

MANAGEMENT OF XERIC OAK IN NORTHERN LOWER MICHIGAN

Grayling, MI October 20, 2009

Matthew Sands, Shared Services Silviculturist
Huron-Manistee National Forests

Objectives

- Review of ecology and landscape occurrence of northern pin, black and white oaks.
- Landscape and forest vegetation conditions c. 1816 - 1856.
- Range of existing conditions.
- Aesthetic and Visual Considerations.
- Management alternatives to attain a range of desired forest conditions.

Silvics of the Species

Burns and Honkala (Agriculture Handbook 654), 1990

www.fs.fed.us/database/feis/plants/tree/queell

Paul S. Johnson, 1992

- Black Oak (*Quercus velutina* Lam.)
- White Oak (*Quercus alba* L.)
- Northern Pin oak (*Quercus ellipsoidalis* E.J. Hill)

Landscape Ecology aka Silvics of Xeric Oak Species

photo: Michael Clayton



Silvicultural Highlights:

Seed Production and Seedling Recruitment

	BLACK OAK	WHITE OAK	N. PIN OAK
Seed Production	Age 40 – 75	Age 40 – 200	Age 20+
Seed Crop	2 to 3 years	4 to 10 years	3 to 4 years
Seedling Establishment	Mineral soil contact	Loose, humic soil	Mineral soil contact
	Partial shade < “B level”	Partial shade < “B level”	30 – 60% stocking
	14”+ d.b.h. trees	12”+ d.b.h. trees	14”+ d.b.h trees
Vegetative Reproduction	Stumps 3“ diameter	Stumps 2 – 5” diameter	Stumps
	Seedling sprouts	Seedling sprouts	Seedling sprouts
Advanced Reproduction	4 – 5’ tall with well	443/ac. > 4.5’ tall to obtain	Probability of a > 3’ tall
	developed root systems	future stocking of 220/ac.	seedling < 50% when
		at 3” avg. stand diameter	Stand BA > 75 ft ²

Seedling Establishment

Full sunlight



Seedling Establishment

Partial canopy



Seedling Establishment

Closed canopy



Vegetative Reproduction

Stump Sprouts, small diameter



Vegetative Reproduction

Stump sprouts, large diameter



Silvicultural Highlights: Sapling to Maturity

	BLACK OAK	WHITE OAK	N. PIN OAK
Reaction to Competition	Intolerant, less tolerant & persistent than White oak	Intermediate Persistent in the understory	Very intolerant No reproduction in shade
Rooting Habits	Deep > 10' Seedling root growth slowed by top damage	Deep > 10' Seedling root growth slowed by top damage	Deep > 10' Seedling root growth slowed by top damage
	Grafts: Black & N.Pin oaks	Grafts: White oaks	Grafts: Black & N.Pin oaks
Sapling – Pole – Mature	Site index < 55 Rotation length 50 - 80	Site index < 55 Rotation length 50 - 80	Site index < 55 Rotation length 50 - 80
Damaging Agents	Fire, Gypsy moth, frost, Oak wilt, & Armillaria mella	Fire, Gypsy moth, frost, & Armillaria mella	Fire, Gypsy moth, frost, Oak wilt, & Oak canker (Botryodiplodia gallae)

Xeric Oaks in Pre-Settlement Forests

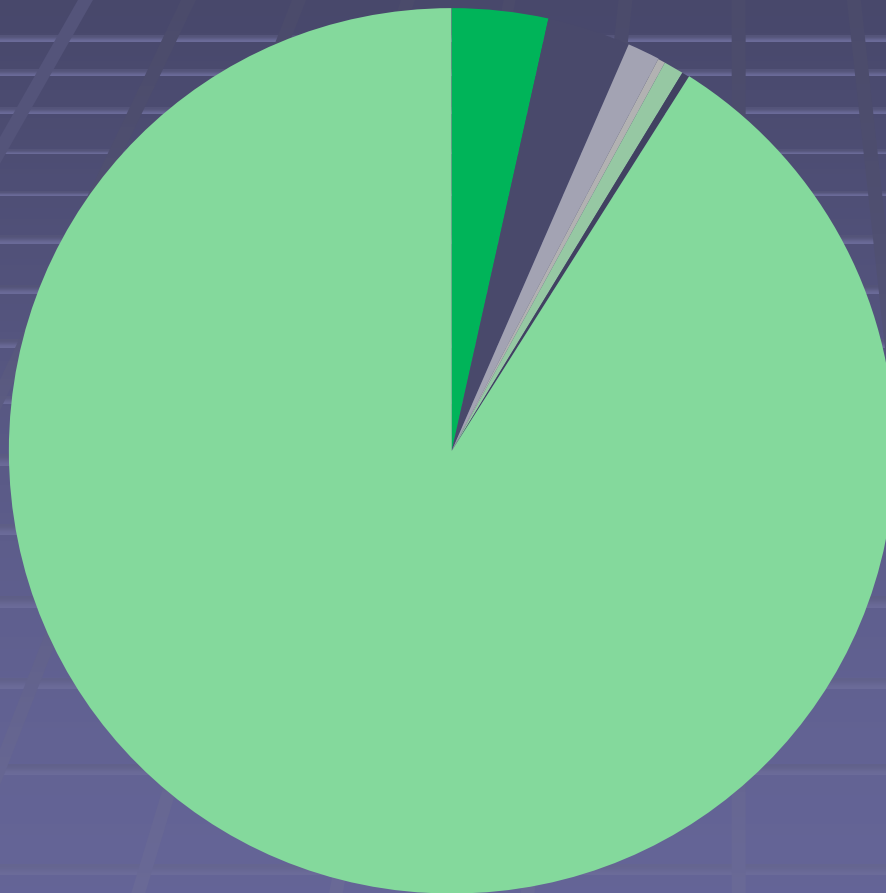
photo: Michael Clayton



% Distribution of Xeric Oak Cover Types

c. 1816 – 1856

Albert and Comer, 2008

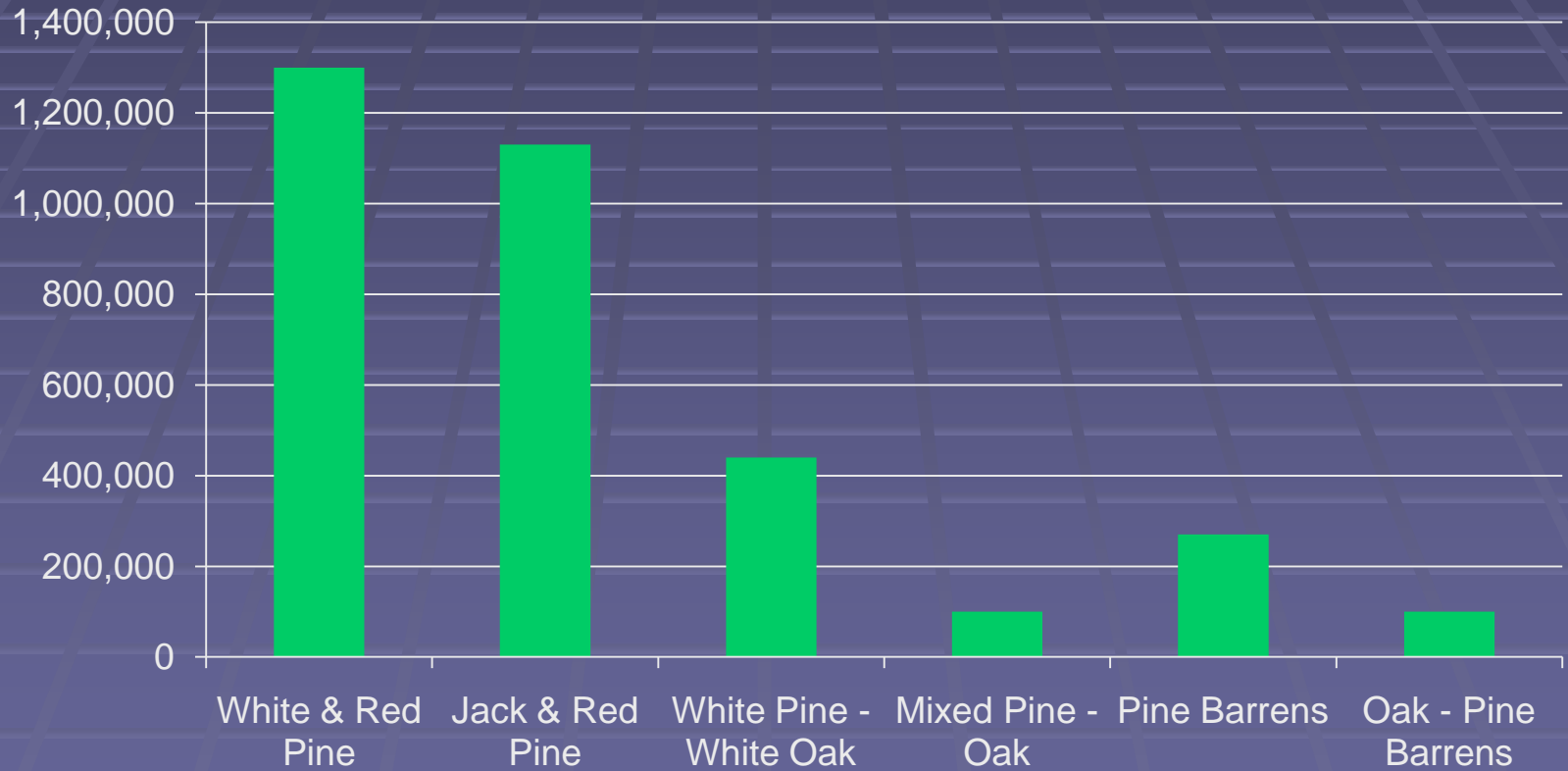


- White & Red Pine
- Jack & Red Pine
- White Pine - White Oak
- Mixed Pine - Oak
- Pine Barrens
- Oak - Pine Barrens
- All Other Vegetation & Water

Acres of Each Vegetation Type

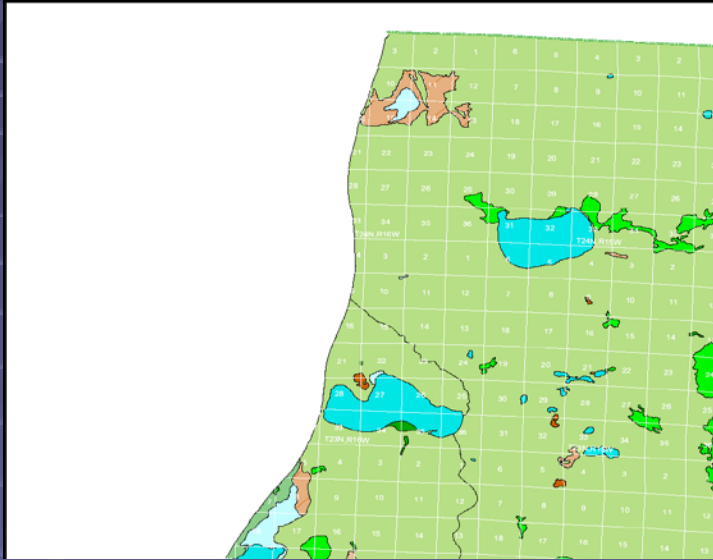
c. 1816 – 1856

Albert and Comer, 2008



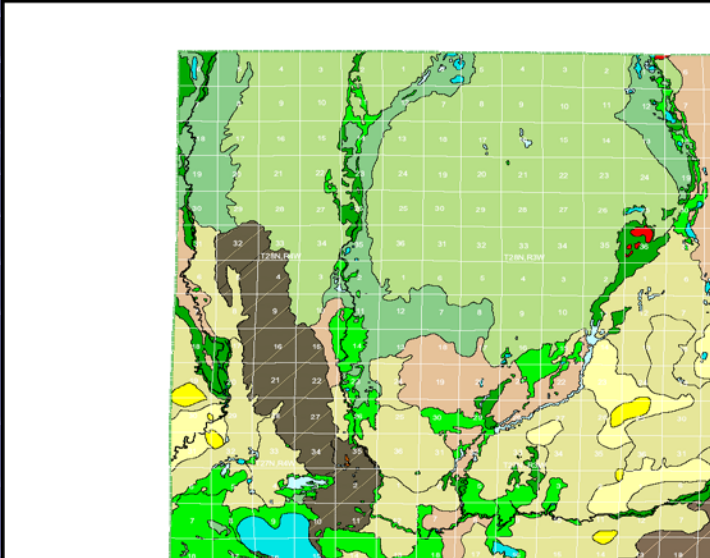
Pre-Settlement Occurrences

From Comer, et. al. 1995



Pre-Settlement Occurrences

From Comer, et. al. 1995



Landscape Ecology of Xeric Oaks

photo: answers.com



Hierarchical structure of the national framework of ecological units developed by the Forest Service of the U.S. Department of Agriculture i

(Cleland et al. 1997).

<u>Application scale</u>	<u>Ecological units</u>	<u>Principal map unit design criteria includes</u>
▪ National (ecoregions)	Domain	Broad climatic zones or groups
▪	Division	Regional climatic types, vegetation affinities
▪	Province	Dominant potential natural vegetation, mountains
▪ Regional (subregions)	Section	Geologic stratigraphy and lithology, soils
▪	Subsection	Surficial geology, soils
▪		
▪ National forest (landscapes)	Landtype association	Geologic formation, elevation, soils
▪		
▪ Project (land units)	Landtype	Landform and topography, rock type, soils
▪	Landtype phase	Landform and slope position, soils

Ecoregions of the U.S.: Provinces

- Bailey's Ecoregions, 1995



Ecological Setting

- Sections, the largest ecological unit of the subregion planning scale of the U.S. Department of Agriculture (USDA) Forest Service National Hierarchical Framework of Ecological Units, are shown nested within provinces, the smallest unit of the ecoregion level. Sections are delineated primarily by evaluation and integration of physical and biological components including climate, physiography, lithology, soils, and potential natural communities.

Province 212: Laurentian Mixed Forest

Northern Michigan Surficial Geology

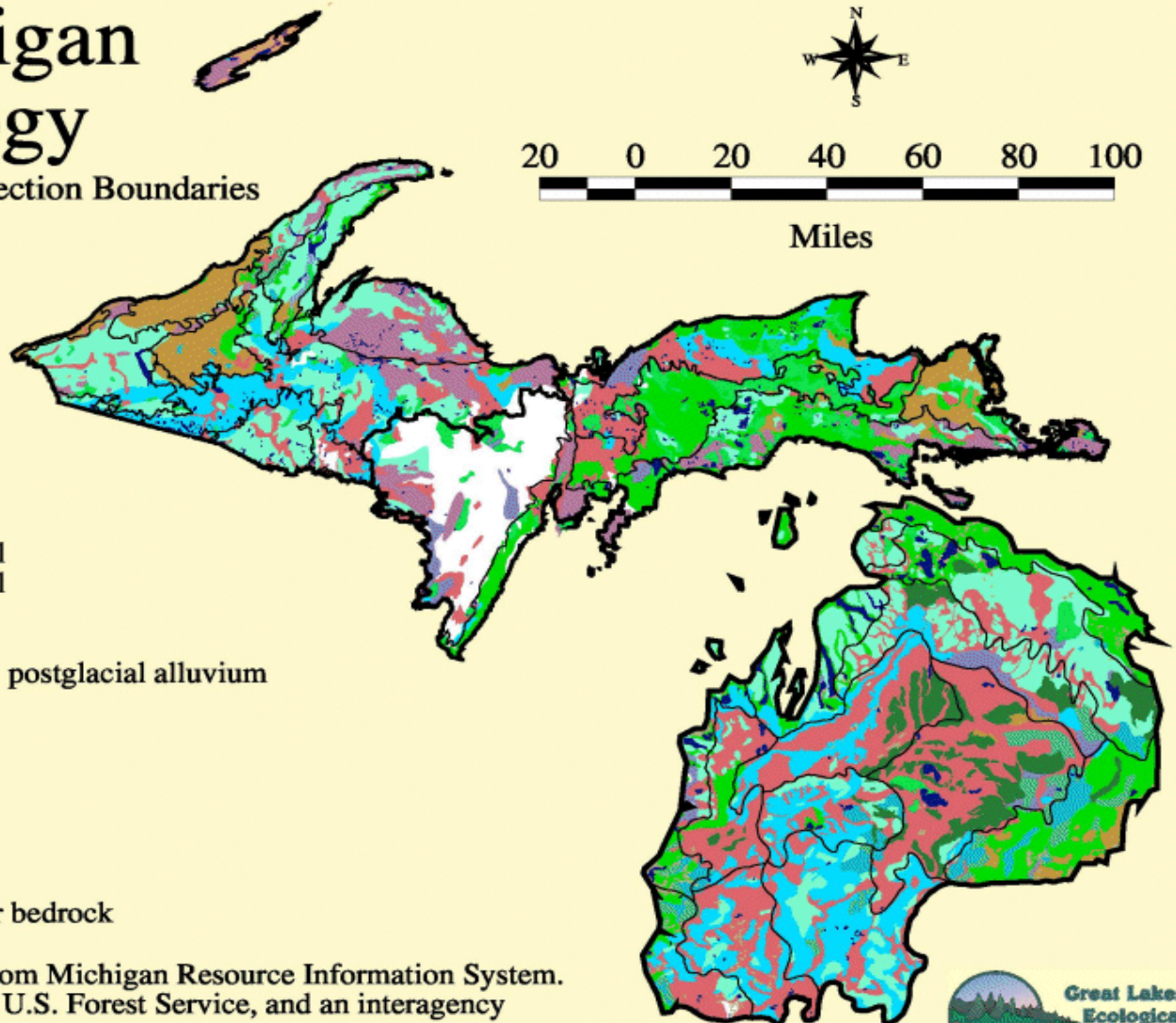
with Province 212 Section and Subsection Boundaries

Legend

- Section Boundaries
- Subsection Boundaries

Surficial Geology

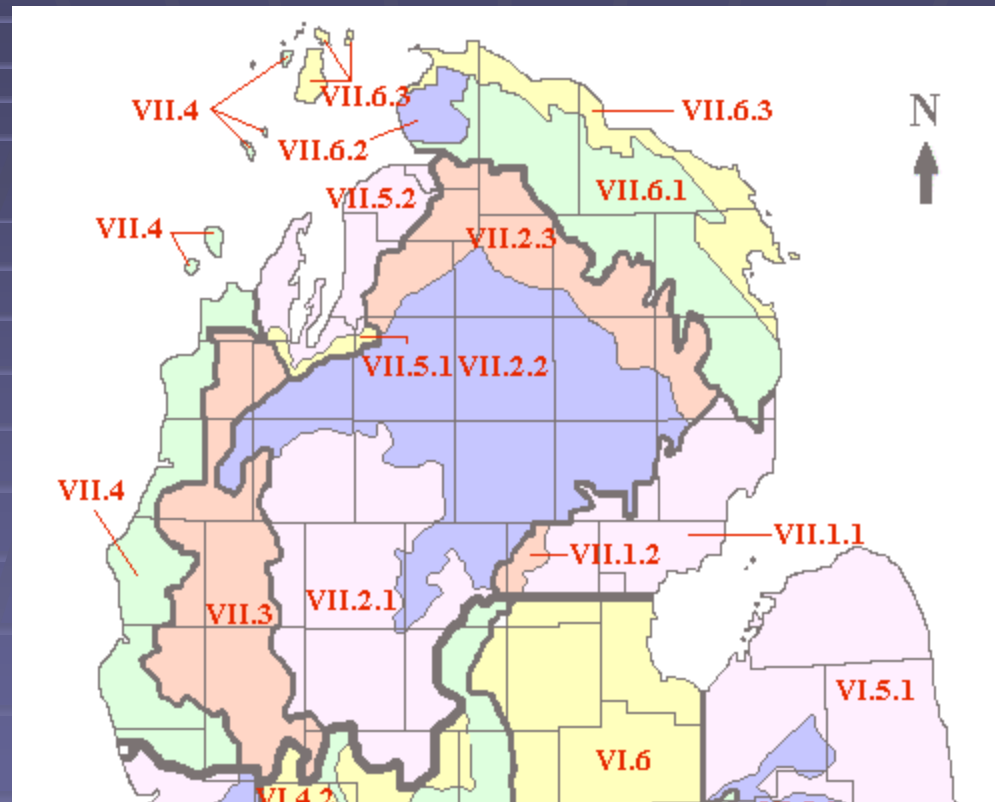
- Artificial fill
- Course-textured glacial till
- Dune sand
- End moraines of fine-textured till
- End moraines of medium-textured till
- End moraines of medium-textured till
- Exposed bedrock surfaces
- Fine-textured glacial till
- Glacial outwash sand and gravel and postglacial alluvium
- Ice-contact outwash sand and gravel
- Lacustrine clay and silt
- Lacustrine sand and gravel
- Lakes
- Medium-textured till
- Peat and Muck
- Postglacial alluvium
- Thin to discontinuous glacial till over bedrock



Surficial geology coverage was obtained from Michigan Resource Information System. Section and subsection coverages are from U.S. Forest Service, and an interagency adaptation of Albert et al. (1996).

212 Subsections/Sub-subsections, Northern Lower Michigan

Albert, 1994



Sub-subsection VII.2.2

Grayling Outwash Plain

- Relatively high elevation: 900 – 1580’.
- Broad outwash plain with sandy ridges; extremely low winter temperatures and frosts throughout the summer.
- Course – medium sand soils; low inherent fertility; drainage class excessively well-drained common.
- Growing season length 80 – 130 days.
- Relatively uniform annual precipitation 28 – 32”.

Subsection VII.3

- Newaygo Outwash Plain
 - Relatively lower elevation, 700 – 1210’.
 - Narrower outwash plain with sandy end moraines; late spring freezes influenced by cold air drainage from the Grayling outwash plain.
 - Course – medium sand soils; low inherent fertility; drainage class excessively well-drained common.
 - Growing season 130 – 150 days.
 - Annual precipitation 32”.

Xeric Oak Landtype Association on the Huron- Manistee National Forests

Cleland et. al. 1991

- Landtype association (LTA) 1 consists of level outwash plains formed by high energy glacial melt-waters. In places, the outwash has been dissected by watercourses after deposition; pitted locations resulted from the melting of blocks of stagnant ice in the glacial outwash.
- Physiography is flat to slightly undulating; slopes 2 – 6%; elevation 630 – 1080’.
- Soils consist of poorly developed, excessively well-drained sands with gravel strata, classified as Typic Udipsamments.
- Deposits are well-sorted coarse to medium in size, with siliceous mineralogy; droughty; low fertility.
- Depth to the water table is generally below the tree rooting depth; however, areas where the outwash deposits are closer to the surface are identified at the next lower hierarchical scale.
- Dominant forest vegetation is jack - red pines, n. pin – black – white oaks.

Xeric Oaks: Existing Conditions and Causal Event

- Regenerating Forests
- Young Forests
- Mature Forests
- Over-Mature Forests
- Non-Forest

Regenerating Forests

Cause: Wildfire



Regenerating Forests

Cause: Wildfire



Regenerating Forests

Cause: Windstorm



Regenerating Forests

Cause: Windstorm



Regenerating Forests

Cause: Succession



Regenerating Forests

Cause: Partial Removal Harvest



Young Forests

Cause: Clearcut Harvest



Young Forests

Cause: Clearcut Harvest



Young Forests

Cause: Partial Removal Harvest



Young Forests

Cause: Removal Harvest



Mature Forest

Cause: Second Growth



Mature Forest

Cause: Second Growth



Mature Forest

Cause: Second Growth



Over-Mature Forest



Over-Mature Forest



Non-Forest

Cause: Failed Clearcut



Non-Forest

Cause: Prescribed Fire



Non-Forest

Cause: Upland Opening Maintenance



Xeric Oaks: Social Considerations

photo: Ohio DNR



Aesthetic and Visual Considerations

- The National Forest Scenery Management System defines landscape character as the combination of physical, biological and cultural attributes that give a geographic area its visual and cultural image.
- Landscape character represents distinct attributes of landform, vegetation, surface water and cultural features.
- Scenic Attractiveness measures the importance of the landscape, classified as Distinctive, Typical, or Indistinctive.
- Scenic Integrity is an indication of the state of disturbance, ranging from unaltered to heavily altered.

Isn't This A Little Like ?



Example From the Huron NF: Identify the Desired Future Condition

- Scenic Integrity is evaluated from existing travel-ways and use areas, from the perspective of the observer.
- Consider historic, existing, interim and long term Scenic Integrity levels.
- The Result: Long-Term Scenic Integrity Objectives
- Contrast M-18 corridor (Roaded Natural Sandy Plains & Hills) and South Branch Au Sable (Semi-primitive Non-Motorized) DFC's

Long-Term Scenic Integrity Objectives

Scenic Classes: measure scenic value by combining attractiveness, distance zone, and level of landscape visibility.

Identified in the Huron NF Revised Forest Plan Standards & Guidelines for Scenic Resources

Scenic Class	Roaded Natural Sandy Plains and Hills (RNSP&H)	Semi-primitive Non-motorized (SPNM)
1	High	High
2	Moderate	
3	Low	

Mapping Existing Scenic Integrity

Suitable for Multiple Scales: Forest planning to implementing and monitoring

- Used to describe the existing landscape character.
- Uses National Forests standards and guidelines for individual Management Area direction.
 - RNSP&H has been heavily altered, and is proposed for a high percentage of shelterwood and clearcut; Low Scenic class predominates.
 - SPNM has been less intensively altered, minimal shelterwood and clearcut amounts proposed: Moderate to High Scenic classes predominate.

M-18 and South Branch Au Sable 2005 Aerial



Roaded Natural Sandy Plains & Hills

Scenic Classes High to Moderate Public Value

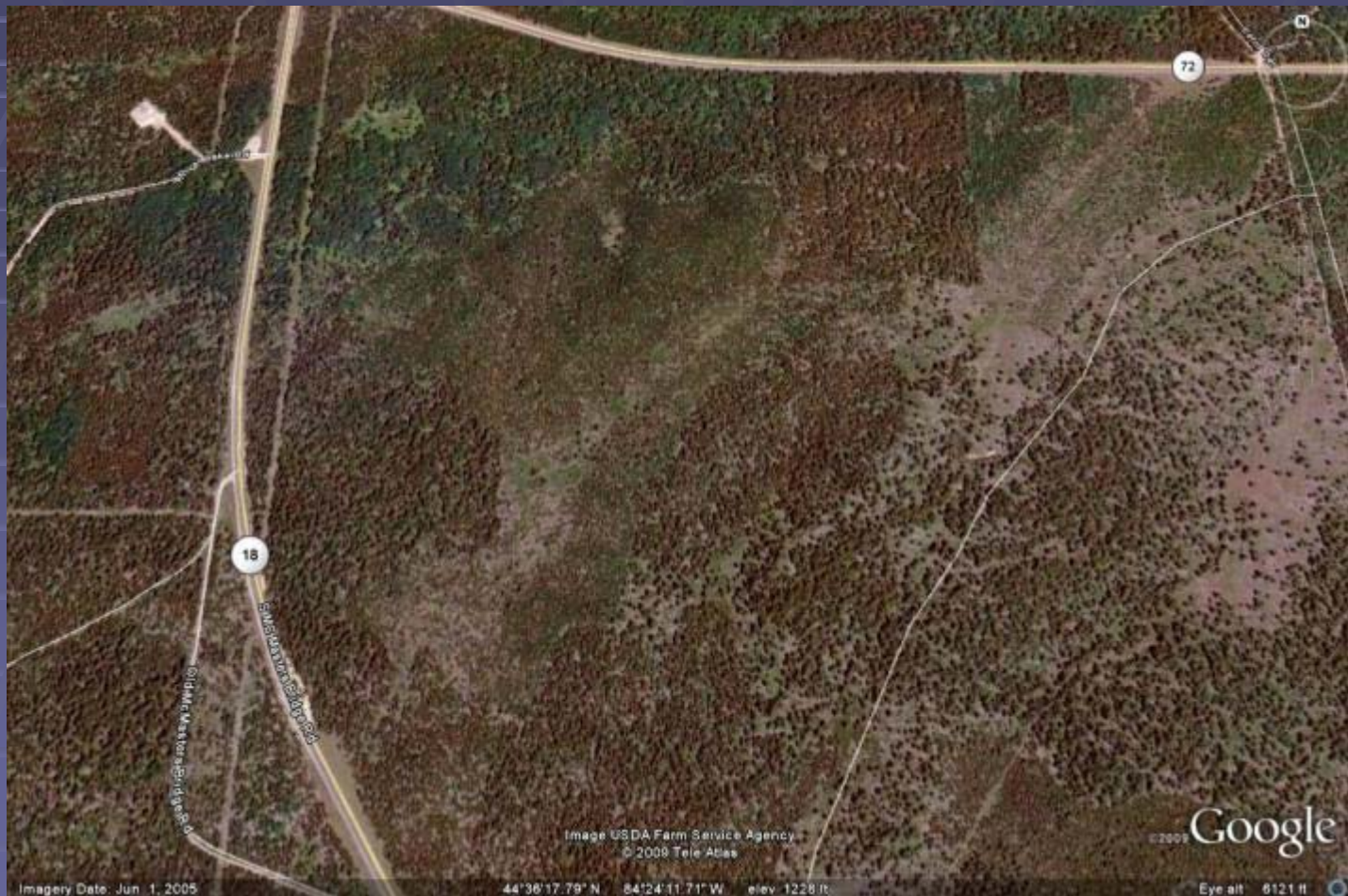


Semi-Primitive Non-Roaded

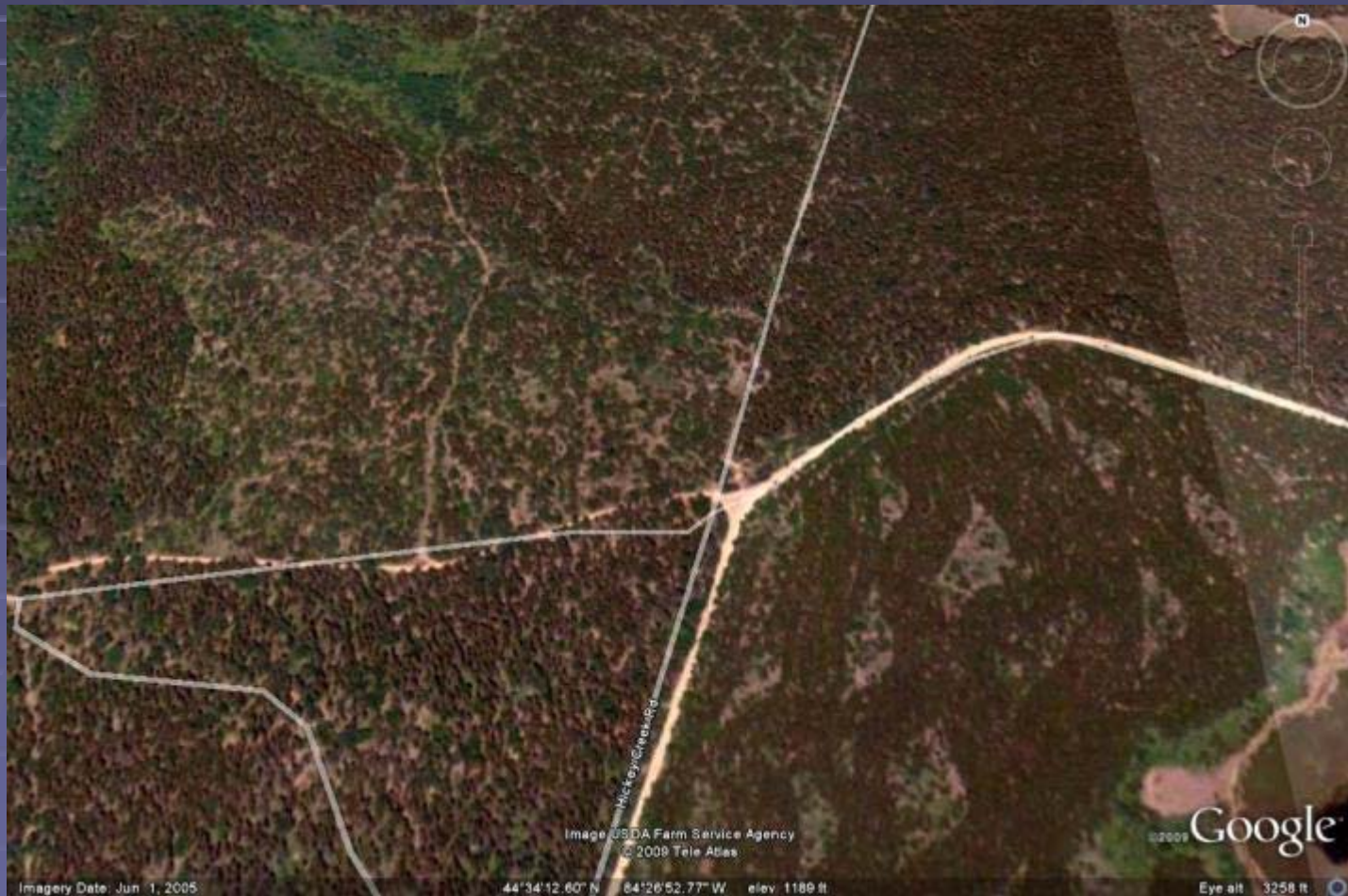
Scenic Class High Public Value



RNSP&H Scenic Integrity Objectives: High to Low



SPNM Scenic Integrity Objective: High



Management Alternatives to Achieve the Desired Condition

- Planned Forest Harvests
- Reactive Forest Harvests
- Other Active or Passive Strategies
- Back to the Future

Achieving the Desired Condition: What Works

- Removal and partial removal harvests when advanced regeneration is present.
- Advantages:
 - Low cost, sustainable
 - Flexible in time and space
 - Provides integrated benefits, socially acceptable
- Disadvantages:
 - Patience
 - Failure(s)
 - Low product values, restricted markets

Achieving the Desired Condition: What Works

- Salvage and Sanitation Harvests.
- Advantages:
 - Low cost, sustainable
 - Leverage natural events
 - Integrate at various scales
 - Public perception(s)
 - Forest Health considerations
- Disadvantages:
 - Silviculture after the fact
 - Poor output:return ratio & Opportunity cost
 - Lower product values, local markets

Achieving the Desired Condition: What Works

- Prescribed Fire and/or Natural Succession.
- Advantages:
 - Low cost, sustainable
 - Leverage natural processes
 - Integrate at various scales
 - Public perception(s)
- Disadvantages:
 - Unintended consequences
 - Public perception(s)
 - Low or zero product values, restricted markets
 - Forest Health affects

Achieving the Desired Condition: What Works

- Convert Forestland to Non-Forestland.
- Advantages:
 - Low cost, sustainable
 - Leverage natural processes
 - Integrate at various scales
 - Public perception(s)
 - Landscape diversification/additional benefits
- Disadvantages:
 - Unintended consequences
 - Public perception(s)
 - Reduces commercial forest land base

Objective Checklist

- Review of ecology and landscape occurrence of northern pin, black and white oaks.
- Landscape and forest vegetation conditions c. 1816 - 1856.
- Range of existing conditions.
- Aesthetic and Visual Considerations.
- Management alternatives to attain a range of desired forest conditions.

Thank You, Michigan Chapter of
the Society of American
Foresters