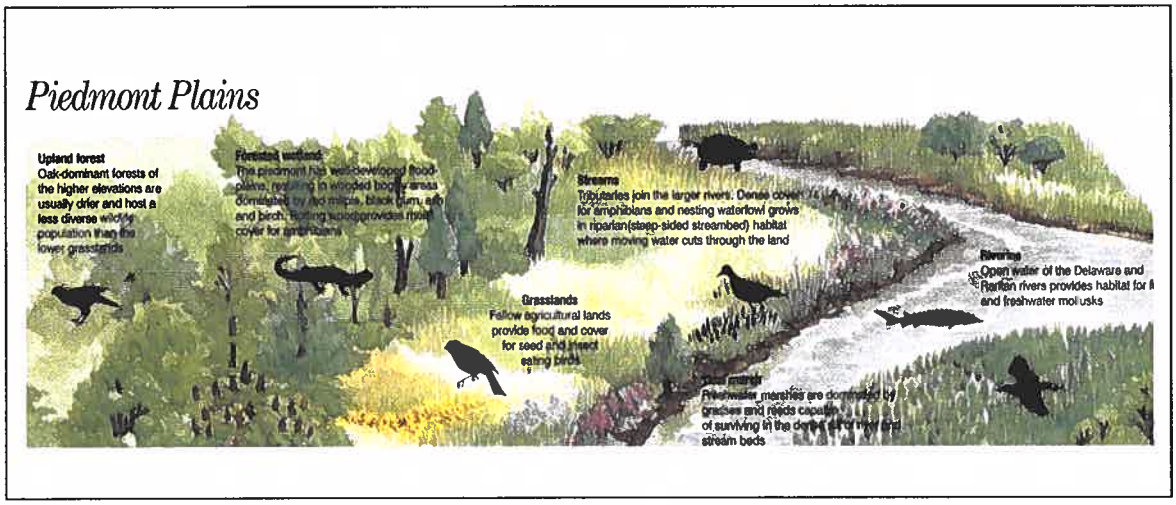
CRITICAL HABITATS
IN READINGTON TOWNSHIP

THERE IS RECENT evidence of dozens of endangered species and threatened species presently living in Readington Township. Readington Township is slightly more than 50% developed. The rate of development of our Township is one of the highest in the state. Readington must act decisively and take advantage of the brief opportunity provided by the Garden Sate Preservation Trust if it is to preserve its remaining critical habitats. In addition, habitat loss and destruction is happening so rapidly, not just in Readington, but throughout the state, that species not presently listed will also be lost in the near future if decisive action is not taken.

LACHENMAYER FIELD, BLOCK 55

CRITICAL HABITATS IN NEW JERSEY



BIOLOGISTS WITH THE Division of Fish and Wildlife's Endangered and Non Game Species Program are using a new science called landscape ecology in an effort to simplify the protection and preservation of critical wildlife habitats. Landscape ecology combines field research with Geographic Information System data to map the habitats of endangered and threatened animals. This effort is called the Landscape Project and is intended to be used to set priorities for the state's ambitious $1 billion open space land acquisition program. Six regions have been identified in the state and Readington falls within the Piedmont Plains. Each region is an interdependent group of habitat types. Each habitat type supports specific endangered animals. Most Threatened and endangered animals are listed due to human disturbance through habitat destruction, loss of breeding, feeding and nesting areas, over harvesting and pollution.

Critical Habitats in Readington Township

Report produced by;

Readington Township Environmental Commission

April 2001

Written by;
R. Daniel Allen, member, Readington Environmental Commission

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Appendix:

- Fact sheet, Raritan Basin Management Project
- Report: Wander Ecological, Ecological rationale for Open Space Preservation in Readington Township.
- Discussion of the Landscape Project
- Resources and references

MATURE FOREST HABITAT

MATURE UNBROKEN WOODLAND habitat in Readington Township is severely limited, so what remains should be a high priority for protection and preservation in the Township. Fragmentation of existing mature forests occurs even when low-density development takes place in the woods. The effects of this can be seen with the construction of houses on 5-acre lots in Block 1.

It is of utmost importance to protect those high quality mature woodland habitats that still remain unspoiled. Forest species need large expanses of interior forest for survival, as being close to a forest edge has negative consequences for the survival and reproduction of these "area sensitive" target species. Readington has excellent quality mature woodland of significant size on Cushetunk and Round Mountains. Other areas where mature forest stands of significant size can be found are the steep sloped areas in the vicinity of the major stream corridors and their tributaries.

BOTH PHOTOS, BLOCK 53

Mature forest habitat

A. Definition/ structure

- Land dominated by relatively mature trees (*ca.* 35-100 years old).
- In Readington, usually possesses a mostly-closed deciduous canopy ranging from 35'to 100' tall.
- Ideal structure: Multi-tiered vegetation consisting of
  (1) deciduous tree canopy at 35'-100'
  (2) under-story and young canopy trees at 15'-30'
  (3) woody shrubs and saplings at 5'-15'
  (4) woody vines scattered throughout
  (5) native perennial spring ephemerals, perennial grasses and sedges, annual herbs at <1'
  (6) rich litter and organic soil horizon 3"-2' deep.
- Deer-overbrowsed variant: deciduous canopy, but with more numerous gaps and few younger replacement trees, sparse or absent shrub and sapling layer, and depauperate or exotic species-dominated herb layer.
- Riparian variant: more open deciduous canopy with more numerous woody vines.

B. Extent and location in Readington

- See Figure 1.

C. Characteristic flora and fauna of mature forest habitat

- The following lists include some species found in Readington which depend mostly, entirely, or for a significant portion of their lives on the habitat.

- **Canopy trees:** oak (white, black, northern red, scarlet, pin, chestnut, swamp white), maple (red, sugar, silver, boxelder), american beech, tulip tree, ash (white, green), hickory (shagbark, mockernut, pignut, bitternut), elm (American, slippery), black birch, black walnut, butternut, black cherry, blackgum, american basswood, sassafass, *plus* remnant plantings of locally-non-native white pine, Norway spruce, Austrian pine, and scotch pine.

- **Understory trees:** flowering dogwood, shadbush, hornbeam (eastern hop, ironwood), american chestnut

- **Shrubs:** viburnum (blackhaw, mapleleaf), dogwood (silky, gray), spicebush, witch hazel, lowbush blueberry, bladdernut

- **Vines:** wild grape (fox, etc.), poison ivy, virginia creeper

- **Herbs:** Jack-in-the-pulpit, mayapple, false Solomon's seal, white wood aster, trout lily, spring beauty, common violet, Indian pipe, spotted wintergreen, showy orchis, bugbane, cluster-leaved tick trefoil, northern maidenhair, common polypody, christmas fern

- **Mosses and lichens:** common greenshield lichen, speckled grayshield lichen

- **Mammals:** squirrel (gray, flying, red), eastern chipmunk, raccoon, black bear, white-footed mouse, striped skunk

- **Birds:** pileated woodpecker, american redstart, black and white warbler, wood thrush, ovenbird, veery, scarlet tanager, cooper's hawk, rose-breasted grosbeak, barred owl, blue jay, long-eared owl

- **Herpetiles:** wood turtle, box turtle, red-backed salamander

- **Invertebrates:** katydid, cicada, black carpenter ant, pigeon horntail, spring azure, mourning cloak, luna moth, polyphemous moth, cecropia moth, plus many species of soil dwelling invertebrates (e.g., earthworms, mites, beetles, etc.)

- **Fungi:** chicken mushroom, hen-of-the-woods, russula spp., amanita spp., bolette spp., shelf fungi, jelly fungi, puffballs, earthstars

D. Key requirements for healthy flora and fauna populations

- **Large contiguous area**

Larger contiguous tracts contain less *edge* habitat (i.e., forest area within *ca.* 150 feet of the edge), and more *interior* forest habitat. "Edge forest" is susceptible to many factors which reduce the suitability of the habitat for sensitive forest-adapted species (both plant and animal). Such factors include:

(1) greater access to invasive exotic plant species propagules,
(2) overabundance of light penetration into the understory (encouraging both overabundant vines and exotic species),
(3) increased exposure to tree-toppling high winds during storms,
(4) greater access of nest-parasitic cowbirds to forest nesting bird species, and
(5) increased exposure to human-caused disturbances such as traffic noise, predation by pets (especially house cats), and vegetative/soil disturbances.

Larger size also results, typically, in an increased overall diversity of species. This increase of biodiversity with increasing size results from several factors, including a larger diversity of available microhabitats within the forest, and the presence of larger, more stable populations of various forest species, which are less susceptible to complete local extirpation during periods of low-resource availability.

- **Appropriate abundance of key species or features**

  "Keystone" species serving key ecological functions within the forest can increase or decrease the suitability of the habitat for many other forest species, depending on the over-abundance or absence of those key species.

  One example involves herbivores, such as white-tailed deer, which may promote diversity in low abundance, but can devastatingly decrease diversity when overabundant. Another example is the presence of standing and fallen dead trees in tandem with tree-excavating woodpeckers (especially the pileated woodpecker). Excavated cavities in dead trees provide crucial refuge and nesting habitat for a wide variety of forest species. The absence of either dead trees or their excavators can drastically reduce forest habitat quality.

- **Multi-tiered structure**

  A complex, layered structure consisting of canopy, sub-canopy, vine, shrub, herb, and forest litter layers allows the maximum utilization of space and resources to support rich and diverse flora and fauna populations. Many species depend on the presence of more than one of these structural layers during daily or seasonal activities, or for key life-cycle events.

E. Important ecosystem functions of mature forest

- **Hydrologic buffering**

  A healthy forest ecosystem will infiltrate and hold large quantities of storm-water – more than any other land-cover type in our area. The result is less erosive runoff, decreased peak flood volumes, maintained groundwater recharge, and the maintenance of base flow volumes in streams and rivers during times of drought.

- **Air quality and temperature regulation**

  Dense forest vegetation functions as a net producer of oxygen and a net consumer of atmospheric carbon dioxide. Canopy foliage and woody architecture also moderate temperatures by absorbing heat in the summer, and reducing chilling winter winds.

- **Nutrient cycling**

  Through carbon fixation, uptake of mineral nutrients from the subsoil, binding of topsoil by roots and debris, and decomposition of organic matter into nutrient-rich humus, deciduous forests continually build soil fertility.

- **Preserve biodiversity of native organisms**

  Healthy deciduous forest habitat contains the richest diversity and highest abundance of native species in our area.

F. Major threats to habitat and proposed solutions

- **Loss and fragmentation of remaining forest habitat through development**

Decreasing the size of remaining mature forest fragments results in instability of the remaining forest flora and fauna populations, due to a decrease in necessary resources, smaller populations sizes, and relative isolation of populations. Further degradation of smaller fragments results from a number of inter-related factors, including: (1) overabundance of human-associated predators and herbivores, (2) human-caused vegetative or soil disturbances, (3) increased access for exotic species, and (4) increased exposure to climatic extremes.

Possible solutions: Make a township priority of conserving remaining areas of mature forest habitat through (1) deed restriction (purchase of development or conservation easements), (2) offering tax incentives for woodland conservation management, and (3) fee purchase of larger parcels for Township open-space.

- **Overabundance of white-tailed deer**

Forest ecosystems in our area can withstand the herbivory pressure of approximately four deer per square mile, while still maintaining adequate regeneration of native vegetation and maximum diversity of forest wildlife. Current populations of white-tailed deer in Readington exist at many times this optimum level – as much as *ten times or more*. The destructive result is two-fold:

a. *Loss of forest structure* -- Inability of overstory trees to regenerate results in large, un-replaced canopy gaps when older trees die, are harvested, or topple in storms. Such gaps then fill with brambles, vines, and unpalatable exotic shrubs and herbs. Over time, this process results in a vegetative structure more resembling a dense, shrubby thicket than a forest.

b. *Loss of biodiversity* – Loss of forest structure not only leads to the decline of native vegetative species via replacement with unpalatable species, but the resulting shrubby, semi-open habitat is unsuitable or far inferior for most forest wildlife species. The result is a replacement of the much more rare native forest flora and fauna with that composed of common or exotic species. In some cases, as has likely happened with many of the native forest-floor spring ephemeral wildflowers, formerly abundant forest species may already be completely absent from the Township.

Possible solutions: Control population of white-tailed deer to an appropriate density through the granting of more liberal hunting permits.

- **Inappropriate tree harvest**

Logging of mature forest trees (particularly oak, hickory, beech, sugar maple, and black walnut) by clear-cut or selective-cut methods can be particularly damaging to forest habitat when accompanied by overabundant white-tailed deer populations. In such cases, forest trees are prohibited from regenerating (via seed or stump-sprout) by excessive herbivory. The net effect is piecemeal deforestation, where logged forests are replaced by briars, exotic shrubs, and lower-value (for both wildlife and forestry) unpalatable trees, rather than successional hardwood trees.

Possible solutions: Substitute forestry practices in mature forest habitat without appropriate measures to protect native flora and fauna from over-abundant white-tailed deer populations with responsible forestry stewardship.

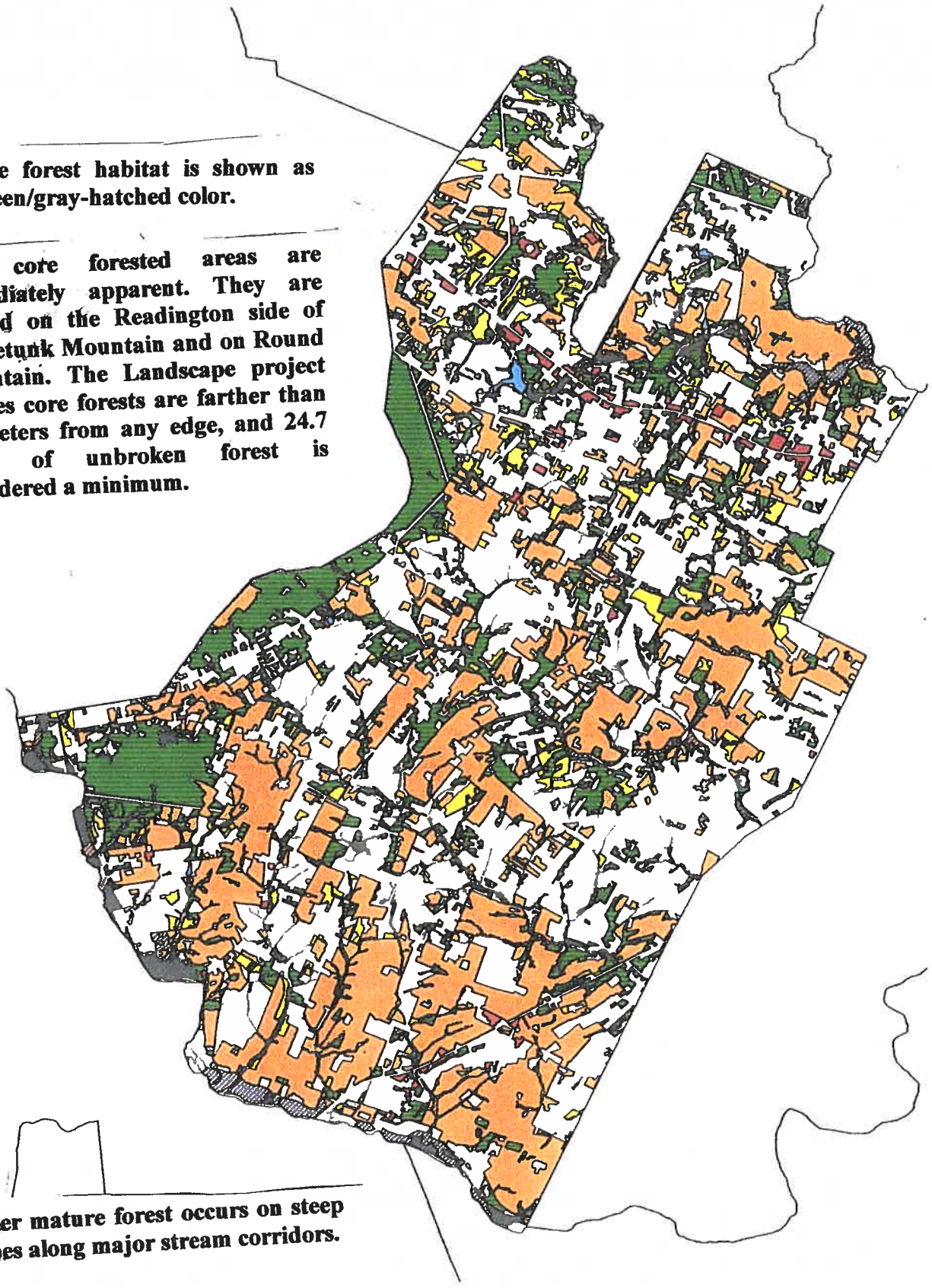
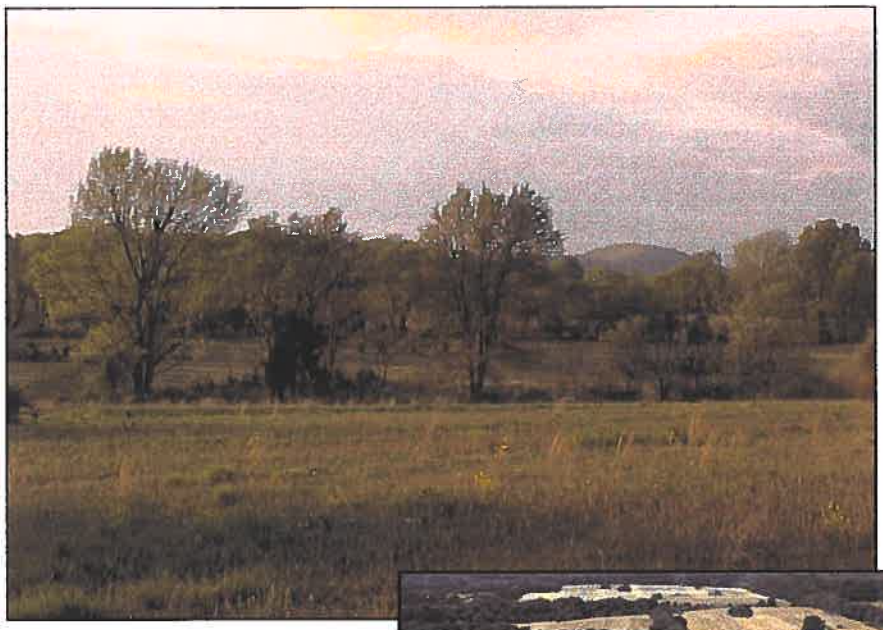

Mature forest habitat is shown as the green/gray-hatched color.
Two core forested areas are immediately apparent. They are located on the Readington side of Cushetunk Mountain and on Round Mountain. The Landscape project defines core forests are farther than 90 meters from any edge, and 24.7 acres of unbroken forest is considered a minimum.
Other mature forest occurs on steep slopes along major stream corridors.

Figure 1

AGRICULTURAL LANDSCAPE



ABOVE:
ROMANO/KOWAL FARM
BLOCK 52.01

RIGHT:
MISTY ACRES FARM
(ALLEN FARM)
BLOCK 66

READINGTON TOWNSHIP's recent Farmland Preservation Plan identified 8,000 acres of active farmland worthy of preservation efforts. The Township has presently preserved over 3,000 acres, and has hundreds more acres pending preservation at this time. Large contiguous masses of land with a predominance of good soils within Readingtonís Agricultural Development area are a priority. The agricultural landscapes that are protected in the process are home to an enormous variety of flora and fauna. Typically, they are made up of fields and pastures separated by tree rows with edge shrubbery and wildflowers, occasionally complemented by appurtenant woodland.

Agricultural landscape

A. Definition/structure

- A diverse mixture of many different habitat types, including hayfields and pastures, cultivated cropland, wooded field-borders, shrubby fence-lines, wetland swales, ponds, streams, and small woodlands.

B. Extent and location in Readington

- See Figure 2.

C. Characteristic flora and fauna of agricultural landscapes

- The following lists include some species found in Readington which are commonly found in the associated habitat.
- *Fields, fencerows, small woodlands, and cropland*
    a. **Trees:** black cherry, ash (white, green), black walnut, red mulberry, eastern redcedar, sassafrass, dogwood, maple (red, silver, boxelder), oak (red, pin), shagbark hickory, apple, crabapple

    b. **Shrubs:** blackhaw viburnum, dogwood (silky, gray), sumac (staghorn, winged, smooth)

    c. **Vines:** grape spp., poison ivy, virginia creeper, greenbriar

    d. **Herbs:** common milkweed, common mullein, hawkweed, ox-eye daisy, red clover, white clover, orchard grass, timothy

    e. **Mammals:** white-tailed deer, red fox, raccoon, opossum, striped skunk, groundhog, cottontail rabbit, meadow vole, short-tailed shrew, white-footed mouse, deer mouse, squirrel (gray, red), coyote

    f. **Birds:** red-tailed hawk, great horned owl, screech owl, indigo bunting, white-eyed vireo, northern oriole, kingbird, eastern bluebird, northern flicker, American woodcock, barn owl, barn swallow, tree swallow

    g. **Herpetiles:** snakes (eastern milk, black rat, northern black racer, eastern garter), red-backed salamander, American toad, box turtle

    h. **Invertebrates:** monarch butterfly, bumblebee, honey bee, swallowtail (tiger, black)

- *Ponds*
    a. **Herpetiles:** painted turtle, snapping turtle, spring peeper, bullfrog, green frog, pickerel frog, southern leopard frog

    b. **Plants:** duckweed spp.

    c. **Mammals:** muskrat

    d. **Invertebrates:** dragonfly spp., damselfly spp.

    e. **Fish:** large-mouthed bass, bluegill, pumpkinseed sunfish

    f. **Birds:** green heron, great blue heron, spotted sandpiper, ducks (mallard, black, wood), Canada goose

D. Key requirements for healthy flora and fauna populations

- **Large size of contiguous agricultural landscape/grassland**

  Larger sized areas offer a larger number of soil and climatic microsites (e.g., moisture and nutrient content of soil, aspect of slope, combinations of adjacent habitat types), a larger pool of resources, and more protection from disturbances/predation. This, in turn, allows such larger areas to support both a higher diversity, and larger, more stable populations of characteristic species.

- **Diversity within the landscape**

  A greater number and closer proximity of all the elements of a diverse agricultural landscape (e.g., pastures, fields, fencelines, ponds, streams, etc.) will support larger and more diverse populations than a less-varied landscape (e.g., vast crop monocultures with no pasture or fence lines).

- **Environmentally-friendly agricultural practices**
    1. Less-frequent, lower-volume applications of pesticides and herbicides reduce toxicity to wildlife at all levels of the food chain, promoting larger, healthier, and more diverse populations of wildlife species.
    2. Lower applications of soluble fertilizers prevent eutrophication of ponds, streams, and rivers. Such non-eutrophied water bodies generally support a higher diversity of wildlife species.
    3. Reduction of tillage decreases soil erosion which can pollute water bodies and harm wildlife species (both plant and aminal) with suspended sediments.
    4. Agricultural practices more closely modeled after ecological processes observed in natural ecosystems (e.g., use of composted organic material as fertilizer, high crop and landscape diversity, low toxicity) maintain a more balanced wildlife community, consisting of populations of predators and prey in a relatively stable dynamic equilibrium. This stability results in a

larger, more consistent resource supply for all types of wildlife (including insects, birds, herpetiles, and mammals), and helps to prevent destructive overpopulations of pest species.

E. Important ecosystem functions of agricultural landscape

- **Hydrologic buffering**

  A diverse agricultural landscape will exhibit increased infiltration of precipitation relative to developed land. The result, as discussed for forested habitat above, is less erosive runoff, decreased peak flood volumes, maintained groundwater recharge, and the maintenance of base flow volumes in streams and rivers during times of drought.

- **Preserve biodiversity of native organisms**

  A diverse agricultural landscape contains a rich diversity and high abundance of native species, many of which are lost when agricultural diversity decreases or when the land is partially developed.

F. Major threats to habitat and possible solutions

- **Loss and fragmentation of remaining agricultural landscape through development**

  Decreasing the size of remaining agricultural landscape fragments results in instability of the remaining forest flora and fauna populations, due to a decrease in necessary resources, smaller populations sizes, and relative isolation of populations. Further degradation of smaller fragments (especially wooded areas and fence-lines) also results from an overabundance of white-tailed deer associated with the proliferation of suburban lawns.

  Possible solutions: Continue (and, if possible, accelerate) township efforts to preserve remaining agricultural landscapes, especially large pieces and those contiguous to already-preserved farmland.

- **Environmentally-unfriendly agricultural practices**

  Agricultural practices which are (1) toxic (e.g., over-use of pesticides and herbicides), (2) erosive (e.g., tillage on sloping land, failure to utilize cover-crops), (3) non-diverse (e.g., large monocultures, absence of fence-lines and associated woodlands), and (4) use excessive amounts of soluble fertilizer represent major threats to the health and persistence of wildlife populations associated with agricultural landcapes, for reasons stated above.

  Possible solutions: Encourage the use of environmentally-friendly agricultural practices through Township-sponsored educational programs to demonstrate these practices for both farmers and non-farmers, and through increased farmer access to Township composting facilities.

- *Ponds*
    a. **Herpetiles:** painted turtle, snapping turtle, spring peeper, bullfrog, green frog, pickerel frog, southern leopard frog

    b. **Plants:** duckweed spp.

    c. **Mammals:** muskrat

    d. **Invertebrates:** dragonfly spp., damselfly spp.

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    2. Lower applications of soluble fertilizers prevent eutrophication of ponds, streams, and rivers. Such non-eutrophied water bodies generally support a higher diversity of wildlife species.
    3. Reduction of tillage decreases soil erosion which can pollute water bodies and harm wildlife species (both plant and aminal) with suspended sediments.
    4. Agricultural practices more closely modeled after ecological processes observed in natural ecosystems (e.g., use of composted organic material as fertilizer, high crop and landscape diversity, low toxicity) maintain a more balanced wildlife community, consisting of populations of predators and prey in a relatively stable dynamic equilibrium. This stability results in a

larger, more consistent resource supply for all types of wildlife (including insects, birds, herpetiles, and mammals), and helps to prevent destructive overpopulations of pest species.

E. Important ecosystem functions of agricultural landscape

- **Hydrologic buffering**

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- **Preserve biodiversity of native organisms**

  A diverse agricultural landscape contains a rich diversity and high abundance of native species, many of which are lost when agricultural diversity decreases or when the land is partially developed.

F. Major threats to habitat and possible solutions

- **Loss and fragmentation of remaining agricultural landscape through development**

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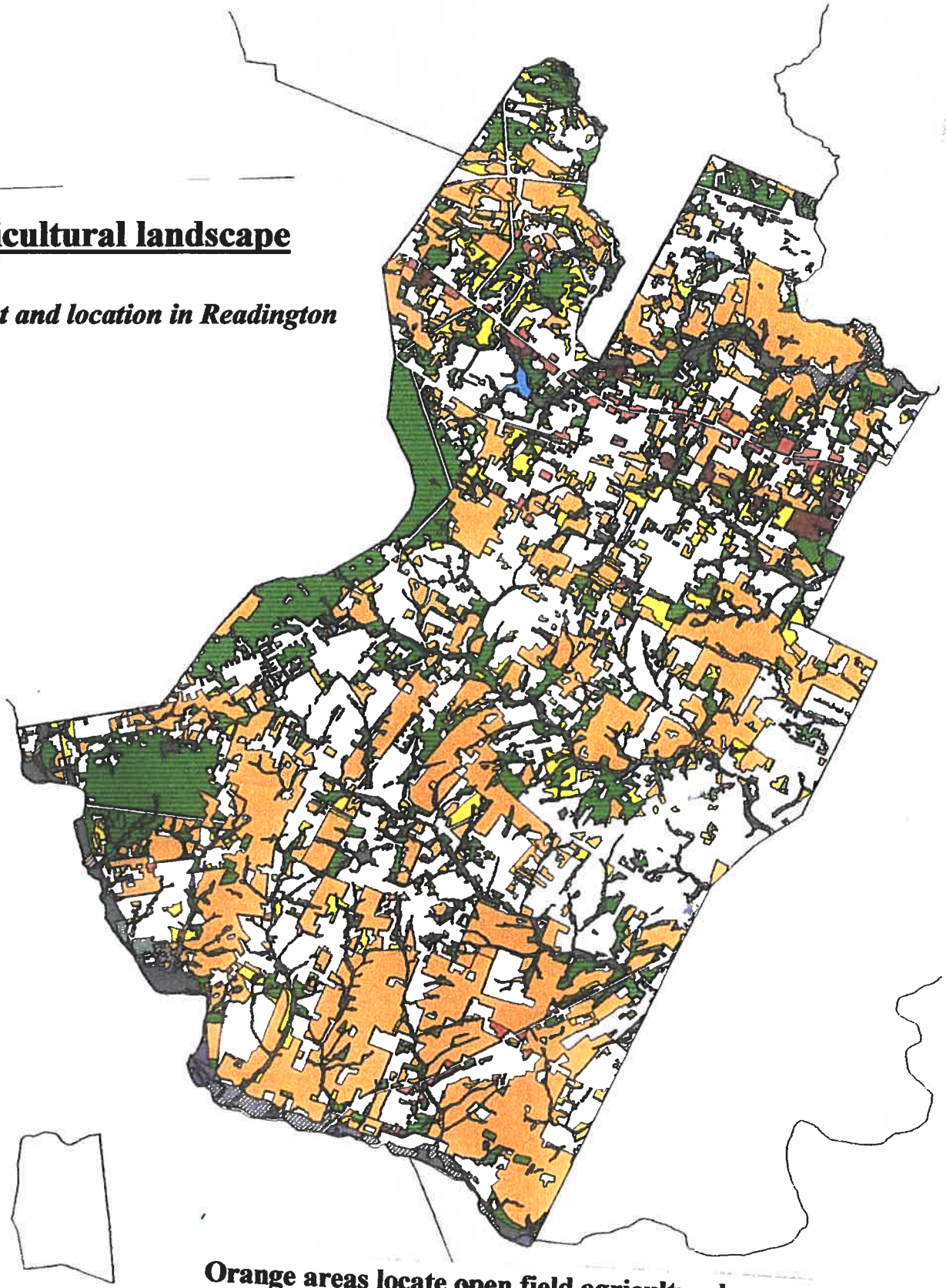
Agricultural landscape

Extent and location in Readington



Orange areas locate open field agricultural areas

Figure 2

GRASSLANDS HABITAT

READINGTON TOWNSHIP is home to a grassland habitat so significant as to be listed by the Office of Natural Lands Management as a Natural Heritage Priority Site. Their literature explains, "These areas should be considered to be top priorities for the preservation of biodiversity. If these areas are destroyed, we may lose some of the most unique components of our natural heritage." This Priority Site, the grasslands located at and surrounding Solberg Airport is shown on the map labeled Figure # 16. This map shows existing grassland habitat in Readington Township. 24.7 acres is the minimum size grassland parcel needed to support viable populations of several of the priority grassland species. Significant predation losses occur within 50 meters of grassland edges.

Grassland habitat is the most threatened habitat in the entire nation. Habitat suitable for grassland birds and the birds themselves have been said to be the most seriously threatened type of habitat and species in New Jersey. Grasslands birds nest in the grass, and these fields should not be mowed prior to July 15th if the birds are to fledge successfully. Thus, it is not enough to save the existing grassland for agriculture; the grasslands must be also managed to prevent the fields from becoming a "species sink"; that is, areas where nesting birds are killed by modern agricultural machinery, while attempting to nest. An overlay of land preserved for agriculture over the grasslands mapped in figure 16 shows that a majority of lands shown as grasslands have been preserved for agriculture, rather than habitat protection. The two most significant areas left in Readington Township, however, are still available for the preservation and management of grasslands habitat. These are the Illva Saronno and Fallone Tracts in Blocks 74 and 73, and the Solberg Aviation tracts in Blocks 56 and 48. Each of these tracts is notable for the fact that they represent a large contiguous acreage with frequent sightings of threatened and endangered grassland birds.

Grassland Habitat

A. Definition/structure

Open fields of considerable size (25-45+ acres); vegetation consists primarily of grasses, forbs, brambles, and some low-growing woody shrubs; notable for the complete or near-complete absence of tall objects such as trees, utility towers, and buildings throughout the area.

Note: Although habitat maps of Readington often show a considerable amount of "grassland habitat", most (or all) of this land is managed for agriculture. Such agricultural management may not be compatible with the requirements for many grassland species, and in some cases, may be severely detrimental to such species. Grassland habitat as defined here, while not necessarily incompatible with agriculture per se, depends on specific management practices often not (or only sporadically) associated with modern agriculture.

B. Extent and location in Readington

- See Figure 3.

C. Characteristic flora and fauna

- **Grasses and forbs:** little bluestem, goldenrod spp., orchard grass, timothy, smooth brome grass, oxeye daisy, thistle spp., wild garlic, common milkweed, dogbane, queen anne's lace, orange hawkweed, common dandelion, clover (red, white sweet, yellow hop), bird's-foot trefoil, white campion

- **Brambles:** dewberry, Allegheny blackberry, multiflora rose

- **Birds:** upland sandpiper, bobolink, grasshopper sparrow, savannah sparrow, vesper sparrow, meadowlark, american kestrel, short-eared owl (winter), northern harrier (winter), rough-legged hawk (winter)

- **Mammals:** meadow vole, woodchuck, cottontail rabbit, red fox

- **Reptiles:** black racer, common garter snake

- **Invertebrates:** butterflies, spiders, ants, grasshoppers, beetles, soil invertebrates

D. Key requirements for healthy flora and fauna populations

- **Large size of contiguous grassland area**

  Many grassland wildlife species (especially the NJ-threatened and endangered birds) require a large minimum area of open grassland for both nesting and feeding. Large contiguous grassland area provides both the necessary

resource supplies (insects, voles) and safety from predators usually associated with edge habitat (e.g., raccoon, opossum, domestic cat). While 25 acres has been established as the minimum size capable of supporting area-sensitive species of imperiled grassland birds, significant predation losses likely occur within 50-55 meters of the edge. As a result the minimum viable area accounting for edge-predation has been established at 45 acres.

- **Diversity within the grassland landscape**

  A diversity of vegetation, soil, and moisture conditions within the grassland complex provides the most abundant and consistent resource supply for grassland flora and fauna. For example, some species of grassland birds require tall-grass areas for nesting, but prefer to forage in short-grass areas. A diversity of soil and hydrologic conditions will also ensure high productivity in some portion of the grassland throughout the year, despite climatic variations.

- **Grassland wildlife management**

  Grasslands require periodic management during critical parts of the year to maintain optimal habitat for grassland flora and fauna. Mowing or controlled-burning of the grassland on an annual or semi-annual basis interrupts vegetational succession and prevents the establishment of undesired woody vegetation. These disturbances, however, must be undertaken during the winter or early spring, in order to avoid disruption of nesting birds.

E. Important ecosystem functions of agricultural landscape

- **Preserve biodiversity of imperiled native organisms**

  A diverse grassland habitat contains a rich diversity and high abundance of native species, including, notably, several NJ-threatened and endangered species.

- **Hydrologic buffering**

  A well-managed grassland is second only to mature forest habitat in allowing infiltration of precipitation into the soil. The result, as discussed for forested habitat, above, is less erosive runoff, decreased peak flood volumes, maintained groundwater recharge, and the maintenance of base flow volumes in streams and rivers during times of drought.

F. Major threats to habitat and proposed solutions

- **Loss and fragmentation of remaining grassland habitats through development**

  Decreasing the size of remaining grassland habitats results in the decreased ability of the grassland to support characteristic fauna populations. Many of the grassland birds (especially the threatened and endangered species) will no longer nest in formerly-suitable grasslands which are encroached or fragmented by development.

Possible solutions: Continue and, in fact, accelerate, township efforts to preserve remaining high-quality grassland habitats (i.e., especially large contiguous pieces, or those adjacent to already-preserved agricultural land). This would likely involve the fee-simple purchase by the Township of particularly high-quality grassland habitats to be managed as wildlife preserves for threatened and endangered species. Two very significant remaining tracts, of a contiguous mass large enough to function as significant grassland habitat that still offer the opportunity for grassland habitat protection in Readington Township are the Illva Sarrono tract and the lands of Solberg Aviation. Open lands that have already entered the farmland preservation program are no longer available, for the long term, because the nature of the deed restriction on such lands does not assure protection of grassland habitat.

- **Agricultural practices unfavorable to grassland fauna**

  Agricultural practices which disturb otherwise suitable grassland habitat at key times of the year (e.g., mowing, spraying, or cultivating during grassland bird nesting season) can drastically reduce or eliminate the suitability of a grassland to wildlife. As a result, many seemingly high-quality agricultural grassland habitats in Readington may actually be population *sinks* for imperiled grassland species (i.e., causing overall population decreases).

  Possible solutions: The best solution is to make acquisition of large contiguous tracts that are suitable for grassland habitat a Township priority for open space acquisition. This priority is made ever more pressing by reports that grassland species are the most threatened species nationwide.

  The government entity that acquires the land could then allow only those agricultural practices that respect the needs of the threatened and endangered species that reside there. In addition, the Township could encourage the use of grassland-friendly agricultural practices through Township-sponsored educational programs for willing landowners. Such programs might provide information on when to mow grasslands, as well as giving tips on beneficial practices such as leaving unmowed strips or central areas within a field.

  Alternatively, the township may subsidize farmers for practicing less-lucrative grassland-friendly farming methods. Such an arrangement might involve (1) the farmer and Township agreeing on both a management plan and a compensatory payment to the farmer (possibly donated, in part or entirely, by conservation organizations), (2) visit to the site by volunteers to identify areas within the field ideal for grassland bird management, (3) marking, and/or temporary-fencing those areas to be left free of mowing and/or grazing during the breeding season, and (4) monitoring of the success of grassland-bird nesting by volunteers and/or interested conservation agencies.

Grassland Habitat

Extent and location in Readington

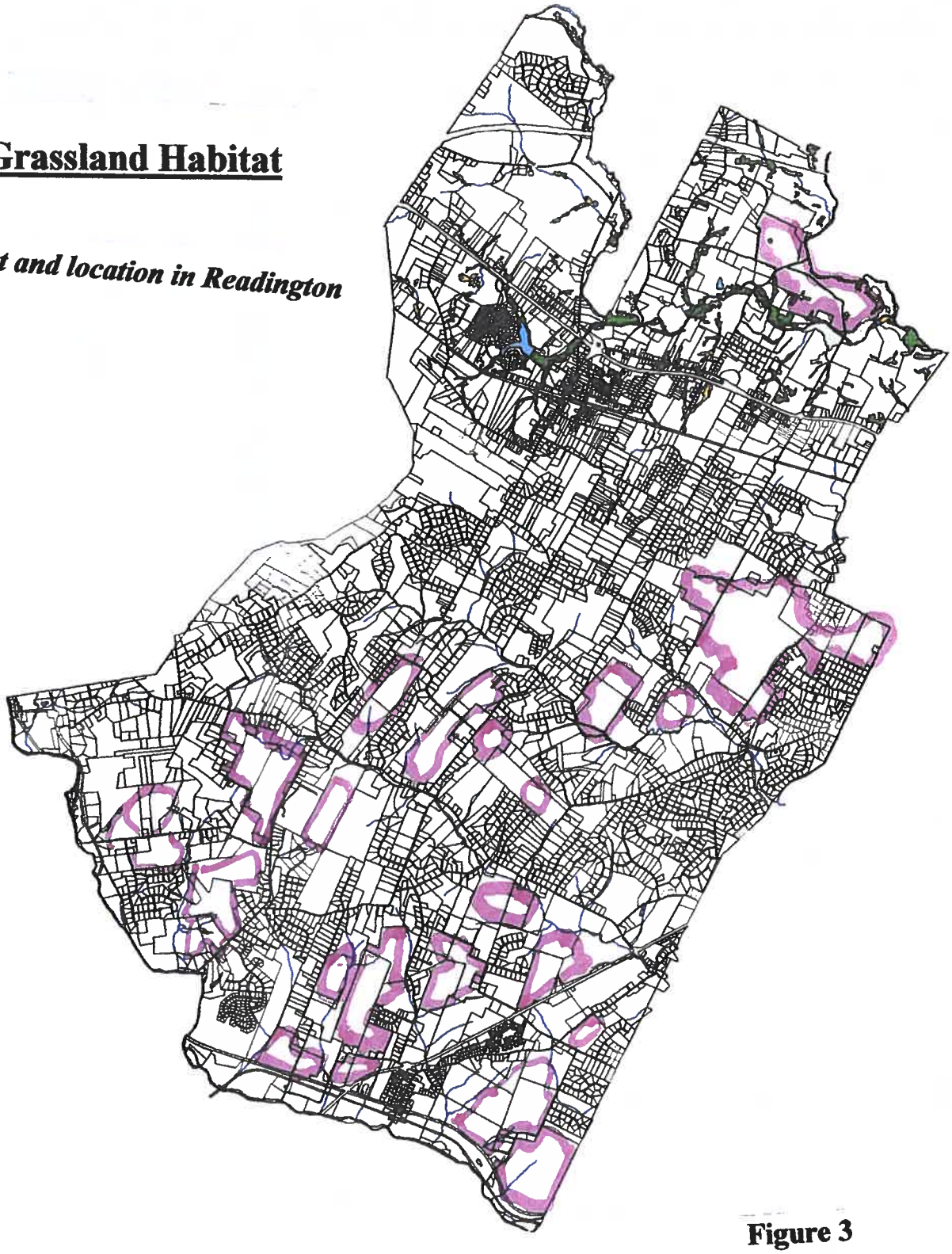
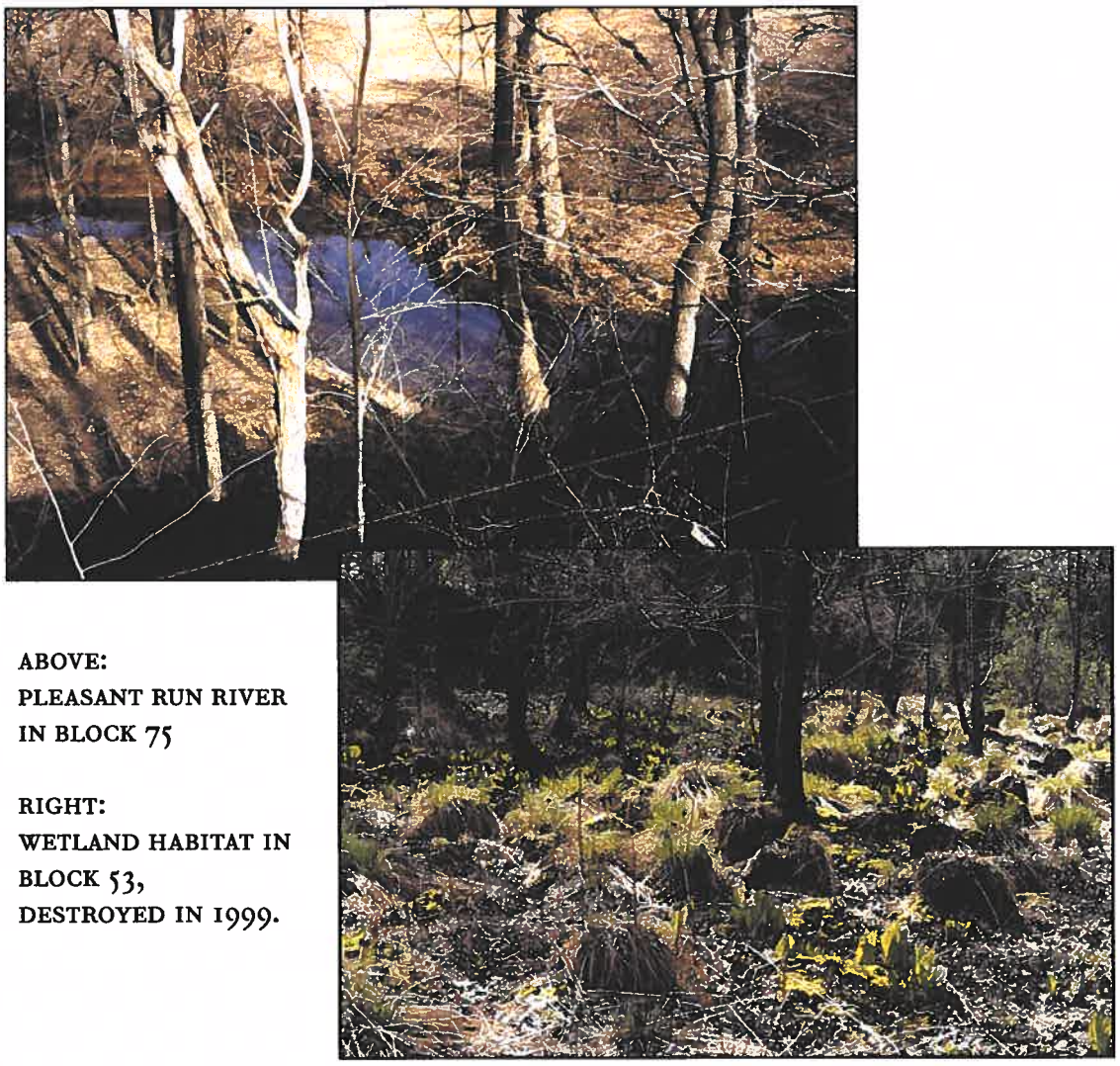


Figure 3

WETLANDS, STREAM, AND RIVER HABITATS



ABOVE:
PLEASANT RUN RIVER
IN BLOCK 75

RIGHT:
WETLAND HABITAT IN
BLOCK 53,
DESTROYED IN 1999.

SINCE THE ADOPTION of Readington's Greenways Plan in 1995, significant progress has been made in protecting "greenways" along Readington's major stream and river corridors. The state regulations of wetlands, as well as Readington's stream corridor protection ordinance have offered some, but not enough, protection for these habitats. Much still remains to be protected if Readington Township is going to retain these valuable habitats in good condition into the 21st century, and while improving existing ordinances is an important priority, this protection can best be accomplished by fee simple acquisition for conservation purposes.

Lowland habitats (wetlands, streams, and rivers)

A. Definition/structure

- *Wetlands:* Areas inundated or saturated with water close to the surface for an extended period of the growing season, resulting in characteristic wetland vegetation and/or soil characteristics; In Readington, these areas include floodplain and drainage-area-associated wooded swamps, shrub- and herbaceous-dominated marshes, and intermittently-flooded agricultural drainage swales.
- *Streams:* Small to medium-sized water courses which collect and conduct precipitation run-off from upland areas, and appear on the USGS and County Soil Survey maps; Includes both permanent- and intermittently-flowing water courses.
- *Rivers:* large water courses maintaining a relatively large-volume continuous flow during all seasons.

B. Extent and location

- See Figure 4.

C. Characteristic flora and fauna of lowland and water habitats

- The following lists include wetland/stream/river-associated species found in Readington which depend mostly, entirely, or for a significant portion of their lives on the habitat.

- **Canopy trees:** oak (pin, swamp white), maple (red, silver, boxelder), black willow, green ash, bitternut hickory, elm (American, slippery), black walnut, butternut, black gum, American sycamore

- **Shrubs:** dogwood (silky, gray), spicebush, pussy willow

- **Vines:** grape (fox, etc.), poison ivy, virginia creeper

- **Herbs:** skunk cabbage, common rush, pickerelweed, arrow arum, tussock sedge, jewelweed, panicled tick-trefoil, swamp milkweed, blue-eyed grass, woolgrass, reed canary grass, phragmites, lizard's tail, white water lily

- **Ferns:** cinnamon fern, sensitive fern, ostrich fern

- **Mosses and lichens:** sphagnum moss

- **Mammals:** muskrat

- **Birds:** great blue heron, green heron, spotted sanpiper, kingfisher, wood duck, bald eagle, Louisiana waterthrush

- **Herpetiles:** wood turtle, box turtle, painted turtle, snapping turtle, musk turtle, pickerel frog, green frog, bullfrog, spring peeper, northern leopard frog, two-lined salamander, long-tailed slamander, northern water snake, ribbon snake

- **Invertebrates:** dragonflies, damselflies, mayflies, stoneflies, caddisflies, Dobsonflies

D. Key requirements for healthy flora and fauna populations

- **Relatively predictable, seasonal hydrologic regime**

  Water-habitat-associated organisms can adapt to a relatively predictable seasonal hydrologic regime. This regime is usually characterized by low mid-summer and high spring water levels. Diversity can drop drastically, however, if the hydrology is altered in an unpredictable, non-seasonal manner by human activities.

- **Adequate base flow in droughts**

  Water levels in wetlands, streams, and rivers normally drop during an extended drought, however levels must be maintained at some minimum level to support organisms adapted to constantly- or mostly-wet conditions. This minimum level is called the "base flow" volume, and is maintained to adequate levels by the presence of land cover in the surrounding upland areas exhibiting good infiltration of precipitation.

  The key factor in maintaining an adequate base flow volume is the presence of good infiltration (i.e., permeable soils) in surrounding uplands. In areas where the soils in surrounding uplands absorb considerable amounts of precipitation (e.g., wooded land -- as opposed to other areas such as lawns, which shed much of that precipitation immediately as surface runoff), slow percolation of that water through the soil results in a prolonged input of groundwater to wetlands, streams, and rivers. The slow passage of water through the soil acts as a "delay effect", allowing the input of water from the uplands to continue even through a severe drought. As a result, groundwater supplied to wetlands, streams, and rivers during droughts maintains a minimum "base flow" volume in those wet areas, rather than having the hydrology of those areas exhibiting wild fluctuations mirroring short-term extremes in precipitation.

- **Low-level, seasonal nutrient inputs (i.e., below nutrient-saturation level)**

  Most native stream, river, and wetland communities are adapted to seasonal cycles of relatively low-volume nutrient inputs of slow-release organic matter. Such communities generally exhibit relatively high diversity, due partly to the differential competitive abilities of different organisms in a natural environment of subtly shifting resource levels. Inputs of excessive amounts of nutrients from human activity (e.g., septic system discharge, leaching of soluble lawn and agricultural fertilizers) favor one or a handful of organisms best able to utilize

these excess nutrients. The result is the replacement of a diverse low-nutrient community with a species-depauperate nutrient-saturated community.

- **Large size of contiguous wetland/riparian area**

  Larger sized areas of wetland or riparian corridors offer a larger number of soil and climatic microsites (e.g., moisture and nutrient content of soil, aspect of slope, combinations of adjacent habitat types), a larger pool of resources, and more protection from disturbances/predation. This, in turn, allows such larger areas to support both a higher diversity, and larger, more stable populations of characteristic species.

- **Low levels of unnatural physical disturbance**

  Wetlands and riparian areas can be relatively vulnerable to physical disturbance due to soft, saturated soils, and the likelihood of occasional high-energy water flow. While some baseline levels of disturbance are natural, and can even be necessary for the maintenance of diversity, excessive physical disturbance associated with human activities in these areas (e.g., soil erosion and compaction due to off-road vehicle traffic, over-grazing by livestock or grazing at inappropriately wet times) can degrade the habitat qualities required by native flora and fauna, thus lowering overall abundance and/or diversity of these organisms.

- **Suitability of neighboring/associated habitats**

  Many organisms associated with wetlands, streams, and rivers depend on other habits for critical resources during some or all of the year. Thus, loss or degradation of those neighboring or associated habitats can have severe negative impacts on populations of organisms in otherwise healthy-appearing, but isolated/fragmented habitats.

E. Important ecosystem functions of lowland habitats

- **Buffer maximum flow volumes (i.e., flood control)**

  Lowland riparian and wetland areas can hold large amounts of surface runoff during storm events. By sequestering this runoff and releasing it more slowly into streams and rivers, such habitats lower maximum-flow volumes during storms. This, in turn, reduces the destructive power of short duration high-volume flows, benefiting plant, wildlife, and human communities.

- **Increase minimum (base) flow volumes**

  By sequestering surface runoff from uplands and releasing it relatively slowly into streams and rivers, wetlands and riparian areas maintain water inputs into waterways even during times of drought. The result of sizeable wetlands and riparian areas is to increase minimum-flow volumes in these waterways, which, again, benefits plant, wildlife and human communities.

- **Pollutant/nutrient-input buffering and removal**

Wetlands and riparian areas perform removal of potential stream and river pollutants (e.g., excess nutrient runoff or leachate, sediment) via a combination of filtration, deposition, infiltration, absorption, adsorption, decomposition, and volatilization. Healthy and extensive wetland and riparian areas are vitally important to the maintenance of clean, liveable, and drinkable surface- and ground-water supplies.

- **Maintain genetic- and bio-diversity**

  By providing migration corridors between suitable habitats, wetlands and riparian areas can connect otherwise isolated populations of organisms. Migration along these corridors can allow exchange of genetic material and repopulation of temporarily extirpated populations. A large percentage of New Jersey's endangered and threatened species rely on stream corridors and wetland for survival.

F. Major threats to habitat and proposed solutions

- **Fragmentation and associated physical disturbances**

  Isolation from other similar habitats, and the reduction in size of wetlands and riparian areas, results in a number of negative impacts to organisms. Lack of migration between habitats prevents the genetic exchange conducive to healthy populations, and also prevents repopulation of extirpated populations. Smaller habitat fragments are also more vulnerable to disturbance from human activity (e.g., erosion, pollution, soil compaction) and related disturbances (e.g., over-population of white-tailed deer and human-subsidized predators such as house cats and raccoons).

  Possible solutions: Make a priority of preserving wetlands through strict enforcement of current EPA wetland regulations. On some questionable properties, this may entail independent wetland delineations of proposed developments by Township-funded professionals, in addition to already-existing delineations offered by the applicant.

  In addition, continued (and accelerated) efforts should be made to preserve contiguous stretches of riparian corridor, utilizing Township, County, State, and private funding.

- **Degradation of surrounding upland habitats**

  Seemingly healthy wetland, riparian, and stream/river habitats can be drastically reduced in suitability for many lowland organisms by the degradation of surrounding upland habitats. Due to the use of uplands by many lowland and stream/river organisms, as well as the dependence of lowland ecosystems on organic-material nutrient inputs from upland areas, lowland habitats can be directly and indirectly dependent on the health of upland habitats.

  Possible solutions: *Significant* buffers of surrounding uplands should be included in the preservation of wetlands and riparian stream corridors. These should be more extensive (probably several times wider) than the current wetland- and stream-corridor- buffer zones currently utilized by the Township. Small

buffer strips of upland vegetation, although offering some benefit to lowland organisms, are of unsuitable quality for most of the more sensitive lowland species (especially many threatened and endangered species such as the wood turtle).

- **Excessive nutrient input from human activity in uplands**

  Excessive nutrient inputs from agricultural (i.e., leaching of soluble fertilizers and improperly handled manure) and suburban (i.e., leaching of incompletely treated septic effluent, overfertilization of lawns and golf courses) sources can lead to significant degradation of lowland habitats. Excessive nutrient inputs decreases diversity by allowing a few "nutrient-greedy" species to thrive at the expense of most others. Nutrient overload also degrades waterways by promoting excessive algal growth which leads to oxygen deprivation and associated die-offs of organisms (i.e., eutrophication).

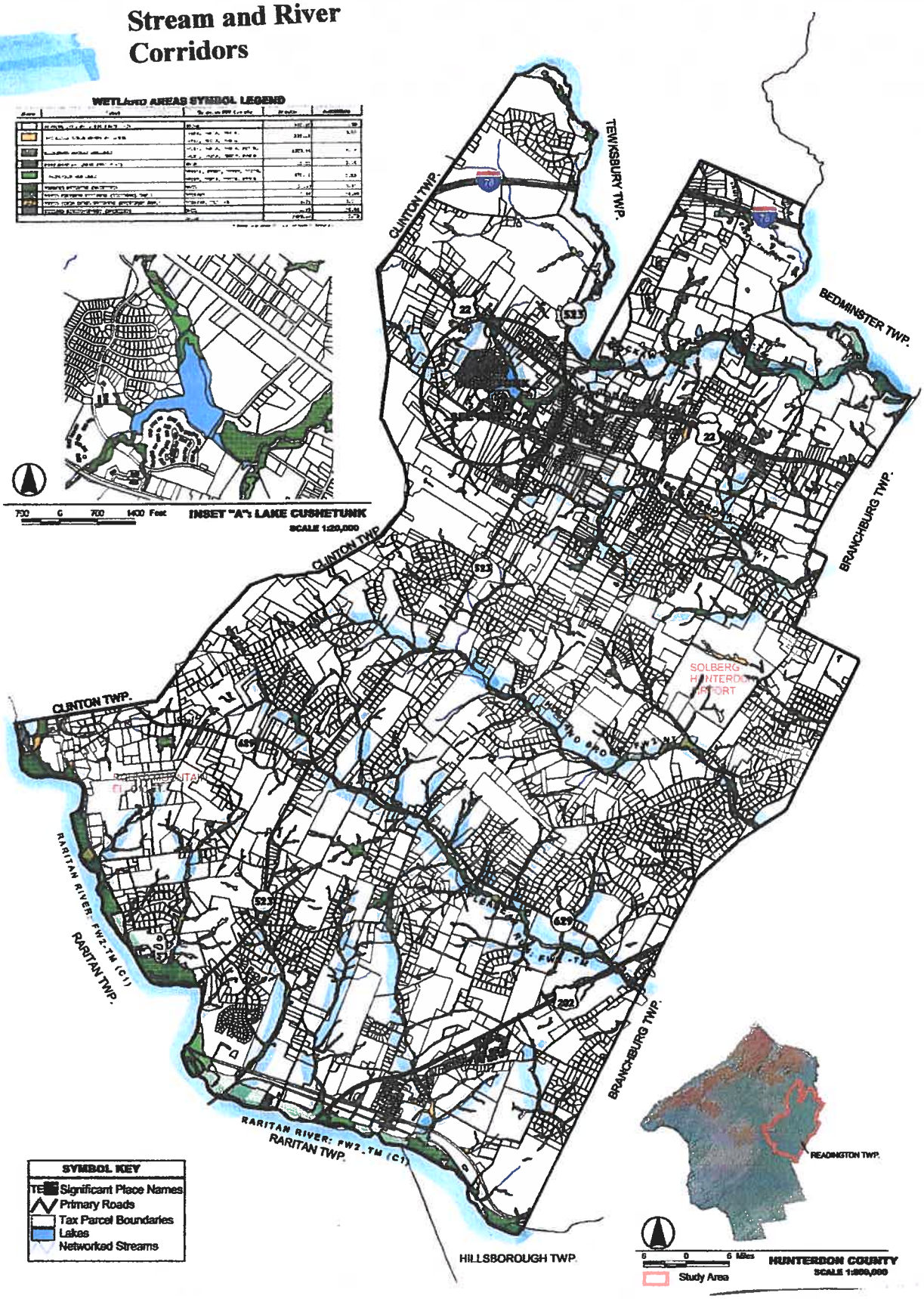
  Possible solutions: Encourage lower-volume agricultural applications of soluble fertilizer through incentive programs for farmers (e.g., additional tax breaks for environmental-friendly agricultural practices), in conjunction with Township efforts to make organic-material fertilization easier and thus more appealing to farmers (i.e., by identifying and coordinating composting raw-material sources, processors, and possible end-users within the township).

  Suburban sources of excessive nutrient inputs may be controlled by regulations or tax-incentive programs for golf course fertilizer management. In addition, education efforts for suburban homeowners regarding the environmental and human health-consequences of excessive application of soluble fertilizers on lawns may be undertaken, along with the dissemination of possible alternatives to such practices.

- **Disruptions in flow volumes by human activity**

  Drastic reductions or increases in flow volumes of streams and rivers due to human activities (e.g., diversion of water to reservoirs, sudden release from reservoirs) can cause significant disruptions and even mass die-offs of many organisms. In addition to the potentially-fatal lack of water associated with decreased flow-volumes and the potentially-destructive power of increased flow-volumes, alterations in flow are often accompanied by significant temperature fluctuations, which can be equally disruptive to organisms.

  Possible solutions: Establish an acceptable range of flow-volumes in Township streams and rivers (in consultation with the Hunterdon County Park Service and reservoir managers), and manage inputs and outputs to maintain this flow range.



Lowland habitats (wetlands, streams, and rivers)

Extent and location in Readington

Figure 4