

***Conservation Assessment for  
Lake Huron Locust (Trimerotropis huroniana)***



***USDA Forest Service, Eastern Region***  
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*This document is undergoing peer review, comments welcome*

*This Conservation Assessment was prepared to compile the published and unpublished information on the subject taxon or community; or this document was prepared by another organization and provides information to serve as a Conservation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.*

**Table of Contents**

**EXECUTIVE SUMMARY ..... 4**  
**ACKNOWLEDGEMENTS ..... 4**  
**NOMENCLATURE AND TAXONOMY ..... 5**  
**DESCRIPTION OF SPECIES ..... 5**  
**LIFE HISTORY ..... 5**  
**HABITAT ..... 6**  
**DISTRIBUTION AND ABUNDANCE ..... 6**  
    **(RANGEWIDE/REGIONWIDE) ..... 6**  
**STATUS IN THE GREAT LAKES REGION ..... 7**  
**POPULATION BIOLOGY AND VIABILITY ..... 7**  
**POTENTIAL THREATS AND MONITORING ..... 8**  
    **PRESENT OR THREATENED RISKS TO HABITAT OR RANGE 8**  
    **COMMERCIAL, RECREATIONAL, SCIENTIFIC OR**  
    **EDUCATIONAL OVERUTILIZATION ..... 8**  
    **DISEASE OR PREDATION ..... 9**  
    **INADEQUACY OF EXISTING REGULATORY MECHANISMS ... 9**  
    **OTHER NATURAL OR HUMAN FACTORS AFFECTING**  
    **CONTINUED EXISTENCE OF SPECIES ..... 9**  
**SUMMARY OF LAND OWNERSHIP AND EXISTING HABITAT**  
**PROTECTION..... 9**  
**SUMMARY OF EXISTING MANAGEMENT ACTIVITIES..... 10**  
    **PAST AND CURRENT CONSERVATION ACTIVITIES..... 10**  
**RESEARCH AND MONITORING..... 10**  
    **EXISTING SURVEYS, MONITORING AND RESEARCH..... 10**  
    **SURVEY PROTOCOL..... 11**  
    **RESEARCH PRIORITIES ..... 11**  
**REFERENCES..... 11**  
**LIST OF CONTACTS..... 12**  
    **INFORMATION REQUESTS..... 12**  
    **REVIEW REQUESTS..... 12**

## EXECUTIVE SUMMARY

The following is a draft conservation assessment providing a summary of readily available information regarding the distribution, ecology, and population biology of the Lake Huron locust (*Trimerotropis huroniana*). Where relevant information exists and was found, special attention was placed on issues pertinent to the conservation of this species in Region 9 of the USDA Forest Service.

The Lake Huron locust is listed by the USDA Forest Service as a Regional Forester Sensitive Species. It is known to occur in two states within Region 9 and is listed as threatened in Michigan and endangered in Wisconsin. Additional survey work in Wisconsin, Michigan, and Ontario, Canada is necessary to complete the distribution data for this endemic species.

The Lake Huron locust is a small, grasshopper like insect. Coloration is generally silvery to ash-gray with darker brown and white markings. In Michigan and Wisconsin its habitat is restricted to sparsely vegetated, high quality coastal dunes. Where the open dunes grade into heavily vegetated or disturbed areas, their numbers quickly decline.

The major threat to the Lake Huron locust is habitat loss. Its habitat and community type lends itself to development or recreation use. The precise level of disturbance which can be tolerated has not been determined. In some areas, large locust populations seem to be tolerating some human disturbance. In other areas where there is less extensive habitat or more dune-altering human disturbance, populations have been reduced or eliminated. Disturbance may also be related to the replacement of the Lake Huron locust by a similar grasshopper, *Spharagemon collare*, which appears to tolerate a higher level of disturbance.

There are many research needs for this species which has only been studied on a limited basis. Research needs include: surveys to verify the current ranges of the Lake Huron locust, the seaside locust (*T. maritima*), and *S. collare*; examination of the ecological relationships between these species; research on the life history and ecology of the Lake Huron locust to develop a stronger base for management and conservation efforts; determination of the microhabitat requirements of the species over the course of its lifespan; information about normal movement and dispersal patterns to better understand the species' recolonization capabilities; and long-term monitoring of populations including a range of geographic sites and human disturbance in order to make management recommendations.

## ACKNOWLEDGEMENTS

Information was provided by the following individuals: Kenneth Ennis, Forest Wildlife Biologist, Huron-Manistee National Forest, Janelle Schlangen, Department of Natural Resources, State of Wisconsin; Michigan Natural Features Inventory; Steve Sjogren, Wildlife Biologist, Hiawatha NF, USFS.

## NOMENCLATURE AND TAXONOMY

Order:	Orthoptera
Family:	Acrididae
Scientific name:	<i>Trimerotropis huroniana</i> Walker
Subspecies name:	N/A
Common name:	Lake Huron locust
Synonyms:	N/A

## DESCRIPTION OF SPECIES

(Taken from Wilsmann 1994.)

The Lake Huron locust is a small, grasshopper like insect [length to end of folded forewings: males 24-30 mm; females 29-40 mm]. Coloration is generally silvery to ash-gray with darker brown and white markings. Brick red, burnt orange, and ocher color morphs occur occasionally, especially among females. The toughened forewings (tegmina) of the adults have darker bands that may be weakly or strongly expressed. The hindwings are light yellow near the body with a smoky patch near the tip. Sexes are easily distinguished by the males' stronger mottling, their noisy (crepitating) flight, and smaller size. The Lake Huron locust is one of four species in the Great Lakes region with the pronotum (the saddle like structure behind the head) cut across by two well-defined grooves called sulci. The other three species occur farther south than the Lake Huron locust (Wilsmann, 1994).

## LIFE HISTORY

There is little published on the life history of the Lake Huron locust. Courtship behaviors are thought to be similar to that of the pallid-winged locust, *T. pallidipennis* (Rabe, 1999). Ballard (1991) reports that *T. huroniana* over winters as an egg and nymphs hatch out in late spring (observed as early as May). Limited study by Sholtens (1996) indicates there are likely five Lake Huron locust instars. Courtship flights by males begin in late July and continue into late fall (Ballard, 1991). Adults may be found in large numbers through the fall, most likely succumbing to the first hard frosts (Rabe, 1999). The hard frosts presumably make the habitat and vegetation unusable (Ballard, 1991).

Adults communicate through visual and auditory signals. Males crepitate in flight by flashing and snapping their wings, making a cracking noise with each snap. Crepitation occurs during a hovering courtship flight in which the males snap their wings two or three times while hovering. This display typically occurs on sunny days when temperatures reach 80 degrees F. Crepitation also occurs during flight elicited by a disturbance. On the ground, courting males stridulate by rubbing the femora against the forewings, producing a trill in bursts of two or three pulses. Females are cryptically colored against the light sand of the back dunes, whereas the males are virtually invisible on the gravel dominated upper beaches of the fore dunes. (Wilsmann, 1994).

The Lake Huron locust is a ground dwelling species. Host plant use is not restricted to grasses although they likely make up a large portion of their diet (Sholtens, 1996). Sholtens (1996) conducted a no-choice test study using different dune plants. Acceptable species for the Lake Huron locust included (in order of acceptability): *Calamovilfa longifolia* (a dune grass); *Ammophila breviligulata* (beachgrass); *Artemisia campestris* (wormwood); *Agropyron dasystachyum* (wheatgrass); and *Cirsium pitcheri* (Pitcher's thistle). Significant among the acceptable forbs is Pitcher's thistle which is a federally protected species restricted to the dunes (Sholtens, 1996). Unacceptable plant species were generally woody species but also included *Tanacetum huronense* (Lake Huron tansy) (Sholtens, 1996).

It is thought that locust nymphs scavenge dead insects to supplement the nitrogen intake in their diet. Nitrogen is widely recognized as the most common limiting factor for herbivorous insects. Sholtens (1997) concluded that the locust appear to be fairly randomly distributed in dune habitat with respect to plant species and seemed to eat most acceptable host plants, virtually at random, although some preference was shown for beach grass. Host plant specialization is not thought to be a factor limiting this species to shoreline dune habitats at this time (Rabe, 1999).

On sunny, windless days, the Lake Huron locust is most common on sparsely vegetated sands where they are evenly distributed with territories of several feet in diameter. In windy, overcast weather individuals are densely distributed within the heavy dune grass cover, apparently seeking shelter (Rabe, 1999).

Lake Huron locusts show a preference for the dry, loose sand characteristic of shoreline dune habitats and not stabilized, wooded dunes or most inland habitat (Sholtens, 1997). The biological reason for this preference is not known (Rabe, 1999).

## **HABITAT**

In Michigan, the Lake Huron locust is restricted to sparsely vegetated, high quality coastal sand dunes (Wilsman, 1994). A similar habitat affinity has been reported from Wisconsin (Ballard, 1989). In appropriate habitat, it occurs in high numbers and is always the dominant species. Where the open dunes grade into heavily vegetated or disturbed areas, their numbers quickly decline (Ballard, 1989).

## **DISTRIBUTION AND ABUNDANCE** **(rangewide/regionwide)**

The Lake Huron locust is a regional endemic species that is known only from Great Lakes sand dunes in northeastern Wisconsin, the eastern Upper Peninsula and northern Lower Peninsula of Michigan, and on the central Lake Huron shoreline of Ontario, Canada (Nature Serve, September 3, 2001). The Nature Conservancy gives it a global ranking of G2 (Globally imperiled) because of the limited range, narrow ecological tolerance and threatened habitat (Nature Serve, September 3, 2001).

## STATUS IN THE GREAT LAKES REGION

**Table 1:** State Rankings of the Lake Huron Locust

State	Ranking	Comments
Michigan	Threatened	S2/S3 (imperiled/vulnerable)
Wisconsin	Endangered	S1 (critically imperiled)

Some additional work on distribution of the species has been done in Michigan. Sholtens (1996) survey work nearly doubled the number of known occurrences for the species and he further indicates that only approximately half of the known coastal range has been surveyed intensively. It is clear that our knowledge of the distribution and range of this species is still incomplete (Sholtens, 1996). The southern extent of the range on both Lake Michigan and Huron need to have additional survey work done. The northward range contraction along Lake Huron suggested by Otte in 1984 was confirmed by Sholtens (1996). However, the exact northern and southern limits of *T. maritima* and *huroniana*, respectively, along Lake Michigan are still unknown (Sholtens, 1996). Sholtens (1996) further indicates that his 1996 data suggest that the populations of these two species may actually interdigitate. It has been suggested that *Trimerotropis maritima* (seaside locust) replaces the Lake Huron locust as an ecological equivalent in Michigan (Rabe, 1999) but further study is necessary.

Some work has been done on abundance at one location in Michigan. In 1989, Ballard (1991) used a triple catch method at the Grass Bay Preserve in Cheboygan County and estimated the population of Lake Huron locust to consist of approximately 5,200 to 6,500 individuals. In 1996, Sholtens used the same method at the same location and estimated the population to consist of approximately 1500 individuals. The apparent decline in population size could be due to: a trend of declining population, reduction in habitat suitability, variation in water levels, and variation in weather (Sholtens, 1996). In order to distinguish among the potential reasons for a change in population, an annual monitoring system at several sites would need to be established so that population estimates can be correlated with habitat and climatic variables (Sholtens, 1996).

The largest Lake Huron locust populations seem to be associated with areas of extensive, wide dunes (Rabe, 1999). Explaining the presence or absence of the locust from particular dune systems requires evaluation of a variety of factors, including geological process, biological interactions, and human influences. Interactions between changes in lake levels, availability of suitable habitat, and the locust's ability to colonize and recolonize areas could have significant impacts on the species' distribution pattern (Rabe, 1999).

## POPULATION BIOLOGY AND VIABILITY

Very little information exists. At present, information is lacking about minimum viable population size. The only population information available is that given previously.

## POTENTIAL THREATS AND MONITORING

### Present or Threatened Risks to Habitat or Range

The major threat to the Lake Huron locust is habitat loss (Nature Serve, September 13, 2001). In Michigan, parts of the locust's high-quality dune habitat have been degraded or destroyed by shoreline home and recreational development (Rabe, 1999). Range-wide, the habitat and community type lends itself to development or recreation use (Nature Serve, September 13, 2001). Although a dune-obligate species, the Lake Huron locust can apparently tolerate low to medium levels of human-related disturbance (Rabe, 1999). The apparently limited tolerance of the species to habitat change results in the loss of local populations when habitat is degraded, not just a reduction in population numbers (Nature Serve, September 13, 2001).

Sholtens (1996) reports that disturbance may be an important factor in the replacement of Lake Huron locust by another very similar sand-colored, yellow-banded grasshopper, *Spharagemon collare* that can occur in dune habitat typically used by the Lake Huron locust. Only one site he surveyed contained both species. *Spharagemon collare* was not found on any shoreline sites in good to excellent condition. All localities where it occurred were heavily disturbed with high numbers of invasive weeds (Sholtens, 1996). Where the character of the dunes is changed (by disturbance or successional changes to heavy vegetation cover), some report that the aggressive Carolina locust (*Dissosteira carolina*) and *Melanophis* sp. can displace the Lake Huron locust (Nature Serve, September 13, 2001). Additional study is necessary to determine if the hypothesis of competitive replacement of *S. collare* (on disturbed sites) and *T. maritima* (along southern edge of distribution) is correct or if other ecological restrictions are at work (Sholtens, 1996).

The precise level of disturbance that can be tolerated has not been determined. In Emmet County where there is extensive habitat available, large numbers of locusts are present even though the area has some forms of human disturbance including foot traffic, housing developments, and previous heavy ORV use (Sholtens, 1996). Healthy locust populations have been maintained on private lands in several places as long as the dune system is intact (Sholtens, 1996). Housing developments which appear to have the most impact on locust populations are those which occur where the dune system was narrow and the construction of houses and swimming beaches have removed the dune and its vegetation (Sholtens, 1996). Severe destruction, where the dunes have been mechanically flattened and the vegetation has been removed to create swimming and volleyball areas, reduces or eliminates the population (Sholtens, 1996).

### Commercial, Recreational, Scientific or Educational Overutilization

There is no indication that the Lake Huron locust is threatened by commercial, recreational, scientific or educational overutilization of the species itself.



### **Disease or Predation**

Unknown.

### **Inadequacy of Existing Regulatory Mechanisms**

N/A.

### **Other Natural or Human Factors Affecting Continued Existence of Species**

Fluxuations in lake levels may affect this species by abruptly narrowing the high quality shoreline dunes during high water years. It is possible that this leads to dramatic local population declines or extirpation when beach width falls below a minimum width threshold that cannot support the species (Nature Serve, September 13, 2001).

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

Sholtens (1996) indicates that the Pt. aux Chenes occurrence on the Hiawatha National Forest which has at least 2-3 miles of dune is one of the four largest and most stable populations in Michigan. A portion of the Pointe aux Chenes occurrence is under consideration as a candidate Research Natural Area by the Hiawatha National Forest and the North Central Research Station.

The other three large populations, not on National Forest, are Sturgeon Bay (Emmet Co.), Sleeping Bear Dunes National Lakeshore (National Park Service Management) and much of the Lake Superior shore between Whitefish Point and Grand Marais, Michigan.

**Table 2:** Number of Occurrences and Land Ownership by National Forest\*

<b>Forest</b>	<b>Number of Occurrences</b>	<b>County</b>	<b>Land Ownership</b>	<b>Comments</b>
Hiawatha NF	1	Mackinac	Mostly Federal; one private parcel with water frontage	Incomplete inventories
Huron-Manistee NF	1	Mason	Federal, not known if habitat extends onto surrounding private lands	Incomplete inventories

- Information provided by Kenneth Ennis and Steve Sjogren.

**Table 3:** Occurrences by County, State and Year

State	County of Occurrence (Number of Occurrences)	Number of Occurrences and Year*
Michigan	Alcona (4)	1996
	Alger (2)	1997
	Alpena (2)	1996
	Antrim (1)	1995
	Charlevoix (15)	1923-1999
	Chippewa (4)	1914-1997
	Emmet (9)	1921-1996
	Iosco (2)	1937-1996
	Leelanau (2)	1922-1996
	Luce (4)	1989-1997
	Mackinac (9)	1920-1997
	Manistee (3)	1996
	Mason (2)	1991-1996
	Presque Isle (4)	1996
Schoolcraft (9)	1997-2000	
Wisconsin	Door (2)	1988

- County occurrences from Michigan Natural Features Inventory, March 13, 2001.
- County occurrences from Natural Heritage Inventory Data, Wisconsin, October 1, 2001.

## SUMMARY OF EXISTING MANAGEMENT ACTIVITIES

Protection of its dune habitat is the most significant action that can be taken for the Lake Huron locust (Wilsmann, 1994). The amount of dune habitat that needs to be protected should be large enough to allow natural process to locally change the nature of the dunes through blowouts (which creates more habitat) and stabilization (which reduces habitat) Wilsmann, 1994).

### Past and Current Conservation Activities

The Michigan Department of Natural Resources and the Michigan Chapter of The Nature Conservancy have commissioned several studies (Ballard, 1991; Sholtens 1996 and 1997) to improve the information available for this species.

## RESEARCH AND MONITORING

### Existing Surveys, Monitoring and Research

Some survey work has been done in Michigan by Sholtens in 1996 and 1997. No formal monitoring has been identified. Research on the species has been limited to the work of Ballard (1991): population estimate, distribution, and observations; and Sholtens (1996):

current overall range, degree of co-occurrence with other rare elements, phenology, host plants, and population estimate.

### **Survey Protocol**

No survey protocol has been established. Nymphs can be found before mid-July. Adults are present from early to mid-July into October until the time of frequent heavy frosts and snow. Individuals become active between 9:30 and 10:00 am, after the sun rises far enough to warm the fore dune shoreline (Rabe, 1999).

### **Research Priorities**

Research priorities include (Rabe, 1999):

- Surveys to verify the current ranges of the Lake Huron locust, the seaside locust (*T. maritima*) and *S. collare*.
- Examination of the ecological relationships between these species.
- Research on the life history and ecology of the Lake Huron locust to develop a stronger base for management and conservation efforts.
- Determination of the microhabitat requirements of the species over the course of its lifespan.
- Information about normal movement and dispersal patterns to better understand the species' recolonization capabilities.
- Long-term monitoring of populations including a range of geographic sites and human disturbance in order to make management recommendations.

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### **Information Requests**

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### **Review Requests**