NORTH CENTRAL FOREST EXPERIMENT STATION

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FOREST TREATMENT OPPORTUNITIES FOR EASTERN SOUTH DAKOTA 1980-1989

W. Brad Smith, *Mensurationist, St. Paul, Minnesota,*
Raymond A. Sowers, *Forest Management Specialist, South Dakota Division of Forestry, Pierre, South Dakota,*
and **Pamela J. Jakes,** *Resource Analyst, St. Paul, Minnesota*

ABSTRACT.—Provides a view of management opportunites of eastern South Dakota commercial forest land during the decade 1980-1989. Discusses harvest, timber stand improvement, and restocking opportunities.

KEY WORDS: Harvest, thinning, area, volume, management.

Forest Inventory and Analysis (or Forest Survey) is a continuing endeavor as mandated by the Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974. The objective of RPA is to periodically inventory our Nation's forest land to determine the magnitude, condition, volume, growth, and depletions of the timber resource. In 1980, the North Central Forest Experiment Station, Forest Inventory and Analysis Project, conducted the third inventory of forest land east of the 103rd meridian in South Dakota (fig. 1).

This part of South Dakota is not heavily forested; however, the region has 867,000 acres of wooded land vital to the quality of life in the area. Although most wooded acres are in scattered pockets and stringers along rivers and streams, they shelter and protect homes, farm buildings, crops, livestock, and wildlife. Approximately 114,000 acres are commercial forest land capable of producing commercial crops of timber and have not been withdrawn from utilization by statute or administrative regulation.

The potential for managing commercial forest land in eastern South Dakota is the subject of this note. Treatment opportunities during the decade 1980-1989 were identified for projected forest conditions in eastern South Dakota. The treatments evaluated were: (1) harvest, (2) thinning or timber stand improvement (commercial and noncommercial), and (3) stand conversion or restocking. Projected stand conditions were evaluated by treatment criteria during the decade and the qualifying area was determined for each treatment. Volumes were tabulated for each of those stands selected for treatment and represent the volume that could be removed if the treatment was carried out.

Treatment criteria for eastern South Dakota were adopted from those used in other Plains States. They reflect feasible management practices for current conditions on commercial forest land in eastern South Dakota (table 1).

There is no single or correct evaluation for treatment opportunities in eastern South Dakota—they vary according to the treatment criteria specified. The findings presented are the result of just one set of treatment options.

ASSUMPTIONS

To conduct the analysis, we made three basic assumptions: (1) the area of commercial forest land (113,600 acres) would remain stable for the decade 1980-1989, (2) all commercial forest land would be available for treatment, and (3) a ready market would exist for all species and products. This analysis does not take into account possible economic, social, or political constraints on treatment opportunities.

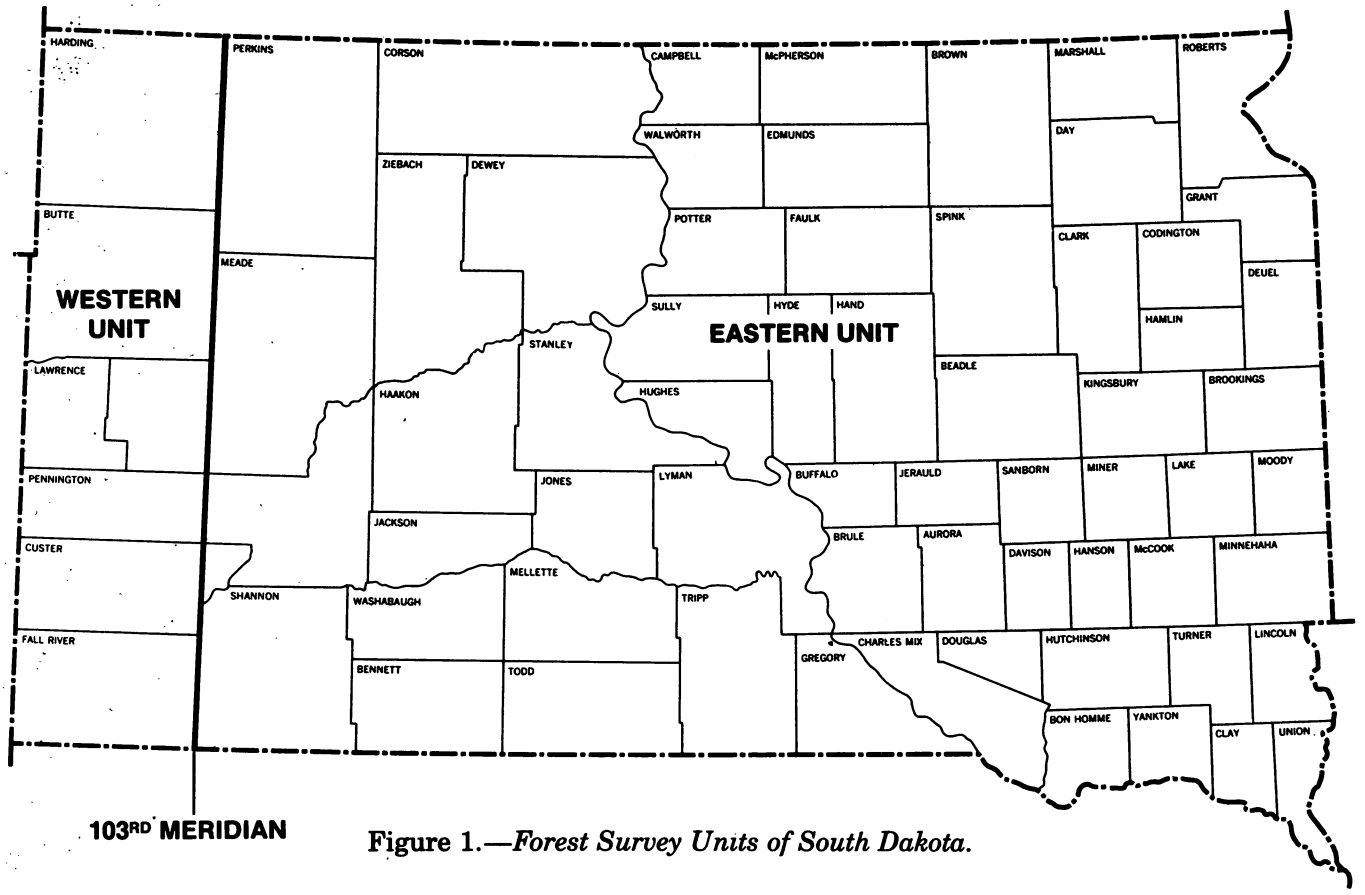

Figure 1.—*Forest Survey Units of South Dakota.*

METHOD

Treatment opportunities are projected for one decade because this is viewed as a reasonable planning period, and forest inventories are conducted every 10 years. In practice, treatments could occur anytime throughout the decade. An estimate of the average annual volumes removed during the treatment pe-

Table 1.—*Harvest and timber stand improvement criteria used in assessing treatment opportunities, eastern South Dakota, 1980*

Forest type	Site index range	Rotation age for harvest	Thinning[1]	
			Pre-thinning basal area	Post-thinning basal area
	Feet	*Years*	*----Square feet----*	
Ponderosa pine	0-50	100	110	80
	51+	120	110	80
Oak	0-55	110	90	65[2]
	56+	80	90	65[3]
Elm-ash	All sites	80	90	70
Cottonwood	All sites	60	95	60
Plains hardwood	All sites	90	90	65

[1]Stands must be more than 10 years from harvest age to be considered for thinning.

[2]Stands must be less than 41 years old to be considered for thinning.

[3]Stands must be less than 51 years old to be considered for thinning.

riod must reflect the growth that would occur on plots between 1980 (when the data were collected) and the time of treatment. Therefore, it was necessary to project an average of 5 years growth on each stand before treatments were evaluated. Plot data from the 1980 Eastern South Dakota Forest Inventory were used as input to the Stand and Tree Evaluation and Modeling System (STEMS).[1] This System "grew" each plot for 5 years and projected the areas and volumes represented by the plots. After the projection, we used the following process to identify treatment opportunities for each forest inventory plot (fig. 2):

(1) **Identify areas for stand conversion or restocking.**

The basal area for each plot was compared to the stand age to see if the plot would achieve full stocking. A plot was selected for stand conversion or restocking if plot basal area was < 19 + (0.38 x stand age).

[1]*U.S. Department of Agriculture, Forest Service. A generalized forest growth projection system applied to the Lake States region. Gen. Tech. Rep. NC-49. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station; 1979. 96 p.*

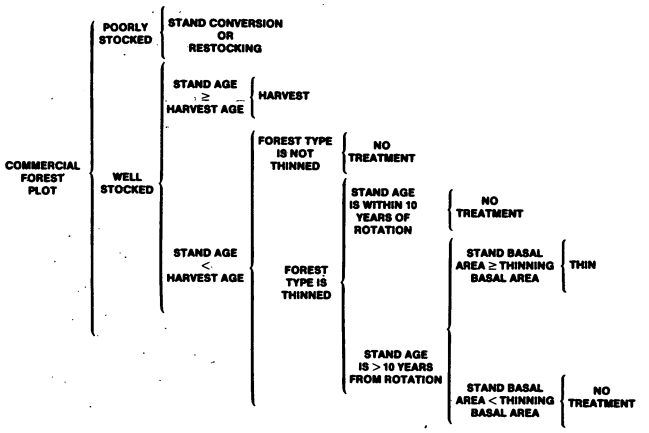

Figure 2.—*Logic used to assign treatments to commercial forest plots.*

(2) **Identify areas for harvest.**
Criteria outlined in table 1 were used to calculate harvest acreage for each forest type for the decade 1980-1989. All plots at rotation age or above were selected for harvest. Harvest volume is the projected volume found on harvest plots.

(3) **Identify areas for thinning.**
Criteria outlined in Table 1 were used to calculate thinning acreage for each forest type for the decade 1980-1989. Stands selected for thinning were at least 10 years from rotation age. In the oak forest type, thinning on high sites occurred only in stands less than 51 years old and thinning on low sites occurred only in stands less than 41 years old.

On plots selected for thinning, STEMS assigned the highest thinning priority to cull trees, then growing-stock trees of undesirable species (elm, boxelder, and noncommercial species), and finally growing-stock crop trees. Large diameter growing-stock crop trees were favored for retention during thinning operations. Trees were "thinned" from the plot until the recommended post-thinning basal area was reached. Thinning volume is the projected volume of trees removed during thinning.

FINDINGS

Harvest Treatment Opportunities

Area: According to the treatment criteria, 17,200 acres of commercial forest land could be harvested by 1989 (table 2). Many of the stands are mature and in need of harvest. More than 39 percent of the total cottonwood acreage qualified for harvest as did 34 percent of the oak and 19 percent of the elm-ash.

Table 2.—*Area of commercial forest land qualifying for treatment by forest type and treatment class, Eastern South Dakota, 1980-1989*

(In thousand acres)

		Treatment class			
Forest type	All classes	Harvest	Thinning	Stand conversion or restocking	No treatment
Ponderosa pine	17.8	—	3.1	3.1	11.6
Oak	4.5	1.5	—	—	3.0
Elm-ash	45.4	8.4	3.5	2.9	30.6
Cottonwood	18.5	7.3	—	6.5	4.7
Plains hardwoods	13.0	—	2.9	—	10.1
Nonstocked	14.4	—	—	14.4	—
All types	113.6	17.2	9.5	26.9	60.0

In the cottonwood forest type many of the stands are overmature—nearly one-third of the stands are more than 10 years past rotation age.

Although some of the harvested stands are on poor sites (low site index), nearly one-fourth of them are on areas with a site index of more than 60 feet at age 50.

Volume: Timber volume harvested from commercial forest land totals 18.3 million cubic feet during the decade—15.6 million cubic feet of which came from growing-stock trees (table 3).

An average of 904 cubic feet of growing stock would be removed for every acre of commercial forest land harvested. Growing-stock removals are highest in the cottonwood forest type at 1,507 cubic feet per acre.

Table 3.—*Growing-stock volume targeted for removal on commercial forest land qualifying for treatment by forest type and treatment class, eastern South Dakota, 1980-1989*

(In million cubic feet)

		Treatment class		
Forest type	All classes	Harvest	Thinning	Stand conversion or restocking
Ponderosa pine	2.2	—	1.2	1.0
Oak	0.9	0.9	—	—
Elm-ash	5.2	3.7	0.8	0.7
Cottonwood	14.8	11.0	—	3.8
Plains hardwoods	0.3	—	0.3	—
Nonstocked	0.7	—	—	0.7
All types	24.1	15.6	2.3	6.2

Forest type	Harvest volume per acre (Cubic feet)
Ponderosa pine	—
Oak	585
Elm-ash	438
Cottonwood	1,507
Plains hardwoods	—
All types	904

Thinning Treatment Opportunities

Area: During the decade 9,600 acres of commercial forest land qualified for thinning. The ponderosa pine (3,100 acres), elm-ash (3,500 acres), and plains hardwood forest types (2,900 acres) were the only ones to have stands in need of thinning.

All the thinned stands were between 40 and 80 years old. The average site index of stands selected for thinning was 50. Most of the thinnings were in stands less than 10 acres in size. Thinning was projected for 1,560 acres in ponderosa pine stands that were at least 20 acres in size.

Volume: The volume from thinnings totaled 3.3 million cubic feet for the decade, 2.3 million cubic feet of which came from growing-stock trees. The average growing stock removed during thinnings is 235 cubic feet per acre thinned. Ponderosa pine poletimber trees accounted for a majority of the volume thinned.

Stand Conversion or Restocking Treatment Opportunities

Area: In eastern South Dakota 26,900 acres of commecial forest land are so poorly stocked that they have been targeted for stand conversion or restocking during the decade. These stands are found in the cottonwood (6,500 acres), ponderosa pine (3,100 acres), and elm-ash (2,900 acres) forest types. Additionally, 14,400 acres of nonstocked forest land would be restocked. The average site index is 50, and the majority of these areas are comprised of stands less than 20 acres in size.

Volume: If these stands were clearcut prior to stand conversion or restocking, 7.6 million cubic feet of growing stock could be recovered during the decade—6.2 million cubic feet in growing-stock trees. This is an average of 230 cubic feet of growing stock removed per acre. Most of the growing-stock volume removed is in sawtimber-size trees and cottonwood accounts for more than half the volume.

DISCUSSION

According to the criteria used in this analysis, 53,600 acres of commercial forest land in South Dakota can benefit from some treatment during the decade 1980-1989. The most common treatments are restocking and stand conversion (26,900 acres) and harvesting (17,200 acres).

The harvest opportunities identified will not result in a sustained yield from forest land in eastern South Dakota. Sustained yield implies that an even flow of timber volume could be produced by the forest indefinitely. Currently the forests of eastern South Dakota have an accrual of timber in overmature stands in need of harvest and a backlog of poorly stocked stands in need of restocking. Thus, under a fully regulated forest the sustained annual harvest would differ from that shown here.

The treatments identified here may not be carried out for a number of reasons. Wood production may not be a priority for many land owners—timber management may be incompatible with their ownership objectives. Social or political considerations may limit timber management. Traditional markets may not exist for some of the products removed during the treatment period. However, with interest running high for use of wood biomass and with new technological developments, new markets may be opening for many products. Physical features (i.e. physiographic class, slope, distance to transportation systems) may make some sites inoperable or uneconomical. Administrative regulations may limit treatment options in other areas.

For these reasons, the acreage targeted for treatment in this report is the biological maximum available, given the treatment criteria and current forest conditions. Forest managers and planners can use their knowledge to temper the findings to fit resource conditions in their areas.

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