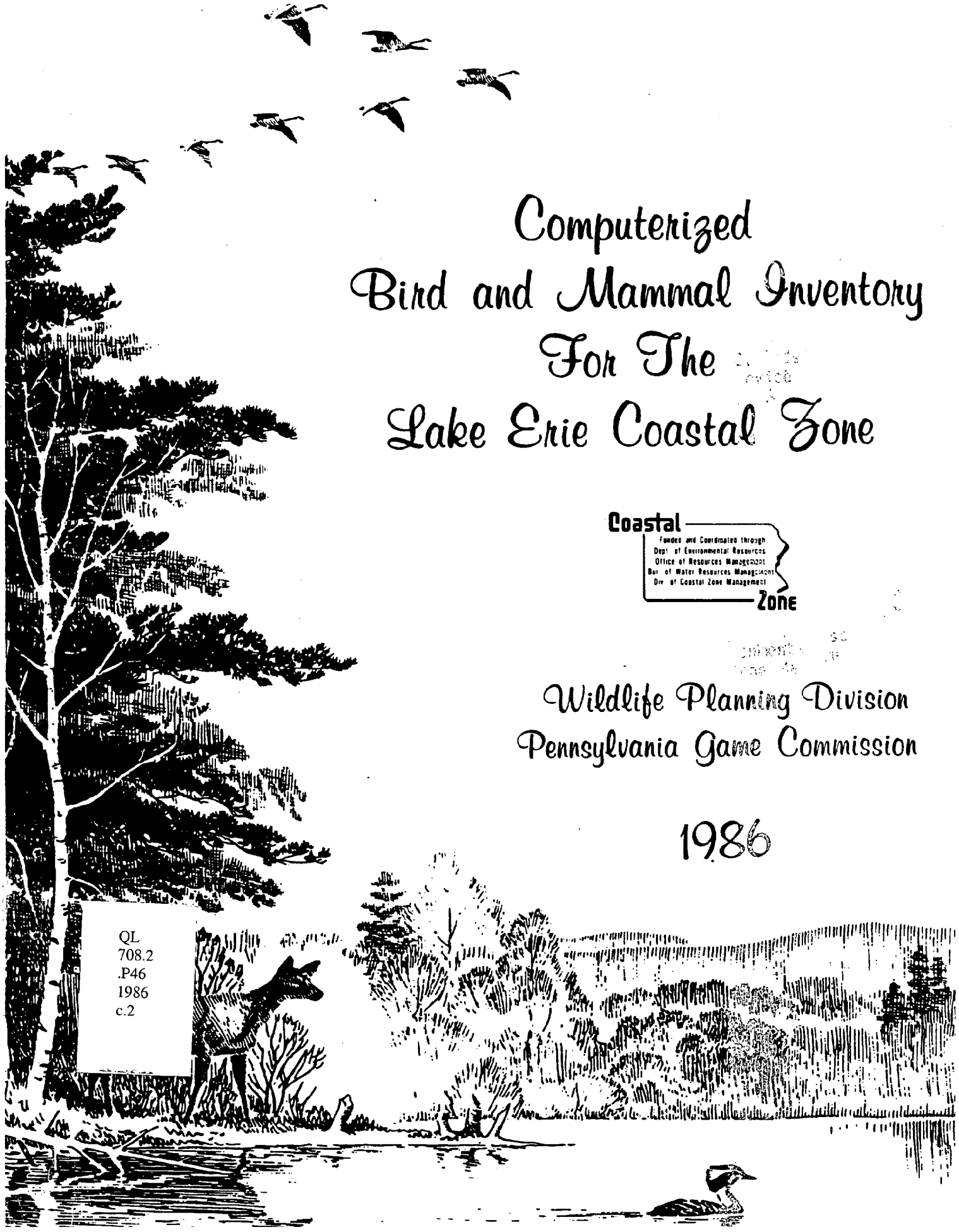

Computerized Bird and Mammal Inventory For The Lake Erie Coastal Zone

Coastal Zone

Funded and Coordinated through
Dept. of Environmental Resources
Office of Resources Management
Bur. of Water Resources Management
Div. of Coastal Zone Management

Wildlife Planning Division
Pennsylvania Game Commission

1986

Pennsylvania Game Commission. Bureau of Land Management
...
Division of Wildlife Planning.

COMPUTERIZED BIRD AND MAMMAL INVENTORY FOR THE LAKE ERIE COASTAL ZONE

Prepared by:

DIVISION OF WILDLIFE PLANNING
BUREAU OF LAND MANAGEMENT
PENNSYLVANIA GAME COMMISSION

JUNE, 1986

The preparation of this report was financed in part through the Pennsylvania Coastal Zone Management Program under provisions of the Coastal Zone Management Act of 1972, administered by the Division of Coastal Zone Management, Bureau of Water Resources Management, Pennsylvania Department of Environmental Resources.

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INTRODUCTION

One of the major limiting factors in the analysis of environmental projects is the availability of faunal inventory data for the project area. Ideally, the project manager should know which animal species are present within the project area (at all times of year, not just the present time), how many (abundance) of each species are present, the habitats utilized by each species and the responses likely elicited by the species (individuals and populations) due to habitat changes and use on the project site. Many times a plethora of faunal information already is available for a project area, but is widely dispersed in books, filing cabinets, field notebooks, and the expert minds of professional ecologists and research biologists. Advances in computer technology have made it possible for biologists to summarize data from these diffuse sources into a concise, easily accessible database, with the ability subsequently to analyse complex environmental problems for faunal concerns in minutes rather than hours, days, and weeks.

A computerized database of Pennsylvania's faunal resources was developed in the early 1980's by a group of research biologists with the U.S. Fish and Wildlife Service, Eastern Energy and Land Use Team. Management of this database was transferred to the Pennsylvania Game Commission in 1982. The database subsequently was named the Pennsylvania Fish and Wildlife Data Base.

Data Base Contents

The Pennsylvania Fish and Wildlife Data Base contains complete profiles for 844 resident and common migrant vertebrate and invertebrate species occurring within Pennsylvania. The Data Base includes all 578 vertebrate species known to be present in Pennsylvania and a select group of "important" invertebrates. Invertebrates are considered important if identified by federal or state agencies as endangered or threatened, if the species is recognized by the professional biological community as an indicator of environmental quality or sensitive to environmental changes, or if the species is of some economic significance. The 844 species in the Data Base are represented by nine major animal groups, as follows: amphibians (38), reptiles (41), fishes (184), birds (250), mammals (65), molluscs (69), crustaceans (4), aquatic invertebrates (93), and terrestrial invertebrates (100).

Each species profile in the Data Base was compiled using a standard format containing standard definitions and classifications. The definitions, classifications, and data collection format evolved out of an extensive survey of hundreds of professional natural resource agencies, industry, universities, and private conservation organizations.

Each species profile contains descriptors defining distribution in Pennsylvania, legal and use statuses, habitat associations, food habits, environmental associations and requirements, life history, and the influence of typical land management activities and land use changes on the species. All of this information, compiled in the standard coding booklet, was summarized by professionals with sound research backgrounds and expert knowledge of the species or species group. Each species profile was developed from a combination of published reports and field notes, and also includes professional opinion. Each data base entry is fully referenced to the original source documents. All species data was edited and verified prior to entry into the Data Base.

Data Base Management

The Pennsylvania Fish and Wildlife Data Base operates on the Univac computer at Bloomsburg University, Bloomsburg, Pennsylvania, using the MANAGE database management system; this system allows users with limited computer experience to have complete control of their particular data files. Interactive access or batch processing is possible via telephone with compatible computer hardware.

Data Base Availability

The Fish and Wildlife Data Base is available to federal and state agencies, universities, conservation organizations, environmental organizations, environmental and engineering consulting firms, and any individual needing fish and wildlife information. Two modes of access are possible; direct interactive access, and over-the-counter request service through the Game Commission.

Interactive access is at present available only to public agencies. All other prospective users must request information through the Game Commission's Division of Wildlife Planning.

Users of the Data Base include the U.S. Bureau of Land Management (Eastern States Office), U.S. Office of Surface Mining (Eastern Technical Center), U.S. Army Corps of Engineers (Baltimore, Philadelphia, and Pittsburgh District Offices), U.S. Forest Service (Allegheny National Forest, Northeastern State and Private Forestry, and the Northeastern Forest Experiment Station), U.S. Nuclear Regulatory Commission, U.S. Soil Conservation Service, U.S. Fish and Wildlife Service, Pennsylvania Fish Commission, Pennsylvania Department of Environmental Resources (Bureaus of Water Quality Management, Water Resource Management, Dams and Waterways Management, Information Systems, and Forestry), and numerous environmental/engineering consulting firms.

Applications

Each species profile in the Data Base is divided into 125 separate datafields (e.g., species common name, or occurrence within a watershed). Literally thousands of combinations, i.e., questions, are answerable given this type of data organization.

The Pennsylvania Fish and Wildlife Data Base will give almost instantaneous answers to questions like the following:

- What fish and wildlife species are found in Erie County?
- What birds and mammals are found in riparian habitats of the Chatauqua-Conneaut drainage of eastern Lake Erie?
- What species occurring in the Chatauqua-Conneaut drainage would be adversely affected (or benefited) by channelizing and/or impounding water?
- What vertebrate wildlife species in Erie County require cavities in snags for nesting?
- What endangered or threatened species occur in palustrine habitats in Erie County and what types of activities would adversely affect their survival?

- What are the habitat requirements and limiting factors of the federally endangered piping plover?

Specific applications already noted by Data Base users include:

1. Basic descriptions of individual species, their habitat associations, and life histories.

2. Preparation and review of permit applications for surface mining, power plant siting, point source discharge, solid waste and hazardous waste disposal, and wetland encroachments.

3. Analysis of proposals to designate species water quality classifications for waterways.

4. Evaluation and review of energy development project sites, flood control projects, road construction and improvement projects, bridge replacements, and fly ash disposal sites.

5. Preparation and review of environmental assessments and impact statements (fish and wildlife section) related to items 2 and 4.

6. Preparation of wildlife research proposals.

7. Guilding species (grouping by common attributes) for habitat analysis procedures and the construction of species models.

8. Analysis of forest wildlife trends in Pennsylvania.

9. Information source for biological technical training and public information requests.

Updating

The Pennsylvania Fish and Wildlife Data Base, like any other data source, remains valuable only as long as the information obtained is current and meets the expressed needs of the end-user. Information must be updated periodically, incorporating new research findings and new information elements required by users to maintain value and integrity. Through an extensive review of the present Data Base elements and capabilities with Data Base users, several new elements or categories of information (e.g., life history - behavior, reproduction, population dynamics, and limiting factors) and new element values had been identified for inclusion in the Data Base. Additionally, evaluators emphasized the need to review and incorporate new information on species distribution and life history reported in ecological publications.

PROJECT OBJECTIVE

The objective of this research was to update select Erie coastal zone dwelling species in the Pennsylvania Fish and Wildlife Data Base by summarizing the best available information and adding it to existing and new data categories in the Data Base; that is, by compiling data on animal species seasonal distribution, forest-habitat relationships, environmental associations and preferences, food habits, life history, HEP/PAM-HEP model data, and additional management practices and effects. This effort consisted of a comprehensive survey of existing literature and records, without further field investigation, i.e., a summary of our state-of-knowledge. This information was entered into the Data Base and stored in key-word searchable fashion to facilitate data retrieval and analysis.

Updated faunal data stored and retrieved in the Data Base from this project may be readily obtained to advance Coastal Zone Management program goals requiring the consideration of wildlife resources, including port projects in lakefront areas, public access projects along the coastal zone, coastal zone comprehensive plan updates, and educational programs informing the public of the value of coastal zone areas.

METHODS

Species to be updated were identified by geographic location (Erie Coastal Zone Area), and habitats (e.g., lacustrine littoral systems with cobble/gravel beaches) occurring within the area. Emphasis was placed on species that breed, over-winter, and use adjacent habitats for a significant purpose. The species selected for the project are identified in Figures 1 and 2.

Information from existing literature sources and agency records were obtained to facilitate data summary, and computerized literature surveys (i.e., DIALOG) were completed by Game Commission (PGC) staff. At the same time, consulting biologists were contracted with via Commonwealth competitive contracting procedures to review, critique, and summarize the available species information in the standard Species Workbook format. See Appendix A for a list of subcontractors.

Species Workbooks were reviewed and corrected as needed by PGC staff in Harrisburg. Species Workbook contents were entered into individual files on the Univac computer at Bloomsburg University, Bloomsburg, PA, reviewed and edited as necessary. Each edited species file was verified and batch loaded into the revised Pennsylvania Fish and Wildlife Data Base.

At the time of data review and summarization in Species Workbook format by consulting biologists, PGC staff 1) compiled 23 data entry files on the computer to facilitate data entry of Species Workbook information, and 2) designed and tested a new, revised format for the Pennsylvania Fish and Wildlife Data Base that was capable of accepting data being compiled in the Species Workbooks. All other species profiles in the Data Base (the remaining 802 species) will be updated and loaded into this new, state-of-the-art format.

Figure 1. Birds included in the computerized faunal inventory for the Lake Erie Coastal Zone

Common Name	Scientific Name
Bufflehead	Bucephala albeola
Coot, American	Fulica americana
Duck, Black	Anas rubripes
Duck, Ring-necked	Aythya collaris
Flycatcher, Yellow-bellied	Empidonax flaviventris
Gadwall	Anas strepera
Goldeneye, Common	Bucephala clangula
Heron, Little blue	Egretta caerulea
Kingfisher, Belted	Megaceryle alcyon
Loon-red-throated	Gavia stellata
Merganser, Red-breasted	Mergus serrator
Pintail, Northern	Anas acuta
Plover, Piping	Charadrius melodus
Redhead	Aythya americana
Scoter, Surf	Melanitta perspicillata
Swallow, Bank	Riparia riparia
Swallow, Rough-winged	Stelgidopteryx ruficollis
Swallow, Tree	Tridoprocne bicolor
Tern, Common	Sterna hirundo
Waterthrush, Louisiana	Seiurus motacilla
Waterthrush, Northern	Seiurus noveboracensis
Yellowthroat, Common	Geothlypis trichas

Figure 2. Mammals included in the computerized faunal inventory for the Lake Erie Coastal Zone

Common Name	Scientific Name
Beaver	Castor canadensis
Ermine	Mustela erminea
Lemming, Southern bog	Synaptomys cooperi
Mink	Mustela vison
Mole, Hairy-tailed	Parascalops breweri
Mole, Star-nosed	Condylura cristata
Mouse, Deer	Peromyscus maniculatus
Mouse, Meadow jumping	Zapus hudsonius
Mouse, Woodland jumping	Napaeozapus insignis
Muskrat	Ondatra zibethicus
Opossum, Virginia	Didelphis virginiana
Pipistrelle, Eastern	Pipistrellus subflavus
Raccoon	Procyon lotor
Shrew, Masked	Sorex cinereus
Shrew, Short-tailed	Blarina brevicauda
Shrew, Smoky	Sorex fumeus
Squirrel, Flying, northern	Glaucomys sabrinus
Squirrel, Flying, southern	Glaucomys volans
Vole, Meadow	Microtus pennsylvanicus
Weasel, Long-tailed	Mustela frenata

DESCRIPTION OF SPECIES PROFILE CONTENTS

Species descriptions were compiled by species experts using the standard format, the Pennsylvania Fish and Wildlife Data Base Species Workbook. Appendix B contains a sample. This workbook provides a standard format for species profiles in ten information categories:

1. Taxonomy

Standard, generally accepted, taxonomic references are used to enter common and scientific names, and a complete taxonomic profile from phylum to subspecies. Also included is a narrative discussion of the species taxonomy, and commonly used scientific and common name synonyms that permit greater search efficiency.

2. Status

The status category allows for a description of the species current legal and use status within the Commonwealth and the identification of regulatory authorities. Status types are identified to facilitate locating federal/state endangered/threatened/vulnerable species, as well as a variety of other categories.

3. Distribution

Species distribution within Pennsylvania is discussed narratively and fully referenced. Distribution is coded into separate searchable fields by county using Federal Information Processing Standard (FIPS) codes; 7 1/2' quadrangles; U.S. Geological Survey, Office of Water Data Coordination (OWDC) Hydrologic Units; Bailey's Ecoregion Classification; Kuchler's Potential Natural Vegetation; and, for special status species, latitude/longitude of specific point and areal locations. Also included is seasonal occurrence within each county and relative abundance by county.

4. Habitat Associations

Species - habitat associations are described narratively as discussed in the reviewed literature and using a series of standard habitat surrogates commonly used for habitat inventory and environmental review. Habitat associations used include the U.S. Geological Survey's Land Use and Land Cover Classification system; the U.S. Forest Service's Forest Inventory Classes and Timber Size Classes; and the U.S. Fish and Wildlife Service's National Wetland Inventory Classification System. Additionally, environmental (physical, biological, and ecological) associations and requirements were recorded for each species by life stage.

5. Habitat Evaluation Procedures Models

If final or draft habitat evaluation models were available for a species, this was recorded and the model type identified. Habitats and model elements are listed as well.

6. Animal and Plant Associations

Important animal and/or plant associations, e.g., commensalism, are recorded in this section.

7. Food Habits

Species food habits are described narratively and using a standard set of food resources. Foods consumed by each life stage (e.g., juvenile is recorded separately.

8. Life History

A complete narrative profile of the species life history is compiled in six separate sections: physical description, origin within Pennsylvania, behavior, reproduction, population dynamics, and limiting factors. Select life history paramaters were recorded into 22 separate searchable fields.

9. Management

Management activities that affect the species survival and population levels either positively or negatively are narratively described and recorded using a standard set of management practices.

10. References

All the literature sources and other information sources referenced in compiling the previous nine sections are compiled in this category.

DATA BASE FORMAT

The revised format for the Pennsylvania Fish and Wildlife Data Base includes 120 separate fields of information for each species (Figure 3). Data from each completed Species Workbook are inserted into the Data Base in the designated fields. (Note: only 108 fields contain descriptive information; 12 fields are blank "expansion" fields and receive no data). These fields of data are stored and retrieved using the MANAGE database management system.

Printouts or listings of species accounts before and after updating completed during this study provide an excellent illustration of the additional fields of information included in updating and additional values in existing data fields. Printouts of the short-tailed shrew (Blarina brevicauda) prior to updating (Figure 4) and after updating (Figure 5) are provided for comparative purposes. A field-by-field comparison of these two printouts will highlight the 46 new data fields for each species account, including the expanded narrative discussions and the additional values added in pre-existing fields.

In addition to the short-tailed shrew (a non-game mammalian insectivore occurring in woodlands of the Erie Coastal Zone) displayed in Figure 5, the following updated species accounts are provided as representative examples of the nature and extent of information generated by this project:

Appendix C - Kingfisher, Belted (Megaceryle alcyon):
A non-game avian carnivore that nests in sand and dirt banks in riparian and lakeside areas

Appendix D - Loon, Red-throated (Gavia stellata):
A non-game migrant and occasional wintering bird found at Presque Isle and the Erie coast

Appendix E - Plover, Piping (Charadrius melodus):
A federally-endangered bird that historically nested (and may nest again) on the sand/gravel beaches of Lake Erie

Appendix F - Weasel, Long-tailed (Mustela frenata):
A carnivorous predatory mammal occupying open woods and riparian edges in the Erie Coastal Zone

Appendix G - Raccoon (Procyon lotor):
An omnivorous furbearer occurring in urban, forested, agricultural, and wetland habitats of the coastal zone area.

Figure 3. Fieldnames and definitions of data categories defined in the Pennsylvania Fish and Wildlife Data Base

No.	Fieldname	Definition
1	Spp-code	Species identification number
2	Category	Common name for species class or order (e.g. birds)
3	Com-name	Species common English name
4	Sci-name	Species scientific name (genus and species)
5	Tax-phylum	Species taxonomic classification: phylum
6	Tax-subphylum	Species taxonomic classification: subphylum
7	Tax-class	Species taxonomic classification: class
8	Tax-subclass	Species taxonomic classification: subclass
9	Tax-order	Species taxonomic classification: order
10	Tax-suborder	Species taxonomic classification: suborder
* 11	Tax-superfam	Species taxonomic classification: superfamily
12	Tax-family	Species taxonomic classification: family
13	Tax-sbfamily	Species taxonomic classification: subfamily
* 14	Tax-tribe	Species taxonomic classification: tribe
15	Tax-genus	Species taxonomic classification: genus
16	Tax-subgenus	Species taxonomic classification: subgenus
17	Tax-species	Species taxonomic classification: species
18	Tax-subspec	Species taxonomic classification: subspecies
19	Tax-author	Taxonomic authority for species
20	Spp-status	Species legal status/use category
* 21	Res-status	Species residency status with the Commonwealth
22	Habitat	General habitat classification for species
23	Trophic	Trophic (food) habit best characterizing the species
24	Territory	Territorial behavior of species
* 25	Terr-size	Territory size
* 26	Home-range	Home range size
27	Dispersion	Dispersion pattern of the species
28	Periodicity	Daily and seasonal periodicity of species activities
* 29	Forag-strat	Foraging strategy(ies) employed by species
* 30	Mating	Seasonal mating system of species
* 31	Pair-bond	Duration of mating pair bond
* 32	Display-site	Reproductive display site(s)
* 33	Preg-incubat	Length of gestation/incubation period
* 34	Ave-young	Average number of young/reproductive effort
* 35	Reprod-year	Number of reproductive efforts per year
* 36	Devel-young	Neonate development
* 37	Parent-care	Parental care of young/offspring
38	Pop-trend	Species population trend
39	Pop-future	Species population potential in the future
* 40	HEP	Existing HEP models
41	Entered	Date species record was entered into Data Base
42	Updated	Last date species record was updated in Data Base
43	Expand1	Expansion fields for revisions
44	Expand2	Expansion fields for revisions
45	Expand3	Expansion fields for revisions
46	Expand4	Expansion fields for revisions
47	Expand5	Expansion fields for revisions
* 48	Com-synonyms	Common name synonyms
* 49	Sci-synonyms	Scientific name synonyms

* New data fields

Figure 3. (Continued)

	No.	Fieldname	Definition
	50	Occur-county	Counties in which species occurs
	51	Abs-county	Counties in which species is absent
	52	Unk-county	Counties in which species occurrence is unknown
*	53	Seas-occur	Species occurrence within counties by season
*	54	Abund-cty	Species relative abundance by county
*	55	Hydro-name	Watershed (name) in which species occurs
	56	Hydro-code	Watershed (code) in which species occurs
*	57	Ecoreg-name	Ecoregion (name) in which species occurs
	58	Ecoreg-code	Ecoregion (code) in which species occurs
	59	PNV	potential natural vegetation type in which species occurs
*	60	Quad-name	7 1/2' quadrangle (name) in which species occurs
	61	Quad-code	7 1/2' quadrangle (code) in which species occurs
	62	Latlong	Latitude/longitude points and areas in which species occurs
	63	Landuse-asoc	Landuse/cover types with which species is associated
*	64	Landuse-pref	Landuse/cover types species prefers
*	65	Forest-type	Forest types and size classes with which species is associated
	66	Forest-size	Forest size classes with which species is associated
	67	Wetland-name	Wetland types (names) with which species is associated
	68	Wetland-code	Wetland types (codes) with which species is associated
*	69	Envir-assoc	Environmental parameters with which the species is associated
	70	Envir-lim	Environmental parameters which the species requires
	71	Envir-lim-e	Environmental parameters which the species requires:egg stage
	72	Envir-lim-lf	Environmental parameters which the species requires:feeding lar.
	73	Envir-lim-lr	Environmental parameters which the species requires:rest. larv.
	74	Envir-lim-p	Environmental parameters which the species requires:pupa
	75	Envir-lim-jf	Environmental parameters which the species requires:feed. juv.
	76	Envir-lim-jr	Environmental parameters which the species requires:rest. juv.
	77	Envir-lim-af	Environmental parameters which the species requires:feed. adult
	78	Envir-lim-ar	Environmental parameters which the species requires:rest. adult
	79	Envir-lim-ab	Environmental parameters which the species requires:breed. adult
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	81	Food-l	Food types consumed by species as larval life stage
	82	Food-j	Food types consumed by species as a juvenile
	83	Food-a	Food types consumed by species as an adult
*	84	Forag-site	Foraging site(s) used by species
*	85	Breed-season	Breeding season months
*	86	Spawn-site	Spawning site(s) used by species
*	87	Nest-site	Nest site(s) used by species
*	88	Nest-matrls	Nesting materials used by species
*	89	Trend-cause	Causes for population trend
	90	Mgmt-benefit	Management practices beneficial to the species
	91	Mgmt-harm	Management practices harmful to the species
*	92	N-taxonomy	Narrative discussion of the species taxonomy
*	93	N-spp-status	Narrative discussion of the species legal/use status
*	94	N-distrib	Narrative discussion of the species distribution
*	95	N-habitat	Narrative discussion of the species habitat requirements
*	96	N-food	Narrative discussion of the species food habits
*	97	N-mgmt	Narrative discussion of the species management requirements
*	98	HEP-data	Identification description of HEP models available
*	99	Animal-plant	Discussion of animal-plant associations

* New data fields

Figure 3. (Continued)

No.	Fieldname	Definition
*100	Description	Narrative description of the physical appearance of the sp.
*101	Origin	Narrative discussion of the species origin in Pennsylvania
*102	Behavior	Narrative discussion of the species behavior
*103	Reproduction	Narrative discussion of the species reproductive requirements
*104	Pop-dynamics	Narrative discussion of the species population ecology
*105	Lim-factors	Narrative discussion of the factors limiting the species pop.
106	R-taxonomy	References used for taxonomy information
107	R-Spp-status	References used for status information
108	R-distrib	References used for distribution information
109	R-habitat	References used for habitat information
110	R-food	References used for food habits
111	R-mgmt	References used for management information
112	R-life-hist	References used for life history information
113	References	Complete citations for references used
114	Expand6	Expansion fields for revisions
115	Expand7	Expansion fields for revisions
116	Expand8	Expansion fields for revisions
117	Expand9	Expansion fields for revisions
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* New data fields

Figure 4. Short-tailed shrew species account prior to updating completed during this study.

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Figure 4. (Continued).

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   OAK-HICKORY-PINE
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   063,064,065,075,076,077,078,079,095,097
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   JACK PINE,BALSAM FIR,NORTHERN PIN OAK,RED PINE,ASPEN,PIN CHERRY,
   PAPER BIRCH,GRAY BIRCH-RED MAPLE,WHITE PINE-RED OAK-WHITE ASH,
   WHITE PINE,WHITE PINE-HEMLOCK,HEMLOCK,HEMLOCK-YELLOW BIRCH,
   SUGAR MAPLE-BEECH-YELLOW BIRCH,SUGAR MAPLE-BASSWOOD,SUGAR MAPLE,
   BLACK CHERRY-SUGAR MAPLE,BLACK CHERRY,RED SPRUCE-YELLOW BIRCH,
   RED SPRUCE-SUGAR MAPLE-BEECH,RED SPRUCE,RED SPRUCE-BALSAM FIR,
   RED SPRUCE-FRASER FIR,PAPER BIRCH-RED SPRUCE-BALSAM FIR,
   WHITE SPRUCE-BALSAM FIR-PAPER BIRCH,NORTHERN WHITE CEDAR,TAMARACK,
   BLACK ASH-AMERICAN ELM-RED MAPLE,POST OAK-BLACK OAK,SCARLET OAK,
   BUR OAK,BEAR OAK,CHESTNUT OAK,PITCH PINE,EASTERN REDCEDAR,
   EASTERN REDCEDAR-PINE,EASTERN REDCEDAR-HARDWOOD,
   EASTERN REDCEDAR-PINE-HARDWOOD,BLACK LOCUST,WHITE PINE-CHESTNUT OAK,
   WHITE PINE-RED OAK-HICKORY,WHITE OAK,RED OAK-BASSWOOD-WHITE ASH,
   RED OAK,RED OAK-HOCKERNUT HICKORY-SWEETGUM,YELLOW POPLAR,
   YELLOW POPLAR-HEMLOCK,YELLOW POPLAR-WHITE OAK-RED OAK,
   BEECH-SUGAR MAPLE,RIVER BIRCH-SYCAMORE,SILVER MAPLE-AMERICAN ELM,
   COTTONWOOD,SASSAFRAS-PERSIMMON,PIN OAK-SWEETGUM,SHORTLEAF PINE,
   SHORTLEAF PINE-OAK,SHORTLEAF PINE-VIRGINIA PINE,
   VIRGINIA PINE-SOUTHERN RED OAK,VIRGINIA PINE,BLACK WILLOW,
   ATLANTIC WHITE CEDAR
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   32
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   SHRUB-BRUSH
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   CONFINED FEEDING OPERATIONS,OTHER AGRICULTURE LAND
<FOREST>
   40,41,42,43
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   ALL FOREST LAND,DECIDUOUS,EVERGREEN,MIXED
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   10,11,12,13,14,15,16,17
<URBAN-T>
   ALL URBAN LAND,RESIDENTIAL,COMMERCIAL-SERVICES,INDUSTRIAL,
   TRANSPORTATION-UTILITIES,INDUSTRIAL-COMMERCIAL,MIXED URBAN,
   OTHER URBAN LAND
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(Continued on next page)

Figure 4. (Continued).

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   INSECTS-IMMATURE TERRESTRIAL,ARTHROPODS-OTHER TERRESTRIAL,
   WORMS-TERRESTRIAL,INVERTEBRATES-OTHER TERRESTRIAL,CRUSTACEANS-AQUATIC,
   SNAILS-AQUATIC,MAMMALS-JUVENILE/NESTLINGS,REPTILE JUVENILES,
   AMPHIBIAN JUVENILES,AMPHIBIAN ADULTS,CARRION
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   INSECTS-IMMATURE TERRESTRIAL,ARTHROPODS-OTHER TERRESTRIAL,
   WORMS-TERRESTRIAL,INVERTEBRATES-OTHER TERRESTRIAL,CRUSTACEANS-AQUATIC,
   SNAILS-AQUATIC,MAMMALS-JUVENILE/NESTLINGS,REPTILE JUVENILES,
   AMPHIBIAN JUVENILES,AMPHIBIAN ADULTS,CARRION
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<NICHE-P-T>
<NICHE-JF>
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   ORCHARDS:SEE COMMENTS,PASTURES:SEE COMMENTS,GRASSLAND:SEE COMMENTS,
   MEADOWS:SEE COMMENTS,OLD FIELDS:SEE COMMENTS,SHRUBS:SEE COMMENTS,
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   HARDWOOD FOREST ASSOCIATION:SEE COMMENTS
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   C9020S
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   ORCHARDS:SEE COMMENTS,PASTURES:SEE COMMENTS,GRASSLAND:SEE COMMENTS,
   MEADOWS:SEE COMMENTS,OLD FIELDS:SEE COMMENTS,SHRUBS:SEE COMMENTS,
   CONIFEROUS FOREST ASSOCIATION:SEE COMMENTS,
   HARDWOOD FOREST ASSOCIATION:SEE COMMENTS,NEST SITES:SEE COMMENTS
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   C8920S,09340S,09400S,09460S,09520S,09580S,09640S,09700S,09760S,09820S,
   C9040S
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(Continued on next page)

Figure 4. (Continued).

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   ORCHARDS:SEE COMMENTS,PASTURES:SEE COMMENTS,GRASSLAND:SEE COMMENTS,
   MEADOWS:SEE COMMENTS,OLD FIELDS:SEE COMMENTS,SHRUBS:SEE COMMENTS,
   CONIFEROUS FOREST ASSOCIATION:SEE COMMENTS,
   HARDWOOD FOREST ASSOCIATION:SEE COMMENTS,NEST SITES:SEE COMMENTS
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   LEAF LITTER/DEBRIS/HUMUS:SEE COMMENTS,GRASSES:SEE COMMENTS,
   ORCHARDS:SEE COMMENTS,PASTURES:SEE COMMENTS,GRASSLAND:SEE COMMENTS,
   MEADOWS:SEE COMMENTS,OLD FIELDS:SEE COMMENTS,SHRUBS:SEE COMMENTS,
   CONIFEROUS FOREST ASSOCIATION:SEE COMMENTS,
   HARDWOOD FOREST ASSOCIATION:SEE COMMENTS
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   C9O3OS
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   ORCHARDS:SEE COMMENTS,PASTURES:SEE COMMENTS,GRASSLAND:SEE COMMENTS,
   MEADOWS:SEE COMMENTS,OLD FIELDS:SEE COMMENTS,SHRUBS:SEE COMMENTS,
   CONIFEROUS FOREST ASSOCIATION:SEE COMMENTS,
   HARDWOOD FOREST ASSOCIATION:SEE COMMENTS,NEST SITES:SEE COMMENTS
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   C14,G22
<MGMT-B-T>
   PLANTINGS,REFORESTATION
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   CO2,OO3,OO1
<MGMT-A-T>
   APPLICATION OF INSECTICIDES,APPLICATION OF PESTICIDES,
   APPLICATION OF HERBICIDES
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   C1BURT, W.H. 1969. MAMMALS OF THE GREAT LAKES REGION. UNIV. OF
   C1MICHIGAN PRESS, ANN ARBOR. 246 PP.
   C2DOUTT, J.K., C.A. HEPPENSTALL, AND J.E. GUILDAY. 1977. MAMMALS OF
   C2PENNSYLVANIA. PA. GAME COMM., HARRISBURG. 282 PP.
   C3KIRKLAND, G.L., JR. 1978. THE SHORT-TAILED SHREW, BLARINA BREVICAUDA
   C3(SAY), IN THE CENTRAL MOUNTAINS OF WEST VIRGINIA. PROCEEDINGS OF THE
   C3PA. ACAD. SCI. 52:126-3O. 1978.
   C4PALMER, R.S. 1954. THE MAMMAL GUIDE. DOUBLEDAY AND CO., INC., GARDEN
   C4CITY, N.Y. 384 PP.
   O5RHODES, S.N. 1903. THE MAMMALS OF PENNSYLVANIA AND NEW JERSEY.
   C5PRIVATELY PUBLISHED, PHILADELPHIA. 266 PP.
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   AUTHORITY                 01
   DISTRIBUTION/ABUNDANCE    021977
   %COUNTIES                 02
   HYDROUNIT                 02
   ECOREGION                 02
   PNV                       02
   FTYPE                     02,04
   FSIZE                     02,03
   STATUS                    01,02
   ORIGIN                    02
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(Continued on next page)

Figure 4. (Continued).

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   HABITAT                    02
   RANGELAND                  04
   AGRICULTURE                01
   FOREST                     01
   URBAN                      02
   FOOD-J                     01,02,04,05
   FOOD-A                     01,02,04,05
   NICHE-JF                   01,02,03,04
   NICHE-JR                   01,02,03,04
   NICHE-AB                   01,02,03,04
   NICHE-AF                   01,02,03,04
   NICHE-AR                   01,02,03,04
   C-NICHE-S                  02
   MANAGEMENT-B               02
   MANAGEMENT-A               02
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<C-TAXONOMY>
<C-STATUS>
   CONSIDERABLE ECONOMIC IMPORTANCE AS INSECT DESTROYER.*01*
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   TUNNELS IN TOP INCHES OF LEAF LITTER, UNDER COVER, IN SNOW.*02*
<C-NICHE-JR>
   TUNNELS IN TOP FEW INCHES LEAF LITTER OR UNDER COVER.*02*  NESTS 6-8
   IN. DIAMETER OF DRY LEAVES, GRASSES, INFREQUENTLY MOUSE FUR UNDER LOGS
   .*01*
<C-NICHE-AB>
   NESTS 6-8 IN. DIAMETER OF DRY LEAVES, GRASSES, INFREQUENTLY MOUSE FUR,
   1-12 IN. UNDER LOGS.*01*
<C-NICHE-AF>
   FEED IN TUNNELS A FEW INCHES IN LEAF LITTER, SNOW, UNDER COVER.*02*
<C-NICHE-AR>
   NESTS 6-8 IN. DIAMETER OF DRY LEAVES, GRASSES, INFREQUENTLY MOUSE FUR
   UNDER LOGS 1-12 IN.*01*
<C-NICHE-G>
<C-NICHE-S>
   TUNNEL IN SNOW IN WINTER.*02*
<C-MANAGEMENT>
<C-OTHER>
   *****DISTRIBUTION BY SAF FOREST COVER TYPES (FTYPE)*****
   ALL TYPES OF WOODLANDS.*04*
   *****PERIODICITY DESCRIPTORS (PERIODICITY)*****
   OCCASIONALLY ACTIVE DURING DAY.*02*
   *****GENERAL HABITAT ASSOCIATIONS (HABITAT)*****
   BURROW IN TOP FEW INCHES OF SOIL, LEAF LITTER.*02*
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Figure 5. Short-tailed shrew species account after updating completed by this study.

<SPP-CODE> 0500007 <CATEGORY> MAMMAL <COM-NAME> SHREW, SHORT-TAILED
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<TAX-SUBSPEC> <TAX-AUTHOR> SAY 1823 <SPP-STATUS> NONE
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<UPDATED>
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SOREX BREVICAUDUS,BLARINA BREVICAUDA,BLARINA COSTARICENSIS,
BLARINA FOSSALIS,BLARINA BREVICAUDA KIRTLANDI
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ADAMS,ALLEGHENY,ARMSTRONG,BEAVER,BEDFORD,BERKS,BLAIR,BRADFORD,BUCKS,
BUTLER,CAMBRIA,CAMERON,CARBON,CENTRE,CHESTER,CLARION,CLEARFIELD,
CLINTON,COLUMBIA,CRAWFORD,CUMBERLAND,DAUPHIN,DELAWARE,ELK,ERIE,
FAYETTE,FOREST,FRANKLIN,FULTON,GREENE,HUNTINGDON,INDIANA,JEFFERSON,
JUNIATA,LACKAWANNA,LANCASTER,LAWRENCE,LEBANON,LEHIGH,LUZERNE,LYCOMING,
MCKEAN,MERCER,MIFFLIN,MONROE,MONTGOMERY,MONTOUR,NORTHAMPTON,
NORTHUMBERLAND,PERRY,PHILADELPHIA,PIKE,POTTER,SCHUYLKILL,SNYDER,
SOMERSET,SULLIVAN,SUSQUEHANNA,TIOGA,UNION,VENANGO,WARREN,WASHINGTON,
WAYNE,WESTMORELAND,WYOMING,YORK
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<UNK-COUNTY>
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BERKS:SBFW,BLAIR:SBFW,BRADFORD:SBFW,BUCKS:SBFW,BUTLER:SBFW,
CAMBRIA:SBFW,CAMERON:SBFW,CARBON:SBFW,CENTRE:SBFW,CHESTER:SBFW,
CLARION:SBFW,CLEARFIELD:SBFW,CLINTON:SBFW,COLUMBIA:SBFW,
CRAWFORD:SBFW,CUMBERLAND:SBFW,DAUPHIN:SBFW,DELAWARE:SBFW,ELK:SBFW,
ERIE:SBFW,FAYETTE:SBFW,FOREST:SBFW,FRANKLIN:SBFW,FULTON:SBFW,
GREENE:SBFW,HUNTINGDON:SBFW,INDIANA:SBFW,JEFFERSON:SBFW,JUNIATA:SBFW,
LACKAWANNA:SBFW,LANCASTER:SBFW,LAWRENCE:SBFW,LEBANON:SBFW,
LEHIGH:SBFW,LUZERNE:SBFW,LYCOMING:SBFW,MCKEAN:SBFW,MERCER:SBFW,
MIFFLIN:SBFW,MONROE:SBFW,MONTGOMERY:SBFW,MONTOUR:SBFW,
NORTHAMPTON:SBFW,NORTHUMBERLAND:SBFW,PERRY:SBFW,PHILADELPHIA:SBFW,
PIKE:SBFW,POTTER:SBFW,SCHUYLKILL:SBFW,SNYDER:SBFW,SOMERSET:SBFW,
SULLIVAN:SBFW,SUSQUEHANNA:SBFW,TIOGA:SBFW,UNION:SBFW,VENANGO:SBFW,
WARREN:SBFW,WASHINGTON:SBFW,WAYNE:SBFW,WESTMORELAND:SBFW,WYOMING:SBFW,
YORK:SBFW
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ADAMS:A,ALLEGHENY:A,ARMSTRONG:A,BEAVER:A,BEDFORD:A,BERKS:A,BLAIR:A,
BRADFORD:A,BUCKS:A,BUTLER:A,CAMBRIA:A,CAMERON:A,CARBON:A,CENTRE:A,
CHESTER:A,CLARION:A,CLEARFIELD:A,CLINTON:A,COLUMBIA:A,CRAWFORD:A,
CUMBERLAND:A,DAUPHIN:A,DELAWARE:A,ELK:A,ERIE:A,FAYETTE:A,FOREST:A,
FRANKLIN:A,FULTON:A,GREENE:A,HUNTINGDON:A,INDIANA:A,JEFFERSON:A,
JUNIATA:A,LACKAWANNA:A,LANCASTER:A,LAWRENCE:A,LEBANON:A,LEHIGH:A,
LUZERNE:A,LYCOMING:A,MCKEAN:A,MERCER:A,MIFFLIN:A,MONROE:A,
MONTGOMERY:A,MONTOUR:A,NORTHAMPTON:A,NORTHUMBERLAND:A,PERRY:A,
PHILADELPHIA:A,PIKE:A,POTTER:A,SCHUYLKILL:A,SNYDER:A,SOMERSET:A,
SULLIVAN:A,SUSQUEHANNA:A,TIOGA:A,UNION:A,VENANGO:A,WARREN:A,
WASHINGTON:A,WAYNE:A,WESTMORELAND:A,WYOMING:A,YORK:A
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UPPER DELAWARE:UPPER DELAWARE,

(Continued on next page)

Figure 5. (Continued).

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   UPPER DELAWARE:LACKAWAXEN,
   UPPER DELAWARE:MIDDLE DELAWARE/MONGAUP/BRODHEAD,
   UPPER DELAWARE:MIDDLE DELAWARE/MUSCONETCONG,
   UPPER DELAWARE:LEHIGH,
   LOWER DELAWARE:CROSSWICKS-NESHAMINY,
   LOWER DELAWARE:LOWER DELAWARE,
   LOWER DELAWARE:SCHUYLKILL,
   LOWER DELAWARE:BRANDYWINE-CHRISTINA,
   UPPER SUSQUEHANNA:UPPER SUSQUEHANNA,
   UPPER SUSQUEHANNA:OWEGO-WAPPASENING,
   UPPER SUSQUEHANNA:TIOGA,
   UPPER SUSQUEHANNA:CHEMUNG,
   UPPER SUSQUEHANNA:UPPER SUSQUEHANNA-TUNKHANNOCK,
   UPPER SUSQUEHANNA:UPPER SUSQUEHANNA-LACKAWANNA,
   WEST BRANCH SUSQUEHANNA:UPPER WEST BRANCH SUSQUEHANNA,
   WEST BRANCH SUSQUEHANNA:SINNEMAHONING,
   WEST BRANCH SUSQUEHANNA:MIDDLE WEST BRANCH SUSQUEHANNA,
   WEST BRANCH SUSQUEHANNA:BALD EAGLE,
   WEST BRANCH SUSQUEHANNA:PINE,
   WEST BRANCH SUSQUEHANNA:LOWER WEST BRANCH SUSQUEHANNA,
   LOWER SUSQUEHANNA:LOWER SUSQUEHANNA-PENNS,
   LOWER SUSQUEHANNA:UPPER JUNIATA,
   LOWER SUSQUEHANNA:RAYSTOWN,
   LOWER SUSQUEHANNA:LOWER JUNIATA,
   LOWER SUSQUEHANNA:LOWER SUSQUEHANNA-SWATARA,
   LOWER SUSQUEHANNA:LOWER SUSQUEHANNA,
   UPPER CHESAPEAKE:CHESTER-SASSAFRAS,
   UPPER CHESAPEAKE:GUNPOWDER-PATAPSCO,
   POTOMAC:NORTH BRANCH POTOMAC,
   POTOMAC:CACAPON-TONN,
   POTOMAC:CONOCOCHEAGUE-OPEQUON,
   POTOMAC:MONOCACY,
   SOUTHERN LAKE ERIE:ASHTABULA,
   EASTERN LAKE ERIE:CHAUTAUQUA-CONNEAUT,
   LAKE ERIE:LAKE ERIE,
   SOUTHWESTERN LAKE ONTARIO:UPPER GENESEE,
   ALLEGHENY:UPPER ALLEGHENY,
   ALLEGHENY:CONEWANGO,
   ALLEGHENY:MIDDLE ALLEGHENY,
   ALLEGHENY:FRENCH,
   ALLEGHENY:CLARION,
   ALLEGHENY:MIDDLE ALLEGHENY-REDBANK,
   ALLEGHENY:CONEMAUGH,
   ALLEGHENY:KISKIMINETAS,
   ALLEGHENY:LOWER ALLEGHENY,
   MONONGAHELA:UPPER MONONGAHELA,
   MONONGAHELA:CHEAT,
   MONONGAHELA:LOWER MONONGAHELA,
   MONONGAHELA:YOUGHIOGHENY,
   UPPER OHIO:UPPER OHIO,
   UPPER OHIO:SHENANGO,
   UPPER OHIO:MAHONING,
   UPPER OHIO:BEAVER,
   UPPER OHIO:CONNOQUENESSING,
   UPPER OHIO:UPPER OHIO-WHEELING
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(Continued on next page)

Figure 5. (Continued).

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   05020006,05030101,05030102,05030103,05030104,05030105,05030106
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   NORTHERN HARDWOODS FOREST, 50-80% GENTLY SLOPING, 100-300 FT.
   ELEVATION, 50-75% OF GENTLE SLOPE IS IN LOWLAND;
   NORTHERN HARDWOODS FOREST, 50-80% GENTLY SLOPING, 300-500 FT.
   ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
   NORTHERN HARDWOODS FOREST, 20-50% GENTLY SLOPING, 500-[illegible] FT.
   ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
   NORTHERN HARDWOODS FOREST, 20-50% GENTLY SLOPING, 500-1000 FT.
   ELEVATION, MORE THAN 75% OF GENTLE SLOPE IS ON UPLAND;
   NORTHERN HARDWOODS FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT.
   ELEVATION, MORE THAN 75% OF GENTLE SLOPE IS IN LOWLAND;
   NORTHERN HARDWOODS FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT.
   ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
   NORTHERN HARDWOODS FOREST, LESS THAN 20% GENTLE SLOPING,
   1000-3000 FT. ELEVATION;
   MIXED MESOPHYTIC FOREST, 20-50% GENTLY SLOPING, 500-1000 FT.
   ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
   MIXED MESOPHYTIC FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT.
   ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
   MIXED MESOPHYTIC FOREST, LESS THAN 20% GENTLY SLOPING,
   500-1000 FT. ELEVATION;
   BEECH-MAPLE FOREST, 50-80% GENTLY SLOPING, [illegible]-300 FT.
   ELEVATION, 50-75% OF GENTLE SLOPE IS IN LOWLAND;
   BEECH-MAPLE FOREST, 50-80% GENTLY SLOPING, 300-500 FT.
   ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
   APPALACHIAN OAK FOREST, MORE THAN 80% GENTLY SLOPING,
   0-100 FT. ELEVATION;
   APPALACHIAN OAK FOREST, MORE THAN 80% GENTLY SLOPING,
   100-300 FT. ELEVATION, 50-75% OF GENTLE SLOPE IS IN LOWLAND;
   APPALACHIAN OAK FOREST, 50-80% GENTLY SLOPING, 100-300 FT.
   ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
   APPALACHIAN OAK FOREST, 50-80% GENTLY SLOPING, 300-500 FT.
   ELEVATION, 50-75% OF GENTLE SLOPE IS ON LOWLAND;
   APPALACHIAN OAK FOREST, 50-80% GENTLY SLOPING, 300-500 FT.
   ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
   APPALACHIAN OAK FOREST, 50-80% GENTLY SLOPING, 500-1000 FT.
   ELEVATION, LESS THAN 75% OF GENTLE SLOPE IS IN LOWLAND;
   APPALACHIAN OAK FOREST, 20-50% GENTLY SLOPING, 500-1000 FT.
   ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
   APPALACHIAN OAK FOREST, 20-50% GENTLY SLOPING, 500-1000 FT.
   ELEVATION, MORE THAN 75% OF GENTLE SLOPE IS ON UPLAND;
   APPALACHIAN OAK FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT.
   ELEVATION, LESS THAN 75% OF GENTLE SLOPE IS IN LOWLAND;
   APPALACHIAN OAK FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT.
   ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
   APPALACHIAN OAK FOREST, LESS THAN 20% GENTLY SLOPING, 500-1000 FT.
   ELEVATION;
   APPALACHIAN OAK FOREST, LESS THAN 20% GENTLY SLOPING, 1000-3000 FT.
   ELEVATION;
   SOUTHERN MIXED FOREST, 50-80% GENTLY SLOPING, 300-500 FT.
   ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND
<ECOREG-CODE>
   2113B2B,2113B3C,2113C4C,2113C4D,2113C5A,2113C5C,2113D5D,2211C4C,
   2211C5C,2211D4D,2212B2B,2212B3C,2214A1C,2214A2B,2214B2C,2214B3B,
   2214B3C,2214B4A,2214C4C,2214C4D,2214C5A,2214C5C,2214D4D,2214D5D,
   2320B3C
<PNV>
   BEECH-MAPLE,MIXED MESOPHYTIC,APPALACHIAN OAK, NORTHERN HARDWOODS,
   OAK-HICKORY-PINE
<QUAD-NAME>
   NEWARK WEST,BAY VIEW,WOODBURY,BRIDGEPORT,MARCUS HOOK,WILMINGTON NORTH,
   KENNETT SQUARE,WEST GROVE,OXFORD,CAMDEN,PHILADELPHIA,LANSDOWNE,MEDIA,
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(Continued on next page)

Figure 5. (Continued)

WEST CHESTER,UNIONVILLE,COATESVILLE,PARKESBURG,RISING SUN,
CONOWINGO DAM,DELTA,FAWN GROVE,NORRISVILLE,NEW FREEDOM,LINEBORO,
MANCHESTER,KIRKWOOD,WAKEFIELD,HOLTWOOD,AIRVILLE,STEWARTSTOWN,
GLEN ROCK,SEVEN VALLEYS,HANOVER,GAP,QUARRYVILLE,CONESTOGA,SAFE HARBOR,
RED LION,YORK,WEST YORK,ABBOTTSTOWN,LITTLESTOWN,TANEYTOWN,EMMITSBURG,
BLUE RIDGE SUMMIT,SMITHSBURG,HAGERSTOWN,MASON DIXON,CLEAR SPRING,
MC SHERRYSTOWN,GETTYSBURG,FAIRFIELD,IRON SPRINGS,WAYNESBORO,
GREENCASTLE,WILLIAMSON,MERCERSBURG,HAMPTON,BIGLERVILLE,ARENDTSVILLE,
CALEDONIA PARK,SCOTLAND,CHAMBERSBURG,ST THOMAS,MC CONNELLSBURG,
CHERRY RUN,HANCOCK (MD),BELLEGROVE,ARTEMAS,FLINTSTONE,
EVITTS CREEK,CUMBERLAND,FROSTBURG,BIG COVE TANNERY,NEEDMORE,AMARANTH,
CHANEYSVILLE,BEANS COVE,HYNDMAN,FAIRHOPE,WITTENBERG,MEADOW GROUNDS,
BREEZEWOOD,MENCH,CLEARVILLE,RAINSBURG,BUFFALO MILLS,NEW BALTIMORE,
BERLIN,AVILTON,GRANTSVILLE,ACCIDENT,FRIENDSVILLE (MD),BRANDONVILLE,
BRUCETON MILLS,LAKE LYNN,MORGANTOWN NORTH,MEYERSDALE,MARKLETON,
CONFLUENCE,OHIOPYLE,FT NECESSITY,BROWNFIELD,SMITHFIELD,MASONTOWN,
MURDOCK,ROCKWOOD,KINGWOOD,MILL RUN,SOUTH CONNELLSVILLE,UNIONTOWN,
NEW SALEM,CARMICHAELS,OSAGE,BLACKSVILLE,WADESTOWN,HUNDRED,LITTLETON,
GARARDS FORT,OAK FOREST,HOLBROOK,NEW FREEPORT,CAMERON (WV),MATHER,
WAYNESBURG,ROGERSVILLE,WIND RIDGE,MAJORSVILLE,BRISTOL,BEVERLY,
TRENTON EAST,TRENTON WEST,LANGHORNE,PENNINGTON,LAMBERTVILLE,STOCKTON,
FRANKFORD,GERMANTOWN,NORRISTOWN,VALLEY FORGE,MALVERN,DOWNINGTOWN,
WAGONTOWN,HONEY BROOK,HATBORO,AMBLER,LANSDALE,COLLEGEVILLE,
PHOENIXVILLE,POTTSTOWN,ELVERSON,MORGANTOWN,BUCKINGHAM,DOYLESTOWN,
TELFORD,PERKIOMENVILLE,SASSAMANSVILLE,BOYERTOWN,BIRDSBORO,READING,
LUMBERVILLE,BEDMINSTER,QUAKERTOWN,MILFORD SQUARE,EAST GREENVILLE,
MANATAWNY,FLEETWOOD,TEMPLE,FRENCHTOWN,RIEGELSVILLE,HELLERTOWN,
ALLENTOWN EAST,ALLENTOWN WEST,TOPTON,KUTZTOWN,HAMBURG,EASTON,NAZARETH,
CATASAUQUA,CEMENTON,SLATEDALE,NEW TRIPOLI,NEW RINGGOLD,BELVIDERE,
BANGOR,WIND GAP,KUNKLETOWN,PALMERTON,LEHIGHTON,NESQUEHONING,TAMAQUA,
PORTLAND,STROUDSBURG,SAYLORSBURG,BROOMEADSVILLE,POHOPOCO MTN,
CHRISTMANS,WEATHERLY,HAZLETON,NEW HOLLAND,LEOLA,LANCASTER,
COLUMBIA EAST,COLUMBIA WEST,YORK HAVEN,DOVER,WELLSVILLE,TERRE HILL,
EPHRATA,LITITZ,MANHEIM,ELIZABETHTOWN,MIDDLETOWN,STEELTON,LEMOYNE,
SINKING SPRING,WOMELSDORF,RICHLAND,LEBANON,PALMYRA,HERSHEY,
HARRISBURG EAST,HARRISBURG WEST,BERNVILLE,STRAUSSTOWN,BETHEL,
FREDERICKSBURG,INDIANTOWN GAP,GRANTVILLE,ENDERS,HALIFAX,AUBURN,
FRIEDENSBURG,SWATARA HILL,PINE GROVE,TOWER CITY,LYKENS,ELIZABETHVILLE,
MILLERSBURG,ORWIGSBURG,POTTSVILLE,MINERSVILLE,TREMONT,VALLEY VIEW,
KLINGERSTOWN,PILLOW,DALMATIA,DELANO,SHENANDOAH,ASHLAND,MT CARMEL,
SHAMOKIN,TREVORTON,SUNBURY,FREEBURG,CONYNGHAM,NUREMBERG,SHUMANS,
CATAWISSA,DANVILLE,RIVERSIDE,NORTHUMBERLAND,LEWISBURG,DILLSBURG,
MOUNT HOLLY SPRINGS,DICKINSON,WALNUT BOTTOM,SHIPPENSBURG,ROXBURY,
FANNETTSBURG,BURNT CABINS,MECHANICSBURG,CARLISLE,PLAINFIELD,NEWVILLE,
NEWBURG,DOYLESBURG,SHADE GAP,ORBISONIA,WERTZVILLE,SHERMANS DALE,
LANDISBURG,ANDERSONBURG,BLAIN,BLAIRS MILLS,AUGHWICK,BUTLER KNOB,
DUNCANNON,NEWPORT,ICKESBURG,SPRUCE HILL,MC COYSVILLE,MC VEYTOWN,
NEWTON HAMILTON,MOUNT UNION,REWARD,MILLERSTOWN,MEXICO,MIFFLINTOWN,
LEWISTOWN,BELLEVILLE,ALLENSVILLE,DONATION,RICHFIELD,BEAVER SPRINGS,
MC CLURE,ALFARATA,BURNHAM,BARRVILLE,MC ALEVYS FORT,PINE GROVE MILLS,
MIDDLEBURG,BEAVERTOWN,WEIKERT,COBURN,SPRING MILLS,CENTRE HALL,
STATE COLLEGE,JULIAN,MIFFLINBURG,HARTLETON,WOODWARD,MILLHEIM,
MADISONBURG,MINGOVILLE,BELLEFONTE,BEAR KNOB,HUSTONTOWN,WELLS TANNERY,
EVERETT EAST,EVERETT WEST,BEDFORD,SCHELLSBURG,CENTRAL CITY,STOYSTOWN,
SALTILLO,SAXTON,HOPEWELL,NEW ENTERPRISE,ALUM BANK,OGLETOWN,WINDBER,
HOOVERSVILLE,CASSVILLE,ENTRIKEN,MARTINSBURG,ROARING SPRING,BLUE KNOB,
BEAVERDALE,GEISTOWN,JOHNSTOWN,HUNTINGDON,WILLIAMSBURG,FRANKSTOWN,
HOLLIDAYSBURG,CRESSON,EBENSBURG,NANTY GLO,VINTONDALE,ALEXANDRIA,
SPRUCE CREEK,BELLWOOD,ALTOONA,ASHVILLE,CARROLLTOWN,COLVER,STRONGSTOWN,
FRANKLINVILLE,TYRONE,TIPTON,BLANDBURG,COALPORT,HASTINGS,BARNESBORO,
COMMODORE,PORT MATILDA,SANDY RIDGE,HOUTZDALE,RAMEY,IRVONA,WESTOVER,
BURNSIDE,ROCHESTER MILLS,BLACK MOSHANNON,PHILIPSBURG,WALLACETON,
GLEN RICHEY,CURWENSVILLE,MAHAFFEY,MCGEES MILLS,PUNXSUTAWNEY,SOMERSET,

(Continued on next page)

Figure 5. (Continued).

BAKERSVILLE,SEVEN SPRINGS,DONEGAL,CONNELLSVILLE,DAWSON,FAYETTE CITY,
CALIFORNIA,BOSWELL,LIGONIER,STAHLSTOWN,MAMMOTH,MT PLEASANT,SMITHTON,
DONORA,MONONGAHELA,RACHELWOOD,WILPEN,DERRY,LATROBE,GREENSBURG,IRWIN,
MC KEESPORT,GLASSPORT,NEW FLORENCE,BOLIVAR,BLAIRSVILLE,SALTSBURG,
SLICKVILLE,MURRYSVILLE,BRADDOCK,PITTSBURGH EAST,BRUSH VALLEY,INDIANA,
MC INTYRE,AVONMORE,VANDERGRIFT,NEW KENSINGTON EAST,
NEW KENSINGTON WEST,GLENSHAW,CLYMER,ERNEST,ELDERTON,WHITESBURG,
LEECHBURG,FREEPORT,CURTISVILLE,VALENCIA,MARION CENTER,PLUMVILLE,
RURAL VALLEY,MOSGROVE,KITTANNING,WORTHINGTON,SAXONBURG,BUTLER,WALTER,
DAYTON,DISTANT,TEMPLETON,EAST BRADY,CHICORA,EAST BUTLER,MT CHESTNUT,
ELLSWORTH,AMITY,PROSPERITY,CLAYSVILLE,VALLEY GROVE,HACKETT,
WASHINGTON EAST,WASHINGTON WEST,WEST MIDDLETOWN,BETHANY,BRIDGEVILLE,
CANONSBURG,MIDWAY,AVELLA,STEUBENVILLE EAST,PITTSBURGH WEST,OAKDALE,
CLINTON,BURGETTSTOWN,WEIRTON,EMSWORTH,AMBRIDGE,ALIQUIPPA,HOOKSTOWN,
EAST LIVERPOOL SOUTH,MARS,BADEN,BEAVER,MIDLAND,EAST LIVERPOOL NORTH,
EVANS CITY,ZELIENOPLE,BEAVER FALLS,NEW GALILEE,EAST PALESTINE,
PROSPECT,PORTERSVILLE,NEW CASTLE SOUTH,BESSEMER,NEW MIDDLETOWN,
FLATBROOKVILLE,CULVERS GAP,LAKE MASKENOZHA,PORT JERVIS SOUTH,MILFORD,
EDGEMERE,PORT JERVIS NORTH,POND EDDY,SHOHOLA,ELDRED (NY),BUSHKILL,
EAST STROUDSBURG,MOUNT POCONO,POCONO PINES,BLAKESLEE,HICKORY RUN,
WHITE HAVEN,FREELAND,TWELVEMILE POND,SKYTOP,BUCK HILL FALLS,TOBYHANNA,
THORNHURST,PLEASANT VIEW SUMMIT,WILKES-BARRE EAST,WILKES-BARRE WEST,
PECKS POND,PROMISED LAND,NEWFOUNDLAND,STERLING,MOSCOW,AVOCA,PITTSTON,
KINGSTON,ROWLAND,HAWLEY,LAKEVILLE,LAKE ARIEL,OLYPHANT,SCRANTON,RANSOM,
CENTER MORELAND,NARROWSBURG,WHITE MILLS,HONESDALE,WAYMART,CARBONDALE,
DALTON,FACTORYVILLE,TUNKHANNOCK,DAMASCUS,GALILEE,ALDENVILLE,
FOREST CITY,CLIFFORD,LENOXVILLE,HOP BOTTOM,SPRINGVILLE,CALLICOON,
LONG EDDY,LAKE COMO,ORSON,THOMPSON,HARFORD,MONTROSE EAST,
MONTROSE WEST,HANCOCK,STARRUCCA,SUSQUEHANNA,GREAT BEND,FRANKLIN FORKS,
LAUREL LAKE,SYBERTSVILLE,BERWICK,MIFFLINVILLE,BLOOMSBURG,MILLVILLE,
WASHINGTONVILLE,MILTON,ALLENWOOD,NANTICOKE,SHICKSHINNY,STILLWATER,
BENTON,LAIRDSVILLE,HUGHESVILLE,MUNCY,MONTOURSVILLE SOUTH,HARVEYS LAKE,
SWEET VALLEY,RED ROCK,ELK GROVE,SONESTOWN,PICTURE ROCKS,HUNTERSVILLE,
MONTOURSVILLE NORTH,NOXEN,DUTCH MTN,LOPEZ,LAPORTE,EAGLES MERE,
HILLSGROVE,BARBOURS,BODINES,MESHOPPEN,JENNINGSVILLE,COLLEY,DUSHORE,
OVERTON,SHUNK,GROVER,RALSTON,AUBURN CENTER,LACEYVILLE,WYALUSING,
MONROETON,POWELL,LEROY,CANTON,GLEASON,LAWTON,LE RAYSVILLE,ROME,
TOWANDA,ULSTER,EAST TROY,TROY,ROSEVILLE,FRIENDSVILLE,LITTLE MEADOWS,
WINDHAM,LITCHFIELD,SAYRE,BENTLEY CREEK,GILLETT,MILLERTON,
WILLIAMSPORT SE,CARROLL,LOGANTON,MILL HALL,BEECH CREEK,HOWARD,
SNOW SHOE SE,SNOW SHOE,WILLIAMSPORT,LINDEN,JERSEY SHORE,LOCK HAVEN,
FARRANDSVILLE,HOWARD NW,SNOW SHOE NE,SNOW SHOW NW,COGAN STATION,
SALLADASBURG,WATERVILLE,JERSEY MILLS,GLEN UNION,RENOVO EAST,
RENOVO WEST,KEATING,TROUT RUN,WHITE PINE,ENGLISH CENTER,CAMMAL,
SLATE RUN,YOUNG WOMANS CREEK,TAMARACK,HAMMERSLEY FORK,LIBERTY,NAUVOO,
MORRIS,CEDAR RUN,LEE FIRE TOWER,OLEONA,SHORT RUN,CONRAD,BLOSSBURG,
CHERRY FLATS,ANTRIM,TIADAGHTON,MARSHLANDS,GALETON,CHERRY SPRINGS,
AYERS HILL,MANSFIELD,CROOKED CREEK,KEENEYVILLE,ASAPH,SABINSVILLE,
WEST PIKE,BROOKLAND,SWEDEN VALLEY,JACKSON SUMMIT,TIOGA,ELKLAND,
KNOXVILLE,POTTER BROOK,HARRISON VALLEY,ULYSSES,ELLISBURG,KARTHAUS,
FRENCHVILLE,LECONTES MILLS,CLEARFIELD,ELLIOTT PARK,LUTHERSBURG,
DU BOIS,REYNOLDSVILLE,POTTERSDALE,DEVILS ELBOW,THE KNOBS,HUNTLEY,
PENFIELD,SABULA,FALLS CREEK,HAZEN,SINNEMAHONING,DRIFTWOOD,DENTS RUN,
WEEDVILLE,KERSEY,BRANDY CAMP,CARMAN,MUNDERF,FIRST FORK,CAMERON,
WEST CREEK,RATHBUN,ST MARYS,RIDGWAY,PORTLAND MILLS,HALLTON,WHARTON,
EMPORIUM,RICH VALLEY,WILDWOOD FIRE TOWER,GLEN HAZEL,WILCOX,JAMES CITY,
RUSSELL CITY,AUSTIN,KEATING SUMMIT,NORWICH,CROSBY,HAZEL HURST,
MT JEWETT,KANE,LUDLOW,COUDERSPORT,ROULETTE,PORT ALLEGANY,SMETHPORT,
CYCLONE,LEWIS RUN,WESTLINE,CORNPLANTER BRIDGE,OSWAYO,SHINGLEHOUSE,
BULLIS MILLS,ELDRED,DERRICK CITY,BRADFORD,STICKNEY,CORNPLANTER RUN,
COOLSPRING,SUMMERVILLE,NEW BETHLEHEM,SLIGO,RIMERSBURG,PARKER,
HILLIARDS,WEST SUNBURY,BROOKVILLE,CORSICA,STRATTANVILLE,CLARION,KNOX,
EMLENTON,EAU CLAIRE,BARKEYVILLE,SIGEL,COOKSBURG,LUCINDA,FRYBURG,

(Continued on next page)

Figure 5. (Continued).

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   KOSSUTH,CRANBERRY,KENNERDELL,POLK,MARIENVILLE EAST,MARIENVILLE WEST,
   TYLERSBURG,TIONESTA,PRESIDENT,OIL CITY,FRANKLIN,UTICA,LYNCH,MAYBURG,
   KELLETTVILLE,WEST HICKORY,PLEASANTVILLE,TITUSVILLE SOUTH,DEMPSEYTOWN,
   SUGAR LAKE,SHEFFIELD,CHERRY GROVE,COBHAM,TIDIOUTE,GRAND VALLEY,
   TITUSVILLE NORTH,CENTERVILLE,TOWNVILLE,CLARENDON,WARREN,YOUNGSVILLE,
   PITTSFIELD,SPRING CREEK,SPARTANSBURG,LAKE CANADOHTA,MILLERS STATION,
   SCANDIA,RUSSELL,SUGAR GROVE,LOTTSVILLE,COLUMBUS,CORRY,UNION CITY,
   WATERFORD,SLIPPERY ROCK,HARLANSBURG,NEW CASTLE NORTH,EDINBURG,
   CAMPBELL,GROVE CITY,MERCER,GREENFIELD,SHARON EAST,SHARON WEST,
   SANDY LAKE,JACKSON CENTER,FREDONIA,SHARPSVILLE,ORANGEVILLE,
   NEW LEBANON,HADLEY,GREENVILLE EAST,GREENVILLE WEST,KINSMAN,COCHRANTON,
   GENEVA,CONNEAUT LAKE,HARTSTOWN,ANDOVER,BLOOMING VALLEY,MEADVILLE,
   HARMONSBURG,LINESVILLE,LEON,CAMBRIDGE SPRINGS,EDINBORO SOUTH,
   CONNEAUTVILLE,BEAVER CENTER,PIERPONT,CAMBRIDGE SPRINGS NE,
   EDINBORO NORTH,ALBION,EAST SPRINGFIELD,CONNEAUT,WAVERLY,WELLSBURG,
   ELMIRA,SEELEY CREEK,CATON,ALLENTOWN,BOLIVAR (NY),WATTSBURG,HAMMETT,
   NORTH EAST,HARBORCREEK,ERIE SOUTH,SWANVILLE,FAIRVIEW,FAIRVIEW SW,
   ERIE NORTH
<QUAD-CODE>
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(Continued on next page)

Figure 5. (Continued).

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(Continued on next page)

Figure 5. (Continued).

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<LATLONG>
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   URBAN:RESIDENTIAL,URBAN:MIXED URBAN,AGRIC:CROPLAND-PASTURE,
   AGRIC:ORCHARDS-VINEYARDS-NURSERIES,RANGE:HERBACEOUS,RANGE:SHRUB-BRUSH,
   RANGE:MIXED,FOREST:DECIDUOUS,FOREST:EVERGREEN,FOREST:MIXED,
   WETLAND:FORESTED,WETLAND:NONFORESTED,BARREN:TRANSITIONAL AREAS
<LANDUSE-PREF>
   FOREST:DECIDUOUS,FOREST:MIXED
<FOREST-TYPE>
   RED PINE:GRASS/FORB,
   RED PINE:SEEDLING/SHRUB,
   RED PINE:SAPLING,
   RED PINE:POLE,
   RED PINE:MATURE,
   RED PINE:OLD GROWTH,
   WHITE PINE:GRASS/FORB,
   WHITE PINE:SEEDLING/SHRUB,
   WHITE PINE:SAPLING,
   WHITE PINE:POLE,
   WHITE PINE:MATURE,
   WHITE PINE:OLD GROWTH,
   WHITE PINE/HEMLOCK:GRASS/FORB,
   WHITE PINE/HEMLOCK:SEEDLING/SHRUB,
   WHITE PINE/HEMLOCK:SAPLING,
   WHITE PINE/HEMLOCK:POLE,
   WHITE PINE/HEMLOCK:MATURE,
   WHITE PINE/HEMLOCK:OLD GROWTH,
   HEMLOCK:GRASS/FORB,
   HEMLOCK:SEEDLING/SHRUB,
   HEMLOCK:SAPLING,
   HEMLOCK:POLE,
   HEMLOCK:MATURE,
   HEMLOCK:OLD GROWTH,
   SCOTCH PINE:GRASS/FORB,
   SCOTCH PINE:SEEDLING/SHRUB,
   SCOTCH PINE:SAPLING,
   SCOTCH PINE:POLE,
   SCOTCH PINE:MATURE,
   SCOTCH PINE:OLD GROWTH,
   RED SPRUCE/BALSAM FIR:GRASS/FORB,
   RED SPRUCE/BALSAM FIR:SEEDLING/SHRUB,
   RED SPRUCE/BALSAM FIR:SAPLING,
   RED SPRUCE/BALSAM FIR:POLE,
   RED SPRUCE/BALSAM FIR:MATURE,
   RED SPRUCE/BALSAM FIR:OLD GROWTH,
   TAMARACK (EASTERN LARCH):GRASS/FORB,
   TAMARACK (EASTERN LARCH):SEEDLING/SHRUB,
   TAMARACK (EASTERN LARCH):SAPLING,
   TAMARACK (EASTERN LARCH):POLE,
   TAMARACK (EASTERN LARCH):MATURE,
   TAMARACK (EASTERN LARCH):OLD GROWTH,
   WHITE SPRUCE:GRASS/FORB,
   WHITE SPRUCE:SEEDLING/SHRUB,
   WHITE SPRUCE:SAPLING,
   WHITE SPRUCE:POLE,
   WHITE SPRUCE:MATURE,
   WHITE SPRUCE:OLD GROWTH,
   NORWAY SPRUCE:GRASS/FORB,
   NORWAY SPRUCE:SEEDLING/SHRUB,
   NORWAY SPRUCE:SAPLING,
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(Continued on next page)

Figure 5. (Continued).

```
NORWAY SPRUCE:POLE,
NORWAY SPRUCE:MATURE,
NORWAY SPRUCE:OLD GROWTH,
LARCH:GRASS/FORB,
LARCH:SEEDLING/SHRUB,
LARCH:SAPLING,
LARCH:POLE,
LARCH:MATURE,
LARCH:OLD GROWTH,
VIRGINIA PINE:GRASS/FORB,
VIRGINIA PINE:SEEDLING/SHRUB,
VIRGINIA PINE:SAPLING,
VIRGINIA PINE:POLE,
VIRGINIA PINE:MATURE,
VIRGINIA PINE:OLD GROWTH,
EASTERN REDCEDAR:GRASS/FORB,
EASTERN REDCEDAR:SEEDLING/SHRUB,
EASTERN REDCEDAR:SAPLING,
EASTERN REDCEDAR:POLE,
EASTERN REDCEDAR:MATURE,
EASTERN REDCEDAR:OLD GROWTH,
PITCH PINE:GRASS/FORB,
PITCH PINE:SEEDLING/SHRUB,
PITCH PINE:SAPLING,
PITCH PINE:POLE,
PITCH PINE:MATURE,
PITCH PINE:OLD GROWTH,
WHITE PINE/NORTHERN RED OAK/WHITE ASH:GRASS/FORB,
WHITE PINE/NORTHERN RED OAK/WHITE ASH:SEEDLING/SHRUB,
WHITE PINE/NORTHERN RED OAK/WHITE ASH:SAPLING,
WHITE PINE/NORTHERN RED OAK/WHITE ASH:POLE,
WHITE PINE/NORTHERN RED OAK/WHITE ASH:MATURE,
WHITE PINE/NORTHERN RED OAK/WHITE ASH:OLD GROWTH,
EASTERN REDCEDAR/HARDWOOD:GRASS/FORB,
EASTERN REDCEDAR/HARDWOOD:SEEDLING/SHRUB,
EASTERN REDCEDAR/HARDWOOD:SAPLING,
EASTERN REDCEDAR/HARDWOOD:POLE,
EASTERN REDCEDAR/HARDWOOD:MATURE,
EASTERN REDCEDAR/HARDWOOD:OLD GROWTH,
VIRGINIA PINE/SOUTHERN RED OAK:GRASS/FORB,
VIRGINIA PINE/SOUTHERN RED OAK:SEEDLING/SHRUB,
VIRGINIA PINE/SOUTHERN RED OAK:SAPLING,
VIRGINIA PINE/SOUTHERN RED OAK:POLE,
VIRGINIA PINE/SOUTHERN RED OAK:MATURE,
VIRGINIA PINE/SOUTHERN RED OAK:OLD GROWTH,
POST/BLACK/OR BEAR OAK:GRASS/FORB,
POST/BLACK/OR BEAR OAK:SEEDLING/SHRUB,
POST/BLACK/OR BEAR OAK:SAPLING,
POST/BLACK/OR BEAR OAK:POLE,
POST/BLACK/OR BEAR OAK:MATURE,
POST/BLACK/OR BEAR OAK:OLD GROWTH,
CHESTNUT OAK:GRASS/FORB,
CHESTNUT OAK:SEEDLING/SHRUB,
CHESTNUT OAK:SAPLING,
CHESTNUT OAK:POLE,
CHESTNUT OAK:MATURE,
CHESTNUT OAK:OLD GROWTH,
WHITE OAK/RED OAK/HICKORY:GRASS/FORB,
WHITE OAK/RED OAK/HICKORY:SEEDLING/SHRUB,
WHITE OAK/RED OAK/HICKORY:SAPLING,
WHITE OAK/RED OAK/HICKORY:POLE,
WHITE OAK/RED OAK/HICKORY:MATURE,
WHITE OAK/RED OAK/HICKORY:OLD GROWTH,
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(Continued on next page)

Figure 5. (Continued).

```
WHITE OAK:GRASS/FORB,
WHITE OAK:SEEDLING/SHRUB,
WHITE OAK:SAPLING,
WHITE OAK:POLE,
WHITE OAK:MATURE,
WHITE OAK:OLD GROWTH,
NORTHERN RED OAK:GRASS/FORB,
NORTHERN RED OAK:SEEDLING/SHRUB,
NORTHERN RED OAK:SAPLING,
NORTHERN RED OAK:POLE,
NORTHERN RED OAK:MATURE,
NORTHERN RED OAK:OLD GROWTH,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:GRASS/FORB,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:SEEDLING/SHRUB,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:SAPLING,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:POLE,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:MATURE,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:OLD GROWTH,
BLACK LOCUST:GRASS/FORB,
BLACK LOCUST:SEEDLING/SHRUB,
BLACK LOCUST:SAPLING,
BLACK LOCUST:POLE,
BLACK LOCUST:MATURE,
BLACK LOCUST:OLD GROWTH,
BLACK WALNUT:GRASS/FORB,
BLACK WALNUT:SEEDLING/SHRUB,
BLACK WALNUT:SAPLING,
BLACK WALNUT:POLE,
BLACK WALNUT:MATURE,
BLACK WALNUT:OLD GROWTH,
YELLOW POPLAR:GRASS/FORB,
YELLOW POPLAR:SEEDLING/SHRUB,
YELLOW POPLAR:SAPLING,
YELLOW POPLAR:POLE,
YELLOW POPLAR:MATURE,
YELLOW POPLAR:OLD GROWTH,
CENTRAL HARDWOOD REVERTING FIELD:GRASS/FORB,
CENTRAL HARDWOOD REVERTING FIELD:SEEDLING/SHRUB,
CENTRAL HARDWOOD REVERTING FIELD:SAPLING,
CENTRAL HARDWOOD REVERTING FIELD:POLE,
CENTRAL HARDWOOD REVERTING FIELD:MATURE,
CENTRAL HARDWOOD REVERTING FIELD:OLD GROWTH,
SCARLET OAK:GRASS/FORB,
SCARLET OAK:SEEDLING/SHRUB,
SCARLET OAK:SAPLING,
SCARLET OAK:POLE,
SCARLET OAK:MATURE,
SCARLET OAK:OLD GROWTH,
SASSAFRAS/PERSIMMON:GRASS/FORB,
SASSAFRAS/PERSIMMON:SEEDLING/SHRUB,
SASSAFRAS/PERSIMMON:SAPLING,
SASSAFRAS/PERSIMMON:POLE,
SASSAFRAS/PERSIMMON:MATURE,
SASSAFRAS/PERSIMMON:OLD GROWTH,
RED MAPLE/CENTRAL HARDWOODS:GRASS/FORB,
RED MAPLE/CENTRAL HARDWOODS:SEEDLING/SHRUB,
RED MAPLE/CENTRAL HARDWOODS:SAPLING,
RED MAPLE/CENTRAL HARDWOODS:POLE,
RED MAPLE/CENTRAL HARDWOODS:MATURE,
RED MAPLE/CENTAL HARDWOODS:OLD GROWTH,
MIXED CENTRAL HARDWOODS:GRASS/FORB,
MIXED CENTRAL HARDWOODS:SEEDLING/SHRUB,
MIXED CENTRAL HARDWOODS:SAPLING,
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(Continued on next page)

Figure 5. (Continued).

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MIXED CENTRAL HARDWOODS:POLE,
MIXED CENTRAL HARDWOODS:MATURE,
MIXED CENTRAL HARDWOODS:OLD GROWTH,
BLACK ASH/AMERICAN ELM/RED MAPLE:GRASS/FORB,
BLACK ASH/AMERICAN ELM/RED MAPLE:SEEDLING/SHRUB,
BLACK ASH/AMERICAN ELM/RED MAPLE:SAPLING,
BLACK ASH/AMERICAN ELM/RED MAPLE:POLE,
BLACK ASH/AMERICAN ELM/RED MAPLE:MATURE,
BLACK ASH/AMERICAN ELM/RED MAPLE:OLD GROWTH,
RIVER BIRCH/SYCAMORE:GRASS/FORB,
RIVER BIRCH/SYCAMORE:SEEDLING/SHRUB,
RIVER BIRCH/SYCAMORE:SAPLING,
RIVER BIRCH/SYCAMORE:POLE,
RIVER BIRCH/SYCAMORE:MATURE,
RIVER BIRCH/SYCAMORE:OLD GROWTH,
COTTONWOOD:GRASS/FORB,
COTTONWOOD:SEEDLING/SHRUB,
COTTONWOOD:SAPLING,
COTTONWOOD:POLE,
COTTONWOOD:MATURE,
COTTONWOOD:OLD GROWTH,
WILLOW:GRASS/FORB,
WILLOW:SEEDLING/SHRUB,
WILLOW:SAPLING,
WILLOW:POLE,
WILLOW:MATURE,
WILLOW:OLD GROWTH,
SUGAR MAPLE/BEECH/YELLOW BIRCH:GRASS/FORB,
SUGAR MAPLE/BEECH/YELLOW BIRCH:SEEDLING/SHRUB,
SUGAR MAPLE/BEECH/YELLOW BIRCH:SAPLING,
SUGAR MAPLE/BEECH/YELLOW BIRCH:POLE,
SUGAR MAPLE/BEECH/YELLOW BIRCH:MATURE,
SUGAR MAPLE/BEECH/YELLOW BIRCH:OLD GROWTH,
BLACK CHERRY:GRASS/FORB,
BLACK CHERRY:SEEDLING/SHRUB,
BLACK CHERRY:SAPLING,
BLACK CHERRY:POLE,
BLACK CHERRY:MATURE,
BLACK CHERRY:OLD GROWTH,
RED MAPLE/NORTHERN HARDWOODS:GRASS/FORB,
RED MAPLE/NORTHERN HARDWOODS:SEEDLING/SHRUB,
RED MAPLE/NORTHERN HARDWOODS:SAPLING,
RED MAPLE/NORTHERN HARDWOODS:POLE,
RED MAPLE/NORTHERN HARDWOODS:MATURE,
RED MAPLE/NORTHERN HARDWOODS:OLD GROWTH,
NORTHERN HARDWOOD REVERTING FIELD:GRASS/FORB,
NORTHERN HARDWOOD REVERTING FIELD:SEEDLING/SHRUB,
NORTHERN HARDWOOD REVERTING FIELD:SAPLING,
NORTHERN HARDWOOD REVERTING FIELD:POLE,
NORTHERN HARDWOOD REVERTING FIELD:MATURE,
NORTHERN HARDWOOD REVERTING FIELD:OLD GROWTH,
MIXED NORTHERN HARDWOODS:GRASS/FORB,
MIXED NORTHERN HARDWOODS:SEEDLING/SHRUB,
MIXED NORTHERN HARDWOODS:SAPLING,
MIXED NORTHERN HARDWOODS:POLE,
MIXED NORTHERN HARDWOODS:MATURE,
MIXED NORTHERN HARDWOODS:OLD GROWTH,
ASPEN:GRASS/FORB,
ASPEN:SEEDLING/SHRUB,
ASPEN:SAPLING,
ASPEN:POLE,
ASPEN:MATURE,
ASPEN:OLD GROWTH,
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(Continued on next page)

Figure 5. (Continued).

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   PAPER BIRCH:GRASS/FORB,
   PAPER BIRCH:SEEDLING/SHRUB,
   PAPER BIRCH:SAPLING,
   PAPER BIRCH:POLE,
   PAPER BIRCH:MATURE,
   PAPER BIRCH:OLD GROWTH,
   GRAY BIRCH:GRASS/FORB,
   GRAY BIRCH:SEEDLING/SHRUB,
   GRAY BIRCH:SAPLING,
   GRAY BIRCH:POLE,
   GRAY BIRCH:MATURE,
   GRAY BIRCH:OLD GROWTH
<FOREST-SIZE>
   UNSTOCKED,SEEDLING/SAPLING,POLE,MATURE,OVER MATURE
<WETLAND-NAME>
   ESTUARINE,ESTUARINE:INTERTIDAL,
   ESTUARINE:INTERTIDAL/FORESTED,
   ESTUARINE:INTERTIDAL/FORESTED:BROAD-LEAVED DECIDUOUS,
   ESTUARINE:INTERTIDAL/FORESTED:BROAD-LEAVED EVERGREEN,
   ESTUARINE:INTERTIDAL/FORESTED:NEEDLE-LEAVED EVERGREEN,
   ESTUARINE:INTERTIDAL/FORESTED:DEAD,
   ESTUARINE:INTERTIDAL/FORESTED:DECIDUOUS,
   ESTUARINE:INTERTIDAL/FORESTED:EVERGREEN,
   ESTUARINE:INTERTIDAL/SCRUB-SHRUB,
   ESTUARINE:INTERTIDAL/SCRUB-SHRUB:BROAD-LEAVED DECIDUOUS,
   ESTUARINE:INTERTIDAL/SCRUB-SHRUB:DECIDOUS,
   PALUSTRINE,PALUSTRINE:FORESTED,
   PALUSTRINE/FORESTED:BROAD-LEAVED DECIDUOUS,
   PALUSTRINE/FORESTED:NEEDLE-LEAVED DECIDUOUS,
   PALUSTRINE/FORESTED:NEEDLE-LEAVED EVERGREEN,
   PALUSTRINE/FORESTED:DEAD,
   PALUSTRINE/FORESTED:DECIDUOUS,
   PALUSTRINE/FORESTED:EVERGREEN,
   PALUSTRINE/SCRUB-SHRUB,
   PALUSTRINE/SCRUB-SHRUB:BROAD-LEAVED DECIDUOUS,
   PALUSTRINE/SCRUB-SHRUB:DECIDUOUS
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   E2SS6,P....,PF...,PDF01,PDF02,PDF04,PDF05,PDF06,PDF07,PDSS.,PDSS1,
   PDSS6
<ENVIR-ASSOC>
   INLAND WETLAND:VEGETATED STREAM BANKS;
   INLAND WETLAND:ISLAND INHABITANT;
   INLAND WETLAND:BOGS;
   INLAND WETLAND:WET MEADOWS;
   COASTAL ZONE:BRACKISH WATER MARSH;
   COASTAL ZONE:FRESHWATER MARSH;
   COASTAL ZONE:COASTAL MARSH;
   COASTAL ZONE:SWAMP;
   COASTAL ZONE:DUNES;
   SOIL:LOAM;
   SOIL PROFILE:UNDECOMPOSED ORGANIC MATTER (O1 HORIZON);
   SOIL PROFILE:PARTIALLY DECOMPOSED ORGANIC MATTER (O2 HORIZON);
   SOIL PROFILE:MINERAL SOIL/MIXED WITH HUMUS (A1 HORIZON);
   SOIL DRAINAGE:MODERATELY WELL DRAINED;
   SOIL DRAINAGE:IMPERFECTLY AND POORLY DRAINED;
   PORTION OF THE YEAR);
   SOIL MOISTURE:MOIST;
   SOIL COMPACTION:EASILY PENETRATED;
   ASPECT:NORTHEAST;
   TERRESTRIAL FEATURES:STANDING SNAGS;
   TERRESTRIAL FEATURES:DOWNED LOGS;
   TERRESTRIAL FEATURES:RIDGES;
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(Continued on next page)

Figure 5. (Continued).

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TERRESTRIAL FEATURES:LEAF NESTS;
TERRESTRIAL FEATURES:BRUSH PILES/ROCK PILES;
TERRESTRIAL FEATURES:HEDGEROWS/WIND BREAKS;
TERRESTRIAL FEATURES:FENCE ROWS;
TERRESTRIAL FEATURES:ROADSIDE DITCHES;
TERRESTRIAL FEATURES:GRASSY UNCULTIVATED AREAS;
TERRESTRIAL FEATURES:LEAF LITTER;
TERRESTRIAL FEATURES:VEGETATION MOSAICS/EDGES;
TERRESTRIAL FEATURES:HIGHWAY MEDIANS;
ECOTONE:WOODLAND/CROP FIELDS;
ECOTONE:WOODLAND/SHRUB-BRUSH FIELD;
ECOTONE:WOODLAND/OPEN WATER;
ECOTONE:WOODLAND/HERBACEOUS FIELD;
ECOTONE:CROP FIELD/HERBACEOUS FIELD;
ECOTONE:HERBACEOUS FIELD/SHRUB-BRUSH FIELD;
ECOTONE:CONIFEROUS FOREST/DECIDUOUS FOREST;
ECOTONE:WOODLAND/WETLAND;
ECOTONE:WOODLAND/URBAN LAND;
ECOTONE:SHRUB-BRUSH FIELD/CROP FIELD;
ECOTONE:SHRUB-BRUSH FIELD/WETLAND;
ECOTONE:SHRUB-BRUSH FIELD/URBAN LAND;
ECOTONE:HERBACEOUS FIELD/WETLAND;
ECOTONE:HERBACEOUS FIELD/URBAN LAND;
FOREST ECOTONE:CLEARCUT/SEEDLING-SAPLING STAGE;
FOREST ECOTONE:CLEARCUT/POLE STAGE;
FOREST ECOTONE:CLEARCUT/MATURE STAGE;
FOREST ECOTONE:SEEDLING-SAPLING/POLE STAGE;
FOREST ECOTONE:SEEDLING-SAPLING/MATURE STAGE;
FOREST ECOTONE:POLE/MATURE STAGE;
TERRESTRIAL VERTICAL DIVERSITY:SURFACE LAYER;
NEST SITES:UNDERGROUND BURROW;
NEST SITES:DOWNED LOGS;
AGRICULTURAL TYPES:PASTURELAND;
AGRICULTURAL TYPES:SPRING GRAINS (OATS, CORN, BUCKWHEAT, ETC.);
AGRICULTURAL TYPES:ORCHARDS (APPLE, PEAR, PEACH, CHERRY, ETC.);
PEACH, ETC.);
AGRICULTURAL TYPES:VINEYARDS;
AGRICULTURAL TYPES:HAYLANDS;
AGRICULTURAL TYPES:CORN;
AGRICULTURAL TYPES:VEGETABLE CROPS;
VEGETATION SUCCESSIONAL:ABANDONED FIELDS;
VEGETATION SUCCESSIONAL:SAND DUNE;
VEGETATION SUCCESSIONAL:STABLE FOREST;
VEGETATION SUCCESSIONAL:SUBCLIMAX FOREST;
VEGETATION SUCCESSIONAL:CLIMAX FOREST;
VEGETATION SUCCESSIONAL:STABLE PRAIRIE/GRASSLAND;
CONIFEROUS TREES:NORWAY SPRUCE;
CONIFEROUS TREES:WHITE SPRUCE;
CONIFEROUS TREES:(EASTERN) WHITE PINE;
CONIFEROUS TREES:SCOTCH PINE;
CONIFEROUS TREES:HEMLOCK;
CONIFEROUS TREES:NORTHERN WHITE CEDAR (THUJA);
CONIFEROUS TREES:RED SPRUCE/BLACK SPRUCE;
CONIFEROUS TREES:LARCH/TAMARACK;
HARDWOOD TREES:ALDER;
HARDWOOD TREES:ASPEN;
HARDWOOD TREES:BIRCH;
HARDWOOD TREES:HICKORY;
HARDWOOD TREES:SYCAMORE;
HARDWOOD TREES:SASSAFRAS;
HARDWOOD TREES:DOGWOOD SPECIES;
HARDWOOD TREES:WHITE OAKS GROUP;
HARDWOOD TREES:MAPLE, BOX ELDER;
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(Continued on next page)

Figure 5. (Continued).

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   HARDWOOD TREES:ASHES;
   HARDWOOD TREES:BLACK WALNUT/BUTTERNUT;
   HARDWOOD TREES:WILLOW;
   HARDWOOD TREES:CHERRY SPECIES;
   HARDWOOD TREES:RED OAKS GROUP;
   HARDWOOD TREES:ELM;
   HARDWOOD TREES:TULIP OR YELLOW POPLAR;
   HARDWOOD TREES:BEECH;
   HARDWOOD TREES:BASSWOOD;
   HARDWOOD TREES:COTTONWOOD;
   HARDWOOD TREES:HOP HORNBEAM;
   HUMAN ASSOCIATION:RESIDENTIAL LAWN/ORNAMENTAL TREES/SHRUBS;
   HUMAN ASSOCIATION:RESIDENTIAL HOUSES/CHIMNEYS/ATTICS;
   HUMAN ASSOCIATION:FARM OUTBUILDINGS (BARNS, SHEDS);
   HUMAN ASSOCIATION:FARMS (CROPLAND/PASTURES);
   HUMAN ASSOCIATION:PUBLIC CITY PARKS;
   HUMAN ASSOCIATION:PUBLIC RESIDENTIAL PARKS;
   HUMAN ASSOCIATION:STATE AND COUNTY PARKS
<ENVIR-LIM>
   SOIL PROFILE:UNDECOMPOSED ORGANIC MATTER (O HORIZON);
   SOIL MOISTURE:MOIST
<ENVIR-LIM-E>
<ENVIR-LIM-LF>
<ENVIR-LIM-LR>
<ENVIR-LIM-P>
<ENVIR-LIM-JF>
   SOIL MOISTURE:MOIST
<ENVIR-LIM-JR>
   SOIL MOISTURE:MOIST
<ENVIR-LIM-AF>
   SOIL PROFILE:UNDECOMPOSED ORGANIC MATTER (OI HORIZON);
   SOIL MOISTURE:MOIST
<ENVIR-LIM-AR>
   SOIL PROFILE:UNDECOMPOSED ORGANIC MATTER (OI HORIZON);
   SOIL MOISTURE:MOIST
<ENVIR-LIM-AB>
   SOIL PROFILE:UNDECOMPOSED ORGANIC MATTER (OI HORIZON);
   SOIL MOISTURE:MOIST
<FOOD-GEN>
   HERBACEOUS FRUIT (BERRIES/CAPSULES/FRUIT/NUTS/GRAIN),
   HARDWOOD FRUIT (BERRIES/SEEDS/NUTS/CAPSULES),FUNGI,
   ROOTS-TUBERS-RHIZOMES,INSECTS-ADULT,INSECTS-IMMATURE,
   ARTHROPODS (NOT INSECTS),WORMS,INVERTEBRATES-OTHER TERRESTRIAL,
   MAMMALS-JUVENILES/NESTLINGS,MAMMALS-SMALL,BIRD NESTLINGS,
   REPTILE JUVENILES,REPTILE ADULTS,AMPHIBIAN ADULTS,FECES
<FOOD-L>
<FOOD-J>
   HERBACEOUS FRUIT (BERRIES/CAPSULES/FRUIT/NUTS/GRAIN),
   HARDWOOD FRUIT (BERRIES/SEEDS/NUTS/CAPSULES),FUNGI,
   ROOTS-TUBERS-RHIZOMES,INSECTS-ADULT,INSECTS-IMMATURE,
   ARTHROPODS (NOT INSECTS),WORMS,INVERTEBRATES-OTHER TERRESTRIAL,
   MAMMALS-JUVENILES/NESTLINGS,MAMMALS-SMALL,BIRD NESTLINGS,
   REPTILE JUVENILES,REPTILE ADULTS,AMPHIBIAN ADULTS,FECES
<FOOD-A>
   HERBACEOUS FRUIT (BERRIES/CAPSULES/FRUIT/NUTS/GRAIN),
   HARDWOOD FRUIT (BERRIES/SEEDS/NUTS/CAPSULES),FUNGI,
   ROOTS-TUBERS-RHIZOMES,INSECTS-ADULT,INSECTS-IMMATURE,
   ARTHROPODS (NOT INSECTS),WORMS,INVERTEBRATES-OTHER TERRESTRIAL,
   MAMMALS-JUVENILES/NESTLINGS,MAMMALS-SMALL,BIRD NESTLINGS,
   REPTILE JUVENILES,REPTILE ADULTS,AMPHIBIAN ADULTS,FECES
<FORAG-SITE>
   GROUND SURFACE,STUMPS,LOGS,UNDERGROUND BURROWS
<BREED-SEASON>
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(Continued on next page)

Figure 5. (Continued).

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   FEBRUARY,MARCH,APRIL,MAY,JUNE,JULY,AUGUST,SEPTEMBER
<SPAWN-SITE>
<NEST-SITE>
   UNDERGROUND BURROW,STUMPS,LOGS,UNDER LEAVES
<NEST-MATRLS>
   GRASSES,LEAVES,HAIR AND FEATHERS
<TREND-CAUSE>
<MGMT-BENEFIT>
   RETENTION OF WILDERNESS;
   MAINTAINING UNDISTURBED/UNDEVELOPED AREAS;
   MAINTAINING NATURAL VEGETATION (NATIVE);
   MAINTAINING NATURAL ECOLOGICAL SUCCESSION;
   MAINTAINING WOODLOTS;
   CREATING/MAINTAINING SNAGS;
   RETAINING DEAD/DOWNED WOODY MATERIALS;
   ESTABLISHMENT OF FIELD BORDERS;
   DEVELOPING/MAINTAINING HEDGEROWS;
   DEVELOPING/MAINTAINING BRUSH OR SLASH PILES;
   DEVELOPING/MAINTAINING STREAMBANK/STREAMSIDE VEGETATION;
   MAINTAIN MATURE HARDWOOD FORESTS;
   REFORESTATION - DECIDUOUS;
   REFORESTATION - CONIFEROUS;
   REFORESTATION - MIXED DECIDUOUS/CONIFEROUS;
   FOREST FIRE SUPPRESSION
<MGMT-HARM>
   BRUSH REMOVAL/CUTTING IN PASTURES AND CROPLAND;
   TIMBER HARVEST;
   TIMBER HARVESTING - CLEARCUTTING;
   CONVERTING WOODLAND TO OPEN LAND;
   SURFACE MINING;
   INTENSIVE AGRICULTURAL PRACTICES;
   CREATION OF SUBURBAN RESIDENTIAL AREAS;
   LOCATING/CONSTRUCTING POWERLINES AND OTHER RIGHTS-OF-WAY
<N-TAXONOMY>
        IN 1972 THE GENUS BLARINA UNDERWENT A REVISION WHEREBY TWO
   SPECIES WERE RECOGNIZED: THE NORTHERN SHORT-TAILED SHREW, BLARINA
   BREVICAUDA (SAY) TO WHICH PENNSYLVANIA POPULATIONS BELONG; AND THE
   SMALLER, SOUTHERN SHORT-TAILED SHREW, B. CAROLINENSIS (BACHMAN).
   THE LATTER SPECIES HAD PREVIOUSLY BEEN CONSIDERED A SUBSPECIES OF
   B. BREVICAUDA. *01*  FURTHER SUPPORT FOR THIS REVISION HAS BEEN
   DEMONSTRATED THROUGH MORPHOMETRIC AND KARYOTYPIC ANALYSES. *02,03,
   04,05:914,06:68*  IN 1982 ANOTHER SPECIES, B. HYLOPHAGA ELLIOT
   WAS CONSIDERED DISTINCT FROM B. CAROLINENSIS. *04*  SOME WORKERS
   LIST A FOURTH SPECIES, B. TELMALESTES MERRIAM, AN INSULAR POP-
   ULATION CONFINED TO THE DISMAL SWAMP OF VIRGINIA. *06:68,08:54-56*
        AN EAST TO WEST CLINE OF INCREASING BODY SIZE HAS BEEN DEMON-
   STRATED BY B. BREVICAUDA IN PENNSYLVANIA, ILLINOIS, AND CONNECTICUT.
   *03,09,10*  A NORTH TO SOUTH CLINE OF DECREASING BODY SIZE BETWEEN
   PENNSYLVANIA AND WEST VIRGINIA IS SUGGESTED; AND AN ALTITUDINAL CLINE
   OCCURS IN TENNESSEE, WITH THE LARGER ANIMALS INHABITING THE MORE
   MOUNTAINOUS REGIONS. *05,07*
        THE TYPE LOCALITY FOR B. BREVICAUDA IS WASHINGTON CO., NEBRASKA
   NEAR BLAIR ON THE WEST BANK OF THE MISSOURI RIVER. *06:68,08:54*
        THE SCIENTIFIC SYNONYMY OF THE SPECIES IS AS FOLLOWS:  SOREX
   BREVICAUDUS SAY 1823; BLARINA BREVICAUDA BAIRD 1858; BLARINA
   COSTARCENSIS ALLEN 1891; AND BLARINA FOSSALIS HIBBARD 1943. *08:54*
   OTHER COMMON NAMES INCLUDE NORTHERN SHORT-TAILED SHREW, BIG SHORT-
   TAILED SHREW, BOB-TAILED SHREW, MOLE SHREW, SHREW MOUSE, AND BLARINA.
   *02,08:54,12:53,13:42*
        THE SUBSPECIES THAT OCCURS IN PENNSYLVANIA IS B. B. KIRTLANDI
   BOLE AND MOUTHROP 1942.  ITS TYPE SPECIMEN IS FROM HOLDEN ARBORETUM,
   KIRTLAND TOWNSHIP, LAKE COUNTY, AND CHADRON TOWNSHIP, GEAUGA COUNTY,
   OHIO (COUNTY LINE BISECTS TYPE LOCALITY). *08:56*
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Figure 5. (Continued).

SINCE BLARINA BREVICAUDA IS THE LARGEST OF THE PENNSYLVANIA SORICIDS IT IS OFTEN MISTAKEN FOR A MOLE. IT IS, HOWEVER, MUCH SMALLE THAN AN ADULT MLE AND DOES NOT HAVE THE ENLARGED, SPECIALIZED FRONT FEET CHARACTERISTIC OF MOLES. IT IS ALSO SOMETIMES MISTAKEN FOR A MEADOW VOLE, MICROTUS PENNSYLVANICUS, AT A DISTANCE, SINCE BOTH ARE DARK AND MOVE VERY CLOSE TO THE GROUND SURFACE WITH THEIR SHORT LEGS. CLOSER EXAMINATION REVEALS THE VOLE'S RODENTIFORM DENTITION AND COARSER PELAGE.

<N-SPP-STATUS>

THE SHORT-TAILED SHREW, BLARINA BREVICAUDA, HAS NO RECOGNIZED STATUS IN THE COMMONWEALTH OF PENNSYLVANIA BY EITHER STATE OR FEDERAL GOVERNMENT AGENCIES. THERE IS OVERWHELMING EVIDENCE TO SUGGEST THAT THIS IS, AND HAS BEEN FOR A LONG TIME, THE MOST WIDESPREAD AND ABUNDANT SPECIES OF MAMMAL IN THE COMMONWEALTH, OCCUPYING ALMOST EVERY CONCEIVABLE TERRESTRIAL HABITAT. *07, 13:42-44,14:193,16:VIII;3-4,22,33,34:52-53,35:46-47,36:52-53, 37:45-46,38:41,39:39-40* IN THE CONTIGUOUS STATES OF NEW YORK, NEW JERSEY, MARYLAND, AND WEST VIRGINIA THE PREVALENCE OF THIS SPECIES HAS ALSO BEEN RECORDED. *07,26:28-32,14:193,20,21,47:445, 41*

<N-DISTRIB>

IN LIGHT OF THE RECENT REVISIONS OF THE GENUS BLARINA *01,04* THE DISTRIBUTION OF THE SHORT-TAILED SHREW DIFFERS IN ITS SOUTHERN LIMITS FROM THAT GIVEN BY HALL. *08:55* IT OCCURS FROM CENTRAL SASKATCHEWAN TO SOUTHEASTERN CANADA, SOUTH TO SOUTHERN NEBRASKA AND IOWA, AND EAST TO CENTRAL TENNESSEE AND NORTHEASTERN GEORGIA, OMITTING ONLY THE EASTERN PART OF THE CAROLINAS AND A SMALL PORTION OF VIRGINIA ALONG THE EASTERN SEABOARD. *04,06:69*

THIS SPECIES IS FOUND THROUGHOUT THE COMMONWEALTH AND IS PROBABLY OUR MOST ABUNDANT SMALL MAMMAL. HISTORICALLY, RHOADS IN 1903 CONSIDERED THE SHORT-TAILED SHREW TO BE SUPERIOR TO ALL OTHER SPECIES OF PENNSYLVANIA MAMMALS IN ABUNDANCE AND IN THEIR UNIVERSAL TERRESTRIAL DISTRIBUTION. *14:93* THE PENNSYLVANIA MAMMAL SURVEY OF THE LATE 1940'S AND EARLY 1950'S LISTED B. BREVICAUDA AS OCCURRING IN ALL COUNTIES OF THE COMMONWEALTH. *34:52-53, 35:46-47,36:52-53,37:45-46,38:41,39:39-40* HOWEVER, THERE WERE A FEW COUNTIES (ALLEGHENY, ARMSTRONG, CLARION, CRAWFORD, DAUPHIN, ELK, FOREST, LACKAWANNA, PHILADELPHIA, SNYDER, AND TIOGA) THAT WERE NOT SAMPLED AT THAT TIME. APPARENTLY THE INFERENCE WAS MADE THAT IF ALL OF THE SURROUNDING OR ADJACENT COUNTIES SUSTAINED REASONABLY HIGH POPULATIONS OF THE SHREWS, THEN CERTAINLY THE OMITTED ONE MUST ALSO. CUNNINGHAM *33* HAS RECORDS OF SMALL MAMMALS COLLECTED AND/OR OBSERVED WHICH ATTEST TO THE PRESENCE OF B. BREVICAUDA IN ALLEGHENY COUNTY IN THE 1960'S, BEAVER COUNTY *1959*, CRAWFORD COUNTY *1957, 59, 6 , 61*, AND ERIE COUNTY *19 95*. KIRKLAND *30* HAS COLLECTIONS FROM ADAMS, CENTRE, CUMBERLAND, AND FRANKLIN COUNTIES FROM 1980 THROUGH 1984. HE INDICATES THAT IN SOUTHCENTRAL PENNSYLVANIA BLARINA IS UBIQUITOUS. *31*.

WILKINSON *29* HAS RECORDS OF B. BREVICAUDA FROM PERRY COUNTY FOR 1984. DALBY *32* CITES THE ABUNDANCE OF THE SPECIES IN CLARION COUNTY IN 1985. BRENNER ET AL *22* FOUND THIS SPECIES TO BE ABUNDANT IN MERCER COUNTY IN 1982.

IN COMPARING THE NUMBERS OF BLARINA COLLECTED DURING THE MAMMAL SURVEY IT CAN BE SEEN THAT THE NORTHWESTERN AND SOUTHWESTERN SECTIONS OF PENNSYLVANIA, COMPRISING 37 COUNTIES, YIELDED 2386 SPECIMENS WHICH IS ABOUT TWICE THE NUMBER COLLECTED IN THE CENTRAL AND EASTERN REGIONS, RESPECTIVELY. WHETHER THIS IS AN ARTIFACT OF DIFFERENTIAL EFFORT OR REPRESENTS A TRUE PICTURE OF RELATIVE ABUNDANCE IS NOT KNOWN AS INFORMATION ON TRAPPING INTENSITY WAS NOT AVAILABLE.

IT SEEMS SAFE TO SAY THAT THIS SPECIES OF SHREW IS FOUND IN ALL COUNTIES OF PENNSYLVANIA AND, IS EITHER COMMON OR ABUNDANT. THERE IS NO EVIDENCE TO SUGGEST THAT POPULATIONS IN ANY GIVEN REGION SHOW

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Figure 5. (Continued).

A DECLINING TREND OR THAT AN IMPENDING PERTURBATION IMPERILS THIS SPECIES IN PENNSYLVANIA. THE CONCLUSIONS OF THE MAMMAL SURVEY ARE THU PROBABLY STILL VALID TODAY.

<N-HABITAT>

THROUGHOUT ITS RANGE, BLARINA BREVICAUDA IS FOUND IN PRACTICALLY ALL TERRESTRIAL HABITATS, BUT OPTIMUM CONDITIONS FOR ITS EXISTENCE OCCURS MOST OFTEN IN MOIST DECIDUOUS FORESTS WITH A THICK LITTER LAYER AND FRIABLE, LOAMY SOIL. THIS IS RELATED TO ITS BURROWING AND FORAGIN ACTIVITY. *16-VII:3-4,11:22-23,12:54,42:106-115,43:37-41,24,27,:42-43 21,44:42-54,26:28-32,28:48-51,49,7,25,54,60.* INDEED, EVEN THOUGH THEY OCCUR BY A MUCH WIDER RANGE OF HABITATS, THEY MAY DURING PERIODS OF DROUGHT, PULL BACK INTO FOREST REFUGIA. *11:22-23,44:42-54*. GETZ *49* FOUND THAT IN AREAS WITH SOIL MOISTURE LOWER THAN THAT REQUIRED TO KEEP AIR IN THE BURROWS OR HUMUS SATURATED, WERE NOT INHABITED BY BLARINA. WRIGLEY ET AL *58* CONCURS THAT MOISTURE IS A LIMITING FACTOR IN THE HABITAT SELECTION OF BLARINA. WHITAKER *28* CONSIDERED MOISTURE, TO BE A LIMITING FACTOR IN EXCLUDING BLARINA FROM THE QUICK DRYING, SANDY SOILS OF VIGO COUNTY, INDIANA. PRUITT *56* IN STUDYING THE MICROHABITAT OF BLARINA IN NORTHERN MICHIGAN, FOUND THE SPECIES TO OCCUR IN LOCAL POCKETS WHERE SOIL MOISTURE CONDITIONS WERE SUCH THAT FREE WATER OR WATER OF CONDENSATION WAS PRESENT AND WHERE NEITHER EXTENSIVE SOIL FREEZING NOR HEATING ABOVE LETHAL LIMITS OCCUR. THESE CONDITIONS ARE BEST MET ON LOAMS IN MATURE DECIDUOUS FORESTS. PALMER AND GOOD *104* FOUND GREATER NUMBERS OF BLARINA ON NORTHEAST FACING SLOPES THAN SOUTHWEST FACING SLOPES IN OHIO. THE FORMER WAS MOISTER THAN THE LATTER AND HAD A MORE CONTINUOUS LITTER LAYER AND A BETTER DEVELOPED HUMUS LAYER. THESE FACTORS APPARENTLY CONTRIBUTED TO A GREATER QUANTITY AND QUALITY OF INVERTEBRATE FOOD SPECIES ON THE NORTHEAST SLOPE. IN THE DRIER, WESTERN EXTREMITY OF THE SPECIES RANGE, IN THE DAKOTAS AND NEBRASKA, BLARINA IS RRESTRICTED TO RIPARIAN COMMUNITIES. *12:54*

OTHER HABITATS INCLUDE: OLD-FIELDS *16-VIII:3-4,11:22-23, 12:54,43:37-41* 44:42-54,19:193,26:28-32,46,51,20,17,18,55, 57,105*, CULTIVATED FIELDS *19,58*, PASTURES *42:37-41,55*, EDGES BETWEEN FIELDS AND WOODLANDS *12:54,43:37-41,44:42-54, 51,17,41,23*, SHELTER BELTS OF TREES IN THE MIDWEST*59*, FLOWER AND VEGETABLE GARDENS *44:42-54*, BOGS, SWAMPS, AND MARSHES *11:22-23,44:42-54,45:53-62,19:193,41,56,58*, HOUSES, SHEDS, AND BARNS *44:42-54,41,33,58*, IN ROADSIDE HERBACEOUS VEGETATION *58,33*, SHRUBBY AREAS *16-VIII:3-4,42:106-115,44: 42-54,43,20,18,7,105*, CITY AND SUBURBAN LOTS *13:43-44,43:37-41, 45:53-62*, CONIFER WOODS AND PLANTATIONS *20,41,23,22,57*, RIGHT OF WAY CLEAR-CUTS *23,7*, AND RECLAIMED STRIP MINE HABITAT *22*.

THE FOLLOWING REPRESENTS COMMENTS OF VARIOUS WORKERS WHO HAVE CHOICE OF HABITATS: THE MOST UNIVERSALLY DISTRIBUTED OF OUR SMALL MAMALS *35:46-47*, FOUND IN ALL TERRESTRIAL HABITATS *34:52-53,37:45-46,38:41*, DENSE FOREST *39:39-40*, CULTIVATED FIELDS *37:45-46,39:39-40*, PREFERS MOIST AREAS WHETHER FORESTED OR NOT: *35:46-47*, EQUALLY ABUNDANT IN FORESTED OR NON-FORESTED *34:52-53,37:45-46*, OPTIMUM HABITAT HAS EITHER FRIABLE SOIL OR DENSE COVER ON THE SURFACE OF MATTED VEGETATION OR LEAVES *36:52-53*, CUNNINGHAM HAS COLLECTED THEM IN ERIE COUNTY FROM NORTHERN HARDWOOD-HEMLOCK FOREST, IN OLD-FIELDS, IN SEVERAL OF THE WOODED RAVINES OF STREAMS FLOWING INTO LAKE ERIE, IN LAWNS, AROUND FOUNDATION PLANTINGS OF PRIVATE HOMES, AND ALONG INTERSTATE HIGHWAY ROADSIDES *33*. IN WESTERN MOST ERIE COUNTY, THE SPECIES WAS MOST ABUNDANT IN A NORTHERN HARDWOOD-HEMLOCK FOREST THAT WAS RATHER SWAMP; AND AT LEAST ABUNDANT IN AN OLD-FIELD WHERE MICMICROTUS PENNSYLVANICUS APPEARED TO BE IN A RAPID GROWTH PHASE OF ITS POPULATION CYCLE, *16-VIII:3-4*. HE ALSO

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Figure 5. (Continued).

WHILE IT HAS BEEN WIDELY HELD THAT BLARINA MUST CONSUME MORE THAN ITS WEIGHT OF FOOD DAILY, IT IS NOW BELIEVED THAT ONE HALF OR LESS OF ITS WEIGHT EQUIVALENT IN FOOD IS AMPLE *12:54,77*. IN FACT, ONE LARGE MALE WAS OBSERVED FASTING FOR 36 HOURS WITHOUT ANY APPARENT ILL EFFECTS *77*. BUCKNER *81* IN CHEMICALLY ANALYZING THE STOMACH CONTENTS OF BLARINA AFTER EATING LARCH SAWFLIES SHOWED THE FOLLOWING COMPONENTS: 89 MG. PROTEIN, 27 MG. CARBOHYDRATES, 78 MG. FAT, AND 1.21K CALCIUM. THE ASSIMILATION EFFECIENCY, WAS 78% ON A DIET OF LARCH SAWFLIES, AS COMPARED TO 92% ON A DIET OF COMMERCIAL DOG FOOD.

<N-MGMT>

THERE IS NO LITERATURE THAT ADDRESSES OR PRESCRIBES A MANAGEMENT REGIME FOR THE SHORT-TAILED SHREW. INDEED, IN VIEW OF THE SEEMINGLY UBIQUITOUS NATURE OF ITS DISTRIBUTION, THERE IS LITTLE FORESEEABLE NECESSITY FOR MANAGING THE SPECIES. IF ANY SUGGESTION MIGHT BE MADE IT WOULD BE TO MAINTAIN ADEQUATE PATCHES OF DECIDUOUS FOREST WITH AN ABUNDANCE OF LEAF LITTER. STEPS SHOULD BE TAKEN TO ALLOW OLD LOGS AND STUMPS TO REMAIN IN PLACE IN THOSE HABITATS TO PROVIDE REFUGES AND NESTING SITES *11:22-23,44:42,54,49,18,56,104,12:54*.

<HEP-DATA>

<ANIMAL-PLANT>

THE SHORT-TAILED SHREW LIVES SYMPATRICALLY WITH A NUMBER OF OTHER SPECIES OF SMALL MAMMALS. IN WOODED AREAS, IT IS OFTEN STRONGLY ASSOCIATED WITH PEROMYSCUS LEUCOPUS. *42 *42:106-115,20,45:53-62,21,23,25,60*. OTHER SPECIES ARE: MICROTUS PENNSYLVANICUS, IN OPEN FIELDS OR BOGGY HABITATS *45:53062,16-VIII:3-4*, MICROTUS PINETORUM IN MOIST WOODS WITH SOFT SOIL *42:106-115, 21*, SOREX CINEREUS, S. ARTICUS, SIPALUSTRIS, MICROSOREX HOYI, CONDYLURA COSTATA, CLETHRIONEMYS GAPPERI, SYNAPTOMYS COOPERI, ZAPUS HUDSONICUS, NAPAEOZAPUS INSIGNIS AND TAMIAS STRIATUS, IN MORE NORTHERN HABITATS *45:53-62,46,20,21,23,25,58,60*. IN TENNESSEE, THE SHORT-TAILED SHREW IS AN OCCASIONAL ASSOCIATE OF REITHRODONTOMYS HUMILUS, OCHROTOMYS NUTTALLI, AND SIGMODAN HISPIDUS *23*.

ZEGERS *51* SUGGESTED THAT BLARINA AND PERMYSCUS LEUCOPUS SOMETIMES SHARE THE SAME FOOD RESOURCES BUT CONFLICT COMPETITION IS AVOIDED SPATIALLY AS PERMYSCUS TENDS TO BE MORE ARBOREAL BLARINA MAY BE RESPONSIBLE FOR EXCLUDING SOREX FUMEUS FROM SOME FOREST HABITATS AND MICROTUS PENNSYLVANICUS FROM ISLANDS THAT THEY ARE ABLE TO COLONIZE *19:53*. WILD HOGS, SUS SCROFA, HAVE BEEN KNOWN TO DISRUPT THE LEAF LITTER AND HERBACEOUS GROUND COVER IN PARTS OF THE SMOKY MOUNTAINS TO THE EXTENT THAT BLARINA WAS NEARLY ELIMINATED *1:2*. INTRASPECIFIC COMPETITION HAS BEEN CITED BY MARTIN *62*.

BLARINA BREVICAUDA IS KNOWN TO BE PREYED UPON BY SEVERAL SPECIES OF OWLS, HAWKS, OPOSSUMS, MINK, SEVERAL SPECIES OF WEASELS, STRIPED SKUNKS, FISHER, RACCOONS, BOBCATS, DOMESTIC CATS, RED AND GRAY FOXES, WATER SNAKES, PINE SNAKES, PILOT SNAKES, MILK SNAKES, RATTLE SNAKES, COPPERHEADS, RAINBOW TROUT, LAKE TROUT, NORTHERN PIKE, GAR, LARGE MOUTH BASS, AND GREEN SUNFISH *13:43-44,11:22-23,12:54,42:106-115,44:42-54,45:53-62,47,100,108,111*.

ECTOPARASITES THAT HAVE BEEN KNOWN TO OCCUR ON BLARINA BREVICAUDA ARE FLEAS, MITES, TICKS, AND BOT FLY LARVAE. ENDOPARASITES INCLUDE CESTODES, TREMATODES, NEMATODES, AND ACANTHOCEPHALANS *12:54*. SPECIFICALLY, THE COMMONEST ECTOPARASITES THAT HAVE BEEN REPORTED ARE MITES, OF WHICH SEVEN SPECIES HAVE BEEN REPORTED FROM INDIANA *42:106-115*, SIXTEEN SPECIES FROM WISCONSIN *44:42-54*, FIVE GENERA FROM NEW YORK *100*. BAKER *45:53-62*, CITES MICHIGAN SHREWS INFESTED WITH CHIGGERS. THERE ARE THREE SPECIES OF FLEAS LISTED FROM INDIANA *42:106-115*, NINE FROM WISCONSIN *44:42-54*, TWO FROM MICHIGAN *45:53-62*, AND SEVEN FROM ILLINOIS *69*. THE TWO

(Continued on next page)

Figure 5. (Continued).

COLLECTED BLARINA ALONG FENCE ROWS AND IN A HOUSE IN ALLEGHENY COUNTY; IN A SHRUBBY OLD-FIELD IN BEAVER COUNTY; AND IN MIXED DECIDUOUS FORESTS IN CRAWFORD COUNTY.

<N-FOOD>

VARIOUS INVESTIGATORS HAVE RECORDED THE DIETS OF BLARINA BREVICAUDA. BELYING THE NAME INSECTIVORE, IT FEEDS ON A WIDE VARIETY OF FOODS BESIDES INSECTS. WHILE SOME AUTHORS HAVE SHOWN INSECTS TO BE THE PREFERRED FOOD *45:53-62*,11:22-23,12:54,43:37-41,27:42-43,77,97*, OTHERS CONSIDER EARTHWORMS TO BE THE SINGLE MOST ABUNDANT FOOD ITEM IN BLARINA'S DIET *28:46-51,42:106-115*. THE INSECTS THEY HAVE BEEN KNOWN TO EAT ARE: CRICKETS, MOTHS AND THEIR LARVAE, DIPTERANS, GROUND LIVING BEES AND WASPS, BEETLES AND THEIR LARVAE *45:53-62,97*. OTHER ARTHROPODS INCLUDE SPIDERS (INCLUDING THEIR EGG MASSES), MILLIPEDES, CENTIPEDES, AND SNOWBUGS *45:53-62,11:22-23,12:54,42:106-115,43:37-41,27:42-43,77*, SNAILS AND SLUGS FOUND THROUGHOUT THE LITTER LAYER ARE OFTEN CONSUMED. *45:53-62,28:48-51,11:22-23,12:54,42:106-115,43:37-41,27:42-43,61,87,76,77,79,79,80,97,103*. THE DIET IS COMPLETED BY VEGETABLE MATTER: INCLUDING FRUITS, ROOTS, ACORNS AND BEECHNUTS; AND ENDOGONE, A SUB-TERRANEAN FUNGUS, SPORES OF WHICH HAVE BEEN FOUND IN BLARINA STOMACH CONTENTS ON NUMEROUS OCCASSIONS *45:53-62,28:46-51,11:22-23,42:106-115,43:37-41,76,77*. ONE WORKER HAS REPORTED OBSERVING COPROPHAGY IN BLARINA *97*.

THERE HAS BEEN SOME QUESTION AS TO THE IMPORTANCE OF MICE IN THE DIET OF BLARINA. SOME FEEL THAT AT CERTAIN TIMES OF THE YEAR, OR WHEN MICE ARE PARTICULARLY PLENTIFUL THAT THEY MAKE UP A MAJOR PAT OF BLARINA'S DIET, *13:43-44,76,79,53,79,97*, WHILE OTHERS FEEL THEIR CONTRIBUTION HAS BEEN OVERRATED *28:48-51,11:54,42:106-115*. AT ANY RATE, IT HAS BEEN AMPLY DEMONSTRATED THAT IN CAPTIVITY THESE SHREWS WILL EAT MICE WITH GREAT ENTHUSIASM *42:106-115,76,33*. IN DEALING WITH MICE, AND TO SOME EXTENT WITH LARGE INSECTS, BLARINA HAS OFTEN BEEN OBSERVED TO KILL THE PREY BY BITING IT IN THE HEAD REGION. EVEN IF THE PREY IS ALREADY DEAD, IT WILL OFTEN BEGIN EATING THE BRAINS FIRST BEFORE GOING ON TO THE OTHER PARTS OF THE BODY *33,87,72,76,96,97*. THIS BEHAVIOR MAY BE RELATED TO THE FACT THAT THE SALIVA OF BLARINA IS TOXIC AND THE BITE MAY SUBDUE THE PREY SOONER, THE CLOSER IT GETS TO THE BRAIN *72*. IT IS THOUGHT BY MANY THAT THE MAJOR FUNCTION OF THE TOXIC SALIVA IS TO IMMOBILIZE ARTHROPODS, EARTHWORMS, AND MOLLUSCS, ENABLING THEM TO BE HOARDED. ORGANISMS STORED ALIVE ARE NOT APT TO DECOMPOSE. THUS, THE SHREW IS ABLE TO TAKE ADVANTAGE OF TEMPORARY SURPLUSSES OF PREY BY QUICKLY SUBDUING THEM AND STORING AGAINST A FOOD SHORTAGE LATER *52,43,37-41,11:22-23,71,72,73,75,77*. EVIDENCE OF SEASONAL SHIFT IN DIET IS PRESENTED BY JONES ET AL *12:54* WHO SUGGEST THAT IN WINTER BELOW 0 DEGREES CELSIUS, BLARINA EATS PROPORTIONALLY MORE INSECTS THAN IN SUMMER, MOSTLY DORMANT BEETLES AND PUPAE. ALSO, MORE PLANT MATERIAL IS EATEN AT THAT TIME: HAMILTON *77* SHOWED THAT IN WINTER, INSECTS MADE UP 60% OF THE DIET OF BLARINA. IN RESPONSE TO OUTBREAKS OF LARCH SNOWFLIES, BLARINA HAS BEEN KNOWN TO NOT ONLY INCREASE IN NUMBERS IN THE INFESTED AREA *57*, BUT ALSO TO EAT A SIGNIFICANTLY GREATER NUMBER OF PUPAE OF THE INSECTS PER INDIVIDUAL *61*.

OLFACTION SEEMS TO BE THE MAJOR MEANS BY WHICH BLARINA IS ABLE TO DETECT ITS PREY *85,87,74*, BUT GUSTATION IS IMPORTANT IN THE ULTIMATE ACCEPTANCE OF THE FOOD *74*. IN VIEW OF THIS, IT SEEMS WORTH MENTIONING THAT SOME VERTEBRATES HAVE DEVELOPED GLANDULAR SECRETIONS THAT SERVE AN ANTI-PREDATORY FUNCTION AND ARE EFFECTIVE IN SLOWING BLARINA'S ATTACKS BUT NOT IN THWARTING THEM ENTIRELY. NOTABLE AMONG THESE ARE SOME SPECIES OF FROGS AND SALAMANDERS *59,61,103*. SHREWS WOULD NOT EAT WEASELS CAUGHT IN A TRAP, EVEN THOUGH THEY WILL CONSUME MANY OTHER SPECIES OF TRAPPED MAMMALS *70*.

(Continued on next page)

Figure 5. (Continued).

SPECIES THAT SEEM TO BE COMMON TO ALL THESE FINDINGS ARE CTENOPHTHALMUS PSEUDAGYRTES AND ORATOPSYLLA BLARINAE.

FIVE SPECIES OF BEETLES FROM SHREW NESTS HAVE BEEN REPORTED, BUT POSSIBLY ONLY ONE OF THESE IS PARASITIC *42:106-115,44:42-54*.

HELMINTHS HAVE A PARTICULARLY HIGH INCIDENCE IN BLARINA. ONE HUNDRED-EIGHTY ONE SPECIMENS FROM INDIANA SHOWED 9.9% HAD NEMATODES, 29.8% HAD TREMATODES, AND 43% HAD CESTODES *42:106-115*. OF 53 SHREWS EXAMINED IN IOWA, ONLY THREE WERE NEGATIVE FOR HELMINTHS. EIGHTEEN SPECIES WERE IDENTIFIED: 4 TREMATODES, 7 CESTODES, AND 7 NEMATODES. CAPILLARIA OESOPHAGICOLA WAS THE MOST COMMON NEMATODE: PROFOGYRELLA BLARINAE AND PSEUDODIORCHIS REYNOLDS WERE THE MOST CESTODES AND PANOBISTUS PRICEI WAS THE MOST COMMON TREMATODE. OF THE 93 BLARINA OSWALD *64* EXAMINED, 83.9% HAD HELMINTHS 6 SPECIES OF CESTODES, 4 TREMATODES, 8 NEMATODES, AND 1 ACANTHOCEPHALAN. A SIMILAR RATE OF INFESTATION WAS FOUND IN CONNECTICUT *67* WITH 5 SPECIES OF TREMATODES, 3 CESTOFES, 7 NEMATODES, AND 1 ACANTHOCEPHALAN. SOLOMON AND HANDLEY *66* ESTABLISHED A NEW RECORD FOR CAPILLARIA HEPATICA, A NEMATODE, IN THE SHORT-TAILED SHREW *66*. HUFFMAN AND ROSCOE *65* REPORTED A SPOROZOAN PARASITE, PROBABLY A SPECIES OF SARCOCYSTIS IN THE HEART MUSCLE OF BLARINA. THIS HAD NOT BEEN PREVIOUSLY CITED FOR BLARINA.

<DESCRIPTION>

THE SHORT-TAILED SHREW, BLARINA BREVICAUDA, IS THE LARGEST OF THE NORTH AMERICAN SORICIDS. THE TWO INSECTIVORA WITH WHICH IT MIGHT BE CONFUSED ARE THE LEAST SHREW, CRYPTOTIS PARVA, FROM WHICH IT CAN BE DISTINGUISHED BY ITS LARGER SIZE (ABOUT FOUR TIMES AS HEAVY), ITS DARK GRAY TO BLACK COLORATION AS OPPOSED TO BROWN AND ITS FIVE, RATHER THAN FOUR, UPPER UNICUSPIDS PER ROW AND THE HAIRY-TAILED MOLE, PARASCALOPS BREWERI WHICH IS THREE TO FIVE TIMES AS HEAVY AND HAS ENORMOUSLY ENLARGED FRONT PAWS FOR DIGGING. THE TEETH OF BLARINA HAVE DARK CHESTNUT ENAMEL WHILE ALL OF OUR MOLES HAVE WHITE ENAMEL *13:43-44,12:54,28:48-51*. THE SHORT LEGS, MINUTE EYES, AND CONCEALED EARS ARE GOOD FIELD CHARACTERISTICS. WHILE IT HAS A SHARP POINTED SNOUT, IT IS NOT NEARLY AS PROMINENT AS THOSE OF THE GENERA SOREX, MICROSOREX, AND CRYPTOTIS. ADULTS ARE SLATE GRAY DORSALLY, BECOMING PALER ON THE VENTRAL SURFACE. THE SHORT TAIL AND FEET ARE DARK GRAY ABOVE AND PALER BELOW. NEW FUR IS GLOSSY AND TENDS TO BE BLACKER IN YOUNG INDIVIDUALS THAN ADULTS *28:48-51*. THE FUR SIMILAR TO THAT OF OTHER INSECTIVORES IS VELVET-LIKE AND CAN BE BRUSHED IN EITHER A CRANIAD OR CAUDAD DIRECTION AND IT WILL LIE DOWN. SHREWS BORN IN SPRING AND EARLY SUMMER MOLT FROM A JUVENILE TO SUMMER PELAGE, AND LATER TO A WINTER PELAGE. THE SPRING MOLT AND POST-JUVENILE MOLTS PROCEED FROM THE HEAD IN A CAUDAD DIRECTION, WHILE THE REVERSE IS TRUE FOR THE FALL MOLT *42:106-115,90*. HAMILTON *91* FEELS THE MOLTS OCCUR RATHER RAPIDLY AS ONLY A SMALL PERCENTAGE EVER SHOW THE MOLT LINES IN A COLLECTION.

THE STANDARD MEASUREMENTS ARE FROM DOUTT, ET AL *13:258* RATHER THAN HALL *8:54* BECAUSE THE LATTER'S MEASUREMENTS DO NOT REFLECT THE REVISION OF GENOWAYS AND CLOATE *1* AND STILL INCLUDE THE SMALLER BLARINA CAROLINENSIS. IF ALL THE MEASUREMENTS IN DOUTT ET AL ARE FROM PENNSYLVANIA SPECIMENS, IT IS ASSURED THAT THEY ARE EXCLUSIVELY BLARINA BREVICAUDA. THE TOTAL LENGTH RANGES FROM 100-132 MM TAIL LENGTH 18-32 MM HIND FOOT LENGTH 12-17 MM AND 12-23.5 G.

<ORIGIN>

BLARINA BREVICAUDA IS NATIVE TO PENNSYLVANIA *13:42-45, 8:54-56*. THE FIRST IN-DEPTH ACCOUNT OF THE SPECIES WAS PUBLISHED IN 1903 BY RHOADS *14:193*.

<BEHAVIOR>

BLARINA BREVICAUDA IS ACTIVE THROUGHOUT THE YEAR, BEING MOST ACTIVE AT NIGHT BUT SHOWING PERIODIC BURSTS OF ACTIVITY DURING THE

(Continued on next page)

Figure 5. (Continued).

ENTIRE DAY *11:22,23,42:106-115*. MARTIN *82* USING MICROSWITCHES TO DETERMINE ACTIVITY PATTERNS FOUND BLARINA TO BE MOST ACTIVE BETWEEN 1 A.M. AND 3 A.M., AND LEAST ACTIVE FROM NOON UNTIL 3 P.M., THUS ADJUSTING THEIR DAILY ACTIVITY TO MINIMIZE ENERGY USED IN THERMOREGULATION. IN THE WINTER LOCAMOTORY ACTIVITY INCREASED IMMEDIATELY AFTER DARK WHILE SOME HEAT REMAINED FROM THE DAYLIGHT HOURS . THESE SHREWS HAVE BEEN SHOWN TO BE ACTIVE ONLY BETWEEN 10% AND 16% OF THE TIME, WITH ACTIVITY COMING IN SHORT BURSTS AVERAGING 49 MINUTES. AVERAGE INTERVALS BETWEEN ACTIVITY PERIODS ARE 99 MINUTES *88,93*. MARTINSEN *68*, SHOWED THE SHREW'S MINIMUM RESTING METABOLISM TO BE 2.18CC O2/G/H, AND THAT THIS TRIPLED DURING FEEDING ACTIVITY, AND QUADRUPLED DURING HYPERACTIVITY. DEAVERS AND HUDSON *84* SHOWED A LINEAR INCREASE IN OXYGEN CONSUMPTION WITH A DECREASE IN AMBIENT TEMPERATURE. THIS INCREASE WAS 0.22CC O2/G/H/DC WHICH IS GREATER THAN IN MICE OR VOLES. BLARINA APPARENTLY HAS A HIGHER EVAPORATIVE HEAT LOSS THAN THE OTHERS. THESE SHREWS DIED FROM HEAT STRESS IN ONE HOUR AT 32 DEGREES CELCIUS. MARTINSEN *88* FEELS THAT THE SHORT-TAILED SHREW HAS ADAPTED TO COLD TEMPERATURE REGIONS BY ITS ABILITY TO EAT ANYTHING OF ENERGY VALUE, AND ITS SPENDING MOST OF ITS TIME INACTIVE AT A LOW RESTING METABOLISM.

ESTIMATES OF BLARINA'S HOME RANGE VARY FROM 1/2 ACRE TO 4.43 ACRES WITH MOST FALLING BETWEEN 1/2 AND 1-1/2 ACRES *11:22-23,12:54,24,27:42-43,48,92*. THIS SHREW SEEMS TO BE SOLITARY DURING MOST OF THE YEAR AND CAN BE VERY PUGNACIOUS TOWARD ITS CONSPECIFICS *26:28-32,15*. IT IS THOUGHT THAT AT LEAST ONE OF THE FUNCTIONS OF THE SECRETIONS OF THE VENTRAL AND LATERAL SCENT GLANDS IS TERRITORIAL MARKING. THESE GLANDS ARE MORE PRONOUNCED IN MALES THAN FEMALES *12:54,42:106-115,15*. VOCAL COMMUNICATION IS PROBABLY ALSO USED TO MAINTAIN TERRITORIES, AS BLARINA IS KNOWN TO EMIT SEVERAL SOUNDS *42:106-115,23:48-51,98,100,15*. THESE SHREWS ALSO USE ULTRASOUND, APPARENTLY AS AN ECHOLOCATION DEVICE IN EXPLORING THEIR TUNNEL SYSTEMS *43*.

THE BURROW SYSTEMS OF BLARINA CONSIST OF TUNNELS A FEW INCHES BELOW THE SOIL SURFACE OR IN THE LITTER LAYER; AND THOSE THAT OCCUPY A DEEPER ZONE, 16-22 INCHES BELOW THE SURFACE. THE TWO ARE JOINED AT IRREGULAR INTERVALS BY AERUPF CONNECTIONS *12:54*. THE SURFACE BURROWS ARE USUALLY 25-30 MM IN DIAMETER AND MAY EXTEND AS FAR AS 30 METERS IN A ZIG-ZAGGING FASHION. THE TWO OPENINGS TO A BURROW SYSTEM ARE NEVER MORE THAN 4 METERS APART, NOR CLOSER THAN 1 METER *97*.

<REPRODUCTION>

NOT MUCH IS KNOWN ABOUT THE ACTUAL MATING BEHAVIOR OF BLARINA. THE MATING SEASON EXTENDS FROM EARLY SPRING TO LATE FALL *13:42-45*. MORE SPECIFICALLY, THE FIRST PREGNANCIES ARE NOTICED IN APRIL AND END IN SEPTEMBER IN CANADA *11:22-23*. IN MICHIGAN, THEY ARE REPRODUCTIVELY ACTIVE FROM MARCH TO SEPTEMBER *45:53-62*. CHRISTIAN *95* ESTIMATED THAT BREEDING BEGAN BY FEBRUARY 10 IN NORTHEASTERN PENNSYLVANIA. HAMILTON AND WHITAKER *13* FOUND YOUNG TO BE BORN FROM EARLY SPRING TO LATE SEPTEMBER. PRUITT *56* FEELS THAT BLARINA DOES NOT HAVE A SINGLE UNIFORM BREEDING SEASON, AS THOSE INHABITATING HARDWOOD AND PINE AREAS HAVE THEIR BREEDING COMPLETED BEFORE MID-JUNE IN BOGS AND PINES BREEDING IS STILL IN PROGRESS IN MIDSUMMER. IN THE BOG AREA, THERE IS REDUCED LIGHT INCIDENT ON THE FOREST FLOOR. THEREFORE, IF LIGHT CONTROLS THE BREEDING CYCLE, IT WOULD YIELD A LATE ONSET OF BREEDING IN THE SHREWS. THE GESTATION PERIOD IS GENERALLY THOUGHT TO BE BETWEEN 17 AND 22 DAYS *13:42-45,11:22-23,12:54,42:106-115, 43:37-41,27:42-43,44:49-54*. ESTIMATES OF THE NUMBER IN EACH LITTER RANGE FROM 4 TO 10 WITH SOME INVESTIGATORS PROJECTING 2 TO 4 LITTERS PER YEAR. OTHERS CONSIDER THIS NUMBER UNKNOWN

(Continued on next page)

Figure 5. (Continued).

13:42-45,28:49-51,11:22-23,12:54,42:106-115,43:37-41,27:42-43,44:42-54.

NESTS ARE FAIRLY SIMPLE HOLLOW BALLS CONSTRUCTED OF SHREDDED OR UNSHREDDED LEAVES, GRASS, AND SOMETIMES MOUSE HAIR. USUALLY IT IS PLACED BENEATH AN OLD LOG OR STUMP *13:42-45, 28:49-51,12-54,43:37-41*. ONE WORKER FOUND A NEST AS DEEP AS NINE INCHES IN THE GROUND *99*. THERE ARE USUALLY TWO TYPES OF NESTS: RESTING NESTS AND BREEDING NESTS WHICH ARE MUCH SMALLER *12:54*.

THE YOUNG GROW VERY RAPIDLY, BECOMING HALF-GROWN WHEN ONLY A MONTH OLD *28:49-51*. THEY DEVELOP FUR BETWEEN DAY 6 AND 10, AND TEETH BY DAY 22 *12:54,43:37-41*. THEY ARE USUALLY WEANED BETWEEN 2 AND 3 WEEKS OF AGE, ALTHOUGH SOME EXTEND THIS TO 25 DAYS *13:42-45,94*. THE YOUNG OFTEN STAY IN THE NEST UNTIL NEARLY FULL GROWN WHICH ACCOUNTS FOR THE FACT THAT ONE RARELY CATCHES A JUVENILE SHREW IN A TRAP *42:105-115*. IT HAS BEEN REPORTED FROM CANADA THAT 17 DAYS AFTER BIRTH, YOUNG, RANGING FROM 9 TO 12 GRAMS WERE BEGINNING TO DISPERSE *11:22-23*. ONE WORKER FOUND A NEST WITH A LACTATING SHREW WEIGHING 13.5G WHICH HAD THREE YOUNG FEMALES, WEIGHING RESPECTIVELY 9.0, 9.3, 9.6, ATTACHED TO HER NIPPLES *99*.

ACTIVITY OUT OF THE NEST INCREASED DURING PREGNANCY AND GREATLY INCREASED DURING LACTATION. THE ADULT SHREW RETRIEVES THE PUPS BY DRAGGING THEM OR CARAVANNING THEM. ONCE WEANING OCCURS, MATERNAL BEHAVIOR CEASES ENTIRELY *109*. PEARSON *89* STUDIED ALL ASPECTS OF THE REPRODUCTIVE PROCESSES OF BLARINA.

AGES OF BLARINA CAN BE ESTIMATED BY TOOTH WEAR, ALTHOUGH THIS METHOD IS SUBJECT TO THE DIFFERENTIAL ABRASION CAUSED BY DIFFERENT FOOD MATERIALS IN DIFFERENT HABITATS *56*. HOWEVER, PEARSON *101* FOUND IT A QUITE RELIABLE METHOD OF AGING. BLARINA RARELY LIVES 2 YEARS AND THOSE THAT DO ARE PRACTICALLY TOOTHLESS *13:42-45,12:54,101*. A STUDY DONE ON 383 SHORT TAILED SHREWS BORN AND RAISED IN CAPTIVITY SHOWED THAT ONLY 8.7% OF THOSE BORN URVIVED ONE YEAR, AND 16.4% OF THOSE WEANED SURVIVED FOR A YEAR. FEMALES BECOME SEXUALLY MATURE AT ABOUT 6 WEEKS OF AGE, WHILE MALES DON'T REACH THIS POINT UNTIL 12 WEEKS OLD *11:22-23,12:54*. THIS HAS LED MOST WORKERS TO BELIEVE THAT BLARINA DOES NOT BREED DURING ITS FIRST YEAR *12:54,43:37-41,48*, ALTHOUGH THERE IS THE POSSIBILITY THAT FEMALE YOUNG OF THE YEAR MAY HAVE A FALL LITTER *11:22-23.

<POP-DYNAMICS>

THERE IS A GREAT DEAL OF VARIANCE IN THE POPULATION DENSITIES REPORTED FOR BLARINA BREVICAUDA. IN CANADA, BANFIELD *11:22-23* CITES POPULATIONS THAT VARY FROM LESS THAN 1 TO 11.6 PER ACRE IN GOOD HABITAT. CUNNINGHAM *16:VIII:3-4* ESTIMATED 96 PER HECTARE IN NORTHEASTERN OHIO. OTHERS HAVE REPORTED 0.8-2.2/ACRE, 3-5 /ACRE, 25/ACRE, AND 4 PAIRS OF SHREWS PER ACRE OF CHOICE HABITAT *12:54,27:42-43,100,92*. CHRISTIAN *95* COLLECTED 139 IN 1000 TRAP-NIGHTS IN THE FIRST 24 HOURS OF TRAPPING, BUT FOUND FEWER THAN 5% OF THIS NUMBER THE FOLLOWING YEAR. PRUITT *56* SHOWED THAT IN HARDWOOD FORESTS, BLANDINA SHOWED A NORMAL DISTRIBUTION OF AGE GROUPS, I.E., A SUBSTANTIAL NUMBER OF MIDDLE-AGED GROUPS. IN NON-HARDWOOD AREAS, THE ANIMALS WERE EITHER YOUNG OR OLD. HE CONCLUDED THAT THE HARDWOODS WERE THE CENTERS OF DISTRIBUTION WITH THE OTHER AREAS BEING INHABITED BY EITHER YOUND OR OLD INVADERS. WHILE THESE SHREWS RARELY LIVE 2 FULL YEARS, A WILD CAUGHT FEMALE LIVED 30 MONTHS IN CAPTIVITY AND 2 MALES LIVED 29 AND 33 MONTHS RESPECTIVELY, IN CAPTIVITY *12:54*.

WHILE SOME WORKERS HAVE DETERMINED THE SEX RATIOS IN BLARINA POPULATIONS TO BE ABOUT 1:1 *25,92*, PRUITT *56* FOUND THAT IN UNDISTURBED AREAS THE RATIO WAS APPROXIMATELY

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Figure 5. (Continued).

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   1 MALE:2 FEMALES, WHILE IN DISTURBED AREAS, THE REVERSE WAS
   TRUE.  THIS WAS EXPLAINED ON THE BASIS OF MALES BEING THE
   PRIMARY INVADRS OF A DISTURBED AREA WITH FEMALES FOLLOWING
   AT A LATER DATE.
        OTHER POPULATION DATA IS SPARSE.
<LIM-FACTORS>
        IT WOULD APPEAR THAT THE ONLY MAJOR FACTORS LIMITING
   POPULATIONS OF BLARINA BREVICAUDA ARE SOIL MOISTURE AND THE
   PRESENCE OF LEAF LITTER *11:22-23,44:42-54,49,18,56,58,104,
   12:54*.  EVEN THE APPLICATION OF PERSISTENT PESTICIDES LIKE
   DDT DO NOT APPEAR TO HAVE LIMITED BLARINA, AT LEAST IN THE
   QUANTITIES USED BY BRAHAM AND NEAL *80* WHO SHOWED THAT
   THE SHREW'S METABOLISM INCREASED DURING THE SECOND AND
   THIRD WEEKS AS LIVER ENZYMES WERE INDUCED TO METABOLIZE THE
   POISON.  TWO OTHER STUDIES SHOW THAT THE ACCUMULATION OF
   DDT RESIDUES CONTINUE TO BUILD UP IN BLARINA'S TISSUES
   AFTER APPLICATION OF THE CHEMICAL HAS BEEN DISCONTINUED,
   AS IT DOES IN OTHER SPECIES OF SHREWS AND MICROTUS
   PENNSYLVANICUS *106,110*.
<R-TAXONOMY>
   01,02,03,04,05,06,07,08,09,10,12,13
<R-SPP-STATUS>
   07,13,14,16,19,20,21,22,23,26,34,35,36,37,38,39,40,41
<R-DISTRIB>
   04,06,08,14,22,29,30,31,32,33,34,35,36,37,38,39
<R-HABITAT>
   07,11,12,13,14,16,17,18,20,21,22,23,24,25,26,27,28,33,34,35,37,38,39,
   41,42,43,44,45,46,49,50,51,54,55,56,57,58,60,104
<R-FOOD>
   11,12,13,27,28,33,42,43,45,52,53,57,59,61,70,71,72,73,74,75,76,
   77,78,79,80,81,85,87,96,97,103
<R-MGMT>
   11,12,18,44,49,56,104
<R-LIFE-HIST>
   08,11,12,13,14,15,16,18,24,25,27,28,42,43,44,45,48,49,56,86,87,36,88
   89,92,93,94,95,97,98,99,100,101,104,106,109,110
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Figure 5. (Continued).

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IMPLEMENTATION AND FUTURE PLANS

The Pennsylvania Fish and Wildlife Data Base is used regularly by the Game Commission, federal and state agencies (e.g., the U.S. Army Corps of Engineers and the Pennsylvania Department of Environmental Resources), and environmental impact statements and permit applications, species inventories by location and habitat, the preparation of research proposals, habitat management planning, and as a public information source.

More comprehensive information in each species profile as provided by this updating will be immediately available to permit more precise searches of location than previously possible, guilding for habitat analysis using life requirements and associations for species, more management effects information, and comprehensive species narratives.

This updating project is only the beginning of a program to update comprehensively the life requirements and distribution of every vertebrate animal occurring in the Commonwealth. As stated earlier, 802+ additional species must be reviewed and data compiled before the system is complete; and the need for updating never ends as we learn more about our natural ecosystems and the fauna inhabiting them. Additional proposals for outside funding are being written to further updating the Data Base and additional Game Commission funds have been authorized to fund data collection by qualified resource professionals.

We envision many management and research opportunities as a result of this updating program. Examples include a catalog of endangered, threatened, and vulnerable wildlife defining locations, population levels, and reasons for population trends; literature reviews of potential research species and the identification of research data gaps for sound management; development of a guidebook for state game lands, state forest land, and state park land management that identifies species present, their habitat requirements, and suggested beneficial management practices; and habitat guilding for improved environmental assessments and habitat mitigation proposals.

Our goal is to establish the Pennsylvania Fish and Wildlife Data Base as the central source and repository of faunal inventory data in the Commonwealth.

APPENDICES

APPENDIX A

List of Subcontractors

Appendix A. List of subcontractors used in compiling the computerized bird and mammal inventory for the Lake Erie Coastal Zone

Name	Title	Address	Telephone
Kenneth W. Anderson	Associate Professor	Department of Biology Gannon University Erie, PA 16541	(814)871-7633
Harry N. Cunningham, Jr.	Associate Professor	Biology Department Behrend College Penn State University Erie, PA 16563	(814)989-6403
J. Timothy Kimmel	Assistant Professor	Villa Maria College 2551 West Lake Road Erie, PA 16505	(814)838-1966
Larry J. Miller	Assistant Professor	Department of Biology Gannon University Erie, PA 16541	(814)871-7639

Appendix A. List of subcontractors used in compiling the computerized bird and mammal inventory for the Lake Erie Coastal Zone

Name	Title	Address	Telephone
Kenneth W. Anderson	Associate Professor	Department of Biology Gannon University Erie, PA 16541	(814)871-7633
Harry N. Cunningham, Jr.	Associate Professor	Biology Department Behrend College Penn State University Erie, PA 16563	(814)989-6403
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Larry J. Miller	Assistant Professor	Department of Biology Gannon University Erie, PA 16541	(814)871-7639

APPENDIX B

Species Workbook

Pennsylvania Fish and Wildlife Data Base

Pennsylvania Fish and Wildlife Data Base

PENNSYLVANIA GAME COMMISSION
BUREAU OF LAND MANAGEMENT
P.O. BOX 1567
HARRISBURG, PENNSYLVANIA 17105-1567

SPECIES WORKBOOK

Species Code Number: _____

Species Common Name: _____

Species Scientific Name: _____

****

Workbook Compilers:

Name: _____
Agency: _____
Address: _____
_____
_____
_____
Phone: ( ) _____

Name: _____
Agency: _____
Address: _____
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Phone: ( ) _____

Workbook Reviewers:

Name: _____
Agency: _____
Address: _____
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Name: _____
Agency: _____
Address: _____
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Phone: ( ) _____

****

Computer Entry:

Name: _____
Date: _____

Computer Entry Verification:

Name: _____
Date: _____

Date loaded into Data Base System: _____

P E N N S Y L V A N I A

F I S H A N D W I L D L I F E

D A T A B A S E

S P E C I E S W O R K B O O K

Pennsylvania Game Commission
P.O. Box 1567
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Developed by

Calvin W. DuBrock
Biometrician and Data Base Coordinator
Division of Environmental Impact
Assessment and Minerals
Bureau of Land Management

August 1984
(Revised September, 1985)

ACKNOWLEDGMENTS

This Species Workbook and the resulting Pennsylvania Fish and Wildlife Data Base are the result of a continuing effort over several years by many individuals and agencies to provide readily accessible species information for use in natural resource planning and management. Agencies that have contributed to this project over the many years include the U.S. Fish and Wildlife Service, U.S. Bureau of Land Management, U.S. Army Corps of Engineers, U.S. Office of Surface Mining, U.S. Soil Conservation Service, U.S. Forest Service, U.S. Nuclear Regulatory Commission, Pennsylvania Department of Environmental Resources, Pennsylvania Fish Commission, Missouri Department of Conservation, Colorado Division of Wildlife, Illinois Department of Conservation, Virginia Commission of Game and Inland Fisheries, and the Western Pennsylvania Conservancy.

Special thanks are due many for their support in this program and development of the workbook. In particular, I would like to recognize and thank for their assistance and helpful comments: Charles Cushwa, Gene Ludlow, Henry Gerke, James Brown, Glenn Gravatt, David Putnam, Jerry Touval, David Reese, John Forren, Richard Heaslip, Stephen Miller, Robert Brooks, Joseph Barnard, Richard Roth, Edwin Pentecost, Germain LaRoche, Daniel Devlin, Richard Croop, Ken Hickok, Paul Steblein, Jerry Hassinger, John Kriz, Bill Palmer, Bill Shope, Calvin Butchkoski, Jerry Wunz, Arnie Hayden, Fred Hartman, John Dunn, Gregory Grabowicz, John Byerly, Frank Mazzotti, and Bruce Anderson.

Special recognition and thanks are due to Arlene Miller and Joan Mehaffey for their patience, perserverance, and typing and editorial skills that permitted completion of this workbook.

PENNSYLVANIA
FISH AND WILDLIFE
DATA BASE

SPECIES WORKBOOK

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GENERAL INSTRUCTIONS

This Species Workbook has been developed to compile information in a standard format for the Pennsylvania Fish and Wildlife Data Base. The Data Base is a computerized library of species information that is keyword searchable, providing instant access to information for 840+ animals occurring in Pennsylvania. The Data Base provides an important focus for storing and acces sing animal for Pennsylvania species. Game Commission personnel and others use this Data Base for environmental assessments, habitat evaluation and management, species management research, wildlife extension, and education.

This workbook has been designed for compiling a complete, concise profile of the distribution, status, biology, and management of the species. You will find several "narrative" and "checklist" sections in this workbook, with specific instructions accompanying each section. Most of the reference materials required to complete a section have been incorporated into the instructions and checklists. Additional materials or references that might be required to correctly complete a section, but were too voluminous or inappropriate to include in the workbook, are included in the Species Workbook Supplemental Manual.

Some of the information requested in sections of the workbook will appear to be duplicated; therefore, it is important to understand the different functions of the narrative sections and checklists.

Narratives

The narratives should be written in a flowing, readable format. They should provide quick, fully referenced, documentation to the Data Base user for environmental assessments, planning decisions, etc. The narratives should be written to stand alone; that is, even if the information is requested again in a summary checklist, it is essential that all relevant/appropriate information for the topic be included in the narrative text. An individual retrieving narrative information from the Data Base probably will not have viewed any of the checklist information.

All information presented in these narratives must be referenced. Assign each reference a numerical code (sequentially beginning with Ø1, based upon order of appearance in the text); then record the complete citation in the REFERENCE section of this workbook. Use these codes along with the page numbers in the citation throughout the narratives to indicate the sources for each item of information; e.g., this species deposits eggs in warm, well-drained, sandy soils (Ø3:14, 14:35Ø-353, 15:4-5).

When completing the narratives (and other sections requesting text), it is preferred that the information first be drafted and then typed or neatly printed in the workbook. Slash all zeros ("Ø") to prevent confusion with the letter "O". These steps will greatly decrease the incidence of keypunch errors when the information is entered into the computer.

Summary Checklists

The checklists are designed to summarize selected information in the narratives into standardized keywords to allow rapid retrievals from the Data Base. Many of the checklist codes/words are established standards used by other agencies. By using these standards, the checklists will permit specific retrievals from the Data Base; e.g., what species occur in palustrine wetlands? These standard keywords also are useful for crosswalking to other existing databases or mapping systems and for regional/national summaries.

Use your professional judgment to resolve cases in which there may be overlap or gray areas in the checklists. If a species relationship to a standard code/word is uncertain, it is better to indicate a positive connection rather than not indicate it and not be able to retrieve the species in situations involving that code/word. Remember, the narratives will always serve as the definitive source for describing the species.

TAXONOMY

A. Taxonomic Nomenclature

Note: If this Workbook is being used to describe more than one subspecies, indicate all subspecies being described in the Taxonomic Narrative section. Complete the taxonomic description below to the species level only and enter the taxonomic authority for species.

Group (check only one):
- __ Amphibian
- __ Bird
- __ Crustacean
- __ Fish
- __ Insect - Aquatic
- __ Insect - Terrestrial
- __ Mammal
- __ Mollusc
- __ Other Aquatic Invertebrate (not insect)
- __ Other Terrestrial Invertebrate (not insect)
- __ Reptile

Phylum: _____

Subphylum: _____

Class: _____

Subclass: _____

Order: _____

Suborder: _____

Superfamily: _____

Family: _____

Subfamily: _____

Tribe: _____

Genus: _____

Subgenus: _____

Species: _____

Subspecies: _____

Taxonomic Authority and Date (for Species/Subspecies): _____

_____

B. Taxonomic Narrative

Briefly discuss any variations or disagreements on species identification, classification, and/or nomenclature. Identify any common synonyms for both common and scientific names found in the literature (past or present) or in use in other databases or by other administrative agencies. Additionally, identify type specimens and/or references to descriptions, photographs, drawings, or collections which may be useful for species identification. For all information provided in the narrative, provide reference codes identifying the information source and source page(s) within the text (e.g. Ø3:438-44Ø) and record the complete citation in the REFERENCE section at the back of this workbook.

C. Taxonomic Synonyms

Sequentially list (one per line) all other nomenclature variations and common names used for this species and reported in the Taxonomic Narrative.

Other Scientific Names (Genus, species, subspecies):

Other Common Names:

D. References for Taxonomy [enter the reference codes for all references used in compiling the entries in this section, separate each reference code with a comma]:

STATUS

A. Status Narrative

Develop a narrative profile describing the current legal and use status of this species in the Commonwealth of Pennyslvania. If the species is recognized as endangered, threatened, or a species of special concern, indicate the reasons for the special status and factors that may be threatening to populations of the species. For federally listed species, include the date of listing, whether or not a federal recovery plan exists, and where designated critical habitats have been identified in Pennsylvania. Also, indicate all federal and state agencies that have executive, legislative, or other designated responsibilities for this species and describe the nature of this responsibility following the agency name. Provide appropriate reference codes including page number(s) for all information, and record the complete citation in the REFERENCE section at the back of this workbook.

Note: In developing this narrative, it may be helpful to be aware of the status categories that are included in the checklist that follows.

B. References for Status (enter the reference codes for all references used in compiling the entries in this section, separate each reference code with a comma):

_____

_____

_____

C. Status Checklist

Check all the status categories that apply to the species.

Code	Status	Definition
__ F-E	Federal Endangered	Species is officially classified by the Federal Government as being in danger of extinction throughout all or a significant part of its range. (Consult the Federal Register listing in the Species Workbook Supplemental Manual.)
__ F-T	Federal Threatened	Species is officially classified by the Federal Government as being likely to become endangered within the foreseeable future throughout all or a significant part of its range. (Consult the Federal Register listing in the Species Workbook Supplemental Manual.)
__ F-P	Federal Proposed	Species is officially identified by the Federal Government as being likely to become endangered or threatened and has been proposed for listing. (Consult the Federal Register listings in the Species Workbook Supplemental Manual.)
__ F-C	Federal Candidate	Species is offically identified by the Federal Government as under review or consideration for listing as an endangered or threatened species. (Consult the Federal Register listings in the Species Workbook Supplemental Manual.)
__ S-E	State Endangered	Species is officially classified by the responsible State Government agency (Game Commission or Fish Commission) as endangered.
__ S-T	State Threatened	Species is officially classified by the responsible State Government agency (Game Commission or Fish Commission) as threatened.

Code	Status	Definition
__ S-SC	State Special Concern Species	Species is officially classified by the responsible State Government agency (Game Commission or Fish Commission) as a species of special concern.
__ S-SU	State Status Undetermined	Species is officially recognized by the responsible State Government agency (Game Commission or Fish Commission) as status undetermined or status indeterminate.
__ S-X	State Extirpated	Species is officially classified by the responsible State Government agency (Game Commission or Fish Commission) as extirpated. These generally include species that have disappeared from Pennsylvania, but still exist elsewhere. For birds, includes species that do not presently nest in Pennsylvania, but did at one time.
__ MIGRATORY	Federal Migratory	Species is officially recognized by the Federal Government as a migratory bird in 50 CFR. (Consult the Species Workbook Supplemental Manual for a complete listing.)
__ COMMERCIAL	Commercial	Species is commercially harvested for fur or flesh value.
__ CONSUMP-REC	Consumptive Recreational	Species is harvested recreationally for fur, flesh, or trophy value and its defined as such by State or Federal Law; may be officially classified as "protected", "nongame", or "wild" animal.
__ NON-CONSUMP-REC	Non-consumptive Recreational	Species is not defined by State or Federal law as a species to be harvested recreationally; may be officially classified as "protected", "nongame", or "wild" animal.
__ INDICATOR	Biological Indicator	Species whose occurrence indicates environmental quality (e.g., presence indicates low levels of dissolved oxygen).
__ SENSITIVE	Sensitive	Species especially susceptible to environmental perturbation (e.g., raptor breeding success has been closely tied to pesticide application and exposure).
__ UNCLASSIFIED	Unclassified	Species has no recognized status in the Commonwealth of Pennsylvania or its status does not correspond to any of the above categories.

SPECIES DISTRIBUTION

The following sections have been designed to record the species distribution in the Commonwealth of Pennsylvania. First, the species distribution should be described in "narrative" form. Each item of information presented in this narrative should be referenced in the Narrative Reference section. After the narrative is completed, this information can then be used to fill out the remaining distribution sections [County distribution, distribution by watershed (OWDC Hydrologic Units), 1:24,000 scale USGS maps, latitude/longitude point locations, etc.].

Consider and use the following DEFINITIONS in completing the distribution section of this workbook:

Occurrence - a species occurs in an area if it breeds, winters, or significantly uses habitat in that area. A species would occur in an area if the animal occurs there sometime during the year and the presence of that area served some vital or essential role in the animal's life cycle (even though habitat utilization may not be considered great). When defining the species occurrence, remember that you are specifying those areas in which the species will be considered in environmental studies, research project planning, management planning, etc.

The following values will be used in recording species occurrence geographically in the Commonwealth: known to occur, known not to occur, occurrence is unknown. Use the following guideline and definitions to interpret reports and other data sources for recording species distribution and occurrence:

Known to occur: a species has "known" occurrence in an area if there exists recorded sightings, specimen data, and documentation/evidence that suggest occurrence (e.g., sightings in an area of previously documented ocurrence), or documentation/evidence judged by professional, expert opinion to be valid. Range maps might, but do not necessarily, qualify or meet these criteria. Occurrence must qualify as defined above.

Known not to occur: a species is "known not to occur" in an area, i.e., area is outside the range of the species distribution. This value only applies for County Distribution.

Unknown: a species occurrence in the area is unknown, i.e., unable to determine from the available information base or from expert opinion whether species occurrence is "known" in an area or whether the species is "known not to occur" in an area.

A. Distribution Narrative

The Distribution Narrative section is provided for compiling a complete profile of the species distribution within Pennyslvania. The schematic below is provided for mapping the species distribution.

This narrative will provide the core or base for data recorded in subsequent distribution sections and the database. Individuals accessing the database should find in this narrative a complete and concise description of known locations of the species and/or populations of the species, and be able to discern breeding locations, wintering locations, and areas of migratory occurrences.

In the first paragraph, provide a brief description of the species current and historic distribution in the Commonwealth. (This paragraph should be brief and concise, not exceeding 3-4 sentences or 10 lines of text.) In the next paragraphs, highlight areas of year-round occurrence, seasonal occurrence, and migratory occurrence. If the species is migratory only in Pennsylvania, indicate the general migratory movement pattern (e.g. by major water drainage or mountain chain) and general dates of movement.

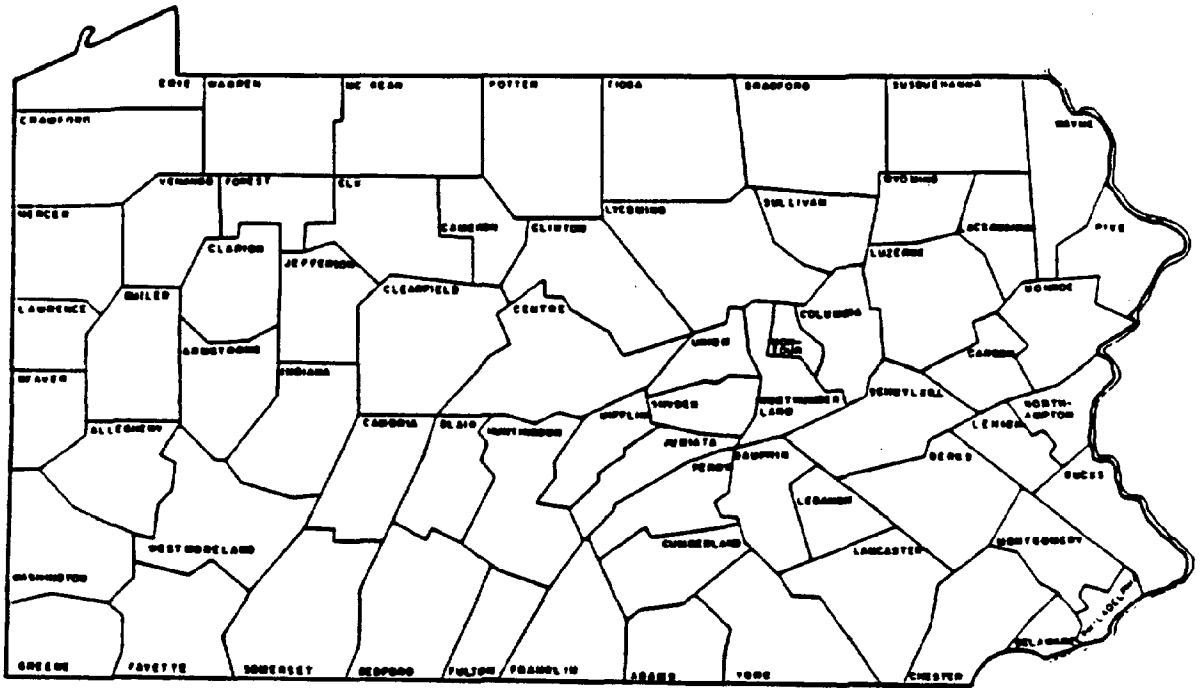
When describing the species distribution in these paragraphs, first indicate the general area of occurrences (region, county, watershed, national forest, game lands, state park/forest, etc.), then record information (if feasible) on site locations using reference points such as cities, roads/mileposts, topographic features/elevations, rivers/streams/reservoirs, quads, latitude/longitude, UTM coordinates, etc.

Be sure that possible occurrence (speculation and professional opinion) is noted as such, and that the occurrence type or mode is indicated (i.e., breeds in the following locations: . . .; winters in the following locations: . . ., etc.). Information related to relative abundance might also be included when available.

If precise distribution is considered too sensitive or secure to present in this workbook and the database give the name, title, affiliation, address, and business telephone number of the person(s) maintaining this information. Make certain that the individual(s) is consulted prior to providing the information.

Be certain to follow each item of distribution information with the reference code indicating the source of information, e.g., "known to occur in southeastern Pennsylvania in the counties of Chester, Delaware, and Berks (03:21, 05:14-16, 11:140)." Note that persons providing expert opinion/interpretation are considered a reference and should be assigned a reference code and cited in the REFERENCE section at the back of this workbook.

Map the species distribution below and narratively describe the distribution as instructed above in the space provided below and on the following pages.



Area location

Point location

FOR BIRDS ONLY

Breeding locations

Wintering locations

Migration corridors

B. References for Distribution (enter the reference codes for all references used in compiling the entries in this section, separate each reference code with a comma):

C. Statewide Resident Status

Check the one category that best describes the species' resident status in the Commonwealth.

	Code	Status	Definition
__	RES-B	Breeding Resident Only	Species primarily present during the breeding season only.
__	RES-W	Winter Resident Only	Species only present during most or all of the winter months.
__	RES-YR	Year-round Resident	Species breeds in Pennsylvania and is present year-round.
__	MIGRANT	Migratory Species	Species does not occur in Pennsylvania year-round or for an extended time period as described above, (i.e. is not a breeding or winter resident). Pensylvania is used only as a migration corridor.
__	UNKNOWN	Unknown	Species for which so few records exist in Pennsylvania that it cannot be classified into a different resident status cateogory.

D. Distribution by County

Complete the table that follows indicating species occurrence at the county level, seasonal occurrence within the counties in which the species "occurs", and species relative abundance within counties in which the species "occurs". Your entries in this table must correspond with information presented in the Distribution Narrative (Section A). Use the following codes and definitions in completing the table.

1. Occurrence codes and definitions are those defined earlier in the definitions.

Occurrence Codes

O - Known to occur
N - Known not to occur
X - Occurrence is unknown

2. Seasonal occurrence codes should be entered for counties in which the species is "known to occur". If the species does not occur in a county, or its occurence in a county is unknown, do not make an entry in that county blank for seasonal occurrence.

Seasonal Occurrence Codes

A - Spring Migration only
B - Spring Migration/Breeding Season
C - Spring Migration/Fall Migration
D - Spring Migration/Winter Season
E - Spring Migration/Breeding Season/Fall Migration
F - Spring Migration/Breeding Season/Winter Season
G - Spring Migration/Fall Migration/Winter Season
H - Breeding Season only
I - Breeding Season/Fall Migration
J - Breeding Season/Winter Season
K - Breeding Season/Fall Migration/Winter Season
L - Fall Migration only
M - Fall Migration/Winter Season
N - Winter Season only

O - Year-round Resident

X - Occurrence in the county by season is unknown

3. Abundance codes should be entered for counties in which the species is "known to occur". If the species does not occur in a county, or its occurrence in a county is unknown, do not make an entry in that county blank for relative species abundance.

Abundance Codes

A - abundant (occurs regularly or in large numbers in appropriate habitat or season or is frequently observed)
C - medium abundance (i.e., common - occurs in small numbers in appropriate habitat or season; observed occasionally in prime habitat)
U - low abundance (i.e., uncommon - occupies a small percentage of suitable habitat; occupies a very specific limited habitat; very few individuals observed in prime habitat)
X - abundance in county is unknown

County Name	County FIPS Code	Occurrence Code	Seasonal Occurrence Code	Abundance Code
ALL COUNTIES	ALL			
Adams	001			
Allegheny	003			
Armstrong	005			
Beaver	007			
Bedford	009			
Berks	011			
Blair	013			
Bradford	015			
Bucks	017			
Butler	019			
Cambria	021			
Cameron	023			
Carbon	025			
Centre	027			
Chester	029			
Clarion	031			
Clearfield	033			
Clinton	035			
Columbia	037			
Crawford	039			
Cumberland	041			
Dauphin	043			
Delaware	045			
Elk	047			
Erie	049			
Fayette	051			
Forest	053			
Franklin	055			
Fulton	057			
Greene	059			
Huntingdon	061			
Indiana	063			
Jefferson	065			
Juniata	067			

Occurrence Codes

O - Known to occur
N - Known not to occur
X - Occurrence is unknown

Seasonal Occurrence Codes

A - Spring Migration only
B - Spring Migration/Breeding Season
C - Spring Migration/Fall Migration
D - Spring Migration/Winter Season
E - Spring Migration/Breeding Season/Fall Migration
F - Spring Migration/Breeding Season/Winter Season
G - Spring Migration/Fall Migration/Winter Season
H - Breeding Season only
I - Breeding Season/Fall Migration
J - Breeding Season/Winter Season
K - Breeding Season/Fall Migration/Winter Season
L - Fall Migration only
M - Fall Migration/Winter Season
N - Winter Season only

O - Year-round Resident

X - Occurrence in the county by season is unknown

Abundance Codes

A - Abundant
C - Medium abundance
U - Low abundance
X - Abundance is unknown

County Name	County FIPS Code	Occurrence Code	Seasonal Occurrence Code	Abundance Code
Lackawanna	069			
Lancaster	071			
Lawrence	073			
Lebanon	075			
Lehigh	077			
Luzerne	079			
Lycoming	081			
McKean	083			
Mercer	085			
Mifflin	087			
Monroe	089			
Montgomery	091			
Montour	093			
Northampton	095			
Northumberland	097			
Perry	099			
Philadelphia	101			
Pike	103			
Potter	105			
Schuylkill	107			
Snyder	109			
Somerset	111			
Sullivan	113			
Susquehanna	115			
Tioga	117			
Union	119			
Venango	121			
Warren	123			
Washington	125			
Wayne	127			
Westmoreland	129			
Wyoming	131			
York	133			

Occurrence Codes

O - Known to occur
N - Known not to occur
X - Occurrence is unknown

Seasonal Occurrence Codes

A - Spring Migration only
B - Spring Migration/Breeding Season
C - Spring Migration/Fall Migration
D - Spring Migration/Winter Season
E - Spring Migration/Breeding Season/Fall Migration
F - Spring Migration/Breeding Season/Winter Season
G - Spring Migration/Fall Migration/Winter Season
H - Breeding Season only
I - Breeding Season/Fall Migration
J - Breeding Season/Winter Season
K - Breeding Season/Fall Migration/Winter Season
L - Fall Migration only
M - Fall Migration/Winter Season
N - Winter Season only

O - Year-round Resident

X - Occurrence in the county by season is unknown

Abundance Codes

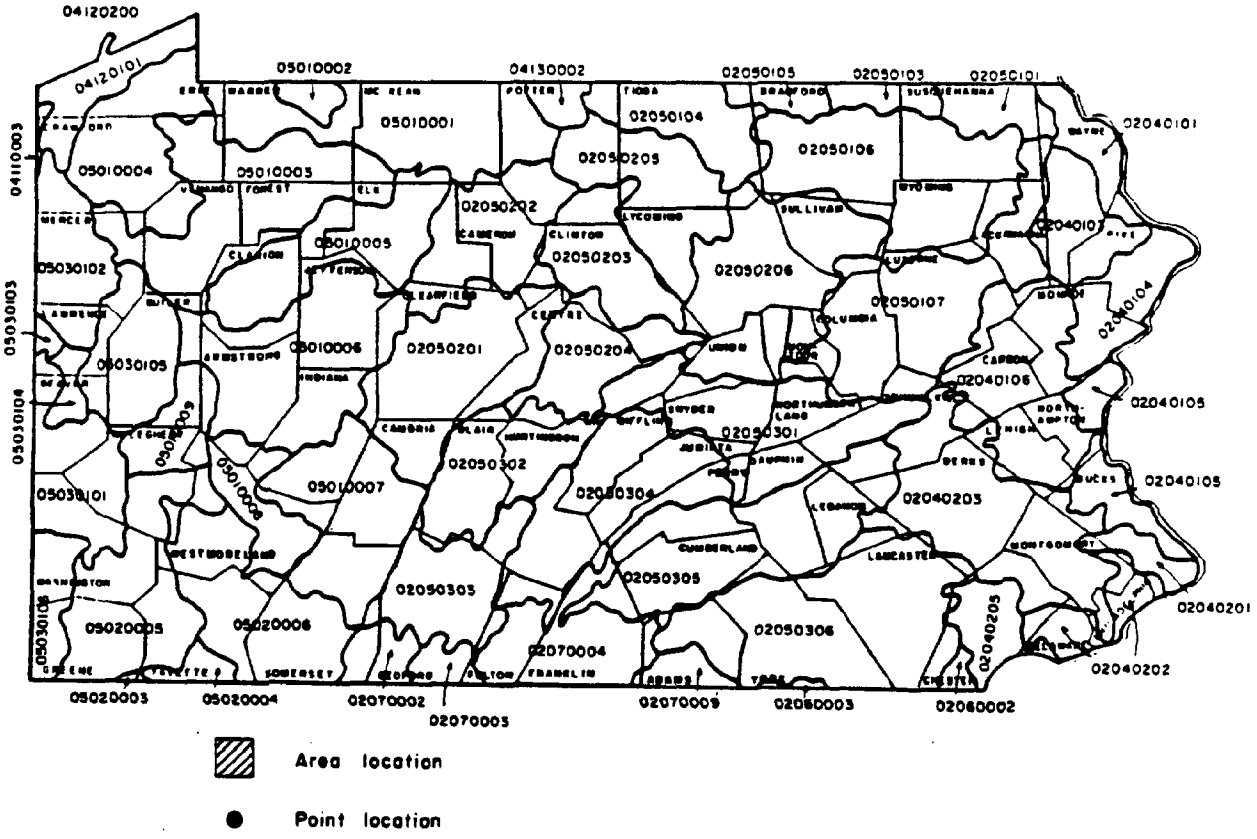
A - Abundant
C - Medium abundance
U - Low abundance
X - Abundance is unknown

General Distribution

E. Distribution by Office of Water Data Coordination (OWDC) Hydrologic Units in Pennsylvania

NOTE: OWDC hydrologic units refer to watersheds in the state, not aquatic habitats only; therefore, complete this section for all species. For bird species, entries should correspond with "resident" occurrence (breeding, wintering, year-round occurrences).

Using the map provided below (or the large scale - 1:500,000 USGS Hydrologic Unit Map of Pennsylvania) and the checklist on the next two pages, check all the OWDC hydrologic units (watersheds) in which the species "occurs". If the species is found statewide and in all watersheds, check "all" at the top of the list. Your entries should correspond with county level occurrence information (Section D) and the Distribution Narrative (Section A).



E. Distribution by OWDC Hydrologic Units (continued)

__ Species occurs in all OWDC hydrologic units to cataloging unit level as displayed on the USGS Hydrologic Unit Map.

Species does not occur statewide (i.e., in all OWDC hydrologic units), but occurs in the following units:

	Code	Definition
__	02040101	Upper Delaware: Upper Delaware
__	02040103	Upper Delaware: Lackawaxen
__	02040104	Upper Delaware: Middle Delaware - Mongaup - Brodhead
__	02040105	Upper Delaware: Middle Delaware - Musconetcong
__	02040106	Upper Delaware: Lehigh
__	02040201	Lower Delaware: Crosswicks - Neshaminy
__	02040202	Lower Delaware: Lower Delaware
__	02040203	Lower Delaware: Schuylkill
__	02040205	Lower Delaware: Brandywine - Christina
__	02050101	Upper Susquehanna: Upper Susquehanna
__	02050103	Upper Susquehanna: Owego - Wappasening
__	02050104	Upper Susquehanna: Tioga
__	02050105	Upper Susquehanna: Chemung
__	02050106	Upper Susquehanna: Upper Susquehanna - Tunkhannock
__	02050107	Upper Susquehanna: Upper Susquehanna - Lackawanna
__	02050201	West Branch Susquehanna: Upper West Branch Susquehanna
__	02050202	West Branch Susquehanna: Sinnemahoning
__	02050203	West Branch Susquehanna: Middle West Branch Susquehanna
__	02050204	West Branch Susquehanna: Bald Eagle
__	02050205	West Branch Susquehanna: Pine
__	02050206	West Branch Susquehanna: Lower West Branch Susquehanna
__	02050301	Lower Susquehanna: Lower Susquehanna - Penns
__	02050302	Lower Susquehanna: Upper Juniata
__	02050303	Lower Susquehanna: Raystown
__	02050304	Lower Susquehanna: Lower Juniata
__	02050305	Lower Susquehanna: Lower Susquehanna - Swatara
__	02050306	Lower Susquehanna: Lower Susquehanna
__	02060002	Upper Chesapeake: Chester - Sassafras
__	02060003	Upper Chesapeake: Gunpowder - Patapsco
__	02070002	Potomac: North Branch Potomac
__	02070003	Potomac: Cacapon - Town
__	02070004	Potomac: Conococheague - Opequon
__	02070009	Potomac: Monocacy
__	04110003	Southern Lake Erie: Ashtabula
__	04120101	Eastern Lake Erie: Chautauqua - Conneaut
__	04120200	Lake Erie: Lake Erie

E. Distribution by OWDC Hydrologic Units (continued)

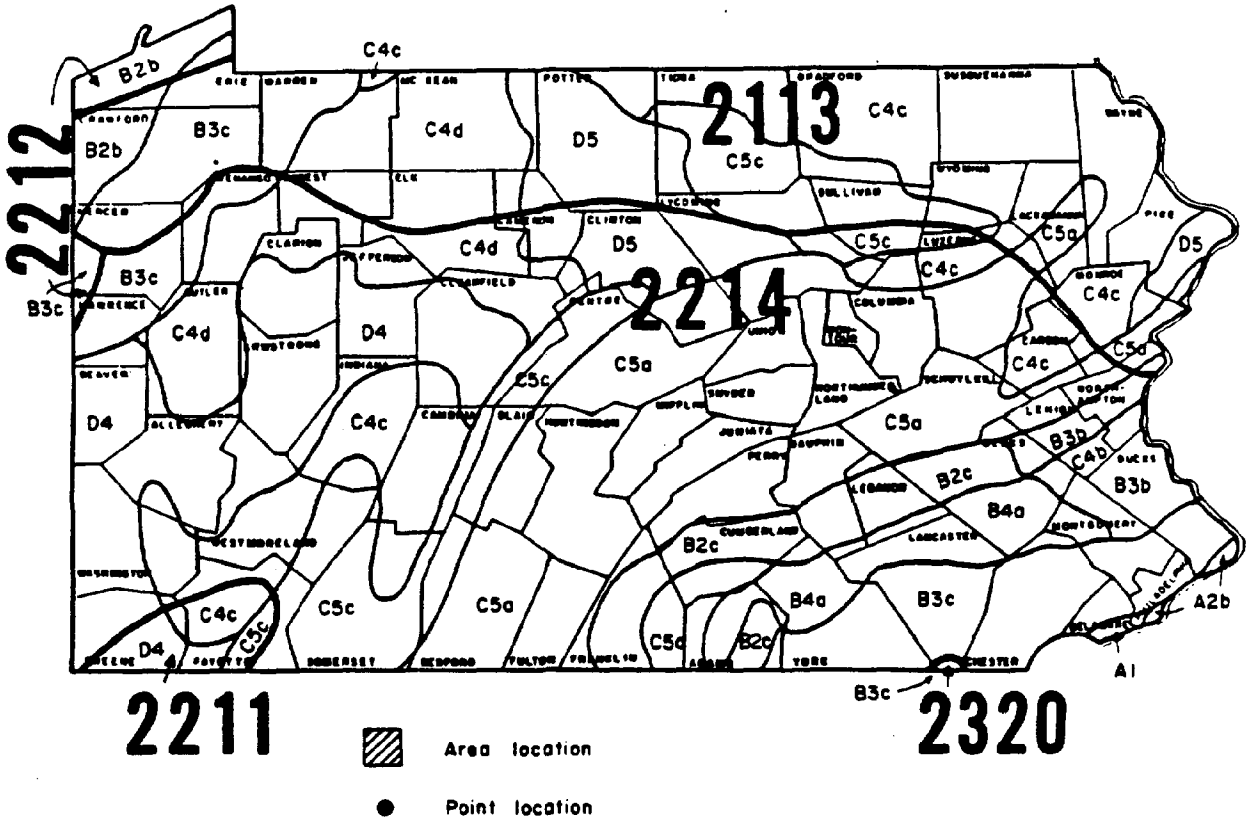
Code	Definition
04130002	Southwestern Lake Ontario: Upper Genesee
05010001	Allegheny: Upper Allegheny
05010002	Allegheny: Conewango
05010003	Allegheny: Middle Allegheny
05010004	Allegheny: French
05010005	Allegheny: Clarion
05010006	Allegheny: Middle Allegheny - Redbank
05010007	Allegheny: Conemaugh
05010008	Allegheny: Kiskiminetas
05010009	Allegheny: Lower Allegheny
05020003	Monongahela: Upper Monongahela
05020004	Monongahela: Cheat
05020005	Monongahela: Lower Monongahela
05020006	Monongahela: Youghiogheny
05030101	Upper Ohio: Upper Ohio
05030102	Upper Ohio: Shenango
05030103	Upper Ohio: Mahoning
05030104	Upper Ohio: Beaver
05030105	Upper Ohio: Connoquenessing
05030106	Upper Ohio: Upper Ohio - Wheeling

F. Distribution by Ecoregions and Land Surface Forms in Pennsylvania

NOTE: Complete this section for all species.

Ecoregions are designed to stratify ecologically similar areas based on vegetation, soils, climate, and other factors. They are named after a vegetation type characteristic of the area and secondarily by landform. Although an animal species may not specifically associate with the particular vegetation type and/or landform used to name a region (e.g. Appalachian Oak Forest, High Hills), if it "occurs" in that map unit, it should be marked as occurring in that ecoregion.

Using the ecoregion map provided below and the checklist on the next page, check all ecoregions in which the species "occurs". For descriptions and definitions consult the explanatory notes in the Species Workbook Supplemental Manual. Bird species entries should correspond with "resident" occurrence (i.e., breeding, wintering, year-round occurrences). All entries should correspond with county level occurrence information (Section D), and the Distribution Narrative (Section A).



F. Distribution by Ecoregions and Land Surface Forms in Pennsylvania (cont.)

___ Species occurs in all Ecoregions and Land Surface Forms in Pennsylvania as displayed on the preceding map.

Species does not occur statewide (i.e., in all Ecoregions and Land Surface Forms in Pennsylvania), but occurs in the following units:

	Code	Definition
___	2113B2b	Northern Hardwoods Forest, 50-80% gently sloping, 100-300 ft. elevation, 50-75% of gentle slope is in lowland
___	2113B3c	Northern Hardwoods Forest, 50-80% gently sloping, 300-500 ft. elevation, 50-75% of gentle slope is on upland
___	2113C4c	Northern Hardwoods Forest, 20-50% gently sloping, 500-1000 ft. elevation, 50-75% of gentle slope is on upland
___	2113C4d	Northern Hardwoods Forest, 20-50% gently sloping, 500-1000 ft. elevation, more than 75% of gentle slope is on upland
___	2113C5a	Northern Hardwoods Forest, 20-50% gently sloping, 1000-3000 ft. elevation, more than 75% of gentle slope is in lowland
___	2113C5c	Northern Hardwoods Forest, 20-50% gently sloping, 1000-3000 ft. elevation, 50-75% of gentle slope is on upland
___	2113D5Ø	Northern Hardwoods Forest, less than 20% gently sloping, 1000-3000 ft. elevation
___	2211C4c	Mixed Mesophytic Forest, 20-50% gently sloping, 500-1000 ft. elevation, 50-75% of gentle slope is on upland
___	2211C5c	Mixed Mesophytic Forest, 20-50% gently sloping, 1000-3000 ft. elevation, 50-75% of gentle slope is on upland
___	2211D4Ø	Mixed Mesophytic Forest, less than 20% gently sloping, 500-1000 ft. elevation
___	2212B2b	Beech-Maple Forest, 50-80% gently sloping, 100-300 ft. elevation, 50-75% of gentle slope is in lowland
___	2212B3c	Beech-Maple Forest, 50-80% gently sloping, 300-500 ft. elevation, 50-75% of gentle slope is on upland
___	2214A1Ø	Appalachian Oak Forest, more than 80% gently sloping, 0-100 ft. elevation
___	2214A2b	Appalachian Oak Forest, more than 80% gently sloping, 100-300 ft. elevation, 50-75% of gentle slope is in lowland
___	2214B2c	Appalachian Oak Forest, 50-80% gently sloping, 100-300 ft. elevation, 50-75% of gentle slope is on upland
___	2214B3b	Appalachian Oak Forest, 50-80% gently sloping, 300-500 ft. elevation, 50-75% of gentle slope is on lowland
___	2214B3c	Appalachian Oak Forest, 50-80% gently sloping, 300-500 ft. elevation, 50-75% of gentle slope is on upland
___	2214B4a	Appalachian Oak Forest, 50-80% gently sloping, 500-1000 ft. elevation, less than 75% of gentle slope is in lowland
___	2214C4c	Appalachian Oak Forest, 20-50% gently sloping, 500-1000 ft. elevation, 50-75% of gentle slope is on upland

F. Distribution by Ecoregions and Land Surface Forms in Pennsylvania (cont.)

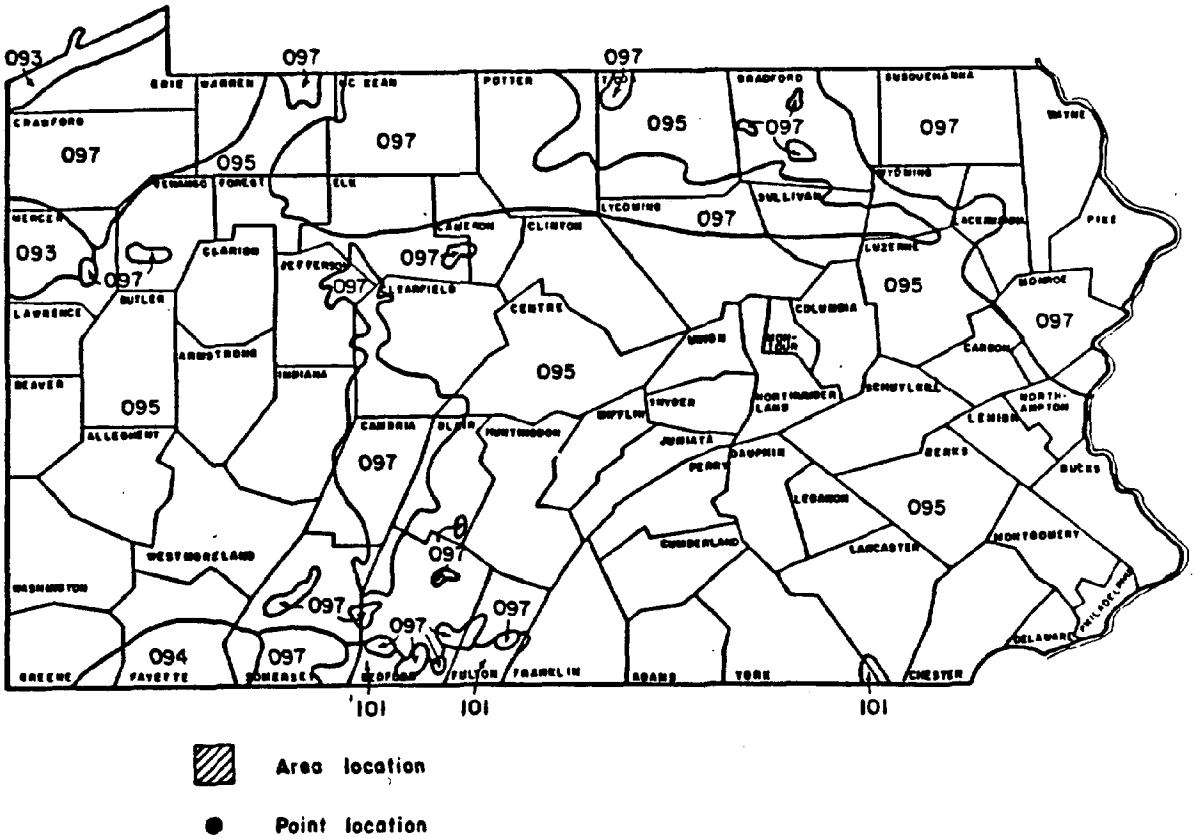
	Code	Definition
__	2214C4d	Appalachian Oak Forest, 20-50% gently sloping, 500-1000 ft. elevation, more than 75% of gentle slope is on upland
__	2214C5a	Appalachian Oak Forest, 20-50% gently sloping, 1000-3000 ft. elevation, less than 75% of gentle slope is in lowland
__	2214C5c	Appalachian Oak Forest, 20-50% gently sloping, 1000-3000 ft. elevation, 50-75% of gentle slope is on upland
__	2214D4Ø	Appalachian Oak Forest, less than 20% gently sloping, 500-1000 ft. elevation
__	2214D5Ø	Appalachian Oak Forest, less than 20% gently sloping, 1000-3000 ft. elevation
__	2320B3c	Southern Mixed Forest, 50-80% gently sloping, 300-500 ft. elevation, 50-75% of gentle slope is on upland

G. Distribution by Potential Natural Vegetation Types in Pennsylvania

NOTE: Complete this section for all species.

Potential natural vegetation types are vegetation types that would exist today if man were removed and plant succession after his removal were telescoped into a single moment; however, the effects of man's earlier activities are permitted to stand. As such the potential natural vegetation type portrays the biological potential of a site.

Using the map provided below and the checklist on the next page (or a large scale USGS map of potential natural vegetation types), identify all the potential natural vegetation types in which the species "occurs". Bird species entries should correspond with resident occurrence (i.e., breeding, wintering, year-round occurrences). Keep in mind that if the species "occurs" in the map unit, it should be marked as occurring in the potential natural vegetation type. All entries should correspond with county level occurrence information (Section D) and the Distribution Narrative (Section A).



G. Distribution by Potential Natural Vegetation Types in Pennsylvania (cont.)

___ Species occurs in all Potential Natural Vegetation types in Pennsylvania as displayed on the preceding page.

Species does not occur statewide (i.e., in all Potential Natural Vegetation types in Pennsylvania), but occurs in the following types:

	Code	Definition
___	093	Beech-Maple Forest
___	094	Mixed Mesophytic Forest
___	095	Appalachian Oak Forest
___	097	Northern Hardwoods
___	101	Oak-Hickory-Pine Forest

Site-Specific Distribution

H. Distribution by 7 1/2' Quadrangles

NOTE: Complete this section for all species.

Using the U.S. Geological Survey Index to Topographic Map Coverage in Pennsylvania provided in the Species Workbook Supplemental Manual, identify the seven (7) digit USGS 7 1/2' quadrangle code(s) and names that define the species occurrence within the Commonwealth of Pennsylvania. The format for quadrangle codes is as follows:

__/___/_/_
LAT LONG UP OVER
(N) (W)

The first two digits indicate the reference point latitude in degrees; the third, fourth, and fifth digits indicate the reference point longitude (values are right-justified - all longitudes in PA. would begin with 0, e.g., 80 would be 080); the sixth digit is the vertical one-degree row number counting up from the reference point; and the seventh digit is the horizontal one-degree cell counting over from the vertical row number. This is diagrammatically described in the appendix to the USGS 7 1/2' (1:24,000) series Quadrangle Map in the Species Workbook Supplemental Manual.

All entries should correspond with occurrence information provided in the Distribution Narrative (Section A).

__ Species occurs in <u>all</u> 7 1/2' quadrangles in Pennsylvania.

Species does not occur statewide, but occurs in the following quadrangle:

	Quad No.	Quad Name		Quad No.	Quad Name
___	3907567	Newark West	___	3907661	Rising Sun
___	3907568	Bay View	___	3907662	Conowingo Dam
___	3907572	Woodbury	___	3907663	Delta
___	3907573	Bridgeport	___	3907664	Fawn Grove
___	3907574	Marcus Hook	___	3907665	Norrisville
___	3907575	Wilmington North	___	3907666	New Freedom
___	3907576	Kennett Square	___	3907667	Lineboro
___	3907577	West Grove	___	3907668	Manchester
___	3907578	Oxford	___	3907671	Kirkwood
___	3907581	Camden	___	3907672	Wakefield
___	3907582	Philadelphia	___	3907673	Holtwood
___	3907583	Lansdowne	___	3907674	Airville
___	3907584	Media	___	3907675	Stewartstown
___	3907585	West Chester	___	3907676	Glen Rock
___	3907586	Unionville	___	3907677	Seven Valleys
___	3907587	Coatesville	___	3907678	Hanover
___	3907588	Parkesburg	___	3907681	Gap
			___	3907682	Quarryville
			___	3907683	Conestoga

	Quad No.	Quad Name
___	3907684	Safe Harbor
___	3907685	Red Lion
___	3907686	York
___	3907687	West York
___	3907688	Abbottstown
___	3907761	Littlestown
___	3907762	Taneytown
___	3907763	Emmitsburg
___	3907764	Blue Ridge Summit
___	3907765	Smithsburg
___	3907766	Hagerstown
___	3907767	Mason Dixon
___	3907768	Clear Spring
___	3907771	McSherrystown
___	3907772	Gettysburg
___	3907773	Fairfield
___	3907774	Iron Springs
___	3907775	Waynesboro
___	3907776	Greencastle
___	3907777	Williamson
___	3907778	Mercersburg
___	3907781	Hampton
___	3907782	Biglerville
___	3907783	Arendtsville
___	3907784	Caledonia Park
___	3907785	Scotland
___	3907786	Chambersburg
___	3907787	St. Thomas
___	3907788	McConnellsburg
___	3907861	Cherry Run
___	3907862	Hancock (W. VA.)
___	3907863	Bellegrove
___	3907864	Artemas
___	3907865	Flintstone
___	3907866	Evitts Creek
___	3907867	Cumberland
___	3907868	Frostburg
___	3907871	Big Cove Tannery
___	3907872	Needmore
___	3907873	Amaranth
___	3907874	Chaneysville
___	3907875	Beans Cove
___	3907876	Hyndman
___	3907877	Fairhope
___	3907878	Wittenberg
___	3907881	Meadow Grounds
___	3907882	Breezewood
___	3907883	Mench
___	3907884	Clearville
___	3907885	Rainsburg
___	3907886	Buffalo Mills
___	3907887	New Baltimore
___	3907888	Berlin

	Quad No.	Quad Name
___	3907961	Avilton
___	3907962	Grantsville
___	3907963	Accident
___	3907964	Friendsville (MD)
___	3907965	Brandonville
___	3907966	Bruceton Mills
___	3907967	Lake Lynn
___	3907968	Morgantown North
___	3907971	Meyersdale
___	3907972	Markleton
___	3907973	Confluence
___	3907974	Ohiopyle
___	3907975	Ft Necessity
___	3907976	Brownfield
___	3907977	Smithfield
___	3907978	Masontown
___	3907981	Murdock
___	3907982	Rockwood
___	3907983	Kingwood
___	3907984	Mill Run
___	3907985	South Connellsville
___	3907986	Uniontown
___	3907987	New Salem
___	3907988	Carmichaels
___	3908061	Osage
___	3908062	Blacksville
___	3908063	Wadestown
___	3908064	Hundred
___	3908065	Littleton
___	3908071	Garards Fort
___	3908072	Oak Forest
___	3908073	Holbrook
___	3908074	New Freeport
___	3908075	Cameron (W. VA.)
___	3908081	Mather
___	3908082	Waynesburg
___	3908083	Rogersville
___	3908084	Wind Ridge
___	3908085	Majorsville
___	4007417	Bristol
___	4007418	Beverly
___	4007426	Trenton East
___	4007427	Trenton West
___	4007428	Langhorne
___	4007437	Pennington
___	4007438	Lambertville
___	4007448	Stockton
___	4007511	Frankford
___	4007512	Germantown
___	4007513	Norristown
___	4007514	Valley Forge

Quad No.	Quad Name
4007515	Malvern
4007516	Downingtown
4007517	Wagontown
4007518	Honey Brook
4007521	Hatboro
4007522	Ambler
4007523	Lansdale
4007524	Collegeville
4007525	Phoenixville
4007526	Pottstown
4007527	Elverson
4007528	Morgantown
4007531	Buckingham
4007532	Doylestown
4007533	Telford
4007534	Perkiomenville
4007535	Sassamansville
4007536	Boyertown
4007537	Birdsboro
4007538	Reading
4007541	Lumberville
4007542	Bedminster
4007543	Quakertown
4007544	Milford Square
4007545	East Greenville
4007546	Manatawny
4007547	Fleetwood
4007548	Temple
4007551	Frenchtown
4007552	Riegelsville
4007553	Hellertown
4007554	Allentown East
4007555	Allentown West
4007556	Topton
4007557	Kutztown
4007558	Hamburg
4007562	Easton
4007563	Nazareth
4007564	Catasauqua
4007565	Cementon
4007566	Slatedale
4007567	New Tripoli
4007568	New Ringgold
4007571	Belvidere
4007572	Bangor
4007573	Wind Gap
4007574	Kunkletown
4007575	Palmerton
4007576	Lehighton
4007577	Nesquehoning
4007578	Tamaqua
4007581	Portland
4007582	Stroudsburg
4007583	Saylorsburg
4007584	Brodheadsville
4007585	Pohopoco Mtn
4007586	Christmans
4007587	Weatherly
4007588	Hazleton
4007611	New Holland
4007612	Leola
4007613	Lancaster
4007614	Columbia East
4007615	Columbia West
4007616	York Haven
4007617	Dover
4007618	Wellsville
4007621	Terre Hill
4007622	Ephrata
4007623	Lititz
4007624	Manheim
4007625	Elizabethtown
4007626	Middletown
4007627	Steelton
4007628	Lemoyne
4007631	Sinking Spring
4007632	Womelsdorf
4007633	Richland
4007634	Lebanon
4007635	Palmyra
4007636	Hershey
4007637	Harrisburg East
4007638	Harrisburg West
4007641	Bernville
4007642	Strausstown
4007643	Bethel
4007644	Fredericksburg
4007645	Indiantown Gap
4007646	Grantville
4007647	Enders
4007648	Halifax
4007651	Auburn
4007652	Friedensburg
4007653	Swatara Hill
4007654	Pine Grove
4007655	Tower City
4007656	Lykens
4007657	Elizabethville
4007658	Millersburg
4007661	Orwigsburg
4007662	Pottsville
4007663	Minersville
4007664	Tremont
4007665	Valley View
4007666	Klingerstown
4007667	Pillow
4007668	Dalmatia
4007671	Delano
4007672	Shenandoah

Quad No.	Quad Name
4007673	Ashland
4007674	Mt Carmel
4007675	Shamokin
4007676	Trevorton
4007677	Sunbury
4007678	Freeburg
4007681	Conyngham
4007682	Nuremberg
4007683	Shumans
4007684	Catawissa
4007685	Danville
4007686	Riverside
4007687	Northumberland
4007688	Lewisburg
4007711	Dillsburg
4007712	Mount Holly Springs
4007713	Dickinson
4007714	Walnut Bottom
4007715	Shippensburg
4007716	Roxbury
4007717	Fannettsburg
4007718	Burnt Cabins
4007721	Mechanicsburg
4007722	Carlisle
4007723	Plainfield
4007724	Newville
4007725	Newburg
4007726	Doylesburg
4007727	Shade Gap
4007728	Orbisonia
4007731	Wertzville
4007732	Shermansdale
4007733	Landisburg
4007734	Andersonburg
4007735	Blain
4007736	Blairs Mills
4007737	Aughwick
4007738	Butler Knob
4007741	Duncannon
4007742	Newport
4007743	Ickesburg
4007744	Spruce Hill
4007745	McCoysville
4007746	McVeytown
4007747	Newton Hamilton
4007748	Mount Union
4007751	Reward
4007752	Millerstown
4007753	Mexico
4007754	Mifflintown
4007755	Lewistown
4007756	Belleville
4007757	Allensville
4007758	Donation
4007761	Richfield
4007762	Beaver Springs
4007763	McClure
4007764	Alfarata
4007765	Burnham
4007766	Barrville
4007767	McAlevys Fort
4007768	Pine Grove Mills
4007771	Middleburg
4007772	Beavertown
4007773	Weikert
4007774	Coburn
4007775	Spring Mills
4007776	Centre Hall
4007777	State College
4007778	Julian
4007781	Mifflinburg
4007782	Hartleton
4007783	Woodward
4007784	Millheim
4007785	Madisonburg
4007786	Mingoville
4007787	Bellefonte
4007788	Bear Knob
4007811	Hustontown
4007812	Wells Tannery
4007813	Everett East
4007814	Everett West
4007815	Bedford
4007816	Schellsburg
4007817	Central City
4007818	Stoystown
4007821	Saltillo
4007822	Saxton
4007823	Hopewell
4007824	New Enterprise
4007825	Alum Bank
4007826	Ogletown
4007827	Windbur
4007828	Hooversville
4007831	Cassville
4007832	Entriken
4007833	Martinsburg
4007834	Roaring Spring
4007835	Blue Knob
4007836	Beaverdale
4007837	Geistown
4007838	Johnstown
4007841	Huntingdon
4007842	Williamsburg
4007843	Frankstown
4007844	Hollidaysburg

Quad No.	Quad Name
4007845	Cresson
4007846	Ebensburg
4007847	Nanty Glo
4007848	Vintondale
4007851	Alexandria
4007852	Spruce Creek
4007853	Bellwood
4007854	Altoona
4007855	Ashville
4007856	Carrolltown
4007857	Colver
4007858	Strongstown
4007861	Franklinville
4007862	Tyrone
4007863	Tipton
4007864	Blandburg
4007865	Coalport
4007866	Hastings
4007867	Barnesboro
4007868	Commodore
4007871	Port Matilda
4007872	Sandy Ridge
4007873	Houtzdale
4007874	Ramey
4007875	Irvona
4007876	Westover
4007877	Burnside
4007878	Rochester Mills
4007881	Black Moshannon
4007882	Philipsburg
4007883	Wallaceton
4007884	Glen Richey
4007885	Curwensville
4007886	Mahaffey
4007887	McGees Mills
4007888	Punxsutawney
4007911	Somerset
4007912	Bakersville
4007913	Seven Springs
4007914	Donegal
4007915	Connellsville
4007916	Dawson
4007917	Fayette City
4007918	California
4007921	Boswell
4007922	Ligonier
4007923	Stahlstown
4007924	Mammoth
4007925	Mt Pleasant
4007926	Smithton
4007927	Donora
4007928	Monongahela
4007931	Rachelwood

Quad No.	Quad Name
4007932	Wilpen
4007933	Derry
4007934	Latrobe
4007935	Greensburg
4007936	Irwin
4007937	McKeesport
4007938	Glassport
4007941	New Florence
4007942	Bolivar
4007943	Blairsville
4007944	Saltsburg
4007945	Slickville
4007946	Murrysville
4007947	Braddock
4007948	Pittsburgh East
4007951	Brush Valley
4007952	Indiana
4007953	McIntyre
4007954	Avonmore
4007955	Vandergrift
4007956	New Kensington East
4007957	New Kensington West
4007958	Glenshaw
4007961	Clymer
4007962	Ernest
4007963	Elderton
4007964	Whitesburg
4007965	Leechburg
4007966	Freeport
4007967	Curtisville
4007968	Valencia
4007971	Marion Center
4007972	Plumville
4007973	Rural Valley
4007974	Mosgrove
4007975	Kittanning
4007976	Worthington
4007977	Saxonburg
4007978	Butler
4007981	Valier
4007982	Dayton
4007983	Distant
4007984	Templeton
4007985	East Brady
4007986	Chicora
4007987	East Butler
4007988	Mt Chestnut

	Quad No.	Quad Name
___	4008011	Ellsworth
___	4008012	Amity
___	4008013	Prosperity
___	4008014	Claysville
___	4008015	Valley Grove
___	4008021	Hackett
___	4008022	Washington East
___	4008023	Washington West
___	4008024	West Middletown
___	4008025	Bethany
___	4008031	Bridgeville
___	4008032	Cannonsburg
___	4008033	Midway
___	4008034	Avella
___	4008035	Steubenville East
___	4008041	Pittsburgh West
___	4008042	Oakdale
___	4008043	Clinton
___	4008044	Burgettstown
___	4008045	Weirton
___	4008051	Emsworth
___	4008052	Ambridge
___	4008053	Aliquippa
___	4008054	Hookstown
___	4008055	East Liverpool South
___	4008061	Mars
___	4008062	Baden
___	4008063	Beaver
___	4008064	Midland
___	4008065	East Liverpool North
___	4008071	Evans City
___	4008072	Zelienople
___	4008073	Beaver Falls
___	4008074	New Galilee
___	4008075	East Palestine
___	4008081	Prospect
___	4008082	Portersville
___	4008083	New Castle South
___	4008084	Bessemer
___	4008085	New Middletown
___	4107418	Flatbrookville
___	4107427	Culvers Gap
___	4107428	Lake Maskenozha
___	4107436	Port Jervis South
___	4107437	Milford
___	4107438	Edgemere
___	4107446	Port Jervis North
___	4107447	Pond Eddy
___	4107448	Shohola
___	4107458	Eldred
___	4107511	Bushkill
___	4107512	East Stroudsburg
___	4107513	Mount Pocono
___	4107514	Pocono Pines
___	4107515	Blakeslee
___	4107516	Hickory Run
___	4107517	White Haven
___	4107518	Freeland
___	4107521	Twelve Mile Pond
___	4107522	Skytop
___	4107523	Buck Hill Falls
___	4107524	Tobyhanna
___	4107525	Thornhurst
___	4107526	Pleasant View Summit
___	4107527	Wilkes-Barre East
___	4107528	Wilkes-Barre West
___	4107531	Pecks Pond
___	4107532	Promised Land
___	4107533	Newfoundland
___	4107534	Sterling
___	4107535	Moscow
___	4107536	Avoca
___	4107537	Pittston
___	4107538	Kingston
___	4107541	Rowland
___	4107542	Hawley
___	4107543	Lakeville
___	4107544	Lake Ariel
___	4107545	Olyphant
___	4107546	Scranton
___	4107547	Ransom
___	4107548	Center Moreland
___	4107551	Narrowsburg
___	4107552	White Mills
___	4107553	Honesdale
___	4107554	Waymart
___	4107555	Carbondale
___	4107556	Dalton
___	4107557	Factoryville
___	4107558	Tunkhannock
___	4107561	Damascus
___	4107562	Galilee
___	4107563	Aldenville
___	4107564	Forest City
___	4107565	Clifford
___	4107566	Lenoxville
___	4107567	Hop Bottom
___	4107568	Springville
___	4107571	Callicoon
___	4107572	Long Eddy
___	4107573	Lake Como
___	4107574	Orson
___	4107575	Thompson
___	4107576	Harford
___	4107577	Montrose East
___	4107578	Montrose West
___	4107583	Hancock
___	4107584	Starrucca

	Quad No.	Quad Name
___	4107585	Susquehanna
___	4107586	Great Bend
___	4107587	Franklin Forks
___	4107588	Laurel Lake
___	4107611	Sybertsville
___	4107612	Berwick
___	4107613	Mifflinville
___	4107614	Bloomsburg
___	4107615	Millville
___	4107616	Washingtonville
___	4107617	Milton
___	4107618	Allenwood
___	4107621	Nanticoke
___	4107622	Shickshinny
___	4107623	Stillwater
___	4107624	Benton
___	4107625	Lairdsville
___	4107626	Hughesville
___	4107627	Muncy
___	4107628	Montoursville South
___	4107631	Harveys Lake
___	4107632	Sweet Valley
___	4107633	Red Rock
___	4107634	Elk Grove
___	4107635	Sonestown
___	4107636	Picture Rocks
___	4107637	Huntersville
___	4107638	Montoursville North
___	4107641	Noxen
___	4107642	Dutch Mtn
___	4107643	Lopez
___	4107644	Laporte
___	4107645	Eagles Mere
___	4107646	Hillsgrove
___	4107647	Barbours
___	4107648	Bodines
___	4107651	Meshoppen
___	4107652	Jenningsville
___	4107653	Colley
___	4107654	Dushore
___	4107655	Overton
___	4107656	Shunk
___	4107657	Grover
___	4107658	Ralston
___	4107661	Auburn Center
___	4107662	Laceyville
___	4107663	Wyalusing
___	4107664	Monroeton
___	4107665	Powell
___	4107666	Leroy
___	4107667	Canton
___	4107668	Gleason
___	4107671	Lawton

	Quad No.	Quad Name
___	4107672	Le Raysville
___	4107673	Rome
___	4107674	Towanda
___	4107675	Ulster
___	4107676	East Troy
___	4107677	Troy
___	4107678	Roseville
___	4107681	Friendsville
___	4107682	Little Meadows
___	4107683	Windham
___	4107684	Litchfield
___	4107685	Sayre
___	4107686	Bentley Creek
___	4107687	Gillett
___	4107688	Millerton
___	4107711	Williamsport SE
___	4107712	Carroll
___	4107713	Loganton
___	4107714	Mill Hall
___	4107715	Beech Creek
___	4107716	Howard
___	4107717	Snow Shoe SE
___	4107718	Snow Shoe
___	4107721	Williamsport
___	4107722	Linden
___	4107723	Jersey Shore
___	4107724	Lock Haven
___	4107725	Farrandsville
___	4107726	Howard NW
___	4107727	Snow Shoe NE
___	4107728	Snow Shoe NW
___	4107731	Cogan Station
___	4107732	Salladasburg
___	4107733	Waterville
___	4107734	Jersey Mills
___	4107735	Glen Union
___	4107736	Renovo East
___	4107737	Renovo West
___	4107738	Keating
___	4107741	Trout Run
___	4107742	White Pine
___	4107743	English Center
___	4107744	Cammal
___	4107745	Slate Run
___	4107746	Young Womans Creek
___	4107747	Tamarack
___	4107748	Hammersley Fork
___	4107751	Liberty
___	4107752	Nauvoo
___	4107753	Morris
___	4107754	Cedar Run
___	4107755	Lee Fire Tower
___	4107756	Oleona

	Quad No.	Quad Name
___	4107757	Short Run
___	4107758	Conrad
___	4107761	Blossburg
___	4107762	Cherry Flats
___	4107763	Antrim
___	4107764	Tiadaghton
___	4107765	Marshlands
___	4107766	Galeton
___	4107767	Cherry Springs
___	4107768	Ayers Hill
___	4107771	Mansfield
___	4107772	Crooked Creek
___	4107773	Keeneyville
___	4107774	Asaph
___	4107775	Sabinsville
___	4107776	West Pike
___	4107777	Brookland
___	4107778	Sweden Valley
___	4107781	Jackson Summit
___	4107782	Tioga
___	4107783	Elkland
___	4107784	Knoxville
___	4107785	Potter Brook
___	4107786	Harrison Valley
___	4107787	Ulysses
___	4107788	Ellisburg
___	4107811	Karthaus
___	4107812	Frenchville
___	4107813	Lecontes Mills
___	4107814	Clearfield
___	4107815	Elliott Park
___	4107816	Luthersburg
___	4107817	Du Bois
___	4107818	Reynoldsville
___	4107821	Pottersdale
___	4107822	Devils Elbow
___	4107823	The Knobs
___	4107824	Huntley
___	4107825	Penfield
___	4107826	Sabula
___	4107827	Falls Creek
___	4107828	Hazen
___	4107831	Sinnemahoning
___	4107832	Driftwood
___	4107833	Dents Run
___	4107834	Weedville
___	4107835	Kersey
___	4107836	Brandy Camp
___	4107837	Carman
___	4107838	Munderf
___	4107841	First Fork
___	4107842	Cameron
___	4107843	West Creek

	Quad No.	Quad Name
___	4107844	Rathbun
___	4107845	St. Marys
___	4107846	Ridgway
___	4107847	Portland Mills
___	4107848	Hallton
___	4107851	Wharton
___	4107852	Emporium
___	4107853	Rich Valley
___	4107854	Wildwood Fire Tower
___	4107855	Glen Hazel
___	4107856	Wilcox
___	4107857	James City
___	4107858	Russel City
___	4107861	Austin
___	4107862	Keating Summit
___	4107863	Norwich
___	4107864	Crosby
___	4107865	Hazel Hurst
___	4107866	Mt Jewett
___	4107867	Kane
___	4107868	Ludlow
___	4107871	Coudersport
___	4107872	Roulette
___	4107873	Port Allegany
___	4107874	Smethport
___	4107875	Cyclone
___	4107876	Lewis Run
___	4107877	Westline
___	4107878	Cornplanter Bridge
___	4107881	Oswayo
___	4107882	Sh nglehouse
___	4107883	Bullis Mills
___	4107884	Eldred
___	4107885	Derrick City
___	4107886	Bradford
___	4107887	Stickney
___	4107888	Cornplanter Run
___	4107911	Coolspring
___	4107912	Summerville
___	4107913	New Bethlehem
___	4107914	Sligo
___	4107915	Rimersburg
___	4107916	Parker
___	4107917	Hilliards
___	4107918	West Sunbury
___	4107921	Brookville
___	4107922	Corsica
___	4107923	Strattanville
___	4107924	Clarion
___	4107925	Knox
___	4107926	Emlenton
___	4107927	Eau Claire
___	4107928	Barkeyville

	Quad No.	Quad Name
___	4107931	Sigel
___	4107932	Cooksburg
___	4107933	Lucinda
___	4107934	Fryburg
___	4107935	Kossuth
___	4107936	Cranberry
___	4107937	Kennerdell
___	4107938	Polk
___	4107941	Marienville East
___	4107942	Marienville West
___	4107943	Tylersburg
___	4107944	Tionesta
___	4107945	President
___	4107946	Oil City
___	4107947	Franklin
___	4107948	Utica
___	4107951	Lynch
___	4107952	Mayburg
___	4107953	Kellettville
___	4107954	West Hickory
___	4107955	Pleasantville
___	4107956	Titusville South
___	4107957	Dempseytown
___	4107958	Sugar Lake
___	4107961	Sheffield
___	4107962	Cherry Grove
___	4107963	Cobham
___	4107964	Tidioute
___	4107965	Grand Valley
___	4107966	Titusville North
___	4107967	Centerville
___	4107968	Townville
___	4107971	Clarendon
___	4107972	Warren
___	4107973	Youngsville
___	4107974	Pittsfield
___	4107975	Spring Creek
___	4107976	Spartansburg
___	4107977	Lake Canadohta
___	4107978	Millers Station
___	4107981	Scandia
___	4107982	Russell
___	4107983	Sugar Grove
___	4107984	Lottsville
___	4107985	Columbus
___	4107986	Corry
___	4107987	Union City
___	4107988	Waterford
___	4108011	Slippery Rock
___	4108012	Harlansburg
___	4108013	New Castle North
___	4108014	Edinburg
___	4108015	Campbell

	Quad No.	Quad Name
___	4108021	Grove City
___	4108022	Mercer
___	4108023	Greenfield
___	4108024	Sharon East
___	4108025	Sharon West
___	4108031	Sandy Lake
___	4108032	Jackson Center
___	4108033	Fredonia
___	4108034	Sharpsville
___	4108035	Orangeville
___	4108041	New Lebanon
___	4108042	Hadley
___	4108043	Greenville East
___	4108044	Greenville West
___	4108045	Kinsman
___	4108051	Cochranton
___	4108052	Geneva
___	4108053	Conneaut Lake
___	4108054	Hartstown
___	4108055	Andover
___	4108061	Blooming Valley
___	4108062	Meadville
___	4108063	Harmonsburg
___	4108064	Linesville
___	4108065	Leon
___	4108071	Cambridge Springs
___	4108072	Edinboro South
___	4108073	Conneautville
___	4108074	Beaver Center
___	4108075	Pierpoint
___	4108081	Cambridge Springs NE
___	4108082	Edinboro North
___	4108083	Albion
___	4108084	East Springfield
___	4108085	Conneaut
___	4207615	Waverly
___	4207616	Wellsburg
___	4207617	Elmira
___	4207618	Seeley Creek
___	4207711	Caton
___	4207811	Allentown
___	4207812	Bolivar
___	4207917	Wattsburg
___	4207918	Hammett
___	4207927	North East
___	4207928	Harborcreek
___	4208011	Erie South
___	4208012	Swanville
___	4208013	Fairview
___	4208014	Fairview SW
___	4208021	Erie North

I. Distribution by Latitude and Longitude

NOTE: Complete this section for 1) special status species, including federal and/or state designations of endangered, threatened, species of special concern, status undetermined, and status indeterminate, and 2) species with a limited resident distribution in Pennsylvania (i.e., species occurring in less than 5% of Pennsylvania counties).

This section is divided into two data entry parts - in part one point locations should be entered and/or the second part enter a series of latitude/longitude points that enclose an area or polygon in which the species occurs.

Latitude and longitude are to be expressed in degrees, minutes, and seconds. Examples are: latitude 03°20'10", longitude 096°36'15". Latitude and longitude should be entered in the following parts as a string separated by commas (e.g., 032010096361 5,032010095362 0, etc.).

All entries in this section should correspond with occurrence information provided in the Distribution Narrative (Section A).

1. Point Locations - this should be used for species of very limited distribution to designate occurrence (e.g. bald eagle nests, Indiana bat caves, etc.). Separate each latitude/longitude string (13 characters) with a comma.

LATITUDE	LONGITUDE		LATITUDE	LONGITUDE		LATITUDE	LONGITUDE	
_____	_____	,	_____	_____	,	_____	_____	,
_____	_____	,	_____	_____	,	_____	_____	,
_____	_____	,	_____	_____	,	_____	_____	,
_____	_____	,	_____	_____	,	_____	_____	,
_____	_____	,	_____	_____	,	_____	_____	,
_____	_____	,	_____	_____	,	_____	_____	,

2. Polygon or Areal Locations - use this part to describe a more widespread species, or a species of more general occurrence (but still falling into one of the above special status designations). Most appropriately describe the boundary using a series of latitudes and longitudes that encompass a number of point locations that are clustered should fully define the species areas of occurrence in regions of the State.

POLYGON #1:

_____	_____	,	_____	_____	,	_____	_____	,
_____	_____	,	_____	_____	,	_____	_____	,
_____	_____	,	_____	_____	,	_____	_____	

POLYGON #2:

_____	_____	,	_____	_____	,	_____	_____	,
_____	_____	,	_____	_____	,	_____	_____	,
_____	_____	,	_____	_____	,	_____	_____	

POLYGON #3:

_____	_____ ,	_____	_____ ,	_____	_____ ,
_____	_____ ,	_____	_____ ,	_____	_____ ,
_____	_____ ,	_____	_____ ,	_____	_____

POLYGON #4:

_____	_____ ,	_____	_____ ,	_____	_____ ,
_____	_____ ,	_____	_____ ,	_____	_____ ,
_____	_____ ,	_____	_____ ,	_____	_____

POLYGON #5:

_____	_____ ,	_____	_____ ,	_____	_____ ,
_____	_____ ,	_____	_____ ,	_____	_____ ,
_____	_____ ,	_____	_____ ,	_____	_____

POLYGON #6:

_____	_____ ,	_____	_____ ,	_____	_____ ,
_____	_____ ,	_____	_____ ,	_____	_____ ,
_____	_____ ,	_____	_____ ,	_____	_____

POLYGON #7:

_____	_____ ,	_____	_____ ,	_____	_____ ,
_____	_____ ,	_____	_____ ,	_____	_____ ,
_____	_____ ,	_____	_____ ,	_____	_____

HABITAT ASSOCIATIONS

A. Habitat Associations Narrative

Develop a complete and concise narrative describing this species habitat associations and preferences. Specifically describe the species associations and preferences with urban lands, agricultural lands, rangelands (i.e. herbaceous fields), forests, wetlands, barren lands, etc. Before developing this narrative, it may be best to review and be aware of the types of information required to complete the checklists that follow in this section and the Environmental Associations' sections. The object is to identify and describe fully the habitats in which this species occurs and those habitats, which if disturbed, would adversely impact the species. Be sure to describe any minimum area requirements, significant seasonal variations in habitat use, variations in habitat requirements which occur in different life stages and geographic areas, requirements or preferences for habitat interspersion and juxtaposition, habitat condition, etc.

Devote a section of this narrative to describing specific environmental parameters required by the species in certain habitats (e.g. temperature, pH, alkalinity, turbidity, dissolved oxygen, flow rates, velocity, salinity, soil moisture, soil depth, elevation, etc.). Again, it would be most helpful to review the Environmental Associations section prior to compiling this information.

Be certain to cite the appropriate reference codes (e.g. Ø3:435-45Ø, Ø6:14) for all information, and record the complete citations in the REFERENCE section at the back of this workbook.

B. References for Habitat Associations (enter the reference codes for all references used in compiling the entries in this section, separate each reference code with a comma):

C. General Habitat Associations

In the following checklist, check all appropriate categories that correspond to the species - habitat associations (i.e., where the species normally occurs):

__ Terrestrial habitats

__ Aquatic habitats

__ Riparian habitats: Terrestrial land bordering streams, lakes, reservoirs (i.e. water): ecotone between aquatic and upland habitats that is influenced by the water regime.

D. Land Use/Land Cover Associations

In the following list, check all appropriate land use/land cover types with which the species is associated and those that are most important or preferred by the species. (Consult A LAND USE AND LAND COVER CLASSIFICATION SYSTEM FOR USE WITH REMOTE SENSOR DATA, U.S. Geological Survey, Professional Paper No. 964, 1976, for use/cover descriptions, or the land use/cover explanatory notes in the Species Workbook Supplemental Manual).

****

__ Association with specific land use/land cover types are unknown

Assoc. (A) = Species is generally associated with land use/cover type
Pref. (P) = Species demonstrates a preference for the land use/cover type specified

A	P	Code	Land Use/Land Cover Type
			URBAN OR BUILT-UP LAND
__	__	11	Residential
__	__	12	Commercial and Services
__	__	13	Industrial
__	__	14	Transportation, Communications, and Utilities
__	__	15	Industrial and Commercial Complexes
__	__	16	Mixed Urban or Built-up Land
			AGRICULTURAL LAND
__	__	21	Cropland and Pasture
__	__	22	Orchards, Groves, Vineyards, Nurseries & Ornamental Horticulture
__	__	23	Confined Feeding Operations
			RANGELAND
__	__	31	Herbaceous Rangeland
__	__	32	Shrub and Brush Rangeland
__	__	33	Mixed Rangeland
			FOREST LAND
__	__	41	Deciduous Forest Land
__	__	42	Evergreen Forest Land
__	__	43	Mixed Forest Land
			WATER
__	__	51	Streams and Canals
__	__	52	Lakes
__	__	53	Reservoirs
__	__	54	Bays and Estuaries
			WETLAND
__	__	61	Forested Wetland
__	__	62	Nonforested Wetland
			BARREN LAND
__	__	72	Beaches
__	__	73	Sandy Areas other than Beaches
__	__	74	Bare Exposed Rock
__	__	75	Strip Mines, Quarries, and Gravel Pits
__	__	76	Transitional Areas
__	__	77	Mixed Barren Land

E. Forest Habitat Associations

In the table that follows, check all appropriate forest types/size classes with which the species is associated. Use the Species Workbook Supplemental Manual for forest cover type descriptions. If available species information fails to identify a specific size class association, check all size classes.

Size class definitions are as follows:

A. Grass/Forb = understory is in grasses and forbs or other vegetation, no regeneration of tree species

B. Seedling/Shrub = understory predominately trees less than 1" diameter

C. Sapling = young stand of trees (trees 1" to 5" dbh)

D. Pole = young stand of trees [trees 5" - 9" dbh (softwoods) or 11" dbh (hardwoods)]

E. Mature = mature stand of trees [trees ≥ 9" dbh (softwoods) or 11" dbh (hardwoods), but not "old growth"]

F. Old Growth = old growth stand of trees (trees which are rotting or dying due to old age)

****

___ Association with specific forest types are unknown
___ Species does not associate with forests

FOREST GROUP & TYPE	CODE	ALL SIZE CLASSES	GRASS/FORB	SEEDLING/SHRUB	SAPLING	POLE	MATURE	OLD GROWTH
White/Red/Jack Pine Group	10							
Red Pine	02	___	___	___	___	___	___	___
White Pine	03	___	___	___	___	___	___	___
White Pine/Hemlock	04	___	___	___	___	___	___	___
Hemlock	05	___	___	___	___	___	___	___
Scotch Pine	06	___	___	___	___	___	___	___
		___	___	___	___	___	___	___
Spruce/Fir Group	20							
Red Spruce/Balsam Fir	13	___	___	___	___	___	___	___
Tamarack (eastern larch)	15	___	___	___	___	___	___	___
White Spruce	16	___	___	___	___	___	___	___
Norway Spruce	17	___	___	___	___	___	___	___
Larch	18	___	___	___	___	___	___	___
		___	___	___	___	___	___	___
Loblolly and Shortleaf Pine Group	30							
Virginia Pine	33	___	___	___	___	___	___	___
Eastern Redcedar	35	___	___	___	___	___	___	___
Pitch Pine	38	___	___	___	___	___	___	___
		___	___	___	___	___	___	___

FOREST GROUP & TYPE	CODE	ALL SIZE CLASSES	GRASS/FORB	SEEDLING/SHRUB	SAPLING	POLE	MATURE	OLD GROWTH
Oak/Pine Group	40							
White Pine/Northern Red Oak/ White Ash	41							
Eastern Redcedar/Hardwood	42							
Virginia Pine/Southern Red Oak	45							
Oak/Hickory Group	50							
Post, Black, or Bear Oak	51							
Chestnut Oak	52							
White Oak/Red Oak/Hickory	53							
White Oak	54							
Northern Red Oak	55							
Yellow Poplar/White Oak/Northern Red Oak	56							
Black Locust	57							
Black Walnut	83							
Yellow Poplar	94							
Central Hardwood Reverting Field	95							
Scarlet Oak	96							
Sassafras/Persimmon	97							
Red Maple/Central Hardwoods	29							
Mixed Central Hardwoods	59							
Elm/Ash/Red Maple Group	70							
Black Ash/American Elm/Red Maple	71							
River Birch/Sycamore	72							
Cottonwood	73							
Willow	74							
Maple/Beech/Birch Group	80							
Sugar Maple/Beech/Yellow Birch	81							
Black Cherry	82							
Red Maple/Northern Hardwoods	84							
Northern Hardwood Reverting Field	88							
Mixed Northern Hardwoods	89							
Aspen/Birch Group	90							
Aspen	91							
Paper Birch	92							
Gray Birch	93							

F. Timber Class Association

Check the box(es) below that represent the timber inventory size classes with which the species is associated.

__ Species Association with specific timber size classes is unknown or insufficient data to make a determination

__ Species is not associated with timber/forest land

****

__ All Forest Size Classes

__ Unstocked (nonstocked areas) - timberland less than 10 percent occupied with growing-stock trees

__ Seedling/Sapling - stands at least 10 percent occupied with growing stock trees of which more than half of the stocking is in saplings (1.0 - 4.9 inches dbh) and/or seedlings (<1.0 inch dbh)

__ Pole (Poletimber stands) - stands at least 10 percent occupied with growing stock trees of which half or more of this stocking is in poletimber (5.0 - 9.0 inches dbh for softwoods; 5.0 - 11.0 inches dbh for hardwoods) and/or sawtimber trees, and with poletimber stocking exceeding that of sawtimber

__ Mature (Sawtimber stands) - stands at least 10 percent occupied with growing stock trees, with half or more of total stocking in sawtimber (≥9.0 inches dbh for softwoods; ≥11.0 inches dbh for hardwoods) or poletimber trees, and with sawtimber stocking at last equal to poletimber stocking

__ Over Mature - stands at least 10 percent occupied with growing stock trees, with half or more of total stocking in over mature (decadent) or sawtimber trees, and with over mature stocking at least equal to sawtimber stocking

G. Wetland Habitat Associations

From the lists that follow, check all wetland habitat types with which the species is associated. Note that the system is hierarchical, indicate wetland associations to the subclass level in the checklists. Use the Wetland Classification Scheme information presented below and on the next two pages, and the booklet, CLASSIFICATION OF WETLANDS AND DEEPWATER HABITATS OF THE UNITED STATES, FWS/OBS-79/31, Washington, D.C., for habitat descriptions.

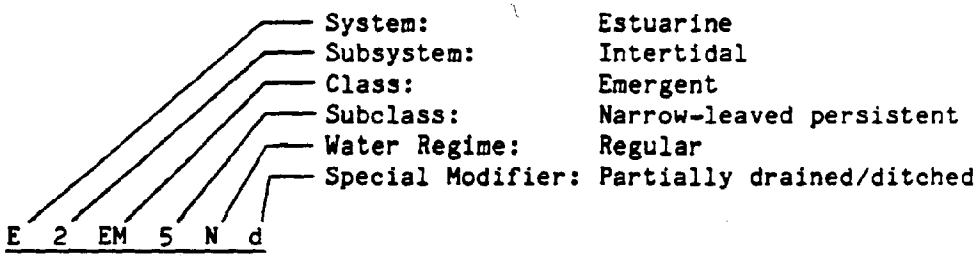
****

WETLAND CLASSIFICATION SCHEME

Use of Wetland Legend: Species are related to wetlands by a series of letters and numbers (alpha numerics) with the first letter representing the system and subsequent alpha numerics representing, in sequential order, the subordinate levels of detail to modifier level. Note: The lists that are provided in this section require specifying wetland associations to the subclass level only. Special modifiers, i.e. water regime, water chemistry, and other modifiers, should be identified and referenced in the Habitat Associations Narrative.

Example

Classification of wetlands to water regime and special modifier:



****

SYSTEMS AND SUBSYSTEMS

__ System
__ Subsystem

M Marine
- 1 Subtidal
- 2 Intertidal

E Estuarine
- 1 Subtidal
- 2 Intertidal

P Palustrine
- Ø No Subsystem

R Riverine
- 1 Tidal
- 2 Lower Perennial
- 3 Upper Perennial
- 4 Intermittent
- 5 Unknown Perennial

L Lacustrine
- 1 Limnetic
- 2 Littoral

__ Class
__ Subclass

CLASSES AND SUBCLASSES

AB Aquatic Bed

1 Submergent Algal
2 Submergent Vascular
3 Submergent Moss
4 Floating-Leaved
5 Floating

BB Beach/Bar

1 Cobble/Gravel
2 Sand

EM Emergent

1 Persistent
2 Nonpersistent
3 Narrow-Leaved Nonpersistent
4 Broad-Leaved Nonpersistent
5 Narrow-Leaved Persistent
6 Broad-Leaved Persistent

FL Flat

1 Cobble/Gravel
2 Sand
3 Mud
4 Organic
5 Vegetated Pioneer
6 Vegetated Nonpioneer

FO Forested

1 Broad-Leaved Deciduous
2 Needle-Leaved Deciduous
3 Broad-Leaved Evergreen
4 Needle-Leaved Evergreen
5 Dead
6 Deciduous
7 Evergreen

OW Open Water/ Unknown Bottom

RB Rock Bottom

1 Bedrock
2 Boulder

RS Rocky Shore

1 Bedrock
2 Boulder
3 Vegetated Nonpioneer

SB Streambed

1 Cobble/Gravel
2 Sand
3 Mud
4 Organic

SS Scrub/Shrub

1 Broad-Leaved Deciduous
2 Needle-Leaved Deciduous
3 Broad-Leaved Evergreen
4 Needle-Leaved Evergreen
5 Dead
6 Decidous
7 Evergreen

UB Unconsolidated Bottom

1 Cobble/Gravel
2 Sand
3 Mud
4 Organic

US Unconsolidated shore

1 Cobble/Gravel
2 Sand
3 Mud
4 Organic
5 Vegetated

MODIFIERS TO WETLAND CLASSIFICATION

WATER REGIME MODIFIERS

Nontidal

A Temporary
B Saturated
C Seasonal
D Seasonal/Well-Drained
E Seasonal/Saturated
F Semipermanent
G Intermittently Exposed
H Permanent
J Intermittently Flooded

Nontidal Combined

Z Intermittently Exposed/
Permanent (G,H above)
W Intermittently Flooded/
Temporary (A,J above)
Y Saturated Semipermanent/
All Seasonals (B,C,D,E,F above)

Nontidal and Tidal

U Unknown
K Artificial

Tidal

L Subtidal
M Irregularly Exposed
N Regular
P Irregular
R Seasonal
S Temporary
T Semipermanent
V Permanent

WATER CHEMISTRY MODIFIERS

Coastal Halinity

1 Hyperhaline
2 Euhaline
3 Mixohaline (Brackish)
4 Polyhaline
5 Mesohaline
6 Oligohaline
Ø Fresh

Inland Salinity

7 Hypersaline
8 Eusaline
9 Mixosaline
Ø Fresh

pH Freshwater

a Acid
t Circumneutral
1 Alkaline

OTHER MODIFIERS

Special

b Beaver
d Partially Drained/Ditched
f Farmed
h Diked/Impounded
r Artificial
s Spoil
x Excavated

Soils

g Organic
n Mineral

****

__ Association with specific wetland types are unknown
__ Species is not associated with wetlands

ESTUARINE HABITATS

__ E....

__ E1...

__ E1AB.
- __ E1AB1
- __ E1AB2
- __ E1AB4
- __ E1AB5

__ E10WØ
- __ E10WØ

__ E1RB.
- __ E1RB1
- __ E1RB2

__ E1UB.
- __ E1UB1
- __ E1UB2
- __ E1UB3
- __ E1UB4

__ E2...

__ E2AB.
- __ E2AB1
- __ E2AB2

__ E2BB.
- __ E2BB1
- __ E2BB2

__ E2EM.
- __ E2EM1
- __ E2EM2
- __ E2EM3
- __ E2EM4
- __ E2EM5
- __ E2EM6

__ E2FL.
- __ E2FL1
- __ E2FL2
- __ E2FL3
- __ E2FL4
- __ E2FL5
- __ E2FL6

__ E2FO.
- __ E2FO1
- __ E2FO3
- __ E2FO4
- __ E2FO5
- __ E2FO6
- __ E2FO7

__ E2RS.
- __ E2RS1
- __ E2RS2
- __ E2RS3

__ E2SB.
- __ E2SB1
- __ E2SB2
- __ E2SB3
- __ E2SB4

__ E2SS.
- __ E2SS1
- __ E2SS3
- __ E2SS4
- __ E2SS5
- __ E2SS6
- __ E2SS7

__ E2US.
- __ E2US1
- __ E2US2
- __ E2US3
- __ E2US4
- __ E2US5

PALUSTRINE HABITATS

- P ....
  - PØ...
    - PØAB.
      - PØAB1
      - PØAB2
      - PØAB3
      - PØAB4
      - PØAB5
    - PØEM.
      - PØEM1
      - PØEM2
      - PØEM3
      - PØEM4
      - PØEM5
      - PØ3M6
    - PØFL.
      - PØFL1
      - PØFL2
      - PØFL3
      - PØFL4
      - PØFL5
      - PØFL6
    - PØFO.
      - PØFO1
      - PØFO2
      - PØFO3
      - PØFO4
      - PØFO5
      - PØF06
      - PØFO7
    - PØOWØ
      - PØOWØ
    - PØRB.
      - PØRB1
      - PØRB2
    - PØSS.
      - PØSS1
      - PØSS2
      - PØSS3
      - PØSS4
      - PØSS5
      - PØSS6
      - PØSS7
    - PØUB.
      - PØUB1
      - PØUB2
      - PØUB3
      - PØUB4
    - PØUS.
      - PØUS1
      - PØUS2
      - PØUS3
      - PØUS4
      - PØUS5

LACUSTRINE HABITATS

- L....
  - L1...
    - L1AB.
      - L1AB1
      - L1AB2
      - L1AB3
      - L1AB4
      - L1AB5
    - L1OWØ
      - L1OWØ
    - L1RB.
      - L1RB1
      - L1RB2
    - L1UB.
      - L1UB1
      - L1UB2
      - L1UB3
      - L1UB4
  - L2...
    - L2AB.
      - L2AB1
      - L2AB2
      - L2AB3
      - L2AB4
      - L2AB5
    - L2BB.
      - L2BB1
      - L2BB2
    - L2EM.
      - L2EM2
      - L2EM3
      - L2EM4
    - L2FL.
      - L2FL1
      - L2FL2
      - L2FL3
      - L2FL4
      - L2FL5
      - L2FL6
    - L2OWØ
      - L2OWØ
    - L2RB.
      - L2RB1
      - L2RB2
    - L2RS.
      - L2RS1
      - L2RS2
    - L2UB.
      - L2UB1
      - L2UB2
      - L2UB3
      - L2UB4
    - L2US.
      - L2US1
      - L2US2
      - L2US3
      - L2US4
      - L2US5

RIVERINE HABITATS

__ R....

__ R1...

__ R1AB.
- __ R1AB1
- __ R1AB2
- __ R1AB3
- __ R1AB4
- __ R1AB5

__ R1BB.
- __ R1BB1
- __ R1BB2

__ R1EM.
- __ R1EM2
- __ R1EM3
- __ R1EM4

__ R1FL.
- __ R1FL1
- __ R1FL2
- __ R1FL3
- __ R1FL4
- __ R1FL5
- __ R1FL6

__ R1OWØ
- __ R1OWØ

__ R1RB.
- __ R1RB1
- __ RLRB2

__ R1RS.
- __ R1RS1
- __ R1RS2

__ R1UB.
- __ R1UB1
- __ R1UB2
- __ R1UB3
- __ R1UB4

__ R1US.
- __ R1US1
- __ R1US2
- __ R1US3
- __ R1US4
- __ R1US5

__ R2...

__ R2AB.
- __ R2AB1
- __ R2AB2
- __ R2AB3
- __ R2AB4
- __ R2AB5

__ R2BB.
- __ R2BB1
- __ R2BB2

__ R2EM.
- __ R2EM2
- __ R2EM3
- __ R2EM4

__ R2FL.
- __ R2FL1
- __ R2FL2
- __ R2FL3
- __ R2FL4
- __ R2FL5
- __ R2FL6

__ R2OWØ
- __ R2OWØ

__ R2RB.
- __ R2RB1
- __ R2RB2

__ R2RS.
- __ R2RS1
- __ R2RS2

__ R2UB.
- __ R2UB1
- __ R2UB2
- __ R2UB3
- __ R2UB4

__ R2US.
- __ R2US1
- __ R2US2
- __ R2US3
- __ R2US4
- __ R2US5

__ R3...

__ R3AB.
- __ R3AB1
- __ R3AB2
- __ R3AB3
- __ R3AB4
- __ R3AB5

__ R3BB.
- __ R3BB1
- __ R3BB2

__ R3FL.
- __ R3FL1
- __ R3FL2
- __ R3FL3
- __ R3FL4
- __ R3FL5
- __ R3FL6

__ R3OWØ
- __ R3OWØ

__ R3RB.
- __ R3RB1
- __ R3RB2

__ R3RS.
- __ R3RS1
- __ R3RS2

__ R3UB.
- __ R3UB1
- __ R3UB2
- __ R3UB3
- __ R3UB4

__ R3US.
- __ R3US1
- __ R3US2
- __ R3US3
- __ R3US4
- __ R3US5

__ R4...

__ R4OWØ
- __ R4OWØ

__ R4SB.
- __ R4SB1
- __ R4SB2
- __ R4SB3
- __ R4SB4

NICHE/ENVIRONMENTAL REQUIREMENTS

Use the following lists to describe 1) the range of environmental conditions in which the species occurs regardless of life stage/activity (even though the conditions may represent suboptimal conditions); and 2) the specific limiting environmental conditions that are necessary for the species to survive and complete its life cycle for the species as a whole and by activity/life stage. Keep in mind that this section is an extension of Habitat Associations and any explanations of entries in this section and references should be cited in the Habitat Associations narrative.

Apply the following instruction in deciding whether an environmental parameter is necessary - an environmental parameter is necessary if a change or modification of the parameter or condition has the potential for negatively impacting the species survival (and the species population, behavior, or distribution).

Using the lists on the pages that follow, check those parameter values that represent conditions in which the species will occur (column labeled Environmental Associations) and check those values that represent conditions that are necessary for the species to survive and complete its life cycle (column labeled Limiting Factors). Note: A species may be associated with many parameters and values, but have limiting factors identified for only a few parameters and values. For every limiting factor, check the activity/life stage for which the factor is important. To illustrate, a fish species x will be found in a variety of aquatic habitats with water temperatures ranging from 4°C to 25°C on a seasonal basis; however, breeding adults require water temperatures between 11°C and 14.5°C to spawn and the eggs must have water temperatures of 16°C to 18°C to hatch. On the first page of the checklist for the parameter "Water Temperature" for the fish just described, the following checks would be placed: The Environmental Associations column would have checks placed across from second order values B and C (water temperatures between 0°C to 30°C); the Limiting Factors column would have checks across from second order values B and C, too; the Egg column would receive a check for the value B; and the Breeding Adult column would receive a check for the value C.

Keep in mind that these checklists are designed to summarize specific information recorded in the narrative sections of the workbook into standard keywords. These keyword values will permit rapid retrievals from the database, but precise values and explanations should be recorded in the narrative. Remember, the narrative should function as a source for these checklists.

Different life stages will be completed in the following pages depending on taxonomic group. The five life stages - egg, larva, pupa, juvenile, and adult - are defined for the following taxonomic groups:

	Taxonomic Group	Egg	Larva	Pupa	Juvenile	Adult
Ø1	Fishes	x	x		x	x
Ø2	Amphibians	x	x			x
Ø3	Reptiles	x			x	x
Ø4	Birds	x			x	x
Ø5	Mammals				x	x
Ø6	Aquatic Molluscs	x	x			x
Ø7	Aquatic Crustaceans	x	x		x	x
Ø8	Aquatic Insects	x	x	x	x	x
Ø9	Other Aquatic Invertebrate Taxa	x	x	x	x	x
1Ø	Terrestrial Insects	x	x	x	x	x
11	Other Terrestrial Invertebrate Taxa	x	x	x	x	x

Environmental Parameter (First Order)		Environmental Association / Limiting Factors: Egg	Feeding Larva	Resting Larva	Pupa	Feeding Juvenile	Resting Juvenile	Feeding Adult	Resting Adult	Breeding Adult	Environmental Parameter (Second Order)
1. Physical/Chemical											
A. AIR DESCRIPTORS											
Air Temperature	00010										A. Less than 0°C (32°F)
											B. 0° - 4° (32°F - 39°F)
											C. 4° - 15° (40°F - 59°F)
											D. 15° - 32°C (60°F - 90°F)
											E. Greater than 32°C (>90°F)
B. AQUATIC DESCRIPTORS											
Water Temperature	00070										A. Euthermal - prefers temperature greater than 30°C (86°F)
											B. Mesothermal - prefers temperature between 15°-30°C (59°F - 86°F)
											C. Oligothermal - prefers temperature between 0°-15°C (32°F - 59°F)
											D. Indifferent - enjoys a wide range in temperatures
Dissolved Oxygen	00130										A. Euoxyphilous - needs high (>9 mg/l) O_2 concentrations (saturated)
											B. Mesoxyphilous - needs moderate (6-9 mg/l) O_2 concentrations
											C. Oligoxyphilous - needs low O_2 concentrations (<6 mg/l)
											D. Anoxyphilous - enjoys a wide O_2 concentration range
Water pH	00190										A. Acidobiontic - prefers pH below 5.5
											B. Acidophilous - prefers pH below 7
											C. Neutral - prefers pH about 7
											D. Alkaliphilous - prefers pH above 7
											E. Alkalibiontic - prefers pH above 8.5
											F. Indifferent - no pH preference shown
Specific Conductance	01220										A. Less than 800
											B. 800-8000
											C. 8000-30,000
											D. 30,000-45,000
											E. 45,000-60,000
											F. Greater than 60,000

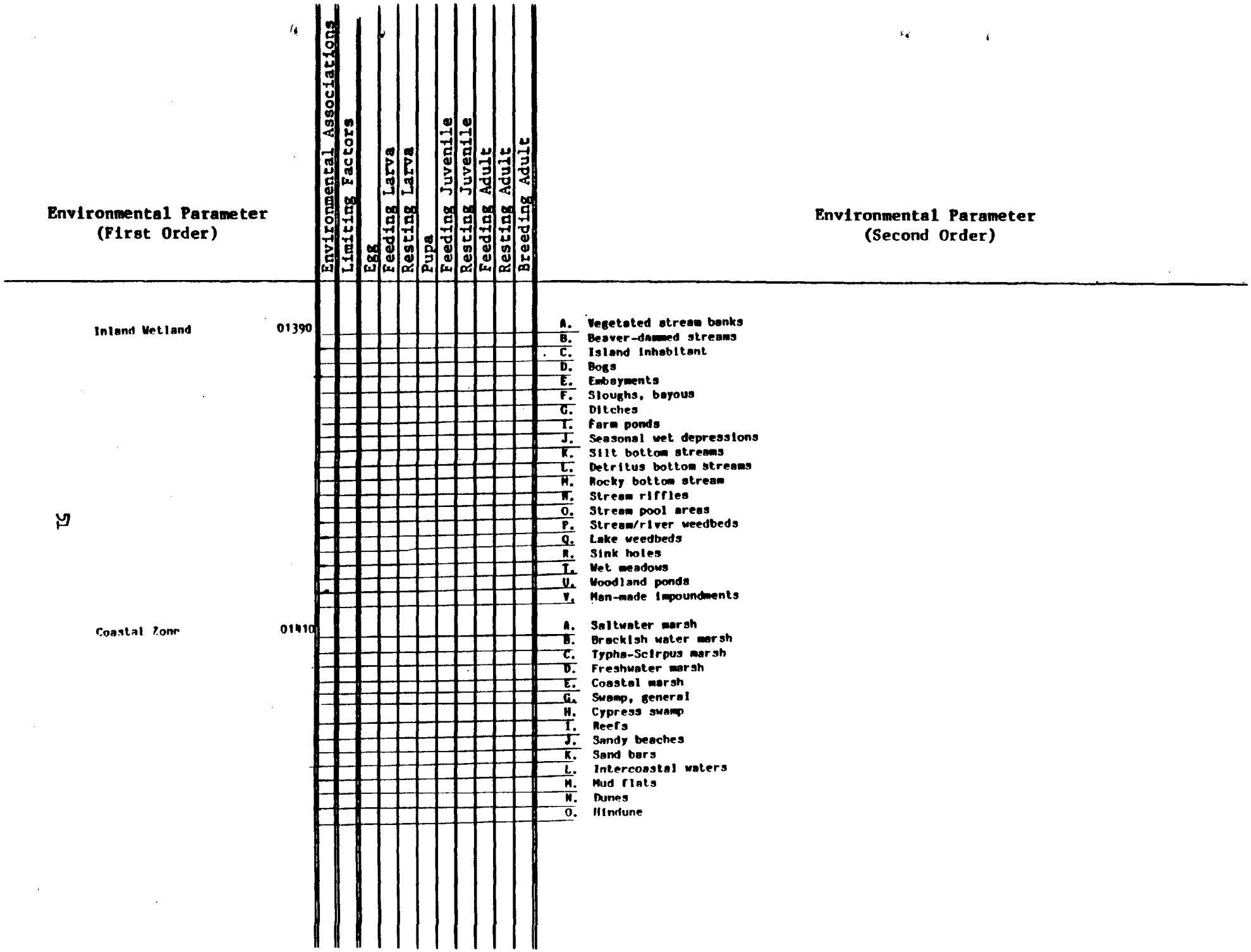
Environmental Parameter (First Order)		Environmental Association / Limiting Factors	Egg	Feeding Larva	Resting Larva	Pupa	Feeding Juvenile	Resting Juvenile	Feeding Adult	Resting Adult	Breeding Adult	Environmental Parameter (Second Order)
Alkalinity	01230											A. Less than 30 ppm/$CaCO_3$
												B. 30-120 ppm/$CaCO_3$
												C. 120-200 ppm/$CaCO_3$
												D. Greater than 200 ppm/$CaCO_3$
Total Hardness	01240											A. Less than 20 ppm
												B. 20-150 ppm
												C. Greater than 150 ppm
Current Velocity	00790											A. .5 fps or less
												B. .5-.99 fps
												C. 1.0-1.49 fps
												D. 1.5-1.99 fps
												E. 2.0-2.49 fps
												F. 2.5-2.99 fps
												G. 3.0-3.49 fps
												H. 3.5 - greater fps
Flow	00710											A. Rheophile - living in flowing water
												B. Helokrene - living in a marsh spring
												C. Intermittent flow - periodic standing water
												D. Small stream inhabitant - flows less than 50 cfs mean annual flow
												E. Medium size stream inhabitant - flows between 50-1,000 cfs mean annual flow
												F. Large size stream inhabitat - flows between 1,000-5,000 cfs mean annual flow
												G. River inhabitant - flows greater than 5,000 cfs mean annual flow
Gradient	00700											A. Low
												B. Moderate
												C. High

Environmental Parameter (First Order)		Environmental Associations	Limiting Factors	Egg	Feeding Larva	Resting Larva	Pupa	Feeding Juvenile	Resting Juvenile	Feeding Adult	Resting Adult	Breeding Adult	Environmental Parameter (Second Order)	
Water Depth	01250												A.	Less than 1 ft.
													B.	1-5 ft.
													C.	5-10 ft.
													D.	10-25 ft.
													E.	25-50 ft.
													F.	50-100 ft.
													G.	100-200 ft.
													H.	200-500 ft.
													I.	500-1000 ft.
													J.	1000-1500 ft.
													K.	Greater than 1500 ft.
Water Level	01030												A.	Permanently flooded - species preferences
													B.	Intermittently exposed
													C.	Semipermanently flooded
													D.	Seasonally flooded
													E.	Saturated
													F.	Temporarily flooded
													G.	Intermittently flooded
													H.	Artificially flooded
													I.	Reservoir tailwater
													J.	Steady-state reservoir levels
													K.	Fluctuating reservoir water levels
Substrate and Relation to Substrate	00670												A.	Epibenthic - occurring on, but not penetrating the substrate and submerged objects
													B.	Embenthic - occurring in, penetrating, the substrate
													C.	Epipelic - occurring on (or in) mud and silt
													D.	Episabulic - occurring on (or in) sand
													E.	Epilithic - occurring on (or under) rocks
													F.	Epixylous - occurring on (or into) wood
													G.	Epizoic - occurring on (or within) other animals
													H.	Epiphytic - occurring on (or within) plants
													I.	Attached - normally sessile
													J.	Unattached - normally free living, and capable of locomotion

Environmental Parameter (First Order)		Environmental Associations	Limiting Factors	Egg	Feeding Larva	Resting Larva	Pupa	Feeding Juvenile	Resting Juvenile	Feeding Adult	Resting Adult	Breeding Adult	Environmental Parameter (Second Order)
Bottom Type (Aquatic)	00675												A. Mud or silt
													B. Sand
													C. Pebble
													D. Gravel
													E. Rubble
													F. Boulders
													G. Bedrock
													H. Organic debris
													I. Rooted aquatic vegetation
Percent of Substrate/ Bottom Covered (by aquatic vegetation, logs, debris, etc.)	00677												A. Less than 20%
													B. 20-40%
													C. 40-60%
													D. 60-80%
													E. Greater than 80%
Stability of Bottom	00680												A. Stable
													B. Unstable
Turbidity	00310												A. Eulichotophilous - prefers low turbidities (clear water)
													B. Mesolichtophilous - prefers generally clear water, but tolerates periodic cloudiness
													C. Polylichtophilous - enjoys a wide range of turbidities
													D. Oligilichtophilous - prefers high turbidities - murky water
Total Dissolved Solids	00370												A. Less than 5000 ppm
													B. Between 5000-10,000 ppm
													C. Greater than 10,000 ppm

Environmental Parameter (First Order)		Environmental Association:	Limiting Factors	Egg	Feeding Larva	Resting Larva	Pupa	Feeding Juvenile	Resting Juvenile	Feeding Adult	Resting Adult	Breeding Adult	Environmental Parameter (Second Order)
Nutrients (Phosphorus and Nitrogen)	00430												A. Eutrophic - prefers high nutrient concentrations
													B. Mesotrophic - prefers moderate nutrient concentrations
													C. Oligotrophic - prefers low nutrient concentrations
													D. Dystrophic - prefers warm, humic rich habitat
Biodegradeable Organics	00610												A. Saprophilic - prefers polluted waters with brief periods of DO concentractions under 5 mg/l, pH 2 SUs, and temps exceeding 25°C
													B. Faculatative - wide range of tolerance to organic pollution, pH tolerance
													C. Saprozenous - prefers clean water habitats, can tolerate infrequent periods of low DO if pH and temps are unaltered
													D. Saprophobic - restricted to clean waters that have not been exposed to pollution
Trophic Zones	00850												A. Heterotrophic - belonging to nonself-sustaining community of organisms; needs outside energy
													B. Autotrophic - belonging to a self-nourishing community of
Trophogenic Zones	00910												A. Epilimnion inhabitant - needs well lighted, upper layer of standing water
													B. Hypolimnion inhabitant - needs dark, lower layer of standing water
Aquatic Habitat Zonation	00970												A. Littoral zone inhabitant - prefers the shallows with emergent vegetation
													B. Sublittoral zone inhabitant - prefers dimly lighted region without emergent vegetation
													C. Profundal zone inhabitant - prefers the cold, stratified region with no light and reduced oxygen levels and high pH, temperatures are uniform, sediments fine grained
													D. Pelagic - needs open water
													E. Planktonic - microscopic plants and animals

Environmental Parameter (First Order)		Environmental Associations	Limiting Factors	Egg	Feeding Larva	Resting Larva	Pupa	Feeding Juvenile	Resting Juvenile	Feeding Adult	Resting Adult	Breeding Adult	Environmental Parameter (Second Order)
Aquatic Vegetation	00685												A. Pondweeds
													B. Pickerelweed
													C. Algae
													D. Mosses
													E. Widgeon Grass
													F. Wild Celery
													G. Bladderworts
													H. Coontails
													I. Cordgrass
													J. Rushes
													K. Sedges
													L. Cattails
													M. Smartweeds
													N. Wild Rice
													O. Alder
													P. White Cedar
													Q. Horsetails
													R. Burreeds
													T. Eelgrass
													U. Arrow Weeds
													V. Rice Cutgrass
													W. Duckweeds
													Y. Water lilies
Relative Density of Aquatic Vegetation	00690												A. Low
													B. Moderate
													C. High


Environmental Parameter (First Order)
Environmental Associations
Limiting Factors
Egg
Feeding Larva
Resting Larva
Pupa
Feeding Juvenile
Resting Juvenile
Feeding Adult
Resting Adult
Breeding Adult
Environmental Parameter (Second Order)
Inland Wetland
01390
A. Vegetated stream banks
B. Beaver-dammed streams
C. Island inhabitant
D. Bogs
E. Embayments
F. Sloughs, bayous
G. Ditches
I. Farm ponds
J. Seasonal wet depressions
K. Silt bottom streams
L. Detritus bottom streams
M. Rocky bottom stream
N. Stream riffles
O. Stream pool areas
P. Stream/river weedbeds
Q. Lake weedbeds
R. Sink holes
T. Wet meadows
U. Woodland ponds
V. Man-made impoundments
Coastal Zone
01410
A. Saltwater marsh
B. Brackish water marsh
C. Typha-Scirpus marsh
D. Freshwater marsh
E. Coastal marsh
G. Swamp, general
H. Cypress swamp
I. Reefs
J. Sandy beaches
K. Sand bars
L. Intercoastal waters
M. Mud flats
N. Dunes
O. Hindune

Environmental Parameter (First Order)		Environmental Associations	Limiting Factors	Egg	Feeding Larva	Resting Larva	Pupa	Feeding Juvenile	Resting Juvenile	Feeding Adult	Resting Adult	Breeding Adult	Environmental Parameter (Second Order)
Salinity	01090												A. Polyhalobous - prefers salt concentrations above 40,000 mg/l (=40 ppt)
													B. Euhalobous - prefers salt concentrations above 30,000 mg/l (=30 ppt)
													C. Mesohalobous - prefers salt concentrations between 500-30,000 mg/l (=0.5-30 ppt)
													D. Oligohalobous - prefers salt concentrations less than 500 mg/l
													E. Euryhalinous - enjoys a wide range of salt concentrations
Seeps/Springs	01210												A. Flowing - Spring
													B. Pool - Spring
C. TERRESTRIAL DESCRIPTIONS													
Soil	01280												A. Clay
													B. Silt
													C. Sand
													D. Loam
													E. Gravel
													F. Rocky
Soil Texture	01290												A. Coarse
													B. Medium
													C. Fine

Environmental Parameter (First Order)		Environmental Associations / Limiting Factors: Egg	Feeding Larva	Resting Larva	Pupa	Feeding Juvenile	Resting Juvenile	Feeding Adult	Resting Adult	Breeding Adult	Environmental Parameter (Second Order)
Soil Depth	01300										A. Less than 10 inches
											B. 10-20 inches
											C. 20-36 inches
											D. Greater than 36 inches
Soil Profile	01310										A. Organic Matter - Undecomposed (O1 Horizon)
											B. Organic Matter - Partially Decomposed (O2 Horizon)
											C. Mineral Soil/Mixed with humus (A1 Horizon)
											D. *Mineral Soil/Zone of Eluviation (A2 Horizon)*
											E. Transitional zone between the A and B Horizons (B1 Horizon)
											F. Zone of illuviation with accumulation of clay, Fe, Al, (B2 Horizon)
											G. Unconsolidated Rock Material (C Horizon)
Soil Drainage	01320										A. Excessively drained (coarse soil, very porous)
											B. Well drained (medium texture soils)
											C. Moderately well drained (wet a small but significant portion of the year)
											D. Imperfectly and poorly drained (wet a significant portion of the year)
											E. Very poorly drained (water table at or near surface greater part of the year)
Soil pH	01330										A. Less than 5.0
											B. 5.0-6.0
											C. 6.0-8.0
											D. 8.0-10.0
											E. Greater than 10.0
Soil Moisture	01350										A. Wet
											B. Moist
											C. Dry

Environmental Parameter (First Order)		Environmental Associations	Limiting Factors	Egg	Feeding Larva	Resting Larva	Pupa	Feeding Juvenile	Resting Juvenile	Feeding Adult	Resting Adult	Breeding Adult	Environmental Parameter (Second Order)
Soil Compaction	01360												A. Easily penetrated
													B. Difficult to penetrate
													C. Not penetrable
Aspect	01270												A. North
													B. Northeast
													C. East
													D. Southeast
													E. South
													F. Southwest
													G. West
													H. Northwest
Elevation	01260												A. Below sea level
													B. 0-100 ft.
													C. 100-300 ft.
													D. 300-500 ft.
													E. 500-1,000 ft.
													F. 1,000-2,000 ft.
													G. 2,000-3,000 ft.
													H. 3,000-4,000 ft.
													I. Greater than 4,000 ft.
Slope	01340												A. Level (no slope)
													B. Less that 5%
													C. 5-10%
													D. 10-15%
													E. 15-25%
													F. Greater than 25%

Environmental Parameter (First Order)		Environmental Associations	Limiting Factors	Egg	Feeding Larva	Resting Larva	Pupa	Feeding Juvenile	Resting Juvenile	Feeding Adult	Resting Adult	Breeding Adult	Environmental Parameter (Second Order)
Terrestrial Features	01370												A. Burrows
													B. Talus
													C. Standing Snags
													D. Downed Logs
													E. Rock Outcrops
													F. Ridges
													G. Depressions/Sinkholes
													H. Bare Ground
													I. Leaf Nests
													J. Brush Piles/Rock Piles
													K. Cliffs/Ledges
													L. Dry Caves
													M. Wet Caves
													N. Beaches
													O. Hedgerows/Wind Breaks
													P. Fence Rows
													Q. Roadside Ditches
													R. Grassy Uncultivated Areas
													S. Large, Lone Trees (Wolf Trees)
													T. Leaf Litter
													U. Vegetation Mosaics/Edges
													V. Insect Mounds
													W. Tree Cavities
													Y. Highway Medians
													Z.

Environmental Parameter (First Order)		Environmental Associations	Limiting Factors	Egg	Feeding Larva	Resting Larva	Pupa	Feeding Juvenile	Resting Juvenile	Feeding Adult	Resting Adult	Breeding Adult	Environmental Parameter (Second Order)
Ecotones	02000												A. Woodland/crop fields
													B. Woodland/shrub-brush field
													C. Woodland/water
													D. Woodland/herbaceous field
													E. Shrub-brush field/water
													F. Crop field/water
													G. Crop field/herbaceous field
													H. Herbaceous field/shrub-brush field
													I. Herbaceous field/water
													J. Coniferous forest/deciduous forest
													K. Woodland/barren land
													L. Woodland/wetland (not open water)
													M. Woodland/urban land
													N. Shrub-brush field/barren land
													O. Shrub-brush field/crop field
													P. Shrub-brush field/wetland (not open water)
													Q. Shrub-brush field/urban land
													R. Crop field/barren land
													S. Crop field/urban land
													T. Crop field/wetland (not open water)
													U. Woodland/herbaceous field
													V. Barren land/herbaceous field
													W. Herbaceous field/wetland (not open water)
													X. Herbaceous field/urban land
													Y. Barren land/wetland
													Z. Wetland/urban land
Forest Ecotones	01690												A. Clearcut (opening)/seedling-sapling stage
													B. Clearcut (opening)/pole stage
													C. Clearcut (opening)/mature stage
													D. Seedling-sapling/pole stage
													E. Seedling-sapling/mature stage
													F. Pole/mature stage
Terrestrial Vertical Diversity	01750												A. Subsurface layer
													B. Surface layer (bare soil, organic layer and leaf litter)
													C. Herbaceous layer
													D. Shrub layer
													E. Understory tree layer (canopy)
													F. Overstory tree layer (canopy)

Environmental Parameter (First Order)		Environmental Associations	Limiting Factors	Egg	Feeding Larva	Resting Larva	Pupa	Feeding Juvenile	Resting Juvenile	Feeding Adult	Resting Adult	Breeding Adult	Environmental Parameter (Second Order)
Nest Sites	01990												A. Cavities in live trees
													B. Cavities in dead trees
													C. Underground burrow (Upland)
													D. Underwater burrow
													E. Riparian burrow
													F. Depressions
													G. Rock outcrops
													H. Bare ground/very sparce vegetation
													I. Emergent vegetation over/near water
													J. Ledges
													K. Caves
													L. Sand beaches/pebble beach
													M. Leaf nests in live trees
													N. Twig nests in live trees
													O. Leaf litter
													P. Hedgerows
													Q. Downed logs
													R. Grassy uncultivated areas/hay fields
													T. Roadside ditches
													U. Brush piles
													V. Shrubs/shrubbery trees
													W. Trees
Size of Forest Clearings/Openings	02010												A. Less than 1/2 acre
													B. 1/2-1 acre
													C. 1-5 acres
													D. 5-20 acres
													E. 20-40 acres
													F. Greater than 40 acres
Size of Continuous Forested Stand	02020												A. Less than 10 acres
													B. 10-19 acres
													C. 20-49 acres
													D. 50-99 acres
													E. 100-499 acres
													F. 500-5000 acres
													G. 5000-10,000 acres
													H. Greater than 10,000 acres

Environmental Parameter (First Order)		Environmental Associations	Limiting Factors	Egg	Feeding Larva	Resting Larva	Pupa	Feeding Juvenile	Resting Juvenile	Feeding Adult	Resting Adult	Breeding Adult	Environmental Parameter (Second Order)
Distance to Forest Opening	02030												A. Less than 500 ft. (.1 miles)
													B. 500-2640 ft. (.1-.5 miles)
													C. Greater than 2640 ft. (.5 miles)
Perch Sites Location	02050												A. Near permanent water
													B. Overhanging permanent water
Percent Overstory Canopy Closure	02060												A. Greater than 70% closure
													B. 40-70% closure
													C. Less than 40% closure
Average Height of Overstory Trees	02070												A. Less than 20 ft.
													B. 20-40 ft.
													C. 40-80 ft.
													D. Greater than 80 ft.
Average DBH of Overstory Trees	02080												A. Less than 4 inches
													B. 4-11 inches
													C. 12-18 inches
													D. Greater than 18 inches
Percent Shrub Crown Cover	03010												A. Less than 10%
													B. 10-25% cover
													C. 25-50% cover
													D. 50-75% cover
													E. Greater than 75%
Average Height of Shrub Cover	03020												A. Less than 3 ft.
													B. 3-6 ft.
													C. 6-12 ft.
													D. Greater than 12 ft.

Environmental Parameter (First Order)		Environmental Associations	Limiting Factors	Egg	Feeding Larva	Resting Larva	Pupa	Feeding Juvenile	Resting Juvenile	Feeding Adult	Resting Adult	Breeding Adult	Environmental Parameter (Second Order)
Percent Herbaceous Ground Cover (Spring/Early Summer)	03040												A. Less than 10% B. 10-25% C. 25-50% D. 50-75% E. Greater than 75%
Average Height of Herbaceous Cover (Summer)	03050												A. Less than 4 inches B. 4-8 inches C. 8-12 inches D. 12-24 inches E. 24-36 inches F. Greater than 36 inches
Agricultural Types	03100												A. Pastureland B. Winter grains (barley, wheat, rye) C. Spring grains (oats, corn, buckwheat, soybeans) D. Orchards (fruits - apple, pear, peach, etc.) E. Vineyards F. Haylands G. Wheat H. Rye I. Oats J. Barley K. Soybeans L. Corn M. Potatoes N. Tobacco O. Vegetable crops (beans, tomatoes, cabbage, etc.) P. Cherry Q. Apples R. Pears T. Peaches

Environmental Parameter (First Order)		Environmental Associations	Limiting Factors	Egg	Feeding Larva	Resting Larva	Pupa	Feeding Juvenile	Resting Juvenile	Feeding Adult	Resting Adult	Breeding Adult	Environmental Parameter (Second Order)
Vegetation Successional	02830												A. Abandoned fields
													B. Sand dune
													C. Stable forest
													D. Subclimax forest
													E. Climax forest
													F. Pond pioneer aquatic vegetation
													G. Filled pond
													H. Bare rock
													I. Pioneer community
													J. Stable prairie/grassland
													K. Subclimax grassland
													L. Climax grassland
													M. Vegetation-choked pond
Distance to Perch Sites (forbs, trees, fence, telephone pole, etc.)	02840												A. Less than 100 ft.
													B. 100-300 ft.
													C. 300-600 ft.
													D. 600-1320 ft.
													E. 1320-2640 ft. (1/4-1/2 mile)
													F. Greater than 1/2 mile
Percent Coniferous Trees in Mixed Forest	02850												A. Less than 5%
													B. 5-10%
													C. 10-25%
													D. Greater than 25%
Number of Snags (Dead Trees) per acre	02860												A. 1 or less
													B. 2
													C. 3
													D. 4
													E. Greater than 4

Environmental Parameter (First Order)		Environmental Associations	Limiting Factors	Egg	Feeding Larva	Resting Larva	Pupa	Feeding Juvenile	Resting Juvenile	Feeding Adult	Resting Adult	Breeding Adult	Environmental Parameter (Second Order)	
Percent of Overstory Canopy Trees in Deciduous Species	02870												A.	Less than 10%
													B.	10-25%
													C.	25-50%
													D.	50-75%
													E.	Greater than 75%
Shrubs	02120												A.	Spicebush
													B.	Serviceberry
													C.	Mountain Maple/Striped Maple
													D.	Dogwood Species
													E.	Sumacs
													F.	Hazelnut
													G.	Elderberry (American elder)
													H.	Chokeberry
													I.	Viburnum Species
													J.	Wintergreen
													K.	Winterberry
													L.	Juniper
													M.	Mountain-ash
													N.	Buttonbush
													O.	Buckthorn
													P.	Rubus (blackberry, raspberry, dewberry)
													Q.	Multiflora Rose
													R.	Vaccinium Species (blueberry, deerberry)
													T.	Alder
													U.	Huckleberry
													V.	Barberry
													W.	Rhododendren
													Y.	Laurel

Environmental Parameter (First Order)		Environmental Associations	Limiting Factors	Egg	Feeding Larva	Resting Larva	Pupa	Feeding Juvenile	Resting Juvenile	Feeding Adult	Resting Adult	Breeding Adult	Environmental Parameter (Second Order)
More Shrubs	02130												A. Poison ivy
													B. Hawthorn
													C. Witch hazel
													D. Tartarian honeysuckle
													E. Autumn olive/Russian olive
													F. Rugosa rose
													G. Willow species
													H. Amur honeysuckle
													I. Sweet bay
													J. Sweet fern
Vines	02170												A. Japanese honeysuckle
													B. Trumpet creeper
													E. Poison ivy
													F. Virginia creeper
													G. Grape
													H. Greenbrier
													I. Bittersweet
													J. Kudzu
													K. English ivy

Environmental Parameter (First Order)		Environmental Associations / Limiting Factors	Egg	Feeding Larva	Resting Larva	Pupa	Feeding Juvenile	Resting Juvenile	Feeding Adult	Resting Adult	Breeding Adult	Environmental Parameter (Second Order)
Legumes/Other Herbs	02230											A. Partridge pea
												B. Crown vetch
												C. Soybean
												D. Flatpea
												E. Sericea lespedeza
												F. Common lespedeza
												G. Kobe lespedeza
												H. Buckwheat
												I. Sunflower/Asters
												J. Birdsfoot trefoil
												K. Alfalfa
												L. Sweet clover
												M. Alsike clover
												N. Red clover
												O. Ladino clover/White clover
												P. Hairy vetch
												Q. Cowpea
												R. Bristly locust
												T. Smartweeds
												U. Crimson clover
												V. Milkweed
												W. Pokeweed
												Y. Goldenrod
												Z. Thistles

Environmental Parameter (First Order)		Environmental Associations	Limiting Factors	Egg	Feeding Larva	Resting Larva	Pupa	Feeding Juvenile	Resting Juvenile	Feeding Adult	Resting Adult	Breeding Adult	Environmental Parameter (Second Order)
Grasses	02290												A. Big bluestem
													B. Bermuda grass
													C. Orchard grass
													D. Japanese millet
													E. Weeping love grass
													F. Tall fescue
													G. Annual ryegrass
													H. Perennial ryegrass
													I. Switch grass
													J. Redtop
													K. Little bluestem
													L. Pearl millet
													M. Reed canary grass
													N. Timothy
													O. Foxtail millet
													P. German millet
													Q. Indian grass
													R. Grain sorghum
													T. Proso millet
More Grasses	02295												A. Smooth bromegrass
													B. Deer tongue
													C. Field bromegrass
													D. American beachgrass
													E. Quackgrass
													F. Poverty grass
													G. Panic grass
													H. Bristle grasses

Environmental Parameter (First Order)		Environmental Associations	Limiting Factors	Egg	Feeding Larva	Resting Larva	Pupa	Feeding Juvenile	Resting Juvenile	Feeding Adult	Resting Adult	Breeding Adult	Environmental Parameter (Second Order)
Coniferous Trees	02720												A. Eastern redcedar (Juniperus)
													B. Norway spruce
													C. White spruce
													D. Shortleaf pine
													E. Austrian pine
													F. Red pine
													G. Pitch pine
													H. (Eastern) white pine
													I. Scotch pine
													J. Virginia pine
													K. Jack pine
													L. Hemlock
													M. Northern white cedar (Thuja)
													N. Table mountain pine
													O. Balsam fir
													P. Red spruce/Black spruce
													Q. Larch/Tamarack
Hardwood Trees	02780												A. Alder
													B. Aspen
													C. Birch
													D. Hickory
													E. Sycamore
													F. Sassafras
													G. Dogwood species
													H. White oaks group
													I. Maple, Box elder
													J. Chinese chestnut/Golden Chinquepin
													K. Ashes
													L. Russian olive/Autumn olive
													M. Black walnut/Butternut
													N. Hackberry
													O. Locust - Honey and Black
													P. Willow
													Q. Cherry species
													R. Red oaks group

Environmental Parameter (First Order)		Environmental Associations	Limiting Factors	Egg	Feeding Larva	Resting Larva	Pupa	Feeding Juvenile	Resting Juvenile	Feeding Adult	Resting Adult	Breeding Adult	Environmental Parameter (Second Order)
More Hardwood Trees	02790												A. Elm
													B. Tulip or yellow poplar
													C. Crabapple
													D. Mountain ash
													E. Beech
													F. Basswood
													G. Cottonwood
													H. American holly/hollies
													I. Blackgum
													J. Mulberry
													K. Hazel
													L. Hop hornbeam
													M. Hornbeam
													N. Bitternut Hickory
													O. Persimmon
Human Association	02890												A. Residential lawn/ornamental trees/shrubs
													B. Residential houses/chimneys/attics
													C. Farm outbuildings (barns, sheds)
													D. Abandoned buildings
													E. Farms (cropland/pastures)
													F. Farm ponds
													G. Public city parks
													H. Public residential parks
													I. State and county parks
													J. National parks/historic landmarks
													K. Wildlife refuges/sanctuaries
													L. Zoos

HABITAT EVALUATION PROCEDURES MODELS

Is there an existing model for this species? __ Yes __ No

If yes, indicate type(s) below:

__ PAMHEP
__ HEP
__ DRAFT-HEP

Habitat Evaluation Procedures Models Description (enter the model preparer, date prepared, agency affiliation, habitats and land use types for which the model applies):

ANIMAL AND PLANT ASSOCIATIONS

Use the space provided below to identify important animal and plant associations; i.e., predation, parasitism, symbiosis, commensalism, mutualism, etc. Of particular interest are dependent relationships where such relationships offer predictability of occurrence. Describe each pair or group of species in an association using their common and scientific names, with the names preceded by the type of relationship, and explain the relationship.

Be certain to follow each entry with the reference code of the reference for the source of the relationship.

References for Animal and Plant Associations (enter the reference code for all references used in compiling the entries in this section, separate each reference code with a comma):

FOOD HABITS

A. Food Habits Narrative

Develop a complete and concise description of the food items consumed by this species during its life. If available, give specific information on the foods (e.g. deer mice, frogs, and fungi, etc.) and food parts (e.g. leaves, bark, cambium, flower petals, hair, blood, etc.) consumed during each life stage of the species, i.e., the foods consumed by larva, juvenile, and adult life stages. Devote a section of the description to preferred food types and those foods essential to the species as a whole. Also, devote a paragraph or section to a discussion of seasonal variations or changes in food habits and preferences by food types and/or food parts.

Provide appropriate reference codes, including page numbers, for all information and record the complete citations in the Reference Section at the back of this workbook.

B. References for Food Habits (enter the reference codes for all references used in compiling the entries in this section, separate each reference code with a comma):

C. General Food Habit of the species (check the one value that best characterizes the food habits of the species):

__ Carnivore
__ Insectivore
__ Herbivore
__ Omnivore

D. Food Habits Checklist (check all that apply):

Check the appropriate column identifying the foods consumed by the species at the various life stages. For example, if the animal consumes bird eggs as a juvenile and adult, then you would check the Juvenile and Adult columns next to the value "Bird eggs - 2150".

The three life stages - larva, juvenile, and adult - are defined for the following taxonomic groups:

	Taxonomic Group	Larva	Juvenile	Adult
01	Fishes	x	x	x
02	Amphibians	x		x
03	Reptiles		x	x
04	Birds		x	x
05	Mammals		x	x
06	Aquatic Molluscs	x		x
07	Aquatic Crustaceans	x	x	x
08	Aquatic Insects	x	x	x
09	Other Aquatic Invertebrate Taxa	x	x	x
10	Terrestrial Insects	x	x	x
11	Other Terrestrial Invertebrate Taxa	x	x	x

[1]Larva - includes the immature life stages of aquatic insects known as nymphs, the free-swimming and glochidia stage of molluscs and the nauplius stage of crustaceans.

[2]Juvenile - a young individual (not larva) that resembles an adult, but is not sexually mature.

[3]Adult - a sexually mature individual.

Foods Consumed		GENERAL (Any life stage)	LARVA	JUVENILE	ADULT
MICRO ORGANISMS					
Bacteria	1010	—	—	—	—
Other Micro-organisms	1040	—	—	—	—
PLANTS					
Herbaceous plant parts; buds, leaves, stems, flowers	1070	—	—	—	—
Woody plant parts; buds, leaves, stems, twigs, bark	1100	—	—	—	—
Flower nectar, pollen	1130	—	—	—	—
Herbaceous fruit; berries, capsules, fruit, nuts, grain	1160	—	—	—	—
Softwood fruit; seeds of Taxaceae and Pinaceae	1190	—	—	—	—
Hardwood fruit; berries, seeds, nuts, capsules	1220	—	—	—	—
Plant sap	1250	—	—	—	—
Phytoplankton					
Diatoms	1280	—	—	—	—
Algae	1290	—	—	—	—
Other Phytoplankton	1310	—	—	—	—
Aufwuchs (attached plants and animals)	1340	—	—	—	—
Rooted aquatic plants	1370	—	—	—	—
Fungi (including sporocarps and mycelium)	1380	—	—	—	—

Foods Consumed		GENERAL (Any life stage)	LARVA	JUVENILE	ADULT
Mosses/lichens	1400	—	—	—	—
Roots/tubers/rhizomes	1430	—	—	—	—
Floating aquatic plants	1460	—	—	—	—
Detritus					
Inorganic	1490	—	—	—	—
Organic	1520	—	—	—	—
ANIMALS					
Invertebrates, Terrestrial					
Insects, adult	1580	—	—	—	—
Insects, immature	1610	—	—	—	—
Other arthropods	1640	—	—	—	—
Worms	1670	—	—	—	—
Other terrestrial invertebrates	1700	—	—	—	—
Invertebrates, Aquatic					
Insects	1730	—	—	—	—
Crustaceans	1760	—	—	—	—
Clams	1790	—	—	—	—
Snails	1820	—	—	—	—
Worms, segmented	1850	—	—	—	—
Worms, flat	1880	—	—	—	—
Coelenterates	1910	—	—	—	—
Bryozoans	1940	—	—	—	—
Zooplankton	1970	—	—	—	—
Other aquatic invertebrates	2000	—	—	—	—
Mammals, juvenile and nestlings	2030	—	—	—	—
Mammals, small	2060	—	—	—	—
Mammals, medium	2090	—	—	—	—
Mammals, large	2120	—	—	—	—

Foods Consumed		GENERAL (Any life stage)	LARVA	JUVENILE	ADULT
Bird eggs	2150	—	—	—	—
Bird nestlings	2180	—	—	—	—
Bird adults	2210	—	—	—	—
Fish eggs	2240	—	—	—	—
Fish fry	2270	—	—	—	—
Fish adults	2300	—	—	—	—
Reptile eggs	2330	—	—	—	—
Reptile juveniles	2360	—	—	—	—
Reptile adults	2390	—	—	—	—
Amphibian eggs	2420	—	—	—	—
Amphibian juveniles	2450	—	—	—	—
Amphibian adults	2480	—	—	—	—
Domestic mammals	2510	—	—	—	—
Domestic birds	2540	—	—	—	—
Carrion	2570	—	—	—	—
Feces	2600	—	—	—	—
Garbage/Trash	2630	—	—	—	—

LIFE HISTORY

In the following sections, describe the species life history. Be as complete and concise as possible.

Attempt to address most of the elements described in each section, but be concise. Be certain to follow each item of information with the reference code and page numbers that indicate the source of the information.

A. Life History Narrative

1. Physical Description

Provide a brief morphological description of the species including descriptors for size, color, etc.

2. Origin Within Pennsylvania

Describe this species origin within Pennsylvania (e.g., native, introduced, etc.). If the species is not native to Pennsylvania, include descriptive information concerning the source of animals, etc.

3. Behavior

Describe the behavior of the species including: territoriality, home range size, dispersion within natural habitat, diurnal periodicity, seasonal periodicity, movement/migration patterns within and out of Pennyslvania, dispersal, foraging strategy and sites, and interspecific and intraspecific interactions.

4. Reproductive Characteristics and Requirements

Describe the details of this species breeding behavior and characteristics, as well as reproductive site requirements, including: breeding season, mating system, duration of pair bond (if any), display site, gestation/incubation period, delayed fertilization or implantation, number of offspring per reproductive cycle, number of reproductive cycles per year, type of nesting/denning/spawning site, placement of nest/den, type of materials required for nesting/denning/spawning site, development of offspring, parental care of offspring, age at sexual maturity, minimum and maximum and breeding age, sex ratio's of clutch/litter/offspring.

5. Population Biology

Describe the population biology of this species, including: relative population trend, average annual mortality rate, survival rates, average and optimum population densities, rate of increase, sex ratio, and turnover rates.

6. Limiting Factors

Describe limiting factors that are influencing this species in including: predation, disease, food, competition, population levels, space, cover, natural catastrophes, and other factors.

B. References for Life History (enter the reference codes for all references used in compiling the entries in this section, separate each reference code with a comma):

C. Life History Checklists

Complete the following life history checklists. These checklists are used to summarize information in a consistent format with standard definitions facilitating automated data element search and retrieval.

Checklist entries should be consistent with the life history narrative. Check all categories and values in a category that apply. If a category does apply, but an appropriate value does not exist to describe the species, then write in the appropriate value or entry in the category checklist.

1. ORIGIN WITHIN PENNSYLVANIA

__ 001A Native

__ 001B Transplanted - originally native to another state, now in Pennsylvania

__ 001C Exotic - originally native to another country, now in Pennsylvania

__ 001D Feral - animals which have escaped from domestication

__ 001E Hybrid - offspring of two separate, but closely related species

__ 001F Reintroduced native - species once extirpated in Pennsylvania, now reintroduced

__ 001G Stocked - populations are artificially maintained

2. BEHAVIOR

A. Territoriality

__ 024A Defends entire breeding, feeding, and nesting territory
__ 024B Defends breeding and nesting territory
__ 024C Defends breeding territory only
__ 024D Defends nesting territory only
__ 024E Defends feeding territory only
__ 024F Non-territorial

B. Territory Size

___ 025A Less than 1/4 acre
___ 025B 1/4 - 1 acre
___ 025C 1 - 5 acres
___ 025D 5 - 20 acres
___ 025E 20 - 100 acres
___ 025F Greater than 100 acres

C. Home Range Size

___ 026A Less than 1/4 acre
___ 026B 1/4 - 1 acre
___ 026C 1 - 5 acres
___ 026D 5 - 20 acres
___ 026E 20 - 100 acres
___ 026F Greater than 100 acres

D. Dispersion

___ 027A Random
___ 027B Uniform
___ 027C Clumped

E. Periodicity

___ 028A Active at night
___ 028B Active in day
___ 028C Active at dawn and/or dusk (crepuscular)
___ 028D Cyclic day-night activity rhythms
___ 028E Most active in winter
___ 028F Most active in early spring
___ 028G Most active in late spring
___ 028H Most active in early summer
___ 028I Most active in late summer
___ 028J Most active in fall

F. Foraging Strategy

___	002A	Gleaning
___	002B	Probing
___	002C	Hovering
___	002D	Hawking
___	002E	Grazing
___	002F	Browsing
___	002G	Scavenging
___	002H	Stalking
___	002I	Filtering
___	002J	Flycatching
___	002K	Diving (Aquatic)
___	002L	Stooping
___	002M	Ambushing
___	002N	Pouncing

G. Foraging Sites

___	003A	Ground Surface
___	003B	Air
___	003C	Herbaceous vegetation
___	003D	Snags (dead/dying trees)
___	003E	Stumps
___	003F	Shrubs Cover/Canopy
___	003G	Understory tree canopy
___	003H	Branches of overstory trees
___	003I	Canopy of overstory trees
___	003J	Trunk of trees
___	003K	Tree cavities
___	003L	Rocks
___	003M	Logs
___	003N	Underground burrows
___	003O	Caves
___	003P	Cliffs/Ledges
___	003Q	Standing Water - Littoral Zone
___	003R	Standing Water - Limnetic Zone
___	003T	Standing Water - Profundal Zone
___	003U	Flowing Water - Riffles
___	003V	Flowing Water - Pools
___	003W	Flowing Water - aquatic weedbeds/vegetation

3. REPRODUCTION

A. Breeding/Spawning Season

___	004A	January
___	004B	February
___	004C	March
___	004D	April
___	004E	May
___	004F	June
___	004G	July
___	004H	August
___	004I	September
___	004J	October
___	004K	November
___	004L	December

B. Mating System (Single breeding season)

___	006A	Monogamy (male or female mates once or with only one male or female)
___	006B	Polygyny (male mates with more than one female)
___	006C	Polyandry (female mates with more than one male)
___	006D	Promiscuity (both males and females mate with more than one male or female)
___	006E	Polybrachygamy
___	006F	Colonial

C. Duration of Pair Bond

___	007A	Pair for life
___	007B	Pair for one breeding season
___	007C	No pair bond formed

D. Display Site

___	008A	Ground
___	008B	Water
___	008C	Air
___	008D	Perch
___	008E	Cavity
___	008F	Lek/Arena
___	008G	Log
___	008H	Nest

E. Gestation/Incubation Period (insemination to parturition or egg laying to hatching)

___ 015A Less than 1 day
___ 015B 1-2 days
___ 015C 3-4 days
___ 015D 5-7 days
___ 015E 1-2 weeks
___ 015F 3-4 weeks
___ 015G 1-2 months
___ 015H 3-4 months
___ 015I 5-6 months
___ 015J 7-8 months
___ 015K Greater than 8 months

F. Average Number of Offspring/Reproductive Effort

___ 016A 1
___ 016B 2
___ 016C 3-4
___ 016D 5-7
___ 016E 8-10
___ 016F 11-15
___ 016G 16-30
___ 016H 31-100
___ 016I 101-1000
___ 016J 1000-10,000
___ 016K Greater than 10,000

G. Number of Broods/Litters (Reproductive Efforts) Per Year

___ 017A One
___ 017B Two
___ 017C Three
___ 017D Greater than three

H. Spawning Site

___ 010A Standing water
___ 010B Flowing water
___ 010C Sand
___ 010D Gravel
___ 010E Rocks
___ 010F Detritus
___ 010G Mud
___ 010H Aquatic vegetation

I. Nest/Den Site

___	009A	Cavity in live tree
___	009B	Cavity in dead tree
___	009C	Primary cavity (excavates its own)
___	009D	Secondary cavity (use cavity excavated by another species)
___	009E	Under bark
___	009F	On the ground
___	009G	Underground burrow
___	009H	Hole in ground
___	009I	Depression
___	009J	Grass/Forbs
___	009K	Shrubs
___	009L	Stumps
___	009M	Trees
___	009N	Floating aquatic vegetation
___	009O	Emergent aquatic vegetation
___	009P	Rush and cattails
___	009Q	Log
___	009R	Dirt bank
___	009T	Cave
___	009U	Under rocks/rock outcrops
___	009V	Man-made structures (houses, barns, silos, etc.)
___	009W	Under leaves
___	009X	Underwater burrow
___	009Y	Ledges
___	009Z	Bare ground (no or sparce vegetation)/sand beaches
___	009AA	Upturned tree roots

J. Nest Materials

___	013A	Grasses
___	013B	Forbs
___	013C	Sticks
___	013D	Vegetative Crown
___	013E	Leaves
___	013F	Bark
___	013G	Mud
___	013H	Hair and feathers
___	013I	Rootlets
___	013J	No nest structure
___	013K	Moss
___	013L	Sand
___	013M	Gravel
___	013N	Organic debris
___	013O	Inorganic debris
___	013P	Aquatic vegetation

K. Development of Young at Birth/Hatching

___ 018A Altricial
___ 018B Precocial

L. Parental Care of Young

___ 019A Female
___ 019B Male
___ 019C Both parents
___ 019D Foster parents
___ 019E No care given young

4. POPULATION CHARACTERISTICS

A. Population Trend (Statewide)

___ 036A Increasing
___ 036B Stable
___ 036C Decreasing
___ 036D No trend-variable

B. Reasons For Population Trend

___ 032A Low Reproductive Potential
___ 032B Periphery of Range
___ 032C Overharvesting
___ 032D Disease
___ 032E Predation
___ 032F Environmental Contaminants (including heavy metals)
___ 032G Herbicides
___ 032H Pesticides/Insecticides
___ 032I Habitat Loss
___ 032J Habitat Improvement
___ 032K Range Expansion (Habitat Addition)
___ 032L Underharvesting
___ 032M High Reproduction
___ 032N Seasonal and Catastrophic Weather Conditions
___ 032O Interspecific Competition
___ 032P Intraspecific Competition

C. Population Potential Through Habitat Manipulation (MGMT)

___ 037A Increase < 10%
___ 037B Increase 10-25%
___ 037C Increase > 25%
___ 037D Decrease < 10%
___ 037E Decrease 10-25%
___ 037F Decrease > 25%

MANAGEMENT

A. Management Narrative

Develop a narrative describing those management activities or human actions that affect the species survival. Identify and describe those actions or activities that improve or are harmful to the species or its habitat. Also explain actions or activities that have a varying influence depending on how the action is implemented, and any other variations by geographic area, season, etc.

B. References for Management (enter the reference codes for all references used in compiling the entries in this section, separate each reference code with a comma):

C. Management Checklists

Check as beneficial those actions that improve a species habitat or benefit the species chance for survival. Check as harmful those actions that have an adverse impact on a species or its habitat and present a threat to the species survival. Check as many values as apply for both beneficial and harmful. Some actions may be both beneficial and harmful (make certain this situation is properly explained in the Management Narrative).

****

BENEFICIAL		HARMFUL	ACTION
_	001	_	Regulate numbers and sex of harvest
_	002	_	Prohibiting harvest of species being described
_	003	_	Transplanting wild animals
_	004	_	Stocking captive-reared domestic-strain animals
_	005	_	Stocking captive-reared wild-strain animals
_	006	_	"Put-and-Take" stocking
_	008	_	Restricting/regulating human use of habitats
_	009	_	Restricting/regulating human disturbance of populations
_	010	_	Restrict human harassment during migration
_	011	_	Restrict human disturbance during breeding or other stressful periods
_	101	_	Retention of wilderness
_	102	_	Maintaining undisturbed/undeveloped areas
_	103	_	Limit number of roads and road usage
_	104	_	Suppressing wild fire
_	110	_	Maintaining natural vegetation (native)
_	111	_	Maintaining natural ecological succession
_	112	_	Maintain early stages of succession
_	113	_	Creation and maintenance of edge situation

BENEFICIAL		HARMFUL	ACTION
__	120	__	Maintaining woodlots
__	121	__	Maintain mast producing trees
__	122	__	Creating/maintaining snags
__	123	__	Retaining dead/downed woody materials
__	124	__	Maintaining large trees for denning, nesting, or roosting
__	125	__	Creating tree cavities by mechanical excavation/ introduction of fungi/etc.
__	126	__	Retain or produce special habitat features as caves, cliffs, rims, ledges, etc.
__	127	__	Developing/maintaining greenspace (wildlife corridors)
__	128	__	Establish/maintain escape cover
__	129	__	Establishing/maintaining nesting cover
__	130	__	Providing artificial nesting sites
__	131	__	Providing ledges on highwalls
__	132	__	Providing nesting cavities in highwalls
__	133	__	Creating artificial leks or display grounds
__	134	__	Providing artificial nesting/spawning sites
__	135	__	Creating/maintaining supplemental water sources
__	136	__	Develop artificial water devices or catchments
__	137	__	Developing/maintaining water holes, ponds, potholes, etc.
__	140	__	Providing food and cover for birds in urban/ suburban areas
__	141	__	Development of food plots
__	142	__	Supplemental feeding (winter, spring, etc.)
__	150	__	Grassland burning
__	151	__	Prescribed burning of brushland habitat
__	152	__	Haying/mowing - May up to mid-June
__	153	__	Haying/mowing - After mid-June
__	154	__	Brush removal/cutting in pastures and cropland
__	155	__	Chaining vegetation to improve habitat
__	156	__	Establishment of field borders
__	157	__	Locating/constructing fences
__	158	__	Creating wind and snowbreaks
__	159	__	Developing/maintaining hedgerows
__	160	__	Creating/maintaining rock piles
__	161	__	Developing/maintaining brush or slash piles
__	162	__	Developing/maintaining ditchbank vegetation
__	163	__	Removal of hedgerows
__	164	__	Removal of stone walls

BENEFICIAL		HARMFUL	ACTION
__	170	__	Plantings (shrubs, grasses, trees, etc.)
__	171	__	Planting hardy, drought-resistant plants
__	172	__	Plantings (grasses)
__	173	__	Plantings (shrubs)
__	174	__	Plantings along roadsides
__	175	__	Transplanting native vegetation
__	176	__	Transplanting nursery grown plants
__	180	__	Using flushing devices on mowers
__	181	__	Using taste repellents
__	182	__	Using odor repellents
__	183	__	Using noise or visual repellents
__	200	__	Stream bank preservation
__	201	__	Stream bank protection - gabion matting or riprap
__	202	__	Developing/maintaining streambank/streamside vegetation
__	203	__	Removal of streamside vegetation
__	204	__	Siltation
__	205	__	Controlling sedimentation
__	206	__	Providing overstory shade adjacent to waterways to prevent high water temperature
__	207	__	Maintaining dry streambeds and/or gullies
__	208	__	Planting hedgerows along dry streambeds and/or gullies
__	209	__	Creating artificial stream meanders
__	210	__	Creating pools in streams
__	211	__	Creating riffles in streams
__	212	__	Developing/maintaining stream structures
__	213	__	Mechanical manipulation of stream bottoms
__	214	__	Maintaining/protecting riparian habitat
__	215	__	Man caused fluctuations in water level during breeding season
__	216	__	Placing artificial islands or rafts in water
__	217	__	Creating/maintaining islands within permanent impoundments
__	218	__	Maintain and/or create submerged brush and timber in rivers, lakes, and reservoirs
__	219	__	Seeding aquatic plants
__	220	__	Plantings (aquatic plants)
__	221	__	Developing/maintaining suitable salinity
__	222	__	Developing/maintaining suitable pH
__	223	__	Liming and fertilizing ponds/lakes
__	224	__	Controlling vegetation in ponds and waterways
__	225	__	Nutrient and bacteria loading of streams

BENEFICIAL		HARMFUL	ACTION
___	300	___	Developing/maintaining/protecting freshwater wetlands
___	301	___	Developing/maintaining/protecting brackish wetlands
___	302	___	Draining/excavating wetlands, including marshes with vegetatior
___	303	___	Draining/excavating ponds and lakes
___	304	___	Subsurface land drainage
___	400	___	Dredging
___	401	___	Deposition of fill
___	402	___	Channelization
___	403	___	Channel Realignments
___	404	___	Channel deepening
___	405	___	Channel widening
___	406	___	Channel lining
___	407	___	Creation of concrete channel
___	408	___	Clearing/snagging
___	420	___	Navigational improvements (i.e., dams and locks)
___	421	___	Constructing/maintaining piers
___	422	___	Constructing/maintaining moring piles, dolphins and buoys
___	423	___	Constructing/maintaining bulkheads, seawalls and dikes
___	424	___	Constructing/maintaining jetties, groins and breakwaters
___	425	___	Dry dam construction for flood control
___	426	___	Impoundment of waterways (flood control, recreation, etc.)
___	427	___	Development of shallow water impoundments
___	428	___	Increase in deep water habitats
___	429	___	Developing fishways
___	430	___	Establishment of elevated floodways
___	431	___	Maintain constant water pool level
___	432	___	Water levels seasonally fluctuating in reservoirs
___	433	___	Entrainment/impingement from water intakes

BENEFICIAL		HARMFUL	ACTION
___	500	___	Even age timber management
___	501	___	Uneven age timber management
___	502	___	Timber harvest
___	503	___	Maintain mature hardwood forests
___	504	___	Maintain overmature hardwood and coniferous forests
___	505	___	Regeneration cuts (i.e., clearcut, selection, seed tree, shelterwood, etc.)
___	506	___	Timber harvesting - clearcutting
___	507	___	Timber harvesting - selection cuts
___	508	___	Timber harvesting - shelterwood cuts
___	509	___	Timber harvesting - seed tree cuts
___	510	___	Timber stand improvement (thinning, release cuttings, pruning)
___	511	___	Converting woodland to open land
___	512	___	Clearing/controlling understory vegetation in woodlots and forests
___	513	___	Developing/maintaining forest openings
___	514	___	Reforestation - Deciduous
___	515	___	Reforestation - Coniferous
___	516	___	Reforestation - Mixed deciduous/coniferous
___	517	___	Prescribed burning in forest habitat
___	518	___	Forest fire suppression
___	519	___	Cut-and-bend or hinge-cutting trees
___	520	___	Locating/constructing access/haul roads in forested habitat
___	521	___	Maintain haul roads/access roads in forested areas
___	522	___	Daylight cutting along roads
___	523	___	"Vista" cutting along roads and trails to open up views
___	600	___	Surface mining
___	601	___	Underground mining/deep mining
___	602	___	Dozer basin and gouging methods of surface manipulation
___	603	___	Deep chizelng
___	604	___	Creating small depressions or furrows to increase water filtration
___	605	___	Stabilizing highwalls
___	606	___	Contouring to create water holes, knolls, gentle slopes and windbreaks

BENEFICIAL		HARMFUL	ACTION
___	700	___	Intensive agricultural practices
___	701	___	Clean farming (complete removal of residue)
___	702	___	Conventional tillage agriculture
___	703	___	Strip cropping
___	704	___	Minimum tillage agriculture (strip tillage)
___	705	___	Non-inversion tillage (deep offset disk, disk plow, chizel plow, disk harrow, spring tooth cultivator)
___	706	___	No-till farming
___	707	___	Retaining crop residue (over winter)
___	708	___	Grazing
___	709	___	Delayed grazing pastures/fields until late June or July
___	710	___	Fencing out cattle, sheep, horses, or other livestock
___	711	___	Overgrazing by livestock
___	712	___	Drainage land grading (reshaping land surface to drain soil)
___	713	___	Farm pond development
___	714	___	Farm pond removal
___	715	___	Irrigating
___	716	___	Irrigating - drip or trickle
___	717	___	Irrigating - sprinkler
___	718	___	Development/maintenance of grassed waterways
___	800	___	Site preparation for revegetation
___	801	___	Planting preparatory crops (cover and green manure crop)
___	802	___	Mowing of preparatory crop before seeding
___	803	___	Planting seed
___	804	___	Planting seed - broadcasting
___	805	___	Planting seed - drilling
___	806	___	Application of herbicides
___	807	___	Application of insecticides
___	808	___	Application of pesticides
___	809	___	Application of fertilizers
___	810	___	Mulching
___	811	___	Mulching - organic
___	812	___	Mulching - inorganic
___	813	___	Mulching - frabic or mats
___	814	___	Mulching - manure or sludge
___	815	___	Mulching - straw or hay
___	816	___	Mulching - native grasses
___	817	___	Mulching - wood residues
___	818	___	Mulching - asphalt
___	819	___	Mulching - resin or latex emulsion

BENEFICIAL		HARMFUL	ACTION
	900		Intensive recreational development
	901		Rights-of-way management for wildlife
	902		Creation of suburban residential areas
	903		Industrial pollution
	904		Locating/constructing powerlines and other rights-of-way
	905		Controlling pollution (thermal, chemical, physical)
	906		Controlling refuse disposal (landfills)
	950		Specimen collection
	951		Egg collection

APPENDIX C

Updated Species Profile

Kingfisher, Belted

(*Megaceryle alcyon*)

<SPP-CODE> 0400114 <CATEGORY> BIRD <COM-NAME> KINGFISHER, BELTED
<SCI-NAME> CERYLE ALCYON <TAX-PHYLUM> CHORDATA <TAX-SBPHYLUM> VERTEBRATA
<TAX-CLASS> AVES <TAX-SUBCLASS> NEORNITHES <TAX-ORDER> CORACIIFORMES
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<HABITAT> TERRESTRIAL,RIPARIAN <TROPHIC> CARNIVORE
<TERRITORY> BREEDING/FEEDING/NESTING TERRITORY <TERR-SIZE> 20-100 ACRES
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<FORAG-STRAT> HOVERING,HAWKING,POUNCING <MATING> MONOGAMY
<PAIR-BOND> ONE SEASON ONLY <DISPLAY-SITE> AIR <PREG-INCUBAT> 3-4 WEEKS
<AVE-YOUNG> 5-7 <REPROD-YR> 1 <DEVEL-YOUNG> ALTRICIAL
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KINGFISHER;KINGFISHER, EASTERN BELTED
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MEGACERYLE ALCYON ALCYON
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ADAMS,ALLEGHENY,ARMSTRONG,BEAVER,BEDFORD,BERKS,BLAIR,BRADFORD,BUCKS,
BUTLER,CAMBRIA,CAMERON,CARBON,CENTRE,CHESTER,CLARION,CLEARFIELD,
CLINTON,COLUMBIA,CRAWFORD,CUMBERLAND,DAUPHIN,DELAWARE,ELK,ERIE,
FAYETTE,FOREST,FRANKLIN,FULTON,GREENE,HUNTINGDON,INDIANA,JEFFERSON,
JUNIATA,LACKAWANNA,LANCASTER,LAWRENCE,LEBANON,LEHIGH,LUZERNE,LYCOMING,
MCKEAN,MERCER,MIFFLIN,MONROE,MONTGOMERY,MONTOUR,NORTHAMPTON,
NORTHUMBERLAND,PERRY,PHILADELPHIA,PIKE,POTTER,SCHUYLKILL,SNYDER,
SOMERSET,SULLIVAN,SUSQUEHANNA,TIOGA,UNION,VENANGO,WARREN,WASHINGTON,
WAYNE,WESTMORELAND,WYOMING,YORK
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<UNK-COUNTY>
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ADAMS:SBFW,ALLEGHENY:SBF.,ARMSTRONG:SBF.,BEAVER:SBFW,BEDFORD:SBFW,
BERKS:SBFW,BLAIR:SBF.,BRADFORD:SBF.,BUCKS:SBFW,BUTLER:SBFW,
CAMBRIA:SBF.,CAMERON:SBF.,CARBON:SBFW,CENTRE:SBF.,CHESTER:SBFW,
CLARION:SBF.,CLEARFIELD:SBF.,CLINTON:SBF.,COLUMBIA:SBFW,
CRAWFORD:SBFW,CUMBERLAND:SBFW,DAUPHIN:SBFW,DELAWARE:SBFW,ELK:SBF.,
ERIE:SBFW,FAYETTE:SBF.,FOREST:SBFW,FRANKLIN:SBFW,FULTON:SBFW,
GREENE:SBF.,HUNTINGDON:SBFW,INDIANA:SBF.,JEFFERSON:SBF.,JUNIATA:SBFW,
LACKAWANNA:SBFW,LANCASTER:SBFW,LAWRENCE:SBFW,LEBANON:SBFW,LEHIGH:SBFW,
LUZERNE:SBFW,LYCOMING:SBFW,MCKEAN:SBF.,MERCER:SBFW,MIFFLIN:SBFW,
MONROE:SBFW,MONTGOMERY:SBFW,MONTOUR:SBFW,NORTHAMPTON:SBFW,
NORTHUMBERLAND:SBFW,PERRY:SBFW,PHILADELPHIA:SBFW,PIKE:SBFW,
POTTER:SBF.,SCHUYLKILL:SBFW,SNYDER:SBFW,SOMERSET:SBF.,
SULLIVAN:SBFW,SUSQUEHANNA:SBFW,TIOGA:SBF.,UNION:SBFW,VENANGO:SBFW,
WARREN:SBFW,WASHINGTON:SBF.,WAYNE:SBFW,WESTMORELAND:SBF.,
WYOMING:SBFW,YORK:SBFW
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ADAMS:U,ALLEGHENY:X,ARMSTRONG:U,BEAVER:U,BEDFORD:U,BERKS:U,BLAIR:U,
BRADFORD:A,BUCKS:C,BUTLER:C,CAMBRIA:X,CAMERON:X,CARBON:U,CENTRE:U,
CHESTER:U,CLARION:U,CLEARFIELD:X,CLINTON:A,COLUMBIA:X,CRAWFORD:C,
CUMBERLAND:C,DAUPHIN:U,DELAWARE:X,ELK:U,ERIE:C,FAYETTE:U,FOREST:U,
FRANKLIN:X,FULTON:U,GREENE:A,HUNTINGDON:U,INDIANA:U,JEFFERSON:X,
JUNIATA:U,LACKAWANNA:X,LANCASTER:C,LAWRENCE:U,LEBANON:C,LEHIGH:C,
LUZERNE:U,LYCOMING:C,MCKEAN:C,MERCER:U,MIFFLIN:U,MONROE:U,
MONTGOMERY:U,MONTOUR:C,NORTHAMPTON:U,NORTHUMBERLAND:X,PERRY:X,

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   PHILADELPHIA:X,PIKE:A,POTTER:U,SCHUYLKILL:U,SNYDER:U,SOMERSET:U,
   SULLIVAN:U,SUSQUEHANNA:C,TIOGA:C,UNION:X,VENANGO:X,WARREN:U,
   WASHINGTON:A,WAYNE:C,WESTMORELAND:U,WYOMING:A,YORK:C
<HYDRO-NAME>
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   UPPER DELAWARE:LACKAWAXEN,
   UPPER DELAWARE:MIDDLE DELAWARE/MONGAUP/BRODHEAD,
   UPPER DELAWARE:MIDDLE DELAWARE/MUSCONETCONG,
   UPPER DELAWARE:LEHIGH,
   LOWER DELAWARE:CROSSWICKS-NESHAMINY,
   LOWER DELAWARE:LOWER DELAWARE,
   LOWER DELAWARE:SCHUYLKILL,
   LOWER DELAWARE:BRANDYWINE-CHRISTINA,
   UPPER SUSQUEHANNA:UPPER SUSQUEHANNA,
   UPPER SUSQUEHANNA:OWEGO-WAPPASENING,
   UPPER SUSQUEHANNA:TIOGA,
   UPPER SUSQUEHANNA:CHEMUNG,
   UPPER SUSQUEHANNA:UPPER SUSQUEHANNA-TUNKHANNOCK,
   UPPER SUSQUEHANNA:UPPER SUSQUEHANNA-LACKAWANNA,
   WEST BRANCH SUSQUEHANNA:UPPER WEST BRANCH SUSQUEHANNA,
   WEST BRANCH SUSQUEHANNA:SINNEMAHONING,
   WEST BRANCH SUSQUEHANNA:MIDDLE WEST BRANCH SUSQUEHANNA,
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   WEST BRANCH SUSQUEHANNA:PINE,
   WEST BRANCH SUSQUEHANNA:LOWER WEST BRANCH SUSQUEHANNA,
   LOWER SUSQUEHANNA:LOWER SUSQUEHANNA-PENNS,
   LOWER SUSQUEHANNA:UPPER JUNIATA,
   LOWER SUSQUEHANNA:RAYSTOWN,
   LOWER SUSQUEHANNA:LOWER JUNIATA,
   LOWER SUSQUEHANNA:LOWER SUSQUEHANNA-SWATARA,
   LOWER SUSQUEHANNA:LOWER SUSQUEHANNA,
   UPPER CHESAPEAKE:CHESTER-SASSAFRAS,
   UPPER CHESAPEAKE:GUNPOWDER-PATAPSCO,
   POTOMAC:NORTH BRANCH POTOMAC,
   POTOMAC:CACAPON-TOWN,
   POTOMAC:CONOCOCHEAGUE-OPEQUON,
   POTOMAC:MONOCACY,
   SOUTHERN LAKE ERIE:ASHTABULA,
   EASTERN LAKE ERIE:CHAUTAUQUA-CONNEAUT,
   SOUTHWESTERN LAKE ONTARIO:UPPER GENESEE,
   ALLEGHENY:UPPER ALLEGHENY,
   ALLEGHENY:CONEMANGO,
   ALLEGHENY:MIDDLE ALLEGHENY,
   ALLEGHENY:FRENCH,
   ALLEGHENY:CLARION,
   ALLEGHENY:MIDDLE ALLEGHENY-REDBANK,
   ALLEGHENY:CONEMAUGH,
   ALLEGHENY:KISKIMINETAS,
   ALLEGHENY:LOWER ALLEGHENY,
   MONONGAHELA:UPPER MONONGAHELA,
   MONONGAHELA:CHEAT,
   MONONGAHELA:LOWER MONONGAHELA,
   MONONGAHELA:YOUGHIOGHENY,
   UPPER OHIO:UPPER OHIO,
   UPPER OHIO:SHENANGO,
   UPPER OHIO:MAHONING,
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<ECOREG-NAME>

NORTHERN HARDWOODS FOREST, 50-80% GENTLY SLOPING, 100-300 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS IN LOWLAND
NORTHERN HARDWOODS FOREST, 50-80% GENTLY SLOPING, 300-500 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
NORTHERN HARDWOODS FOREST, 20-50% GENTLY SLOPING, 500-1000 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
NORTHERN HARDWOODS FOREST, 20-50% GENTLY SLOPING, 500-1000 FT.
ELEVATION, MORE THAN 75% OF GENTLE SLOPE IS ON UPLAND;
NORTHERN HARDWOODS FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT.
ELEVATION, MORE THAN 75% OF GENTLE SLOPE IS IN LOWLAND;
NORTHERN HARDWOODS FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
NORTHERN HARDWOODS FOREST, LESS THAN 20% GENTLE SLOPING,
1000-3000 FT. ELEVATION;
MIXED MESOPHYTIC FOREST, 20-50% GENTLY SLOPING, 500-1000 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
MIXED MESOPHYTIC FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
MIXED MESOPHYTIC FOREST, LESS THAN 20% GENTLY SLOPING,
500-1000 FT. ELEVATION;
BEECH-MAPLE FOREST, 50-80% GENTLY SLOPING, 100-300 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS IN LOWLAND;
BEECH-MAPLE FOREST, 50-80% GENTLY SLOPING, 300-500 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
APPALACHIAN OAK FOREST, MORE THAN 80% GENTLY SLOPING,
0-100 FT. ELEVATION;
APPALACHIAN OAK FOREST, MORE THAN 80% GENTLY SLOPING,
100-300 FT. ELEVATION, 50-75% OF GENTLE SLOPE IS IN LOWLAND;
APPALACHIAN OAK FOREST, 50-80% GENTLY SLOPING, 100-300 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
APPALACHIAN OAK FOREST, 50-80% GENTLY SLOPING, 300-500 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS IN LOWLAND;
APPALACHIAN OAK FOREST, 50-80% GENTLY SLOPING, 300-500 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
APPALACHIAN OAK FOREST, 50-80% GENTLY SLOPING, 500-1000 FT.
ELEVATION, LESS THAN 75% OF GENTLE SLOPE IS IN LOWLAND;
APPALACHIAN OAK FOREST, 20-50% GENTLY SLOPING, 500-1000 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
APPALACHIAN OAK FOREST, 20-50% GENTLY SLOPING, 500-1000 FT.
ELEVATION, MORE THAN 75% OF GENTLE SLOPE IS ON UPLAND;
APPALACHIAN OAK FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT.
ELEVATION, LESS THAN 75% OF GENTLE SLOPE IS IN LOWLAND;
APPALACHIAN OAK FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
APPALACHIAN OAK FOREST, LESS THAN 20% GENTLY SLOPING, 500-1000 FT.
ELEVATION;
APPALACHIAN OAK FOREST, LESS THAN 20% GENTLY SLOPING, 1000-3000 FT.
ELEVATION;
SOUTHERN MIXED FOREST, 50-80% GENTLY SLOPING, 300-500 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND

<ECOREG-CODE>

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<PNV>

BEECH-MAPLE,MIXED MESOPHYTIC,APPALACHIAN OAK, NORTHERN HARDWOODS,

OAK-HICKORY-PINE

<QUAD-NAME>

NEWARK WEST,BAY VIEW,WOODBURY,BRIDGEPORT,MARCUS HOOK,WILMINGTON NORTH,
KENNETT SQUARE,WEST GROVE,OXFORD,CAMDEN,PHILADELPHIA,LANSDOWNE,MEDIA,
WEST CHESTER,UNIONVILLE,COATESVILLE,PARKESBURG,RISING SUN,
CONOWINGO DAM,DELTA,FAWN GROVE,NORRISVILLE,NEW FREEDOM,LINEBORO,
MANCHESTER,KIRKWOOD,WAKEFIELD,HOLTWOOD,AIRVILLE,STEWARTSTOWN,
GLEN ROCK,SEVEN VALLEYS,HANOVER,GAP,QUARRYVILLE,CONESTOGA,SAFE HARBOR,
RED LION,YORK,WEST YORK,ABBOTTSTOWN,LITTLESTOWN,TANEYTOWN,EMMITSBURG,
BLUE RIDGE SUMMIT,SMITHSBURG,HAGERSTOWN,MASON DIXON,CLEAR SPRING,
MC SHERRYSTOWN,GETTYSBURG,FAIRFIELD,IRON SPRINGS,WAYNESBORO,
GREENCASTLE,WILLIAMSON,MERCERSBURG,HAMPTON,BIGLERVILLE,ARENDTSVILLE,
CALEDONIA PARK,SCOTLAND,CHAMBERSBURG,ST THOMAS,MC CONNELLSBURG,
CHERRY RUN,HANCOCK (WV),BELLEGROVE,ARTEMAS,FLINTSTONE,
EVITTS CREEK,CUMBERLAND,FROSTBURG,BIG COVE TANNERY,NEEDMORE,AMARANTH,
CHANEYSVILLE,BEANS COVE,HYNDMAN,FAIRHOPE,WITTENBERG,MEADOW GROUNDS,
BREEZEWOOD,MENCH,CLEARVILLE,RAINSBURG,BUFFALO MILLS,NEW BALTIMORE,
BERLIN,AVILTON,GRANTSVILLE,ACCIDENT,FRIENDSVILLE (MD),BRANDONVILLE,
BRUCETON MILLS,LAKE LYNN,MORGANTOWN NORTH,MEYERSDALE,MARKLETON,
CONFLUENCE,OHIOPYLE,FT NECESSITY,BROWNFIELD,SMITHFIELD,MASONTOWN,
MURDOCK,ROCKWOOD,KINGWOOD,MILL RUN,SOUTH CONNELLSVILLE,UNIONTOWN,
NEW SALEM,CARMICHAELS,OSAGE,BLACKSVILLE,WADESTOWN,HUNDRED,LITTLETON,
GARARDS FORT,OAK FOREST,HOLBROOK,NEW FREEPORT,CAMERON (WV),MATHER,
WAYNESBURG,ROGERSVILLE,WIND RIDGE,MAJORSVILLE,BRISTOL,BEVERLY,
TRENTON EAST,TRENTON WEST,LANGHORNE,PENNINGTON,LAMBERTVILLE,STOCKTON,
FRANKFORD,GERMANTOWN,NORRISTOWN,VALLEY FORGE,MALVERN,DOWNINGTOWN,
WAGONTOWN,HONEY BROOK,HATBORO,AMBLER,LANSDALE,COLLEGEVILLE,
PHOENIXVILLE,POTTSTOWN,ELVERSON,MORGANTOWN,BUCKINGHAM,DOYLESTOWN,
TELFORD,PERKIOMENVILLE,SASSAMANSVILLE,BOYERTOWN,BIRDSBORO,READING,
LUMBERVILLE,BEDMINSTER,QUAKERTOWN,MILFORD SQUARE,EAST GREENVILLE,
MANATAWNY,FLEETWOOD,TEMPLE,FRENCHTOWN,RIEGELSVILLE,HELLERTOWN,
ALLENTOWN EAST,ALLENTOWN WEST,TOPTON,KUTZTOWN,HAMBURG,EASTON,NAZARETH,
CATASAUQUA,CEMENTON,SLATEDALE,NEW TRIPOLI,NEW RINGGOLD,BELVIDERE,
BANGOR,WIND GAP,KUNKLETOWN,PALMERTON,LEHIGHTON,NESQUEHONING,TAMAQUA,
PORTLAND,STROUDSBURG,SAYLORSBURG,BROADHEADSVILLE,POHOPOCO MTN,
CHRISTMANS,WEATHERLY,HAZLETON,NEW HOLLAND,LEOLA,LANCASTER,
COLUMBIA EAST,COLUMBIA WEST,YORK HAVEN,DOVER,WELLSVILLE,TERRE HILL,
EPHRATA,LITITZ,MANHEIM,ELIZABETHTOWN,MIDDLETOWN,STEELTON,LEMOYNE,
SINKING SPRING,WOMELSDORF,RICHLAND,LEBANON,PALMYRA,HERSHEY,
HARRISBURG EAST,HARRISBURG WEST,BERNVILLE,STRAUSSTOWN,BETHEL,
FREDERICKSBURG,INDIANTOWN GAP,GRANTVILLE,ENDERS,HALIFAX,AUBURN,
FRIEDENSBURG,SWATARA HILL,PINE GROVE,TOWER CITY,LYKENS,ELIZABETHVILLE,
MILLERSBURG,ORWIGSBURG,POTTSVILLE,MINERSVILLE,TREMONT,VALLEY VIEW,
KLINGERSTOWN,PILLOW,DALMATIA,DELANO,SHENANDOAH,ASHLAND,MT CARMEL,
SHAMOKIN,TREVORTON,SUNBURY,FREEBURG,CONYNGHAM,NUREMBERG,SHUMANS,
CATAWISSA,DANVILLE,RIVERSIDE,NORTHUMBERLAND,LEWISBURG,DILLSBURG,
MOUNT HOLLY SPRINGS,DICKINSON,WALNUT BOTTOM,SHIPPENSBURG,ROXBURY,
FANNETTSBURG,BURNT CABINS,MECHANICSBURG,CARLISLE,PLAINFIELD,NEWVILLE,
NEWBURG,DOYLESBURG,SHADE GAP,ORBISONIA,WERTZVILLE,SHERMANS DALE,
LANDISBURG,ANDERSONBURG,BLAIN,BLAIRS MILLS,AUGHWICK,BUTLER KNOB,
DUNCANNON,NEWPORT,ICKESBURG,SPRUCE HILL,MC COYSVILLE,MC VEYTOWN,
NEWTON HAMILTON,MOUNT UNION,REWARD,MILLERSTOWN,MEXICO,MIFFLINTOWN,
LEWISTOWN,BELLEVILLE,ALLENSVILLE,DONATION,RICHFIELD,BEAVER SPRINGS,
MC CLURE,ALFARATA,BURNHAM,BARRVILLE,MC ALEVYS FORT,PINE GROVE MILLS,
MIDDLEBURG,BEAVERTOWN,WEIKERT,COBURN,SPRING MILLS,CENTRE HALL,
STATE COLLEGE,JULIAN,MIFFLINBURG,HARTLETON,WOODWARD,MILLHEIM,
MADISONBURG,KINGSVILLE,BELLEFONTE,BEAR KNOB,HUSTONTOWN,WELLS TANNERY,
EVERETT EAST,EVERETT WEST,BEDFORD,SCHELLSBURG,CENTRAL CITY,STOYSTOWN,
SALTILLO,SAXTON,HOPEWELL,NEW ENTERPRISE,ALUM BANK,OGLETOWN,WINDBER,
HOOVERSVILLE,CASSVILLE,ENTRIKEN,MARTINSBURG,ROARING SPRING,BLUE KNOB,
BEAVERDALE,GEISTOWN,JOHNSTOWN,HUNTINGDON,WILLIAMSBURG,FRANKSTOWN,
HOLLIDAYSBURG,CRESSON,EBENSBURG,NANTY GLO,VINTONDALE,ALEXANDRIA,
SPRUCE CREEK,BELLWOOD,ALTOONA,ASHVILLE,CARROLLTOWN,COLVER,STRONGSTOWN,

FRANKLINVILLE, TYRONE, TIPTON, BLANDBURG, COALPORT, HASTINGS, BARNESBORO,
COMMODORE, PORT MATILDA, SANDY RIDGE, HOUTZDALE, RAMEY, IRVONA, WESTOVER,
BURNSIDE, ROCHESTER MILLS, BLACK MOSHANNON, PHILIPSBURG, WALLACETON,
GLEN RICHEY, CURWENSVILLE, MAHAFFEY, MCGEES MILLS, PUNXSUTAWNEY, SOMERSET,
BAKERSVILLE, SEVEN SPRINGS, DONEGAL, CONNELLSVILLE, DAWSON, FAYETTE CITY,
CALIFORNIA, BOSWELL, LIGONIER, STAHLSTOWN, MAMMOTH, MT PLEASANT, SMITHTON,
DONORA, MONONGAHELA, RACHELWOOD, WILPEN, DERRY, LATROBE, GREENSBURG, IRWIN,
MC KEESPORT, GLASSPORT, NEW FLORENCE, BOLIVAR, BLAIRSVILLE, SALTSBURG,
SLICKVILLE, MURRYSVILLE, BRADDOCK, PITTSBURGH EAST, BRUSH VALLEY, INDIANA,
MC INTYRE, AVONMORE, VANDERGRIFT, NEW KENSINGTON EAST,
NEW KENSINGTON WEST, GLENSHAW, CLYMER, ERNEST, ELDERTON, WHITESBURG,
LEECHBURG, FREEPORT, CURTISVILLE, VALENCIA, MARION CENTER, PLUMVILLE,
RURAL VALLEY, MOSGROVE, KITTANNING, WORTHINGTON, SAXONBURG, BUTLER, VALIER,
DAYTON, DISTANT, TEMPLETON, EAST BRADY, CHICORA, EAST BUTLER, MT CHESTNUT,
ELLSWORTH, AMITY, PROSPERITY, CLAYSVILLE, VALLEY GROVE, HACKETT,
WASHINGTON EAST, WASHINGTON WEST, WEST MIDDLETOWN, BETHANY, BRIDGEVILLE,
CANONSBURG, MIDWAY, AVELLA, STEUBENVILLE EAST, PITTSBURGH WEST, OAKDALE,
CLINTON, BURGETTSTOWN, WEIRTON, EMSWORTH, AMBRIDGE, ALIQUIPPA, HOOKSTOWN,
EAST LIVERPOOL SOUTH, MARS, BADEN, BEAVER, MIDLAND, EAST LIVERPOOL NORTH,
EVANS CITY, ZELIENOPLE, BEAVER FALLS, NEW GALILEE, EAST PALESTINE,
PROSPECT, PORTERSVILLE, NEW CASTLE SOUTH, BESSEMER, NEW MIDDLETOWN,
FLATBROCKVILLE, CULVERS GAP, LAKE MASKENOZHA, PORT JERVIS SOUTH, MILFORD,
EDGEMERE, PORT JERVIS NORTH, POND EDDY, SHOHOLA, ELDRED (NY), BUSHKILL,
EAST STROUDSBURG, MOUNT POCONO, POCONO PINES, BLAKESLEE, HICKORY RUN,
WHITE HAVEN, FREELAND, TWELVEMILE POND, SKYTOP, BUCK HILL FALLS, TOBYHANNA,
THORNHURST, PLEASANT VIEW SUMMIT, WILKES-BARRE EAST, WILKES-BARRE WEST,
PECKS POND, PROMISED LAND, NEWFOUNDLAND, STERLING, MOSCOW, AVOCA, PITTSTON,
KINGSTON, ROWLAND, HAWLEY, LAKEVILLE, LAKE ARIEL, OLYPHANT, SCRANTON, RANSOM,
CENTER MORELAND, NARROWSBURG, WHITE MILLS, HONESDALE, WAYMART, CARBONDALE,
DALTON, FACTORYVILLE, TUNKHANNOCK, DAMASCUS, GALILEE, ALDENVILLE,
FOREST CITY, CLIFFORD, LENOXVILLE, HOP BOTTOM, SPRINGVILLE, CALLICOON,
LONG EDDY, LAKE COMO, ORSON, THOMPSON, HARFORD, MONTROSE EAST,
MONTROSE WEST, HANCOCK, STARRUCCA, SUSQUEHANNA, GREAT BEND, FRANKLIN FORKS,
LAUREL LAKE, SYLVERTSVILLE, BERWICK, MIFFLINVILLE, BLOOMSBURG, MILLVILLE,
WASHINGTONVILLE, MILTON, ALLENWOOD, NANTICOKE, SHICKSHINNY, STILLWATER,
BENTON, LAIRDSVILLE, HUGHESVILLE, MUNCY, MONTOURSVILLE SOUTH, HARVEYS LAKE,
SWEET VALLEY, RED ROCK, ELK GROVE, SONESTOWN, PICTURE ROCKS, HUNTERSVILLE,
MONTOURSVILLE NORTH, MOXEN, DUTCH MTN, LOPEZ, LAPORTE, EAGLES MERE,
HILLSGROVE, BARBOURS, BODINES, MESHOPPEN, JENNINGSVILLE, COLLEY, DUSHORE,
OVERTON, SHUNK, GROVER, RALSTON, AUBURN CENTER, LACEYVILLE, WYALUSING,
MONROETON, POWELL, LEROY, CANTON, GLEASON, LAWTON, LE RAYSVILLE, ROME,
TOWANDA, ULSTER, EAST TROY, TROY, ROSEVILLE, FRIENDSVILLE, LITTLE MEADOWS,
WINDHAM, LITCHFIELD, SAYRE, BENTLEY CREEK, GILLETT, MILLERTON,
WILLIAMSPORT SE, CARROLL, LOGANTON, MILL HALL, BEECH CREEK, HOWARD,
SNOW SHOE SE, SNOW SHOE, WILLIAMSPORT, LINDEN, JERSEY SHORE, LOCK HAVEN,
FARRANDSVILLE, HOWARD NW, SNOW SHOE NE, SNOW SHOW NW, COGAN STATION,
SALLADASBURG, WATERVILLE, JERSEY MILLS, GLEN UNION, RENOVO EAST,
RENOVO WEST, KEATING, TROUT RUN, WHITE PINE, ENGLISH CENTER, CAMMAL,
SLATE RUN, YOUNG WOMANS CREEK, TAMARACK, HAMMERSLEY FORK, LIBERTY, NAUVOO,
MORRIS, CEDAR RUN, LEE FIRE TOWER, OLEONA, SHORT RUN, CONRAD, BLOSSBURG,
CHERRY FLATS, ANTRIM, TIADAGHTON, MARSHLANDS, GALETON, CHERRY SPRINGS,
AYERS HILL, MANSFIELD, CROOKED CREEK, KEENEYVILLE, ASAPH, SABINSVILLE,
WEST PIKE, BROOKLAND, SWEDEN VALLEY, JACKSON SUMMIT, TIOGA, ELKLAND,
KNOXVILLE, POTTER BROOK, HARRISON VALLEY, ULYSSES, ELLISBURG, KARTHAUS,
FRENCHVILLE, LECONTES MILLS, CLEARFIELD, ELLIOTT PARK, LUTHERSBURG,
DU BOIS, REYNOLDSVILLE, POTTERSDALE, DEVILS ELBOW, THE KNOBS, HUNTLEY,
PENFIELD, SABULA, FALLS CREEK, HAZEN, SINNEMAHONING, DRIFTWOOD, DENTS RUN,
WEEDVILLE, KERSEY, BRANDY CAMP, CARMAN, MUNDERF, FIRST FORK, CAMERON,
WEST CREEK, RATHBUN, ST MARYS, RIDGWAY, PORTLAND MILLS, HALLTON, WHARTON,
EMPORIUM, RICH VALLEY, WILDWOOD FIRE TOWER, GLEN HAZEL, WILCOX, JAMES CITY,
RUSSELL CITY, AUSTIN, KEATING SUMMIT, NORWICH, CROSBY, HAZEL HURST,
MT JEWETT, KANE, LUDLOW, COUDERSPORT, ROULETTE, PORT ALLEGANY, SMETHPORT,
CYCLONE, LEWIS RUN, WESTLINE, CORNPLANTER BRIDGE, OSWAYO, SHINGLEHOUSE,

BULLIS MILLS,ELDRED,DERRICK CITY,BRADFORD,STICKNEY,CORNPLANTER RUN,
COOLSPRING,SUMMERVILLE,NEW BETHLEHEM,SLIGO,RIMERSBURG,PARKER,
HILLIARDS,WEST SUNBURY,BROOKVILLE,CORSICA,STRATTANVILLE,CLARION,KNOX,
EMLENTON,EAU CLAIRE,BARKEYVILLE,SIGEL,COOKSBURG,LUCINDA,FRYBURG,
KOSSUTH CRANBERRY,KENNERDELL,POLK,MARIENVILLE EAST,MARIENVILLE WEST,
TYLERSBURG,TIONESTA,PRESIDENT,OIL CITY,FRANKLIN,UTICA,LYNCH,MAYBURG,
KELLETTVILLE,WEST HICKORY,PLEASANTVILLE,TITUSVILLE SOUTH,DEMPSEYTOWN,
SUGAR LAKE,SHEFFIELD,CHERRY GROVE,COBHAM,TIDIOUTE,GRAND VALLEY,
TITUSVILLE NORTH,CENTERVILLE,TOWNVILLE,CLARENDON,WARREN,YOUNGSVILLE,
PITTSFIELD,SPRING CREEK,SPARTANSBURG,LAKE CANADOHTA,MILLERS STATION,
SCANDIA,RUSSELL,SUGAR GROVE,LOTTSVILLE,COLUMBUS,CORRY,UNION CITY,
WATERFORD,SLIPPERY ROCK,HARLANSBURG,NEW CASTLE NORTH,EDINBURG,
CAMPBELL,GROVE CITY,MERCER,GREENFIELD,SHARON EAST,SHARON WEST,
SANDY LAKE,JACKSON CENTER,FREDONIA,SHARPSVILLE,ORANGEVILLE,
NEW LEBANON,HADLEY,GREENVILLE EAST,GREENVILLE WEST,KINSMAN,COCHRANTON,
GENEVA,CONNEAUT LAKE,HARTSTOWN,ANDOVER,BLOOMING VALLEY,MEADVILLE,
HARMONSBURG,LINESVILLE,LEON,CAMBRIDGE SPRINGS,EDINBORO SOUTH,
CONNEAUTVILLE,BEAVER CENTER,PIERPONT,CAMBRIDGE SPRINGS NE,
EDINBORO NORTH,ALBION,EAST SPRINGFIELD,CONNEAUT,WAVERLY,WELLSBURG,
ELMIRA,SEELEY CREEK,CATON,ALLENTOWN,BOLIVAR (NY),WATTSBURG,HAMMETT,
NORTH EAST,HARBORCREEK,ERIE SOUTH,SWANVILLE,FAIRVIEW,FAIRVIEW SW,
ERIE NORTH
<QUAD-CODE>
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<LATLONG>
<LANDUSE-ASOC>
AGRIC:CROPLAND-PASTURE,FOREST:DECIDUOUS,FOREST:EVERGREEN,FOREST:MIXED,
WATER:STREAMS-CANALS,WATER:LAKES,WATER:RESERVOIRS,
WATER:BAYS-ESTUARIES,WETAND:FORESTED,WETLAND:NONFORESTED,
BARREN:STRIP MINES-QUARRIES-GRAVEL PITS
<LANDUSE-PREF>
WATER:STREAMS-CANALS,WATER:LAKES,WATER:RESERVOIRS,
WATER:BAYS-ESTUARIES,WETLAND:FORESTED,WETLAND:NONFORESTED,
BARREN:STRIP MINES-QUARRIES-GRAVEL PITS
<FOREST-TYPE>
RED PINE:GRASS/FORB,
RED PINE:SEEDLING/SHRUB,
RED PINE:SAPLING,
RED PINE:POLE,
RED PINE:MATURE,
RED PINE:OLD GROWTH,
WHITE PINE:GRASS/FORB,
WHITE PINE:SEEDLING/SHRUB,
WHITE PINE:SAPLING,
WHITE PINE:POLE,
WHITE PINE:MATURE,
WHITE PINE:OLD GROWTH,
WHITE PINE/HEMLOCK:GRASS/FORB,
WHITE PINE/HEMLOCK:SEEDLING/SHRUB,
WHITE PINE/HEMLOCK:SAPLING,
WHITE PINE/HEMLOCK:POLE,
WHITE PINE/HEMLOCK:MATURE,
WHITE PINE/HEMLOCK:OLD GROWTH,
HEMLOCK:GRASS/FORB,
HEMLOCK:SEEDLING/SHRUB,
HEMLOCK:SAPLING,
HEMLOCK:POLE,
HEMLOCK:MATURE,
HEMLOCK:OLD GROWTH,
SCOTCH PINE:GRASS/FORB,
SCOTCH PINE:SEEDLING/SHRUB,
SCOTCH PINE:SAPLING,
SCOTCH PINE:POLE,
SCOTCH PINE:MATURE,
SCOTCH PINE:OLD GROWTH,
RED SPRUCE/BALSAM FIR:GRASS/FORB,
RED SPRUCE/BALSAM FIR:SEEDLING/SHRUB,
RED SPRUCE/BALSAM FIR:SAPLING,
RED SPRUCE/BALSAM FIR:POLE,
RED SPRUCE/BALSAM FIR:MATURE,
RED SPRUCE/BALSAM FIR:OLD GROWTH,
TAMARACK (EASTERN LARCH):GRASS/FORB,
TAMARACK (EASTERN LARCH):SEEDLING/SHRUB,
TAMARACK (EASTERN LARCH):SAPLING,
TAMARACK (EASTERN LARCH):POLE,
TAMARACK (EASTERN LARCH):MATURE,
TAMARACK (EASTERN LARCH):OLD GROWTH,
WHITE SPRUCE:GRASS/FORB,
WHITE SPRUCE:SEEDLING/SHRUB,
WHITE SPRUCE:SAPLING,

WHITE SPRUCE:POLE,
WHITE SPRUCE:MATURE,
WHITE SPRUCE:OLD GROWTH,
NORWAY SPRUCE:GRASS/FORB,
NORWAY SPRUCE:SEEDLING/SHRUB,
NORWAY SPRUCE:SAPLING,
NORWAY SPRUCE:POLE,
NORWAY SPRUCE:MATURE,
NORWAY SPRUCE:OLD GROWTH,
LARCH:GRASS/FORB,
LARCH:SEEDLING/SHRUB,
LARCH:SAPLING,
LARCH:POLE,
LARCH:MATURE,
LARCH:OLD GROWTH,
VIRGINIA PINE:GRASS/FORB,
VIRGINIA PINE:SEEDLING/SHRUB,
VIRGINIA PINE:SAPLING,
VIRGINIA PINE:POLE,
VIRGINIA PINE:MATURE,
VIRGINIA PINE:OLD GROWTH,
EASTERN REDCEDAR:GRASS/FORB,
EASTERN REDCEDAR:SEEDLING/SHRUB,
EASTERN REDCEDAR:SAPLING,
EASTERN REDCEDAR:POLE,
EASTERN REDCEDAR:MATURE,
EASTERN REDCEDAR:OLD GROWTH,
PITCH PINE:GRASS/FORB,
PITCH PINE:SEEDLING/SHRUB,
PITCH PINE:SAPLING,
PITCH PINE:POLE,
PITCH PINE:MATURE,
PITCH PINE:OLD GROWTH,
WHITE PINE/NORTHERN RED OAK/WHITE ASH:GRASS/FORB,
WHITE PINE/NORTHERN RED OAK/WHITE ASH:SEEDLING/SHRUB,
WHITE PINE/NORTHERN RED OAK/WHITE ASH:SAPLING,
WHITE PINE/NORTHERN RED OAK/WHITE ASH:POLE,
WHITE PINE/NORTHERN RED OAK/WHITE ASH:MATURE,
WHITE PINE/NORTHERN RED OAK/WHITE ASH:OLD GROWTH,
EASTERN REDCEDAR/HARDWOOD:GRASS/FORB,
EASTERN REDCEDAR/HARDWOOD:SEEDLING/SHRUB,
EASTERN REDCEDAR/HARDWOOD:SAPLING,
EASTERN REDCEDAR/HARDWOOD:POLE,
EASTERN REDCEDAR/HARDWOOD:MATURE,
EASTERN REDCEDAR/HARDWOOD:OLD GROWTH,
VIRGINIA PINE/SOUTHERN RED OAK:GRASS/FORB,
VIRGINIA PINE/SOUTHERN RED OAK:SEEDLING/SHRUB,
VIRGINIA PINE/SOUTHERN RED OAK:SAPLING,
VIRGINIA PINE/SOUTHERN RED OAK:POLE,
VIRGINIA PINE/SOUTHERN RED OAK:MATURE,
VIRGINIA PINE/SOUTHERN RED OAK:OLD GROWTH,
POST/BLACK/OR BEAR OAK:GRASS/FORB,
POST/BLACK/OR BEAR OAK:SEEDLING/SHRUB,
POST/BLACK/OR BEAR OAK:SAPLING,
POST/BLACK/OR BEAR OAK:POLE,
POST/BLACK/OR BEAR OAK:MATURE,
POST/BLACK/OR BEAR OAK:OLD GROWTH,
CHESTNUT OAK:GRASS/FORB,
CHESTNUT OAK:SEEDLING/SHRUB,
CHESTNUT OAK:SAPLING,
CHESTNUT OAK:POLE,
CHESTNUT OAK:MATURE,
CHESTNUT OAK:OLD GROWTH,

WHITE OAK/RED OAK/HICKORY:GRASS/FORB,
WHITE OAK/RED OAK/HICKORY:SEEDLING/SHRUB,
WHITE OAK/RED OAK/HICKORY:SAPLING,
WHITE OAK/RED OAK/HICKORY:POLE,
WHITE OAK/RED OAK/HICKORY:MATURE,
WHITE OAK/RED OAK/HICKORY:OLD GROWTH,
WHITE OAK:GRASS/FORB,
WHITE OAK:SEEDLING/SHRUB,
WHITE OAK:SAPLING,
WHITE OAK:POLE,
WHITE OAK:MATURE,
WHITE OAK:OLD GROWTH,
NORTHERN RED OAK:GRASS/FORB,
NORTHERN RED OAK:SEEDLING/SHRUB,
NORTHERN RED OAK:SAPLING,
NORTHERN RED OAK:POLE,
NORTHERN RED OAK:MATURE,
NORTHERN RED OAK:OLD GROWTH,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:GRASS/FORB,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:SEEDLING/SHRUB,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:SAPLING,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:POLE,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:MATURE,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:OLD GROWTH,
BLACK LOCUST:GRASS/FORB,
BLACK LOCUST:SEEDLING/SHRUB,
BLACK LOCUST:SAPLING,
BLACK LOCUST:POLE,
BLACK LOCUST:MATURE,
BLACK LOCUST:OLD GROWTH,
BLACK WALNUT:GRASS/FORB,
BLACK WALNUT:SEEDLING/SHRUB,
BLACK WALNUT:SAPLING,
BLACK WALNUT:POLE,
BLACK WALNUT:MATURE,
BLACK WALNUT:OLD GROWTH,
YELLOW POPLAR:GRASS/FORB,
YELLOW POPLAR:SEEDLING/SHRUB,
YELLOW POPLAR:SAPLING,
YELLOW POPLAR:POLE,
YELLOW POPLAR:MATURE,
YELLOW POPLAR:OLD GROWTH,
CENTRAL HARDWOOD REVERTING FIELD:GRASS/FORB,
CENTRAL HARDWOOD REVERTING FIELD:SEEDLING/SHRUB,
CENTRAL HARDWOOD REVERTING FIELD:SAPLING,
CENTRAL HARDWOOD REVERTING FIELD:POLE,
CENTRAL HARDWOOD REVERTING FIELD:MATURE,
CENTRAL HARDWOOD REVERTING FIELD:OLD GROWTH,
SCARLET OAK:GRASS/FORB,
SCARLET OAK:SEEDLING/SHRUB,
SCARLET OAK:SAPLING,
SCARLET OAK:POLE,
SCARLET OAK:MATURE,
SCARLET OAK:OLD GROWTH,
SASSAFRAS/PERSIMMON:GRASS/FORB,
SASSAFRAS/PERSIMMON:SEEDLING/SHRUB,
SASSAFRAS/PERSIMMON:SAPLING,
SASSAFRAS/PERSIMMON:POLE,
SASSAFRAS/PERSIMMON:MATURE,
SASSAFRAS/PERSIMMON:OLD GROWTH,
RED MAPLE/CENTRAL HARDWOODS:GRASS/FORB,
RED MAPLE/CENTRAL HARDWOODS:SEEDLING/SHRUB,
RED MAPLE/CENTRAL HARDWOODS:SAPLING,

RED MAPLE/CENTRAL HARDWOODS:POLE,
RED MAPLE/CENTRAL HARDWOODS:MATURE,
RED MAPLE/CENTRAL HARDWOODS:OLD GROWTH,
MIXED CENTRAL HARDWOODS:GRASS/FORB,
MIXED CENTRAL HARDWOODS:SEEDLING/SHRUB,
MIXED CENTRAL HARDWOODS:SAPLING,
MIXED CENTRAL HARDWOODS:POLE,
MIXED CENTRAL HARDWOODS:MATURE,
MIXED CENTRAL HARDWOODS:OLD GROWTH,
BLACK ASH/AMERICAN ELM/RED MAPLE:GRASS/FORB,
BLACK ASH/AMERICAN ELM/RED MAPLE:SEEDLING/SHRUB,
BLACK ASH/AMERICAN ELM/RED MAPLE:SAPLING,
BLACK ASH/AMERICAN ELM/RED MAPLE:POLE,
BLACK ASH/AMERICAN ELM/RED MAPLE:MATURE,
BLACK ASH/AMERICAN ELM/RED MAPLE:OLD GROWTH,
RIVER BIRCH/SYCAMORE:GRASS/FORB,
RIVER BIRCH/SYCAMORE:SEEDLING/SHRUB,
RIVER BIRCH/SYCAMORE:SAPLING,
RIVER BIRCH/SYCAMORE:POLE,
RIVER BIRCH/SYCAMORE:MATURE,
RIVER BIRCH/SYCAMORE:OLD GROWTH,
COTTONWOOD:GRASS/FORB,
COTTONWOOD:SEEDLING/SHRUB,
COTTONWOOD:SAPLING,
COTTONWOOD:POLE,
COTTONWOOD:MATURE,
COTTONWOOD:OLD GROWTH,
WILLOW:GRASS/FORB,
WILLOW:SEEDLING/SHRUB,
WILLOW:SAPLING,
WILLOW:POLE,
WILLOW:MATURE,
WILLOW:OLD GROWTH,
SUGAR MAPLE/BEECH/YELLOW BIRCH:GRASS/FORB,
SUGAR MAPLE/BEECH/YELLOW BIRCH:SEEDLING/SHRUB,
SUGAR MAPLE/BEECH/YELLOW BIRCH:SAPLING,
SUGAR MAPLE/BEECH/YELLOW BIRCH:POLE,
SUGAR MAPLE/BEECH/YELLOW BIRCH:MATURE,
SUGAR MAPLE/BEECH/YELLOW BIRCH:OLD GROWTH,
BLACK CHERRY:GRASS/FORB,
BLACK CHERRY:SEEDLING/SHRUB,
BLACK CHERRY:SAPLING,
BLACK CHERRY:POLE,
BLACK CHERRY:MATURE,
BLACK CHERRY:OLD GROWTH,
RED MAPLE/NORTHERN HARDWOODS:GRASS/FORB,
RED MAPLE/NORTHERN HARDWOODS:SEEDLING/SHRUB,
RED MAPLE/NORTHERN HARDWOODS:SAPLING,
RED MAPLE/NORTHERN HARDWOODS:POLE,
RED MAPLE/NORTHERN HARDWOODS:MATURE,
RED MAPLE/NORTHERN HARDWOODS:OLD GROWTH,
NORTHERN HARDWOOD REVERTING FIELD:GRASS/FORB,
NORTHERN HARDWOOD REVERTING FIELD:SEEDLING/SHRUB,
NORTHERN HARDWOOD REVERTING FIELD:SAPLING,
NORTHERN HARDWOOD REVERTING FIELD:POLE,
NORTHERN HARDWOOD REVERTING FIELD:MATURE,
NORTHERN HARDWOOD REVERTING FIELD:OLD GROWTH,
MIXED NORTHERN HARDWOODS:GRASS/FORB,
MIXED NORTHERN HARDWOODS:SEEDLING/SHRUB,
MIXED NORTHERN HARDWOODS:SAPLING,
MIXED NORTHERN HARDWOODS:POLE,
MIXED NORTHERN HARDWOODS:MATURE,
MIXED NORTHERN HARDWOODS:OLD GROWTH,

ASPEN:GRASS/FORB,
ASPEN:SEEDLING/SHRUB,
ASPEN:SAPLING,
ASPEN:POLE,
ASPEN:MATURE,
ASPEN:OLD GROWTH,
PAPER BIRCH:GRASS/FORB,
PAPER BIRCH:SEEDLING/SHRUB,
PAPER BIRCH:SAPLING,
PAPER BIRCH:POLE,
PAPER BIRCH:MATURE,
PAPER BIRCH:OLD GROWTH,
GRAY BIRCH:GRASS/FORB,
GRAY BIRCH:SEEDLING/SHRUB,
GRAY BIRCH:SAPLING,
GRAY BIRCH:POLE,
GRAY BIRCH:MATURE,
GRAY BIRCH:OLD GROWTH

<FOREST-SIZE>
UNSTOCKED,SEEDLING/SAPLING,POLE,MATURE,OVER-MATURE

<WETLAND-NAME>
ESTUARINE,ESTUARINE:SUBTIDAL,ESTUARINE:SUBTIDAL/OPEN WATER,
PALUSTRINE,PALUSTRINE:OPEN WATER,LACUSTRINE,LACUSTRINE:LITTORAL,
LACUSTRINE:LITTORAL/OPEN WATER,RIVERINE,RIVERINE:TIDAL,
RIVERINE:TIDAL/OPEN WATER,RIVERINE:LOWER,
RIVERINE:LOWER/OPEN WATER,RIVERINE:UPPER,
RIVERINE:UPPER/OPEN WATER,
RIVERINE:UPPER/UNCONSOLIDATED BOTTOM,
RIVERINE:UPPER/UNCONSOLIDATED BOTTOM:COBBLE-GRAVEL,
RIVERINE:UPPER/UNCONSOLIDATED BOTTOM:SAND,
RIVERINE:INTERMITTENT,RIVERINE:INTERMITTENT/OPEN WATER

<WETLAND-CODE>
E....,E1...,E1OWD,P....,PO...,POOWD,L....,L2...,L2OWD,R....,R1...,
R1OWD,R2...,R2OWD,R3...,R3OWD,R3UB...,R3UB1,R3UB2,R4...,R4OWD

<ENVIR-ASSOC>
WATER TEMPERATURE:INDIFFERENT TO TEMPERATURES;
CURRENT VELOCITY:<.5 FPS;CURRENT VELOCITY:.5-.99 FPS;
CURRENT VELOCITY:1.0-1.49 FPS;
GRADIENT:LOW;WATER DEPTH:<1 FT.;WATER DEPTH:1-5 FT.;
SUBSTRATE TYPE:SAND;SUBSTRATE TYPE:PEBBLE;
SUBSTRATE TYPE:GRAVEL;SUBSTRATE TYPE:RUBBLE;
SUBSTRATE (%) COVERED:<20%;TURBIDITY:CLEAR WATER;
TURBIDITY:GENERALLY CLEAR WATER, BUT PERIODIC CLOUDINESS;
TROPHOGENIC ZONES:WELL LIGHTED, UPPER LAYER OF STANDING WATER;
AQUATIC HABITAT ZONATION:OPEN WATER ZONE;
AQUATIC VEGETATION DENSITY:LOW;
INLAND WETLAND:VEGETATED STREAM BANKS;
INLAND WETLAND:BEAVER-DAMMED STREAMS;INLAND WETLAND:FARM PONDS;
INLAND WETLAND:ROCKY BOTTOM STREAM;INLAND WETLAND:STREAM RIFFLES;
INLAND WETLAND:STREAM POOL AREAS;
INLAND WETLAND:MAN-MADE IMPOUNDMENTS;SOIL:CLAY;
SOIL:SAND;SOIL:LOAM;SOIL:GRAVEL;SOIL TEXTURE:COARSE;
SOIL TEXTURE:MEDIUM;
SOIL DRAINAGE:EXCESSIVELY DRAINED (COARSE SOIL, VERY POROUS);
SOIL DRAINAGE:WELL DRAINED (MEDIUM TEXTURE SOILS);
SOIL COMPACTION:EASILY PENETRATED;SLOPE:>25%;
TERRESTRIAL FEATURES:BURROWS;TERRESTRIAL FEATURES:STANDING SNAGS;
TERRESTRIAL FEATURES:CLIFFS/LEDGES;
ECOTONE:WOODLAND/OPEN WATER;ECOTONE:SHRUB-BRUSH FIELD/OPEN WATER;
ECOTONE:CROP FIELD/OPEN WATER;
ECOTONE:HERBACEOUS FIELD/OPEN WATER;
NEST SITES:CAVITIES IN DEAD TREES;NEST SITES:RIPARIAN BURROW;
PERCH SITES:NEAR PERMANENT WATER;

PERCH SITES:OVERHANGING PERMANENT WATER;
PERCH SITES DISTANCE:<100 FT.;HUMAN ASSOCIATION:FARM PONDS
<ENVIR-LIM>
WATER DEPTH:<1 FT.;WATER DEPTH:1-5 FT.;
SUBSTRATE (%) COVERED:<20%;
TURBIDITY:CLEAR WATER;
TURBIDITY:GENERALLY CLEAR WATER, BUT PERIODIC CLOUDINESS;
AQUATIC HABITAT ZONATION:OPEN WATER ZONE;
AQUATIC VEGETATION DENSITY:LOW;INLAND WETLAND:VEGETATED STREAM BANKS;
INLAND WETLAND:MAN-MADE IMPOUNDMENTS;SOIL:CLAY;SOIL:SAND;SOIL:LOAM;
SOIL:GRAVEL;SLOPE:>25%;TERRESTRIAL FEATURE:BURROWS;
NEST SITES:RIPARIAN BURROW;PERCH SITES:OVERHANGING PERMANENT WATER
<ENVIR-LIM-E>
<ENVIR-LIM-LF>
<ENVIR-LIM-LR>
<ENVIR-LIM-P>
<ENVIR-LIM-JF>
WATER DEPTH:<1 FT.;
WATER DEPTH:1-5 FT.;
SUBSTRATE (%) COVERED:<20%;TURBIDITY:CLEAR WATER;
TURBIDITY:GENERALLY CLEAR WATER, BUT PERIODIC CLOUDINESS;
AQUATIC HABITAT ZONATION:OPEN WATER ZONE;
AQUATIC VEGETATION DENSITY:LOW;
INLAND WETLAND:VEGETATED STREAM BANKS;
INLAND WETLAND:MAN-MADE IMPOUNDMENTS;
PERCH SITES:OVERHANGING PERMANENT WATER;
<ENVIR-LIM-JR>
INLAND WETLAND:VEGETATED STREAM BANKS;
PERCH SITES:OVERHANGING PERMANENT WATER.
<ENVIR-LIM-AF>
WATER DEPTH:<1 FT.;WATER DEPTH:1-5 FT.;
SUBSTRATE (%) COVERED:<20%;
TURBIDITY:CLEAR WATER;
TURBIDITY:GENERALLY CLEAR WATER, BUT PERIODIC CLOUDINESS;
AQUATIC HABITAT ZONATION:OPEN WATER ZONE;
AQUATIC VEGETATION DENSITY:LOW;INLAND WETLAND:VEGETATED STREAM BANKS;
INLAND WETLAND:MAN-MADE IMPOUNDMENTS;
SUBSTRATE TYPE:PEBBLE;
SUBSTRATE TYPE:GRAVEL;SUBSTRATE TYPE:RUBBLE;
TERRESTRIAL FEATURES:STANDING SNAGS;
PERCH SITES:OVERHANGING PERMANENT WATER
<ENVIR-LIM-AR>
INLAND WETLAND:VEGETATED STREAM BANKS;
PERCH SITES:OVERHANGING PERMANENT WATER
<ENVIR-LIM-AB>
INLAND WETLAND:VEGETATED STREAM BANKS;SOIL:CLAY;SOIL:SAND;SOIL:LOAM;
SOIL:GRAVEL;SLOPE:>25%;
TERRESTRIAL FEATURES:BURROWS;
NEST SITES:RIPARIAN BURROW;PERCH SITES:OVERHANGING PERMANENT WATER
<FOOD-GEN>
HERBACEOUS FRUIT (BERRIES/CAPSULES/FRUIT/NUTS/GRAIN),
HARDWOOD FRUIT (BERRIES/SEEDS/NUTS/CAPSULES),
INSECTS-ADULT,INSECTS-AQUATIC,CRUSTACEANS,CLAMS,MAMMALS-SMALL,
BIRD NESTLINGS,BIRD ADULTS,FISH FRY,FISH ADULTS,REPTILE JUVENILES,
REPTILE ADULTS,AMPHIBIAN JUVENILES,AMPHIBIAN ADULTS
<FOOD-L>
<FOOD-J>
HERBACEOUS FRUIT (BERRIES/CAPSULES/FRUIT/NUTS/GRAIN),
HARDWOOD FRUIT (BERRIES/SEEDS/NUTS/CAPSULES),INSECTS-ADULTS,
INSECTS-AQUATIC,CRUSTACEANS,CLAMS,MAMMALS-SMALL,BIRD NESTLINGS,
BIRD ADULTS,FISH FRY,FISH ADULTS,REPTILE JUVENILES,REPTILE ADULTS,
AMPHIBIAN JUVENILES,AMPHIBIAN ADULTS
<FOOD-A>

HERBACEOUS FRUIT (BERRIES/CAPSULES/FRUIT/NUTS/GRAIN),
HARDWOOD FRUIT (BERRIES/SEEDS/NUTS/CAPSULES),INSECTS-ADULTS,
INSECTS-AQUATIC,CRUSTACEANS,CLAMS,MAMMALS-SMALL,BIRD NESTLINGS,
BIRD ADULTS,FISH FRY,FISH ADULTS,REPTILE JUVENILES,REPTILE ADULTS,
AMPHIBIAN JUVENILES,AMPHIBIAN ADULTS
<FORAG-SITE>
GROUND SURFACE,STANDING WATER-LITTORAL ZONE,
STANDING WATER-LIMNETIC ZONE,FLOWING WATER-RIFFLES,
FLOWING WATER-POOLS
<BREED-SEASON>
APRIL,MAY,JUNE,JULY
<SPAWN-SITE>
<NEST-SITE>
CAVITY IN DEAD TREE,PRIMARY CAVITY (EXCAVATES ITS OWN),
UNDERGROUND BURROW,DIRT BANK
<NEST-MATRLS>
SAND,GRAVEL,ORGANIC DEBRIS
<TREND-CAUSE>
<MGMT-BENEFIT>
RESTRICTING/REGULATING HUMAN USE OF HABITATS;
RESTRICTING/REGULATING HUMAN DISTURBANCE OF POPULATIONS;
RESTRICT HUMAN DISTURBANCE DURING BREEDING OR OTHER STRESSFUL PERIODS;
CREATING/MAINTAINING SNAGS;
RETAIN OR PRODUCE SPECIAL HABITAT FEATURES AS CAVES, LEDGES, ETC.;
PROVIDING ARTIFICIAL NESTING/SPAWNING SITES;
DEVELOP ARTIFICIAL WATER DEVICES OR CATCHMENTS;
DEVELOPING/MAINTAINING WATER HOLES, PONDS, POTHOLES, ETC.;
STREAM BANK PRESERVATION;
DEVELOPING/MAINTAINING STREAMSIDE/STREAMBANK VEGETATION;
REMOVAL OF STREAMSIDE VEGETATION;CONTROLLING SEDIMENTATION;
CREATING ARTIFICIAL STREAM MEANDERS;CREATING POOLS IN STREAMS;
CREATING RIFFLES IN STREAMS;DEVELOPING/MAINTAINING STREAM STRUCTURES;
MAINTAINING/PROTECTING RIPARIAN HABITAT;
CONTROLLING VEGETATION IN PONDS AND WATERWAYS;
DEVELOPING/MAINTAINING/PROTECTING FRESHWATER WETLANDS;
DEVELOPING/MAINTAINING/PROTECTING BRACKISH WETLANDS;
IMPOUNDMENT OF WATERWAYS (FLOOD CONTROL, RECREATION, ETC.;
DEVELOPMENT OF SHALLOW WATER IMPOUNDMENTS;FARM POND DEVELOPMENT;
CONTROLLING POLLUTION (THERMAL, CHEMICAL, PHYSICAL)
<MGMT-HARM>
STREAM BANK PROTECTION - GABION MATTING OR RIPRAP;
DEVELOPING/MAINTAINING STREAMBANK/STREAMSIDE VEGETATION;
REMOVAL OF STREAMSIDE VEGETATION;SILTATION;SEEDING AQUATIC PLANTS;
PLANTINGS (AQUATIC PLANTS);NUTRIENT AND BACTERIA LOADING OF STREAMS;
DRAINING/EXCAVATING WETLANDS, INCLUDING MARSHES WITH VEGETATION;
DRAINING/EXCAVATING PONDS AND LAKES;DREDGING;DEPOSITION OF FILL;
CHANNELIZATION;CHANNEL DEEPENING;CHANNEL WIDENING;CHANNEL LINING;
CREATION OF CONCRETE CHANNEL;
NAVIGATIONAL IMPROVEMENTS (I.E. DAMS AND LOCKS);
FARM POND REMOVAL;APPLICATION OF HERBICIDES;
APPLICATION OF INSECTICIDES;APPLICATION OF PESTICIDES;
APPLICATION OF FERTILIZERS;INTENSIVE RECREATIONAL DEVELOPMENT;
INDUSTRIAL POLLUTION;SPECIMEN COLLECTION;EGG COLLECTION
<N-TAXONOMY>
THERE ARE 86 SPECIES IN THE KINGFISHER FAMILY (FAMILY ALCEDINIDAE). MEMBERS OF THIS FAMILY ARE FOUND THROUGHOUT MOST OF THE WORLD, BUT ONLY THE BELTED KINGFISHER (CERYLE ALCYON ALCYON) OCCURS IN EASTERN NORTH AMERICA, INCLUDING PENNSYLVANIA *02:315,04:162*. ANOTHER SUBSPECIES, THE WESTERN BELTED KINGFISHER (C. A. CAURINA) OCCURS ALONG THE PACIFIC COAST OF NORTH AMERICA, AND IS SIMILAR IN APPEARANCE BUT GENERALLY LARGER IN SIZE *15:129*.

THE AVAILABLE LITERATURE YIELDED NO INFORMATION REGARDING THE LOCATION OF THE TYPE SPECIMEN. HOWEVER, PETERSON *22:186* PROVIDES

A SUITABLE FIELD DESCRIPTION AND PAINTING OF THE BELTED KINGFISHER.

THE BELTED KINGFISHER IS ALSO REFERRED TO AS THE KINGFISHER OR EASTERN BELTED KINGFISHER *02:313,02:315,03:72,04:162*. SCIENTIFIC SYNONYMS INCLUDE ALCYON ALCYON *03:71* AND STREPTOCERYLE ALCYON ALCYON *02:315*.

<N-SPP-STATUS>

THE BELTED KINGFISHER MAY NOT BE AS COMMON LOCALLY AS IN FORMER TIMES, BUT IT IS IN NO SPECIAL DANGER OF EXTERMINATION *02:313*. THUS, IT IS NOT LISTED ON EITHER FEDERAL OR PENNSYLVANIA LISTS OF ENDANGERED, THREATENED OR SPECIES OF SPECIAL CONCERN; IT IS PROTECTED UNDER THE MIGRATORY BIRD TREATY ACT *13*.

THE BELTED KINGFISHER IS CONSIDERED A NON-CONSUMPTIVE RECREATIONAL SPECIES (FOR BIRD WATCHERS, NATURE PHOTOGRAPHERS, ETC.) ALSO, BECAUSE IT IS SO DEPENDENT UPON AQUATIC ANIMAL LIFE FOR FOOD, IT CAN ALSO BE CONSIDERED AN INDICATOR SPECIES FOR THE QUALITY OF AQUATIC ECOSYSTEMS WITH WHICH IT ASSOCIATES *02:313*.

<N-DISTRIB>

THE BELTED KINGFISHER IS KNOWN TO OCCUR IN MOST PARTS OF NORTH AMERICA AS FAR NORTH AS THE BARREN GROUNDS *02:313,03:72,04:162,05:118 22:186*, AND IT IS GENERALLY FOUND WITHIN ITS RANGE WHEREVER THERE ARE AREAS OF SUITABLE OPEN WATER *08*. THE KINGFISHER BREEDS THROUGHOUT PENNSYLVANIA, AND ALSO OCCURS AS A NON-BREEDING TRANSIENT (SPRING/FALL MIGRANT) ACROSS THE COMMONWEALTH *03:72,06:270,23*. IT OCCURS OCCASIONALLY AS A WINTERING BIRD IN MANY PARTS OF THE STATE, PARTICULARLY THE NW AND SE *22:340*. (NOTE: WINTER OCCURRENCE OF KINGFISHERS BY COUNTY IN THE KEY WORD CHECKLIST ROUGHLY FOLLOWS PETERSON'S WINTER RANGE MAP *22:340, MAP 205*.)

THE KINGFISHER IS CONSIDERED A 'REGULAR SPRING MIGRANT' DURING THE MONTHS OF MARCH AND APRIL, AND A 'REGULAR FALL MIGRANT' IN SEPTEMBER AND OCTOBER *01:5,02:313,03:72*. HOWEVER, IT MAY ARRIVE AS EARLY AS FEBRUARY AND DEPART IN DECEMBER *04:163*, GENERALLY ARRIVING AS SOON AS THE ICE MELTS IN SPRING AND LEAVING WHEN THE WATER FREEZES *02:314,17*.

THE AVAILABLE LITERATURE SHOWS THE KINGFISHER HAS BEEN RECORDED DURING THE BREEDING SEASON FOR ALL PENNSYLVANIA COUNTIES EXCEPT NORTHUMBERLAND AND PERRY COUNTIES *01:5,02:315,06:270,07,23*.; BUT, BECAUSE THESE TWO COUNTIES WOULD HAVE SUITABLE BREEDING HABITAT, AND BECAUSE THE SURROUNDING COUNTIES HAVE 'BREEDING' KINGFISHERS, BOTH NORTHUMBERLAND AND PERRY COUNTIES SHOULD HAVE BREEDING KINGFISHERS AS WELL *06*.

DATA FROM THE BREEDING BIRD SURVEYS (BBS) CONDUCTED FROM 1966-77 SUGGEST THAT KINGFISHERS ARE RELATIVELY LESS ABUNDANT IN PENNSYLVANIA (0.570 MEAN KINGFISHERS PER BREEDING SURVEY ROUTE) AS COMPARED TO THE ENTIRE EASTERN U.S. (0.629 MEAN KINGFISHERS PER BREEDING SURVEY ROUTE *06:9*. IT WAS NOT INDICATED WHETHER THIS DIFFERENCE IS STATISTICALLY SIGNIFICANT.

RELATIVE ABUNDANCE OF KINGFISHERS FOR MOST PENNSYLVANIA COUNTIES WAS OBTAINED FROM BBS DATA. THE FOLLOWING IS A LIST OF THESE COUNTIES, WITH THE VALUES IN PARENTHESES REPRESENTING MEAN NUMBER OF KINGFISHERS PER 500 BBS STOPS *06:270*: ADAMS (1); ARMSTRONG (2); BEAVER (2); BEDFORD (5); BERKS (5); BLAIR (4); BRADFORD (22); BUCKS (6); BUTLER (6); CARBON (1); CENTRE (4); CHESTER (4); CLARION (3); CLINTON (13); CRAWFORD (6); CUMBERLAND (6); DAUPHIN (4); ELK (4); ERIE (6); FAYETTE (4); FOREST (1); FULTON (3); GREENE (20); HUNTINGDON (4); INDIANA (1); JUNIATA (5); LANCASTER (6); LAWRENCE (2); LEBANON (6); LEHIGH (8); LUZERNE (3); LYCOMING (11); MCKEAN (6); MERCER (5); MIFFLIN (3); MONROE (4); MONTGOMERY (1); MONTOUR (7); NORTHAMPTON (4); PIKE (13); POTTER (4); SCHUYLKILL (3); SNYDER (4); SOMERSET (3); SULLIVAN (5); SUSQUEHANNA (6); TIOGA (6); WARREN (5); WASHINGTON (19); WAYNE (8); WESTMORELAND (4); WYOMING (17); YORK (6).

THE MEAN NUMBER OF KINGFISHERS PER 500 BBS STOPS RANGES FROM 1-22. FOR PURPOSES OF INDICATING RELATIVE ABUNDANCE ON THE CHECKLIST,

THE COMPILER ARBITRARILY DECIDED THAT VALUES OF 1-5, 6-12, AND 13-22 WOULD REFLECT LOW, MEDIUM AND HIGH ABUNDANCE, RESPECTIVELY.

<N-HABITAT>

ALL AMERICAN KINGFISHERS, INCLUDING THE BELTED KINGFISHER, GENERALLY LIVE NEAR WATER *02:313*. SINCE THE KINGFISHER UTILIZES BOTH TERRESTRIAL AND AQUATIC HABITATS *06:270*, IT WOULD BE CONSIDERED A RIPARIAN SPECIES. IT USUALLY IS FOUND ASSOCIATED WITH ANY OPEN BODY OF WATER, STILL OR FLOWING, WHERE SMALL FISH ARE ABUNDANT AND AVAILABLE *20:IV-I-24*. AQUATIC HABITATS USED BY KINGFISHERS INCLUDE RIVERS, STREAMS, CREEKS, PONDS, LAKES, FISH HATCHERIES, BAYS, COASTS AND ESTUARIES *03:71,04:162,08,15:111, 22:186*. PREFERRED AQUATIC HABITATS INCLUDE RELATIVELY OPEN LOW-LAND STREAMS AND OTHER BODIES OF WATER FRINGED WITH TREES AND SHRUBBERY *02:315,21:5-74*. THEY TEND TO AVOID SMALL WATERCOURSES FLOWING THROUGH DENSE WOODLAND, AND MOUNTAIN STREAMS IN GENERAL, BUT WILL SOMETIMES ASCEND THESE WHEN THEY HAPPEN TO FURNISH AN ABUNDANT FOOD SUPPLY *02:315*.

REGARDING LAND USE/LAND COVER TYPES, THE BELTED KINGFISHER IS ASSOCIATED WITH AGRICULTURAL LAND (CROPLAND AND PASTURE), FOREST LAND (DECIDUOUS, EVERGREEN, AND MIXED), WATER (STREAMS AND CANALS, LAKES, RESERVOIRS, BAYS AND ESTUARIES), WETLANDS (FORESTED AND NONFORESTED), AND BARREN LAND (GRAVEL PITS), WHILE PREFERRING THE WATER AND WETLAND TYPES *15,16,18,19,25*.

THE KINGFISHER IS NOT DIRECTLY TIED TO ANY PARTICULAR FOREST COVER TYPE OR SIZE CLASS *25*; THUS, IT IS ASSUMED TO BE ASSOCIATED WITH ALL FOREST TYPES FOUND WITHIN PENNSYLVANIA *00*. HOWEVER, IN THE SOUTHEASTERN U.S., OPTIMAL FOREST HABITAT IS ELM-ASH-COTTON-WOOD SAWTIMBER; SUBOPTIMAL FOREST HABITAT IS OAK-GUM-CYPRESS POLE-TIMBER AND SAPLING; AND, MARGINAL FOREST HABITAT IS WHITE PINE-HEMLOCK, POND PINE, SPRUCE PINE, AND OAK-HICKORY POLETIMBER *24:251*. IT HAS ALSO BEEN RECORDED ASSOCIATING WITH RIVER BIRCH-SYCAMORE, SILVER MAPLE-AMERICAN ELM, COTTONWOOD, SUGARBERRY-AMERICAN ELM-GREEN ASH, SYCAMORE-SWEETGUM, AMERICAN ELM, BLACK WILLOW *25*, MATURE PINE, SPRUCE AND MAPLE-BASSWOOD FOREST *29:835*, AND SYCAMORE, SAND BAR WILLOW, MAPLE AND OAK FORESTS *31:354*.

MANY KINDS OF WETLANDS ARE USED BY KINGFISHERS. THEY ARE ASSOCIATED WITH ALL OF THE WETLAND SYSTEMS. MORE SPECIFICALLY, THEY ARE ASSOCIATED WITH THE OPEN WATER WETLANDS OF: SUBTIDAL ESTUARINE *08,15:111*; PALUSTRINE *15,16,18,19,25*; LITTORAL LACUSTRINE *15,16,18,19,25*; LOWER PERENNIAL RIVERINE *15,16,18,19,25*; UPPER PERENNIAL RIVERINE WITH GRAVEL AND SAND BOTTOM *31:354*; AND, TIDAL AND INTERMITTENT RIVERINE *15,16,18,19,25*.

KINGFISHERS TOLERATE A WIDE RANGE OF AIR AND WATER TEMPERATURE AS EVIDENCED BY THEIR WIDESPREAD GEOGRAPHIC DISTRIBUTION. HOWEVER, THEY ARE HARD PRESSED FOR FOOD WHEN STREAMS AND OTHER WATER FREEZES OVER, INTERFERRING WITH AND LIMITING THEIR FISHING *02:313,17*.

NESTING KINGFISHERS STRONGLY PREFER VERTICAL CLAY, SAND, LOAMY, OR GRAVEL BANKS NEAR OPEN WATER *02:315,11:108,25*. SOIL CONSISTENCY IS IMPORTANT IN NEST CONSTRUCTION, AND SANDY-CLAY SOILS ARE PREFERRED AND ROCKY SOILS ARE AVOIDED *16*. LOW BANKS WITH DENSE VEGETATION ARE UNSUITABLE AS NESTING HABITAT *16*. THE AVAILABILITY OF SUITABLE NESTING HABITAT HAS BEEN KNOWN TO LIMIT KINGFISHER POPULATIONS *18,29:835*. ON A FEW OCCASIONS, KINGFISHERS HAVE BEEN OBSERVED NESTING IN HOLES IN DEAD TREES OR STUBS OVER WATER *15:114*. PERCHES (E.G., LEAFLESS BRANCHES OR SNAGS) ARE USUALLY FOUND WITHIN 100 FEET OF NESTS *16*.

FEEDING ADULT AND JUVENILE KINGFISHERS GENERALLY REQUIRE OPEN WATER (THEY WILL TOLERATE SOME SPARSE AQUATIC VEGETATION), WITH LOW TURBIDITY, AND AN ABUNDANT AND AVAILABLE SUPPLY OF FISH FOR FOOD *02:315,19,20:IV-I-24,25*. MOST FISH ARE CAPTURED IN WATER LESS THAN TWO FEET DEEP *18,19,25*. FISHING SUCCESS IS USUALLY BEST IN SHALLOW STRETCHES OF WATER WHERE THE CURRENT IS MODERATE TO SLOW *19*, AND SHALLOW RIFFLES ARE PREFERRED *31:356*. THE PRESENCE OF SUITABLE

PERCHES OVER FORAGING AREAS IS ALSO IMPORTANT *20:IV-I-26*.

<N-FOOD>

THE KINGFISHER IS CONSIDERED TO BE AN AQUATIC POUNCING CARNIVORE *24:70*. THE PREDOMINANT TYPE OF FOOD EATEN IS SMALL FISH *02:314, 03:72,04:163,05:118,09,15:118*, WITH ONE STUDY INDICATING THAT SMALL FISH COMPRISE BETWEEN 50-88% OF THE KINGFISHER'S DIET *16*. MOST FISH CAPTURED AND EATEN ARE FROM ONE TO SEVEN INCHES IN LENGTH, AND USUALLY LESS THAN THREE INCHES LONG *19*. IN MOST INSTANCES, THE SPECIES OF FISH CAUGHT ARE OF LITTLE ECONOMIC IMPORTANCE, INCLUDING MINNOWS OF VARIOUS KINDS, CHUBS AND SUCKERS; HOWEVER, SOMETIMES KINGFISHERS BECOME PESTS WHEN THEY FORAGE AT PONDS OR HATCHERIES WHERE TROUT AND OTHER VALUABLE SPECIES OF FISH ARE ARTIFICIALLY REARED *02:314,09*. EVIDENCE SUGGESTS THAT THE FISH WHICH ARE THE MOST ABUNDANT, MOST AVAILABLE (IN CLEAR WATER LESS THAN TWO FEET DEEP), AND OF A SUITABLE SIZE WILL BE THOSE CAPTURED MOST FREQUENTLY *31:355*

ALTHOUGH KINGFISHERS FEED PREDOMINANTLY ON FISH, THEY HAVE ALSO BEEN OBSERVED FEEDING ON FROGS *02:314,05:118,15:118*, TOADS *15:120*, TADPOLES *15:118,28:140*, SALAMANDERS *02:314,15:120*, CRABS *05:118, 15:120*, CRAYFISH *02:314,05:118,15:118,19*, BIVALVE MOLLUSCS *04:163, 05:118,15:120*, LIZARDS *05:118,09,15:118,19*, SMALL SNAKES *15:120, 19*, TURTLES *15:118*, INSECTS *02:314,03:72,04:163,09,15:118,19*, WILD FRUITS *02:314,15:120-2*, YOUNG BIRDS *15:120*, MICE *04:163, 15:120* AND SQUID *15:121*.

GEOGRAPHIC VARIATION IN KINGFISHER DIET PROBABLY REFLECTS THE RELATIVE ABUNDANCE, AVAILABILITY AND SUITABILITY OF PREY IN ANY LOCATION. APPARENTLY, IN THE ARID SOUTHWESTERN U.S., TERRESTRIAL VERTEBRATES (AMPHIBIANS, REPTILES, AND SOME BIRDS AND MAMMALS) AND TERRESTRIAL INVERTEBRATES (MOSTLY INSECTS) ARE FAVORED *15:120*. ALONG THE MISSISSIPPI RIVER AND ITS TRIBUTARIES IN NORTHWESTERN ILLINOIS, GIZZARD SHAD (DOROSOMA CEPEDIANUM) ARE PREFERRED *30:310*. AND IN SOUTHWESTERN OHIO, ONE STUDY REVEALED THAT KINGFISHER DIETS INCLUDED 37.6% STONEROLLERS (CAMPOSTOMA ANOMALUM), 26.1% UNIDENTIFIED CYPRINIDS, 12.7% "MINNOWS", 10.2% NON-MINNOW FISH, AND 13.5% CRAYFISH *31:355*.

ADULTS FEED YOUNG NESTLINGS (LESS THAN FIVE DAYS OLD) PARTLY DIGESTED, REGURGITATED FISH; THEY FEED OLDER NESTLINGS WHOLE, FRESH FISH *15:116-7,16,36:40*. ONE STUDY REPORTED THAT FLEDGED JUVENILES FIRST CAPTURED INSECTS (PREDOMINANTLY MAYFLIES), THEN CRAYFISH AND THEN FISH (DURING THE SECOND WEEK FOLLOWING FLEDGING) *19*.

NO INFORMATION WAS FOUND TO ASCERTAIN SEASONAL VARIATION IN KINGFISHER DIETS.

<N-MGMT>

THE BELTED KINGFISHER SHOWS "SOME POTENTIAL" FOR MANAGEMENT *06:270*. GENERALLY, MANAGEMENT PRACTICES SHOULD BE AIMED AT ENSURING AN ADEQUATE QUANTITY, QUALITY, AND DIVERSITY OF AQUATIC HABITATS AS FORAGING AREAS, AS WELL AS THE MANAGEMENT OF NESTING HABITAT *02:313,14,25*.

BENEFICIAL MANAGEMENT PRACTICES FOR TERRESTRIAL PORTIONS OF KINGFISHER HABITAT WOULD INCLUDE: SEASONAL RESTRICTION ON HUMAN USE OF KINGFISHER HABITATS; MAINTAIN RIPARIAN HABITATS; MAINTAIN UNIQUE OR SPECIAL HABITAT FEATURES SUCH AS SNAGS, WETLANDS, ETC.; MAINTAIN STREAM BANKS; AND, MAINTAIN APPROPRIATE STREAMSIDE VEGETATION *25*. (WITH REGARD TO STREAMSIDE VEGETATION, THE REMOVAL OF POTENTIAL PERCHES WOULD BE DETRIMENTAL; HOWEVER, THE REMOVAL OF VEGETATION HIDING AN OTHERWISE EXPOSED BANK WOULD BENEFIT NESTING POTENTIAL.) ALSO, SINCE KINGFISHERS ARE LARGELY DEPENDENT UPON STEEP BANKS ALONG OR NEAR (WITHIN ONE-HALF MILE) WATER *14*, THE CREATION OR RETENTION OF SUCH BANKS WOULD BE BENEFICIAL FOR EXPANDING OR INCREASING LOCAL POPULATIONS *29:835*. IF NOT OVER WATER, BANKS SHOULD BE AT LEAST TWELVE FEET HIGH TO PROTECT AGAINST PREDATION *14*.

BENEFICIAL MANAGEMENT PRACTICES FOR WATER WOULD INCLUDE: CONTROL POLLUTION; EXCLUDE LIVESTOCK FROM BANKS AND WATER; DEVELOP AND MAINTAIN LAKES, PONDS AND WETLANDS; CONTROL SEDIMENTATION; AND STABI-

LIZE STREAM BANK *25*.

ADVERSE MANAGEMENT PRACTICES WOULD INCLUDE: APPLICATION OF INSECTICIDES AND HERBICIDES (PESTICIDES IN GENERAL); APPLICATION OF ORGANIC AND INORGANIC FERTILIZERS; DREDGING, FILLING OR DRAINING WETLANDS; NAVIGATIONAL IMPROVEMENTS (CHANNELIZATION, DAMS AND LOCKS); AND, STREAM CHANNELIZATION *25*. ALSO, THE GRADING OF BANKS AT UNUSED GRAVEL PITS AND NEAR STREAMS HAS DESTROYED MANY KINGFISHER NEST SITES *14*.

KINGFISHERS WILL READILY DESERT THE NEST, PARTICULARLY DURING EGG LAYING AND EARLY STAGES OF INCUBATION *36:28*; THUS, MANAGEMENT PRACTICES SHOULD CONSIDER THIS IN RELATION TO HUMAN ACTIVITY NEAR KINGFISHER NESTING AREAS.

<HEP-DATA>

TWO DRAFT-HEP MODELS WERE FOUND:

1. U.S. FISH AND WILDLIFE SERVICE. 1978. BELTED KINGFISHER (DESCRIPTION AND MODEL FOR RIPARIAN ZONE). PP. 24-28. IN: TERRESTRIAL HABITAT EVALUATION CRITERIA HANDBOOK FOR ECOREGION 2213 (MIDWEST). USDI, FWS, DIVISION OF ECOLOGICAL SERVICES, WASHINGTON, D.C. *20*
   HSI CRITERIA INCLUDE WATER TURBIDITY, PERCH SITE AVAILABILITY, WATER DEPTH, AND STREAM CHANNEL VEGETATION OVERSTORY.

2. U.S. FISH AND WILDLIFE SERVICE. 1978. BELTED KINGFISHER (DESCRIPTION AND MODEL FOR BOTTOMLAND HARDWOODS). PP. 6-161 TO 6-163. IN: TERRESTRIAL HABITAT EVALUATION CRITERIA HANDBOOK FOR ECOREGION 2211 (APPALACHIANS). USDI, FWS, DIVISION OF ECOLOGICAL SERVICES, WASHINGTON, D.C. *21*
   HSI CRITERIA INCLUDE WATER TURBIDITY, PERCH SITE AVAILABILITY, WATER DEPTH, STREAM CHANNEL VEGETATION OVERSTORY, DISTANCE FROM WATER TO NEST EMBANKMENT, AND NEST EMBANKMENT SOIL TYPE.

<ANIMAL-PLANT>

PREDATION: PREDATION IS USUALLY NOT A SERIOUS FACTOR EXCEPT WHEN YOUNG LEAVE THE NEST CAVITY *16*. HOWEVER, KINGFISHERS HAVE BEEN RECORDED AS BEING PREYED UPON BY MAN (HOMO SAPIENS) *16*, MINK (MUSTELA VISON) *16,15:124-5*, SKUNKS (MEPHITIS MEPHITIS) *16,15:124,5*, 'SNAKES' (SUBORDER SERPENTES) *16,15:124-5*, INCLUDING GREAT RAT SNAKE (ELAPHE OBSOLETA SPILOIDES) *32:22*, 'LARGE FISH' *15:124-5*, COOPER'S HAWKS (ACCIPITER COOPERII) *15:124-5,33:25*, SHARP-SHINNED HAWKS *15:124-5*, RED-TAILED HAWKS (BUTEO JAMAICENSIS *15:124-5*, AND THEY HAVE ALSO BEEN PURSUED BY GOSHAWKS (ACCIPITER GENTILIS) *26:599*.

PARASITISM: LITTLE INFORMATION WAS AVAILABLE ON ECTO- OR ENDOPARASITES OF KINGFISHERS, ALTHOUGH ONE SOURCE INDICATED PARASITES INCLUDE 'ROUNDWORMS AND RINGWORMS' *15:124-5*.

COMMENSULISM: COMMENSULISTIC FEEDING OF KINGFISHERS WITH HOODED MERGANSERS (LOPHODYTES CUCULLATUS), SNOWY EGRET (LEUCOPHOYX THULA) AND LOUISIANA HERON (HYDRANASSA TRICOLOR) HAS BEEN OBSERVED. THE KINGFISHER CAPTURED FISH STIRRED UP BY THE FEEDING MERGANSERS AND HERONS *27:199*.

NESTING SYMBIOSIS: IN NEW YORK, ROUGH-WINGED SWALLOWS (STELGIDOPTERYX RUFICOLLUSIS) USED AN ACTIVE KINGFISHER NEST ENTRANCE, ALTHOUGH THE SWALLOW NEST CAVITY WAS PROBABLY SEPARATE FROM THE KINGFISHER NEST CAVITY *15:113-4*. KINGFISHER BURROWS FROM PREVIOUS YEARS (OR INCOMPLETELY EXCAVATED BURROWS) IN MINNESOTA HAVE BEEN USED BY ROUGH-WINGED SWALLOWS AND BANK SWALLOWS (RIPARIA RIPARIA) *36:13*. ALSO, SOURCES INDICATE THAT YELLOW-SHAFTED FLICKERS (COLAPTES SURATUS) OCCASIONALLY SELECT BURROWS OF KINGFISHERS AS NEST SITES, ESPECIALLY IN PRAIRIE AND NORTHERN REGIONS *35:233-4*.

SPRING MIGRATION ARRIVAL DATES IN PENNSYLVANIA GENERALLY COINCIDE WITH THOSE FOR COMMON FLICKER (COLAPTES AURATUS), MOURNING DOVE (ZENAIDA MACROURA) AND COWBIRD (MOLOTHRUS ATER) *02:313*.

<DESCRIPTION>

KINGFISHERS ARE STOCKY BIRDS WITH BIG HEADS AND LARGE HERON-LIKE

BILLS. THEIR FEET ARE SMALL, WEAK AND UNFIT FOR WALKING; THE MIDDLE AND OUTER TOES ARE JOINED AT THE BASE FOR HALF THEIR LENGTH *02:313*.

THE BELTED KINGFISHER IS ABOUT 13 INCHES IN TOTAL LENGTH, AND HAS A WINGSPREAD OF ABOUT 22 INCHES. IT HAS A LARGE CRESTED HEAD, AND A STRAIGHT BLACK BILL WHICH IS STRONG, SHARP AND ABOUT TWO INCHES LONG *04:162*. IN ONE STUDY, THE BODY WEIGHTS OF 14 ADULT BIRDS RANGED FROM 140 TO 169 GRAMS WITH AN AVERAGE OF 147.1 GRAMS *36:07*.

THE PLUMAGE OF THE MALE AND FEMALE ARE QUITE SIMILAR (WITH ONE EXCEPTION NOTED BELOW). THE MALE'S COLORATION IS: UPPERPARTS BLUISH-SLATE; WINGS AND TAIL BLACKISH WITH WHITE BARS AND SPOTS; TOP AND SIDE OF HEAD BLUISH-SLATE (WITH A WHITE SPOT ON THE LOWER EYELID AND IN FRONT OF EYE); THROAT AND MOST OF NECK WHITE; REMAINING UNDERPARTS LARGELY WHITE WITH A BROAD COLLAR OF WHITE. ADDITIONALLY, THE FEMALE HAS A BAND OF REDDISH-BROWN ACROSS BREAST (BELOW COLLAR BAND), WITH THE REDDISH-BROWN SPREADING DOWN AND OUT OVER HER SIDES *02:313, 04:162,22:186*. IN YOUNG KINGFISHERS THE BREAST MARKINGS ARE SUFFUSED WITH RUFOUS AND BROWNISH TINTS *02:313*.

<ORIGIN>

THE BELTED KINGFISHER IS NATIVE TO PENNSYLVANIA *02:313,06:270*.

<BEHAVIOR>

THE BELTED KINGFISHER BELONGS TO THE GUILD OF BIRDS CHARACTERIZED AS BURROW NESTING, AQUATIC POUNCING CARNIVORES *24:70*. KINGFISHERS ARE SOLITARY *02:314,10*, EXCEPT DURING THE BREEDING SEASON WHEN THEY OCCUR IN PAIRS *02:314*. ALTHOUGH THE KINGFISHER IS PRIMARILY A DIURNAL BIRD *18*, SOME EVIDENCE SUGGESTS THAT IT MAY SHOW LIMITED NOCTURNAL AND/OR CREPUSCULAR ACTIVITY *04:162,16*. GENERALLY, THE KINGFISHER ROOSTS AT NIGHT 20 TO 25 FEET ABOVE GROUND ON THE SMALL SLENDER TWIGS AT THE ENDS OF BRANCHES OF TREES THAT ARE 100 TO 2000 FEET FROM WATER *18*. DURING THE BREEDING SEASON, THE MALE MAY ROOST IN A BURROW HE EXCAVATES NEAR THE NEST BURROW *11:108*. IN MICHIGAN, THE DAILY FEEDING ACTIVITY OF ADULTS CARING FOR NESTLINGS PEAKED IN MORNING, AFTERNOON, AND EARLY EVENING *19*; AND, IN MINNESOTA, SIMILAR ACTIVITY PEAKED IN EARLY MORNING *16*.

IN THE SOUTHEASTERN U.S., BREEDING DENSITIES OF KINGFISHERS AVERAGE 0.2 BREEDING PAIRS PER 40 HECTARE (S.E. = 0.06), AND WINTER DENSITIES AVERAGE 1.6 INDIVIDUALS PER 40 HECTARE (S.E. = 0.39) *24:212*.

BELTED KINGFISHERS ARE VERY TERRITORIAL *02:315,15:123*, BEING OVERTLY AGGRESSIVE BIRDS THAT DEFEND WELL-DEFENDED TERRITORIES *31:353*. DURING THE BREEDING SEASON BOTH MALE AND FEMALE JOINTLY DEFEND THEIR NESTING TERRITORY, AND OUTSIDE OF THE BREEDING SEASON INDIVIDUAL KINGFISHERS DEFEND FORAGING TERRITORIES *31:353*. BECAUSE MOST STUDIES OF KINGFISHER TERRITORIALITY HAVE BEEN UNDERTAKEN WITH BIRDS NESTING ALONG STREAMS, TERRITORY SIZE IS GENERALLY GIVEN IN LINEAR DIMENSIONS. THE BEST STUDY OF KINGFISHER TERRITORIALITY AVAILABLE (15 TERRITORIES STUDIED) REPORTS THAT TERRITORY SIZE ALONG A STREAM RANGED FROM 230 TO 560 METERS, WITH AN AVERAGE OF ABOUT 400 METERS *31:357*. (NOTE: AREAL TERRITORY SIZE HAS BEEN CALCULATED ON A CIRCULAR BASIS, USING A DIAMETER OF 400 METERS. THIS YIELDS AN AVERAGE TERRITORY SIZE OF ABOUT 31 ACRES.) HOME RANGES, AS EXPECTED, ARE MUCH LARGER, AS ADULTS MAY TRAVEL UP TO FIVE MILES FROM THE NEST TO A FORAGING AREA *19*, AND DAILY FORAGING FLIGHTS OF TWO MILES FROM THE NEST SITE ARE NOT UNUSUAL *16*. (NOTE: AREAL HOME RANGE SIZE HAS BEEN CALCULATED ON A CIRCULAR BASIS, USING A DIAMETER OF ONE MILE. THIS YIELDS A HOME RANGE SIZE OF APPROXIMATELY 500 ACRES.)

KINGFISHER FORAGING STRATEGY INVARIABLY INVOLVES PLUNGING INTO THE WATER AFTER AQUATIC PREY, OR POUNCING ON TERRESTRIAL PREY, CAPTURING THE PREY IN THEIR BILL. PREY MAY BE PURSUED DIRECTLY FROM A CONVENIENT PERCH (USUALLY OVER THE WATER), FROM A HOVER (USUALLY TEN TO TWENTY-FIVE FEET OVER WATER), OR USING A COMBINATION OF THESE TWO STRATEGIES (FROM PERCH TO HOVER TO DIVE) *02:314*. MOST AQUATIC PREY IS CAPTURED IN LESS THAN TWO FEET OF WATER *21:5-74*. ALTHOUGH NO

SPECIFIC DATA ON FISHING SUCCESS WAS FOUND IN THE LITERATURE, KINGFISHERS ARE REPORTED TO BE 'PECULIARLY SUCCESSFUL' IN THEIR FISHING EFFORTS *02:314*. ONE SOURCE REPORTS THAT KINGFISHERS HAVE BEEN OBSERVED CAPTURING FISH STIRRED UP BY FEEDING MERGANSERS AND HERONS *27:199* (SEE ANIMAL AND PLANT ASSOCIATIONS).

BOTH ADULTS PARTICIPATE IN THE FEEDING OF THE NESTLINGS, BUT THE MALE APPARENTLY TAKES ON A MAJORITY OF THIS RESPONSIBILITY *36:41*. AFTER THE YOUNG FLEDGE, THE FAMILY REMAINS TOGETHER FOR ABOUT 10 TO 15 DAYS. YOUNG KINGFISHERS USUALLY FEED WITHIN ONE-QUARTER TO ONE-HALF MILE FROM THE NEST AT FIRST, THEN MOVE GREATER DISTANCES BY LATE AUGUST (APPROXIMATELY SIX WEEKS AFTER FLEDGING) *19*.

OTHER THAN BREEDING AND MIGRATION, NO INFORMATION WAS AVAILABLE ON SEASONAL PERIODICITY OF BEHAVIOR. PENNSYLVANIA KINGFISHERS ARE 'REGULAR MIGRANTS' IN MARCH-APRIL AND IN SEPTEMBER-OCTOBER *03:72*, BUT THEY SOMETIMES REMAIN UNTIL LATE NOVEMBER OR DECEMBER, WITH FAILURE OF FOOD SUPPLY (FROZEN WATER) RATHER THAN COLD WEATHER BEING RESPONSIBLE FOR SOUTHWARD MOVEMENT *02:313*. THEY WINTER PRINCIPALLY IN THE SOUTHERN U.S. AND MIDDLE AMERICA *03:72*, BUT AS FAR SOUTH AS PANAMA *22:186* AND NORTHWARD TO THE MARITIME PROVINCES *22:MAP 205*. IN SPRING, THE MALES ARRIVE ABOUT ONE MONTH BEFORE FEMALES TO SELECT A NEST SITE *31:358*. PENNSYLVANIA RECORDS FOR FEBRUARY AND EARLY MARCH PROBABLY REFER TO WINTERING BIRDS. IT IS UNKNOWN WHETHER THESE FEW WINTERING KINGFISHERS ARE BIRDS THAT HAVE BRED HERE OR BIRDS THAT HAVE ARRIVED FROM FURTHER NORTH *02:313*.

INTRASPECIFIC AGGRESSION IS GENERALLY ATTRIBUTED TO TERRITORIALITY SINCE KINGFISHERS ARE KNOWN TO BE VERY TERRITORIAL TOWARDS CONSPECIFICS *02:315*. INTERSPECIFIC INTERACTIONS REPORTED INCLUDE AGGRESSION TOWARDS COOPER'S HAWKS AND GOSHAWKS (INTERPRETED AS MOBBING BEHAVIOR) *26:598-9*, AND ESCAPE FROM PURSUING RAPTORS BY DIVING INTO WATER *15:174,26:598-9,33:25* AND TAKING REFUGE IN THICK BRUSH PILES *33:25*.

<REPRODUCTION>

SINCE KINGFISHERS ARE OBSERVED AS SOLITARY BIRDS, EXCEPT DURING BREEDING SEASON WHEN THEY OCCUR IN PAIRS *02:314*, IT IS REASONABLE TO ASSUME THAT THEY ARE MONOGAMOUS AND FORM A PAIR BOND ONLY DURING THE BREEDING SEASON. LITTLE IS KNOWN OF THE COURTSHIP BEHAVIOR OF THE BELTED KINGFISHER . IN THE BEST STUDY OF REPRODUCTIVE BEHAVIOR AVAILABLE, NO ELABORATE PRE-COPULATORY DISPLAYS WERE EVER DOCUMENTED. AT THE TIME OF COPULATION, THE MALE LANDS ON THE FEMALE'S PERCH, PAUSES BRIEFLY AND THEN MOUNTS HER. COPULATION LASTS FROM 7 TO 12 SECONDS (SEVEN OBSERVATIONS). AFTER COPULATION, THE MALE (FOLLOWED BY THE FEMALE) LEAVES THE PERCH AND BOTH FLY OVER A BODY OF WATER. DURING THIS POST-COPULATORY FLIGHT, THE MALE OCCASIONALLY SOARS AND DIPS CLOSE TO THE WATER AS THE FEMALE FOLLOWS. THEN THE FEMALE RETURNS TO A PERCH ALONG THE SHORE, AND THE MALE CONTINUES ON AN ASCENDING FLIGHT (REACHING AN ALTITUDE OF 200-300 FEET), PAUSES BRIEFLY AND PROCEEDS TO EXECUTE A DIVE, OFTEN SOMERSAULTING IN THE DESCENT. JUST BEFORE REACHING THE WATER, THE MALE PULLS OUT OF THE DIVE AND INTO AN ASCENDING GLIDE IN WHICH THE WINGS ARE FULLY EXTENDED, READILY EXPOSING THE WHITE PATCHES ON HIS WINGS. AT THIS POINT, THE FEMALE SOMETIMES FOLLOWS THE MALE AND THE PAIR AGAIN CIRCLES THE WATER *36:9*.

NESTS ARE GENERALLY EXCAVATED IN VERTICAL BANKS *02:313,03:72, 04:162,11:108*, ALTHOUGH SOME KINGFISHER NESTS HAVE BEEN FOUND IN HOLES IN DEAD TREES OR STUBS OVER WATER (FLORIDA, WEST VIRGINIA, AND LOUISIANA) *03:72,15:114*. PREFERABLY, NESTS ARE DUG IN STREAM OR RIVER BANKS *04:162,11:108*, ALTHOUGH IF SITES NEAR WATER ARE NOT AVAILABLE, KINGFISHERS HAVE BEEN KNOWN TO NEST AT LEAST ONE-HALF MILE FROM WATER *14*. OTHER BANKS USED FOR NEST SITES HAVE BEEN ASSOCIATED WITH SAND/GRAVEL PITS OR QUARRIES *02:315,04:162,11:108,29:835*, ROAD OR RAILROAD CUTS *02:315,04:162,11:108,29:835*, SANITARY LAND FILLS *29:835*, SAWDUST PILES *32:22* AND TERMITE NESTS *03:72*. BOTH SEXES TAKE TURNS EXCAVATING THE BURROW, AND THE MALE REPORTEDLY DOES

A MAJORITY OF THE WORK *36:16*. EXCAVATION TIME DEPENDS UPON THE NATURE OF THE SOIL, BUT IT USUALLY REQUIRES LESS THAN TWO TO THREE WEEKS *11:108*. IN MINNESOTA, THE TIME REQUIRED FOR THE COMPLETION OF NESTS WAS FOUR TO SEVEN DAYS *36:17*. THE NEST ENTRANCE IS GENERALLY ONE TO THREE FEET FROM THE TOP OF THE BANK (RARELY IF EVER MORE THAN FOUR FEET) *02:315,11:108*. THE DIMENSIONS OF THE NEST ENTRANCE ARE THREE AND ONE-HALF TO FOUR INCHES WIDE AND THREE TO THREE AND ONE-HALF INCHES HIGH *11:108*. OCCUPIED NESTS CAN BE RECOGNIZED BY THE ENTRANCE SHOWING TWO FURROWS SEPARATED BY A RIDGE, FORMED BY THE BIRD'S FEET AS IT ENTERS THE BURROW *15:112*. THE BURROW EXTENDS INTO THE BANK ABOUT THREE TO SIX FEET (RARELY TEN TO FIFTEEN FEET), AND SLOPES SLIGHTLY UPWARD *11:108*. OCCASIONALLY, THE BURROWS ARE STRAIGHT, BUT USUALLY THEY ARE DIRECTED TO THE RIGHT OR LEFT OF THE ENTRANCE *02:315,04:162*. THE BURROW TERMINATES IN THE NESTING CAVITY PROPER, WHICH IS A CIRCULAR DOME-SHAPED CAVITY *02:315,04:162*, MEASURING TEN TO TWELVE INCHES IN DIAMETER AND SIX TO SEVEN INCHES HIGH *11:108*. A PAIR MAY RETURN TO THE SAME BANK, AND OFTEN USE THE SAME BURROW YEAR AFTER YEAR IF UNDISTURBED. EGGS LAID IN FRESHLY EXCAVATED BURROWS ARE LAID ON BARE GROUND. BUT, IN SUCCEEDING YEARS EGGS ARE LAID ON FISH SCALES WHICH ACCUMULATE FROM THE REGURGITATION OF UNDIGESTED PORTIONS OF THE DIET *02:315,04:163,11:108*.

A SINGLE BROOD OF YOUNG IS RAISED PER REPRODUCTIVE SEASON *11:106*, AND IF THE EGGS ARE REMOVED FROM THE NEST, THE FEMALE MAY LAY ANOTHER CLUTCH *15:144*. THE NUMBER OF EGGS PER CLUTCH RANGES FROM FIVE TO EIGHT, BUT COMMONLY THERE ARE SIX OR SEVEN EGGS PER CLUTCH *02:315,04:162,11:108*. THEY HAVE BEEN DESCRIBED AS SHORT-OVAL TO ELLIPTICAL WITH A SMOOTH, RATHER GLOSSY WHITE SHELL. THE AVERAGE DIMENSIONS OF KINGFISHER EGGS ARE 1.05 BY 1.34 INCHES *02:315,11:108*. IN PENNSYLVANIA, EGG LAYING DATES RANGE FROM VERY LATE APRIL THROUGH LATE MAY *02:315*. INCUBATION IS BY BOTH SEXES (BUT MOSTLY BY THE FEMALE) AND TAKES 22 TO 24 DAYS *11:108,36:25*. KINGFISHER EGGS USUALLY HATCH SYNCHRONOUSLY WITHIN A 12-18 HOUR PERIOD, INDICATING THAT INCUBATION BEGINS WHEN THE LAST EGG IS LAID *36:25*. YOUNG ARE ALTRICIAL AND CARED FOR BY BOTH PARENTS *02:315*. THEY REMAIN IN THE NEST UNTIL READY TO FLY AT FOUR WEEKS OF AGE *15:115*. AFTER THE YOUNG HAVE FLEDGED, THE FAMILY REMAINS TOGETHER FOR ABOUT TEN TO FIFTEEN DAYS *19*.

A STUDY OF KINGFISHER EGGSHELLS IN ONTARIO REVEALED A STATISTICALLY SIGNIFICANT DIFFERENCE IN SHELL THICKNESS AND SHELL STRENGTH BETWEEN SAMPLES OF EGGSHELLS FROM PRE- AND POST-DDT ERAS *34:358*. HOWEVER, IT IS NOT KNOWN WHETHER OR NOT THIS CHANGE IN EGGSHELL QUALITY WAS SUFFICIENT TO AFFECT REPRODUCTIVE SUCCESS.

NO INFORMATION WAS FOUND ON THE AGE OF SEXUAL MATURITY, MINIMUM AND MAXIMUM BREEDING AGES OR SEX RATIOS OF THE CLUTCH. HOWEVER, BASED UPON THE MINIMUM BREEDING AGES OF SIMILAR SIZED BIRDS, ONE COULD REASONABLY ASSUME THAT KINGFISHERS WOULD BREED AT ONE YEAR OF AGE *00*.

<POP-DYNAMICS>

ACCORDING TO DATA FROM 1966-77 BREEDING BIRD SURVEYS (BBS), THE KINGFISHER IS RELATIVELY LESS ABUNDANT IN PENNSYLVANIA (0.570 KINGFISHERS PER BBS ROUTE) AS COMPARED TO EASTERN NORTH AMERICA IN GENERAL (0.629 KINGFISHERS PER BBS ROUTE) *06:9*; HOWEVER, IT WAS NOT INDICATED IF THIS DIFFERENCE WAS STATISTICALLY SIGNIFICANT. ALSO, USING THE 1966-77 BBS DATA, IT HAS BEEN CONCLUDED THAT THE PENNSYLVANIA KINGFISHER POPULATION WAS STABLE DURING THIS PERIOD, BUT THE POPULATION IN EASTERN NORTH AMERICA SHOWED A SIGNIFICANT (P LESS THAN 0.05) INCREASE *06:150*. NO POSSIBLE REASON FOR THIS INCREASE WAS INDICATED. ONE SOURCE (FROM 1978) CONTRADICTS THE ABOVE BY STATING THAT POPULATIONS (GEOGRAPHIC REGION UNKNOWN) ARE DECEASING DUE TO THE DESTRUCTION OF NESTING HABITAT WITH THE GRADING OF BANKS AT UNUSED GRAVEL PITS AND NEAR STREAMS *14*.

ALTHOUGH OPTIMUM POPULATION DENSITIES COULD NOT BE FOUND IN THE LITERATURE, ONE STUDY ESTIMATES BREEDING DENSITIES FOR THE SOUTHEAS-

TERN U.S. TO BE 0.2 PAIRS PER 40 HECTARES (S.E. = 0.06) AND WINTER DENSITIES TO BE 1.6 INDIVIDUALS PER 40 HECTARES (S.E. = 0.39) *24:212*. NO INFORMATION COULD BE FOUND REGARDING SEX RATIOS, TURNOVER RATES, RATES OF INCREASE, SURVIVAL RATES, OR ANNUAL MORTALITY RATES.

<LIM-FACTORS>

GENERALLY, THE TWO MOST IMPORTANT FACTORS LIMITING KINGFISHER POPULATIONS ARE (1) THE ABUNDANCE AND AVAILABILITY OF FOOD AND (2) THE AVAILABILITY OF SUITABLE NESTING SITES.

ABUNDANCE AND DIVERSITY OF FOOD IS REDUCED BY THE POLLUTION OF STREAMS AND THE RESULTING DECLINE IN AQUATIC LIFE. A STREAM RICH IN AQUATIC LIFE WILL SUPPORT A GREATER NUMBER OF KINGFISHER PAIRS THAN ONE WHICH IS POOR IN SUCH LIFE *02:315*. AVAILABILITY OF FOOD IN COLD WEATHER IS OFTEN DETERMINED BY ICE COVERING BODIES OF WATER, AND THIS WILL LIMIT WINTER POPULATIONS *02:313,17*. OTHER FACTORS WHICH LIMIT KINGFISHER POPULATIONS BY REDUCING THE SUITABILITY OF RIVERS, STREAMS, PONDS, ETC. FOR FORAGING ARE HIGH WATER TURBIDITY *19,20:IV-I-24*, WATER DEPTH MORE THAN TWO FEET, DENSE VEGETATION OVERHANGING A STREAM, AND A PAUCITY OF FORAGING PERCHES OVER THE WATER *20:IV-I-24*.

THE AVAILABILITY OF SUITABLE NESTING HABITAT IS IMPORTANT AND KNOWN TO LIMIT KINGFISHER POPULATIONS *02:315,16,18*. SOIL CONSISTENCY IS IMPORTANT FOR NEST TUNNEL EXCAVATION, WITH SANDY-CLAY SOILS BEING MOST SUITABLE AND ROCKY SOILS NOT USED *16*. ALSO, LOW BANKS WITH DENSE VEGETATION ARE UNSUITABLE *16*.

<R-TAXONOMY>
02,03,04,15,22

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02,13

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APPENDIX D

Updated Species Profile

Loon, Red-throated

(*Gavia stellata*)

<SPP-CODE> 0400002 <CATEGORY> BIRD <COM-NAME> LOON, RED-THROATED
<SCI-NAME> GAVIA STELLATA <TAX-PHYLUM> CHORDATA <TAX-SBPHYLUM>
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<TAX-SBFAMILY> <TAX-TRIBE> <TAX-GENUS> GAVIA <TAX-SUBGENUS>
<TAX-SPECIES> STELLATA <TAX-SUBSPEC> <TAX-AUTHOR> PONTOPPIDAN
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<TROPHIC> CARNIVORE <TERRITORY> NESTING TERRITORY ONLY DEFENDED
<TERR-SIZE> <1/4 ACRE <HOME-RANGE> >100 ACRES <DISPERSION> CLUMPED
<PERIODICITY> ACTIVE AT NIGHT,ACTIVE IN DAY,CREPUSCULAR
<FORAG-STRAT> HAWKING,DIVING <MATING> MONOGAMY <PAIR-BOND> ONE SEASON
<DISPLAY-SITE> WATER <PREG-INCUBAT> 3-4 WEEKS <AVE-YOUNG> 2
<REPROD-YR> 1 <DEVEL-YOUNG> PRECOCIAL <PARENT-CARE> BOTH PARENTS
<POP-TREND> NO TREND <POP-FUTURE> <HEP> NONE <ENTERED> 86/04/15
<UPDATED>
<COM-SYNONYMS>
DIVER, RED-THROATED
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ALLEGHENY,BERKS,BUCKS,BUTLER,CENTRE,CHESTER,CLINTON,CRAWFORD,
ERIE,INDIANA,LEHIGH,LUZERNE,LYCOMING,MONTOUR,NORTHAMPTON,PERRY,
PHILADELPHIA,SCHUYLKILL,YORK
<ABS-COUNTY>
<UNK-COUNTY>
ADAMS,ARMSTRONG,BEAVER,BEDFORD,BLAIR,BRADFORD,CAMBRIA,CAMERON,
CARBON,CLARION,CLEARFIELD,COLUMBIA,CUMBERLAND,DAUPHIN,
DELAWARE,ELK,FAYETTE,FOREST,FRANKLIN,FULTON,GREENE,HUNTINGDON,
JEFFERSON,JUNIATA,LACKAWANNA,LANCASTER,LAWRENCE,LEBANON,MCKEAN,
MERCER,MIFFLIN,MONROE,MONTGOMERY,NORTHUMBERLAND,PIKE,POTTER,
SNYDER,SOMERSET,SULLIVAN,SUSQUEHANNA,TIOGA,UNION,VENANGO,WARREN,
WASHINGTON,WAYNE,WESTMORELAND,WYOMING
<SEAS-OCCUR>
ALLEGHENY:S,FW,BERKS:S,FW,BUCKS:S,FW,BUTLER:S,FW,CENTRE:S,FW,
CHESTER:S,FW,CLINTON:S,FW,CRAWFORD:S,FW,ERIE:S,FW,INDIANA:S,FW,
LEHIGH:S,FW,LUZERNE:S,FW,LYCOMING:S,FW,MONTOUR:S,FW,NORTHAMPTON:S,FW,
PERRY:S,FW,PHILADELPHIA:S,FW,SCHUYLKILL:S,FW,YORK:S,FW
<ABUND-CTY>
ALLEGHENY:U,BERKS:U,BUCKS:U,BUTLER:U,CENTRE:U,CHESTER:U,
CLINTON:U,CRAWFORD:U,ERIE:U,INDIANA:U,LEHIGH:U,LUZERNE:U,
LYCOMING:U,MONTOUR:U,NORTHAMPTON:U,PERRY:U,PHILADELPHIA:U,
SCHUYLKILL:U,YORK:U
<HYDRO-NAME>
UPPER DELAWARE:MIDDLE DELAWARE/MUSCONETCONG,
UPPER DELAWARE:LEHIGH,LOWER DELAWARE:CROSSWICKS-NESHAMINY,
LOWER DELAWARE:LOWER DELAWARE,LOWER DELAWARE:SCHUYLKILL,
LOWER DELAWARE:BRANDYWINE-CHRISTINA,UPPER SUSQUEHANNA:CHEMUNG,
UPPER SUSQUEHANNA:UPPER SUSQUEHANNA-TUNKHANNOCK,
UPPER SUSQUEHANNA:UPPER SUSQUEHANNA-LACKAWANNA,
WEST BRANCH SUSQUEHANNA:UPPER WEST BRANCH SUSQUEHANNA,
WEST BRANCH SUSQUEHANNA:MIDDLE WEST BRANCH SUSQUEHANNA,
WEST BRANCH SUSQUEHANNA:BALD EAGLE,
WEST BRANCH SUSQUEHANNA:PINE,
WEST BRANCH SUSQUEHANNA:LOWER WEST BRANCH SUSQUEHANNA,
LOWER SUSQUEHANNA:LOWER SUSQUEHANNA-PENNS,
LOWER SUSQUEHANNA:UPPER JUNIATA,
LOWER SUSQUEHANNA:LOWER JUNIATA,
LOWER SUSQUEHANNA:LOWER SUSQUEHANNA-SWATARA,
LOWER SUSQUEHANNA:LOWER SUSQUEHANNA,
UPPER CHESAPEAKE:CHESTER-SASSAFRAS,
UPPER CHESAPEAKE:GUNPOWDER-PATAPSCO,
SOUTHERN LAKE ERIE:ASHTABULA,
EASTERN LAKE ERIE:CHAUTAUQUA-CONNEAUT,LAKE ERIE:LAKE ERIE,

ALLEGHENY:FRENCH,ALLEGHENY:MIDDLE ALLEGHENY-REDBANK,
ALLEGHENY:CONEMAUGH,ALLEGHENY:KISKIMINETAS,ALLEGHENY:LOWER ALLEGHENY,
MONONGAHELA:LOWER MONONGAHELA,MONONGAHELA:YOUGHIOGHENY,
UPPER OHIO:UPPER OHIO,UPPER OHIO:SHENANGO,
UPPER OHIO:CONNOQUENESSING
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05010009,05020005,05020006,05030101,05030102,05030105
<ECOREG-NAME>
NORTHERN HARDWOODS FOREST, 50-80% GENTLY SLOPING, 100-300 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS IN LOWLAND;
NORTHERN HARDWOODS FOREST, 50-80% GENTLY SLOPING, 300-500 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
NORTHERN HARDWOODS FOREST, 20-50% GENTLY SLOPING, 500-1000 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
NORTHERN HARDWOODS FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT.
ELEVATION, MORE THAN 75% OF GENTLE SLOPE IS IN LOWLAND;
NORTHERN HARDWOODS FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
NORTHERN HARDWOODS FOREST, LESS THAN 20% GENTLE SLOPING,
1000-3000 FT. ELEVATION;
MIXED MESOPHYTIC FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
BEECH-MAPLE FOREST, 50-80% GENTLY SLOPING, 100-300 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS IN LOWLAND;
BEECH-MAPLE FOREST, 50-80% GENTLY SLOPING, 300-500 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
APPALACHIAN OAK FOREST, MORE THAN 80% GENTLY SLOPING,
0-100 FT. ELEVATION;
APPALACHIAN OAK FOREST, MORE THAN 80% GENTLY SLOPING,
100-300 FT. ELEVATION, 50-75% OF GENTLE SLOPE IS IN LOWLAND;
APPALACHIAN OAK FOREST, 50-80% GENTLY SLOPING, 100-300 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
APPALACHIAN OAK FOREST, 50-80% GENTLY SLOPING, 300-500 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS IN LOWLAND;
APPALACHIAN OAK FOREST, 50-80% GENTLY SLOPING, 300-500 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
APPALACHIAN OAK FOREST, 50-80% GENTLY SLOPING, 500-1000 FT.
ELEVATION, LESS THAN 75% OF GENTLE SLOPE IS IN LOWLAND;
APPALACHIAN OAK FOREST, 20-50% GENTLY SLOPING, 500-1000 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
APPALACHIAN OAK FOREST, 20-50% GENTLY SLOPING, 500-1000 FT.
ELEVATION, MORE THAN 75% OF GENTLE SLOPE IS ON UPLAND;
APPALACHIAN OAK FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT.
ELEVATION, LESS THAN 75% OF GENTLE SLOPE IS IN LOWLAND;
APPALACHIAN OAK FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
APPALACHIAN OAK FOREST, LESS THAN 20% GENTLY SLOPING, 500-1000 FT.
ELEVATION;
APPALACHIAN OAK FOREST, LESS THAN 20% GENTLY SLOPING, 1000-3000 FT.
ELEVATION
<ECOREG-CODE>
2113B2B,2113B3C,2113C4C,2113C5A,2113C5C,2113D50,2211C5C,
2212B2B,2212B3C,2214A10,2214A2B,2214B2C,2214B3B,
2214B3C,2214B4A,2214C4C,2214C4D,2214C5A,2214C5C,2214D4D,2214D50
<PNV>
BEECH-MAPLE,APPALACHIAN OAK,NORTHERN HARDWOODS,OAK-HICKORY-PINE
<QUAD-NAME>
<QUAD-CODE>
<LATLONG>

<LANDUSE-ASSOC>
WATER:STREAMS-CANALS,WATER:LAKES,WATER:RESERVOIRS,
WATER:BAYS-ESTUARIES
<LANDUSE-PREF>
WATER:LAKES,WATER:BAYS-ESTUARIES
<FOREST-TYPE>
NOT ASSOCIATED
<FOREST-SIZE>
NOT ASSOCIATED
<WETLAND-NAME>
ESTUARINE,ESTUARINE:SUBTIDAL,ESTUARINE:SUBTIDAL/OPEN WATER,
PALUSTRINE,PALUSTRINE/OPEN WATER,
LACUSTRINE,LACUSTRINE:LIMNETIC,LACUSTRINE:LIMNETIC/OPEN WATER,
RIVERINE,RIVERINE:TIDAL,RIVERINE:TIDAL/OPEN WATER,
RIVERINE:LOWER PERENNIAL,RIVERINE:LOWER PERENNIAL/OPEN WATER
<WETLAND-CODE>
E....,E1...,E1OWO,P....,P0...,P0OWO,L....,L1...,L1OWO,R....,R1...,
R1OWO,R2...,R2OWO
<ENVIR-ASSOC>
AIR TEMPERATURE:<0 DEGREES CELCIUS;
AIR TEMPERATURE:0-4 DEGREES CELCIUS;
AIR TEMPERATURE:4-15 DEGREES CELCIUS;
AIR TEMPERATURE:15-32 DEGREES CELCIUS;
FLOW:RIVER->5,000 CFS MEAN ANNUAL FLOW;
WATER DEPTH:1-5 FT.;WATER DEPTH:5-10 FT.;WATER DEPTH:10-25 FT.;
AQUATIC HABITAT ZONATION:OPEN WATER ZONE;
INLAND WETLAND:WOODLAND PONDS;INLAND WETLAND:MAN-MADE IMPOUNDMENTS;
COASTAL ZONE:SALTWATER MARSH;COASTAL ZONE:BRACKISH WATER MARSH;
COASTAL ZONE:FRESHWATER MARSH;COASTAL ZONE:COASTAL MARSH;
NEST SITES:BARE GROUND/VERY SPARCE VEGETATION;NEST SITES:DEPRESSIONS;
NEST SITES:EMERGENT VEGETATION OVER/NEAR WATER
<ENVIR-LIM>
NEST SITES:BARE GROUND/VERY SPARCE VEGETATION;
NEST SITES:EMERGENT VEGETATION OVER/NEAR WATER
<ENVIR-LIM-E>
<ENVIR-LIM-LF>
<ENVIR-LIM-LR>
<ENVIR-LIM-P>
<ENVIR-LIM-JF>
<ENVIR-LIM-JR>
<ENVIR-LIM-AF>
<ENVIR-LIM-AR>
<ENVIR-LIM-AB>
NEST SITES:BARE GROUND/VERY SPARCE VEGETATION;
NEST SITES:EMERGENT VEGETATION OVER/NEAR WATER
<FOOD-GEN>
CRUSTACEANS,FISH EGGS,FISH FRY,FISH ADULTS,AMPHIBIAN ADULTS
<FOOD-L>
<FOOD-J>
CRUSTACEANS,FISH EGGS,FISH FRY,FISH ADULTS,AMPHIBIAN ADULTS
<FOOD-A>
CRUSTACEANS,FISH EGGS,FISH FRY,FISH ADULTS,AMPHIBIAN ADULTS
<FORAG-SITE>
STANDING WATER-LITTORAL ZONE,STANDING WATER-LIMNETIC ZONE,
FLOWING WATER-POOLS
<BREED-SEASON>
JUNE,JULY,AUGUST
<SPAWN-SITE>
<NEST-SITE>
ON THE GROUND,DEPRESSION,FLOATING AQUATIC VEGETATION
<NEST-MATRLS>
GRASSES,MOSS,AQUATIC VEGETATION
<TREND-CAUSE>

<MGMT-BENEFIT>
RESTRICTING/REGULATING HUMAN USE OF HABITATS;
RESTRICTING/REGULATING HUMAN DISTURBANCE OF POPULATIONS;
RESTRICT HUMAN HARASSMENT DURING MIGRATION;
RESTRICT HUMAN DISTURBANCE DURING BREEDING OR OTHER STRESSFUL PERIODS;
RETENTION OF WILDERNESS;MAINTAINING UNDISTURBED/UNDEVELOPED AREAS;
MAINTAINING NATURAL VEGETATION (NATIVE);
DEVELOPING/MAINTAINING WATER HOLES, PONDS, POTHOLES, ETC.;
PLACING ARTIFICIAL ISLANDS OR RAFTS IN WATER;
CREATING/MAINTAINING ISLANDS WITHIN PERMANENT IMPOUNDMENTS;
DEVELOPING/MAINTAINING/PROTECTING FRESHWATER WETLANDS;
IMPOUNDMENT OF WATERWAYS (FLOOD CONTROL, RECREATION, ETC.);
INCREASE IN DEEP WATER HABITATS;
MAINTAIN CONSTANT WATER POOL LEVELS;
CONTROLLING POLLUTION (THERMAL, CHEMICAL, PHYSICAL)
<MGMT-HARM>
DRAINING/EXCAVATING WETLANDS, INCLUDING MARSHES WITH VEGETATION;
DRAINING/EXCAVATING PONDS AND LAKES;
SPECIMEN COLLECTION;EGG COLLECTION
<N-TAXONOMY>
HISTORICAL SCIENTIFIC SYNONYMS INCLUDE COLYMBUS STELLATA, URINATOR LUMME, AND GAVIA LUMME *01,02:34*. THE SYNONYM COLYMBUS STELLATA CAN BE TRACED TO HUXLEY *01* WHO UNITED THE LOONS AND GREBES INTO A SINGLE FAMILY, THE COLYMBIDAE. HE ARGUED THE COLYMBIDAE APPEAR TO BE CLOSELY CONNECTED ON ONE HAND WITH THE GULLS, AND ON THE OTHER, MORE REMOTELY BUT STILL REALLY WITH THE RAILS *01:458*. THE SIMILARITIES BETWEEN LOONS AND GREBES ARE NOW GENERALLY ATTRIBUTED TO CONVERGENCE *03:55* ONLY. CONSEQUENTLY, LOONS AND GREBES ARE NOW PLACED IN SEPARATE ORDERS, GAVIIFORMES AND PODICIPEDIFORMES, RESPECTIVELY. CURRENTLY, LOONS ARE THOUGHT TO BE MOST CLOSELY RELATED TO THE GULLS (CHARADRIIFORMES) *03:04:2*.

THE COMMON SYNONYM, RED-THROATED DIVER, IS GENERALLY SEEN IN EUROPEAN PUBLICATIONS. THE LITERATURE REVEALS NO OTHER COMMON NAME.

A SUBSPECIES, GAVIA STELLATA SQUAMATA (PORTENKO), HAS BEEN DESCRIBED AS OCCURRING FROM THE SCANDANAVIA-BALTIC SEA REGION. VAURIE *05:4* SUPPORTS THIS DESIGNATION WHILE STORER DOES NOT *04:7*.

BASED ON COMPARISONS OF FOSSIL EVIDENCE WITH CHARACTERS OF EXTANT LOONS, GAVIA STELLATA MAY BE THE MORE PRIMITIVE OF THE LOONS *04:3*. THESE CHARACTERS INCLUDE RELATIVELY SIMPLE NUPTIAL PLUMAGE, SMALLER SIZE, AND GOOD FLYING ABILITY.
<N-SPP-STATUS>
RED-THROATED LOONS ARE PROTECTED UNDER THE GAME LAWS OF PENNSYLVANIA *06*. THEIR STATUS IS NON-CONSUMPTIVE RECREATIONAL. THIS SPECIES ALSO IS PROTECTED UNDER THE MIGRATORY BIRD TREATY ACT *19*. THE SPECIES APPEARS TO BE SENSITIVE TO HUMAN DISTURBANCE *07:60*.

THE U.S. FISH AND WILDLIFE SERVICE, U.S. DEPARTMENT OF THE INTERIOR IS CHARGED WITH THIS SPECIES PROTECTION AT THE FEDERAL LEVEL. THE PENNSYLVANIA GAME COMMISSION PROVIDES PROTECTION AT THE STATE LEVEL.
<N-DISTRIB>
THE RED-THROATED LOON IS AN OCCASONAL WINTER RESIDENT IN PENNSYLVANIA *02,08,09*. IT ALSO IS SEEN DURING BOTH SPRING AND FALL MIGRATORY SEASONS. EXCEPT WHEN SEEN FLYING, SIGHTINGS WITHIN PENNSYLVANIA HAVE BEEN MADE FROM VARIOUS BODIES OF FRESH WATER, INCLUDING LAKES, BAYS, AND RIVERS.

THIS SPECIES OCCURS ACROSS THE NORTHERN HEMISPHERE IN BOTH EURASIA AND NORTH AMERICA. IT BREEDS ON THE TUNDRA AND FAVORS WINTERING ALONG THE COASTS AS FAR SOUTH AS FLORIDA AND THE BAJA PENINSULA *07:53*. CONSEQUENTLY, THE NUMBERS OF RED-THROATED LOONS RECORDED FOR PENNSYLVANIA HAS NEVER BEEN LARGE.

IN SPRING, MIGRANTS MAY BE SEEN IN APRIL AND EARLY MAY PRESUMABLY COMING FROM THE ATLANTIC *07:54*. IN FALL, MOST MIGRATION IN THE EASTERN U.S. AGAIN OCCURS ALONG THE ATLANTIC COAST, GENERALLY DURING

OCTOBER AND NOVEMBER.

RECORDS TAKEN FROM THE JOURNAL, AMERICAN BIRDS, FROM 1975-1983 INCLUDE THE FOLLOWING PENNSYLVANIA COUNTIES: ERIE-PRESQUE ISLE *24:718,26:176,28:331,32:176,33:281,36:160,45:869,46:201*; CENTRE-STATE COLLEGE *31:1005,34:770,46:201*; CENTRE-BALD EAGLE STATE PARK *32:176,40:181,42:822,43:293*; CENTRE-MC ELHATTAN *41:299*; PERRY-LITTLE BUFFALO STATE PARK *44:851*; MONTOUR *29:1000,32:176*; CRAWFORD-PYMATUNING LAKE *20:58,23:67*; CRAWFORD=CONNEAUT LAKE *32:176*; LUZERNE-DALLAS *21:827*; LUZERNE-HARVEY'S LAKE *30:183*; CHESTER-MARSH CREEK STATE PARK *22:39,25:156*; BUTLER-LAKE ARTHUR *29:1000,36:160,39:775,46:201*; LEHIGH-ALLENTOWN *27:312*; YORK-HANOVER *38:272*; BUCKS-PEACE VALLEY PARK *37:257*; BERKS AND SCHUYLKILL-HAWK MOUNTAIN *35:144*; ALLEGHENY-PITTSBURGH *46:201*; AND INDIANA *46:20*.

AN EARLIER SUMMARY (1940) REPORTED SIGHTINGS ON THE SHENANGO RIVER IN GREENVILLE (MERCER COUNTY), AND THE WEST BRANCH OF THE SUSQUEHANNA RIVER AT RENOVO (CLINTON COUNTY) *02*. SPECIMENS HAVE BEEN REPORTED CAPTURED IN LYCOMING, CLINTON, NORTHAMPTON, AND PHILADELPHIA COUNTIES IN THE LATE 1800'S *08*.

IT SEEMS REASONABLE TO CONCLUDE THAT RED-THROATED LOONS PROBABLY OCCUR SPORADICALLY DURING THE WINTER AND MIGRATORY SEASONS THROUGHOUT THE COMMONWEALTH.

<N-HABITAT>

THE RED-THROATED LOON HAS BEEN SIGHTED SPORADICALLY IN A VARIETY OF FRESH-WATER HABITATS (LAKES, BAYS, RESERVOIRS, AND RIVERS) WITHIN PENNSYLVANIA (SEE THE DISTRIBUTION NARRATIVE) DURING THE WINTER AND MIGRATORY SEASONS. THERE ARE NO RECORDS FOR BREEDING WITHIN THE COMMONWEALTH.

BREEDING OCCURS COMMONLY ALONG SHALLOW TUNDRA PONDS AND LAKES SHORTLY AFTER THE ICE MELTS IN NORTH AMERICA, EUROPE, AND ASIA. SPECIFICALLY, NESTING SEEMS TO BE FAVORED ON NATURAL OR CONSTRUCTED ISLANDS AT THESE LAKES *10,11,12*. WETLANDS SELECTED BY RED-THROATED LOONS WERE PREDOMINATELY THOSE FOUND IN LARGE AND SHALLOW, PARTIALLY DRAINED LAKES (BASIN-COMPLEX) *10*.

<N-FOOD>

RED-THROATED LOONS ARE ALMOST EXCLUSIVELY FISH-EATERS THROUGHOUT THEIR BREEDING AND WINTERING RANGES. COD (GADUS CALLARIAS) COMPRISES THE BULK OF THE DIET OF BIRDS STUDIED IN BOTH NORTH AMERICA AND EUROPE *10,13*. OTHER FISH EATEN INCLUDE GOBIES (GOBIUS SPP.), STICKLEBACKS (GASTEROSTEUS SPP), AND HERRING (CLUPEA HARENGUS) *13*. IN THE SAME STUDY, MORE THAN HALF (58%) SUBSISTED ON A SINGLE KIND OF FISH. OCCASIONALLY, CRUSTACEANS, FROGS, AND FISH EGGS ARE EATEN *13,14*. WHILE G. STELLATA MAY NEST ON INLAND FRESHWATER LAKES, THEY MAY FLY SEVERAL MILES TO SEA TO SEEK FOOD *10*. SUCH BEHAVIOR WAS NOTED IN THE NORTHWEST TERRITORIES OF CANADA WHERE FISH WERE ABSENT FROM ALL WETLAND CLASSES WHERE LOONS NESTED.

<N-MGMT>

RED-THROATED LOONS GENERALLY NEST ON ISLANDS OF SHALLOW ARCTIC FRESH-WATER LAKES YET OBTAIN MOST, IF NOT ALL OF THEIR FOOD FROM THE SEA. THEREFORE, POLLUTION OF FRESH WATER WILL INFLUENCE FOOD GATHERING LESS THAN POLLUTION (I.E., OIL) AT SEA *10*. ANY LIMITATIONS OR SIGNIFICANT DESTRUCTION OF NESTING HABITAT HAS NOT BEEN DESCRIBED.

HUMAN ACTIVITY DOES NOT APPEAR TO BE A SIGNIFICANT FACTOR AFFECTING THE STABILITY OF THIS SPECIES *07:60*. HOWEVER, THEIR HABIT OF MAKING FEEDING FLIGHTS TO THE SEA AND BACK MAKES THEM MORE LIKELY TO COME INTO CONTACT WITH HUMANS (ESPECIALLY ESKIMO). THE BIRDS REPORTEDLY REACT TO SUDDEN SHOUTS. THE ESKIMOS OF BAFFIN ISLAND SHOUT TO INDUCE PASSING BIRDS TO ALIGHT ON NEARBY FRESH WATER *07:60*. FEWER BIRDS OR EGGS ARE TAKEN NOW BY ESKIMOS THAN IN THE PAST, WITH LITTLE OVERALL EFFECT ON THE SPECIES POPULATION. VERY LITTLE CAN BE DONE FOR THE MANAGEMENT OF THIS SPECIES ON WINTERING SITES IN PENNSYLVANIA.

<HEP-DATA>

<ANIMAL-PLANT>

BECAUSE THE MAINSTAY OF THE DIET OF RED-THROATED LOONS IS FISH, LOONS MAY BE EXPECTED TO OCCUR NOT FAR FROM A SOURCE OF FISH (SEE FOOD HABITS NARRATIVE). FURTHERMORE, COD (GADUS CALLARIUS) APPEARS TO BE A FAVORITE SPECIES IN BOTH WINTERING AND BREEDING AREAS. CONSEQUENTLY, ANY AREAS WITH PREDICTABLY HIGH POPULATIONS OF COD MAY BE AREAS IN WHICH LOONS WILL OCCUR *10:14,13:19*.

FOX, JAEGERS, SKUAS, AND GULLS ARE THE PRINCIPAL PREDATORS OF RED-THROATED LOONS, ESPECIALLY EGGS AND JUVENILES *17:191*.

<DESCRIPTION>

THE RED-THROATED LOON IS A SMALL LOON WITH SEXES SIMILAR, L.:24 - 27 IN., MALES AVERAGE SLIGHTLY LARGER, WT. TO OVER 4.5 LB., WINGSPREAD 42-45 INCHES. SUMMER ADULT PLUMAGE: BACK, WING, TAIL IS TAN WITH SPOTTED WHITE HEAD; REST OF HEAD AND SIDES OF NECK IS ASH-GRAY; BACK OF NECK IS BLACK STREAKED WHITE; FRONT OF NECK IS RUST OR CHESTNUT; UNDERSIDE IS WHITE; BILL IS DULL BLUISH-GRAY WITH PALER STRIPE ALONG RIDGE. IRIS IS REDDISH BROWN, UPPERPARTS BLACKISH-BROWN WITH SLIGHT GREENISH GLOSS, FEATHERS AT SHOULDERS LIGHTLY WASHED WITH GRAYISH, EACH HAVING A PAIR OF SMALL GRAYISH-WHITE SPOTS AT ITS TIP FORMING WHITE STREAKS. WINTER ADULT PLUMAGE: SIMILAR TO SUMMER EXCEPT LOSS OF RUST ON THE NECK *07:49-51*.

<ORIGIN>

RED-THROATED LOONS ARE OCCASIONALLY SEEN IN PENNSYLVANIA DURING FALL AND SPRING MIGRATIONS AND DURING THE WINTER. MOST INDIVIDUALS FAVOR WINTERING ALONG THE COASTS AND BREEDING IN NORTHERN CANADA.

<BEHAVIOR>

TERRITORIALITY OCCURS ON THE BREEDING GROUNDS FOR DISPLAY, COPULATING, NESTING AND FEEDING IF FOOD IS PRESENT. YEARLINGS AND UNMATED LOONS VISIT TERRITORIES - ARE SOMETIMES DRIVEN AWAY BUT OFTEN TOLERATE OTHER WATER BIRDS, INCLUDING DUCKS, ARE OFTEN TOLERATED WITHIN TERRITORIES, BUT JAEGERS USUALLY ELICIT DEFENSIVE BEHAVIOR *07:58,17*.

THE RED-THROATED LOON IS VERY VOCAL DURING THE BREEDING SEASON, BOTH NIGHT AND DAY, BUT RATHER SILENT AT OTHER TIMES. A CALL REPEATED AS "COO-HA-CRAH-OH" *15* AND "KA-KA-KA-KA" AS A FLIGHT CALL HAVE BEEN DESCRIBED *16*. A SINGLE "KWUK" OR "KARK" IS MADE AS AN ALARM NOTE *07:52*. DURING THE SUMMER, THEY MAKE A FAR-CARRYING "GAYORWORRK" REPEATEDLY EVERY MINUTE OR SO *07:53*.

THEY ARE MIGRATORY, FLYING BETWEEN BREEDING GROUNDS ON ARCTIC TUNDRA LAKES AND THE COASTS OF NORTH AMERICA AND EUROPE. IN PENNSYLVANIA, THEY ARE SEEN INFREQUENTLY DURING MIGRATION OR AS TEMPORARY WINTER RESIDENTS. THE HOME RANGE OF NESTING BIRDS VARIES WITH THE DISTANCE COVERED TO FIND FOOD. IN ONE STUDY CONDUCTED IN THE NORTHWEST TERRITORIES, LOONS FLEW FROM THEIR NESTS ON INLAND FRESHWATER LAKES SEVERAL MILES TO SEA TO OBTAIN FOOD *10*.

ON BREEDING GROUNDS, ONE PAIR MAY OCCUPY A SMALL POND. THEY HAVE ALSO BEEN OBSERVED TO BREED COLONIALLY WHERE NESTS MAY BE ONLY A FEW YARDS APART *07:59*. IMMATURES SUMMER MOSTLY ON COASTAL SALT WATER BUT ARE SOMETIMES FOUND ON LARGER FRESH WATER PONDS. DAILY ROUTINE OUTSIDE BREEDING SEASON IS MAINLY CONCERNED WITH OBTAINING FOOD; THIS IS WHEN THEY ARE MORE LIKELY TO BE SEEN TOGETHER IN LARGE NUMBERS.

THEY ARE EXCELLENT SWIMMERS AND DIVERS, USING MAINLY THEIR FEET, BUT ALSO THEIR WINGS FOR PROPULSION *07:59*. FISH ARE CAPTURED BY GRASPING WITH THE BILL AND ARE BROUGHT TO THE SURFACE BEFORE SWALLOWING. SMALL FISH MAY BE EATEN UNDER WATER. ORDINARILY THEY DIVE QUIETLY FROM THE WATER SURFACE.

THEY ALSO ARE STRONG FLIERS WITH RAPID WINGBEATS. THEY REQUIRE A SMALLER WATER SURFACE FOR TAKEOFF THAN OTHER LOONS, AND UNLIKE OTHER LOONS CAN FLY DIRECTLY FROM LAND *07:59*. SHORT FLIGHTS MAY BE LOW OVER OPEN WATER, WHILE MIGRATORY FLIGHTS MAY OCCUR AT SEVERAL HUNDRED FEET. THEY MAY FLY TO CONSIDERABLE HEIGHTS ON BREEDING GROUNDS, HURTLE DOWN IN A STEEP GLIDE, AND LAND WITH GREAT FORCE ON THE WATER *07:59*. BIRDS COME ASHORE MOSTLY FOR NESTING AND MOVE AWKWARDLY ON LAND.

<REPRODUCTION>

RED-THROATED LOONS ARE MONOGAMOUS AT LEAST FOR THE DURATION OF THE BREEDING SEASON *07:57*. BIRDS ARRIVE ON THE BREEDING GROUNDS IN ALASKA IN THE FIRST TWO WEEKS OF JUNE *10*. COURTSHIP BEHAVIOR IS DESCRIBED AS SIMILAR TO WELL-KNOWN DISPLAY OF THE WESTERN GREBE *16*. BIRDS RUSH ABOUT SWIFTLY IN THE WATER IN A NEARLY UPRIGHT ALTITUDE WITH ONLY THE REAR OF THE BODY SUBMERGED AND HEAD AND NECK RAISED AND EXTENDED.

NESTS ARE BUILT PREFERENTIALLY ON SMALL VEGETATION ISLANDS IN SHALLOW, TUNDRA LAKES *10,11,12*. ONLY 11% WERE FOUND ON MAINLAND SHORES *10*. THESE ISLANDS MAY BE NATURAL OR CONSTRUCTED FROM AQUATIC VEGETATION. NESTS CAN BE A BARE DEPRESSION IN THE GROUND *14*. THERE APPEARS TO BE A TENDENCY TOWARD NEST-SITE LOYALTY. IN ONE STUDY 19 OF 27 NESTS FOUND OCCURRED AT PONDS USED BY PAIRS DURING MORE THAN ONE SUMMER *11*. NESTING SUCCESS WAS GREATER IN THOSE CIRCUMSTANCES AND FOR PAIRS NESTING ON ISLANDS THAN ON MAINLAND SHORES

A CLUTCH IS GENERALLY TWO EGGS *10,17* LAID 48 HOURS APART. EGGS ARE BLOTCHED OLIVE-GREEN AND AVERAGE 2.83 BY 1.73 INCHES *14*. THE ADULTS ALTERNATE INCUBATING. WHEN CHANGING, THE BIRD LANDING FROM THE WATER USUALLY FLICKS MOSS OVER ITS BACK AND OFTEN TURNS AROUND A FEW TIMES BEFORE SETTLING DOWN *17*. THE INCUBATOR ALWAYS FACES WATER, NEVER INLAND. INCUBATION PERIOD IS 27 DAYS, BASED ON ONLY ONE INSTANCE *07:58*. NESTING ACTIVITY WAS OBSERVED INTO AUGUST IN A POPULATION STUDIED ON BAFFIN ISLAND *15* AND IN EAST GREENLAND *17*.

CHICKS CAN SWIM WITHIN 24 HOURS OF HATCHING *17*. BOTH ADULTS BRING FOOD TO NEST. THE PARENTS "COO" GENTLY, THE CHICKS LEAVE THE NEST AND SWIM OUT TO BE FED. THE FISH OFFERED TO CHICKS IS SMALL AND THEREFORE TAKEN WHOLE. ARCTIC COD WERE FED TO YOUNG IN AN ALASKAN POPULATION *10*. THESE LOONS MAY BEGIN REPRODUCTIVE ACTIVITY AT 2 YEARS OF AGE *07:54*.

<POP-DYNAMICS>

THERE APPEARS TO BE NO INFORMATION REGARDING THE POPULATION BIOLOGY OF THIS SPECIES *00*.

<LIM-FACTORS>

PREDATION AFFECTS MOSTLY EGGS AND JUVENILES. FOX, JAEGERS, SKUAS, AND GULLS ARE THE PRINCIPAL PREDATORS *17*. TUCK AND BOROTRA *18* FOUND THAT LOONS DID NOT BREED ON NEWFOUNDLAND BUT DID ON A NEARBY ARCHIPELAGO. THEY ATTRIBUTED THE SCARCITY OF MAMMALIAN PREDATORS, PARTICULARLY THE RED FOX, ON THE ARCHIPELAGO TO THE OCCURRENCE OF BREEDING THERE.

ON ITS COASTAL WINTER GROUNDS, SOME MORTALITY IS CAUSED BY OILING *07:60* AND ILLEGAL SHOOTING. LATE SPRINGS, COLD SUMMERS, OR EARLY FALLS MAY HAVE ADVERSE EFFECTS ON BREEDING DUE TO LACK OF OPEN WATER *07:60*.

<R-TAXONOMY>

01,02,03,04,05

<R-SPP-STATUS>

06,07,19

<R-DISTRIB>

02,07,08,09,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46

<R-HABITAT>

10,11,12

<R-FOOD>

10,13,14

<R-MGMT>

07,10

<R-LIFE-HIST>

07,10,11,12,14,15,16,17,18

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27 - AMERICAN BIRDS 1976. VOLUME 31(3):312
28 - AMERICAN BIRDS 1976. VOLUME 31(3):331
29 - AMERICAN BIRDS 1976. VOLUME 31(5):1000
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37 - AMERICAN BIRDS 1979. VOLUME 34(3):257
38 - AMERICAN BIRDS 1979. VOLUME 34(3):272
39 - AMERICAN BIRDS 1980. VOLUME 34(5):775

40 - AMERICAN BIRDS 1980. VOLUME 35(2):181
41 - AMERICAN BIRDS 1980. VOLUME 35(3):299
42 - AMERICAN BIRDS 1981. VOLUME 35(5):822
43 - AMERICAN BIRDS 1981. VOLUME 36(3):293
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46 - AMERICAN BIRDS 1983. VOLUME 38(2):201

APPENDIX E

Updated Species Profile

Plover, Piping

(*Charadrius melodus*)

<SPP-CODE> 0400075 <CATEGORY> BIRD <COM-NAME> PLOVER, PIPING
<SCI-NAME> CHARADRIUS MELODUS <TAX-PHYLUM> CHORDATA
<TAX-SBPHYLUM> VERTEBRATA <TAX-CLASS> AVES <TAX-SUBCLASS> NEORNITHES
<TAX-ORDER> CHARADRIIFORMES <TAX-SUBORDER> CHARADRII <TAX-SUPERFAM>
<TAX-FAMILY> CHARADRIIDAE <TAX-SBFAMILY> CHARADRINNAE <TAX-TRIBE>
<TAX-GENUS> CHARADRIUS <TAX-SUBGENUS> <TAX-SPECIES> MELODUS
<TAX-SUBSPEC> CIRCUMCINCTUS <TAX-AUTHOR> ORD (1824)
<SPP-STATUS> F-E,S-X,MIGRATORY,NON-CONSUMP-REC,INDICATOR,SENSITIVE
<RES-STATUS> MIGRANT <HABITAT> TERRESTRIAL,RIPARIAN <TROPHIC> CARNIVORE
<TERRITORY> BREEDING/FEEDING/NESTING TERRITORY
<TERR-SIZE> 1/4-1 ACRE,1-5 ACRES <HOME-RANGE> <DISPERSION> CLUMPED
<PERIODICITY> ACTIVE IN DAY <FORAG-STRAT> GLEANING,PROBING
<MATING> MONOGAMY <PAIR-BOND> ONE SEASON ONLY <DISPLAY-SITE> GROUND
<PREG-INCUBAT> 3-4 WEEKS <AVE-YOUNG> 3-4 <REPROD-YR> 1
<DEVEL-YOUNG> PRECOCIAL <PARENT-CARE> BOTH PARENTS <POP-TREND> DECREASING
<POP-FUTURE> <HEP> NONE <ENTERED> 86/06/03 <UPDATED> <EXPAND1>
<EXPAND2> <EXPAND3> <EXPAND4> <EXPAND5>
<COM-SYNONYMS>
   BIRD, BEACH;PLOVER, BEACH;PLOVER, PIPING, BELTED;CALM-BIRD;
   BIRD, MOURNING;RING-NECK, PALE;RING-NECK; PLOVER, SAND;
   PLOVER, PIPING, WESTERN;BUTTER-BIRD;YLE-O;PEEP-LO;FEEBLE
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   AEGIALITIS MELODUS,AEGIALITIS MELODA CIRCUMCINCTA
<OCCUR-COUNTY>
   BUCKS,CRAWFORD,ERIE,LANCASTER
<ABS-COUNTY>
<UNK-COUNTY>
   ADAMS,ALLEGHENY,ARMSTRONG,BEAVER,BEDFORD,BERKS,BLAIR,BRADFORD,
   BUTLER,CAMBRIA,CAMERON,CARBON,CENTRE,CHESTER,CLARION,CLEARFIELD,
   CLINTON,COLUMBIA,CUMBERLAND,DAUPHIN,DELAWARE,ELK,
   FAYETTE,FOREST,FRANKLIN,FULTON,GREENE,HUNTINGDON,INDIANA,JEFFERSON,
   JUNIATA,LACKAWANNA,LAWRENCE,LEBANON,LEHIGH,LUZERNE,LYCOMING,
   MCKEAN,MERCER,MIFFLIN,MONROE,MONTGOMERY,MONTOUR,NORTHAMPTON,
   NORTHUMBERLAND,PERRY,PHILADELPHIA,PIKE,POTTER,SCHUYLKILL,SNYDER,
   SOMERSET,SULLIVAN,SUSQUEHANNA,TIOGA,UNION,VENANGO,WARREN,WASHINGTON,
   WAYNE,WESTMORELAND,WYOMING,YORK
<SEAS-OCCUR>
   BUCKS:..F.,CRAWFORD:..F.,ERIE:S.F.,LANCASTER:..F.
<ABUND-CTY>
   BUCKS:U,CRAWFORD:U,ERIE:U,LANCASTER:U
<HYDRO-NAME>
   UPPER DELAWARE:MIDDLE DELAWARE/MUSCONETCONG,
   LOWER SUSQUEHANNA:LOWER SUSQUEHANNA,
   EASTERN LAKE ERIE:CHAUTAUQUA-CONNEAUT,
   ALLEGHENY:FRENCH
<HYDRO-CODE>
   02040105,02050306,04120101,05010004
<ECOREG-NAME>
   NORTHERN HARDWOODS FOREST, 50-80% GENTLY SLOPING, 300-500 FT.
   ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
   BEECH-MAPLE FOREST, 50-80% GENTLY SLOPING, 100-300 FT.
   ELEVATION, 50-75% OF GENTLE SLOPE IS IN LOWLAND;
   APPALACHIAN OAK FOREST, 50-80% GENTLY SLOPING, 300-500 FT.
   ELEVATION, 50-75% OF GENTLE SLOPE IS IN LOWLAND;
   APPALACHIAN OAK FOREST, 50-80% GENTLY SLOPING, 300-500 FT.
   ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND
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   211B3C,221282B,2214B3B,2214B3C
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   BEECH-MAPLE,APPALACHIAN OAK,NORTHERN HARDWOODS
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   WATER:LAKES,WATER:RESERVOIRS,WETLAND:NONFORESTED,BARREN:BEACHES
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   BARREN:BEACHES
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<FOREST-SIZE>
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   ESTUARINE,ESTUARINE:INTERTIDAL,ESTUARINE:INTERTIDAL/BEACH-BAR,
   ESTUARINE:INTERTIDAL/BEACH-BAR:SAND,
   ESTUARINE:INTERTIDAL/FLAT,ESTUARINE:INTERTIDAL/FLAT:SAND,
   ESTUARINE:INTERTIDAL/FLAT:MUD,
   ESTUARINE:INTERTIDAL/UNCONSOLIDATED SHORE,
   ESTUARINE:INTERTIDAL/UNCONSOLIDATED SHORE:SAND,
   ESTUARINE:INTERTIDAL/UNCONSOLIDATED SHORE:MUD,
   PALUSTRINE,PALUSTRINE/FLAT,PALUSTRINE/FLAT:SAND,PALUSTRINE/FLAT:MUD,
   PALUSTRINE/UNCONSOLIDATED SHORE,PALUSTRINE/UNCONSOLIDATED SHORE:SAND,
   PALUSTRINE/UNCONSOLIDATED SHORE:MUD,LACUSTRINE,LACUSTRINE:LITTORAL,
   LACUSTRINE:LITTORAL/BEACH-BAR,LACUSTRINE:LITTORAL/BEACH-BAR:SAND,
   LACUSTRINE:LITTORAL/FLAT,LACUSTRINE:LITTORAL/FLAT:SAND,
   LACUSTRINE:LITTORAL/FLAT:MUD,LACUSTRINE:LITTORAL/UNCONSOLIDATED SHORE,
   LACUSTRINE:LITTORAL/UNCONSOLIDATED SHORE:SAND,
   LACUSTRINE:LITTORAL/UNCONSOLIDATED SHORE:MUD,RIVERINE,RIVERINE:TIDAL,
   RIVERINE:TIDAL/BEACH-BAR,RIVERINE:TIDAL/BEACH-BAR:SAND,
   RIVERINE:TIDAL/UNCONSOLIDATED SHORE,
   RIVERINE:TIDAL/UNCONSOLIDATED SHORE:SAND,
   RIVERINE:TIDAL/UNCONSOLIDATED SHORE:MUD,
   RIVERINE:LOWER,RIVERINE:LOWER/BEACH-BAR,
   RIVERINE:LOWER/BEACH-BAR:SAND,
   RIVERINE:LOWER/UNCONSOLIDATED SHORE,
   RIVERINE:LOWER/UNCONSOLIDATED SHORE:SAND,
   RIVERINE:LOWER/UNCONSOLIDATED SHORE:MUD
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   PE...,POFL.,POFL2,POFL3,POUS.,POUS2,POUS3,L....,L2...,L2BB.,L2BB2,
   L2FL.,L2FL2,L2FL3,L2US.,L2US2,L2US3,R....,R1...,R1BB.,R1BB2,R1US.,
   R1US2,R1US3,R2...,R2BB.,R2BB2,R2US.,R2US2,R2US3
<ENVIR-ASSOC>
   AIR TEMPERATURE:4-15 DEGREES CELCIUS;
   AIR TEMPERATURE:15-32 DEGREES CELCIUS;
   AIR TEMPERATURE:>32 DEGREES CELCIUS;
   AQUATIC VEGETATION:RUSHES;COASTAL ZONE:SANDY BEACHES;
   COASTAL ZONE:SAND BARS;COASTAL ZONE:MUD FLATS;COASTAL ZONE:DUNES;
   SOIL:SAND;TERRESTRIAL FEATURES:BEACHES;
   ECOTONE:BARREN LAND/WETLAND;NEST SITES:SAND BEACHES/PEBBLE BEACH;
   SHRUB CROWN COVER:<10%;SHRUB COVER HEIGHT:<3 FT.;
   HERBACEOUS GROUND COVER:<10%;VEGETATION SUCCESSIONAL:SAND DUNE;
   GRASSES:AMERICAN BEACHGRASS;HUMAN ASSOCIATION:STATE AND COUNTY PARKS;
   HUMAN ASSOCIATION:NATIONAL PARKS/HISTORIC LANDMARKS;
   HUMAN ASSOCIATION:WILDLIFE REFUGES/SANCTUARIES
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   COASTAL ZONE:MUD FLATS;TERRESTRIAL FEATURES:BEACHES;
   NEST SITES:SAND BEACHES/PEBBLE BEACH;
   HERBACEOUS GROUND COVER:<10%;GRASSES:AMERICAN BEACHGRASS
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   NEST SITES:SAND BEACHES/PEBBLE BEACH;HERBACEOUS GROUND COVER:<10%;
   GRASSES:AMERICAN BEACHGRASS
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COASTAL ZONE:MUD FLATS;TERRESTRIAL FEATURES:BEACHES;
NEST SITES:SAND BEACHES/PEBBLE BEACH;HERBACEOUS GROUND COVER:<10%
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COASTAL ZONE:MUD FLATS;TERRESTRIAL FEATURES:BEACHES;
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COASTAL ZONE:SANDY BEACHES;TERRESTRIAL FEATURES:BEACHES;
NEST SITES:SAND BEACHES/PEBBLE BEACH;HERBACEOUS GROUND COVER:<10%;
GRASSES:AMERICAN BEACHGRASS
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HERBACEOUS FRUIT (BERRIES/CAPSULES/FRUIT/NUTS/GRAIN),
INSECTS-ADULT,INSECTS-IMMATURE,ARTHROPODS (NOT INSECTS),WORMS,
INSECTS-AQUATIC,CRUSTACEANS,CLAMS,SNAILS,WORMS-SEGMENTED
<FOOD-L>
<FOOD-J>
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INSECTS-AQUATIC,CRUSTACEANS,CLAMS,SNAILS,WORMS-SEGMENTED
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INSECTS-ADULT,INSECTS-IMMATURE,ARTHROPODS (NOT INSECTS),WORMS,
INSECTS-AQUATIC,CRUSTACEANS,CLAMS,SNAILS,WORMS-SEGMENTED
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GROUND SURFACE
<BREED-SEASON>
APRIL,MAY,JUNE,JULY
<SPAWN-SITE>
<NEST-SITE>
ON THE GROUND,BARE GROUND/SAND BEACHES
<NEST-MATRLS>
SAND,GRAVEL,ORGANIC DEBRIS,INORGANIC DEBRIS
<TREND-CAUSE>
PREDATION,HABITAT LOSS
<MGMT-BENEFIT>
PROHIBITING HARVEST OF SPECIES BEING DESCRIBED;
TRANSPLANTING WILD ANIMALS;
STOCKING CAPTIVE-REARED WILD-STRAIN ANIMALS;
RESTRICTING/REGULATING HUMAN USE OF HABITATS;
RESTRICTING/REGULATING HUMAN DISTURBANCE OF POPULATIONS;
RESTRICT HUMAN HARRASSMENT DURING MIGRATION;
RESTRICT HUMAN DISTURBANCE DURING BREEDING OR OTHER STRESSFUL PERIODS;
RETENTION OF WILDERNESS;MAINTAINING UNDISTURBED/UNDEVELOPED AREAS;
MAINTAIN EARLY STAGES OF SUCCESSION;
RETAIN OR PRODUCE SPECIAL HABITAT FEATURES AS CAVES, LEDGES, ETC.;
PROVIDING ARTIFICIAL NESTING/SPAWNING SITES;
DEVELOPING/MAINTAINING WATER HOLES, PONDS, POTHOLES, ETC.;
MAINTAINING/PROTECTING RIPARIAN HABITAT;
CREATING/MAINTAINING ISLANDS WITHIN PERMANENT IMPOUNDMENTS;
DEVELOPING/MAINTAINING/PROTECTING FRESHWATER WETLANDS;
DEVELOPING/MAINTAINING/PROTECTING BRACKISH WETLANDS;

DEVELOPMENT OF SHALLOW WATER IMPOUNDMENTS;
MAINTAIN CONSTANT WATER POOL LEVEL;
FENCING OUT CATTLE, SHEEP, HORSES, OR OTHER LIVESTOCK;
FARM POND DEVELOPMENT;
CONTROLLING POLLUTION (THERMAL, CHEMICAL, PHYSICAL)

<HGMT-HARM>

MAINTAINING NATURAL ECOLOGICAL SUCCESSION;
PLANTINGS (SHRUBS, GRASSES, TREES, ETC.);PLANTINGS (GRASSES);
PLANTINGS (SHRUBS);
MAN CAUSED FLUCTUATIONS IN WATER LEVEL DURING BREEDING SEASON;
SURFACE MINING;DRAINING/EXCAVATING WETLANDS, INCLUDING ;
DRAINING/EXCAVATING WETLANDS, INCLUDING MARSHES WITH VEGETATION;
DREDGING;DEPOSITION OF FILL;CHANNELIZATION;CHANNEL REALIGNMENTS;
CHANNEL DEEPENING;CHANNEL WIDENING;
NAVIGATIONAL IMPROVEMENTS (I.E., DAMS AND LOCKS);
IMPOUNDMENT OF WATERWAYS (FLOOD CONTROL, RECREATION, ETC.);
WATER LEVELS SEASONALLY FLUCTUATING IN RESERVOIRS;
INTENSIVE AGRICULTURAL PRACTICES;GRAZING;FARM POND REMOVAL;
SITE PREPARATION FOR REVEGETATION;APPLICATION OF HERBICIDES;
APPLICATION OF INSECTICIDES;APPLICATION OF PESTICIDES;
INTENSIVE RECREATIONAL DEVELOPMENT;INDUSTRIAL POLLUTION;
SPECIMEN COLLECTION;EGG COLLECTION

<N-TAXONOMY>

THE PIPING PLOVER (CHARADRIUS MELODUS) WAS FIRST DESCRIBED IN 1824. THE LOCATION OF THE TYPE SPECIMEN WAS NOT AVAILABLE FROM THE LITERATURE. CURRENTLY, THE AMERICAN ORNITHOLOGISTS' UNION RECOGNIZES TWO SUBSPECIES OF THE PIPING PLOVER, AND BOTH NEST STRICTLY WITHIN NORTH AMERICA. C.M. MELODUS GENERALLY BREEDS ALONG THE ATLANTIC COAST OF NORTH AMERICA, WHILE C.M. CIRCUMCINCTUS BREEDS IN THE INTERIOR GREAT PLAINS OF THE U.S. AND CANADA AND IN THE GREAT LAKES DRAINAGE BASIN *26:44712*.

THE PIPING PLOVER IS VERY SIMILAR TO THE MORE SOUTHERN SNOWY PLOVER (C. ALEXANDRINUS). HOWEVER, THE SNOWY PLOVER CAN BE DISTINGUISHED BY ITS MORE SLENDER BACK BILL, BLACKISH LEGS, AND A DARK EAR PATCH;THE PIPING PLOVER TYPICALLY LACKS THE DARK EAR PATCH AND HAS YELLOWISH LEGS AND A YELLOW BILL AT THE BASE *02:120*.

OTHER COMMON NAMES INCLUDE BEACH BIRD, BEACH PLOVER, BELTED PIPING PLOVER, CALM-BIRD, MOURNING BIRD, PALE RING-NECK, RING-NECK, SAND PLOVER, WESTERN PIPING PLOVER, BUTTER-BIRD, YEE-O, FEEBLE, AND PEEP-LO *06:744,14:45*. TAXONOMIC SYNONYMS INCLUDE AEGIALITIS MELODUS AND AEGIALITIS MELODA CIRCUMCINCTA *18:197*.

<N-SPP-STATUS>

THE PIPING PLOVER IS PROTECTED UNDER THE MIGRATORY BIRD TREATY ACT. IT WAS ONCE VERY ABUNDANT, BUT IS NOW UNCOMMON OVER MOST OF ITS RANGE, AND IT HAS DISAPPEARED FROM MANY HISTORICAL NESTING AREAS *20:4*. ON DECEMBER 30, 1982, THE PIPING PLOVER WAS FIRST LISTED AS BEING CONSIDERED FOR ADDITION TO THE U.S. LIST OF ENDANGERED AND THREATENED WILDLIFE, CATEGORY 2 SPECIES (A SPECIES NEEDING MORE DATA BEFORE A PROPOSED LISTING CAN BE MADE) *27:50727*. BECAUSE OF THE DRASTIC POPULATION DECLINE IN THE GREAT LAKES REGION, THIS POPULATION WAS BELIEVED IN 1984 TO BE IN DANGER OF EXTINCTION *26:44713*. AT THE TIME, THERE WERE FEWER THAN 20 BREEDING PAIRS REMAINING IN THIS POPULATION *20:4*. THE PIPING PLOVER WAS PROPOSED AS ENDANGERED IN THE GREAT LAKES WATERSHED AND THREATENED THROUGHOUT THE REMAINDER OF ITS RANGE ON NOVEMBER 8, 1984 *26:44712*. THE FINAL RULING OF ENDANGERED IN THE GREAT LAKES WATERSHED (INCLUDING PENNSYLVANIA) AND THREATENED THROUGHOUT THE REMAINDER OF ITS RANGE BECAME EFFECTIVE ON DECEMBER 11, 1985. THE CANADIAN COMMITTEE ON THE STATUS OF ENDANGERED WILDLIFE IN CANADA (CCSEWC) ASSIGNED THE STATUS OF ENDANGERED TO THE PIPING PLOVER IN APRIL, 1985 *27:50726*.

THE REASONS FOR THE RECENT DECLINE OF THE PIPING PLOVER

GENERALLY INCLUDE BEACH DISTURBANCE BY PEOPLE AND THEIR PETS AND VEHICLES, LOSS OF SANDY BEACH HABITAT DUE TO RECREATIONAL AND COMMERCIAL DEVELOPMENT, AND EXTENSIVE DAMMING AND CHANNELIZATION OF RIVERS IN THE MIDWESTERN U.S. *02:MAP 120,20:4*.

THE PIPING PLOVER IS LISTED AS A PENNSYLVANIA SPECIES OF SPECIAL CONCERN (EXTIRPATED) *22:348*. CURRENTLY, IT IS CONSIDERED ONLY A RARE MIGRANT IN PENNSYLVANIA, AND IT IS FOUND ALMOST EXCLUSIVELY ALONG THE LAKE ERIE SHORELINE *04:82*. IT USED TO NEST ON PRESQUE ISLE (ERIE COUNTY), BUT BECAUSE OF THE LACK OF PROTECTION OF NESTING SITES AND THE SUBSEQUENT USE OF THE NESTING HABITATS BY RECREATIONISTS, IT BECAME EXTIRPATED BY THE MID-1950'S. IF ITS FORMER NESTING AREA AT PRESQUE ISLE WERE STRICTLY PROTECTED, THE PIPING PLOVER MIGHT RETURN *22:348*. EFFORTS BY THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES (BUREAU OF STATE PARKS) AND THE PRESQUE ISLE AUDUBON SOCIETY ARE BEING MADE TO ENCOURAGE THE RETURN OF THIS SPECIES AS A NESTING BIRD TO THE GULL POINT AREA OF PRESQUE ISLE *04:43*.

THE PIPING PLOVER HAS BEEN ON THE NATIONAL AUDUBON SOCIETY'S BLUE LIST (AN EARLY WARNING LIST OF DECLINING, THREATENED, OR VULNERABLE SPECIES) SINCE 1972 *11:7*. IT IS CONSIDERED AN INDICATOR SPECIES, IN THAT IT SHOWS A NARROW RANGE OF TOLERANCE FOR ENVIRONMENTAL CHANGE *08:177*. IT IS CONSIDERED A NON-CONSUMPTIVE RECREATIONAL SPECIES (FOR BIRD WATCHING, NATURE PHOTOGRAPHY, ETC.).

AT THE CURRENT TIME, NO FEDERAL RECOVERY PLAN EXISTS. HOWEVER, THE U.S. FISH AND WILDLIFE SERVICE (USFWS) HAS INITIATED THE DEVELOPMENT OF A RECOVERY PLAN. THE FIRST DRAFT SHOULD BE COMPLETED BY OCTOBER 1, 1986, AND THE FINAL PLAN SHOULD BE APPROVED BY JULY, 1987. THE LEADER OF THE USFWS PIPING PLOVER RECOVERY TEAM IS JOHN G. SIDLE, ENDANGERED SPECIES DIVISION, FORT SNELLING, TWIN CITIES, MN 55111, PHONE (612)725-3276 *10*. NO CRITICAL HABITATS HAVE BEEN DESIGNATED IN PENNSYLVANIA OR ELSEWHERE DUE TO THE EPHEMERAL NATURE OF PIPING PLOVER HABITAT AND ITS WIDELY SCATTERED DISTRIBUTION *20:4*.

THE USFWS OF THE DEPARTMENT OF THE INTERIOR AND THE PENNSYLVANIA GAME COMMISSION ARE THE FEDERAL AND STATE AGENCIES LEGALLY MANDATED TO PROTECT AND MANAGE THIS SPECIES.

<N-DISTRIB>

THE PIPING PLOVER NESTS LOCALLY ACROSS CANADA FROM CENTRAL ALBERTA, SOUTHERN SASKATCHEWAN, SOUTHERN MANITOBA, NORTHERN MICHIGAN, SOUTHERN ONTARIO, THE NORTH SHORE OF THE GULF OF ST. LAWRENCE, PRINCE EDWARD ISLAND, TO MAGDELENS AND SOUTHWEST NEWFOUNDLAND, SOUTH TO SOUTHEAST SOUTH DAKOTA, CENTRAL NEBRASKA, SOUTHERN SHORES OF LAKES MICHIGAN AND ERIE, AND ALONG THE ATLANTIC COAST TO VIRGINIA *32:MAP 120,06:744*.

THE THREE DISTINCT BREEDING POPULATIONS OF THE PIPING PLOVER ARE FOUND IN THE NORTHERN GREAT PLAINS, ATLANTIC COAST, AND GREAT LAKES WATERSHED REGIONS. THE GREAT LAKES POPULATION HISTORICALLY NESTED FROM THUNDER BAY AND DULUTH ON LAKE SUPERIOR LOCALLY AS FAR EAST AS THE HEADWATERS OF THE ST. LAWRENCE RIVER AND SOUTH TO THE INDIANA DUNES AND OHIO SHORE. IN 1983, THE GREAT LAKES POPULATION WAS VIABLE BUT APPARENTLY DECREASING, AND IT EXISTED ONLY IN MICHIGAN'S UPPER PENINSULA, AT WILDERNESS STATE PARK ON THE STRAITS OF MACKINAC, AND ON SOME OF THE OFFSHORE ISLANDS IN NORTHERN LAKE MICHIGAN. AT THAT TIME, THE SPECIES WAS NEARING EXTIRPATION IN THE DULUTH-SUPERIOR REGION OF WESTERN LAKE SUPERIOR, AND IT HAS RECENTLY DISAPPEARED AS A BREEDING SPECIES FROM SOUTHERN ONTARIO *24:951*.

THE PIPING PLOVER WINTERS SOUTH ALONG THE ATLANTIC COAST FROM SOUTH CAROLINA TO FLORIDA AND WEST ALONG THE GULF COAST TO TEXAS, RARELY TO THE BAHAMA'S AND GREATER ANTILLES *02:MAP 120,06:744*.

IN PENNSYLVANIA, THE PIPING PLOVER HAS HISTORICALLY BEEN A VERY RARE AND IRREGULAR VISITOR EVERYWHERE EXCEPT ALONG THE SHORES OF LAKE ERIE WHERE IT USED TO NEST *16:29,19:101-102,32:304 AND 309*. ONLY A FEW RECORDS EXIST FOR LOCATIONS OTHER THAN THE LAKE ERIE SHORELINE,

AND ALL OF THESE ARE LATE SUMMER OR EARLY AUTUMN RECORDS (FALL MIGRANTS). A GROUP OF FOUR WERE SEEN AT THE TINICUM WILDLIFE PRESERVE IN BUCKS COUNTY (LUMBERVILLE QUADRANGLE) ON 1 AUGUST 1950 *16:29*. PRIOR TO 1984, INDIVIDUAL PLOVERS HAD BEEN RECORDED ON SIX DIFFERENT OCCASIONS AT THE CONEJOHELA FLATS ALONG THE SUSQUEHANNA RIVER IN LANCASTER COUNTY (BORDER OF THE COLUMBIA EAST AND SAFE HARBOR QUADRANGLES). ALL SIX OF THESE RECORDS WERE BETWEEN AUGUST 21 AND SEPTEMBER 25 *13:140*. THERE ARE TWO RECORDS FROM CRAWFORD COUNTY. ONE RECORD (1908) IS OF A SINGLE PLOVER SIGHTED AT MEADVILLE (MEADVILLE QUADRANGLE) *18:196*. THE OTHER RECORD IS OF A SINGLE PIPING PLOVER SEEN AT WOODCOCK CREEK LAKE ON 8 SEPTEMBER 1983 (BLOOMING VALLEY QUADRANGLE) *21:180*. BOTH OF THESE RECORDS ARE VERY UNUSUAL AS THESE AREAS GENERALLY LACK TYPICAL PIPING PLOVER HABITAT, AND THEY ARE NOT ALONG ANY KNOWN MIGRATION CORRIDORS *00*.

PIPING PLOVERS NESTED ON PRESQUE ISLE (ERIE COUNTY) UNTIL THE MID TO LATE 1950'S, WHEREAS IN THE EARLY 1900'S ABOUT 15 PAIRS NESTED THERE ANNUALLY *04:82*. THIS WAS THE ONLY PLACE WHERE THIS SPECIES HAS EVER BEEN RECORDED NESTING IN THE STATE, AND THE LACK OF PROTECTION OF NESTING SITES AND RECREATIONAL USE OF THIS SITE LED TO THE PIPING PLOVER'S EXTIRPATION AS A BREEDER IN PENNSYLVANIA *22:348*. ACCORDING TO THE MOST RECENT PENNSYLVANIA BREEDING BIRD ATLAS PROJECT REPORT (1984-1985 RESULTS), THE SPECIES STILL OCCURS AT PRESQUE ISLE AS A MIGRANT BUT NOT AS A BREEDER *36*. IF ITS FORMER NESTING AREA (GULL POINT AREA, PRESQUE ISLE) WERE STRICTLY PROTECTED, SOME BELIEVE THE PIPING PLOVER MIGHT RETURN *22:348*. FOR THE PERIOD WHEN THE PIPING PLOVER USED TO NEST ON PRESQUE ISLE, THE EARLIEST ARRIVAL DATE FOR BREEDING BIRDS WAS APRIL 16, AND THE LATEST DEPARTURE DATE WAS SEPTEMBER 26 *18:196*.

CURRENTLY THE PIPING PLOVER IS CONSIDERED AN IRREGULAR, RARE SPRING AND FALL VISITOR IN ERIE COUNTY *03:3*. DURING SPRING MIGRATION IT MAY OCCUR ALONG PENNSYLVANIA'S LAKE ERIE SHORELINE BETWEEN THE LAST WEEK OF APRIL AND THE THIRD WEEK OF MAY. DURING THE FALL MIGRATION IT MAY BE SEEN THERE FROM THE LAST WEEK OF JULY THROUGH THE FIRST WEEK OF SEPTEMBER *03:3*. THE LAKE ERIE SHORELINE IS THE ONLY KNOWN TRUE MIGRATION CORRIDOR IN THE STATE *00*, ALTHOUGH IN THE MIDWESTERN U.S. THE PIPING PLOVER DOES MIGRATE ALONG MAJOR RIVER SYSTEMS SUCH AS AS MISSISSIPPI VALLEY *02:MAP 120*.

<N-HABITAT>

THE PIPING PLOVER IS A RIPARIAN SPECIES *34*. IT IS GENERALLY FOUND ASSOCIATED WITH SANDY BEACHES, TIDAL FLATS, MUDFLATS, SANDBARS, GRAVEL SPITS, AND SALINE AND ALKALINE WETLANDS *02:120,13:140,25:3940*. THIS SPECIES NORMALLY OCCUPIES WIDE, OPEN BEACHES WITH LITTLE BRUSH, DEBRIS, OR COASTAL VEGETATION *01:64,24:951*; IT USUALLY SHUNS THE SHORES OF ALL BUT THE LARGEST BODIES OF WATER *18:196*. ALSO, IT IS USUALLY ABSENT FROM NARROW BLUFF-LINED BEACHES, SHINGLE, ROCKY, OR CLAY SHORES, AND HEAVILY DISTURBED SITES *24:951*.

THE PIPING PLOVER HAS A RATHER NARROW RANGE OF HABITAT REQUIREMENTS AND PREFERENCES FOR UNSPOILED AND UNDEVELOPED BEACHES WITH LITTLE VEGETATION *33:224*, AND IT IS THUS CONSIDERED AN INDICATOR SPECIES *08:177*. HABITAT PREFERENCES DO, HOWEVER, VARY SOMEWHAT GEOGRAPHICALLY. ON THE ATLANTIC COAST AND THE SHORES OF THE GREAT LAKES, THE PIPING PLOVER PREFERS ESSENTIALLY A NARROW BAND OF OPEN OR SPARSELY VEGETATED, DRY SANDY BEACH UP TO SEVERAL HUNDRED METERS WIDE *08:173,08:177,18:196,20:4*. ON THE GREAT PLAINS, PIPING PLOVERS ARE CONFINED TO A NARROW BAND ALONG THE SHORES OF LAKES AND RIVERS *08:177*. ALONG THE UPPER MISSOURI RIVER SYSTEM, IT PREFERS BARE AREAS ON NATURAL ALLUVIAL ISLANDS; AND, IN THE DAKOTAS, MONTANA, AND THE CANADIAN PRAIRIE PROVINCES IT PREFERS SALT-ENCRUSTED, BARE PATCHES OF SAND, GRAVEL, OR PEBBLY MUD ALONG INTERIOR ALKALI LAKES *08:173,12:59,20:4*.

THE PIPING PLOVER IS NOT ASSOCIATED WITH ANY FOREST HABITATS *33*.

LAND USE/LAND COVER TYPES WITH WHICH THE PIPING PLOVER IS ASSOCIATED INCLUDE WATER (LAKES AND RESERVOIRS), WETLANDS (NONFORESTED), AND BARREN LAND (BEACHES), WITH A PREFERENCE FOR BEACHES *34,35*. IT HAS ALSO BEEN KNOWN TO COLONIZE MAN-MADE HABITATS AND DREDGE FILL AREAS *08:173*.

WETLAND HABITAT ASSOCIATIONS INCLUDE MARINE (INTERTIDAL BEACH/BAR SAND, IRREGULAR TIDAL), ESTUARINE (INTERTIDAL FLAT), PALUSTRINE (FLAT SAND, UNCONSOLIDATED SHORE OF SAND AND MUD), RIVERINE, (LOWER PERENNIAL, BEACH/BAR, AND UNCONSOLIDATED SHORE OF SAND AND SATURATED MUD), AND LACUSTRINE (LITTORAL, FLAT, LITTORAL BEACH/BAR, AND LITTORAL UNCONSOLIDATED SHORE OF SAND AND SATURATED MUD *34,35*.

BREEDING PIPING PLOVERS REQUIRE WIDE AND RELATIVELY UNDISTURBED SANDY BEACHES WITH LITTLE VEGETATION *07:235,29:531, 30:135,33:224*. ON LONG ISLAND (NEW YORK) THIS SPECIES FAVORED DRY SANDY OUTER BEACHES FOR NESTING *30:134*. IN NOVA SCOTIA, 55 OF 61 NESTS (90%) WERE FOUND ON RELATIVELY BARE AREAS OF SANDSPITS *08:173*. THE PRESENCE OF RIVER OR STREAM OUTLETS, LAGOONS, OR COASTAL STORM PONDS INCREASES THE ATTRACTIVENESS OF SITES FOR BREEDING PLOVERS *24:952*. ANOTHER STUDY AREA OF BREEDING PLOVERS IN NOVA SCOTIA HAD UNCONSOLIDATED SAND STREWN WITH GRAVEL, CLODS OF PEAT, DRIFTWOOD, AND OTHER DEBRIS, AND EXTREMELY SCANTY VEGETATION CONSISTING OF SEABEACH SANDWORT (ARENARIA PEPLOIDES) AND, TO A LESSER EXTENT, MARRAM BEACH GRASS (AMMOPHILA BREVILIGULATA) *29:531*. PIPING PLOVERS HAVE ALSO BEEN OBSERVED NESTING ON A GRAVEL PAVEMENT ON A SAND DUNE 100 M. FROM THE SHORE, SEPARATED BY RUSHES (JUNCUS BALTICUS) AND OTHER VEGETATION *12:59*. ANOTHER STUDY OF BREEDING PIPING PLOVERS (LONG ISLAND, NEW YORK) EMPHASIZES THE PIPING PLOVER'S PREFERENCE FOR LITTLE OR NO VEGETATION. THIS STUDY REVEALED THAT ONCE MARRAM BEACH GRASS BECAME ESTABLISHED, THE BREEDING PLOVERS DESERTED THE BEACH *30:135*.

PREFERRED FEEDING HABITATS IN COASTAL AREAS INCLUDE WET SANDS ALONG THE EDGES OF INCOMING WAVES AND MUD FLATS EXPOSED AT LOW TIDE *33:225*. A STUDY OF FEEDING HABITAT PREFERENCES ON LONG POINT, ONTARIO (LAKE ERIE) SHOWED A DIFFERENTIAL USE OF SPARSELY VEGETATED BEACH POOL VS. THE BEACH-LAKE INTERFACE. THIS DIFFERENTIAL USE OF THESE HABITATS WAS CORRELATED WITH SEASON AND WAS APPARENTLY THE RESULT OF SEASONAL VARIATION IN FOOD DENSITIES IN THESE TWO HABITATS. IN SPRING (APRIL-JUNE), THE BEACH-LAKE INTERFACE WAS FAVORED (80% UTILIZATION); IN SUMMER (JULY-AUGUST), THE SHIFT WAS TO THE BEACH POOL HABITAT (70% UTILIZATION); AND, IN FALL (SEPTEMBER-OCTOBER), THE BEACH POOL HABITAT WAS MOST HEAVILY USED (90% UTILIZATION) *07:232*.

DURING MIGRATION ALONG THE ATLANTIC COAST, THE PREFERRED HABITAT IS MOSTLY OUTER BEACHES, ESPECIALLY THE SAND-WATER INTERFACE OF WET OR WATER-COVERED SAND *08:174*. LITTLE IS KNOWN ABOUT SPECIFIC HABITAT REQUIREMENTS ON THEIR WINTERING GROUNDS *08:180*.

<N-FOOD>

THE PIPING PLOVER FEEDS PRIMARILY ON INVERTEBRATE FOODS (ANNELIDS, MOLLUSCS, AND ARTHROPODS) WHICH IT LOCATES GENERALLY IN THE WET SAND OF THE SHORELINE. FOOD ITEMS IDENTIFIED INCLUDE MARINE WORMS, SMALL CRUSTACEANS, MOLLUSCS, VARIOUS SHORE-BRED INSECTS (ESPECIALLY FLY LARVAE AND BEETLES), "HOPPERS", AND "OTHER SMALL MARINE ANIMALS AND THEIR EGGS" *06:744,14:44,28:240*. THEY HAVE ALSO BEEN KNOWN TO CONSUME SEEDS FOUND ALONG THE DRY, SANDY BEACHES THEY INHABIT *34*. BEYOND THIS, VERY LITTLE IS APPARENTLY KNOWN REGARDING ADDITIONAL DETAILS OF PIPING PLOVER DIETS. NO INFORMATION WAS FOUND FOR EITHER SEASONAL VARIATION IN DIET OR ANY DIFFERENCES BETWEEN THE DIETS OF ADULT AND JUVENILE PIPING PLOVERS. THE PRECOCIAL YOUNG ARE NOT FED BY THEIR PARENTS, BUT INSTEAD FEED THEMSELVES *24:241*. IT IS ASSUMED THAT

ADULT AND JUVENILE PIPING PLOVER DIETS ARE BASICALLY THE SAME *00*.

<N-MGMT>

ONCE A VERY ABUNDANT BIRD, THE PIPING PLOVER IS NOW UNCOMMON OVER MOST OF ITS RANGE, DUE PRINCIPALLY TO VARIOUS KINDS OF DISTURBANCE AND HABITAT LOSS *20:4*. IT REQUIRES RELATIVELY WIDE, UNDISTURBED AND UNVEGETATED BEACHES FOR NESTING *07:235*. BECAUSE OF DECLINGING PIPING PLOVER NUMBERS AND CONTINUAL LOSS OF SUCH HABITATS, IT WAS CONCLUDED IN 1983 THAT THE ENTIRE GREAT LAKES POPULATION WOULD BECOME EXTIRPATED WITHIN A DECADE UNLESS IMMEDIATE MEASURE WERE TAKEN TO AFFORD MORE THAN MINIMAL PROTECTION TO THE REMAINING BIRDS AND THEIR HABITAT *24:955*. IT IS GENERALLY BELIEVED THAT THE PRESENT DECLINE IS THE RESULT OF REPRODUCTIVE FAILURES (DUE TO HABITAT CHANGE, DISTURBANCE TO NESTING BIRDS, AND THE DESTRUCTION OF EGGS AND YOUNG) RATHER THAN AN INCREASE IN POST-FLEDGING MORTALITY *09*.

ANY MEASURES WHICH WOULD INCREASE, ENHANCE, OR MAINTAIN APPROPRIATE HABITAT, AND PROVIDE GREATER PROTECTION TO NESTING BIRDS AND THEIR EGGS/YOUNG WOULD BE BENEFICIAL. SOME BELIEVE THAT IF THE PIPING PLOVER'S FORMER NESTING HABITAT ON PRESQUE ISLE PENINSULA (ERIE COUNTY, PENNSYLVANIA) WAS STRICTLY PROTECTED, IT MIGHT RETURN AS A BREEDER *22:348*. HOWEVER, THE NEAR TOTAL ABSENCE OF SOURCE BIRDS ON THE EASTERN GREAT LAKES FROM WHICH A NEW COLONY MIGHT BE ESTABLISHED WOULD REDUCE THIS POSSIBILITY *24:954*. IN AN ATTEMPT TO ENCOURAGE THE RETURN OF THIS SPECIES AS A BREEDER TO PRESQUE ISLE IN 1985, THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES AND THE PRESQUE ISLE AUDUBON SOCIETY (ERIE, PA.) CREATED EXCLOSURE AREAS TO REDUCE THE DISTURBANCE OF TRADITIONAL PLOVER BREEDING HABITAT BY PEOPLE AND THEIR PETS ON GULL POINT. SILHOUETTE DECOYS HAVE ALSO BEEN PLACED WITHIN THE EXCLOSURE AREAS IN AN ATTEMPT TO ENTICE MIGRANTS TO REMAIN IN THE AREA *00*.

THE SUCCESS OF MANAGING PRESQUE ISLE FOR THE RETURN OF BREEDING PLOVERS COULD BE INCREASED IF GREATER PROTECTIVE POLICIES WERE ESTABLISHED AND ENFORCED ON PRESQUE ISLE. THE INVOLVEMENT OF OTHER AGENCIES SUCH AS THE PENNSYLVANIA GAME COMMISSION (PGC) AND U.S. FISH AND WILDLIFE SERVICE (USFWS) IS CERTAINLY WARRANTED. BECAUSE OF THE RECENT LISTING OF THE PIPING PLOVER AS ENDANGERED OR THREATENED, THE AUTHORITY OF THE FEDERAL GOVERNMENT IS INCREASED. SECTION 5 OF THE ENDANGERED SPECIES ACT AUTHORIZES THE ACQUISITION OF LANDS FOR THE PURPOSE OF CONSERVING ENDANGERED OR THREATENED SPECIES; AND, PURSUANT TO SECTION 6, THE USFWS COULD GRANT FUNDS TO THE PGC FOR MANAGEMENT ACTIONS AIDING THE PROTECTION AND RECOVERY OF THE PIPING PLOVER ON PRESQUE ISLE ONCE A RECOVERY PLAN IS COMPLETED AND APPROVED *26:44714*.

EVEN IF THE APPROPRIATE PHYSICAL HABITAT COULD BE PROTECTED, HOWEVER, PREDATION BY AVIAN AND MAMMALIAN PREDATORS WOULD STILL POSE SERIOUS THREATS. PIPING PLOVER EGGS AND CHICKS HAVE BEEN DESTROYED BY GULLS, CROWS, MICE, RATS, OPPOSSUMS, SKUNKS, RACCOONS, AND FERAL DOGS AND CATS *09,11:7,23:294,31:50*. THUS, ANY SERIOUS ATTEMPT AT MANAGING PIPING PLOVERS MUST ALSO INCLUDE SOME DEGREE OF PREDATOR CONTROL OR EXCLUSION.

OTHER BENEFICIAL MANAGEMENT PRACTICES INCLUDE: RESTRICTING/REGULATING HUMAN USE OF HABITATS, RESTRICTING/REGULATING HUMAN DISTURBANCE OF POPULATIONS, MAINTAINING WILDERNESS ENVIRONMENTS, CREATING IMPOUNDMENTS, DEVELOPING/MAINTAINING MUDFLATS, MAINTAIN UNDISTURBED RESTING AREAS FOR MIGRATING PIPING PLOVERS, MAINTAINING NATURAL RIVER AND LAKE DYNAMICS, MAINTAINING EARLY STAGES OF SUCCESSION, PREDATOR CONTROL, CREATION OF OPEN SANDY AREAS BY BURNING, CUTTING VEGETATION OR USE OF EARTHMOVING EQUIPMENT OUTSIDE OF THE BREEDING SEASON, TEMPORARY AND CAREFULLY CONTROLLED LOWERING OF WATER LEVELS ON LAKES OR RESERVOIRS TO CREATE MUD AND SAND FLATS FOR FEEDING, DEPOSITION OF FILL MATERIAL (SAND) ALONG SHORELINES, AND PROHIBITION OF THE TAKING OR HARASING OF BIRDS, EGGS, AND YOUNG

08:176,09,20:4,34,35.

ADVERSE MANAGEMENT PRACTICES INCLUDE: COMMERICIAL AND RECREATIONAL DEVELOPMENT OF BEACHES, RAISING WATER LEVELS WHICH MIGHT FLOOD THE BREEDING HABITAT, INCREASED NOISE LEVELS, APPLICATION OF PESTICIDES AND HERBICIDES, INDUSTRIAL POLLUTION, SURFACE MINING, RIVER STABILIZATION, MAINTAIN OR ENHANCING NORMAL PLANT SUCCESSION, VEHICULAR TRAFFIC ON BEACHES, DAMMING AND CHANNELIZATION OF RIVERS, DREDGING, HARVESTING OF BIRDS OR THEIR EGGS, AND GRAZING *07:235, 08:176-179,09,20:4,26:44713,31:50*.

<HEP-DATA>

<ANIMAL-PLANT>

GENERAL ANIMAL ASSOCIATIONS: MUCH OF THE RIVERINE HABITAT IN THE MIDWEST USED BY PIPING PLOVERS MAY ALSO BE USED BY THE INTERIOR LEAST TERN (STERNA ANTILLARUM ATHALASSOS) *20:4*.

PREDATION: SUSPECTED EGG PREDATORS INCLUDE NORWAY RATS (RATTUS NORVEGICUS), HOUSE MICE (MUS. MUSCULUS), RACCOONS (PROCYON LOTOR), STRIPED SKUNKS (MEPHITIS MEPHITIS), AND RING-BILLED GULLS (LARUS DELAWARENSIS) *08:174,09,20:4,23:294,30:140*. CONFIRMED PREDATORS OF EGGS/YOUNG INCLUDE COMMON CROWS (CORVUS BRACHYRHYNCHOS), RED FOX (VULPES VULPES), DOGS (CANIS FAMILIARIS), AND OPOSSUM (DIDELPHIS MARSUPIALIS) *09,20:4,30:140*. ALSO, FERAL DOMESTIC CATS (FELIS DOMESTICUS) ARE THOUGHT TO BE RESPONSIBLE FOR PREDATION ON EGGS/YOUNG *09*.

<DESCRIPTION>

THE PIPING PLOVER IS A RELATIVELY SMALL PLOVER VERY SIMILAR IN APPEARANCE TO THE MORE SOUTHERN SNOWY PLOVER (CHARADRIUS ALEXANDRINUS) *02:120*. THE PLUMAGE OF THE ADULT MALE PIPING PLOVER IS DESCRIBED AS: FOREHEAD, RING AROUND BACK OF NECK, AND ENTIRE UNDERPARTS ARE WHITE; BLACK BAND ABOVE WHITE FOREHEAD; BAND ENCIRCLING THE NECK IS BLACK (THIS BAND IF OFTEN INTERRUPTED IN FRONT); HEAD ABOVE AND UPPERPARTS OF BODY LIGHT ARE BROWNISH CINEREOUS; RUMP AND UPPER TAIL COVERTS ARE LIGHTER AND OFTEN WHITE; TAIL AT BASE IS WHITE, WITH THE OUTER FEATHERS WHITE; MIDDLE TAIL FEATHERS WITH A WIDE SUB-TERMINAL BAND OF BROWNISH-BLACK, TIPPED WITH WHITE. BILL IS ORANGE-YELLOW AT BASE, TIPPED WITH BLACK; LEGS ARE ORANGE-YELLOW. THE FEMALE IS SIMILAR TO THE MALE, BUT WITH THE DARK COLORS BRIGHTER AND LESS IN EXTENT *19:151*. WHEN BOTH MALE AND FEMALE ARE COMPARED IN THE HAND, THE MALES APPEAR TO HAVE LARGER BILLS AND A BROADER BLACK BAND ON THE FOREHEAD. THESE CHARACTERISTICS WILL DISTINGUISH THE SEXES ABOUT 95% OF THE TIME IN THE HAND *30:147-148*.

TOTAL LENGTH OF THE PIPING PLOVER IS 6 TO 7-1/2 INCHES *02:120*. THE WEIGHTS OF 49 BREEDING MALES AVERAGED 54.9 GM. (RANGE, 46.5 TO 63.7 GM.), AND THERE IS A SLIGHT INCREASE IN WEIGHT WITH AGE *30:148*.

<ORIGIN>

THE PIPING PLOVER IS NATIVE TO PENNSYLVANIA *19*.

<BEHAVIOR>

THE PIPING PLOVER IS A DIURNAL SPECIES *34* WHICH IS USUALLY SEEN SINGLY OR IN SMALL FLOCKS *06:744*. ITS GENERAL BEHAVIOR IS ALMOST IDENTICAL TO THAT OF THE SEMIPALATED PLOVER (CHARADRIUS SEMIPALMATUS) *28:241*. IN FLIGHT, ITS COURSE HAS BEEN DESCRIBED AS WILDER THAN THE HEADLONG FLIGHT OF THE SANDERLING (CALIDRIS ALBA); BY CONTRAST THE PIPING PLOVER'S FLIGHT INVOLVES MORE TWISTING AND TURNING *06:744*. WHILE FLYING LOW OVER SANDY BEACHES, IT UTTERS A CLEAR, MELODIOUS WHISTLE DESCRIBED AS PEEP, PEEP, PEEP-LO, AND WHILE RUNNING ON THE SAND THE CALL IS A PLAINTIVE, TWO-SYLLABLED PEEP-LO *02:120,06:744*. ON THE GROUND, THE PIPING PLOVER FREQUENTLY BOBS IN CHARACTERISTIC PLOVER FASHION. THIS BEHAVIOR IS A SINGLE HITCHING MOTION BY WHICH THE BODY IS TILTED UP AND DOWN ON THE LEGS AS A FULCRUM *28:244*. WHEN IT CROUCHES, IT SEEMS TO DISAPPEAR DUE TO ITS CRYPTIC COLORATION *06:744*.

THE PIPING PLOVER GENERALLY FORAGES ON SANDY BEACHES OR MUD FLATS EXPOSED AT LOW TIDE *08:172,33:225*. ITS FORAGING STRATEGY

IS PROBING AND GLEANING THE SAND ALONG THE EDGE OF THE WATER *33:225, 35*. FEEDING HABITS ARE DESCRIBED AS LEISURELY AND DELIBERATE, AND MUCH LIKE THAT OF THE ROBIN (TURDUS MIGRATORIUS) *06:744,28:240*. IT WILL RUN A SHORT DISTANCE, PAUSE TO STARE AT THE SAND, HEAD TILTED SLIGHTLY TO ONE SIDE, THEN PICK UP SOMETHING FROM THE SAND *06:744*. ALSO, IT OFTEN STANDS ON ONE FOOT AND VIBRATES THE OTHER FOOT AGAINST THE MOIST SAND BEFORE PROBING. IT HAS BEEN PROPOSED THAT THIS FOOT-TREMBLING HELPS THE BIRD DETECT FOOD ITEMS. WHEN ACTIVELY FEEDING, THE BIRD AVERAGES ABOUT 30 PECKS PER MINUTE *08:172*.

BOTH NESTING AND FEEDING TERRITORIES ARE DEFENDED THROUGHOUT THE BREEDING SEASON BY BREEDING PAIRS. UNMATED MALES, NON-BREEDING PAIRS, AND PAIRS THAT HAVE LOST A CLUTCH ALSO DEFEND BOTH KINDS OF TERRITORIES *29:532*. CAIRNS *1982* DESCRIBES TERRITORIAL DISPLAYS IN DETAIL *29:533-536*. GENERALLY, THEY INCLUDE BOTH GROUND AND AERIAL DISPLAYS FOR ADVERTISEMENT AND DEFENSE OF THE TERRITORY. NESTING TERRITORIES FOR A POPULATION IN NOVA SCOTIA RANGED FROM 500-8000 SQ. M. AND AVERAGED ABOUT 4000 SQ. M. (0.4 HA OR ONE ACRE). OF 23 NESTS STUDIED ONE YEAR, THE AVERAGE DISTANCE TO THE NEAREST NEIGHBOR WAS 51 M.; AND OF 27 NESTS STUDIED ANOTHER YEAR, THE AVERAGE DISTANCE WAS 53 M. THE CLOSEST SIMULTANEOUSLY ACTIVE NESTS WERE 3 M. APART *29:532*. FEEDING TERRITORIES REPORTED FOR THE SAME POPULATION WERE ADJACENT TO THE NESTING TERRITORIES AND INCLUDED FROM 50 TO 100 M. OF THE BEACH-WATER INTERFACE *29:532*. WHEN THE YOUNG HAVE HATCHED AND ARE MOVING ABOUT IN THE NESTING/FEEDING TERRITORY, THE PARENTS WILL CHASE AWAY OTHER ADULTS IF THEY COME TOO NEAR *30:136*.

INTERSPECIFIC INTERACTIONS INCLUDE BOTH INTERSPECIFIC TERRITORIAL DEFENSE AND FEIGNING INJURY ("BROKEN WING ACT"). PIPING PLOVERS HAVE BEEN OBSERVED DEFENDING THEIR TERRITORY AND YOUNG FROM ROBINS, HERRING GULLS, AND GREAT BLACK-BACKED GULLS *30:144*. A MALE WAS ONCE SEEN FEIGNING INJURY TO A LEAST TERN WHICH WAS NESTING NEAR THE PLOVER'S NEST *30:144*. THIS TYPE OF DISTRACTION BEHAVIOR USUALLY BEGINS ABOUT ONE TO TWO WEEKS BEFORE THE EGGS HATCH AND IS MOST FREQUENT AND INTENSE ABOUT THE TIME OF HATCHING *14:43-44, 29:539,30:144*. OTHER DISTRACTION DISPLAYS TO INTRUDERS (AVIAN, HUMAN AND OTHER MAMMALIAN) INCLUDE SQUATTING, FALSE BROODING, HIGH-TAILED RUNNING, AND CROUCH RUNNING. BOTH BIRDS OF A PAIR MAY SIMULTANEOUSLY ENGAGE IN DISTRACTION DISPLAYS, OR ONE MAY LEAD THE YOUNG AWAY WHILE THE OTHER DISPLAYS TOWARDS THE INTRUDER *29:539*.

THE YOUNG SEEM TO LEAVE THE BREEDING AREA SOON AFTER BEING ABLE TO FLY (FLEDGING). THE JUVENILES WERE OBSERVED TO LEAVE THE BREEDING BEACH 32 AND 47 DAYS AFTER HATCHING. THERE IS NO EVIDENCE THAT SUGGESTS THE BIRDS REMAIN IN FAMILY GROUPS AFTER THEY LEAVE THE NESTING AREA *08:174*. IN NOVA SCOTIA, THE OLDEST OF THE FLEDGED YOUNG AND SOME ADULTS FLOCKED ON NEUTRAL FEEDING AREAS AND ASSOCIATED WITH OTHER MIGRANTS IN EARLY JULY PRIOR TO MIGRATION. THESE OTHER MIGRANT SPECIES INCLUDED LEAST SANDPIPERS, GREATER YELLOWLEGS, SANDERLINGS, SEMIPALMATED PLOVERS AND SPOTTED SANDPIPERS *29:543-544*. MIGRATION ALONG THE ATLANTIC COAST OCCURS MOSTLY ON THE OUTER BEACHES, ESPECIALLY ON WET OR WATER-COVERED SAND *08:174*, AND IN PENNSYLVANIA MIGRATION OCCURS ALMOST EXCLUSIVELY ALONG THE LAKE ERIE SHORELINE *18:196*. ON THE WINTERING GROUNDS, PIPING PLOVERS CONGREGATE IN SMALL WINTER FLOCKS *32:225*. ADULTS TEND TO RETURN TO PREVIOUSLY USED NESTING TERRITORIES; HOWEVER, YOUNG SHOW LESS FIDELITY TO THEIR NATAL AREA AS DETERMINED FROM BANDING STUDIES *30:136*.

<REPRODUCTION>

THE PIPING PLOVER HAS BEEN DESCRIBED AS BOTH A SOLITARY NESTING SPECIES *01:644 AND A SEMI-COLONIAL NESTER *08:175*. GENERALLY, NESTING HABITAT INCLUDES RELATIVELY WIDE UNVEGETATED, LIGHT-COLORED SANDY BEACHES ALONG THE OUTER SHORE OF COASTAL AREAS; HOWEVER, SPECIFIC NESTING HABITATS MAY VARY GEOGRAPHICALLY. ALONG THE GREAT LAKES, THEY USUALLY NEST ON SANDY BEACHES OR OTHER OPEN, UNVEGETATED

AREAS. SOME HAVE BEEN FOUND TO NEST ON ROCKY BEACHES, ALTHOUGH THIS IS RATHER UNUSUAL. OTHER REPORTED NEST SITES INCLUDE: UNVEGETATED FLATS NEAR ALKALINE OR SALT LAKES; BARE AREAS NEXT TO WATER WITH GRAVEL, SAND, OR PEBBLY MUD SUBSTRATE; BARE SANDSPITS; AND RIVER SANDBARS *08:172-173*. THE PRESENCE OF RIVER OR STREAM OUTLETS, LAGOONS, OR COASTAL STORM PONDS APPARENTLY INCREASE THE ATTRACTIVENESS OF SITES FOR BREEDING PLOVERS *24:952*.

THE NEST IS USUALLY LOCATED WELL ABOVE THE HIGH TIDE MARK WHERE THERE IS LITTLE OR NO VEGETATION. IN CONTRAST TO OTHER SPECIES OF CHARADRII, THE CHOICE OF NEST SITES BY PIPING PLOVERS IS NOT TIED TO THE PROXIMITY OF VEGETATION OR OTHER PHYSIOGRAPHIC FEATURES *29:539*. IN FACT, IF TOO MUCH VEGETATION BECOMES ESTABLISHED PIPING PLOVERS MAY DESERT THE NESTING AREA *30:135*.

THE NEST IS A SLIGHT HOLLOW IN THE SAND, SOMETIMES LINED WITH BITS OF BROKEN SHELL, DRIFTWOOD, OR PEBBLES *01:64,06:744*.

PIPING PLOVERS OCCUPY THEIR BREEDING GROUNDS FROM LATE MARCH TO AUGUST *20:4*. PENNSYLVANIA BREEDING BIRD ATLAS PROJECT 'SAFE DATES' FOR NESTING PIPING PLOVERS ARE JUNE 15 TO JULY 20 *05: APPENDIX A2*. ON LONG POINT, ONTARIO (LAKE ERIE), PIPING PLOVERS USED TO ARRIVE IN EARLY APRIL, AND EGGS WERE GENERALLY LAID FROM THE FIRST OF MAY TO THE END OF JULY *07:226*. HISTORICAL EGG DATES FOR PRESQUE ISLE ARE MAY 24, 29, AND 31 *16:196*, AND ON LONG ISLAND, NEW YORK, THE EARLIEST EGG DATE IS APRIL 26 AND LATEST IS JULY 23 *30;141*. IT IS LIKELY THAT THIS LATE EGG DATE IS FROM A SECOND CLUTCH OF A FAILED FIRST CLUTCH. ONE PAIR ON LONG ISLAND RENESTED AFTER A 10-DAY INTERVAL FOLLOWING FAILURE OF THE FIRST CLUTCH *08:173*.

CAIRNS *1982* PROVIDES DETAILS OF COURTSHIP BEHAVIOR OF PIPING PLOVERS. THE DISPLAY SITE IS ON THE GROUND. TWO PRECOPULATORY DISPLAYS INCLUDE 'SCRAPING', WHERE THE COURTING MALE SQUATS, LEANS FAR FORWARD ON HIS BREAST, KICKS SAND BACKWARDS, AND PRODUCES A SHALLOW DEPRESSION OR SCRAPE IN SAND; AND, A 'TILT DISPLAY' WHERE THE MALE HOLDS IS BODY HORIZONTAL, BUT WITH TAIL ELEVATED UPWARD AT AN ANGLE OF ABOUT 30 DEGREES. THE FEMALE OFTEN THEN CROUCHES SLIGHTLY BEHIND THE MALE, AND THRUSTS HER BEAK ONE OR MORE TIMES AMONG THE FEATHERS AT THE BASE OF HIS TAIL. COPULATION IS TYPICAL OF OTHER CHARADRIUS SPP., AND LASTS FOR UP TO 1.5 MINUTES. NO POST-COPULATORY DISPLAYS HAVE BEEN OBSERVED, ALTHOUGH BOTH BIRDS MAY PREEN AFTER COPULATION. PIPING PLOVERS WILL COPULATE ANYWHERE WITHIN THEIR NESTING AND FEEDING TERRITORY, ALTHOUGH OTHER CLOSELY RELATED SPECIES COPULATE ONLY AT THE NEST OR SCRAPE SITES *29:537-539*.

EGG LAYING BEGINS ABOUT TWO WEEKS FOLLOWING SCRAPE FORMATION, AND CLUTCHES ARE GENERALLY COMPLETED IN SIX DAYS WITH INTERVALS BETWEEN LAYING RANGING FROM 44-77 HOURS, GENERALLY 44-54 HOURS *29: 540*. DATA FROM 56 CLUTCHES (215 EGGS) INDICATE THAT THE PIPING PLOVER ALMOST ALWAYS LAYS FOUR EGGS (AVERAGE CLUTCH SIZE, 3.96 EGGS; RANGE 3-4). SECOND CLUTCHES (FROM FAILED FIRST CLUTCHES), USUALLY CONTAIN ONLY THREE EGGS *01:64,29:450*. ONE UNUSUAL CLUTCH WAS FOUND CONTAINING EIGHT EGGS *23:294*; ALL INDICATIONS WOULD SUGGEST THAT THIS WAS THE RESULT OF TWO FEMALES HAVING PRODUCED THIS 'DOUBLE CLUTCH'.

EGGS ARE OVAL TO PYRIFORM, LIGHT BUFF, EVENLY AND LIGHTLY MARKED WITH FINE SPOTS OF DARK BROWN WITH A SMOOTH, DULL SHELL (AVE. LENGTH 32.5 MM, AVE. WIDTH 24.8 MM, AVE. WT. 9.6 G.) *01:64,08:173,29:450*.

INCUBATION BEGINS WITH THE LAYING OF THE THIRD OR FOURTH EGG *01:64,30:141* AND IS SHARED APPROXIMATELY EQUALLY BY BOTH SEXES DURING THE DAYTIME PERIOD *01:64,29:540-541*. ONE STUDY REVEALED A MEAN TIME OF DAYTIME INCUBATION BOUTS OF 79.4 MINUTES (RANGE, 25-153 MINUTES; N=17) *29:540-541*. THE INCUBATION PERIOD IS GENERALLY 27-28 DAYS, SOMETIMES SLIGHTLY LONGER *01:64,06:744, 08:173*. THE ENTIRE CLUTCH GENERALLY HATCHES WITHIN FOUR TO EIGHT HOURS, AND THE YOUNG LEAVE THE NEST AS SOON AS THEY ARE DRY,

USUALLY WITHIN TWO TO THREE HOURS.

YOUNG ARE CARED FOR BY BOTH PARENTS, AND THE ADULTS MAY BROOD THE YOUNG UNTIL THEY ARE 20 DAYS OLD. GENERALLY, THE YOUNG STAY WITHIN 100 TO 200 METERS OF THE NEST UNTIL THEY CAN FLY WHEN FOUR TO FIVE WEEKS OLD *08:174,30:142*. IF A YOUNG BIRD IS PRESSED TO ESCAPE A POTENTIAL PREDATOR, IT WILL NOT HESITATE TO TAKE TO THE WATER, AND EVEN THOSE ONLY A FEW HOURS OLD CAN SWIM WELL *28:239*. A STUDY ON LONG ISLAND REPORTED THAT 612 OF 668 EGGS (91%) IN 174 NESTS HATCHED, WITH AN AVERAGE OF 3.5 YOUNG HATCHED PER NEST. IN ANOTHER STUDY (NOVA SCOTIA), 152 OF 201 EGGS IN 51 NESTS HATCHED (76%) FOR AN AVERAGE OF 3.0 YOUNG PER NEST *08:173-174*. LESS INFORMATION IS AVAILABLE ON FLEDGING SUCCESS, AND THIS CAN BE MORE DIFFICULT TO ASSESS. HOWEVER, ON A REMOTE BEACH SITE IN NOVA SCOTIA, 1.3 TO 2.1 YOUNG PER PAIR FLEDGED, WHILE ON A RECREATIONAL BEACH 0.7 TO 1.1 YOUNG PER PAIR FLEDGED *29:542-543*.

AT HATCHING, THE YOUNG WEIGH AN AVERAGE OF 6.8 G. AT TEN DAYS, THEY WEIGH 12.4 G.; 21 DAYS, 25.7 G.; AND 29 DAYS, 29.4 G. THUS, AT THE TIME OF FLEDGING, THEY WEIGH ONLY A LITTLE OVER HALF THE ADULT WEIGHT. THE YOUNG APPARENTLY LEAVE THE BREEDING AREA SOON AFTER FLEDGING, AND THERE IS NO EVIDENCE THAT THE BIRDS STAY IN A FAMILY GROUP AFTER THEY LEAVE *08:174*.

PIPING PLOVERS ARE REPRODUCTIVELY MATURE AT ONE YEAR OF AGE *33:225*. PIPING PLOVERS ARE CONSIDERED MONOGAMOUS. THEY MAY CHANGE MATES BETWEEN YEARS ON A REGULAR BASIS, ALTHOUGH A FEW BIRDS ARE KNOWN TO HAVE HAD THE SAME MATE IN CONSECUTIVE YEARS *08:175*. NO INFORMATION WAS AVAILABLE REGARDING SEX RATIOS OF OFFSPRING OR MAXIMUM BREEDING AGE. ONE PIPING PLOVER, HOWEVER, IS KNOWN TO HAVE LIVED TO BE AT LEAST 14 YEARS OLD *08:175*.

<POP-DYNAMICS>

THE PIPING PLOVER, WHICH WAS ONCE A VERY ABUNDANT BIRD, IS NOW UNCOMMON OVER MOST OF ITS RANGE AND HAS DISAPPEARED FROM MANY HISTORICAL NESTING AREAS. THIS DECLINE IN THE POPULATION HAS BEEN DUE LARGELY TO DISTURBANCE AND HABITAT LOSS *07:MAP 120,20:4*. A 1977 PUBLICATION INDICATES THAT U.S. PIPING PLOVER HABITAT HAS INCREASED RECENTLY IN ONLY ONE STATE (KANSAS), DECREASED IN 10 STATES, REMAINED STATIC IN FIVE STATES, AND THE HABITAT TREND WAS UNKNOWN IN NINE OTHER STATES *32:314*.

THREE DISTINCT BREEDING POPULATIONS OF PIPING PLOVERS EXIST: ATLANTIC COAST, NORTHERN GREAT PLAINS, AND GREAT LAKES POPULATIONS *20:4*. THE GREAT LAKES POPULATION HAS SUFFERED THE MOST DRAMATIC DECLINE, AND IT NOW (AS OF DECEMBER 11, 1985) HAS THE LEGAL STATUS OF ENDANGERED, WHILE THE OTHER TWO POPULATIONS ARE LISTED AS THREATENED IN THE U.S. *27:50726*. THE GREAT LAKES POPULATION, WHICH WAS ESTIMATED AT ONE TIME TO BE 649-802 BREEDING PAIRS, SHRUNK TO ABOUT 38 PAIRS BY 1979 AND 17-19 PAIRS BY 1982 *24:955*. ON LONG POINT, ONTARIO (LAKE ERIE), PIPING PLOVERS WERE LOST AS BREEDING BIRDS IN 1978 (ONE PAIR IN 1977) ALTHOUGH THE BREEDING POPULATION MAY HAVE BEEN CLOSE TO 100 IN 1927 *24:954*. ABOUT 15 PAIRS USED TO NEST ON PRESQUE ISLE PENINSULA (ERIE COUNTY, PENNSYLVANIA) IN THE 1940'S *16:196*, BUT THEY HAVE NOT BRED THERE SINCE THE MID- TO LATE-1950'S *04:82*.

LITTLE IS KNOWN ABOUT AVERAGE ANNUAL MORTALITY RATES, BUT DATA FROM LONG-TERM BANDING STUDIES ON LONG ISLAND, NEW YORK (FROM 1937 TO 1958) PROVIDE SOME GOOD INFORMATION ON AVERAGE AND MAXIMUM LONGEVITY. 47 PLOVERS BANDED AS CHICKS WERE LATER RETRAPPED AS ADULTS AND HAD ACHIEVED AN AVERAGE MINIMUM AGE OF 3.4 YEARS (MALES AVERAGED 4.4 YEARS, FEMALES 2.6 YEARS). 13% OF THE FEMALES AND 28% OF THE MALES LIVED FIVE YEARS OR LONGER, WITH AN EXTREME OF 14 YEARS *08:175*.

SURVIVAL RATES OF EGGS TO HATCHING IN ONE STUDY WAS 79.4% ONE YEAR (DATA FOR 25 NESTS), AND 72.1% ANOTHER YEAR (DATA FOR 26 NESTS) *29:541-542*. ALTHOUGH SURVIVORSHIP OF HATCHED YOUNG TO FLEDGING IS MORE DIFFICULT TO ASSESS, THIS SAME STUDY ESTIMATED THAT ON A RE-

NOTE BEACH IN NOVA SCOTIA APPROXIMATELY 1.3 TO 2.1 CHICKS FLEDGED PER PAIR, WHEREAS ONLY ABOUT 0.7 TO 1.1 CHICKS FLEDGED PER PAIR ON A RECREATIONAL BEACH *29:542-543*.

THE MAXIMUM BREEDING POPULATION DENSITY REPORTED WAS ABOUT 5.6 BREEDING PAIRS/HA (OR 13.8 PAIRS/ACRE) *08:175*. ANOTHER STUDY YIELDED A POPULATION DENSITY OF 2.5 BREEDING PAIRS/HA (OR 6.2 PAIRS/ACRE), AND PAIRS NESTED AN AVERAGE OF ABOUT 52 M. APART. THE CLOSEST TWO NESTS WERE ONLY 3 M. APART *29:532*. NO INFORMATION WAS FOUND ON RATES OF INCREASE, SEX RATIOS OR TURNOVER RATES.

<LIM-FACTORS>

THE MAJOR LIMITING FACTORS FOR THE PIPING PLOVERS ARE DISTURBANCE OF BREEDING PLOVERS BY HUMANS AND THEIR PETS, MORTALITY DUE TO AVIAN AND MAMMALIAN PREDATORS, AND HABITAT LOSS IN GENERAL *02:MAP 120,04:82,20:4,25:3940,26:44713*. THE LACK OF PROTECTION OF NESTING SITES AND THE SUBSEQUENT DISTURBANCE OF NESTING PLOVERS ON PRESQUE ISLE (ERIE COUNTY, PENNSYLVANIA) BY RECREATIONISTS PRESUMABLY RESULTED IN THE LOSS OF THIS BIRD AS A BREEDING SPECIES IN PENNSYLVANIA DURING THE 1950'S *22:348*. PREDATION OF EGGS AND YOUNG BY GULLS, CROWS, FOXES, SKUNKS, OPOSSUMS, MICE, RATS, AND FERAL DOGS AND CATS HAVE HAD A DRAMATIC AFFECT ON REDUCING PIPING PLOVER NUMBERS IN SOME AREAS *08:174,09,20:4,23:294,36:140*. THE REDUCTION OF PIPING PLOVER HABITAT CAN TAKE MANY FORMS INCLUDING RECREATIONAL AND COMMERCIAL DEVELOPMENT *26:44713*, ALTERATION OF WATER LEVELS *07:235* AND NATURAL RIVER DYNAMICS *25:3940*, UNFAVORABLE PLANT SUCCESSION *25:3940*, AND AGRICULTURAL PRACTICES SUCH AS GRAZING *26:44713*. SINCE THE PIPING PLOVER HAS ONE OF THE MOST RESTRICTED BREEDING HABITATS OF ALL BREEDING BIRDS (AT LEAST IN THE GREAT PLAINS REGION) *27:5029*, THE LOSS OF HABITAT BY ANY OR ALL OF THESE FACTORS COULD HAVE PROFOUND EFFECTS ON PIPING PLOVER NUMBERS.

<R-TAXONOMY>

02,06,14,18,26

<R-SPP-STATUS>

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<EXPAND12>

APPENDIX F

Updated Species Profile

Weasel, Long-tailed

(*Mustela frenata*)

<SPP-CODE> D500058 <CATEGORY> MAMMAL <COM-NAME> WEASEL, LONG-TAILED
<SCI-NAME> MUSTELA FRENATA <TAX-PHYLUM> CHORDATA <TAX-SBPHYLUM>
<TAX-CLASS> MAMMALIA <TAX-SUBCLASS> <TAX-ORDER> CARNIVORA
<TAX-SUBORDER> <TAX-SUPERFAM> <TAX-FAMILY> MUSTELIDAE
<TAX-SBFAMILY> MUSTELINAE <TAX-TRIBE> <TAX-GENUS> MUSTELA
<TAX-SUBGENUS> <TAX-SPECIES> FRENATA <TAX-SUBSPEC> NOVEBORACENSIS
<TAX-AUTHOR> EMMONS (1840) <SPP-STATUS> COMMERCIAL,CONSUMP-REC
<RES-STATUS> RES-YR <HABITAT> TERRESTRIAL,RIPARIAN <TROPHIC> CARNIVORE
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<HOME-RANGE> 20-100 ACRES <DISPERSION> RANDOM
<PERIODICITY> ACTIVE AT NIGHT <FORAG-STRAT> STALKING <MATING> POLYGYNY
<PAIR-BOND> NO BOND FORMED <DISPLAY-SITE> GROUND <PREG-INCUBAT> >8 MONTHS
<AVE-YOUNG> 5-7;8-10 <REPROD-YR> 1 <DEVEL-YOUNG> ALTRICIAL
<PARENT-CARE> BOTH PARENTS <POP-TREND> STABLE <POP-FUTURE> INCREASE <10%
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WEASEL, LONG-TAILED, NEW YORK;STOAT, BIG;WEASEL, ERMINE;
WEASEL, LARGE BROWN;ERMINE, LARGE;WEASEL, LARGE;WEASEL, NEW YORK;
WEASEL, NEW YORK STATE;WEASEL, BRIDLED
<SCI-SYNONYMS>
<OCCUR-COUNTY>
ADAMS,ALLEGHENY,ARMSTRONG,BEAVER,BEDFORD,BERKS,BLAIR,BRADFORD,BUCKS,
BUTLER,CAMBRIA,CAMERON,CARBON,CENTRE,CHESTER,CLARION,CLEARFIELD,
CLINTON,COLUMBIA,CRAWFORD,CUMBERLAND,DAUPHIN,DELAWARE,ELK,ERIE,
FAYETTE,FOREST,FRANKLIN,FULTON,GREENE,HUNTINGDON,INDIANA,JEFFERSON,
JUNIATA,LACKAWANNA,LANCASTER,LAWRENCE,LEBANON,LEHIGH,LUZERNE,LYCOMING,
MCKEAN,MERCER,MIFFLIN,MONROE,MONTGOMERY,MONTOUR,NORTHAMPTON,
NORTHUMBERLAND,PERRY,PHILADELPHIA,PIKE,POTTER,SCHUYLKILL,SNYDER,
SOMERSET,SULLIVAN,SUSQUEHANNA,TIOGA,UNION,VENANGO,WARREN,WASHINGTON,
WAYNE,WESTMORELAND,WYOMING,YORK
<ABS-COUNTY>
<UNK-COUNTY>
<SEAS-OCCUR>
ADAMS:SBFW,ALLEGHENY:SBFW,ARMSTRONG:SBFW,BEAVER:SBFW,BEDFORD:SBFW,
BERKS:SBFW,BLAIR:SBFW,BRADFORD:SBFW,BUCKS:SBFW,BUTLER:SBFW,
CAMBRIA:SBFW,CAMERON:SBFW,CARBON:SBFW,CENTRE:SBFW,CHESTER:SBFW,
CLARION:SBFW,CLEARFIELD:SBFW,CLINTON:SBFW,COLUMBIA:SBFW,
CRAWFORD:SBFW,CUMBERLAND:SBFW,DAUPHIN:SBFW,DELAWARE:SBFW,ELK:SBFW,
ERIE:SBFW,FAYETTE:SBFW,FOREST:SBFW,FRANKLIN:SBFW,FULTON:SBFW,
GREENE:SBFW,HUNTINGDON:SBFW,INDIANA:SBFW,JEFFERSON:SBFW,JUNIATA:SBFW,
LACKAWANNA:SBFW,LANCASTER:SBFW,LAWRENCE:SBFW,LEBANON:SBFW,
LEHIGH:SBFW,LUZERNE:SBFW,LYCOMING:SBFW,MCKEAN:SBFW,MERCER:SBFW,
MIFFLIN:SBFW,MONROE:SBFW,MONTGOMERY:SBFW,MONTOUR:SBFW,
NORTHAMPTON:SBFW,NORTHUMBERLAND:SBFW,PERRY:SBFW,PHILADELPHIA:SBFW,
PIKE:SBFW,POTTER:SBFW,SCHUYLKILL:SBFW,SNYDER:SBFW,SOMERSET:SBFW,
SULLIVAN:SBFW,SUSQUEHANNA:SBFW,TIOGA:SBFW,UNION:SBFW,VENANGO:SBFW,
WARREN:SBFW,WASHINGTON:SBFW,WAYNE:SBFW,WESTMORELAND:SBFW,WYOMING:SBFW,
YORK:SBFW
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ADAMS:C,ALLEGHENY:C,ARMSTRONG:C,BEAVER:U,BEDFORD:C,BERKS:C,BLAIR:C,
BRADFORD:C,BUCKS:C,BUTLER:C,CAMBRIA:C,CAMERON:C,CARBON:C,CENTRE:C,
CHESTER:C,CLARION:C,CLEARFIELD:C,CLINTON:C,COLUMBIA:C,CRAWFORD:C,
CUMBERLAND:C,DAUPHIN:C,DELAWARE:U,ELK:C,ERIE:C,FAYETTE:C,FOREST:C,
FRANKLIN:C,FULTON:C,GREENE:C,HUNTINGDON:C,INDIANA:C,JEFFERSON:C,
JUNIATA:C,LACKAWANNA:C,LANCASTER:C,LAWRENCE:C,LEBANON:C,LEHIGH:C,
LUZERNE:C,LYCOMING:C,MCKEAN:C,MERCER:C,MIFFLIN:C,MONROE:C,
MONTGOMERY:C,MONTOUR:C,NORTHAMPTON:C,NORTHUMBERLAND:C,PERRY:C,
PHILADELPHIA:U,PIKE:C,POTTER:C,SCHUYLKILL:C,SNYDER:C,SOMERSET:C,

SULLIVA. :C,SUSQUEHANNA:C,TIOGA:C,UNION:C,VENANGO:C,WARREN:C,
WASHINGTON:C,WAYNE:C,WESTMORELAND:C,WYOMING:C,YORK:C
<HYDRO-NAM I>
UPPER DELAWARE:UPPER DELAWARE,UPPER DELAWARE:LACKAWAXEN,
UPPER DELAWARE:MIDDLE DELAWARE/MONGAUP/BRODHEAD,
UPPER DELAWARE:MIDDLE DELAWARE/MUSCONETCONG,
UPPER DELAWARE:LEHIGH,LOWER DELAWARE:CROSSWICKS-NESHAMINY,
LOWER DELAWARE:LOWER DELAWARE,LOWER DELAWARE:SCHUYLKILL,
LOWER DELAWARE:BRANDYWINE-CHRISTINA,
UPPER SUSQUEHANNA:UPPER SUSQUEHANNA,
UPPER SUSQUEHANNA:OWEGO-WAPPASENING,UPPER SUSQUEHANNA:TIOGA,
UPPER SUSQUEHANNA:CHEMUNG,
UPPER SUSQUEHANNA:UPPER SUSQUEHANNA-TUNKHANNOCK,
UPPER SUSQUEHANNA:UPPER SUSQUEHANNA-LACKAWANNA,
WEST BRANCH SUSQUEHANNA:UPPER WEST BRANCH SUSQUEHANNA,
WEST BRANCH SUSQUEHANNA:SINNEMAHONING,
WEST BRANCH SUSQUEHANNA:MIDDLE WEST BRANCH SUSQUEHANNA,
WEST BRANCH SUSQUEHANNA:BALD EAGLE,WEST BRANCH SUSQUEHANNA:PINE,
WEST BRANCH SUSQUEHANNA:LOWER WEST BRANCH SUSQUEHANNA,
LOWER SUSQUEHANNA:LOWER SUSQUEHANNA-PENNS,
LOWER SUSQUEHANNA:UPPER JUNIATA,LOWER SUSQUEHANNA:RAYSTOWN,
LOWER SUSQUEHANNA:LOWER JUNIATA,
LOWER SUSQUEHANNA:LOWER SUSQUEHANNA-SWATARA,
LOWER SUSQUEHANNA:LOWER SUSQUEHANNA,
UPPER CHESAPEAKE:CHESTER-SASSAFRAS,
UPPER CHESAPEAKE:GUNPOWDER-PATAPSCO,
POTOMAC:NORTH BRANCH POTOMAC,POTOMAC:CACAPON-TOWN,
POTOMAC:CONOCOCHEAGUE-OPEQUON,POTOMAC:MONOCACY,
SOUTHERN LAKE ERIE:ASHTABULA,EASTERN LAKE ERIE:CHAUTAUGUA-CONNEAUT,
SOUTHWESTERN LAKE ONTARIO:UPPER GENESEE,
ALLEGHENY:UPPER ALLEGHENY,ALLEGHENY:CONEWANGO,
ALLEGHENY:MIDDLE ALLEGHENY,ALLEGHENY:FRENCH,ALLEGHENY:CLARION,
ALLEGHENY:MIDDLE ALLEGHENY-REDBANK,ALLEGHENY:CONEMAUGH,
ALLEGHENY:KISKIMINETAS,ALLEGHENY:LOWER ALLEGHENY,
MONONGAHELA:UPPER MONONGAHELA,MONONGAHELA:CHEAT,
MONONGAHELA:LOWER MONONGAHELA,MONONGAHELA:YOUGHIOGHENY,
UPPER OHIO:UPPER OHIO,UPPER OHIO:SHENANGO,UPPER OHIO:MAHONING,
UPPER OHIO:BEAVER,UPPER OHIO:CONNOQUENESSING,
UPPER OHIO:UPPER OHIO-WHEELING
<HYDRO-CODE>
02040101,02040103,02040104,02040105,02040106,02040201,02040202,
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05030101,05030102,05030103,05030104,05030105,05030106
<ECOREG-NAME>
NORTHERN HARDWOODS FOREST, 50-80% GENTLY SLOPING, 100-300 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS IN LOWLAND
NORTHERN HARDWOODS FOREST, 50-80% GENTLY SLOPING, 300-500 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
NORTHERN HARDWOODS FOREST, 20-50% GENTLY SLOPING, 500-1000 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
NORTHERN HARDWOODS FOREST, 20-50% GENTLY SLOPING, 500-1000 FT.
ELEVATION, MORE THAN 75% OF GENTLE SLOPE IS ON UPLAND;
NORTHERN HARDWOODS FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT.
ELEVATION, MORE THAN 75% OF GENTLE SLOPE IS IN LOWLAND;
NORTHERN HARDWOODS FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
NORTHERN HARDWOODS FOREST, LESS THAN 20% GENTLE SLOPING,
1000-3000 FT. ELEVATION;

MIXED MESOPHYTIC FOREST, 20-50% GENTLY SLOPING, 500-1000 FT. ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
MIXED MESOPHYTIC FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT. ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
MIXED MESOPHYTIC FOREST, LESS THAN 20% GENTLY SLOPING, 500-1000 FT. ELEVATION;
BEECH-MAPLE FOREST, 50-80% GENTLY SLOPING, 100-300 FT. ELEVATION, 50-75% OF GENTLE SLOPE IS IN LOWLAND;
BEECH-MAPLE FOREST, 50-80% GENTLY SLOPING, 300-500 FT. ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
APPALACHIAN OAK FOREST, MORE THAN 80% GENTLY SLOPING, 0-100 FT. ELEVATION;
APPALACHIAN OAK FOREST, MORE THAN 80% GENTLY SLOPING, 100-300 FT. ELEVATION, 50-75% OF GENTLE SLOPE IS IN LOWLAND;
APPALACHIAN OAK FOREST, 50-80% GENTLY SLOPING, 100-300 FT. ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
APPALACHIAN OAK FOREST, 50-80% GENTLY SLOPING, 300-500 FT. ELEVATION, 50-75% OF GENTLE SLOPE IS IN LOWLAND;
APPALACHIAN OAK FOREST, 50-80% GENTLY SLOPING, 300-500 FT. ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
APPALACHIAN OAK FOREST, 50-80% GENTLY SLOPING, 500-1000 FT. ELEVATION, LESS THAN 75% OF GENTLE SLOPE IS IN LOWLAND;
APPALACHIAN OAK FOREST, 20-50% GENTLY SLOPING, 500-1000 FT. ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
APPALACHIAN OAK FOREST, 20-50% GENTLY SLOPING, 500-1000 FT. ELEVATION, MORE THAN 75% OF GENTLE SLOPE IS ON UPLAND;
APPALACHIAN OAK FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT. ELEVATION, LESS THAN 75% OF GENTLE SLOPE IS IN LOWLAND;
APPALACHIAN OAK FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT. ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
APPALACHIAN OAK FOREST, LESS THAN 20% GENTLY SLOPING, 500-1000 FT. ELEVATION;
APPALACHIAN OAK FOREST, LESS THAN 20% GENTLY SLOPING, 1000-3000 FT. ELEVATION;
SOUTHERN MIXED FOREST, 50-80% GENTLY SLOPING, 300-500 FT. ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND

<ECOREG-CODE>

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2214B3C,2214B4A,2214C4C,2214C4D,2214C5A,2214C5C,2214D4D,2214D5D,
2320B3C

<PNV>

BEECH-MAPLE,MIXED MESOPHYTIC,APPALACHIAN OAK,NORTHERN HARDWOODS,
OAK-HICKORY-PINE

<QUAD-NAME>

NEWARK WEST,BAY VIEW,WOODBURY,BRIDGEPORT,MARCUS HOOK,WILMINGTON NORTH,
KENNETT SQUARE,WEST GROVE,OXFORD,CAMDEN,PHILADELPHIA,LANSDOWNE,MEDIA,
WEST CHESTER,UNIONVILLE,COATESVILLE,PARKESBURG,RISING SUN,
CONOWINGO DAM,DELTA,FAWN GROVE,NORRISVILLE,NEW FREEDOM,LINEBORO,
MANCHESTER,KIRKWOOD,WAKEFIELD,HOLTWOOD,AIRVILLE,STEWARTSTOWN,
GLEN ROCK,SEVEN VALLEYS,HANOVER,GAP,QUARRYVILLE,CONESTOGA,SAFE HARBOR,
RED LION,YORK,WEST YORK,ABBOTTSTOWN,LITTLESTOWN,TANEYTOWN,EMMITSBURG,
BLUE RIDGE SUMMIT,SMITHSBURG,HAGERSTOWN,MASON DIXON,CLEAR SPRING,
MC SHERRYSTOWN,GETTYSBURG,FAIRFIELD,IRON SPRINGS,WAYNESBORO,
GREENCASTLE,WILLIAMSON,MERCERSBURG,HAMPTON,BIGLERVILLE,ARENDTSVILLE,
CALEDONIA PARK,SCOTLAND,CHAMBERSBURG,ST THOMAS,MC CONNELLSBURG,
CHERRY RUN,HANCOCK (WV),BELLEGROVE,ARTEMAS,FLINTSTONE,
EVITTS CREEK,CUMBERLAND,FROSTBURG,BIG COVE TANNERY,NEEDMORE,AMARANTH,
CHANEYSVILLE,BEANS COVE,HYNDMAN,FAIRHOPE,WITTENBERG,MEADOW GROUNDS,
BREEZEWOOD,MENCH,CLEARVILLE,RAINSBURG,BUFFALO MILLS,NEW BALTIMORE,
BERLIN,AVILTON,GRANTSVILLE,ACCIDENT,FRIENDSVILLE (MD),BRANDONVILLE,
BRUCETON MILLS,LAKE LYNN,MORGANTOWN NORTH,MEYERSDALE,MARKLETON,
CONFLUENCE,OHIOPYLE,FT NECESSITY,BROWNFIELD,SMITHFIELD,MASONTOWN,

MURDOCK,ROCKWOOD,KINGWOOD,MILL RUN,SOUTH CONNELLSVILLE,UNIONTOWN,
NEW SALEM,CARMICHAELS,OSAGE,BLACKSVILLE,WADESTOWN,HUNDRED,LITTLETON,
GARARDS FORT,OAK FOREST,HOLBROOK,NEW FREEPORT,CAMERON (WV),MATHER,
WAYNESBURG,ROGERSVILLE,WIND RIDGE,MAJORSVILLE,BRISTOL,BEVERLY,
TRENTON EAST,TRENTON WEST,LANGHORNE,PENNINGTON,LAMBERTVILLE,STOCKTON,
FRANKFORD,GERMANTOWN,NORRISTOWN,VALLEY FORGE,MALVERN,DOWNINGTOWN,
WAGONTOWN,HONEY BROOK,HATBORO,AMBLER,LANSDALE,COLLEGEVILLE,
PHOENIXVILLE,POTTSTOWN,ELVERSON,MORGANTOWN,BUCKINGHAM,DOYLESTOWN,
TELFORD,PERKIOMENVILLE,SASSAMANSVILLE,BOYERTOWN,BIRDSBORO,READING,
LUMBERVILLE,BEDMINSTER,QUAKERTOWN,MILFORD SQUARE,EAST GREENVILLE,
MANATAWNY,FLEETWOOD,TEMPLE,FRENCHTOWN,RIEGELSVILLE,HELLERTOWN,
ALLENTOWN EAST,ALLENTOWN WEST,TOPTON,KUTZTOWN,HAMBURG,EASTON,NAZARETH,
CATASAUQUA,CEMENTON,SLATEDALE,NEW TRIPOLI,NEW RINGGOLD,BELVIDERE,
BANGOR,WIND GAP,KUNKLETOWN,PALMERTON,LEHIGHTON,NESQUEHONING,TAMAQUA,
PORTLAND,STROUDSBURG,SAYLORSBURG,BROADHEADSVILLE,POHOPOCO MTN,
CHRISTMANS,WEATHERLY,HAZLETON,NEW HOLLAND,LEOLA,LANCASTER,
COLUMBIA EAST,COLUMBIA WEST,YORK HAVEN,DOVER,WELLSVILLE,TERRE HILL,
EPHRATA,LITITZ,MANHEIM,ELIZABETHTOWN,MIDDLETOWN,STEELTON,LEMOYNE,
SINKING SPRING,WOMELSDORF,RICHLAND,LEBANON,PALMYRA,HERSHEY,
HARRISBURG EAST,HARRISBURG WEST,BERNVILLE,STRAUSSTOWN,BETHEL,
FREDERICKSBURG,INDIANTOWN GAP,GRANTVILLE,ENDERS,HALIFAX,AUBURN,
FRIEDENSBURG,WATARA HILL,PINE GROVE,TOWER CITY,LYKENS,ELIZABETHVILLE,
MILLERSBURG,ORWIGSBURG,POTTSVILLE,MINERSVILLE,TREMONT,VALLEY VIEW,
KLINGERSTOWN,PILLOW,DALMATIA,DELANO,SHENANDOAH,ASHLAND,MT CARMEL,
SHAMOKIN,TREVORTON,SUNBURY,FREEBURG,CONYNGHAM,NUREMBERG,SHUMANS,
CATAWISSA,DANVILLE,RIVERSIDE,NORTHUMBERLAND,LEWISBURG,DILLSBURG,
MOUNT HOLLY SPRINGS,DICKINSON,WALNUT BOTTOM,SHIPPENSBURG,ROXBURY,
FANNETTSBURG,BURNT CABINS,MECHANICSBURG,CARLISLE,PLAINFIELD,NEWVILLE,
NEWBURG,DOYLESBURG,SHADE GAP,ORBISONIA,MERTZVILLE,SHERMANS DALE,
LANDISBURG,ANDERSONBURG,BLAIN,BLAIRS MILLS,AUGHWICK,BUTLER KNOB,
DUNCANNON,NEWPORT,ICKESBURG,SPRUCE HILL,MC COYSVILLE,MC VEYTOWN,
NEWTON HAMILTON,MOUNT UNION,REWARD,MILLERSTOWN,MEXICO,MIFFLINTOWN,
LEWISTOWN,BELLEVILLE,ALLENSVILLE,DONATION,RICHFIELD,BEAVER SPRINGS,
MC CLURE,ALFARATA,BURNHAM,BARRVILLE,MC ALEVYS FORT,PINE GROVE MILLS,
MIDDLEBURG,BEAVERTOWN,WEIKERT,COBURN,SPRING MILLS,CENTRE HALL,
STATE COLLEGE,JULIAN,MIFFLINBURG,HARTLETON,WOODWARD,MILLHEIM,
MADISONBURG,MINGOVILLE,BELLEFONTE,BEAR KNOB,HUSTONTOWN,WELLS TANNERY,
EVERETT EAST,EVERETT WEST,BEDFORD,SCHELLSBURG,CENTRAL CITY,STOYSTOWN,
SALTILLO,SAXTON,HOPEWELL,NEW ENTERPRISE,ALUM BANK,OGLETOWN,WINDBER,
HOOVERSVILLE,CASSVILLE,ENTRIKEN,MARTINSBURG,ROARING SPRING,BLUE KNOB,
BEAVERDALE,GEISTOWN,JOHNSTOWN,HUNTINGDON,WILLIAMSBURG,FRANKSTOWN,
HOLLIDAYSBURG,CRESSON,EBENSBURG,NANTY GLO,VINTONDALE,ALEXANDRIA,
SPRUCE CREEK,BELLWOOD,ALTOONA,ASHVILLE,CARROLLTOWN,COLVER,STRONGSTOWN,
FRANKLINVILLE,TYRONE,TIPTON,BLANDBURG,COALPORT,HASTINGS,BARNESBORO,
COMMODORE,PORT MATILDA,SANDY RIDGE,HOUTZDALE,RAMEY,IRVONA,WESTOVER,
BURNSIDE,ROCHESTER MILLS,BLACK MOSHANNON,PHILIPSBURG,WALLACETON,
GLEN RICHEY,CURWENSVILLE,MAHAFFEY,MCGEES MILLS,PUNXSUTAWNEY,SOMERSET,
BAKERSVILLE,SEVEN SPRINGS,DONEGAL,CONNELLSVILLE,DAWSON,FAYETTE CITY,
CALIFORNIA,BOSWELL,LIGONIER,STAHLSTOWN,MAMMOTH,MT PLEASANT,SMITHTON,
DONORA,MONONGAHELA,RACHELWOOD,WILPEN,DERRY,LATROBE,GREENSBURG,IRWIN,
MC KEESPORT,GLASSPORT,NEW FLORENCE,BOLIVAR,BLAIRSVILLE,SALTSBURG,
SLICKVILLE,MURRYSVILLE,BRADDOCK,PITTSBURGH EAST,BRUSH VALLEY,INDIANA,
MC INTYRE,AVONMORE,VANDERGRIFT,NEW KENSINGTON EAST,
NEW KENSINGTON WEST,GLENSHAW,CLYMER,ERNEST,ELDERTON,WHITESBURG,
LEECHBURG,FREEPORT,CURTISVILLE,VALENCIA,MARION CENTER,PLUMVILLE,
RURAL VALLEY,MOSGROVE,KITTANNING,WORTHINGTON,SAXONBURG,BUTLER,VALIER,
DAYTON,DISTANT,TEMPLETON,EAST BRADY,CHICORA,EAST BUTLER,MT CHESTNUT,
ELLSWORTH,AMITY,PROSPERITY,CLAYSVILLE,VALLEY GROVE,HACKETT,
WASHINGTON EAST,WASHINGTON WEST,WEST MIDDLETOWN,BETHANY,BRIDGEVILLE,
CANONSBURG,MIDWAY,AVELLA,STEUBENVILLE EAST,PITTSBURGH WEST,OAKDALE,
CLINTON,BURGETTSTOWN,WEIRTON,EMSWORTH,AMBRIDGE,ALIQUIPPA,HOOKSTOWN,
EAST LIVERPOOL SOUTH,MARS,BADEN,BEAVER,MIDLAND,EAST LIVERPOOL NORTH,
EVANS CITY,ZELIENOPLE,BEAVER FALLS,NEW GALILEE,EAST PALESTINE,

PROSPECT,PORTERSVILLE,NEW CASTLE SOUTH,BESSEMER,NEW MIDDLETOWN,
FLATBROOKVILLE,CULVERS GAP,LAKE MASKENOZHA,PORT JERVIS SOUTH,MILFORD,
EDGEMERE,PORT JERVIS NORTH,POND EDDY,SHOHOLA,ELDRED (NY),BUSHKILL,
EAST STROUDSBURG,MOUNT POCONO,POCONO PINES,BLAKESLEE,HICKORY RUN,
WHITE HAVEN,FREELAND,TWELVEMILE POND,SKYTOP,BUCK HILL FALLS,TOBYHANNA,
THORNHURST,PLEASANT VIEW SUMMIT,WILKES-BARRE EAST,WILKES-BARRE WEST,
PECKS POND,PROMISED LAND,NEWFOUNDLAND,STERLING,MOSCOW,AVOCA,PITTSTON,
KINGSTON,ROWLAND,HANLEY,LAKEVILLE,LAKE ARIEL,OLYPHANT,SCRANTON,RANSOM,
CENTER MORELAND,NARROWSBURG,WHITE MILLS,HONESDALE,WAYMART,CARBONDALE,
DALTON,FACTORYVILLE,TUNKHANNOCK,DAMASCUS,GALILEE,ALDENVILLE,
FOREST CITY,CLIFFORD,LENOXVILLE,HOP BOTTOM,SPRINGVILLE,CALLICOON,
LONG EDDY,LAKE COMO,ORSON,THOMPSON,HARFORD,MONTROSE EAST,
MONTROSE WEST,HANCOCK,STARRUCCA,SUSQUEHANNA,GREAT BEND,FRANKLIN FORKS,
LAUREL LAKE,SYBERTSVILLE,BERWICK,MIFFLINVILLE,BLOOMSBURG,MILLVILLE,
WASHINGTONVILLE,MILTON,ALLENWOOD,NANTICOKE,SHICKSHINNY,STILLWATER,
BENTON,LAIRDSVILLE,HUGHESVILLE,MUNCY,MONTOURSVILLE SOUTH,HARVEYS LAKE,
SWEET VALLEY,RED ROCK,ELK GROVE,SONESTOWN,PICTURE ROCKS,HUNTERSVILLE,
MONTOURSVILLE NORTH,MOXEN,DUTCH MTN,LOPEZ,LAPORTE,EAGLES MERE,
HILLSGROVE,BARBOURS,BODINES,MESHOPPEN,JENNINGSVILLE,COLLEY,DUSHORE,
OVERTON,SHUNK,GROVER,RALSTON,AUBURN CENTER,LACEYVILLE,WYALUSING,
MONROETON,POWELL,LEROY,CANTON,GLEASON,LAWTON,LE RAYSVILLE,ROME,
TOWANDA,ULSTER,EAST TROY,TROY,ROSEVILLE,FRIENDSVILLE,LITTLE MEADOWS,
WINDHAM,LITCHFIELD,SAYRE,BENTLEY CREEK,GILLETT,MILLERTON,
WILLIAMSPORT SE,CARROLL,LOGANTON,MILL HALL,BEECH CREEK,HOWARD,
SNOW SHOE SE,SNOW SHOE,WILLIAMSPORT,LINDEN,JERSEY SHORE,LOCK HAVEN,
FARRANDSVILLE,HOWARD NW,SNOW SHOE NE,SNOW SHOW NW,COGAN STATION,
SALLADASBURG,WATERVILLE,JERSEY MILLS,GLEN UNION,RENOVO EAST,
RENOVO WEST,KEATING,TROUT RUN,WHITE PINE,ENGLISH CENTER,CAMMAL,
SLATE RUN,YOUNG WOMANS CREEK,TAMARACK,HAMMERSLEY FORK,LIBERTY,NAUVOO,
MORRIS,CEDAR RUN,LEE FIRE TOWER,OLEONA,SHORT RUN,CONRAD,BLOSSBURG,
CHERRY FLATS,ANTRIM,TIADAGHTON,MARSHLANDS,WALTON,CHERRY SPRINGS,
AYERS HILL,MANSFIELD,CROOKED CREEK,KELNEYVILLE,ASAPH,SABINSVILLE,
WEST PIKE,BROOKLAND,SWEDEN VALLEY,JACKSON SUMMIT,TIOGA,ELKLAND,
KNOXVILLE,POTTER BROOK,HARRISON VALLEY,ULYSSES,ELLISBURG,KARTHAUS,
FRENCHVILLE,LECONTES MILLS,CLEARFIELD,ELLIOTT PARK,LUTHERSBURG,
DU BOIS,REYNOLDSVILLE,POTTERSDALE,DEVILS ELBOW,THE KNOBS,HUNTLEY,
PENFIELD,SABULA,FALLS CREEK,HAZEN,SINNEMAHONING,DRIFTWOOD,DENTS RUN,
WEEDVILLE,KERSEY,BRANDY CAMP,CARMAN,MUNDERF,FIRST FORK,CAMERON,
WEST CREEK,RATHBUN,ST MARYS,RIDGWAY,PORTLAND MILLS,HALLTON,WHARTON,
EMPORIUM,RICH VALLEY,WILDWOOD FIRE TOWER,GLEN HAZEL,WILCOX,JAMES CITY,
RUSSELL CITY,AUSTIN,KEATING SUMMIT,NORWICH,CROSBY,HAZEL HURST,
MT JEWETT,KANE,LUDLOW,COUDERSPORT,ROULETTE,PORT ALLEGANY,SMETHPORT,
CYCLONE,LEWIS RUN,WESTLINE,CORNPLANTER BRIDGE,OSWAYO,SHINGLEHOUSE,
BULLIS MILLS,ELDRED,DERRICK CITY,BRADFORD,STICKNEY,CORNPLANTER RUN,
COOLSPRING,SUMMERVILLE,NEW BETHLEHEM,SLIGO,RIMERSBURG,PARKER,
HILLIARDS,WEST SUNBURY,BROOKVILLE,CORSICA,STRATTANVILLE,CLARION,KNOX,
EMLENTON,EAU CLAIRE,BARKEYVILLE,SIGEL,COOKSBURG,LUCINDA,FRYBURG,
KOSSUTH,CRANBERRY,KENNERDELL,POLK,MARIENVILLE EAST,MARIENVILLE WEST,
TYLERSBURG,TIONESTA,PRESIDENT,OIL CITY,FRANKLIN,UTICA,LYNCH,MAYBURG,
KELLETTVILLE,WEST HICKORY,PLEASANTVILLE,TITUSVILLE SOUTH,DEMPSEYTOWN,
SUGAR LAKE,SHEFFIELD,CHERRY GROVE,COBHAM,TIDIOUTE,GRAND VALLEY,
TITUSVILLE NORTH,CENTERVILLE,TOWNVILLE,CLARENDON,WARREN,YOUNGSVILLE,
PITTSFIELD,SPRING CREEK,SPARTANSBURG,LAKE CANADOHTA,MILLERS STATION,
SCANDIA,RUSSELL,SUGAR GROVE,LOTTSVILLE,COLUMBUS,CORRY,UNION CITY,
WATERFORD,SLIPPERY ROCK,HARLANSBURG,NEW CASTLE NORTH,EDINBURG,
CAMPBELL,GROVE CITY,MERCER,GREENFIELD,SHARON EAST,SHARON WEST,
SANDY LAKE,JACKSON CENTER,FREDONIA,SHARPSVILLE,ORANGEVILLE,
NEW LEBANON,HADLEY,GREENVILLE EAST,GREENVILLE WEST,KINSMAN,COCHRANTON,
GENEVA,CONNEAUT LAKE,HARTSTOWN,ANDOVER,BLOOMING VALLEY,MEADVILLE,
HARMONSBURG,LINESVILLE,LEON,CAMBRIDGE SPRINGS,EDINBORO SOUTH,
CONNEAUTVILLE,BEAVER CENTER,PIERPONT,CAMBRIDGE SPRINGS NE,
EDINBORO NORTH,ALBION,EAST SPRINGFIELD,CONNEAUT,WAVERLY,WELLSBURG,
ELMIRA,KELLEY CREEK,CATON,ALLENTOWN,BOLIVAR (NY),WATTSBURG,HAMMETT,

NORTH EAST,HARBORCREEK,ERIE SOUTH,SWANVILLE,FAIRVIEW,FAIRVIEW SW,
ERIE NORTH
<QUAD-CODE>
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AGRIC:CROPLAND-PASTURE,AGRIC:ORCHARDS-VINEYARDS-NURSERIES,
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RANGE:HERBACEOUS,RANGE:SHRUB-BRUSH,RANGE:MIXED,
FOREST:DECIDUOUS,FOREST:EVERGREEN,FOREST:MIXED,
WATER:STREAMS-CANALS,
WETLAND:FORESTED,WETLAND:NONFORESTED
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RANGE:HERBACEOUS,RANGE:SHRUB-BRUSH,RANGE:MIXED,
FOREST:DECIDUOUS,FOREST:EVERGREEN,FOREST:MIXED
<FOREST-TYPE>
RED PINE:GRASS/FORB,RED PINE:SEEDLING/SHRUB,RED PINE:SAPLING,

RED PINE:POLE,RED PINE:MATURE,RED PINE:OLD GROWTH,
WHITE PINE:GRASS/FORB,WHITE PINE:SEEDLING/SHRUB,
WHITE PINE:SAPLING,WHITE PINE:POLE,WHITE PINE:MATURE,
WHITE PINE:OLD GROWTH,WHITE PINE/HEMLOCK:GRASS/FORB,
WHITE PINE/HEMLOCK:SEEDLING/SHRUB,WHITE PINE/HEMLOCK:SAPLING,
WHITE PINE/HEMLOCK:POLE,WHITE PINE/HEMLOCK:MATURE,
WHITE PINE/HEMLOCK:OLD GROWTH,HEMLOCK:GRASS/FORB,
HEMLOCK:SEEDLING/SHRUB,HEMLOCK:SAPLING,HEMLOCK:POLE,
HEMLOCK:MATURE,HEMLOCK:OLD GROWTH,SCOTCH PINE:GRASS/FORB,
SCOTCH PINE:SEEDLING/SHRUB,SCOTCH PINE:SAPLING,
SCOTCH PINE:POLE,SCOTCH PINE:MATURE,SCOTCH PINE:OLD GROWTH,
RED SPRUCE/BALSAM FIR:GRASS/FORB,
RED SPRUCE/BALSAM FIR:SEEDLING/SHRUB,RED SPRUCE/BALSAM FIR:SAPLING,
RED SPRUCE/BALSAM FIR:SAPLING,RED SPRUCE/BALSAM FIR:POLE,
RED SPRUCE/BALSAM FIR:MATURE,RED SPRUCE/BALSAM FIR:OLD GROWTH,
TAMARACK (EASTERN LARCH):GRASS/FORB,
TAMARACK (EASTERN LARCH):SEEDLING/SHRUB,
TAMARACK (EASTERN LARCH):SAPLING,TAMARACK (EASTERN LARCH):POLE,
TAMARACK (EASTERN LARCH):MATURE,TAMARACK (EASTERN LARCH):OLD GROWTH,
WHITE SPRUCE:GRASS/FORB,WHITE SPRUCE:SEEDLING/SHRUB,
WHITE SPRUCE:SAPLING,WHITE SPRUCE:POLE,WHITE SPRUCE:MATURE,
WHITE SPRUCE:OLD GROWTH,NORWAY SPRUCE:GRASS/FORB,
NORWAY SPRUCE:SEEDLING/SHRUB,NORWAY SPRUCE:SAPLING,
NORWAY SPRUCE:POLE,NORWAY SPRUCE:MATURE,NORWAY SPRUCE:OLD GROWTH,
LARCH:GRASS/FORB,LARCH:SEEDLING/SHRUB,LARCH:SAPLING,LARCH:POLE,
LARCH:MATURE,LARCH:OLD GROWTH,VIRGINIA PINE:GRASS/FORB,
VIRGINIA PINE:SEEDLING/SHRUB,VIRGINIA PINE:SAPLING,
VIRGINIA PINE:POLE,VIRGINIA PINE:MATURE,VIRGINIA PINE:OLD GROWTH,
EASTERN REDCEDAR:GRASS/FORB,EASTERN REDCEDAR:SEEDLING/SHRUB,
EASTERN REDCEDAR:SAPLING,EASTERN REDCEDAR:POLE,
EASTERN REDCEDAR:POLE,EASTERN REDCEDAR:MATURE,
EASTERN REDCEDAR:OLD GROWTH,PITCH PINE:GRASS/FORB,
PITCH PINE:SEEDLING/SHRUB,PITCH PINE:SAPLING,PITCH PINE:POLE,
PITCH PINE:MATURE,PITCH PINE:OLD GROWTH,
WHITE PINE/NORTHERN RED OAK/WHITE ASH:GRASS/FORB,
WHITE PINE/NORTHERN RED OAK/WHITE ASH:SEEDLING/SHRUB,
WHITE PINE/NORTHERN RED OAK/WHITE ASH:SAPLING,
WHITE PINE/NORTHERN RED OAK/WHITE ASH:POLE,
WHITE PINE/NORTHERN RED OAK/WHITE ASH:MATURE,
WHITE PINE/NORTHERN RED OAK/WHITE ASH:OLD GROWTH,
EASTERN REDCEDAR/HARDWOOD:GRASS/FORB,
EASTERN REDCEDAR/HARDWOOD:SEEDLING/SHRUB,
EASTERN REDCEDAR/HARDWOOD:SAPLING,EASTERN REDCEDAR/HARDWOOD:POLE,
EASTERN REDCEDAR/HARDWOOD:MATURE,EASTERN REDCEDAR/HARDWOOD:OLD GROWTH,
VIRGINIA PINE/SOUTHERN RED OAK:GRASS/FORB,
VIRGINIA PINE/SOUTHERN RED OAK:SEEDLING/SHRUB,
VIRGINIA PINE/SOUTHERN RED OAK:SAPLING,
VIRGINIA PINE/SOUTHERN RED OAK:POLE,
VIRGINIA PINE/SOUTHERN RED OAK:MATURE,
VIRGINIA PINE/SOUTHERN RED OAK:OLD GROWTH,
POST/BLACK/OR BEAR OAK:GRASS/FORB,
POST/BLACK/OR BEAR OAK:SEEDLING/SHRUB,
POST/BLACK/OR BEAR OAK:SAPLING,
POST/BLACK/OR BEAR OAK:POLE,
POST/BLACK/OR BEAR OAK:MATURE,
POST/BLACK/OR BEAR OAK:OLD GROWTH,
CHESTNUT OAK:GRASS/FORB,CHESTNUT OAK:SEEDLING/SHRUB,
CHESTNUT OAK:SAPLING,CHESTNUT OAK:POLE,CHESTNUT OAK:MATURE,
CHESTNUT OAK:OLD GROWTH,WHITE OAK/RED OAK/HICKORY:GRASS/FORB,
WHITE OAK/RED OAK/HICKORY:SEEDLING/SHRUB,
WHITE OAK/RED OAK/HICKORY:SAPLING,WHITE OAK/RED OAK/HICKORY:POLE,
WHITE OAK/RED OAK/HICKORY:MATURE,
WHITE OAK/RED OAK/HICKORY:OLD GROWTH,

WHITE OAK:GRASS/FORB,WHITE OAK:SEEDLING/SHRUB,
WHITE OAK:SAPLING,WHITE OAK:POLE,WHITE OAK:MATURE,
WHITE OAK:OLD GROWTH,NORTHERN RED OAK:GRASS/FORB,
NORTHERN RED OAK:SEEDLING/SHRUB,NORTHERN RED OAK:SAPLING,
NORTHERN RED OAK:POLE,NORTHERN RED OAK:MATURE,
NORTHERN RED OAK:OLD GROWTH,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:GRASS/FORB,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:SEEDLING/SHRUB,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:SAPLING,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:POLE,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:MATURE,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:OLD GROWTH,
BLACK LOCUST:GRASS/FORB,
BLACK LOCUST:SEEDLING/SHRUB,
BLACK LOCUST:SAPLING,
BLACK LOCUST:POLE,
BLACK LOCUST:MATURE,
BLACK LOCUST:OLD GROWTH,
BLACK WALNUT:GRASS/FORB,
BLACK WALNUT:SEEDLING/SHRUB,
BLACK WALNUT:SAPLING,
BLACK WALNUT:POLE,
BLACK WALNUT:MATURE,
BLACK WALNUT:OLD GROWTH,
YELLOW POPLAR:GRASS/FORB,
YELLOW POPLAR:SEEDLING/SHRUB,
YELLOW POPLAR:SAPLING,
YELLOW POPLAR:POLE,
YELLOW POPLAR:MATURE,
YELLOW POPLAR:OLD GROWTH,
CENTRAL HARDWOOD REVERTING FIELD:GRASS/FORB,
CENTRAL HARDWOOD REVERTING FIELD:SEEDLING/SHRUB,
CENTRAL HARDWOOD REVERTING FIELD:SAPLING,
CENTRAL HARDWOOD REVERTING FIELD:POLE,
CENTRAL HARDWOOD REVERTING FIELD:MATURE,
CENTRAL HARDWOOD REVERTING FIELD:OLD GROWTH,
SCARLET OAK:GRASS/FORB,
SCARLET OAK:SEEDLING/SHRUB,
SCARLET OAK:SAPLING,
SCARLET OAK:POLE,
SCARLET OAK:MATURE,
SCARLET OAK:OLD GROWTH,
SASSAFRAS/PERSIMMON:GRASS/FORB,
SASSAFRAS/PERSIMMON:SEEDLING/SHRUB,
SASSAFRAS/PERSIMMON:SAPLING,
SASSAFRAS/PERSIMMON:POLE,
SASSAFRAS/PERSIMMON:MATURE,
SASSAFRAS/PERSIMMON:OLD GROWTH,
RED MAPLE/CENTRAL HARDWOODS:GRASS/FORB,
RED MAPLE/CENTRAL HARDWOODS:SEEDLING/SHRUB,
RED MAPLE/CENTRAL HARDWOODS:SAPLING,
RED MAPLE/CENTRAL HARDWOODS:POLE,
RED MAPLE/CENTRAL HARDWOODS:MATURE,
RED MAPLE/CENTRAL HARDWOODS:OLD GROWTH,
MIXED CENTRAL HARDWOODS:GRASS/FORB,
MIXED CENTRAL HARDWOODS:SEEDLING/SHRUB,
MIXED CENTRAL HARDWOODS:SAPLING,
MIXED CENTRAL HARDWOODS:POLE,
MIXED CENTRAL HARDWOODS:MATURE,
MIXED CENTRAL HARDWOODS:OLD GROWTH,
BLACK ASH/AMERICAN ELM/RED MAPLE:GRASS/FORB,
BLACK ASH/AMERICAN ELM/RED MAPLE:SEEDLING/SHRUB,
BLACK ASH/AMERICAN ELM/RED MAPLE:SAPLING,

BLACK ASH/AMERICAN ELM/RED MAPLE:POLE,
BLACK ASH/AMERICAN ELM/RED MAPLE:MATURE,
BLACK ASH/AMERICAN ELM/RED MAPLE:OLD GROWTH,
RIVER BIRCH/SYCAMORE:GRASS/FORB,
RIVER BIRCH/SYCAMORE:SEEDLING/SHRUB,
RIVER BIRCH/SYCAMORE:SAPLING,
RIVER BIRCH/SYCAMORE:POLE,
RIVER BIRCH/SYCAMORE:MATURE,
RIVER BIRCH/SYCAMORE:OLD GROWTH,
COTTONWOOD:GRASS/FORB,
COTTONWOOD:SEEDLING/SHRUB,
COTTONWOOD:SAPLING,
COTTONWOOD:POLE,
COTTONWOOD:MATURE,
COTTONWOOD:OLD GROWTH,
WILLOW:GRASS/FORB,
WILLOW:SEEDLING/SHRUB,
WILLOW:SAPLING,
WILLOW:POLE,
WILLOW:MATURE,
WILLOW:OLD GROWTH,
SUGAR MAPLE/BEECH/YELLOW BIRCH:GRASS/FORB,
SUGAR MAPLE/BEECH/YELLOW BIRCH:SEEDLING/SHRUB,
SUGAR MAPLE/BEECH/YELLOW BIRCH:SAPLING,
SUGAR MAPLE/BEECH/YELLOW BIRCH:POLE,
SUGAR MAPLE/BEECH/YELLOW BIRCH:MATURE,
SUGAR MAPLE/BEECH/YELLOW BIRCH:OLD GROWTH,
BLACK CHERRY:GRASS/FORB,
BLACK CHERRY:SEEDLING/SHRUB,
BLACK CHERRY:SAPLING,
BLACK CHERRY:POLE,
BLACK CHERRY:MATURE,
BLACK CHERRY:OLD GROWTH,
RED MAPLE/NORTHERN HARDWOODS:GRASS/FORB,
RED MAPLE/NORTHERN HARDWOODS:SEEDLING/SHRUB,
RED MAPLE/NORTHERN HARDWOODS:SAPLING,
RED MAPLE/NORTHERN HARDWOODS:POLE,
RED MAPLE/NORTHERN HARDWOODS:MATURE,
RED MAPLE/NORTHERN HARDWOODS:OLD GROWTH,
NORTHERN HARDWOOD REVERTING FIELD:GRASS/FORB,
NORTHERN HARDWOOD REVERTING FIELD:SEEDLING/SHRUB,
NORTHERN HARDWOOD REVERTING FIELD:SAPLING,
NORTHERN HARDWOOD REVERTING FIELD:POLE,
NORTHERN HARDWOOD REVERTING FIELD:MATURE,
NORTHERN HARDWOOD REVERTING FIELD:OLD GROWTH,
MIXED NORTHERN HARDWOODS:GRASS/FORB,
MIXED NORTHERN HARDWOODS:SEEDLING/SHRUB,
MIXED NORTHERN HARDWOODS:SAPLING,
MIXED NORTHERN HARDWOODS:POLE,
MIXED NORTHERN HARDWOODS:MATURE,
MIXED NORTHERN HARDWOODS:OLD GROWTH,
ASPEN:GRASS/FORB,
ASPEN:SEEDLING/SHRUB,
ASPEN:SAPLING,
ASPEN:POLE,
ASPEN:MATURE,
ASPEN:OLD GROWTH,
PAPER BIRCH:GRASS/FORB,
PAPER BIRCH:SEEDLING/SHRUB,
PAPER BIRCH:SAPLING,
PAPER BIRCH:POLE,
PAPER BIRCH:MATURE,
PAPER BIRCH:OLD GROWTH,

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   GRAY BIRCH:GRASS/FORB,
   GRAY BIRCH:SEEDLING/SHRUB,
   GRAY BIRCH:SAPLING,
   GRAY BIRCH:POLE,
   GRAY BIRCH:MATURE,
   GRAY BIRCH:OLD GROWTH
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   ESTUARINE:INTERTIDAL/EMERGENT:PRTDERSISTENT,
   ESTUARINE:INTERTIDAL/EMERGENT:NONPERSISTENT,
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   ESTUARINE:INTERTIDAL/EMERGENT:BROAD-LEAVED NONPERSISTENT,
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   ESTUARINE:INTERTIDAL/EMERGENT:BROAD-LEAVED PERSISTENT,
   ESTUARINE:INTERTIDAL/FLAT,ESTUARINE:INTERTIDAL/FLAT:COBBLE-GRAVEL,
   ESTUARINE:INTERTIDAL/FLAT:SAND,ESTUARINE:INTERTIDAL/FLAT:MUD,
   ESTUARINE:INTERTIDAL/FLAT:ORGANIC,
   ESTUARINE:INTERTIDAL/FLAT:VEGETATED PIONEER,
   ESTUARINE:INTERTIDAL/FLAT:VEGETATED NONPIONEER,
   ESTUARINE:INTERTIDAL/FORESTED,
   ESTUARINE:INTERTIDAL/FORESTED:BROAD-LEAVED DECIDUOUS,
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   ESTUARINE:INTERTIDAL/FORESTED:DEAD,
   ESTUARINE:INTERTIDAL/FORESTED:DECIDUOUS,
   ESTUARINE:INTERTIDAL/FORESTED:EVERGREEN,
   PALUSTRINE,PALUSTRINE/EMERGENT,PALUSTRINE/EMERGENT:PERSISTENT,
   PALUSTRINE/EMERGENT:NONPERSISTENT,
   PALUSTRINE/EMERGENT:NARROW-LEAVED NONPERSISTENT,
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   PALUSTRINE/EMERGENT:BROAD-LEAVED PERSISTENT,
   PALUSTRINE/FLAT,PALUSTRINE/FLAT:COBBLE-GRAVEL,
   PALUSTRINE/FLAT:SAND,PALUSTRINE/FLAT:MUD,PALUSTRINE/FLAT:ORGANIC,
   PALUSTRINE/FLAT:VEGETATED PIONEER,
   PALUSTRINE/FLAT:VEGETATED NONPIONEER,
   PALUSTRINE/FORESTED,PALUSTRINE/FORESTED:BROAD-LEAVED DECIDUOUS,
   PALUSTRINE/FORESTED:NEEDLE-LEAVED DECIDUOUS,
   PALUSTRINE/FORESTED:BROAD-LEAVED EVERGREEN,
   PALUSTRINE/FORESTED:NEEDLE-LEAVED EVERGREEN,
   PALUSTRINE/FORESTED:DEAD,PALUSTRINE/FORESTED:DECIDUOUS,
   PALUSTRINE/FORESTED:EVERGREEN,
   RIVERINE,RIVERINE:TIDAL,RIVERINE:TIDAL/BEACH-BAR,
   RIVERINE:TIDAL/BEACH-BAR:COBBLE-GRAVEL,
   RIVERINE:TIDAL/BEACH-BAR:SAND,
   RIVERINE:TIDAL/EMERGENT,RIVERINE:TIDAL/EMERGENT:NONPERSISTENT,
   RIVERINE:TIDAL/EMERGENT:NARROW-LEAVED NONPERSISTENT,
   RIVERINE:TIDAL/EMERGENT:BROAD-LEAVED NONPERSISTENT,
   RIVERINE:TIDAL/FLAT,RIVERINE:TIDAL/FLAT:COBBLE-GRAVEL,
   RIVERINE:TIDAL/FLAT:SAND,RIVERINE:TIDAL/FLAT:MUD,
   RIVERINE:TIDAL/FLAT:ORGANIC,RIVERINE:TIDAL/FLAT:VEGETATED PIONEER,
   RIVERINE:TIDAL/FLAT:VEGETATED NONPIONEER,RIVERINE:TIDAL/ROCKY SHORE,
   RIVERINE:TIDAL/ROCKY SHORE:BEDROCK,RIVERINE:TIDAL/ROCKY SHORE:BOULDER,
   RIVERINE,RIVERINE:LOWER,
   RIVERINE:LOWER/BEACH-BAR,
   RIVERINE:LOWER/BEACH-BAR:COBBLE-GRAVEL,
   RIVERINE:LOWER/BEACH-BAR:SAND,
   RIVERINE:LOWER/EMERGENT,
   RIVERINE:LOWER/EMERGENT:NONPERSISTENT,
   RIVERINE:LOWER/EMERGENT:NARROW-LEAVED NONPERSISTENT,
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   RIVERINE:LOWER/EMERGENT:BROAD-LEAVED NONPERSISTENT,
   RIVERINE:LOWER/FLAT,
   RIVERINE:LOWER/FLAT:COBBLE-GRAVEL,
   RIVERINE:LOWER/FLAT:SAND,
   RIVERINE:LOWER/FLAT:MUD,
   RIVERINE:LOWER/FLAT:ORGANIC,
   RIVERINE:LOWER/FLAT:VEGETATED PIONEER,
   RIVERINE:LOWER/FLAT:VEGETATED NONPIONEER,
   RIVERINE:LOWER/ROCKY SHORE,
   RIVERINE:LOWER/ROCKY SHORE:BEDROCK,
   RIVERINE:LOWER/ROCKY SHORE:BOULDER,
   RIVERINE:UPPER,RIVERINE:UPPER:BEACH-BAR,
   RIVERINE:UPPER/BEACH-BAR:COBBLE-GRAVEL,
   RIVERINE:UPPER/BEACH-BAR:SAND,
   RIVERINE:UPPER/FLAT,
   RIVERINE:UPPER/FLAT:COBBLE-GRAVEL,
   RIVERINE:UPPER/FLAT:SAND,
   RIVERINE:UPPER/FLAT:MUD,
   RIVERINE:UPPER/FLAT:ORGANIC,
   RIVERINE:UPPER/FLAT:VEGETATED PIONEER,
   RIVERINE:UPPER/FLAT:VEGETATED NONPIONEER,
   RIVERINE:UPPER/ROCKY SHORE,
   RIVERINE:UPPER/ROCKY SHORE:BEDROCK,
   RIVERINE:UPPER/ROCKY SHORE:BOULDER
<WETLAND-CODE>
   E....,E2...,E2EM.,E2EM1,E2EM2,E2EM3,E2EM4,E2EM5,E2EM6,
   E2FL.,E2FL1,E2FL2,E2FL3,E2FL4,E2FL5,E2FL6,E2FO.,E2FO1,E2FO3,E2FO4,
   E2FO5,E2FO6,E2FO7,R....,R1...,R1BB.,R1BB1,R1BB2,R1EM.,R1EM2,R1EM3,
   R1EM4,R1FL.,R1FL1,R1FL2,R1FL3,R1FL4,R1FL5,R1FL6,R1RS.,R1RS1,R1RS2,
   P....,PO...,POEM.,POEM1,POEM2,POEM3,POEM4,POEM5,POEM6,POFL.,POFL1,
   POFL2,POFL3,POFL4,POFL5,POFL6,POFO.,POFO1,POFO2,POFO3,POFO4,POFO5,
   POFO6,POFO7,R2...,R2B3..,R2BB1,R2BB2,R2EM.,R2EM2,R2EM3,R2EM4,
   R2FL.,R2FL1,R2FL2,R2FL3,R2FL4,R2FL5,R2FL6,R2RS.,R2RS1,R2RS2,R3...,
   R3BB.,R3BB1,R3BB2,R3FL.,R3FL1,R3FL2,R3FL3,R3FL4,R3FL5,R3FL6,R3RS.,
   R3RS.,R3RS1,R3RS2
<ENVIR-ASSOC>
   INLAND WETLAND:VEGETATED STREAM BANKS;
   INLAND WETLAND:BEAVER-DAMMED STREAMS;
   INLAND WETLAND:FARM PONDS;
   INLAND WETLAND:WET MEADOWS;
   SOIL:CLAY;SOIL:SILT;SOIL:SAND;SOIL:LOAM;SOIL:GRAVEL;SOIL:ROCKY;
   SOIL TEXTURE:COARSE;SOIL TEXTURE:MEDIUM;SOIL TEXTURE:FINE;
   SOIL DEPTH:10-20;SOIL DEPTH:20-36;SOIL DEPTH:>36;
   SOIL PROFILE:UNDECOMPOSED ORGANIC MATTER (O1 HORIZON);
   SOIL PROFILE:PARTIALLY DECOMPOSED ORGANIC MATTER (O2 HORIZON);
   SOIL PROFILE:MINERAL SOIL/MIXED WITH HUMUS (A1 HORIZON);
   SOIL PROFILE:MINERAL SOIL/ZONE OF ELUVIATION (A2 HORIZON);
   SOIL PROFILE:TRANSITIONAL ZONE (B1 HORIZON);
   (B1 HORIZON);
   SOIL DRAINAGE:EXCESSIVELY DRAINED (COARSE SOIL, VERY POROUS);
   SOIL DRAINAGE:WELL DRAINED (MEDIUM TEXTURE SOILS);
   SOIL DRAINAGE:MODERATELY WELL DRAINED;
   SOIL DRAINAGE:IMPERFECTLY AND POORLY DRAINED;
   PORTION OF THE YEAR);
   SOIL PH:5.0-6.0;SOIL PH:6.0-8.0;SOIL PH:8.0-10.0;
   SOIL MOISTURE:WET;SOIL MOISTURE:MOIST;SOIL MOISTURE:DRY;
   SOIL COMPACTION:EASILY PENETRATED;
   ASPECT:NORTH;ASPECT:NORTHEAST;ASPECT:EAST;ASPECT:SOUTHEAST;
   ASPECT:SOUTH;ASPECT:SOUTHWEST;ASPECT:WEST;ASPECT:NORTHWEST;
   ELEVATION:BELOW SEA LEVEL;ELEVATION:0-100 FT.;ELEVATION:100-300 FT.;
   ELEVATION:300-500 FT.;ELEVATION:500-1,000 FT.;
   ELEVATION:1,000-2,000 FT.;ELEVATION:2,000-3,000 FT.;
   ELEVATION:3,000-4,000 FT.;ELEVATION:>4,000 FT.;
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SLOPE:LEVEL (NO SLOPE);SLOPE:LESS THAN 5%;SLOPE:5-10%;
SLOPE:10-15%;SLOPE:15-25%;SLOPE:>25%;
TERRESTRIAL FEATURES:BURROWS;TERRESTRIAL FEATURES:TALUS;
TERRESTRIAL FEATURES:STANDING SNAGS;TERRESTRIAL FEATURES:DOWNED LOGS;
TERRESTRIAL FEATURES:ROCK OUTCROPS;TERRESTRIAL FEATURES:RIDGES;
TERRESTRIAL FEATURES:DEPRESSIONS/SINKHOLES;
TERRESTRIAL FEATURES:BRUSH PILES/ROCK PILES;
TERRESTRIAL FEATURES:HEDGEROWS/WIND BREAKS;
TERRESTRIAL FEATURES:FENCE ROWS;
TERRESTRIAL FEATURES:ROADSIDE DITCHES;
TERRESTRIAL FEATURES:GRASSY UNCULTIVATED AREAS;
TERRESTRIAL FEATURES:VEGETATION MOSAICS/EDGES;
ECOTONE:WOODLAND/CROP FIELDS;
ECOTONE:WOODLAND/SHRUB-BRUSH FIELD;
ECOTONE:WOODLAND/OPEN WATER;
ECOTONE:WOODLAND/HERBACEOUS FIELD;
ECOTONE:SHRUB-BRUSH FIELD/OPEN WATER;
ECOTONE:CROP FIELD/OPEN WATER;
ECOTONE:CROP FIELD/HERBACEOUS FIELD;
ECOTONE:HERBACEOUS FIELD/SHRUB-BRUSH FIELD;
ECOTONE:HERBACEOUS FIELD/OPEN WATER;
ECOTONE:CONIFEROUS FOREST/DECIDUOUS FOREST;
ECOTONE:WOODLAND/BARREN LAND;
ECOTONE:WOODLAND/WETLAND;
ECOTONE:WOODLAND/URBAN LAND;
ECOTONE:SHRUB-BRUSH FIELD/BARREN LAND;
ECOTONE:SHRUB-BRUSH FIELD/CROP FIELD;
ECOTONE:SHRUB-BRUSH FIELD/WETLAND;
ECOTONE:SHRUB-BRUSH FIELD/URBAN LAND;
ECOTONE:CROP FIELD/BARREN LAND;
ECOTONE:CROP FIELD/URBAN LAND;
ECOTONE:CROP FIELD/WETLAND;
ECOTONE:BARREN LAND/HERBACEOUS FIELD;
ECOTONE:HERBACEOUS FIELD/WETLAND;
ECOTONE:HERBACEOUS FIELD/URBAN LAND;
ECOTONE:BARREN LAND/WETLAND;
ECOTONE:WETLAND/URBAN LAND;
FOREST ECOTONE:CLEARCUT/SEEDLING-SAPLING STAGE;
FOREST ECOTONE:CLEARCUT/POLE STAGE;
FOREST ECOTONE:CLEARCUT/MATURE STAGE;
FOREST ECOTONE:SEEDLING-SAPLING/POLE STAGE;
FOREST ECOTONE:SEEDLING-SAPLING/MATURE STAGE;
FOREST ECOTONE:POLE/MATURE STAGE;
TERRESTRIAL VERTICAL DIVERSITY:SUBSURFACE LAYER;
TERRESTRIAL VERTICAL DIVERSITY:SURFACE LAYER;
TERRESTRIAL VERTICAL DIVERSITY:HERBACEOUS LAYER;
NEST SITES:UNDERGROUND BURROW;NEST SITES:ROCK OUTCROPS;
NEST SITES:DOWNED LOGS;NEST SITES:BRUSH PILES;
FOREST OPENINGS:<1/2 ACRE;FOREST OPENINGS:1/2 - 1 ACRE;
FOREST OPENINGS:1-5 ACRES;FOREST OPENINGS:5-20 ACRES;
FOREST OPENINGS:20-40 ACRES;FOREST OPENINGS:>40 ACRES;
CONTINUOUS FORESTED STAND:<10 ACRES;
CONTINUOUS FORESTED STAND:10-19 ACRES;
CONTINUOUS FORESTED STAND:20-49 ACRES;
CONTINUOUS FORESTED STAND:50-99 ACRES;
CONTINUOUS FORESTED STAND:100-499 ACRES;
CONTINUOUS FORESTED STAND:500-5,000 ACRES;
CONTINUOUS FORESTED STAND:5,000-10,000 ACRES;
CONTINUOUS FORESTED STAND:>10,000 ACRES;
DISTANCE TO FOREST OPENING:<500 FT. (.1 MILES);
DISTANCE TO FOREST OPENING:500-2640 FT. (.1-.5 MILES);
DISTANCE TO FOREST OPENING:>2640 FT. (.5 MILES);
OVERSTORY CANOPY CLOSURE:>70% CLOSURE;

OVERSTORY CANOPY CLOSURE:40-70% CLOSURE;
OVERSTORY CANOPY CLOSURE:<40% CLOSURE;
OVERSTORY TREES HEIGHT:<20 FT.;
OVERSTORY TREES HEIGHT:20-40 FT.;
OVERSTORY TREES HEIGHT:40-80 FT.;
OVERSTORY TREES HEIGHT:>80 FT.;
OVERSTORY TREES DBH:<4 INCHES;
OVERSTORY TREES DBH:4-11 INCHES;
OVERSTORY TREES DBH:12-18 INCHES;
OVERSTORY TREES DBH:>18 INCHES;
SHRUB CROWN COVER:<10%;
SHRUB CROWN COVER:10-25% COVER;
SHRUB CROWN COVER:25-50% COVER;
SHRUB CROWN COVER:50-75% COVER;
SHRUB CROWN COVER:>75%;
SHRUB COVER HEIGHT:<3 FT.;
SHRUB COVER HEIGHT:3-6 FT.;
SHRUB COVER HEIGHT:6-12 FT.;
SHRUB COVER HEIGHT:>12 FT.;
HERBACEOUS GROUND COVER:10-25%;HERBACEOUS GROUND COVER:25-50%;
HERBACEOUS GROUND COVER:50-75%;
HERBACEOUS GROUND COVER:>75%;
HERBACEOUS COVER HEIGHT:<4 INCHES;
HERBACEOUS COVER HEIGHT:4-8 INCHES;
HERBACEOUS COVER HEIGHT:8-12 INCHES;
HERBACEOUS COVER HEIGHT:12-24 INCHES;
HERBACEOUS COVER HEIGHT:24-36 INCHES;
HERBACEOUS COVER HEIGHT:>36 INCHES;
AGRICULTURAL TYPES:PASTURELAND;
AGRICULTURAL TYPES:WINTER GRAINS (BARLEY, WHEAT, RYE);
AGRICULTURAL TYPES:SPRING GRAINS (OATS, CORN, BUCKWHEAT, ETC.);
AGRICULTURAL TYPES:ORCHARDS (APPLE, PEAR, PEACH, CHERRY, ETC.);
AGRICULTURAL TYPES:HAYLANDS;
VEGETATION SUCCESSIONAL:ABANDONED FIELDS;
VEGETATION SUCCESSIONAL:STABLE FOREST;
VEGETATION SUCCESSIONAL:SUBCLIMAX FOREST;
VEGETATION SUCCESSIONAL:CLIMAX FOREST;
VEGETATION SUCCESSIONAL:PIONEER COMMUNITY;
VEGETATION SUCCESSIONAL:STABLE PRAIRIE/GRASSLAND;
VEGETATION SUCCESSIONAL:SUBCLIMAX GRASSLAND;
VEGETATION SUCCESSIONAL:CLIMAX GRASSLAND;
CONIFEROUS TREES IN MIXED FOREST:<5%;
CONIFEROUS TREES IN MIXED FOREST:5-10%;
CONIFEROUS TREES IN MIXED FOREST:10-25%;
CONIFEROUS TREES IN MIXED FOREST:>25%;
SNAGS:1 OR LESS PER ACRE;SNAGS:2 PER ACRE;SNAGS:3 PER ACRE;
SNAGS:4 PER ACRE;SNAGS:>4 PER ACRE;
OVERSTORY CANOPY IN DECIDUOUS SPECIES:<10%;
OVERSTORY CANOPY IN DECIDUOUS SPECIES:10-25%;
OVERSTORY CANOPY IN DECIDUOUS SPECIES:25-50%;
OVERSTORY CANOPY IN DECIDUOUS SPECIES:50-75%;
OVERSTORY CANOPY IN DECIDUOUS SPECIES:>75%;
HUMAN ASSOCIATION:FARMS (CROPLAND/PASTURES);
HUMAN ASSOCIATION:STATE AND COUNTY PARKS;
HUMAN ASSOCIATION:NATIONAL PARKS/HISTORIC LANDMARKS;
HUMAN ASSOCIATION:WILDLIFE REFUGES/SANCTUARIES
<ENVIR-LIM>
NEST SITES:UNDERGROUND BURROW;NEST SITES:ROCK OUTCROPS
<ENVIR-LIM-E>
<ENVIR-LIM-LF>
<ENVIR-LIM-LR>
<ENVIR-LIM-P>
<ENVIR-LIM-JF>

<ENVIR-LIM-JR>
<ENVIR-LIM-AF>
<ENVIR-LIM-AR>
<ENVIR-LIM-AB>
NEST SITES:UNDERGROUND BURROW;NEST SITES:ROCK OUTCROPS
<FOOD-GEN>
INSECTS-ADULT,INSECTS-AQUATIC,CRUSTACEANS,
MAMMALS-JUVENILES/NESTLINGS,MAMMALS-SMALL,
BIRD EGGS,BIRD NESTLINGS,BIRD ADULTS,REPTILE EGGS,
REPTILE JUVENILES,REPTILE ADULTS,AMPHIBIAN EGGS,
AMPHIBIAN JUVENILES,AMPHIBIAN ADULTS,DOMESTIC BIRDS
<FOOD-L>
<FOOD-J>
INSECTS-ADULT,INSECTS-AQUATIC,CRUSTACEANS,
MAMMALS-JUVENILES/NESTLINGS,MAMMALS-SMALL,
BIRD EGGS,BIRD NESTLINGS,BIRD ADULTS,REPTILE EGGS,
REPTILE JUVENILES,REPTILE ADULTS,AMPHIBIAN EGGS,
AMPHIBIAN JUVENILES,AMPHIBIAN ADULTS,DOMESTIC BIRDS
<FOOD-A>
INSECTS-ADULT,INSECTS-AQUATIC,CRUSTACEANS,
MAMMALS-JUVENILES/NESTLINGS,MAMMALS-SMALL,
BIRD EGGS,BIRD NESTLINGS,BIRD ADULTS,REPTILE EGGS,
REPTILE JUVENILES,REPTILE ADULTS,AMPHIBIAN EGGS,
AMPHIBIAN JUVENILES,AMPHIBIAN ADULTS,DOMESTIC BIRDS
<FORAG-SITE>
GROUND SURFACE,HERBACEOUS VEGETATION,SNAGS (DEAD/DYING TREES),
STUMPS,ROCKS,LOGS,UNDERGROUND BURROWS
<BREED-SEASON>
JULY,AUGUST
<SPAWN-SITE>
<NEST-SITE>
SECONDARY CAVITY (EXCAVATED BY ANOTHER SPECIES),
UNDERGROUND BURROW,LOG,UNDER ROCKS/ROCK OUTCROPS
<NEST-MATRLS>
GRASSES,HAIR AND FEATHERS
<TREND-CAUSE>
<MGMT-BENEFIT>
REGULATE NUMBERS AND SEX OF HARVEST;
RESTRICT HUMAN DISTURBANCE DURING BREEDING OR OTHER STRESSFUL PERIODS;
SUPPRESSING WILD FIRE;MAINTAINING NATURAL VEGETATION (NATIVE);
MAINTAIN EARLY STAGES OF SUCCESSION;
CREATION AND MAINTENANCE OF EDGE SITUATION;MAINTAINING WOODLOTS;
CREATING/MAINTAINING SNAGS;RETAINING DEAD/DOWNED WOODY MATERIALS;
DEVELOPING/MAINTAINING GREENSPACE (WILDLIFE CORRIDORS);
DEVELOPING/MAINTAINING WATER HOLES, PONDS, POTHOLES, ETC.;
ESTABLISHMENT OF FIELD BORDERS;CREATING WIND AND SNOWBREAKS;
DEVELOPING/MAINTAINING HEDGEROWS;CREATING/MAINTAINING ROCK PILES;
DEVELOPING/MAINTAINING BRUSH OR SLASH PILES;
DEVELOPING/MAINTAINING DITCHBANK VEGETATION;
PLANTINGS (SHRUBS, GRASSES, TREES, ETC.);
PLANTINGS (GRASSES);PLANTINGS (SHRUBS);PLANTINGS ALONG ROADSIDES;
STREAM BANK PRESERVATION;
DEVELOPING/MAINTAINING STREAMBANK/STREAMSIDE VEGETATION;
PLANTING HEDGEROWS ALONG DRY STREAMBEDS AND/OR GULLIES;
DEVELOPING/MAINTAINING/PROTECTING FRESHWATER WETLANDS;
SUBSURFACE LAND DRAINAGE;DEVELOPMENT OF SHALLOW WATER IMPOUNDMENTS;
EVEN AGE TIMBER MANAGEMENT;TIMBER HARVEST;
REGENERATION CUTS (I.E., CLEARCUT, SELECTION, SEED TREE, ETC.);
TIMBER HARVESTING - CLEARCUTTING;
TIMBER HARVESTING - SELECTION CUTS;
TIMBER HARVESTING - SHELTERWOOD CUTS;
TIMBER HARVESTING - SEED TREE CUTS;
TIMBER STAND IMPROVEMENT (THINNING, RELEASE CUTTINGS, PRUNING);

DEVELOPING/MAINTAINING FOREST OPENINGS;
REFORESTATION - DECIDUOUS;REFORESTATION - CONIFEROUS;
REFORESTATION - MIXED DECIDUOUS/CONIFEROUS;
FOREST FIRE SUPPRESSION;CUT-AND-BEND OR HINGE-CUTTING TREES;
DAYLIGHT CUTTING ALONG ROADS;
VISTA CUTTING ALONG ROADS AND TRAILS TO OPEN UP VIEWS;
STRIP CROPPING;MINIMUM TILLAGE AGRICULTURE (STRIP TILLAGE);
NON-INVERSION TILLAGE (DEEP OFFSET, DISK PLOW, CHIZEL PLOW, ETC.);
NO-TILL FARMING;RETAINING CROP RESIDUE (OVER WINTER);
DELAYED GRAZING PASTURES/FIELDS UNTIL LATE JUNE OR JULY;
FENCING OUT CATTLE, SHEEP, OR OTHER LIVESTOCK;
DRAINAGE LAND GRADING (RESHAPING LAND SURFACE TO DRAIN SOIL);
FARM POND DEVELOPMENT;DEVELOPMENT/MAINTENANCE OF GRASSED WATERWAYS;
PLANTING PREPARATORY CROPS (COVER AND GREEN MANURE CROP);
RIGHTS-OF-WAY MANAGEMENT FOR WILDLIFE;
LOCATING/CONSTRUCTING POWERLINES AND OTHER RIGHTS-OF-WAY;
CONTROLLING POLLUTION (THERMAL, CHEMICAL, PHYSICAL)

<MGMT-HARM>
GRASSLAND BURNING;PRESCRIBED BURNING OF BRUSHLAND HABITAT;
BRUSH REMOVAL/CUTTING IN PASTURES AND CROPLAND;
CHAINING VEGETATION TO IMPROVE HABITAT;
REMOVAL OF HEDGEROWS;REMOVAL OF STONE WALLS;
REMOVAL OF STREAMSIDE VEGETATION;
DRAINING/EXCAVATING WETLANDS, INCLUDING MARSHES WITH VEGETATION;
PRESCRIBED BURNING IN FOREST HABITAT;SURFACE MINING;
INTENSIVE RECREATIONAL DEVELOPMENT;
CREATION OF SUBURBAN RESIDENTIAL AREAS;
INDUSTRIAL POLLUTION

<N-TAXONOMY>
MUSTELA FRENATA, THE LONG-TAILED WEASEL, ALSO IS KNOWN LOCALLY AS THE NEW YORK LONG-TAILED WEASEL, BIG STOAT, ERMINE WEASEL, LARGE BROWN WEASEL, LARGE ERMINE, LARGE WEASEL, LONG-TAILED WEASEL, NEW YORK WEASEL, AND NEW YORK STATE WEASEL *01:345-346,02:205*.

THE TERM "BRIDLED WEASEL" ALSO HAS BEEN USED TO DESCRIBE THIS WEASEL BECAUSE THE RESEMBLANCE OF THE WHITE MARKINGS ON THE HEADS OF SOME INDIVIDUALS OF THIS SPECIES TO A BRIDLE *03:307*.

<N-SPP-STATUS>
THE LONG-TAILED WEASEL (M. FRENATA IS CLASSIFIED AS A PREDATOR IN PENNSYLVANIA. BECAUSE THE WEASEL IS NOT CLASSIFIED AS A FURBEARER, ONLY A HUNTING LICENSE IS NEEDED TO TAKE (HUNT OR TRAP) THIS SPECIES. A FURTAKER LICENSE IS NOT REQUIRED. THERE IS NO CLOSED HUNTING SEASON FOR THIS WEASEL EXCEPT DURING THE ANTLERED AND ANTERLESS DEER SEASONS AND UNTIL 12 NOON DAILY DURING THE SPRING GOBBLER TURKEY SEASON. TRAPPING OF WEASELS TYPICALLY IS PERMITTED FROM LATE OCTOBER THROUGH LATE JANUARY. CONSULT THE PENNSYLVANIA GAME COMMISSION FOR CURRENT YEAR REGULATIONS CONCERNING SPECIFIC TRAPPING SEASONS AND STATUS CHANGES FOR THIS SPECIES. THERE IS AN UNLIMITED DAILY AND SEASON POSESSION LIMIT FOR WEASELS *19*.

<N-DISTRIB>
THE LONG-TAILED WEASEL (M. FRENATA OCCURS FROM SOUTHERN CANADA TO SOUTH AMERICA *04:613*. IT IS NOT FOUND IN THE SOUTHWESTERN DESERT OF THE UNITED STATES, NORTHWESTERN MEXICO OR THE BAJA PENINSULA *05:138*. THIS SPECIES IS KNOWN TO OCCUR THROUGHOUT PENNSYLVANIA *02:208*. IT OCCURS IN ALL COUNTIES OF THE SOUTHWESTERN REGION, BUT IS MORE ABUNDANT IN THE ALLEGHENY MOUNTAINS SECTION *06:52*. IT IS COMMON IN ALL COUNTIES IN THE SOUTHEASTERN REGION, ALTHOUGH IT IS SCARCE IN DELAWARE AND PHILADELPHIA COUNTIES *06:37*. IT OCCURS THROUGHOUT THE NORTHEASTERN REGION AND IS LOCALLY COMMON *09:45*. IT IS FOUND IN ALL COUNTIES IN THE NORTHCENTRAL REGION, BUT IS CONSISTENTLY COMMON IN CERTAIN AREAS AND SCARCE IN OTHERS *10:33*. IT IS GENERALLY DISTRIBUTED AND COMMON IN NORTHWESTERN PENNSYLVANIA, EXCEPT IN BEAVER COUNTY WHERE ALL WEASELS APPEAR TO BE SCARCE *11:30*. SPECIMENS

WERE RECENTLY COLLECTED IN BLAIR COUNTY *12*, CUMBERLAND COUNTY *13* AND FRANKLIN COUNTY *14*.

<N-HABITAT>

FAVORED HABITATS INCLUDE OPEN WOODS AND WOODLAND EDGES *05:138,04:613,15:150,16:292,09:45,08:37,07:41,01:347,17:224,18:141,20:135*, BRUSHLAND AND BRUSHY FIELD BORDERS *04:613,15:150,08:37,07:41,01:347,17:224,18:141,20:135*, AGRICULTURAL LANDS *18:141,05:138,04:613*, AND MARSHES *04:613,16:292,08:37,10:34*. IT IS MOST COMMON IN AREAS NEAR WATER *17:224,01:347,07:41,05:138,04:613) THAT PROVIDE BRUSHY FENCEROWS, STONE PILES OR FENCES, WIND-FALLEN TIMBER, BRIARS OR THICKETS, AND CULVERTS *05:138,09:45,08:37,10:34,07:41,17:224*. WOODCHUCK BURROWS ARE RARELY OVERLOOKED *10:34*. INTENSIVELY FARMED AREAS, WHICH PROVIDE LITTLE OR NO COVER FOR PREY SPECIES, INVARIABLY SUPPORT VERY FEW WEASELS *08:37*.

<N-FOOD>

THE LONG-TAILED WEASEL (M. FRENATA HAS ADAPTED TO A HIGHLY SPECIALIZED CARNIVOROUS WAY OF LIFE *04:623*. THIS WEASEL IS AN EFFICIENT PREDATOR THAT PREYS PRIMARILY ON SMALL MAMMALS; SOME BIRDS, ESPECIALLY GROUND NESTING SPECIES; A FEW INSECTS AND AN OCCASIONAL REPTILE OR AMPHIBIAN *04:621-622,05:139,17:225,06:52,18:141*. DURING PERIODS OF RODENT SCARCITY, WEASELS MAY SHIFT TO ALTERNATIVE PREY SUCH AS DOMESTIC POULTRY *04:621-622*. WEASELS REQUIRE A CONSTANT SUPPLY OF DRINKING WATER. M. FRENATA DRINKS ABOUT 25CC DAILY *04:623*. IT IS GENERALLY ASSUMED THAT WEASELS UTILIZE LIVING PREY AND DO NOT SCAVENGE *04:621-622*.

<N-MGMT>

HABITAT CONDITIONS CAN BE IMPROVED BY DEVELOPING OR MAINTAINING EDGE CONDITIONS: PROVIDING FOOD AND COVER FOR SMALL MAMMALS AND BIRDS; CREATING OR MAINTAINING ROCK PILES, BRUSH OR SLASH PILES, MAINTAINING DEAD OR DOWNED WOODY MATERIALS; MAINTAINING AND PROTECTING RIPARIAN AND WETLAND HABITATS *05:138,09:45,08:37,10:34,07:41,17:224,04:621-622,02:207,03:310 AND 313,15:150,18:141*.

<HEP-DATA>

<ANIMAL-PLANT>

FOOD ITEMS: VOLES (MICROTUS SP.) *04:621-622*,DEER MICE (PEROMYSCUS SP.) *04:621-622*, EASTERN COTTONTAIL (SYLVILAGUS SP.) *04:621-622,06:52,17:225*, SHORT-TAILED SHREW (BLARINA BREVICAUDA) *04:621-622,06:52*, HARVEST MICE (REITHRODONTOMYS SP.) *04:621-622*.

PREDATORS: RATTLESNAKES (CROTALUS SP.) *04:624-625,01:349*, BLACK RAT SNAKE (ELAPHE OBSOLETA) *04:624-625,01:349*, GREAT HORNED OWL (BUBO VIRGINIANUS) *04:624-625,01:349*, BARRED OWL (STRIX VARIA) *04:624-625,01:349), ROUGH-LEGGED HAWK (BUTEO LAGOPUS) *04:624-625,01:349*, AND GRAY FOX (UROCYON CINEREOEOARGENTEUS) *04:624-625,01:349*.

<DESCRIPTION>

MUSTELA FRENATA IS PENNSYLVANIA'S LARGEST WEASEL. ADULT MALES REACH LENGTHS OF 33-56 CM. AND ADULT FEMALES ATTAIN LENGTHS OF 28-38 CM. *04:614-615,18:141*. THE TAIL IS 40-70% OF THE HEAD AND BODY LENGTH AND IT HAS A DESTINCT BLACK TIP *04:614-615*. MALES ARE ABOUT 10-15 PERCENT LARGER THAN FEMALES IN MOST POPULATIONS. ADULT MALES WEIGH 184-354 GMS. WHILE ADULT FEMALES WEIGH 71-198 GMS. *18:141*. THE PELAGE IS SHORT, MODERATELY FINE, BUT NOT THICK *03:307*. MOLTING OCCURS FROM MID-OCTOBER TO MID-NOVEMBER AND MID-FEBRUARY TO MID-APRIL *05:139*. THE UPPER PARTS ARE BROWN IN SUMMER. THE UNDERPARTS ARE WHITISH, TINGED WITH YELLOWISH OR BUFFY BROWN FROM THE CHIN TO THE INGUINAL REGION. THE TAIL IS UNIFORMLY BROWN EXCEPT FOR THE BLACK TIP. THE WINTER PELAGE IN NORTHERN POPULATIONS IS NORMALLY ENTIRELY WHITE, EXCEPT FOR THE BLACK TIP OF THE TAIL *04:614-615*. MOST WEASELS IN PENNSYLVANIA REMAIN BROWN ALL WINTER *02:207*. THE SHORT LIMBS BEAR FIVE DIGITS WITH NONRETRACTIBLE, CURVED CLAWS. EARS ARE SHORT AND ROUNDED *04:614-615*. THE SKULL HAS 34 TEETH. THERE ARE 8 MAMMAE *18:141*.

<ORIGIN>

THE LONG-TAILED WEASEL IS NATIVE WITHIN PENNSYLVANIA *02*.

<BEHAVIOR>

THE LONG-TAILED WEASEL MAINTAINS A SOLITARY EXISTENCE EXCEPT DURING THE BREEDING SEASON *04:624*. THEY ARE ACTIVE ALL YEAR LONG AND ARE MAINLY NOCTURNAL *05:139,16:292,18:141*. MALES DEFEND TERRITORIES AGAINST MALES AND FEMALES DEFEND AGAINST FEMALES, BUT THE TERRITORY OF AN INDIVIDUAL OF ONE SEX MAY OVERLAP WITH THE TERRITORY OF A MEMBER OF THE OTHER SEX *04:620*. HOME RANGE SIZE VARIES WITH FOOD AVAILABILITY, COVER TYPE, POPULATION DENSITY, SEASON AND SEX *04:620,05:139*. STUDIES HAVE SHOWN HOME RANGES TO VARY FROM 12-162 HA *04:620,05:139*. MOVEMENT IS PRIMARILY RELATED TO HUNTING AND SEEKING MATES. THEY TRAVEL AN AVERAGE DISTANCE OF 100-200M DURING A SINGLE NIGHT *04:619*. THEY TRAVEL FARTHER IN OPEN COUNTRY THAN IN BRUSHY COUNTRY *03:309,04:619*. WEASELS HUNT BY TRAVELLING THROUGH THEIR HABITAT IN A 'RANDOM SEARCH' MANNER, INVESTIGATING TUNNELS, NESTS, AND POTENTIAL HIDING PLACES OF RODENTS AS THEY ENCOUNTER THEM *04:623*. WHERE SNOW IS DEEP, WEASELS BURROW BENEATH THE SNOW TO HUNT *04:619*. WEASELS ARE CAPABLE OF CLIMBING TREES IN PURSUIT OF PREY *04:623,01:348,18:141* AND WILL TAKE TO THE WATER *04:623,17:225*. WHEN WEASELS ENCOUNTER A LOCAL ABUNDANCE OF FOOD IN EXCESS OF WHAT THEY CAN CONSUME, THEY WILL CACHE THE UNUSED FOOD AND RETURN TO EAT IT LATER *04:623,18:141*.

<REPRODUCTION>

THE BREEDING SEASON IS FROM JULY TO AUGUST *05:138,18:141*. M. FRENATA EXHIBITS AN UNUSUALLY LONG PERIOD BETWEEN CONCEPTION AND PARTURITION BECAUSE OF DELAYED IMPLANTATION *04:617,05:138, 18:141*. THE GESTATION PERIOD IS APPROXIMATELY 278 DAYS *04: 617-618,05:138*. THE EMBRYO IS NOT IMPLANTED UNTIL 27 DAYS BEFORE BIRTH, AFTER WHICH TIME DEVELOPMENT IS RAPID *03:313*. PARTURITION OCCURS IN APRIL AND MAY AND A SINGLE LITTER OF BETWEEN 5-9 YOUNG IS PRODUCED EACH YEAR *04:617-618,02:207,05:138*. THE YOUNG ARE BORN IN AN UNDEVELOPED STATE, HAIRLESS AND WITH EYES AND EARS SHUT TIGHTLY *02:207*. THE YOUNG SPEND THE FIRST 5 WEEKS BEDDED DOWN IN SOFT FUR SUPPLIED BY THEIR MOTHER'S HUNTING PROWESS *02: 207*. BOTH PARENTS CARE FOR THEIR OFFSPRING, AT LEAST UNTIL THEY ARE WEANED *03:313*. DEN SITES INCLUDE THE BURROWS OF OTHER ANIMALS: HOLLOW TREES, LOGS AND STUMPS; OR OTHER NATURAL HOLES OR CREVICES *02:207,05:138,03:310 AND 313,15:150,18:141*. THE NEST CENTER IS USUALLY FILLED WITH GRASS AND LINED WITH FUR AND FEATHERS FROM THE WEASEL'S PREY *15:150,03:310*. MALES ATTAIN ADULT BODY WEIGHT IN 3-4 MONTHS, BUT DO NOT BECOME SEXUALLY MATURE UNTIL ABOUT ONE YEAR OF AGE. FEMALES ARE FULLY GROWN AND SEXUALLY MATURE AT 3-4 MONTHS OF AGE *04:617-618,05:138,18:141*.

<POP-DYNAMICS>

THE NORTH AMERICAN LONG-TAILED WEASEL POPULATION IS RELATIVELY WIDESPREAD, STABLE AND APPARENTLY DIRECTLY RELATED TO HABITAT CONDITIONS *18:141*. IT IS CONSIDERED RELATIVELY COMMON TO UNCOMMON IN THE NORTHEASTERN UNITED STATES *05:138*. LONGEVITY IN THE WILD IS NOT WELL DOCUMENTED FOR WEASELS, BUT IS ESTIMATED TO BE APPROXIMATELY 3 YEARS FOR M. FRENATA *04:624*. POPULATION DENSITIES FLUCTUATE CONSIDERABLY WITHIN THE ANNUAL CHANGES IN SMALL MAMMAL ABUNDANCES *04:620,01:347,18:141-142*. IN FAVORABLE HABITAT, MAXIMUM DENSITIES ARE 6-7 PER SQUARE KM. THE SEX RATIO AT BIRTH IS 1:1 AND NO EVIDENCE OF DIFFERENTIAL MORTALITY RATES FOR ADULTS HAS BEEN FOUND *04:620*.

<LIM-FACTORS>

NATURAL MORTALITY OF WEASELS IS A RESULT OF SEVERAL INTERACTING FACTORS: DISEASE, PARASITES, NUTRITION, POPULATION STRESS AND PREDATION. THE INCIDENCE OF DISEASE AND PARASITES OF WEASELS ARE POORLY KNOWN. WEASELS ARE HIGHLY SUSCEPTIBLE TO TULAREMIA *04:624-625*. EXTERNAL PARASITES INCLUDE TICKS, FLEAS AND MITES *01:349-350*. INTERNAL PARASITES INCLUDE NEMATODES, CESTODES,

AND TREMATODES *04:624-625*. PREDATORS OF WEASELS ARE NUMEROUS AND INCLUDE RATTLESNAKES, BLACKSNAKES, SNOWY OWLS, GREAT HORNED OWLS, BARRED OWLS, ROUGH-LEGGED HAWKS, GOSHAWKS, RED FOXES, GRAY FOXES, DOGS AND CATS *01:349,04:624-625*.

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01,02,03

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<REFERENCES>
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APPENDIX G

Updated Species Profile

Raccoon

(*Procyon lotor*)

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<PAIR-BOND> NO BOND FORMED <DISPLAY-SITE> <PREG-INCUBAT> 1-2 MONTHS
<AVE-YOUNG> 3-4 <REPROD-YR> 1 <DEVEL-YOUNG> ALTRICIAL
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BUTLER,CAMBRIA,CAMERON,CARBON,CENTRE,CHESTER,CLARION,CLEARFIELD,
CLINTON,COLUMBIA,CRAWFORD,CUMBERLAND,DAUPHIN,DELAWARE,ELK,ERIE,
FAYETTE,FOREST,FRANKLIN,FULTON,GREENE,HUNTINGDON,INDIANA,JEFFERSON,
JUNIATA,LACKAWANNA,LANCASTER,LAWRENCE,LEBANON,LEHIGH,LUZERNE,LYCOMING,
MCKEAN,MERCER,MIFFLIN,MONROE,MONTGOMERY,MONTOUR,NORTHAMPTON,
NORTHUMBERLAND,PERRY,PHILADELPHIA,PIKE,POTTER,SCHUYLKILL,SNYDER,
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WAYNE,WESTMORELAND,WYOMING,YORK
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<UNK-COUNTY>
<SEAS-OCCUR>
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CAMBRIA:SBFW,CAMERON:SBFW,CARBON:SBFW,CENTRE:SBFW,CHESTER:SBFW,
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CRAWFORD:SBFW,CUMBERLAND:SBFW,DAUPHIN:SBFW,DELAWARE:SBFW,ELK:SBFW,
ERIE:SBFW,FAYETTE:SBFW,FOREST:SBFW,FRANKLIN:SBFW,FULTON:SBFW,
GREENE:SBFW,HUNTINGDON:SBFW,INDIANA:SBFW,JEFFERSON:SBFW,JUNIATA:SBFW,
LACKAWANNA:SBFW,LANCASTER:SBFW,LAWRENCE:SBFW,LEBANON:SBFW,
LEHIGH:SBFW,LUZERNE:SBFW,LYCOMING:SBFW,MCKEAN:SBFW,MERCER:SBFW,
MIFFLIN:SBFW,MONROE:SBFW,MONTGOMERY:SBFW,MONTOUR:SBFW,
NORTHAMPTON:SBFW,NORTHUMBERLAND:SBFW,PERRY:SBFW,PHILADELPHIA:SBFW,
PIKE:SBFW,POTTER:SBFW,SCHUYLKILL:SBFW,SNYDER:SBFW,SOMERSET:SBFW,
SULLIVAN:SBFW,SUSQUEHANNA:SBFW,TIOGA:SBFW,UNION:SBFW,VENANGO:SBFW,
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YORK:SBFW
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CHESTER:A,CLARION:A,CLEARFIELD:A,CLINTON:A,COLUMBIA:A,CRAWFORD:A,
CUMBERLAND:A,DAUPHIN:A,DELAWARE:A,ELK:A,ERIE:A,FAYETTE:A,FOREST:A,
FRANKLIN:A,FULTON:A,GREENE:A,HUNTINGDON:A,INDIANA:A,JEFFERSON:A,
JUNIATA:A,LACKAWANNA:A,LANCASTER:A,LAWRENCE:A,LEBANON:A,LEHIGH:A,
LUZERNE:A,LYCOMING:A,MCKEAN:A,MERCER:A,MIFFLIN:A,MONROE:A,
MONTGOMERY:A,MONTOUR:A,NORTHAMPTON:A,NORTHUMBERLAND:A,PERRY:A,
PHILADELPHIA:A,PIKE:A,POTTER:A,SCHUYLKILL:A,SNYDER:A,SOMERSET:A,
SULLIVAN:A,SUSQUEHANNA:A,TIOGA:A,UNION:A,VENANGO:A,WARREN:A,

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   UPPER DELAWARE:MIDDLE DELAWARE/MONGAUP/BRODHEAD,
   UPPER DELAWARE:MIDDLE DELAWARE/MUSCONETCONG,
   UPPER DELAWARE:LEHIGH,
   LOWER DELAWARE:CROSSWICKS-NESHAMINY,
   LOWER DELAWARE:LOWER DELAWARE,
   LOWER DELAWARE:SCHUYLKILL,
   LOWER DELAWARE:BRANDYWINE-CHRISTINA,
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   UPPER SUSQUEHANNA:TIOGA,
   UPPER SUSQUEHANNA:CHEMUNG,
   UPPER SUSQUEHANNA:UPPER SUSQUEHANNA-TUNKHANNOCK,
   UPPER SUSQUEHANNA:UPPER SUSQUEHANNA-LACKAWANNA,
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   WEST BRANCH SUSQUEHANNA:SINNEMAHONING,
   WEST BRANCH SUSQUEHANNA:MIDDLE WEST BRANCH SUSQUEHANNA,
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   WEST BRANCH SUSQUEHANNA:PINE,
   WEST BRANCH SUSQUEHANNA:LOWER WEST BRANCH SUSQUEHANNA,
   LOWER SUSQUEHANNA:LOWER SUSQUEHANNA-PENNS,
   LOWER SUSQUEHANNA:UPPER JUNIATA,
   LOWER SUSQUEHANNA:RAYSTOWN,
   LOWER SUSQUEHANNA:LOWER JUNIATA,
   LOWER SUSQUEHANNA:LOWER SUSQUEHANNA-SWATARA,
   LOWER SUSQUEHANNA:LOWER SUSQUEHANNA,
   UPPER CHESAPEAKE:CHESTER-SASSAFRAS,
   UPPER CHESAPEAKE:GUNPOWDER-PATAPSCO,
   POTOMAC:NORTH BRANCH POTOMAC,
   POTOMAC:CACAPON-TOWN,
   POTOMAC:CONOCOCHEAGUE-OPEQUON,
   POTOMAC:MONOCACY,
   SOUTHERN LAKE ERIE:ASHTABULA,
   EASTERN LAKE ERIE:CHAUTAUQUA-CONNEAUT,
   SOUTHWESTERN LAKE ONTARIO:UPPER GENESEE,
   ALLEGHENY:UPPER ALLEGHENY,
   ALLEGHENY:CONEMANGO,
   ALLEGHENY:MIDDLE ALLEGHENY,
   ALLEGHENY:FRENCH,
   ALLEGHENY:CLARION,
   ALLEGHENY:MIDDLE ALLEGHENY-REDBANK,
   ALLEGHENY:CONEMAUGH,
   ALLEGHENY:KISKIMINETAS,
   ALLEGHENY:LOWER ALLEGHENY,
   MONONGAHELA:UPPER MONONGAHELA,
   MONONGAHELA:CHEAT,
   MONONGAHELA:LOWER MONONGAHELA,
   MONONGAHELA:YOUGHIOGHENY,
   UPPER OHIO:UPPER OHIO,
   UPPER OHIO:SHENANGO,
   UPPER OHIO:MAHONING,
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ELEVATION, 50-75% OF GENTLE SLOPE IS IN LOWLAND
NORTHERN HARDWOODS FOREST, 50-80% GENTLY SLOPING, 300-500 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
NORTHERN HARDWOODS FOREST, 20-50% GENTLY SLOPING, 500-1000 FT.
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NORTHERN HARDWOODS FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT.
ELEVATION, MORE THAN 75% OF GENTLE SLOPE IS IN LOWLAND;
NORTHERN HARDWOODS FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
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MIXED MESOPHYTIC FOREST, 20-50% GENTLY SLOPING, 500-1000 FT.
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MIXED MESOPHYTIC FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
MIXED MESOPHYTIC FOREST, LESS THAN 20% GENTLY SLOPING,
500-1000 FT. ELEVATION;
BEECH-MAPLE FOREST, 50-80% GENTLY SLOPING, 100-300 FT.
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BEECH-MAPLE FOREST, 50-80% GENTLY SLOPING, 300-500 FT.
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APPALACHIAN OAK FOREST, MORE THAN 80% GENTLY SLOPING,
0-100 FT. ELEVATION;
APPALACHIAN OAK FOREST, MORE THAN 80% GENTLY SLOPING,
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APPALACHIAN OAK FOREST, 50-80% GENTLY SLOPING, 300-500 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
APPALACHIAN OAK FOREST, 50-80% GENTLY SLOPING, 500-1000 FT.
ELEVATION, LESS THAN 75% OF GENTLE SLOPE IS IN LOWLAND;
APPALACHIAN OAK FOREST, 20-50% GENTLY SLOPING, 500-1000 FT.
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ELEVATION, MORE THAN 75% OF GENTLE SLOPE IS ON UPLAND;
APPALACHIAN OAK FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT.
ELEVATION, LESS THAN 75% OF GENTLE SLOPE IS IN LOWLAND;
APPALACHIAN OAK FOREST, 20-50% GENTLY SLOPING, 1000-3000 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND;
APPALACHIAN OAK FOREST, LESS THAN 20% GENTLY SLOPING, 500-1000 FT.
ELEVATION;
APPALACHIAN OAK FOREST, LESS THAN 20% GENTLY SLOPING, 1000-3000 FT.
ELEVATION;
SOUTHERN MIXED FOREST, 50-80% GENTLY SLOPING, 300-500 FT.
ELEVATION, 50-75% OF GENTLE SLOPE IS ON UPLAND
<ECOREG-CODE>
2113B2B,2113B3C,2113C4C,2113C4D,2113C5A,2113C5C,2113D5D,2211C4C,
2211C5C,2211D4D,2212B2B,2212B3C,2214A1C,2214A2B,2214B2C,2214B3B,
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2320B3C
<PNV>
BEECH-MAPLE,MIXED MESOPHYTIC,APPALACHIAN OAK, NORTHERN HARDWOODS,
OAK-HICKORY-PINE
<QUAD-NAME>

NEWARK WEST,BAY VIEW,WOODBURY,BRIDGEPORT,MARCUS HOOK,WILMINGTON NORTH,
KENNETT SQUARE,WEST GROVE,OXFORD,CAMDEN,PHILADELPHIA,LANSDOWNE,MEDIA,
WEST CHESTER,UNIONVILLE,COATESVILLE,PARKESBURG,RISING SUN,
CONOWINGO DAM,DELTA,FAWN GROVE,NORRISVILLE,NEW FREEDOM,LINEBORO,
MANCHESTER,KIRKWOOD,WAKEFIELD,HOLTWOOD,AIRVILLE,STEWARTSTOWN,
GLEN ROCK,SEVEN VALLEYS,HANOVER,GAP,QUARRYVILLE,CONESTOGA,SAFE HARBOR,
RED LION,YORK,WEST YORK,ABBOTTSTOWN,LITTLESTOWN,TANEYTOWN,EMMITSBURG,
BLUE RIDGE SUMMIT,SMITHSBURG,HAGERSTOWN,MASON DIXON,CLEAR SPRING,
MC SHERRYSTOWN,GETTYSBURG,FAIRFIELD,IRON SPRINGS,WAYNESBORO,
GREENCASTLE,WILLIAMSON,MERCERSBURG,HAMPTON,BIGLERVILLE,ARENDTSVILLE,
CALEDONIA PARK,SCOTLAND,CHAMBERSBURG,ST THOMAS,MC CONNELLSBURG,
CHERRY RUN,HANCOCK (WV),BELLEGROVE,ARTEMAS,FLINTSTONE,
EVITTS CREEK,CUMBERLAND,FROSTBURG,BIG COVE TANNERY,NEEDMORE,AMARANTH,
CHANEYSVILLE,BEANS COVE,HYNDMAN,FAIRHOPE,WITTENBERG,MEADOW GROUNDS,
BREEZEWOOD,MENCH,CLEARVILLE,RAINSBURG,BUFFALO MILLS,NEW BALTIMORE,
BERLIN,AVILTON,GRANTSVILLE,ACCIDENT,FRIENDSVILLE (MD),BRANDONVILLE,
BRUCETON MILLS,LAKE LYNN,MORGANTOWN NORTH,MEYERSDALE,MARKLETON,
CONFLUENCE,OHIOPYLE,FT NECESSITY,BROWNFIELD,SMITHFIELD,MASONTOWN,
MURDOCK,ROCKWOOD,KINGWOOD,MILL RUN,SOUTH CONNELLSVILLE,UNIONTOWN,
NEW SALEM,CARMICHAELS,OSAGE,BLACKSVILLE,WADESTOWN,HUNDRED,LITTLETON,
GARARDS FORT,OAK FOREST,HOLBROOK,NEW FREEPORT,CAMERON (WV),MATHER,
WAYNESBURG,ROGERSVILLE,WIND RIDGE,MAJORSVILLE,BRISTOL,BEVERLY,
TRENTON EAST,TRENTON WEST,LANGHORNE,PENNINGTON,LAMBERTVILLE,STOCKTON,
FRANKFORD,GERMANTOWN,NORRISTOWN,VALLEY FORGE,MALVERN,DOWNINGTOWN,
WAGONTOWN,HONEY BROOK,HATBORO,AMBLER,LANSDALE,COLLEGEVILLE,
PHOENIXVILLE,POTTSTOWN,ELVERSON,MORGANTOWN,BUCKINGHAM,DOYLESTOWN,
TELFORD,PERKIOMENVILLE,SASSAMANSVILLE,BOYERTOWN,BIRDSBORO,READING,
LUMBERVILLE,BEDMINSTER,QUAKERTOWN,MILFORD SQUARE,EAST GREENVILLE,
MANATAWNY,FLEETWOOD,TEMPLE,FRENCHTOWN,RIEGELSVILLE,HELLERTOWN,
ALLENTOWN EAST,ALLENTOWN WEST,TOPTON,KUTZTOWN,HAMBURG,EASTON,NAZARETH,
CATASAUQUA,CEMENTON,SLATEDALE,NEW TRIPOLI,NEW RINGGOLD,BELVIDERE,
BANGOR,WIND GAP,KUNKLETOWN,PALMERTON,LEHIGHTON,NESQUEHONING,TAMAQUA,
PORTLAND,STROUDSBURG,SAYLORSBURG,BROADHEADSVILLE,POHOPOCO MTN,
CHRISTMANS,WEATHERLY,HAZLETON,NEW HOLLAND,LEOLA,LANCASTER,
COLUMBIA EAST,COLUMBIA WEST,YORK HAVEN,DOVER,WELLSVILLE,TERRE HILL,
EPHRATA,LITITZ,MANHEIM,ELIZABETHTOWN,MIDDLETOWN,STEELTON,LEMOYNE,
SINKING SPRING,WOMELSDORF,RICHLAND,LEBANON,PALMYRA,HERSHEY,
HARRISBURG EAST,HARRISBURG WEST,BERNVILLE,STRAUSSTOWN,BETHEL,
FREDERICKSBURG,INDIANTOWN GAP,GRANTVILLE,ENDERS,HALIFAX,AUBURN,
FRIEDENSBURG,SWATARA HILL,PINE GROVE,TOWER CITY,LYKENS,ELIZABETHVILLE,
MILLERSBURG,ORWIGSBURG,POTTSVILLE,MINERSVILLE,TREMONT,VALLEY VIEW,
KLINGERSTOWN,PILLOW,DALMATIA,DELANO,SHENANDOAH,ASHLAND,MT CARMEL,
SHAMOKIN,TREVORTON,SUNBURY,FREEBURG,CONYNGHAM,NUREMBERG,SHUMANS,
CATAWISSA,DANVILLE,RIVERSIDE,NORTHUMBERLAND,LEWISBURG,DILLSBURG,
MOUNT HOLLY SPRINGS,DICKINSON,WALNUT BOTTOM,SHIPPENSBURG,ROXBURY,
FANNETTSBURG,BURNT CABINS,MECHANICSBURG,CARLISLE,PLAINFIELD,NEWVILLE,
NEWBURG,DOYLESBURG,SHADE GAP,ORBISONIA,MERTZVILLE,SHERMANS DALE,
LANDISBURG,ANDERSONBURG,BLAIN,BLAIRS MILLS,AUGHWICK,BUTLER KNOB,
DUNCANNON,NEWPORT,ICKESBURG,SPRUCE HILL,MC COYSVILLE,MC VEYTOWN,
NEWTON HAMILTON,MOUNT UNION,REWARD,MILLERSTOWN,MEXICO,MIFFLINTOWN,
LEWISTOWN,BELLEVILLE,ALLENSVILLE,DONATION,RICHFIELD,BEAVER SPRINGS,
MC CLURE,ALFARATA,BURNHAM,BARRVILLE,MC ALEVYS FORT,PINE GROVE MILLS,
MIDDLEBURG,BEAVERTOWN,WEIKERT,COBURN,SPRING MILLS,CENTRE HALL,
STATE COLLEGE,JULIAN,MIFFLINBURG,HARTLETON,WOODWARD,MILLHEIM,
MADISONBURG,MINGOVILLE,BELLEFONTE,BEAR KNOB,HUSTONTOWN,WELLS TANNERY,
EVERETT EAST,EVERETT WEST,BEDFORD,SCHELLSBURG,CENTRAL CITY,STOYSTOWN,
SALTILLO,SAXTON,HOPEWELL,NEW ENTERPRISE,ALUM BANK,OGLETOWN,WINDBER,
HOOVERSVILLE,CASSVILLE,ENTRIKEN,MARTINSBURG,ROARING SPRING,BLUE KNOB,
BEAVERDALE,GEISTOWN,JOHNSTOWN,HUNTINGDON,WILLIAMSBURG,FRANKSTOWN,
HOLLIDAYSBURG,CRESSON,EBENSBURG,NANTY GLO,VINTONDALE,ALEXANDRIA,
SPRUCE CREEK,BELLWOOD,ALTOONA,ASHVILLE,CARROLLTOWN,COLVER,STRONGSTOWN,
FRANKLINVILLE,TYRONE,TIPTON,BLANDBURG,COALPORT,HASTINGS,BARNESBORO,
COMMODORE,PORT MATILDA,SANDY RIDGE,HOUTZDALE,RAMEY,IRVONA,WESTOVER,

BURNSIDE,ROCHESTER MILLS,BLACK MOSHANNON,PHILIPSBURG,WALLACETON,
GLEN RICHEY,CURWENSVILLE,MAHAFFEY,MCGEES MILLS,PUNXSUTAWNEY,SOMERSET,
BAKERSVILLE,SEVEN SPRINGS,DONEGAL,CONNELLSVILLE,DAWSON,FAYETTE CITY,
CALIFORNIA,BOSWELL,LIGONIER,STAHLSTOWN,MAMMOTH,MT PLEASANT,SMITHTON,
DONORA,MONONGAHELA,RACHELWOOD,WILPEN,DERRY,LATROBE,GREENSBURG,IRWIN,
MC KEESPORT,GLASSPORT,NEW FLORENCE,BOLIVAR,BLAIRSVILLE,SALTSBURG,
SLICKVILLE,MURRYSVILLE,BRADDOCK,PITTSBURGH EAST,BRUSH VALLEY,INDIANA,
MC INTYRE,AVONMORE,VANDERGRIFT,NEW KENSINGTON EAST,
NEW KENSINGTON WEST,GLENSHAW,CLYMER,ERNEST,ELDERTON,WHITESBURG,
LEECHBURG,FREEPORT,CURTISVILLE,VALENCIA,MARION CENTER,PLUMVILLE,
RURAL VALLEY,MOSGROVE,KITTANNING,WORTHINGTON,SAXONBURG,BUTLER,VALIER,
DAYTON,DISTANT,TEMPLETON,EAST BRADY,CHICORA,EAST BUTLER,MT CHESTNUT,
ELLSWORTH,AMITY,PROSPERITY,CLAYSVILLE,VALLEY GROVE,HACKETT,
WASHINGTON EAST,WASHINGTON WEST,WEST MIDDLETOWN,BETHANY,BRIDGEVILLE,
CANONSBURG,MIDWAY,AVELLA,STEUBENVILLE EAST,PITTSBURGH WEST,OAKDALE,
CLINTON,BURGETTSTOWN,WEIRTON,EMSWORTH,AMBRIDGE,ALIQUIPPA,HOOKSTOWN,
EAST LIVERPOOL SOUTH,MARS,BADEN,BEAVER,MIDLAND,EAST LIVERPOOL NORTH,
EVANS CITY,ZELIENOPLE,BEAVER FALLS,NEW GALILEE,EAST PALESTINE,
PROSPECT,PORTERSVILLE,NEW CASTLE SOUTH,BESSEMER,NEW MIDDLETOWN,
FLATBROOKVILLE,CULVERS GAP,LAKE MASKENOZHA,PORT JERVIS SOUTH,MILFORD,
EDGEMERE,PORT JERVIS NORTH,POND EDDY,SHOHOLA,ELDRED (NY),BUSHKILL,
EAST STROUDSBURG,MOUNT POCONO,POCONO PINES,BLAKESLEE,HICKORY RUN,
WHITE HAVEN,FREELAND,TWELVEMILE POND,SKYTOP,BUCK HILL FALLS,TOBYHANNA,
THORNHURST,PLEASANT VIEW SUMMIT,WILKES-BARRE EAST,WILKES-BARRE WEST,
PECKS POND,PROMISED LAND,NEWFOUNDLAND,STERLING,MOSCOW,AVOCA,PITTSTON,
KINGSTON,ROWLAND,HAWLEY,LAKEVILLE,LAKE ARIEL,OLYPHANT,SCRANTON,RANSOM,
CENTER MORELAND,NARROWSBURG,WHITE MILLS,HONESDALE,WAYMART,CARBONDALE,
DALTON,FACTORYVILLE,TUNKHANNOCK,DAMASCUS,GALILEE,ALDENVILLE,
FOREST CITY,CLIFFORD,LENOXVILLE,HOP BOTTOM,SPRINGVILLE,CALLICOON,
LONG EDDY,LAKE COMO,ORSON,THOMPSON,HARFORD,MONTROSE EAST,
MONTROSE WEST,HANCOCK,STARRUCCA,SUSQUEHANNA,GREAT BEND,FRANKLIN FORKS,
LAUREL LAKE,SYBERTSVILLE,BERWICK,MIFFLINVILLE,BLOOMSBURG,MILLVILLE,
WASHINGTONVILLE,MILTON,ALLENWOOD,NANTICOKE,SHICKSHINNY,STILLWATER,
BENTON,LAIRDSVILLE,HUGHESVILLE,MUNCY,MONTOURSVILLE SOUTH,HARVEYS LAKE,
SWEET VALLEY,RED ROCK,ELK GROVE,SONESTOWN,PICTURE ROCKS,HUNTERSVILLE,
MONTOURSVILLE NORTH,NOXEN,DUTCH MTN,LOPEZ,LAPORTE,EAGLES MERE,
HILLSGROVE,BARBOURS,BODINES,MESHOPPEN,JENNINGSVILLE,COLLEY,DUSHORE,
OVERTON,SHUNK,GROVER,RALSTON,AUBURN CENTER,LACEYVILLE,WYALUSING,
MONROETON,POWELL,LEROY,CANTON,GLEASON,LAWTON,LE RAYSVILLE,ROME,
TOWANDA,ULSTER,EAST TROY,TROY,ROSEVILLE,FRIENDSVILLE,LITTLE MEADOWS,
WINDHAM,LITCHFIELD,SAYRE,BENTLEY CREEK,GILLETT,MILLERTON,
WILLIAMSPORT SE,CARROLL,LOGANTON,MILL HALL,BEECH CREEK,HOWARD,
SNOW SHOE SE,SNOW SHOE,WILLIAMSPORT,LINDEN,JERSEY SHORE,LOCK HAVEN,
FARRANDSVILLE,HOWARD NE,SNOW SHOE NE,SNOW SHOW NW,COGAN STATION,
SALLADASBURG,WATERVILLE,JERSEY MILLS,GLEN UNION,RENOVO EAST,
RENOVO WEST,KEATING,TROUT RUN,WHITE PINE,ENGLISH CENTER,CAMMAL,
SLATE RUN,YOUNG WOMANS CREEK,TAMARACK,HAMMERSLEY FORK,LIBERTY,NAUVOO,
MORRIS,CEDAR RUN,LEE FIRE TOWER,OLEONA,SHORT RUN,CONRAD,BLOSSBURG,
CHERRY FLATS,ANTRIM,TIADAGHTON,MARSHLANDS,GALETON,CHERRY SPRINGS,
AYERS HILL,MANSFIELD,CROOKED CREEK,KEENEYVILLE,ASAPH,SABINSVILLE,
WEST PIKE,BROOKLAND,SWEDEN VALLEY,JACKSON SUMMIT,TIOGA,ELKLAND,
KNOXVILLE,POTTER BROOK,HARRISON VALLEY,ULYSSES,ELLISBURG,KARTHAUS,
FRENCHVILLE,LEGONTES MILLS,CLEARFIELD,ELLIOTT PARK,LUTHERSBURG,
DU BOIS,REYNOLDSVILLE,POTTERSDALE,DEVILS ELBOW,THE KNOBS,HUNTLEY,
PENFIELD,SABULA,FALLS CREEK,HAZEN,SINNEMAHONING,DRIFTWOOD,DENTS RUN,
WEEDVILLE,KERSEY,BRANDY CAMP,CARMAN,MUNDERF,FIRST FORK,CAMERON,
WEST CREEK,RATHBUN,ST MARYS,RIDGWAY,PORTLAND MILLS,HALLTON,WHARTON,
EMPORIUM,RICH VALLEY,WILDWOOD FIRE TOWER,GLEN HAZEL,WILCOX,JAMES CITY,
RUSSELL CITY,AUSTIN,KEATING SUMMIT,NORWICH,CROSBY,HAZEL HURST,
MT JEWETT,KANE,LUDLOW,COUDERSPORT,ROULETTE,PORT ALLEGANY,SMETHPORT,
CYCLONE,LEWIS RUN,WESTLINE,CORNPLANTER BRIDGE,OSWAYO,SHINGLEHOUSE,
BULLIS MILLS,ELDRED,DERRICK CITY,BRADFORD,STICKNEY,CORNPLANTER RUN,
COOLSPRING,SUMMERVILLE,NEW BETHLEHEM,SLIGO,RIMERSBURG,PARKER,

HILLIARDS,WEST SUNBURY,BROOKVILLE,CORSICA,STRATTANVILLE,CLARION,KNOX,
EMLENTON,EAU CLAIRE,BARKEYVILLE,SIGEL,COOKSBURG,LUCINDA,FRYBURG,
KOSSUTH,CRANBERRY,KENNERDELL,POLK,MARIENVILLE EAST,MARIENVILLE WEST,
TYLERSBURG,TIONESTA,PRESIDENT,OIL CITY,FRANKLIN,UTICA,LYNCH,MAYBURG,
KELLETTVILLE,WEST HICKORY,PLEASANTVILLE,TITUSVILLE SOUTH,DEMPSEYTOWN,
SUGAR LAKE,SHEFFIELD,CHERRY GROVE,COBHAM,TIDIOUTE,GRAND VALLEY,
TITUSVILLE NORTH,CENTERVILLE,TOWNVILLE,CLARENDON,WARREN,YOUNGSVILLE,
PITTSFIELD,SPRING CREEK,SPARTANSBURG,LAKE CANADOHTA,MILLERS STATION,
SCANDIA,RUSSELL,SUGAR GROVE,LOTTSVILLE,COLUMBUS,CORRY,UNION CITY,
WATERFORD,SLIPPERY ROCK,HARLANSBURG,NEW CASTLE NORTH,EDINBURG,
CAMPBELL,GROVE CITY,MERCER,GREENFIELD,SHARON EAST,SHARON WEST,
SANDY LAKE,JACKSON CENTER,FREDONIA,SHARPSVILLE,ORANGEVILLE,
NEW LEBANON,HADLEY,GREENVILLE EAST,GREENVILLE WEST,KINSMAN,COCHRANTON,
GENEVA,CONNEAUT LAKE,HARTSTOWN,ANDOVER,BLOOMING VALLEY,MEADVILLE,
HARMONSBURG,LINESVILLE,LEON,CAMBRIDGE SPRINGS,EDINBORO SOUTH,
CONNEAUTVILLE,BEAVER CENTER,PIERPONT,CAMBRIDGE SPRINGS NE,
EDINBORO NORTH,ALBION,EAST SPRINGFIELD,CONNEAUT,WAVERLY,WELLSBURG,
ELMIRA,SEELEY CREEK,CATON,ALLENTOWN,BOLIVAR (NY),WATTSBURG,HAMMETT,
NORTH EAST,HARBORCREEK,ERIE SOUTH,SWANVILLE,FAIRVIEW,FAIRVIEW SW,
ERIE NORTH

<QUAD-CODE>

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<LATLONG>
<LANDUSE-ASOC>
URBAN:RESIDENTIAL,URBAN:MIXED URBAN,
AGRIC:CROPLAND-PASTURE,AGRIC:ORCHARDS-VINEYARDS-NURSERIES,
AGRIC:CONFINED FEEDING OPERATIONS,RANGE:HERBACEOUS,
RANGE:SHRUB-BRUSH,RANGE:MIXED,FOREST:DECIDUOUS,FOREST:EVERGREEN,
FOREST:MIXED,WATER:STREAMS-CANALS,WATER:LAKES,WATER:RESERVOIRS,
WATER:BAYS-ESTUARIES,WETLAND:FORESTED,WETLAND:NONFORESTED,
BARREN:STRIP MINES-QUARRIES-GRAVEL PITS
<LANDUSE-PREF>
FOREST:DECIDUOUS,FOREST:MIXED,WATER:STREAMS-CANALS,WATER:LAKES,
WETLAND:FORESTED,WETLAND:NONFORESTED
<FOREST-TYPE>
WHITE PINE/NORTHERN RED OAK/WHITE ASH:GRASS/FORB,
WHITE PINE/NORTHERN RED OAK/WHITE ASH:SEEDLING/SHRUB,
WHITE PINE/NORTHERN RED OAK/WHITE ASH:SAPLING,
WHITE PINE/NORTHERN RED OAK/WHITE ASH:POLE,
WHITE PINE/NORTHERN RED OAK/WHITE ASH:MATURE,
WHITE PINE/NORTHERN RED OAK/WHITE ASH:OLD GROWTH,
POST/BLACK/OR BEAR OAK:GRASS/FORB,
POST/BLACK/OR BEAR OAK:SEEDLING/SHRUB,
POST/BLACK/OR BEAR OAK:SAPLING,
POST/BLACK/OR BEAR OAK:POLE,
POST/BLACK/OR BEAR OAK:MATURE,
POST/BLACK/OR BEAR OAK:OLD GROWTH,
CHESTNUT OAK:GRASS/FORB,
CHESTNUT OAK:SEEDLING/SHRUB,
CHESTNUT OAK:SAPLING,
CHESTNUT OAK:POLE,
CHESTNUT OAK:MATURE,
CHESTNUT OAK:OLD GROWTH,
WHITE OAK/RED OAK/HICKORY:GRASS/FORB,
WHITE OAK/RED OAK/HICKORY:SEEDLING/SHRUB,
WHITE OAK/RED OAK/HICKORY:SAPLING,
WHITE OAK/RED OAK/HICKORY:POLE,
WHITE OAK/RED OAK/HICKORY:MATURE,
WHITE OAK/RED OAK/HICKORY:OLD GROWTH,
WHITE OAK:GRASS/FORB,
WHITE OAK:SEEDLING/SHRUB,
WHITE OAK:SAPLING,
WHITE OAK:POLE,
WHITE OAK:MATURE,
WHITE OAK:OLD GROWTH,
NORTHERN RED OAK:GRASS/FORB,
NORTHERN RED OAK:SEEDLING/SHRUB,
NORTHERN RED OAK:SAPLING,
NORTHERN RED OAK:POLE,
NORTHERN RED OAK:MATURE,
NORTHERN RED OAK:OLD GROWTH,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:GRASS/FORB,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:SEEDLING/SHRUB,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:SAPLING,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:POLE,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:MATURE,
YELLOW POPLAR/WHITE OAK/NORTHERN RED OAK:OLD GROWTH,
BLACK LOCUST:GRASS/FORB,
BLACK LOCUST:SEEDLING/SHRUB,
BLACK LOCUST:SAPLING,

BLACK LOCUST:POLE,
BLACK LOCUST:MATURE,
BLACK LOCUST:OLD GROWTH,
BLACK WALNUT:GRASS/FORB,
BLACK WALNUT:SEEDLING/SHRUB,
BLACK WALNUT:SAPLING,
BLACK WALNUT:POLE,
BLACK WALNUT:MATURE,
BLACK WALNUT:OLD GROWTH,
YELLOW POPLAR:GRASS/FORB,
YELLOW POPLAR:SEEDLING/SHRUB,
YELLOW POPLAR:SAPLING,
YELLOW POPLAR:POLE,
YELLOW POPLAR:MATURE,
YELLOW POPLAR:OLD GROWTH,
CENTRAL HARDWOOD REVERTING FIELD:GRASS/FORB,
CENTRAL HARDWOOD REVERTING FIELD:SEEDLING/SHRUB,
CENTRAL HARDWOOD REVERTING FIELD:SAPLING,
CENTRAL HARDWOOD REVERTING FIELD:POLE,
CENTRAL HARDWOOD REVERTING FIELD:MATURE,
CENTRAL HARDWOOD REVERTING FIELD:OLD GROWTH,
SCARLET OAK:GRASS/FORB,
SCARLET OAK:SEEDLING/SHRUB,
SCARLET OAK:SAPLING,
SCARLET OAK:POLE,
SCARLET OAK:MATURE,
SCARLET OAK:OLD GROWTH,
SASSAFRAS/PERSIMMON:GRASS/FORB,
SASSAFRAS/PERSIMMON:SEEDLING/SHRUB,
SASSAFRAS/PERSIMMON:SAPLING,
SASSAFRAS/PERSIMMON:POLE,
SASSAFRAS/PERSIMMON:MATURE,
SASSAFRAS/PERSIMMON:OLD GROWTH,
RED MAPLE/CENTRAL HARDWOODS:GRASS/FORB,
RED MAPLE/CENTRAL HARDWOODS:SEEDLING/SHRUB,
RED MAPLE/CENTRAL HARDWOODS:SAPLING,
RED MAPLE/CENTRAL HARDWOODS:POLE,
RED MAPLE/CENTRAL HARDWOODS:MATURE,
RED MAPLE/CENTRAL HARDWOODS:OLD GROWTH,
MIXED CENTRAL HARDWOODS:GRASS/FORB,
MIXED CENTRAL HARDWOODS:SEEDLING/SHRUB,
MIXED CENTRAL HARDWOODS:SAPLING,
MIXED CENTRAL HARDWOODS:POLE,
MIXED CENTRAL HARDWOODS:MATURE,
MIXED CENTRAL HARDWOODS:OLD GROWTH,
BLACK ASH/AMERICAN ELM/RED MAPLE:GRASS/FORB,
BLACK ASH/AMERICAN ELM/RED MAPLE:SEEDLING/SHRUB,
BLACK ASH/AMERICAN ELM/RED MAPLE:SAPLING,
BLACK ASH/AMERICAN ELM/RED MAPLE:POLE,
BLACK ASH/AMERICAN ELM/RED MAPLE:MATURE,
BLACK ASH/AMERICAN ELM/RED MAPLE:OLD GROWTH,
RIVER BIRCH/SYCAMORE:GRASS/FORB,
RIVER BIRCH/SYCAMORE:SEEDLING/SHRUB,
RIVER BIRCH/SYCAMORE:SAPLING,
RIVER BIRCH/SYCAMORE:POLE,
RIVER BIRCH/SYCAMORE:MATURE,
RIVER BIRCH/SYCAMORE:OLD GROWTH,
COTTONWOOD:GRASS/FORB,
COTTONWOOD:SEEDLING/SHRUB,
COTTONWOOD:SAPLING,
COTTONWOOD:POLE,
COTTONWOOD:MATURE,
COTTONWOOD:OLD GROWTH,

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   WILLOW:GRASS/FORB,
   WILLOW:SEEDLING/SHRUB,
   WILLOW:SAPLING,
   WILLOW:POLE,
   WILLOW:MATURE,
   WILLOW:OLD GROWTH,
   SUGAR MAPLE/BEECH/YELLOW BIRCH:GRASS/FORB,
   SUGAR MAPLE/BEECH/YELLOW BIRCH:SEEDLING/SHRUB,
   SUGAR MAPLE/BEECH/YELLOW BIRCH:SAPLING,
   SUGAR MAPLE/BEECH/YELLOW BIRCH:POLE,
   SUGAR MAPLE/BEECH/YELLOW BIRCH:MATURE,
   SUGAR MAPLE/BEECH/YELLOW BIRCH:OLD GROWTH,
   BLACK CHERRY:GRASS/FORB,
   BLACK CHERRY:SEEDLING/SHRUB,
   BLACK CHERRY:SAPLING,
   BLACK CHERRY:POLE,
   BLACK CHERRY:MATURE,
   BLACK CHERRY:OLD GROWTH,
   RED MAPLE/NORTHERN HARDWOODS:GRASS/FORB,
   RED MAPLE/NORTHERN HARDWOODS:SEEDLING/SHRUB,
   RED MAPLE/NORTHERN HARDWOODS:SAPLING,
   RED MAPLE/NORTHERN HARDWOODS:POLE,
   RED MAPLE/NORTHERN HARDWOODS:MATURE,
   RED MAPLE/NORTHERN HARDWOODS:OLD GROWTH,
   NORTHERN HARDWOOD REVERTING FIELD:GRASS/FORB,
   NORTHERN HARDWOOD REVERTING FIELD:SEEDLING/SHRUB,
   NORTHERN HARDWOOD REVERTING FIELD:SAPLING,
   NORTHERN HARDWOOD REVERTING FIELD:POLE,
   NORTHERN HARDWOOD REVERTING FIELD:MATURE,
   NORTHERN HARDWOOD REVERTING FIELD:OLD GROWTH,
   MIXED NORTHERN HARDWOODS:GRASS/FORB,
   MIXED NORTHERN HARDWOODS:SEEDLING/SHRUB,
   MIXED NORTHERN HARDWOODS:SAPLING,
   MIXED NORTHERN HARDWOODS:POLE,
   MIXED NORTHERN HARDWOODS:MATURE,
   MIXED NORTHERN HARDWOODS:OLD GROWTH,
   ASPEN:GRASS/FORB,
   ASPEN:SEEDLING/SHRUB,
   ASPEN:SAPLING,
   ASPEN:POLE,
   ASPEN:MATURE,
   ASPEN:OLD GROWTH,
   PAPER BIRCH:GRASS/FORB,
   PAPER BIRCH:SEEDLING/SHRUB,
   PAPER BIRCH:SAPLING,
   PAPER BIRCH:POLE,
   PAPER BIRCH:MATURE,
   PAPER BIRCH:OLD GROWTH,
   GRAY BIRCH:GRASS/FORB,
   GRAY BIRCH:SEEDLING/SHRUB,
   GRAY BIRCH:SAPLING,
   GRAY BIRCH:POLE,
   GRAY BIRCH:MATURE,
   GRAY BIRCH:OLD GROWTH
<FOREST-SIZE>
   UNSTOCKED,SEEDLING/SAPLING,POLE,MATURE,OVER-MATURE
<WETLAND-NAME>
   ESTUARINE,ESTUARINE:INTERTIDAL,ESTUARINE:INTERTIDAL/EMERGENT,
   ESTUARINE:INTERTIDAL/EMERGENT:PERSISTENT,
   ESTUARINE:INTERTIDAL/EMERGENT:NONPERSISTENT,
   ESTUARINE:INTERTIDAL/EMERGENT:NARROW-LEAVED NONPERSISTENT,
   ESTUARINE:INTERTIDAL/EMERGENT:BROAD-LEAVED NONPERSISTENT,
   ESTUARINE:INTERTIDAL/EMERGENT:NARROW-LEAVED PERSISTENT,
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ESTUARINE:INTERTIDAL/EMERGENT:BROAD-LEAVED PERSISTENT,
ESTUARINE:INTERTIDAL/FLAT,ESTUARINE:INTERTIDAL/FLAT:VEGETATED PIONEER,
ESTUARINE:INTERTIDAL/FLAT:VEGETATED NONPIONEER,
ESTUARINE:INTERTIDAL/FORESTED,
ESTUARINE:INTERTIDAL/FORESTED:BROAD-LEAVED DECIDUOUS,
ESTUARINE:INTERTIDAL/FORESTED:DEAD,
ESTUARINE:INTERTIDAL/FORESTED:DECIDUOUS,
ESTUARINE:INTERTIDAL/SCRUB-SHRUB,
ESTUARINE:INTERTIDAL/SCRUB-SHRUB:BROAD-LEAVED DECIDUOUS,
ESTUARINE:INTERTIDAL/SCRUB-SHRUB:DEAD,
ESTUARINE:INTERTIDAL/SCRUB-SHRUB:DECIDUOUS,
PALUSTRINE,PALUSTRINE/EMERGENT,PALUSTRINE/EMERGENT:PERSISTENT,
PALUSTRINE/EMERGENT:NONPERSISTENT,
PALUSTRINE/EMERGENT:NARROW-LEAVED NONPERSISTENT,
PALUSTRINE/EMERGENT:BROAD-LEAVED NONPERSISTENT,
PALUSTRINE/EMERGENT:NARROW-LEAVED PERSISTENT,
PALUSTRINE/EMERGENT:BROAD-LEAVED PERSISTENT,
PALUSTRINE/FORESTED,PALUSTRINE/FORESTED:BROAD-LEAVED DECIDUOUS,
PALUSTRINE/FORESTED:DEAD,PALUSTRINE/FORESTED:DECIDUOUS,
PALUSTRINE/SCRUB-SHRUB,
PALUSTRINE/SCRUB-SHRUB:BROAD-LEAVED DECIDUOUS,
PALUSTRINE/SCRUB-SHRUB:DEAD,PALUSTRINE/SCRUB-SHRUB:DECIDUOUS,
LACUSTRINE,LACUSTRINE:LITTORAL,LACUSTRINE:LITTORAL/EMERGENT,
LACUSTRINE:LITTORAL/EMERGENT:NONPERSISTENT,
LACUSTRINE:LITTORAL/EMERGENT:NARROW-LEAVED NONPERSISTENT,
LACUSTRINE:LITTORAL/EMERGENT:BROAD-LEAVED NONPERSISTENT,
LACUSTRINE:LITTORAL/FLAT,LACUSTRINE:LITTORAL/FLAT:VEGETATED PIONEER,
LACUSTRINE:LITTORAL/FLAT:VEGETATED NONPIONEER,
RIVERINE,RIVERINE:TIDAL,RIVERINE:TIDAL/EMERGENT,
RIVERINE:TIDAL/EMERGENT:NONPERSISTENT,
RIVERINE:TIDAL/EMERGENT:NARROW-LEAVED NONPERSISTENT,
RIVERINE:TIDAL/EMERGENT:BROAD-LEAVED NONPERSISTENT,
RIVERINE:TIDAL/FLAT,RIVERINE:TIDAL/FLAT:VEGETATED PIONEER,
RIVERINE:TIDAL/FLAT:VEGETATED NONPIONEER,
RIVERINE:TIDAL/OPEN WATER,
RIVERINE:LOWER,RIVERINE:LOWER/EMERGENT,
RIVERINE:LOWER/EMERGENT:NONPERSISTENT,
RIVERINE:LOWER/EMERGENT:NARROW-LEAVED NONPERSISTENT,
RIVERINE:LOWER/EMERGENT:NARROW-LEAVED PERSISTENT,
RIVERINE:LOWER/FLAT,
RIVERINE:LOWER/FLAT:VEGETATED PIONEER,
RIVERINE:LOWER/FLAT:VEGETATED NONPIONEER,
RIVERINE:LOWER/OPEN WATER,
RIVERINE:UPPER,RIVERINE:UPPER/FLAT,
RIVERINE:UPPER/FLAT:VEGETATED PIONEER,
RIVERINE:UPPER/FLAT:VEGETATED NONPIONEER,
RIVERINE:UPPER/OPEN WATER,
RIVERINE:INTERMITTENT,RIVERINE:INTERMITTENT/OPEN WATER,
RIVERINE:INTERMITTENT/STREAMBED,
RIVERINE:INTERMITTENT/STREAMBED:COBBLE-GRAVEL,
RIVERINE:INTERMITTENT/STREAMBED:SAND,
RIVERINE:INTERMITTENT/STREAMBED:MUD,
RIVERINE:INTERMITTENT/STREAMBED:ORGANIC

<WETLAND-CODE>

E....,E2....,E2EM.,E2EM1,E2EM2,E2EM3,E2EM4,E2EM5,E2EM6,E2FL.,E2FL5,
E2FL6,E2FO.,E2FO1,E2FO5,E2FO6,E2SS.,E2SS1,E2SS5,E2SS6,
P....,PO....,POEM.,POEM1,POEM2,POEM3,POEM4,POEM5,POEM6,POFL.,POFL5,
POFL6,POFO.,POFO1,POFO5,POFO6,POOWO,POSS.,POSS1,POSS5,POSS6,
L....,L2....,L2EM.,L2EM2,L2EM3,L2EM4,L2FL.,L2FL5,L2FL6,
R....,R1....,R1EM.,R1EM2,R1EM3,R1EM4,R1FL.,R1FL5,R1FL6,R1OWO,
R2....,R2EM.,R2EM2,R2EM3,R2EM4,R2FL.,R2FL5,R2FL6,R2OWO,
R3....,R3FL.,R3FL5,R3FL6,R3OWO,
R4....,R4OWO,R4SB.,R4SB1,R4SB2,R4SB3,R4SB4

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<ENVIR-ASSOC>
   WATER DEPTH:<1 FT.;AQUATIC HABITAT ZONATION:LITTORAL ZONE;
   INLAND WETLAND:VEGETATED STREAM BANKS;
   INLAND WETLAND:BEAVER-DAMMED STREAMS;
   INLAND WETLAND:ISLAND INHABITANT;INLAND WETLAND:BOGS;
   INLAND WETLAND:DITCHES;INLAND WETLAND:FARM PONDS;
   INLAND WETLAND:SEASONAL WET DEPRESSIONS;
   INLAND WETLAND:SILT BOTTOM STREAMS;
   INLAND WETLAND:DETRITUS BOTTOM STREAMS;
   INLAND WETLAND:ROCKY BOTTOM STREAM;
   INLAND WETLAND:STREAM POOL AREAS;
   INLAND WETLAND:STREAM/RIVER WEEDBEDS;
   INLAND WETLAND:LAKE WEEDBEDS;
   INLAND WETLAND:WET MEADOWS;
   INLAND WETLAND:WOODLAND PONDS;
   INLAND WETLAND:MAN-MADE IMPOUNDMENTS;
   COASTAL ZONE:SALTWATER MARSH;
   COASTAL ZONE:BRACKISH WATER MARSH;
   COASTAL ZONE:TYPHA-SCIRPUS MARSH;
   COASTAL ZONE:FRESHWATER MARSH;COASTAL ZONE:SWAMP;
   COASTAL ZONE:MUD FLATS;
   SEEPS/SPRINGS:FLOWING;SEEPS/SPRINGS:POOL;
   SOIL:CLAY;SOIL:SILT;SOIL:SAND;SOIL:LOAM;GRAVEL;SOIL:ROCKY;
   SOIL TEXTURE:COARSE;SOIL TEXTURE:MEDIUM;SOIL TEXTURE:FINE;
   TERRESTRIAL FEATURES:BURROWS;TERRESTRIAL FEATURES:STANDING SNAGS;
   TERRESTRIAL FEATURES:DOWNED LOGS;TERRESTRIAL FEATURES:ROCK OUTCROPS;
   TERRESTRIAL FEATURES:RIDGES;
   TERRESTRIAL FEATURES:LEAF NESTS;
   TERRESTRIAL FEATURES:BRUSH PILES/ROCK PILES;
   TERRESTRIAL FEATURES:HEDGEROWS/WIND BREAKS;
   TERRESTRIAL FEATURES:FENCE ROWS;
   TERRESTRIAL FEATURES:ROADSIDE DITCHES;
   TERRESTRIAL FEATURES:LARGE, LONE TREES (WOLF TREES);
   TERRESTRIAL FEATURES:LEAF LITTER;
   TERRESTRIAL FEATURES:VEGETATION MOSAICS/EDGES;
   TERRESTRIAL FEATURES:TREE CAVITIES;
   ECOTONE:WOODLAND/CROP FIELDS;
   ECOTONE:WOODLAND/SHRUB-BRUSH FIELD;
   ECOTONE:WOODLAND/OPEN WATER;
   ECOTONE:WOODLAND/HERBACEOUS FIELD;
   ECOTONE:SHRUB-BRUSH FIELD/OPEN WATER;
   ECOTONE:CROP FIELD/OPEN WATER;
   ECOTONE:CROP FIELD/HERBACEOUS FIELD;
   ECOTONE:HERBACEOUS FIELD/SHRUB-BRUSH FIELD;
   ECOTONE:HERBACEOUS FIELD/OPEN WATER;
   ECOTONE:CONIFEROUS FOREST/DECIDUOUS FOREST;
   ECOTONE:WOODLAND/BARREN LAND;
   ECOTONE:WOODLAND/WETLAND;
   ECOTONE:WOODLAND/URBAN LAND;
   ECOTONE:SHRUB-BRUSH FIELD/BARREN LAND;
   ECOTONE:SHRUB-BRUSH FIELD/CROP FIELD;
   ECOTONE:SHRUB-BRUSH FIELD/WETLAND;
   ECOTONE:SHRUB-BRUSH FIELD/URBAN LAND;
   ECOTONE:CROP FIELD/BARREN LAND;
   ECOTONE:CROP FIELD/URBAN LAND;
   ECOTONE:CROP FIELD/WETLAND;
   ECOTONE:BARREN LAND/HERBACEOUS FIELD;
   ECOTONE:HERBACEOUS FIELD/WETLAND;
   ECOTONE:HERBACEOUS FIELD/URBAN LAND;
   ECOTONE:BARREN LAND/WETLAND;
   ECOTONE:WETLAND/URBAN LAND;
   FOREST ECOTONE:CLEARCUT/SEEDLING-SAPLING STAGE;
   FOREST ECOTONE:CLEARCUT/POLE STAGE;
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FOREST ECOTONE:CLEARCUT/MATURE STAGE;
FOREST ECOTONE:SEEDLING-SAPLING/POLE STAGE;
FOREST ECOTONE:SEEDLING-SAPLING/MATURE STAGE;
FOREST ECOTONE:POLE/MATURE STAGE;
TERRESTRIAL VERTICAL DIVERSITY:SUBSURFACE LAYER;
TERRESTRIAL VERTICAL DIVERSITY:SURFACE LAYER;
TERRESTRIAL VERTICAL DIVERSITY:HERBACEOUS LAYER;
TERRESTRIAL VERTICAL DIVERSITY:SHRUB LAYER;
TERRESTRIAL VERTICAL DIVERSITY:UNDERSTORY TREE CANOPY;
TERRESTRIAL VERTICAL DIVERSITY:OVERSTORY TREE CANOPY;
NEST SITES:CAVITIES IN LIVE TREES;
NEST SITES:CAVITIES IN DEAD TREES;
NEST SITES:UNDERGROUND BURROW;
NEST SITES:ROCK OUTCROPS;
NEST SITES:LEAF NESTS IN LIVE TREES;
NEST SITES:DOWNED LOGS;NEST SITES:BRUSH PILES;
NEST SITES:TREES;
FOREST OPENINGS:<1/2 ACRE;
FOREST OPENINGS:1/2 - 1 ACRE;
FOREST OPENINGS:1-5 ACRES;
CONTINUOUS FORESTED STAND:<10 ACRES;
CONTINUOUS FORESTED STAND:10-19 ACRES;
CONTINUOUS FORESTED STAND:20-49 ACRES;
CONTINUOUS FORESTED STAND:50-99 ACRES;
CONTINUOUS FORESTED STAND:100-499 ACRES;
CONTINUOUS FORESTED STAND:500-5,000 ACRES;
CONTINUOUS FORESTED STAND:5,000-10,000 ACRES;
CONTINUOUS FORESTED STAND:>10,000 ACRES;
OVERSTORY CANOPY CLOSURE:>70% CLOSURE;
OVERSTORY CANOPY CLOSURE:40-70% CLOSURE;
OVERSTORY CANOPY CLOSURE:<40% CLOSURE;
OVERSTORY TREES HEIGHT:40-80 FT.;
OVERSTORY TREES HEIGHT:>80 FT.;
OVERSTORY TREES DBH:<4 INCHES;
OVERSTORY TREES DBH:4-11 INCHES;
OVERSTORY TREES DBH:12-18 INCHES;
OVERSTORY TREES DBH:>18 INCHES;
SHRUB CROWN COVER:<10%;
SHRUB CROWN COVER:10-25% COVER;
SHRUB CROWN COVER:25-50% COVER;
SHRUB CROWN COVER:50-75% COVER;
SHRUB CROWN COVER:>75%;
SHRUB COVER HEIGHT:<3 FT.;
SHRUB COVER HEIGHT:3-6 FT.;
SHRUB COVER HEIGHT:6-12 FT.;
SHRUB COVER HEIGHT:>12 FT.;
HERBACEOUS GROUND COVER:<10%;
HERBACEOUS GROUND COVER:10-25%;
HERBACEOUS GROUND COVER:25-50%;
HERBACEOUS GROUND COVER:50-75%;
HERBACEOUS GROUND COVER:>75%;
HERBACEOUS COVER HEIGHT:<4 INCHES;
HERBACEOUS COVER HEIGHT:4-8 INCHES;
HERBACEOUS COVER HEIGHT:8-12 INCHES;
HERBACEOUS COVER HEIGHT:12-24 INCHES;
HERBACEOUS COVER HEIGHT:24-36 INCHES;
HERBACEOUS COVER HEIGHT:>36 INCHES;
AGRICULTURAL TYPES:PASTURELAND;
AGRICULTURAL TYPES:WINTER GRAINS (BARLEY, WHEAT, RYE);
AGRICULTURAL TYPES:SPRING GRAINS (OATS, CORN, BUCKWHEAT, ETC.);
AGRICULTURAL TYPES:ORCHARDS (APPLE, PEAR, CHERRY, PEACH, ETC.);
AGRICULTURAL TYPES:VINEYARDS;
AGRICULTURAL TYPES:HAYLANDS;

AGRICULTURAL TYPES:WHEAT;
AGRICULTURAL TYPES:RYE;
AGRICULTURAL TYPES:OATS;
AGRICULTURAL TYPES:BARLEY;
AGRICULTURAL TYPES:SOYBEANS;
AGRICULTURAL TYPES:CORN;
AGRICULTURAL TYPES:POTATOES;
AGRICULTURAL TYPES:VEGETABLE CROPS;
AGRICULTURAL TYPES:CHERRY;
AGRICULTURAL TYPES:APPLES;
AGRICULTURAL TYPES:PEARS;
AGRICULTURAL TYPES:PEACHES;
VEGETATION SUCCESSIONAL:ABANDONED FIELDS;
VEGETATION SUCCESSIONAL:STABLE FOREST;
VEGETATION SUCCESSIONAL:SUBCLIMAX FOREST;
VEGETATION SUCCESSIONAL:CLIMAX FOREST;
CONIFEROUS TREES IN MIXED FOREST:<5%;
CONIFEROUS TREES IN MIXED FOREST:5-10%;
CONIFEROUS TREES IN MIXED FOREST:10-25%;
CONIFEROUS TREES IN MIXED FOREST:>25%;
SNAGS:1 OR LESS PER ACRE;
SNAGS:2 PER ACRE;
SNAGS:3 PER ACRE;
SNAGS:4 PER ACRE;
SNAGS:>4 PER ACRE;
OVERSTORY CANOPY IN DECIDUOUS SPECIES:<10%;
OVERSTORY CANOPY IN DECIDUOUS SPECIES:10-25%;
OVERSTORY CANOPY IN DECIDUOUS SPECIES:25-50%;
OVERSTORY CANOPY IN DECIDUOUS SPECIES:50-75%;
OVERSTORY CANOPY IN DECIDUOUS SPECIES:>75%;
SHRUBS:HAZELNUT;SHRUBS:ELDERBERRY (AMERICAN ELDER);
SHRUBS:CHOKEBERRY;
SHRUBS:WINTERBERRY;
SHRUBS:BLACKBERRY/RASPBERRY/DEWBERRY;
SHRUBS:VACCINIUM SPECIES;
SHRUBS:HUCKLEBERRY;SHRUBS:BARBERRY;
VINES:GRAPE;VINES:GREENBRIER;
HARDWOOD TREES:HICKORY;HARDWOOD TREES:SYCAMORE;
HARDWOOD TREES:WHITE OAKS GROUP;HARDWOOD TREES:ASHES;
HARDWOOD TREES:BLACK WALNUT/BUTTERNUT;
HARDWOOD TREES:HONEY LOCUST AND BLACK LOCUST;
HARDWOOD TREES:CHERRY SPECIES;HARDWOOD TREES:RED OAKS GROUP;
HARDWOOD TREES:ELM;
HARDWOOD TREES:TULIP OR YELLOW POPLAR;
HARDWOOD TREES:CRABAPPLE;
HARDWOOD TREES:BEECH;
HARDWOOD TREES:BASSWOOD;HARDWOOD TREES:AMERICAN HOLLY/HOLLIES;
HARDWOOD TREES:BLACKGUM;HARDWOOD TREES:MULBERRY;
HARDWOOD TREES:BITTERNUT HICKORY;
HUMAN ASSOCIATION:RESIDENTIAL HOUSES/CHIMNEYS/ATTICS;
HUMAN ASSOCIATION:FARM OUTBUILDINGS (BARNS, SHEDS);
HUMAN ASSOCIATION:ABANDONED BUILDINGS;
HUMAN ASSOCIATION:FARMS (CROPLAND/PASTURES);
HUMAN ASSOCIATION:FARM PONDS;
HUMAN ASSOCIATION:PUBLIC CITY PARKS;
HUMAN ASSOCIATION:PUBLIC RESIDENTIAL PARKS;
HUMAN ASSOCIATION:STATE AND COUNTY PARKS;
HUMAN ASSOCIATION:NATIONAL PARKS/HISTORIC LANDMARKS;
HUMAN ASSOCIATION:WILDLIFE REFUGES/SANCTUARIES;
HUMAN ASSOCIATION:ZOOS
<ENVIR-LIM>
TERRESTRIAL FEATURES:BURROWS;TERRESTRIAL FEATURES:STANDING SNAGS;
TERRESTRIAL FEATURES:DOWNED LOGS;TERRESTRIAL FEATURES:TREE CAVITIES;

FOREST ECOTONE:POLE/MATURE STAGE;
NEST SITES:CAVITIES IN LIVE TREES;NEST SITES:CAVITIES IN DEAD TREES;
NEST SITES:UNDERGROUND BURROW;NEST SITES:ROCK OUTCROPS;
OVERSTORY CANOPY CLOSURE:<40% CLOSURE;
OVERSTORY TREES DBH:12-18 INCHES;OVERSTORY TREES DBH:>18 INCHES;
SNAGS:1 OR LESS PER ACRE;
OVERSTORY CANOPY IN DECIDUOUS SPECIES:50-75%;
OVERSTORY CANOPY IN DECIDUOUS SPECIES:>75%

<ENVIR-LIM-E>
<ENVIR-LIM-LF>
<ENVIR-LIM-LR>
<ENVIR-LIM-P>
<ENVIR-LIM-JF>
<ENVIR-LIM-JR>
<ENVIR-LIM-AF>
<ENVIR-LIM-AR>
<ENVIR-LIM-AB>
TERRESTRIAL FEATURES:BURROWS;TERRESTRIAL FEATURES:STANDING SNAGS;
TERRESTRIAL FEATURES:DOWNED LOGS;TERRESTRIAL FEATURES:TREE CAVITIES;
FOREST ECOTONES:POLE/MATURE STAGE;
NEST SITES:CAVITIES IN LIVE TREES;NEST SITES:CAVITIES IN DEAD TREES;
NEST SITES:UNDERGROUND BURROW;NEST SITES:ROCK OUTCROPS;
OVERSTORY CANOPY CLOSURE:<40% CLOSURE;
OVERSTORY TREES DBH:12-18 INCHES;OVERSTORY TREES DBH:>18 INCHES;
SNAGS:1 OR LESS PER ACRE;
OVERSTORY CANOPY IN DECIDUOUS SPECIES:50-75%;
OVERSTORY CANOPY IN DECIDUOUS SPECIES:>75%

<FOOD-GEN>
HERBACEOUS FRUIT (BERRIES/CAPSULES/FRUIT/NUTS/GRAIN),
HARDWOOD FRUIT (BERRIES/SEEDS/NUTS/CAPSULES),
INSECTS-ADULT,INSECTS-IMMATURE,ARTHROPODS (NOT INSECTS),WORMS,
INSECTS-AQUATIC,CRUSTACEANS,CLAMS,INVERTEBRATES-OTHER AQUATIC,
MAMMALS-JUVENILES/NESTLINGS,MAMMALS-SMALL,
BIRD EGGS,BIRD NESTLINGS,BIRD ADULTS,FISH FRY,FISH ADULTS,
REPTILE JUVENILES,REPTILE ADULTS,AMPHIBIAN JUVENILES,
AMPHIBIAN ADULTS,GARBAGE/TRASH

<FOOD-J>
HERBACEOUS FRUIT (BERRIES/CAPSULES/FRUIT/NUTS/GRAIN),
HARDWOOD FRUIT (BERRIES/SEEDS/NUTS/CAPSULES),
INSECTS-ADULT,INSECTS-IMMATURE,ARTHROPODS (NOT INSECTS),WORMS,
INSECTS-AQUATIC,CRUSTACEANS,CLAMS,INVERTEBRATES-OTHER AQUATIC,
MAMMALS-JUVENILES/NESTLINGS,MAMMALS-SMALL,
BIRD EGGS,BIRD NESTLINGS,BIRD ADULTS,FISH FRY,FISH ADULTS,
REPTILE JUVENILES,REPTILE ADULTS,AMPHIBIAN JUVENILES,
AMPHIBIAN ADULTS,GARBAGE/TRASH

<FOOD-A>
HERBACEOUS FRUIT (BERRIES/CAPSULES/FRUIT/NUTS/GRAIN),
HARDWOOD FRUIT (BERRIES/SEEDS/NUTS/CAPSULES),
INSECTS-ADULT,INSECTS-IMMATURE,ARTHROPODS (NOT INSECTS),WORMS,
INSECTS-AQUATIC,CRUSTACEANS,CLAMS,INVERTEBRATES-OTHER AQUATIC,
MAMMALS-JUVENILES/NESTLINGS,MAMMALS-SMALL,BIRD EGGS,
BIRD NESTLINGS,BIRD ADULTS,FISH FRY,FISH ADULTS,
REPTILE JUVENILES,REPTILE ADULTS,AMPHIBIAN JUVENILES,
AMPHIBIAN ADULTS,GARBAGE/TRASH

<FORAG-SITE>
GROUND SURFACE,HERBACEOUS VEGETATION,SNAGS (DEAD/DYING TREES),
STUMPS,LOGS,STANDING WATER-LITTORAL ZONE,
FLOWING WATER-AQUATIC VEGETATION

<BREED-SEASON>
JANUARY,FEBRUARY,MARCH

<SPAWN-SITE>

<NEST-SITE>

CAVITY IN LIVE TREE,CAVITY IN DEAD TREE,
SECONDARY CAVITY (EXCAVATED BY ANOTHER SPECIES),
UNDERGROUND BURROW,UNDER ROCKS/ROCK OUTCROPS,
MAN-MADE STRUCTURES (HOUSES/BARNS/SILOS/ETC.)
<NEST-MATRLS>
<TREND-CAUSE>
<MGMT-BENEFIT>
REGULATE NUMBERS AND SEX OF HARVEST;
RESTRICTING/REGULATING HUMAN DISTURBANCE OF POPULATIONS;
RESTRICT HUMAN DISTURBANCE DURING BREEDING OR OTHER STRESSFUL PERIODS;
RETENTION OF WILDERNESS;MAINTAINING UNDISTURBED/UNDEVELOPED AREAS;
SUPPRESSING WILD FIRE;MAINTAINING NATURAL VEGETATION (NATIVE);
MAINTAINING NATURAL ECOLOGICAL SUCCESSION;
CREATION AND MAINTENANCE OF EDGE SITUATION;
MAINTAINING WOODLOTS;MAINTAIN MAST PRODUCING TREES;
CREATING/MAINTAINING SNAGS;
RETAINING DEAD/DOWNED WOODY MATERIALS;
MAINTAINING LARGE TREES FOR DENNING, NESTING, OR ROOSTING;
CREATING TREE CAVITIES BY MECHANICAL EXCAVATION/INTRODUCTION OF FUNGI;
DEVELOPING/MAINTAINING GREENSPACE (WILDLIFE CORRIDORS);
ESTABLISH/MAINTAIN ESCAPE COVER;
ESTABLISHING/MAINTAINING NESTING COVER;
DEVELOPING/MAINTAINING WATER HOLES, PONDS, POTHOLES, ETC.;
ESTABLISHMENT OF FIELD BORDERS;
DEVELOPING/MAINTAINING HEDGEROWS;CREATING/MAINTAINING ROCK PILES;
DEVELOPING/MAINTAINING BRUSH OR SLASH PILES;
DEVELOPING/MAINTAINING DITCHBANK VEGETATION;
PLANTINGS (SHRUBS, GRASSES, TREES, ETC.);
TRANSPLANTING NATIVE VEGETATION;
TRANSPLANTING NURSERY GROWN PLANTS;STREAM BANK PRESERVATION;
DEVELOPING/MAINTAINING STREAMBANK/STREAMSIDE VEGETATION;
CONTROLLING SEDIMENTATION;
PROVIDING SHADE ADJACENT TO WATERWAYS TO PREVENT HIGH WATER TEMP.;
PLANTING HEDGEROWS ALONG DRY STREAMBEDS AND/OR GULLIES;
CREATING POOLS IN STREAMS;DEVELOPING/MAINTAINING STREAM STRUCTURES;
MAINTAINING/PROTECTING RIPARIAN HABITAT;
CREATING/MAINTAINING ISLANDS WITHIN PERMANENT IMPOUNDMENTS;
DEVELOPING/MAINTAINING/PROTECTING FRESHWATER WETLANDS;
DEVELOPING/MAINTAINING/PROTECTING BRACKISH WETLANDS;
DEVELOPMENT OF SHALLOW WATER IMPOUNDMENTS;
WATER LEVELS SEASONALLY FLUCTUATING IN RESERVOIRS;
UNEVEN AGE TIMBER MANAGEMENT;MAINTAIN MATURE HARDWOOD FORESTS;
MAINTAIN OVERMATURE HARDWOOD AND CONIFEROUS FORESTS;
REFORESTATION - DECIDUOUS;
REFORESTATION - MIXED DECIDUOUS/CONIFEROUS;
FOREST FIRE SUPPRESSION;DAYLIGHT CUTTING ALONG ROADS;
CONVENTIONAL TILLAGE AGRICULTURE;
STRIP CROPPING;MINIMUM TILLAGE AGRICULTURE (STRIP TILLAGE);
NON-INVERSION TILLAGE (DEEP OFFSET DISK, DISK PLOW, CHIZEL PLOW, ETC);
NO-TILL FARMING;RETAINING CROP RESIDUE (OVER WINTER);
FENCING OUT CATTLE, SHEEP, OR OTHER LIVESTOCK;
FARM POND DEVELOPMENT;RIGHTS-OF-WAY MANAGEMENT FOR WILDLIFE;
CONTROLLING POLLUTION (THERMAL, CHEMICAL, PHYSICAL)
<MGMT-HARM>
MAINTAIN EARLY STAGES OF SUCCESSION;GRASSLAND BURNING;
PRESCRIBED BURNING OF BRUSHLAND HABITAT;
REMOVAL OF HEDGEROWS;REMOVAL OF STONE WALLS;
REMOVAL OF STREAMSIDE VEGETATION;SILTATION;
MECHANICAL MANIPULATION OF STREAM BOTTOMS;
DRAINING/EXCAVATING WETLANDS, INCLUDING MARSHES WITH VEGETATION;
DRAINING/EXCAVATING PONDS AND LAKES;CHANNELIZATION;
CHANNEL REALIGNMENTS;EVEN AGE TIMBER MANAGEMENT;TIMBER HARVEST;
REGENERATION CUTS (I.E., CLEARCUT, SELECTION, SEED TREE, ETC.);

TIMBER HARVESTING - CLEARCUTTING;TIMBER HARVESTING - SEED TREE CUTS;
CONVERTING WOODLAND TO OPEN LAND;TIMBER HARVESTING - SEED TREE, ETC.);
PRESCRIBED BURNING IN FOREST HABITAT;SURFACE MINING;
UNDERGROUND MINING/DEEP MINING;
DOZER BASIN AND GOUGING METHODS OF SURFACE MANIPULATION;
INTENSIVE AGRICULTURAL PRACTICES;
CLEAN FARMING (COMPLETE REMOVAL OF RESIDUE);
OVERGRAZING BY LIVESTOCK;FARM POND REMOVAL;
INTENSIVE RECREATIONAL DEVELOPMENT;
CREATION OF SUBURBAN RESIDENTIAL AREAS;
INDUSTRIAL POLLUTION;
LOCATING/CONSTRUCTING POWERLINES AND OTHER RIGHTS-OF-WAYS

<N-TAXONOMY>

THE RACCOON'S RESEMBLANCE TO THE BEAR (FAMILY URSIDAE) LED LINNAEUS TO NAME HIM URSUS LOTOR IN 1758. THE RACCOON WAS LATER RENAMED BY DESMAREST, PROCYON LOTOR *32:103*. THE SCIENTIFIC NAME OF THE RACCOON, PROCYON, MEANS BEFORE (PRO) DOG (CYON); THE SPECIFIC NAME MEANS WASHER (LOTOR). THE IMPLICATION OF THE GENERIC NAME IS THAT THE RACCOON IS MORE PRIMITIVE EVOLUTIONARILY THAN THE DOG; THE SPECIFIC NAME REFERS TO THE RACCOON'S HABIT OF DUNKING ITS FOOD IN WATER *29:196*.

NO ADDITIONAL SCIENTIFIC SYNONYMS WERE FOUND IN THE LITERATURE. OTHER COMMON NAMES INCLUDE COON AND RING-TAIL *29:198*.

<N-SPP-STATUS>

THE PENNSYLVANIA GAME COMMISSION IS RESPONSIBLE FOR THE PROTECTION AND MANAGEMENT OF THIS SPECIES. THE RACCOON WAS RECLASSIFIED AS A FUR-BEARING ANIMAL (IT WAS PREVIOUSLY A GAME ANIMAL) EFFECTIVE 7/3/85 *18*. A PERSON DESIRING TO EITHER HUNT OR TRAP RACCOONS NEEDS A FURTAKERS LICENSE. NO OTHER LICENSE IS NECESSARY. THE RACCOON HUNTING SEASON IN THE STATE TYPICALLY RUNS FROM LATE OCTOBER THROUGH LATE JANUARY. UNLIMITED POSSESSION IS PERMITTED. RACCOON TRAPPING SEASON USES THE SAME DATES AS THE HUNTING SEASON. (CONSULT THE PENNSYLVANIA DIGEST OF HUNTING AND TRAPPING REGULATIONS FOR CURRENT YEAR SEASON OPENING/CLOSING DATES). PROTECTION HAS BEEN REMOVED THROUGHOUT THE YEAR FOR RACCOONS IN SELECTED MUNICIPALITIES BY PENNSYLVANIA GAME COMMISSION REGULATIONS DUE TO AN INCREASE IN THE INCIDENCE OF RABIES. CONSULT CURRENT YEAR HUNTING/TRAPPING REGULATIONS FOR SEASONS AND POSSESSION LIMITS.

<N-DISTRIB>

THE RACCOON, PROCYON LOTOR, OCCURS THROUGHOUT SOUTHERN CANADA AND THE EASTERN UNITED STATES, FROM MAINE SOUTH TO GEORGIA AND WESTERN FLORIDA *33:121,36:130*. IT ALSO IS FOUND THROUGHOUT THE REMAINDER OF THE U.S., EXCEPT FOR THE DESERTS OF THE SOUTHWEST AND HIGHER ELEVATIONS OF THE ROCKY MOUNTAINS *30:130*.

THE RACCOON HISTORICALLY HAS BEEN NUMEROUS IN ALL WOODED TRACTS OF THE COMMONWEALTH WITH THE POSSIBLE EXCEPTION OF SUBURBAN AND URBAN LOCATIONS *32:132*. THE RACCOON PRESENTLY IS COMMON TO LOCALLY ABUNDANT THROUGHOUT THE COMMONWEALTH, INCLUDING WELL-POPULATED CITIES *01:50,02:36,03:32,04:39,05:29,06:24,13:2,29:198*.

<N-HABITAT>

RACCOONS ARE EXTREMELY ADAPTABLE AND OCCUR IN A WIDE VARIETY OF HABITATS, INCLUDING UPLAND WOODS, SWAMPS, BRACKISH AND FRESHWATER MARSHES, CULTIVATED FARMLANDS, ORCHARDS, SUBURBAN HOUSING DEVELOPMENTS, AND ALONG STREAMS AND LAKES *01:50,02:36,05:29,06:24,07:117,14:571,16:125,31:145*. PREFERRED HABITATS ARE FORESTED AREAS INTERRUPTED BY FIELDS AND WATER COURSES, ESPECIALLY ALONG STREAMS AND NEAR LAKES WHERE LARGE, HOLLOW TREES ARE PRESENT *28:59,29:198-199,30:130,31:145*. POPULATIONS RAPIDLY DIMINISH IN NUMBERS WHEN TREES ARE CUT OVER, AND WILL EITHER DIE OFF OR LEAVE AN AREA AFTER ALL TREES ARE GONE *31:145*.

A STUDY TRACT IN NORTHERN TIOGA COUNTY CONSIDERED AS EXCELLENT RACCOON HABITAT HAD 68% FIELD, AND 32% WOODLAND COVER TYPES. MOST OF THE FIELDS WERE IN HAY OR PASTURE WITH CORN AND OATS. THE AREA

ENCOMPASSED THE UPPER DRAINAGE OF TWO STREAMS AND THE STREAM BOTTOMS WERE WOODED *27*. FROM A STUDY IN MARYLAND, OUTSTANDING HABITAT TYPES USED WAS BOTTOMLAND HARDWOOD FOREST FOLLOWED BY CULTIVATED FIELDS (ESPECIALLY CORN), HEDGEROWS, AND WOOD MARGINS, PARTICULARLY IF LEADING TO CORN FIELDS *31:145*. RACCOONS USUALLY ARE NOT FOUND IN DENSE FORESTS *30:130*.

RACCOONS REQUIRE FREE WATER DAILY *34*. U.S. FOREST SERVICE MANAGEMENT GUIDELINES FOR THE SOUTHEASTERN U.S. RECOMMEND THREE OR MORE PERMANENT WATER SOURCES PER SQUARE MILE (2.6 KM. SQUARE) *35*.

SUITABLE DEN SITE AVAILABILITY IS A PREREQUISITE FOR THE HABITABILITY OF AN AREA *01:50,03:32,04:39*. BOTH GROUND AND TREE DENS ARE USED. THE PREFERRED DEN SITE FOR RAISING YOUNG IS THE HOLLOW BOLE OF AN OVERMATURE HARDWOOD TREE. DENS ARE USUALLY LOCATED IN TREES 10 FEET (3 METERS) OR MORE ABOVE THE GROUND *30:130*. DEN CAVITIES ARE USUALLY WITHIN, OR JUST BELOW, THE TREE CANOPY AND MAY BE AS HIGH AS 70 FEET (21 M.) ABOVE THE GROUND *36*. OTHER DEN SITES USED INCLUDE HOLLOW STUMPS, SMALL CAVES OR HOLES IN ROCK OUTCROPS OR LEDGES, FISSURES IN CLIFFS, HOLLOW LOGS, CULVERTS, ABANDONED BUILDINGS AND ABANDONED WOODCHUCK BURROWS *01:50,03:32,04:39,29:200,30:150,31:145,33:124*. USE OF LEAF/TWIG NESTS OF BIRDS OR SQUIRRELS AS RESTING SITES IN DECIDUOUS FORESTS SITUATED NEAR MARSHES AND OPEN WATER ALSO HAS BEEN REPORTED *28*.

DEN SITES LOCATED WITHIN ONE QUARTER OF A MILE OF A PERMANENT WATER SOURCE ARE PREFERRED. SUITABLE DEN CAVITIES HAVE 4-10 INCH OPENINGS FACING AWAY FROM PREVAILING WINDS. A RACCOON MAY HAVE SEVERAL DENS WITHIN ITS RANGE AND DOES NOT NECESSARILY USE THE SAME DEN CONTINUOUSLY *36*. GUIDELINES USED IN MICHIGAN SUPPORT A MINIMUM OF 1 TO 2 DENS/15 TO 20 ACRES AND 2 TO 3 TIMES THAT MANY POTENTIAL DEN SITES *34*.

RACCOONS TYPICALLY ARE SOLITARY *29:200,36*; HOWEVER, COMMUNAL DENS MAY BE SHARED DURING SEVERE WEATHER, PERIODS OF HIGH POPULATION DENSITY, OR IN THE VICINITY OF ABUNDANT FOOD SUPPLIES *37*.

<N-FOOD>

RACCOONS ARE OMNIVOROUS AND OPPORTUNISTIC. RACCOONS EAT A WIDE RANGE OF BOTH PLANT AND ANIMAL MATTER. THEY ARE SELECTIVE WHEN FOOD IS ABUNDANT, BUT EAT WHATEVER IS AVAILABLE WHEN FOOD IS SCARCE *17:4*. IN MOST HABITATS, PLANTS ARE GENERALLY MORE IMPORTANT THAN ANIMALS IN THE RACCOON'S DIET *14:573*. ONLY IN THE SPRING AND EARLY SUMMER DO MOST RACCOONS EAT MORE ANIMAL THAN PLANT FOOD *14:574,30:131*. IN FORESTED OR UPLAND REGIONS, PLANT FOODS (SUCH AS ACORNS, BEECH NUTS, HICKORY NUTS, HAZELNUTS), FRUITS AND BERRIES (SUCH AS JUNEBERRIES, BLUEBERRIES, WILD GRAPES, HOLLY, APPLES, WILD CHERRIES, GREENBRIER, HACKBERRY, POKEBERRY), AND CULTIVATED CROPS SUCH AS CORN COMPRISE 50-80% OF THEIR DIET *01:50,02:37,04:40,05:29,07:117,10:645,14:573,15:221*. THE REMAINING 20-50% CONSISTS LARGELY OF INSECTS (HYMENOPTERANS, COLEOPTERANS, PHYLLOPHAGA SP.) AND CRAYFISH *01:50,04:40,05:29,07:117,10:645*. IN WETLAND AREAS, RACCOONS FEED PRIMARILY ON ANIMAL MATTER, ESPECIALLY AQUATIC INVERTEBRATES *07:117*. OTHER FOODS CONSTITUTING A RELATIVELY MINOR ROLE IN THEIR DIET INCLUDE COTTONTAIL RABBITS, SQUIRRELS, MICE AND SHREWS, FISH, FROGS, SNAKES (NATRIX AND THAMNOPHIS), WORMS, MUSSELS, BIRDS AND THEIR EGGS, AND CARRION *01:50,04:40,05:29,14:574,28:59,30:131*. GARBAGE IS A COMMON ELEMENT OF THE DIET AROUND FARMS AND TOWNS *14:574*. RAIDS OF POULTRY HOUSES ALSO HAVE BEEN REPORTED *28:60,32:182*.

<N-MGMT>

RACCOON POPULATIONS WILL BENEFIT THROUGH THE REGULATION OF THEIR HARVEST. RACCOON HARVESTS APPEAR TO BE INFLUENCED BY PREVAILING PELT VALUES. THE MEAN PELT VALUE ACCOUNTS FOR MORE ANNUAL VARIATION IN HARVEST THAN ANY OTHER VARIABLE CONSIDERED *08:1484*. LAWS RESTRICTING RACCOON HUNTING TO THE LATE FALL AND WINTER ARE USEFUL IN PROTECTING POPULATIONS IN HEAVILY HUNTED

AREAS. IT IS IMPORTANT TO OPEN THE SEASON AFTER THE JUVENILES ARE MATURE ENOUGH TO CARE FOR THEMSELVES AND TO CLOSE IT BEFORE THE BREEDING SEASON BEGINS *14:579*.

RACCOON POPULATIONS ARE SUSCEPTIBLE TO OVER-HUNTING IN AREAS WHERE THERE ARE FEW REFUGE TREES, BURROWS, OR DENS *24*. POPULATION CONTROL OF RACCOONS COULD BE IMPLEMENTED BY ADJUSTING FOOD AND DEN AVAILABILITY THEREBY AFFECTING PRODUCTIVITY. RACCOONS ARE MOST SENSITIVE TO CHANGES IN THE FOREST ENVIRONMENT. THE PRESERVATION OF DEN TREES (MINIMUM OF 1-2/15-20 ACRES WITH 2 TO 3 TIMES AS MANY POTENTIAL DEN SITES), WETLAND AREAS, AND FRUIT-BEARING AND MAST-PRODUCING PLANTS IS CRITICAL. FOREST STANDS WITH 20% STOCKING OF MAST PRODUCING TREES MANAGED IN 100 YEAR ROTATIONS ARE DESIRABLE FOR ADEQUATE PRODUCTION OF FOOD AND DEN TREES *35,37*.

GENERALLY, RACCOON NUMBERS CAN BE INCREASED BY MANAGING FOR OLD-GROWTH MAST TREES; MAINTAINING DEAD OR DOWNED WOODY MATERIALS AND SNAGS; ERECTING NEST BOXES WHERE NATURAL DENS ARE SCARCE; UNEVEN-AGED TIMBER MANAGEMENT; MAINTAINING MAST-PRODUCING TREES; SUPPRESSING WILD FIRES; DEVELOPING OR MAINTAINING ROCK PILES, BRUSH OR SLASH PILES; MAINTAINING WOODLOTS; MAINTAINING OR PROTECTING RIPARIAN HABITATS; DEVELOPING OR MAINTAINING STREAMBANK VEGETATION; AND RETAINING CROP RESIDUES OVER WINTER.

ADVERSE IMPACTS TO RACCOON POPULATIONS CAN BE EXPECTED TO RESULT FROM MECHANICAL MANIPULATION OF STREAM BOTTOMS; DRAINING WETLANDS AND PONDS; CLEAN FARMING; CLEARCUTTING OF TIMBER; AND GRAZING OF WOODLOTS *10:649,14:579*.

<HEP-DATA>

DRAFT-HEP AND PAMHEP MODELS HAVE BEEN DEVELOPED FOR THE RACCOON:

1. U.S. FISH AND WILDLIFE SERVICE. 1976. RACCOON (DESCRIPTION AND MODELS FOR UPLAND HARDWOODS, LOWLAND HARDWOODS, AND RIPARIAN ZONE). TERRESTRIAL HABITATS EVALUATION CRITERIA HANDBOOK FOR ECOREGION 2213 (MIDWEST). U.S. DEPARTMENT OF THE INTERIOR, DIVISION OF ECOLOGICAL SERVICES, WASHINGTON, DC. *40*.
HSI PARAMETERS INCLUDE DISTANCE TO WATER AND NUMBER OF AVAILABLE DEN SITES PER ACRE.

2. U.S. FISH AND WILDLIFE SERVICE. 1978. RACCOON (DESCRIPTION AND MODELS FOR UPLAND HARDWOODS AND BOTTOMLAND HARDWOODS). TERRESTRIAL HABITAT EVALUATION CRITERIA HANDBOOK FOR ECOREGION 2211 (APPALACHIANS). U.S. DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE, DIVISION OF ECOLOGICAL SERVICES, WASHINGTON, DC. *41*.
HSI PARAMETERS INCLUDE AVERAGE DISTANCE TO PERMANENT WATER, ABUNDANT OF DEN TREES PER 10 ACRES, AVERAGE D.B.H. OF TREES, AND HEIGHT OF TREES.

3. ANONYMOUS. 1980. HABITAT SUITABILITY INDEX MODELS: RACCOON. (REVIEW COPY). DEPARTMENT OF THE INTERIOR, U.S. FISH AND WILDLIFE SERVICE, WASHINGTON, DC. 11 PP.
APPLIES TO THE FOLLOWING COVER TYPES; UPLAND HARDWOOD, BOTTOMLAND HARDWOOD. NARRATIVES ONLY PROVIDED *57*.

4. PALMER, J.H. 1983. PAM-HEP HSI MODEL: RACCOON. PENNSYLVANIA GAME COMMISSION, HARRISBURG, PA. 4 PP. MIMEO. *42*.
COVER TYPES INCLUDE: URBAN LAND, AGRICULTURAL LAND, HERBACEOUS RANGELAND, SHRUB-BRUSH RANGELAND, MIXED RANGELAND, DECIDUOUS FOREST, EMERGENT WETLANDS, SCRUB-SHRUB WETLANDS, AND FOREST WETLANDS.
HSI PARAMETERS INCLUDE NUMBER OF DEN TREES PER 10 ACRES; DISTANCE TO DECIDUOUS FOREST AND/OR WETLANDS, AND DISTANCE TO PARAMETER WATER.ERMA

<ANIMAL-PLANT>

SPECIFIC FOOD ITEMS INCLUDE: ACORNS (QUERCUS SP.) *14:573, HICKORY NUTS (CARYA SP.) *14:573*, BEECH NUTS (FAGUS GRANDIFOLIA) *14:573*, AND CRAYFISH *07:117*.

KNOWN PREDATORS INCLUDE: BOBCAT (FELIS RUFUS) *13:4*, RED FOX (VULPES VULPES) *13:4*, AND OWLS *13:4*.

THERE IS A KNOWN ASSOCIATION WITH THE WOODCHUCK (MARMOTA MONAX) *14:572*; RACCOONS USE WOODCHUCK BURROWS FOR DENNING SITES.

<DESCRIPTION>

THE RACCOON IS A MEDIUM-SIZED MAMMAL, EASILY DISTINGUISHED BY THEIR "BANDIT" BLACK MASK AND TAIL WITH 5 TO 7 BLACK RINGS ALTERNATING WITH LIGHTER HAIRS, ALWAYS TERMINATING IN A DARK BAND. THE PELAGE HAS A GRIZZLED APPEARANCE AND MALES AND FEMALES ARE MARKED ALIKE. THE TOTAL BODY LENGTH OF ADULT RACCOONS RANGES FROM 63-96 CM., INCLUDING A 19-40 CM. TAIL *13:2,07:117,17:1182,28:223,29:202*. ADULTS VARY IN WEIGHT FROM ABOUT 7.9 POUNDS (3.6 KG.) TO 36 POUNDS (17.7 KG.), WITH TYPICAL WEIGHTS VARYING FROM 7.9 TO 19.8 POUNDS *14:568*. MALES TYPICALLY OUTWEIGH FEMALES BY 10 TO 15% *14:568*. THE FEET, RESEMBLING THOSE OF MAN *17:1182*, EACH BEAR FIVE DIGITS WITH NO WEBBING BETWEEN THE DIGITS. THE SKULL HAS 40 TEETH (3/3, 1/1,4/4,2/2), AND THERE ARE 6 MAMMAE *13:2,07:117*.

<ORIGIN>

THE RACCOON IS NATIVE TO PENNSYLVANIA AND THE ENTIRE EASTERN UNITED STATES *32:182*.

<BEHAVIOR>

TERRITORIALITY IS INDICATED AMONG ADULT MALES *11:262*, BUT NOT IN FEMALES *13:5,14:575*. ADULT MALES MAINTAIN LARGE AREAS RELATIVELY EXCLUSIVE OF OTHER ADULT MALES *11:269*. THERE IS GREAT VARIATION IN HOME RANGE SIZES REPORTED FOR RACCOONS WITH MOST FALLING IN THE 40 TO 100 HA (98.8-247 AC) RANGE *14:573*. ADULT AND JUVENILE MALE RACCOONS HAVE LARGER HOME RANGES THAN FEMALES OF CORRESPONDING AGES, AND ADULTS HAVE LARGER HOME RANGES THAN JUVENILES. HOME RANGES OFTEN OVERLAP *37*. MOVEMENTS OCCUR PRIMARILY ALONG WATER COURSES AND ARE RELATED TO FOOD AVAILABILITY AND PREFERENCES *59*. RACCOONS MAY FORAGE OUTSIDE THEIR USUAL HOME AREA IF AN ATTRACTIVE FOOD SUPPLY, SUCH A CORN, IS AVAILABLE *37*. RACCOONS MAY USE SMALLER HOME RANGES WHEN THEIR POPULATION DENSITIES ARE HIGH *13:4*.

RACCOONS PRIMARILY ARE NOCTURNAL AND SELDOM ACTIVE IN THE DAYTIME *07:117,13:4,17:1182*. RACCOONS ARE ACTIVE FROM SUNSET TO SUNRISE. DAILY ACTIVITY OF RACCOONS INVOLVE MOVEMENT TOWARD FEEDING SITES, ACTIVITY WITHIN FEEDING SITES, AND THEN RETURN TO A NESTING SITE *13:4*. THERE IS MUCH INDIVIDUAL AND SEASONAL VARIATION IN DAILY ACTIVITY CYCLES *14:572*. RACCOONS DO NOT HIBERNATE, BUT TYPICALLY UNDERGO A VARIABLE PERIOD OF WINTER DORMANCY *14:569,13:3*. THEY MAY BE INACTIVE FOR PERIODS OF SEVERAL DAYS DURING SEVERE WINTER WEATHER *07:117*. RACCOONS ARE EXCELLENT CLIMBERS AND READILY ASCEND TREES TO FEED OR SEEK SHELTER. RACCOONS TAKE READILY TO WATER WHEN FEEDING AND TRAVELLING AND ARE STRONG SWIMMERS *14:575*. THE MOST COMMON SOCIAL GROUP AMONG RACCOONS CONSISTS OF A MOTHER AND HER YOUNG OF THE YEAR. ADULT RACCOONS TEND TO BE SOLITARY *14:576*.

<REPRODUCTION>

IN PENNSYLVANIA, RACCOON BREEDING TAKES PLACE FROM JANUARY THROUGH MARCH WITH A PEAK IN FEBRUARY *07:117-118*. RACCOONS PREFER LARGE HOLLOW TREES, ROCKY LEDGES, ROCK SLIDES, AND GROUND BURROWS FOR DENNING. CHIMNEYS, ATTICS, AND BARNLOFTS ALSO ARE USED *05:29,07:117,12:13-14,13:5,14:572,19:37*. DENS TYPICALLY ARE LOCATED NEAR WATER *14:573*. USUALLY NO NEST IS PREPARED. AFTER EMERGING FROM HER WINTER SLEEP AND MATING, A PREGNANT FEMALE CHOOSES A DIFFERENT DEN IN WHICH TO HAVE HER LITTER *14:572*. GESTATION IS APPROXIMATELY 63 DAYS AND PARTURITION USUALLY OCCURS IN APRIL AND MAY. LITTERS CONTAIN 2 TO 7 ALTRICIAL YOUNG, WITH AN AVERAGE OF FOUR *07:117-118,28:222,29:200,30:131,33:124*. AT BIRTH, THE YOUNG WEIGH ABOUT 3 OUNCES AND ARE WELL COVERED WITH FUR SOON ACQUIRING THE MARKINGS OF AN ADULT, BUT THEIR EYES DO NOT OPEN UNTIL NEARLY 3 WEEKS OLD *29:200,33:124-125*.

MALES TYPICALLY MATE WITH SEVERAL FEMALES EACH SPRING *14:570*, BUT MALES WILL USUALLY REMAIN WITH THE FEMALES FROM BREEDING TO PARTURITION, AND SOMETIMES THE MALE ASSISTS IN REARING THE YOUNG *07:117-118*. FEMALE RACCOONS HAVE THE PREDOMINANT OR SOLE ROLE IN THE CARE OF THE YOUNG *13:5*. THE YOUNG ARE WEANED AT ABOUT 3 MONTHS OF AGE *07:117-118*. BY AUTUMN, A JUVENILE MAY WEIGH UP TO

15 POUNDS (7 KG.), BUT FULL GROWTH IS NOT ACHIEVED UNTIL THE SECOND YEAR *14:571*. FEMALES MAY REACH SEXUAL MATURITY AND BREED DURING THEIR FIRST YEAR, BUT MALES GENERALLY DO NOT BECOME SEXUALLY MATURE UNTIL THEIR SECOND YEAR *07:117-118*. UP TO 60% OF FEMALES FIRST MATE AS JUVENILES, PRODUCING LITTERS WHEN THEY ARE 1 YEAR OLD *14:569-570*. ONLY ONE LITTER IS PRODUCED PER YEAR.

THERE IS SOME EVIDENCE TO SUGGEST THAT IF A FEMALE MISSED (IS NOT FERTILIZED) THE JANUARY-MARCH BREEDING PERIOD, A SECOND BREEDING CYCLE MAY BEGIN 2-4 MONTHS LATER *29:200,30:130*. THIS WOULD ACCOUNT FOR VERY SMALL YOUNG BEING OBSERVED AT VERY LATE DATES IN THE SUMMER AND EARLY FALL *29:200*.

THE NUMBERS OF MALES AND FEMALES AT BIRTH ARE APPROXIMATELY EQUAL *13:4*. THE SEX RATIO OF JUVENILES IN A WEST-CENTRAL ILLINOIS STUDY AVERAGED 112.8 MALES TO 100 FEMALES *09:492*.

<POP-DYNAMICS>

RACCOONS HAVE BECOME MORE NUMEROUS SINCE THE TURN OF THE CENTURY. THEY HAVE ADAPTED TO URBANIZATION AND ARE BECOMING INCREASINGLY COMMON IN URBAN AREAS *07:118*. SINCE 1980, A STATEWIDE SCENT-SIGN POST SURVEY HAS SHOWN NO SIGNIFICANT CHANGE IN THE PENNSYLVANIA RACCOON POPULATION *25*. THE GAMETAKE SURVEY, HOWEVER, HAS INDICATED A CONTINUING DECLINE IN THE RACCOON HARVEST SINCE 1980. THE DECREASE IN HARVEST IS ATTRIBUTED TO LOW MARKET PRICES AND NO MARKET FOR SMALL SIZES *26*.

MOST RACCOONS IN THE WILD LIVE LESS THAN FIVE YEARS. MEANS OF 3.1 AND 1.8 YEARS HAVE BEEN REPORTED *13:4*. THE ANNUAL MORTALITY RATE MAY BE AS HIGH AS 50% FOR THE ENTIRE POPULATION *14:577*.

RACCOON POPULATIONS FLUCTUATE. THEY MAY INCREASE RAPIDLY OR SLOWLY OVER A NUMBER OF YEARS AND THEN DECREASE. THE HIGHEST POPULATION RECORDED WAS 167 RACCOONS FROM 41 HA (101 ACRES). DENSITIES VARYING FROM ONE RACCOON PER 5 HA (12.35 ACRES) TO ONE PER 43 HA (106 ACRES) ARE MORE TYPICAL *13:5*. POPULATION DENSITIES IN NEW JERSEY RANGED FROM ONE RACCOON PER 1.8 HA (4.5 ACRES) TO ONE PER 18.9 HA (46.7 ACRES). DENSITIES OF 1 PER 4.7 HA (11.6 ACRES) AND 1 PER 5.6 HA (13.8 ACRES) WERE FOUND IN RURAL AREAS THAT WERE PREDOMINANTLY FORESTED (86% AND 72% RESPECTIVELY). THE LOWEST DENSITY WAS FOUND IN AN AREA ONLY 24% FORESTED WITH THE REMAINDER BEING COMPRISED OF AGRICULTURAL LANDS. THE FORESTED STANDS WERE QUITE YOUNG AND SCATTERED. THE HIGHEST DENSITY WAS RELATED TO ITS PROXIMITY TO THE SUBURBS *20:3*.

A POPULATION OF RACCOONS IN AN AGRICULTURAL AREA IN YORK COUNTY WAS CALCULATED AT 70 PER SQ. MILE (1 PER 9.1 ACRE) IN 1982 *21*. LIVE-TRAPPING STUDIES INDICATED A POTENTIAL POPULATION OF 26.5 RACCOONS PER SQ. MILE (1 PER 24.2 ACRES) IN A 95% FORESTED SAWLOG STAND COMPRISED OF WHITE OAK, RED OAK, AND RED MAPLE TRACT IN BUTLER COUNTY. WATER WAS ABUNDANT ALONG THE DRAINAGE WITHIN THIS TRACT *22*. A FURBEARER HABITAT MANIPULATION STUDY INDICATED 0.9 TREE DENNING SITES AND 12.6 GROUND DENNING SITES PER 5 ACRES OF HABITAT *23*. THE POTENTIAL POPULATION OF RACCOONS WAS DETERMINED AS 11.7 PER SQ. MILE (1 PER 54.7 ACRES) IN A LUZERNE COUNTY STUDY SITE. AN OBVIOUS DIFFERENCE BETWEEN THIS SITE AND OTHERS WITH HIGHER POPULATIONS WAS THE LACK OF DENNING TREES *24*.

PRODUCTIVITY IS GENERALLY LOWER IN URBAN AREAS THAN IN EITHER AGRICULTURAL OR FORESTED AREAS. URBAN POPULATIONS ARE PROBABLY MAINTAINED BY IMMIGRATION *10:648*. THE DIFFERING SEX RATIOS BETWEEN URBAN RACCOON POPULATIONS (60 MALES:40 FEMALES) AND THOSE OF FORESTED (51 MALES:49 FEMALES) AND AGRICULTURAL (52 MALES:48 FEMALES) AREAS LEND SUPPORT TO THE IMMIGRATION HYPOTHESIS SINCE MALES USUALLY DISPERSE FARTHER THAN FEMALES *10:647*.

<LIM-FACTORS>

HABITAT DEFICIENCIES ARE THE MAJOR LIMITING FACTORS IN MANY AREAS. THE MOST IMPORTANT LIMITING FACTORS ARE USUALLY THE AVAILABILITY OF LATE WINTER FOOD SOURCES AND DEN TREES *37*.

PRINCIPAL CAUSES OF MORTALITY ARE THE ACTIVITIES OF MAN (HUNTING,

TRAPPING, AUTOS), AND MALNUTRITION AND RELATED EFFECTS IN THE LATE WINTER AND EARLY SPRING *14:577*. THE MAJOR PREDATOR ON THE RACCOON IS MAN. BOBCAT, RED FOX, AND OWLS ARE ALSO KNOWN TO FEED OCCASIONALLY ON RACCOONS *13:4*. THE ONLY DISEASES LIKELY TO HAVE SIGNIFICANT IMPACT ON RACCOON POPULATIONS ARE CANINE DISTEMPER AND RABIES *14:577*.

<R-TAXONOMY>
14,29,32

<R-SPP-STATUS>
18

<R-DISTRIB>
01,02,03,04,05,06,13,29,30,32,33

<R-HABITAT>
01,02,03,04,05,06,07,14,16,27,28,29,30,31,33,34,35,36,37

<R-FOOD>
01,02,04,05,07,10,13,14,15,28,30,32

<R-MGMT>
03,10,14,24,35,37

<R-LIFE-HIST>
05,07,09,10,11,12,13,14,17,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,37,39

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