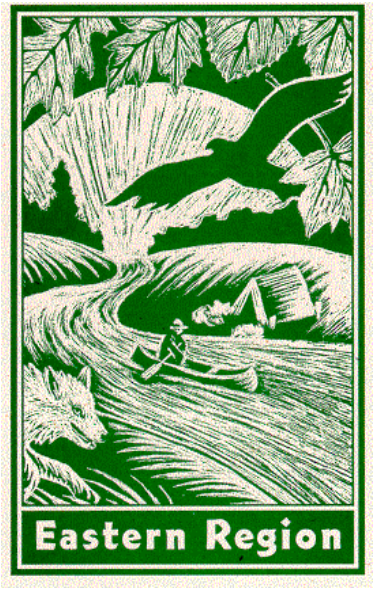
Conservation Assessment for the stinging rose caterpillar (Parasa indetermina Boisduval)



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This document is undergoing peer review, comments welcome

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EXECUTIVE SUMMARY

The stinging rose caterpillar (*Parasa indetermina* Boisduval) is a medium-sized, green and brown moth occurring in dry coastal scrub, woodlands and barrens. It is considered uncommon to rare and local throughout its range. Usually this moth is found in close association with one of its primary larval food plants, woody Rosaceae, Myricaceae and oaks. This moth typically produces two broods per year in the southern part of it's range, with the adults appearing in late spring and late summer. It is never common (except on a very local level) and most states in its range contain only a few populations. During the westward and southern expansion of European settlers in the 1800's, vast acreage of oak woodland and barrens was felled for timber, home sites and agricultural production. Native grasslands were heavily pastured, with erosion and topsoil loss being widespread. During this time, the stinging rose caterpillar probably has lost a considerable amount of habitat. Given the current degraded status of coastal scrub, oak barrens and dry woodlands ecosystems, this species' remaining habitat is patchy and occurrences are often widely separated. Ongoing efforts to protect and restore remnants of these ecosystems will hopefully provide additional habitat for this species. However, *Parasa indetermina* overwinters as a cocoon in the duff and is considered fire-sensitive. Therefore, efforts should be taken to leave unburned refugia with known populations of the moth during prescribed burns. Whenever feasible, current and future restoration projects should track the effects of their efforts on potentially sensitive species such as the stinging rose caterpillar. This would provide land managers with useful information for measuring the effectiveness of various restoration techniques in enhancing and maintaining habitat.

ACKNOWLEDGEMENTS

I would first like to thank Steve Olson, Kelle Reynolds and Kirk Larson (US Forest Service) for initiating this project and providing valuable support throughout. Steve Olson (US Forest Service) provided information on the vegetation of the Hoosier National Forest and introduced me to the Barrens Special Areas of the Hoosier National Forest, where I eventually discovered healthy populations of *Parasa indetermina*. Kelle Reynolds was instrumental in obtaining funding for much of this Conservation Assessment work. Kirk Larson supplied valuable logistic and botanical assistance. Several other individuals provided valuable information regarding the distribution and food plant associations of this moth. These include Dr. James K. Adams (Dalton State University, Georgia), Dr. Lucianna Musetti (The Ohio State University Insect Collection), Dr. Steven Passoa (USDA APHIS, Ohio), Dr. Dennis Profant (Ohio) and Dr. Kristin Simpson (Washington University Insect Collection, St. Louis, Missouri). All were extremely helpful in looking up museum records and providing personal experience with this species. Mr. Troy Barlett provided the excellent photo of a *Parasa indetermina* larva used in this document.

NOMENCLATURE AND TAXONOMY

The genus *Parasa* is small and contains only a few North American species (see Hodges, 1983). Dyar (1906) lists roughly a dozen more species from Mexico south to Brazil. The stinging rose caterpillar (*Parasa indetermina*) was described by Jean Baptiste Alphonse Boisduval in 1832,

from watercolor paintings provided to him and John LeConte by John Abbott. Abbott lived in Bullock County, Georgia and had been collecting, drawing and painting American insects, their food plants and birds since his arrival on the continent in 1773. He had been commissioned by John Le Conte in 1813 to provide him with paintings and drawings of new Lepidoptera from America. Abbott was instructed that he “draw only the adults, larvae, and pupae” and that he not include the food plants, unlike most of his previous work. Boisduval described *Parasa indetermina* in "Histoire Générale et Iconographie des Lépidoptères et des Chenilles de l'Amerique Septentrionale (1832 and 1837)" which he wrote and published with John LeConte. Abbott continued to collect and paint until his death in 1840. Abbott's original watercolor painting of an adult and larva of *Parasa indetermina* is contained in the Special Collections Department of the University Library at South Carolina State University.

DESCRIPTION OF SPECIES

DESCRIPTION OF ADULT STAGE

Our two native slug moths of the genus *Parasa* (*chloris* and *indetermina*) are quite similar in appearance; being medium brown in color, with a large green patch covering much of the forewings and thorax (see Figure 1). *Parasa indetermina* typically measures 20-25 mm (.75 - 1.0 inch) in wingspan and is as described above and shown in Figure 1. The ventral ground color is typically tan or light brown. This species is also figured in Covell (1988).

DESCRIPTION OF IMMATURE STAGES

Eggs of *Parasa indetermina* are flattened, circular and transparent (see Wagner, 2005). They are placed on foodplant stems and/or leaves, typically *Rosa* or other woody Rosaceae. The eggs hatch into young larvae that, as they moult, progressively develop a thick, "armor-like" skin that forms a sort of shield over the entire body. They also develop six pairs of large protuberances (or tubercles) along the dorsal surface that become covered with sharp, hollow spines with detachable tips that can deliver a highly irritating poison, hence the common name "stinging rose caterpillar". These fleshy protuberances are retracted into cavities on the skin surface when the larva is feeding. When agitated, the caterpillar inflates these with body fluid and everts the tubercles quickly, in a defensive motion. There is an additional row of smaller processes with the stinging spines along the sides of the caterpillar. The larvae of this moth are brilliantly colored, with alternating stripes of blue, orange and white forming a ribbon-like pattern on the body (see Figure 2). They look very much like tropical sea slugs (Nudibranchia).

LIFE HISTORY

REPRODUCTION

Like all other Lepidoptera, the stinging rose caterpillar goes through four distinct developmental stages: egg, larva, pupa and adult. A single brood is produced each year. The adults emerge

from their cocoons in the spring and begin laying eggs shortly thereafter. In most of the Indiana populations, the slow-growing larvae feed primarily on *Rosa* leaves from mid-summer to fall, when they pupate in their tough cocoons in the leaflitter. The cocoon is partially encased in the shed larval skin, with the stinging hairs providing protection through the winter. The larvae are reported to also feed on other woody species, including apple (*Malus* spp.), bayberry (*Myrica pennsylvanicum*), cherry and plum (*Prunus* spp.), chestnut (*Castanea dentata*), cottonwood (*Populus deltoides*), dogwood (*Cornus* spp.), hickory (*Carya* spp.), maple (*Acer* spp.), oaks (*Quercus* spp.), redbud (*Cercis canadensis*) and sycamore (*Platanus occidentalis*).

ECOLOGY

Parasa indetermina is a species of high quality, dry coastal scrub, barrens, woodland and associated prairies, typically on sand and usually associated with the Atlantic Coastal Plain (Dyar, 1906; Holland, 1905). At times it has also been reported as a minor pest of roses, although they are reported to feed on a number of woody shrubs and trees. In Indiana, this moth is typically associated with barrens containing large populations of wild rose (*Rosa carolina*) and other known foodplants. There is a single adult brood per season, in spring and again in late summer. The adult brood periods lasts roughly a month, during which they mate and females lay eggs. The adults have rudimentary mouthparts and likely do not feed. The larvae feed throughout late summer and overwinter as pupae in hard, dark brown cocoons located in the duff under their foodplant.

DISPERSAL/MIGRATION

Given its specific foodplant requirements, the stinging rose caterpillar does not travel far from remnants of high quality dry coastal scrub, woodlands and barrens. Maximum individual dispersal distances are probably on the order of a few hundred yards to half a mile, and the species is generally regarded as being highly local in occurrence. However, populations are probably capable of dispersing over large areas of contiguous suitable habitat, particularly along stream corridors, ridgelines and other linear natural features. *Parasa indetermina* is not known to migrate.

OBLIGATE ASSOCIATIONS

Throughout much of its range, the obligate habitat for the stinging rose caterpillar is a mixture of high quality dry coastal scrub, woodland or barrens with a diverse woody species component, characterized by an abundance of the preferred larval foodplants, native Rosaceae. The moth occurs infrequently in man-made habitats, particularly in landscaping or nursery situations where preferred foodplants are planted..

HABITAT

Parasa indetermina occurs in three fairly distinct ecosystems;

1. the sandy, pine-oak savannas of the southern Atlantic Coastal Plain,
2. clay-soil barrens on limestone in the unglaciated Ohio River Valley, and
3. sand barrens in the Kankakee Valley and southern Lake Michigan sand dunes of NW IN and NE Illinois.

NATIONAL FORESTS: HOOSIER NF (PERRY CO., IN)

In the Hoosier National Forest (HNF) of Indiana, the habitat for *Parasa indetermina* is typical of that for the species throughout much of the Ohio Valley. At the known population in Perry County, the overstory is dominated by oaks (*Quercus alba, Q. stellata* and *Q. marilandica*) and several other species, including red maple (*Acer rubrum*), hickories (*Carya*), ash (*Fraxinus*) and tulip tree (*Liriodendron tulipifera*). Beech (*Fagus grandiflora*), persimmon (*Diospyros*), black gum (*Nyssa sylvatica*), hop hornbeam (*Ostrya virginiana*), red elm (*Ulmus rubra*), and other species may be locally important. The shrub layer includes saplings of canopy species, plus paw paw (*Asimina triloba*), redbud (*Cercis canadensis*), flowering dogwood (*Cornus florida*), hazelnut (*Corylus americana*), huckleberry (*Gaylusaccia baccata*), witch hazel (*Hamamelis virginiana*), spicebush (*Lindera benzoin*), Carolina buckthorn (*Rhamnus caroliniana*), raspberries (*Rubus alleghaniensis, R. occidentalis*), coralberry, sassafras (*Sassafras albidum*) and blueberries (*Vaccinium* spp.).

Characteristic herbaceous species include Virginia snakeroot (*Aristolochia serpentaria*), Indian plantain (*Cacalia atriplicifolia*), bellflower (*Campanula americana*), poison hemlock (*Cicuta maculata*), Carolina thistle (*Cirsium carolinianum*), tall tickseed (*Coreopsis tripteris*), wild oregano (*Cunila origanoides*), numerous sticktights (*Desmodium canescens, D. glutinosum, D. nudiflorum, D. paniculatum, D. rotundifolium*), coneflowers, bonesets (*Eupatorium* spp.), woodland sunflowers (*Helianthus divaricatus* and *H. hirsutus*), dwarf crested iris (*Iris cristata*), wild bergamot (*Monarda fistulosa*), scurfy pea (*Psoralea psoralioides*), Jacob's ladder (*Polemonium reptans*), cup plant (*Polymnia uvedalia*), mountain mint (*Pycnanthemum tenuifolium*), rattlesnake master, black-eyed Susan, wild petunia (*Ruellia humilis*), skullcaps (*Scutellaria elliptica, S. leonardii*), goldenrods (*Solidago glauca, S. caesia, S. ulmifolia*), American columbo (*Swertia caroliniensis*), Virginia spiderwort (*Tradescantia virginiana*), ironweed (*Vernonia altissima*) and wingstem (*Verbesina* spp.).

Grasses, sedges and rushes are also important components of the herbaceous layer in areas of occupied habitat. These include wood reed (*Cinna arundinacea*), bottlebrush grass (*Elymus hystrix*), Virginia wild rye (*Elymus virginicus*) and panic grasses (*Rosa anceps, P. boscii, P. dichotomum, P. laxiflorum, P. virgatum*). Sedges include *Carex albicans, C. cephalophora, C. complanata, C. glaucodea* and *C. rosea*, while rushes (*Juncus* spp.), nodding bulrush (*Scirpus pendulus*) and nut rush (*Scleria oligantha*) are locally important, especially in open, grassy seepage areas.

SITE SPECIFIC

Hoosier NF: Boone Creek, Cloverlick and Harding Flats Special Areas

The only known occurrences for *Parasa indetermina* within the HNF are the Boone Creek, Cloverlick and Harding Flats Special Areas. The three Special Areas cover more than 2,600 acres of open and closed canopy oak and oak-pine barrens. These sites contain several hundred or more acres of habitat for the moth, with a diverse flora as listed above. Much of the occupied stinging rose caterpillar habitat at these SA's was formerly open oak barrens, with old (100 yrs or more), widely-spaced white, black, blackjack and post oaks occupying the canopy layer.

Currently, young (15-35 yr old) oak, ash, tulip tree and red maple saplings dominate much of the former barrens, forming a closed-canopy forest. *Rosa* grows in the more, open grass-dominated areas and this is typically where the moth was encountered. Additional potential foodplants at these sites include cherry and plum (*Prunus* spp.), dogwood, hickory, maple, oaks, paw paw, redbud and sycamore. Recent fire management and mechanical brush removal has opened much of the fire suppressed barrens and encouraged a diverse array of wildflowers and grasses. Several hundred to a few thousand acres of superficially similar habitat (much of it closed canopy oak forest) occurs on adjacent Forest Service and private lands.

DISTRIBUTION AND ABUNDANCE

RANGE-WIDE DISTRIBUTION

Historically, this moth was reported as occurring almost exclusively on the southern Atlantic Coastal Plain (Dyar 1906; Forbes, 1923; Holland, 1903). Currently, it is known from scattered populations on the Atlantic Coastal Plain, from New York south to Florida, and west to eastern Texas. There are also a few scattered populations in the Appalachians. More recently, scattered populations have been found along the edges of the Ozark Plateau and the Interior Uplands, primarily along the Ohio River in Indiana, Kentucky and Ohio (see Figure 3). Still more isolated populations are found in the Kankakee Valley and Lake Michigan dunes of northwest Indiana and northeast Illinois. It also occurs on barrens and prairie remnants along the Illinois River. The Ohio Valley and southern Great Lakes records are primarily recent and associated with high quality barrens remnants (see Bess, 1991, 1999, 2000, 2001, 2004, 2005; Covell, 1999; Panzer, 2005 pers. comm.). Many occurrences for this species are represented by a single collection or individual (see Covell, 1999).

STATE AND NATIONAL FOREST DISTRIBUTION

Known populations of *Parasa indetermina* are plotted in Figure 3. This species is reported from 18 states: Alabama, Arkansas, Connecticut, Florida, Illinois, Indiana, Kentucky, Maryland, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee and Texas.

RANGE WIDE STATUS

Parasa indetermina is considered uncommon to rare in most or all parts of its range (Covell, 1988, 1999; Lepidopterists Society , 2005; NatureServe, 2005a). While it does not appear to be in immediate danger of extirpation, there seems to be insufficient information to conclude that it is demonstrably secure throughout much or all of its range. This is especially true with regards to its preferred habitats (i.e. fire maintained dry coastal scrub, oak woodlands, barrens and grassland), which are globally imperiled (see Homoya, 1994; NatureServe, 2005b; Nuzzo, 1984). The following information was taken directly from the NatureServe.org Website in December of 2005 (see NatureServe, 2005a).

Global Status: G4
Global Status Last Reviewed: 31 July, 2004
Global Status Last Changed: 1995
Rounded Global Status: G4
National Status: N3N4

Status (S-Rank) in the Following States:
Arkansas (SNR), Indiana (S1S2), New York (SH).

Reasons: The following is taken directly from the NatureServe Website and authored by Dr. Dale F. Schweitzer, dated 31 July, 2004. Dr. Schweitzer states "While apparently not really considered common anywhere, this may be an artifact of collecting methods. This species is at least widespread in forests, and probably more so in burshland(sic), and occurs in many habitat types. While some threats exist in some areas none appear serious on a large scale and this species appears secure in much of its range." It is also stated on the NatureServe site that *Parasa indetermina* "seems to be most common in dry brushy places and thickets, but it also occurs widely in a variety of second growth forest habitats. Like most Limacodidae, the larvae feed on many genera of shrubs and trees." Dr. Schweitzer provides no sources for these statements, but follows with "The S1S2 rank for Indiana probably would not hold up to careful scrutiny. No other state considers this species to be of conservation concern."

Dr. Schweitzer apparently bases his understanding of *Parasa indetermina* on information gathered from three states, Arkansas, Indiana and New York (see NatureServe, 2004). The New York data apparently come from historic records gathered from Forbes (1923) and possibly Dyar (1895-1899). Forbes recorded this species only from Staten Island, Woodhaven and Long Island, all on the Atlantic Coastal Plain and now all completely urbanized. Tim McCabe, in his "Atlas of Adirondack Caterpillars (1991)" failed to record this species from upstate New York. The State of New York, Department Environmental Conservation currently lists this moth as a "Species of Special Conservation Concern." This moth is currently considered of historic status by the State of New York, indicating it is currently thought to have been extirpated and making it of extreme conservation significance. However, there is a (recent?) record on Dr. David Wagner's Website from "Jones Beach, New York" feeding on *Myrica pennsylvanica* (see Wagner, 1999).

Despite more than 500 trap nights of sampling across the southern Ouachita's and Upper Coastal Plain, I did not find this moth in Arkansas. There are recent and historic records of the stinging rose caterpillar from Arkansas, primarily in the northwest part of the state (see Blossom Nursery, 2005; Bugguide.net, 2005). The Indiana data used in Dr. Schweitzer's assessment apparently come from my own insect surveys and the S1S2 ranking is my recommendation to the State Division of Nature Preserves. In Indiana, this species is found almost exclusively in high quality barrens and associated dry grasslands with an abundance of native roses, primarily *Rosa carolina*. Despite extensive insect sampling over much of Indiana from 1986 to present, there are still fewer than 12 records for this moth from the state, making it a solid S1S2 species.

Of the 12 or so occurrences I have recorded for this species in Indiana and Kentucky, it was found to be locally common only in two places, the Kankakee Valley of northwest Indiana and in the Mitchell Karste Plain of extreme southern Indiana. It should also be noted that (despite Dr. Schweitzer's suggestions to the contrary) the Limacodidae, and particularly this species, are readily attracted to incandescent, mercury vapor and ultraviolet lights. For example, each year, one to a half dozen individuals of this species show up at the lights on my farm in the Kankakee Valley of Indiana. I have remnant barrens and dry-mesic prairie within a half-mile of my house and much of my property has been planted to native sand prairie, with an abundance of *Rosa carolina* and *R. palustris*.

In neighboring Illinois, Dr. Panzer has found this species to be very rare and local in the northeastern and west-central parts of the state, with fewer than 6 records from high quality, remnant sand barrens in the Kankakee and Illinois River drainages. The excellent insect collection maintained by the Illinois Natural History Survey at the University of Illinois has only three additional county records for this species, with all locations in close proximity to the Illinois, Mississippi or Ohio rivers. Dr. Schweitzer provides no information on the NatureServe Website from his home state, New Jersey, indicating the species is absent (unlikely), rare or of historic and conservation status. There is a potentially recent record from the Internet for New Jersey ("Higbee's Beach, NJ": see Wagner, 1999).

In his classic work "Field Guide to the Moths of Eastern North America" (1984), Dr. Charles Covell states that this moth is found from New York south to Florida and west to Texas and Missouri. He also states that it is generally uncommon, which is unusual for Dr. Covell and indicates that the species is probably quite rare. In his thorough study of the Lepidoptera of Kentucky, based on the collecting efforts of dozens of individuals over many years, Dr. Covell could find only five records for this species in Kentucky, all from counties dominated by barrens and dry woodland areas. All were based on single collections and some were apparently taken with flight-intercept (Malaise) traps. From my own surveys on more than ten large barrens complexes in central and western Kentucky, involving hundreds of trap nights of sampling, I have encountered this moth only once.

A few other facts also allude to this moth's general rarity. *Parasa indetermina* is of historic occurrence in MD, with no recent records (see Patterson, 2004). The University of Auburn, Virginia Website (Auburn, 2005) states that the stinging rose caterpillar is uncommon in the region around the college. This is despite its location in the center of this moth's historic range, where it is supposedly more common. A search of the insect collection records at North

Carolina State University (NCSU), also well within the historic range of this species, finds only six specimens of *Parasa indetermina* (see NCSU, 2005). Contrast this with 19 specimens of *Parasa chloris*, its close relative and another generally uncommon species. A search of records at the North Carolina State University "Entomology Diagnostic Clinic", which processed over 20,000 insect samples sent in by extension agents and the general public over the past ten years, found only one record for *Parasa indetermina*. This is despite its common name of "stinging rose caterpillar" and identification as an occasional pest of roses.

Similarly, the Virginia Polytechnic Institute and State College "Insect Identification Laboratory" also has only a single record for the stinging rose caterpillar in 1995, out of more than 1,500 requests for identification. The insect collection at Clemson University in South Carolina contains only four records for *Parasa indetermina*. Kimball (1965) did not list this species from Florida, despite its inclusion in many older texts as being found in that state. A recent bulletin from the Florida Department of Forestry mentions this species as a stinging caterpillar found in the state, but gives no details on range or abundance (see Heppner, 1995). A search of the Lepidopterists Society annual Season Collecting Summary records finds only two records (CT, PA) for *Parasa indetermina* in the past 20 years (Lepidopterists Society, 2005). The record from Pennsylvania (collected by James Adams) is accompanied by a note stating the species is "uncommon in Pennsylvania".

Statements are sometimes made that this species "probably occurs in the forest canopy" or "is found in forests", as are some other Limacodidae. For example, in their treatment of the forest caterpillars of the eastern United States, Dr. David Wagner and his colleagues mention this species as feeding on forest trees and shrubs, especially oak (1997). They did not provide a photograph of the highly distinctive larva, suggesting either that they thought it was of casual occurrence in forests or that they did not have a photograph. However, in his most recent publication on the caterpillars of eastern North America (Wagner, 2005), Dr. Wagner states that this species occurs in "coastal scrub, barrens, woodlands and forests…from Illinois to Long Island, south to Florida and Texas". In this excellent publication, he also provides photographs of the larvae.

Parasa indetermina has not been found in areas of dense forest or canopy cover in Indiana or Kentucky, despite repeated sampling in these habitats (Bess, 1991-2005; Covell, 1999). This moth is also not known from Canada, Maine, Michigan, Minnesota or Wisconsin, all areas with extensive hardwood forest cover. Even within its known range, the moth is not typically found in areas of intact, old growth hardwood forests. For example, recent insects surveys, including multiple "Bio-Quests", have failed to find this moth in the Great Smoky Mountains National Park (see ATBI, 2005). This includes searches in both the North Carolina and Tennessee mountains and is in spite of historic records from North Carolina.

RANGEWIDE STATUS OF HABITAT FOR *PARASA INDETERMINA*

The NatureServe site provides little information on the range, habitat requirements or biology of this species. However, from a review of the literature, it appears that the historic habitats for *Parasa indetermina* were dry, sandy coastal barrens, scrub and woodland. Similar barrens and

woodland communities associated with the southern Great Lakes and Arkansas-Ohio-Mississippi River drainages were also occupied. These plant communities have become increasingly rare over the past 150 years, with many species requiring them also becoming rare. The larvae and adults of *Parasa indetermina* are very attractive and are readily observed when present. The lack of records from both serious moth collectors and the general public suggests this species is very locally distributed and uncommon on the general landscape. These conditions suggest that the stinging rose caterpillar is indeed a species of conservation concern and efforts should be made to identify and track all known records for this moth and take actions to prevent its eradication wherever found.

STATUS OF *PARASA INDETERMINA* HABITAT IN INDIANA

Status of Habitat in the Kankakee Valley

In the Kankakee Valley (and certain portions of the Lake Michigan Dunes) of Indiana, this moth can be locally common in fire-maintained oak barrens with an abundance of *Rosa carolina* and other herbaceous species. Little bluestem and other warm-season grasses are often the dominant groundcover. Canopy cover is sparse and dominated by black oak (*Quercus velutina*) and white oak (*Q. alba*). Burr oak (*Quecus macrocarpa*) and pin oak (Quercus palustris) are of local importance throughout much of the Kankakee Valley. Less than 0.005 percent of the ~1.5-2.5 million acres of prairie, barrens and wetland that covered the Kankakee Valley in historic times is present today in its original form. Dry and mesic habitats were the most extensively impacted with little left but narrow strips of prairie vegetation along roadsides, ditches and railroad lines. All are heavily impacted by invasive weeds, pesticide drift and extreme hydrologic changes.

Status of Habitat in Southern Indiana

It should be noted that the *Parasa indetermina* habitat at Cloverlick Barrens SA (and probably elsewhere in the southern district of the Hoosier NF) is located on the Mitchell Karst Plain. This area was prehistorically covered in open oak woodland, barrens and dry-mesic prairie (see Homoya, 1994; NatureServe, 2005b). This complex of woodland and grassland spread east through the Bluegrass region of Kentucky to southern Ohio (Adams County). One of the oak woodland/barrens types in this complex is known to occur only on the Mitchell Plain of southern Indiana and again in Adams County, Ohio. This community type is considered globally significant and imperiled (G1; see NatureServe, 2005b; Homoya, 1994). The Mitchell Plain passes inexorably into the the Muldraugh Hills of west-central Kentucky and superficially identical habitats also occur in Meade, Mason, Hardin and Bullitt Counties and are similarly imperiled (G1G3; NatureServe, 2005b). The barrens and prairies of Adams County, OH; Perry County, IN and Hardin County, KY are known to contain some of the richest assemblages of rare insects in North America (see Bess, 1991-2005; Metzler et al., 2004)

POPULATION BIOLOGY AND VIABILITY

The stinging rose caterpillar occurs in a series of plant communities that were once widespread across the eastern United States. It is a species of dry woodland, barrens and associated grasslands characterized (in their primordial state) by an open canopy dominated by oak. These

communities are always characterized by mature or over-mature canopy trees, with a rich herbaceous layer. Most (if not all) of these habitats were fire-maintained in the past, with pockets of protected forest and woodland along streams that only occasionally received fire. The larval foodplant, *Rosa*, is also widespread across eastern North America. Therefore, prior to the westward expansion of Europeans across eastern North America, the stinging rose caterpillar was probably locally common wherever *Rosa* occurred in the region delineated in Figure 3.

However, pressures from grazing by domesticated animals and deforestation began to reduce acreage of suitable habitat for the stinging rose caterpillar and many other species of flora and fauna. The suppression of wildfires has also been among the more profound changes to the North American environment in the past 5,000 years. Many open, grasslands and barrens communities quickly succeeded to brushland or closed canopy forests of young softwoods and hardwoods. Others were invaded by non-native plant species that quickly excluded native species from the flora. As a result, habitat suitable for *Parasa indetermina* has become fragmented, often with large expanses of plowed fields, roads, cities and other barriers to dispersal, separating the remnants and isolating populations of the moth.

POTENTIAL THREATS

The NatureServe Website, states that "no major threats are known on a wide scale" regarding *Parasa indetermina*. However, Dr. Schweitzer then goes on to describe several serious threats to this species' long-term survival, such as "more local threats could include summer disturbance such as cutting in forest understory or brush areas, but it is really unknown to what extent larvae occur in these versus in the trees. Use of persistent biocides like Dimilin or probably Mimic against gypsy moth would have a major local impact on larvae in the summer. Winter cutting is not a problem. Very unlikely BTK would impact the larvae since they occur two or more months after gypsy moth spraying. Gypsy moth defoliation probably has some negative impact by lowering food quality for *Parasa* larvae later in season but such impact is very unlikely to be serious. Mosquito spraying could be a threat. Replacement of native understory shrubs by exotics or obliteration of understory by deer probably could greatly reduce or wipe out occurrences. Prescribed burning would cause substantial mortality but since cocoons are probably deep in the litter or humus, there should be substantial survival in light fall, winter, or spring fires." I have provided some additional views on this subject in the following sections.

PRESENT OR THREATENED RISKS TO HABITAT

Human activity over the past 200 years has resulted in a shift in the distribution of the plant communities on which the stinging rose caterpillar depends. Suppression of wildfires has resulted in the rapid succession of these barrens and savannas to closed canopy forest. Extensive livestock grazing has reduced the cover of native roses that this moth depends on and repeated, heavy grazing greatly degrades native plant communities. The thin soils underlying this vegetation are easily disturbed and overgrazing often leads to the widespread erosion of topsoil. Many overgrazed pastures have been subsequently replanted with Eurasian, cool-season grasses, further limiting and fragmenting the amount of available habitat for insects dependent on native

grasses and grasslands. This isolation of often small populations can lead to inbreeding and extinction (see Wilson and MacArthur, 1967).

Because *Parasa indetermina* is fire-sensitive, these now isolated populations are susceptible to extirpation from fire management activities, should an entire population be contained within a given burn unit. The larvae are relatively sedentary and probably do not occur far from the ground (i.e. <1 meter or 10 feet in height), since they have to travel down to pupate in the leaflitter. Therefore, they probably require an abundance of low stature shrubs for food sources, which would be most easily maintained by periodic fire. Therefore, when using prescribed fire, Land Managers should attempt to delineate known populations and provide unburned refugia for re-population of restored habitat.

Grazing

Browsing by deer is probably a threat to stinging rose caterpillar rangewide. *Rosa carolina* and many other known foodplants for this moth are eaten by deer (Bess, pers. obs) and heavy browsing of the shrub layer might have an overall negative impact on this species by reducing availability of larval foodplant or direct killing of eggs or young larvae in the summer. Domesticated cattle and horses will also eat herbaceous roses and other low shrubs, posing a threat to the moth by consuming and/or trampling larval food sources, eggs, larvae and/or pupae. However, well-managed, rotational, grazing by cattle would probably have only limited negative effects on this species. Unfortunately, excessive stocking rates (which are often the norm) leads to the compaction and erosion of soils, destruction of foodplant and altering of plant community structure. Swine, goats and sheep eat nearly all green matter and often severely compact and erode soils in areas where they are stocked. These factors have combined to make many sites formerly suitable for this species currently unfit as habitat.

Pasture Development

Intimately associated with grazing is the development and maintenance of sustainable pastures. In prehistoric times and locally in our recent history, pastures have been developed, maintained and enhanced through the use of fire. Fire removes the accumulated duff, kills seedlings and saplings of woody species and provides germination sites for the seeds of fire adapted grassland plants (see Anderson et al., 1970, 1984; Daubenmire, 1968; Dorney and Dorney, 1989; Grimm, 1984; Henderson and Long, 1984; Knapp and Seastedt, 1986; Packard, 1988; Peet et al., 1975; Schwaegman and Anderson, 1984; Tester, 1989; Thor and Nichols, 1973; Tilman, 1987; White, 1983; Whitford and Whitford, 1978; Wright and Bailey, 1982). Prehistoric Native Americans were typically concerned with providing feeding grounds for game animals and the production of native plant crops. European immigrants used fire to clear brush and enhance the growth of grasses and other plants that provided forage for their domesticated, European livestock. Unfortunately, excessive numbers of animals were often placed on grasslands with marginal amounts of available forage, leading to the destruction of the vegetation and erosion of topsoil.

In the early 1800's, when America experienced its first great wave of westward expansion by Europeans, most formal training on the subject of pasturage was based in Europe. Therefore, nearly all American pasture development, enhancement or maintenance projects involved the seeding of cool-season, non-native grasses. Preferred species in upland pastures include smooth brome (*Bromus inermis*), fescue (*Festuca arundinacea* and *F. elatior*), orchardgrass (*Dactylis*

glomerata) and the bluegrasses (*Poa compressa* and *P. pratensis*). These methods became indoctrinated into our system of land reclamation and these grasses persist to this day as recommended cover species. Clovers (*Medicago, Melilotus* and *Trifolium* spp.) are often placed in the grass mix to provide nitrogen fixation in the soil and fodder for livestock. By producing large amounts of seed that germinate under cool temperatures, these grasses and clovers can quickly dominate areas of exposed soil and move into adjacent native habitats. They compete with native species for resources and can exclude many of them from sites where they were formerly common, especially following disturbance of the original vegetation. Only in recent times (past 20 years) have native species been marketed as alternatives for use in erosion control, bank stabilization and pasture/range enhancement.

Row Crop Agriculture

The conversion of much of the Great Plains and central Midwest to large scale row crop agriculture following World War II coincided with a precipitous loss of wet prairie, fen and sedge meadow habitat (see Hutchinson, 1996). Up until this time, most U.S. farms were small and diverse, geared towards self-sustenance and supplying small local economies. Often, wetter parts of the land were placed under pasture or ignored and fencerows were common. Marginal areas of farmland often contained a diverse assemblage of prairie plants, associated insects and other organisms. These conditions were rapidly changed with the development of hybrid seeds, insecticides, herbicides and the entrance of the U.S. into the global food economy. Fencerows and pastures were knocked out to make way for large-scale machinery to till and plant vast stretches of corn, rice, cotton and bean monocultures. Center-pivot irrigation allowed many formerly un-farmable acres to be tilled, especially in the drier, sandier prairies and barrens of the Midwest and Great Plains. Historically, state and federal government incentives were given to farmers to ditch, tile and wetlands to increase agricultural production. Oftentimes, the states themselves would actively participate in the ditching and draining of large wetlands (see Illinois DNR, 2000).

Fore example, The Kankakee Valley of Indiana was historically one of the largest prairie wetland complexes in the world. However, in the short span of 150 years, it has been almost entirely converted to row crop agricultural production, with even cattle pasture becoming quite rare by 2005. Extensive ditching, tiling and center-pivot irrigation has allowed this transformation, much of it in the past 40 years. Currently, what exists of the original vegetation is confined to a few, widely scattered, state Fish and Wildlife Areas and Nature Preserves.

Fire Suppression

The suppression of wildfires following European colonization is among the more profound changes to the North American environment in the past 5,000 years (see Heinselman, 1981; Nuzzo, 1996). Fire is known to regulate vegetation structure, which has a reciprocal influence on fire frequency (Anderson et al., 1970; Anderson and Brown, 1986; Anderson et al., 1999; Auclair, et al., 1973; Bancroft, 1977; Cohen et al., 1984; Daubenmire, 1968; Duever, et al., 1986; Forman, 1979; Glasser, 1985; Henderson and Long, 1984; Kozlowski and Ahlgrens, 1974; Schwaegman and Anderson, 1984; Tester, 1989; Wade, et al., 1980; Weaver, 1954; Weaver and Fitzpatrick, 1934; Wells and Boyce, 1953; Wright and Bailey, 1982). In the absence of fire, many formerly open, grass-dominated plant communities have quickly succeeded to shrublands and closed canopy forests.

It has been well documented that many North American grass dominated plant communities burned with relative frequency in the past (Bayley and Odum, 1976; Bancroft, 1977; Cohen, 1974; Cohen, et al. 1984; Cypert, 1961; Duever, et al. 1986; Forman, 1979; Foster and Glaser, 1986; Garren, 1943; Glasser, 1985; Henderson and Long, 1984; Higgins, 1986; Kirby, et al., 1988; Komarek, 1971: Lotan, 1981; Loveless, 1959; Penfound, 1952; Schwegman and Anderson, 1984; Thompson, 1959; Weaver and Alderson, 1956; Wells, 1931, 1942). Many of the plants occurring in these communities are also "fire-dependent", meaning they require periodic fire for their long-term survival (Anderson et al., 1970; Arend and Scholtz, 1969; Daubenmire, 1968; Hulbert, 1969, 1981; Knapp and Seastadt, 1986; Peet et al., 1975; Thor and Nichols, 1973; Tilman, 1987; Weaver, 1954; Weaver and Fitzpatrick, 1934; Whitford and Whitford, 1978; Wright and Bailey, 1982).

In degraded remnants of these habitat-types, prescribed burning relaxes competition from invading, non-fire adapted plants, allowing fire-adapted species to proliferate and expand into newly opened areas (Allan and Anderson, 1955; Anderson and Brown, 1986; Britton, et al., 1980; Daubenmire, 1968; Dorney and Dorney, 1989; Grimm, 1984; Henderson and Long, 1984; Kozlowski and Ahlgren, 1974; Kline, 1984; Lotan et al., 1981; Miller, 1963; Schwartz and Heim, 1996; Schwaegman and Anderson, 1984; Tester, 1989; Tester and Marshall, 1962; Uhler, 1944; White, 1983; Wright and Bailey, 1982). Fire also reduces canopy cover of woody species and removes accumulated detritus (Gresham, C. A. 1985; Linde, 1969; Linduska, 1960; Miller, 1963; Van Lear and Johnson, 1983; Witford and Whitford, 1978). This allows more sunlight to reach the soil surface, resulting in increased photosynthetic productivity in the herbaceous flora (Allan and Anderson, 1955; Auclair, et al. 1973; Cohen, 1974; Dorney and Dorney, 1981; Lorimer, 1985; Smith and Kadlec, 1985; Thor and Nichols, 1973; U.S. Fish and Wildlife Service, 1964). Burning also releases nutrients, although their availability is often limited temporally (Bancroft, 1977; Bayley and Odum, 1976; Faulkner and de la Cruz, 1982)

Fire Management

In the case of *Parasa indetermina*, fire causes direct mortality of its overwintering stages, given their location in the previous year's detritus on the soil surface. Conversely, many of its primary food plants, woody Rosaceae, Myricaceae, oak, paw paw and others all require fire for their continued survival and reproduction, through reduction of litter accumulation and canopy closure. Most of these woody species respond to periodic burning through an increase in the number of stems and increased flower and seed production. Therefore, although fire is essential to the long-term survival of *Parasa indetermina* habitat and foodplants, some precautions are necessary to ensure that the entire population of leafhoppers (or Panic grasses) is not contained in a single burn unit. Both species respond favorably to burn rotations (per unit) of 2 to 4 years (see Dokken and Hulbert, 1978; Panzer, 1998). In the southern part of its range, *Parasa indetermina* is double brooded. The second-brood adults can move into recently burned habitat, allowing them to more rapidly colonize new habitat than more northern populations.

Competition from Introduced Species

In addition to the pasture species mentioned above, a number of other introduced plants threaten the quality and survival of stinging rose caterpillar habitat (see McKnight, 1993). These include garlic mustard (*Alliaria petiolata*), Japanese honeysuckle (*Lonicera japonica*), bush

honeysuckles (*Lonicera mackii* and *L. tartarica*), Japanese stilt grass (*Microstegium vimineum*), glossy buckthorn (*Rhamnus cathartica*) and black locust (*Robinia pseudoacaccia*). Each of these will be dealt with separately in the following sections.

Black Locust

In the northwest portion *Parasa indetermina*'s range, black locust was frequently planted as a wind-break and for erosion control in the 1950's. Unlike in the areas where this tree is native (SE U. S.), in the sands of the Upper Midwest, this tree is very aggressive and forms numerous root suckers, in addition to prodigious quantities of seed. When a single individual is cut, it may send up more than 100 new sprouts from the lateral roots. These grow quickly and can attain heights of two meters (~6 feet) in two years. This species is best controlled through late summer or dormant season cutting and treatment of cut stumps with Glyphosate or Triclopyr. Mature trees can also be girdled at chest height and the cut band painted with herbicide. Repeated treatments are inevitable and this species can be quite difficult to control and eradicate.

Garlic Mustard

Non-native garlic mustard is a severe threat to the long-term survival of many wooded plant communities. This plant is highly adaptable and survives under a broad range of moisture, light and soil conditions (Anderson and Kelley, 1995; Anderson et al., 1996; Brunelle, 1996; Byers and Quinn, 1998; Cruden et al., 1996; Dhillion and Anderson, 1999; Nuzzo, 1993; Roberts and Bodrell, 1983). Garlic mustard overgrows native herbaceous plants, often excluding them from the flora (see Brothers and Springarn, 1992; Luken and Shea, 2000; Luken et al., 1997; McCarthy, 1997; Nuzzo, 1999). Although it is fond of disturbed situations, garlic mustard can invade relatively pristine plant communities, especially along paths, roadsides and utility rights-of-way (Brothers and Springarn, 1992; Brunell, 1996; Luken et al., 1997; Luken and Shea, 2000; Nuzzo, 1999).

Japanese and Bush Honeysuckles

Non-native honeysuckles have long been used for landscape and wildlife plantings. They grow rapidly, flower prodigiously and produce large numbers of berries, which are readily eaten by birds and redistributed across our woodlands and forests. The seeds germinate and seedlings grow in shade or light. They are now a common (often dominant) component of the understory in our woodlands and forests. Both *Lonicera japonica* and *L. mackii* can become so abundant as to exclude nearly all other flora from the ground and shrub layers. They are especially abundant in woodlands that have experienced a history of grazing that reduced the native vegetative cover. All can be controlled with manual cutting and herbicide application, although re-infestations are often inevitable (Luken et al., 1997).

Japanese Stilt Grass

Like garlic mustard, Japanese stilt grass poses a serious threat to habitat for *Parasa indetermina* throughout much of the moth's range (Barden, 1987, 1991; Fairbrothers and Gray, 1972; Hunt and Zaremba, 1992; LaFleur, 1996). This fairly recent introduction moves into natural areas quickly along roadsides, paths and waterways. In the south, where many small streamlets dry up or cease flowing during the summer months, this grass can establish itself quickly on newly exposed soil in the streambed. The species forms numerous clones over the growing season, each of which flowers in late summer. Once established, this grass typically forms a solid

monoculture along roadsides and pathways. Rain events wash plants and seed down roadways and paths into drains and streams, quickly distributing fresh propagules over a large area. Japanese stilt grass is best controlled with a combination of mowing prior to seed set, with follow up mowing and herbicide application as needed.

Glossy Buckthorn and Multiflora Rose

The threat, mode of dispersal and methods of control for these species are the same as the honeysuckles mentioned previously. Both are aggressive invaders that need repeated management effort to completely eradicate from even small sites.

Over utilization

The stinging rose caterpillar is somewhat of concern to moth enthusiasts, although comparatively few people pursue it for the purpose of collecting specimens. Its habitat selection and secretive habits make it relatively difficult to collect on a large scale, although it can be locally common, especially in the northwestern part of its range. However, rarely are more than a half dozen individuals observed at any one time.

Disease or Predation

A number of insectivorous animals feed on moth larvae and pupae, particularly birds, mice, voles, squirrels and chipmunks. Numerous insects attack moth larvae, such as wasps (Hymeonptera: Vespidae), bee flies (Diptera: Bombyliidae), stink bugs (Hemiptera: Pentatomidae), ants (Hymenoptera: Formicidae) and spiders (Araneidae). Typically, this species' stinging spines and thick skin protect it from most insectivores. However, parasitic wasps and flies can bypass these defenses and lay eggs or young larvae on the caterillars.

Microbial pathogens also affect *Parasa indetermina* and related species, one of which is the soil born bacteria, *Bacillus thuringiensis kurstaki* (B_{tk}). For the past 30 years, this bacterium has been developed on a massive scale to control a number of agricultural insect pests. The use of B_{tk} for control of the introduced gypsy moth (*Lymantria dispar*) has potential for negatively affecting populations of the wild rose borer. The larvae are present throughout the growing season increasing their susceptibility to the pathogen in the local environment (resulting from both the initial spray efforts and decomposing gypsy moth larval cadavers). This could lead to an increase in mortality in the *Parasa* larvae. They would also be susceptible to drift of B_{tk} onto wild rose growing in areas adjacent to where gypsy moths are present. Potential effects from the gypsy moth and its control efforts are dealt with in the following section.

Gypsy Moth Outbreaks and Control Efforts

Since its introduction into New England in the early 1800's, the Eurasian gypsy moth (*Lymantria dispar*) has posed a direct and indirect threat to native Lepidoptera, including the stinging rose caterpillar. For many years, the gypsy moth had few predators or parasites here, and its populations soared to outbreak proportions throughout the Northeast (see Schweitzer 2004 for a review). The larvae feed primarily on oaks (*Quercus* spp.) and defoliated countless acres of oak and mixed hardwood forest, including habitat for *Parasa indetermina*. These defoliation events result in the direct mortality of many other insect species that feed on oak, and change the character of the forest, allowing light to reach the ground flora for a prolonged period of time in early summer. On sites where trees are already stressed by edaphic conditions, repeated

defoliation can lead to tree mortality. The leaves that remain or re-sprout have characteristic differing from those on trees that did not experience defoliation (Feeny, 1970; Schultz and Baldwin, 1982; Schweitzer, 1979). The effects of canopy defoliation on the herbaceous flora are discussed by Cooper et al. (1993).

Attempts to eradicate the gypsy moth in the mid 20th century involved the use of broad scale organophosphate insecticides such as DDT and Carbaryl. These spraying campaigns covered over 12 million acres in the northern and central Appalachians and affected a wide array of organisms, insects and non-insects alike (Schweitzer, 2004). Chemicals such as DDT also accumulate in successive trophic levels as they pass through an ecosystem. Organisms at the tops of food chains (such as insectivores) accumulate ever-increasing levels of toxins, causing death and/or reduced fecundity. Given the widespread, catastrophic effects of DDT and Carbaryl spraying, these pesticides have been banned in the United States.

In 1976, the growth inhibitor Diflurobenzuron (trade name Dimilin or Vigilante) was registered to control pest insects, while eliminating the indiscriminate poisoning of other organisms (see Schweitzer, 2004). Diflurobenzuron inhibits the formation of chitin, a protein that is the principal component of most arthropod exoskeletons. It only affects young insects, killing them when they go through their next moult ("skin shedding event"). Many fungi also contain chitin in their cell walls, and may also be affected (Dubey, 1995). Like the earlier pesticides, Dimilin kills insects (and most other Arthropods) indiscriminately across all orders (see Uniroyal, 1983).

The chemical also has a long-lasting residual effect by becoming bound to leaves (particularly conifers) and remaining active even after leaf fall (Martinat et al., 1987; Mutanen et al., 1988; Whimmer et al., 1993). Both aquatic leaf shredders and terrestrial detritivores that feed on these fallen leaves are highly susceptible to this chemical (Bradt and Williams, 1998). Widespread mortality has been documented in the field and laboratory, in both aquatic and terrestrial ecosystems (Bradt and Williams, 1990; Butler et al., 1997; Dubey, 1995; Hansen and Garten, 1982; Lih et al., 1995; Martinat et al., 1987, 1988a-b; 1993; McCasland et al., 1998; Mutanen, et al., 1988; Reardon, 1995; Swift et al., 1988).

Bacillus thuringiensis (*Btk*) is a relatively new threat to the butterfly, introduced in the fight to control Gypsy moth outbreaks in the early 1970's. *Btk* is a naturally occurring soil pathogen that is stated to affect only Lepidoptera larvae, causing high rates of mortality in exposed individuals across many families (Peacock et al., 1998). The bacterium attacks the lining of the gut wall, interrupting the uptake of nutrients by the affected caterpillar, causing starvation and death. *Btk* spraying for both gypsy moth and spruce budworm control is known to have long-lasting, deleterious effects on resident populations of non-target Lepidoptera (Boettner et al., 2000; Butler et al., 1995, 1997; Cooper et al., 1990; Hall et al., 1990; Herms et al., 1997; Johnson, et al., 1995; Krieg and Langenbruch, 1981; Miller, 1990; Morris, 1969; Schweitzer, 2000, 2004a-b; Severns, 2002; Wagner, 1995; Wagner et al., 1996; Whaley, 1998).

Gypsy moth outbreaks tend to occur in oak-dominated forests, woodlands and barrens. The larvae of this moth also feed readily on a number of other species occurring in forests of which oaks are a component. Unfortunately for the stinging rose caterpillar, the gypsy moth currently occurs throughout the northeastern portion of its range. Oak barrens, woodlands and forests also

typically adjoin prairies and related plant communities. Therefore, the potential for co-occurrence is high. Because of this, large scale spraying efforts within the range of *Parasa indetermina* could likely have deleterious effects on its long-term survival. Btk is currently the preferred control agent for outbreaks of the gypsy moth and in Wisconsin alone, more than 250,000 acres were sprayed in 2004 (see USDA, 2004a). However, there is no evidence to suggest that B_{tk} (in any way) has limited the spread of the gypsy moth.

These control efforts not only indiscriminately kill countless insects, but also have long-lasting effects on the habitats that are sprayed. The loss of caterpillars from spraying is known to negatively affect fecundity and body weight in nesting birds, bats and small mammals (Bellocq et al., 1992; Cooper et al., 1990; Holmes, 1998; Sample, 1991; Sample et al., 1993a-b, 1996; Seidel and Whitmore, 1995; Whitmore et al., 1993a-b; Williams, 2000). This effect is typically carried over through at least a second year, mimicking the reduction in observed Lepidoptera larvae during the season of application. Given that gypsy moth larvae develop at the same time of year as the stinging rose caterpillar, spraying of *Btk* or other pesticides in occupied habitat could certainly have a negative effect on the resident butterfly population.

Residential Development

Residential Development can negatively affect habitat for *Parasa indetermina* in a variety of ways. The clearing of sites for houses and associated roadways eliminates habitat and divides what remains into highly isolated islands, separated by paved streets, parking lots, lawns and other habitats inhospitable to the butterfly. Lawn development and maintenance eliminates the native flora, including wild rose, and drift of herbicides and insecticides has a cumulative effect in deteriorating what remains in adjacent natural areas. Fertilizer and pesticide runoff can also contaminate adjacent natural areas, enter streams and rivers and can degrade local and regional water quality (Medina, 1990). In the Northeast and Upper Midwest, high-end and exclusive residential developments are often located in remnants of woodland and barrens.

Inadequacy of Existing Regulatory Mechanisms

The current, species-based approach to federal laws regarding the protection of imperiled organisms does not currently afford legal protection to the stinging rose caterpillar. An ecosystem or plant community based approach would be more adequate for the protection of organisms whose habitats are becoming increasingly fragmented and degraded by human activity. This is especially true for those requiring southern barrens and savannas, where there are no federally protected insect species. Federally mandated efforts to restore our Nation's woodlands, barrens and grasslands would not only protect hundreds of species from impending peril, but provide the human population with expanded opportunities for hunting, fishing, gathering of forest products, development of medicines, education, research, observation and enlightenment.

SUMMARY OF LAND OWNERSHIP & EXISTING HABITAT PROTECTION

The U. S. Forest Service owns occupied stinging rose caterpillar habitat in Indiana. Additional Federal lands may also harbor populations of this species. State and Private Nature Preserves hold additional potential or occupied habitat in a number of states.

SUMMARY OF EXISTING MANAGEMENT ACTIVITIES

Little or no management is currently being directed at stinging rose caterpillar habitat based solely on the species' presence or absence. However, the moth's preferred habitat happens to be the juncture of two highly imperiled plant communities, oak barrens and woodland. Therefore, *Parasa indetermina* habitat has received management in many areas, given ongoing efforts to protect and restore the Nation's remaining prairies and oak barrens.

In most areas management has taken the form of prescribed fire. The Cloverlick Barrens site has recently undergone prescribed fire management. The efforts at Cloverlick have created a substantial amount of habitat for this species and it was found scattered throughout the open and lightly wooded portions of the 1,300 acre site. *Parasa indetermina* overwinters as a tough, silken cocoon at the base of *Rosa* stems or nearby in the surface detritus. Pupae/cocoons hibernating in this dried vegetation would surely be consumed in a fire. Therefore, this species is considered fire-sensitive, although it is possible that at least some *Rosa* may escape fire in a given burn. In sites where it is known to occur, unburned refugia containing *Rosa carolina* or related species should be left to provide stock for re-colonizing the newly restored areas.

Efforts to manually remove exotic invasive plants (as mentioned in previous sections) have also benefited this species, by reducing competition with its larval food plant and adult nectar sources. This is especially true with regards to glossy buckthorn, multiflora rose and non-native honeysuckles. This species is not known to feed on multiflora rose and many other *Rosa* specialist insects also avoid this plant.

PAST AND CURRENT CONSERVATION ACTIVITIES

The stinging rose caterpillar has always been reported as rare and local, though not usually from a conservation standpoint. Only recently have researchers begun to suggest that the species is indeed imperiled and that efforts should be undertaken to identify known and active populations. It is also becoming apparent that we need to assess the health and long-term viability of these populations. Currently, the stinging rose caterpillar is considered critically imperiled (S1S2) in Indiana and Virginia (S1S3). However, it is listed as probably of historic occurrence in New York. All other states have it listed as secure or unranked.

RESEARCH AND MONITORING

Currently, little or no research is being conducted regarding the stinging rose caterpillar. The larval food plants, *Rosa* and other native shrubs abd trees, are palatable to deer, and effects of deer browsing need to be assessed. *Rosa* has attractive foliage and flowers and several species are already cultivated, with innumerable cultivar's developed over many years of breeding. Finally, the habitats occupied by this moth and its foodplant are aesthetically pleasing to the human eye. These attributes could make restoration of occupied and potential *Parasa indetermina* habitat more attractive to land managers and the general public.

EXISTING SURVEYS, MONITORING, AND RESEARCH

At the present time, no monitoring or survey work is being focused on this species, despite its relative rarity. However, recent surveys for rare insects on the Hoosier National Forest uncovered three previously unknown Indiana populations of *Parasa indetermina* (Bess, 2004).

SURVEY PROTOCOL

Surveys for the stinging rose caterpillar should initially be focused on known populations of *Rosa carolina* or similar species. Timing of surveys should occur when the larvae are present, as these are the easiest to locate and identify. Best timing for surveys is mid-July. Look for feeding signs on the leaves and the distinctive larvae. Adults can be surveyed for with ultraviolet lights, but this is a less reliable method of sampling. Given the extreme similarity of adults of this species to *Parasa chloris*, vocuher specimens should be collected from any new population. The larvae of *Parasa indetermina* is unmistakable and the two species' larvae are very dissimilar. Larvae can be photographed and easily identified to species. Collected adults can be placed live into a glass or plastic jar and frozen. If a killing jar is at your disposal, this may be used instead. Collected adults should be either kept in a freezer or pinned and affixed with a label bearing the following information:

1. State, County, Town, Range, Section and quarter section (or nearest reference point) of origin;
2. Date of Collection
3. Name of Collector
4. Type of habitat

The specimen can then be forwarded to an expert on the group for verification. A list of potential identification experts for *Parasa* specimens is given in Appendix A.

MONITORING PROTOCOL

To conduct long-term monitoring programs, a long-term monitoring transect will need to be developed (see Pollard, 1977). Monitoring programs will naturally vary from site to site and depend greatly on the amount of resources available to conduct such programs. At a minimum, a long-term monitoring program for *Parasa indetermina* should involve the designation of at least one permanent, monitoring transect. Monitoring transects should be placed in patches of *Rosa* and occur when larvae are roughly half-grown (mid-July).

The monitoring transect should be of a length that can be covered by one or two observers in one to two hours, while walking at a moderate pace. All *Rosa* observed within 30 feet of the transect line should be counted and searched for larvae. Standardized survey forms can easily be developed for such surveys. At a minimum; transect name, location, date and time should be noted on each survey form. If more than one transect is being used, each should be identified individually. Information on plant phenology, species blooming, canopy cover, invasive species, predation, etc. is also useful. Surveys should be conducted when larvae are at their peak of growth (July or September). These surveys can provide a wealth of data for use in tracking long-term population shifts in size, phenology, distribution and resource utilization.

RESEARCH PRIORITIES

Further research is needed regarding the exact habitat requirements of this species, such as:

1. Optimal canopy cover,
2. Minimum habitat patch size requirements,
3. Optimal density and distribution of *Rosa*,
4. Long-term fire effects and optimal fire regime,
5. Effects of invasive plants (and efforts to control them) on wild rose, nectar sources and the moth,
6. Effects of silvicultural activities such as pine plantations, pesticide application, harvesting, etc.

It is also quite probable that there are additional, undetected populations of this species in the central United States. Statewide efforts are needed to survey for this and other rare species.

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APPENDIX

LIST OF CONTACTS

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REVIEW REQUESTS

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FIGURES

Figure 1. Adult of the Stinging Rose Caterpillar (*Parasa indetermina*)

Figure 2. Larva of the Stinging Rose Caterpillar (*Parasa indetermina*)

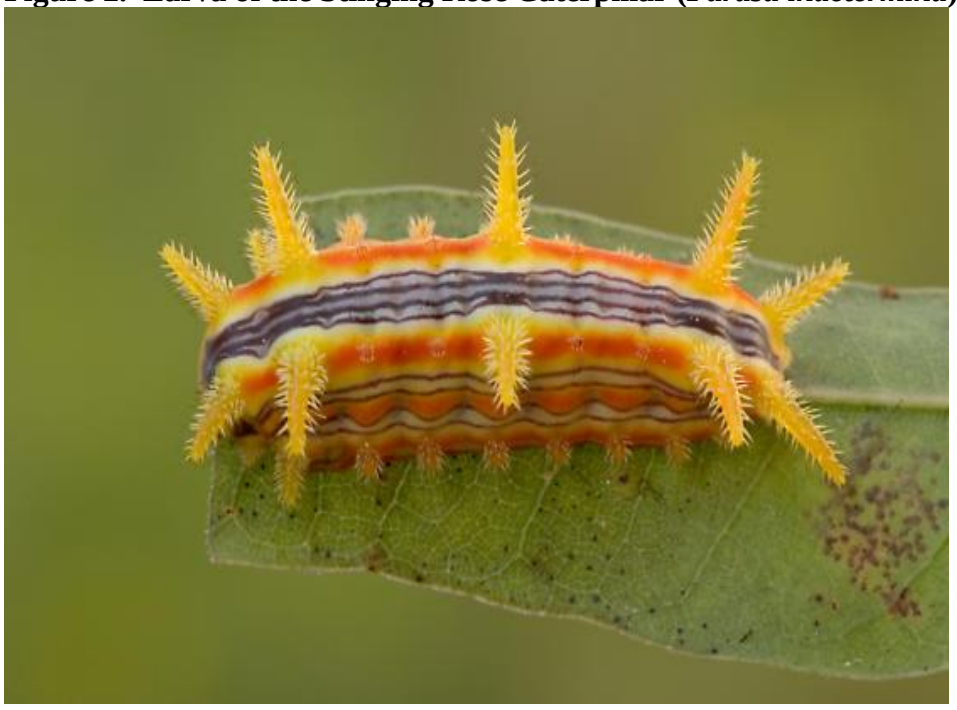
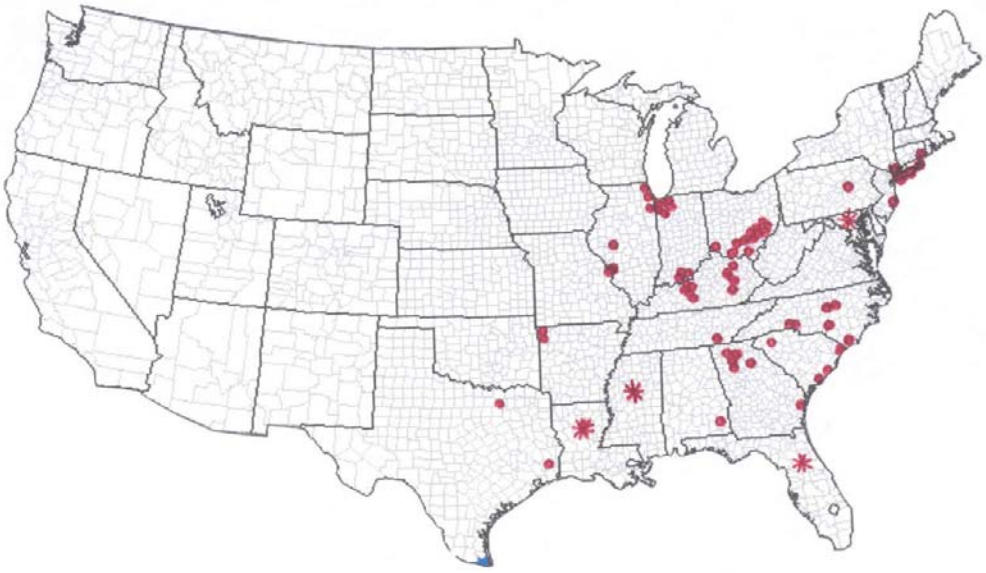


Figure 3. Current Distribution of the Stinging Rose Caterpillar (*Parasa indetermina*) in Eastern North America.



● = Known Occurrence of *Parasa indetermina* ✳ = Approximated State Occurrence