independent collaboration.

Objective 13. To promote continual improvement in the practice of *sustainable forestry* and monitor, measure, and report performance in achieving the commitment to *sustainable forestry*.

Performance Measure 13.1. *Program Participants* shall establish a management review system to examine findings and progress in implementing the SFI Standard, to make appropriate improvements in *programs*, and to inform their employees of changes.

Indicators:

1. System to review commitments, *programs*, and procedures to evaluate effectiveness.
2. System for collecting, reviewing, and reporting information to management regarding progress in achieving SFI Standard *objectives* and *performance measures*.
3. Annual review of progress by management and determination of changes and improvements necessary to continually improve SFI conformance.

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Appendix D.–List of DNR forest certification work instructions

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Work Area Group 1—Plan, Monitor, and Review

- 1.1 Strategic Framework for Sustainable Management of State Forest Land
- 1.2 Management Review Process for Continual Improvement in the Management of Forest Resources
- 1.3 Regional State Forest Management Plan Development
- 1.4 Biodiversity Management on State Forest Lands ¹
- 1.5 Social Impact Considerations and Public Involvement Processes ¹
- 1.6 Forest Management Unit Analyses ¹
- 1.7 State Forest Timber Harvest Trends

Work Area Group 2—Forest Regeneration and Chemical Use

- 2.1 Reforestation ¹
- 2.2 Use of Pesticides and Other Chemicals on State Forest Lands ¹
- 2.3 Integrated Pest Management and Forest Health ¹

Work Area Group 3—Best Management Practices

- 3.1 Forest Operations ¹
- 3.2 Best Management Practices Non-Conformance Reporting Instructions ¹
- 3.3 Road Closures ¹

Work Area Group 4—Deleted and integrated with WAG 7

Work Area Group 5—Research

- 5.1 Coordinated Natural Resource Management Research

Work Area Group 6—Education and Recreation

- 6.1 Implementing Public Informational and Educational Opportunities on State Forests ¹
- 6.2 Integrating Public Recreational Opportunities with Management on State Forest Lands ¹
- 6.3 SFI Involvement and the Michigan State Implementation Committee

Work Area Group 7—Integrated Implementation and Contracting

- 7.1 Timber Sale Preparation and Administration Procedures ¹
- 7.2 Legal Compliance and Administration of Contracts ¹

Work Area Group 8—Training

- 8.1 MDNR Staff Training for State Forest Management

Work Area Group 9—Tribal Issues

- 9.1 Collaboration with Tribes in regard to management of State Forest Land ¹

¹ This work instruction is directly pertinent to and is required to be used by field staff in the course of daily forest operations.

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Appendix E.–DNR management unit boundaries

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DNR Forest, Mineral, and Fire Management Division (FMFM)

The mission of Forest, Mineral, and Fire Management Division is to provide for the protection, integrated management and responsible use of a healthy productive forest and mineral resource base for the social, recreational, environmental, and economic benefit of the people of the State of Michigan. This includes direct day-to-day management of Michigan’s state forest.

Operational management of the state forest is largely conducted at the forest management unit (FMU) level (Figure E1). There are 15 FMUs. Management planning is also conducted on an ecoregional basis, following political boundaries that roughly follow the ecoregional boundaries. There are three ecoregions that coincide with the area containing the state forest system: the Northern Lower Peninsula; the Eastern Upper Peninsula; and the Western Upper Peninsula.

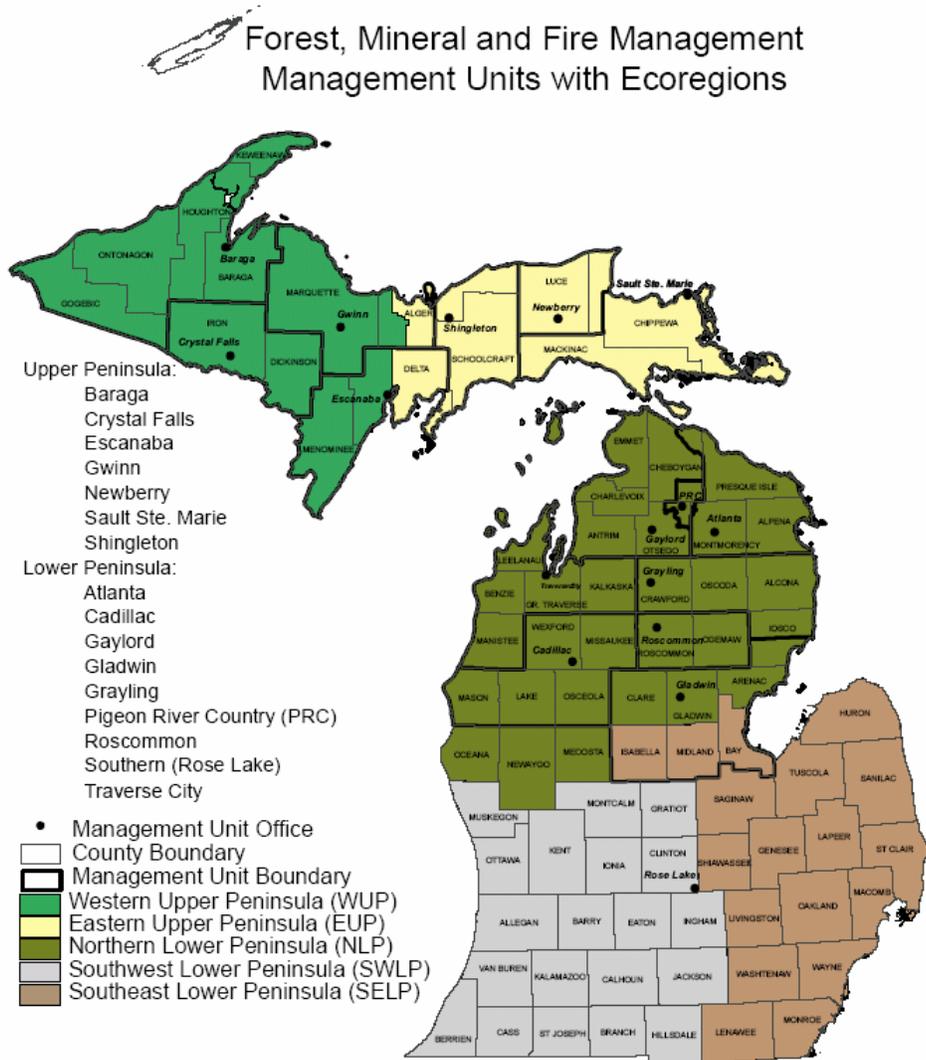


Figure E1.—FMFM state forest management units and ecoregions.

DNR Wildlife Division

The mission of the Wildlife Division is to enhance, restore, and conserve the state's wildlife resources, natural communities, and ecosystems for the benefit of Michigan's citizens, visitors, and future generations. Wildlife personnel have the primary responsibility for the management and regulation of bird and mammal populations and their habitats, but also have the lead responsibility for rare species which include plants, insects, amphibians, reptiles, and fish. There are eight Wildlife Division management units (Figure E2), five of which contain state forestlands.

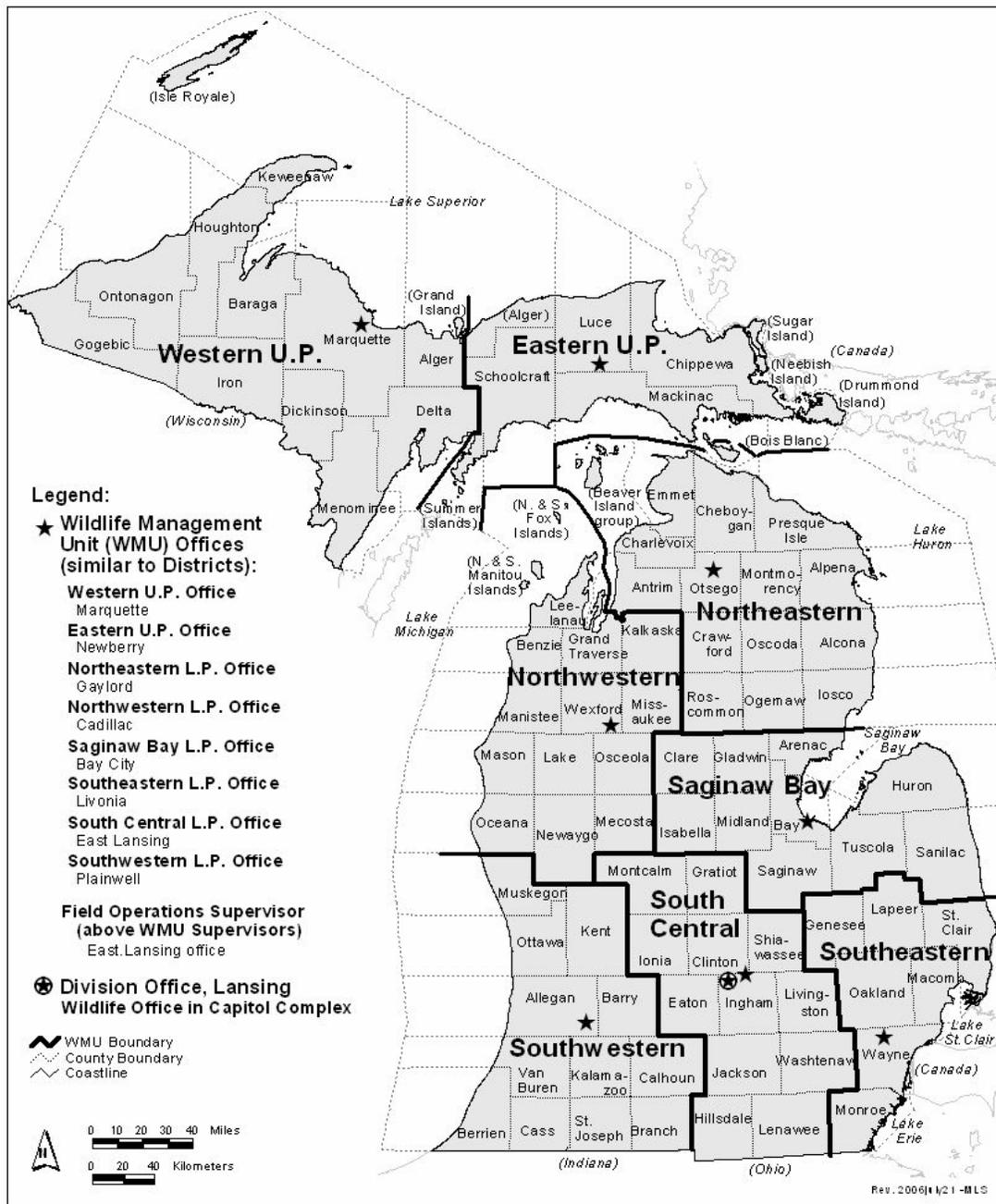


Figure E2.—Wildlife Division management units.

DNR Fisheries Division

The mission of Fisheries Division is to protect and enhance all forms of aquatic life and the habitats on which they depend, and to provide for wise use of these resources for benefit of the people of Michigan. Fisheries Division is responsible for the management of all fish species, all other aquatic organisms, and their habitats across the broad spectrum of all ownerships in the state. Because landscape processes are integrally linked with aquatic habitat and because of the biotic interdependency between upstream and downstream habitats, Fisheries Division is organized on the basis of basins and watersheds. There are four Great Lakes basins (Erie, Huron, Michigan, and Superior) and each is divided into fisheries management units that are organized on the basis of watershed boundaries (Figure E3).

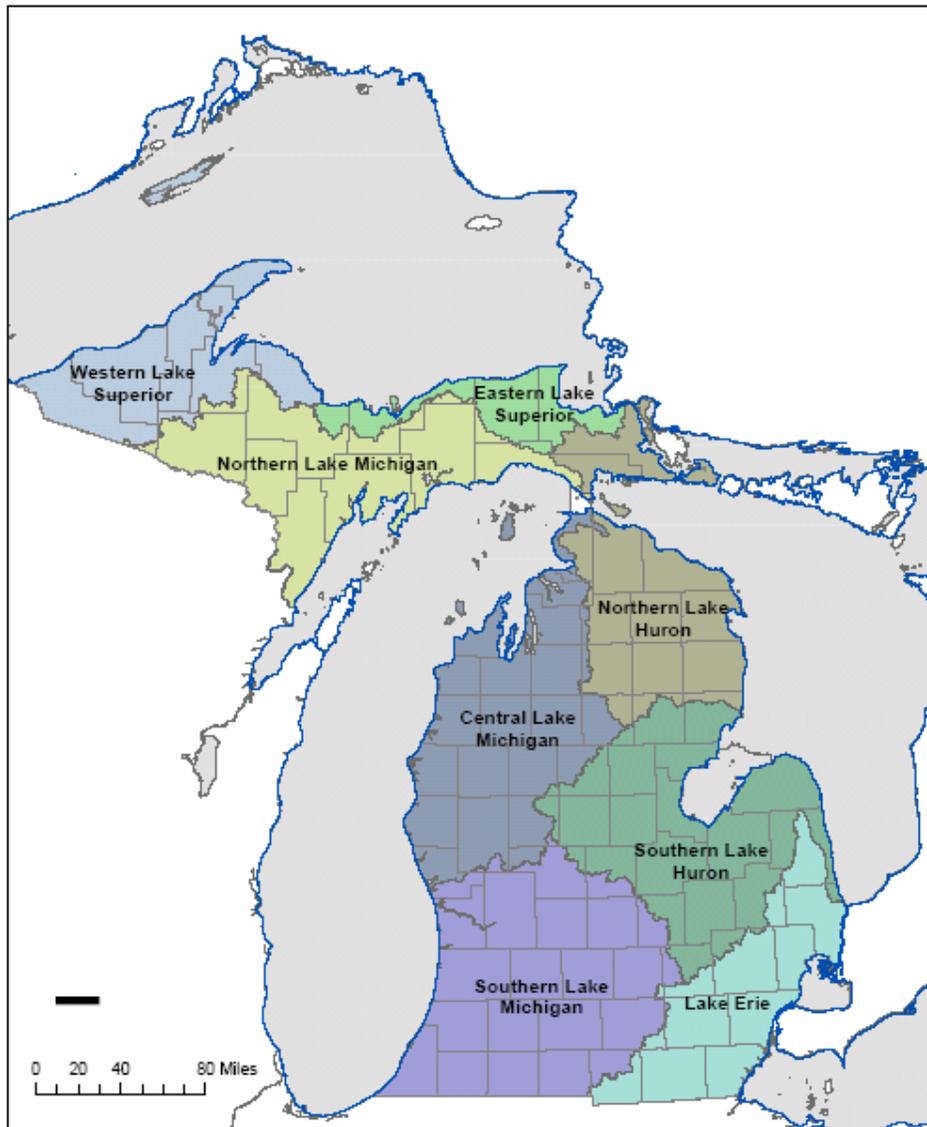


Figure E3.–Fisheries Division management units.

DNR Law Enforcement Division

The mission statement of the Law Enforcement Division is to protect Michigan's natural resources and the environment, and the health and safety of the public through effective law enforcement and education. Law Enforcement Division is responsible for enforcement of fish and wildlife laws, and other enforcement activities to protect fish and wildlife resources and habitat, and to promote and maintain Michigan's natural resources base, economy, and quality of life. Other enforcement activities include: 1) environmental protection, enforcement, and investigation; 2) habitat protection (e.g., protection of forests, wetlands, sand dunes, lakes and streams, and parks); 3) protection of recreation facilities and persons who recreate on DNR lands and facilities; 4) recreational safety education and enforcement; 5) protection of threatened and endangered species (plant and wildlife); and 6) oversight of those who seek to alter the environment. The Law Enforcement Division is organized into 10 districts (Figure E5).

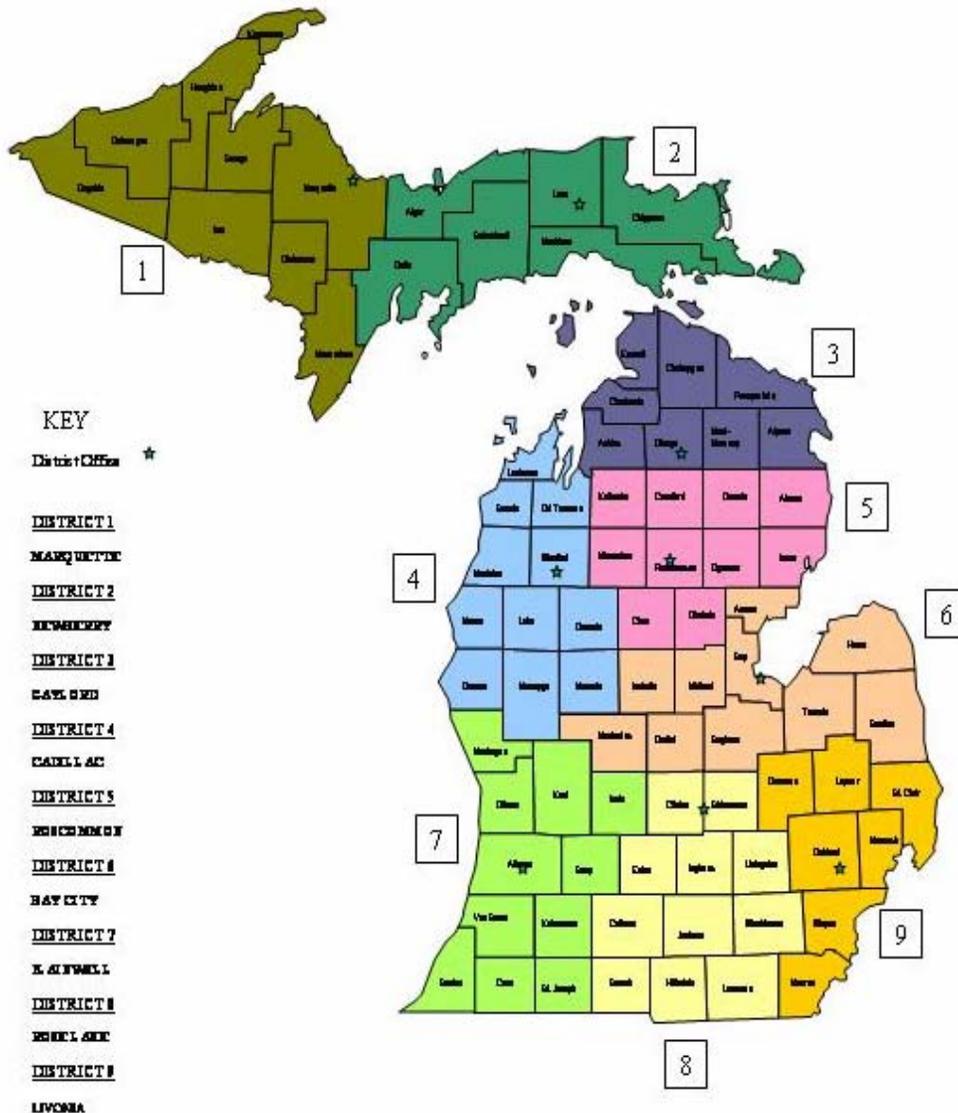


Figure E5.–Law Enforcement Division districts.

Federal Land Ownership

The major federal lands in Michigan are principally composed of the national forests, national parks, and national wildlife refuges, which are managed by the USDA Forest Service, the USDI Park Service, and the USDI Fish and Wildlife Service respectively. The largest land holdings are the three national forests, which total over 2.9 million acres. There are three major national parks totaling approximately 674,000 acres and national wildlife refuges total over 112,000 acres.

These federal lands are located adjacent to or in close proximity to extensive areas of state-owned lands (Figure 1.2), mostly in the northern two-thirds of Michigan. Effectively holistic management of lands on a landscape scale requires cooperation between state and federal land managers. Interactions range from broad, long-range landscape-level planning (e.g., species recovery plans), through coordination of recreation infrastructure and policies (e.g., trail designation and use), to short-term tactical projects (e.g., fire prevention and suppression).

Private Lands

As of 2003, private individuals own 45% of all timberland in the state. Cooperative management with private ownerships within the matrix of public ownership is critical for the effective management of resources, such as timber, game and nongame wildlife habitat, aquatic habitats, and recreation. To this end, the DNR is a cooperative partner in a number of initiatives that focus on the sustainable management of private land resources.

There are 49 land trusts and conservancies located throughout Michigan. The organizations hold title or conservation easements on thousands of acres containing rare and unique habitats and natural communities. In turn, the DNR also holds conservation easements on lands owned by conservancies.

Corporate lands have been traditionally associated with those primarily owned by the forest products industry. A recent trend has seen a significant divestiture of timberland by the forest products industry and a corresponding increase in timberland under the ownership of timberland investment management organizations. The majority of these corporate lands are enrolled in the Commercial Forest Program.

The Commercial Forest Program provides a property tax reduction to individual or corporate private landowners as an incentive to retain and manage forestland for long-term timber production. Landowners in this program agree to provide public access for hunting, trapping, and fishing and to develop, maintain, and manage the land as commercial forest through planting, natural reproduction, or other silvicultural practices. There are approximately 2.2 million acres listed in this program under the ownership of nearly 1,300 private landowners. Landowners include private individuals, clubs, forest industry, and other corporations.

The DNR has developed a Forest Stewardship Program that assists landowners with the development of Forest Stewardship management plans for their private forestlands. The Michigan Forestland Enhancement Program is an important tool that augments the Forest Stewardship Program by providing financial assistance for encouraging the long-term sustainability of nonindustrial private forestlands.

Finally, the DNR Landowner Incentive Program helps private landowners create and manage habitat for species that are rare or declining by providing advice, management plans, and funding to qualified individuals and organizations throughout the state.

**Appendix F.–Forest type composition of
DNR forestland by ecoregion**

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Table F-1.—Northern Lower Peninsula Ecoregion forest types in 2006 by management unit (acres; unpublished DNR inventory data).

Cover type	Statewide						Pigeon		Traverse	Ecoregion total	Percent of state
	total	Atlanta	Cadillac	Gaylord	Gladwin	Grayling	River	Roscommon	City		
aspen	884,822	67,702	70,805	67,622	83,030	62,642	28,752	69,995	70,078	520,626	58.8
balsam poplar swmp	71,655	24,417	1,579	8,521	1,689	1,943	809	425	1,906	41,289	57.6
bedrock	1,065	5								5	0.5
black spruce swamp	68,636	2,400	387	929	113	1,767	667	1,117	287	7,667	11.2
bog or marsh	35,163	1,984	2,221	1,390	3,500	989	73	5,454	1,149	16,760	47.7
cedar swamp	228,397	18,331	6,427	14,375	2,561	6,276	5,320	6,899	7,359	67,548	29.6
emergent marsh	113,355	2,819	3,077	3,537	7,527	1,688	1,975	13,349	1,918	35,890	31.7
grassland	125,288	6,508	7,902	12,063	4,302	8,891	2,942	4,832	12,707	60,147	48.0
hemlock	17,479	226	282	247	54	12	289	380	97	1,587	9.1
jack pine	367,034	25,296	21,198	13,280	14,591	73,864	4,438	51,761	29,459	233,887	63.7
local name	6,544	26	79	57	255	4,240	78	294	319	5,348	81.7
lowland hardwoods	135,912	9,165	11,628	6,019	36,562	3,302	2,056	10,612	13,598	92,942	68.4
lowland brush	197,448	12,510	9,511	11,771	18,315	3,311	2,598	12,984	6,147	77,147	39.1
mixed swamp conifers	261,183	16,588	7,707	20,068	1,378	6,074	11,269	19,906	10,962	93,952	36.0
northern hardwoods	508,302	16,573	16,200	93,857	2,250	12,455	17,652	1,465	46,847	207,299	40.8
non stocked	22,791	2,298	778	2,279	1,412	5,087	235	2,264	2,439	16,792	73.7
oak	243,691	27,069	36,361	11,589	23,764	54,254	3,364	42,698	30,583	229,682	94.3
paper birch	35,462	1,611	67	2,220	131	474	640	434	165	5,742	16.2
red pine	279,973	28,923	21,237	30,314	8,741	21,542	12,181	17,717	40,790	181,445	64.8
sand dune	1,106	76	37	123		7			44	287	25.9
spruce fir	51,504	1,253	1,196	1,168	445	615	864	1,172	1,744	8,457	16.4
tamarack swamp	22,256	2,034	730	2,491	399	846	154	250	442	7,346	33.0
treed bog	62,692	752	673	160	88	400	413	1,263	912	4,661	7.4
upland brush	53,008	4,585	4,171	6,672	341	8,379	2,231	1,994	16,925	45,298	85.5
water	47,751	2,399	2,627	3,031	4,740	1,559	1,166	3,787	3,308	22,617	47.4
white pine	93,568	4,087	8,903	3,001	2,725	3,812	4,883	5,859	11,959	45,229	48.3
Total	3,936,085	279,637	235,783	316,784	218,913	284,429	105,049	276,911	312,144	2,029,650	51.6

Table F-2.—Eastern Upper Peninsula Ecoregion forest types in 2006 by management unit (acres; unpublished DNR inventory data).

Cover type	Statewide total	Newberry	Sault Ste Marie	Shingleton	Ecoregion total	Percent of state
aspen	884,822	22,764	65,435	34,589	122,788	13.9
balsam poplar swamp	71,655	4,515	15,866	2,045	22,426	31.3
bedrock	1,065		79	56	135	12.7
black spruce swamp	68,636	11,272	10,003	15,578	36,853	53.7
bog or marsh	35,163	3,438	5,784	2,785	12,007	34.1
cedar swamp	228,397	19,034	51,801	28,675	99,510	43.6
emergent marsh	113,355	23,275	8,809	37,677	69,761	61.5
grassland	125,288	4,743	12,486	24,766	41,995	33.5
hemlock	17,479	2,249	1,822	3,059	7,130	40.8
jack pine	367,034	59,823	1,750	43,432	105,005	28.6
local name	6,544	253	80	232	565	8.6
lowland hardwoods	135,912	7,540	5,724	7,290	20,554	15.1
lowland brush	197,448	20,951	23,727	32,187	76,865	38.9
mixed swamp conifers	261,183	33,291	16,921	19,135	69,347	26.6
northern hardwoods	508,302	37,745	43,164	48,345	129,254	25.4
non stocked	22,791	592	995	2,043	3,630	15.9
oak	243,691	1,968	1,188	1,704	4,860	2.0
paper birch	35,462	3,915	9,344	4,160	17,419	49.1
red pine	279,973	23,880	16,197	37,699	77,776	27.8
sand dune	1,106	504	137	138	779	70.4
spruce fir	51,504	2,921	8,136	3,339	14,396	28.0
tamarack swamp	22,256	1,480	3,495	3,106	8,081	36.3
treed bog	62,692	33,154	7,069	4,291	44,514	71.0
upland brush	53,008	2,896	2,643	708	6,247	11.8
water	47,751	6,355	4,506	4,056	14,917	31.2
white pine	93,568	17,888	3,674	15,340	36,902	39.4
Total	3,936,085	346,446	320,835	376,435	1,043,716	26.5

Table F-3.—Western Upper Peninsula Ecoregion forest types in 2006 by management unit (in acres; unpublished DNR inventory data).

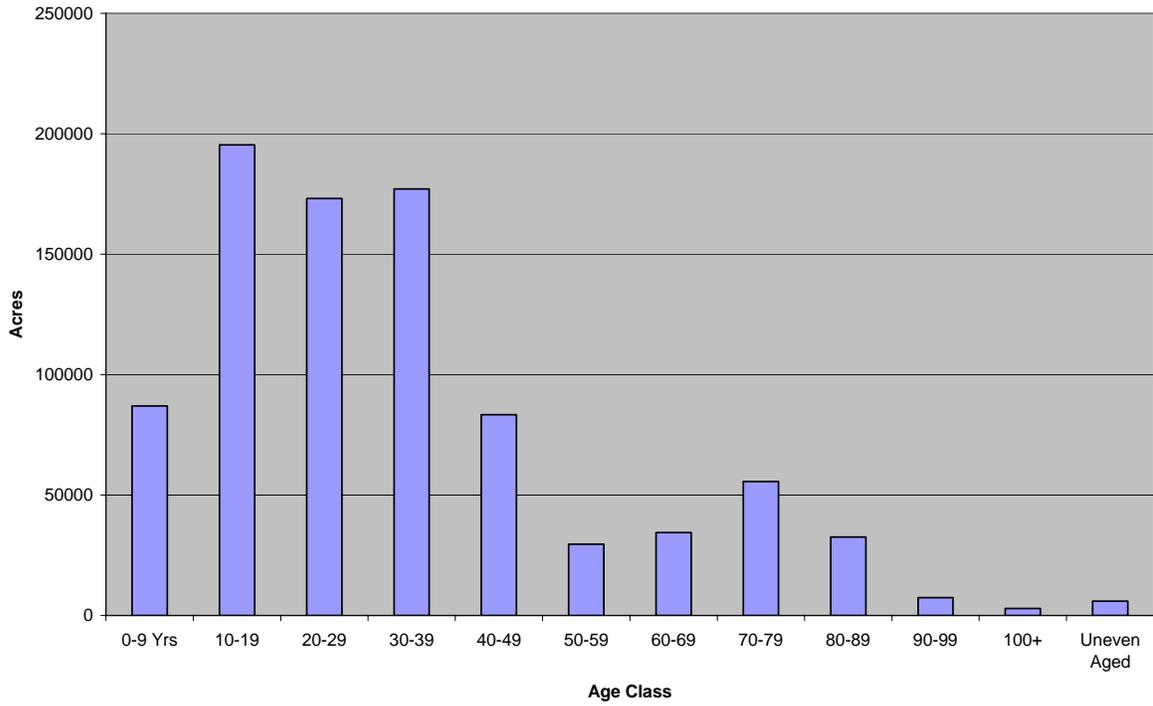
Cover type	Statewide total	Baraga	Crystal Falls	Escanaba	Gwinn	Ecoregion total	Percent of state
aspen	884,822	15,030	123,240	31,794	71,344	241,408	27.3
balsam poplar swamp	71,655		1,967	3,902	2,071	7,940	11.1
bedrock	1,065	74	536	1	314	925	86.9
black spruce swamp	68,636	2,292	6,043	4,202	11,579	24,116	35.1
bog or marsh	35,163	869	1,279	399	3,849	6,396	18.2
cedar swamp	228,397	2,316	8,224	29,660	21,139	61,339	26.9
emergent marsh	113,355	2,179	1,179	2,634	1,712	7,704	6.8
grassland	125,288	2,736	9,907	2,203	8,300	23,146	18.5
hemlock	17,479	2,732	194	2,611	3,225	8,762	50.1
jack pine	367,034	7,630	3,056	130	17,326	28,142	7.7
local name	6,544	42	5	161	423	631	9.6
lowland hardwoods	135,912	2,537	2,408	8,468	9,003	22,416	16.5
lowland brush	197,448	7,666	17,284	6,078	12,408	43,436	22.0
mixed swamp conifers	261,183	10,856	43,889	9,213	33,926	97,884	37.5
northern hardwoods	508,302	62,406	43,751	17,846	47,746	171,749	33.8
non stocked	22,791	930	733	288	418	2,369	10.4
oak	243,691	1,545	1,469	2,807	3,328	9,149	3.8
paper birch	35,462	3,999	2,864	504	4,934	12,301	34.7
red pine	279,973	496	9,280	3,524	7,452	20,752	7.4
sand dune	1,106	12			28	40	3.6
spruce fir	51,504	7,423	7,090	4,750	9,388	28,651	55.6
tamarack swamp	22,256	1,716	648	3,728	737	6,829	30.7
treed bog	62,692	5,087	744	3,208	4,478	13,517	21.6
upland brush	53,008	212	143	555	553	1,463	2.8
water	47,751	2,011	4,068	1,174	2,964	10,217	21.4
white pine	93,568	256	4,275	2,338	4,568	11,437	12.2
Total	3,936,085	143,052	294,276	142,178	283,213	862,719	21.9

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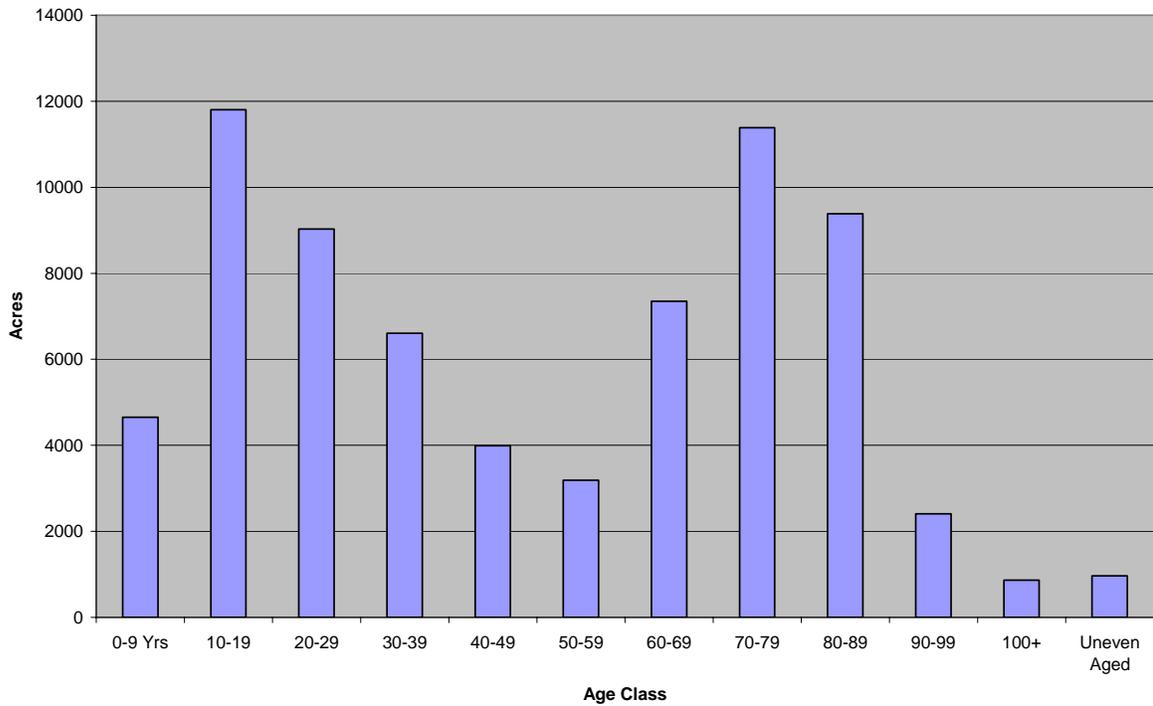
**Appendix G.—Age class distributions by forest type
on DNR forestland**

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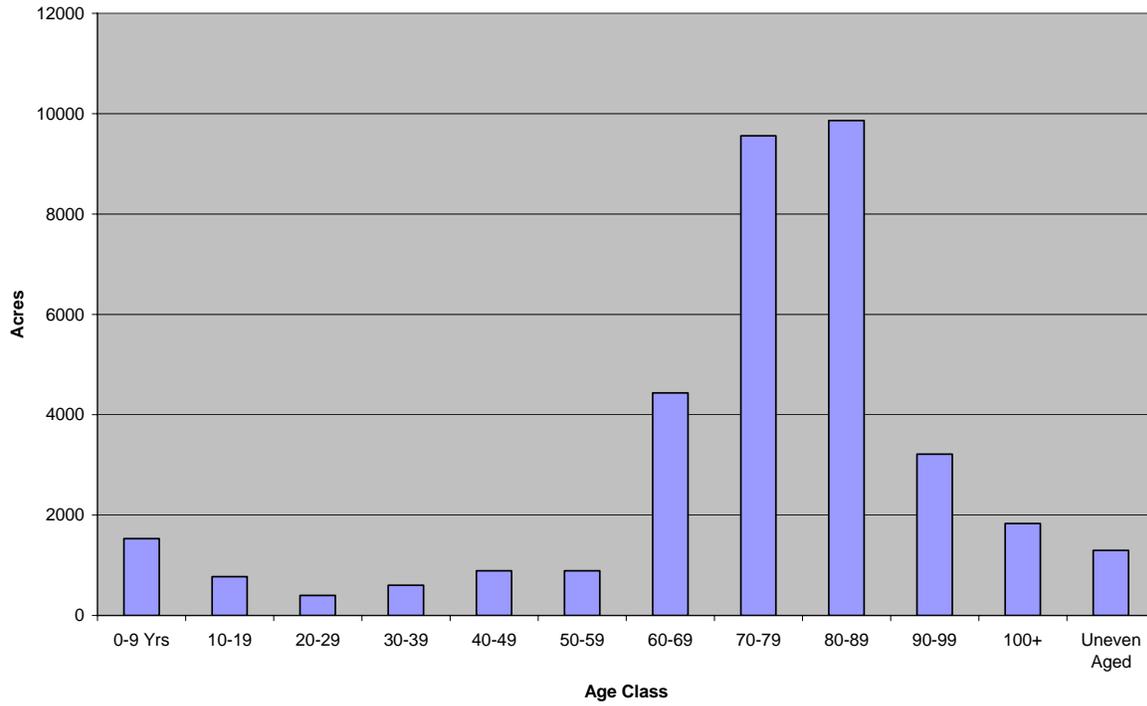
Age Class Distribution for Aspen (2006)



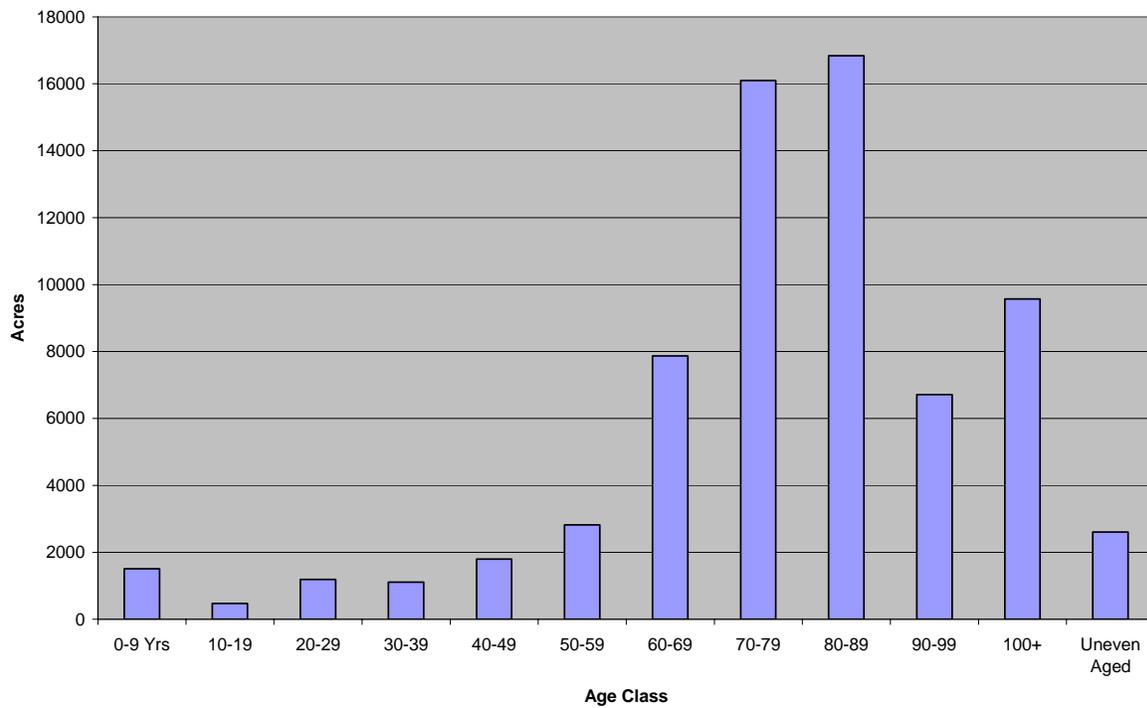
Age Class Distribution for Balsam Poplar Swamp (2006)



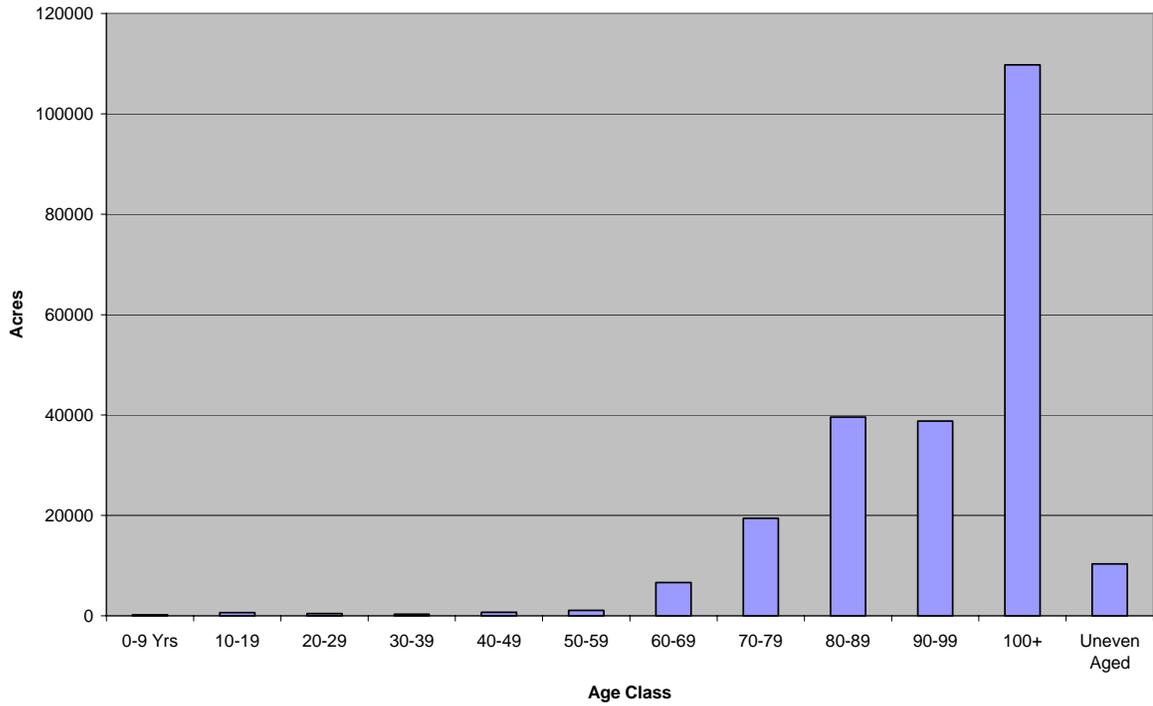
Age Class Distribution for Paper Birch (2006)



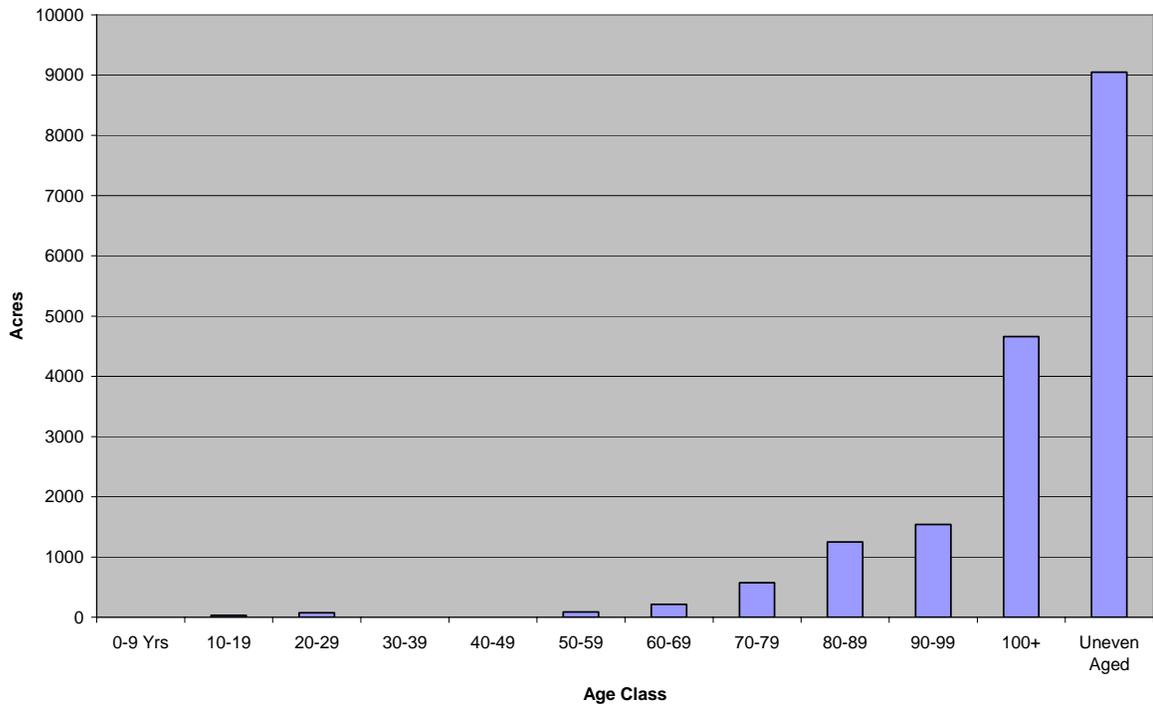
Age Class Distribution of Black Spruce Swamp (2006)



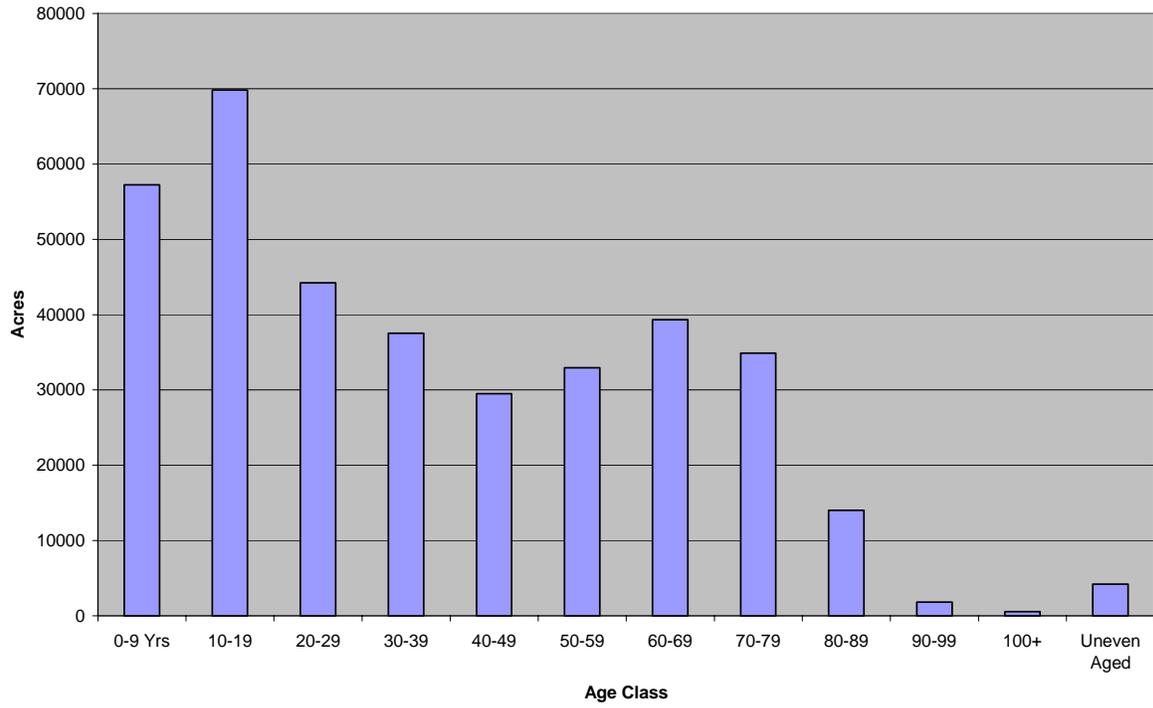
Age Class Distribution for Cedar Swamp (2006)



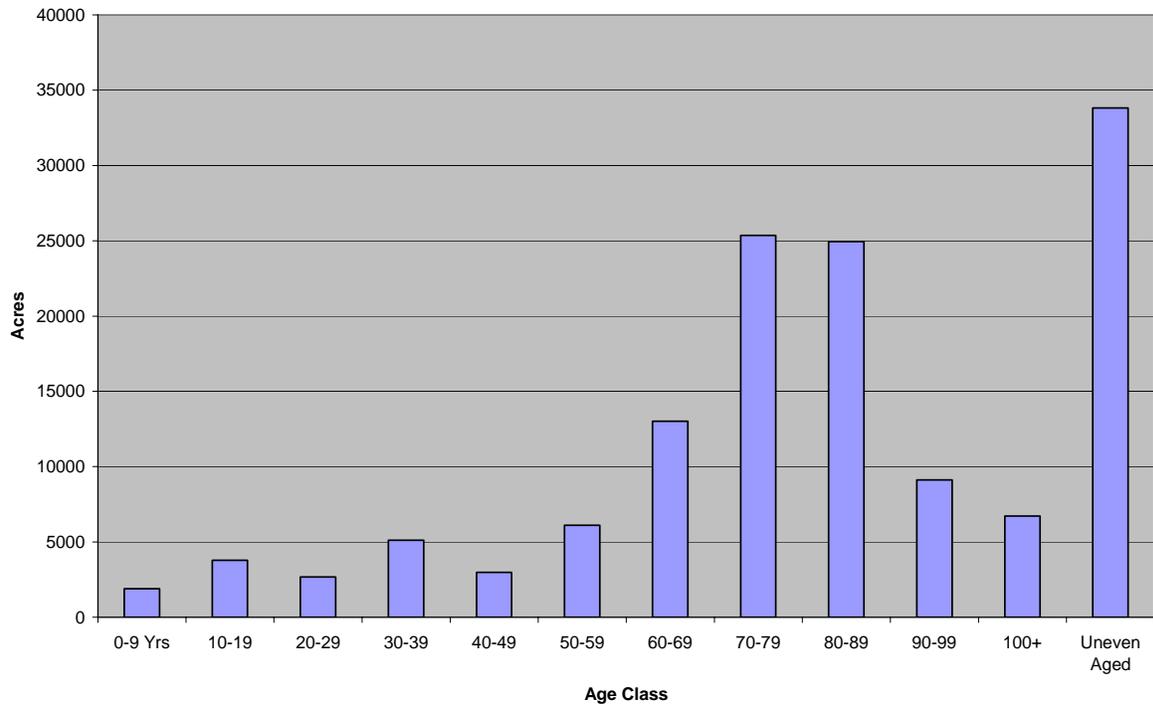
Age Class Distribution for Hemlock (2006)



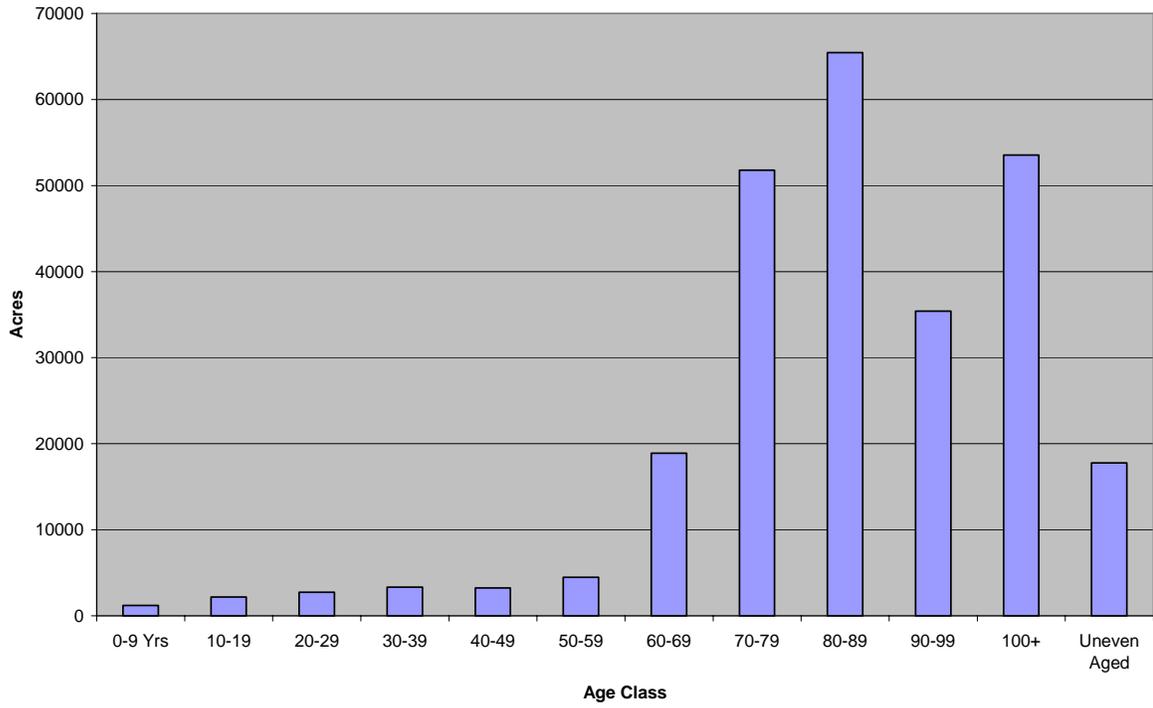
Age Class Distribution for Jack Pine (2006)



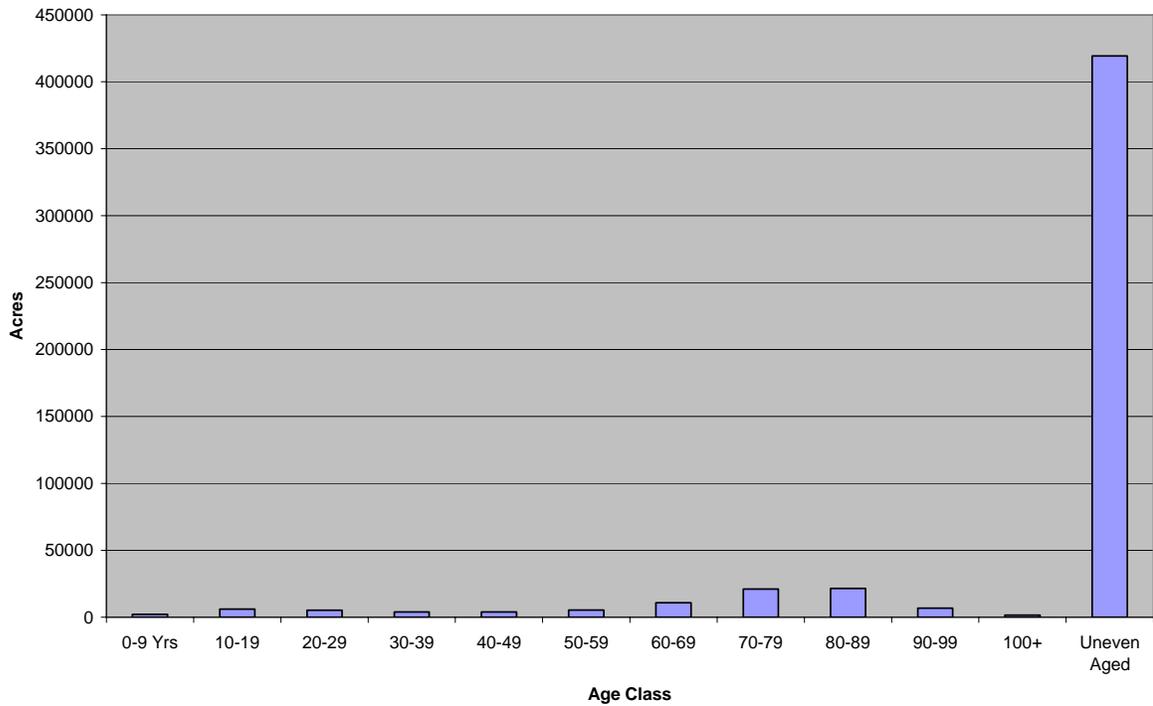
Age Class Distribution for Lowland Hardwoods (2006)



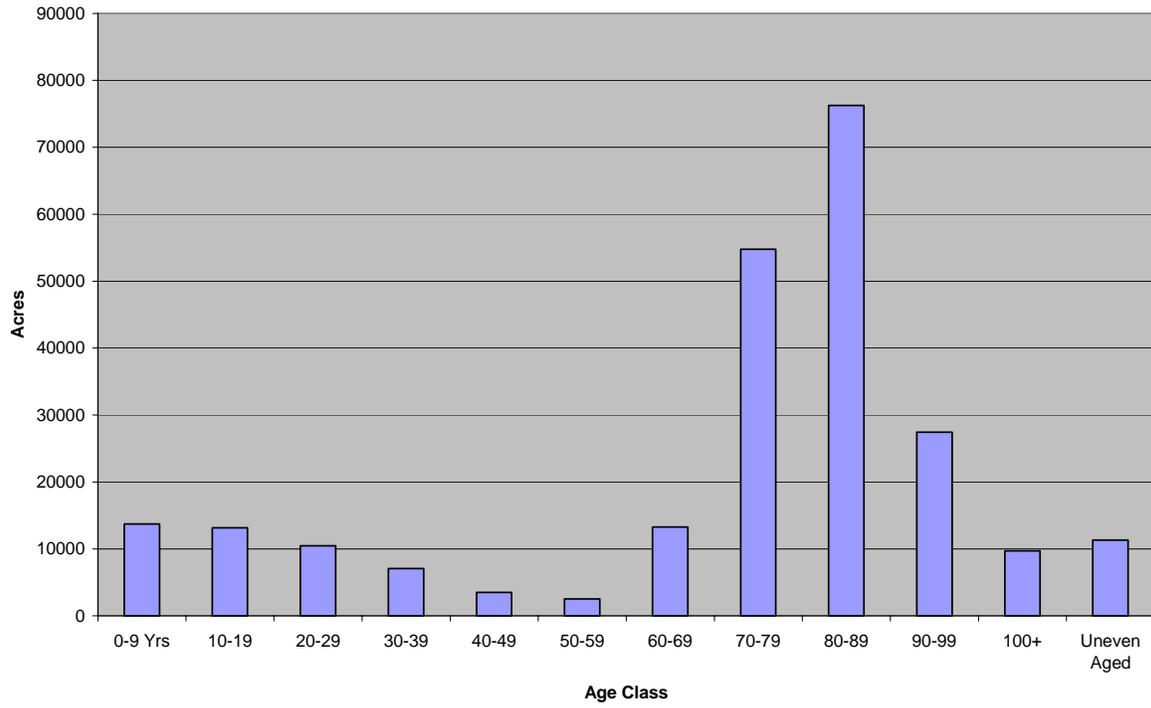
Age Class Distribution for Mixed Conifer Swamp (2006)



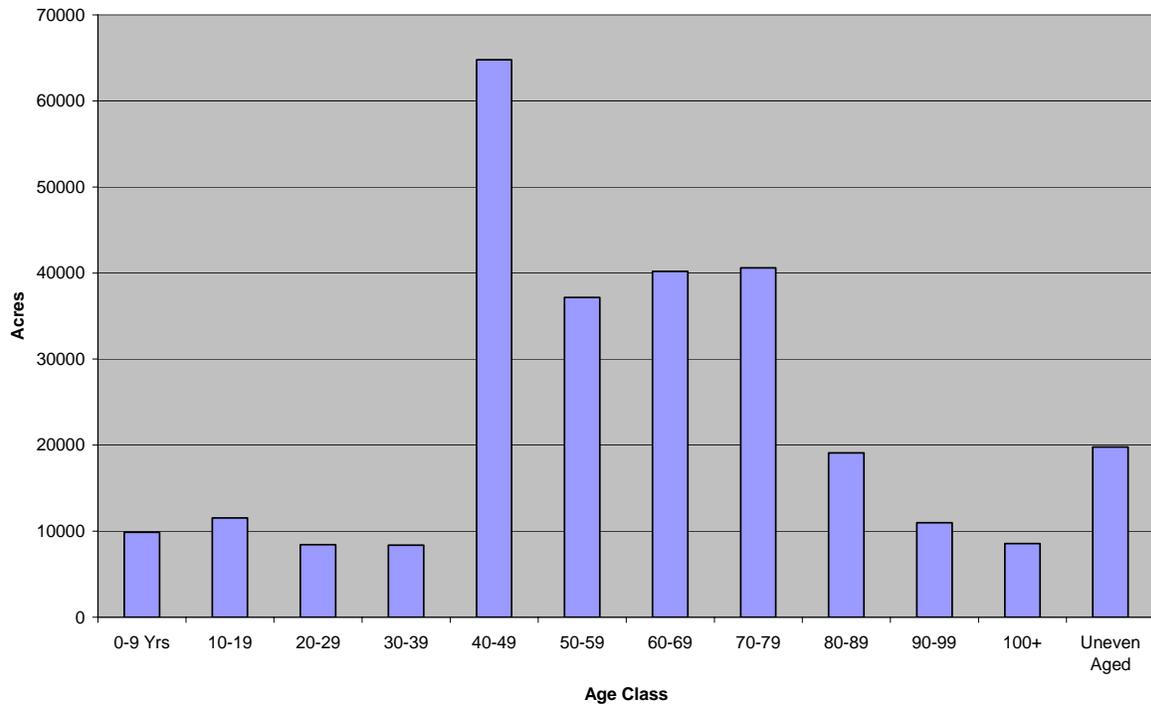
Age Class Distribution of Northern Hardwoods (2006)



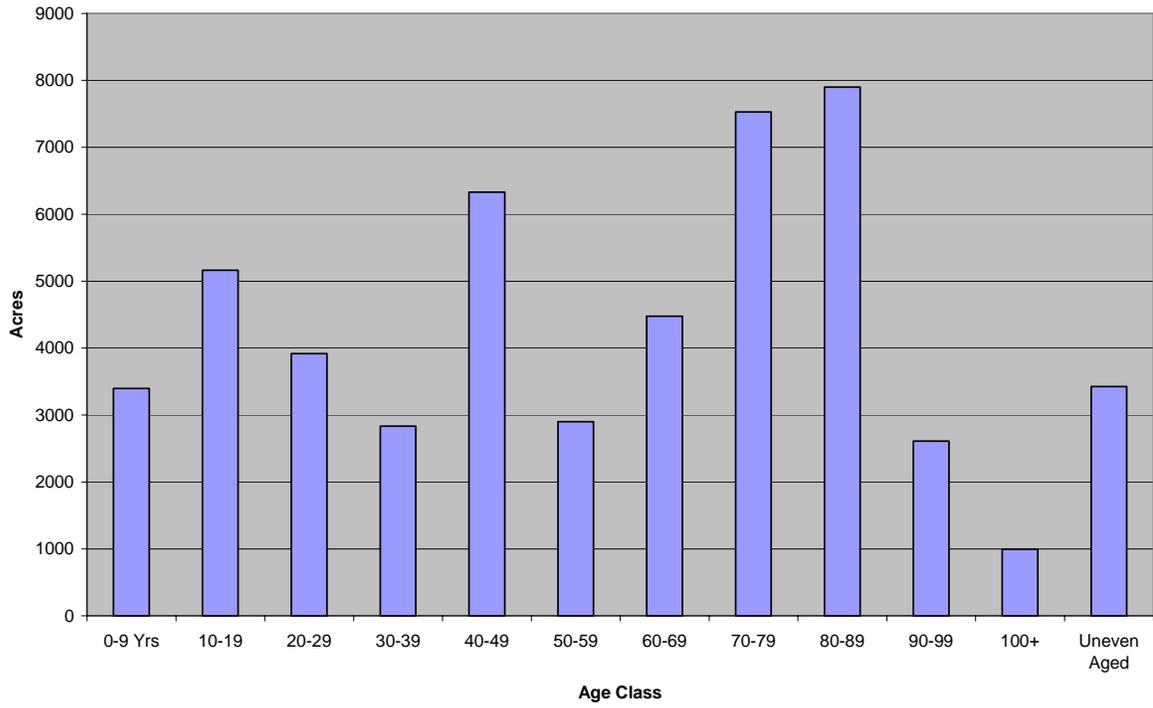
Age Class Distribution for Oak (2006)



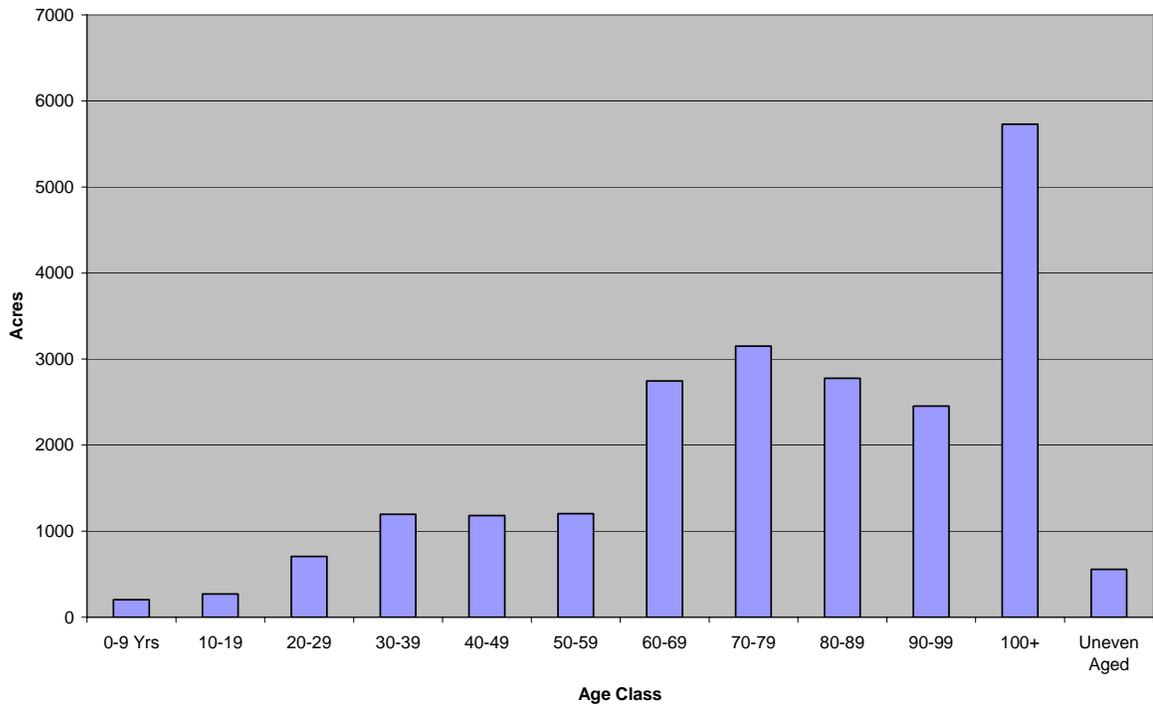
Age Class Distribution for Red Pine (2006)



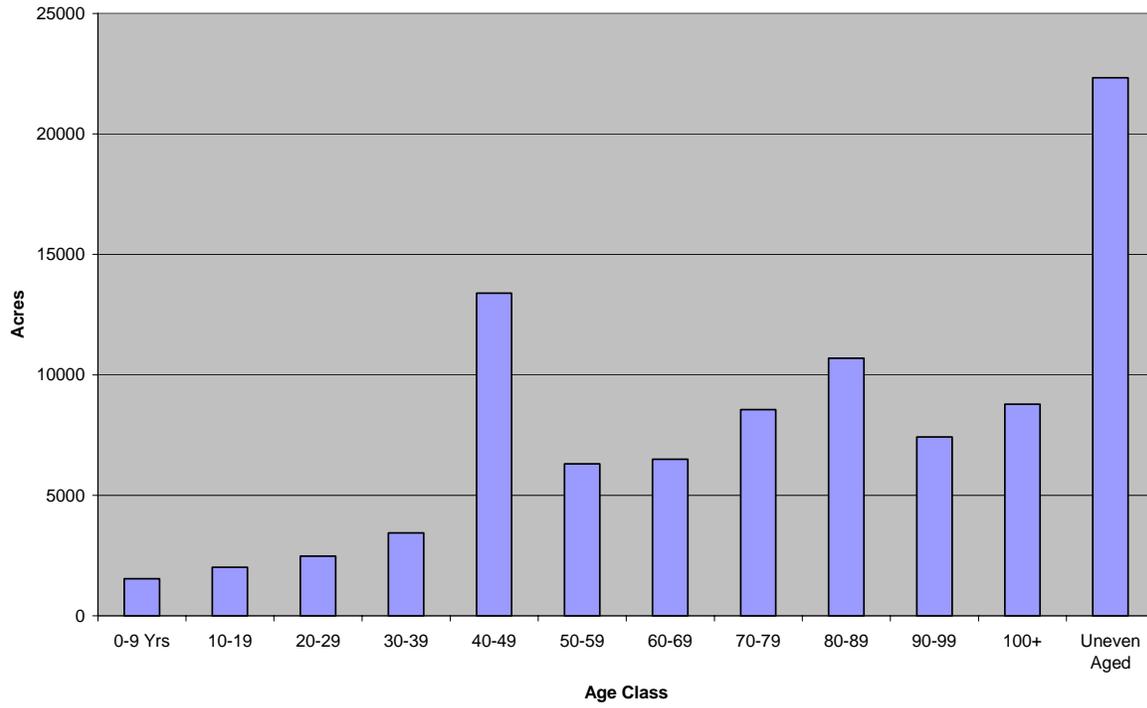
Age Class Distribution for Spruce Fir (2006)



Age Class Distribution for Tamarack (2006)



Age Class Distribution for White Pine (2006)



Appendix H.–Core set of statewide criteria and indicators

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Criteria and Indicators (C&I) provide a framework for gathering data and for evaluating the importance, status, and sustainability of the management of complex landscapes. Criteria define broad categories of capacity, goals or processes that are essential to sustainable resource management. Criteria address biological diversity, ecosystem condition and productivity, social, cultural and spiritual values, recreation values, ownership patterns, economic health, institutional processes that support forest conservation and sustainable management.

Indicators monitor how a system operates or functions. Any indicator by itself provides limited information about the system as a whole. To effectively monitor a complex system, such as a forest, more than one indicator may be required. The different values held by people about the environmental, social, and economic spheres of forests may also require a diverse set of indicators to depict the many facets of forests and forest management. The information derived from monitoring changes in common indicators contributes to an improved understanding of the consequences of earlier decisions, which leads to informed decision making processes for sustainable forest management.

Metrics are used to identify data needed to measure indicators. They provide the means to measure or describe various aspects of the indicators, and are a tool used for monitoring the progress toward achieving sustainable forest management. Metrics, therefore, need to be discrete, explicit and easy to quantify. The purpose of a metric is to:

1. measure the condition of a resource,
2. measure the level of stress or pressure on a resource,
3. provide a direct measure of a management action taken to either improve conditions or reduce stress on a resource, or
4. measure the outcome of management.

The nonachievement of a metric or a significant change in a trend measured by a metric provides an indication that management processes may need to be adjusted or changed to meet management goals and objectives necessary to achieve a sustainable desired future condition for a specific ecological, social or economic value.

No criterion, indicator or metric alone can provide an adequate measure of forest sustainability. The criteria considered together provide a more comprehensive picture of the status of forests and their management. The C&I used will likely be adapted over time to reflect experience gained with their use, new research findings, advances in technology, and public understanding of forests.

A core set of C&I for DNR-managed lands were developed to provide a standardized statewide basis for planning and monitoring. All ecoteams will use the below core set of Criteria and Indicators (C&I) in Ecoregional Resource Plans. Ecoteams may not delete core metrics, however, reflecting the unique character and values of their regions they may develop additional indicators and metrics. Before an ecoteam adds metrics, lead division(s) for completing the metrics must be identified. The lead division(s) will be responsible for coordinating the collection and analysis of data; obtaining the funding for staff time, materials, services, or contracts needed to measure the metric; reporting the metric by a self-defined deadline; and updating the metric at a self-defined frequency.

The core set of C&I will be evaluated for revision in accordance with the plan review and revision requirements provided in Chapter 6, whereby the DNR may seek to add additional metrics or to remove metrics that do not provide an effective measure of an indicator. Proposed additions or removals of metrics will be reviewed by the Statewide Resource Planning Team to obtain consensus of the resource divisions. Within this context, the lead division(s) for a metric will have the option to alter the metric to make it practical, technologically feasible, cost effective, or scientifically

defensible. Prior to adopting a metric for inclusion, the lead division(s) will: describe the purpose and primary use of the metric; define and set boundaries for the metric; identify the unit(s) of measure that will be reported; set the date for when the completed metric will be reported; set the frequency at which the metric will be updated; and determine the tier level. Metrics will be included in the core or ecoregional sets upon approval by the Statewide Council.

The extent, scope, and limits of criteria & indicator metrics will be clearly defined in all Ecoregional Resource Plans and any other plans or guidance documents that discuss these metrics. The scope of the core set of statewide criteria & indicator metrics include:

1. gathering information on a statewide basis (where applicable) from a variety of existing data sources;
2. providing information on a statewide basis and may be broken down by ecoregion where applicable and where the robustness of the data is not compromised;
3. gathering information related to all land ownerships, whether state-owned, public, corporate, or private lands;
4. application to any and all land cover community types; and
5. use for monitoring purposes by the ecoteams, divisions, and DNR workgroups, as needed.

Data are not currently available for the effective measurement of all metrics. The core C&I metrics have been categorized into tiers based upon the availability of data and the frequency with which the DNR can commit to measure specific metrics (Table E1). The measurement of metrics may also be subject to DNR workforce and budgetary constraints, whereby the DNR has the option to cease collecting, analyzing, or reporting a metric due to changes in priorities, funding, availability of data, or scientific understanding. There are four tiers of metric measurement:

Tier 1: Metrics for which the DNR or others have databases available, and that are measured with short periodicity. Data collected more frequently than on a yearly basis will be reported annually. Examples include: USGS hydrologic data from stream gauges, acres and volumes of forest timber, lake and stream surveys for status and trends.

Tier 2: Metrics for which the DNR or others have databases available, but which are measured at a longer periodicity (every 5-10 years). Metrics will be reported when updated data become available. These could be items that are contracted out to universities as graduate student research. Examples include: Forest Inventory Analysis (FIA) data, large lake surveys, stock-recruitment relationships of specific fish stocks.

Tier 3: Metrics for which the DNR or others have the means to measure, but the data sources are inconsistent and only partially available. The DNR will be responsible for reporting only that portion of the data that are currently available. Examples include: resource inventories and population distribution and trends.

Tier 4: Metrics that the DNR would like to measure, but does not currently have the means to do. The DNR will not measure these metrics until data sources or funding become available. These metrics would likely be measured or assembled by a contractor, university, or special project within the DNR. Examples include: large scale genetic or population investigations.

The core set of criteria, indicators, and metrics are:

Criterion 1—Conservation of Biological Diversity

Biological diversity, or biodiversity, is the variability among living organisms and the ecological systems of which they are a part. Biodiversity can be measured at the landscape, ecosystem, species and genetic levels. Each level of biodiversity has three components: 1) Compositional diversity -the number of elements within a system; 2) Structural diversity -the variety of patterns within a system; and 3) Functional diversity -the number of ecological processes within a system. The conservation of biodiversity ensures that all ecosystems maintain their integrity, continue to be productive and are able to adapt to changing conditions.

Indicator 1.1—The extent of uncommon or rare natural features.

Identification and recognition of uncommon geological sites, plant and animal species, and ecological communities can make a difference between success and failure at sustaining our heritage and protection of natural systems over the long run.

- Metric 1.1.1 Percent and extent of rare natural communities relative to historical conditions.
- Metric 1.1.2 Percent and extent of uncommon geophysical features relative to historical conditions.
- Metric 1.1.3 Percent and extent of uncommon hydro-physical features relative to historical conditions (e.g., aquifers, artesian wells, springs, waterfalls, and recharge zones).

Indicator 1.2—The extent of landscape and ecosystem diversity.

The number of patches, their characteristics, size, shape and connectivity determines the complexity of landscapes. Ecosystem diversity is the kind and number of ecosystems in an area. Landscape diversity is the variety of ecosystems across a landscape, and reflects the patterns of association of ecosystems with one another and the recurrence of these patterns in a given landscape. The impacts of change in landscapes are expressed through shifts in ecosystem diversity.

- Metric 1.2.1 Percent and extent of vegetation types relative to historical conditions.
- Metric 1.2.2 Number of natural community types.
- Metric 1.2.3 Distribution of natural community types.
- Metric 1.2.4 Percentage, area and representativeness of vegetation types in designated protected areas of natural and scientific interest.
- Metric 1.2.5 Level of fragmentation, connectivity, shape, size, and spatial distribution of vegetation types.

Indicator 1.3—The extent of species population diversity.

Species diversity refers to the number and relative abundance of species found in an area. The impacts of change in ecosystems are expressed through shifts in species biodiversity.

- Metric 1.3.1 Distribution, dispersion, and population trends of focal species.

- Metric 1.3.2 Absolute and relative abundance of vegetation types and their importance as habitat for focal species.
- Metric 1.3.3 Trends in habitat of focal species.
- Metric 1.3.4 Species classified as threatened, endangered, rare, or vulnerable, their population trends and habitat condition.
- Metric 1.3.5 Species richness of plants and animals within representative ecosystems.

Indicator 1.4—The extent of genetic diversity.

Genetic diversity includes the range of genetic characteristics found within a species and among different species.

- Metric 1.4.1 Proportion of forest area as plantations using native vs. nonnative genotypes.
- Metric 1.4.2 Proportion of water bodies with native vs. nonnative fish-stock genotypes in both inland and Great Lakes waters.
- Metric 1.4.3 Proportion of water bodies with fishery sustained by natural reproduction.
- Metric 1.4.4 Herbaceous native vs. nonnative species plantings on roads, trails, easements, openings, savannas, grasslands, and wetlands on managed lands.

Criterion 2—Ecosystem Condition and Productivity

Ecosystem condition is a measure of relative freedom from stress and the relative level of physical/biological energy within an ecosystem. Ecosystem productivity refers to the rate of production of biomass (organic matter) within an ecosystem. This results from interactions between plants, animals and micro-organisms or biotic components and abiotic factors such as soil, water and climate. Sustainable productivity is dependent upon the ability of ecosystems to recover from or adapt to both natural and human-induced disturbances. A healthy and diverse ecosystem is more resilient in its ability to respond or adapt to, or to recover from these disturbances in its environment.

Indicator 2.1—The scope, scale, and intensity of disturbance and stress.

Ecosystems are dynamic and are constantly subject to changes in composition and structure. Many of these changes are adaptations to disturbance. Disturbances generally cause ecosystems to revert to earlier successional stages or establish new patterns of succession. Fundamental to the continued health, vitality and productivity of ecosystems are their ability to adapt to the various stresses placed upon them. Disturbances may be part of natural ecological cycles or the result of human activities. Human-induced stress and disturbance include introduced (exotic) species, prescribed burning, fire suppression, populations out of balance with available habitat, pollution, and land-use practices. Natural disturbances include native insects, high wind events, flooding, and fire.

- Metric 2.1.1 Area and severity of insect and disease infestation.
- Metric 2.1.2 Area and severity of flooding, drought, wind, and fire activity.
- Metric 2.1.3 Presence, extent, and number of invasive exotic species.
- Metric 2.1.4 Area and location by county of severe mammalian herbivory.
- Metric 2.1.5 Area and intensity of timber harvest by type.

- Metric 2.1.6 Area and intensity of timber salvage by type.
- Metric 2.1.7 Number and distribution of active and nonrestored mineral and nonmineral extraction sites per township.
- Metric 2.1.8 Miles and density of utility corridors and numbers of communication structures.
- Metric 2.1.9 Miles of undeveloped Great Lakes, inland lakes, rivers, and stream shoreline.
- Metric 2.1.10 Mean concentration of Chlorophyll A during annual growing season in inland lakes.
- Metric 2.1.11 Miles of streams designated as priority for beaver-trout management per DNR Policy 39.21-20.

Indicator 2.2—The extent and change of biomass.

Biomass is the total mass of organic matter in all living organisms within a specific unit area, such as an ecosystem. It is an integrating measure of ecosystem condition, providing a measure of the productivity, health and vitality of all species and habitat types. Evidence that the condition of habitat types is constant or improving indicates that they are being managed in a sustainable way.

- Metric 2.2.1 Volume, net annual growth, mortality, and removals by forest type and age class.

Indicator 2.3—The extent and type of structure within aquatic ecosystems.

Vegetation and other biotic and abiotic materials provide the physical structure within which most organisms live. Ecosystem structure is the variety of patterns within a system, and includes the presence and arrangement of these physical structures in three-dimensional space. Species richness in some taxa is correlated with ecosystem community structure.

- Metric 2.3.1 Alteration of surface and sub-surface geology of valley segment.
- Metric 2.3.2 Alteration of surface and sub-surface hydrology of valley segment.
- Metric 2.3.3 Number and location of lake and stream restoration projects.

Indicator 2.4—The extent and type of structure within upland and wetland ecosystems.

Vegetation and other biotic and abiotic materials provide the physical structure within which most organisms live. Ecosystem structure is the variety of patterns within a system, and includes the presence and arrangement of these physical structures in three-dimensional space. Species richness in some taxa is correlated with ecosystem community structure.

- Metric 2.4.1 Tree size: basal area per acre/hectare for different forest cover types.
- Metric 2.4.2. Distribution of cliffs, outcrops, sinks and glacial erratics.
- Metric 2.4.3 Snags per area, basal area, mean DBH, and decay class.
- Metric 2.4.4 Large woody debris per area, mean DBH, and decay class.
- Metric 2.4.5 Number of vegetative species and structural diversity by age class for forested systems.

Indicator 2.5—Condition of water quality.

Long-term productivity and resilience of habitats, and a potable water supply for humans and wildlife, are dependent upon abundant and clean water resources. Management policies that address stream crossings, watershed management and riparian areas help to maintain water flow patterns, water levels and water quality, and ensure that the condition of aquatic ecosystems are maintained and improved.

- Metric 2.5.1 Distribution and acres of lakes and miles of streams of artificial nitrification (nitrates and phosphates).
- Metric 2.5.2 Pesticide and contaminant residue concentrations in surface water as measured by fish advisories and eagle nesting success.
- Metric 2.5.3 Percentage of impervious surface in watersheds.

Indicator 2.6—Carbon cycle and greenhouse gas emissions.

The carbon cycle represents an important set of processes linking plant and animal communities with climate change. The release or removal of CO₂ to and from the atmosphere impacts global ecological cycles. Forests, wetlands, and water bodies can act as either sinks (a vigorous and growing forest) or sources for atmospheric carbon, depending on whether they are primarily storing carbon or releasing it. Knowledge of the influence of natural disturbances and human intervention on this role can indicate the type of forest practices required for sustainable management.

- Metric 2.6.1 Area of forest permanently, semi-permanently, or temporarily converted to nonforest land use (Also see Indicator 5.3 Land Use).
- Metric 2.6.2 Changes in carbon pool in vegetative biomass.
- Metric 2.6.3 Number of wildfire acres and fuels reported by county and township.
- Metric 2.6.4 Trends in metric tons of greenhouse gas emissions by region or county.

Indicator 2.7—Variance in and type of disruption of hydrological cycles.

Hydrological cycles involve the movement of water from the atmosphere to the surface of the earth in the form of precipitation; from soils to streams to lakes to the atmosphere; and from soil to plants to the atmosphere. Because of their vast area in the state, forests play a major role in Great Lakes hydrological cycles. Changes in forestland cover and management influence the storage and movement of water and the timing of the various components of the hydrological cycle. Forests can influence stream and river hydrographs by regulating the flow of water into wetlands, streams and lakes. Consequently, sustainable forest management plays a crucial role in contributing to the regulation of the hydrological cycle.

- Metric 2.7.1 Number, distribution, and acres of impoundments affected by natural and artificial water control structures.
- Metric 2.7.2 Surface area of lakes and wetlands.
- Metric 2.7.3 Total flow data for rivers and streams.

Indicator 2.8—Effectiveness of soil conservation.

The long-term productivity and resilience of forests and other habitats are dependent upon the maintenance of appropriate levels of soil oxygen, nutrients, organic matter, and water. In order to ensure that terrestrial and aquatic ecosystems are maintained and improved, management policies must be implemented that provide for specific management practices or the protection of sensitive sites.

- Metric 2.8.1 Miles and width of vegetated riparian corridors.
- Metric 2.8.2 Number and location by county of soil erosion and sedimentation BMP violations.
- Metric 2.8.3 Number, location by county, type, and funding for soil erosion and sedimentation restoration projects.
- Metric 2.8.4 Trends in soil quality as measured by pH by eco-region.

Criterion 3—Social/Cultural/Spiritual

Social/Cultural.—The Northern Lower and Upper Peninsula ecoregions in which the state forest is located are predominantly rural, natural resource rich regions of Michigan with large amounts of public forestland. Current social values rely on tourism, recreation, and resource extraction based on the existing natural resources. Life styles and values of the people of this region are strongly connected to its natural resources. Therefore, sustainability of these natural resources is essential to the social and cultural fabric of the region.

Spiritual.—Spiritual values or existence values are personal feelings and sentiments that natural resources stir within the human spirit. This criterion is concerned with the continued ability of the resources to provide these values. Because spiritual values are personal in nature and to a large degree intangible, the indicators pertain primarily to ecosystem features of that appeal to the senses or address the ability of people to use those resources.

Indicator 3.1—Extent of archaeological and historical sites.

Resource management planning takes into account the identification and protection of known unique or significant Native American and Euro-American social, cultural, or spiritual sites.

- Metric 3.1.1 Number of known archaeological sites. (More weight can be given to sites that are on the National Register of Historic Places. This register includes prehistoric sites as well.)
- Metric 3.1.2. Number (presence, extent, location) of area(s) of historical/cultural significance. (Many times these areas may show no signs of their significance, (e.g., a Native American Indian trail corridor where the trail is no longer visible), or a spot at which a meeting or discovery took place.)

Indicator 3.2—Extent of undeveloped natural resources.

The existence and maintenance of large undeveloped forests or other similar resources at landscape scales are a significant influence upon social/cultural/spiritual values.

- Metric 3.2.1 Size and distribution of natural, wilderness, and wild areas and the allowed use of those areas.

Indicator 3.3—Extent and type of aesthetics landscapes.

The visual or aesthetic quality of natural landscapes are a significant influence upon social/cultural/spiritual values (see also metrics under **Indicator 2.1**).

- Metric 3.3.1 Number of designated access opportunities to view scenic vistas or wildlife.
Metric 3.3.2 Miles of road by use class, distribution, and density

Indicator 3.4—Extent and type of traditional uses for cultural forest products (e.g., berries, syrup, mushrooms, black ash, cattails, etc.).

The use of cultural forest products is a form of recreation that originates from historic needs for subsistence. These activities continue to exist for both subsistence and pure recreation. While they do not serve as a significant basis for segments of the state and local economies, they do provide a foundation for traditional social well being. Level of participation and potential resource impacts are also important to consider.

- Metric 3.4.1 Number of traditional harvest festivals across the state – blueberry, morel mushrooms, thimbleberry etc.
Metric 3.4.2 Number of special use permits, (e.g., firewood, Christmas greens (Lycopodium), seeds, cones).
Metric 3.4.3 Extent of tribal gathering activities, (e.g., black ash, bark, berries, medicinal plants, commercial vs. subsistence).
Metric 3.4.4 Amounts, kinds, and impacts of medicinal plant gathering.
Metric 3.4.5 Kinds of and numbers of membership in nonforest product producer organizations.

Criterion 4—Outdoor Recreation

The ability to maintain and strengthen the quality of leisure pursuits in the access of resources and amenities while minimizing social or environmental degradation.

Indicator 4.1—Type, extent and quality of hunting, trapping, and fishing.

Hunting, trapping, and fishing are important forms of recreation that originate from historic needs for subsistence. These activities continue to exist for both purposes of subsistence and pure recreation. They serve as a significant basis for large segments of the state and many local economies, as well as for providing a foundation for traditional social well being.

- Metric 4.1.1 User days per activity.
Metric 4.1.2 Number of animals testing positive for pathogens.
Metric 4.1.3 Population indices for selected species.

- Metric 4.1.4 Estimated harvest by selected species.
- Metric 4.1.5 Amount and locations by county of commercial forestlands, changes in status.
- Metric 4.1.6 Satisfaction of recreational experience for selected programs.

Indicator 4.2—Extent, type, and quality of designated trail use – motorized and nonmotorized (hiking, ORV, snowmobile, skiing, equestrian).

Trails that are designated for authorized hiking, ORV, snowmobile, skiing, and equestrian uses are significant locations for recreation that form a significant basis for large segments of the state and many local economies, as well as providing a foundation for traditional social well being.

- Metric 4.2.1 Amount of money and other resources (hours of staff and volunteer time) available for infrastructure, and trail maintenance and development.
- Metric 4.2.2 User days per activity.
- Metric 4.2.3 Miles of trail systems by trail ownership and management type.
- Metric 4.2.4 Accident trends per activity per season.
- Metric 4.2.5 Satisfaction of recreational experience for selected programs.

Indicator 4.3—Nature Appreciation and Education

One measure for nature appreciation and education is the existence of places where people can interact with natural communities that exist in perpetuity, and where natural processes occur to some degree, such as natural areas, wilderness areas, high conservation value areas, and ecological reference areas.

- Metric 4.3.1 Miles of public Great Lakes, inland lakes, and stream shoreline.
- Metric 4.3.2 Percentage, area, and representativeness of vegetative types in areas of natural and scientific interest.
- Metric 4.3.3 Existence and level of nature oriented and eco-tourism activities, (e.g., guiding and interpretive services for kayaking, canoeing, birding, elk viewing, wildlife viewing, hunting, fishing, photography, backpacking etc.).
- Metric 4.3.4 Satisfaction of recreational experience for selected programs.

Indicator 4.4—Extent, type, and quality of camping – including dispersed and designated site camping. (Refer also to social economic assessment contract.)

Camping is an important form of recreation that originates from historic needs for shelter while traveling through a natural setting. Camping activities of both forms are a significant basis for large segments of the state and many local economies, as well as providing a foundation for traditional social well being.

- Metric 4.4.1 Number, type, and distribution of campground facilities – rustic, modern, semi-modern, and cabin rentals.
- Metric 4.4.2 Number of campsites by type in public and private campgrounds.
- Metric 4.4.3 User days by campground and campsite.

- Metric 4.4.4 Number of dispersed camps per year.
- Metric 4.4.5 Satisfaction of recreational experience for selected programs.

Indicator 4.5—Extent, type and quality of water recreation – motorized and nonmotorized (including swimming, scuba diving, kayaking, etc.).

Water recreation is an important form of recreation that has roots in historic modes of transportation and for fulfilling needs for exercise and adventure. Both forms of water recreation are a significant basis for large segments of the state and many local economies, as well as providing a foundation for traditional social well being.

- Metric 4.5.1 Trends in water activity user days (e.g., power/sail boating, jet-skis, canoes, rafting/tubing, kayaking, swimming, snorkeling, fishing, water skiing, boat races, cruise ships, and sail boarding, etc.).
- Metric 4.5.2 Trends in water recreation equipment sales.
- Metric 4.5.3 Trends in commercial water recreation operators.
- Metric 4.5.4 Number of water access sites and boat slips by type and capacity for watercraft and available amenities.
- Metric 4.5.5 Change in status of water body designation and use.
- Metric 4.5.6 Satisfaction of recreational experience for selected programs.

Indicator 4.6—Public land open to outdoor recreation.

Trends in all land open to outdoor recreation, not just forestland.

- Metric 4.6.1 Amount of public land open to outdoor recreation, by agency (e.g., federal, state, local conservancy, and conservation easement lands).

Criterion 5 Ownership Patterns

The pattern and distribution of ownership and use of lands greatly affects the ability to sustain natural resources. Management options, resource demand and ecological processes are affected by how the land is managed, fragmented, and patterned. Successful sustainable management depends upon the degree of functional connectivity across ownerships, boundaries, and landscapes.

Indicator 5.1—Degree of stewardship.

Stewardship is the practice of carefully managing land usage and associated resources to ensure natural systems are maintained or enhanced for use by future generations.

- Metric 5.1.1 Number, acres, and distribution of Forest Stewardship, Conservation Reserve Program, Qualified Forest Program, American Tree Farm, Commercial Forest, Landowner Incentive Program, private land management plans, and percent of private ownership with management plans.
- Metric 5.1.2 Number of acres and location by county of private land with public conservation easements.

- Metric 5.1.3 Number, kinds, and acres by county of conservation easements.
- Metric 5.1.4 Number, kinds, and acres by county of cooperative planning “agreements” across ownerships, (e.g., Clay Lake Plains Plan, Two Hearted River Watershed Plan, Les Cheneaux Economic Forum, Munuscong Watershed Plan, and St. Mary’s River Plan).
- Metric 5.1.5 Numbers, acres, and percentage of forested lands certified by county for sustainable forestry by ownership.

Indicator 5.2—Extent of accessibility to public lands.

The extent to which a parcel or area of land can be reached and used by people.

- Metric 5.2.1 Number by county of access easements to public lands.
- Metric 5.2.2 Number of acres and location by township of public land without access landlocked by private ownerships.
- Metric 5.2.3 Trends in numbers and location by county of barrier free facilities.

Indicator 5.3—Degree of stability of land use.

The stability of land use or large-scale trends in land use can have direct effect upon the landscape resources base from which social/cultural/spiritual values are derived.

- Metric 5.3.1 Percent of forestland and nonforest land by county.
- Metric 5.3.2 Acres of forestland converted to developed land.
- Metric 5.3.3 Amount of ownership fragmentation and parcelization of land.
- Metric 5.3.4. Number and size of forested parcels added to or removed from the Commercial Forest Program.
- Metric 5.3.5 Distribution of forestland ownership by acres.
- Metric 5.3.6 Percent change by ownership class.

Criterion 6—Economic Health

A wide range of goods and services are derived by and from managing natural resources in the northern Lower and Upper peninsulas of Michigan. In addition to the traditional forest products sector, the resource base supports mining, commercial fishing, and an ever-growing tourist and recreation industry. These goods and services create jobs and provide economic stability to the region.

Indicator 6.1—Extent and trends of local and community economic health.

Trends in planning and investment are important gauges of sustainable natural resource management and in local and community economic health (see also social economic assessment contract).

- Metric 6.1.1 Number of local economic development plans.

- Metric 6.1.2 Trends in job/income/employment/retirement data.
- Metric 6.1.3 Contribution of the resource use to gross domestic product of all sectors of the economy.
- Metric 6.1.4 Diversity of forest economic activity.
- Metric 6.1.5 Capital outlay and investment trends.

Indicator 6.2—Extent of nontimber economic benefits of the forest.

The extent of nontimber economic benefits are an important gauge of sustainable natural resource management and in local and community economic health (see also social and economic assessment contract).

- Metric 6.2.1 Number of recreation and tourism jobs/economic activity.
- Metric 6.2.2 Total expenditures by individuals by select activity.
- Metric 6.2.3 Value and jobs/economic activity related to mineral, oil, and gas extraction.

Indicator 6.3—Extent and type of timber and wood products produced.

The extent and type of timber and wood products are important gauges of sustainable natural resource management and in local and community economic health (see also social and economic assessment contract).

- Metric 6.3.1 Timber volume, growth, and mortality by county.
- Metric 6.3.2 Timber harvest by species by county.
- Metric 6.3.3 Value and volume of wood products by county.
- Metric 6.3.4 Number of jobs/economic activity (e.g., logging, hauling, and mills).

Criterion 7—Institutional Processes

Institutional processes address the legal and institutional framework for the application of ecosystem management. They address the policies, legislation, regulations, and guidelines that drive and direct ecosystem practices; and direct how institutions cooperate with others in the application of ecosystem management. Institutional processes include the quality and quantity of opportunities for public involvement in ecosystem planning leading to resource management decisions.

Indicator 7.1—Extent of the legal framework for ecosystem management.

The framework should include the existence and/or application of laws, regulations, policies, and guidelines for land management. The framework should also consider and meet legal obligations with respect to duly established Native American treaty rights. (Note the metrics here are very important to the public based on the public meetings that were held).

- Metric 7.1.1 Presence of and compliance with land management laws and regulations based on continued Forest Certification management review system, Natural Resource Commission and other open meetings, and stake holder reports.

- Metric 7.1.2 Presence of and compliance with wildlife management laws and regulations.
- Metric 7.1.3 Presence of and compliance with recreation laws and regulations.
- Metric 7.1.4 Presence of and compliance with fisheries management laws and regulations.
- Metric 7.1.5 Presence of and compliance with Native American treaty rights.
- Metric 7.1.6 Presence of and compliance with department and division policies, procedures, and guidelines.
- Metric 7.1.7 Number and extent of laws that reference ecosystem management.

Indicator 7.2—Extent of an institutional framework.

An effective institutional framework is necessary to implement ecosystem management processes effectively.

- Metric 7.2.1 Trends in public participation processes.
- Metric 7.2.2 The number of public advisory committees.

Indicator 7.3—Extent of resources allocated for ecosystem management values.

Sufficiency of resources is necessary to effectively implementation ecosystem management processes.

- Metric 7.3.1 Resources allocated within the department for ecosystem management planning and monitoring.
- Metric 7.3.2 Participation in external planning efforts (e.g., National Forest Plan revisions).
- Metric 7.3.3 Expenditure of resources and dedicated funds for implementation of “on-the-ground” projects.
- Metric 7.3.4 Expenditure of resources and dedicated funds for research in ecosystem management.

Table H1.–Tiered criterion and indicators metrics. Organizations in parentheses represent contributing sources of data.

Core metric	Tier	Measurement frequency	Lead division
1.1.1 Percent and extent of rare natural communities relative to historical conditions.	4	annually	FMFM (MNFI)
1.1.2 Percent and extent of uncommon geophysical features relative to historical conditions.	4	NA	FMFMD
1.1.3 Percent and extent of uncommon hydro-physical features relative to historical conditions (e.g., aquifers, artesian wells, springs, waterfalls, recharge zones).	4	NA	FD
1.2.1 Percent and extent of vegetation types relative to historical conditions.	3	5 years	FMFMD (MNFI)
1.2.2 Number of natural community types.	1	5 years	FMFMD (MNFI) FMFMD (BIODIV TEAM)
1.2.3 Distribution of natural community types.	4	NA	
1.2.4 Percentage, area and representativeness of vegetation types in designated protected areas of natural and scientific interest.	3	annually	FMFMD (WLD, BIODIV TEAM)
1.2.5 Level of fragmentation, connectivity, shape, size, and spatial distribution of vegetation types.	4	NA	WLD (MNFI)
1.3.1 Distribution, dispersion and population trends of focal species.	3	annually	WLD (FD)
1.3.2 Absolute and relative abundance of vegetation types and their importance as habitat for focal species.	3	annually	WLD (FD)
1.3.3 Trends in habitat of focal species.	3	5 years	WLD (FD)
1.3.4 Species classified as threatened, endangered, rare, or vulnerable, their population trends and habitat condition.	3	2 years	WLD, FD
1.3.5 Species richness of plants and animals within representative ecosystems.	4	NA	FMFM (WLD, FD, MNFI)
1.4.1 Proportion of forest area as plantations using native vs. nonnative genotypes.	3	5 years	FMFMD
1.4.2 Proportion of water bodies with native vs. nonnative fish-stock genotypes in both inland and Great Lakes waters.	1	5 years	FD
1.4.3 Proportion of water bodies with fishery sustained by natural reproduction.	1	annually	FD
1.4.4 Herbaceous native vs. nonnative species plantings on roads, trails, easements, openings, savannas, grasslands, and wetlands on managed lands.	4	5 years	WLD (FMFMD, PRD)

Table H1.–Continued.

Core metric	Tier	Measurement frequency	Lead division
2.1.1 Area and severity of insect and disease infestation.	1	annually	FMFMD
2.1.2 Area and severity of flooding, drought, wind, and fire activity.	3	5 years	FMFMD
2.1.3 Presence, extent and number of invasive exotic species.	4	NA	FMFMD (MDA)
2.1.4 Area and location by county of severe mammalian herbivory.	4	NA	FMFMD
2.1.5 Area and intensity of timber harvest by type.	1	annually	FMFMD
2.1.6 Area and intensity of timber salvage by type.	2	annually	FMFMD
2.1.7 Number and distribution of active and nonrestored mineral and nonmineral extraction sites per township.	2	5 years	FMFMD
2.1.8 Miles and density of utility corridors and numbers of communication structures.	3	10 years	FMFMD (OLAF)
2.1.9 Miles of undeveloped Great Lakes, inland lakes, rivers, and stream shoreline.	3	10 years	FD
2.1.10 Mean concentration of Chlorophyll A during annual growing season in inland lakes.	1	annually	FD
2.1.11 Miles of streams designated as priority for beaver-trout management per DNR Policy 39.21-20.	4	NA	FD (WLD)
2.2.1 Volume, net annual growth, mortality, and removals by forest type and age class.	1	annually	FMFMD
2.3.1 Alteration of surface and sub-surface geology of valley segment.	2	10 years	FD
2.3.2 Alteration of surface and sub-surface hydrology of valley segment.	1	as necessary	FD
2.3.3 Number and location of lake and stream restoration projects.	2	as necessary	FD
2.4.1 Tree size: basal area per acre/hectare for different forest cover types.	1	annually	FMFMD
2.4.2. Distribution of cliffs, outcrops, sinks, and glacial erratics.	3	5 years	FMFMD
2.4.3 Snags per area, basal area, mean DBH, and decay class.	3	annually	FMFMD
2.4.4 Large woody debris per area, mean DBH and decay class.	4	NA	FMFMD
2.4.5 Number of vegetative species and structural diversity by age class for forested systems.	1	annually	FMFMD

Table H1.–Continued.

Core metric	Tier	Measurement frequency	Lead division
2.5.1 Distribution and acres of lakes and miles of streams of artificial nitrification (nitrates and phosphates).	1	annually	FD
2.5.2 Pesticide and contaminant residue concentrations in surface water as measured by fish advisories and Eagle nesting success.	1	annually	FD
2.5.3 Percentage of impervious surface in watersheds.	2	10 years	FD
2.6.1 Area of forest permanently, semi-permanently, or temporarily converted to nonforest land use (Also see Indicator 5.3 Land Use).	2	5 years	FMFMD
2.6.2 Changes in carbon pool in vegetative biomass.	2	5 years	FMFMD
2.6.3 Number of wildfire acres reported by county and township.	3	annually	FMFMD
2.6.4 Trends in metric tons of greenhouse gas emissions by region or county.	2	10 years	FMFMD (DEQ)
2.7.1 Number, distribution, and acres of impoundments with artificial water control structures.	3	10 years	FD (WLD)
2.7.2 Surface area of lakes and wetlands.	2	10 years	FD
2.7.3 Total flow data for rivers and streams.	1	annually	FD
2.8.1 Miles and width of vegetated riparian corridors.	4	NA	FMFMD
2.8.2 Number and location by county of soil erosion and sedimentation BMP violations.	1	annually	FMFMD
2.8.3 Number, location by county, type, and funding for soil erosion and sedimentation restoration projects.	1	annually	FD
2.8.4 Trends in soil quality as measured by pH by eco-region	4	NA	FMFMD
3.1.1 Number of known archaeological sites. (More weight can be given to sites that are on the National Register of Historic Places. This register includes prehistoric sites as well.)	3	5 years	FMFMD (SHPO)
3.1.2. Number (presence, extent, location) of area(s) of historical/cultural significance. Many times these areas may show no signs of their significance (e.g., a Native American Indian trail corridor where the trail is no longer visible, or a spot at which a meeting or discovery took place).	3	10 years	FMFMD (SHPO)
3.2.1 Size and distribution of natural, wilderness and wild areas and the allowed use of those areas.	1	annually	FMFMD (WLD)
3.3.1 Number of designated access opportunities to view scenic vistas and/or wildlife.	3	10 years	FMFMD (WLD, PRD)

Table H1.–Continued.

Core metric	Tier	Measurement frequency	Lead division
3.3.2 Miles of road by use class, distribution and density	1	annually	FMFMD
3.4.1 Number of traditional harvest festivals across the state – blueberry, morel mushrooms, thimbleberry etc.	2	5 years	FMFMD (MEDC)
3.4.2 Number of special use permits (e.g., firewood, Christmas greens (Lycopodium), seeds, cones).	1	annually	FMFMD (WLD)
3.4.3 Extent of tribal gathering activities, e.g. black ash, bark, berries, medicinal plants—commercial vs. subsistence.	4	NA	FMFMD (WLD)
3.4.4 Amounts, kinds, and effects of medicinal plant gathering.	4	NA	FMFMD
3.4.5 Kinds of and numbers of membership in nonforest product producer organizations.	4	NA	FMFMD
4.1.1 User days per activity.	1	annually	WLD (FD)
4.1.2 Proportion or number of animals testing positive for pathogens, or number of diseases or pathogens for which there are active surveillance programs.	1	annually	WLD (FD)
4.1.3 Population indices for selected species.	4	NA	WLD (FD)
4.1.4 Estimated harvest by selected species.	4	NA	WLD (FD)
4.1.5 Amount and locations by county of commercial forestlands, changes in status.	1	annually	FMFMD
4.1.6 Satisfaction of recreational experience for selected programs.	3	annually	WLD, FD (LED)
4.2.1 Amount of money and other resources (hours of staff and volunteer time) available for infrastructure and trail maintenance and development.	1	annually	FMFMD (PRD, WLD)
4.2.2 User days per activity.	3	10 years	FMFMD (PRD, WLD)
4.2.3 Miles of trail systems by trail ownership and management type.	1	annually	FMFMD (PRD)
4.2.4 Accident trends per activity per season.	1	annually	LED
4.2.5 Satisfaction of recreational experience for selected programs.	4	NA	FMFMD (PRD, WLD, LED)
4.3.1 Miles of public Great Lakes, inland lakes, and stream shoreline.	3	10 years	FD
4.3.2 Percentage, area and representativeness of vegetative types in areas of natural and scientific interest.	3	5 years	FMFMD (WLD, BIODIV TEAM)

Table H1.–Continued.

Core metric	Tier	Measurement frequency	Lead division
4.3.3 Existence and level of nature oriented and eco-tourism activities (e.g., guiding and interpretive services for kayaking, canoeing, birding, elk viewing, wildlife viewing, hunting, fishing, photography, backpacking etc.).	4	NA	FMFMD (MEDC)
4.3.4 Satisfaction of recreational experience for selected programs.	4	NA	Office of Communications
4.4.1 Number, type, and distribution of campground facilities – rustic, modern, semi-modern, cabin rentals.	1	annually	FMFMD (PRD)
4.4.2 Number of campsites by type in public and private campgrounds.	1	annually	FMFMD (PRD, DEQ)
4.4.3 User days by campground and campsite.	1	annually	FMFMD (PRD)
4.4.4 Number of dispersed camps per year.	1	annually	FMFMD
4.4.5 Satisfaction of recreational experience for selected programs.	4	NA	FMFMD, PRD (WLD, LED)
4.5.1 Trends in water activity user days (e.g., power/sail boating, jet-skis, canoes, rafting/tubing, kayaking, swimming, snorkeling, fishing, water skiing, boat races, cruise ships, sail boarding, etc.).	3	10 years	LED (MSU)
4.5.2 Trends in water recreation equipment sales and registrations.	1	annually	PRD
4.5.3 Trends in commercial water recreation operators.	4	NA	LED
4.5.4 Number of water access sites and boat slips by type and capacity for watercraft and available amenities.	1	annually	PRD
4.5.5 Change in status of water body designation and use.	2	5 years	LED
4.5.6 Satisfaction of recreational experience for selected programs.	4	NA	PRD (FMFMD, LED)
4.6.1 Amount of public land open to outdoor recreation in Michigan, by agency.	1	annually	FMFMD (PRD, WLD)
5.1.1 Number, acres, and distribution of Forest Stewardship, Conservation Reserve Program, Qualified Forest Program, American Tree Farm, Commercial Forest and Landowner Incentive Program private land management plans, and percent of private ownership with management plans.	4	NA	FMFMD (WLD)
5.1.2 Number of acres and location by county of private land with public conservation easements.	3	5 years	FMFMD (WLD)

Table H1.–Continued.

Core metric	Tier	Measurement frequency	Lead division
5.1.3 Number, kinds, and acres by county of conservation easements.	3	5 years	FMFMD
5.1.4 Number, kinds, and acres by county of cooperative planning “agreements” across ownerships (e.g., Clay Lake Plains Plan, Two Hearted River Watershed Plan, Les Cheneaux Economic Forum, Munuscong Watershed Plan, St. Mary’s River Plan).	2	5 years	FMFMD
5.1.5 Numbers, acres, and percentage of forested lands certified by county for sustainable forestry by ownership.	4	NA	FMFMD
5.2.1 Number by county of access easements to public lands.	2	5 years	FMFMD (OLAF)
5.2.2 Number of acres and location by township of public land without access landlocked by private ownerships.	2	10 years	FMFMD (OLAF)
5.2.3 Trends in numbers and location by county of barrier free facilities.	3	10 years	FMFMD (PRD)
5.3.1 Percent of forestland and nonforest land by county.	2	10 years	FMFMD
5.3.2 Acres of forestland converted to developed land.	4	NA	FMFMD
5.3.3 Amount of ownership fragmentation and parcelization of land.	3	10 years	FMFMD (OLAF)
5.3.4. Number and size of forested parcels added to or removed from the Commercial Forest Program.	1	annually	FMFMD
5.3.5 Distribution of forestland ownership by acres.	2	10 years	FMFMD
5.3.6 Percent change by ownership class.	2	10 years	FMFMD
6.1.1 Number of local economic development plans.	2	10 years	FMFMD (DLEG)
6.1.2 Trends in job/income/employment/retirement data.	2	10 years	FMFMD (DLEG)
6.1.3 Contribution of the resource use to gross domestic product of all sectors of the economy.	2	10 years	FMFMD (DLEG)
6.1.4 Diversity of forest economic activity.	2	10 years	FMFMD (DLEG)
6.1.5 Capital outlay and investment trends.	2	10 years	FMFMD (DLEG)
6.2.1 Number of recreation and tourism jobs/economic activity.	2	10 years	FMFMD
6.2.2 Total expenditures by individuals by select activity.	2	10 years	FMFMD
6.2.3 Value and jobs/economic activity related to mineral, oil, and gas extraction.	2	10 years	FMFMD
6.3.1 Timber volume, growth, and mortality by county.	2	10 years	FMFMD

Table H1.–Continued.

Core metric	Tier	Measurement frequency	Lead division
6.3.2 Timber harvest by species by county.	2	10 years	FMFMD
6.3.3 Value and volume of wood products by county.	2	10 years	FMFMD
6.3.4 Number of jobs/economic activity (e.g., logging, hauling, and mills).	2	10 years	FMFMD
7.1.1 Presence of and compliance with land management laws and regulations based on continued Forest Certification management review system, Natural Resource Commission and other open meetings, and stake holder reports.	1	annually	FMFMD
7.1.2 Presence of and compliance with wildlife management laws and regulations.	2	5 years	LED (WLD)
7.1.3 Presence of and compliance with recreation laws and regulations.	2	5 years	LED (PRD, FMFMD)
7.1.4 Presence of and compliance with fisheries management laws and regulations.	2	5 years	LED (FD)
7.1.5 Presence of and compliance with Native American treaty rights.	1	annually	FMFMD
7.1.6 Presence of and compliance with department and division policies, procedures, and guidelines.	3	5 years	FMFMD (All DNR)
7.1.7 Number and extent of laws that reference ecosystem management.	2	10 years	FMFMD
7.2.1 Trends in public participation processes.	3	5 years	FMFMD (All DNR)
7.2.2 The number of public advisory committees.	2	5 years	FMFMD (All DNR)
7.3.1 Resources allocated within the department for ecosystem management planning and monitoring.	2	5 years	FMFMD (All DNR)
7.3.2 Participation in external planning efforts (e.g., National Forest plan revisions).	2	10 years	FMFMD (All DNR)
7.3.3 Expenditure of resources and dedicated funds for implementation of “on-the-ground” projects.	3	annually	FMFMD (All DNR)
7.3.4 Expenditure of resources and dedicated funds for research in ecosystem management.	3	annually	FMFMD (All DNR)

Appendix I.–Michigan’s natural communities

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Table I.1.—Michigan’s natural communities.

Communities	State rank
Palustrine Marsh	
Coastal plain marsh	S2—imperiled because of rarity
Emergent marsh	S4—secure
Great lakes marsh	S3—rare or uncommon
Inland salt marsh	S1—critically imperiled because of extreme rarity
Interdunal wetland	S2—imperiled because of rarity
Intermittent wetland	S3—rare or uncommon
Northern wet meadow	S4—secure
Southern wet meadow	S3—rare or uncommon
Submergent marsh	S4—secure
Palustrine Prairie	
Lakeplain wet prairie	S1—critically imperiled because of extreme rarity
Lakeplain wet-mesic prairie	S1—critically imperiled because of extreme rarity
Wet prairie	S2—imperiled because of rarity
Wet-mesic prairie	S2—imperiled because of rarity
Wet-mesic sand prairie	S1—critically imperiled because of extreme rarity
Palustrine Fen	
Prairie fen	S3—rare or uncommon
Northern fen	S3—rare or uncommon
Patterned fen	S2—imperiled because of rarity
Poor fen	S3—rare or uncommon
Palustrine Bog	
Bog	S4—secure
Muskeg	S3—rare or uncommon
Palustrine Forest	
Floodplain forest	S3—rare or uncommon
Hardwood-conifer swamp	S3—rare or uncommon
Northern hardwood swamp	S3—rare or uncommon
Poor conifer swamp	S4—secure
Rich conifer swamp	S3—rare or uncommon
Rich tamarack swamp	S3—rare or uncommon
Southern hardwood swamp	S3—rare or uncommon
Wet-mesic flatwoods	S2—imperiled because of rarity
Palustrine Shrub	
Inundated shrub swamp	S3—rare or uncommon
Northern shrub thicket	S5—demonstrably secure and essentially ineradicable under present conditions
Southern shrub-carr	S5—demonstrably secure and essentially ineradicable under present conditions
Palustrine/Terrestrial	
Wooded dune and swale complex	S3—rare or uncommon
Terrestrial Forest	
Boreal forest	S3—rare or uncommon
Dry northern forest	S3—rare or uncommon

Table I.1.—Continued.

Communities	State rank
Dry southern forest	S3—rare or uncommon
Dry-mesic northern forest	S3—rare or uncommon
Dry-mesic southern forest	S3—rare or uncommon
Mesic northern forest	S3—rare or uncommon
Mesic southern forest	S3—rare or uncommon
Terrestrial Savanna	
Bur oak plains	SX—apparently extirpated
Lakeplain oak openings	S1—critically imperiled because of extreme rarity
Oak barrens	S1—critically imperiled because of rarity
Oak openings	S1—critically imperiled because of extreme rarity
Oak-pine barrens	S2—imperiled because of rarity
Pine barrens	S2—imperiled because of rarity
Terrestrial Prairie	
Dry sand prairie	S2—imperiled because of rarity
Dry mesic prairie	S2—imperiled because of rarity
Hillside prairie	S1—critically imperiled because of extreme rarity
Mesic prairie	S1—critically imperiled because of extreme rarity
Mesic sand prairie	S1—critically imperiled because of extreme rarity
Terrestrial Primary	
Alvar	S1—critically imperiled because of rarity
Great lakes barrens	S2—imperiled because of rarity
Northern bald	S1—critically imperiled because of extreme rarity
Open dunes	S3—rare or uncommon in the state
Sand and gravel beach	S3—rare or uncommon
Sinkhole	S2—imperiled because of rarity
Granite bedrock glade	S2—imperiled because of rarity
Limestone bedrock glade	S2—imperiled because of rarity
Volcanic bedrock glade	S2—imperiled because of rarity
Granite bedrock lakeshore	S2—imperiled because of rarity
Limestone bedrock lakeshore	S2—imperiled because of rarity
Sandstone bedrock lakeshore	S2—imperiled because of rarity
Volcanic bedrock lakeshore	S2—imperiled because of rarity
Limestone cobble lakeshore	S3—rare or uncommon
Sandstone cobble lakeshore	S3—rare or uncommon
Volcanic cobble lakeshore	S3—rare or uncommon
Granite cliff	S2—imperiled because of rarity
Limestone cliff	S2—imperiled because of rarity
Sandstone cliff	S2—imperiled because of rarity
Volcanic cliff	S2—imperiled because of rarity
Granite lakeshore cliff	S2—imperiled because of rarity
Limestone lakeshore cliff	S2—imperiled because of rarity
Sandstone lakeshore cliff	S2—imperiled because of rarity
Volcanic lakeshore cliff	S1—critically imperiled because of rarity
Terrestrial Subterranean	
Cave	S1—critically imperiled because of rarity