

RESOURCE MANAGEMENT PLAN
SHENANDOAH NATIONAL PARK

July 1991

Submitted By: J. W. Wade 4/11/91
Superintendent Date

Approved By: James W. Coleman 7/11/91
Regional Director Date

159 pp Text

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SHENANDOAH NATIONAL PARK
MAMMALS

D-18

Common Name	Occurrence Form	Elevation
Virginia Opossum	C(1) U(2-3)	1-2-3
[Hairytail Mole]		
Eastern Mole	C	1-2-3
[Starnose Mole]		
Masked Shrew	C?	
Smoky Shrew	U	2-3
[Southeastern Shrew]		
[Pigmy Shrew]		
Least Shrew	R?(Park Hq)	1?
Shorttail Shrew	C	1-2-3
Little Brown Myotis (Little Brown Bat)	C	
Keen Myotis	U	
[Indiana Myotis]		
[Small-footed Myotis]		
[Silver-haired Bat]		
Eastern Pipistrel	U	
Big Brown Bat	C	1-2-3
Red Bat	U	1-2-3
[Hoary Bat]		
Black Bear	U	1-2-3

Occurrence symbols (where known): C common; U uncommon; R rare. The more secretive species and those difficult to identify in the field, such as bats, may be more common than indicated.

Elevation range symbols: 1 below 2,000 feet; 2 2,000 to 3,000 feet; 3 above 3,000 feet. Most of these animals inhabit either forest or a variety of habitats. Common names follow Burt and Grossenheider's A Field Guide to the Mammals.

Common Name	Occurrence Form	Elevation
Raccoon	C	1-2-3
Fisher (formerly)		
[Least Weasel]		-
Longtail Weasel	U	1-2-3
Mink	U	1(streams)
River Otter	(one record, in 1890's)	
Spotted Skunk	U	1-2-3
Striped Skunk	C	1-2-3
Red Fox	U	1-2
Gray Fox	C	1-2-3
Gray Wolf (formerly)		
Mountain Lion (Cougar)	(current status unknown)	
Bobcat	C	1-2-3
Woodchuck	C	1-2-3
Eastern Chipmunk	C(2-3) U(1)	1-2-3
Red Squirrel	U	1-2-3
Gray Squirrel	C	1-2-3
Fox Squirrel	R	
Southern Flying Squirrel	C	1-2-3
Beaver	R	1(streams)
Eastern Harvest Mouse	(one record)	
Deer Mouse	C	2-3
White-footed Mouse	C	1-2-3
Northeastern Woodrat	U?	1-2-3
[Southern Bog Lemming]		
Boreal Redback Vole	C	2-3

Common Name	Occurrence Form	D-20 Elevation
Meadow Vole	C	1-2-3(openings)
Pine Vole	U	1?-2-3
Muskrat	U	1 (streams)
Black Rat	U	1-2-3(buildings)
Norway Rat	U?	(buildings)
House Mouse	U?	1-2-3 (buildings and old homesites)
Meadow Jumping Mouse	C?	1-2-3(openings)
Woodland Jumping Mouse	(one record)	
Eastern Cottontail	C	1-2-3
New England Cottontail	(one record)	
Elk (formerly)		
Whitetail Deer	C	1-2-3
Bison (formerly)		

SHENANDOAH NATIONAL PARK
REPTILES AND AMPHIBIANS

Species	Habitat	Occurrence	Elevation	Breeding Period
Snapping Turtle <i>Chelydra serpentina</i>	S	T	1-2	Spring
Stinkpot (Musk Turtle) <i>Sternotherus odoratus</i>	S	T	1	Summer
Spotted Turtle <i>Clemmys guttata</i>	B	E	1-2--3	Spring
Wood Turtle <i>Clemmys insculpta</i>	H	R	2	Spring
Box Turtle <i>Terrapene Carolina</i>	D, H, M, B	U	1-2--3	Summer
Painted Turtle <i>Chrysemys picta</i>	S	T	1	Spring
Fence Lizard <i>Sceloporus undulatus</i>	D, R	U	1-2	Summer
Five-lined Skink <i>Eioneces fasciatus</i>	D, H, U, R	U	1-2	Summer
Broad-headed Skink <i>Eioneces- Zaticeps</i>	D, U, R	R	1-2--3	Summer
Coal Skink <i>Eioneces anthraeinus</i>	H, U	R	1-2	Summer
Northern Water Snake <i>Naatrix sipedon</i>	S, H, U	U	1-2	Summer
Queen Snake <i>Naatrix septemvittata</i>	S, U	R	1	Summer
Brown Snake (DeKay's Snake) <i>Storeria dekayi</i>	D, H, U, M, B	E	1-2--3	Summer
Red-bellied Snake <i>Storevia occipitomaculata</i>	D, H, U, M, B	U	1-2--3	Summer
Eastern Garter Snake <i>Thamnophis sirtalis</i>	S, D, H, U M, R, B	U	1-2-3	Summer
Ribbon Snake <i>Thamnophis sauritus</i>	S, H, U, M	U	1-2	Summer
Smooth Earth Snake <i>Haldea valeriae</i>	D, H, U, M	E	1-2	Summer
Eastern Hognose Snake <i>Heterodon platyrhinos</i>	D, H, M	U	1-2	Summer
Ringneck Snake <i>Diadophis punctatus</i>	D, H, U, M R, B	C	1-2-3	Summer

Habitat symbols: S-streams; D-dry woods; H-humid woods; U-under cover (rocks, logs); M-meadows; R-dry, rocky areas; B-Big Meadows Swamp.

Occurrence symbols: C-common; U-uncommon; R-rare; T-transient, not known to breed in Park; E-expected. Status for frogs and salamanders refers to breeding season only.

Elevation range symbols: 1-below 2,000 feet; 2-2,000 to 3,000 feet; 3-above 3,000 feet.

Species	Habitat	Occurrence	Elevation	Breeding Period
Worm Snake <i>Carphophis amoenus</i>	H, U, M	U	1-2-3	Summer
Black Racer <i>Coluber constrictor</i>	D, H, U, M R, B	U	1-2-3	Summer
Rough Green Snake <i>Opheodrys aestivus</i>	M	u	1-2	Summer
Smooth Green Snake <i>Opheodrys vernalis</i>	U, M	u	2-3	Summer
Corn Snake <i>Elaphe guttata</i>	H, U, M	R	1-2	Summer
Black Rat Snake <i>Elaphe obsoleta</i>	H, U, M, R	U	1-2	Summer
Pine Snake <i>Pituophis melanoleucus</i>	D, R	R	2-3	
Eastern Kingsnake <i>Lampropeltis getulus</i>	H, U	R	1-2	Summer
Milk Snake <i>Lampropeltis doliata</i>	D, H, U, M, B	U	1-2-3	Summer
Mole Snake <i>Lampropeltis cdlligaster</i>	H, U	E	1	Summer
Scarlet Snake <i>Cemophora coccinea</i>	H, U	E	1-2-3	Summer
Crowned Snake <i>Tantilla coronata</i>	D, U, M	E	1-2	Summer
Copperhead <i>Agkistrodon contortrix</i>	D, H, U, M, R	U	1-2-3	Fall
Timber Rattlesnake <i>Crotalus horridus</i>	D, H, U, R	U	1-2-3	Fall
Jefferson Salamander <i>Ambystoma jeffersonianum</i>	M, B	R	3	Spring
Marbled Salamander <i>Ambystoma opacum</i>	M	E	1	Fall
Spotted Salamander <i>Ambystoma maculatum</i>	M, B	U	1-2-3	Spring
Red-spotted Newt <i>Diemictylus viridescens</i>	S, D, H, U	U	1-2-3	Spring
Dusky Salamander <i>Desmognathus fuscus</i>	S, U, B	C	1-2-3	Spring Summer
Allegheny Mountain Salamander <i>Desmognathus ochrophaeus</i>	S, H, U, B	E	2-3	Spring Summer
Virginia Seal Salamander <i>Desmognathus monticola jeffersoni</i>	S, U, B	C	1-2-3	Spring Summer
Red-backed Salamander <i>Plethodon cinereus</i>	H, U	C	1-2-3	Spring Summer
Shenandoah Salamander <i>Plethodon richmondi shenandoah</i>	D	U	3	Spring Summer
Slimy Salamander <i>Plethodon glutinosus</i>	D, H, U, R	C	1-2-3	Spring Summer
Four-toed Salamander <i>Hemidactylum scutatum</i>	B	C	1-2-3	Spring

Species	Habitat	Occurrence	Elevation	Breeding Period
Spring Salamander <i>Gyrinophilus porphyriticus</i>	S,U,B	U	1-2-3	Spring
Northern Red Salamander <i>Pseudotriton ruber ruber</i>	S,H,U	R	1-2	Fall
Blue Ridge Red Salamander <i>Pseudotriton ruber nitidus</i>	S,H,U	R	1	Fall
Two-lined Salamander <i>Eurycea bistineata</i>	S,H,U,B	C	1-2-3	Fall
Long-tailed Salamander <i>Eurycea longicauda longicauda</i>	S,H,U	R	1-2-3	Fall
Three-lined Salamander <i>Eurycea longicauda guttolineata</i>	S,H,U	E	1	Fall
Eastern Spadefoot <i>Scaphiopus holbrooki</i>	H,M	R	1	Summer
American Toad <i>Bufo americanus</i>	D,H,M,R,B	C	1-2-3	Spring
Fowler's Toad <i>Bufo woodhousei</i>	D,H,M,R,B	U	1-2	Spring
Northern Cricket Frog <i>Acris crepitans</i>	S,H	U	1-2	Spring
Spring Peeper <i>Hyla crucifer</i>	S,H,B	U	1-2-3	Spring
Gray Treefrog <i>Hyla versicolor</i>	S,H,B	U	1-2-3	Spring
Upland Chorus Frog <i>Pseudacris triseriata</i>	S,H,B	U	1-2-3	Spring
Mountain Chorus Frog <i>Pseudacris brachyphona</i>	S	E	1	Spring
Bullfrog <i>Bufo catesbeiana</i>	S,B	R	1-2-3	Spring
Green Frog <i>Rana clamitans</i>	S,B	C	1-2-3	Spring
Leopard Frog <i>Rana pipiens</i>	S	E	1	Spring
Pickerel Frog <i>Rana palustris</i>	S,B	C	1-2-3	Spring
Wood Frog <i>Rana sylvatica</i>	S,D,H,U M,B	U	1-2-3	Spring

SHENANDOAH NATIONAL PARK
BIRDS

D-24

Common Name	Habitats	Occurrence
Horned Grebe		
Pied-billed Grebe		0
Great Blue Heron		0, Su, v
Green Heron		U, Su, v
Common Egret		A
American Bittern		A
Canada Goose		U, t
Mallard	6	0, t
Black Duck		0, W, v
Blue-winged Teal		0, t
Wood Duck	6	U, b
Canvasback		A
Turkey Vulture		C, r
Black Vulture		U, r
Goshawk		0, W, v
Sharp-shinned Hawk		C, t U, W, v

Habitat symbols: 1 oak, oak-hickory forest; 2 cove hardwoods, 3 hemlock, hemlock-white pine groves; 4 oak-pine forest; 5 birch-maple forest; 6 wooded streams, stream margins, boggy places; 7 fields, road shoulders; 8 shrubby abandoned fields; 9 shrub swamp; 10 open cliffs, rock outcrops; 11 shaded cliffs, rock outcrops.

Occurrence symbols: A accidental, unexpected because extra-limital, only one park record; 0 occasional, two to eight park records; R rare, occurs at wide intervals, usually in small numbers; U uncommon, occurs in small numbers in limited habitats; C common, occurs regularly in suitable habitats.

Seasonal symbols: Sp spring; Su summer; F fall; W winter
Status symbols: r resident, present throughout year, breeds in park; b breeder, breeds in park in summer, spends cooler months south; t transient, passes through park in migration, non-breeder; v visitor, wanders into park in summer or winter, non-breeder.

Common Name	Habitats	Occurrence
Cooper's Hawk		U, r
Red-tailed Hawk		C, r
Red-shouldered Hawk		U, r
Broad-winged Hawk	.	C, b C, t
Rough-legged Hawk		U, t U, W, v
Golden Eagle		R, t H, W, v
Bald Eagle		R, t R, W, v
Marsh Hawk		U, t U, W, v
Osprey		U, t U, Su, v
Peregrine Falcon		R, t
Pigeon Hawk		U, t
Sparrow Hawk		u, t 0, b
Ruffed Grouse	1-11	C, r
Bobwhite	7, 8	C, r
Ring-necked Pheasant		0, r
Turkey	1-11	U, r
Killdeer		0, t o, su, v
American Woodcock	6-9	C, b
Common Snipe		0, t
Upland Plover		0, t
Spotted Sandpiper		0, t
Solitary Sandpiper		0, t
Dunlin		A
Herring Gull		0, t
Mourning Dove	4, 7, 8	C, r
Yellow-billed Cuckoo	1, 2	C, b
Black-billed Cuckoo	1, 2	C, b

Common Name	Habitats	
Barn Owl		R, r
Screech Owl	1-11	U, r
Great Horned Owl	1-11	U, r
Barred Owl	1-11	C, r
Long-eared Owl		0, W, v 0, t
Saw-whet Owl		0, W, v 0, t
Whip-poor-will	1-11	C, b
Common Nighthawk	1-11	C, t
Chimney Swift		U, b C, Su, v
Ruby-throated Hummingbird	1-11	C, b
Belted Kingfisher	6	U, r
Yellow-shafted Flicker	1-11	C, r
Pileated Woodpecker	1, 2, 3, 5	C, r
Red-bellied Woodpecker	1, 2	C, r
Red-headed Woodpecker		U, r
Yellow-bellied Sapsucker	1, 2, 3 5	C, t U, W, v
Hairy Woodpecker	1, 2, 3 5	C, r
Downy Woodpecker	1-11	C, r
Eastern Kingbird	7, 8	U, b
Great Crested Flycatcher	1, 2, 3	C, b
Eastern Phoebe	1-11	C, b
Yellow-bellied Flycatcher	1, 2, 3	U, F, t
Acadian Flycatcher	2, 3	U, b
Traill's Flycatcher	8, 9	0, t
Least Flycatcher	1-11	0, t U, b?
Eastern Wood Pewee	1, 2, 3, 5	C, b
Olive-sided Flycatcher	8	0, t

Common Name	Habitats	Occurrence
Horned Lark	7	U, t 0, W, v 0, b
Tree Swallow		0, t
Bank Swallow		0, t
Rough-winged Swallow		0, b U, Su, v
Barn Swallow		U, b C, Su, vC, t
Cliff Swallow		0, t 0, Su, v
Purple Martin	•	0, t 0, Su, v
Blue Jay	1-11	C, r C, t
Common Raven	1-11	C, r
Common Crow	1-11	C, r
Fish Crow	1-11	0, t 0, Su, v
Black-capped Chickadee	1-6, 8--11	W, v
Carolina Chickadee	1-6, 8--11	C, r
Tufted Titmouse	1-6, 8--11	C, r
White-breasted Nuthatch	1-5	C, r
Red-breasted Nuthatch	3, 4	U, t U, W, v
Brown Creeper	1-5	C, t C, W, v
House Wren	8	C, b
Winter Wren	1, 2, 3, 5	U, t U, W, v U, b
Bewick's Wren	8	U, b
Carolina Wren	1, 2, 3, 6, 10, 11	C, b
Mockingbird	7, 8	U, r
Catbird	4, 8, 9	C, b
Brown Thrasher	4, 8	C, b
Robin	7, 8	C, b C, t U, W, v

<u>Common Name</u>	<u>Habitats</u>	<u>Occurrence</u>
Wood Thrush	1,2,3,5	C,b
Hermit Thrush	1-5	C, t U,W,v
Swainson's Thrush	1,2,3,5	C, t
Gray-cheeked Thrush	1,2,3,5	C, t
Veery	3,5,9,11	C,b
Eastern Bluebird	7,8	U,b C,W,v
Golden-crowned Kinglet	1-5	C, t U,W,v
Ruby-crowned Kinglet	1-5,8	C, t O,W,v
Water Pipit	7	O, t
Cedar Waxwing"	. 1-9	C,b C,F,t O,W,v
Loggerhead Shrike	7	O
Starling	7	C,r
White-eyed Vireo	6,8	U,b
Yellow-throated Vireo	1,2,3	U,b C, t
Solitary Vireo	1,2,3,5	C,b C, t
Red-eyed Vireo	1,2,3,5	C,b C, t
Philadelphia Vireo	1,2	O, t
Warbling Vireo	6	O,b O,t
Black and White Warbler	1,2,3,5	C,b C, t
Worm-eating Warbler	1,2	U,b O, t
Golden-winged Warbler	8	U, t R,b
Blue-winged Warbler	8	U, t R,b
Tennessee Warbler	1-5,8	C, t
Orange-crowned Warbler	8	U, t
Nashville Warbler	1-5,8	U, S _p , t C,F,t
Parula Warbler	2,3,6	C,b

Common Name	<u>Habitats</u>	<u>Occurrence</u>
Yellow Warbler	8	0, t
Magnolia Warbler	1-6, 9	U, Sp, t C, F, t
Cap May Warbler	1-5	U, Sp, t C, F, t
Black-throated Blye Warbler	2, 3 5	C, b C, t
Myrtle Warbler	1-11	C, t U, W, v
Black-throated Green Warbler	1, 2 3, 5	U, b C, t
Cerulean Warbler	1, 2	u, t U, b
Blackburnian Warbler	2, 3	C, b C, t
Yellow-throated Warbler	6	0, b u, t
Chestnut-sided Warbler	. 4, 5, 8, 9	C, b C, t
Bay-breasted Warbler	1, 2, 3, 5	C, t
Blackpoll Warbler	1, 2, 3, 5	
Pine Warbler	4	U, b
Prairie Warbler	4, 8	C, b
Palm Warbler	7, 8	U, t
Ovenbird	1-5	C, b C, t
Northern Waterthrush	6, 9	0, t
Louisiana Waterthrush	6	C, b
Kentucky Warbler	2, 6	U, b
Connecticut Warbler	8	0, F, t
Yellowthroat	8, 9	C, b
Yellow-breasted Chat	8	C, b
Hooded Warbler	1, 2	C, b
Wilson's Warbler	8, 9	U, t
Canada Warbler	3, 5, 11	C, b C, t
American Redstart	2, 6	C, b C, t
House Sparrow	(around buildings)	U, r

Common Name	Habitats	Occurrence
Bobolink		0, t
Eastern Meadowlark	7	U, b U, t U, W, v
Red-winged Blackbird		0, Sp, Su
Orchard Oriole		U, b
Baltimore Oriole	1, 2	U, t U, b
Rusty Blackbird	9	0, t
Common Grackle	1-9	C, t U, b
Brown-headed Cowbird	1-9	C, b
Scarlet Tanager	1, 2, 3, 5	C, b C, t
Summer Tanager	1	0, t
Cardinal	8	C, r
Rose-breasted Grosbeak	1, 2, 3, 5	C, b C, t
Evening Grosbeak	1, 2, 3	C, t C, W, v
Blue Grosbeak	8	U, b U, t
Indigo Bunting	7, 8, 10	C, b C, t
Painted Bunting		A
Purple Finch	1-11	C, t 0, W, v
Pine Grosbeak	5, 8	0, W, v
Pine Siskin	3, 4, 5	C, t C, W, v
American Goldfinch	1-11	C, r
Red Crossbill	4	U, t U, W, v
White winged Crossbill	3	0, W, v
Rufous-side Towhee	4, 5, 8	C, b
Savannah Sparrow	7	U, t
Grasshopper Sparrow	7	0, Su, v
Henslow's Sparrow	7	0, b

<u>Common Name</u>	<u>Habitats</u>	<u>Occurrence</u>
Vesper Sparrow	7	C, b
Bachman's Sparrow	8	0, Su, v
Slate-colored Junco	1, 2, 3, 5, 11	C, t C, r
Tree Sparrow	8	C, W, v C, t
Chipping Sparrow	7, 8	C, b C, t
Field Sparrow	8	C, b C, t U, W, v
White-crowned Sparrow	8	C, t U, W, v
White-throated Sparrow	3, 8	C, t U, W, v
Fox Sparrow	4, 8	C, t U, W, v
Lincoln's Sparrow	8, 9	0, t
Swamp Sparrow	8, 9	C, t
Song Sparrow	8, 9	U, r C, t
Lapland Longspur	7	0, t
Snow Bunting	7	0, t 0, W, v

Fish species
of
Shenandoah National Park
1985

SCIENTIFIC NAME	COMMON NAME
Family Salmonidae	
<u>Salvelinus fontinalis</u>	Brook trout
<u>Salmo trutta</u>	Brown trout
<u>Salmo gairdneri</u>	Rainbow trout
Family Cyprinidae	
<u>Rhinichthys atratulus</u>	Blacknose dace
<u>Rhinichthys cataractae</u>	Longnose dace
<u>Clinostomus funduloides</u>	Redside dace
<u>Phoxinus erythrogaster</u>	S. Redbelly dace
<u>Phoxinus oreas</u>	Mtn- Redbelly dace
<u>Nocomis leptcephalus</u>	Bluehead chub
<u>Nocomis micropogon</u>	River chub
<u>Notropis cornutus</u>	Common shiner
<u>Semotilus atromaculatus</u>	Creek chub
<u>Semotilus corporalis</u>	Fallfish
<u>Camptostoma anomalum</u>	Common stoneroller
<u>Exoglossum maxilllingua</u>	Cutlips minnow
Family Catostomidae	
<u>Catostomus commersoni</u>	White sucker
<u>Hypentelium nigricans</u>	Northern hogsucker
<u>Moxostoma rhothoeca</u>	Torrent sucker
<u>Moxostoma erythrurum</u>	Golden redhorse
Family Cottidae	
<u>Cottus bairdi</u>	Mottled sculpin
Family Ictaluridae	
<u>Noturus insignis</u>	Margined madtom
Family Percidae	
<u>Etheostoma flabellare</u>	Fantail darter
<u>Etheostoma nigrum</u>	Johnny darter
<u>Etheostoma olmstedi</u>	Tessellated darter
Family Centrarchidae	
<u>Ambloplites rupestris</u>	Rockbass
<u>Micropterus dolomieu</u>	Smallmouth bass
Family Anguillidae	
<u>Anguilla rostrata</u>	American eel

A. General

Adams, Harold D. 1982. Relationship of spruce stands in west-central Virginia. Lancaster Community College. Unpublished report.

Spruce stands in the Park and surrounding areas were studied to determine if there was any consistent relationship between these stands and other plant communities.

Albee, Thomas F. and N. Stevens. 1980. Preliminary Investigation of Light Scattering and Visibility in Two Eastern National Parks. M.S. Thesis. VPI & SU, Blacksburg, VA. 102 pp.

Technical research on the mechanism of light scattering as caused by suspended particles in the atmosphere.

Allen, R. M., Jr. 1963. Geology and Mineral Deposits of Green and Madison Counties. Mineral Resources Bull. 78. Virginia Division of Mineral Resources, Charlottesville, VA. 102 pp. with map.

Almy, Gerald. 197? Shenandoah Park: Native Brook Trout Mecca.

A popular article discussing the status of trout fishing in the Park. Reasons are given for particular problems relating to under use and overuse of various streams. A map of 10 streams is included, as well as a listing of Park streams managed for native trout.

Anderson, Sumner M. 1929. Geologic Recommendations for Shenandoah National Park (proposed). U. S. Government Printing Office, Washington, DC. 19 pp.

Contains preliminary suggestions for geologic trails, signs, and interpretive markers, including locations and explanations of various structures and formations. Charts the probable history of the main drainage development in the area.

Avery, Myron H. 1936. In the Blue Ridge Mountains of Virginia. Supplement to January Bulletin. Potomac Appalachian Trail Club, Washington, DC. 16 pp.

A short description of trails to take in Shenandoah, along with the history and natural history of the area traversed by the Appalachian Trail in the Park. A simple map is included.

Badger, Robert L. 1989. Geochemistry and Petrogenesis of the Catoctin Volcanic Province, Central Appalachians. Ph.D. Dissertation. VPI & SU, Blacksburg, VA. 337 pp.

\ Baptiste, M. E. 1977. A Survey of Visitor Knowledge, Attitude, and Judgment Concerning Black Bears at Shenandoah National Park. M.S. Thesis. VPI & SU, Blacksburg, VA. 90 pp.

A visitor survey was used to determine knowledge, attitude, and judgment concerning black bears. The average Park visitor realized that visitor carelessness was the cause of most problems with bears.

\ Barlow, Wallace D. 1936. The geology of the Shenandoah National Park. Shenandoah Nature Journal 1(1):8-9.

A very general interpretive article dealing with Park surface geology.

Baumann, Richard W. 1973. New *Megaleuctra* from the eastern United States (Plecoptera: Leuctridae). *Entomologist News* 84:247-250.

A highly technical article describing a fifth relic species of *Megaleuctra flinti* collected in Shenandoah National Park. The holotype for a male was found at Hog Camp Brook. No female holotype has been discovered.

Baxter, E. E. 1978. Plant Composition Responses to Single and Repeated Prescribed Burns at Big Meadows, Shenandoah National Park. M.S. Thesis. James Madison Univ., Harrisonburg, VA. 99 pp.

Four dormant season burning regimes were considered in relation to relative and absolute plant community cover at Big Meadows, SNP, Virginia. Overall conclusion was that prescribed burning at Big Meadows results in a transient reduction in plant community biomass which is compensated for within one or two growing seasons with little impact on the species composition of the community as measured by plant cover.

Baxter, Emily E. n.d. Vascular Plants of the Meadow at Big Meadows, Shenandoah National Park. James Madison Univ., Harrisonburg, VA.

Listing of vascular plants that can be found in the herb and shrub communities of the meadow area.

Baxter, E. E. 1986. Vegetation and Soil Moisture Survey of Big Meadows Swamp, SNP. NPS Final Report N2621. 37 pp.

A floristic study, a vegetation map, and a soil survey of the open wetland area of Big Meadows Swamp.

Bell, Sarah. 1972. A Preliminary Comparison of Three Sites in the Shenandoah National Park forest. Unpublished manuscript. University of Maryland, College Park, MD. 7 pp.

Three sites (southeastern slope on drive near Buck Hollow Overlook and near the summit of Stony Man) along an elevation gradient were surveyed in July 1972. Analysis of transect data showed differences in composition and dominance among the sites. Species diversity decreased with increasing elevation.

Bellinger, R. G., F. W. Ravlin, and M. L. McManus. 1989. Forest edge effects and their influence on gypsy moth egg mass distribution. *Environmental Entomology* 18:840-843.

_____. 1990. Predicting fecundity in field populations of the gypsy moth using male wing length. *Environmental Entomology* 19:1024-1028.

Bennett, James P. 1984. Geographical Extent of Air Pollution Injury to Milkweed. NPS Air Quality Division Report SHEN-N-092.

The level of ozone damage to milkweed was studied in several eastern National Parks. Milkweed samples from SNP showed very high damage levels.

Bennett, James P. and Kenneth W. Stolte. 1985. Using Vegetation Biomonitors to Assess Air Pollution Injury in National Parks: Milkweed Survey. NPS Natural Resources Report 85-1. 18 pp.

Berg, L. Y. 1937. Rare Trees in Shenandoah. Shenandoah Nature 1(3).

A brief description with location and status of red spruce, paper and gray birch, frazier fir, and Pawlonia.

_____ and Robert B. Moore. 1941. The Forest Cover of Shenandoah National Park. Unpublished manuscript. 78 pp.

Forest cover is classified into 12 dominant types (chestnut oak, red oak, scarlet oak, cove hardwoods, pitch pine, bear oak, black locust, white pine, Virginia pine, gray birch, open and barren). Composition, associates, and occurrence of plant species within Shenandoah are described for each forest type. Nineteen Park sections are investigated according to description, vegetative cover understory, reproduction, fire hazards, insects, and disease. A summary of burned forest acreages is given in the appendix by year and forest type.

Bloomfield, S. A. 1985. Ground-cover Regeneration Monitoring of Closed Campsites on Old Rag Mountain, 1985. NPS Unpublished Report.

_____. 1986. Ground-cover Regeneration Monitoring of Closed Campsites on Old Rag Mountain, 1986 Field Season. NPS Unpublished Report.

_____. 1987. Ground-cover Regeneration Monitoring of Closed Campsites on Old Rag Mountain, 1987 Field Season. NPS Unpublished Report.

Bonanno, Anthony James. 1971. Earth History of Page County, Virginia. Unpublished manuscript. The Pennsylvania State Univ., University Park, PA. 36 pp.

Term paper covers the topography, stratigraphy, structure, and geologic history of Page County. Contains a good bibliography of area geology.

Bowersox, Todd W. 1986. Gypsy Moth Risk Assessment for SNP. Pennsylvania State Univ., University Park, PA. Unpublished Report NRSP-N-32. 28 pp.

Bowling, Kim D., V. Fisher, R. L. Anderson, and J. D. Artman. 1979. White Pine Blister Rust Evaluation, Shenandoah National Park. USFS Forest Insect and Disease Management Report No. 79-1-46. 6 pp.

Brocato, Kathleen K. 1979. An Assessment of Visitor Attitudes Toward Resource Use and Management. Unpublished Final Report. VPI & SU, Blacksburg, VA. 25 pp.

Bryan, R. D., J. J. Ney. 1989. Dynamics of Native Brook Trout in the Hazel River, Shenandoah National Park. Virginia Journal of Science.

Bunn, Eric C. 1984. Tree Rings as an Indicator of Past Climate in Western Maryland and Northern Virginia. M. S. Thesis. Univ. of Maryland, Frostburg, MD. 131 pp.

Burns, Douglas A. 1989. Speciation and Equilibrium Relations of Soluble Aluminum in a Headwater Stream at Base Flow and During Rain Events. Water Resources Research 25(7):1653-1665.

A technical article summarizing a study of soluble aluminum in the streamwater of White Oak Run in the SNP. Short-term dynamics of soluble aluminum in streamwater sampled during rain events differed significantly from streamwater sampled during base flow conditions.

Burns, D., J. N. Galloway, and G. R. Hendrey. 1981. Acidification of surface waters in two areas of the eastern United States. *Water, Air & Soil Pollution* 16:277-285.

Carney, Daniel W. 1985. Population Dynamics and Denning Ecology of Black Bears in SNP, VA. M.S. Thesis. VPI&SU, Blacksburg, VA. 84 pp.

Thesis report covering the denning and reproduction sections of final report NRSP-N-64.

Castelle, A. 1986. Carbon Dioxide Dynamics and Base Cation Leaching From Acid Forest Soils in the White Oak Run Catchment, Shenandoah National Park, Virginia. M.S. Thesis, Univ. of Virginia, Charlottesville, VA.

Castelle, A. J. and J. N. Galloway. 1990. Carbon dioxide dynamics in acid forest soils in Shenandoah National Park, Virginia. *Soil Science Society of American Journal* 54:252-257.

Streamwater alkalinity and base-cation concentrations vary seasonally in White Oak Run located in SNP, VA. Because carbonic acid, derived from soil CO₂, may strongly affect streamwater chemistry, the study examined spatial and temporal variability of soil CO₂ in the White Oak Run watershed in an attempt to explain changes in streamwater chemistry.

Castro, M. S. 1990. Characterization of Natural Sulfur Fluxes from Forest Soils in a Temperate Deciduous Forest. Ph.D. Dissertation. Univ. of Virginia, Charlottesville, VA.

Cermac, Gregory W., and Kenneth A. Bollen. 1981. Results from a Survey of Judged Visibility and Air Quality in the Blue Ridge Mountains. General Motors Research Report. 39 pp.

The survey was conducted on viewpoints along the Skyline Drive and studies show how visitors rated the degree of visibility on various days. A comparison was made to actual visibility.

Christensen, Norman L. 1979. Short-Term Effects of Mowing and Burning on Soil Nutrients in Big Meadows, SNP. M.S. Thesis. Duke Univ., Durham, NC.

Burning was found to have an overall effect of decreasing nutrients available to plants in the Meadow, particularly nitrogen.

Cibula, William G. 1981. Computer Implemented Land Cover Classification Using Landsat MSS Digital Data, Section III, Vegetation and Other Land Cover Analysis of Shenandoah National Park. NASA Earth Resources Laboratory Report 194. 67 pp.

Cosby, B. J. 1986. Modelling the reversibility of acidification with mathematical models. In: *Proceedings of the Workshop of Reversibility of Acidification*. Grimstad, Norway, June, 1986. Commission of the European Communities, Directorate-General for Science, Research and Development, Brussels, Belgium, pp. 137-148.

Cosby, B. J., G. M. Hornberger, J. N. Galloway, and R. F. Wright. 1985. Modelling the effects of acid deposition: Assessment of a lumped-parameter model of soil water and streamwater chemistry. *Water Resource Research* 21:51-63.

- _____. 1985. Freshwater acidification from atmospheric deposition of sulfuric acid: a quantitative model. *Environmental Science and Technology* 19:1145-1149.
- _____. 1985. Modelling the effects of acid deposition: Estimation of long-term water quality responses in a small forested catchment. *Water Resource Research* 21:1591-1601.
- _____. 1986. Modelling the effects of acid deposition: Control of long-term sulfate dynamics by soil sulfate adsorption. *Water Resource Research* 22:1283-1291.
- Cosby, B. J., G. M. Hornberger, R. F. Wright, E. B. Rastetter, and J. N. Galloway. 1986. Estimating catchment water quality response to acid deposition using mathematical models of soil ion exchange processes. *Geoderma* 38:77-95.
- Cosby, B. J., P. F. Ryan, J. R. Webb, G. M. Hornberger, J. N. Galloway. 1990. Mountains of Western Virginia. In D. F. Charles, ed. *Acid Deposition and Aquatic Ecosystems: Regional Case Studies*. Springer-Verlag, New York. In Press.
- Cozzarelli, I. 1986. A Two-water Model of Aluminum Mobilization in a Natural Soil System.
- Cozzarelli, I. M., J. S. Herman, and R. A. Parnell. 1987. The mobilization of aluminum in a natural soil system: Effects of hydrologic pathways. *Water Resource Research* 23:859-874.
- Crandall, Hugh. 1975. *The Story Behind the Scenery*. KC Publication, Las Vegas, NV. 32 pp.
- A visitor publication containing general information about the geology and vegetation of Shenandoah National Park. Chapter bibliographies are valuable.
- Dalby, Peter L. 1976. *Fire as a Management Tool and Its Effect Upon the Animal Community at Big Meadows*. M.S. Thesis. VPI & SU, Blacksburg, VA.
- Animal populations were monitored before and after prescribed fires on the Meadow. Most species were not affected.
- Dalrymple, Helen and Dana Dalrymple. 1973. *Guide to the Appalachian Trail and Side Trails in Shenandoah National Park*, 7th Edition. Potomac Appalachian Trail Club, Washington, DC. 263 pp.
- The trail guide gives considerable detail as to the vegetation on some sections of the trail, although this treatment is not consistent.
- Dawson, J. L. 1984. *Botanical Studies in Conjunction with ZAPS Field Exposure in Shenandoah National Park*. NPS-Air Quality Division Report TR-84-02. 31 pp.
- A portable air pollution fumigation system, Zonal Air Pollution System (ZAPS) was used for in-situ testing of ozone and sulfur dioxide injury to natural vegetation.

- Dawson, James and J. Bennett. 1985. Effects of Chronic Air Pollution on Forests of SNP. Northrop Environmental Sciences Final Report NRSP-N-86.

Report discusses methods used to try to determine the effects of ozone on trees. Difficulties in factoring out other influences on growth rates and mortality were found causing study results to be uncertain.

- Dekay, Richard H. 1972. Development of Ground Water Supplies in Shenandoah National Park, Virginia. Mineral Resources Report 10. Virginia Division of Mineral Resources, Charlottesville, VA. 158 pp.

A comprehensive report. From 1961-1971, the Division of Mineral Resources located test hole drilling sites in predesignated areas along the crest of the mountain. Contains temperature records; rock formations; relationships of temperature, precipitation, and stream flow; drilling records for all wells; and drainage patterns.

- Dise, Nancy B. 1984. A Synoptic Survey of Headwater Streams in SNP, Virginia to Evaluate Sensitivity to Acidification by Acid Deposition. M.S. Thesis on Shenandoah Watershed Acidification Study. Univ. of Virginia, Charlottesville, VA. 135 pp.

Fifty-six watersheds representing roughly 70 percent of the Park area were sampled six times during the period from August 1981 to June 1982. Results indicate that nearly all of the streams sampled show alkalinity values below 200 ueq/l during at least part of the year.

- Dodd, C. Kenneth, Jr. 1989. Duration of immobility in salamanders, Genus *Plethodon* (Caudata: Plethodontidae). *Herpetologica* 45(4):467-473.

A short technical article describing the defensive behavior of immobility in 15 species of terrestrial salamanders (*Plethodon*). *Plethodon Shenandoah*, the Shenandoah salamander was included and the results showed that immobility in the Shenandoah salamander was significantly different from any other species.

- Dodd, C. Kenneth, Jr. 1990. Postures associated with immobile woodland salamanders, Genus *Plethodon*. *Florida Scientist* 53(1):43-49.

A technical article discussing the immobile postures of 15 species of southeastern woodland salamanders (genus *Plethodon*) including the Shenandoah salamander, *Plethodon Shenandoah*.

- Duchelle, Stephen F. 1981. The Response of Indigenous Vegetation in the Blue Ridge Mountains of Virginia to Photochemical Oxidant Air Pollution. M.S. Thesis. VPI & SU, Blacksburg, VA. 122 pp.

The effect of ambient concentrations of air pollutants on biomass production and height growth of vegetation native to the Big Meadows area of the Shenandoah National Park was examined in two experiments. A third experiment determined the response of common milkweed (*Asclepias syriaca* L.) to ozone exposures.

- Duchelle, S. F. and J. M. Skelly. 1981. Response of common milkweed to oxidant air pollution in the Shenandoah National Park in VA. *Plant Disease* 65:661-663.

The effects of ambient doses of ozone on *Asclepias syriaca*, were determined in twelve 10-foot diameter plots in the Big Meadows area.

Feldman, Richard S. 1982. Correlation Between Macro-Invertebrate Community Structure and Stream Alkalinity. M.S. Thesis. Univ. of Virginia, Charlottesville, VA.

This study was conducted in three Park streams of varying alkalinity to test the hypothesis that species richness and abundance is greater in streams having higher alkalinity. He found this to be true.

Ferman, M. W., G. T. Wolff, and N. A. Kelly. 1981. The Nature and Source of Haze in the Shenandoah Valley/Blue Ridge Mountain Area. General Motors Research Report 3747-R. Reprinted from Journal of Air Pollution Control 31(10):1074-1082.

Both visibility and air quality tests were conducted in the Park and in the Bentonville area of the Valley. The study concluded that up to 87 percent of visibility impairment was due to sulfate aerosols.

Fernald, M. L. 1950. Gray's Manual of Botany, 8th Edition. The American Book Company, New York, NY. 1632 pp.

The copy in the Chief Naturalist's Office is used to mark species identified in the Park; in some cases, location is written in.

Fisher, J. Elwood. 1972. Some Studies on the Cultivated Plants Surviving on the Abandoned Homesites in Shenandoah National Park, Virginia. Presented at: Academy of Science, 50th Annual Meeting, Lexington, VA.

Fosberg, F. Raymond. 1959. Notes on the Shenandoah National Park flora, 4th Supplement. Castanea 24:135-143.

_____ and Egbert. H. Walker. 1941. A preliminary checklist of the plants in the Shenandoah National Park, Virginia. Castanea 6:89-136.

_____. 1943. First supplement to a preliminary checklist of plants in the Shenandoah National Park, Virginia. Castanea 8:109-111.

_____. 1948. Second supplement-to a preliminary checklist of plants in the Shenandoah National Park, Virginia. Castanea 13:83-92.

_____. 1955. Third supplement to a preliminary checklist of plants in the Shenandoah National Park, Virginia. Castanea 20:61-70.

Fosberg, F. R. and P. M. Mazzeo. 1965. Further notes on Shenandoah National Park plants (5th supplement). Castanea 30:191-205.

Furcon, A. S. 1934. Igneous rocks of the Shenandoah National Park area. Reprinted for private circulation from Journal of Geology 52(4):400-410.

A preliminary paper summarizing work in area from Thornton's Gap to Swift Run on the character of the igneous rocks, especially their age and relationships to one another.

Galloway, J. N., G. M. Hornberger, K. J. Beven (Investigators), D. A. Burns, N. B. Dise, T. Haelen, P. W. Shaffer, and J. L. Vreeland (Co-Investigators). 1982. Shenandoah Watershed Acidification Study: Three Year Summary Report. September 1979-September 1982. Univ. of Virginia, Charlottesville, VA. 130 pp.

Galloway, J. N. and E. Fechner. 1986. The Effects of Stream Acidification on Fish. Unpublished Report. 15 pp.

An independent project directed by J. N. Galloway.. At the time of the study, the fish do not seem to be adversely affected by streamwater conditions.

Galloway, J. N., S. A. Norton and M. R. Church. 1983. Freshwater acidification from atmospheric deposition of sulfuric acid: A conceptual model. Environmental Science and Technology 17:541A-545A.

Garner, Nathan P. 1987. Seasonal Movements, Habitat Selection, and Food Habits of Black Bears (*Ursus americanus*) in Shenandoah National Park, Virginia. M.S. Thesis. VPI & SU, Blacksburg, VA. 104 pp.

_____. and M. R. Vaughan. 1987. Black Bear-Human Interactions in SNP, VA. NPS Unpublished Report. 22 pp.

Seasonal use of various human disturbance areas by black bears was studies in central SNP. Most bears avoided front-country campgrounds, picnic areas, and heavy and light duty roads. Bears did use foot trails during all seasons of the year.

Gathright, T. M., II. 1976. Geology of Shenandoah National Park, Virginia, Mineral Resources Bull. No. 86. Virginia Division of Mineral Resources, Charlottesville, VA. 93 pp.

Gentle, Edgar C., III. 1973. While Trout Fishing the Central District of Shenandoah National Park. Unpublished manuscript.

A well written report sketching the history of trout fishing in the Park. A record of the author's catches--time fishing, trout caught, trout/minute, average size, and autopsical reports on stomach contents of fish--are included. Comparison of various streams fished is presented.

Geologic Tour to Shenandoah National Park. ca 1939. Unpublished report.

The tour begins on the Washington side of the Key Bridge and picks up Skyline at Front Royal. A very general treatment, descriptive rather than explanative.

Gilliam, F. S., J. T. Sigmon, M. A. Reiter, and D. O. Krovetz. 1988. Elevational and spatial variation in daytime ozone concentrations in the Virginia Blue Ridge Mountains: implications for forest exposure. Canadian Journal of Forest Research 19:422-426.

Gilbert, W. Dennis. 1972. Talus Development on Basal Cambrian Quartzites: South District, Shenandoah National Park, Virginia. Unpublished manuscript. Univ. of Virginia, Charlottesville, VA. 28 pp + map.

The study area was located between Swift Run Gap and Jarman Gap along the west slope of the Blue Ridge. Study was designed to ascertain the major factors contributing to the development and distribution of block or scree fields within the South District. Factors analyzed included topography, rock type and structure, weathering, and influence of Quaternary climates on original development.

Haas, Glenn E. 1975. Relationships Among Campers in Shenandoah National Park as Related to Social Interaction, Activity Patterns, Camping Style and Descriptive Characteristics. M.S. Thesis. The Pennsylvania State Univ., University Park, PA. 153 pp.

The study investigated the selected aspects of human behavior at the Big Meadows Campground as sampled between August 7 and September 10, 1974. Good summary statistics and recommendations are given.

Hack, John T. and J. C. Goodlett. 1960. Geomorphology and Forest Ecology of a Mountain Region in the Central Appalachians. U.S.G.S. Professional Paper No. 347. 66 pp.

Haelen, T. 1984. Hydrological and Solution Chemistry Responses, of a Tributary Valley in the White Oak Run Catchment, Shenandoah National Park, Virginia. M.S. Thesis. Univ. of Virginia, Charlottesville, VA.

Hall, C. N. 1986. A Determination of Vegetation Resistance and Alteration to Trail Impact in Shenandoah National Park, VA. M.S. Thesis. Univ. of Maryland, Frostburg, MD. 155 pp.

The study's objectives were two-fold: to test a plant resistance modelling scheme developed in the west, and to analyze vegetation along trail sides and determine how the vegetation was altered due to treading along the trail.

Hanawalt, Ronald B. 1975. Distribution of Plant Species in Shenandoah National Park. Map.

Based on the same classification scheme of forest types used by Berg and Moore (1941). Included with the map are a description of bedrock associated with the various forest types and land classifications by suitability.

Harrison, E. A. 1987. A Simulation Model of Forest Succession in Shaver Hollow, SNP, VA. M.S. Thesis. Univ. of Virginia, Charlottesville, VA. 127 pp.

A FORET-based model, which is a type of gap model, was used to simulate the forest patterns in Shaver Hollow and then to predict the future forest dynamics of the watershed.

B. M. McIntyre, and R. D. Dueser. 1989. Community dynamics and topographic controls on forest pattern in Shenandoah National Park, Virginia. Bulletin of the Torrey Botanical Club 116(1):1-14.

Harrison, E. A. and H. H. Shugart. 1990. Evaluating performance of an Appalachian oak forest dynamics model. Vegetation 86:1-13.

A forest inventory of the Shaver Hollow watershed in the SNP, VA was used to calibrate and test OVALIS, a forest dynamics simulation model.

Haskell, David A. 1982. Evaluation of Trout Populations in Major Park Streams. Unpublished NPS Report SHEN-N-083.

NPS research project showed that brook trout population levels vary considerably in Park streams. Some streams showed noticeable impacts from fishing pressure and illegal fish poaching. A monitoring program was initiated as a result of this study.

1986. Management of a High Elevation Meadow in SNP. 'In: Proceedings of U.S. Forest Service Balds Management Workshop. Crosnore, NC. 24 pp.

Description of research and management actions conducted over a ten year period to restore a threatened meadow in SNP.

Healy, Patricia A. and James B. Whelan. 1977. A Problem Analysis of Black Bear Management in Shenandoah National Park. M.S. Thesis. VPI & SU, Blacksburg, VA.

Discusses various bear management problems and possible solutions.

Hendrey, G. R., J. N. Galloway, S. A. Norton, C. L. Schofield, P. W. Shaffer, and D. A. Burns. 1980. Geological and Hydrochemical Sensitivity of the Eastern United States to Acid Precipitation: U. S. Environmental Protection Agency Report EPA-600/3-80-024.

Hermann, F. J. 1959. Range extensions of Bryophytes in eastern United States. Reprinted from The Bryologist 62(2).

The following species were identified and specific locations in Shenandoah National Park are given: Brachythecium campestre, Campyllum crvsophyllum var. brevifolium, Eontinalis dalecarlica, Hypnum pratense, Philonotis lonqiseta. Sphagnum imbricatum.

Highton, Richard. 1971. Distributional Interactions Among Eastern North American Salamanders of the Genus Plethodon. Research Division Monograph, VPI & SU, Blacksburg, VA.

Primarily taxonomic work describing variation in taxonomic characteristics of the eastern salamanders (Plethodons). A section is included on interactions between the Shenandoah and the red-backed salamanders in the Park.

_____ and Allan Larson. 1979. The genetic relationships of the salamanders of the genus Plethodon. Systematic Zoology 28:579-599.

Highton, Richard and Richard Worthington. 1967. A new salamander of the genus Plethodon from Virginia. Reprinted from Copera 3:617-626.

A taxonomic report, but the only investigation of the Shenandoah salamander in all three geographic isolates. Plethodon n. Shenandoah is apparently separated into three isolates because of restricted habitat distribution (north-facing slopes above 3,000 feet).

Hook, Paul E., Jr. 1978. A Social-Psychological Study of Privacy and Crowding in Wilderness Recreation Areas. M.S. Thesis. West Virginia Univ., Morgantown, WV.

Hornberger, G. M. and J. Galloway. 1984. Model of Acidification of Groundwater in Catchments (MAGIC). Task Group Project: E-2-14, EPA Acid Precipitation Program.

Research report describing a model developed by the Department of Environmental Sciences, University of Virginia, to describe and predict the rate of watershed acidification in SNP.

Hornberger, G. M., K. J. Beven, B. J. Cosby, and D. E. Sappington. 1985. Shenandoah Watershed Study: Calibration of a topography-based, variable contributing area model to a small forested catchment. Water Resource Research 21:1841-1850.

Hornberger, G. M. and B. J. Cosby. 1985. Selection of parameter values in environmental models using sparse data: A case study. Applied Mathematics and Computers 17:335-355.

- _____. 1985. Evaluation of a model describing the long-term dynamic response of catchments to deposition of atmospheric sulfate. In: Proceedings of the 7th IFAC Symposium on Identification and System Parameter Estimation, Pergamon Press, pp. 229-234.
- Hornberger, G. M., B. J. Cosby, and J. N. Galloway. 1986. Modelling the effects of acid deposition: Uncertainty and spatial variability in estimation of long-term responses of regions to atmospheric deposition of sulfate. *Water Resource Research* 22:1293-1302.
- Hornberger, G. M., B. J. Cosby, and E. B. Rastetter. 1986. Regionalization of predictions of effects of atmospheric acidic deposition on surface waters. In: Proceedings of the International Conference on Water Quality Modelling in the Inland Natural Environment. Bournemouth, England, pp. 535-550.
- Hornberger, G. M. 1990. Modelling complex natural processes with small observation sets: The case of acidification of surface waters in North America and Europe. *Mathematics and Computers in Simulation* Volume 32. In Press.
- Houston, Dee H. 1974. A Study of the Effects of Fire at Big Meadows. M.S. Thesis. James Madison Univ., Harrisonburg, VA.
- Fire was found to have very little effect on plant communities in the meadow.
- Jaeger, Robert G. 1969. Competitive Exclusion and Environmental Tolerances in the Distributions of Two Species of Salamanders (genus *Plethodon*) in Virginia. Ph.D. Dissertation. Univ. of Maryland, College Park, MD 152 pp.
- A review of red-backed and Shenandoah salamander interactions on Hawksbill. Food may be a limited resource for the Shenandoah salamander during dry periods and may affect reproductive success. Mappings of the talus distribution are included.
- _____. 1970. Potential extinction through competition between two species of terrestrial salamanders. *Evolution* 24:632-642.
- Hawksbill Mountain is the study site for an investigation of competition between *P. cinereus* and *P. Shenandoah*. In areas where soil has encroached into talus areas, *P. cinereus* is present and *P. Shenandoah* is scarce or absent.
- _____. 1971a. Competitive exclusion as a factor influencing the distributions of two species of terrestrial salamanders. *Ecology* 52:632-637.
- The study, conducted primarily at Hawksbill, describes the micro-geographic distributions of the red-backed and Shenandoah salamanders. Shenandoah salamander may be faced with potential extinction due to erosion of soil into its talus refugium, followed by subsequent encroachment of *P. cinereus*.
- _____. 1971b. Moisture as a factor influencing the distributions of two species of terrestrial salamanders. *Oecology* 6:191-207.
- Studies indicate that survival of *P. Shenandoah* in the talus is due, in part, to its ability to withstand the stress of dehydration for a longer period than can *P. cinereus*.

1972. Food as a limited resource in competition between two species of terrestrial salamanders. *Ecology* 53:535-546.

The author relates the suggestion that food (availability rather than abundance) could be a limited resource during long, dry seasons in interspecific competition between the Shenandoah salamander and the red-backed salamander.

1974. Interference or exploitation? A second look at competition between salamanders. *Journal Herpetology* 8(3):191-194.

A recent lab experiment (specimens from Hawksbill) suggests that an interference component may also exist in competition for borrow space.

_____. 1978. Plant climbing by salamanders; periodic availability of plant dwelling prey. *Copeia* 4:686-691.

Study conducted on Blackrock Mountain, SNP from 1970 to 1975. Observations showed that large numbers of these salamanders climb vegetation at night in search of prey.

Josephson, Dan. 1981. An Evaluation of Sympatric Populations of Brown and Brook Trout in Four Virginia Streams. M.S. Thesis. VPI & SU, Blacksburg, VA. NPS Report SHEN-N-082.

The study showed that in all Park streams tested, brook trout were better able to compete for available stream territory than were brown trout. There were strong indications that brown trout were not a threat to brook trout populations.

Karnosky, David F., Paul Berrang, and Robert Mickler. 1986. A Genecological Evaluation of Air Pollution Tolerances in Hardwood Trees in Eastern Forest Parks. NPS-Air Quality Division Final Report. 93 pp.

The study evaluated variation in ozone tolerance between and within populations of hardwood trees from various eastern parks. Results suggest that sensitive clones are being eliminated from polluted parks.

Keating, S. T., J. P. Burand, J. S. Elkinton. 1989. A DNA hybridization assay for the detection of gypsy moth nuclear polyhedrosis virus in infected gypsy moth (*Lymantria dispar* L.) larvae. *Journal of Applied Environmental Microbiology* 55:2749-2754.

Kekluk, Theresa A. 1980. An Evaluation of Factors Influencing the Establishment of Self-Sustaining Populations of Brown Trout in Virginia Streams. M.S. Thesis. VPI & SU, Blacksburg, VA.

This research was conducted in cooperation with the VDGIF to determine what stream parameters were necessary to allow brown trout to dominate over native brook trout. Study showed that most high elevation streams were not favored by brown trout.

Krovetz, D. O., M. A. Reiter, J. T. Sigmon, F. S. Gilliam. 1988. Assembly and field testing of a ground-based presence-of-cloud detector. *Journal of Atmospheric and Oceanic Technology* 5(4):579-581.

Langdon, Keith R. and Julie M. Langdon. 1981. Biogeography of Red Spruce in Shenandoah National Park, Virginia. NPS Unpublished report. 16 pp.

The report describes the factors affecting the distribution of red spruce in the Park.

Lawrey, James D. 1984. Lichens as Air Pollution Monitors in Shenandoah National Park. NPS Contract Research. Final Unpublished Report SHEN-N-071. George Mason Univ., Fairfax, VA. 33 pp.

Lichen samples were taken from along 12 east/west transects to study variation of lead and sulfur contents along altitudinal gradients.

Lawrey, J. D. 1985. Lichens as Lead and Sulfur Monitors in Shenandoah National Park, Virginia. Unpublished Final Report. 38 pp.

_____. 1986. Lichens as Indicators of Atmospheric Quality in the Northern District of SNP, VA. MAR Science Report Series NRSP-N-106. 50 pp.

Research on the relationship of lichens and past levels of atmospheric SO₄.

_____. 1987. Lichens as Indicators of Atmospheric Quality in the Northern District of SNP, VA. NPS Resource Management Final Report. 31 pp.

Lichens collected in the past and newly collected lichens were analyzed for chemicals representative of atmospheric pollutants. Background sulfur pollution levels have been steadily increasing in SNP, particularly at high elevation sites, but that the concentrations of lead and many other pollutants have declined during the 50 year history of SNP.

Lee, Paul R., II. 1973. A Study of the Impact of Exotics Lonicera japonica Thumb. and Ailanthus altissima (Mill.) Swingle on the Shenandoah National Park Ecosystem. Final Research Report SHEN-N-10. 73 pp.

Seven quadrants in the Swift Run Gap area were studied. Ecological data, growth rate measurements, and related information were recorded weekly at the sites. Neither appeared to be invading forested lands due to low light levels in established forested areas.

Leininger, Theodor D. 1982. Forest Response to Anthropogenic Stress (FORAST). M.S. Thesis. VPI&SU, Blacksburg, VA and supported by Oak Ridge National Laboratory, Oak Ridge, TN.

Report describes the FORAST program and how the growth rates of trees in the SNP study site compare to other areas.

_____. 1988. Chemical Interactions Between Rainfall and Northern Red Oak (Quercus rubra L.) Foliage. Ph.D. Dissertation. VPI & SU, Blacksburg, VA. 113 pp.

Nutrient ion exchange was examined between simulated acid rain solutions and northern red oak (Quercus rubra L.) leaves of trees growing in fertile, limestone derived soil and less fertile, sandstone/shale-derived soil. Concentrations of inorganic ions were measured in bulk rainfall and bulk throughfall collected beneath northern red oak trees growing on both the fertile and less fertile sites.

Lennon, Robert E. 1961. The Trout Fishery in Shenandoah National Park. Special Science Report No. 395. U. S. Fish and Wildlife Service. 16 pp.

Contains information on stream descriptions and status of populations prior to 1952 and an explanation of decline of trout status based on sequence of floods and droughts. Population estimates are given for 1955-1959, as well as information on shocking, recovery of the resource, and the growth of sport fishing.

Lessard, L. 1989. The Variability of Acidic Gas Particle Composition and Deposition Rates in a Virginia Deciduous Forest. M.S. Thesis. Univ. of Virginia, Charlottesville, VA.

Levandowsky, Daniel. 1936. Effects of Altitude and Exposure on Certain Plants of the Blue Ridge. Shenandoah Nature Journal.

A very general article comparing lowland sumac and mountain sumac by observation.

Lilly, S. L. 1980. Plant Community Standing Crop Responses to Single and Repeated Prescribed Burns at Big Meadows, Shenandoah National Park. M.S. Thesis. James Madison Univ., Harrisonburg, VA. 108 pp.

Three prescribed burning regimes were carried out at Big Meadows. Changes in the August standing crop of various vegetative compartments were used to measure responses of vegetation which was: (1) left unburned as a control, (2) subjected to a single spring burn, (3) burned the previous spring and undergoing a second year of recovery, and (4) burned the previous spring and reburned in the spring of the second growing season. Responses to mowing were also investigated.

Lipford, M. L. 1984. The Effect of Aspect and Elevation on Forest Community Composition in Intermediate Age Successional Stands in Shenandoah National Park, Virginia. M.S. Thesis. James Madison University. Harrisonburg, VA. 135 pp.

Forest community composition was quantitatively described in 20 intermediate successional forest stands on open slope northwest and southeast aspects at elevations of 730m and 915m within the SNP, VA.

, G. D. Rouse, and C. A. Clampitt. 1987. The Virginia Natural Heritage Program: Monitoring Rare Species and Exemplary Natural Communities. Virginia Journal of Science.

Lizards of Virginia. ????. Special Bull. 67-68. Virginia Herpetological Society. 16 pp.

Lizards in the state are described using picture guides and distribution maps. A matrix is provided of county and species and whether or not each species exists in the county.

Lynch, D. D. 1987. Hydrologic Conditions and Trends in Shenandoah National Park, VA 1983-84. U. S. Geological Survey Water-Resources Investigations Report 87-4131. 115 pp with map.

The study focused on: (1) the amount and variability of precipitation, surface water, and ground water in the Park, and (2) long-term trends in ground water levels in relation to climate and withdrawals.

Lynch, D. D. and N. B. Dise. 1985. Sensitivity of Stream Basins in SNP to Acid Deposition. U. S. Geological Survey Water-Resources Investigations Report 85-4115. 61 pp.

A USGS summary report of the results from Dise 1984, M.S. Thesis.

Mackey, Halkard, E. 1973. The present composition of a former oak-chestnut forest in the Allegheny Mountains of western Pennsylvania. Ecology 54(4):915-919.

A blighted, lumbered oak-chestnut forest in the Allegheny Mountains was studied 50 years after elimination of the chestnut. Removal by lumbering has regenerated an area that resembles a mid-successional stand mixed with species associated with the former chestnut.

Manville, Richard H. 1956. The Mammals of Shenandoah National Park. Shenandoah Natural History Association, Luray, VA. 67 pp.

Provides good summaries of the establishment, status, and reintroduction of many species. Valuable for historical population information.

Marion, J. L. and D. A. Haskell. 1988. An Analysis of Visitor Impacts and Rehabilitation Methods for Backcountry Campsites at Shenandoah NP. NPS Research Resource Management Unpublished Report. 41 pp.

A Parkwide inventory of backcountry campsites was conducted between 1981 and 1983. Campsites were evaluated to determine the level of impact from use and a campsite rehabilitation study documented the effectiveness of several methods for closing campsites and speeding the recovery process.

Martin, Robert G. 1961. Descriptions and life histories of Virginia's game fishes. Virginia Wildlife 22(8):16-19.

A good descriptive and general information article.

Mathews, N. C. 1989. Surface, Subsurface Water Interaction in the Alluviated Stream Channel of the Shaver Hollow Catchment, Shenandoah National Park, Virginia. M.S. Thesis. Univ. of Virginia, Charlottesville, VA.

Maxwell, Hu. 1910. The use and abuse of forests by the Virginia Indians. William and Mary College Quarterly 19(2).

An historical article discussing indian influence upon the spread of species and use of fire and land-clearing by Indians.

Mazzeo, Peter M. 1977. Ferns and Fern Allies of Shenandoah National Park. Bull. No. 6, Shenandoah Natural History Association, Luray, VA. 52 pp.

_____. 1966a. Native and exotic ornamentals in the Shenandoah National Park. American Horticulture Magazine. 45:419-421.

_____. 1966b. New additions to the Shenandoah National Park flora (6th supplement). Castanea 31:236-240.

_____. 1966c. Notes on the conifers of the Shenandoah National Park. Castanea 31:240-247.

_____. 1967. New additions and notes to the Shenandoah National Park flora (7th supplement). Castanea 32:177-183.

_____. 1968. Trees of Shenandoah National Park in the Blue Ridge Mountains of Virginia. Bulletin No. 3, Shenandoah Natural History Association, Luray, VA. 80 pp.

_____. 1972. Further notes on the flora of the Shenandoah National Park, Virginia (8th supplement). Castanea 37:168-178.

McIntyre, Blodwyn M., M. A. Scholl, and J. T. Sigmon. 1990. A quantitative description of a deciduous forest canopy using a photographic technique. Forest Science 36(2):381-393.

Mellinger, Clair. 1979. Ecological Effects of Fire on the Big Meadows Flora. Unpublished report. James Madison Univ., Harrisonburg, VA.

Fire was found to have very little long-term effects on species composition, although it did have short-term effects on woody vegetation.

Melson, William G. and Bevan M. French. 1970. Shenandoah National Park-Skyline Drive Field Trip Guide. NASA/Goddard Space Flight Center, Greenbelt, MD. 15 pp.

An easily read guide to geology along the Drive. The first section covers the general geology and rock types and the second section described individual areas and outcrops showing specific geologic features.

Meyer, K. J. 1990. Effects of Drifting Prey Abundance on Food Consumption and Growth of Brook Trout in Shenandoah National Park. M.S. Thesis. VPI & SU, Blacksburg, VA. 111 pp.

Objectives of the study were to quantify the relationship between prey density and food consumption in brook trout, to identify how diet, feeding, and prey size selectivity by brook trout affect the relation, and to determine if slow growth in the summer was caused by low daily rations or other factors.

Miller, Gary and Robert Momich. 1973. Growth Rates of Trees in Shenandoah National Park. Unpublished manuscript.

A term paper preceding development of an interpretive program. Trees were sampled using increment borings. Locations and identifications are coded by area in each district.

Oliver, Rick D. 1986. Decorana Ordination of Forest Stands in Shenandoah National Park, VA. M.S. Thesis. James Madison Univ., Harrisonburg, VA. 121 pp.

Describes changes in forest composition by elevation.

Palmer, William. 1902. August birds of Stony Man Mountain. Osprey 1(1):6-12.

Essentially a short listing and description of birds migrating through the area.

Patterson, Paul M. 1955. Additions and corrections to the bryophyte flora of the Shenandoah National Park. Reprinted from Castanea 20(1):19-24.

A simple listing with no description of the changes.

Peacock, J. W., S. W. Bullington. 1989. Evaluation of the impact of Bacillus thuringiensis on non-target Lepidoptera in the Shenandoah National Park. In: Proceedings of the 1989 National Gypsy Moth Review. November 6-9, 1989. Annapolis, MD.

Pielke, Roger A. 1979. Meso Scale Climatology in Shenandoah National Park and It's Relation to Red Spruce Distribution. M.S. Thesis. University of Virginia, Charlottesville, VA.

Test the relationship between climate and the distribution of red spruce stands.

podgwaite, J. D. and R. C. Reardon. 1989. Gypchek: Current Status. In: Proceedings of the 1989 National Gypsy Moth Review, November 6-9, 1989. Annapolis, MD. pp. 143-145.

A short article which describes USFS research on Gypchek and the results of two AIPM methods improvement studies. The study in the SNP evaluated one versus two applications of Gypchek and the results showed that two applications provided excellent foliage protection.

Prior, Paul V. 1959. Further bryophytes from Shenandoah National Park, Virginia. Reprinted from The Bryologist 62(1):41-45.

Pyle, Robert. 1975. Butterflies and the National Park. National Parks and Conservation Magazine (1975):10-14.

Specific mention is given to the scarce West Virginia white butterfly (*Pieris virginianensis*) whose habitat is protected in Shenandoah National Park.

Raphael, David L. 1982. A Hiking Trail System Model for the Central District Shenandoah National Park. Unpublished Final Report. Pennsylvania State Univ., University Park, PA. 73 pp.

Ravlin, W. F., S. J. Fleisher, and S. L. Rutherford. 1990. Shenandoah National Park Long-term Ecological Monitoring System, Section IV, Gypsy Moth Component User Manual. USDI-NPS Report NPS/NRSHEN/NRTR-90/02. 38 pp.

Ravlin, F. W., J. R. Voshell, Jr., D. Wm. Smith, S. L. Rutherford, S. W. Hiner. 1990. Shenandoah National Park Long-term Ecological Monitoring System, Section I, Overview. USDI-NPS Report NPS/NRSHEN/NRTR-90/02. 17 pp.

Introductory chapter for the Long-term Ecological Monitoring System Manual. The chapter describes the purpose for inventory and monitoring in parks and an overview of the approaches used in establishing the different monitoring projects in Shenandoah National Park.

Raybourne, Jack W. 1973-1975. Ecology and Population Dynamics of the Black Bear. Virginia Commission of Game and Inland Fisheries Unpublished Report. 19 pp.

Yearly reports of trapping records (age, weight, etc.) and hunting harvests in the state are given in annual reports. Most of the tagged bears are located in Shenandoah National Park.

_____. 1976. A Study of the Black Bear Populations in Virginia. In: Proceedings of the Northeast Section of the Wildlife Society Convention, April 26-29, Hershey, PA. 18 pp.

The paper summarizes the accumulation of three years of age and sex data on black bear populations. Trapping operations, drugging, marking, and tagging are described and data analysis presented.

Reed, John C. Geologic maps:

- Structural contour map of the Catoctin formation in the Big Meadows-Stony Man area showing a possible structural interpretation.
- Geologic cross sections of the Blue Ridge near Luray, Virginia.
- Geologic cross sections of the Big Meadows-Stony Man area including Stony Man, Pollock Knob, Whiteoak Run, Crescent Rock, Cedar Run, Hawksbill, Cedar Run, Robertson Mountain, west branch of Naked Creek, Chapman Mountain, Tanners Ridge, and Jordan Hollow.

- Geologic map of the Blue Ridge near Luray, VA.

_____. 1955. Catoctin formation near Luray, Virginia. Bulletin of the Geological Society of America 66:871-896.

Mineralogy, chemical composition, and primary structures indicate the original Catoctin formation was basaltic in composition and probably composed of normal plateau basalts. The report is comprehensive; some photographs of primary structures are included.

_____. 1964. Chemistry of Greenstone of the Catoctin Formation in the Blue Ridge of Central Virginia. U. S. Geological Survey Professional Paper 501-C. Pages C69-C73.

A highly technical article. Includes a map of the Blue Ridge anticlinorium showing sources of the analyzed rocks.

_____ and Benjamin A. Morgan. 1971. Chemical alteration and spilitization of the Catoctin greenstones, Shenandoah National Park, Virginia. Reprinted for private circulation from The Journal of Geology 79(5):526-548.

The study indicates that the spilitic greenstones and epidosite are the products of chemical alteration of basalt flows with compositions like those of the feeder dikes.

_____ and John T. Hack. 1971. Resume of the Geology of the Blue Ridge. Unpublished manuscript. 4 pp.

A quick survey of the geologic history of the Blue Ridge and a description of rock types within Shenandoah.

Reed, John C., Jr. 1969. Ancient Lava Flows in Shenandoah National Park Near Luray, Virginia. Geological Survey Bulletin 1265, U.S. Geologic Survey, Washington, DC. 43 pp.

A technical, highly informative report describing a study designed to determine the thickness of the Catoctin formation, its relationship to underlying and overlying rocks, and the original nature of the lavas from which the Catoctin greenstone was derived.

Regelbrugge, John C. 1988. Effects of Wildfire on the Structure and Composition of Mixed Oak Forests in the Blue Ridge of Virginia. M. S. Thesis. VPI & SU, Blacksburg, VA. 125 pp.

Reus, J. O., B. J. Cosby and R. F. Wright. 1987. Chemical processes governing soil and water acidification. (Review Article). Nature 329:27-32.

Rutherford, S. L. and F. W. Ravlin. 1990. Shenandoah National Park Long-term Ecological Monitoring System, Section V, Database Management System. USDI-NPS Report NPS/NRSHEN/NRTR-90/02. 89 pp.

Ryan, P. F., G. M. Hornberger, B. J. Cosby, J. N. Galloway, J. R. Webb, and E. B. Rastetter. 1989. Changes in the chemical composition of stream water* in two catchments in the Shenandoah National Park, Virginia, in response to atmospheric deposition of sulfur. Water Resources Research 25(10):2091-2099.

Streamwater samples from the Deep Run and White Oak Run catchments in the SNP and rainwater samples from the same areas were collected at weekly intervals over an eight year period. The article summarizes the changes in streamwater composition over time and based on present levels of sulfur emissions, projected what additional changes might occur in streamwater composition in the future.

Sanchini, P. J. and S. J. Stein. 1987. Ozone Monitoring, Foliar Injury and Tree Mortality at Shenandoah National Park: 1985 Survey Results. Unpublished Final report. Holcomb Research Institute, Butler University, Indianapolis, IN. 136 pp.

Two hundred individuals of yellow poplar, white oak, and red maple were examined for visible foliar injury attributable to ozone at Shenandoah National Park in 1985. Species composition, size-class structure and mortality rates were also determined for the stands.

Sanchini, P. J. 1988. Ozone Injury on Pinus strobus in Permanent Plots at Shenandoah National Park: 1986 Survey Results. Holcomb Research Institute Report No. 144, Butler Univ., Indianapolis, IN. 99 pp.

Twenty-two permanent biomonitoring plots containing 15 eastern white pine (Pinus strobus) trees each were established at Shenandoah National Park in August and September 1986. This report describes the degree of ozone injury to foliage of the 326 tagged trees which constitute the permanent plot sample.

_____. 1989. Extent of Ozone Injuries in Pinus strobus Populations of Five Eastern National Parks in 1986. Unpublished Final Report. 79 pp.

Scanlon, John J. and M. Vaughan. 1981. Population and Behavior Ecology of White-Tailed Deer in SNP, VA. USFWS Cooperative Unit Final Report NRSP-N-63, VPI & SU, Blacksburg, VA. 104 pp.

Schnoorberger, Irma and F. E. Wayne. 1945. The bryophytes of Shenandoah National Park, Virginia. Bulletin of the Torrey Botanical Club 72:506-520.

Schupple, Henry L., Jr. 1982. The Physical Influences of the Morphology of Second Order Drainages Basins in Northern Virginia's Blue Ridge Mountains. M.S. Thesis. Towson State University, Towson, MD. 140 pp.

Discusses the effects of various physical parameters of small drainages on stream characteristics.

_____. 1983. Physical Influences on the Morphology of 2nd Order Drainage Basins in Northern Virginia's Blue Ridge Mountains. M.S. Thesis. Towson State University, Towson, MD. 14 pp.

Morphological characteristics of 2nd order drainage basins in the Park were investigated and the study tried to explain the relationship between morphology characteristics and physical influences such as bedrock percentages and climate.

Shaffer, P. W., and J. N. Galloway. 1982. Acid Precipitation: The Impact on Two Headwater Streams in Shenandoah National Park, Virginia. International Symposium on Hydrometeorology, American Water Resources Association. pp 11.

Sharpe, G. and W. Sharpe. 1958. Wildflowers of Shenandoah National Park. Univ. Washington Press, Seattle, WA. 40 pp.

Shelton, Napier. 1975. The Nature of Shenandoah. Natural History Series, Washington, DC. 112 pp.

A well-written popular publication on history and natural history of the Park. Summary lists of vegetation, wildlife, fishes, etc., are included in the appendices.

Shenandoah National Park Master Plan. 1937. National Park Service, Luray, VA.

Includes vegetation maps and planned developments.

Sheridan, John R. 1963. Fishing holes: Purists' paradise on the Rapidan. Virginia Wildlife 5:6-7.

Article on the beginning of the Fish-for-Fun program and a status report on the fish populations.

_____. 1971-1972. Fishery Management Program, Shenandoah National Park. Bureau of Sport Fisheries and Wildlife.

Comprehensive study sampling some of the Park streams for fish populations and bottom fauna. Results are summarized for each stream and recommendations are given.

Shumway, D. L. and T. W. Bowersox. 1987. Gypsy Moth Risk Assessment for Shenandoah National Park. NPS Unpublished Report. 28 pp.

The report outlines procedures for developing a gypsy moth risk assessment for SNP.

Sigmon, J. T. and M. J. Estes. 1987. Comparisons of chemical compositions of mountain stratiform clouds and valley fog in the Shenandoah National Park. In: Proceedings of Sixth Symposium on Meteorological Observations and Instrumentation, American Meteorological Society, pp. 59-60.

Sigmon, J. T. and F. S. Gilliam. 1987. Relationships Between Throughfall Chemistry and the Chemical Fluxes in Dry Deposition and Mountain Clouds. In: Proceedings of Sixth Symposium on Meteorological Observations and Instrumentation. American Meteorological Society. pp. 63-65.

Sigmon, J. T., K. R. Knoerr, D. Krovetz, and T. Schneider. 1987. An Inexpensive Fine Wire Thermocouple Probe and Amplifier for Rapid Temperature Fluctuation Measurements. In: Proceedings of Sixth Symposium on Meteorological Observations and Instrumentation. American Meteorological Society. pp. 229-230.

Sigmon, J. T. and L. H. Lessard. 1987. Measurements of Concentrations of Some Reactive Atmospheric Gases and Fine Primary Particulates with Annular Denuder Atmospheric Samplers. In: Proceedings of Sixth Symposium on Meteorological Observations and Instrumentation. American Meteorological Society. pp. 60-62.

Sigmon, J. T., F. S. Gilliam, and M. E. Partin. Precipitation and throughfall chemistry for a montane hardwood forest ecosystem: Potential contributions from cloud water. Canadian Journal of Forest Research 19:1240-1247.

Sigmon, J. T. 1988. Elevational Gradients in Wet and Dry Deposition of Pollution. EPA Internal Report.

- Sigmon, J. T., F. S. Gilliam, M. A. Reiter, and D. O. Krovetz. 1988. Elevational and spatial variation in daytime ozone concentrations in the Virginia Blue Ridge Mountains: Implications for forest exposure. *Canadian Journal of Forest Research* 19:422-426.
- Sigmon, J. T., D. O. Krovetz, and M. A. Reiter. 1988. An inexpensive thermocouple probe-amplifier and its response to rapid temperature fluctuations in a mountain forest. *Journal of Atmospheric and Oceanic Technology*. 6(5):870-874.
- Sigmon, J. T., D. O. Krovetz, M. A. Reiter, and F. S. Gilliam. 1988. Assembly and field testing of a ground-based presence of cloud detector. *Journal of Atmospheric and Oceanic Technology* 4(5):579-581.
- Sigmon, J. T., D. O. Krovetz, M. A. Reiter, and L. H. Lessard. 1988. An automated system for air sampling with annular denuders at a remote site. *Environmental Pollution* 58:97-107.
- Sigmon, J. T. and C. E. Murphy. 1990. Dry deposition of sulfur and nitrogen oxide gases to forest vegetation. *Acid Precipitation* 3:217-238.
- Sigmon, J. T., D. W. Sjostedt, and S. J. Colucci. 1990. The Carolina nocturnal low-level jet. *Weather and Forecasting*. In Press.
- Skelley, John, S. F. Duchelle, and L. W. Kress. 1979. The Impact of Photochemical Oxidant Air Pollution on the Quality of Air and Plant Life in Shenandoah, Blue Ridge Parkway, and Great Smoky Mountains National Parks. NPS Unpublished Report. 25 pp.
- First major research in the Park which indicated that ozone was causing damage to sensitive plant species.
- Skelley, John M. and Stephen F. Duchelle. 1981. The Response of Indigenous Vegetation in the Blue Ridge Mountains of Virginia to Photochemical Oxidant Air Pollution. NPS Unpublished Report. VPI 6 SU, Blacksburg, VA.
- Smith, D. W. and J. L. Torbert. 1990. Shenandoah National Park Long-term Ecological Monitoring System, Section II, Forest Component Manual. USDI-NPS Report No. NPS/NRSHEN/NRTR-90/02. 62 pp.
- Stevens, N. T., L. C. Thomas, and T. F. Albee. 1979. A Study of Ambient Air Quality and Visibility in National Parks. NPS Unpublished Report. VPI & SU, Blacksburg, VA and Uplands Research Laboratory, GSMNP, TN.
- Stevenson, J. A. 1977. A preliminary list of the fungi of Shenandoah National Park. *Claytonia* 3:21-28.
- A total of 269 species are reported; no locations are given.
- Stewart, D. A., R. E. Morris, A. B. Hudischewskj, and M. K. Liu. 1983. Evaluation of Episodic Regional Transport Models of Interest to the National Park Service. Systems Applications, Inc., San Rafael, CA. NPS Unpublished Report.
- Depicts how air masses move in and around the Park under various climatic conditions.

Stoltzfus, Dwight L. 1980. The Effect of Slope Exposure and Elevation on Patterns of Secondary Succession in Shenandoah National Park, Virginia. M.S. Thesis, James Madison Univ., Harrisonburg, VA. 93 pp.

Describes changes in forest composition by elevation.

Stupka, A. 1965. Wildflowers in Color. Harper and Row, New York, NY. 144 pp.

Pictorial guide and description with some specific locations of flowers in Shenandoah, Great Smokies, and the Blue Ridge Parkway.

Swietlik, William F. 1980. The Effects of Acid Precipitation on Benthic Insects in Headwater Streams in Shenandoah National Park. M.S. Thesis. George Mason Univ., Fairfax, VA. 56 pp.

The hypothesis that lower alkalinity leads to lower reproduction, fewer benthic genera and vigor, was successfully tested. Park streams with high alkalinity showed greater benthic species richness and higher total biomass.

Systems Applications, Inc. Dispersion Meteorology and Predictive Air Quality and Visibility Modeling. San Rafael, CA.

Talerico, Robert L. 1965. Examination of the Fir at Skyland and Hawksbill for the Balsam Woolly Aphid (*Adelges picea* Ratz) on the Shenandoah National Park. Report 65-SZ-5220, USDA Southern Insect and Disease Control Zone.

Simple report locating and identifying balsam fir infected with the aphid at Crescent Rock, Skyland, and Hawksbill.

Teetor, A. 1988. Identification and Mapping of Vegetation Communities in SNP, VA. NPS Resource Management Unpublished Final Report. 61 pp.

Summary report describing the forest cover type map completed for the SNP over a 4-year period, 1983-1987. The report includes methodology used to create the map, accuracy testing, and a description of the seven major forest cover types.

1989. Applying GIS Technology to Evaluate the Effects of Forest Defoliation by Gypsy Moth in SNP, VA. In: Proceedings of International Geographic Information Systems, Baltimore, MD. March 18-19, 1989. pp. 363-368.

Using the Park's GIS, a gypsy moth risk assessment map based on forest cover and the locations of developed areas. The result was less than satisfactory.

Tenbus, F. 1987. Hydrological Characteristics of the Alluvial Infill at the White Oak Run Catchment, Shenandoah National Park, Virginia. M.S. Thesis. University of Virginia, Charlottesville, VA.

Thomas, Sarah H. 1978. Birds of Shenandoah National Park. Shenandoah Natural History Association, Luray, VA.

A folder which lists 203 species which have been identified in the Park by Park personnel and qualified visitors.

Vaughan, Michael R., D. W. Carney, and N. P. Garner. 1987. Population and Habitat Ecology of Black Bears in SNP, VA. Final Report NRSP-N-64. USFWS Cooperative Unit, VPI&SU, Blacksburg, VA. 26 pp.

Extensive research conducted over a three-year period provided important information on bear populations, habitat use, denning ecology, travel patterns, etc.

1988. Population and Habitat Ecology of Black Bears in Shenandoah National Park, VA. NPS Unpublished Report. 26 pp.

An abbreviated version and summary of Carney 1986, M.S. Thesis and Garner 1987, M.S. Thesis.

Virginia's Breeding Birds: An Atlas Workbook. 1989. Virginia Society of Ornithology. 228 pp.

An atlas of breeding birds in Virginia based on data collected 1984 and 1988. The book contains maps showing known distribution, description of nesting habitat, safe dates for possible and probable breeding times, and areas where data are missing. This book is an effort to present the known breeding bird information with hopes that cooperators will fill in additional missing information.

Voshell, J. R., Jr. and S. W. Hiner. Shenandoah National Park Long-term Ecological Monitoring System, Section III, Aquatic Component User Manual. USDI-NPS Report No. NPS/NRSHEN/NRTR-90/02. 64 pp.

Vreeland, J. L. 1983. The Role of Shallow Groundwater in the Hydrogeochemical Response of the White Oak Run Catchment, SNP. M.S. Thesis, University of Virginia, Charlottesville, VA. 207 pp.

Groundwater comprises a very large percentage of total catchment outflow during periods of low flow. An input of new water may be observed in White Oak Run as a small early peak in discharge.

Ward, J. D., Alison Teetor, and Richard R. Potts, II. 1987. Biological Evaluation of Gypsy Moth, Lymantria dispar L., Outbreaks on the Shenandoah National Park, Virginia. USDA-USFS Report #88-1-6. 17 pp.

The 1987 evaluation of gypsy moth, Lymantria dispar L., infestation in the Shenandoah National Park to determine the current population status and the probable course of the outbreak in 1988.

Watson, J. K., J. D. Ward, and D. D. Sellers. 1989. Post Suppression and Biological Evaluation of Gypsy Moth, Lymantria dispar (L.), Outbreaks in Shenandoah National Park, Virginia - 1989. Annual Report for USDA-FS and USDI-NPS. Report #90-1-02, 17 pp.

Weathers, K. C., G. E. Likens, F. H. Bormann, S. H. Bickell, B. T. Bormann, B. C. Daube, Jr., J. S. Eaton, J. N. Galloway, W. C. Keene, K. D. Kimball, W. H. McDowell, T. G. Siccama, D. Smiley, and R. A. Tarrant. Cloud water chemistry from ten sites in North America. Environmental Science and Technology 22:1018-1026.

Webb, R. 1987. Retention of Atmospheric Sulfate by Catchments in Shenandoah National Park, Virginia. M.S. Thesis. Univ. of Virginia, Charlottesville, VA.

Webb, J. R., B. J. Cosby, J. N. Galloway, G. M. Hornberger, P. F. Ryan. 1989. The Shenandoah Watershed Study: An Overview. Department of Environmental Sciences, University of Virginia, Charlottesville, VA 30 pp.

The Shenandoah Watershed Study (SWAS) was initiated in 1979 as a cooperative research and monitoring program of SNP and the Department of Environmental Sciences at UVA. The objective of SWAS is to understand the processes which govern biogeochemical cycles in SNP's mountain watersheds. [The report provides a summary description of the SWAS program and current information concerning acidic deposition effects in SNP. A bibliography of related technical reports is included.]

Webb, J. R., B. J. Cosby, J. N. Galloway, G. M. Hornberger, and P. F. Ryan. 1989. Acidification of Native Brook Trout Streams in Virginia. January 1987-December 1988. VDGIF Report. 65 pp.

Webb, J. R., B. J. Cosby, J. N. Galloway, and G. M. Hornberger. 1989. Acidification of native brook trout streams in Virginia. Water Resource Research 25:1367-1377.

Webb, J. R., P. E. Bugas, B. J. Cosby, J. N. Galloway, G. M. Hornberger, J. W. Kauffman, L. O. Mohn, P. F. Ryan, and P. P. Smith. 1989. Acidic deposition and the status of Virginia's wild trout resource. In: Richardson and Hamre, eds. Proceedings of the Symposium, Wild Trout IV, September 18-19, 1989. Yellowstone National Park, WY. pp. 228-233.

A short summary article describing the present threat of acidic deposition to Virginia's wild trout resource including streams located in SNP. The assessment is based on present streamwater conditions, on the predicted increase in streamwater sulfate concentrations, and on observations of acidification-related trends in both stream chemistry and biota.

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