

*Conservation Assessment  
for the  
Southern Grizzled Skipper (Pyrgus Centaureae Wyandot)*



*USDA Forest Service Eastern Region*

July 2002

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*This Conservation Assessment was prepared to compile the published and unpublished information on the subject taxon or community; or this document was prepared by another organization and provides information to serve as a Conservation Assessment for the Eastern Region of the Forest Service. It does not represent a management decision by the U.S. Forest Service. Though the best scientific information available was used and subject experts were consulted in preparation of this document, it is expected that new information will arise. In the spirit of continuous learning and adaptive management, if you have information that will assist in conserving the subject taxon, please contact the Eastern Region of the Forest Service-Threatened and Endangered Species Program at 310 Wisconsin Avenue, Suite 580 Milwaukee, Wisconsin 53203*

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## EXECUTIVE SUMMARY

Originally described in 1853 from Ansalusia (Miller & Brown 1981) the grizzled skipper, *Pyrgus centaureae* is one of a large group of skippers that hold their wings horizontal when at rest or nectaring. Today it is regarded as a circumpolar butterfly with the nominate *Pyrgus centaureae* populations found in Europe and Eurasia. Three subspecies of *Pyrgus centaureae* have been described from North America *freija*, *loki*, and *wyandot*. *Pyrgus centaureae wyandot* is designated as a Regional Forester Sensitive Species by the USDA Forest Service, Eastern Region on the Huron Manistee National Forest in Michigan and the Wayne National Forest in Ohio.

The grizzled skipper, *Pyrgus centaureae wyandot*, has disappeared from much of its historical range. It survives today in mostly small, fragmented colonies. Continued surveys are needed to check old sites, and all known habitat types, not just shale barrens. Recognized threats to the few remaining sites include habitat destruction, and non-target mortality from gypsy moth spraying. Priorities for research, and monitoring to conserve the species include continued monitoring, and survey, propagation of the butterflies, and their plant hosts in addition to protection of known sites from habitat destruction and spraying.

## ACKNOWLEDGEMENTS

This report could not have been completed without the help of many individuals. Many people shared their research, and knowledge about the grizzled skipper. Tom Allen graciously allowed me to report much of his research on the grizzled skipper, and freely discussed many issues for this report. Dr. Steve Roble kindly sent me a copy of his Status Survey for the Appalachian Grizzled Skipper. Discussions with Dr. Roble were very constructive. Dr. David Wright provided the most current data for Pennsylvania. Dr. Robert Dirig shared data for New York, and freely discussed his personal experiences looking for the skipper. Dr. John Rawlins graciously discussed his, and Tom Allen's research with the grizzled skipper, and sent photocopies of literature. Mr. Richard Smith of Maryland discussed his experiences in Maryland, and sent me a copy of records from Maryland. Mr. Mogen C. Nielsen supplied a copy of his records used for his book, Michigan Butterflies and Skippers. Many fruitful discussions with Mr. Nielsen were immensely helpful. Dr. George Balogh also shared his data from Michigan, and gave lots of helpful suggestions.

Dr. John Shuey discussed his experiences in Michigan, and gave many helpful suggestions. Dr. Linda Butler kindly sent me copies of important publications about the effects of chemicals on non-target species of Lepidoptera. Valerie Passoa kindly edited the draft of this report and gave many helpful suggestions.

I owe a great deal of gratitude to the above listed people, and to those listed as contacts.

## NOMENCLATURE AND TAXONOMY

- Superfamily:** Hesperioidea
- Family:** Hesperiidae (Skippers),
- Subfamily:** Pyrginae (horizontal basking Skippers)].

Rambur originally described the grizzled skipper, *Pyrgus centaureae*, in 1853 from Ansalusia (Miller & Brown 1981). It is one of a large group of skippers that hold their wings horizontal when at rest or nectaring. Today it is regarded as a circumpolar butterfly with the nominate *Pyrgus centaureae* populations found in Europe and Eurasia. Three subspecies of *Pyrgus centaureae* have been described from North America: *freiija*, *loki*, and *wyandot*. The subspecies *freiija* occurs from Alaska east to Labrador and as far south as Minnesota (Layberry et al., 1998, Scott 1985). The Southern Rocky Mountain population subspecies, *loki*, occurs as far south as New Mexico. The subspecies *wyandot* was described by Edwards in 1868 from specimens from Long Island, New York, and Washington, D.C. The type locality was restricted to Long Island by Miller and Brown in 1975. The type is now lost and its source or collector is uncertain (Shaparo 1974). The common name for subspecies *wyandot* has until recently been known as the southern grizzled skipper. Its historical range included much of the Appalachian highlands with an isolated population in northern Michigan (Klots 1951, Opler 1988 & Howe 1975)

**Figure 1:** A map of the historical range of the grizzled skipper, *Pyrgus centaureae wyandot*.



In 1924 Warren described the subspecies *freiija* from a few specimens from Labrador (Warren 1924). Warren photographed the male genitalia of only subspecies *freiija*, and even today it remains the only photograph of the *freiija* genitalia in print. In 1936 Lindsey recognized both *wyandot* and *freiija* as subspecies, but he did not have a great deal of material for review. Lindsey listed the range of *centaureae/wyandot* as Virginia, Long Island, and North Carolina. Lindsey figured the male genitalia with the label “*centaureae*”. In 1951, Klots separated *wyandot* from *freiija* by differences in wing maculation and male genitalia, stating that *wyandot* is “smaller and darker with the male genitalia style of the harpe longer”.

In 1953 Evans figured the genitalia of all three nearctic subspecies of *centaureae* with comments based on specimens in the British Museum, which also included specimens reviewed by Warren. Evans states that the genitalia figured by Lindsey in 1936 was subspecies *wyandot*.

Evans genitalia figures are small line drawings and from them only a general review is possible. The valvae (clasp) of the male genitalia of *wyandot* is longer, and thinner and less rounded distally. However, when Evans' figures are compared to the larger and more complete drawing used by Lindsey, the Lindsey figure looks more like subspecies *freiija*. Forbes treated *wyandot* as a race (subspecies) of *centaureae*, but elevated subspecies *freiija* to full species status (Forbes 1960). He gives a fairly detailed description of the male genitalia of each taxon, but does not mention what he based his descriptions on. Forbes did not figure either genitalia. In 1974, Shapiro used the full species taxon *wyandot* for New York populations based on genitalia difference reported in Warren in 1924. He did not mention Evans' work, but he did call for more biological evidence.

In 1989, Dale Schweitzer as part of a review of Category 2 insects for the U.S. Fish and Wildlife Service also suggested the use of full species status for the southern grizzled skipper. The justification for the change in taxon by Schweitzer can be found on the NatureServe Website (assessed Nov. 24, 2001). In summary the reasons given are that there are character differences with the larvae, adult maculation, adult genitalia, and habitat differences between the Michigan and the Appalachian populations.

A study by Tom Allen and John Rawlins was begun in 1994 to determine the taxonomic status of the Michigan and Appalachian populations. As of March 2002, the results have not been published. However, both Michigan and West Virginia life histories have been completed by Tom Allen, and presented here with permission. Allen found differences in the color and number of instars of the larvae from Michigan and West Virginia; also see Allen 1985.

The differences in maculation were noted by Klots (Klots 1951) and were presented by MacNeil in Howe 1975. *Wyandot* is smaller, darker with fainter white spots while subspecies *freiija* is larger with more squared ventral white markings. Scott gave a similar description of the wing maculation (Scott 1986). Wing maculation differences between Michigan and Appalachian populations have never been published.

Reported habitat differences between Michigan and Appalachian population have originated because of the earlier widely held notion that the Appalachian populations were only found on shale barrens. The Ohio populations have never been found in shale barrens, but rather, barren sites with thin soils associated with sparse vegetation and recent disturbance. The Michigan populations occur in similar habitats with more northern plant communities (Shuey 1994 and Nielson 1985, 1999). Today the Appalachian populations are known to also occur in habitats that are not strictly shale barrens, similar to those in Ohio (Allen 1999, Roble 2001). The species is found in a variety of forest ecotones.

The Michigan and Appalachian populations use different larval hosts. In Michigan, Wild Strawberry, *Fragaria virginiana*, (Nielsen 1985 & 1998) is utilized, and in the Appalachian area it uses Canada cinquefoil, *Potentilla canadensis* (Iftner et al. 1987, Allen 1999). Parshall, Davidson, and Watts observed females ovipositing on Canada cinquefoil in Ohio in 1999. Both hosts are from the rose family, *Rosaceae*. This difference in hosts selected by females may be little more than a matter of opportunity (Shuey 1994). However, Allen

found that a few of the larvae refused to cross over to the different host in captivity (Allen, pers. com). This suggests a possible separation. However, different larval host in different isolated populations is well documented for many species of Lepidoptera with large geographic ranges (Scott 1985), and is poor criteria for separation of species.

What is needed now is a complete genitalic review similar to the one conducted by John Burns for *Pyrgus communis* and *Pyrgus albescens*, and one that includes subspecies *freijsa* (Burns 2000). A molecular study is also needed to determine whether the Michigan, and true Appalachian populations have significant genetic differences. Today the two populations are geographically separated, but has this separation been long enough for genetic isolation to have occurred? Allen and Rawlins' work suggest differences, but just how significant are they and at what level? There is little doubt that *wyandot* is a valid subspecies, but can the same evidence be used to elevate it to full species status? If the Michigan and Appalachian populations are different taxa, then what is Michigan? Can they be lumped with *freijsa*? Rawlins and Allen will conduct a molecular study of the Michigan and West Virginia populations during the summer of 2002 (Allen and Rawlins pers. com.). The results of this study will go a long way towards a final conclusion about the status of *Pyrgus centaureae wyandot*.

While doing background research for this report, numerous individuals stated, "the grizzled skipper needs to be listed and protected." Many seemed to feel that if the Appalachian population were a full species and not just a subspecies, it would get quicker attention under the Endangered Species Act. I contacted the U.S. Fish and Wildlife Service and presented them with the question. They reassured me that the Endangered Species Act's definition of species is broad enough to include valid subspecies of insects and other invertebrates (U.S.F.W.S. Washington Office Region One, Endangered Species section, pers. com.). The elevation of a taxon for conservation efforts without clear-cut science to support such a change is unwise because it could hurt the efforts to truly protect the species, and conservation of butterflies in general.

Until a competent study is published in a peer-reviewed publication, which proves the validity of an elevation of the taxon, the use of *wyandot* as a full species should be avoided. The current preferred taxon is still *Pyrgus centaureae wyandot* (Shuey 1994, Opler 1998, and 1999, Glassberg 2000). The U.S. Forest Service prematurely used *wyandot* as a full species in their published list of Regional Sensitive Species in February of 2000, likely because of U.S. Fish and Wildlife Service's use of *wyandot*.

## DESCRIPTION OF SPECIES

The grizzled skipper is one of two checkered skippers found in the Northeastern U.S., and is so named because of the checkered pattern of hair-like scales on the fringes of all wing margins. The adult grizzled skipper was accurately described by Allen in the Butterflies of West Virginia and repeated here with permission:

"Wingspan is 7/8 to 1 1/4 inches (22-32mm). The grizzled skipper is small, dark brown black above, with 2 irregular bands of white spots across the forewing. The hindwing has 2 rows

of partly diffused, white patches. The body and inner third of the upper wing surface are covered with long, fine bluish hairs. The underside is olive colored with 2, and partial third, irregular white bands of zigzag blotches crossing the hindwing. The fringes are boldly checkered. The Grizzled Skipper could be confused with the common Checkered-Skipper which is lighter in color.”(Allen 1998) (see Appendix 2).

**Flight Pattern:** The grizzled skipper flies low over sparse vegetation, and seldom reaches a height of more than a meter. It has a quick fast darting flight. When in flight, it looks like a small gray moth or bee. Its flight is hard to follow against the drab background of its habitat. When disturbed it flies into the woods or a few meters off and drops to the ground where it is hard to find. It takes nectar often from its larval host, Canada cinquefoil, and other available nectar sources. It is easily overlooked by the untrained observer and very difficult to approach.

## **LIFE HISTORY**

The following descriptions are from Element Abstracts compiled by The Nature Conservancy authored by Tom Allen, and presented here with permission of the author, the Ohio Natural Heritage Program, and the Ohio Chapter of The Nature Conservancy:

**“Egg:** Eggs are dome shaped, 0.6 mm wide and 0.5 mm high and pale green (almost white); 18 to 20 longitudinal grooves run from crown to base. The surface between grooves is finely ribbed transversely; the entire surface is finely granulated.

**First Instar Larvae:** Length is one to three mm, the instar is pale green with bristly hairs covering the upper surface of the body and head. The hairs split at distal end and are transparent. The head is 0.3 mm in diameter, black and round with a slight depression separating the two lateral lobes. There is a dark brown-black pronotum pattern on the dorsal portion of the first segment extending midway down the sides. Spiracles are not visible: there is a small tuft of black bristles (anal comb) above the anal vent.

**Second Instar Larvae:** Length is four to five mm, the instar is pale green with a brown-black head capsule (0.45 mm diameter). The bristle hairs on the head and body are slightly split to appear knobby at the ends. Larvae resemble the first instar caterpillar.

**Third Instar Larvae:** Length is six to eight mm, instar is pale green above, light yellow below. Pale stripes run longitudinally along the dorso-lateral surface. Hairs run in rows around the body, translucent and numerous, each arising from a small white tubercle. There are five to six rows of hairs per segment. The head capsule is 0.7 mm in diameter; the pronotum patch is deep brown-black; the anal comb brown. Spiracles are present as a small raised spot on each segment. [Author’s note: Spiracles are on the prothorax segments A1-8 only].

**Fourth Instar Larvae:** Length is nine to eleven mm, the instar is medium green with longitudinal dark green stripes alternating with pale cream, giving an overall appearance of pale green. The head is 1.2 mm in diameter and brown. The darker pronotum patch is

almost black. The head and body are covered with short, stiff hairs each arising from a white tubercle on the body. The anal comb is brown. Spiracles appear as tan spots.

**Fifth Instar Larvae:** Appearance is similar to the fourth instar, length is 13 to 14 mm. Body color and structures are similar except for the brown head (1.7 mm diameter) which is darker than the pronotum patch.

**Sixth Instar Larvae:** Length is 15 to 19 mm, this instar is robust with several skin folds at maturity. The head is 2.4 mm in diameter, deep purple-brown, roughly reticulated and covered with stiff hairs. The pronotum patch is light reddish brown. The body tapers at both ends, the surface is finely granulated and densely sprinkled with white tubercles, each emitting stiff translucent hair. Background color is apple green, and is dorsally striped longitudinally with alternating dark green and pale, flesh colored lines. The anal comb fan is shaped with approximately 20 brown bristles; central bristles are longest. Spiracles are green outlined with light brown.

**Pupae:** Length is 14 to 18 mm. The female pupa is larger than the male. The head is bluntly conical, the thorax is slightly swollen, the abdomen tapers to a long cremaster at the distal end. The cremaster contains long reddish, curved hooks that coil at the ends. The surface of the pupa is roughly granulated, the abdomen is greenish-red, and the wing cases and the thorax are covered with a white powdery bloom. The head is dark brown; amber tufts of bristles appear above and below the eyes, on each abdominal segment, and along the dorsal surface. Wing cases are hairless.” (Allen 1993).

The species is univoltine (has one generation per year). Adults are on the wing from mid-April to mid-May except for Michigan where it flies from mid May to the end of the month. “Females fly from one cinquefoil plant to another ovipositing. Females actively oviposit from midday till approximately 1600 hours. Eggs are deposited singly on the underside of the host plant leaf. Generally, small, new leaves are selected by the female. Eggs hatch within eight to ten days depending on temperature. Within two days prior to hatching, eggs become translucent with the black head capsule of the larva plainly visible. Soon after hatching, the larva spins a silk covering over itself along the midrib on the upper surface of the host leaf. The larva immediately begins feeding on the leaf by chewing small holes near the edges of its tent. At first only the upper surface of the leaf is eaten. The larva will attain a length of nearly 3.0 mm during the following eight to ten days. The second instar larva spins a silk tent in a partially closed leaf and feeds by skeletonizing the leaf. This state lasts approximately 12-14 days. Once molted into the third instar, the larva moves to a new leaf and builds a new tent. The larva is now able to pull the leaf edges together with silk and feeds along the outer edges of the tent or a short distance from it. The stage lasts 14 to 16 days. The fourth instar larva ties two to three leaves or portions of leaves together to form a shelter. Feeding takes place at night a short distance from the shelter on other lobes of the leaf or adjacent leaves. The larva remains in their shelter during the day. The fifth instar larva feeds from its tent consuming several leaves or portions of leaves before moving its shelter. Its slow growth process is advantageous since the food plant, Canada cinquefoil, stays ahead of the larva by growing rapidly and sending out runners and new leaves. This stage lasts 20 to 24 days. The sixth instar larva behaves similarly to the fifth instar, building

new shelters as it feeds on surrounding leaves. The sixth instar stage lasts approximately 30 days. Before pupating, the larva turns a reddish-green. Pupation takes place in late summer in a sealed leaf shelter built close to the ground. The pupae over winter, with the adult emerging in early spring” (Allen 1993). This description was based on material bred from West Virginia.

### **Dispersal/Migration**

The closely related skipper species, the checkered skipper, *Pyrgus communis*, is a migrant species. The checkered skipper is a common species of the southern U.S. During some summers it migrates north to states with grizzled skipper populations. The grizzled skipper does not migrate, but rather disperses by corridors through the forest. Typical dispersal corridors are pipelines, power-cuts, and other disturbed areas. Dispersal is depended on population densities and opportunity. Field separation of these two nearly identical species can be difficult. Diagnostic characters are found on the underside of the hindwings. (See Appendix.). The grizzled skipper is a single brooded spring species, while the checkered skipper is multiple brooded with flights year round in the south, and mainly during the summer, and fall in the north.

### **HABITAT**

At one time the habitat of the grizzled skipper was considered to be shale barren openings in forest regions. Today it is known to occur in a much wider variety of habitats. All of these openings have at least one thing in common; they favor an abundance of suitable larval hosts. In Michigan the habitats are openings in oak/pine woods with sandy soils, adjacent fields, and coastal alvars with large populations of wild strawberry (Shuey 1994, Nielson 1998, George Balogh, Bob Kreigel pers com.). In Ohio the forest openings have good stands of Canada cinquefoil. The same general habitat prevails in Canada where the host is cloudberry, *Rubus chamaemores*.

Cloudberry is the host discovered by Parshall at Churchill, Manitoba in 1977, and reported by Scott in 1986. At Churchill, the skipper is found in the taiga/tundra ecotone along the railroad right-of-way, and along old drainage ditches out onto the tundra. The grizzled skipper flies only on odd numbered years at Churchill. U.S. populations have annual flights. None of the known hosts plants do well with competition, and are to some degree dependent on some sort of disturbance, either natural or anthropogenic. Allen reports that Canada cinquefoil was affected by the drought years of 1987 and 1991. This may have been a factor in some of the decline in numbers at historical sites in West Virginia (Allen 1993).

The amount of suitable host needed for the grizzled skipper to maintain a stable population is not known. In the Ohio Vinton County site, the host was scarce compared to the Dorr Run site. The Greenbrier County site in West Virginia has large concentrations of the host. Many open sites in the range of the grizzled skipper have good stands of Canada cinquefoil or wild strawberry, and yet have no grizzled skipper populations. There are clearly factors involved with the distribution of this skipper that are poorly understood.

Types of habitats to survey for this skipper would include: pipelines, power cuts, clear-cuts, open barrens/glades of all types, and even areas adjacent to woods and roadsides. These are sites that few would ever think about as good places for butterflies. South facing slopes, and ridges are more likely to be dry, and are suitable sites for the skipper.

Many of the historical sites are known to be open, fallow hilltops such as those near Ithaca, New York (Dirig, pers. com.). All of the sites in Ohio, West Virginia, Virginia, and Maryland are elevated sites. Many of these sites can be seen on topographic maps, and aerial photographs, and could be field checked for the presence of the grizzled skipper.

## **DISTRIBUTION AND STATUS**

The historical range of *Pyrgus centaureae wyandot* included sites in Michigan, Pennsylvania, New York, Washington D.C., Maryland, West Virginia, Virginia, and North Carolina (see Appendix 1, page 5). Its historical abundance is described by Clark in *The Butterflies of Virginia* by Clark in 1951:

“Found in clearings and open places in woods, and in open fields near woods; generally distributed, occurring in all suitable localities; frequent to abundant in Frederick County and in the mountains, infrequent east of Frederick County.”

Clark’s book was unique for its time. It was one of the first regional butterfly books in the Eastern U.S. Thus the historical occurrence of the Grizzled Skipper in Virginia is better understood than other states. Most of our historical records are based on old museum specimens, often with poor data, and literature records, which may or may not be accurate. The historical range was often used even in the early 1990’s as the range of the grizzled skipper in popular field guides. Glassberg made an honest attempt to show the current known range of the skipper (Glassberg 2000). Glassberg used the name ‘Appalachian’ Grizzled Skipper.

### **State Distribution and Status**

**State Rank Historical (HS):** (Historically known from the State, but not verified for an extended period, usually more than 15 years; this rank is used primarily when inventory has been attempted recently). **State Rank (S1):** (Extremely rare; usually five or fewer occurrences in the state; or may have a few remaining individuals; often especially vulnerable to extirpation).

**New York:** (last reported in May of 1970 from Tioga County by Arthur Shapiro, (Shapiro 1974 and Dirig pers. com.)

**New Jersey:** Gone by the 1950’s following heavy periods of spaying for Gypsy Moths (David Iftner pers.com. and Michael Gochfeld and Joanna Burger 1997). No active colonies are known.

**North Carolina:** May have been a resident in the western mountains. Reported by Brimley in 1938, “Tryon, Montvale, April”, both records were from Polk County. No other records are known, and no active colonies are known (Steve Hall pers. com.).

**District of Columbia:** Listed by Edwards in 1868 in the type description, and only two other records are known without dates (Clark 1932).

**Kentucky:** Recorded by a single capture from Harlan County in 1980 (Covell 1999).



Repeated surveys have turned up no additional records.

**Illinois:** There is one old record from Cook County with no date. Most likely from the early 1900's. No current active colonies are known (Irwin and Downey 1973).

**Maryland:** Currently known from four sites in Allegheny County. Two of the sites are in Green Ridge State Forest and two are on private property near Flintstone. The Maryland populations are extremely fragmented and small. One or two are seen in a day of searching. The populations were all but wiped out by heavy spraying for gypsy moths in the early 1980's and again in the early 1990's (Richard Smith and Robert Dirig pers. com. and Roble 2001). The grizzled skipper is listed as Endangered in Maryland, and is provided legal protection.

**Figure 2.** Shows the range as of 2001 based on the data gathered by Parshall for this assessment.

**West Virginia:** Once second only to Michigan in known colonies of the grizzled skipper, today there are only three active sites, all in Greenbrier County. Grizzled skipper numbers have likely been reduced from the northeastern part of the state by heavy spraying for gypsy moths. The three current sites are all on Westvaco Forest Product lands, and are the largest colonies known in all of its range covering as much as 5000 acres (Allen pers. com.). These sites have as many as 30 adults on the wing at one time. They were discovered by accident by Tom Allen while doing monitoring of grouse in management areas for the West Virginia Department of Natural Resources. These sites are very close to Monongahela National Forest.

**Pennsylvania:** The exact number of populations is not known. However, there are county records from Bedford 1980, Fulton 1980, Lancaster 1940, Dalipin 1951, a literature record with no date from Reading, and Huntington 2000 (David Wright, Betsy Ray, Richard Boscoe, pers. com.).

**Ohio:** The status of the grizzled skipper in Ohio has not been accurately presented since 1987, so it is presented here with some detail. Historically known from two sites in Hocking, one site in Morgan, two sites in Athens, one site in Vinton, and one site in Cuyahoga counties. The first record in Ohio was from Cuyahoga County, and was collected by Henry Warmsbacher in 1916 from Lakewood, then also known as Dover. It evidently was a dry barren opening because he also collected Edwards's hairstreak, *Satyrium edwardsii*, from the site. The record was reported in 1987 (Iftner et al. 1987). Parshall also reviewed the specimen at The Cleveland Museum of Natural History in 1998.

Parshall rediscovered the grizzled skipper in Ohio on April, 16 1971 in Vinton County, 180 miles south of the Lakewood site. The Vinton County colony was along a road that followed one of the elevated peneplains that surround Lake Hope State Park in Zaleski State Forest. The colony was active until 1983. Repeated surveys through 2001 at the site have been negative. Another site was discovered near The Plains in Athens County (Shuey 1983). The current status of Shuey's site is unknown. Parshall discovered a second Athens County site in May of 1988. Repeated trips to this site from 1989 to 1999 have turned up no additional records. The Morgan County site was discovered by Henry Seibert near Homer and Burr Oak State Park. Only one adult was collected, and the exact site was not recorded (Henry Seibert pers. com. 1998).

In 1986, John Peacock, an entomologist with the U.S. Forest Service, found a large colony on Wayne National Forest in Hocking County. The site is now known as Dorr Run ORV trail system. In the early 1990's, Peacock's original site was buried by tons of gravel to make a parking lot for bikers. In 1993 Parshall found a new site at Dorr Run. It was a small-elevated slope along a road to a gas well. This site was active until 1996 when it was lost to the succession of heavy ground cover and saplings.

Division of Wildlife currently lists the grizzled skipper as a species of Special Concern. Ohio law provides legal protection for animals listed as Endangered. If no new sites are found at the end of 2002 surveys, its listing will be changed to Threatened or Endangered. The Dorr Site is In 1999, another new site was finally located at Dorr Run by Parshall, Davidson, and Watts. The newest site at Dorr Run is along a pipeline-cut and clear-cut area owned by a bankrupted conglomerate company. The site has steep barren hillsides full of Canada cinquefoil. This is the last known site for the grizzled skipper in Ohio. Repeated surveys since 1972 in old and potential new sites have turned up no new colonies. The Ohio site is slated to be the Interchange for a new highway project.

**State Rank (S1/S2):** (critically imperiled/imperiled)

**Michigan:** The status of the Michigan populations is unclear. The most recent records come from Presque Isle and Alpena counties. Roble reported that it is only reliably found in four sites. The Presque Isle population is the most recent. The Michigan Lepidoptera Survey at Michigan State University has records with data up to 1994 (Kregel, pers. com.). The status as of 2002 is unclear. Parshall and other volunteers from the Michigan Lepidoptera Survey will conduct surveys this May to help clarify its status in Michigan.

## **Range-Wide Status**

Global Rank (**G2**): (globally or nationally imperiled)

## **Federal Status**

At one time listed as a Candidate Species, but since 1994 has had no official status with the U.S. Fish and Wildlife Service.

## **POTENTIAL THREATS**

### **Present or Threatened Risks to Habitat**

One of the threats to the survival of *Pyrgus centaureae wyandot* is habitat destruction. The one known remaining Ohio colony in a once fairly large metapopulations is threatened by a state highway project. Sites in northern Michigan have been altered by development (Nielsen, pers. com.). The invasion of the tree canopy following the deforestation of the early 1900's may have eliminated some habitats in the Allegheny plateau. The main threat to the grizzled skipper is gypsy moth spraying.

The decline of the skipper follows the historical path of the chemical frontiers of the U.S. Department of Agriculture's gypsy moth program from east to west. Most researchers feel that gypsy moth control measures are the main reasons for the species decline in the Appalachian highlands. The skipper habitats are small openings in large forests. Attempts to save the skipper by having small "no spray zones" have not always worked (Allen 1994, and Roble 2001). Chemical drift into these areas may be one of the problems. The control of chemicals released from airplanes has improved markedly since the 1950's, but is far from a perfect science. In some forest openings, fire is a management tool often used to keep areas open. Sites with active grizzled skipper colonies should never be burned. However, fire could be a useful tool to prepare historical sites for reintroduction of the skipper (Panzer 1996). Several of the sites in Ohio were kept active for more than ten years by mowing and bush hogging.

While the use of such chemicals as Dimilin and Bt are known to effect a host of non-target species of Lepidoptera, their effect on the grizzled skipper has never been directly proven (Butter et al, 1993,1995,and 1996). There is little likelihood that in its most vulnerable developmental stage in early spring, it is not affected. However, data on a seven-year *Bacillus thuringiensis* non-target study recently completed are being analyzed. The study was conducted on eighteen 500-acre plots in the Monongahela and George Washington National Forest. Publications will be prepared on treatment effects in the next few years (Dr. Linda Butler pers.com.2002). Tom Allen in 1993 states, "This species was not rare in and around WV just prior to the massive biocide blitz of the late 1980's. See Schweitzer 1989 for documentation."

Allegheny and Rockbridge Counties, Virginia, which are home to the known active colonies, are now within the gypsy moth quarantine zone (Roble 2002). Without protection, little can be done legally to protect it from the chemicals. The Ohio site is also in a quarantine zone, and residents in Hocking County are already being notified that spraying may occur soon.

The Ohio nongame technical advisory committee researched the effects of chemical control measures for gypsy moths. They researched decades of scientific literature and reported their findings to the Ohio Division of Wildlife which formulated their policy in regards to the use of chemicals as gypsy moth control measures (this policy is also the backbone of The Ohio Lepidopterists policy as well). The Ohio Division of Wildlife policy is in part stated below:

“The Division is concerned by the potential impact of widespread treatment with Dimilin or *Bacillus thuringiensis* for gypsy moth suppression on nontarget organisms. We will continue to support efforts to promote the use of Gypchek, the fungus *Entomophaga maimaiga*, and measures to educate the public concerning the inevitable range expansion of the gypsy moth through Ohio and the pros and cons of chemical treatment.

While we are interested in minimizing the loss of the oak and hickory component for Ohio’s forest, we do not believe chemical controls for gypsy moths will achieve this goal. Furthermore, based on the temporal and spatial persistence of this moth we do not believe it can be eliminated from Ohio with techniques presently available.”

## **SUMMARY OF LAND OWNERSHIP AND EXISTING HABITAT PROTECTION**

The **Ohio** Dorr Run Site is privately owned by a bankrupt conglomerate company and its future is uncertain. It is hoped that new sites will be found in **Wayne National Forest**. But many of these sites are threatened by a state highway project.

At least one of the **Michigan** remaining sites is a State Park. **Huron Manistee National Forest** may still have active sites, but they have not been checked recently. Other potential and old active sites are on private and public lands.

In **Maryland** all known active sites are in Allegheny County. Only one of the three active sites is on public land, Green Ridge State Forest. The other sites are on private land, and are not directly protected other than by Maryland law.

All but one of the four known active **Virginia** sites in Allegheny County are on protected lands: a TNC preserve, A State Natural Areas preserve, and a Ruffed Grouse Management Area in **George Washington National Forest**. Westvaco Corporation owns the other Allegheny site. The Rockbridge County site is also in **George Washington National Forest**.

Westvaco also owns the only known active sites in **West Virginia**. These are in Greenbrier County and support the largest populations currently known for the grizzled skipper. They are currently interested in preserving the skipper, but the long-term survival of this site is uncertain (Allen, pers. com.).

## **SUMMARY OF EXISTING MANAGEMENT ACTIVITIES**

A portion of the Ohio Dorr Run site is occasionally bush hogged as part of pipeline maintenance. No other management is currently being done other than surveys and some monitoring at the other known Eastern U.S. sites.

## **PAST AND CURRENT CONSERVATION ACTIVITIES**

Little current or past conservation activities has been undertaken. Attempts to locate active populations have been undertaken and need to be continued.

## **RESEARCH AND MONITORING**

**1. Monitoring-** Current monitoring and surveying is being done in West Virginia, Ohio, and Virginia. More than 130 potential sites have been surveyed, and more will be surveyed in Virginia 2002 (Roble 2001). Parshall, Watts, and Davidson are continually looking for new sites in Ohio. The Michigan Lepidoptera Survey will start to reassess old Michigan sites this coming summer. Only a couple of knowledgeable lepidopterists in other states like North Carolina, Maryland, New York, and Pennsylvania are currently looking for this skipper. Some state governments have alienated lepidopterists by controversial policies. This was the case in Michigan for a number of years, but now a healthy partnership has been formed between the state, and those who actually have the expertise to do the survey work.

Most statewide surveys have never been officially supported by state governments, and thus were unofficially conducted by only a few amateur and professional lepidopterists. Today there is a need to form strong working groups with all persons, amateur and professional, who are interested in butterfly conservation. Ohio is a good model to follow.

A strong partnership was formed in the early 1980's between the Ohio Department of Natural Resources, and The Ohio Lepidopterists. With funding provided by the Ohio Division of Wildlife and volunteers from The Ohio Lepidopterists, who at the time were mainly butterfly collectors, a statewide survey was conducted and continues today. In 1998, the Ohio Division of Wildlife set up a statewide monitoring system with The Ohio Lepidopterists at 35 transect sites across the state. Weekly monitoring began using the Pollard model (Pollard 1993). For this reason Ohio's Lepidoptera fauna is more completely known than most other states in North America, and today trends with a large part of the fauna are being monitored annually. Similar efforts are needed in other states, though they may come too late to help the grizzled skipper.

Existing surveys in Ohio, West Virginia and Virginia need to be continued and expanded to include new sites determined from aerial photos or topographic maps. Old sites in Michigan need to be visited. Maryland and Pennsylvania should look in areas other than shale barrens. Active sites should be monitored annually for signs of decline. A standard protocol for survey is simply getting knowledgeable persons into the field. Government and private

entities are needed to support surveys and research into the grizzled skipper's requirements for survival.

**2. Propagation and reintroduction-** Tom Allen has worked out protocols for rearing grizzled skippers. But will these same protocols work in a large breeding program? The Toledo Zoo staff has worked out many of the problems with breeding butterflies for reintroduction. The American Zoological Association (AZA) has an interest in just such projects, and could be a source of valuable help.

Protocols for the large-scale propagation of the larval host Canada cinquefoil needs to be worked out through experimentation. The Ohio Karner Blue Recovery Team has already worked out protocols for transportation of live butterflies for reintroduction. In five short years, the Karner Blue was bred and reintroduced to a prepared site in the Oak Openings west of Toledo, Ohio. The National Recovery Team sponsored by the U.S. Fish and Wildlife Service, just published a recovery plan for the Karner Blue after fourteen years of study. In light of threats to habitat, and to the species itself due to chemical spraying, the grizzled skipper is perhaps in a more critical situation than the Federally Endangered Karner Blue butterfly. Federally protection should be considered.

## **LIST OF PERSONS CONTACTED FOR INFORMATION**

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### **Delaware:**

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### **Georgia:**

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Greg Krakow, Data, Manager Georgia Department of Natural Resources, Wildlife Resources Division, Atlanta Georgia.

Dr. James Adam, web site, [www.daltonstaate.edu/galeps](http://www.daltonstaate.edu/galeps).

### **Illinois:**

Shawnee National Forest. Respondent did not sign date request form.

### **Indiana:**

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Dr. Linda Butler, Division of Plant and Soil Science, West Virginia University, Morgantown, West Virginia.

**Wisconsin:**

Les Ferge, U.S. Forest Service, retired.

**REFERENCES**

Allen, T.J. 1997. The Butterflies of West Virginia and their Caterpillars. University of Pittsburgh Press, Pittsburgh, PA. 399 p.

Brinley, C.S. 1938. The Insects of North Carolina, N.C. Dept. of Ag. Division of Entomology, Raleigh, N.C. pg.261.

Burns, J.M. 2000. *Pyrgus communis* and *Pyrgus albescens* are separate transcontinental species with variable, diagnostic valves. *J.Lep.Soc.* 54:52-72.

Butler, Linda, and Vickie Kondo. 1993. Impact of Dimilin on non-target Lepidoptera: results of an operational Gypsy Moth suppression program at Coopers Rock State Forest, West Virginia, Bulletin 710 Sept. 1993, Agr. & Forestry Exp. Station, West Virginia University, Morgantown. 21p.

Butler, Linda, Cathy Zivkovich, and Bradley E. Sample. 1995. Richness and Abundance of Arthropods in the Oak Canopy of West Virginia's Eastern Ridge and Valley Section During a Study of Impact of *Bacillus thuringiensis* with Emphasis on Macrolepidoptera Larvae; Agricultural and Forestry Exp. Station Bulletin 711 October. 19 p.

Clark, Austin H. 1932. The Butterflies of the District of Columbia and Vicinity, Smithsonian Inst. U.S. Nat. Museum. *Bulletin 157*. 337 p.

Clark, Austin H. and Leile F. Clark. 1951. The Butterflies of Virginia, Smithsonian *Miscellaneous Collections* Vol. 116 no.7. 237 p.

Covell, C.V. 1999. The Butterflies and Moths (Lepidoptera) of Kentucky: an annotated checklist. *Kentucky State Nature Preserves Commission, Scientific and Technical Series* No. 6, Frankfort, Kentucky. 220 p.

Evans, W.H., III. 1953. A Catalogue of the American Hesperidae in the British Museum, Part III, Pyrginae, Section 2. The British Museum, London, England. 252 p. and 52 Plates.  
Fales, John H., 1974. Check-list of the skippers and Butterflies of Maryland., *Chesapeake Science, Bol.* 15 No. 4. . pg. 229-229.

Forbes, W. T .M. 1960. Lepidoptera of New York and Neighboring States, Part IV: Agaristidae through Nymphalidae including Butterflies. Cornell University Agricultural Experiment Station, New York State College of Agriculture, Ithaca, NY. 729 p.

Glassberg, J. 1999. Butterflies through Binoculars: The East. Oxford University Press, New York, New York. 242 p.

Gochfeld, Michael, and Joanna Burger. 1997. Butterflies of New Jersey, Rutgers University Press New Brunswick, New Jersey. 327 p.

Howe, William H. 1975. The Butterflies of North America. Doubleday & Company, Inc. Garden City, New York. 637 p.

Hubbs, Horton H. III. 2000. Ohio Nongame Wildlife Technical Advisory Committee, a report to the Ohio Division of Wildlife, Ohio Dept. of Nat. Res. Columbus, Ohio. 25 p.  
Iftner, D., J.A. Shuey, and J.V.Calhoun. 1992. The Butterflies and Skippers of Ohio. *Ohio Biological Survey* 8(1): 212 p.

Iftner, D., David M. Wright. 1996. Atlas of New Jersey Butterflies. A private publication, Sparta N.J. 27 p.

Irwin, Roderick, and John C. Downey. 1973. Annotated Checklist of the Butterflies of Illinois. *Biological Notes* No. 81, Illinois Natural History Survey, Urbana, Illinois. 60 p.  
Kolts, A.B. 1951. A Field Guide to the Butterflies of North American, East of the Great Plains. Houghton Mifflin Co. Boston, Mass. 349 p.

Layberry, Ross A., Perter W. Hall, and J. Donald Lafontaine. 1998. The Butterflies of Canada, University of Toronto Press, Toronto, Buffalo, and London. 280 p.

Lindsey, A.W., E.S. Bell, and R.C. Williams, Jr. 1936. *Journals of the Scientific Laboratories* Vol. XXVI Article 1, pg. 1-142. Denison University, Granville, Ohio. 43 p.

Miller, Lee D., and Martin F. Brown. 1981. A Catalogue / Checklist of the Butterflies of America North of Mexico, *The Lepidopterists' Society, Memoir* No. 2. 280p.

NatureServe Explorer: An online encyclopedia of life [web application]. 2001. Version 1.6. Arlington, Virginia, USA: NatureServe. Available: <http://www.natureserv.org/explorer>. (Assessed February 24 2002).

Nielsen, Mogens C. 1999. Michigan Butterflies and Skippers, a Field Guide and Reference. Michigan State University Extension. 248 p.

Nielsen, Mogens C. 1985. Notes on the habitat and food plant of *Incisalia henrici* (Lycaenidae) and *Pyrgus centaureae* (Hesperiidae) in Michigan. *Journal of the Lepidopterists Society*, 39: 62-63.

Opler, P.A. 1998. A Field Guide to Eastern Butterflies. Houghton Mifflin Company, Boston, Mass. 486 p.

Panzer, R., Still Waugh, R. Gnaedinger, and G. Derbovitz. 1995. Prevalence of Remnant Dependence among the Prairie-and Savanna-inhibiting Insects of the Chicago Region. *Natural Areas Journal* 15 (2): 101-116 p.

Pollard, Ernest, and Tina J. Hats. 1993. Monitoring Butterflies for Ecology and Conservation. Chapman and Hall, Inc. New York, New York. 279 p.

Roble, Steve. 2001. Status Survey for the Appalachian Grizzled Skipper (*Pyrgus wyandot*) in Virginia and a Rangewide Status Assessment of the Species. *Natural Heritage Technical Report* 01-24. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Richmond. 13 p. plus appendix.

Sample, Bradley, Linda Butler, Cathy Zivkovich, Robert C. Whitmore, & Richard. 1996. Effects of *Bacillus thuringiensis* Berliner Var. Kurstaki and Defoliation By the Gypsy Moth [*Lymantria Dispar* (L.) (Lepidoptera : Lymantridae)] on Native arthropods in West Virginia. *The Canadian Entomologist* 128: 573-592 p. Reardon

Scott, James A. 1986. The Butterflies of North America: a Natural History and Field Guide. Stanford University Press, Stanford, California. 583 p.

Schweitzer, D.F. 1989. A review of Category 2 Insects in U.S.FWS Region 3,4,5. Unpublished report for the U.S. Fish and Wildlife Service, Newton Corner, Massachusetts. 143 p plus appendices.

Schweitzer, D.F. 2001. Taxonomic comments on *Pyrgus wyandot*. NatureServe Explorer Website at: [www.natureserve.org](http://www.natureserve.org). (Assessed 24 November 2001).

Shapiro, A.M. 1974. Butterflies and Skippers of New York State. *Search* 4: 1-60 p.

Shuey, John. 1983. An Annotated Checklist of the Butterflies of Athens County; Ohio. *The Ohio Journal of Science*, 88 (5): 262-269 p.

Shuey, John. 1994. Thoughts on the Status of *Pyrgus centaureae wyandot*, Emphasizing Ecological Similarities in Ohio and Michigan. *The Ohio Lepidopterists Newsletter*, Vol. 16 no. 1, March. 17-20 p.

U.S. Forest Service, Eastern Region 9. Regional Forester Sensitive Animals, issued February 29, 2000.

Warren, B.C.S. 1924. Monograph on tribe Hesperiiidi, *Transactions of Entomological Society of London*. Vol. 74. 168 p.

## APPENDIX

Identification of grizzled skipper, *Pyrgus centaureae wyandoti* (top),  
and the checkered skipper, *Pyrgus communis* (bottom).

