APPENDIX

CONTACT INFORMATION

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   Maine Licensed Forester #3770
   176 Bowden Road
   Corinna, ME 04928

2. Sam Brown (207) 277-4221
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3. Natural Resource Conservation Service (207) 947-6622 x110
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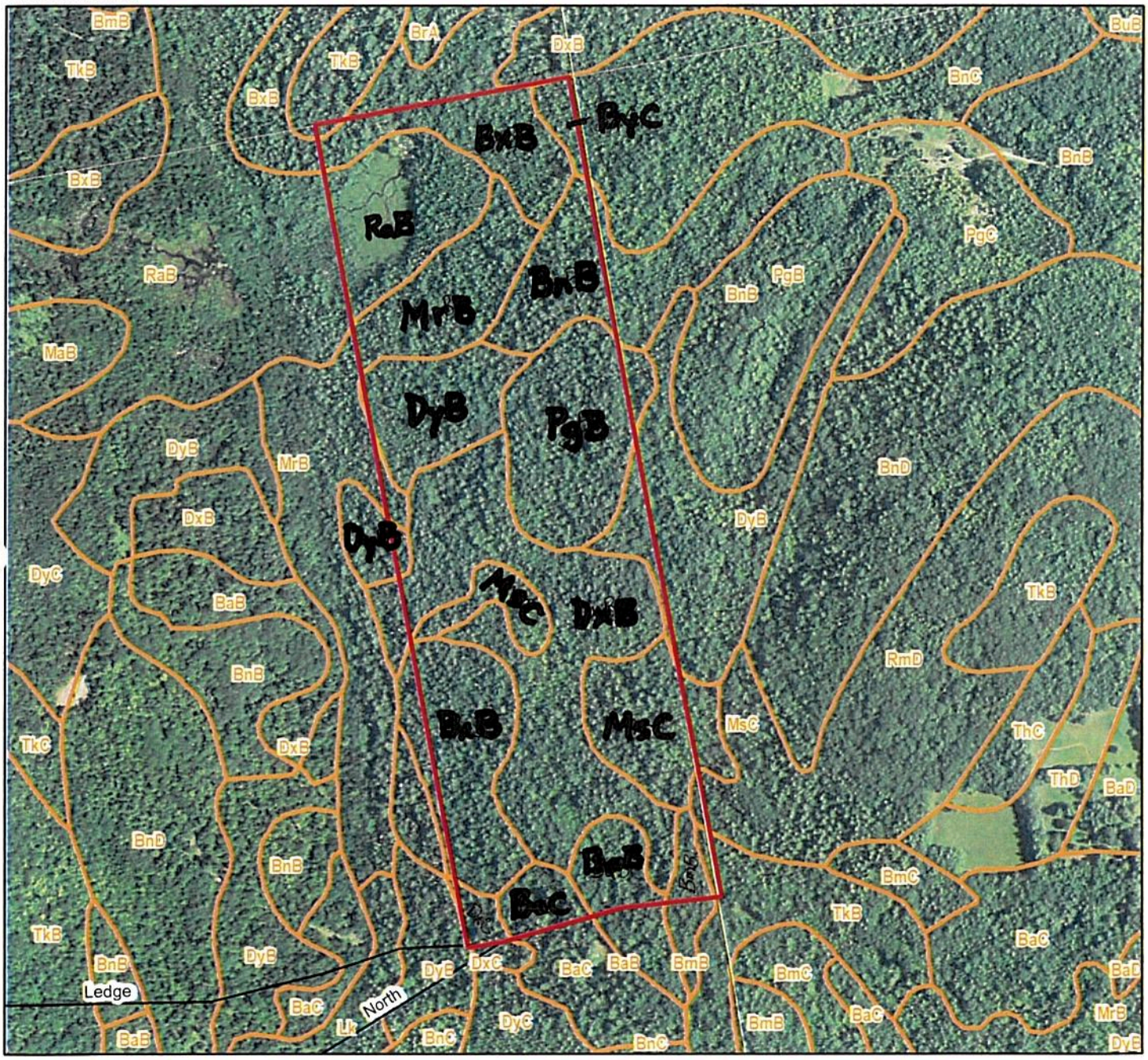
4. Maine Forest Service (207) 441-4139
   Gordon Moore - District Forester
   P.O. Box 315
   Monson, ME 04464

Town of Dixmont

Soils Map

Assisted By: Robert Nelson, Intern Forester
Madeline Lubas
Scale 1:7920
1"=660"
Date: 5/1/2015



From lower left corner, counter clockwise:

69° 4'59.228"W 44° 44'7.603"N
69° 4'57.132"W 44° 44'7.74"N
69° 4'49.988"W 44° 44'9.036"N
69° 4'44.178"W 44° 44'9.923"N
69° 4'53.278"W 44° 44'44.687"N
69° 5'8.808"W 44° 44'42.91"N

BmB PgB BaB
DyB DxB BaC
MrB MsC DxC
BxB RaB

N

660 0 660 1,320 1,980 2,640
Feet

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, or E, shows the slope. Symbols without a slope letter are those of nearly level soils, such as Limerick silt loam, or of land types, such as Rock outcrop, which have a considerable range of slope. A final number 2, in the symbol, shows that the soil is eroded.

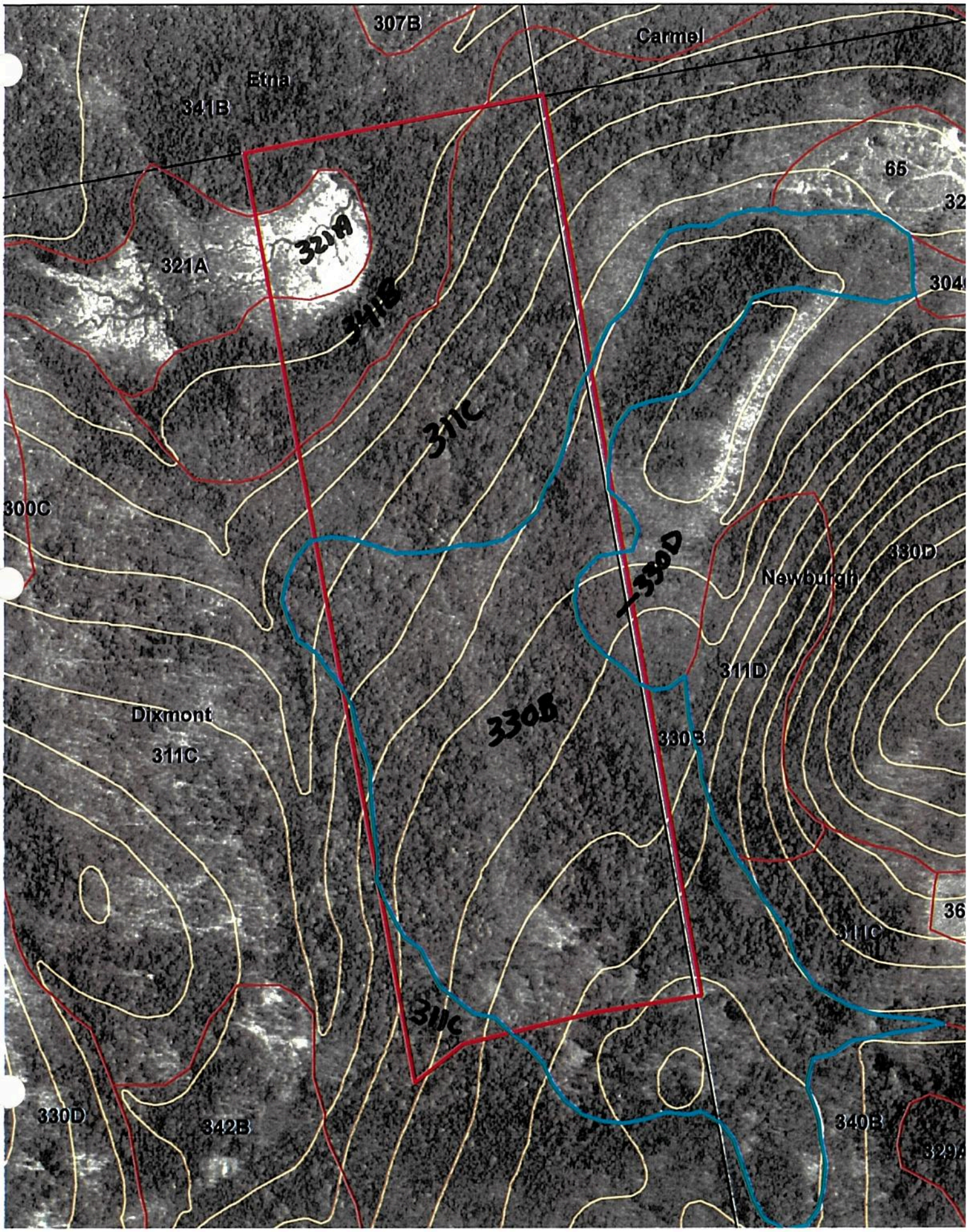
SYMBOL	NAME
AaB	Adams loamy sand, 0 to 8 percent slopes
AaC	Adams loamy sand, 8 to 15 percent slopes
AaE	Adams loamy sand, 15 to 45 percent slopes
AgA	Allagash fine sandy loam, 0 to 2 percent slopes
AgB	Allagash fine sandy loam, 2 to 8 percent slopes
AgC	Allagash fine sandy loam, 8 to 15 percent slopes
AgD	Allagash fine sandy loam, 15 to 25 percent slopes
BaA	Bangor silt loam, 0 to 2 percent slopes
BaB	Bangor silt loam, 2 to 8 percent slopes
BaC	Bangor silt loam, 8 to 15 percent slopes
BaD	Bangor silt loam, 15 to 25 percent slopes
BmB	Bangor silt loam, moderately deep, 2 to 8 percent slopes
BmC	Bangor silt loam, moderately deep, 8 to 15 percent slopes
BmD	Bangor silt loam, moderately deep, 15 to 35 percent slopes
BnB	Bangor very stony silt loam, 0 to 8 percent slopes
BnC	Bangor very stony silt loam, 8 to 15 percent slopes
BnD	Bangor very stony silt loam, 15 to 25 percent slopes
BoA	Biddeford silt loam, 0 to 3 percent slopes
BrA	Burnham silt loam, 0 to 3 percent slopes
BuA	Buxton silt loam, 0 to 2 percent slopes
BuB	Buxton silt loam, 2 to 8 percent slopes
BuC	Buxton silt loam, 8 to 15 percent slopes
BxB	Buxton, Scantic, and Biddeford stony silt loams, 0 to 8 percent slopes
CaC	Canaan extremely rocky sandy loam, 5 to 15 percent slopes
CaE	Canaan extremely rocky sandy loam, 15 to 45 percent slopes
CoB	Colton cobbly sandy loam, dark materials, 0 to 8 percent slopes
CoC	Colton cobbly sandy loam, dark materials, 8 to 15 percent slopes
CoD	Colton cobbly sandy loam, dark materials, 15 to 25 percent slopes
CoE	Colton cobbly sandy loam, dark materials, 25 to 45 percent slopes
CnA	Colton gravelly sandy loam, dark materials, 0 to 2 percent slopes
CnB	Colton gravelly sandy loam, dark materials, 2 to 8 percent slopes
CnC	Colton gravelly sandy loam, dark materials, 8 to 15 percent slopes
CnD	Colton gravelly sandy loam, dark materials, 15 to 25 percent slopes
CnE	Colton gravelly sandy loam, dark materials, 25 to 45 percent slopes
CsA	Colton loamy fine sand, dark materials, 0 to 2 percent slopes
CsB	Colton loamy fine sand, dark materials, 2 to 8 percent slopes
CsC	Colton loamy fine sand, dark materials, 8 to 15 percent slopes
CsD	Colton loamy fine sand, dark materials, 15 to 25 percent slopes
DaA	Daigle silt loam, 0 to 2 percent slopes
DaB	Daigle silt loam, 2 to 8 percent slopes
DaC	Daigle silt loam, 8 to 15 percent slopes
DgA	Daigle stony silt loam, 0 to 2 percent slopes
DgB	Daigle stony silt loam, 2 to 8 percent slopes
DgC	Daigle stony silt loam, 8 to 15 percent slopes
DxA	Dixmont silt loam, 0 to 2 percent slopes
DxB	Dixmont silt loam, 2 to 8 percent slopes
DxC	Dixmont silt loam, 8 to 15 percent slopes
DyA	Dixmont very stony silt loam, 0 to 2 percent slopes
DyB	Dixmont very stony silt loam, 2 to 8 percent slopes
DyC	Dixmont very stony silt loam, 8 to 15 percent slopes
EwB	Elmwood fine sandy loam, 0 to 8 percent slopes
Ha	Hadley silt loam
HtB	Hermon sandy loam, 2 to 8 percent slopes
HtC	Hermon sandy loam, 8 to 15 percent slopes
HuB	Hermon sandy loam, moderately deep, 2 to 8 percent slopes
HuC	Hermon sandy loam, moderately deep, 8 to 15 percent slopes
HeB	Hermon very stony sandy loam, 2 to 8 percent slopes
HeC	Hermon very stony sandy loam, 8 to 15 percent slopes
HeE	Hermon very stony sandy loam, 15 to 45 percent slopes
HhC	Hermon extremely stony sandy loam, 5 to 15 percent slopes
HoB	Howard gravelly loam, 0 to 8 percent slopes
HoC	Howland gravelly loam, 8 to 15 percent slopes
HvB	Howland very stony loam, 0 to 8 percent slopes
HvC	Howland very stony loam, 8 to 15 percent slopes
HvD	Howland very stony loam, 15 to 25 percent slopes
Lk	Limerick silt loam
MaB	Machias fine sandy loam, 0 to 8 percent slopes
MdB	Maddawaska very fine sandy loam, 0 to 8 percent slopes
Md	Made land
MeA	Melrose fine sandy loam, 0 to 2 percent slopes
MeB	Melrose fine sandy loam, 2 to 8 percent slopes
MeC	Melrose fine sandy loam, 8 to 15 percent slopes
Mx	Mixed alluvial land
MnB	Monarda silt loam, 0 to 8 percent slopes
MrB	Monarda and Burnham very stony silt loams, 0 to 8 percent slopes
MsC	Monarda and Burnham extremely stony silt loams, 0 to 15 percent slopes
Mu	Muck
On	Ondawa fine sandy loam
Pa	Peat and muck
Pc	Peat, coarsely fibrous
Pf	Peat, moderately fibrous
PgB	Plaisted gravelly loam, 2 to 8 percent slopes
PgC	Plaisted gravelly loam, 8 to 15 percent slopes
PgD	Plaisted gravelly loam, 15 to 25 percent slopes
PgE	Plaisted gravelly loam, 25 to 45 percent slopes
PhB	Perham silt loam, 0 to 8 percent slopes
PhC	Pernam silt loam, 8 to 15 percent slopes
PmB	Perham stony silt loam, 0 to 8 percent slopes
PmC	Perham stony silt loam, 8 to 15 percent slopes
PrC	Plaisted very stony loam, 5 to 15 percent slopes
PrE	Plaisted very stony loam, 15 to 45 percent slopes
Ps	Peat, sphagnum
PxC	Plaisted extremely stony loam, 5 to 15 percent slopes
Py	Podunk fine sandy loam
RaB	Red Hook and Atherton silt loams, 0 to 8 percent slopes
RdB	Red Hook and Atherton fine sandy loams, 0 to 8 percent slopes
Rw	Riverwash
RkC	Rockland, Canaan material, sloping
RkD	Rockland, Canaan material, strongly sloping
RmC	Rockland, Thorndike material, sloping
RmD	Rockland, Thorndike material, strongly sloping
Ro	Rock outcrop
Sa	Saco silt loam
ScB	Scantic silt loam, 0 to 8 percent slopes
SeA	Stetson fine sandy loam, 0 to 2 percent slopes
SeB	Stetson fine sandy loam, 2 to 8 percent slopes
SeC	Stetson fine sandy loam, 8 to 15 percent slopes
SeD	Stetson fine sandy loam, 15 to 25 percent slopes
StC	Stetson-Suffield complex, 0 to 15 percent slopes
StE	Stetson-Suffield complex, 15 to 45 percent slopes
SmD	Stony land, Hermon material, strongly sloping
SoD	Stony land, Plaisted material, strongly sloping
SuA	Suffield silt loam, 0 to 2 percent slopes
SuB	Suffield silt loam, 2 to 8 percent slopes
SuC	Suffield silt loam, 8 to 15 percent slopes
SuC2	Suffield silt loam, 8 to 15 percent slopes, eroded
SuD	Suffield silt loam, 15 to 25 percent slopes
SuD2	Suffield silt loam, 15 to 25 percent slopes, eroded
SuE	Suffield silt loam, 25 to 45 percent slopes
SvA	Suffield very fine sandy loam, 0 to 2 percent slopes
SvB	Suffield very fine sandy loam, 2 to 8 percent slopes
SvC	Suffield very fine sandy loam, 8 to 15 percent slopes
SvD	Suffield very fine sandy loam, 15 to 25 percent slopes
ThB	Thorndike shaly silt loam, 2 to 8 percent slopes
ThC	Thorndike shaly silt loam, 8 to 15 percent slopes
ThD	Thorndike shaly silt loam, 15 to 25 percent slopes
ThE	Thorndike shaly silt loam, 25 to 45 percent slopes
TkB	Thorndike very rocky silt loam, 2 to 8 percent slopes
TkC	Thorndike very rocky silt loam, 8 to 15 percent slopes
TvB	Thorndike very stony silt loam, 2 to 8 percent slopes
TvC	Thorndike very stony silt loam, 8 to 15 percent slopes
TvD	Thorndike very stony silt loam, 15 to 35 percent slopes
Wn	Winooski silt loam

Soil map constructed 1962 by Cartographic Division, Soil Conservation Service, USDA, from 1942, 1947 and 1960 aerial photographs. Controlled mosaic based on Maine plane coordinate system, east zone, transverse Mercator projection, 1927 North American datum.

Dixmont Property

Subject to change updated mapping of Penobscot Cty.

1:5750 Scale
10' Contours



ME 612, SOUTHERN PENOBSCOT SOIL SURVEY LEGEND, 1-17-2014 (per addition of 238E and 1-19-14 12-DFX team meeting)

All Legend Changes made in NASIS on through1-17-2014 (following addition of 238E and 12-DFX team meeting on 1-16-14)

ORDER 2

MU	Additional Map Unit symbol(s)	Map Unit name, including series and phase
1B	(1A)	ADAMS LOAMY FINE SAND, 3 TO 8% SLOPES
3B	(3A, 47A, 47B)	MADAWASKA-ALLAGASH COMPLEX, 3 TO 8 % SLOPES
3C		ALLAGASH VERY FINE SANDY LOAM, 8 TO 15 % SLOPES
4B	(2B)	NAUMBURG-CROGHAN COMPLEX, 1 TO 8 % SLOPES
6B		SKERRY-BECKETT COMPLEX, 3 TO 8 % SLOPES, VERY BOULDERY
6C		BECKETT-SKERRY COMPLEX, 8 TO 15 % SLOPES, VERY BOULDERY
8A	(338A)	SWANVILLE-BIDDEFORD-WONSQUEAK COMPLEX, 0 TO 2% SLOPES, FREQ. FLD.
9C		MONADNOCK-TUNBRIDGE ASSOCIATION, 8 TO 15 % SLOPES, VERY BOULDERY
13B	(15B, 35B)	PUSHAW-BOOTHBAY COMPLEX, 1 TO 8 % SLOPES
13C		BOOTHBAY SILT LOAM, 8 TO 15 % SLOPES
13D		BOOTHBAY SILT LOAM, 15 TO 25 % SLOPES
13E		BOOTHBAY SILT LOAM, 25 TO 50% SLOPES
14B		PUSHAW-SWANVILLE COMPLEX, 0 TO 8 % SLOPES
16A	(16B, 116B)	BRAYTON FINE SANDY LOAM, 0 TO 3 % SLOPES
17B		BRAYTON-COLONEL COMPLEX, 0 TO 8 % SLOPES, VERY STONY
20A	(19A)	CHARLES-CORNISH COMPLEX, 0 TO 3 % SLOPES, OCCASIONALY FLOODED
21B	(31B, 33B, 39B, 40B, 67B, 139B)	CHESUNCOOK SILT LOAM, 3 TO 8 % SLOPES
21C	(31C, 33C, 67C, 167C)	CHESUNCOOK SILT LOAM, 8 TO 15 % SLOPES
22B		TELOS-CHESUNCOOK COMPLEX,1-8% SLOPES, VERY STONY
22C	(22D)	CHESUNCOOK-TELOS COMPLEX, 8 TO 15 % SLOPES, VERY STONY
23B		COLONEL GRAVELLY FINE SANDY LOAM, 3 TO 8 % SLOPES
24B	(130B)	COLONEL-DIXFIELD COMPLEX, 3 TO 8 % SLOPES, VERY STONY
26A	(37A)	CORNISH-LOVEWELL COMPLEX, 1 TO 3 % SLOPES, OCCASIONALLY FLOODED
26B		CORNISH-CHARLES-FRYEBURG COMPLEX, 0 TO 8% SLOPES, OCC. FLOODED
27B	(9B, 10B, 38B)	DANFORTH CHANNERY SILT LOAM, 3 TO 8 % SLOPES
28C	(38C, 152C)	DANFORTH CHANNERY SILT LOAM, 8 TO 15 % SLOPES, EXTREMELY STONY
29B	(30B)	DIXFIELD FINE SANDY LOAM, 3 TO 8 % SLOPES
29C	(30C, 48C, 48D, 49C, 49D)	DIXFIELD FINE SANDY LOAM, 8 TO 15 % SLOPES
30B		DIXFIELD FINE SANDY LOAM, 3 TO 8 % SLOPES, VERY STONY
30C		DIXFIELD FINE SANDY LOAM, 8 TO 15 % SLOPES, VERY STONY
32		DUMPS, LANDFILL
34B	(34A)	WASSOOKEAG-PENOBSCOT COMPLEX, 1 TO 8 % SLOPES
36B	(59B)	ELLIOTTSVILLE-CHESUNCOOK ASSOCIATION, 3 TO 8 % SLOPES
36C	(59C)	ELLIOTTSVILLE-CHESUNCOOK ASSOCIATION, 8 TO 15 % SLOPES
40A		KINSMAN LOAMY SAND, 0 TO 3 % SLOPES
43B	(41B)	LAMOINE-SCANTIC COMPLEX, 0 TO 8 % SLOPES
44B	(78B)	LYMAN-ABRAM COMPLEX, 3 TO 8 % SLOPES, ROCKY
44C	(70C, 78C)	LYMAN-ABRAM COMPLEX, 8 TO 15 % SLOPES,, ROCKY
50B	(125B)	MASARDIS FINE SANDY LOAM, 3 TO 8 % SLOPES
50C	(1C, 1D, 150C)	MASARDIS AND ADAMS SOILS, 8 TO 15 % SLOPES
50E		MASARDIS AND ADAMS SOILS, 15 TO 60 % SLOPES
51A	(328A)	MEDOMAK AND WONSQUEAK SOILS, 0 TO 2 % SLOPES, FREQUENTLY FLOODED
53A		MONARDA SILT LOAM, 0 TO 3 % SLOPES
54A		MONARDA-BURNHAM COMPLEX, 0 TO 3 % SLOPES, VERY STONY
54B		MONARDA-TELOS COMPLEX, 0 TO 8 % SLOPES, VERY STONY
55B		CORINNA-PENOBSCOT COMPLEX, 3 TO 8 % SLOPES, ROCKY
55C		CORINNA-PENOBSCOT COMPLEX, 8 TO 15 % SLOPES, ROCKY
56B		ELLIOTTSVILLE-CHESUNCOOK ASSOCIATION, 3 TO 8 % SLOPES, VERY STONY
56C		ELLIOTTSVILLE-CHESUNCOOK ASSOCIATION, 8 TO 15 % SLOPES, VERY STONY
56D		ELLIOTTSVILLE-CHESUNCOOK ASSOCIATION, 15 TO 30 % SLOPES, VERY STONY
57B		NICHOLVILLE VERY FINE SANDY LOAM, 3 TO 8 % SLOPES
57C		NICHOLVILLE VERY FINE SANDY LOAM, 8 TO 15 % SLOPES
58B		ROUNDABOUT-NICHOLVILLE ASSOCIATION, 0 TO 8 % SLOPES
65		PITS, SAND AND GRAVEL
66A		PODUNK-RUMNEY COMPLEX, 0 TO 3 % SLOPES, OCCASIONALLY FLOODED
69A		SCANTIC SILT LOAM, 0 TO 3% SLOPES
70A	(11A)	SWANVILLE-BIDDEFORD COMPLEX, 0 TO 3% SLOPES
71A		SWANVILLE SILT LOAM, 0 TO 3 % SLOPES
72B		SHEEPSCOT SANDY LOAM, 3 TO 8 % SLOPES
73B		TELOS SILT LOAM, 1 TO 8 % SLOPES
74B		KENDUSKEAG SILT LOAM, 1 TO 8 % SLOPES
79C	(79B, 79D, 179C)	WINNECOOK- THORNDIKE COMPLEX, 3 TO 15% SLOPES

80B	TUNBRIDGE-LYMAN-URBAN LAND ASSOCIATION, 3 TO 8% SLOPES
81B (82B)	TUNBRIDGE-LYMAN COMPLEX, 3 TO 8 % SLOPES
82C (81C, 81D)	TUNBRIDGE-LYMAN COMPLEX, 8 TO 15 % SLOPES
84B	PUSHAW-SWANVILLE-URBAN LAND COMPLEX, 0 TO 8% SLOPES
85B (83)	URBAN LAND-UDORTHENTS ASSOCIATION, 0 TO 8% SLOPES
86B	TUNBRIDGE-DIXFIELD ASSOCIATION, 3 TO 8% SLOPES
87C	DIXFIELD-TUNBRIDGE ASSOCIATION, 8 TO 15 % SLOPES, VERY STONY
87DX	TUNBRIDGE-DIXFIELD ASSOCIATION, 15 TO 30% SLOPES, VERY STONY
88B	DIXFIELD-TUNBRIDGE ASSOCIATION, 3 TO 8 % SLOPES, VERY STONY
89B	PUSHAW-BOOTHBAY-URBANLAND ASSOCIATION, 1 TO 8% SLOPES
90A	WONSQUEAK MUCK, 0 TO 2% SLOPES, FREQUENTLY FLOODED
91A (349A)	BUCKSPORT AND WONSQUEAK MUCKS, 0 TO 2% SLOPES
92A (336A, 350A)	SEBAGO AND MOOSABEC SOILS, 0 TO 2% SLOPES
99	PITS, ROCK QUARRIES
136B (5B, 7B)	SEBASTICOOK-PENOBSCOT ASSOCIATION, 3 TO 8 % SLOPES
136C (5C, 5D, 7C)	SEBASTICOOK-PENOBSCOT ASSOCIATION, 8 TO 15 % SLOPES
182B	CHESUNCOOK-TELOS-URBAN LAND ASSOCIATION, 1 TO 8% SLOPES
184B	MONARDA-TELOS-URBANLAND ASSOCIATION, 0 TO 8% SLOPES
186C (87B)	CHESUNCOOK-ELLIOTTSVILLE URBAN LAND ASSOCIATION, 3 TO 15% SLOPES
236B (61B, 62B)	ELLIOTTSVILLE-MONSON COMPLEX, 3 TO 8 % SLOPES
236C (61C)	ELLIOTTSVILLE-MONSON COMPLEX, 8 TO 15 % SLOPES
238B	ELLIOTTSVILLE-MONSON COMPLEX, 3 TO 8 % SLOPES, ROCKY
238C	ELLIOTTSVILLE-MONSON COMPLEX, 8 TO 15 % SLOPES, ROCKY
238D	ELLIOTTSVILLE-MONSON COMPLEX, 15 TO 30 % SLOPES, ROCKY
238E	MONSON-ELLIOTTSVILLE-ABRAM COMPLEX, 30 TO 60 % SLOPES, VERY ROCKY
277B	MONSON-ELLIOTTSVILLE-ABRAM COMPLEX, 3 TO 8 % SLOPES, ROCKY
277C (75C, 76C)	MONSON-ELLIOTTSVILLE-ABRAM COMPLEX, 8 TO 15 % SLOPES , ROCKY

ORDER 3

300C	ADAMS-NICHOLVILLE ASSOCIATION, 3 TO 15 % SLOPES
304C (306C, 306D)	DANFORTH-WINNECOOK ASSOCIATION, 3 TO 15 % SLOPES, ROCKY
305C	ALLAGASH-ADAMS COMPLEX, 3 TO 15 % SLOPES
307B	PUSHAW-SWANVILLE COMPLEX, 0 TO 8 % SLOPES
307BX	PUSHAW-BOOTHBAY COMPLEX, 1 TO 8% SLOPES
308A	BRAYTON-PEACHAM COMPLEX, 0 TO 3% SLOPES, EXTREMELY STONY
308B (309B)	BRAYTON-COLONEL COMPLEX, 0 TO 8 % SLOPES, VERY STONY
310A	CHARLES-CORNISH-WONSQUEAK COMPLEX, 0 TO 2% SLOPES, OCC. FLOODED
311C (331C, 332C)	CHESUNCOOK-ELLIOTTSVILLE-TELOS ASSOC., 3 TO 15 % SLOPES, VERY STONY
311D (411D, 332D)	CHESUNCOOK-ELLIOTTSVILLE ASSOC., 15 TO 30% SLOPES, VERY STONY
312B	COLONEL-DIXFIELD-BRAYTON COMPLEX, 0 TO 8 % SLOPES, VERY STONY
313B	BRAYTON-COLONEL-LYMAN ASSOCIATION, 0 TO 8 % SLOPES, ROCKY
315B	NAUMBURG-CROGHAN COMPLEX, 1 TO 8 % SLOPES
316C (138C, 316D)	DANFORTH CHANNERY SILT LOAM, 3 TO 15 % SLOPES, EXTREMELY STONY
317C (317B, 323C)	DIXFIELD-COLONEL-TUNBRIDGE ASSOCIATION, 3 TO 15 % SLOPES, VERY STONY
318C	ELLIOTTSVILLE-MONSON COMPLEX, 3 TO 15 % SLOPES, ROCKY
321A	KINSMAN-SEARSPORT COMPLEX, 0 TO 3 % SLOPES
322B	LAMOINE-SCANTIC COMPLEX, 0 TO 8 % SLOPES
323D (336C)	LYMAN-ABRAM COMPLEX, 8 TO 30 % SLOPES, VERY ROCKY
323E (45E, 68E, 70E, 78E, 336E, 423E)	LYMAN-ABRAM COMPLEX, 30 TO 80 % SLOPES, VERY ROCKY
324E	LYMAN-TUNBRIDGE COMPLEX, 30 TO 60 % SLOPES, ROCKY
325C	MARLOW-DIXFIELD COMPLEX, 8 TO 15 % SLOPES, VERY STONY
326D	MARLOW-LYMAN-DIXFIELD ASSOCIATION, 15 TO 30 %SLOPES, VERY STONY
327C (314C)	MASARDIS-ADAMS-SHEEPSCOT COMPLEX, 3 TO 15 % SLOPES
327E (314E)	MASARDIS-ADAMS COMPLEX, 15 TO 60 % SLOPES
329A	MONARDA-BURNHAM COMPLEX, 0 TO 3% SLOPES, VERY STONY
330B	MONSON-CHESUNCOOK-TELOS ASSOCIATION, 1 TO 8 % SLOPES, ROCKY
330D (318D, 346C)	MONSON-ELLIOTTSVILLE-ABRAM COMPLEX, 8 TO 30 % SLOPES, VERY ROCKY
330E	MONSON-ELLIOTTSVILLE-ABRAM COMPLEX, 30 TO 60 % SLOPES, VERY ROCKY
333B	ROUNDABOUT-NICHOLVILLE ASSOCIATION, 0 TO 8 % SLOPES
335A	SCANTIC-BIDDEFORD COMPLEX, 0 TO 3 % SLOPES
335B	SCANTIC-LAMOINE-COLONEL ASSOCIATION, 0 TO 8 % SLOPES, VERY STONY
337A	SWANVILLE-BIDDEFORD COMPLEX, 0 TO 3% SLOPES
339B (339C)	TELOS-CHESUNCOOK COMPLEX, 1 TO 8 % SLOPES, VERY STONY
340B (340C)	TELOS-CHESUNCOOK-RAGMUFF ASSOCIATION, 1 TO 8 % SLOPES, VERY STONY
341B (320B)	MONARDA-TELOS COMPLEX, 0 TO 8 % SLOPES, VERY STONY
342B (329B, 364B)	MONARDA-MONSON-TELOS ASSOCIATION, 0 to 8 % SLOPES, ROCKY
343B	KENDUSKEAG-MONARDA COMPLEX, 0 TO 8 % SLOPES, VERY STONY
344B	KENDUSKEAG-WASSOOKEAG COMPLEX, 1 TO 8 % SLOPES, VERY STONY
345C (345D)	WINNECOOK-THORNDIKE COMPLEX, 3 TO 15% SLOPES, ROCKY

411C	CHESUNCOOK-TELOS COMPLEX, 3 TO 15 %SLOPES, VERY STONY
416C (313C)	DANFORTH-MASARDIS COMPLEX, 0 TO 15 % SLOPES, VERY STONY
417B	PENOBSCOT-WASSOOKEAG-CORINNA COMPLEX, 1 TO 8 %SLOPES, VERY STONY
423C (324C, 347C)	LYMAN-TUNBRIDGE COMPLEX, 3 TO 15 % SLOPES, ROCKY
423D	LYMAN-TUNBRIDGE COMPLEX, 15 TO 30 % SLOPES, ROCKY
431C (431D)	CORINNA-PENOBSCOT COMPLEX, 3 TO 15 % SLOPES, ROCKY
432C	PENOBSCOT-SEBASTICOOK COMPLEX, 3 TO 15 % SLOPES, VERY STONY
501B	SKERRY-BECKETT-COLONEL COMPLEX, 1 TO 8% SLOPES, VERY BOULDERY
501C	BECKETT-SKERRY COMPLEX, 8 TO 15% SLOPES, VERY BOULDERY
502C	BECKET-TUNBRIDGE-DIXFIELD ASSOCIATION, 8 TO 15% SLOPES, VERY BOULDERY
502D	BECKET-TUNBRIDGE ASSOCIATION, 15-30% SLOPES, VERY BOULDERY
506C (319C, 328E)	MONADNOCK-HERMON COMPLEX, 8 TO 15% SLOPES, EXTREMELY BOULDERY
507C	MONADNOCK-TUNBRIDGE ASSOCIATION, 8 TO 15% SLOPES, VERY BOULDERY
507D	MONADNOCK-TUNBRIDGE ASSOCIATION, 15 TO 30% SLOPES, VERY BOULDERY
511D	ABRAM-KNOB LOCK-ROCK OUTCROP COMPLEX, 3-30% SLOPES
511F	ABRAM-KNOB LOCK-ROCK OUTCROP COMPLEX, 30-100% SLOPES
W	WATER BODIES (>2 acres)

Significant Issues left to address:

- 325C – Should Dixfield be the first named component, rather than the second? What about Tunbridge as a major component? At least 30 points are needed for this map unit to sort this out This is the only map unit in the legend with marlow in it as a major component. the legend that currently has Marlow in it
- Consider adding Easton to taxonomic legend and using it instead of Monarda in MU 343B (Ken-Mo) and in an order 2 consociation to replace 53A in areas where the Sebasticook catena is mapped
- 337A – currently Biddeford is the 2nd major component. Reconsider (via remote spatial investigations) bringing back Wonsqueak as the 2nd component (otherwise the MU is very similar to 335A Scantic-Biddeford and should be made additional to that map unit)
- Should ponded be added to the 91A and (less likely) 92A names?

Remote sensing action items:

- Investigate signature of 337A and whether to bring Wonsqueak back as the second component (otherwise make 337A additional to 335A)
- investigate 416C and apply wet spots or marsh spot ad-hoc symbols as they apply on the landscape
- tighten up some very questionable digitized mapping on the Greenbush, Olamon, Otter Chains and Old Town (NE ¼) 7.5' quads; refer to marked up (by DET, AJB and REE) plotted quads in lower wooden map drawer map next to neutral desk (previously with scanner) with computer on it, this mapping was digitized as mapped by old analog (stereoscoped) means

STATE OF MAINE
DEPARTMENT OF AGRICULTURE, CONSERVATION & FORESTRY
93 STATE HOUSE STATION
AUGUSTA, MAINE
04333-0093

PAUL R LEPAGE
GOVERNOR

WALTER E WHITCOMB
COMMISSIONER

April 28, 2015

Robert Nelson
176 Bowden Road
Corinna, Maine 04928

Re: Forest Management Plan Review

Dear Mr. Nelson:

In response to your request received on April 27, 2015, I have searched our data system for information on rare or unique botanical features, rare animal populations, and essential or significant wildlife habitats in the vicinity of the Town of Dixmont property in Dixmont.

For individual parcel reviews, we use a simple checklist that summarizes our findings. The enclosed checklist includes our review of several data sets, some of which are maintained by MNAP and others that are maintained by the Maine Department of Inland Fisheries and Wildlife (MDIFW), and the U.S. Fish and Wildlife Service (USFWS). If a parcel intersects with a data set maintained by MDIFW or USFWS, please contact the appropriate biologist indicated on the checklist for additional information.

Tributary streams in this area support populations of wild brook trout. Brook trout prefer cool, well oxygenated waters that benefit from intact riparian corridors. Any forest management activities planned for riparian zones should closely follow the state's Best Management Practices, including appropriate buffer distances, shade retention, and minimization of sediment runoff. Please see the attached fact sheet for more information about brook trout in Maine.

Good management of this habitat is consistent with good forestry, and your regional wildlife and fisheries biologists are available to assist you in maintaining its integrity while allowing for forest management and timber procurement. According to the information currently in our files, there are no other rare species or important habitats documented within the property, though the area is mapped as Atlantic salmon critical habitat. This lack of data may indicate minimal survey efforts rather than confirm the absence of rare features.

Thank you for using the MNAP in the forest management planning process. If you have questions about the MNAP, or if you would like more information about this site, please feel free to contact me. You can also visit us on the web at www.maine.gov/dacf/mnap.

Sincerely,

Lisa St. Hilaire

Information Manager | Maine Natural Areas Program
maine.nap@maine.gov | Phone: 287-8044 | Fax: 287-8040

cc: Keel Kemper, Wes Ashe, MDIFW

MAINE NATURAL AREAS PROGRAM
(207)287-8044 or maine.nap@maine.gov

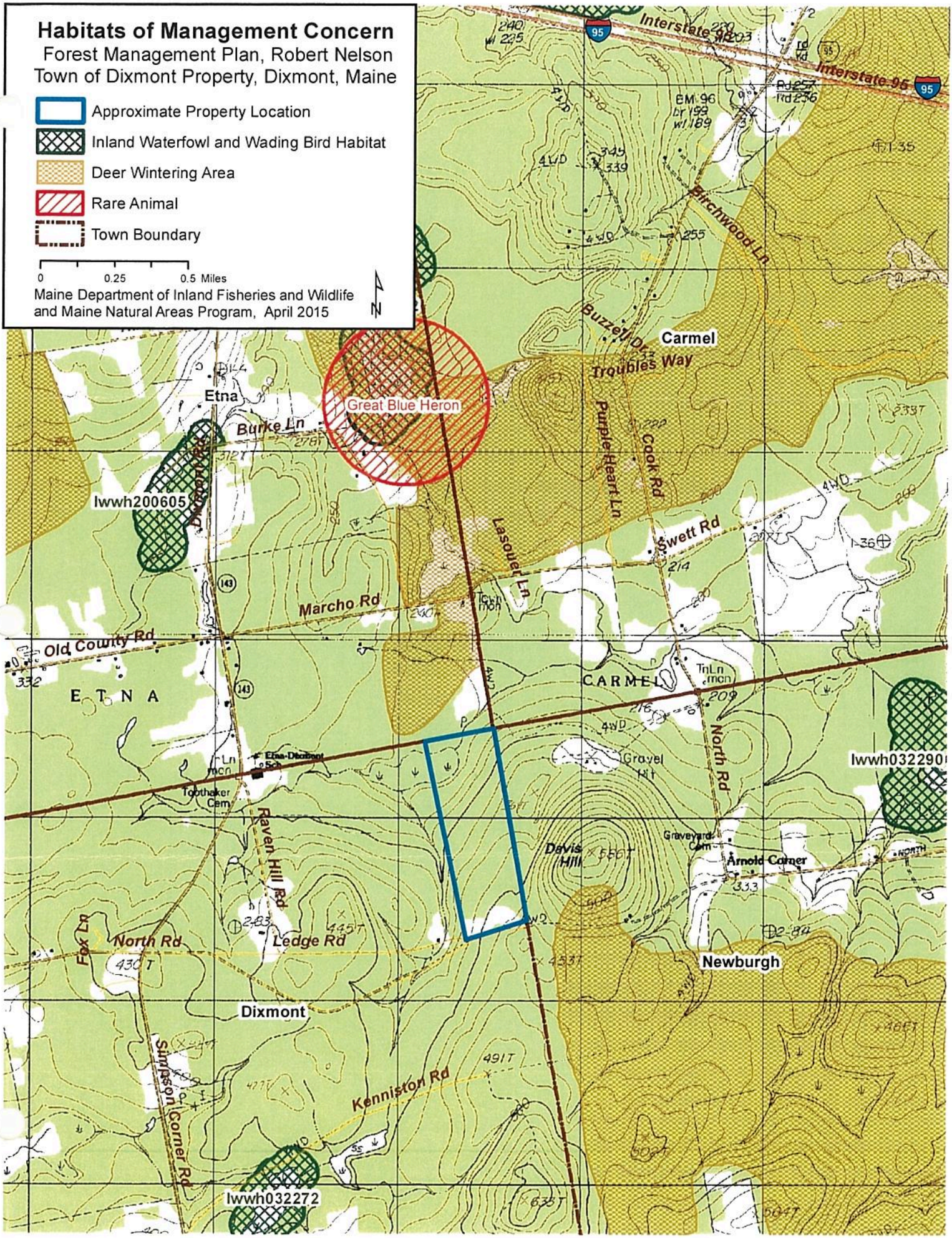
Forest Management Plan Review

Forester: *Robert Nelson* Landowner: *Town of Dixmont* Lot Name: *Dixmont Town Forest*
Date Received: *4.27.2015* Town: *Dixmont* County: *Penobscot* MDIFW Region: *B*

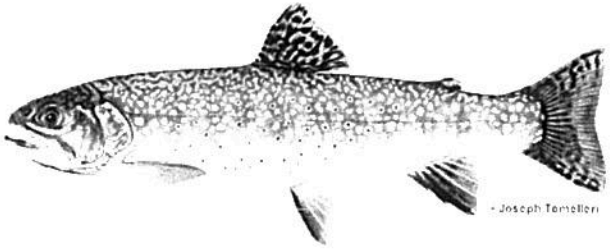
PLANT, ANIMAL, AND HABITATS	Documented to occur at the site? YES	NO	Contact the following biologist to discuss conservation considerations
Plants: rare, threatened and/or endangered *If yes, see attached summary table.*	☐	☒	
Natural Communities: rare and/or exemplary *If yes, see attached summary table.*	☐	☒	
Animals: rare, threatened, or endangered *If yes, see attached summary table.*	☐	☒	
Mapped Essential Wildlife Habitats:			
Roseate tern	☐	☒	
Piping plover and Least tern	☐	☒	
Mapped Significant Wildlife Habitats:			
Deer wintering area	☐	☒	
Inland waterfowl and wading bird habitat	☐	☒	
Tidal waterfowl and wading bird habitat	☐	☒	
Significant vernal pool	☐	☒	
Shorebird roosting area	☐	☒	
Wild brook trout habitat	Yes ☒	Unknown ☐	MDIFW Assistant Regional Fisheries Biologist, Wes Ashe, 547-5314
Atlantic Salmon:	Yes	No	USFWS Biologist, Wende Mahaney, 866-3344 Ext 118
Salmon critical habitat	☒	☐	
Salmon stream habitat	Yes ☐	Unknown ☒	For more information: http://www.fws.gov/mainefieldoffice/Atlantic_salmon.html
Canada lynx: The town & parcel may provide habitat for lynx, please contact the regional biologist	☐	☒	

LANDSCAPE CONTEXT	YES	NO
Does parcel intersect with a Beginning with Habitat Focus Area? Focus Area Name: Additional information on this focus area may be available at www.maine.gov/dacf/mnap/focusarea	☐	☒
Is the parcel adjacent to state-owned land? Owner: Ownership type: ☐ Fee ☐ Easement Area Name:	☐	☒
Is the parcel within an area identified by MNAP as a potential inventory site for undocumented rare plants or exemplary natural communities? If so, MNAP will contact the landowner for permission prior to any inventory work.	☐	☒

Review completed by: LRS
Date: 4/28/2015
MNAP #: 2015-04-28-LS-06


Habitats of Management Concern
Forest Management Plan, Robert Nelson
Town of Dixmont Property, Dixmont, Maine
Approximate Property Location
Inland Waterfowl and Wading Bird Habitat
Deer Wintering Area
Rare Animal
Town Boundary
0
0.25
0.5 Miles
Maine Department of Inland Fisheries and Wildlife
and Maine Natural Areas Program, April 2015
N
Great Blue Heron
Carmel
Etna
Burke Ln
Troubles Way
Purple Heart Ln
Cook Rd
Swett Rd
Lasouet Ln
Marcho Rd
Old County Rd
E T N A
C A R M E L
North Rd
Raven Hill Rd
Ledge Rd
Fox Ln
Dixmont
Simpson Corner Rd
Kenniston Rd
Newburgh
Arnold Corner
Gravel Pit
Davis Hill
Birchwood Ln
Interstate 95
lwwh200605
lwwh032290
lwwh032272

MAINE DEPARTMENT OF
INLAND FISHERIES AND WILDLIFE



Forest Management Recommendations for Brook Trout

Background

Brook trout (*Salvelinus fontinalis*), commonly referred to as squaretail, brookie, and speckled trout, are native to Maine and are the most preferred sport fish sought by Maine anglers. Size may vary, depending on water temperature, productivity, and food sources, but 3 year-old brook trout in Maine lakes may range from 7.5 to 17.5 inches long. Stream populations are typically slower growing, and lengths of 6 to 10 inches are more common place, although some populations mature and reproduce at lengths smaller than 6 inches.

Maine is the last stronghold for wild brook trout in the eastern United States. There are more than twice as many watersheds supporting wild populations in Maine than all of the other 16 states within the historical eastern brook trout range combined. Maine is also the only remaining state with extensive intact lake and pond dwelling populations of wild brook trout.

Brook trout require clean, cool, well oxygenated water and are very sensitive to changes in habitat and water quality. Rivers and streams typically provide spawning and nursery habitat. Adults are commonly resident in streams, but migrate throughout and between drainages to meet seasonal life history requirements.

Stream habitat suitability is maintained by the presence of intact, mature wooded riparian corridors that conserve forest soils, provide shade to reduce stream warming, protect stream water quality, provide cover for fish, and provide a source of woody debris and leaf litter from mature trees that maintain in-stream habitat for fish and the aquatic insects they feed upon. Floodplain and fringe wetlands associated with streams can be a significant source of springs and groundwater discharge that maintain stream flows and cool temperatures during warm low flow summer periods. Protection of these important riparian and wetland functions ensures that the overall health of the stream habitat and watershed is maintained.

Maine brook trout fisheries are unique and highly valuable, but they are vulnerable to habitat alteration that may be caused by poorly planned and implemented land management activities. Well planned forestry operations can protect habitat and help ensure that forests remain as forest; a compatible land use for brook trout and many other fish and wildlife.

Forest Management Recommendations

Brook trout are not afforded any special state or federal regulatory protection for forestry operations, and as such management recommendations are advisory.

The MDIFW recommends following Best Management Practices (BMPs) during all road and trail building activities, as well as timber harvesting. BMPs are detailed in the booklet titled *Best Management Practices for Forestry*, which offers guidance on managing and protecting water quality, installing road-stream crossings, and providing fish passage. This booklet is available at: http://www.maine.gov/doc/mfs/pubs/bmp_manual.htm or contact the Maine Forest Service at 1-800-367-0223.

Potential harmful impacts to fish and wildlife may be further minimized by designating low impact "riparian management zones" adjacent to streams and stream-associated fringe and floodplain wetlands in forest management and harvest plans. Smaller streams may be greatly influenced by land management practices; these systems benefit the most from well-managed and intact riparian corridors.

The MDIFW also recommends limiting the harvest of trees and alteration of other vegetation within 100 feet of streams and their associated fringe and floodplain wetlands to maintain an intact and stable mature stand of trees, characterized by heavy crown closure (at least 60 – 70%) and resistance to wind-throw. In some situations wider buffers should be considered where severe site conditions (e.g., steep slope, vulnerable soils, poor drainage, etc) increase risk to soil and stand stability. Any harvest within the riparian management zone should be selective with a goal of maintaining relatively uniform crown closure.

MAINE HISTORIC PRESERVATION COMMISSION
55 CAPITOL STREET
65 STATE HOUSE STATION
AUGUSTA, MAINE
04333

PAUL R. LEPAGE
GOVERNOR

EARLE G. SHETTLEWORTH, JR.
DIRECTOR

ARCHAEOLOGY AND HISTORIC RESOURCES REVIEW
FORESTRY PLAN

MHPC # F059-15 Date Received 4/27/2015
Township DIXMONT Forester ROBERT NELSON
Parcel TOWN OF DIXMONT

******This worksheet was completed for informational purposes only******

Native American (Prehistoric) Archaeology (for further information: arthur.spiess@maine.gov)

☒ No prehistoric archaeological sites known. Based on location, soils and topography, none are expected.

☐ No prehistoric archaeological sites known because no survey has been conducted. However, the following area is archaeologically sensitive. _____
_____ (or see attached info)

☐ The property includes known sites of archaeological importance. (see attached info)

Historic Archaeology (e.g. 1800s farms, etc.) (for further information: leith.smith@maine.gov)

☒ No sites are known, and none are expected (based on historic maps and documents).

☐ There are possible sites from former houses, barns, and outbuildings shown on maps from 1850 to 1920, now possibly recognizable as foundations or cellar holes. (See attached map.)

☐ The property contains known sites of archaeological importance. (See attached info)

Historic Buildings or Structures (for further information: robin.k.reed@maine.gov)

☒ No historic buildings or structures are known or expected on the property (based on 7.5' USGS topographic maps and MHPC records).

☐ Buildings or structures may exist on the property that have not been evaluated for National Register eligibility. Our office will provide an assessment if a request letter, photos of any buildings over fifty years of age that are on the subject parcel, and a 7.5' USGS topographic map with all photos keyed to it are submitted to our office.

☐ Buildings or structures exist on the property that are either listed in or eligible for nomination to the National Register of Historic Places. (See attached info)

The information on this worksheet is being provided for Forestry Management Planning purposes only.
If any construction or ground disturbing activities on these properties will utilize federal funding, permitting or licensing, initiation of Section 106 review with the Maine Historic Preservation Commission is required pursuant to the National Historic Preservation Act of 1966.

PHONE: (207) 287-2132 FAX: (207) 287-2335

COMMON BUCKTHORN

Rhamnus cathartica L.

Fruits/Seeds: Glossy black at maturity in late summer/ early fall; fruit 0.5 cm (¼ in) in diameter; drupe contains 3-4 seeds;[8,4,7,3,17] cold stratification may[2] or may not[1] be required; optimal germination at 20 or 30°C (68 or 86°F);[2] most fruit falls beneath females; bird dispersed, but not preferred (even in native habitat);[8] seedling establishment more likely on ground with little herb cover;[6] dormancy and seed bank still unclear.[1,13]

Habitat: Native of Eurasia; introduced into the U.S. in 1880s;[21,1] on calcareous soils in native habitat;[8,1] open/shaded areas, roadsides, woodlands, riverbanks (not flooded[5]), pastures,[1,12,17,19] and mature forests;[9] tolerates various soil conditions.[1]

Comments: An alternate host for oat crown/leaf rust[15] and an overwintering host of soybean aphid;[20,16] early leaf-out more important than late senescence for carbon gain;[9] growth rates higher in light;[10] leaves decompose more rapidly than some natives and are high in nitrogen;[11] USDA hardiness zones 3-7.[3]

Similar Native Species: *R. caroliniana*; flowers perfect and in parts of 5; leaves alternate.[7,17]

COMMON BUCKTHORN
[*Rhamnus cathartica* L.]
RHCA3

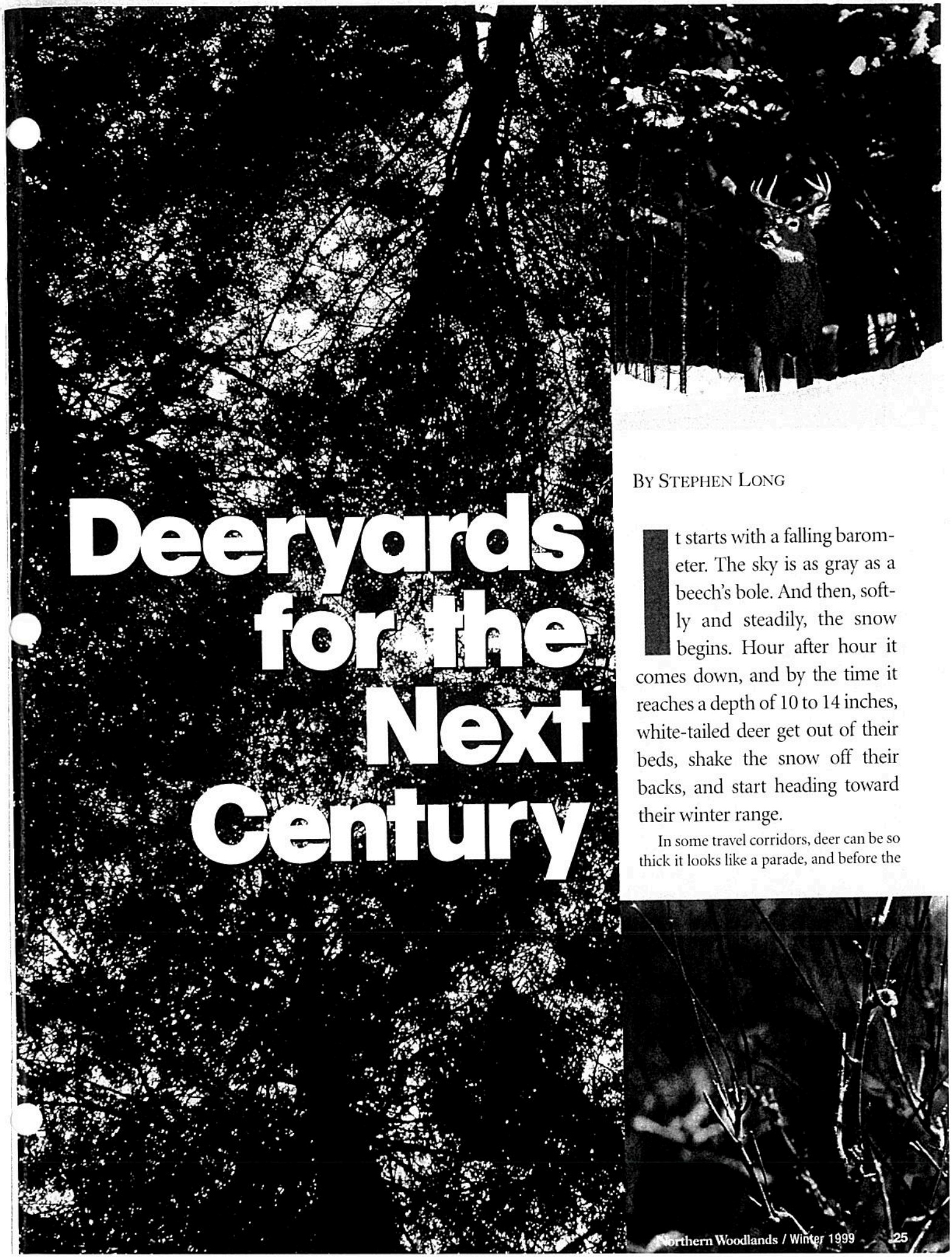
Habit: Deciduous shrub or tree to 8 m (26 ft) and as wide.[7,17,4,3]

Reproduction: Primarily by seed; may sucker from base; dioecious.[7,17,4]

Leaves: Elliptic to oblong/obovate, 3-7 cm (1¼-2¾ in); twice as long as wide; pinnately veined, lateral veins curving upward;[7,14,17] opposite, some alternate, often abruptly pointed with rounded teeth (each bearing a gland[14,18]) on the margin;[7,17] upper surface dark green, lower light green;[7,14,3] yellow/brown in fall;[3,8] downy beneath if young;[8] early leaf-out,[9] late senescence; leaf lifespan exceeds that of native shrubs by 58 days.[9,1,3]

Stems: Branches opposite (or nearly) at right angles to trunk;[8] some twigs end in a short thorn;[7,17,8,3,14] grayish/yellowish-brown, glabrous;[3,14] trunk becomes scaly with age.[18,14]

Flowers: Male 2-6 per cluster with 4 yellowish-greenish petals and sepals, 4 stamens; female 2-15 per cluster, usually without petals, if present, linear and yellowish-brown, 4 vestigial stamens, 4 green sepals shorter than those in the male;[14,7,8] April-June;[14] appear with the leaves;[7,17] females at a 6 to 1 ratio to males; honey-scented; calyx tube with nectarial lining; insect pollinated (bees and flies).[8]



Deeryards for the Next Century

By Stephen Long

It starts with a falling barometer. The sky is as gray as a beech's bole. And then, softly and steadily, the snow begins. Hour after hour it comes down, and by the time it reaches a depth of 10 to 14 inches, white-tailed deer get out of their beds, shake the snow off their backs, and start heading toward their winter range.

In some travel corridors, deer can be so thick it looks like a parade, and before the

Above: before the snow gets deep, deer can find beechnuts and acorns in the leaf litter.

Previous page, left: looking up into a dense hemlock canopy. Right, top: the branches above this buck have intercepted some snow. Right, bottom: heavily browsed twigs are a sure sign of winter deer use.

Photo credits (in caption order): Charles H. Willey; Chuck Wooster; Charles H. Willey; Stephen Long

migration is over, every deer in the area will have abandoned the territory in which it spends all of its non-winter months. For some, it will be a short trip of less than a mile. For others, it will be as much as 25 miles. In Vermont's Northeast Kingdom, virtually every deer within a 200-square-mile section of Essex County will make its way to the 15,000-acre Nulhegan basin deeryard to spend the winter. That means that an estimated 1,200 deer will be on the move at one time, drawn to the magnet of the Nulhegan.

The same scene is taking place anywhere in the Northeast where snow piles up or temperatures drop below zero. It happens every winter in Maine, New Hampshire, New York, and Vermont, even in the southern counties where winters are relatively mild and visits to the deeryard tend to be short. However, in these states' northern counties, where white-tailed deer are within a hundred or so miles of the northern edge of their viability as a species, escape to a deeryard is a matter of life and death.

The destination for each of them is a forest dominated by mature conifers, most probably facing south along a river or stream, the location of which each deer learned from its mother who learned it from her mother. Passed down by social tradition, some of these deeryards have been used continuously for 50 or more years.

What they are escaping is a piling up of snow that will limit their ability to feed and to outrun predators, especially coyotes. And what they are seeking is a thick stand of mature softwood that is tall enough — at least 35 feet tall — to form a good overhead canopy that provides shelter from the snow and cold. The canopy intercepts snow, which hangs up on branches until it evaporates. The density of the stand creates a barrier to wind, so that the wind-chill factor is less brutal inside than out. In addition, the snow-laden boughs serve almost like a blanket, restricting heat loss into the atmosphere and creating a pocket of warmth for a bedded deer. Within the shelter of a deeryard is a micro-climate that is measurably warmer, less windy, and has considerably less snow.

Among the softwood species, hemlock and cedar provide the best shelter, but they are the least common; spruce and fir, generally in combination with each other, are common in riparian areas and provide good cover; white pine is locally very common, but provides the least shelter.

For a softwood stand to be a truly viable deeryard, it should be at least 50 acres — some wildlife biologists say 100 acres is the minimum — but it shouldn't be pure softwood. It's better if, interspersed in a lacework of patches, it has plenty of young hardwoods for deer to browse. Ideally, these hardwood patches — composed especially of sugar and red maple, cherry, ash, and yellow birch — would cover 25 percent of the deeryard.

In *Heart & Blood: Living with Deer in America*, Richard Nelson cites the work of

It is critically important to manage deeryards so that, over time, each one provides continuous cover. Like all forests, deeryards are dynamic habitats, changing over time.

deer biologists C.W. Severinghaus and E.L. Cheatum, and their analogy of the white-tailed deer's winter experience. Nelson's description makes the situation absolutely clear: "First, imagine that 90 percent of our houses become unusable during the coldest and most stressful months, forcing us to crowd into the remaining 10 percent. And to make matters worse, 90 percent of the grocery stores were closed because of snow and other factors, so all of us had to survive on 10 percent of the normal food supply. This is the predicament northern deer face every winter."

In the spruce-fir forests of Maine today, those numbers are even more dramatic: when winter pushes them into deeryards, all the deer are crowded into four percent of the land base.

That sort of crowding — as many as 350 deer per square mile — means there is tremendous competition for food. But even under the best of circumstances, deer lose body weight in winter. In an overcrowded and overbrowsed deeryard, they can lose 20 to 25 percent of their weight. To see why, says Gerry Lavigne, a deer biologist with Maine Department of Inland Fish and Wildlife (MDIFW), take a look at their diet through the four seasons. In spring, they benefit from the emergence of grass, wildflowers and herbs, along with tree leaves. In summer, there's a wealth of leaves and flowers of shrubs, trees, and herbaceous plants. In

MANAGEMENT TIP FOR LANDOWNERS

Pat Bartlett, a Woodstock, Vermont, forester and wildlife consultant has an interesting tip for landowners who want to create instant—and long-term—browse for white-tailed deer. Instead of brush-hogging stands of hardwood saplings when the ground is bare, cut them with a saw in winter at the height of the snow. Leave the fallen trees on the snow and you'll provide a bounty of buds this winter. Best of all, the saplings will sprout next year at the cut, so they'll be above the snow level next winter instead of taking two or three years to poke up out of the snow.

autumn, they find a tremendous variety: in the fields, grasses, and herbs, plus farm crops; in the woods, there's soft and hard mast: apples and berries, acorns and beechnuts. This is the kind of food that helps deer build up their reserves of fat; beechnuts, in particular, are full of fat. Then comes winter, and, with everything either dead, eaten, or covered with snow, the only meal is twigs and buds of shrubs and trees. Only northern white cedar leaves have enough nutrition to sustain a deer through winter without weight loss.

Lavigne said that browsing dormant buds merely slows down the weight loss — it's better than not eating, but not that much better. If deer are restricted to winter browse for too long, they starve to death. A hundred days in a deeryard can kill fawns and those older bucks whose available fat has been depleted by the rigors of the breeding season that ends in early December.

When deer are yarded up, their metabolism slows down considerably so they require much less food. Eating less, they don't need to travel as much as in the other seasons. Richard Nelson writes that the white-tailed deer's life in winter "is akin to a walking hibernation."

The concentration of the herd also helps individuals to escape predators. First, as Nelson notes, more eyes, ears and noses detect danger more readily. But also, many feet make light work, and the herd creates and maintains a network of runways (trails) that makes travel so much easier.

In Mark Raycroft's *White-Tailed Deer*, the stunning photographs attest to the author-photographer's considerable skill at getting into position. He describes a discovery he made about runways in a deeryard. "Early one January I was photographing an impressive 10-point buck as he maneuvered through a wooded area along a packed trail. Once he was out of sight I decided to follow him on the runway to see if I could get some more shots. After rounding some evergreens I saw him about 50 yards off, but he seemed to be on a different trail. The only way I was going to get close enough was to walk across the snow to the next trail and follow it toward him. Well, I had no idea how packed the snow could be on a deer runway. I stepped off the trail and almost disappeared — the snow was up to my chest. Needless to say, I couldn't pursue the buck. It was hard enough to climb back up onto the trail while toting pounds of camera gear."

Maintaining deeryards

While it's important that deer have good summer and autumn food sources so they enter winter in prime condition, it's the quality of winter habitat that determines how many deer survive a tough winter. Said Lavigne, "In locations where winter is mild and short — it can be as little as eight weeks of winter — deer can survive in poor habitat. They compensate by drawing on their body fat. But we have places where we have 20 to 21 weeks of winter, and there the quality of habitat is crucial."

That's why it is critically important to manage deeryards so that, over time, each one provides continuous cover. Like all forests, deeryards are dynamic habitats, changing over time. Making them functional over decades — and even centuries — requires careful planning and skillful execution of the plan.

The differences among the softwood species make it difficult to generalize about deeryard management. For instance, hemlock and northern white cedar are long-lived, but balsam fir is often mature at 80 years. White pine requires full sun and thus large openings in order to regenerate; red spruce is much more tolerant of shade so regeneration openings should be much smaller. These and many other differences call for different management techniques, but there are some general principles that hold true regardless of species or the size of the deeryard.

Regeneration. Landowners must ensure that there is a new forest coming in behind the old one, so they need to make sure that part of the stand is in the seedling and sapling stage. In the Northeast, planting seeds or seedlings is not often necessary because trees regenerate naturally. To get the desired softwood species, managers need to create the conditions under which the seeds can germinate. And if there are softwood seedlings or saplings present, they need to be protected. Softwoods don't sprout, and if a sapling is destroyed, its replacement needs to start from seed. Foresters recommend logging in winter to protect regeneration. Protecting softwood saplings — especially hemlock and cedar — from being eaten by deer is another

JOHN HALL

Do you own a deeryard?

For landowners with a keen interest in wildlife habitat, owning a deeryard — or part of a deeryard, since many deeryards are so large they comprise several ownerships — may be a dream come true.

How do you know for sure if your softwood swamp functions as a deeryard? If you inspect the stand in winter, look for heavily-used trails. Heavy means many deer every day and the traffic will show in the trail. Also showing will be concentrations of droppings.

You can also look during other seasons. See if there is a browse line: deer will eat all the buds from the ground to the top of their reach. You should see a distinct line marking their uppermost reach (about seven feet above winter ground level). A trained eye can also see signs in hemlock trunks where the bark was stripped. These aren't buck rubs — these are places where deer ate the bark. You'll also recognize hardwood saplings whose buds have been eaten. Because the deer eat the buds year after year, the branches develop a broomy look, with tightly packed branching and rebranching.

Managing a deeryard is complicated and if you're not a trained land manager, you should ask for help. You can call the numbers below to find out if your land contains a mapped deeryard or for more information about management.

Maine—207-287-8000

New Hampshire—Charlie Bridges or John Lanier, 603-271-2461

Vermont—John Buck, 802-476-0196

New York—Call your regional Department of Environmental Conservation wildlife office

problem altogether, and it is one of the great difficulties in managing deeryards.

Functional shelter. At any time, a minimum of 50 percent of the entire area has to be what's known as functional shelter. This is defined as softwood cover at least 35 feet tall, with crown closures averaging 65 to 70 percent. This is not a case, however, where if 50 percent is good then 100 percent must be twice as good. When the spruce budworm epidemic hit in the 1970s and 1980s, affecting millions of acres of the Northeast's spruce-fir forests, it hit a forest that was mostly mature and even-aged. It was disastrous to the forest, to the landowners, and to the deer.

Patch cuts. The best way to develop different age classes is to enter the stand at regular intervals (10 to 20 years) and remove mature trees in patches. The size of the patch is determined by the species that you want to regenerate. Patch cuts also result in the rapid development of shrubby browse that deer rely on for food.

Travel corridors and buffers. Deer need to be able to travel throughout the deeryard to reach patches of browse and other areas of shelter. Unbroken, dense lanes of softwood cover help to give them uninterrupted mobility. Vermont and New Hampshire officials recommend using existing buffers along stream corridors

ANDY KIERAS

Gerry Lavigne

since many deeryards occur in riparian areas. They suggest that travel corridors be at least 200 feet wide; however, the newly published *Biodiversity in the Forests of Maine* recommends 330 feet from each bank of a stream, making a total of 660 feet of buffer. The buffers should be managed using single tree selection or patch cuts.

We need only to look at the recent history of the spruce-fir regions of Maine, Vermont and New Hampshire to understand the difficulties of maintaining adequate winter habitat for deer, and the consequences if it doesn't happen.

Between 1975 and 1988, the region's spruce-fir forests were infested with the spruce budworm, which defoliated thousands of acres of balsam fir and spruce. Depending on the severity of the infestation, individual trees or entire stands were killed. By the time it was done, eight million acres in Maine had been affected. In 1982, in the midst of the epidemic, red spruce and balsam fir accounted for 35 percent of the Maine forest. In 1995, it was down to 25 percent. And instead of being mostly mature as it was before the budworm, what remained was a forest dominated by saplings and poletimber, not large enough to provide cover for wintering deer.

Much of the mature spruce-fir was killed by the budworm, but a correspondingly large amount was harvested ahead of schedule by industrial owners trying to forestall an even greater financial disaster. So the viable cover in the spruce-fir region of Maine — which roughly coincides with the industrial lands — is at its lowest point in centuries.

Lavigne said that in the last 30 years, Maine has lost two-thirds of its wintering habitat, dropping from 12 to four percent of the habitat statewide, with the greatest declines occurring in the spruce-fir region of northern, western, and eastern Maine.

The consequences were felt immediately, said Lavigne. Despite winters in the 80s and 90s being no more severe than those in the 1970s, the winter loss of deer in the last two decades has been twice as high as in the 70s.

There's no reason to think that the commercial demand for spruce, fir, hemlock, and pine will decrease. Simultaneously, the Maine Forest Service's 1998 timber supply report predicted that declines in the spruce-

Deeryards...*continued on page 61*

Deeryards...*continued from page 29*

fir supply will continue for the next 10 years.

Because Maine's land is 97 percent privately owned, it's not a stretch to say that private owners control all deer habitat. How do Lavigne and other wildlife managers plan to maintain deeryards if and when the commercial demand for spruce-fir — the building blocks of deeryards — exceeds the supply?

"You've got the carrot and you've got the stick," Lavigne said. "You can regulate land use. Since the 1970s, the Land Use Regulatory Commission (LURC) has placed 200,000 acres in deer protection districts. But this type of regulation is not optimal for deer management. That's the stick and it's not good.

"Here's the carrot — develop long-term cooperative agreements with the large companies. We take into consideration the larger landscape and see if we can devise cutting practices that will still provide all the habitat needs plus a stable wood flow. Stability is very important to these companies. Three hundred acres is the average in the LURC deer protection districts. In the cooperative agreements, it's a much larger scale. There are 5,000- to 15,000-acre wintering complexes. We're working with the companies to manage the entire area."

MDIFW is negotiating with all the large landowners and has cooperative agreements in place protecting 68,000 acres of deeryards. Additional agreements are expected in the near future. Even better than these cooperative agreements, said Lavigne, is the approach that Champion International is taking on its own. Management has classified all its holdings into four categories that match various landscapes to a management regimen. Fifteen percent of its holdings fall into the category of wildlife protection areas, which include the riparian zones of all major and minor rivers, brooks, streams, and ponds.

"They have tremendously widened out the buffer along streams to the point where they are a significant part of the habitat. Nearly all deeryards are along rivers, streams, and ponds, and these will never be more than partially cut, which will result in long-term stable canopy cover. If there's spruce-fir along streams, then you have a long-term deeryard. This amounts to hundreds of thousands of acres over the ownership."

While no other large owners have made such a clear commitment to maintaining their deeryards over the next century, two others — Fraser Paper and J.D. Irving, Maine's largest landowner at 1.6 million acres — are said to be taking a serious look at a similar total-package approach to their holdings in Maine.

Insect outbreaks and overcutting are not the only threats to the region's deeryards. As more and more people move to rural areas, land clearing has a significant impact on deeryards. In the last five years in Vermont, for instance, there have been more than 500 permit applications for developing land in deeryards. In the permitting process, 1,530 acres of deeryards were lost but 12,097 acres were conserved through deed restrictions, permit conditions, and conservation easements. These figures apply only to projects covered by the state's development review law, Act 250. Because many projects do not trigger Act 250 review, it must be assumed that many deeryards lost acreage to single home development.

Too many deer?

It is a considerable understatement to say that deer are plentiful in the southern counties of New York, Vermont, New Hampshire, and Maine, and in the regions further to the south. They are so plentiful, in fact, that they are dramatically altering the composition and structure of the region's forests by eating all the low-growing shrubs and sugar maple, oak, and birch saplings. In doing so, they are compromising their own food sources, the future timber supply, and the habitat for many other species who rely on the cover and food of the shrub layer and the mid-story of the forest.

Yet, even in these regions where the current deer population is at or near the land's carrying capacity, forest managers can't ignore the need for long-term deeryards. Fish and wildlife departments can adjust deer populations by adjusting hunting regulations. And when the public outcry convinces biologists that there are too many deer in a particular area, they can decrease the herd's size primarily through opening or extending seasons for hunting antlerless deer.

But adjusting hunting seasons is a means of fine-tuning the numbers. If the deeryards disappear, what happens in the winter woods will not be fine-tuning. When the region experiences a winter as severe as those that regularly occurred in the early 1970s, there will be a catastrophic winter kill of deer of all ages. And that is something that no one — biologists, foresters, wildlife watchers, hunters, or landowners — wants to see.

STATEMENT OF OWNERSHIP, MANAGEMENT, & CIRCULATION
(Required by 39 USC 3685)

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Stephen Long, s/s Business Manager.

Managing Your Woods with Birds in Mind

A Vermont Landowner's Guide

Audubon Vermont and the Vermont Department of Forests, Parks, and Recreation

FORESTS, PARKS & RECREATION
VERMONT
AGENCY OF NATURAL RESOURCES

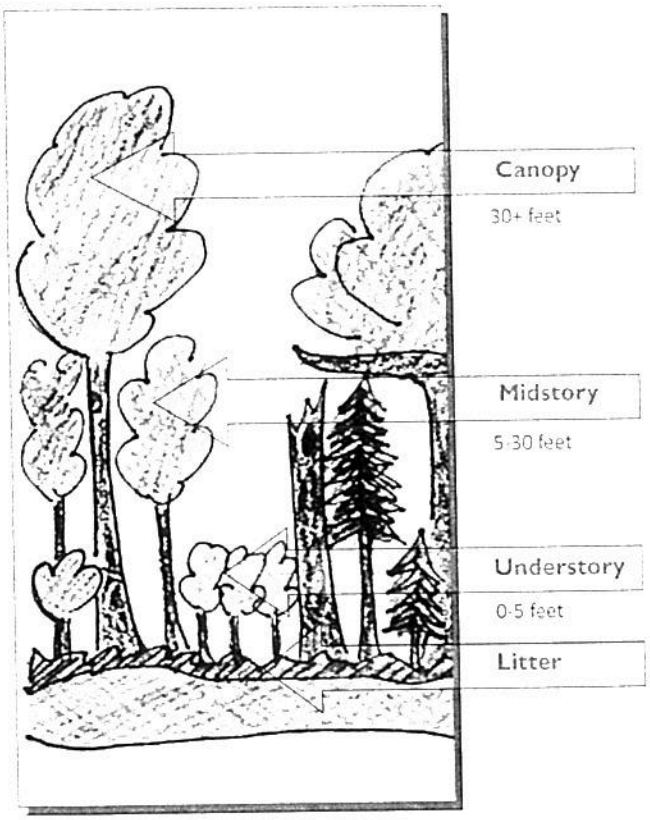
Audubon VERMONT

What is Forest Structure?

Forest structure is all the living and non-living components of a forest and landscape that take up or create space. ***Horizontal structure*** is the arrangement of different habitat types and conditions across an area. A landscape with mature and young forest habitats, open fields, and wetlands is rich in horizontal diversity. Landscapes with greater horizontal diversity support a greater diversity of breeding forest birds and other wildlife.

Horizontal structure across a landscape

Vertical structure is the complexity of vegetation and other structures as they are vertically arranged in the forest. A forest with well-developed layers of vegetation at multiple heights (e.g. understory, midstory, and canopy) exhibits complex or diverse vertical structure, which offers habitat for a greater array of bird species compared with a structurally simple forest. Non-living features, such as coarse woody material and the microtopography of the forest floor, add to the complexity of vertical structure as well.



Vertical structure within a forest

Enhanced vertical structure often looks messy to us. But messy structure is often exactly what birds need. Sometimes we're tempted to treat our woods like a garden or our yards by tidying up downed branches, raking up leaves, or cutting down small trees. But forests aren't gardens. They're complex ecosystems and all that mess isn't really a mess. It's structure! A complex, messy forest structure can be a signature of a healthy forest and key to supporting a wide diversity of living things in your woods.

What you can do

- ✓ Leave the rake and the clippers at home the next time you head out in the woods. Try looking at that "mess" in a different way; from a bird's perspective, all that "messy" structure is home.

What does a bird-friendly forest look like?

We envision healthy forests that provide suitable breeding and post-breeding habitat conditions for a suite of Vermont birds and sustained yields of timber and other forest products and services.

Generally Closed Canopy (in older stands): A forest with a closed canopy (>70-80% cover) works for interior-nesting birds like wood thrush and black-throated blue warbler, but also includes patches of understory regenerating in small canopy gaps.

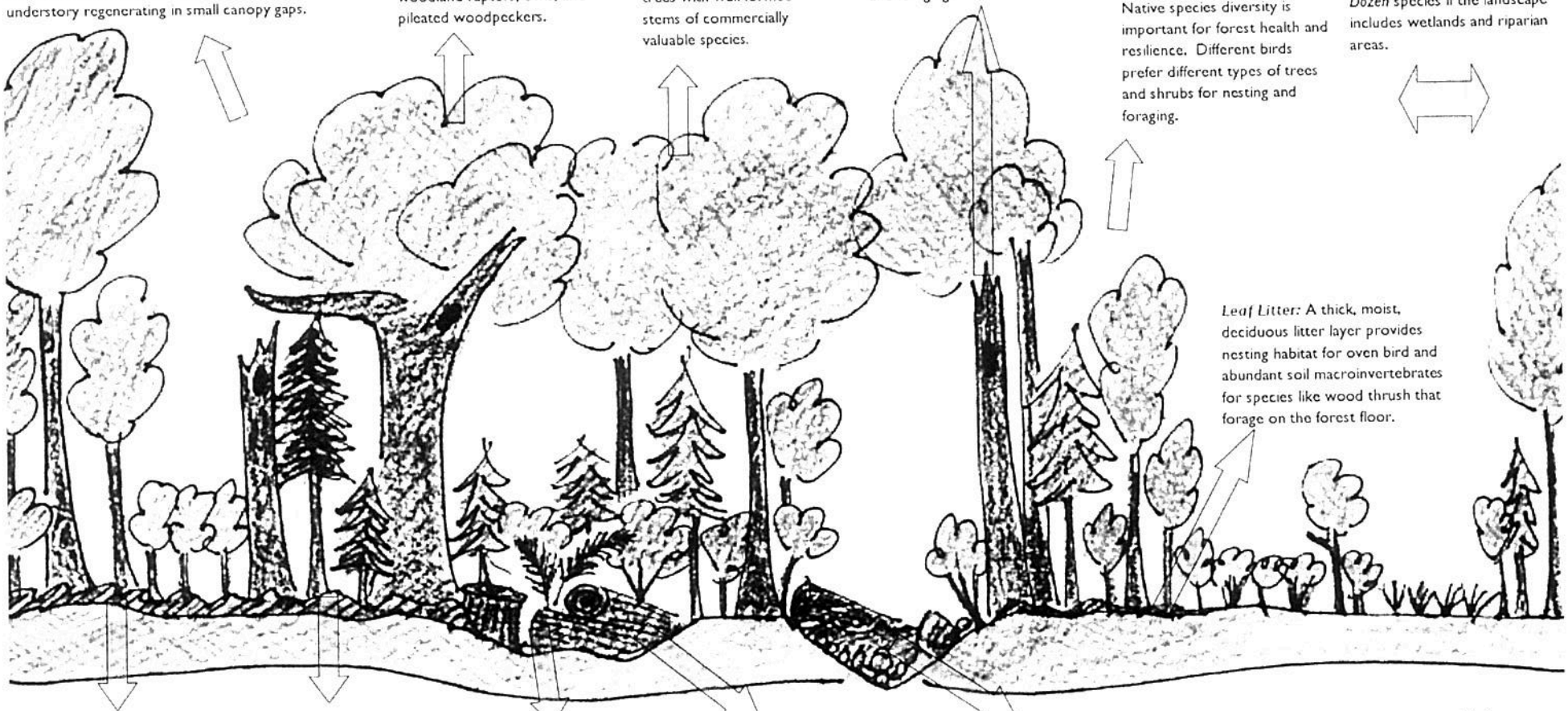
Big Trees: Big (24+" DBH) trees provide nest sites for woodland raptors, owls, and pileated woodpeckers.

Timber value: A well-managed forest has a high concentration of canopy trees with well-formed stems of commercially valuable species.

Snags and Cavity Trees: Snags and cavity trees—especially large sizes—are present for nesting and foraging.

Native Species Diversity: A diversity of native tree species are present and non-native, invasive species are absent. Native species diversity is important for forest health and resilience. Different birds prefer different types of trees and shrubs for nesting and foraging.

Complex Horizontal Structure: A variety of forest habitats and ages should support all twelve *Birder's Dozen* species if the landscape includes wetlands and riparian areas.



Leaf Litter: A thick, moist, deciduous litter layer provides nesting habitat for oven bird and abundant soil macroinvertebrates for species like wood thrush that forage on the forest floor.

Complex Vertical Structure (in older stands): Dense understory, midstory, and canopy layers provide the greatest number of birds with the greatest number of nesting and foraging opportunities.

Softwood Pockets: In northern hardwood forests, patches of softwood trees add to the diversity of habitat conditions and attract species like black-throated green warbler and blackburnian warbler.

Wetlands: Swamps, seeps, and beaver complexes are appropriately protected and provide habitat for species like Canada warbler, veery, and white-throated sparrow.

Downed Dead Wood: Logs of all sizes and stages of decay, branches, and brush piles are present. Downed dead wood is used by birds for drumming, perching, cover, and foraging.

Streams and Riparian Areas: Riparian areas along streams are appropriately protected and provide habitat for species like American redstart and Louisiana waterthrush.

Birds and Wildlife: A healthy forest has a wide array of birds and other wildlife that are successfully reproducing.

In Your Woods

✓ **Maintain interior forest conditions where present.** Limit the creation of new permanent openings and roads >20 feet wide to avoid fragmenting existing forest.

✓ **Maintain or create enhanced horizontal structure across your property and landscape.** Protect and/or create a wide variety of habitat types across your property, especially those that may be lacking or under-represented on the surrounding landscape. If less than 3-5% of the forest in your landscape is in a young, regenerating condition, consider creating and/or maintaining 1-5 acre patches of young forest where appropriate. When possible, locate openings adjacent to roads, fields, and existing development to minimize negative impacts on surrounding interior forest. Take advantage of opportunities to create this habitat type on old landings, under power lines, and in old fields or meadows.

✓ **Enhance vertical structure in mature forest stands.** Enhance vertical structure where it is lacking by creating canopy gaps, establishing new regeneration, creating snags, cavity trees, and downed woody material, and allocating resources to the most vigorous canopy trees. Try to ensure all forest layers are present in moderate to high amounts across stands.

✓ **Promote a dense understory and midstory.** Encourage a dense growth of native seedlings, saplings, and shrubs in the understory (0-5 feet) and midstory (6-30 feet) layers of the forest. Don't cut down small trees; they are not competing with canopy trees, but are providing important habitat and are your future forest. Most birds nest and forage in these lower forest layers. If there is no understory in an area, look for signs of excessive deer browse (browse on seedling, scat, trails, scrapes); if deer browse is inhibiting new tree growth consider opening your land for hunting by permission if it is posted and talk with your forester about forest management options that could encourage regeneration.

✓ **Promote native species composition.** Strive to have the species composition of your forests reflect the full range of species – commercial and non-commercial - that are part of the natural community type. Native species diversity is important for regeneration, forest health, and for forest birds that rely on the specific structures certain species provide for foraging and nesting.

Yellow birch

✓ **Retain large aspen and birch trees.** Yellow-bellied sapsuckers and northern flickers frequently excavate nest cavities in trees in sawtimber-sized (≥ 13 in. dbh) aspen and birch trees. Cavities are often made in trees with the heartrot. Retain as many of these trees as possible when present. Since most birds are territorial, leave scattered clusters of these trees across an area – rather than one cluster – in order to accommodate more breeding pairs.

✓ **Retain yellow birch.** The branches and foliage of yellow birch are preferentially chosen for foraging by insect-eating responsibility bird species

including blackburnian warbler, black-throated green warbler, and scarlet tanager. This preference may be due to the very high diversity and density of native insects on this tree and the ability of these bird species to forage efficiently among the branches and leaves. Retain as many trees of this species – across a variety of sizes – as possible.

✓ **Retain and release pockets of softwoods in hardwood stands.** In a northern hardwood forest, softwoods diversify habitat conditions available to birds and other wildlife species and are particularly beneficial for species such as the black-throated green warbler, blackburnian warbler, and blue-headed vireo. Retain softwoods – across a variety of tree sizes – where present in hardwood stands. Release and regenerate softwoods when the opportunity exists.

Softwood pocket in the understory

✓ **Retrain and grow some large-diameter trees.** Grow and retain some trees that grow to be 24+ inches dbh. Some of these trees may be commercially mature and others may be declining legacy trees that will never be harvested or cut down. Structurally-sound, large-diameter trees are important stick nest sites for woodland raptors; cavity nest sites for larger birds including owls and pileated woodpeckers; den trees for mammals including bear and porcupine; and seed sources.

✓ **Retain standing snags.** Standing dead trees are of significant value to a number of responsibility bird species including northern flicker, chimney swift, and olive-sided flycatcher as well as many other species of wildlife. To the extent possible retain a minimum of six snags and/or cavity trees per acre, with one exceeding 18 in. dbh and two additional exceeding 16 in. dbh. Priority should be given to hardwood snags as they remain intact longer. Also, retain some live trees of poor form and quality during harvests to serve as the next cohort of snags. If target number of snags does not exist, consider girdling poor quality trees.

Large, yellow birch snag

✓ **Retain coarse and fine woody material.** Small limbs and branches, including the tops of harvested trees, on the forest floor provide cover and feeding sites for ground and understory foraging bird species such as veery and white-throated sparrow. Larger diameter logs serve as drumming sites for male ruffed grouse and singing perches for songbirds including ovenbird. Strive to maintain or create a minimum of four downed trees or 16+ foot long logs per acre on average. Refrain from widespread use of whole tree harvesting and leave slash (branches, limbs, etc.) in the forest.

managing woodlots for FUEL & WILDLIFE

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Table Of Contents

If you are heating your home with wood and have access to a woodlot you have an opportunity to "kill two birds with one stone!" You can improve the usefulness of that woodlot for many kinds of wildlife while cutting wood to heat your home.

By clearcutting the forest as you go you can stimulate the regrowth of a young forest which will provide food and cover for animals such as ruffed grouse, woodcock, varying hares, white-tailed deer, beaver and many interesting songbirds.

A 40-acre woodlot provides the best opportunity for developing the greatest benefits from such a program, but much can be done in woodlots as small as 10 acres. If you have access to forested areas larger than 40 acres you can probably accomplish a better forest and wildlife management result through some type of commercial operation. The Ruffed Grouse Society has other publications which describe these larger operations.

Before proceeding too far, your ownership goals have to be defined. The type of woodlot management most likely to produce the greatest wildlife values on a small acreage may not be the type of woodland management you would practice if your goal is to maintain a productive "sugar-bush," or to produce top-value yellow birch, oak or black cherry saw logs.

If the growth of these wood products is of primary importance to you, you should consult any one of several silviculture guides which tell how to remove non-crop trees and to thin to favor the best growth of crop trees. Usually this type of management produces a relatively sterile forest as far as diversity of wildlife is concerned.

However, if you consider wildlife to be as valuable, or more valuable than your timber, then read on and you'll learn how to create a mixture of habitats which should attract a variety of wildlife.

You'll have to accept certain trade-offs, for some wildlife species require habitat features which may be contrary to the needs of other wildlife—so you must decide which you favor. It is difficult to grow corn, tomatoes, squash, beans and peas all on the same square yard of a garden. The same is true of wildlife—some species do not do well in the types of habitats essential to the well-being of other forms.

The management program which follows is designed especially to benefit ruffed grouse, woodcock, hares, deer and the many songbirds that require a **young** forest for their habitat.

These animals need vigorously growing trees generally less than 30 years old, recovering from severe ecological disturbance, such as fire, windstorm, or clearcut logging (Figure 1). The goal here is to describe fuel-wood cutting procedures which will most closely simulate the natural ecological disturbances that maintained habitat for these wildlife species in the North American forests before mankind began interfering with natural processes. This means providing the food and cover these animals require on a year-long basis.

These needs of wildlife must be provided in such a fashion that adequate cover and food resources are always readily accessible. For deer this means producing an abundance of wood browse which is available to them throughout the winter. For ruffed grouse this means providing secure cover close to older forest stands where they can find winter food resources. For migratory woodcock this management needs to provide adequate summer cover and food.

Of the wildlife species that will benefit from this program, ruffed grouse are perhaps the least flexible in their habitat requirements, so their needs will be given priority. To a large degree, proper woodland management for ruffed grouse is also good management for the other wildlife most often associated with young forests.

Depending upon other animals present, there may be certain other constraints placed upon the opportunity for effective management. For example, if deer are especially abundant in your area it may prove rather difficult to create or maintain habitat suitable for ruffed grouse and woodcock, because deer like to eat the young plants which provide the best cover for these birds.

Your success in creating grouse or woodcock cover where deer are numerous depends upon how much cutting has been done recently in the general area. Research in Michigan 20 years ago showed that if deer numbered 11 to 20 per square mile at least 20 acres had to be cut in that square mile to assure adequate regeneration in the face of deer browsing; if there were 41 to 50 deer per square mile nearly a third of that square mile would have to be cut at one time to permit regeneration. So even if you have as few as 10 or 11 deer per square mile and your acre is the only one cut from an old forest that season you may find your efforts will result in little if any improvement in wildlife habitat.

Also, beaver have a particular fondness for aspen and they will commonly range 100 yards from a stream or pond to fell this favorite tree. So where beaver are present it may be difficult to develop satisfactory cover for grouse within that distance of a waterway. These rodents will usually cut so many of the saplings that the cover will be too open for grouse. But other wildlife, less sensitive to cov ensity, will use these areas of thinned, young forest.

The Important Plants Must Have Sunlight

The shrub and tree species most important to all of these wildlife belong to a group of plants generally called **shade intolerant**. This means that they do not grow well in the shade of other trees. They must have full sunlight for vigorous, healthy growth. Cutting programs designed to benefit the wildlife favored by this program must include removing virtually all the shade from the area to allow a maximum amount of sunlight to reach the forest floor.

The improvement and maintenance of an adequate supply of the food and cover plants is the goal of a fuel-wood cutting program designed to benefit wildlife. This simply means cutting in a manner that encourages the development of a succession of habitats which provide secure cover and ample food for desired wildlife. Attention needs to be paid to the **successional** aspect of this management, for the forest is a dynamic system and although changes are gradual, the vegetation proceeds through a predictable sequence of stages, which at some stages favor certain species of wildlife but may discourage use by the same wildlife at other stages.

For example, a stand of young, regenerating hardwoods can be too dense for ruffed grouse for the first few years after cutting, and 20 years later become too open. Adequate cover for these grouse may be present for a span of only 10 to 15 years in the life of a forest.

Deer find an abundance of forage during the first decade or so in forest development and a forest older than 20 to 25 years may provide very little food for deer.

So habitat maintenance has to be a continuous affair and this **management program requires periodic treatment**. This fits a firewood cutting plan very nicely, for the provision of wood for your heating system also requires periodic cutting. You want to cut wood a year or so before you need it, to allow the wood to dry properly. But you don't cut wood so far ahead that decay will take much of its value before it is burned.

Values Of Wood Vary For Fire And Wildlife

Table 1, based on a University of Minnesota publication, shows the relative fuel values of various woods. Actually, all of the woods listed here have essentially the same heating value per pound. The differences shown are based on volume, and hottest burning woods are the heaviest and most dense. So pound for pound there is little difference between one type of wood and another in heating value, but there is a difference between the number of pieces you have to handle and store to provide a winter's supply of fuel.

Cutting some species of trees will provide more benefits to wildlife than if other trees are cut. Throughout the Great Lakes region and most of the northeastern states cutting aspen or "popple" and allowing it to regenerate properly will provide greater benefits to wildlife than cutting any other forest tree. But, due to its light weight, the heat value of aspen ranks rather low among the woods listed in Table 1. You'd have to handle and burn 1.74 times as much aspen as oak to obtain the same amount of heat.

On the other hand, in the Rocky Mountain states, where most fuel wood consists of resinous pines and firs, clean-burning aspen is highly valued for its usefulness in counteracting creosote build-up in chimney flues.

Aspen used to be called "summer wood" in Minnesota, for split, dried aspen was the preferred fuel for summer cooking. It made a quick fire, hot enough to cook a meal on a hot summer day, but burned so rapidly that it did not heat up the kitchen range and keep the kitchen hot for the rest of the day.

Aspen is uniquely important as a habitat resource for a number of wildlife species living in northern forests, so your greatest benefits will result if special attention is paid to maintaining or increasing the abundance of aspen through firewood cutting.

Most other trees and shrubs can provide adequate cover during early stages of forest regrowth, but few do so as well as aspen. Some trees provide food resources that may be seasonably important for some species of wildlife, but no others provide the range or quality of food resources (bark, buds, and leaves) provided by aspens on a nearly year-round basis.

Cutting Arrangements

Figures 2 and 3 show how a firewood cutting program should be carried out to provide maximum benefit for grouse, woodcock and deer. Figure 2 deals with a 10-acre woodlot and Figure 3 considers a 40-acre tract.

The cutting programs described here provide for the interspersion of food and cover both in space and time which will best provide the habitat needs of these wildlife species. These take into account the minimum sized units of cover which grouse find acceptable, as well as the territorial demands made by male grouse and woodcock. Usually one can expect a male ruffed grouse to dominate 8 to 10 acres of forest land, to the exclusion of other males, and usually there is only one hen per male. Each singing male woodcock requires a similar sized area as his mating territory. So these requirements determine the proper arrangement of the cuttings.

The cutting blocks shown on Figures 2 and 3 are either square or rectangular, but they do not have to be that shape. Square or rectangular blocks are the simplest to lay out on the ground and once cut have the least visual impact. One acre squares, when compared to one acre circles, triangles, crescents or diamonds look smaller than any of these other configurations.

If other shapes are used the longest dimension should always have a north-south alignment. This allows a maximum of sunlight to reach the ground, to stimulate the quality of plant growth required to produce optimum cover for wildlife.

Woodcock and deer are not as restricted to specific qualities of cover as ruffed grouse, nor do they gain as much advantage as ruffed grouse to having both young and old aspen nearby. So the spacing of cuts on the ground and in time is designed to especially benefit grouse.

A 10-acre woodlot is probably about the smallest sized area that can be managed for ruffed grouse and at least one acre of that 10 sho lways be in

dense, sapling regeneration. To maintain this succession, a block of little over an acre should be cut every 4 years, in a pattern like that shown in Figure 2. These blocks are 200 feet on a side, but this could be altered to cut ½ of a block every two years, in such a manner that at least one acre is completely cut by the end of two years. That is, cut one-half the block one season, and the other half the next.

Grouse need pockets of at least an acre of uniform, good cover, and even ¾ of an acre of continuous cover is much less attractive than an acre. At the other extreme, if the block of uniform cover exceeds 5 acres its value as grouse cover diminishes. Figure 4 shows part of a forest being managed in this manner since 1968.

The program on a 40-acre tract is essentially a four-fold expansion of the program recommended for the 10-acre tract—except, that by proper placement of the cutting blocks in space and time there is an opportunity to satisfy the needs of a fifth pair of grouse. This represents a 20 percent bonus in grouse numbers.

Cutting Procedures

When your program involves cutting and regenerating aspen there are several fairly important factors that need to be considered. When aspen is not a part of your woodland these are less important.

Regardless of what tree species are being cut, each block should be completely cut in one season, whether ½ acre or a full acre, or larger. All wood should be removed or at least stacked in piles before the growing season begins. This assures that the new tree sprouts will not be broken or damaged once they have started growing. The uniformity and density of sprout growth is important to the development of high quality wildlife cover. Also, competition between plant stems growing close together produces taller and straighter stems free of branches near the ground—all important to the development of premium grouse and woodcock cover.

If you are cutting aspen two other considerations should govern your harvesting procedure. First, aspen (unlike most other hardwoods) reproduces by root suckers, which depend upon nutrients stored in the root system to support their first season's growth. So usually it is wisest to cut aspen in the fall, winter or early spring when leaves are off and the trees are in a dormant condition. Cutting after July usually results in acceptable regeneration from healthy stands, but cutting while the sap is rising in April, May and June can severely hamper plant regrowth. If the aspen is decadent or dying, cutting at this season may kill the remaining root systems.

The second matter of importance is that of completely cutting the aspen stand, even down to stems that are as small as one inch in diameter. Sprout growth from aspen roots is controlled by an **auxin growth hormone** produced by the tips of growing branches. So long as that hormone is produced, root sucker growth is inhibited (totally in most cases, but less so in some). Most aspen occurs as clones, growing from interconnected root systems. The auxin produced by one aspen left standing can spread through this root system and suppress sprout growth from the roots of several surrounding trees that were felled. Even inconspicuous stems as small as an inch in diameter will exert this influence once the trees around them have been removed. If these small stems are numerous they can effectively suppress the needed root sucker response.

Aspen is very intolerant of shade so aspen sprouts growing in the zone shaded by a forest canopy to the south of your clearings will thin out and many will die in a few years.

Meeting The Needs Of Other Wildlife

Since these plans were developed specifically to produce a best quality of habitat for ruffed grouse (which should also be optimum for deer and varying hares) they need some modification if you want to encourage a greater diversity of wildlife.

Woodcock males need a cleared area in the forest, surrounded by low growing vegetation for a radius of about 60 to 90 feet for a display site, or **singing ground.** The singing ground display of the male woodcock provides a really enjoyable nightly show from early April well into May. The display usually starts about a half hour after sunset and lasts until it is quite dark. The male struts about on his chosen ground uttering a repetitive "peent" to advertise his presence. Periodically, he flies from the site and circles overhead, further advertising his location. If you move quickly while he is in the aerial display and remain quiet when he comes down you can often move to a position to watch the on-ground episode from a few yards away.

The grass or forb covered site used by displaying woodcock does not need to be more than 10 to 12 feet across. One or two of these could be maintained in the center of one or two of your one acre clearings. For the rest of their needs most of the time optimum ruffed grouse cover is also optimum summer cover for woodcock.

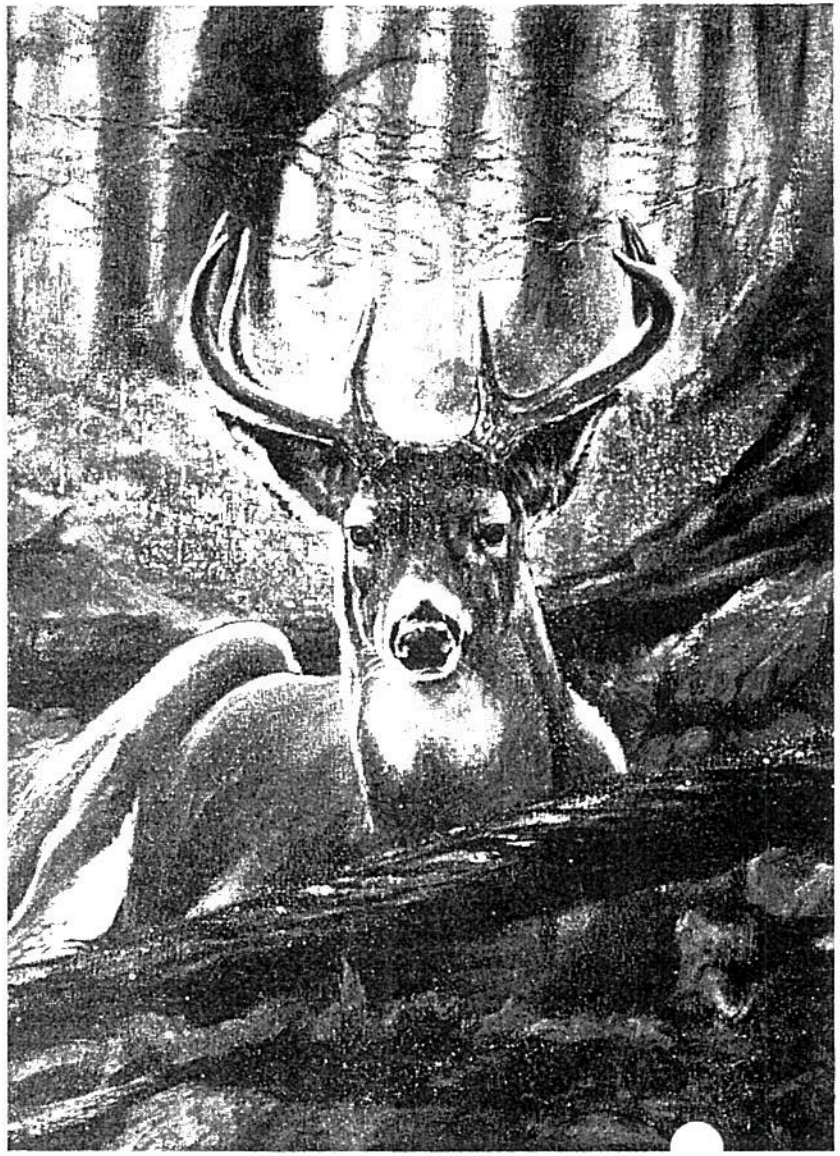
You may want to leave a few (4 or 5) acorn-producing oaks or nut-producing hickories in each block to provide food for other wildlife. To reduce the impact of shading, these trees should be left well separated from one another so the shade from their crowns does not overlap during the day.

To provide nesting sites and foraging perches for some of the 36 species of cavity nesters common to northern forests, several snags and trees containing cavities can be left standing—but don't leave aspen standing unless your stand is largely aspen. Most of the cavity nesters are insect eaters such as swallows, martins, chickadees, wrens, nuthatches and woodpeckers that help reduce insect abundance in woodlands. About 8 to 10 stems for cavities should be left per acre. If you want to favor owls, wood ducks and the larger woodpeckers the snags should be larger than 12 inches in diameter.

If you would like to have a drumming male grouse in a situation where you can observe him, you should place a log or two in a suitable place. Logs for drumming should be 6 to 8 feet long, and put the drumming grouse about a foot above the gro The "log" could consist of a pile of smaller logs, giving the bird the needed elevation above the surrounding terrain (Figure 4).

The drumming log should be placed in a situation where a fairly high density of saplings will develop around it. If aspen have been cut the log should be placed close to the stump of a vigorous aspen, where abundant cover is most likely to develop most rapidly.

If you left snags or living trees standing in the cutover block, place the log as far from these **predator perches** as you can, to provide the occupant with as much security as possible. One of the wildlife values of isolated trees and snags is the role they play in providing perches from which hawks and owls can survey the surrounding area and spot their prey.



Effect Of Slope And Soil

The nature of the physical environment obviously has a considerable influence on the pace and quality of plant growth. Plants growing on rich soils in warm climates develop more rapidly than those on poorer soils or in cooler climates. For ruffed grouse this means that the regenerating forest becomes acceptable habitat faster on better soils and in warmer climates. But also, it may prove to be acceptable cover for a shorter period of time than similar forest development on poorer soils or in cooler climates.

The way your land lies also governs what you can do, or at least how you do it. If you are in the relatively level Lakes States or are cutting on a southerly facing slope, or on a broad valley in New England, your cutting program can be laid out as shown in Figures 2 and 3.

But if you have to work on a northerly facing slope the plans become more complex. In this latter case you'll have to be certain each cut is long enough in a north-south alignment to permit the sun to reach the forest floor.

If your north-slope woodland extends to the top of a ridge, cutting should begin at the highest point and progress downslope. This pattern assures the greatest likelihood of getting a maximum of sunlight onto the forest floor all the way down the slope.

Livestock Grazing

If you really want your woodlot to have an abundance of wildlife you should keep it free of livestock, or at best keep grazing pressure below a level of about 25 animal days per acre on an annual basis. Grazing domestic livestock will feed on the growing tips and leaves of the young trees and shrubs and inflict serious trampling damage on the young growth which interferes with the development of high quality cover.

References

If you would like to know more about forestry, ruffed grouse or woodcock management, or the aspens, the following sources will provide this information.

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INTRODUCTION TO FOREST SCIENCE. R. A. Young (ed). John Wiley & Sons. New York, 554 pages, 1982. (See Chapt. 16 especially).

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QUAKING ASPEN: SILVICS & MANAGEMENT IN THE LAKES STATES. K. A. Brinkman and E. I. Roe, U.S.D.A. Forest Service, Agric: Handbk. 486, 52 pages, 1975.

Table 1. Comparative Heating Value of Various Woods[1]

Available heat per cord (millions of BTU's)

Hickory	15.2
Ironwood (Hophornbeam)	15.0
Apple	14.6
White Oak	14.1
Beech	13.2
Sugar Maple	13.2
Yellow Birch	13.0
White Ash	13.0
Paper Birch	11.2
Cherry	11.0
American Elm	10.7
Black Ash	10.5
Red Maple	10.3
Boxelder	9.8
Jack Pine	9.4
Hemlock	8.7
Black Spruce	8.7
Aspen	8.1
White Pine	7.9
Balsam Fir	7.9
Basswood	7.4
White Cedar	6.7

1. Condensed from Table 2 in T. F. Milton, HEATING THE HOME WITH WOOD, University of Minnesota Ext. Bull. 436, 31 pages, 1980.

Fig. 1

Figure 1. A one-acre block clearcut in 1973, in a piece of forest devoid of grouse for at least the previous 7 years, as it looked after the first growing season. The first territorial male grouse became established here in the fall of 1976, after 4 growing seasons. As of the summer of 1982, thi[illegible]generated covert has been occupied continually since the first use in 1976.

Fig. 2

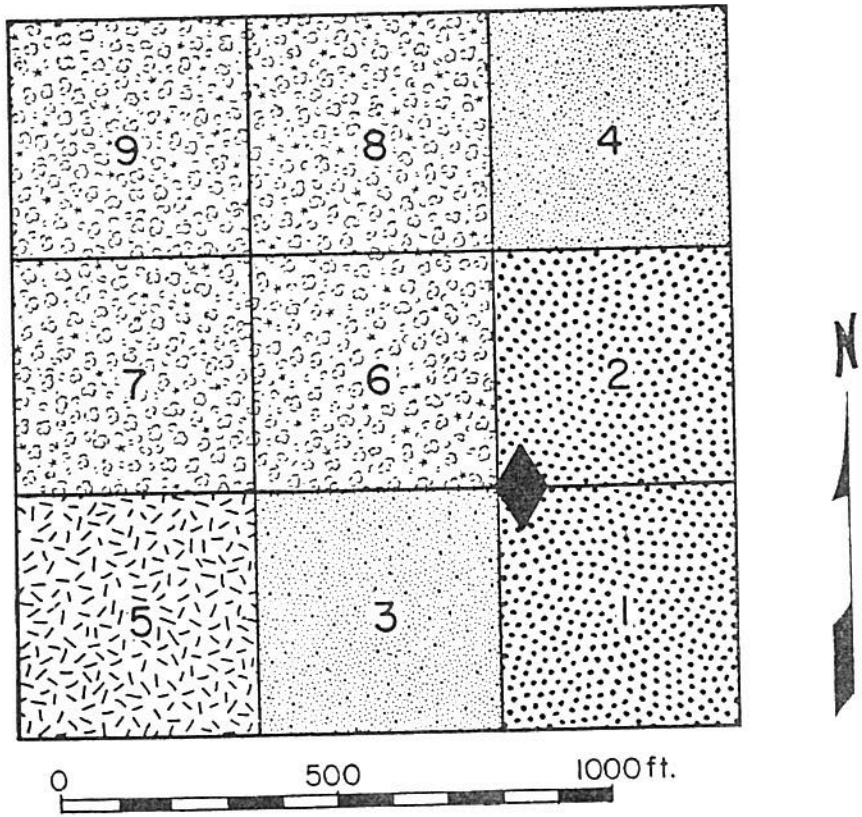


Figure 2. A suggested cutting program for a 10-acre woodlot. This shows the cover would be distributed 21 years after the program began. Block 1 was cut first, then b' ' 2, and so on. Cutting here would be spaced at 4 year intervals, with block ady to cut again after 36 years. These blocks are 220 feet on a side, and a little over one acre in size.

Fig. 3

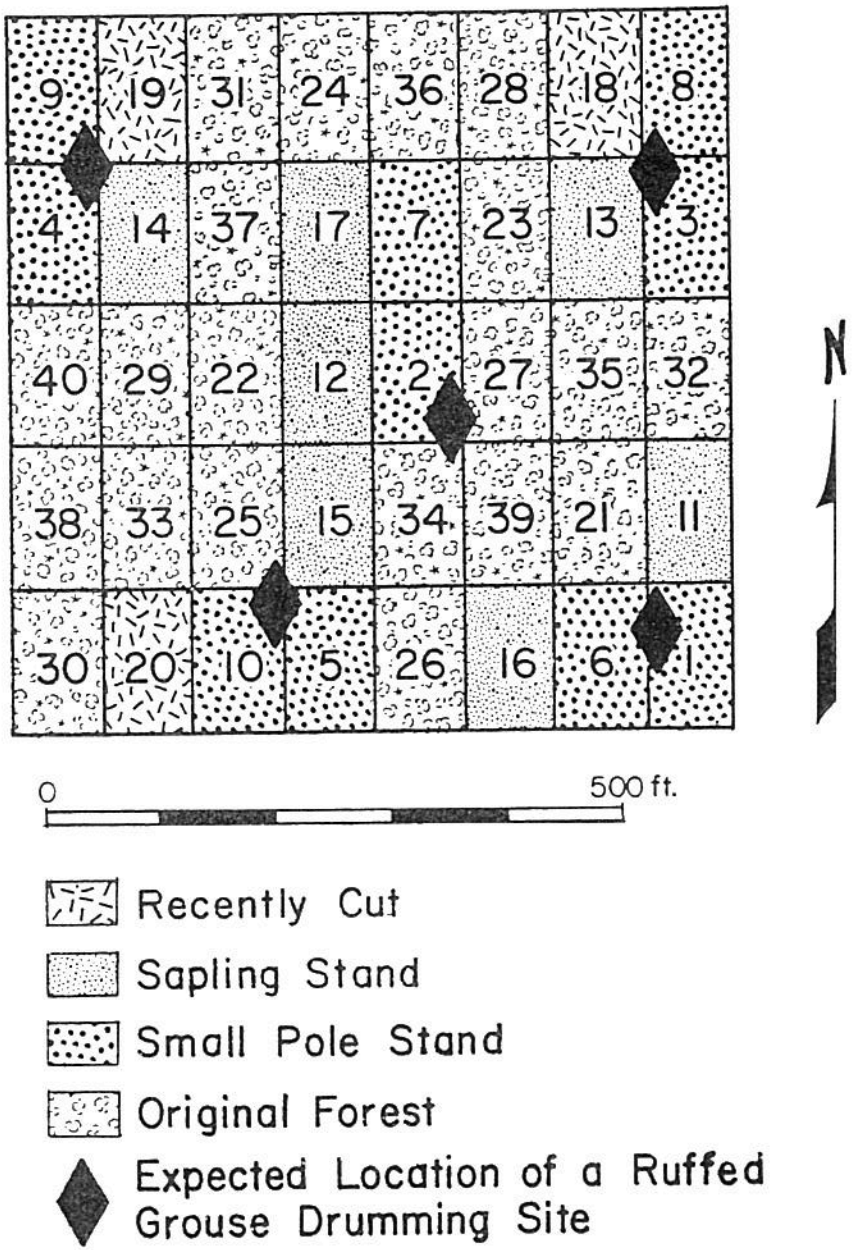


Figure 3. A suggested cutting program for a 40-acre tract. One block 1-acre in size would be cut each year, in the scattered pattern shown here. Block 1 should be cut first, then 2, 3, 4, etc. On the 41st year block 1 should be cut a second time. These rectangular blocks are 165 by 264 feet, with the long axis aligned north and south. This alignment provides the most efficient use of solar radiation to encourage optimum cover development.

Fig. 4

Figure 4. An "artificial" drumming log for ruffed grouse, made by simply piling three small logs (8-inch diameter) atop one another. This pile was made in October 1972 and had its first use in the fall of 1973. This drumming site (as it looked in 1978) continued to be used through the spring of 1980. After that the surrounding 16-year-old aspen cover commenced a natural thinning cycle which reduced the stem density below acceptable levels and this territory has been vacant since.

Pruning an Old Apple Tree

Your neglected tree can be restored to fruit production in three years.

SARAH PRICE

RESTORING an old tree to production takes time. "It's not something which can be done as a one-shot deal," says Maine orchardist Steve Page. "Instead of looking at it as a long-term project, a lot of people go into old trees and prune them way back. The tree becomes nothing but suckers and water sprouts. I try to convince people to go into it slowly but constantly." Plan on three years of work to get the tree back into shape. After that, basic care and annual pruning will keep your tree producing fruit.

First, decide if your tree is really worth saving. The tree's health, location and fruit quality will help you make your decision. Is the tree basically sound? If the trunk is rotted and looks in danger of splitting, or there's only one or two healthy branches, the tree's better off in the woodpile. What about the fruit? How does it taste? Don't let its size or color bother you—they'll improve with pruning. But the flavor won't change. If the apples don't have a good taste, there's no point in bringing the tree back to production. And perhaps most important, where is the tree? Can you clear around it? Stan McCumber, a New Hampshire apple-pruner, says, "If you're really serious about getting fruit, the tree should get sun all day long." Also, disease and insects are more likely to be a problem in a shady, damp situation.

After deciding your tree is worth saving, step back and look at it. The tree is probably a dense thicket of water sprouts and dead, dying and overgrown branches. Cut out the deadwood. While you're cutting out deadwood, keep your eyes open for damaged, diseased or insect-infested branches. Those branches should be removed next. If any of the wood is diseased, be sure to disinfect your tools by wiping the blades with bleach between each cut. Don't leave any brush piles near the tree. They can provide breeding grounds for insects and disease. Burn all diseased and insect-infested wood to prevent reinfection.

The rule of thumb is that you can remove up to a third of the live wood each year. If your tree has been long-abandoned, the first year you probably will be able to cut only diseased and damaged branches before removing one third of the live wood. The tree tries to maintain a balance between roots and live wood. Taking out too much will stimulate sucker and water sprout growth. The stress of producing a lot of vegetative growth will reduce the number of fruit buds produced by the tree. A deeply stressed tree may lose a couple of years of apple production.

As soon as you are able, put your efforts into opening up the tree so that

the fruits and leaves get plenty of light. Light encourages the production of sugars which promote good fruit color and full flavor. Apples that are red on one side and green on the other didn't get enough light. Open up the tree by cutting out branches that grow straight up and any that grow towards the center of the tree. You may also want to lower the height of the tree to make it easier to pick the apples.

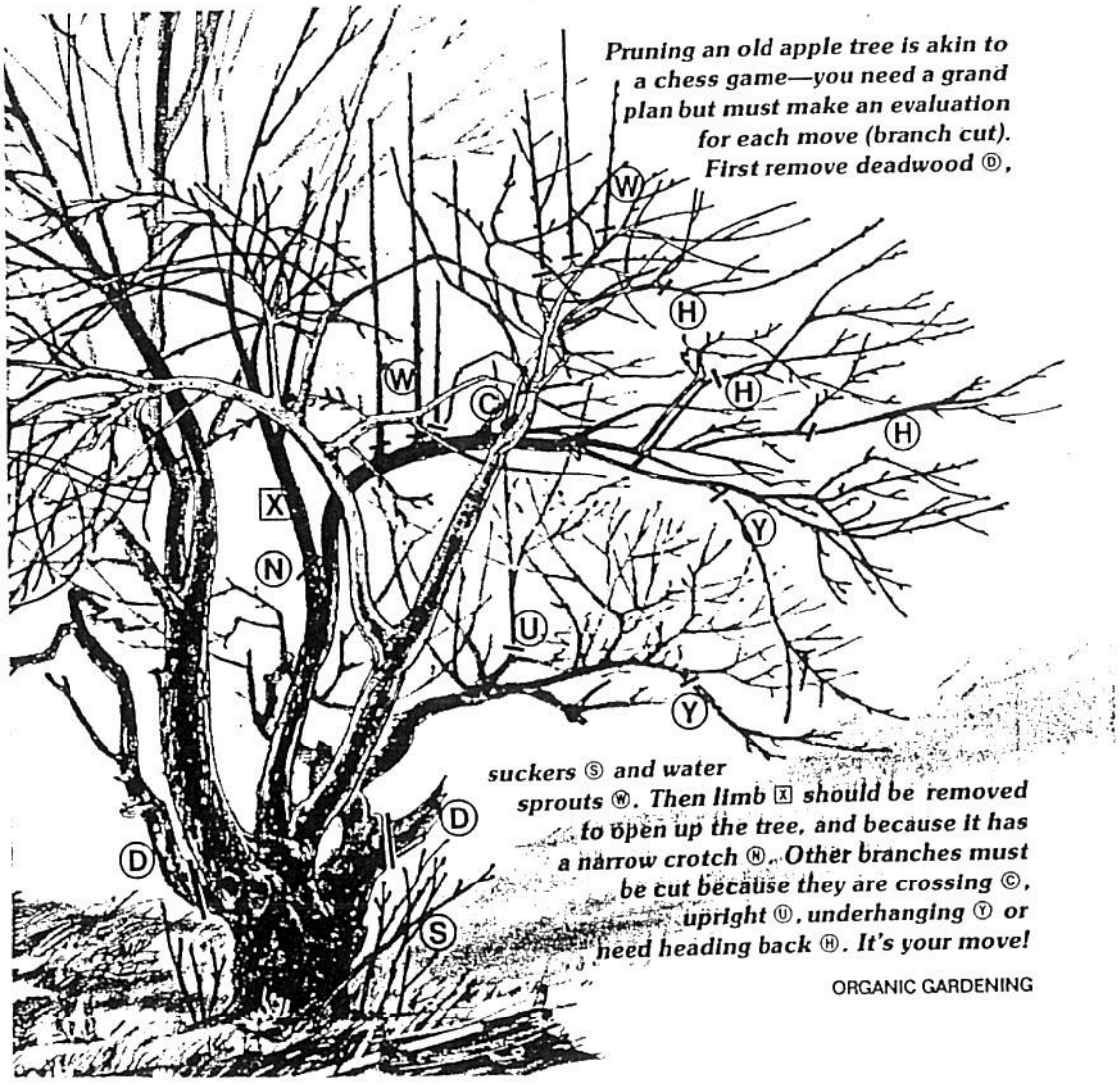
Start the project in late winter or early spring before the tree leafs out. It's easier to see its structure and what cuts are necessary when the branches are bare. By late winter the tree is fully dormant and won't be susceptible to winter injury. Also, it will have a chance to form a protective barrier behind the pruning cuts before insects and disease organisms become active in the spring.

You won't be able to change the basic form of the tree. If it has two main branches, don't cut out one. Cutting off a large portion of the tree can dangerously stress it. The form will never be the perfect shape of a tree pruned correctly from the start. But you will improve its form by keeping the following pruning rules in mind:

Prune more heavily in the upper part of the tree than the lower. Light will reach throughout the tree and help maintain the fruitfulness of the lower limbs.

Take out branches that grow towards the center of the tree. This will help open it up and allow light to reach the fruit.

Cut out branches with narrow crotches. Narrow crotches are weak, causing branches heavy with fruit to split.



Pruning an old apple tree is akin to a chess game—you need a grand plan but must make an evaluation for each move (branch cut). First remove deadwood Ⓓ, suckers Ⓢ and water sprouts Ⓦ. Then limb Ⓧ should be removed to open up the tree, and because it has a narrow crotch Ⓝ. Other branches must be cut because they are crossing Ⓒ, upright Ⓤ, underhanging Ⓨ or need heading back Ⓗ. It's your move!

ORGANIC GARDENING

Cut out branches with crotch angles of less then 35°. Aim for having branches at a 45 to 90° angle.

Remove all vertical growth. Upright branches don't produce fruit. Cut out water sprouts (fast-growing, unbranching upright shoots). Occasionally you may need to leave one to fill in a space.

Encourage horizontal branches. Horizontal branches bear more fruit.

Eliminate branches that hang below or cross another. Branches that cross or rub can damage each other. A branch shaded by an upper one is not likely to be fruitful. Plenty of light is needed to produce fruit.

Cut back drooping branches. Cutting a branch back will strengthen it by encouraging growth farther back along the branch.

Make smaller cuts rather than large ones. Cutting off large branches can leave large holes in the tree's structure.

The soil around a neglected tree is likely to be depleted. So it's especially important to fertilize your old tree. According to Steve Page, the best way to know your tree's needs is to have a foliar (leaf) analysis done. A foliar analysis costs about $12 and will tell you exactly what nutrients your tree lacks. Your county Extension agent can tell you where the service is available.

Apple trees do best with a soil pH between 6.5 and 7. Nutrient-depleted soils often are as low as pH 5. Because a foliar analysis won't give soil pH information, you'll have to have the soil tested to see if the pH needs correction.

Without any tests, a good general recommendation for a mature tree is an inch-thick layer of well-rotted manure spread from the drip line (the outer edge of the existing branches) to about a foot from the trunk.

"Go into it slowly and keep after it. Don't expect it all to be done at once," were Steve Page's parting words on renovating an old tree. Follow his advice, and within a few years your once-neglected tree will be providing apples, shade and enjoyment for years to come. □

LEGAL OBLIGATIONS FOR FOREST LANDOWNERS

Forest Practices Act (FPA)-Maine Forest Service(MFS). The intent of this regulation is to limit the size of clearcuts, to ensure adequate forest regeneration, to notify the MFS of a harvest, and to gather timber sale information.

Timber Harvest Standards to Substantially Eliminate Liquidation Harvesting-(MFS). This standard prevents the purchase, liquidation harvesting, and selling of 100 or more acres of wooded properties within a five year period.

Natural Resources Protection Act (NRPA)-Department of Environmental Protection (DEP). Regulates work in, on, over, and adjacent to State waters and mountain areas to protect these natural areas from soil disturbance, fill, and building permanent structures. This rule will apply to stream crossings when culverts or bridges are utilized.

Shoreland Zoning Act(SZA)-DEP and municipality. Regulates development and activities, such as timber harvesting, near waters of Maine. Town ordinances may be stricter than State regulations. This rule will apply along streams.

Erosion and Sediment Control Act- DEP and town. Regulates activities involving filling, displacing, or exposing soil anywhere in the organized areas of the State.

Protection and Improvement of Waters Act (PIWA)- Regulates activities which discharge or could discharge pollutants into the waters of the State.

Endangered Species Act (ESA, Federal)- US Fish and Wildlife Service. Designed to protect federally-listed endangered and threatened species and their habitats.

Endangered Species Act (ESA, Maine)- Maine Department of Inland Fisheries and Wildlife (DIFW) Service. Designed to protect State-listed endangered and threatened species and their habitats.

Local land use ordinances- contact appropriate municipality for the latest information on ordinances that may affect any woods operations.

Non-Native Insect and Invasive Plant Threats to Forests

A number of existing and potential threats to Maine forests exist in the form of introduced non-native insects and plants. Among these are:

Asian Long-Horned Beetle - Not known to exist in Maine at this time, but has been confirmed in the Worcester, Massachusets area. A serious potential threat to maple trees and other hardwoods. For more information call (207) 287-3891.

Emerald Ash Borer - Also not known to exist in Maine at this time, but has been confirmed in New York and several mid-Atlantic state. A serious threat to ash trees of all species. For more information, call 1-866-322-4512.

Hemlock Wooly Adelgid - Currently has not progressed farther north than the Maine/New Hampshire border. Is slowly killing native hemlock trees in the mid-Atlantic and Appalachian states.

Invasive Plants:

- Japanese Barberry (Berberis thunbergii)
- Japanese Knotweed (Polygonium cuspidatum)
- Asian Bush Honeysuckles (Lonicera spp.)
- Autumn Olive (Elaeagnus umbellata)
- Tree of Heaven (Ailanthus altissima)
- Oriental Bittersweet (Celastrus orbiculatus)
- Glossy Buckthorn

All of the above non-native plants are agressive invaders of forests, and can over time displace native trees and plants. They should be continually monitored for, and control efforts made immediately upon discovery. Once established, they are very difficult and costly to eradicate.

Long-Term Resource Considerations

Forest Health - Balanced amounts of dead, down, and dying wood are a beneficial part of a healthy, functioning forest, as are normal levels of native insects and diseases. However, severe weather, abnormal levels of insects & diseases, non-native insects and plants, or other disturbances sometimes create an imbalance and become a barrier to good forest health. Forest management can correct imbalances and restore a funcioning ecosystem. For more information, contact the Maine Forest Service Division of Forest Health and Monitoring at (207) 287-8044.

Protection from Fire - Wildfire is rare in Maine, but can be quite devastating when it occurs. Management actions can reduce the risk of a wildfire in both forest land and around residences. For more information, contact the Maine Forest Service Division of Forest Protection at (207) 287-4990.

Please be careful with all outdoor fires, and observe all the open burning laws. For wildfires, call 1-800-750-9777.

Monitoring - Landowners and their designated representatives are encouraged to regularly monitor their woodlands. This can take the form of regularly scheduled boundary line maintenance, recreational activities such as hunting or hiking, or following up after silvicultural activities to check results. Regular monitoring can help prevent theft and trespass.

Aesthetic Quality - The visual impact of forestry activities can communicate a lot about good stewardship. For more information about logging aesthetics, contact the Sustainable Forestry Initiative at (207) 622-9288.

Long-Term Resource Considerations, continued ...

Carbon Sequestration - Among the many benefits provided by forests, removing carbon from the atmosphere and storing it in trees may have increasing significance in years to come. For more information, visit www.maine.gov/doc/mfs/topics/carbon.

Pulpwood Conversion Factors

Pulpwood volumes are measured and calculated in cubic foot volume and described in cords. For informational and planning purposes, these volumes were also expressed in this plan in tons. In Maine, pulpwood and firewood is bought and sold in both cords and tons.

The following factors were used to convert cubic foot volumes to tons:

Spruce/Fir (Softwood) Pulpwood	2.1 tons/cord
Mixed Hardwood Pulpwood	2.5 tons/cord
Hemlock Pulpwood	2.4 tons/cord
Popple pulpwood	2.3 tons/cord
Pine pulpwood	2.2 tons/cord