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Estimación de la distribución de los árboles y arbustos de la familia Solanaceae en México para su inclusión en la Lista Roja de la UICN

TESIS

PARA OBTENER EL GRADO ACADÉMICO DE: MAESTRO EN CIENCIAS BIOLÓGICAS (ECOLOGÍA Y CONSERVACIÓN)

Que presenta:

BIOL. DAGOBERTO VALENTÍN MARTÍNEZ

Asesor: Dr. Juan Carlos Montero Castro

Co-Asesora: Dra. Marie-Stéphanie Samain

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RESUMEN

Las plantas vasculares se encuentran ante el riesgo de extinción debido a diversas amenazas. Una de cada cinco está en peligro de extinción. El 19 % de los árboles se encuentran amenazados. Ante esto, la evaluación del riesgo y la asignación de una categoría de amenaza son premisas importantes para su conservación. El presente estudio evalúa el nivel de riesgo que presentan las especies de árboles y arbustos de Solanaceae en México, además se estiman áreas de distribución geográfica potencial actual y futura. Las evaluaciones de conservación se realizaron siguiendo los criterios de la Lista Roja de Especies Amenazadas de la UICN y utilizando el Servicio de Información de Especies. Para la ejecución de los modelos de distribución se utilizó el método de máxima entropía con el programa MaxEnt implementando la plataforma Wallace. Se recabó información de localidades de presencia de las especies. Se utilizaron variables ambientales de 2.5 minutos de resolución. Los modelos obtenidos fueron proyectados al año 2050 utilizando un escenario de cambio climático moderadamente pesimista. Como resultado se evaluaron 42 especies de Solanaceae: *Cestrum* (15 especies), *Lycianthes* (12), *Solanum* (8), *Witheringia* (3) y *Brachistus*, *Schraderanthus*, *Schultesianthus* y *Solandra* con una cada uno. La categoría "En Peligro Crítico" se asignó a dos especies, "En Peligro" a 10, "Vulnerable" a 12 y "Preocupación Menor" a 18. Se generaron modelos de distribución potencial para 29 especies que presentaban más de 20 datos de colecta: *Lycianthes* (11 modelos), *Cestrum* (10), *Solanum* (5) y *Witheringia* (3). Las proyecciones a futuro indican que la mayoría de las especies de este estudio perderán área de distribución potencial. *Solanum chiapasense* aumentara su área de distribución potencial 13.1 % con respecto a la actual. Especies que se desarrollan en lugares templados estarán más afectadas en comparación con las especies que se encuentran en lugares secos.

Palabras clave: Evaluación, Categoría, MaxEnt, Cambio climático, Distribución Potencial.

ABSTRACT

Vascular plants are at risk of extinction due to various threats. One in five is in danger of extinction. 19% of the trees are threatened. Given this, risk assessment and the assignment of a threat category are important premises for its conservation. The present study evaluates the level of risk presented by the species of trees and shrubs of Solanaceae in Mexico, in addition, current and future potential geographic distribution areas are estimated. Conservation assessments were carried out following the criteria of the IUCN Red List of Threatened Species and using the Species Information Service. For the execution of the distribution models, the maximum entropy method was used with the MaxEnt program implementing the Wallace platform. Information was collected on localities of presence of the species. Environmental variables with a resolution of 2.5 minutes were used. The models obtained were projected to the year 2050 using a moderately pessimistic climate change scenario. As a result, 42 species of Solanaceae were evaluated: *Cestrum* (15 species), *Lycianthes* (12), *Solanum* (8), *Witheringia* (3) and *Brachistus*, *Schraderanthus*, *Schultesianthus* and *Solandra* with one each. The category "Critically Endangered" was assigned to two species, "Endangered" at 10, "Vulnerable" at 12 and "Least Concern" at 18. Potential distribution models were generated for 29 species that presented more than 20 collection data: *Lycianthes* (11 models), *Cestrum* (10), *Solanum* (5) and *Witheringia* (3). *Solanum chiapasense* will increase its potential distribution area 13.1% compared to the current one. Species that thrive in temperate places will be more affected compared to species that are found in dry places.

Keywords: Evaluation, Category, MaxEnt, Climate change, Potential distribution.

1. INTRODUCCIÓN

Las plantas silvestres se encuentran bajo la amenaza creciente de extinción (Sharrock, 2012). La biodiversidad disminuye a un ritmo sin precedentes. Se estima que existen alrededor de 400,000 especies de plantas vasculares en el planeta, de las cuales al menos una de cada cinco está en peligro de extinción (BGCI, 2020). En el caso de los árboles, alrededor del 19 % de las especies están en peligro (BGCI, 2020). La destrucción del hábitat, las especies invasoras, la sobreexplotación, la contaminación y el cambio climático son las causas principales de dicha pérdida (Sarukhán *et al.,* 2009).

La riqueza de plantas vasculares de México está compuesta por alrededor de 23,314 especies y cerca de 49.8 % son exclusivas del territorio mexicano (CONABIO, 2012; Villaseñor, 2016). Los números ubican a México en quinto y sexto lugar en riqueza y endemismo, respectivamente. En México, los ecosistemas naturales han sido utilizados por el hombre; sin embargo, el grado de impacto más notable ha tenido lugar en los últimos 50 años. Este período en particular se caracteriza por una tasa muy alta de cambio en la cobertura vegetal y el uso del suelo (Challenger y Dirzo, 2009). Hasta el año 2007, alrededor del 29% de la cubierta vegetal original en México se había transformada en otros usos. Para ese año, las selvas perdieron el 42 % de su cobertura, seguidas por el bosque mesófilo de montaña con 40 % y el bosque templado con 27 % (CONABIO, 2012).

La evaluación del riesgo y la asignación de una categoría son premisas importantes para el diseño de planes y políticas de conservación, especialmente para las especies que se sospecha presentan peligro de extinción (López-Toledo *et al.,* 2011). Para diseñar una estrategia para la conservación y el manejo de esas especies, es necesario identificar su distribución geográfica actual y evaluar su abundancia, variabilidad genética y dinámica poblacional.

El modelado de nicho ecológico (ENM, por sus siglas en inglés) predice la presencia de una especie con base en su distribución geográfica, representa una herramienta importante para estimar el nicho fundamental de las especies objetivo y mapear sus

distribuciones potenciales en relación con las condiciones ambientales (López-Toledo *et al.,* 2011).

Con base en lo anterior se pretende evaluar el nivel de riesgo en que se encuentran las especies de árboles y arbustos de la familia Solanaceae en México, utilizando las categorías y criterios propuestos para la Lista Roja de la UICN (UICN, 2012).

En México, el conocimiento de la presencia de Solanaceae es heterogéneo. Algunas zonas han sido estudiadas, como, por ejemplo: Aguascalientes (Sierra-Muñoz *et al.,* 2015), Jalisco (Cuevas-Arias *et al.,* 2008), Valle de México (Rzedowski, 2005), Veracruz (Nee, 1986,1993), pero en otras no hay información (Martínez *et al*., 2017). Ninguna especie de Solanaceae forma parte de la lista de especies en riesgo de la NOM-059-SEMARNAT-2010 (SEMARNAT, 2010; Martínez *et al*., 2011), tampoco los apéndices publicados en la Convención sobre el Comercio Internacional de Especies Amenazadas de Fauna y Flora Silvestres (CITES, por sus siglas en inglés) (CITES, 2019). Por su parte, las especies incluidas en La Lista Roja de la UICN representan menos de la mitad de las especies presentes en el país (UICN, 2019).

1.1. Familia Solanaceae

La familia Solanaceae se encuentra entre las más grandes de las angiospermas (Martínez *et al*., 2011). Incluye 90 géneros y entre 3000-4000 especies (Solanaceae Source, 2020). Tiene una distribución cosmopolita, pero habita principalmente las regiones tropicales en el nuevo mundo (Gentry y Standley, 1974; Nee, 1986; Sierra-Muñoz *et al*., 2015, Solanaceae Source, 2020). En México, esta familia está representada por 34 géneros y 381 especies y el género *Solanum* es el más diverso con 130 especies (Martínez *et al*., 2017). Algunas especies tienen importancia económica y alimenticia como la papa, el jitomate y el chile; medicinales como el tabaco y la atropa; tóxicas como el toloache y Nierembergia; ornamentales como petunia, floripondio y huele de noche (Gentry y Standley, 1974; Long, 2001; Martínez *et al*., 2017).

1.2. La Lista Roja de la Unión Internacional para la Conservación de la Naturaleza (UICN)

La Lista Roja de las Especies Amenazadas de la UICN contiene información acerca del riesgo de extinción de las especies. Esta organización ha desarrollado y propuesto criterios cuantitativos para asignar a las especies a una de nueve categorías, con base a los datos de tendencias de población como son tamaño y estructura, área de distribución geográfica y las amenazas a las que son propensas. Toda la información obtenida es ampliamente utilizada como base para tomar futuras medidas de conservación de las especies vegetales que se encuentran amenazadas y actuar como fuente de información para apoyar en la planificación de la conservación en el terreno (https://www.conservationtraining.org, consultada en septiembre de 2017).

1.2.1. Los criterios de La Lista Roja de la UICN

Los criterios cuantitativos de la Lista Roja son indicadores biológicos de las poblaciones **(Apéndice 1)**. Sirven para determinar si un taxón está o no amenazado. En caso de estarlo, asigna una categoría de amenaza (En Peligro Crítico, En Peligro o Vulnerable). A su vez, los criterios incluyen subcriterios que deben utilizarse para justificar los resultados de la evaluación (UICN, 2017). Con excepción de los microorganismos, los criterios pueden aplicarse a nivel específico o infraespecífico (UICN, 2012).

De manera resumida los cinco criterios son los siguientes (más detalles en el **Apéndice 1** Criterios de Lista Roja de la UICN):

A. Disminución poblacional (pasada, actual y/o proyectada)

B. Tamaño del área de distribución geográfica, y su fragmentación, disminución o fluctuaciones.

C. Población de pequeño tamaño, fragmentación, declive y fluctuaciones.

D. Población muy pequeña o con distribución muy restringida.

E. Análisis cuantitativo del riesgo de extinción (p. ej., análisis de viabilidad poblacional).

1.2.2. Las categorías de La Lista Roja de la UICN

Las categorías de la Lista Roja constituyen un sistema de fácil comprensión para clasificar a las especies con un alto riesgo de extinción global (UICN, 2012) **(Figura 1)**. Existen nueve categorías y su definición es como sigue:

- **Extinto (EX):** Un taxón se considera "Extinto" cuando no queda ninguna duda razonable de que el último individuo ha muerto.
- **Extinto en Estado Silvestre (EW):** Un taxón se considera "Extinto en Estado Silvestre" cuando sólo sobrevive en cultivo, en cautividad o como población naturalizada fuera de su distribución original.
- **En Peligro Crítico (CR):** Un taxón se considera "En Peligro Crítico" cuando la mejor evidencia disponible indica que cumple cualquiera de los criterios "A" a "E" para estar En Peligro Crítico (ver Tabla 1).
- **En Peligro (EN):** Un taxón se considera "En Peligro" cuando la mejor evidencia disponible indica que cumple cualquiera de los criterios "A" a "E" para estar En Peligro (ver Tabla 1).
- **Vulnerable (VU):** Un taxón se considera "Vulnerable" cuando la mejor evidencia disponible indica que cumple cualquiera de los criterios "A" a "E" para ser Vulnerable (ver Tabla 1).
- **Casi Amenazado (NT):** Un taxón se considera "Casi Amenazado" cuando ha sido evaluado según los criterios y no satisface, actualmente, los criterios para En Peligro Crítico, En Peligro o Vulnerable, pero está próximo a satisfacer los criterios, o posiblemente los satisfaga, en un futuro cercano.
- **Preocupación Menor (LC):** Un taxón se considera en "Preocupación Menor" cuando, habiendo sido evaluado, no cumple ninguno de los criterios que definen las categorías de "En Peligro Crítico", "En Peligro", "Vulnerable" o "Casi Amenazado".
- **Datos Insuficientes (DD):** Un taxón se incluye en la categoría de "Datos Insuficientes" cuando no hay información adecuada para hacer una evaluación,

directa o indirecta, de su riesgo de extinción basándose en la distribución y/o condición de la población.

- **No Evaluado (NE):** Un taxón se considera "No Evaluado" cuando todavía no ha sido clasificado en relación a estos criterios.

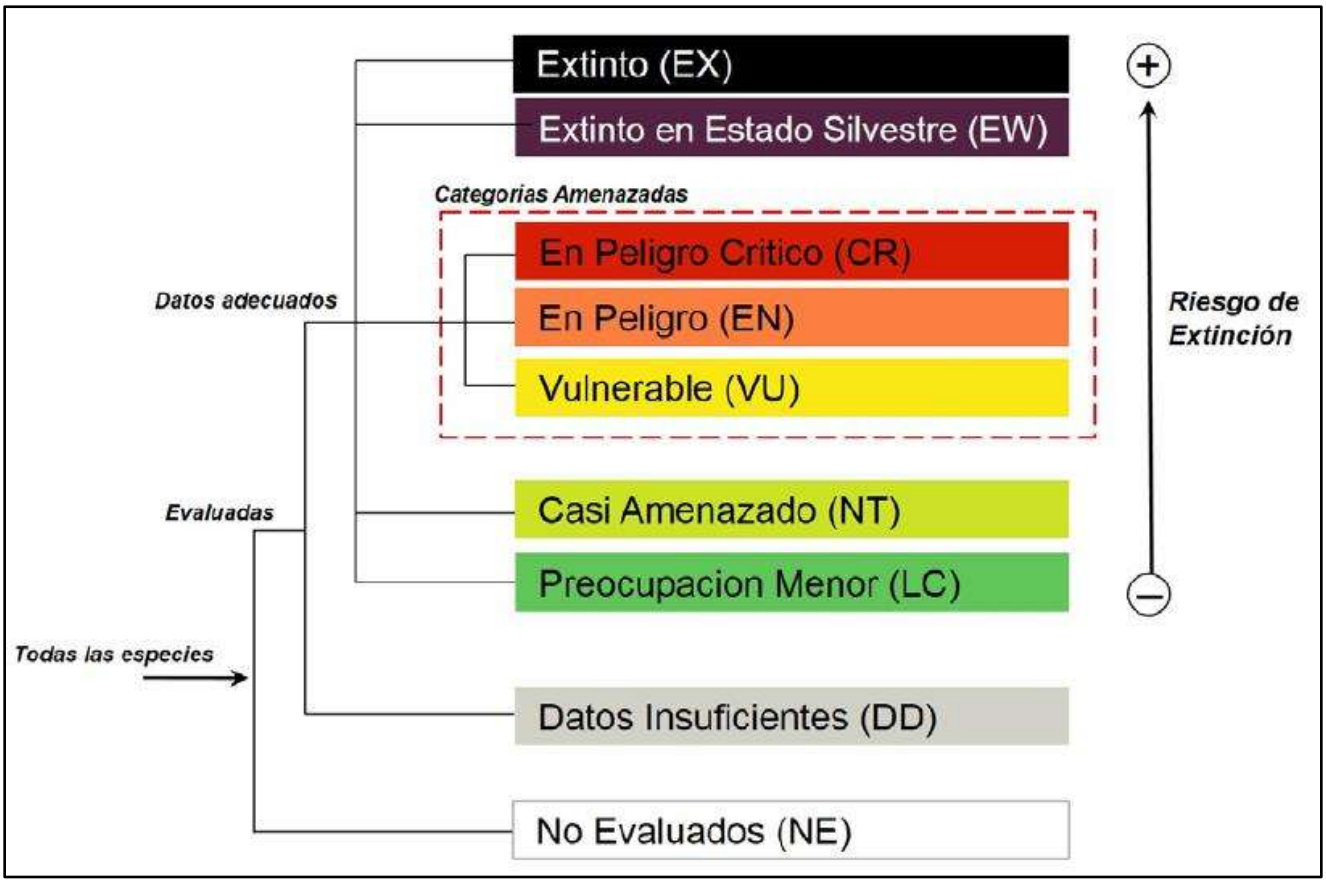

Figura 1. Estructura de las categorías (tomada de Las Categorías y Criterios de la Lista Roja de la UICN 3.1, 2012).

1.2.3. Especies evaluadas por La Lista Roja

Hasta 2019, la Lista Roja contenía 341 especies de Solanáceas. De estas, 115 están presentes en México siendo *Physalis* y *Solanum* los géneros con más especies evaluadas con 61 y 36 respectivamente. Solo 11 fueron consideraras amenazadas en esa epoca. **Tabla 1**.

Tabla 1. Lista de las especies amenazadas de Solanaceae según la Lista Roja (UICN, 2019). Las especies marcadas con asterisco están presentes en México.

Especie	Categoría	Especie	Categoría
Brugmansia arborea	Extinto en Estado Silvestre (EW)	**Physalis lignescens*	En Peligro (EN)
Brugmansia aurea	Extinto en Estado Silvestre (EW)	**Solanum oxycarpum*	En Peligro (EN)
**Physalis muelleri*	En Peligro Crítico (CR)	**Solanum schenckii*	En Peligro (EN)
**Physalis tehuacanensis*	En Peligro Crítico (CR)	**Solanum tarnii*	En Peligro (EN)
**Capsicum lanceolatum*	En Peligro (EN)	**Physalis aggregata*	Vulnerable (VU)
**Physalis greenmanii*	En Peligro (EN)	**Physalis minimaculata*	Vulnerable (VU)
**Physalis hastatula*	En Peligro (EN)		

1.3. Modelos de distribución de especies

La presencia de una especie depende de factores como la temperatura, precipitación, tipo de suelo, entre otros. El clima resulta ser uno de los más importantes ya que condiciona la ausencia o presencia de los seres vivos (Romero y García, 2014). El cambio climático global se ve reflejado en aumentos de temperatura, precipitaciones intensas, así como fuertes olas de calor y grandes sequias (Díaz-Cordero, 2012). Entonces, un efecto del cambio climático será la modificación del rango de distribución de los biomas y sus especies. Las especies tendrían que migrar hacia latitudes y altitudes con condiciones climáticas adecuadas y diferentes a las que se encuentran hoy en día (Tinoco-Rueda *et al.,* 2011; Díaz-Cordero, 2012; Gutiérrez y Trejo, 2014).

Los Sistemas de Información Geográfica (SIG) han sido utilizados en la conservación de la biodiversidad. Estas herramientas estiman la distribución potencial de las especies mediante el modelado de nicho ecológico (Guisa y Zimmermann, 2000; Leal-Nares *et al.,* 2012, Hernández-Ramos, 2018). La modelación del nicho ecológico constituye un campo nuevo de investigación con un crecimiento verdaderamente explosivo en los últimos 15 años (Romero y García, 2014). Se han desarrollado importantes técnicas aplicadas a la generación de modelos de distribución de especies, gracias a la amplia oferta de lenguajes de programación, la amplia difusión de información geoespacial y el desarrollo de los SIG (De Pando y Peñas de Giles, 2007).

Los modelos de distribución de especies predicen áreas dónde se encuentren las condiciones ambientales adecuadas para que la especie prospere. Los modelos correlacionan datos de localidades georreferenciadas donde se ha confirmado la presencia de la especie con una serie de variables ambientales que actúan como predictoras (Villaseñor y Telléz-Valdés, 2004; De Pando y Peñas, 2007; Lagos *et al.,* 2013; Palma-Ordaz y Delgadillo-Rodríguez, 2014). Los modelos permiten evaluar hipótesis biogeográficas, ecológicas, taxonómicas o de conservación (Villaseñor y Telléz-Valdés, 2004). Además, ayudan a la detección de especies raras en campo, tal y como sucedió con *Solanum pseudoamericanum*, una especie que pasó de tener una distribución restringida en una pequeña área a una distribución amplia en los Andes peruanos (Särkinen *et al.,* 2013).

2. ANTECEDENTES

2.1. Antecedentes de evaluaciones

La pérdida de biodiversidad es una realidad. El problema lo enfrentan todos los niveles taxonómicos: familia, género, especie o niveles infraespecificos. Pero su intensidad no es homogénea. Debido a esta problemática, investigadores evalúan variables biológicas, poblacionales y de distribución geográfica de una especie para asignar una categoría de riesgo. Se pueden mencionar los siguientes:

Walker y Gillet (1998) realizan el primer esfuerzo por evaluar el nivel de riesgo en que se encuentran las plantas vasculares a nivel mundial. Identificaron 33,798 especies amenazadas distribuidas en alrededor de 200 países, estimando que alrededor del 12.5 % de la flora vascular del planeta se encuentra amenazada. Por su parte Vivero *et al.* (2005) evaluaron el estado de conservación de árboles y arbustos endémicos a Etiopía y Eritrea, además de las especies de árboles guatemaltecos (Vivero *et al.,* 2006). Para el género *Quercus*, Oldfield y Eastwood (2007) evaluaron 208 especies de las aproximadamente 500 existentes. A su vez, Eastwood *et al.* (2009) evaluaron 96 especies de árboles para la región de Asia Central. Mientras que para México González-Espinoza *et al*. (2011) evaluaron las especies de árboles que crecen en los bosques de niebla del país estimando que el 60 % de la flora arbórea de este tipo de vegetación está amenazada.

2.2. Antecedentes de modelos de distribución de especies

En México los modelos de distribución de especies se han aplicado a diferentes grupos de plantas. Uno de los más estudiados han sido las coníferas, ya que representan un recurso importante en la industria forestal (Leal-Nares *et al.,* 2012; Pérez-Miranda *et al.,* 2012; Avila *et al.,* 2014; Martínez-Méndez *et al.,* 2016).

En el caso del género *Pinus* se han generado modelos para la distribución de diferentes especies. Pérez-Miranda *et al.* (2012) compararon la distribución potencial actual de *P. patula* y *P. pseudostrobus* bajo escenarios de cambio climático en el Estado de México. En el estado de Michoacán, Leal-Nares *et al.* (2012) estudiaron la distribución potencial de

P. martinezii en la cuenca del lago de Cuitzeo. A su vez, Avila *et al.* (2014) generaron un modelo para la distribución potencial de *P. herrerae* en la parte occidente del estado de Jalisco. En tiempos más recientes, Sosa (2017) generó los modelos de distribución potencial de seis especies de pinos endémicos al país. Mientras que García-Aranda *et al.* (2018) estimaron la distribución potencial de *P. cembroides*, *P. nelsonii* y *P. culminicola* en la Sierra Madre Oriental. Para el género *Abies* se han generado modelos de distribución con el objetivo de establecer similitudes entre el nicho ecológico de las especies presentes en el país (Martínez-Méndez *et al.,* 2016). A un nivel más específico, Pérez-Miranda *et al.* (2017) determinaron la distribución potencial de *A. religiosa* bajo escenarios de cambio climático en la zona del Eje Neovolcánico Transversal.

Las leguminosas son otro grupo de plantas las cuales han sido estudiadas con esta aproximación. Un ejemplo es el estudio de Guevara-Escobar *et al.* (2008) quienes modelaron la distribución potencial de algunas especies útiles de leguminosas arbustivas en el altiplano central de México. Por su parte, Palacios *et al.* (2016) generaron la distribución potencial de *Prosopis laevigata* en tres provincias fisiográficas del país. Mientras que Garza-López *et al.* (2018) determinaron la distribución potencial de *Lysiloma latisiliquum* en la región de la península de Yucatán.

Además de los grupos ya mencionados, existen diversas investigaciones enfocadas hacia especies de otras familias. Villaseñor y Téllez-Valdés (2004) modelaron la distribución potencial de cuatro especies endémicas a México del género *Jefea* (Asteraceae). López-Toledo *et al.* (2011) generaron un modelo de la distribución histórica y futura de dos especies del género *Guaiacum* (Zygophyllaceae) presentes en el país para evaluar su estado de conservación. Luna-Cavazos *et al.* (2012) modelaron la distribución geográfica de las especies tuberosas de *Solanum* en México, quienes mencionaron que el país es un centro importante de diversidad para este grupo teniendo su mayor riqueza en la región montañosa del centro México. Flores (2015) realizó un modelo de distribución contemporánea y futura de *Laelia speciosa*, una orquídea endémica de México y su hospedero. Mientras que Hernández Ramos *et al.* (2018) determinaron la distribución histórica, actual y futura de *Cedrela odorata* (Meliaceae) dentro del país.

3. HIPÓTESIS

Dada la limitada distribución con la que se han reportado las especies de árboles y arbustos de Solanaceae en México y debido a las diferentes amenazas a las que están sometidas, es probable que su estado de conservación sea considerado como amenazado. Además, teniendo en cuenta que los cambios en el clima son las principales causas que alteran la distribución de las especies, se espera que las Solanaceae se verán afectadas en el futuro.

4. OBJETIVOS

4.1. Objetivo general

- Evaluar el estado de conservación de las especies de árboles y arbustos de la familia Solanaceae endémicas y casi-endémicas a México.

4.2. Objetivos específicos

- Proporcionar información taxonómica, ecológica, y geográfica de las especies en estudio.
- Analizar las amenazas de las especies en estudio.
- Estimar áreas de distribución geográfica y distribución geográfica potencial de las especies.
- Capturar toda la información obtenida en la herramienta SIS de la UICN, para la posterior publicación de las fichas en la Lista Roja en línea.

5. MATERIALES Y MÉTODOS

5.1. Selección de especies

La selección de las especies se llevó a cabo utilizando dos criterios: 1) especies arbóreas y arbustivas; 2) especies nativas de México con un rango de distribución extendida a Centroamérica. Se consultó la información incluida en la base de datos del Herbario Nacional del Instituto de Biología de la Universidad Nacional Autónoma de México (MEXU) y los artículos más recientes con información acerca de la distribución de las especies de la familia Solanaceae (Villaseñor, 2016; Martínez *et al.,* 2017). Se evaluaron 42 especies de Solanaceae, ubicados en 8 géneros **(Tabla 2)**.

Tabla 2. Número de especies evaluadas por género.

Género	No. De especies
Cestrum	15
Lycianthes	12
Solanum	8
Witheringia	3
Brachistus	1
Schraderanthus	1
Schultesianthus	1
Solandra	1

5.2. Evaluaciones de la Lista Roja

Las evaluaciones de conservación para las especies seleccionadas se realizaron siguiendo los criterios de la Lista Roja de Especies Amenazadas de la UICN (UICN, 2012) y utilizando el Servicio de Información de Especies (SIS) de la UICN, el cual es una base de datos en Internet para almacenar y administrar las evaluaciones de conservación de esta organización.

Para cada una de las especies se recopiló información acerca de seis aspectos que incluyen: distribución, ecología, amenazas, usos y conservación. Para esto se consultó una amplia

variedad de recursos para recopilar toda la información requerida. Las fuentes incluyeron: las principales floras regionales como la Flora del Valle de México (Rzedowski, 2005), Flora de Veracruz (Nee, 1986 y 1993), Flora de Guatemala (Gentry y Standley, 1974), Flora de Nicaragua (Tropicos, 2019) y Los Árboles y Arbustos de México (Standley, 1924), artículos científicos, tesis, informes, fuentes en línea como BGCI.org, CONABIO.gob.mx, JSTOR.org, Tropicos.org, ThePlantList.org. Se consultaron los ejemplares botánicos depositados en las principales colecciones científicas del país: Horto-Herbario del Colegio de Postgraduados (CHAPA), Herbario de la Escuela Nacional de Ciencias Biológicas del IPN (ENCB), Herbario de la Universidad de Guadalajara (IBUG), Herbario del Instituto de Ecología, A. C. en Pátzcuaro (IEB), Herbario Nacional del Instituto de Biología de la Universidad Nacional Autónoma de México (MEXU) y el Herbario del Instituto de Ecología A. C. en Xalapa (XAL). Para las especies que no contaban con registros en los herbarios antes mencionados, se consultaron los registros de la base de datos proporcionados en el portal en línea de Global Biodiversity Information Facility (GBIF) (https://www.gbif.org/ consultada en diciembre de 2019). Con la información obtenida se elaboraron bases de datos para cada una de las especies, depurando los datos, verificando que la información de cada ejemplar fuera correcta, principalmente las coordenadas geográficas y la identificación, ya que se dio prioridad a aquellos ejemplares revisados por especialistas de la familia.

La extensión de presencia (EOO) se define como el área contenida dentro de los límites imaginarios continuos más cortos que incluyen todos los sitios conocidos en los que un taxón se encuentra presente, mientras que el área de ocupación (AOO) como la superficie dentro de la "extensión de presencia" que es ocupada por un taxón (UICN, 2012). Estos aspectos importantes a tomar en cuenta en las evaluaciones fueron calculados mediante la herramienta geoespacial GeoCAT (Bachman *et al.,* 2011), utilizando la información de presencia de las especies obtenida de los herbarios antes mencionados.

Toda la información que se obtuvo fue depositada en el Servicio de Información de Especies (SIS), en la cual se le asignó a cada una de las especies una de las nueve categorías propuestas por la Lista Roja. El Servicio de Información asigna la categoría correspondiente tomando en cuenta la calidad y la importancia de los datos proporcionados.

Finalmente, cada evaluación fue enviada a un miembro revisor de la Lista Roja de la UICN para su revisión, aprobación y posterior publicación en línea.

5.3. Modelos de distribución de especies

5.3.1. Localidades de presencia

Para la ejecución de los modelos de distribución se recabó información acerca de las localidades de presencia de las diferentes especies de Solanaceae incluidas en este estudio. Esta información se obtuvo de la revisión de los ejemplares botánicos depositados en las colecciones científicas mencionadas en la sección anterior. Con la información obtenida se elaboraron bases de datos las cuales fueron depuradas cuidadosamente, verificando que la información fuera correcta, especialmente en sus datos de ubicación e identificación, se excluyeron los registros que presentaban una cercanía entre sí menor a 0.5 km.

5.3.2. Selección de variables ambientales

Se utilizaron variables ambientales de 2.5 minutos de arco de resolución disponibles en WorldClim (www.worldclim.org). Las variables ambientales Temperatura media del trimestre más húmedo (Bio8), Temperatura media del trimestre más seco (Bio9), Precipitación del trimestre más cálido (Bio18) y Precipitación del trimestre más frio (Bio19) fueron excluidas debido a que muestran anomalías espaciales en forma de discontinuidades impares entre píxeles vecinos (Escobar *et al.,* 2014). De las 15 variables restantes se seleccionaron aquellas que presentaron una menor tendencia a la colinealidad y con esto reducir información redundante. Para esto se llevó a cabo un análisis de correlación de pares de variables con el programa estadístico R (R Core Team, 2018). Se detectaron las variables con un valor de correlación > 0.90, las cuales fueron excluidas del análisis.

5.3.3. Modelado de distribución de especies

Para modelar la distribución de las diferentes especies de Solanaceae incluidas en este proyecto se utilizó el método de máxima entropía con el programa MaxEnt (Phillips *et al.,* 2006), implementado en la plataforma Wallace (Kass *et al.,* 2017). La finalidad de MaxEnt es estimar la distribución de probabilidad del objetivo a través de la distribución de probabilidad de máxima entropía (cercana a la uniforme (Phillips *et al.,* 2006; Cruz-Cárdenas *et al.,* 2014). Una de las ventajas importantes que ofrece MaxEnt es el requerimiento de solo datos de presencia y la información ambiental del área de estudio (Phillips *et al.,* 2006).

Los registros de localidades de colecta se dividieron en cuatro grupos, utilizándose alternativamente para obtener el modelo (75 % para entrenamiento) y probar su desempeño predictivo (25 % para validación). Las pruebas de modelado se realizaron en una región de amortiguamiento definida por el polígono mínimo convexo de un grado de amplitud que agrupa a todos los puntos de presencia de la especie en el espacio geográfico. Se realizó un muestreo de 10,000 puntos al azar en la región de amortiguamiento para acotar el rango de condiciones ambientales asociadas con la construcción del modelo. Para cada especie se implementaron diferentes modelos modificando la complejidad de la modelación al variar diferentes argumentos de MaxEnt, como son las características de clase (Linear, Linear-Quadratic e Inge) y el multiplicador de regularización (de 0.5 a 3.5).

Para seleccionar el mejor modelo producido de cada especie se tomaron en cuenta dos índices. El primero fue el valor resultante del análisis de ROC parcial, un método que pondera los errores de omisión, no considera las ausencias y evalúa solo el rango de valores de predicción (Monterrubio-Rico *et al.,* 2016). Los valores de este índice abarcan el intervalo que va de 0 a 2, donde 1 equivale a un modelo totalmente al azar (Garza-López *et al*., 2016). Para esto se utilizó la plataforma en línea NicheToolBox (Osorio-Olvera *et al.,* 2018) donde se cargaron tanto el archivo resultante del modelo en formato ASC y el archivo CSV con la información de los puntos georreferenciados, se hizo el ajuste para correr el análisis usando como parámetros 0.50 de proporción de omisión, 50 % de puntos aleatorios y un número de 1,000 iteraciones para el bootstrap. El segundo fue el Criterio de Información de Akaike

(AIC), considerando el valor más bajo, ya que los modelos que presentan esas métricas son considerados como los óptimos entre los modelos resultantes (Muscarella *et al.,* 2014).

El formato de salida de los modelos fue el logístico. Para crear mapas binarios de presencia/ausencia predicha se estableció un valor del umbral considerando la presencia de entrenamiento de 10 percentil, asumiendo que todos los valores por encima del valor del umbral representan presencia, lo que también se puede interpretar como distribución potencial. Cada modelo considerado como el mejor se guardó en un archivo en formato GEOTIFF.

5.3.4. Proyección de los modelos hacia un escenario climático futuro

Los modelos obtenidos de la distribución actual de las diferentes especies de Solanaceae fueron proyectados hacia el año 2050. Las capas climáticas utilizadas se tomaron directamente de la página de WorldClim (www.worldclim.org).

En este estudio se utilizó el escenario de cambio climático RCP6.0 para el año 2050 del modelo de circulación global CCSM4 (Community Climate System Model 4, www.cesm.ucar.edu/models/ccsm4.0/, consultada en enero 2020). El escenario RCP6.0 utiliza una alta tasa de emisiones de gases de efecto invernadero por lo que las proyecciones de temperatura incluyen el calentamiento global continuo hasta 2100, donde los niveles de CO_2 aumentaran a 670 ppm para 2100, lo que hará que la temperatura global aumente aproximadamente 3-4 °C para el año 2100 (https://sos.noaa.gov/datasets/climate-model-temperature-change-rcp-60-2006-2100, consultada en enero 2020). El mapa resultante de cada proyección se descargó de la plataforma Wallace como un archivo en formato GEOTIFF.

Al igual que los modelos de distribución actual, las proyecciones hacia el futuro se llevaron a cabo mediante el programa MaxEnt (Phillips *et al.,* 2006) y utilizando la plataforma Wallace (Kass *et al.,* 2017).

5.3.5. Pérdida o aumento de área

Las superficies de áreas actuales y futuras se obtuvieron a través del programa R (R Core Team, 2018), utilizando el paquete estadístico *Raster* y los archivos en formato GEOTIFF generados de los modelos resultantes. La superficie perdida de cada especie se calculó restando el valor de la superficie futura a la superficie actual, mientras que el área ganada se obtuvo de la resta del valor de la superficie actual a la superficie futura. El resultado de las pérdidas y ganancias se expresaron como porcentajes.

5.3.6. Elaboración de mapas

Para visualizar gráficamente los cambios del área de distribución, los archivos ráster en formato ASC resultantes de las modelaciones tanto actuales como futuras fueron empalmados con el proceso “R.CROSS” en el programa QGIS (QGIS Development Team, 2019) con GRASS (GRASS Development Team, 2019).

6. RESULTADOS

6.1. Evaluaciones de la Lista Roja de la UICN

En la **tabla 3** se enlistan las especies evaluadas en este estudio según el nivel de la categoría UICN asignada, dos se evaluaron como "En Peligro Crítico" (CR), 28 como "En Peligro" (EN), cinco como "Vulnerable" (VU) y siete como "Preocupación Menor" (LC). Las especies categorizadas como CR, EN y VU califican como amenazadas, mientras que la categoría LC se utilizó para las especies que no se consideran con un riesgo alto de amenaza. Las cifras resultantes indican que alrededor del 57.1 % de los árboles y arbustos evaluados se encuentran con un alto riesgo de amenaza. Las evaluaciones en extenso de los árboles y arbustos realizadas en este proyecto se muestran en el **apéndice 2**.

Tabla 3. Nombre de la especie evaluada y la categoría propuesta para la Lista Roja de la IUCN.

Especie	Categoría	Especie	Categoría
Cestrum flavescens	En Peligro Crítico (CR)	*Solandra nizandensis*	Vulnerable (VU)
Cestrum flavinervium	En Peligro Crítico (CR)	*Solanum brevipedicellatum*	Vulnerable (VU)
Cestrum elegantissimum	En Peligro (EN)	*Witheringia stellata*	Vulnerable (VU)
Cestrum fulvescens	En Peligro (EN)	*Brachistus nelsonii*	Preocupación menor (LC)
Cestrum miradorense	En Peligro (EN)	*Cestrum elegans*	Preocupación menor (LC)
Cestrum nitidum	En Peligro (EN)	*Cestrum fasciculatum*	Preocupación menor (LC)
Cestrum sotonunezii	En Peligro (EN)	*Cestrum oblongifolium*	Preocupación menor (LC)
Lycianthes ceratocalycia	En Peligro (EN)	*Cestrum roseum*	Preocupación menor (LC)
Schultesianthus uniflorus	En Peligro (EN)	*Cestrum laxum*	Preocupación menor (LC)
Solanum axillifolium	En Peligro (EN)	*Lycianthes anomala*	Preocupación menor (LC)
Solanum plumense	En Peligro (EN)	*Lycianthes armentalis*	Preocupación menor (LC)
Solanum pulverulentifolium	En Peligro (EN)	*Lycianthes arrazolensis*	Preocupación menor (LC)
Cestrum guatemalense	Vulnerable (VU)	*Lycianthes geminiflora*	Preocupación menor (LC)
Cestrum mortonianum	Vulnerable (VU)	*Lycianthes surotatensis*	Preocupación menor (LC)
Cestrum pacayense	Vulnerable (VU)	*Lycianthes tricolor*	Preocupación menor (LC)
Lycianthes connata	Vulnerable (VU)	*Solanum atitlanum*	Preocupación menor (LC)
Lycianthes hypoleuca	Vulnerable (VU)	*Solanum chiapasense*	Preocupación menor (LC)
Lycianthes manantlanensis	Vulnerable (VU)	*Solanum mitlense*	Preocupación menor (LC)
Lycianthes pilifera	Vulnerable (VU)	*Solanum pubigerum*	Preocupación menor (LC)

Lycianthes quichensis	Vulnerable (VU)	*Witheringia meiantha*	Preocupación menor (LC)
Schraderanthus viscosus	Vulnerable (VU)	*Witheringia mexicana*	Preocupación menor (LC)

6.2. Modelos de distribución de especies

Se generaron modelos para 29 especies, 11 para el género *Lycianthes*, 10 de *Cestrum*, cinco de *Solanum* y tres de *Whiteringia*.

Se contó con un total de 2,012 registros para las diferentes especies de Solanaceae incluidas en este estudio, resultado de la consulta de los ejemplares botánicos depositados en las principales colecciones científicas del país, el número de registros utilizados para elaborar los modelos de cada especie se resumen en la **tabla 4**.

Tabla 4. Número de registros utilizados para cada especie modelada.

Especie	**No. de registros**	**Especie**	**No. de registros**
Cestrum elegans	78	*Lycianthes hypoleuca*	29
Cestrum elegantissimum	26	*Lycianthes manantlanensis*	21
Cestrum fasciculatum	184	*Lycianthes pilifera*	59
Cestrum fulvescens	24	*Lycianthes quichensis*	34
Cestrum guatemalense	38	*Lycianthes surotatensis*	44
Cestrum laxum	175	*Lycianthes tricolor*	47
Cestrum miradorense	24	*Solanum atitlanum*	48
Cestrum oblongifolium	125	*Solanum brevipedicellatum*	26
Cestrum pacayense	49	*Solanum chiapasense*	23
Cestrum roseum	123	*Solanum mitlense*	37
Lycianthes anomala	36	*Solanum pubigerum*	236
Lycianthes armentalis	91	*Witheringia meiantha*	133
Lycianthes arrazolensis	130	*Witheringia mexicana*	67
Lycianthes connata	28	*Witheringia stellata*	28
Lycianthes geminiflora	49		

De acuerdo con las medidas de evaluación los modelos obtenidos, predicen de buena manera el área potencial para cada una de las especies modeladas. En la mayoría de los casos los valores de ROC parcial fueron aceptables, correspondiendo al valor de AICc más bajo, por lo que se consideran modelos aceptables. La característica clase seleccionada más veces fue la "Hinge" seguida de la "Linear Quadratic" **(Tabla 5)**. La superficie total de área potencial estimada para cada una de las especies se presenta en la **tabla 6**, mientras que los mapas resultantes de las distribuciones potenciales se presentan en el **apéndice 3**.

Tabla 5. Características de clase y valor de ROC parcial para los modelos seleccionados.

Especie	Feature classes	ROC parcial (Radios promedios)	Especie	Feature classes	ROC parcial (Radios promedios)
Cestrum elegans	LQ1	1.90309	*Lycianthes hypoleuca*	H1	1.82622
Cestrum elegantissimum	H1	1.77975	*Lycianthes manantlanensis*	H1	1.71227
Cestrum fasciculatum	H1	1.89379	*Lycianthes pilifera*	H2	1.91485
Cestrum fulvescens	H2	1.87144	*Lycianthes quichensis*	H3	1.88055
Cestrum guatemalense	H2	1.86258	*Lycianthes surotatensis*	H1	1.85416
Cestrum laxum	H1	1.85568	*Lycianthes tricolor*	H3	1.89114
Cestrum miradorense	H2	1.88330	*Solanum atitlanum*	H1	1.88268
Cestrum oblongifolium	H1	1.88458	*Solanum brevipedicellatum*	H1	1.86984
Cestrum pacayense	H3	1.88876	*Solanum chiapasense*	H1	1.63895
Cestrum roseum	H2	1.85203	*Solanum mitlense*	H1	1.77164
Lycianthes anomala	H1	1.39741	*Solanum pubigerum*	H2	1.83257
Lycianthes armentalis	H1	1.68389	*Witheringia meiantha*	H1	1.80426
Lycianthes arrazolensis	LQ1	1.84342	*Witheringia mexicana*	H2	1.84983
Lycianthes connata	H2	1.5008	*Witheringia stellata*	H1	1.84189
Lycianthes geminiflora	H2	1.85492			

6.3. Proyecciones hacia el futuro

Los resultados de los modelos proyectados hacia el año 2050 utilizando un escenario de cambio moderadamente pesimista indican que la mayoría de las especies incluidas en este estudio sufrirán una disminución muy significativa de su área de distribución potencial actual. Sin embargo, para el caso de *Solanum chiapasense* se prevé que las condiciones ambientales serán muy favorables para su desarrollo, ya que su área de distribución potencial actual se verá favorecida con un aumento en su superficie de aproximadamente 13.1 % con respecto a la actual **(Tabla 6)**. Especies de los géneros *Cestrum* y *Whiteringia*, así como algunas especies de *Lycianthes* y *Solanum* que se desarrollan en lugares templados se verán afectados en gran medida, llegando a perder más de la mitad de su área actual, mientras que las especies pertenecientes a los géneros *Lycianthes* y *Solanum* que se encuentran en lugares más cálidos y secos sufrirán una disminución del área menos significativa. **(Fig. 2)**. Los mapas resultantes de las proyecciones futuras se presentan en el **apéndice 3**.

Tabla 6. Porcentaje de cambio de área de las diferentes especies de Solanaceae. (+) Aumento, (-) disminución.

Especie	Área actual (km^2)	Área futura (km^2)	Área de cambio (km^2)	% de cambio
Cestrum elegans	56,007.27	17,800.31	-38,206.96	-68.3
Cestrum elegantissimum	104,318.2	62,540.37	-41,777.83	-40.1
Cestrum fasciculatum	57,539.45	34,470.59	-23,068.86	-40.1
Cestrum fulvescens	49,905.66	15,720.42	-34,185.24	-68.5
Cestrum guatemalense	164,419.3	83,425.16	-80,994.14	-49.3
Cestrum laxum	243,465.7	128,210	-115,255.7	-47.4
Cestrum miradorense	141,982	65,822.96	-76,159.04	-53.7
Cestrum oblongifolium	76,661.66	56,173.84	-20,487.82	-26.8
Cestrum pacayense	92,196.73	39,560.75	-52,635.98	-57.1
Cestrum roseum	136,611.5	87,654.95	-48,956.55	-35.9
Lycianthes anomala	713,450.8	547,964.7	-165,486.1	-23.2
Lycianthes armentalis	818,826.3	772,398.2	-46,428.1	-5.7
Lycianthes arrazolensis	245,305.5	131,374.7	-113,930.8	-46.5
Lycianthes connata	1,767,772	1,509,543	-258,229	-15
Lycianthes geminiflora	220,722.9	104,200.4	-116,522.5	-52.3
Lycianthes hypoleuca	373,702.7	166,360.8	-207,341.9	-55.5
Lycianthes manantlanensis	672,656.5	353,504.8	-319,151.7	-47.5
Lycianthes pilifera	9,418.44	4,432.69	-4,985.75	-53
Lycianthes quichensis	143,297.8	62,338.62	-80,959.18	-56.5
Lycianthes surotatensis	194,815.7	144,070.9	-50,744.8	-26.1
Lycianthes tricolor	58,372.02	28,287.41	-30,084.61	-51.6
Solanum atitlanum	140,196.4	60,108.17	-80,088.23	-57.2
Solanum brevipedicellatum	128,106.3	71,644.71	-56,461.59	-44.1
Solanum chiapasense	689,424.5	792,878.8	+103,454.3	+13.1
Solanum mitlense	394,836.7	342,551.5	-52,285.2	-13.3
Solanum pubigerum	310,904	185,973.9	-124,930.1	-40.19
Witheringia meiantha	421,577.5	186,685.6	-234,891.9	-55.8
Witheringia mexicana	179,169.2	117,130.5	-62,038.7	-34.7
Witheringia stellata	188,869.7	108,450.9	-80,418.8	-42.6

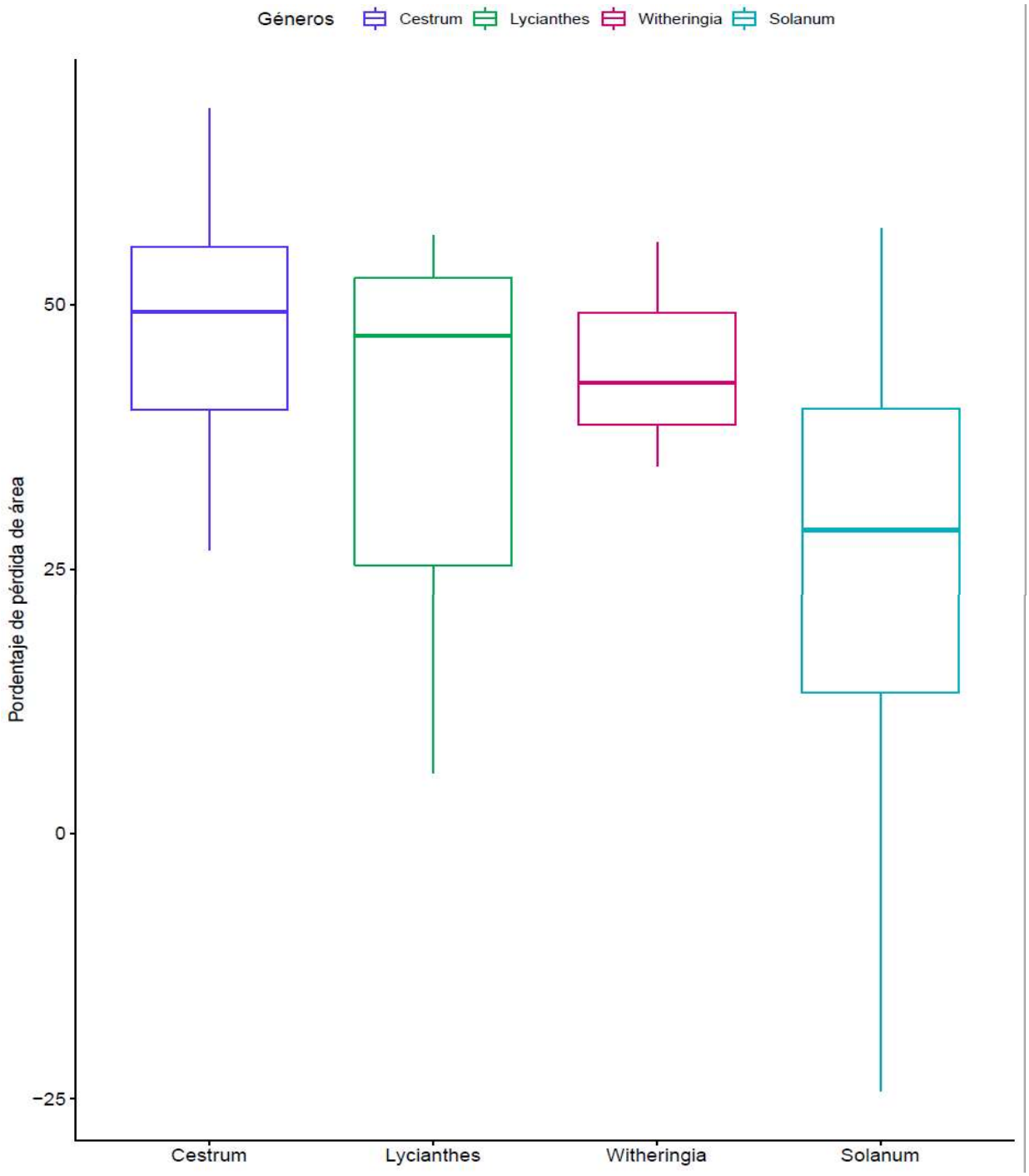

Fig. 2. Comparación de pérdida de área entre los diferentes géneros de Solanaceae.

7. DISCUSIÓN

7.1. Evaluaciones a nivel global

La solanáceas representa un ejemplo de la alta diversidad de plantas en México y Centroamérica (Rodríguez, 2004; Martínez *et al.* 2011, 2017). Por otra parte, las especies de distribución restringida han despertado un especial interés en estudios sobre biogeografía, evolución (Rzedowski, 1991) y en este caso de conservación.

En el país se cuenta con la Norma Oficial Mexicana NOM-059-SEMARNAT-2010 (SEMARNAT, 2010), la cual tiene como objetivo identificar las especies silvestres en riesgo. Sin embargo, ninguna de las especies de Solanáceas presentes en el país se encuentra dentro de ella. Otro caso similar se presenta en los apéndices publicados en la Convención sobre el Comercio Internacional de Especies Amenazadas de Fauna y Flora Silvestres (CITES, por sus siglas en inglés) (CITES, 2019), donde no consideran a las especies de Solanaceae como un recurso importante comercialmente.

De las especies evaluadas en este estudio, veinte son endémicas al territorio mexicano y dieciocho cuentan con una distribución dentro de los países a los que Rzedowski (1991) considera como pertenecientes a Megaméxico 2. Se observa que más de la mitad de las especies evaluadas cumplen con los criterios de amenaza, pero un muy bajo número se considera que cuenta con el nivel más elevado de riesgo de extinción (CR) **(Apéndice 2)**.

La mayoría de las especies evaluadas del género *Cestrum* son especies amenazadas **(Apéndice 2).** Esto podría deberse a que su área de distribución se limita a las áreas montañosas del centro del país, ya que se ha reportado que las zonas montañosas constituyen regiones ecogeográficas que cuentan con la mayor diversidad y endemismos para este género (Canal-Gallego, 2011; Nee, 2001 en Ramírez-Segura, 2013). De las especies amenazadas de *Cestrum*, seis son endémicas al país y cuatro se comparten con algunos países de Centroamérica. En el caso de *Cestrum flavescens* **(Apéndice 2, evaluación 1)** y *C. flavinervium* **(Apéndice 2, evaluación 2)**, estas especies tienen una distribución muy restringida limitándose solo a la localidad tipo, ya que como lo han resaltado Martínez *et al.*

(2017), algunas de las especies de este género solo cuentan con esa información. Tanto *C. flavescens* como *C. flavinervium* han sido reportadas para otras áreas (Villaseñor, 2017, Martínez *et al.,* 2017); sin embargo, no se encontró material de herbario que apoyara esta información, por lo que se cree que se trata de identificaciones erróneas (Montero-Castro comm. pers., 2019). Especies como *C. fulvescens*, *C. miradorense*, *C. nitidum* y *C. sotonunezii* fueron evaluadas como "En Peligro" **(Apéndice 2)**. Si bien, éstas no presentan una distribución muy restringida, si se limitan a ciertas zonas de la región montañosa del centro del país (Nee, 1986; Montero-Castro, 2011; Montero-Castro y Lara-Cabrera, 2019). En cambio *C. sotonunezii* **(Apéndice 2, evaluación 11)** es una especie conocida solo de dos pequeñas áreas en el centro de México, de la cual se estima que existen menos de 250 individuos maduros (Montero-Castro, 2011). En el caso de *C. elegantissimum* **(Apéndice 2, evaluación 3)***,* especie compartida con Guatemala, solo se desarrolla en las partes altas de Chiapas y Guatemala (Gentry y Standley, 1974). La categoría "Vulnerable" se asignó a *C. guatemalense*, *C. mortonianum* y *C. pacayense* **(Apéndice 2)**. Este grupo de especies, aunque están presentes en varios países, no cuentan con una amplia distribución dentro de estos, limitándose a zonas específicas. Por ejemplo *C. guatemalense* **(Apéndice 2, evaluación 8)** y *C. pacayense* **(Apéndice 2, evaluación 15)** son especies muy comunes en las montañas centrales de Guatemala (Gentry y Standley, 1974), pero muy escasos en México, Honduras y Nicaragua, mientras *C. mortonianum* **(Apéndice 2, evaluación 9)***,* que se distribuye desde el centro de México hasta El Salvador (Gentry y Standley, 1974; Martínez *et al.,* 2017), cuenta con poblaciones muy separadas unas de otras.

El género *Lycianthes* es el segundo con más especies evaluadas **(Apéndice 2)**. Este género es considerado como el cuarto más diverso de la familia Solanaceae en México, con 40 especies de las cuales solo 12 son endémicas al país, mientras que 15 se comparten con los países que conforman la región denominada como Megaméxico 2 (Martínez *et al.,* 2017). Dentro de este género solo *L. ceratocalycia* **(Apéndice 2, evaluación 23)** fue evaluado como "En Peligro". Esta especie que comparte su distribución entre México y Guatemala, solo se limita a ciertas zonas montañosas, en áreas abiertas en los bosques de pino (Gentry

y Standley, 1974). Las especies *L. connata*, *L. hypoleuca*, *L. manantlanensis*, *L. pilífera* y *L. quichensis* fueron evaluadas como "Vulnerables" **(Apéndice 2)**. *Lycianthes manantlanensis* **(Apéndice 2, evaluación 29)** y *L. pilifera* **(Apéndice 2, evaluación 30)** son endémicas al país. La primera especie cuenta con una distribución en zonas de transición entre el bosque tropical subcaducifolio y los bosques nubosos presentes en algunos estados que conforman el Eje Neovolcánico Transversal y la Sierra Madre del Sur, además de algunas zonas de los estados de Chiapas y Oaxaca (Rodríguez y Vargas, 2002), mientras que la segunda cuenta con una distribución más limitada en algunas partes de la Sierra de Juárez en el estado de Oaxaca (Dean y Reyes, 2018). El resto de las especies de *Lycianthes* evaluadas como "Vulnerables" presentan una distribución compartida entre Chiapas y Guatemala, lo que aumenta su área de presencia, además de abarcar un rango altitudinal amplio y estar presentes en diferentes tipos de vegetación como son bosques mesófilos de montaña, bosques de pino-encino y bosques de *Abies* (Gentry y Standley, 1974; Reyes, 2015).

A pesar de que el género *Solanum* es considerado como uno de los más diversos dentro de las plantas con flor (Nee, 1993; Tepe y Bohs, 2011; Knapp, 2013; Stern *et al.,* 2013) y por ende es el más diverso de la familia Solanaceae, no solo en México, si no a nivel mundial (Cuevas-Arias *et al.,* 2008; Martínez *et al.,* 2017), únicamente se evaluaron ocho especies, ya que se excluyeron especies herbáceas y especies arbóreas y arbustivas presentes en México con una distribución considerablemente mayor al criterio de corte inicialmente establecido en el presente trabajo. En el caso de las especies herbáceas no consideradas en este estudio, es probable que se puedan detectar especies que ameriten acciones de conservación, como lo ha sugerido Luna-Cavasos *et al.* (2012), documentando que en México hay una gran proporción de especies tuberosas de *Solanum* (Sect. *Petota*) endémicas que proliferan en zonas altas superiores a los 1,500 msnm, sobre todo en los bosques templados de la región montañosa del centro del país.

De los *Solanum* aquí considerados, tres fueron considerados "En Peligro", uno como "Vulnerable" y cuatro como "Preocupación Menor" **(Apéndice 2)**. Dos de las especies que se incluyeron en la primera categoría, *S. axillifolium* **(Apéndice 2, evaluación 24)** y *S.*

plumense **(Apéndice 2, evaluación 25)** cuentan con una distribución restringida a ciertas zonas de los estados de Guerrero y Oaxaca. Un caso similar es *S. pulverulentifolium* **(Apéndice 2, evaluación 26)**, la cual solo se encuentra en ciertas partes del estado de Chiapas (Roe, 1967; Rodríguez, 2004; Martínez *et al.,* 2017). En el caso de *S. brevipedicellatum* **(Apéndice 2, evaluación 32)** se caracteriza por su distribución disjunta y aunque se ha reportado como una especie poco frecuente en la zona de Chiapas-Guatemala, en la zona de Jalisco-Colima se puede encontrar de manera más abundante (Roe, 1967), lo que no impide que pueda ser considerada como Vulnerable.

En el caso de *Schultesianthus uniflorus* **(Apéndice 2, evaluación 7)**, catalogada como "En Peligro", solo se distribuye en el estado de Chiapas y Guatemala (Villaseñor, 2016; Martínez *et al.,* 2017), con una distribución que se limita a las partes altas de estos dos países (Gentry y Standley, 1974), como los casos de otras especies antes expuestos. Además, se ha reportado que esta especie se encuentra dentro de la tribu *Juanulloeae*, cuyos integrantes se les considera raros por su bajo número de registros (Knapp *et al.,* 1997). Especies de otros géneros evaluadas como "Vulnerables" son *Schraderanthus viscosus*, *Solandra nizandensis* y *Witheringia stellata* **(Apéndice 2)**. La primera especie **(Apéndice 2, evaluación 12)** cuenta con una reducida distribución en Guatemala, pero dentro del territorio mexicano se encuentra en varios estados, sobre todo Chiapas, Oaxaca y Veracruz (Averett, 2009). En el caso de *S. nizandensis* **(Apéndice 2, evaluación 13)**, esta especie cuenta con una amplia distribución desde Jalisco a Chiapas; sin embargo, las localidades en donde se ha reportado están muy separadas una de otras (Farrera, 2008). Mientras que *W. stellata* **(Apéndice 2, evaluación 14)** cuenta con una distribución más reducida pero muy bien representada en algunos estados que conforman la Sierra Madre Oriental y algunas montañas del estado de Oaxaca (Nee, 1986; CONABIO, 2004).

La mayoría de las especies evaluadas como amenazadas cuentan con distribuciones restringidas a la región montañosa del centro de México; sin embargo, es posible que exista un sesgo en la distribución de cada especie debido a la falta de trabajo de campo exhaustivo

que refleje la condición real de la misma, ya que al igual que la zona montañosa de los Andes peruanos (Särkinen *et al.,* 2013), la región montañosa del centro del país puede estar aún muy mal recolectada.

Especies como *Cestrum fasciculatum*, *C. oblongifolium*, *C. roseum*, *Lycianthes surotatensis*, *Solanum mitlense* y *Witheringia mexicana* fueron catalogadas como preocupación menor (LC) **(Apéndice 2)**. Si bien estas especies son consideradas endémicas a México (Martínez *et al.,* 2017), dentro del territorio mexicano cuentan con una amplia distribución, por lo que se prevé que no presentan amenazas fuertes a su supervivencia. Además, se ha reportado que muchas de las especies de esta familia tienen hábitos ruderales o malezoides adaptadas a zonas con disturbio en casi todos los tipos de vegetación en que se encuentran (Martínez *et al.,* 2011; Sierra-Muñoz *et al.,* 2015). En el caso de *C. roseum* **(Apéndice 2, evaluación 20)** ha sido introducida y cultivada en diversos países de prácticamente todos los continentes gracias a sus flores rojas y llamativas (Nee, 1986). El resto de las especies incluidas en esta categoría tienen sus distribuciones fuera de los límites del territorio mexicano, pero dentro de la zona denominada como Megaméxico 2 (Rzedowski, 1991), por lo que debido a su amplio rango de distribución no se espera que estén amenazadas, incluso especies como *Brachistus nelsonii* **(Apéndice 2, evaluación 15)**, *Lycianthes anomala* **(Apéndice 2, evaluación 33)**, *Solanum pubigerum* **(Apéndice 2, evaluación 42)** y *Witheringia meiantha* **(Apéndice 2, evaluación 21)** se pueden encontrar desde el centro de México hasta Costa Rica y Panamá (Gentry y Standley, 1974; Knapp, 2013; Martínez *et al.,* 2017; Dean y Reyes, 2018; GBIF, 2019, Tropicos, 2019).

La mayoría de las especies evaluadas, además de tener áreas de distribución pequeñas, están sometidas a amenazas adicionales. Por ejemplo, los factores asociados a la transformación del hábitat, como la sobre explotación de los bosques, contaminación de los ecosistemas, introducción de especies invasoras y el calentamiento global (CONABIO y SEMARNAT, 2009). Otros factores nocivos para la cobertura de la vegetación nativa en México y Centroamérica son la agricultura y ganadería, los incendios forestales, desarrollos

turísticos y el crecimiento de las zonas urbanas (FMCN, 2009; INAB, 2012; ANAM 2014; CONAP, 2014; SINAC, 2014; CONABIO, 2019; DiBio, 2017).

Los resultados aquí presentados aportan evidencias de que las especies arbóreas y arbustivas de la familia Solanaceae en México están en cierta medida amenazadas. En términos de porcentaje, las especies de Solanaceae aquí estudiadas con categorías de amenaza representan el 57.1 %. Esta proporción es similar a la obtenida en otros estudios, como el de árboles de bosques nubosos de México, que determinó que el 60.9 % de las especies estudiadas están amenazadas (González-Espinosa *et al.,* 2011). De forma similar para los árboles evaluados para Guatemala (Vivero *et al.,* 2006), donde se reportó que el 57.4 % de estas especies están amenazadas. Caso similar se reportó para los árboles de la región de Asia Central, donde el 45.8 % están amenazados (Eastwood *et al.,* 2009). Un caso contrario son los resultados de la evaluación de los árboles y arbustos de Etiopía y Eritrea, donde solo el 13 % de las especies de la flora leñosa están amenazadas (Vivero *et al.,* 2005).

7.2. Modelos de distribución de especies

Según las medidas de evaluación (ROC parcial y AICc), los resultados de los modelos predicen de buena manera la distribución actual y futura de las diferentes especies de Solanaceae. El desempeño de los modelos generados con MaxEnt ha sido tradicionalmente evaluado mediante los valores de la curva ROC (Martínez *et al.,* 2013). De acuerdo con De Pando y Peñas de Giles (2009), la determinación de la predicción del área de distribución potencial de cualquier especie mediante esta técnica es aceptada como un método para evaluar la exactitud del modelo con el cálculo del área bajo la curva (AUC). Sin embargo, esta medida ha sido cuestionada, debido a que en los modelos con información de solo presencias las curvas ROC son inaplicables, ya que al carecer de ausencias reales no parece haber ninguna fuente de casos negativos con los que medir la especificidad (Phillips *et al.,* 2006; Manzanilla-Quiñones *et al.,* 2019). Por lo que una alternativa confiable al problema antes mencionado ha sido el uso del análisis de ROC parcial, ya que este método pondera los errores de omisión, no considera las ausencias y evalúa solo el rango de valores de predicción (Monterrubio-Rico *et al.,* 2016). Este método es cada vez más utilizado en

recientes estudios (Palmas-Pérez *et al.,* 2013; Garza-López *et al.* 2016, 2018; Monterrubio-Rico *et al.* 2016; Manzanilla-Quiñones *et al.* 2019).

De acuerdo con los resultados obtenidos de las proyecciones a futuro utilizando un escenario de cambio climático moderadamente pesimista, las especies de *Cestrum*, *Lycianthes*, *Solanum* y *Witheringia* que se reportan en bosques templados y bosques mesófilos de montaña, bosques de pino y bosques de pino-encino se verán afectados en gran medida **(Apéndice 3)**. Entre estos casos, *Cestrum elegans* **(Apéndice 3, modelo 1)** y *C. fulvescens* **(Apéndice 3, modelo 3)** reducirán su área alrededor de 68 %; *Lycianthes tricolor* **(Apéndice 3, modelo 15)**, *L. pilifera* **(Apéndice 3, modelo 12)** y *L. quichensis* **(Apéndice 3, modelo 13)** disminuirán su hábitat óptimo 52 %, 53 % y 57 %, respectivamente, mientras que *Solanum atitlanum* **(Apéndice 3, modelo 16)** sufrirá una reducción de 57 % y *Witheringia meiantha* **(Apéndice 3, modelo 21)** de 56 %. Dado que las especies antes mencionadas comparten requerimientos con las especies que forman los bosques templados como son los pinos, encinos y oyameles, es probable que las afectaciones a estas especies influyan directamente en las solanáceas, por lo que tal vez los resultados obtenidos en el presente trabajo tiendan a ser similares con los reportados para diferentes especies de coníferas mexicanas. Diversas investigaciones con enfoque hacia este tipo de problemas demuestran que algunas de las especies de pinos sufrirán disminuciones bastante considerables en sus respectivas áreas de distribución futura, llegando incluso a perder más de la mitad de su área actual (Pérez-Miranda *et al.,* 2012; Gutiérrez y Trejo, 2014; Cruz-Cárdenas *et al.,* 2016; García-Aranda *et al.,* 2018; Manzanilla-Quiñones *et al.* 2019). Un caso más preocupante son las especies de *Abies,* ya que algunos autores mencionan que este grupo de plantas serán las más susceptibles al cambio climático, estimando que en algunas de las regiones del país perderán entre el 79 % y 96 % de su área de distribución (Sáenz-Romero *et al.,* 2012; Gutiérrez y Trejo, 2014; Cruz-Cárdenas *et al.,* 2016). Estos resultados apoyan lo mencionado por Gutiérrez y Trejo (2014), quienes afirman que las especies que se encuentran en las partes altas de las montañas de México son las más susceptibles a ser afectadas por el cambio climático.

Modelaciones de nicho de árboles de bosques tropicales húmedos indican una inexorable disminución de área de distribución para el año 2050, como es el caso de *Cedrela odorata* (Hernández-Ramos *et al.,* 2018). En este sentido, Estrada-Contreras *et al.* (2015) determinan que el área ocupada por los bosques tropicales perennifolios en el estado de Veracruz sufrirá una reducción de 53 % para 2050. Estimaciones más preocupantes, principalmente por su cercanía temporal, se han obtenido para el año 2030 en la distribución de *Lysiloma latisiliquum* y *Swietenia macrophylla* de las que se estima una reducción del 43 % (Garza-López *et al.* 2018) y 60 % (Garza-López *et al.* 2016), respectivamente. En el caso de las especies aquí estudiadas que se distribuyen preferencialmente en los bosques tropicales húmedos, la afectación es de magnitud menor. Para *Lycianthes anomala* **(Apéndice 3, modelo 7)** la reducción del área será aproximadamente 24 %, mientras que *L. armentalis* **(Apéndice 3, modelo 8)** y *Solanum mitlense* **(Apéndice 3, modelo 19)** tendrán una disminución en áreas con óptimo climático para estas especies del 6 % y 13 %, respectivamente. Es importante mencionar que, si bien estas especies se encuentran principalmente en bosques tropicales, también se pueden encontrar, aunque en menor medida, en bosques tropicales caducifolios y bosques de pino-encino, ampliando su rango altitudinal. Esto indica que son especies que tienen un potencial adaptativo amplio, que abarca varios tipos de vegetación, característica que ayudará a estas especies a amortiguar la pérdida de área optima en el futuro. Un caso comparable es de la familia Marcgraviaceae presente en selvas altas perennifolias y bosques mesófilos del suroeste de México y Centroamérica, de las cuales Palmas-Pérez *et al.* (2013), mediante modelaciones de nicho, determinaron que las amenazas a las que estas especies están expuestas no ameritaban incluirlas en una categoría de amenaza de la lista roja de la UICN, o el caso de *Guaiacum sanctum*, una especie que si bien en México ha sufrido una pérdida de hábitat considerable, en otros países su poblaciones parecen ser abundantes, motivo por el cual no se puede considerar amenazada (López-Toledo *et al.,* 2011).

Caso contrario a las especies que sufren una reducción en su área de distribución potencial futura, *Solanum chiapasense* **(Apéndice 3, modelo 18)** tenderá a aumentarla, ya que se estima que para el año 2050 ganará alrededor de 13 % de área. Esto podría deberse

a su presencia en bosques de pino-encino, bosques de encino y bosques tropicales subcaducifolios y su amplio rango de altitud, lo que también evidencia su adaptación a las diferentes condiciones climáticas. Un caso comparable es el de *Gossypium hirsutum,* una especie de regiones semiáridas que presenta una tendencia a aumentar su área de distribución en escenarios de cambios climáticos (Ramírez-Ojeda *et al.,* 2014). Por otro lado, en el caso de *S. chiapasense* se debe tener en cuenta que es una especie que puede verse favorecida por el disturbio (Sierra-Muñoz *et al.,* 2015).

A pesar de que se ha mencionado que los modelos realizados presentan valores óptimos para asumir que las proyecciones son las mejores, se debe de tomar en cuenta que las variables utilizadas cuentan con una escala espacial relativamente gruesa, que los registros botánicos no reflejan el estado de las especies en cuanto a densidad de población o tasa de crecimiento y que la intensidad de muestreo no es uniforme en la región, debido a que los registros provienen de diferentes temporadas, ya que como lo mencionan Guevara-Escobar *et al.* (2008), estos factores podrían ser fuentes importantes de sesgo en la modelación.

También es importante mencionar que la altitud y la pendiente, dos de las variables que se han reportado como importantes en la distribución de especies con distribuciones restringidas (García-Aranda *et al.,* 2018) no fueron utilizadas, lo que podría ser una fuente de sesgo en la modelación de las especies que cuentan con este tipo de distribuciones.

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Apéndice 1. Resumen de los cinco criterios (A-E) utilizados para evaluar la pertenencia de una especie a una de las categorías de amenaza (En Peligro Crítico, En Peligro y Vulnerable) de la Lista Roja de la UICN (tomada de Las Categorías y Criterios de Lista Roja de la UICN 3.1, 2012).

A. Reducción del tamaño poblacional. Reducción del tamaño de la población basada en cualquiera de los subcriterios A1 a A4. El nivel de reducción se mide considerando el período más largo, ya sea 10 años o 3 generaciones.

	En Peligro Crítico	En Peligro	Vulnerable
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3 & A4	≥ 80%	≥ 50%	≥ 30%

A1 Reducción del tamaño de la población observada, estimada, inferida o sospechada, en el pasado donde las causas de la reducción son claramente reversibles Y entendidas y conocidas Y han cesado.

A2 Reducción del tamaño de la población observada, estimada, inferida o sospechada, en el pasado donde las causas de la reducción pudieron no haber cesado O no ser entendidas y conocidas O no ser reversibles.

A3 Reducción del tamaño de la población que se proyecta, se infiere o se sospecha será alcanzada en el futuro (hasta un máximo de 100 años) *[(a) no puede ser usado]*.

A4 Reducción del tamaño de la población observada, estimada, inferida, proyectada o sospechada donde el período de tiempo considerado debe incluir el pasado y el futuro (hasta un máx. de 100 años en el futuro), y donde las causas de la reducción pueden no haber cesado O pueden no ser entendidas y conocidas O pueden no ser reversibles.

Con base en y especificando cualquiera de los siguientes puntos:

(a) observación directa *[excepto A3]*
(b) un índice de abundancia apropiado para el taxón
(c) una reducción del área de ocupación (AOO), extensión de presencia (EOO) y/o calidad del hábitat
(d) niveles de explotación reales o potenciales
(e) como consecuencia de taxones introducidos, hibridación, patógenos, contaminantes, competidores o parásitos

B. Distribución geográfica representada como extensión de presencia (B1) Y/O área de ocupación (B2)

	En Peligro Crítico	En Peligro	Vulnerable
B1. Extensión de presencia (EOO)	< 100 km²	< 5.000 km²	< 20.000 km²
B2. Área de ocupación (AOO)	< 10 km²	< 500 km²	< 2.000 km²
Y por lo menos 2 de las siguientes 3 condiciones:			
(a) Severamente fragmentada, O Número de localidades	= 1	≤ 5	≤ 10
(b) Disminución continua observada, estimada, inferida o proyectada en cualesquiera de: **(i)** extensión de presencia; **(ii)** área de ocupación; **(iii)** área, extensión y/o calidad del hábitat; **(iv)** número de localidades o subpoblaciones; **(v)** número de individuos maduros			
(c) Fluctuaciones extremas en cualesquiera de: **(i)** extensión de presencia; **(ii)** área de ocupación; **(iii)** número de localidades o subpoblaciones; **(iv)** número de individuos maduros			

C. Pequeño tamaño de la población y disminución.

	En Peligro Crítico	En Peligro	Vulnerable
Número de individuos maduros	< 250	< 2.500	< 10.000
Y por lo menos uno de C1 o C2			
C1. Una disminución continua observada, estimada o proyectada (hasta un máximo de 100 años en el futuro) de al menos:	el 25% en 3 años o 1 generación (lo que fuese más largo)	el 20% en 5 años o 2 generaciones (lo que fuese más largo)	el 10% en 10 años o 3 generaciones (lo que fuese más largo)
C2. Una disminución continua observada, estimada, proyectada o inferida Y por lo menos 1 de las siguientes 3 condiciones:			
(a) (i) Número de individuos maduros en cada subpoblación	≤ 50	≤ 250	≤ 1.000
(ii) % de individuos en una sola subpoblación =	90–100%	95–100%	100%
(b) Fluctuaciones extremas en el número de individuos maduros			

D. Población muy pequeña o restringida

	En Peligro Crítico	En Peligro	Vulnerable
D. Número de individuos maduros	< 50	< 250	D1. < 1.000
D2. *Solo aplicable a la categoría VU* Área de ocupación restringida o bajo número de localidades con una posibilidad razonable de verse afectados por una amenaza futura que podría elevar al taxón a CR o EX en un tiempo muy corto.	-	-	D2. típicamente: AOO < 20 km² o número de localidades ≤ 5

E. Análisis Cuantitativo

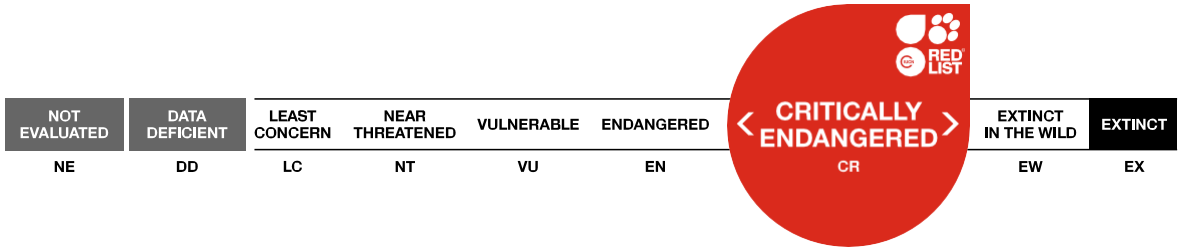
	En Peligro Crítico	En Peligro	Vulnerable
Indica que la probabilidad de extinción en estado silvestre es:	≥ 50% dentro de 10 años o 3 generaciones, lo que fuese más largo (100 años max.)	≥ 20% dentro de 20 años o 5 generaciones, lo que fuese más largo (100 años max.)	≥ 10% dentro de 100 años

Apéndice 2. Reporte de evaluaciones en extenso para cada una de las especies evaluadas. Los reportes 1-22 (Pág. 45-239) ya se encuentran publicados en la página de la Lista Roja de la UICN (www.iucnredlist.org), el resto se encuentra en proceso de publicación.

Evaluación No. 1

Cestrum flavescens

Assessment by: Valentín-Martínez, D. & Montero Castro, J.



View on www.iucnredlist.org

Citation: Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum flavescens*. *The IUCN Red List of Threatened Species* 2020: e.T126624889A126625155. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T126624889A126625155.en

Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Solanales	Solanaceae

Scientific Name: *Cestrum flavescens* Greenm.

Assessment Information

Red List Category & Criteria: Critically Endangered (Possibly Extinct) B2ab(i,iii) ver 3.1

Year Published: 2020

Date Assessed: March 22, 2019

Justification:

Cestrum flavescens is a shrub endemic to Mexico, it is distributed only in the state of Morelos. This species has a very restricted distribution, as it is only known from the type locality in Cuernavaca. It has also been reported for the states of Nuevo León, Tamaulipas, Veracruz, San Luis Potosí, Hidalgo, Queretáro, Michoacán; however, it is most likely confused with *Cestrum oblongifolium*, a species widely distributed in Mexico, while in the state of Guerrero it has been confused with *Cestrum sotonunezii*. It is important to mention that the last record of this taxon dates from 1966. Several explorations have been made in search of this species and it has not been collected again, therefore, it is believed it may be extinct. The extent of occurrence (EOO) could not be calculated and the area of occupancy (AOO) is 8 km^2. However, it is likely that the AOO is higher than calculated, remaining below 500 km^2. It is calculated to occur in one location. The main threat to the taxon has been the change in land use for urban expansion. *Cestrum flavescens* is assessed as Critically Endangered (CR).

Date last seen: 1966

Geographic Range

Range Description:

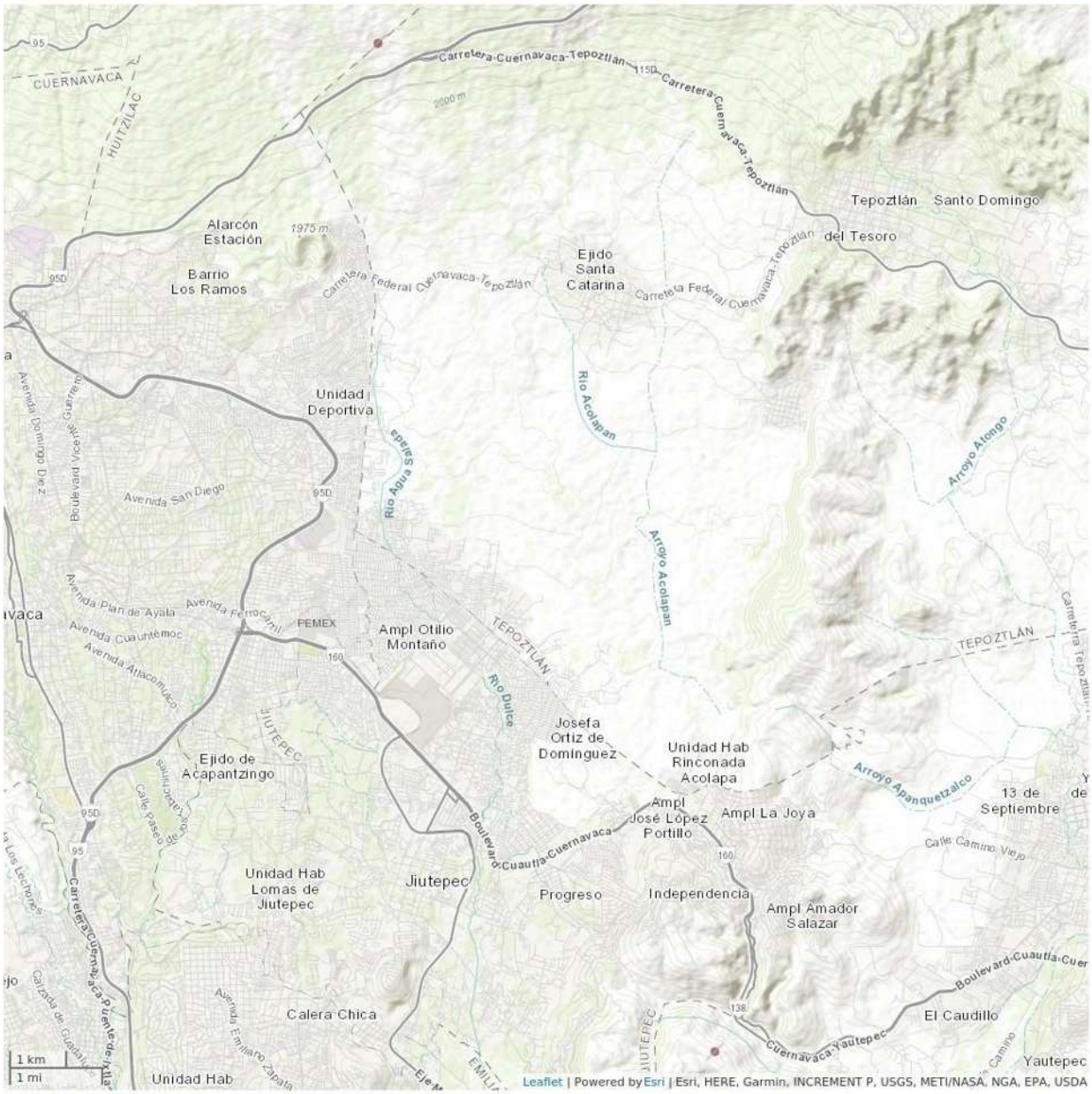
Cestrum flavescens is a shrub endemic to Mexico, it is distributed only in the state of Morelos. This species has a very restricted distribution, as it is only known from the type locality in Cuernavaca. It has also been reported for the states of Nuevo León, Tamaulipas, Veracruz, San Luis Potosí, Hidalgo, Queretáro, Michoacán (Villaseñor 2016, Martínez et al. 2017); however, it is most likely confused with *Cestrum oblongifolium*, a species widely distributed in Mexico, while in the state of Guerrero it has been confused with *Cestrum sotonunezii* (J. C. Montero Castro pers. comm. 2019). It is important to mention that the last record of this taxon dates from 1966 carried out by José Vázquez S. (Montero-Castro data 2019). Several explorations have been made in search of this species and it has not been collected again, so it is believed that it may be extinct (J. C. Montero Castro pers. comm. 2019). The extent of occurrence could not be calculated and the area of occupancy is 8 km^2. It is calculated to occur in one location. The main threat to the taxon has been the change in land use for urban expansion.

Country Occurrence:

Native, Extant (resident): Mexico

Native, Possibly Extant (resident): Mexico (Morelos)

Distribution Map



Legend

POSSIBLY EXTINCT

Compiled by:

IUCN SSC Global Tree Specialist Group 2020

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

Due to the loss of habitat available for *Cestrum flavescens* and the lack of current collections of this species in the distribution area, it is most likely that the population is very small or even extinct (J. C. Montero Castro, pers. comm. 2019).

Current Population Trend: Decreasing

Habitat and Ecology (see Appendix for additional information)

Cestrum flavescens is a small shrub of 1 m tall (Standley 1924). It grows at an altitude range of 1,500–1,600 m. It occurs in pine-oak forests, oak forests and in transition zones with tropical deciduous forest associated with *Quercus* and *Pinus* (J. C. Montero Castro pers. comm. 2019).

Systems: Terrestrial

Use and Trade (see Appendix for additional information)

There is no information available about the use and trade of *Cestrum flavescens*.

Threats (see Appendix for additional information)

The main threat to the taxon has been the change in land use for urban expansion as the city of Cuernavaca has grown considerably, in addition to associated human activities (J.C. Montero Castro pers. comm. 2019).

Conservation Actions (see Appendix for additional information)

According to the distribution points, *Cestrum flavescens* is located within the protected natural area El Tepozteco, but due to the lack of current records in the area, it is most likely that it is no longer within the area (J.C. Montero Castro pers. comm. 2019). The number of *ex situ* sites worldwide is one (BGCI 2019).

Credits

Assessor(s): Valentín-Martínez, D. & Montero Castro, J.

Reviewer(s): Samain, M.-S. & Oldfield, S.

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Martínez, M., Vargas-Ponce, O., Rodríguez, A., Chiang, F. and Ocegueda, S. 2017. Solanaceae Family in Mexico. *Botanical Sciences* 95(1): 131-145.

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Villaseñor, J. L. 2016. Checklist of the native vascular plants of Mexico. *Revista Mexicana de Biodiversidad* 87: 559-902.

Citation

Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum flavescens*. *The IUCN Red List of Threatened Species* 2020: e.T126624889A126625155. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T126624889A126625155.en

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External Resources

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Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.4. Forest - Temperate	Resident	Suitable	-
1. Forest -> 1.5. Forest - Subtropical/Tropical Dry	Resident	Suitable	-

Plant Growth Forms

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Plant Growth Form
SS. Shrub - small

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Majority (50-90%)	Very rapid declines	High impact: 8

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place land/water protection
Conservation sites identified: Yes, over part of range
Percentage of population protected by PAs: 1-10
Occurs in at least one protected area: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed
6. Livelihood, economic & other incentives -> 6.1. Linked enterprises & livelihood alternatives

6. Livelihood, economic & other incentives -> 6.4. Conservation payments

Research Needed

(http://www.iucnredlist.org/technical-documents/classificationschemes)

Research Needed
1. Research -> 1.2. Population size, distribution & trends
3. Monitoring -> 3.1. Population trends

Additional Data Fields

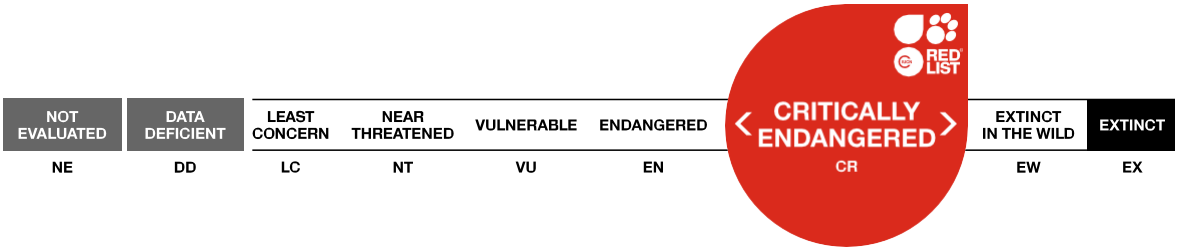
Distribution
Estimated area of occupancy (AOO) (km^2): 8
Continuing decline in extent of occurrence (EOO): Yes
Number of Locations: 1
Lower elevation limit (m): 1,500
Upper elevation limit (m): 1,600
Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Yes

The IUCN Red List of Threatened Species™
ISSN 2307-8235 (online)
IUCN 2020: T126624899A126625160
Scope(s): Global
Language: English

Evaluación No. 2

Cestrum flavinervium

Assessment by: Valentín-Martínez, D. & Montero Castro, J.



View on www.iucnredlist.org

Citation: Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum flavinervium*. *The IUCN Red List of Threatened Species* 2020: e.T126624899A126625160. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T126624899A126625160.en

Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Solanales	Solanaceae

Scientific Name: *Cestrum flavinervium* Francey

Taxonomic Source(s):

Board of Trustees, RBG Kew. 2018. Plants of the World Online Portal. Richmond, UK Available at: http://www.plantsoftheworldonline.org.

Assessment Information

Red List Category & Criteria: Critically Endangered (Possibly Extinct) B2ab(ii,iv); D ver 3.1

Year Published: 2020

Date Assessed: March 22, 2019

Justification:

Cestrum flavinervium is a shrub endemic to Mexico, it is distributed only in the state of Guerrero in the Sierra Madre del Sur. This species has a very restricted distribution, so it is only known from the type locality, probably an area known as Vallecitos. It has also been reported for the state of Michoacán; however, there are no herbarium records that support this information. The last record of this taxon dates from 1937 from a survey carried out by George B. Hinton. The extent of occurrence (EOO) could not be calculated and the area of occupancy (AOO) is 4 km^2. It is calculated one location. The main threats for the taxon range are deforestation, grazing, and forest fires. There is no up-to-date demographical information that enables understanding of current population trends, but it is suggested the population size is less than 50 mature individuals. *Cestrum flavinervium* is assessed as Critically Endangered.

Date last seen: 1937

Geographic Range

Range Description:

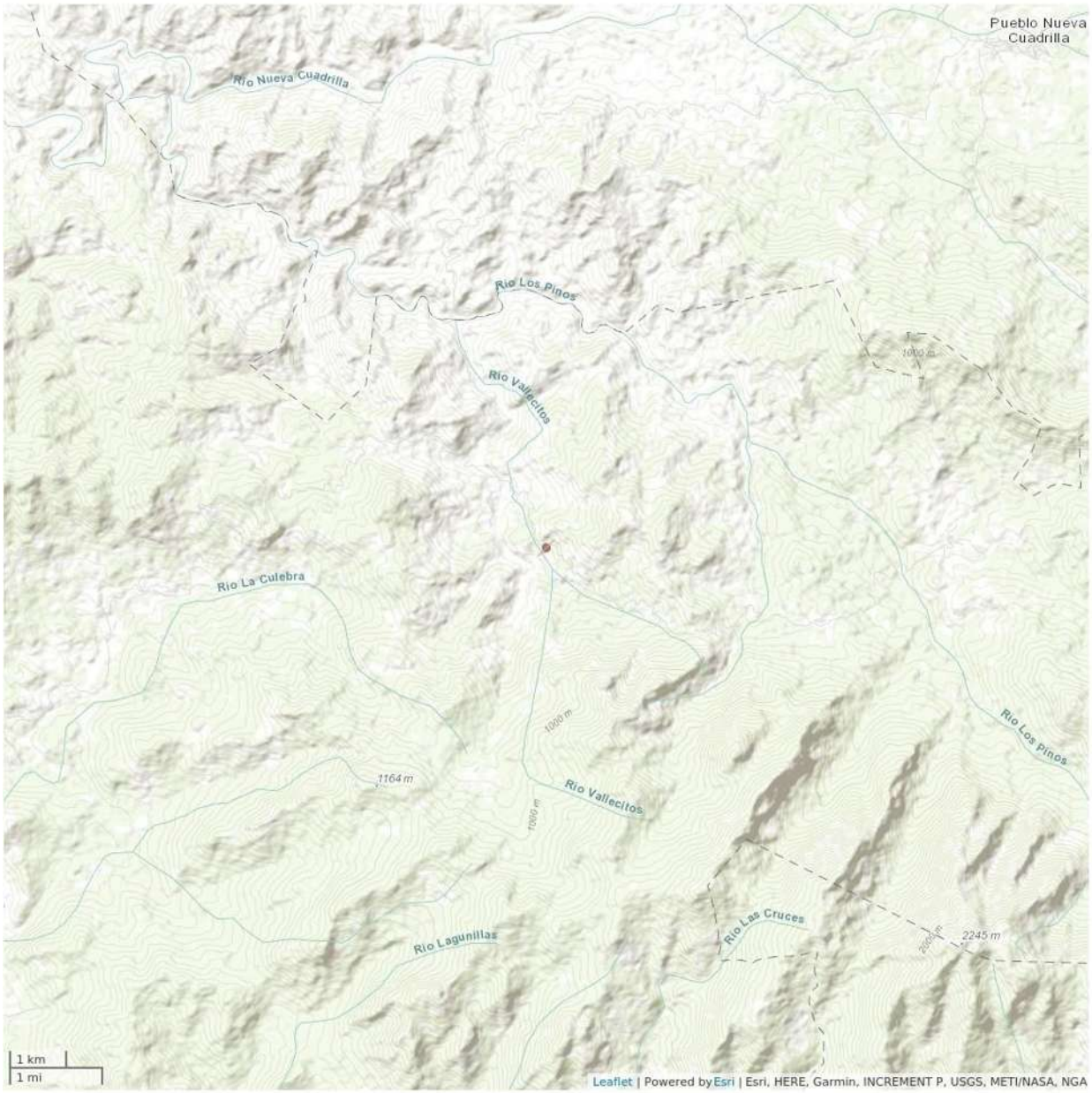
Cestrum flavinervium is a shrub endemic to Mexico, it is distributed only in the state of Guerrero in the Sierra Madre del Sur. This species has a very restricted distribution, as it is only known from the type locality, probably an area known as Vallecitos. It has also been reported for the state of Michoacán (Villaseñor 2016, Martínez *et al.* 2017); however, there are no herbarium records that support this information. It is important to mention that the last record of this taxon dates from 1937 carried out by George B. Hinton. After 1937, explorations have been carried out with the objective of collecting this species, however it has not been possible to find. The extent of occurrence could not be calculated and the area of occupancy is 4 km^2. It is calculated to occur in one location. The main threats for the taxon range are deforestation, grazing, and forest fires.

Country Occurrence:

Native, Extant (resident): Mexico

Native, Possibly Extinct: Mexico (Guerrero)

Distribution Map



Legend

POSSIBLY EXTINCT

Compiled by:

IUCN SSC Global Tree Specialist Group 2019

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

There is no up-to-date demographical information that enables understanding of current population trends, but it is suggested the population size is less than 50 mature individuals, it is likely that the population is decreasing (J.C. Montero-Castro pers. comm. 2019)

Current Population Trend: Decreasing

Habitat and Ecology (see Appendix for additional information)

Cestrum flavinervium is a shrub of 3 to 4 m high. It grows at an altitude range from 1,600 to 1,700 m, in granitic soils. It is located within transition zones in oak forests and tropical subdeciduous forests (J.C. Montero-Castro pers. comm. 2019).

Systems: Terrestrial

Use and Trade (see Appendix for additional information)

There is no information available about the use and trade of *Cestrum flavinervium*.

Threats (see Appendix for additional information)

The taxon is strongly threatened due to deforestation, grazing and forest fires. An important aspect to consider is the strong insecurity that exists in the area of distribution of this species, since it does not allow great efforts in its conservation.

Conservation Actions (see Appendix for additional information)

Cestrum flavinervium is not found within any protected natural area. There are no current *ex situ* sites worldwide (BGCI 2019). It is recommended to develop conservation plans as well as strategies to improve the economy of the communities with livelihood alternatives to avoid the habitat loss. It is important to continue explorations in the area of distribution, as well as research in aspects of the population and habitat for this species.

Credits

Assessor(s): Valentín-Martínez, D. & Montero Castro, J.

Reviewer(s): Samain, M.-S. & Oldfield, S.

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Villaseñor, J.L. 2016. Checklist of the native vascular plants of Mexico. *Revista Mexicana de Biodiversidad* 87 : 559–902.

Citation

Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum flavinervium*. *The IUCN Red List of Threatened Species* 2020: e.T126624899A126625160. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T126624899A126625160.en

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Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.4. Forest - Temperate	Resident	Suitable	-
1. Forest -> 1.5. Forest - Subtropical/Tropical Dry	Resident	Suitable	-

Plant Growth Forms

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Plant Growth Form
SL. Shrub - large

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very rapid declines	High impact: 8
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality		
7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.1. Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality		
11. Climate change & severe weather -> 11.5. Other impacts	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality		

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place research and monitoring

Action Recovery Plan: Unknown

Conservation Action in Place
In-place land/water protection
Conservation sites identified: No
Occurs in at least one protected area: No
In-place species management
Harvest management plan: No
In-place education
Subject to recent education and awareness programmes: No

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed
6. Livelihood, economic & other incentives -> 6.1. Linked enterprises & livelihood alternatives
6. Livelihood, economic & other incentives -> 6.4. Conservation payments

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
1. Research -> 1.2. Population size, distribution & trends
3. Monitoring -> 3.1. Population trends
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km²): 4
Continuing decline in area of occupancy (AOO): Yes
Number of Locations: 1
Continuing decline in number of locations: Yes
Lower elevation limit (m): 1,600
Upper elevation limit (m): 1,700
Population

Number of mature individuals: 49

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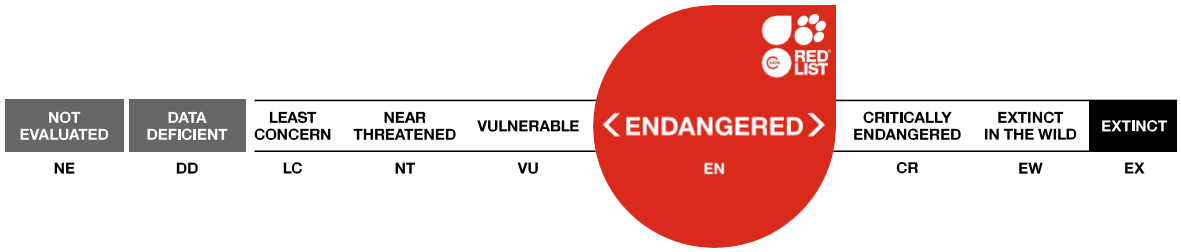
IUCN 2020: T136621126A136621129
Scope(s): Global
Language: English

Evaluación No. 3

Cestrum elegantissimum, Cerezo blanco

Assessment by: Valentín-Martínez, D. & Montero Castro, J.



View on www.iucnredlist.org

Citation: Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum elegantissimum*. *The IUCN Red List of Threatened Species* 2020: e.T136621126A136621129.
https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T136621126A136621129.en

Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Solanales	Solanaceae

Scientific Name: *Cestrum elegantissimum* C .V. Morton

Common Name(s):

- Spanish; Castilian: Cerezo blanco

Taxonomic Source(s):

Board of Trustees, RBG Kew. 2018. Plants of the World Online Portal. Richmond, UK Available at: http://www.plantsoftheworldonline.org.

Taxonomic Notes:

According to Tropicos.org (2019) and The Plant List (2019) *Cestrum elegantissimum* C. V. Morton is an accepted name for this species.

Assessment Information

Red List Category & Criteria: Endangered B2ab(iii) ver 3.1

Year Published: 2020

Date Assessed: March 15, 2019

Justification:

Cestrum elegantissimum is an endemic shrub from Mexico and Guatemala. In Mexico, this species is only distributed in the state of Chiapas around San Cristobal de las Casas, in the mountains near the natural protected area El Triunfo and in the municipality of Motozintla, while in Guatemala it has been reported in the departments of Quezaltenango and Suchitepéquez. The taxon has an extent of occurrence (EOO) of 18,424.950 km^2 and an area of occupancy (AOO) of 100 km^2. However, it is likely that the AOO is higher than calculated, remaining below 500 km^2. It is calculated to occur in between five locations. The main threats for the taxon range are deforestation, agriculture, forest fires, grazing and human settlements. *Cestrum elegantissimum* is assessed as Endangered (EN).

Geographic Range

Range Description:

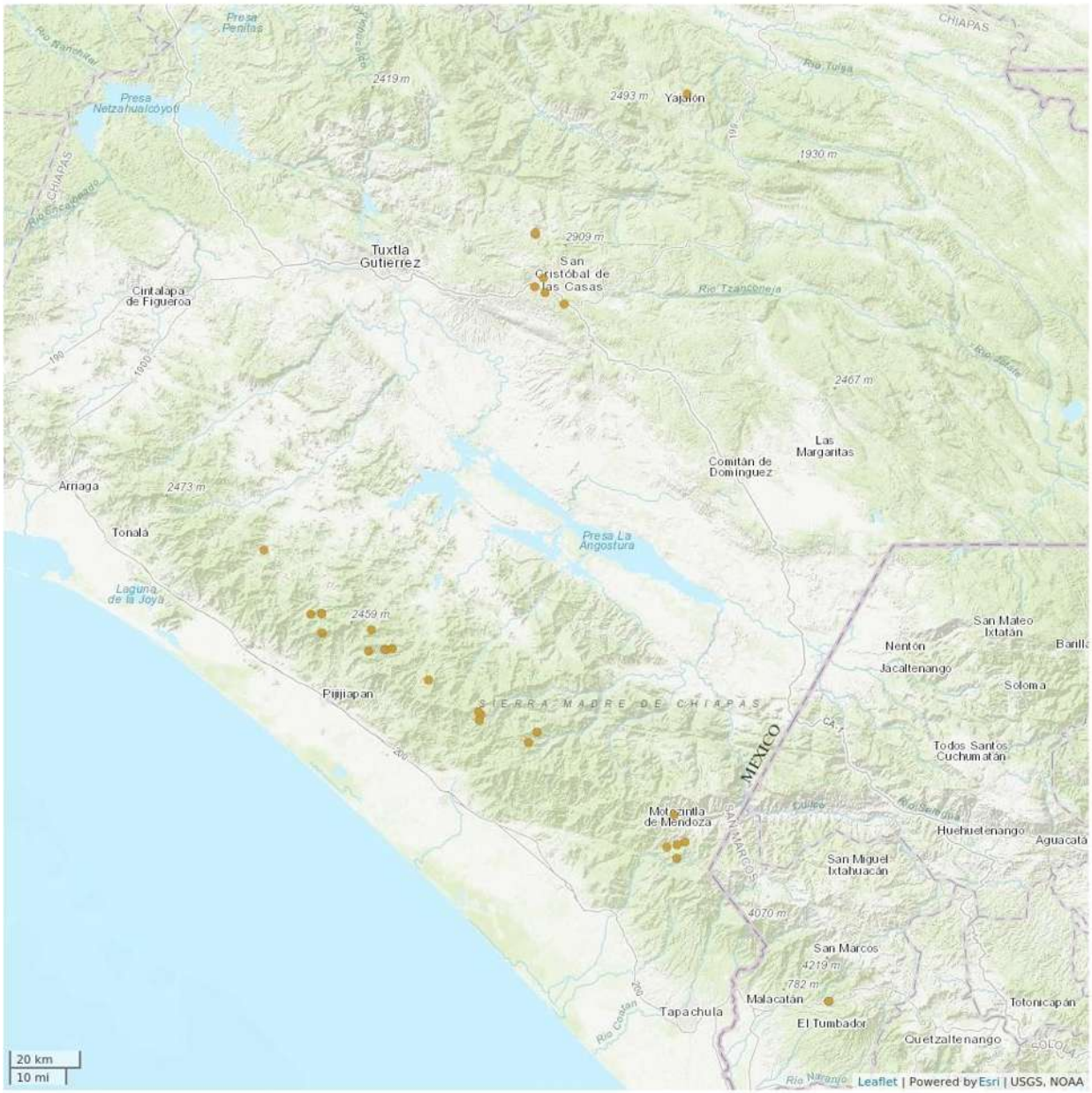
Cestrum elegantissimum is an endemic shrub from Mexico and Guatemala. In Mexico, this species is only distributed in the state of Chiapas around San Cristobal de las Casas, in the mountains near the natural protected area El Triunfo and in the municipality of Motozintla (Montero-Casto 2019), while in Guatemala it has been reported in the departaments of Quezaltenango and Suchitepéquez (Gentry and Standley 1974). The taxon has an extent of occurrence of 18,424.950 km^2 and an area of occupancy of 100 km^2. However, it is likely that the AOO is higher than calculated, remaining below 500 km^2. It is calculated to occur in five

locations. The main threats for the taxon range are deforestation, agriculture, forest fires, grazing and human settlements.

Country Occurrence:

Native, Extant (resident): Guatemala; Mexico (Chiapas)

Distribution Map



Legend

EXTANT (RESIDENT)

Compiled by:

IUCN SSC Global Tree Specialist Group 2019

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

There is no information available about the population size of *Cestrum elegantissimum*.
Current Population Trend: Decreasing

Habitat and Ecology (see Appendix for additional information)

Cestrum elegantissimum is a shrub of 1 to 5 m tall. It grows at an altitude range of 1,100-2,400 m (Gentry and Standley 1974, IBUNAM 2019). It occurs in mountain cloud forest and pine-oak forest associated with *Quercus*, *Pinus, Styrax, Magnolia, Wimmeria* and *Podocarpus* (IBUNAM 2019).

Systems: Terrestrial

Use and Trade (see Appendix for additional information)

There is no information available about the use and trade of *Cestrum elegantissimum*.

Threats (see Appendix for additional information)

The threats that have been observed for this species in Guatemala are deforestation, agriculture, forest fires and human settlements (INAB and IARNA-URL 2012). One of the vegetation types where *Cestrum elegantissimum* develops is the mountain cloud forest. In Mexico, these forests occupy less than 1% of the national territory, which is why it is considered the most threatened terrestrial ecosystem (CONABIO 2010, González-Espinosa *et al.* 2012). Particularly in the state of Chiapas, the strongest threats are deforestation, human settlements, forest fires, grazing and agriculture, where shade coffee crops are very frequent (Navarrete *et al.* 2010). In addition, some research reveals that in the state of Chiapas native forests suffered a 50% reduction in the period from 1975 to 2000 (Cayuela *et al.* 2006).

Conservation Actions (see Appendix for additional information)

Cestrum elegantissimum is present within the protected natural area Parque Nacional El Triunfo (Mexico). There are no current *ex situ* sites worldwide (BGCI 2019).

Credits

Assessor(s): Valentín-Martínez, D. & Montero Castro, J.

Reviewer(s): Samain, M.-S. & Oldfield, S.

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Departamento de Botánica, Instituto de Biología (UNAM). 2019. Cestrum elegantissimum C.V. Morton. Available at: https://datosabiertos.unam.mx/IBUNAM:MEXU:694885.

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The Plant List.org. 2019. Cestrum elegantissimum C.V.Morton. Available at: http://www.theplantlist.org/tpl1.1/record/kew-2713457.

Citation

Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum elegantissimum*. *The IUCN Red List of Threatened Species* 2020: e.T136621126A136621129. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T136621126A136621129.en

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Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.4. Forest - Temperate	Resident	Suitable	-
1. Forest -> 1.9. Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Plant Growth Forms

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Plant Growth Form
SS. Shrub - small
SL. Shrub - large

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.3. Agro-industry grazing, ranching or farming	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.1. Increase in fire frequency/intensity	Ongoing	Minority (50%)	Rapid declines	Medium impact: 6
11. Climate change & severe weather -> 11.5. Other impacts	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place land/water protection
Conservation sites identified: Yes, over part of range
Percentage of population protected by PAs: 1-10
Occurs in at least one protected area: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed
6. Livelihood, economic & other incentives -> 6.1. Linked enterprises & livelihood alternatives
6. Livelihood, economic & other incentives -> 6.4. Conservation payments

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

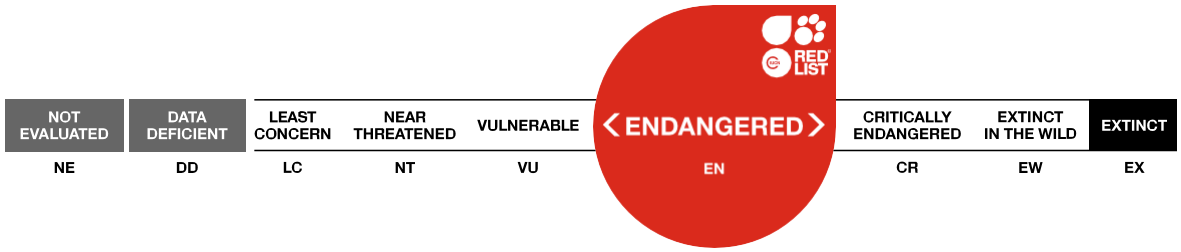
Distribution
Estimated area of occupancy (AOO) (km^2): 100
Estimated extent of occurrence (EOO) (km^2): 18424.950
Number of Locations: 5
Lower elevation limit (m): 1,500
Upper elevation limit (m): 2,400
Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Yes

The IUCN Red List of Threatened Species™
ISSN 2307-8235 (online)
IUCN 2020: T126624902A126625165
Scope(s): Global
Language: English

Evaluación No. 4

Cestrum fulvescens

Assessment by: Valentín-Martínez, D. & Montero Castro, J.



View on www.iucnredlist.org

Citation: Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum fulvescens*. *The IUCN Red List of Threatened Species* 2020: e.T126624902A126625165. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T126624902A126625165.en

Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Solanales	Solanaceae

Scientific Name: *Cestrum fulvescens* Fernald

Synonym(s):

- *Cestrum arborescens* Brandegee

Assessment Information

Red List Category & Criteria: Endangered B2ab(iii) ver 3.1

Year Published: 2020

Date Assessed: April 4, 2019

Justification:

Cestrum fulvescens is an endemic shrub from Mexico, it is distributed in the center-south of the country in the states of Michoacán, Guanajuato, Hidalgo, Puebla and Oaxaca. It has also been reported for the states of Guerrero, Jalisco, Querétaro, Nuevo León and Tamaulipas; however, it is very likely that these concern erroneous identifications. The extent of occurrence (EOO) is 89,998.992 km^2. The area of occupancy (AOO) of the taxon is 96 km^2, but it is likely that the AOO of the species is a little higher than estimated, if the collection efforts were increased. The taxon has five locations and the main threats that the distribution area presents are agriculture, human settlements and deforestation. *Cestrum fulvescens* is assessed as Endangered (EN).

Geographic Range

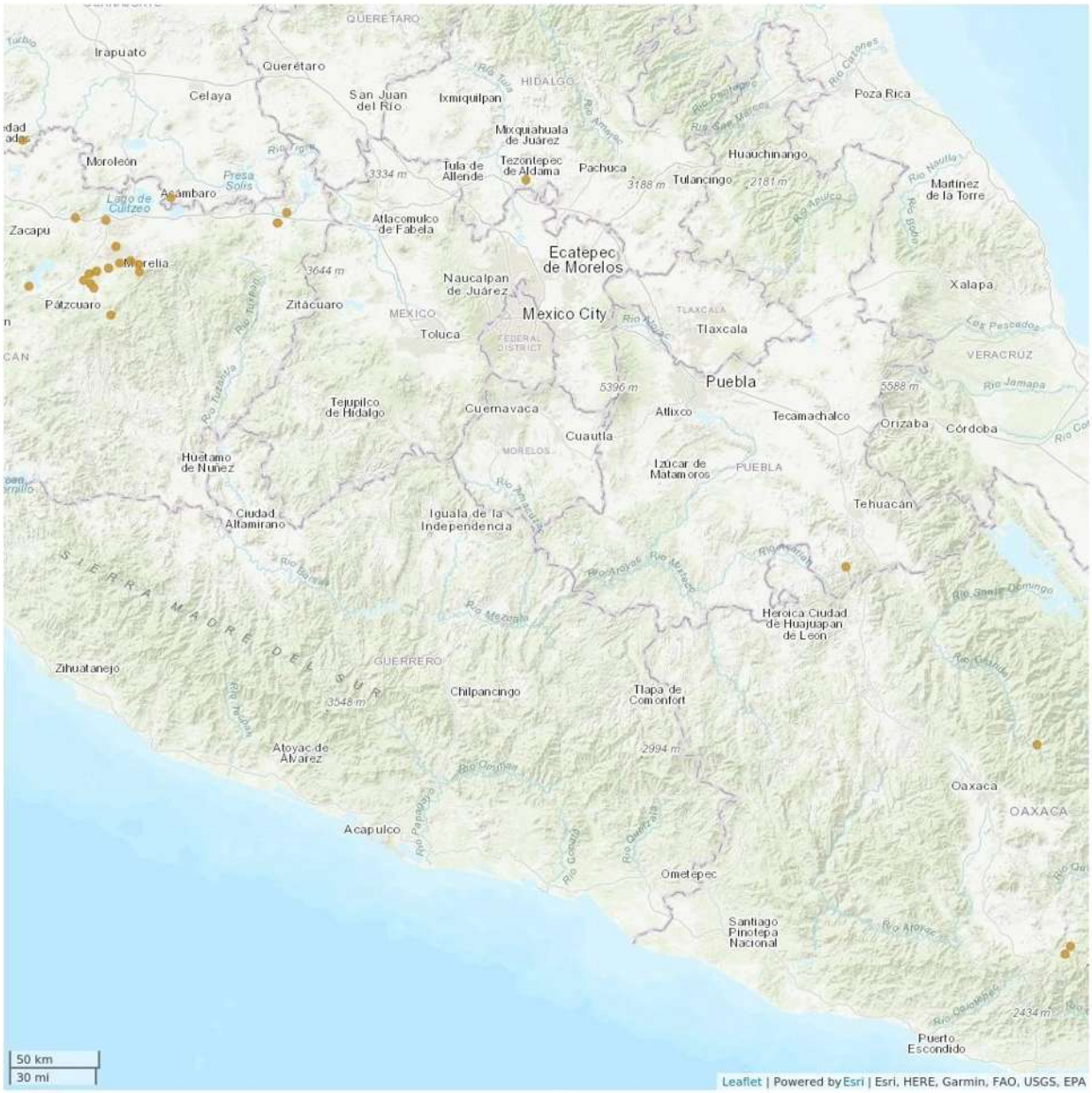
Range Description:

Cestrum fulvescens is an endemic shrub from Mexico, it is distributed in the center-south of the country in the states of Michoacán, Guanajuato, Hidalgo, Puebla and Oaxaca. It has also been reported for the states of Guerrero, Jalisco, Querétaro, Nuevo León and Tamaulipas (Villaseñor 2016, Martínez *et al.* 2017); however, it is very likely that these concern erroneous identifications (J.C. Montero Castro pers. comm. 2019). The extent of occurrence is 89,998.992 km^2. The area of occupancy of the taxon is 96 km^2, but it is likely that the AOO of the species is a little higher than estimated, if the collection efforts were increased. The taxon has five locations and the main threats that the distribution area presents are agriculture, human settlements and deforestation.

Country Occurrence:

Native, Extant (resident): Mexico (Guanajuato, Hidalgo, Michoacán, Oaxaca, Puebla)

Distribution Map



Legend

EXTANT (RESIDENT)

Compiled by:

IUCN SSC Global Tree Specialist Group 2019

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

There is no information available about the population of *Cestrum fulvescens.*
Current Population Trend: Unknown

Habitat and Ecology **(see Appendix for additional information)**

Cestrum fulvescens is a shrub 1 to 3 m tall (Standley 1924). It grows in oak forests, pine-oak forests and deciduous tropical forests associated with *Acacia* sp., *Fraxinus* sp., *Bursera* sp., *Forestiera* sp., *Opuntia* sp., *Quercus* sp. and *Pinus* sp.

Systems: Terrestrial

Use and Trade **(see Appendix for additional information)**

There is no information available about the use and trade of *Cestrum fulvescens.*

Threats **(see Appendix for additional information)**

Cestrum fulvescens develops in temperate forest and tropical deciduous forest. In Mexico, temperate forests have been strongly affected due to deforestation, agriculture, forest fires, livestock and climate change, while deciduous tropical forests have suffered a large decrease due to deforestation that rose from 1970 with the agrarian distribution, since it favored the change of land use for the increase of agriculture and livestock areas (CONABIO 2019) In the period from 1970 to 1990, Mexico lost 14% of the coniferous forests, while hardwood forests suffered a reduction of 9.3% (Sánchez *et al*. 2003).

Conservation Actions **(see Appendix for additional information)**

According to the record points, *Cestrum fulvescens* is not found within a protected natural area. There are no current *ex situ* sites worldwide (BGCI 2019).

Credits

Assessor(s): Valentín-Martínez, D. & Montero Castro, J.

Reviewer(s): Samain, M.-S. & Oldfield, S.

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Martínez, M., Vargas-Ponce, O., Rodríguez, A., Chiang, F. and Ocegueda, S. 2017. Solanaceae family in Mexico. *Botanical Sciences* 95 (1): 131-145.

Sánchez, O., Vega, E., Peters, E. y Monroy-Vilchis, O. 2003. *Conservación de Ecosistemas Templados de Montaña en México*. Instituto Nacional de Ecología (INE-SEMARNAT), México.

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Citation

Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum fulvescens*. *The IUCN Red List of Threatened Species* 2020: e.T126624902A126625165. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T126624902A126625165.en

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External Resources

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Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.4. Forest - Temperate	Resident	Suitable	-
1. Forest -> 1.5. Forest - Subtropical/Tropical Dry	Resident	Suitable	-

Plant Growth Forms

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Plant Growth Form
SL. Shrub - large
SS. Shrub - small

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.1. Increase in fire frequency/intensity	Ongoing	Minority (50%)	Rapid declines	Medium impact: 6

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place land/water protection
Conservation sites identified: No

Occurs in at least one protected area: No

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed
6. Livelihood, economic & other incentives -> 6.1. Linked enterprises & livelihood alternatives
6. Livelihood, economic & other incentives -> 6.4. Conservation payments

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

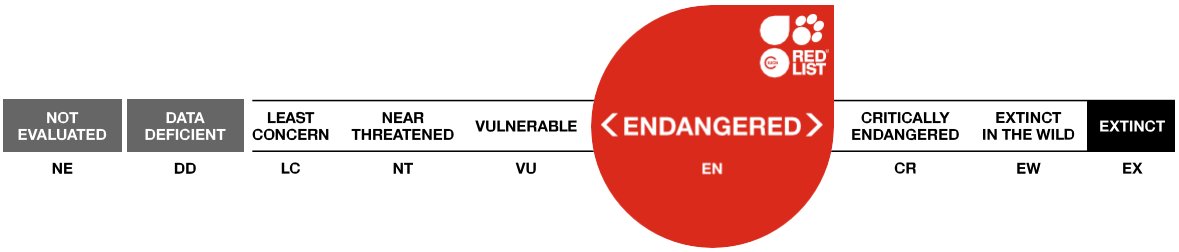
Distribution
Estimated area of occupancy (AOO) (km²): 96-150
Estimated extent of occurrence (EOO) (km²): 89998.992
Number of Locations: 5
Lower elevation limit (m): 1,800
Upper elevation limit (m): 2,800
Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Yes

The IUCN Red List of Threatened Species™
ISSN 2307-8235 (online)
IUCN 2020: T136621177A136621181
Scope(s): Global
Language: English

Evaluación No. 5

Cestrum miradorense

Assessment by: Valentín-Martínez, D. & Montero Castro, J.



View on www.iucnredlist.org

Citation: Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum miradorense*. *The IUCN Red List of Threatened Species* 2020: e.T136621177A136621181. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T136621177A136621181.en

Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Solanales	Solanaceae

Scientific Name: *Cestrum miradorense* Francey

Taxonomic Source(s):

Board of Trustees, RBG Kew. 2018. Plants of the World Online Portal. Richmond, UK Available at: http://www.plantsoftheworldonline.org.

Assessment Information

Red List Category & Criteria: Endangered B2ab(iii) ver 3.1

Year Published: 2020

Date Assessed: April 5, 2019

Justification:

Cestrum miradorense is an endemic shrub from Mexico. In the state of Veracruz, this species is distributed in a small area near Xalapa and Mirador, while in the state of Oaxaca it is located in the region Sierra Norte of Oaxaca. The taxon has an extent of occurrence (EOO) of 7,109.376 km^2 and an area of occupancy (AOO) of 76 km^2. However, it is likely that the AOO is higher than calculated, remaining below 500 km^2. It is calculated to occur in four locations. The main threats for the taxon range are deforestation, agriculture and human settlements. *Cestrum miradorense* is assessed as Endangered (EN).

Geographic Range

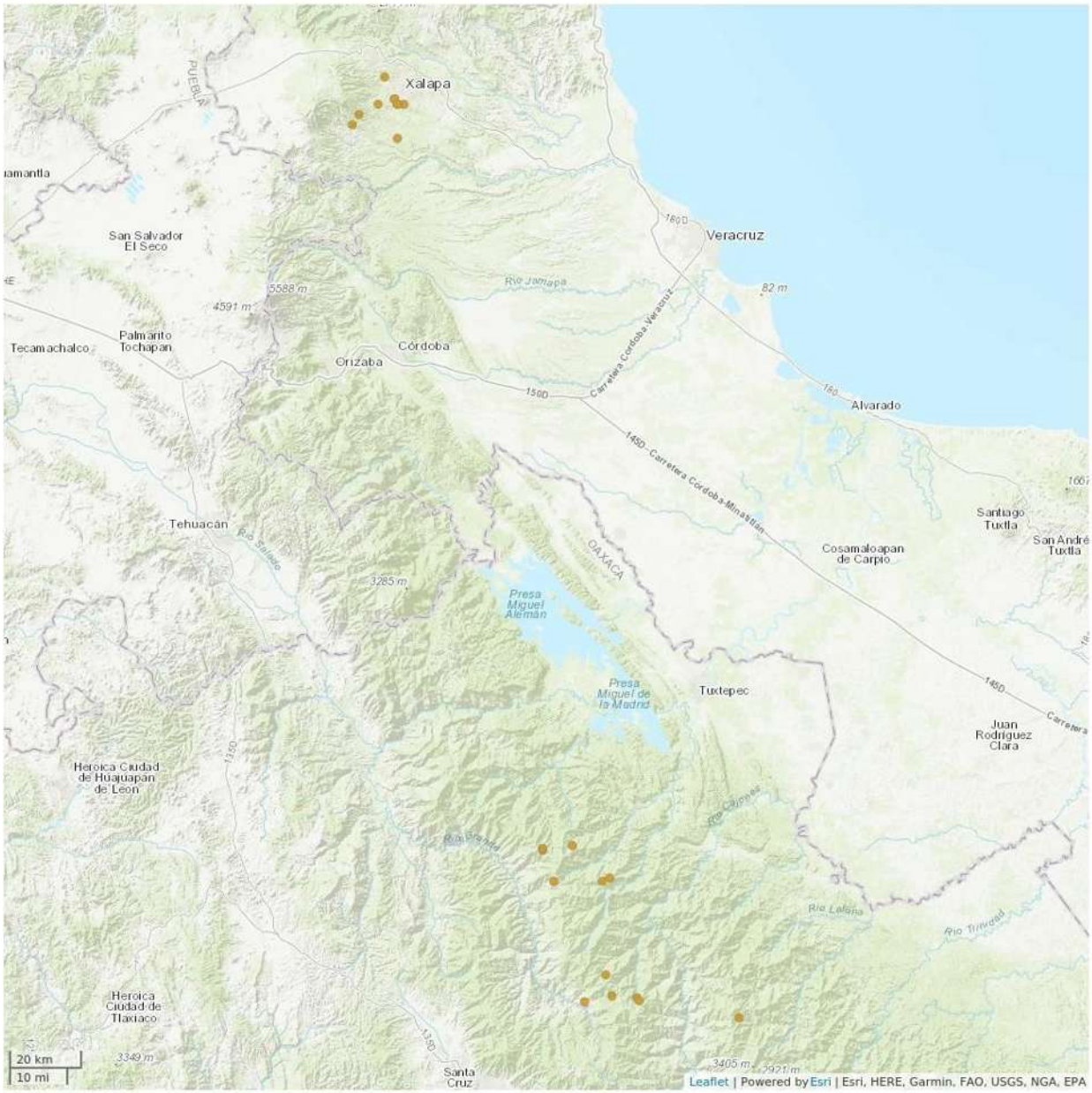
Range Description:

Cestrum miradorense is an endemic shrub from Mexico. In the state of Veracruz, this species is distributed in a small area near Xalapa and Mirador (Nee 1986), while in the state of Oaxaca it is located in the region Sierra Norte of Oaxaca (Montero-Castro data 2019). The taxon has an extent of occurrence (EOO) of 7,109.376 km^2 and an area of occupancy (AOO) of 76 km^2. However, it is likely that the AOO is higher than calculated, remaining below 500 km^2. It is calculated to occur in four locations. The main threats for the taxon range are deforestation, agriculture and human settlements.

Country Occurrence:

Native, Extant (resident): Mexico (Oaxaca, Veracruz)

Distribution Map



Legend

EXTANT (RESIDENT)

Compiled by:

IUCN SSC Global Tree Specialist Group 2019

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

There is no information available about the population size of *Cestrum miradorense.*
Current Population Trend: Decreasing

Habitat and Ecology (see Appendix for additional information)

Cestrum miradorense is a shrub from 1 to 4 m tall. It grows at an altitude range of 1,300–2,400 m (Nee 1986). It occurs in mountain cloud forest, oak forest and pine-oak forest associated with *Carpinus caroliniana*, *Liquidambar macrophylla*, *Alnus* sp., *Piper* sp., *Quercus* sp. and *Pinus* sp. It flowers during the months of October to April (Nee 1986).

Systems: Terrestrial

Use and Trade (see Appendix for additional information)

There is no information available about the use and trade of *Cestrum miradorense.*

Threats (see Appendix for additional information)

Cestrum miradorense grows in mountain cloud forest. In Mexico, these forests occupy less than 1% of the national territory, which is why it is considered the most threatened terrestrial ecosystem (CONABIO 2010, González-Espinosa *et al.* 2012). Another type of vegetation where *Cestrum miradorense* grows is temperate forest, this ecosystem has been strongly affected due to deforestation, agriculture, forest fires, livestock and climate change (CONABIO 2019). In the period from 1970 to 1990, Mexico lost 14% of the coniferous forests, while the hardwood forests suffered a reduction of 9.3% (Sánchez *et al.* 2003).

Conservation Actions (see Appendix for additional information)

According to distribution points, *Cestrum miradorense* is not located within a protected natural area. There are no current *ex situ* sites worldwide (BGCI 2019).

Credits

Assessor(s): Valentín-Martínez, D. & Montero Castro, J.

Reviewer(s): Samain, M.-S. & Oldfield, S.

Bibliography

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Citation

Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum miradorense*. *The IUCN Red List of Threatened Species* 2020: e.T136621177A136621181. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T136621177A136621181.en

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Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.4. Forest - Temperate	Resident	Suitable	-
1. Forest -> 1.9. Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Plant Growth Forms

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Plant Growth Form
SL. Shrub - large
SS. Shrub - small

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Minority (50%)	Rapid declines	Medium impact: 6
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place land/water protection
Conservation sites identified: No
Occurs in at least one protected area: No

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed
6. Livelihood, economic & other incentives -> 6.1. Linked enterprises & livelihood alternatives
6. Livelihood, economic & other incentives -> 6.4. Conservation payments

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

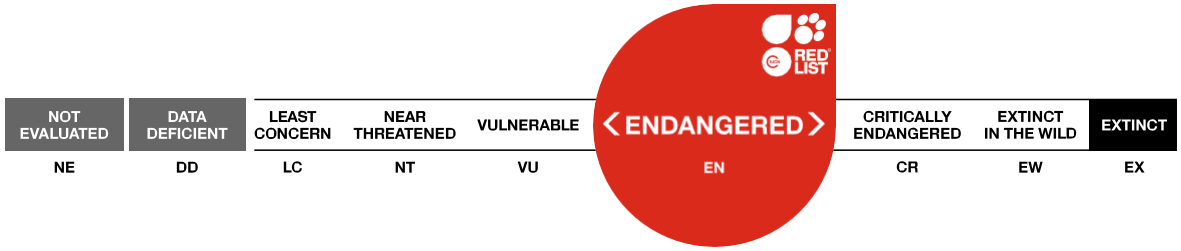
Distribution
Estimated area of occupancy (AOO) (km²): 76-500
Estimated extent of occurrence (EOO) (km²): 7109.376
Number of Locations: 4
Lower elevation limit (m): 1,300
Upper elevation limit (m): 2,400
Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Yes

The IUCN Red List of Threatened Species™
ISSN 2307-8235 (online)
IUCN 2020: T126624926A126625180
Scope(s): Global
Language: English

Evaluación No. 6

Cestrum nitidum

Assessment by: Valentín-Martínez, D. & Montero Castro, J.



View on www.iucnredlist.org

Citation: Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum nitidum*. *The IUCN Red List of Threatened Species* 2020: e.T126624926A126625180. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T126624926A126625180.en

Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Solanales	Solanaceae

Scientific Name: *Cestrum nitidum* M. Martens & Galeotti

Taxonomic Notes:

Cestrum nitidum is an accepted name for this species. *Cestrum nitidum* was described based on specimens of herbarium collected by H. Galeotti in a locality of Oaxaca, however the name of this species has been used erroneously to identify specimens from the Sierra Madre del Sur and the Transmexican Volcanic Belt (Montero-Castro and Lara-Cabrera 2019).

Assessment Information

Red List Category & Criteria: Endangered B1ab(iii)+2ab(iii) ver 3.1

Year Published: 2020

Date Assessed: April 11, 2019

Justification:

Cestrum nitidum is an endemic shrub from Mexico. This species is only distributed in the state of Oaxaca around Ixtlán de Juárez (Capulálpam Mendez, Santa Maria Yavesía, Santiago Xiacuí (Castresana)). This species has previously been reported from the states of Chiapas, Guanajuato, Guerrero, Jalisco, State of Mexico, Mexico City, Michoacán, Morelos, Puebla, Querétaro, Hidalgo, Tlaxcala and Tamaulipas, but the specimens collected in these states correspond to the species *Cestrum commune*. The taxon has an extent of occurrence (EOO) of 4,628.422 km^2 and an area of occupancy (AOO) of 20 km^2. However, it is likely that the AOO is higher than calculated. It is calculated to occur in four locations. The main threats for the taxon range are deforestation, agriculture and human settlements. *Cestrum nitidum* is assessed as Endangered (EN).

Geographic Range

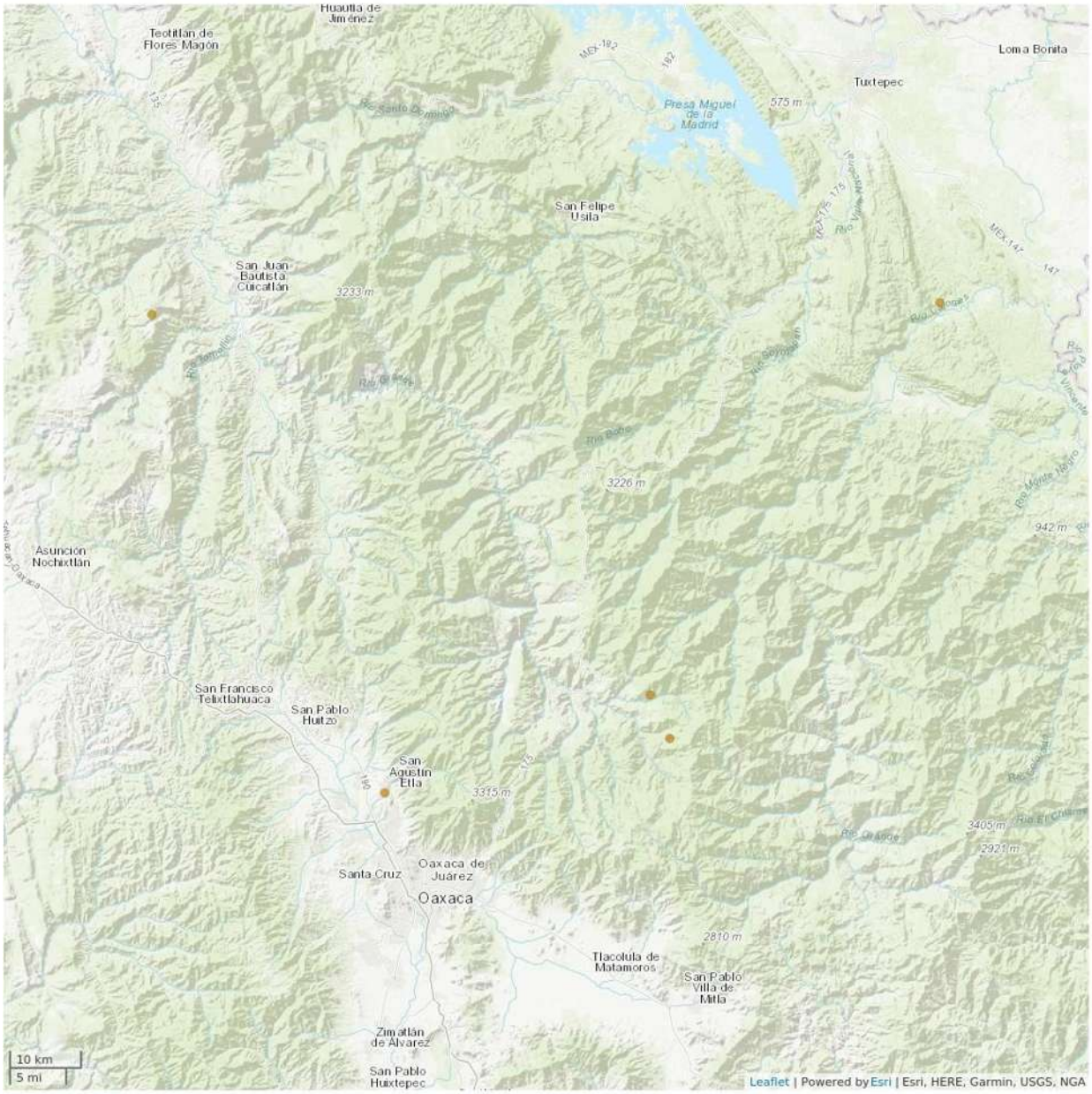
Range Description:

Cestrum nitidum is an endemic shrub from Mexico. This species is only distributed in the state of Oaxaca around Ixtlán de Juárez (Capulálpam de Méndez, Santa Maria Yavesía y Santiago Xiacuí (Castresana))(Montero-Castro and Lara-Cabrera 2019). This species has been reported from the states of Chiapas, Guanajuato, Guerrero, Jalisco, State of Mexico, Mexico City, Michoacán, Morelos, Puebla, Querétaro, Hidalgo, Tlaxcala and Tamaulipas (Villaseñor 2016, Martínez *et al.* 2017), however, the specimens collected in these states correspond to the species *Cestrum commune* (Montero-Castro and Lara-Cabrera 2019). The taxon has an extent of occurrence of 4,628.422 km^2 and an area of occupancy of 20 km^2. It is calculated to occur in four locations. The main threats for the taxon range are deforestation, agriculture and human settlements.

Country Occurrence:

Native, Extant (resident): Mexico (Oaxaca)

Distribution Map



Legend

EXTANT (RESIDENT)

Compiled by:

IUCN SSC Global Tree Specialist Group 2019

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Population

There is no information about the population dynamics of *Cestrum nitidum.*

Current Population Trend: Unknown

Habitat and Ecology (see Appendix for additional information)

Cestrum nitidum is a shrub from 1 to 5 m tall. It grows at an altitude range of 2000-2300 m. It grows in pine-oak forests formed by *Pinus pseudostrobus*, *P. lawsonii*, P*. leiophylla*, *P. rudis*, *Quercus chinantlensis*, *Q. juergensenii*, *Q. sororia*, *Q. liebmannii*, *Q. scytophylla* and *Q. furfuracea* as well as other species associated of the genera *Arbutus*, *Ardisia*, *Bejaria*, *Clethra*, *Fuchsia*, *Garrya*, *Litsea*, *Liquidambar*, *Meliosma*, *Oreopanax*, *Saurauia*, *Styrax* and *Symplocos*. The climate in the region is C (w2) (w) defined as a temperate subhumid climate, with abundant rainfall in summer, average annual temperature of
15.2 ° C and an average annual precipitation of 1115 mm. The flowering of *Cestrum nitidum* occurs in November and December. Based on the phenology of other *Cestrum* species, fruiting would be expected between December and January (Montero-Castro and Lara-Cabrera 2019).

Systems: Terrestrial

Use and Trade (see Appendix for additional information)

There is no information available about the use and trade of *Cestrum nitidum.*

Threats (see Appendix for additional information)

Cestrum nitidum grows in pine-oak forest. In Mexico this ecosystem has been strongly affected due to deforestation, agriculture, forest fires, livestock and climate change (CONABIO 2019). In the period from 1970 to 1990, Mexico lost 14% of the coniferous forests, while the hardwood forests suffered a reduction of 9.3% (Sánchez *et al*. 2003). Oaxaca is one of the states with a broad indigenous cultural heritage, however the majority of its population lives with a strong social lag, so poverty has become one of the main threats to biodiversity. Many of the ecosystems have been heavily degraded due to the establishment of agricultural and livestock areas that offer greater economic value which strongly influences the loss and degradation of biodiversity and its environmental services (CONABIO, SEMAEDESO 2018). Given this problem and due to the small distribution area that *Cestrum nitidum* has, it is very likely that in a few years this species will change from the EN category to the CR category.

Conservation Actions (see Appendix for additional information)

According to distribution points (Montero-Castro data 2019), *Cestrum nitidum* is not located within a protected natural area. There are no current ex situ sites worldwide (BGCI 2019).

Credits

Assessor(s): Valentín-Martínez, D. & Montero Castro, J.

Reviewer(s): Samain, M.-S. & Oldfield, S.

Bibliography

BGCI. 2018. Botanic Gardens Conservation International (BGCI) - Plant Search. Available at: https://www.bgci.org/plant_search.php.

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IUCN. 2020. The IUCN Red List of Threatened Species. Version 2020-1. Available at: www.iucnredlist.org. (Accessed: 19 March 2020).

Martínez, M., Vargas-Ponce, O., Rodríguez, A., Chiang, F. and Ocegueda, S. 2017. Solanaceae family in Mexico. *Botanical Sciences* 95 (1): 131-145.

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Sánchez, O., Vega, E., Peters, E. y Monroy-Vilchis, O. 2003. *Conservación de Ecosistemas Templados de Montaña en México*. Instituto Nacional de Ecología (INE-SEMARNAT), México, D. F.

Villasenor, J.L. 2016. Checklist of the native vascular plants of Mexico. *Revista Mexicana de Biodiversidad* 87(3): 559-902.

Citation

Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum nitidum*. *The IUCN Red List of Threatened Species* 2020: e.T126624926A126625180. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T126624926A126625180.en

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Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.4. Forest - Temperate	Resident	Suitable	-

Plant Growth Forms

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Plant Growth Form
SL. Shrub - large
SS. Shrub - small

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.4. Unintentional effects: (large scale) [harvest]	Ongoing	Minority (50%)	Rapid declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place land/water protection

Conservation Action in Place
Conservation sites identified: No
Occurs in at least one protected area: No
In-place species management
Subject to ex-situ conservation: No

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed
6. Livelihood, economic & other incentives -> 6.1. Linked enterprises & livelihood alternatives
6. Livelihood, economic & other incentives -> 6.4. Conservation payments

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
1. Research -> 1.2. Population size, distribution & trends
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km^2): 20-500
Estimated extent of occurrence (EOO) (km^2): 4628.422
Number of Locations: 4
Lower elevation limit (m): 2,000
Upper elevation limit (m): 2,300
Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Yes

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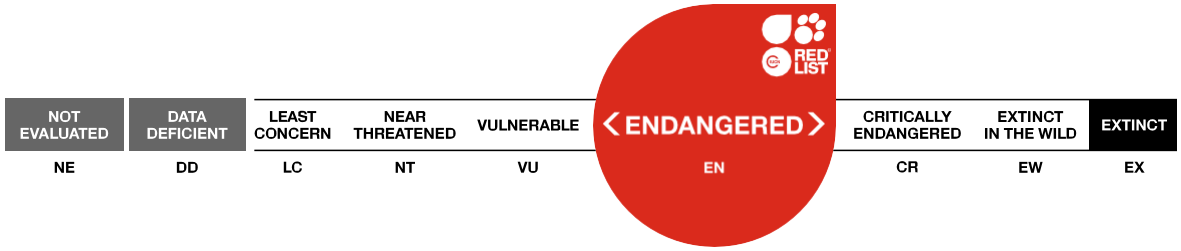
Scope(s): Global
Language: English

Evaluación No. 7

Schultesianthus uniflorus

Assessment by: Valentín-Martínez, D. & Montero Castro, J.



View on www.iucnredlist.org

Citation: Valentín-Martínez, D. & Montero Castro, J. 2020. *Schultesianthus uniflorus*. *The IUCN Red List of Threatened Species* 2020: e.T136621349A136621357.
https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T136621349A136621357.en

Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Solanales	Solanaceae

Scientific Name: *Schultesianthus uniflorus* (Lundell) S. Knapp

Synonym(s):

- *Markea uniflora* Lundell
- *Merinthopodium uniflorum* (Lundell) Hunz.

Taxonomic Source(s):

Board of Trustees, RBG Kew. 2018. Plants of the World Online Portal. Richmond, UK Available at: http://www.plantsoftheworldonline.org.

Assessment Information

Red List Category & Criteria: Endangered B2ab(i) ver 3.1

Year Published: 2020

Date Assessed: April 12, 2019

Justification:

Schultesianthus uniflorus is a shrub from Mexico and Guatemala. In Mexico, this species is only distributed in the state of Chiapas around the Tacaná volcano, in Guatemala near San Marcos and Alta Verapaz. The taxon has an extent of occurrence (EOO) of 16,492.476 km^2 and an area of occupancy (AOO) of 28 km^2. However, it is likely that the AOO is higher than calculated, remaining below 500 km^2. It is calculated to occur in between three to five locations. The main threats for the taxon range are deforestation, agriculture, forest fires, cattle raising and human settlements. *Schultesianthus uniflorus* is assessed as Endangered (EN).

Geographic Range

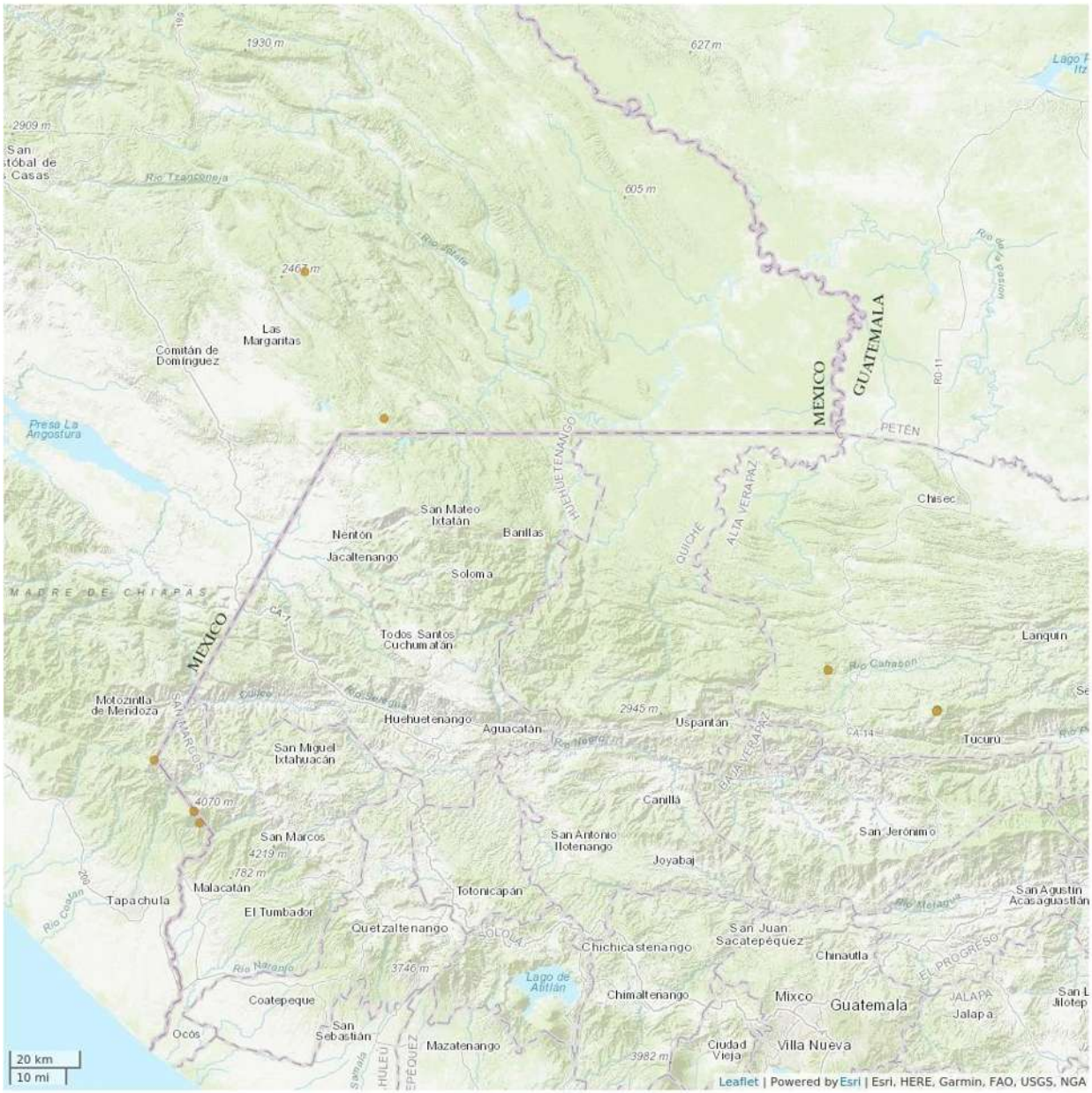
Range Description:

Schultesianthus uniflorus is a shrub from Mexico and Guatemala. In Mexico, this species is only distributed in the state of Chiapas (Villaseñor 2016, Martínez *et al*. 2017) around the Tacaná volcano, in Guatemala near San Marcos and Alta Verapaz (Gentry and Standley 1974). The taxon has an extent of occurrence of 16,492.476 km^2 and an area of occupancy of 28 km^2. However, it is likely that the AOO is higher than calculated, remaining below 500 km^2. It is calculated to occur in between three to five locations. The main threats for the taxon range are deforestation, agriculture, forest fires, cattle raising and human settlements.

Country Occurrence:

Native, Extant (resident): Guatemala; Mexico (Chiapas)

Distribution Map



Legend

EXTANT (RESIDENT)

Compiled by:

IUCN SSC Global Tree Specialist Group 2019

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

There is no information available about the population of *Schultesianthus uniflorus*.
Current Population Trend: Unknown

Habitat and Ecology (see Appendix for additional information)

Schultesianthus uniflorus is a shrub. It grows at an altitude range of 2,000–3,000 m (Gentry and Standley 1974). It occurs in mountain cloud forest and pine-oak forest associated with *Quercus*, *Pinus, Turpinia, Saurauia, Dendropanax* and *Nectandra* (IBUNAM 2019).

Systems: Terrestrial

Use and Trade (see Appendix for additional information)

There is no information available about the use and trade of *Schultesianthus uniflorus*.

Threats (see Appendix for additional information)

Schultesianthus uniflorus occurs in the mountain cloud forest. In Mexico, these forests occupy less than 1% of the national territory, which is why it is considered the most threatened terrestrial ecosystem (CONABIO 2010, González-Espinosa *et al.* 2012). Particularly in the state of Chiapas, the strongest threats are deforestation, human settlements, livestock and agriculture, where shade coffee crops are very frequent (Navarrete *et al.* 2010). In addition, some research reveals that in the state of Chiapas native forests suffered a 50% reduction in the period from 1975 to 2000 (Cayuela *et al.* 2006). Research carried out in Guatemala shows a net annual loss of 48,084 ha of forests, equivalent to a deforestation rate of 1.16%, with unsustainable agriculture being the strongest pressure, followed by forest fires, illegal logging and growth of the population (INAB, IARNA-URL 2012).

Conservation Actions (see Appendix for additional information)

According to the collection points, *Schultesianthus uniflorus* is not found within a protected natural area. There are no current *ex situ* sites worldwide (BGCI 2019).

Credits

Assessor(s): Valentín-Martínez, D. & Montero Castro, J.

Reviewer(s): Samain, M.-S. & Oldfield, S.

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Citation

Valentín-Martínez, D. & Montero Castro, J. 2020. *Schultesianthus uniflorus*. *The IUCN Red List of Threatened Species* 2020: e.T136621349A136621357. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T136621349A136621357.en

Disclaimer

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.4. Forest - Temperate	Resident	Suitable	-
1. Forest -> 1.9. Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Plant Growth Forms

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Plant Growth Form
S. Shrub - size unknown

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming	Ongoing	Majority (50-90%)	Very rapid declines	High impact: 8
2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.3. Agro-industry grazing, ranching or farming	Ongoing	Minority (50%)	Rapid declines	Medium impact: 6
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very rapid declines	High impact: 8
7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.1. Increase in fire frequency/intensity	Ongoing	Minority (50%)	Rapid declines	Medium impact: 6

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place land/water protection

The IUCN Red List of Threatened Species™
ISSN 2307-8235 (online)
IUCN 2020: T126624919A126625170
Scope(s): Global
Language: English

Evaluación No. 8

Cestrum guatemalense

Assessment by: Valentín-Martínez, D. & Montero Castro, J.

View on www.iucnredlist.org

Citation: Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum guatemalense*. *The IUCN Red List of Threatened Species* 2020: e.T126624919A126625170.
https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T126624919A126625170.en

Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Solanales	Solanaceae

Scientific Name: *Cestrum guatemalense* Francey

Common Name(s):

- Spanish; Castilian: Huele de noche, Huele zorra, Shintez

Taxonomic Source(s):

Missouri Botanical Garden. 2014. Tropicos.org. Available at: http://www.tropicos.org/.

Taxonomic Notes:

Cestrum guatemalense Francey is an accepted name for the species.There has been a taxonomic confusion between *Cestrum guatemalense*, *C. mexicanum* and *C. pacayense*, species distributed in southern Mexico, Guatemala, Honduras and El Salvador. This is due to the plasticity of some of their morphological characters, so they have even been proposed as synonyms (Castillo-Batista *et al*. 2017). However, a recent morphometric study carried out by Castillo-Batista *et al*. (2017) indicates that they are different species.

Assessment Information

Red List Category & Criteria: Vulnerable B2ab(iii) ver 3.1

Year Published: 2020

Date Assessed: February 15, 2019

Justification:

Cestrum guatemalense is an endemic shrub or small tree from Mexico, Guatemala and Honduras. In Mexico, this species is only distributed in the state of Chiapas, in Guatemala it is a common shrub in the western and central mountains. The taxon has an extent of occurrence (EOO) of 59,163.300 km^2 and an area of occupancy (AOO) of 152 km^2. However, it is likely that the AOO is higher than calculated, remaining below 500 km^2. It is calculated to occur in eight locations. The main threats for the taxon range are deforestation, agriculture, forest fires and human settlements. *Cestrum guatemalense* is assessed as Vulnerable.

Geographic Range

Range Description:

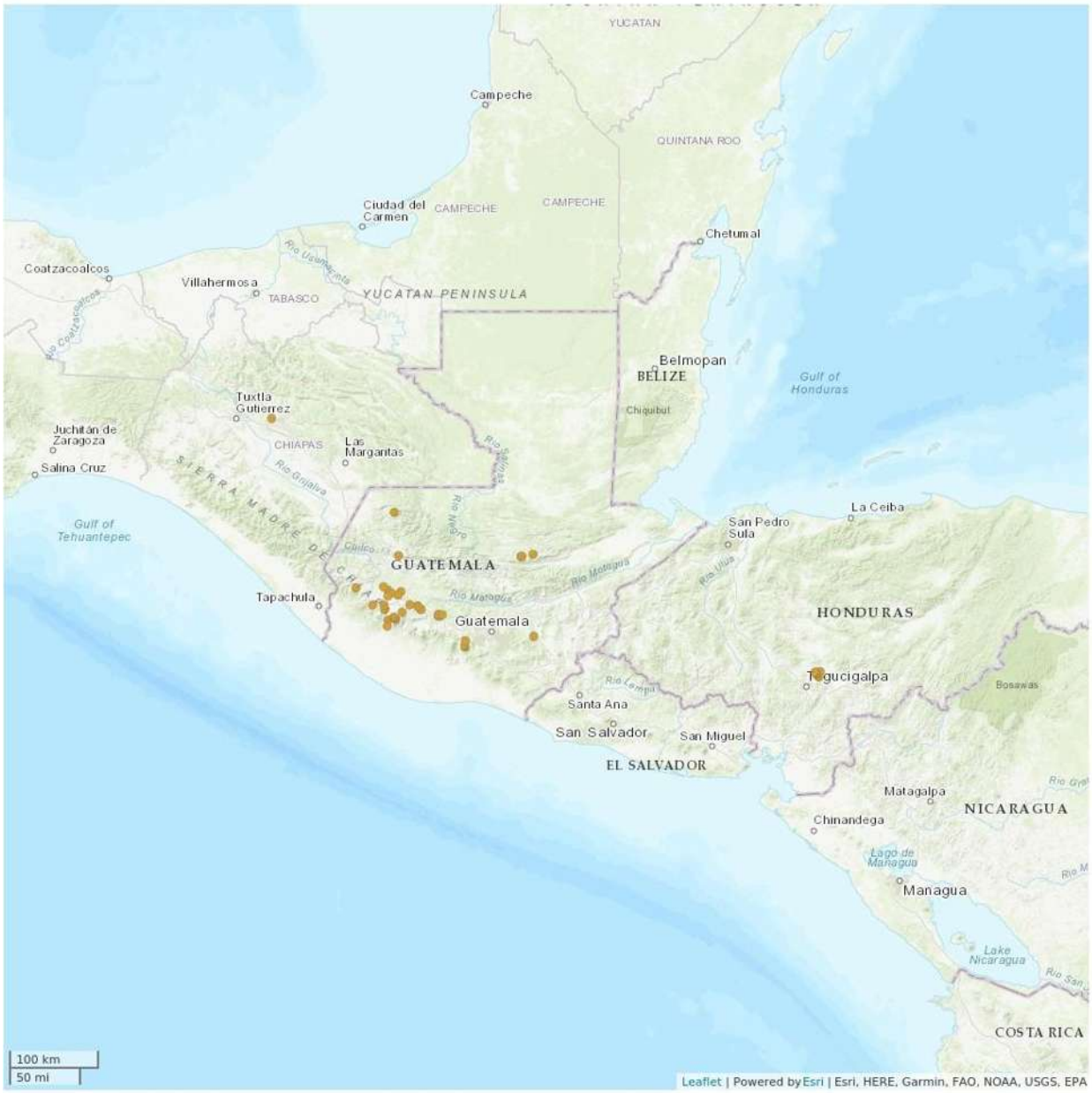
Cestrum guatemalense is an endemic shrub or small tree from Mexico, Guatemala and Honduras. In Mexico, this species is only distributed in the state of Chiapas, in Guatemala it is a common shrub in the western and central mountains (Gentry and Standley 1974). The taxon has an extent of occurrence (EOO) of 59,163.300 km^2 and an area of occupancy (AOO) of 152 km^2. However, it is likely that the AOO is higher than calculated, remaining below 500 km^2. It is calculated to occur in eight locations. The main

threats for the taxon range are deforestation, agriculture, forest fires and human settlements.

Country Occurrence:

Native, Extant (resident): Guatemala; Honduras; Mexico (Chiapas)

Distribution Map



Legend

EXTANT (RESIDENT)

Compiled by:

IUCN SSC Global Tree Specialist Group 2019

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

There is no information available about the population of *Cestrum guatemalense*.
Current Population Trend: Decreasing

Habitat and Ecology (see Appendix for additional information)

Cestrum guatemalense is a shrub or small tree to 1.5–8.5 m tall. It grow at an altitude range of 2,000–3,500 m (Gentry and Standley 1974). It occurs in mountain cloud forest and pine-oak forest associated with *Quercus*, *Pinus* and *Abies* (IBUNAM 2019).

Systems: Terrestrial

Use and Trade (see Appendix for additional information)

There is no information available about the use and trade of *Cestrum guatemalense*.

Threats (see Appendix for additional information)

The threats that have been observed for this species in Guatemala are deforestation, agriculture, construction of roads and human settlements.One of the types of vegetation where *Cestrum guatemalense* develops is the mountain cloud forest. In Mexico, these forests occupy less than 1% of the national territory, which is why it is considered the most threatened terrestrial ecosystem (CONABIO 2010, González-Espinosa *et al.* 2012). Particularly in the state of Chiapas, the strongest threats are deforestation, human settlements, livestock and agriculture, where shade coffee crops are very frequent (Navarrete *et al.* 2010). In addition, some research reveals that in the state of Chiapas native forests suffered a 50% reduction in the period from 1975 to 2000 (Cayuela *et al.* 2006).

Conservation Actions (see Appendix for additional information)

Cestrum guatemalense is located in a protected natural area: National Park "La Tigra" (Honduras). The number of *ex situ* sites worldwide is two (BGCI 2019).

Credits

Assessor(s): Valentín-Martínez, D. & Montero Castro, J.

Reviewer(s): Samain, M.-S. & Oldfield, S.

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González-Espinosa, M., Meave, J.A., Ramírez-Marcial, N., Toledo-Aceves, T., Lorea-Hernández, F.G. e Ibarra-Manríquez, G. 2012. Los bosques de niebla de México: conservación y restauración de su componente arbóreo. *Ecosistemas* 21: 36-52.

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Navarrete, D., Méndez, D., Flamenco, A. y Alba, P. 2010. Situación actual, fragmentación, áreas prioritarias de conservación y principales amenazas del bosque mesófilo de Chiapas. In: Universidad de Ciencias y Artes de Chiapas (ed.), *Los bosques mesófilos de montaña en Chiapas Situación actual, diversidad y conservación*, pp. 326. Tuxtla Gutiérrez.

Citation

Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum guatemalense*. *The IUCN Red List of Threatened Species* 2020: e.T126624919A126625170. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T126624919A126625170.en

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External Resources

For Supplementary Material, and for Images and External Links to Additional Information, please see the Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.6. Forest - Subtropical/Tropical Moist Lowland	Resident	Suitable	-
1. Forest -> 1.9. Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Plant Growth Forms

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Plant Growth Form
TS. Tree - small
SL. Shrub - large

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.3. Agro-industry grazing, ranching or farming	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
4. Transportation & service corridors -> 4.1. Roads & railroads	Ongoing	Minority (50%)	Causing/could cause fluctuations	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		

5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.2. Supression in fire frequency/intensity	Ongoing	Minority (50%)	Causing/could cause fluctuations	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
11. Climate change & severe weather -> 11.1. Habitat shifting & alteration	Ongoing	Minority (50%)	Causing/could cause fluctuations	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place research and monitoring
Action Recovery Plan: Unknown
In-place land/water protection
Conservation sites identified: Yes, over part of range
Percentage of population protected by PAs: 11-20
Occurs in at least one protected area: Yes
In-place species management
Subject to ex-situ conservation: No
In-place education
Subject to recent education and awareness programmes: Unknown
Included in international legislation: Unknown
Subject to any international management / trade controls: Unknown

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed

6. Livelihood, economic & other incentives -> 6.1. Linked enterprises & livelihood alternatives

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

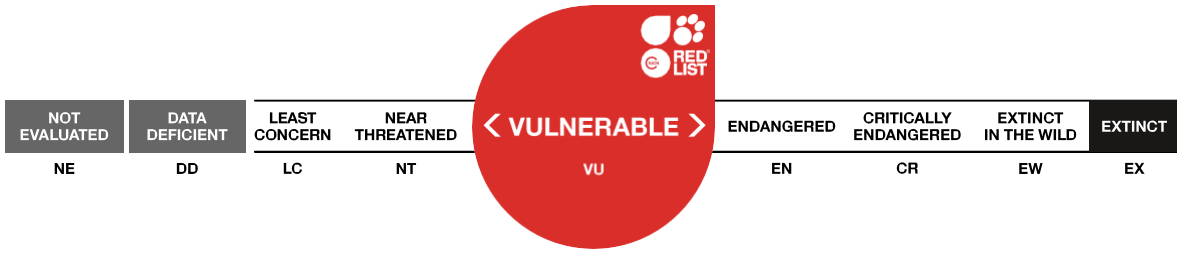
Distribution
Estimated area of occupancy (AOO) (km²): 152-500
Estimated extent of occurrence (EOO) (km²): 59163.300
Number of Locations: 8
Lower elevation limit (m): 2,000
Upper elevation limit (m): 3,800
Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Yes

The IUCN Red List of Threatened Species™
ISSN 2307-8235 (online)
IUCN 2020: T126624922A126625175
Scope(s): Global
Language: English

Evaluación No. 9

Cestrum mortonianum

Assessment by: Valentín-Martínez, D. & Montero Castro, J.



View on www.iucnredlist.org

Citation: Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum mortonianum*. *The IUCN Red List of Threatened Species* 2020: e.T126624922A126625175. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T126624922A126625175.en

Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Solanales	Solanaceae

Scientific Name: *Cestrum mortonianum* J. L. Gentry

Taxonomic Source(s):

Board of Trustees, RBG Kew. 2020. Plants of the World Online Portal. Richmond, UK Available at: http://www.plantsoftheworldonline.org.

Taxonomic Notes:

Cestrum mortonianum is an accepted name for this species. This species is closely related to *Cestrum lanatum*. It can be readily distinguished from that species by the appendiculate and relatively straight filaments (Gentry and Standley 1974).

Assessment Information

Red List Category & Criteria: Vulnerable B2ab(iii) ver 3.1

Year Published: 2020

Date Assessed: April 27, 2019

Justification:

Cestrum mortonianum is an endemic shrub or small tree from Mexico, Guatemala and El Salvador. In Mexico, this species is distributed in the states of Jalisco and Guerrero in the area of the Sierra Madre del Sur, in Chiapas it has been collected near the Municipality of Motozintla, it has also been reported for the states of Colima, Michoacán and Oaxaca, however there are no herbarium records available for these states. In Guatemala it is distributed near the departments of Chimaltenango and Quezaltenango, while in El Salvador it has been reported for the department of Ahuachapán. The taxon has an extent of occurrence (EOO) of 58,651.369 km^2 and an area of occupancy (AOO) of 36 km^2. However, it is likely that the AOO is higher than calculated. It is calculated to occur in seven locations. The main threats for the taxon range are deforestation, agriculture, forest fires and human settlements. *Cestrum mortonianum* is assessed as Vulnerable.

Geographic Range

Range Description:

Cestrum mortonianum is an endemic shrub or small tree from Mexico, Guatemala and El Salvador. In Mexico, this species is distributed in the states of Jalisco and Guerrero in the area of the Sierra Madre del Sur, in Chiapas it has been collected near the Municipality of Motozintla (Villaseñor 2016, Martínez *et al.* 2017), It has also been reported for the states of Colima, Michoacán and Oaxaca (Villaseñor 2016), however there are no herbarium records available for these states. In Guatemala it is distributed near the departments of Chimaltenango and Quezaltenango (Gentry and Standley 1974), while in El Salvador it has been reported for the department of Ahuachapán. The taxon has an extent of occurrence (EOO)

of 58,651.369 km^2 and an area of occupancy (AOO) of 36 km^2. However, it is likely that the AOO is higher than calculated. It is calculated to occur in seven locations. The main threats for the taxon are deforestation, agriculture, forest fires and human settlements.

Country Occurrence:

Native, Extant (resident): El Salvador; Guatemala; Mexico (Chiapas, Guerrero, Jalisco)

Distribution Map

Legend

EXTANT (RESIDENT)

Compiled by:

IUCN SSC Global Tree Specialist Group 2019

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

There is no information available about the population size of *Cestrum mortonianum.*
Current Population Trend: Decreasing

Habitat and Ecology (see Appendix for additional information)

Cestrum mortonianum is a shrub or small tree of 2.5-5 m tall. It grows at an altitude range of 1400-2800 m. It occurs in mountain cloud forest associated with *Quercus*, *Inga*, *Ficus*, *Guarea, Nectandra* (Gentry & Standley 1974, Montero-Castro data 2019). It prefers deep soils, both stony and clayey (IBUNAM 2019).

Systems: Terrestrial

Use and Trade (see Appendix for additional information)

There is no information available about the use and trade of *Cestrum mortonianum.*

Threats (see Appendix for additional information)

The threats that have been observed for this species are deforestation, agriculture, forest fires and human settlements. *Cestrum mortonianum* grows in mountain cloud forest. In Mexico, these forests occupy less than 1% of the national territory, which is why it is considered the most threatened terrestrial ecosystem (CONABIO 2010, González-Espinosa *et al.* 2012).Particularly in the state of Chiapas, the strongest threats are deforestation, human settlements, livestock and agriculture, where shade coffee crops are very frequent (Navarrete *et al.* 2010). In addition, some research reveals that in the state of Chiapas native forests suffered a 50% reduction in the period from 1975 to 2000 (Cayuela *et al.* 2006). In 2017, 726,361.21 hectares were affected due to forest fires, with Jalisco and Chiapas being two of the states with the largest number of fires (CONAFOR 2017). In Guatemala the main threats for this species are deforestation, agriculture, forest fires and human settlements (INAB & IARNA-URL 2012).

Conservation Actions (see Appendix for additional information)

According to the distribution points (Montero-Castro 2019), *Cestrum mortonianum* is located within the protected natural area Reserva de la Biosfera Sierra de Manantlán (Jalisco). There are not current *ex situ* sites worldwide (BGCI 2019).

Credits

Assessor(s): Valentín-Martínez, D. & Montero Castro, J.

Reviewer(s): Samain, M.-S. & Oldfield, S.

Bibliography

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Citation

Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum mortonianum*. *The IUCN Red List of Threatened Species* 2020: e.T126624922A126625175. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T126624922A126625175.en

Disclaimer

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.9. Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Plant Growth Forms

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Plant Growth Form
TS. Tree - small
SL. Shrub - large

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.1. Increase in fire frequency/intensity	Ongoing	Minority (50%)	Rapid declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.2. Species disturbance		

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place land/water protection
Conservation sites identified: Yes, over part of range
Percentage of population protected by PAs: 1-10
Occurs in at least one protected area: Yes
In-place species management
Subject to ex-situ conservation: No

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed
6. Livelihood, economic & other incentives -> 6.1. Linked enterprises & livelihood alternatives
6. Livelihood, economic & other incentives -> 6.4. Conservation payments

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
1. Research -> 1.2. Population size, distribution & trends
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km^2): 36
Estimated extent of occurrence (EOO) (km^2): 58651.369
Number of Locations: 7
Lower elevation limit (m): 1,000
Upper elevation limit (m): 2,800
Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Yes

The IUCN Red List of Threatened Species™
ISSN 2307-8235 (online)
IUCN 2020: T136621189A136621194
Scope(s): Global
Language: English

Evaluación No. 10

Cestrum pacayense, Huele de noche

Assessment by: Valentín-Martínez, D. & Montero Castro, J.

View on www.iucnredlist.org

Citation: Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum pacayense*. *The IUCN Red List of Threatened Species* 2020: e.T136621189A136621194. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T136621189A136621194.en

Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Solanales	Solanaceae

Scientific Name: *Cestrum pacayense* Francey

Synonym(s):

- *Cestrum kellermanii* Francey

Common Name(s):

- Spanish; Castilian: Huele de noche, Hediondillo

Taxonomic Source(s):

Missouri Botanical Garden. 2018. Tropicos.org. Available at: http://www.tropicos.org.

Taxonomic Notes:

Cestrum pacayense Francey is an accepted name for the species.There has been a taxonomic confusion between *Cestrum guatemalense, C. mexicanum* and *C. pacayense*, species distributed in southern Mexico, Guatemala, Honduras and El Salvador. This is due to the plasticity of some of their morphological characters, so they have even been proposed as synonyms (Castillo-Batista *et al*. 2017). However, a recent morphometric study carried out by Castillo-Batista *et al.* (2017) indicates that they are different species.

Assessment Information

Red List Category & Criteria: Vulnerable B2ab(ii) ver 3.1

Year Published: 2020

Date Assessed: February 22, 2019

Justification:

Cestrum pacayense is a shrub or small tree from Mexico, Guatemala, El Salvador and Honduras. In Mexico, this species is only distributed in the state of Chiapas. The taxon has an extent of occurrence (EOO) of 41,122.243 km^2 and an area of occupancy (AOO) of 184 km^2. However, it is likely that the AOO is higher than calculated, but remaining below 500 km^2. It is calculated to occur in between 6-8 locations. The main threats for the taxon range are deforestation, agriculture and human settlements. *Cestrum pacayense* is assessed as Vulnerable (VU).

Geographic Range

Range Description:

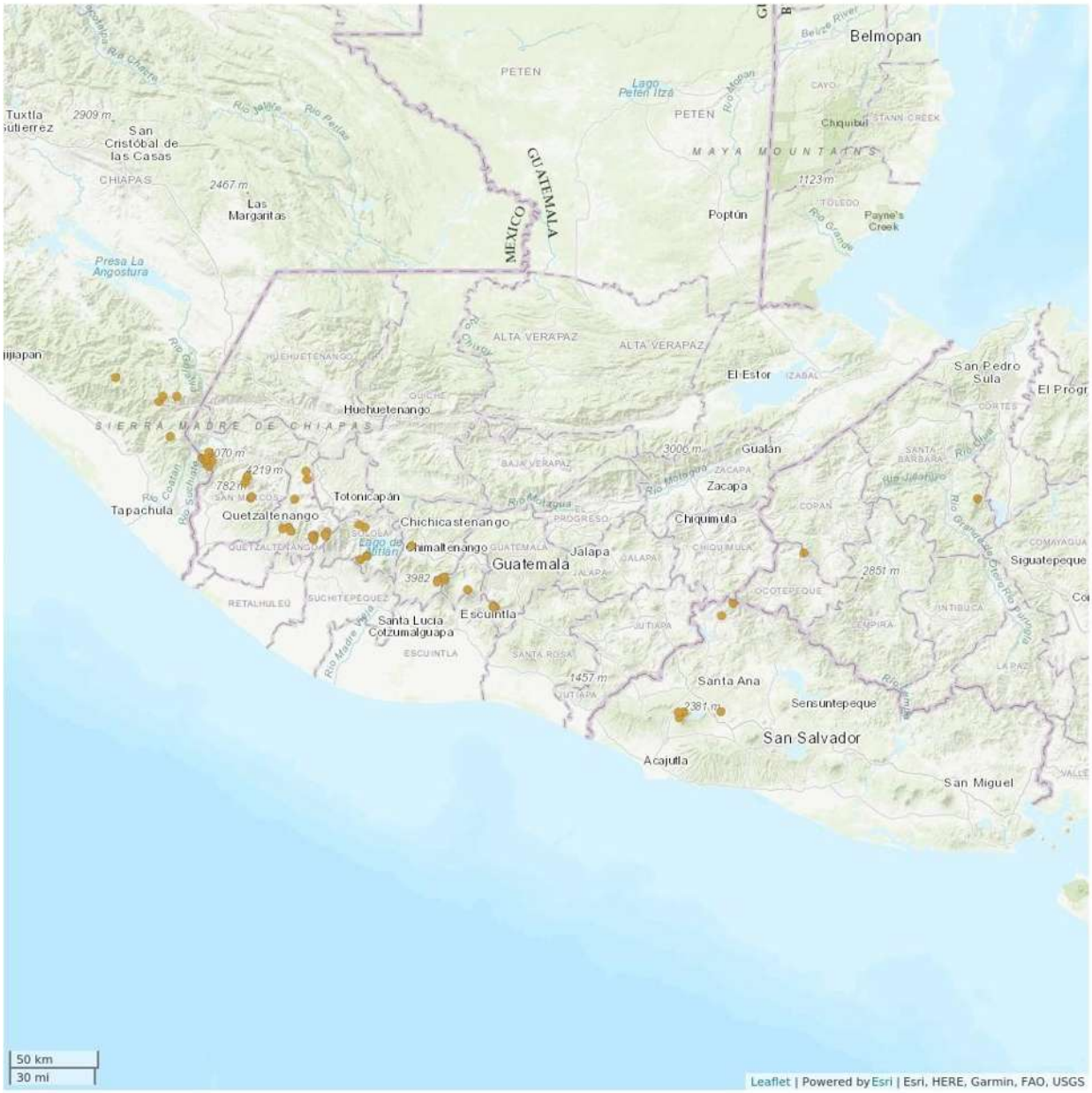
Cestrum pacayense is an endemic shrub or small tree from Mexico, Guatemala, El Salvador and Honduras. In Mexico, this species is only distributed in the state of Chiapas. The taxon has an extent of occurrence of 41,122.243 km^2 and an area of occupancy of 184 km^2. However, it is likely that the AOO is higher than

calculated, remaining below 500 km^2. It is calculated to occur in between 6 to 8 locations.

Country Occurrence:

Native, Extant (resident): El Salvador; Guatemala; Honduras; Mexico (Chiapas)

Distribution Map



Legend

EXTANT (RESIDENT)

Compiled by:

IUCN SSC Global Tree Specialist Group 2019

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

There is no information available about the population size of *Cestrum pacayense*. Base on the threats to the habitat of this species, the population is assumed to be decreasing.

Current Population Trend: Decreasing

Habitat and Ecology (see Appendix for additional information)

Cestrum pacayense is a shrub or small tree of 2–5 m tall. It grows at an altitude range of 1,800–3,300 m (Gentry and Standley 1974). It lives in mountain cloud forest, pine-oak forest and oak forest associated with *Quercus*, *Pinus, Abies, Photinia, Clethra, Cornus* and *Symplocos* (IBUNAM 2019).

Systems: Terrestrial

Use and Trade (see Appendix for additional information)

There is no information available about the use and trade of *Cestrum pacayense*.

Threats (see Appendix for additional information)

The threats that have been observed for this species in Guatemala are deforestation, agriculture and human settlements. One of the types of vegetation where *Cestrum pacayense* develops is the mountain cloud forest. In Mexico, these forests occupy less than 1% of the national territory, which is why it is considered the most threatened terrestrial ecosystem (CONABIO 2010, González-Espinosa *et al.* 2012).Particularly in the state of Chiapas, the strongest threats are deforestation, human settlements, livestock and agriculture, where shade coffee crops are very frequent (Navarrete *et al.* 2010). In addition, some research reveals that in the state of Chiapas native forests suffered a 50% reduction in the period from 1975 to 2000 (Cayuela *et al.* 2006).

Conservation Actions (see Appendix for additional information)

Cestrum pacayense is located in some protected natural areas: Parque Natural "El Triunfo" (Mexico), Área de uso múltiple "Cuenca de Lago Atitlán" (Guatemala), Parque Nacional "Cerro Verde" (El Salvador), Parque Nacional "Montecristo" (El Salvador) and Reserva de la Vida Silvestre "Erapuca" (Honduras). There are no current *ex situ* sites worldwide (BGCI 2019).

Credits

Assessor(s): Valentín-Martínez, D. & Montero Castro, J.

Reviewer(s): Samain, M.-S. & Oldfield, S.

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CONABIO. 2010. *El Bosque Mesófilo de Montaña en México: Amenazas y Oportunidades para su Conservación y Manejo Sostenible*. Comisión Nacional para el Conocimiento y Uso de la Biodiversidad, México D.F.

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González-Espinosa, M., Meave, J. A., Ramírez-Marcial, N., Toledo-Aceves, T., Lorea-Hernández, F. G. e Ibarra-Manríquez, G. 2012. Los bosques de niebla de México: conservación y restauración de su componente arbóreo. *Ecosistemas* 21 (1-2): 36-52.

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Citation

Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum pacayense*. *The IUCN Red List of Threatened Species* 2020: e.T136621189A136621194. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T136621189A136621194.en

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External Resources

For Supplementary Material, and for Images and External Links to Additional Information, please see the Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.4. Forest - Temperate	Resident	Suitable	-
1. Forest -> 1.9. Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Plant Growth Forms

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Plant Growth Form
TS. Tree - small
SL. Shrub - large

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place land/water protection
Conservation sites identified: Yes, over part of range
Percentage of population protected by PAs: 11-20
Occurs in at least one protected area: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed
6. Livelihood, economic & other incentives -> 6.1. Linked enterprises & livelihood alternatives
6. Livelihood, economic & other incentives -> 6.4. Conservation payments

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km^2): 184-500
Continuing decline in area of occupancy (AOO): Yes
Estimated extent of occurrence (EOO) (km^2): 41122.243
Number of Locations: 10-15
Lower elevation limit (m): 1,800
Upper elevation limit (m): 3,300

The IUCN Red List of Threatened Species™
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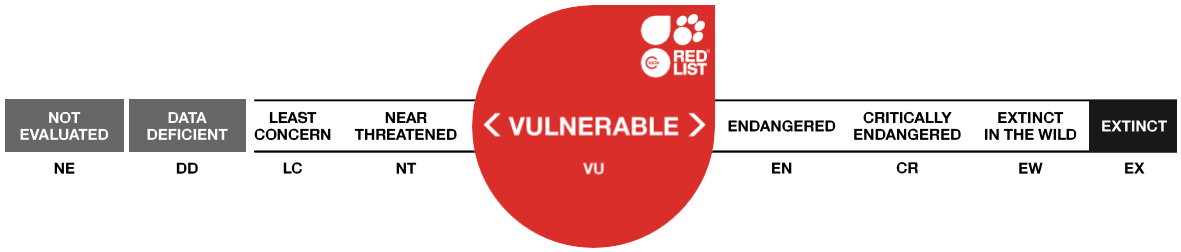
IUCN 2020: T126624941A126625195
Scope(s): Global
Language: English

Evaluación No. 11

Cestrum sotonunezii

Assessment by: Valentín-Martínez, D. & Montero Castro, J.



View on www.iucnredlist.org

Citation: Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum sotonunezii*. *The IUCN Red List of Threatened Species* 2020: e.T126624941A126625195. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T126624941A126625195.en

Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Solanales	Solanaceae

Scientific Name: *Cestrum sotonunezii* Mont.-Castro

Taxonomic Notes:

Specimens of *Cestrum sotonunezii* have been previously confused with those of *C. aurantiacum* Lindl., *C. oblongifolium* Schltdl. and *C. thyrsoideum* Kunth, even though these latter three species differ morphologically from the first. Presumably, these misidentifications occurred because the four species have brilliant yellow, tubular corollas and are distributed mainly in central Mexico. The material of *C. sotonunezii* is more difficult to distinguish from that of *C. flavescens* Greenm. because both species have twigs, buds and leaves with crumpled hairs, and flowers with comparable shape and color. However, *C. sotonunezii* plants can usually be distinguished by being more robust and by having the filaments emerging immediately below or directly from a bilobed bulge in the corolla, as well as by the length of their corolla lobes (Montero-Castro 2011).

Assessment Information

Red List Category & Criteria: Vulnerable D1 ver 3.1

Year Published: 2020

Date Assessed: February 15, 2019

Justification:

Cestrum sotonunezii is a shrub endemic to southern Mexico, distributed in the state of Michoacán near Mil Cumbres along the Trans-Mexican volcanic belt and in the state of Guerrero near Filo de Caballo in the Sierra Madre del Sur. The taxon has an extent of occurrence (EOO) of 9,543.182 km^2 and an area of occupancy (AOO) of 44 km^2, but it is likely that the AOO of the species is a little higher than estimated, if the collection efforts were increased. It is calculated to occur in three locations. The main threats for the taxon range are deforestation, human settlements, and agriculture, especially the change of land use for avocado cultivation. There are thought to be less than 250 mature individuals. *Cestrum sotonunezii* is assessed as Vulnerable.

Geographic Range

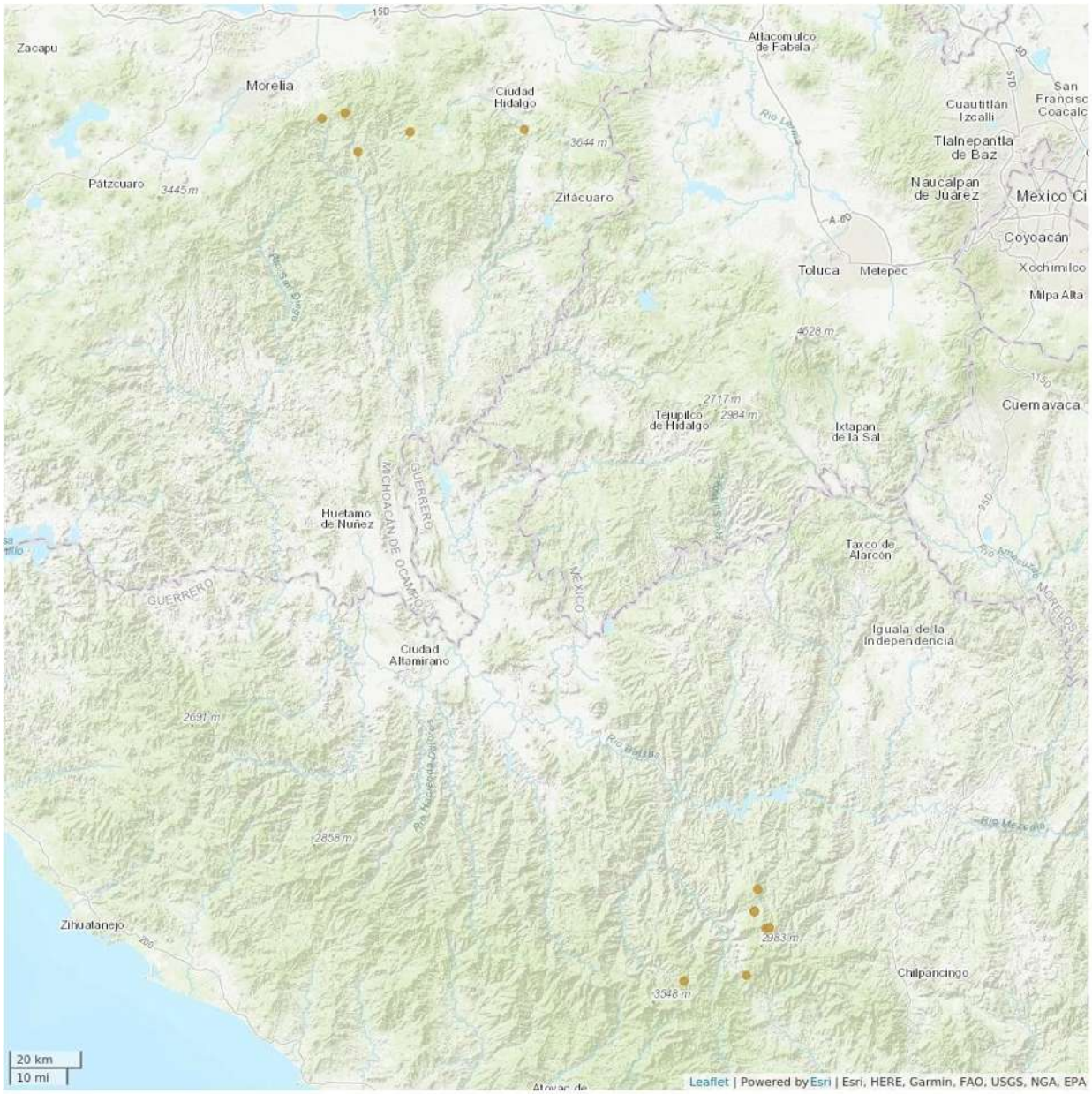
Range Description:

Cestrum sotonunezii is a shrub endemic to southern Mexico, distributed in the state of Michoacán near Mil Cumbres along the Trans-Mexican volcanic belt and in the state of Guerrero near Filo de Caballo in the Sierra Madre del Sur (Montero-Castro 2011).The taxon has an extent of occurrence (EOO) of 9,543.182 km^2 and an area of occupancy (AOO) of 44 km^2, but it is likely that the AOO of the species is a little higher than estimated, if the collection efforts were increased. It is calculated to occur in three locations. The main threats for the taxon range are deforestation, agriculture and human settlements.

Country Occurrence:

Native, Extant (resident): Mexico (Guerrero, Michoacán)

Distribution Map



Legend

EXTANT (RESIDENT)

Compiled by:

IUCN SSC Global Tree Specialist Group 2019

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

In 2011 the number of mature individuals was less than 250 (Montero-Castro 2011). Moreover, due to the limited distribution and the loss of the habitat quality available for *Cestrum sotonunezii*, it is likely that the population is decreasing (J.C. Montero-Castro pers. comm. 2019).

Current Population Trend: Decreasing

Habitat and Ecology **(see Appendix for additional information)**

Cestrum sotonunezii is a shrub of 1-3 m tall. It grows in an altitudinal range of 1,800–2,800 m, on calcareous soils. It is distributed in an intermediate climate, ranging from temperature subhumid to semiwarm subhumid, with an annual mean temperature between 12° C and 18° C, and an annual mean precipitation of 800 to 1,200 mm (Montero-Castro 2011). It has been collected in pine-oak forests and mountain cloud forest, associated with *Acer negundo*, *Alnus acuminata* and *Fraxinus* sp.

Systems: Terrestrial

Use and Trade **(see Appendix for additional information)**

There is no information available about the use and trade of *Cestrum sotonunezii.*

Threats **(see Appendix for additional information)**

The main threats that affect habitat quality of *Cestrum sotonunezii* are deforestation, human settlements, forest fires and agriculture, especially the change of land use for avocado cultivation (J.C. Montero Castro pers. comm. 2019).

Conservation Actions **(see Appendix for additional information)**

Cestrum sotonunezii is not located within any protected natural area. There are no current *ex situ* sites worldwide (BGCI 2019). It is recommended to organize sustainable production activities in its range, as well as livelihood alternatives to the destruction of forests.

Credits

Assessor(s): Valentín-Martínez, D. & Montero Castro, J.

Reviewer(s): Samain, M.-S. & Oldfield, S.

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The Plant List.org. 2019. Available at: http://www.theplantlist.org/tpl1.1/record/tro-100363727. (Accessed: January).

Tropicos.org.Missouri Botanical Garden. 2019. Available at: http://www.tropicos.org/Name/100363727. (Accessed: January).

Citation

Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum sotonunezii*. *The IUCN Red List of Threatened Species* 2020: e.T126624941A126625195. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T126624941A126625195.en

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External Resources

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Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.4. Forest - Temperate	Resident	Suitable	-
1. Forest -> 1.5. Forest - Subtropical/Tropical Dry	Resident	Suitable	-
1. Forest -> 1.9. Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Plant Growth Forms

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Plant Growth Form
SL. Shrub - large

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.1. Increase in fire frequency/intensity	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place research and monitoring
Action Recovery Plan: Unknown
In-place land/water protection

Conservation Action in Place
Conservation sites identified: No
Occurs in at least one protected area: No
In-place species management
Harvest management plan: No
Subject to ex-situ conservation: No
In-place education
Subject to recent education and awareness programmes: Unknown
Included in international legislation: Unknown
Subject to any international management / trade controls: Unknown

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed
4. Education & awareness -> 4.1. Formal education
6. Livelihood, economic & other incentives -> 6.4. Conservation payments

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
1. Research -> 1.2. Population size, distribution & trends
3. Monitoring -> 3.1. Population trends
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km^2): 44
Estimated extent of occurrence (EOO) (km^2): 9543.182
Lower elevation limit (m): 1,800
Upper elevation limit (m): 2,800
Population
Number of mature individuals: 250

Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Unknown

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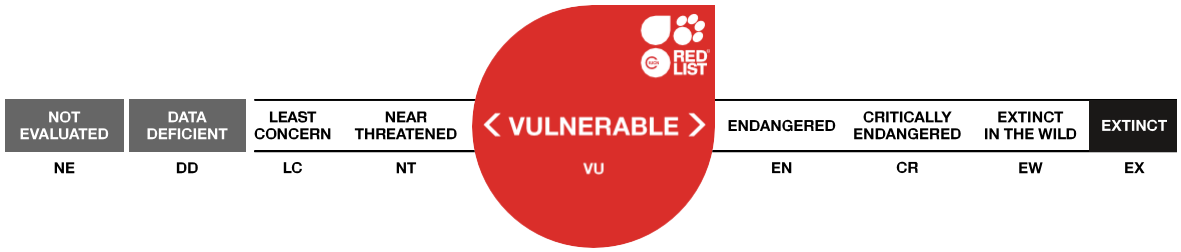
IUCN 2020: T126692189A126694992
Scope(s): Global
Language: English

Evaluación No. 12

Schraderanthus viscosus

Assessment by: Valentín-Martínez, D. & Montero Castro, J.



View on www.iucnredlist.org

Citation: Valentín-Martínez, D. & Montero Castro, J. 2020. *Schraderanthus viscosus*. *The IUCN Red List of Threatened Species* 2020: e.T126692189A126694992.
https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T126692189A126694992.en

Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Solanales	Solanaceae

Scientific Name: *Schraderanthus viscosus* (Schrad.) Averett

Synonym(s):

- *Athenaea viscosa* (Schrad.) Fernald
- *Athenaea macrocardia* Standl. & Steyerm.
- *Chamaesaracha viscosa* (Schrad.) Hunz.
- *Jaltomata viscosa* (Schrad.) D'Arcy & Til. Davis
- *Leucophysalis viscosa* (Schrad.) Hunz.
- *Physalis schraderiana* Bernh.
- *Saracha viscosa* Schrad.
- *Witheringia viscosa* (Schrad.) Miers

Taxonomic Notes:

According to Tropicos (2019) *Schraderanthus viscosus* (Schrad.) Averett is an accepted name for this species. This species has some characteristics that make it very similar to some *Physalis* species (Gentry and Standley 1974, Nee 1986).

Assessment Information

Red List Category & Criteria: Vulnerable B2ab(i) ver 3.1

Year Published: 2020

Date Assessed: June 27, 2019

Justification:

Schraderanthus viscosus is a herb or shrub distributed in Mexico and Guatemala. In Mexico this species occurs in the states of Hidalgo, Guerrero, Veracruz, Oaxaca and Chiapas, while in Guatemala it has been collected in the department of Zacapa. The taxon has an extent of occurrence (EOO) of 273,417.629 km^2 and an area of occupancy (AOO) of 132 km^2. It is calculated to occur in six to ten locations. The main threats for the taxon range are deforestation, agriculture, cattle raising, forest fires and human settlements. *Schraderanthus viscosus* is assessed as Vulnerable (VU).

Geographic Range

Range Description:

Schraderanthus viscosus is a herb or shrub distributed in Mexico and Guatemala. In Mexico this species is distributed in the states of Hidalgo, Guerrero, Veracruz, Oaxaca and Chiapas (Nee 1986, Rodríguez 2004, Villaseñor 2016, Martínez *et al.* 2017), while in Guatemala it has been collected in the department of Zacapa (Gentry and Standley 1974). The taxon has an extent of occurrence of 273,417.629 km^2 and an area of occupancy of 132 km^2. However, it is likely that the taxon has AOO higher than calculated, below to 500 km^2.

It is calculated to occur in six locations. The main threats for the taxon range are deforestation, agriculture, cattle raising, forest fires and human settlements.

Country Occurrence:

Native, Extant (resident): Guatemala; Mexico (Chiapas, Guerrero, Hidalgo, Oaxaca, Veracruz)

Distribution Map

Legend

EXTANT (RESIDENT)

Compiled by:

IUCN SSC Global Tree Specialist Group 2019

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

There is no information available about the population of *Schraderanthus viscosus*.
Current Population Trend: Unknown

Habitat and Ecology (see Appendix for additional information)

Schraderanthus viscosus is a herb or shrub of 1–4 m tall. It grows at an altitude range of 400–2,500 m (Gentry and Standley 1974, Nee 1986). It lives in mountain cloud forests and pine-oak forest associated with *Quercus, Clethra, Oreopanax, Clusia* and *Piper*. It usually grows in deep yellow and reddish soils.

Systems: Terrestrial

Use and Trade (see Appendix for additional information)

There is no information available about the use and trade of *Schraderanthus viscosus*.

Threats (see Appendix for additional information)

Schraderanthus viscosus occurs in the mountain cloud forest. In Mexico, these forests occupy less than 1% of the national territory, which is why it is considered the most threatened terrestrial ecosystem (CONABIO 2010, González-Espinosa *et al.* 2012). Particularly in the state of Chiapas, the strongest threats are deforestation, human settlements, livestock and agriculture, where shade coffee crops are very frequent (Navarrete *et al.* 2010). In addition, some research reveals that in the state of Chiapas native forests suffered a 50% reduction in the period from 1975 to 2000 (Cayuela *et al.* 2006). Another type of vegetation where *Schraderanthus viscosus* develops is the pine-oak forest, this ecosystem has been strongly affected due to deforestation, agriculture, forest fires, livestock and climate change (CONABIO 2019). In the period from 1970 to 1990, Mexico lost 14% of the coniferous forests, while the hardwood forests suffered a reduction of 9.3% (Sánchez *et al.* 2003). In 2017, 726,361.21 hectares were affected by forest fires, being Chiapas, Hidalgo Oaxaca and Guerrero some of the states with the highest number of fires (CONAFOR 2017). At the national level, the states of Veracruz and Chiapas are among the main livestock producers (SIAP 2017). The causes of the loss of biodiversity in Guatemala are related to economic activities, especially agriculture and livestock, as well as forest fires and human settlements (INAB & IARNA-URL 2012, CONAP 2014). It is estimated that during the period 2006-2010 the forest cover lost 38,597 hectares per year due to deforestation, while during the period 2001–2012, there were 758,382 forest fires affecting around 115,385 hectares of forest with an average of 9,613 ha / year (CONAP 2014).

Conservation Actions (see Appendix for additional information)

According to the collection records, *Schraderanthus viscosus* is located within the protected natural area Reserva de la Biósfera Montes Azules (Chiapas). There are no current *ex situ* sites worldwide (BGCI 2019).

Credits

Assessor(s): Valentín-Martínez, D. & Montero Castro, J.

Reviewer(s): Samain, M.-S. & Oldfield, S.

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Villaseñor, J.L. 2016. Checklist of the native vascular plants of Mexico. *Revista Mexicana de Biodiversidad* 87: 559–902.

Citation

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External Resources

For Supplementary Material, and for Images and External Links to Additional Information, please see the Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.4. Forest - Temperate	Resident	Suitable	-
1. Forest -> 1.9. Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Plant Growth Forms

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Plant Growth Form
SS. Shrub - small
SL. Shrub - large
F. Forb or Herb

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming	Ongoing	Majority (50-90%)	Very rapid declines	High impact: 8
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.3. Agro-industry grazing, ranching or farming	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very rapid declines	High impact: 8
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		

7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.1. Increase in fire frequency/intensity	Ongoing	Minority (50%)	Rapid declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place land/water protection
Conservation sites identified: Yes, over part of range
Percentage of population protected by PAs: 1-10
Occurs in at least one protected area: Yes
In-place species management
Subject to ex-situ conservation: No

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed
6. Livelihood, economic & other incentives -> 6.1. Linked enterprises & livelihood alternatives
6. Livelihood, economic & other incentives -> 6.4. Conservation payments

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km^2): 132-500
Estimated extent of occurrence (EOO) (km^2): 273417.629
Continuing decline in extent of occurrence (EOO): Yes
Number of Locations: 6-10

Distribution
Lower elevation limit (m): 400
Upper elevation limit (m): 2,500

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Scope(s): Global
Language: English

Evaluación No. 13

Solandra nizandensis, Flor de chichi

Assessment by: Valentín-Martínez, D. & Montero Castro, J.

View on www.iucnredlist.org

Citation: Valentín-Martínez, D. & Montero Castro, J. 2020. *Solandra nizandensis*. *The IUCN Red List of Threatened Species* 2020: e.T136621376A136621382. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T136621376A136621382.en

Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Solanales	Solanaceae

Scientific Name: *Solandra nizandensis* Matuda

Common Name(s):

- Spanish; Castilian: Flor de chichi, Corneto

Taxonomic Source(s):

Board of Trustees, RBG Kew. 2018. Plants of the World Online Portal. Richmond, UK Available at: http://www.plantsoftheworldonline.org.

Assessment Information

Red List Category & Criteria: Vulnerable B2ab(i) ver 3.1

Year Published: 2020

Date Assessed: June 14, 2019

Justification:

Solandra nizandensis is an endemic erect scandent shrub or vine from Mexico. This species has a disjunct distribution, since it is found in the states of Jalisco, Michoacán, Oaxaca and Chiapas. Bernardello and Hunziker (1987) consider that the distribution of *Solandra nizandensis* goes from Chiapas in Mexico to Guatemala and Honduras in mountain cloudforests; however, when analyzing these specimens it was observed that they actually belong to *Solandra grandiflora,* since *Solandra nizandensis* has so far only been collected in dry tropical forests. The taxon has an extent of occurrence (EOO) of 110,564.142 km^2 and an area of occupancy (AOO) of 52 km^2. It is estimated to occur in six locations. The main threats for the taxon range are deforestation, agriculture, forest fires, cattle raising and human settlements. *Solandra nizandensis* is assessed as Vulnerable.

Geographic Range

Range Description:

Solandra nizandensis is an endemic erect or scandent shrub or vine from Mexico. This species has a disjunct distribution, since it is found in the states of Jalisco, Michoacán, Oaxaca and Chiapas (Rodríguez 2004, Farrera 2008, Ibarra-Manríquez *et al.* 2015, Villaseñor 2016, Martínez *et al.* 2017). Bernardello and Hunziker (1987) consider that the distribution of *Solandra nizandensis* goes from Chiapas in Mexico to Guatemala and Honduras in mountain cloudforests; however, when analyzing these specimens it was observed that they actually belong to *Solandra grandiflora,* since *Solandra nizandensis* has so far only been collected in dry tropical forests (Farrera 2008). The taxon has an extent of occurrence of 110,564.142 km^2 and an area of occupancy of 52 km^2. It is estimated to occur in six locations. The main threats for the taxon range are deforestation, agriculture, forest fires, cattle raising and human settlements.

Country Occurrence:

Native, Extant (resident): Mexico (Chiapas, Jalisco, Michoacán, Oaxaca)

Distribution Map

Legend

EXTANT (RESIDENT)

Compiled by:

IUCN SSC Global Tree Specialist Group 2019

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

There is no information available about the population of *Solandra nizandensis*.

Current Population Trend: Unknown

Habitat and Ecology **(see Appendix for additional information)**

Solandra nizandensis is an erect or scandent shrub or vine up to 10 m tall and with a stem of 10-15 cm in diameter. It grows at an altitude range of 0–900 m. It lives in tropical deciduous forests associated with *Bursera excelsa, Astronium graveolens, Leucaena collinsii, Lysiloma acapulcense, Ceiba aesculifolia, Bucida macrostachya, Pistacia mexicana, Acacia pennatula* and *Amphipterygium adstringens*. It usually grows on calcareous and stony soils. This species flowers during the months of May to September and fructifies from November to January. There is no exact information about some of the ecological aspects of this species; however, due to the characteristics of the flowers of this genus, it is possible that the pollination is carried out by bats. The dispersion of fruits and seeds is likely to be carried out by some birds and arboreous mammals, since *Solandra* fruits present a fleshy exocarp with abundant sweet and fragrant juices at maturity (Farrera 2008)

Systems: Terrestrial

Use and Trade

There is no exact information about the use and trade of *Solandra nizandensis*; however, it has been reported that the main use of plants of this genus is ornamental, due to its striking flowers, in addition to other less frequent uses such as medicinal, edible and ceremonial (Farrera 2008).

Threats **(see Appendix for additional information)**

The main threats for the taxon range are deforestation, agriculture, forest fires, human settlements and cattle raising. In Mexico, the different types of vegetation have been strongly affected due to the change in land use, mainly for agriculture and livestock, climate change and excessive extraction of flora and fauna, which affects the capacity of the ecosystem to maintain its functioning, in addition to the growth of urban areas, forest fires and logging called "ant", which is carried out to obtain firewood and charcoal (FMCN 2009, CONABIO 2019). It has been estimated that Mexico has lost more than 50% of its original coverage. The rate of deforestation reported for 1993–2002 was 523,639 hectares per year (FMCN 2009). *Solandra nizandensis* develops in the tropical decidous forest. This type of vegetation is very characteristic of some areas of the country because it covers large areas (Rzedowski 2006). Particularly in the state of Oaxaca, the tropical deciduous forest is one of the most representative types of vegetation due to the vast surface it occupies. However, the permanence of this type of vegetation is strongly threatened due to agricultural and livestock expansion, in addition to the establishment of large-scale cash crops. It is important to mention that due to its characteristics, the deciduous tropical forest is less attractive compared to other types of vegetation, so there are fewer opportunities for its conservation (Meave *et al.* 2012). Some of the causes of the loss of biodiversity in the state of Jalisco have been the increase in population, about 9% of natural vegetation has been eliminated as a direct consequence of demographic growth, while another of the threats present in the state is the change of land use for agricultural or livestock purposes associated with forest fires (CONABIO 2017). In recent years, the growing demand for tequila by consumers has caused an increase in the cultivation

of agave in some areas of the state of Jalisco, resulting in significant changes in the landscape (Gerritsen *et al*. 2011). In 2017, 726,361.21 hectares were affected by forest fires, with Michoacán, Jalisco, Chiapas and Oaxaca being some of the states with the highest number of fires (CONAFOR 2017). At the national level, the states of Jalisco, Chiapas and Michoacán are among the main livestock producers (SIAP 2017).

Conservation Actions **(see Appendix for additional information)**

According to the collection records, *Solandra nizandensis* is located within the natural protected area Parque Nacional Cañón del Sumidero (Chiapas). The number of *ex situ* sites worldwide is two (BGCI 2019).

Credits

Assessor(s): Valentín-Martínez, D. & Montero Castro, J.

Reviewer(s): Samain, M.-S. & Oldfield, S.

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Martínez, M., Vargas-Ponce, O., Rodríguez, A., Chiang, F. and Ocegueda, S. 2017. Solanaceae family in Mexico. *Botanical Sciences* 95 (1): 131-145.

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Villaseñor, J.L. 2016. Checklist of the native vascular plants of Mexico. *Revista Mexicana de Biodiversidad* 87: 559–902.

Citation

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External Resources

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Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.5. Forest - Subtropical/Tropical Dry	Resident	Suitable	-

Plant Growth Forms

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Plant Growth Form
V. Vines
SL. Shrub - large

Use and Trade

(http://www.iucnredlist.org/technical-documents/classification-schemes)

End Use	Local	National	International
Food - human	No	Yes	Yes
Pets/display animals, horticulture	No	Yes	Yes
Medicine - human & veterinary	No	Yes	Yes

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming	Ongoing	Majority (50-90%)	Very rapid declines	High impact: 8
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		

2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.2. Small-holder grazing, ranching or farming	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.3. Agro-industry grazing, ranching or farming	Ongoing	Majority (50-90%)	Very rapid declines	High impact: 8
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.1. Intentional use: (subsistence/small scale) [harvest]	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very rapid declines	High impact: 8
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.1. Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place land/water protection
Conservation sites identified: Yes, over part of range
Occurs in at least one protected area: Yes
In-place species management
Subject to ex-situ conservation: Yes
In-place education
Subject to recent education and awareness programmes: Unknown
Included in international legislation: Unknown

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed
6. Livelihood, economic & other incentives -> 6.1. Linked enterprises & livelihood alternatives
6. Livelihood, economic & other incentives -> 6.4. Conservation payments

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
1. Research -> 1.2. Population size, distribution & trends
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km^2): 52-500
Estimated extent of occurrence (EOO) (km^2): 110564.142
Continuing decline in extent of occurrence (EOO): Yes
Number of Locations: 6
Lower elevation limit (m): 0
Upper elevation limit (m): 900

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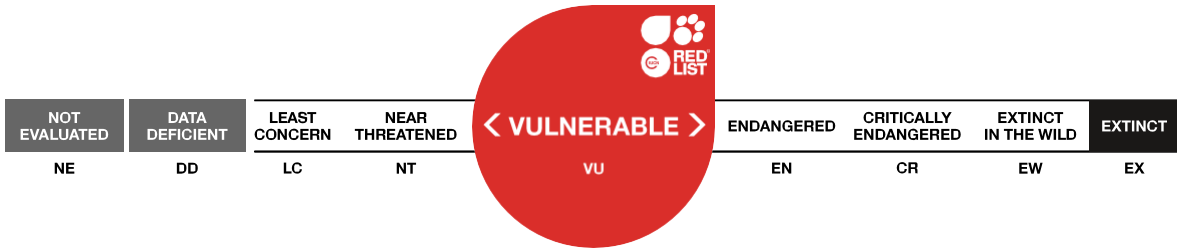
Scope(s): Global
Language: English

Evaluación No. 14

Witheringia stellata

Assessment by: Valentín-Martínez, D. & Montero Castro, J.



View on www.iucnredlist.org

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Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Solanales	Solanaceae

Scientific Name: *Witheringia stellata* (Greenm.) Hunz.

Synonym(s):

- *Bassovia stellata* Greenm.

Assessment Information

Red List Category & Criteria: Vulnerable B2ab(iii) ver 3.1

Year Published: 2020

Date Assessed: April 9, 2019

Justification:

Witheringia stellata is an endemic shrub from Mexico, it is distributed in the Sierra Madre Oriental in the states of Hidalgo, Puebla, Querétaro, Oaxaca and Veracruz. It has also been reported for the states of San Luis Potosí, Chiapas, Jalisco and Nayarit; however, it is very likely that these concern erroneous identifications. The extent of occurrence (EOO) is 30,540.406 km^2. The area of occupancy (AOO) of the taxon is 92 km^2, but it is likely that the AOO of the species is a little higher than estimated, if the collection efforts were increased. The taxon has seven locations and the main threats that the distribution area presents are agriculture, human settlements, deforestation and forest fires. *Witheringia stellata* is assessed as Vulnerable.

Geographic Range

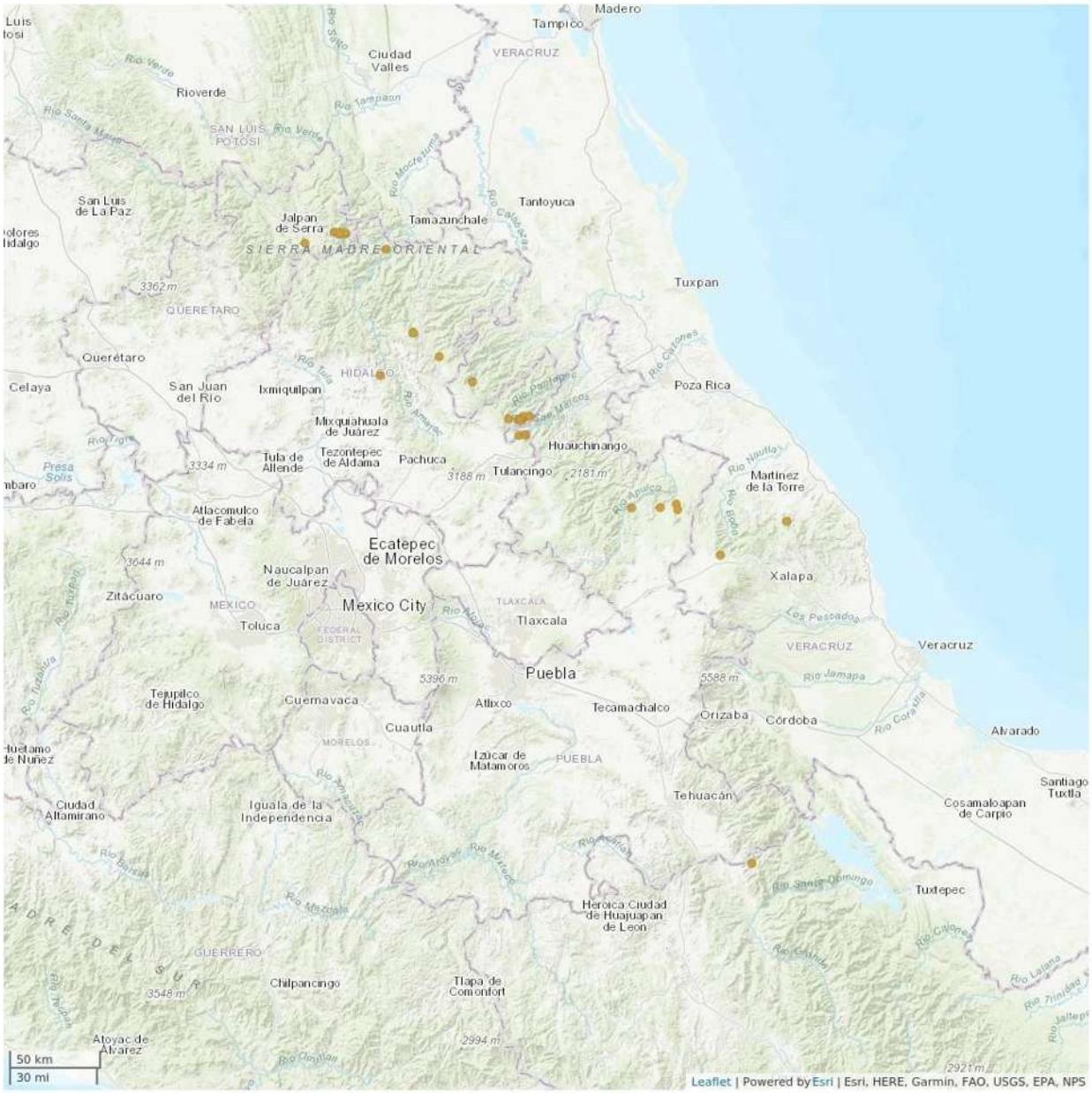
Range Description:

Witheringia stellata is an endemic shrub from Mexico, it is distributed in the Sierra Madre Oriental in the states of Hidalgo, Puebla, Querétaro, Oaxaca and Veracruz (Nee 1986, CONABIO 2004). It has also been reported for the states of San Luis Potosí (Villaseñor, 2016), Chiapas, Jalisco and Nayarit (Martínez *et al.* 2017); however, it is very likely that these concern erroneous identifications. The extent of occurrence is 30,540.406 km^2. The area of occupancy of the taxon is 92 km^2, but it is likely that the AOO of the species is a little higher than estimated, if the collection efforts were increased. The taxon has seven locations and the main threats that the distribution area presents are agriculture, human settlements, deforestation and forest fires.

Country Occurrence:

Native, Extant (resident): Mexico (Hidalgo, Oaxaca, Puebla, Querétaro, Veracruz)

Distribution Map



Legend

EXTANT (RESIDENT)

Compiled by:

IUCN SSC Global Tree Specialist Group 2019

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

There is no information available about the population of *Witheringia stellata*.
Current Population Trend: Unknown

Habitat and Ecology (see Appendix for additional information)

Witheringia stellata is a shrub from 0.8 to 4 m tall. It grows at an altitude range of 1,500–2,300 m. It occurs in pine forest, pine-oak forest and mountain cloud forest associated with *Quercus*, *Pinus* and *Liquidambar.* It develops on the slopes of hills on black, rocky soils with organic material (IBUNAM 2019). Flowers in the month of July (Nee 1986).

Systems: Terrestrial

Use and Trade (see Appendix for additional information)

There is no information available about the use and trade of *Witheringia stellata*.

Threats (see Appendix for additional information)

Witheringia stellata develops in the temperate forest, this ecosystem has been strongly affected due to deforestation, agriculture, forest fires, livestock and climate change (CONABIO 2019). In the period from 1970 to 1990, Mexico lost 14% of coniferous forests, while hardwood forests suffered a reduction of 9.3% (Sánchez *et al.* 2003). Another type of vegetation where *Witheringia stellata* develops is the mountain cloud forest. In Mexico, these forests occupy less than 1% of the national territory, which is why it is considered the most threatened terrestrial ecosystem (CONABIO 2010, González-Espinosa *et al.* 2012).

Conservation Actions (see Appendix for additional information)

According to the record points, *Witheringia stellata* is found within the Biosphere Reserve "Sierra Gorda" in the state of Querétaro. The number of *ex situ* sites worldwide is one (BGCI 2019).

Credits

Assessor(s): Valentín-Martínez, D. & Montero Castro, J.

Reviewer(s): Samain, M.-S. & Oldfield, S.

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Villaseñor, J. L. 2016. Checklist of the native vascular plants of Mexico. *Revista Mexicana de Biodiversidad* 87: 559–902.

Citation

Valentín-Martínez, D. & Montero Castro, J. 2020. *Witheringia stellata*. *The IUCN Red List of Threatened Species* 2020: e.T126692975A126695047. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T126692975A126695047.en

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External Resources

For Supplementary Material, and for Images and External Links to Additional Information, please see the Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.4. Forest - Temperate	Resident	Suitable	-
1. Forest -> 1.9. Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Plant Growth Forms

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Plant Growth Form
SL. Shrub - large
SS. Shrub - small

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Minority (50%)	Rapid declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.1. Increase in fire frequency/intensity	Ongoing	Minority (50%)	Rapid declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place land/water protection
Conservation sites identified: Yes, over part of range
Percentage of population protected by PAs: 1-10
Occurs in at least one protected area: Yes
In-place species management
Subject to ex-situ conservation: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed
6. Livelihood, economic & other incentives -> 6.1. Linked enterprises & livelihood alternatives
6. Livelihood, economic & other incentives -> 6.4. Conservation payments

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

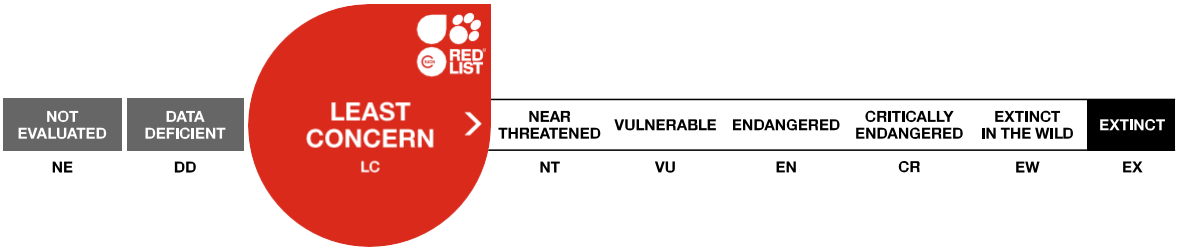
Distribution
Estimated area of occupancy (AOO) (km^2): 92
Estimated extent of occurrence (EOO) (km^2): 30540.406
Number of Locations: 7
Lower elevation limit (m): 1,500
Upper elevation limit (m): 2,300
Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Yes

The IUCN Red List of Threatened Species™
ISSN 2307-8235 (online)
IUCN 2020: T136621113A136621116
Scope(s): Global
Language: English

Evaluación No. 15

Brachistus nelsonii

Assessment by: Valentín-Martínez, D. & Montero Castro, J.



View on www.iucnredlist.org

Citation: Valentín-Martínez, D. & Montero Castro, J. 2020. *Brachistus nelsonii*. *The IUCN Red List of Threatened Species* 2020: e.T136621113A136621116. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T136621113A136621116.en

Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Solanales	Solanaceae

Scientific Name: *Brachistus nelsonii* (Fernald) D'Arcy, J. L. Gentry & Averett

Synonym(s):

- *Athenaea nelsonii* Fernald
- *Athenaea viscida* (Standl.) Standl. & Steyerm.
- *Brachistus affinis* (C.V.Morton) D'Arcy, J.L. Gentry & Averett
- *Capsicum viscidum* Standl.
- *Witheringia affinis* (C.V.Morton) Hunz.
- *Witheringia nelsonii* (Fernald) Hunz.

Taxonomic Source(s):

Board of Trustees, RBG Kew. 2018. Plants of the World Online Portal. Richmond, UK Available at: http://www.plantsoftheworldonline.org.

Taxonomic Notes:

According to Tropicos (2019) and The Plant List (2019), *Brachistus nelsonii* (Fernald) D´Arcy, J.L.Gentry & Averett is an accepted name for this species.

Assessment Information

Red List Category & Criteria: Least Concern ver 3.1

Year Published: 2020

Date Assessed: June 14, 2019

Justification:

Brachistus nelsonii is a shrub or small tree distributed in Mexico, Guatemala, Belize, Honduras, Costa Rica and Panama. In Mexico this species is distributed in the southeast, in the states of Veracruz, Oaxaca, Chiapas, Tabasco and Campeche. In Belize, it has been reported in the El Cayo District, while in Guatemala it has been collected in the departments of Petén, Izabal, Huehuetenango and Alta Verapaz; in Honduras it has been collected near San Pedro Sula, in Costa Rica in the province of Puntarenas and it has also been reported for Panama in the province of Coclé. The taxon has an extent of occurrence (EOO) of 655,941.360 km^2 and an area of occupancy (AOO) of 220 km^2. However, it is likely that the taxon has an AOO higher than calculated, but below 500 km^2. The main threats for the taxon range are deforestation due to agriculture, cattle raising, forest fires, human settlements and tourism. These are not currently thought to be causing population declines at a rate indicating a threatened status global and *Brachistus nelsonii* is assessed as Least Concern (LC).

Geographic Range

Range Description:

Brachistus nelsonii is a shrub or small tree distributed in Mexico, Guatemala, Belize, Honduras, Costa Rica and Panama. In Mexico this species is distributed in the southeast, in the states of Veracruz, Oaxaca, Chiapas, Tabasco and Campeche (Nee 1986, Rodríguez 2004, Villaseñor 2016, Martínez *et al.* 2017, Montero-Castro 2019). In Belize, it has been reported in the El Cayo District, while in Guatemala it has been collected in the departments of Petén, Izabal, Huehuetenango and Alta Verapaz (Gentry and Standley 1974, GBIF 2019); in Honduras it has been collected near San Pedro Sula, in Costa Rica in the province of Puntarenas and it has also been reported for Panama in the province of Coclé (Tropicos 2019). The taxon has an extent of occurrence of 655,941.360 km^2 and an area of occupancy of 220 km^2. However, it is likely that the taxon has an AOO higher than calculated, but below 500 km^2. The main threats for the taxon are deforestation resulting from agriculture, cattle raising, forest fires, human settlements and tourism.

Country Occurrence:

Native, Extant (resident): Belize; Costa Rica; Guatemala; Honduras; Mexico (Campeche, Chiapas, Oaxaca, Tabasco, Veracruz); Panama

Distribution Map

Legend

EXTANT (RESIDENT)

Compiled by:

IUCN SSC Global Tree Specialist Group 2019

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

There is no information available about the population size of *Brachistus nelsonii*.
Current Population Trend: Unknown

Habitat and Ecology **(see Appendix for additional information)**

Brachistus nelsonii is a shrub or small tree of 1-6 m tall. It grows at an altitude range of 100-2,000 m (Gentry and Standley 1974, Nee 1986, Montero-Castro 2019). It occurs in rainforests associated with *Aspidosperma megalocarpon*, *Cordia alliodora* and *Magnolia mexicana* (Nee 1986, Montero-Castro 2019). It grows on hillsides on black and brown soils, both clayey and stony (Montero-Castro 2019). The flowering of this species occurs during the months of May to November (Nee 1986).

Systems: Terrestrial

Use and Trade

There is little information available about the use and trade of *Brachistus nelsonii* in Mexico. In the department of Huehuetenango, Guatemala, the use of this plant in domestic medicine has been reported (Gentry and Standley 1974); however, it is not mentioned what part of the plant is used.

Threats **(see Appendix for additional information)**

The main threats for the taxon range are deforestation due to agriculture, forest fires, human settlements, cattle raising and tourism. *Brachistus nelsonii* grows in rainforests. In Mexico, this type of vegetation has been strongly affected due to the change in land use, mainly for agriculture and livestock, climate change and excessive extraction of flora and fauna, which affects the capacity of the ecosystem to maintain its functioning, in addition to the growth of urban areas, forest fires and logging called "ant", which is carried out to obtain firewood and charcoal (FMCN 2009, CONABIO 2019). It has been estimated that Mexico has lost more than 50% of its original coverage. The rate of deforestation reported for 1993–2002 was 523,639 hectares per year, with tropical rainforests being the most affected (FMCN 2009). Particularly in the state of Chiapas, the strongest threats are deforestation, human settlements, livestock and agriculture, where shade coffee crops are very frequent (Navarrete *et al.* 2010). In addition, some research reveals that in the state of Chiapas native forests suffered a 50% reduction in the period from 1975 to 2000 (Cayuela *et al.* 2006). During the 1980–2011 period the Reserva de la Biósfera Los Tuxtlas located in the state of Veracruz lost 30,074 hectares of forest area as a result of the change in land use, mainly for agricultural and livestock activities. Of the deforested area, 19.41% corresponded to the zone decreed as a reserve, resulting in an average annual rate of deforestation of 1.15% during the period of 31 years. In 2017, 726,361.21 hectares were affected by forest fires in Chiapas and Oaxaca, being two of the states with the highest number of fires (CONAFOR 2017). At a national level, the states of Veracruz and Chiapas are among the main livestock producers (SIAP 2017). The state of Campeche is among the most visited by tourists due to the presence of several archaeological sites, with Calakmul the most visited of all. Due to this phenomenon, the hotel industry suffered an increase since in the year 2000 there were 137 hotels and for the year 2014 it increased to 324 (Campeche 2016). The causes of the loss of biodiversity in Guatemala are related to economic activities, especially agriculture and livestock, as well as forest fires and human settlements (INAB and IARNA-URL 2012, CONAP 2014). It is estimated that during the period 2006–2010 the forest cover had a

loss of 38,597 hectares per year due to deforestation, while during the period 2001–2012 there were 758,382 forest fires affecting around 115,385 hectares of forest with an average of 9,613 ha / year (CONAP 2014). The loss of biodiversity in Honduras is mainly due to the destruction or fragmentation of the habitat as a result of deforestation, infrastructure construction and pollution in general, as well as fragmentation. The change in land use implies the conversion of forests to agricultural and livestock fields, which are considered as the main causes of deforestation. Honduras has one of the highest rates of deforestation in the world, it is estimated that between 34,000 and 58,000 hectares are lost annually as a result of illegal logging and other improper forest management practices; another major negative impact is forest fires, it is estimated that more than 62,000 hectares of forest are affected annually (DiBio 2017).

Conservation Actions **(see Appendix for additional information)**

Brachistus nelsonii is located in some natural protected areas: Reserva de la Biósfera Montes Azules (Chiapas, Mexico), Parque Nacional Cañón del Sumidero (Chiapas, Mexico), Reserva de la Biósfera Los Tuxtlas (Veracruz, Mexico), Reserva de la Biósfera Calakmul (Campeche, Mexico), Reserva de Biósfera Maya (Guatemala), Mountain Pine Ridge Forest Reserve (Belize), Blue Hole National Park (Belize), Deep River Forest Reserve (Belize), and Refugio de Vida Silvestre Golfito (Costa Rica). There are no current *ex situ* sites worldwide (BGCI 2018).

Credits

Assessor(s): Valentín-Martínez, D. & Montero Castro, J.

Reviewer(s): Samain, M.-S. & Oldfield, S.

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Citation

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External Resources

For Supplementary Material, and for Images and External Links to Additional Information, please see the Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.6. Forest - Subtropical/Tropical Moist Lowland	Resident	Suitable	-
1. Forest -> 1.9. Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Plant Growth Forms

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Plant Growth Form
SS. Shrub - small
TS. Tree - small
SL. Shrub - large

Use and Trade

(http://www.iucnredlist.org/technical-documents/classification-schemes)

End Use	Local	National	International
Medicine - human & veterinary	No	Yes	Yes

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming	Ongoing	Majority (50-90%)	Very rapid declines	High impact: 8
2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.3. Agro-industry grazing, ranching or farming	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.1. Intentional use: (subsistence/small scale) [harvest]	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5

5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very rapid declines	High impact: 8
7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.1. Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place research and monitoring
Action Recovery Plan: Unknown
In-place land/water protection
Conservation sites identified: Yes, over part of range
Percentage of population protected by PAs: 11-20
Occurs in at least one protected area: Yes
In-place education
Subject to recent education and awareness programmes: Unknown

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed
6. Livelihood, economic & other incentives -> 6.1. Linked enterprises & livelihood alternatives
6. Livelihood, economic & other incentives -> 6.4. Conservation payments

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km^2): 220-500

Estimated extent of occurrence (EOO) (km²): 655941.360

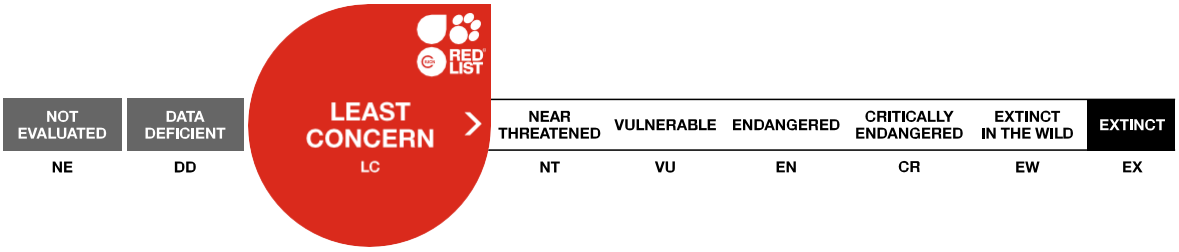
Distribution
Lower elevation limit (m): 100
Upper elevation limit (m): 2,000

The IUCN Red List of Threatened Species™
ISSN 2307-8235 (online)
IUCN 2020: T126624876A126625150
Scope(s): Global
Language: English

Evaluación No. 16

Cestrum elegans, Aretillo

Assessment by: Valentín-Martínez, D. & Montero Castro, J.



View on www.iucnredlist.org

Citation: Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum elegans*. *The IUCN Red List of Threatened Species* 2020: e.T126624876A126625150. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T126624876A126625150.en

Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Solanales	Solanaceae

Scientific Name: *Cestrum elegans* (Brongn. ex Neumann) Schltdl.

Synonym(s):

- *Cestrum elegans* L.H.Bailey var. *smithii*
- *Cestrum elegans* Francey var. *longiflorum*
- *Cestrum elegans* Fernald var. *truncata*
- *Cestrum elegans* Dunal var. *totutla*
- *Cestrum nutans* Hort. ex Francey
- *Cestrum paniculatum* (M.Martens & Galeotti) Schltdl.
- *Cestrum purpureum* (Lindl.) Standl.
- *Cestrum rubrum* Hort. ex Francey
- *Cestrum smithii* Coutts
- *Cestrum sylvaticum* Dunal
- *Habrothamnus elegans* Walp.
- *Habrothamnus elegans* Brongn. ex Neumann
- *Habrothamnus helleri* Hort. ex Francey
- *Habrothamnus huegelii* Regel
- *Habrothamnus paniculatus* M.Martens & Galeotti
- *Habrothamnus purpureus* Lindl.

Common Name(s):

- Spanish; Castilian: Aretillo, Hierba del espanto

Taxonomic Notes:

According to Tropicos (2019) and The Plant List (2019), *Cestrum elegans* is an accepted name for this species.

Assessment Information

Red List Category & Criteria: Least Concern ver 3.1

Year Published: 2020

Date Assessed: May 13, 2019

Justification:

Cestrum elegans is an endemic shrub from Mexico. In Mexico it is distributed in the states of Tamaulipas, Hidalgo, Puebla, Veracruz and Oaxaca (Nee 1986, Villaseñor 2016, Martínez *et al*. 2017). However, this species has been introduced to some countries in South America, Europe, Asia, Africa and Oceania. The extent of occurrence (EOO)is 103,130.041 km^2 and the area of occupancy (AOO) is 340 km^2, it is important to mention that both the EOO and the AOO were calculated taking into account only the natural distribution of the species, omitting the records of the countries where it was introduced. The main threats that it presents in

Mexico are agriculture, human settlements, deforestation, forest fires and livestock. These threats are not however causing a significant decline of the species and *Cestrum elegans* is assessed at Least Concern (LC).

Geographic Range

Range Description:

Cestrum elegans is an endemic shrub from Mexico. In Mexico it is distributed in the states of Tamaulipas, Hidalgo, Puebla, Veracruz and Oaxaca (Nee 1986, Villaseñor 2016, Martínez *et al*. 2017, Montero-Castro 2019). However, this species has been introduced to some countries in South America, Europe, Asia, Africa and Oceania (GBIF 2019). The extent of occurrence (EOO) is 103,130.041 km^2 and the area of occupancy (AOO) of the species is 340 km^2, it is important to mention that both the EOO and the AOO were calculated taking into account only the natural distribution of the species, omitting the records of the countries where it was introduced. The taxon has between six to eight locations and the main threats that it presents in Mexico are agriculture, human settlements, deforestation, forest fires and livestock.

Country Occurrence:

Native, Extant (resident): Mexico (Hidalgo, Oaxaca, Puebla, Tamaulipas, Veracruz); United Kingdom

Extant & Introduced (resident): Australia; Brazil; Colombia; Ecuador; Ethiopia; France; Germany; Morocco; Nepal; Netherlands; New Caledonia; New Zealand; Papua New Guinea; Peru; South Africa; Spain; Tanzania, United Republic of; United Kingdom (Great Britain); United States

Distribution Map

Legend

EXTANT (RESIDENT)

Compiled by:

IUCN SSC Global Tree Specialist Group 2019

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

There is no information available about the population of *Cestrum elegans.*
Current Population Trend: Unknown

Habitat and Ecology (see Appendix for additional information)

Cestrum elegans is a shrub of 1–4 m tall. It grows at an altitude range of 700–2,500 m. It occurs in mountain cloud forest, pine-oak forest associated with *Magnolia schiedeana, Clethra, Liquidambar macrophylla, Alnus acuminata, Styrax* and *Meliosma* (Nee 1986, Montero-Castro 2019). It grows on the slopes and ravines of the hills (Montero-Castro 2019). Flowering occurs throughout the year (Nee 1986).

Systems: Terrestrial

Use and Trade

Due to its very striking red flowers, this species has been cultivated as an ornamental plant in some countries of South America, Europe, Asia, Africa and Oceania. Apparently, it is used occasionally for medicinal purposes as "drink against fright" (Nee 1986). In the State of Veracruz, *Cestrum elegans* is used by farmers as a living fence to delimit areas dedicated to agriculture or livestock (Avedaño and Acosta 2000).

Threats (see Appendix for additional information)

The threats that have been observed for this species are agriculture, human settlements, deforestation, forest fires and livestock. *Cestrum elegans* develops is the mountain cloud forest. In Mexico, these forests occupy less than 1% of the national territory, which is why it is considered the most threatened terrestrial ecosystem (CONABIO 2010, González-Espinosa *et al.* 2012). Another type of vegetation where *Cestrum elegans* develops is the pine-oak forest, this ecosystem has been strongly affected due to deforestation, agriculture, forest fires, livestock and climate change (CONABIO 2019). In the period from 1970 to 1990, Mexico lost 14% of the coniferous forests (Sánchez 2003). In 2017, 726,361.21 hectares were affected by forest fires, Puebla and Hidalgo being two of the states with the largest number of fires (CONAFOR 2017). In Mexico, rainforests have been strongly affected due to the change in land use destined mainly for agriculture and livestock, climate change and excessive extraction of flora and fauna, which affects the capacity of the ecosystem to maintain its functioning in addition to the growth of urban areas, forest fires and logging called "ant", which is carried out to obtain firewood and charcoal (FMCN 2009, CONABIO 2019). It has been estimated that Mexico has lost more than 50% of its original coverage. The rate of deforestation reported for 1993-2002 was 523,639 hectares per year, with tropical rainforests being the most affected (FMCN 2009). In Mexico, the state of Veracruz is among the main livestock producers (SIAP 2017).

Conservation Actions (see Appendix for additional information)

In Mexico *Cestrum elegans* is found within some natural protected areas: Parque Nacional Cañón del Río Blanco (Veracruz) and the Reserva de la Biosfera Los Tuxtlas (Veracruz). The number of *ex situ* sites worldwide is 61 (BGCI 2019).

Credits

Assessor(s): Valentín-Martínez, D. & Montero Castro, J.

Reviewer(s): Samain, M.-S. & Oldfield, S.

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Villaseñor, J.L. 2016. Checklist of the native vascular plants of Mexico. *Revista Mexicana de Biodiversidad* 87: 559–902.

Citation

Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum elegans*. *The IUCN Red List of Threatened Species* 2020: e.T126624876A126625150. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T126624876A126625150.en

Disclaimer

External Resources

For Supplementary Material, and for Images and External Links to Additional Information, please see the Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.4. Forest - Temperate	Resident	Suitable	-
1. Forest -> 1.5. Forest - Subtropical/Tropical Dry	Resident	Suitable	-
1. Forest -> 1.6. Forest - Subtropical/Tropical Moist Lowland	Resident	Suitable	-
1. Forest -> 1.9. Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Plant Growth Forms

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Plant Growth Form
SL. Shrub - large
SS. Shrub - small

Use and Trade

(http://www.iucnredlist.org/technical-documents/classification-schemes)

End Use	Local	National	International
Medicine - human & veterinary	No	Yes	Yes
Construction or structural materials	Yes	Yes	Yes
Pets/display animals, horticulture	Yes	Yes	Yes

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming	Ongoing	Majority (50-90%)	Very rapid declines	High impact: 8

2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.3. Agro-industry grazing, ranching or farming	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5

5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very rapid declines	High impact: 8
7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.1. Increase in fire frequency/intensity	Ongoing	Minority (50%)	Rapid declines	Medium impact: 6

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place land/water protection
Conservation sites identified: Yes, over part of range
Percentage of population protected by PAs: 1-10
Occurs in at least one protected area: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed
6. Livelihood, economic & other incentives -> 6.1. Linked enterprises & livelihood alternatives
6. Livelihood, economic & other incentives -> 6.4. Conservation payments

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km²): 340
Estimated extent of occurrence (EOO) (km²): 103130.041
Number of Locations: 10
Lower elevation limit (m): 700
Upper elevation limit (m): 2,500

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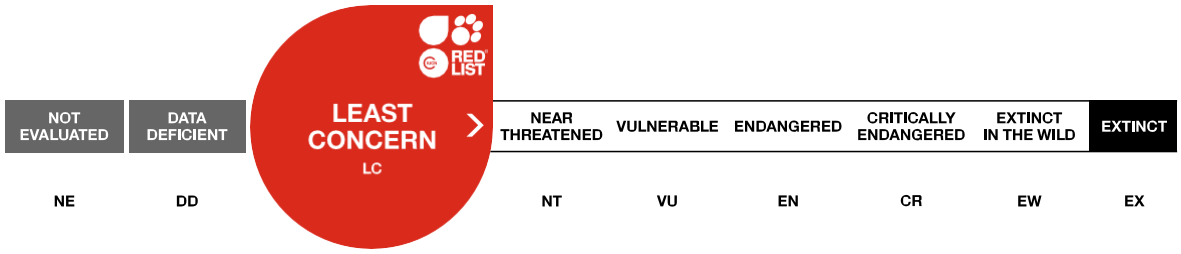
Scope(s): Global
Language: English

Evaluación No. 17

Cestrum fasciculatum

Assessment by: Valentín-Martínez, D. & Montero Castro, J.



View on www.iucnredlist.org

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Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Solanales	Solanaceae

Scientific Name: *Cestrum fasciculatum* (Schltdl.) Miers

Synonym(s):

- *Cestrum spigelioides* Zuccarini ex Francey
- *Habrothamnus fasciculatus* (Schltdl.) Endl.
- *Meyenia fasciculata* Schltdl.

Taxonomic Source(s):

Board of Trustees, RBG Kew. 2018. Plants of the World Online Portal. Richmond, UK Available at: http://www.plantsoftheworldonline.org.

Taxonomic Notes:

According to Tropicos (2019) and The Plant List (2019), *Cestrum fasciculatum* (Schltdl.) Miers is an accepted name for this species.

Assessment Information

Red List Category & Criteria: Least Concern ver 3.1

Year Published: 2020

Date Assessed: April 27, 2019

Justification:

Cestrum fasciculatum is an endemic shrub from Mexico, it is distributed in the states Tamaulipas, San Luis Potosí, Querétaro, Hidalgo, Puebla, Veracruz, Tlaxcala and Oaxaca, especially in the Sierra Madre Oriental. It has also been reported for the states of Michoacán and Nuevo León; however, it is likely that they are bad identifications. The extent of occurrence (EOO) is 95,221.791 km^2. The area of occupancy (AOO) of the taxon is 716 km^2, but it is likely that the AOO of the species is a little higher with increased sampling effort. The main threats that the distribution area presents are agriculture, deforestation, human settlements, cattle raising and forest fires. However, these threats are not expected to significantly affect the survival of the species. Therefore, *Cestrum fasciculatum* is assessed as Least Concern (LC).

Geographic Range

Range Description:

Cestrum fasciculatum is an endemic shrub from Mexico, it is distributed in the states Tamaulipas, San Luis Potosí, Querétaro, Hidalgo, Puebla, Veracruz, Tlaxcala and Oaxaca (Nee 1986, Villaseñor 2016, Martínez *et al.* 2017, Montero-Castro 2019), especially in the Sierra Madre Oriental (CONABIO, 2004). It has also been reported for the states of Michoacán and Nuevo León (Martínez *et al.* 2017); however, it is likely that they are bad identifications. The extent of occurrence is 95,221.791 km^2. The area of

occupancy of the taxon is 716 km^2, but it is likely that the AOO of the species is a little higher than estimated, if the collection efforts were increased.

Country Occurrence:

Native, Extant (resident): Mexico (Hidalgo, Oaxaca, Puebla, Querétaro, San Luis Potosí, Tamaulipas, Tlaxcala)

Distribution Map

Legend

EXTANT (RESIDENT)

Compiled by:

IUCN SSC Global Tree Specialist Group 2019

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

There is no information available about the population of *Cestrum fasciculatum*.
Current Population Trend: Unknown

Habitat and Ecology (see Appendix for additional information)

Cestrum fasciculatum is a shrub of 0.5–3 m tall. It grows at an altitude range of 1,000–3,000 m. It occurs in pine oak forest, pine-oak forest and mountain cloud forest associated with *Pinus*, *Quercus*, *Alnus*, *Liquidambar*, *Podocarpus*, *Clethra* and *Ternstroemia* (Nee 1986, Montero-Castro 2019). Flowers all year (Nee 1986). It develops both in black and brown soils, in stony, sandy and clayey soils with abundant organic material (Montero-Castro 2019).

Systems: Terrestrial

Use and Trade

Cestrum fasciculatum has very striking red flowers, so maybe it can be used as an ornamental plant (Nee 1986).

Threats (see Appendix for additional information)

Cestrum fasciculatum develops in the mountain cloud forest. In Mexico, these forests occupy less than 1% of the national territory, which is why it is considered the most threatened terrestrial ecosystem (CONABIO 2010, González-Espinosa et al. 2012). Another type of vegetation where *Cestrum fasciculatum* develops is the temperate forest, this ecosystem has been strongly affected due to deforestation, agriculture, forest fires, livestock and climate change (CONABIO 2019). In the period from 1970 to 1990, Mexico lost 14% of the coniferous forests, while the hardwood forests suffered a reduction of 9.3% (Sánchez et al. 2003). In 2017, 726,361.21 hectares were affected due to forest fires, with Hidalgo and Puebla being two of the states with the largest number of fires (CONAFOR 2017).

Conservation Actions (see Appendix for additional information)

According to distribution points (Montero-Castro 2019), *Cestrum fasciculatum* is found within protected natural areas: Reserva de la Biosfera Sierra Gorda (Querétaro), Reserva de la Biosfera Barranca del Metztitlán (Hidalgo), Área de Protección de Recursos Naturales Z.P.F.V. la Cuenca Hidrográfica del Río Necaxa (Hidalgo-Puebla), Parque Nacional Cofre del Perote (Veracruz) and the Parque Nacional Cañon del Río Blanco (Veracruz). The number of *ex situ* sites worldwide is 20 (BGCI 2019).

Credits

Assessor(s): Valentín-Martínez, D. & Montero Castro, J.

Reviewer(s): Oldfield, S. & Samain, M.-S.

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Citation

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External Resources

For Supplementary Material, and for Images and External Links to Additional Information, please see the Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.4. Forest - Temperate	Resident	Suitable	-
1. Forest -> 1.9. Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Plant Growth Forms

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Plant Growth Form
SL. Shrub - large
SS. Shrub - small

Use and Trade

(http://www.iucnredlist.org/technical-documents/classification-schemes)

End Use	Local	National	International
Pets/display animals, horticulture	Yes	Yes	Yes

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.3. Agro-industry grazing, ranching or farming	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7

7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.1. Increase in fire frequency/intensity	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place land/water protection
Conservation sites identified: Yes, over part of range
Percentage of population protected by PAs: 21-30
Occurs in at least one protected area: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed
6. Livelihood, economic & other incentives -> 6.1. Linked enterprises & livelihood alternatives
6. Livelihood, economic & other incentives -> 6.4. Conservation payments

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km^2): 716
Estimated extent of occurrence (EOO) (km^2): 95221.791
Lower elevation limit (m): 1,000
Upper elevation limit (m): 3,000

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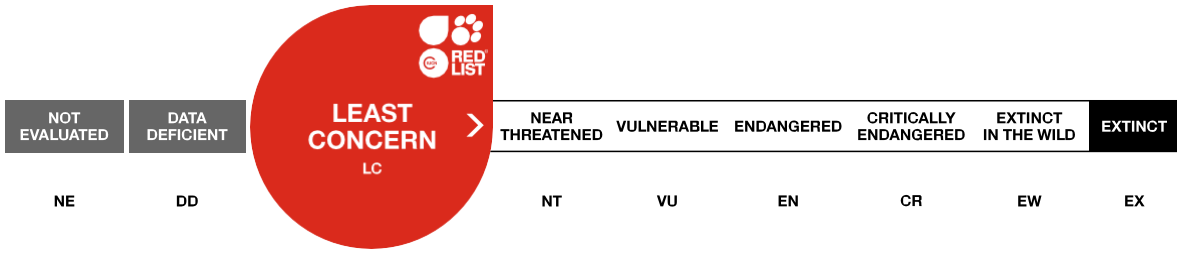
Scope(s): Global
Language: English

Evaluación No. 18

Cestrum laxum

Assessment by: Valentín-Martínez, D. & Montero Castro, J.



View on www.iucnredlist.org

Citation: Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum laxum*. *The IUCN Red List of Threatened Species* 2020: e.T136621150A136621153. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T136621150A136621153.en

Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Solanales	Solanaceae

Scientific Name: *Cestrum laxum* Benth.

Synonym(s):

- *Cestrum anagyris* Dunal
- *Cestrum bourgeauianum* Fernald
- *Fregirardia ligustrina* Dunal

Taxonomic Source(s):

Board of Trustees, RBG Kew. 2018. Plants of the World Online Portal. Richmond, UK Available at: http://www.plantsoftheworldonline.org.

Taxonomic Notes:

Cestrum laxum is the accepted name for this species. Many of the collections of this species made in Mexico have been identified as *Cestrum anagyris*, but it has been suggested that this species is a synonym of *Cestrum laxum*.

Assessment Information

Red List Category & Criteria: Least Concern ver 3.1

Year Published: 2020

Date Assessed: May 10, 2019

Justification:

Cestrum laxum is an endemic shrub from Mexico, Guatemala and Honduras. In Mexico it is distributed in the states of Jalisco, Michoacán, Guanajuato, State of Mexico, Mexico City, Guerrero, Hidalgo, Morelos, Tlaxcala, Puebla, Veracruz, Oaxaca and Chiapas, mainly in the Trans-Mexican volcanic belt. In Guatemala it is found in the departments of Totonicapán, Quezaltenango and Huehuetango, while in Honduras it is located in the municipality of Siguatepeque. The extent of occurrence (EOO) is 405,560.454 km^2. The area of occupancy (AOO) of the taxon is 688 km^2, but it is likely that the AOO of the species is a little higher than estimated, if the collection efforts were increased. The main threats that the distribution area presents are agriculture, deforestation, human settlements, forest fires and livestock. These threats are not however thought to be causing a significant decline and *Cestrum laxum* is assessed at Least Concern (LC).

Geographic Range

Range Description:

Cestrum laxum is a shrub from Mexico, Guatemala and Honduras. In Mexico it is distributed in the states of Jalisco, Michoacán, Guanajuato, State of Mexico, Mexico City, Guerrero, Hidalgo, Morelos, Tlaxcala, Puebla, Veracruz, Oaxaca and Chiapas (Nee 1986, Villaseñor 2016, Martínez *et al.*, 2017), mainly in the Trans-

Mexican volcanic belt. In Guatemala it is found in the departments of Totonicapán, Quezaltenango and Huehuetango, while in Honduras it is located in the municipality of Siguatepeque (Gentry and Standley 1974). The extent of occurrence is 405,560.454 km^2. The area of occupancy of the taxon is 688 km^2, but it is likely that the AOO of the species is a higher than estimated, if the collection efforts were increased. The main threats that the distribution area presents are agriculture, deforestation, human settlements, forest fires and livestock.

Country Occurrence:

Native, Extant (resident): Guatemala; Honduras; Mexico (Chiapas, Guanajuato, Guerrero, Hidalgo, Jalisco, Michoacán, Morelos, México Distrito Federal, México State, Oaxaca, Puebla, Tlaxcala, Veracruz)

Distribution Map

Legend

EXTANT (RESIDENT)

Compiled by:

IUCN SSC Global Tree Specialist Group 2019

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

There is no information available about the population of *Cestrum laxum.*

Current Population Trend: Unknown

Habitat and Ecology (see Appendix for additional information)

Cestrum laxum is a shrub of 1–5 m tall. It grows at an altitude range of 1,100–3,400 m. It occurs in mountain cloud forest, pine forest, oak forest, pine-oak forest, *Pinus-Abies* forest and *Abies* forest associated with *Quercus*, *Pinus, Abies religiosa, Acer negundo, Clethra, Alnus jorullensis, Prunus, Crataegus pubescens, Senecio* and *Buddleja* (Gentry and Standley 1974, Nee 1986, Rzedowski 2005). This species thrives on hillsides and gullies of the hills growing on brown and black soils with organic matter as well as limestone. Flowering occurs during the months of January and February (Nee 1986).

Systems: Terrestrial

Use and Trade (see Appendix for additional information)

There is no information available about the use and trade of *Cestrum laxum.*

Threats (see Appendix for additional information)

The main threats that have been observed within the range of *Cestrum laxum* are deforestation, agriculture, livestock and forest fires (INAB, IARNA-URL 2012, CONAFOR 2017, SIAP 2017, CONABIO 2019).

Conservation Actions (see Appendix for additional information)

According to distribution points, *Cestrum laxum* occurs within the following protected natural areas: Reserva de la Biosfera Mariposa Monarca (Michoacán-Mexico), Parque Nacional Bosencheve (Mexico), Área de Protección de Recursos Naturales Z.P.F.T.C.C. de los Ríos Valle de Bravo, Malacatepec, Tilostoc y Temascaltepec (Mexico), Área de Protección de Flora y Fauna Nevado de Toluca (Mexico), Parque Nacional Lagunas de Zempoala (Morelos), Área de Protección de Flora y Fauna Corredor Biológico Chichinautzin (Morelos), Parque Nacional La Montaña Malinche (Tlaxcala), Parque Nacional Cañón del Río Blanco (Veracruz) and the Reserva de la Biosfera Tehuacán-Cuicatlán (Puebla-Oaxaca). There are no current *ex situ* sites worldwide (BGCI 2019).

Credits

Assessor(s): Valentín-Martínez, D. & Montero Castro, J.

Reviewer(s): Samain, M.-S. & Oldfield, S.

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Citation

Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum laxum*. *The IUCN Red List of Threatened Species* 2020: e.T136621150A136621153. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T136621150A136621153.en

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External Resources

For Supplementary Material, and for Images and External Links to Additional Information, please see the Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.4. Forest - Temperate	Resident	Suitable	-
1. Forest -> 1.9. Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Plant Growth Forms

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Plant Growth Form
SL. Shrub - large
SS. Shrub - small

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming	Ongoing	Majority (50-90%)	Very rapid declines	High impact: 8
2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.3. Agro-industry grazing, ranching or farming	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very rapid declines	High impact: 8
7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.1. Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place land/water protection

Conservation Action in Place
Conservation sites identified: Yes, over part of range
Percentage of population protected by PAs: 21-30
Occurs in at least one protected area: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed
6. Livelihood, economic & other incentives -> 6.1. Linked enterprises & livelihood alternatives
6. Livelihood, economic & other incentives -> 6.4. Conservation payments

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km^2): 688
Estimated extent of occurrence (EOO) (km^2): 405560.454
Lower elevation limit (m): 1,100
Upper elevation limit (m): 3,400

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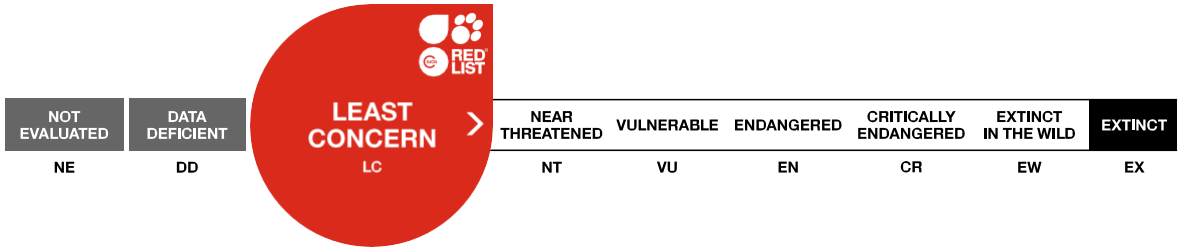
IUCN 2020: T126624929A126625185
Scope(s): Global
Language: English

Evaluación No. 19

Cestrum oblongifolium

Assessment by: Valentín-Martínez, D. & Montero Castro, J.



[View on www.iucnredlist.org](www.iucnredlist.org)

Citation: Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum oblongifolium*. *The IUCN Red List of Threatened Species* 2020: e.T126624929A126625185. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T126624929A126625185.en

Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Solanales	Solanaceae

Scientific Name: *Cestrum oblongifolium* Schltdl.

Synonym(s):

- *Cestrum decurrens* Francey
- *Cestrum ehrembergii* Dunal
- *Cestrum multinervium* Dunal

Common Name(s):

- Spanish; Castilian: Chapadá, Cornetón

Assessment Information

Red List Category & Criteria: Least Concern ver 3.1

Year Published: 2020

Date Assessed: March 1, 2019

Justification:

Cestrum oblongifolium is an endemic shrub or small tree from Mexico, it is distributed in the states of Nuevo León and Tamaulipas, San Luis Potosí, Guanajuato, Querétaro, Michoacán, Hidalgo, Puebla, Veracruz, Mexico State, Morelos, Tlaxcala and Oaxaca, especially in the part that covers the Sierra Madre Oriental. It has also been reported for the states of Coahuila, Guerrero and Jalisco; however, it is most likely confused with *Cestrum laxum*, a species that has a wide distribution in the center of the country. The extent of occurrence (EOO) is 200,937.113 km^2. The area of occupancy (AOO) of the taxon is 528 km^2, but it is likely that the AOO of the species is a little higher than estimated, if the collection efforts were increased. The taxon has over 10 locations and the main threats that the distribution area presents are agriculture, human settlements and deforestation. *Cestrum oblongifolium* is assessed as Least Concern.

Geographic Range

Range Description:

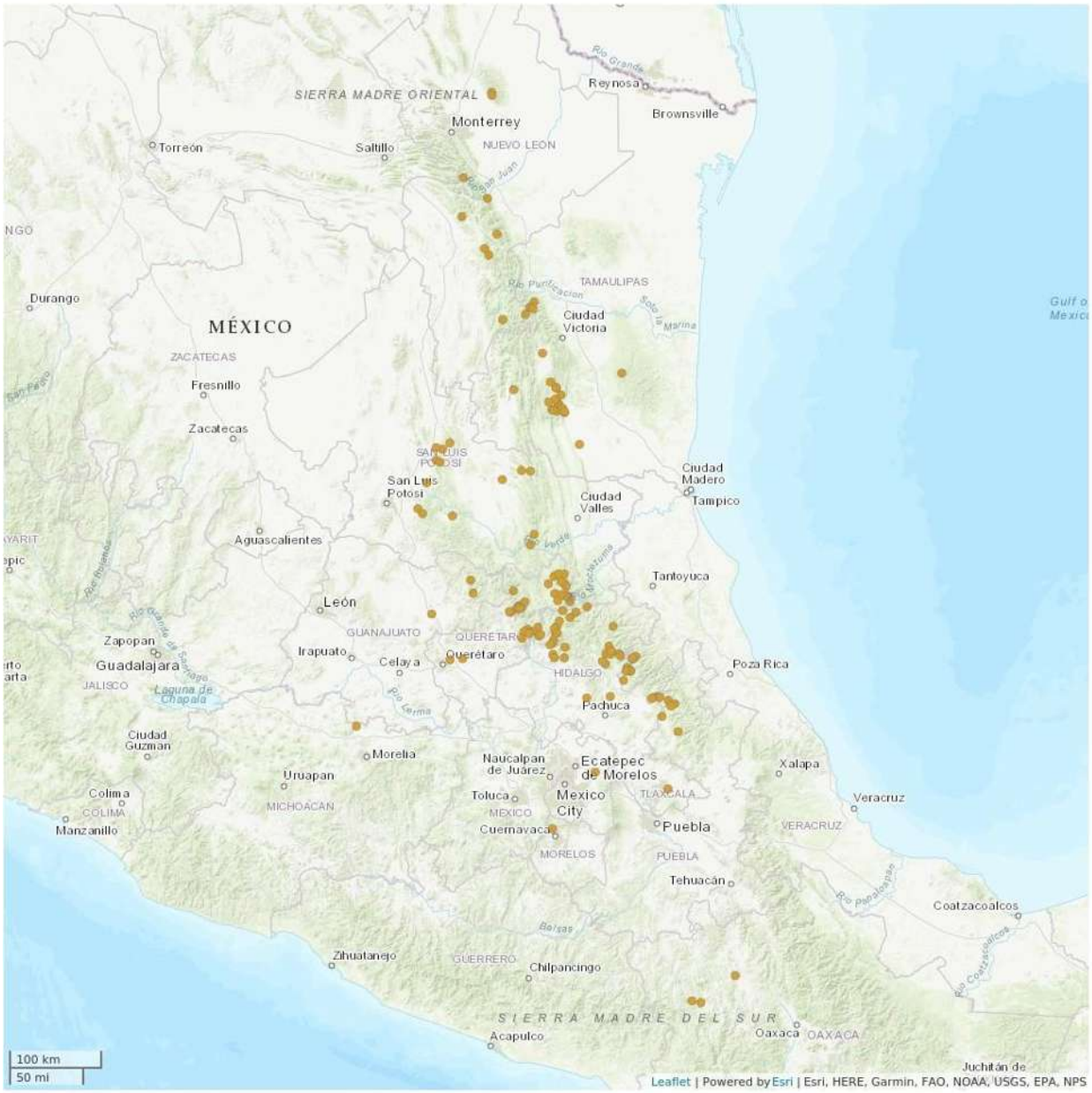
Cestrum oblongifolium is an endemic shrub or small tree from Mexico, it is distributed in the north of the country in the states of Nuevo León and Tamaulipas, and in the central-southern part including the states of San Luis Potosí, Guanajuato, Querétaro, Michoacán, Hidalgo, Puebla, Veracruz, Mexico State, Morelos, Tlaxcala and Oaxaca (Nee 1986), especially in the Sierra Madre Oriental (CONABIO, 2004).It has also been reported for the states of Coahuila, Guerrero and Jalisco (Villaseñor 2016, Martínez *et al.* 2017); however, it is here most likely confused with *Cestrum laxum*, a species that has a wide distribution in the center of the country (J.C. Montero Castro pers. comm. 2019).The extent of occurrence is 200,937.113 km^2. The area of occupancy of the taxon is 528 km^2, but it is likely that the AOO of the

species is a little higher than estimated, if the collection efforts were increased. The taxon has nine locations and the main threats that the distribution area presents are agriculture, human settlements and deforestation.

Country Occurrence:

Native, Extant (resident): Mexico (Guanajuato, Hidalgo, Michoacán, Morelos, México State, Nuevo León, Oaxaca, Puebla, Querétaro, San Luis Potosí, Tamaulipas, Tlaxcala, Veracruz)

Distribution Map



Legend

EXTANT (RESIDENT)

Compiled by:

IUCN SSC Global Tree Specialist Group 2019

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

There is no information available about the population of *Cestrum oblongifolium.*
Current Population Trend: Unknown

Habitat and Ecology **(see Appendix for additional information)**

Cestrum oblongifolium is a shrub or small tree of 2-5 m tall. It grows at an altitude range of 1200-2300 m. It occurs in mountain cloud forest and pine-oak forest associated with *Quercus*, *Pinus* (Nee 1986, González-Espinosa *et al.* 2011). It prefers deep soils, both stony and clayey (IBUNAM 2019). Ramírez- Segura (2013) mentions that *Cestrum oblongifolium* flowers during the months of December to April, with peak flowering in the month of February. According to this autor, *Cestrum oblongifolium* has a diurnal anthesis with a flower duration of four days. The dehiscence of the anthers and the receptivity of the stigma occur when the flower is opened. Fruit production begins at the end of April. Due to the floral morphology of *Cestrum oblongifolium* it is proposed that it is pollinated by diurnal butterflies.

Systems: Terrestrial

Use and Trade

Cestrum oblongifolium could be used as an ornamental plant (González-Espinosa et al. 2011).

Threats **(see Appendix for additional information)**

Cestrum oblongifolium develops in the mountain cloud forest. In Mexico, these forests occupy less than 1% of the national territory, which is why it is considered the most threatened terrestrial ecosystem (CONABIO 2010, González-Espinosa et al. 2012). Another type of vegetation where *Cestrum oblongifolium* develops is the temperate forest, this ecosystem has been strongly affected due to deforestation, agriculture, forest fires, livestock and climate change (CONABIO 2019). In the period from 1970 to 1990, Mexico lost 14% of the coniferous forests, while the hardwood forests suffered a reduction of 9.3% (Sánchez et al. 2003).

Conservation Actions **(see Appendix for additional information)**

Based on the distribution data (Montero-Castro 2019), *Cestrum oblongifolium* has two of its largest populations within protected areas: Reserva de la Biosfera El Cielo (Tamaulipas) and Reserva de la Biosfera Sierra Gorda (Guanajuato and Querétaro). It also has records in: Parque Nacional Cumbres de Monterrey (Nuevo León), Reserva de la Biosfera Sierra de Tamaulipas, Área de protección de Flora y Fauna Sierra de Álvarez (San Luis Potosí), Parque Nacional Los Marmoles (Hidalgo), Reserva de la Biosfera Barranca del Metztitlán (Hidalgo), Área de Protección de Recursos Naturales Z.P.F.V. La Cuenca Hidrográfica del Río Necaxa (Hidalgo-Veracruz) and Área de Protección de Flora y Fauna Corredor Biológico Chichinautzin (Morelos). In a previous assessment in The Red List Of Mexican Cloud Forest Trees, *Cestrum oblongifolium* was evaluated as Near Threatened (González-Espinosa *et al.* 2011).The number of *ex situ* sites worldwide is 1 (BGCI 2019).

Credits

Assessor(s): Valentín-Martínez, D. & Montero Castro, J.

Reviewer(s): Samain, M.-S. & Oldfield, S.

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Citation

Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum oblongifolium*. *The IUCN Red List of Threatened Species* 2020: e.T126624929A126625185. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T126624929A126625185.en

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External Resources

For Supplementary Material, and for Images and External Links to Additional Information, please see the Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.4. Forest - Temperate	Resident	Suitable	-
1. Forest -> 1.6. Forest - Subtropical/Tropical Moist Lowland	Resident	Suitable	-
1. Forest -> 1.9. Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Plant Growth Forms

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Plant Growth Form
TS. Tree - small
SL. Shrub - large

Use and Trade

(http://www.iucnredlist.org/technical-documents/classification-schemes)

End Use	Local	National	International
Pets/display animals, horticulture	Yes	Yes	Yes

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.3. Agro-industry grazing, ranching or farming	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7

7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.1. Increase in fire frequency/intensity	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
11. Climate change & severe weather -> 11.1. Habitat shifting & alteration	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place land/water protection
Conservation sites identified: Yes, over part of range
Percentage of population protected by PAs: 31-40
Occurs in at least one protected area: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed
6. Livelihood, economic & other incentives -> 6.1. Linked enterprises & livelihood alternatives
6. Livelihood, economic & other incentives -> 6.4. Conservation payments

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km²): 528
Estimated extent of occurrence (EOO) (km²): 200937.113
Number of Locations: 10
Lower elevation limit (m): 1,200
Upper elevation limit (m): 2,300

Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: No

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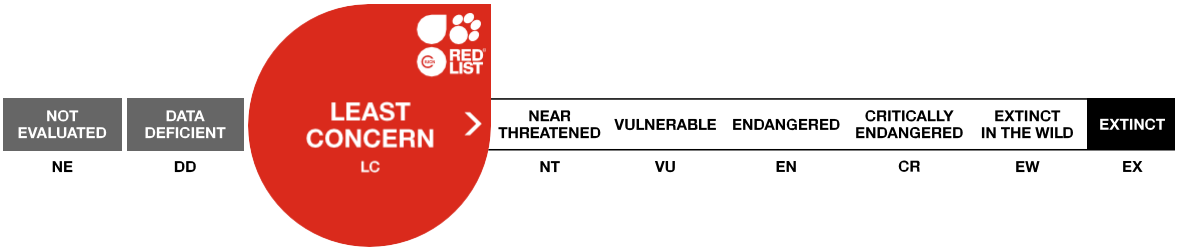
IUCN 2020: T126624932A126625190
Scope(s): Global
Language: English

Evaluación No. 20
Cestrum roseum, Hediondilla

Assessment by: Valentín-Martínez, D. & Montero Castro, J.



View on www.iucnredlist.org

Citation: Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum roseum*. *The IUCN Red List of Threatened Species* 2020: e.T126624932A126625190. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T126624932A126625190.en

Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Solanales	Solanaceae

Scientific Name: *Cestrum roseum* Kunth

Synonym(s):

- *Cestrum benthamii* Miers
- *Habrothamnus roseus* Miers

Common Name(s):

- Spanish; Castilian: Hediondilla

Assessment Information

Red List Category & Criteria: Least Concern ver 3.1

Year Published: 2020

Date Assessed: May 3, 2019

Justification:

Cestrum roseum is an endemic shrub or small tree from Mexico, it is distributed in the states of Michoacán, Mexico State, Guanajuato, Querétaro, Mexico City, Hidalgo, Tlaxcala, Puebla and Oaxaca, especially in the Transmexican Volcanic Belt. It has also been reported for the states of San Luis Potosí, Tamaulipas and Yucatán however, it is likely that they are wrong identifications. The extent of occurrence (EOO) is 133,580.164 km^2. The area of occupancy (AOO) of the taxon is 492 km^2, but it is likely that the AOO of the species is a little higher than estimated, if the collection efforts were increased. The taxon has nine locations and the main threats that the distribution area presents are agriculture, human settlements and deforestation. *Cestrum roseum* is assessed as Least Concern (LC).

Geographic Range

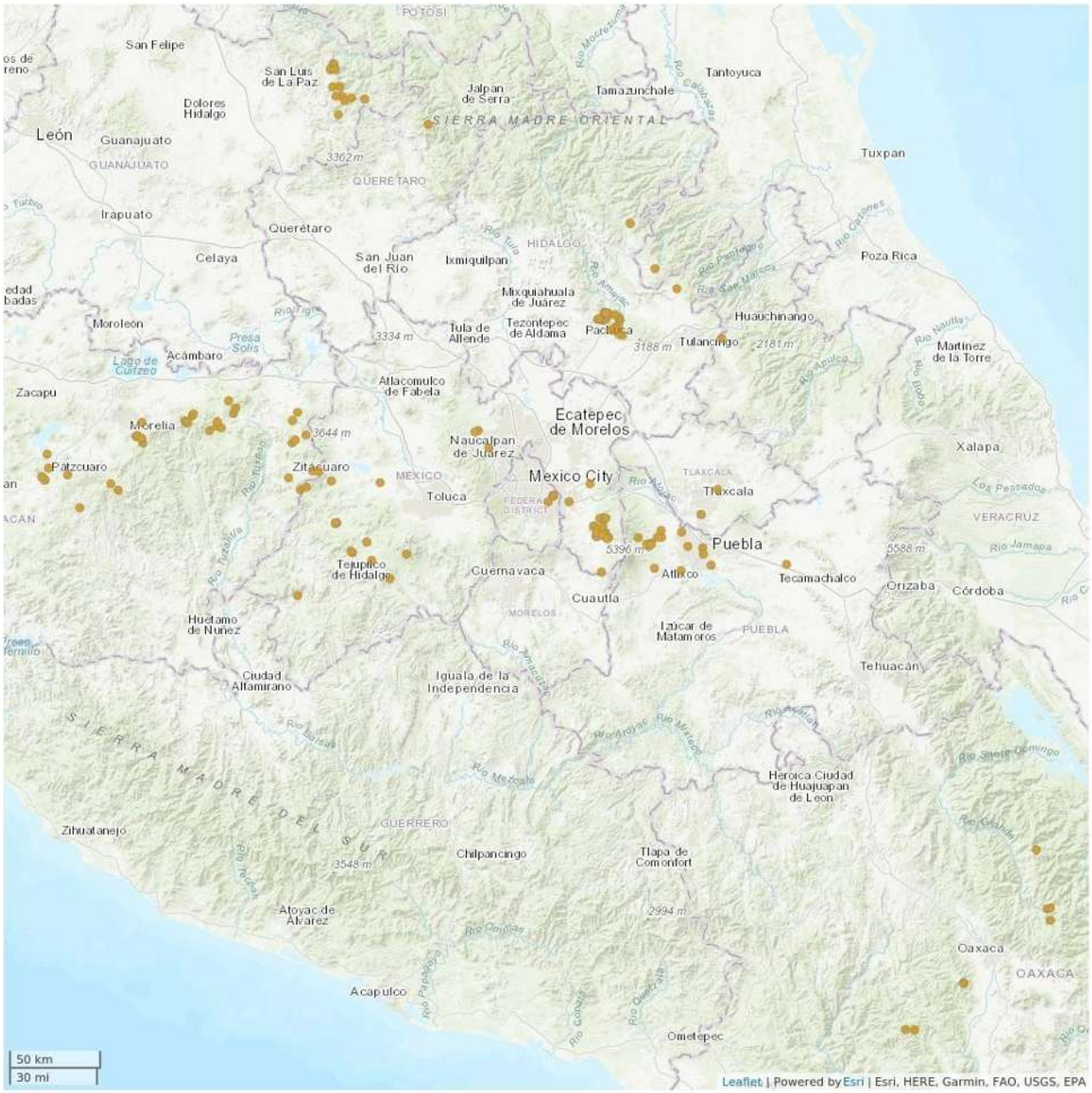
Range Description:

Cestrum roseum is an endemic shrub or small tree from Mexico, it is distributed in the states of Michoacán, Mexico State, Guanajuato, Querétaro, Mexico City, Hidalgo, Tlaxcala, Puebla and Oaxaca (Ramírez-Segura 2013, Villaseñor 2016, Martínez *et al*. 2017), especially in the Transmexican Volcanic Belt (Ramírez-Segura 2013).It has also been reported for the states of San Luis Potosí, Tamaulipas and Yucatán (Villaseñor 2016, Martínez *et al.* 2017). However, it is likely that they are erroneous identifications. The extent of occurrence (EOO) is 133,580.164 km^2. The area of occupancy (AOO) of the taxon is 492 km^2, but it is likely that the AOO of the species is a little higher than estimated, if the collection efforts were increased. The taxon has nine locations and the main threats that the distribution area presents are agriculture, human settlements and deforestation.

Country Occurrence:

Native, Extant (resident): Mexico (Guanajuato, Hidalgo, Michoacán, México Distrito Federal, México State, Puebla, Querétaro, Tlaxcala, Veracruz)

Distribution Map



Legend

EXTANT (RESIDENT)

Compiled by:

IUCN SSC Global Tree Specialist Group 2019

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

There is no information available about the population of *Cestrum roseum.*
Current Population Trend: Unknown

Habitat and Ecology (see Appendix for additional information)

Cestrum roseum is a shrub or small tree of 1–5 m tall. It grows at an altitude range of 1,250–3,500 m. It occurs in mountain cloud forest, pine-oak forest, pine forest, aok forest and *Abies* forest associated with *Alnus, Buddleja, Garrya* and *Senecio* (Rzedowski *et al.* 2005, Montero-Castro 2019). It develops on regosol and cambisol soils (Montero-Castro 2019). Ramírez-Segura (2013) mentions that *Cestrum roseum* flowers during the months of October to April, with peak flowering in the month of February. According to this autor, *Cestrum roseum* has a diurnal anthesis with a flower duration of four days. The dehiscence of the anthers and the receptivity of the stigma occur when the flower is opened. Fruit production begins at the end of April. Due to the morphology of *Cestrum roseum,* it is proposed that it is pollinated by diurnal butterflies and hummingbird.

Systems: Terrestrial

Use and Trade (see Appendix for additional information)

There is no information available about the use and trade of *Cestrum roseum.*

Threats (see Appendix for additional information)

Cestrum roseum grows in the mountain cloud forest. In Mexico, these forests occupy less than 1% of the national territory, which is why it is considered the most threatened terrestrial ecosystem (CONABIO 2010, González-Espinosa *et al.* 2012). Another type of vegetation where *Cestrum roseum* grows is the temperate forest, this ecosystem has been strongly affected due to deforestation, agriculture, forest fires, livestock and climate change (CONABIO 2019). In the period from 1970 to 1990, Mexico lost 14% of the coniferous forests, while the hardwood forests suffered a reduction of 9.3% (Sánchez *et al.* 2003). In 2017, 726,361.21 hectares were affected by forest fires in the country, being Michoacán, State of Mexico, Mexico City, Puebla, Tlaxcala and Hidalgo the states with the highest number of fires (CONAFOR 2017). In the state of Michoacán, farmers plant young avocado trees under the canopy of the forest, and then gradually remove the forest to allow the avocado trees to flourish with better sunlight, these agricultural practices supplanting forests cause an approximate loss of 20,000 hectares of forest each year which will intended for agricultural use (Hansen 2018).

Conservation Actions (see Appendix for additional information)

According to distribution points (Montero-Castro 2019), *Cestrum roseum* is found within some natural protected areas: Reserva de la Biosfera Sierra Gorda (Guanajuato-Querétaro), Parque Nacional El Chico (Hidalgo), Reserva de la Biosfera Mariposa Monarca (Michoacán-México), Área de Protección de Recursos Naturales Z.P.F.T.C.C. de los ríos Valle de Bravo (México) and Área de Protección de Flora y Fauna Nevado de Toluca (México). The number of *ex situ* sites worldwide is six (BGCI 2019).

Credits

Assessor(s): Valentín-Martínez, D. & Montero Castro, J.

Reviewer(s): Samain, M.-S. & Oldfield, S.

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Citation

Valentín-Martínez, D. & Montero Castro, J. 2020. *Cestrum roseum*. *The IUCN Red List of Threatened Species* 2020: e.T126624932A126625190. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T126624932A126625190.en

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Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.4. Forest - Temperate	Resident	Suitable	-
1. Forest -> 1.9. Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Plant Growth Forms

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Plant Growth Form
TS. Tree - small
SL. Shrub - large
SS. Shrub - small

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming	Ongoing	Majority (50-90%)	Very rapid declines	High impact: 8
2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.3. Agro-industry grazing, ranching or farming	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very rapid declines	High impact: 8
7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.1. Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place land/water protection
Conservation sites identified: Yes, over part of range
Percentage of population protected by PAs: 21-30
Occurs in at least one protected area: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed
6. Livelihood, economic & other incentives -> 6.1. Linked enterprises & livelihood alternatives
6. Livelihood, economic & other incentives -> 6.4. Conservation payments

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km²): 492
Estimated extent of occurrence (EOO) (km²): 133580.164
Lower elevation limit (m): 1,250
Upper elevation limit (m): 3,500

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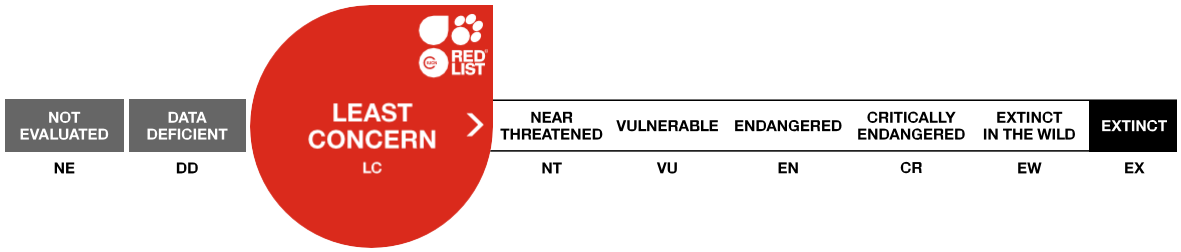
Scope(s): Global
Language: English

Evaluación No. 21

Witheringia meiantha

Assessment by: Valentín-Martínez, D. & Montero Castro, J.



View on www.iucnredlist.org

Citation: Valentín-Martínez, D. & Montero Castro, J. 2020. *Witheringia meiantha*. *The IUCN Red List of Threatened Species* 2020: e.T136621507A136621513. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T136621507A136621513.en

Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Solanales	Solanaceae

Scientific Name: *Witheringia meiantha* (Donn.Sm.) Hunz.

Synonym(s):

- *Brachistus meianthus* Donn.Sm.
- *Capsicum silvigaudens* Standl. & L.O. Williams
- *Capsicum stenophyllum* C. V. Morton & Standl.
- *Capsicum meianthum* (Donn.Sm.) Standl. & Steyerm.
- *Witheringia solanacea* var. *silvigaudens* (Standl. & L.O. Williams) Hunz.

Taxonomic Source(s):

Board of Trustees, RBG Kew. 2018. Plants of the World Online Portal. Richmond, UK Available at: http://www.plantsoftheworldonline.org.

Taxonomic Notes:

Witheringia meiantha (Donn. Sm.) Hunz. is an accepted name for this species. *Witheringia meiantha* is a species very similar to *Witheringia solanacea*, however they present some characteristics that differentiate them (Nee 1986).

Assessment Information

Red List Category & Criteria: Least Concern ver 3.1

Year Published: 2020

Date Assessed: June 28, 2019

Justification:

Witheringia meiantha is a herb or shrub distributed in Mexico, Guatemala, Honduras, Nicaragua, Costa Rica and Panama. The taxon has an extent of occurrence (EOO) of 638,999.571 km^2 and an area of occupancy (AOO) of 536 km^2. However, the threats are not thought to cause a threat to survival, therefore, *Witheringia meiantha* is assessed as Least Concern. Currently this species is not experiencing any serious impact, and no significant future threats to the taxon have been identified.

Geographic Range

Range Description:

Witheringia meiantha is a herb or shrub distributed in Mexico, Guatemala, Honduras, Nicaragua, Costa Rica and Panama. In Mexico this species is distributed in the states of Veracruz, Oaxaca, Chiapas and Tabasco (Nee 1986, Rodríguez 2004, Villaseñor 2016, Martínez *et al.* 2017, Montero-Castro 2019). In Guatemala, it has been reported in the departments of Alta Verapaz, Baja Verapaz, Quezaltenango, Izabal, Huehuetenango and Chimaltenango (Gentry & Standley 1974, GBIF 2019). In Honduras it has been collected in the departaments

of Ocotepeque, Cortés, Santa Bárbara, Comayagua, Francisco Morazán and Olancho (GBIF 2019). In Nicaragua it is distributed in the departments of Nueva Segovia, Estelí, Jinotega, Matagalpa, Boaco, Chontales, Granada, Rivas, Río San Juan, North Atlantic Autonomous Region and in the South Atlantic Autonomous Region (GBIF 2019, Tropicos 2019). In Costa Rica it is found in the provinces of Guanacaste, Alajuela, Puntarenas, Heredia, San José, Cartago and Limón (GBIF 2019). While in Panama it has been reported in the provinces of Chiriqui, Bocas del Toro, Veraguas, Panama and Darien (GBIF 2019). The taxon has an extent of occurrence of 638,999.571 km^2 and an area of occupancy of 536 km^2.

Country Occurrence:

Native, Extant (resident): Costa Rica; Guatemala; Honduras; Mexico (Chiapas, Oaxaca, Tabasco, Veracruz); Nicaragua; Panama

Distribution Map

Legend

EXTANT (RESIDENT)

Compiled by:

IUCN SSC Global Tree Specialist Group 2019

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

There is no information available about the population size of *Witheringia meiantha*.
Current Population Trend: Unknown

Habitat and Ecology (see Appendix for additional information)

Witheringia meiantha is a herb or shrub of 1–5 m tall. It grows at an altitude range of 200–2,000 m. It occurs in mountain cloud forest, rainforests and tropical subdeciduous forests associated with *Brosimum*, *Nectandra*, *Turpinia*, *Calatola*, *Quercus* and *Piper* (Gentry and Standley 1974, Nee 1986). It grows on hillsides on black and reddish soils, both clayey and stony. The specimens collected in Mexico have been reported in flower during the months of March to July (Nee 1986), while in Nicaragua they flower during the months of August to December and fruiting throughout the year (Tropicos 2019).

Systems: Terrestrial

Use and Trade (see Appendix for additional information)

There is no information available about the use and trade of *Witheringia meiantha*.

Threats (see Appendix for additional information)

Although there are different threats within the range of this species, such as deforestation and land use change, they do not represent strong threats as they are favored by the disturbance.

Conservation Actions (see Appendix for additional information)

According to the distribution points, *Witheringia meiantha* occurs within the following natural protected areas: Reserva de la Biósfera Los Tuxtlas (Veracruz), Biotopo del Quetzal (Guatemala), Reserva Protectora de Manantiales Cerro San Gil (Guatemala), Reserva de Vida Silvestre Erapuca (Honduras), Parque Nacional Cerro Azul Meámbar (Honduras), Reserva Natural Bosawás (Nicaragua), Reserva Natural Cerro Kilambé (Nicaragua), Reserva Natural Miraflor (Nicaragua), Reserva Natural Volcán Yalí (Nicaragua), Reserva Nacional Volcán Mombacho (Nicaragua), Reserva Biológica Indio Maíz (Nicaragua), Parque Nacional Guanacaste (Costa Rica), Parque Nacional Volcán Tenorio (Costa Rica), Parque Nacional Tapantí-Macizo de la Muerte (Costa Rica), Parque Nacional Los Quetzales (Costa Rica), Parque Internacional La Amistad (Costa Rica), Reserva Forestal de Fortuna (Panama) and Parque Nacional del Darién (Panama). The number of *ex situ* sites worldwide is two (BGCI 2019).

Credits

Assessor(s): Valentín-Martínez, D. & Montero Castro, J.

Reviewer(s): Samain, M.-S. & Oldfield, S.

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Rzedowski, J. 2006. *Vegetación de México*. Comisión Nacional para el Conocimiento y Uso de la Biodiversidad.

Villaseñor, J.L. 2016. Checklist of the native vascular plants of Mexico. *Revista Mexicana de Biodiversidad* 87: 559–902.

Citation

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Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.4. Forest - Temperate	Resident	Suitable	-
1. Forest -> 1.5. Forest - Subtropical/Tropical Dry	Resident	Suitable	-
1. Forest -> 1.9. Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Plant Growth Forms

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Plant Growth Form
SL. Shrub - large
SS. Shrub - small
F. Forb or Herb

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
1. Residential & commercial development -> 1.3. Tourism & recreation areas	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming	Ongoing	Majority (50-90%)	Very rapid declines	High impact: 8
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		

2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.3. Agro-industry grazing, ranching or farming	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very rapid declines	High impact: 8
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.1. Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Slow, significant declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place land/water protection
Conservation sites identified: Yes, over part of range
Percentage of population protected by PAs: 21-30
Occurs in at least one protected area: Yes
In-place species management
Subject to ex-situ conservation: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed
6. Livelihood, economic & other incentives -> 6.1. Linked enterprises & livelihood alternatives
6. Livelihood, economic & other incentives -> 6.4. Conservation payments

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km²): 536
Estimated extent of occurrence (EOO) (km²): 638999.571
Lower elevation limit (m): 200
Upper elevation limit (m): 2,000

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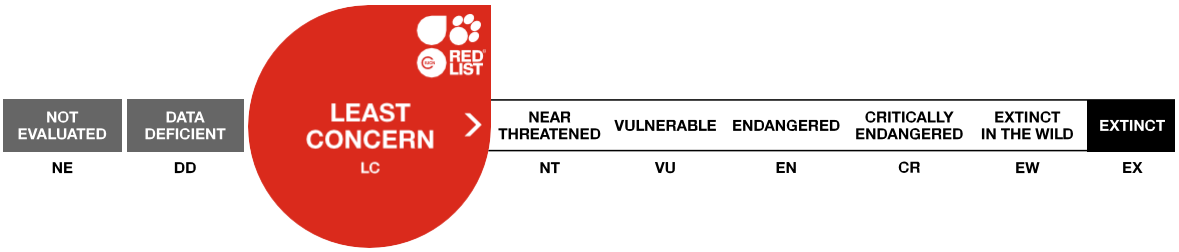
Scope(s): Global
Language: English

Evaluación No. 22

Witheringia Mexicana

Assessment by: Valentín-Martínez, D. & Montero Castro, J.



View on www.iucnredlist.org

Citation: Valentín-Martínez, D. & Montero Castro, J. 2020. *Witheringia mexicana*. *The IUCN Red List of Threatened Species* 2020: e.T126692936A126695042. https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T126692936A126695042.en

Taxonomy

Kingdom	Phylum	Class	Order	Family
Plantae	Tracheophyta	Magnoliopsida	Solanales	Solanaceae

Scientific Name: *Witheringia mexicana* (B. L. Rob.) Hunz.

Synonym(s):

- *Bassovia mexicana* B. L. Rob.

Taxonomic Source(s):

Board of Trustees, RBG Kew. 2020. Plants of the World Online Portal. Richmond, UK Available at: http://www.plantsoftheworldonline.org.

Assessment Information

Red List Category & Criteria: Least Concern ver 3.1

Year Published: 2020

Date Assessed: June 27, 2019

Justification:

Witheringia mexicana is a herb or shrub distributed in Mexico. This species occurs in the states of Nuevo León, Tamaulipas, San Luis Potosí, Querétaro, Hidalgo, Puebla, Veracruz, Guerrero, Oaxaca and Chiapas, mainly in the area that encompasses the Sierra Madre Oriental. The taxon has an extent of occurrence (EOO) of 400,074.728 km^2 and an area of occupancy (AOO) of 272 km^2. It is estimated to occur in twenty locations. The main threats for the taxon range are deforestation, agriculture, cattle raising, forest fires and human settlements. *Witheringia mexicana* is assessed as Least Concern (LC).

Geographic Range

Range Description:

Witheringia mexicana is an herb or shrub distributed in Mexico. This species occurs in the states of Nuevo León, Tamaulipas, San Luis Potosí, Querétaro, Hidalgo, Puebla, Veracruz, Guerrero, Oaxaca and Chiapas (Standley 1924, CONABIO 2004, Villaseñor 2016, Martínez *et al.* 2017), mainly in the area that encompasses the Sierra Madre Oriental. The taxon has an extent of occurrence of 400,074.728 km^2 and an area of occupancy of 272 km^2. It is estimated to occur in twenty locations. The main threats for the taxon range are deforestation, agriculture, cattle raising, forest fires and human settlements.

Country Occurrence:

Native, Extant (resident): Mexico (Chiapas, Guerrero, Hidalgo, Nuevo León, Oaxaca, Puebla, Querétaro, San Luis Potosí, Tamaulipas, Veracruz)

Distribution Map

Legend

EXTANT (RESIDENT)

Compiled by:

IUCN SSC Global Tree Specialist Group 2019

The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

There is no information available about the population of *Witheringia mexicana*.
Current Population Trend: Unknown

Habitat and Ecology (see Appendix for additional information)

Witheringia mexicana is a herb or shrub of 1-4.5 m tall (Standley 1924). It grows at an altitude range of 700–2,300 m. It occurs in mountain cloud forest and pine-oak forest associated with *Liquidambar*, *Quercus*, *Pinus, Dodonaea viscosa*, *Rhus virens*, *Acacia coulteri Ostrya* and *Juglans.* It grows on the slopes of the hills, on limestone soils.

Systems: Terrestrial

Use and Trade (see Appendix for additional information)

There is no information available about the use and trade of *Witheringia mexicana*.

Threats (see Appendix for additional information)

Witheringia mexicana has been recorded many times. Additionally, there are still areas of well conserved habitat. Despite change in land use is occurring across its range, it is not considered to currently be significantly impacted by the habitat loss.

Conservation Actions (see Appendix for additional information)

According to the collection records, *Witheringia mexicana* is found within some protected natural areas: Parque Nacional Cumbres de Monterrey (Nuevo León), Monumento Natural Cerro de la Silla (Nuevo León), Reserva de la Biósfera El Cielo (Tamaulipas) and Reserva de la Biósfera Sierra Gorda (Querétaro). The number of *ex situ* sites worldwide is one (BGCI 2019).

Credits

Assessor(s): Valentín-Martínez, D. & Montero Castro, J.

Reviewer(s): Samain, M.-S. & Oldfield, S.

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Citation

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Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.4. Forest - Temperate	Resident	Suitable	-
1. Forest -> 1.9. Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Plant Growth Forms

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Plant Growth Form
SL. Shrub - large
SS. Shrub - small
F. Forb or Herb

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming	Ongoing	Majority (50-90%)	Very rapid declines	High impact: 8
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.3. Agro-industry grazing, ranching or farming	Ongoing	Majority (50-90%)	Very rapid declines	High impact: 8
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
5. Biological resource use -> 5.3. Logging & wood harvesting -> 5.3.4. Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very rapid declines	High impact: 8

	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		

		2. Species Stresses -> 2.2. Species disturbance		
7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.1. Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place
In-place land/water protection
Conservation sites identified: Yes, over part of range
Percentage of population protected by PAs: 21-30
Occurs in at least one protected area: Yes
In-place species management
Subject to ex-situ conservation: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action Needed
6. Livelihood, economic & other incentives -> 6.1. Linked enterprises & livelihood alternatives
6. Livelihood, economic & other incentives -> 6.4. Conservation payments

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
3. Monitoring -> 3.4. Habitat trends

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km²): 272
Estimated extent of occurrence (EOO) (km²): 400074.728
Number of Locations: 20
Lower elevation limit (m): 700

Distribution
Upper elevation limit (m): 2,300
Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Yes

Evaluación No. 23

Lycianthes ceratocalycia - (Donn.Sm.) Bitter

PLANTAE - TRACHEOPHYTA - MAGNOLIOPSIDA - SOLANALES - SOLANACEAE - *Lycianthes ceratocalycia*

Common Names: No Common Names
Synonyms: *Brachistus ceratocalycius* Donn.Sm.

Taxonomic Note:
According to Tropicos (2019) and The Plant List (2019), *Lycianthes ceratocalycia* (Donn. Sm.) Bitter is an accepted name for this species. *Lycianthes ceratocalycia* is an herb or shrub with purple, stellate corollas. One of its most distinctive characters is a rough, scurfy texture on the young branches formed by horizontal indentations. It was under collected until quite recently and mainly known from the type specimens (Dean & Reyes 2018).

Red List Status
EN - Endangered, B2ab(iii) (IUCN version 3.1)

Red List Assessment

Assessment Information

Regions: Global

Assessment Rationale

Lycianthes ceratocalycia is an endemic shrub from Mexico and Guatemala. In Mexico, this species is distributed in the states of Chiapas and Oaxaca, while in Guatemala it has been reported for the departments of Alta Verapaz and Huehuetenango. The taxon has an extent of occurrence (EOO) of 36,754.584 km² and an area of occupancy (AOO) of 44 km². It is calculated to occur in four locations. The main threats for the taxon range are deforestation, agriculture, forest fires, cattle raising and human settlements. *Lycianthes ceratocalycia* is assessed as Endangered (EN).

Distribution

Geographic Range

Lycianthes ceratocalycia is an endemic shrub from Mexico and Guatemala (Dean & Reyes 2018). In Mexico, this species is distributed in the states of Chiapas and Oaxaca, while in Guatemala it has been reported for the departments of Alta Verapaz and Huehuetenango (Gentry & Standley 1974, Rodríguez 2004, Villaseñor 2016, Martínez *et al.* 2017). The taxon has an extent of occurrence (EOO) of 36,754.584 km² and an area of occupancy (AOO) of 44 km². However, it is likely that the AOO is higher than calculated. It is calculated to occur in four locations. The main threats for the taxon range are deforestation, agriculture, forest fires, cattle raising and human settlements.

Area of Occupancy (AOO)

Estimated area of occupancy (AOO) - in km2	Justification
44	AOO calculated with GeoCAT using Montero-Castro data

(2019).

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO)- in km2	EOO estimate calculated from Minimum Convex Polygon	Justification
36754.584	true	EOO calculated with GeoCAT using Montero-Castro data (2019).

Locations Information

Number of Locations	Justification
4	The main threats for the taxon range are deforestation, agriculture, forest fires, cattle raising and human settlements.

Very restricted AOO or number of locations (triggers VU D2)

Very restricted in area of occupancy (AOO) and/or # of locations	Justification
Yes	This species is calculated to occur in four locations.

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 1300

Elevation Upper Limit (in metres above sea level): 2200

Map Status

Map Status	Use map from previous assessment	How the map was created, including data sources/methods used:	Please state reason for map not available:	Data Sensitive?	Justification	Geographic range this applies to:	Date restriction imposed:
Done	-	Prepared with GeoCAT using Montero-Castro data (2019).	-	-	-	-	-

Biogeographic Realms

Biogeographic Realm: Neotropical

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality

Guatemala	Extant	Native	-	Resident
Mexico -> Chiapas	Extant	Native	-	Resident
Mexico -> Oaxaca	Extant	Native	-	Resident

Population

There is no information available about the population of *Lycianthes ceratocalycia*.

Habitats and Ecology

Lycianthes ceratocalycia is an herb or shrub to 2 m tall. It grow at an altitude range of 1300-2200 m. It lives in pine forest and mountain cloud forest (Gentry & Standley 1974, Montero-Castro data 2019).

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
1.4. Forest -> Forest - Temperate	Resident	Suitable	-
1.9. Forest -> Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Continuing Decline in Habitat

Continuing decline in area, extent and/or quality of habitat?	Qualifier	Justification
Yes	Projected	According to an analysis of niche models performed for this species, it is projected that during the next 30 years the available area with the necessary conditions for the development of this species will suffer a fairly significant reduction of approximately 36 percent.

Systems

System: Terrestrial

Plant Specific

Plant Growth Forms
Forb or Herb
Shrub - small

Use and Trade

General Use and Trade Information

There is no information available about the use and trade of *Lycianthes ceratocalycia*.

Threats

It has been estimated that Mexico has lost more than 50% of its original coverage. The rate of deforestation reported for 1993-2002 was 523,639 hectares per year (FMCN 2009). *Lycianthes ceratocalycia* occurs in the mountain cloud forest. In Mexico, these forests occupy less than 1% of the national territory, which is why it is considered the most threatened terrestrial ecosystem (CONABIO 2010, González-Espinosa *et al.* 2012).

Particularly in the state of Chiapas, the strongest threats are deforestation, human settlements, livestock and agriculture, where shade coffee crops are very frequent (Navarrete *et al.* 2010). In addition, some research reveals that in the state of Chiapas native forests suffered a 50% reduction in the period from 1975 to 2000 (Cayuela *et al.* 2006). Another type of vegetation where *Lycianthes ceratocalycia* develops is the pine forest, this ecosystem has been strongly affected due to deforestation, agriculture, forest fires, livestock and climate change (CONABIO 2019). In the period from 1970 to 1990, Mexico lost 14% of the coniferous forests, while the hardwood forests suffered a reduction of 9.3% (Sánchez *et al.* 2003). In 2017, 726,361.21 hectares were affected by forest fires, being Chiapas and Oaxaca some of the states with the highest number of fires (CONAFOR 2017). At the national level, the state of Chiapas is among the main livestock producers (SIAP 2017).

Threats Classification Scheme

Threat	Timing	Scope	Severity	Impact Score
1.1. Residential & commercial development -> Housing & urban areas	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
2.1.3. Agriculture & aquaculture -> Annual & perennial non-timber crops -> Agro-industry farming	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
2.3.3. Agriculture & aquaculture -> Livestock farming & ranching -> Agro-industry grazing, ranching or farming	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7
5.3.1. Biological resource use -> Logging & wood harvesting -> Intentional use: (subsistence/small scale) [harvest]	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
5.3.4. Biological resource use -> Logging & wood harvesting -> Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
7.1.1. Natural system modifications -> Fire & fire suppression -> Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7

Conservation

According to the collection records, *Lycianthes ceratocalycia* is only found within the protected natural area Parque Nacional Lagunas de Montebello (Chiapas). There are not current *ex situ* sites worldwide (BGCI 2019).

Conservation Actions In- Place

Conservation sites identified	Note
Yes, over part of range	-

Occur in at least one PA	Note
Yes	*Lycianthes ceratocalycia* is found within the protected natural area Parque Nacional Lagunas de Montebello (Chiapas).

Percentage of population protected by PAs (0-100)	Note
1-10	Due to the little distribution that this species presents, the presence in the protected natural areas is very little.

Subject to ex-situ conservation	Note
No	There are not current ex situ sites worldwide.

Important Conservation Actions Needed

Conservation Actions	Note
6.1. Livelihood, economic & other incentives -> Linked enterprises & livelihood alternatives	-
6.4. Livelihood, economic & other incentives -> Conservation payments	-

Research Needed

Research	Note
3.4. Monitoring -> Habitat trends	-

Evaluación No. 24

Solanum axillifolium - K.E.Roe

PLANTAE - TRACHEOPHYTA - MAGNOLIOPSIDA - SOLANALES - SOLANACEAE - *Solanum axillifolium*

Common Names: No Common Names
Synonyms: No Synonyms

Taxonomic Note:
According to Tropicos (2019), *Solanum axillifolium* K. E. Roe is an accepted name for this species. Morphologically, *Solanum axillifolium* is very similar to *Solanum atitlanum*, however, it is distinguished by the more conspicuous axillary leaves on mature plants, the larger, white corollas, longer anthers and greenish-yellow tomentum on young stems (Roe 1967).

Red List Status
EN - Endangered, B2ab(iii) (IUCN version 3.1)

Red List Assessment

Assessment Information

Date of Assessment: 2020-02-13

Assessor(s): Valentín-Martínez, D. & Rodríguez Contreras, A.

Reviewer(s): Samain, M.-S. & Oldfield, S.

Regions: Global

Assessment Rationale

Solanum axillifolium is an endemic shrub or tree from Mexico. The taxon has an extent of occurrence of 34,395.035 km² and an area of occupancy of 36 km². It is calculated to occur in three locations. The main threats for the taxon range are deforestation, agriculture, forest fires, cattle raising and human settlements. *Solanum axillifolium* is assessed at Endangered (EN).

Distribution

Geographic Range

Solanum axillifolium is an endemic shrub or small tree from Mexico. Its geographical distribution goes mainly along the southern slope of the Sierra Madre del Sur and the Pacific coastal plain in Guerrero, Oaxaca and Chiapas (Roe 1967, Rodríguez 2004, Martínez *et al.* 2017). The taxon has an extent of occurrence of 34,395.035 km² and an area of occupancy of 36 km². It is calculated to occur in three locations. The main threats for the taxon range are deforestation, agriculture, forest fires, cattle raising and human settlements.

Area of Occupancy (AOO)

Estimated area of occupancy (AOO) - in km2	Justification

36	AOO calculated with GeoCAT using Montero-Castro data (2019).

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO)- in km2	EOO estimate calculated from Minimum Convex Polygon	Justification
34395.035	true	EOO calculated with GeoCAT using Montero-Castro data (2019).

Locations Information

Number of Locations	Justification
3	The main threats for the taxon range are deforestation, agriculture, forest fires, cattle raising and human settlements.

Very restricted AOO or number of locations (triggers VU D2)

Very restricted in area of occupancy (AOO) and/or # of locations	Justification
Yes	It is estimated that this species occurs in three locations.

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 0

Elevation Upper Limit (in metres above sea level): 800

Map Status

Map Status	Use map from previous assessment	How the map was created, including data sources/methods used:	Please state reason for map not available:	Data Sensitive?	Justification	Geographic range this applies to:	Date restriction imposed:
Done	-	Prepared with GeoCAT using Montero-Castro data (2019).	-	-	-	-	-

Biogeographic Realms

Biogeographic Realm: Neotropical

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Mexico -> Chiapas	Extant	Native	-	Resident
Mexico -> Guerrero	Extant	Native	-	Resident
Mexico -> Oaxaca	Extant	Native	-	Resident

Population

There is no information about the population dynamics of *Solanum axillifolium*.

Population Information

Current Population Trend: Unknown

Habitats and Ecology

Solanum axillifolium is a shrub or small tree of 1-5 m tall and stems up to 9 cm in diameter. It grows at an altitude range of 0-800 m. It occurs in tropical dry forest on limestone soils (Roe 1967, Montero-Castro data 2019).

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
1.5. Forest -> Forest - Subtropical/Tropical Dry	Resident	Suitable	-

Continuing Decline in Habitat

Continuing decline in area, extent and/or quality of habitat?	Qualifier	Justification
Yes	Projected	According to a niche modeling analysis, it is projected that during the next 30 years the available area with the necessary conditions for the development of this species will reduce in approximately 13 percent.

Systems

System: Terrestrial

Plant Specific

Plant Growth Forms
Shrub - large
Shrub - small
Tree - small

Use and Trade

General Use and Trade Information

There is no information about the use and trade of *Solanum axillifolium*.

Threats

Solanum axillifolium develops in the tropical decidous forest. The permanence of this type of vegetation is strongly threatened due to agricultural and livestock expansion, in addition to the establishment of large-scale cash crops. It is important to mention that due to its characteristics the deciduous tropical forest is less attractive compared to other types of vegetation, so there are fewer opportunities for its conservation (Meave *et al.* 2012).

Threats Classification Scheme

Threat	Timing	Scope	Severity	Impact Score
1.1. Residential & commercial development -> Housing & urban areas	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
2.1.3. Agriculture & aquaculture -> Annual & perennial non-timber crops -> Agro-industry farming	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
2.3.3. Agriculture & aquaculture -> Livestock farming & ranching -> Agro-industry grazing, ranching or farming	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7
5.3.4. Biological resource use -> Logging & wood harvesting -> Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
7.1.1. Natural system modifications -> Fire & fire suppression -> Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7

Conservation

According to the records of the collection, *Solanum axillifolium* grows in the protected natural area Parque Nacional Cañón del Sumidero in Chiapas. There are no current *ex situ* sites worldwide (BGCI 2019).

Conservation Actions In- Place

Conservation sites identified	Note
Yes, over part of range	-

Occur in at least one PA	Note
Yes	*Solanum axillifolium* is found within the protected natural area: Parque Nacional Cañón del Sumidero.

Percentage of population protected by PAs (0-100)	Note
1-10	*Solanum axillifolium* has been reported in one protected natural area.

Subject to ex-situ conservation	Note
No	There are not current ex situ sites worldwide.

Subject to recent education and awareness programmes	Note
Unknown	-

Included in international legislation	Note
Unknown	-

Important Conservation Actions Needed

Conservation Actions	Note
6.1. Livelihood, economic & other incentives -> Linked enterprises & livelihood alternatives	-
6.4. Livelihood, economic & other incentives -> Conservation payments	-

Research Needed

Research	Note
3.4. Monitoring -> Habitat trends	-

Evaluación No. 25

Solanum plumense - Fernald

PLANTAE - TRACHEOPHYTA - MAGNOLIOPSIDA - SOLANALES - SOLANACEAE - *Solanum plumense*

Common Names: Bichate (Spanish; Castilian)
Synonyms: No Synonyms

Taxonomic Note:
According to Tropicos (2019), *Solanum plumense* Fernald is an accepted name for this species.

Red List Status
EN - Endangered, B2ab(ii) (IUCN version 3.1)

Red List Assessment

Assessment Information

Date of Assessment: 2020-02-14

Assessor(s): Valentín-Martínez, D. & Rodríguez Contreras, A.

Reviewer(s): Samain, M.-S. & Oldfield, S.

Regions: Global

Assessment Rationale

Solanum plumense is a shrub or small tree endemic to Mexico. The extent of occurrence is 14,756.082 km². The area of occupancy of the taxon is 32 km², but it is likely that the AOO of the species is a little higher than estimated, if the collection efforts were increased. The taxon has four locations and the main threats that the distribution area presents are agriculture, deforestation, forest fires and livestock ranching. *Solanum plumense* is assessed as Endangered (EN).

Distribution

Geographic Range

Solanum plumense is a shrub or small tree endemic to Mexico. It is distributed in the states of Guerrero and Oaxaca in the Sierra Madre del Sur (Roe 1967, Rodríguez 2004, Villaseñor 2016, Martínez *et al.,* 2017). The extent of occurrence is 14,756.082 km². The area of occupancy of the taxon is 32 km², but it is likely that the AOO of the species is a little higher than estimated, if the collection efforts were increased. The taxon has four locations and the main threats that the distribution area presents are agriculture, deforestation, forest fires and livestock ranching.

Area of Occupancy (AOO)

Estimated area of occupancy (AOO) - in km2	Justification
32	AOO calculated with GeoCAT using Montero-Castro data

(2019).		
Continuing decline in area of occupancy (AOO)	**Qualifier**	**Justification**
Yes	Observed	Due to the threats present in the range of this species, the quality of available habitat has been decreasing.

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO)- in km2	EOO estimate calculated from Minimum Convex Polygon	Justification
14756.082	true	EOO calculated with GeoCAT using Montero-Castro data (2019).

Locations Information

Number of Locations	Justification
4	The main threats that the distribution area presents are agriculture, deforestation, forest fires and livestock ranching.

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 700

Elevation Upper Limit (in metres above sea level): 1500

Map Status

Map Status	Use map from previous assessment	How the map was created, including data sources/methods used:	Please state reason for map not available:	Data Sensitive?	Justification	Geographic range this applies to:	Date restriction imposed:
Done	-	Prepared with GeoCAT using Montero-Castro data (2019).	-	-	-	-	-

Biogeographic Realms

Biogeographic Realm: Neotropical

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Mexico -> Guerrero	Extant	Native	-	Resident
Mexico -> Oaxaca	Extant	Native	-	Resident

Population

There is no information available about the population of *Solanum plumense*.

Population Information

Current Population Trend: Unknown

Habitats and Ecology

Solanum plumense is a shrub or small tree of 2-10 m tall. It grows at an altitude range of 700-1500 m (Roe 1967). It occurs in pine-oak forest, tropical deciduous forest and tropical subdeciduous forest (Rodríguez 2004). It grows on the slopes of hills and wet ravines, on black clay and sandy soils with the presence of igneous rocks (Montero-Castro data 2019).

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
1.4. Forest -> Forest - Temperate	Resident	Suitable	-
1.5. Forest -> Forest - Subtropical/Tropical Dry	Resident	Suitable	-

Systems

System: Terrestrial

Plant Specific

Plant Growth Forms
Shrub - large
Shrub - small
Tree - small

Use and Trade

General Use and Trade Information

There is no information available about the use and trade of *Solanum plumense*.

Threats

Solanum plumense develops is the pine-oak forest; this type of vegetation has been strongly affected due to deforestation, agriculture, forest fires, livestock and climate change (CONABIO 2019). In the period from 1970 to 1990, Mexico lost 14% of the coniferous forests, while the hardwood forests suffered a reduction of 9.3% (Sánchez *et al.* 2003). *Solanum plumense* also grows in the tropical deciduous forest. Particularly in the state of Oaxaca, this forest is strongly threatened due to agricultural and livestock expansion, in addition to the establishment of large-scale cash crops. It is important to mention that due to it is phenological characteristics, the deciduous tropical forest has a lower value compared to other types of vegetation, so there are fewer opportunities for its conservation (Meave *et al.* 2012). In 2017, 726,361.21 hectares were affected by forest fires, with Guerrero and Oaxaca being some of the states with the highest number of fires (CONAFOR 2017).

Threats Classification Scheme

Threat	Timing	Scope	Severity	Impact Score
2.1.3. Agriculture & aquaculture -> Annual & perennial non-timber crops -> Agro-industry farming	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
2.3.2. Agriculture & aquaculture -> Livestock farming & ranching -> Small-holder grazing, ranching or farming	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
5.3.1. Biological resource use -> Logging & wood harvesting -> Intentional use: (subsistence/small scale) [harvest]	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
5.3.4. Biological resource use -> Logging & wood harvesting -> Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
7.1.1. Natural system modifications -> Fire & fire suppression -> Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7

Conservation

According to the collection records, *Solanum plumense* does not occur within any protected natural area. There are no current *ex situ* sites worldwide (BGCI 2019).

Conservation Actions In- Place

Conservation sites identified	Note
No	-

Occur in at least one PA	Note
No	*Solanum plumense* is not within any protected natural area.

Subject to ex-situ conservation	Note
No	There are not current ex situ sites worldwide.

Subject to recent education and awareness programmes	Note
Unknown	-

Included in international legislation	Note
Unknown	-

Important Conservation Actions Needed

Conservation Actions	Note
1.1. Land/water protection -> Site/area protection	-
6.1. Livelihood, economic & other incentives -> Linked enterprises & livelihood alternatives	-
6.4. Livelihood, economic & other incentives -> Conservation payments	-

Research Needed

Research	Note

3.4. Monitoring -> Habitat trends -

Evaluación No. 26

Solanum pulverulentifolium - K.E.Roe

PLANTAE - TRACHEOPHYTA - MAGNOLIOPSIDA - SOLANALES - SOLANACEAE - *Solanum pulverulentifolium*

Common Names: No Common Names
Synonyms: No Synonyms

Taxonomic Note:
According to Tropicos (2019), *Solanum pulverulentifolium* K.E. Roe is an accepted name for this species. *Solanum pulverulentifolium* seems to be closely related to *Solanum chiapasense* with which it is sympatric. However, it is distinguished by the whitish, pulverulent leaves, minute calyx lobes, and strongly exserted corollas (Roe 1967).

Red List Status
EN - Endangered, B2ab(iii) (IUCN version 3.1)

Red List Assessment

Assessment Information

Date of Assessment: 2020-02-14

Assessor(s): Valentín-Martínez, D. & Rodríguez Contreras, A.

Reviewer(s): Samain, M.-S. & Oldfield, S.

Regions: Global

Assessment Rationale

Solanum pulverulentifolium is an endemic shrub or tree from Mexico. This species is only distributed in the state of Chiapas, mainly in the highlands. The taxon has an extent of occurrence of 17,339.854 km² and an area of occupancy of 64 km². It is calculated to occur in five locations. The main threats for the taxon range are deforestation, agriculture, forest fires, cattle raising and human settlements. *Solanum pulverulentifolium* is assessed at Endangered (EN).

Distribution

Geographic Range

Solanum pulverulentifolium is an endemic shrub or tree from Mexico. This species is only distributed in the state of Chiapas, mainly in the highlands (Roe 1967, Villaseñor 2016, Martínez *et al.* 2017). The taxon has an extent of occurrence of 17,339.854 km² and an area of occupancy of 64 km². It is calculated to occur in five locations. The main threats for the taxon range are deforestation, agriculture, forest fires, cattle raising and human settlements.

Area of Occupancy (AOO)

Estimated area of occupancy (AOO) - in km2	Justification

64	AOO calculated with GeoCAT using Montero-Castro data (2019).

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO)- in km2	EOO estimate calculated from Minimum Convex Polygon	Justification
17339.854	true	EOO calculated with GeoCAT using Montero-Castro data (2019).

Locations Information

Number of Locations	Justification
5	The main threats for the taxon range are deforestation, agriculture, forest fires, cattle raising and human settlements.

Very restricted AOO or number of locations (triggers VU D2)

Very restricted in area of occupancy (AOO) and/or # of locations	Justification
Yes	It is estimated that this species occurs in five locations.

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 1200

Elevation Upper Limit (in metres above sea level): 1700

Map Status

Map Status	Use map from previous assessment	How the map was created, including data sources/methods used:	Please state reason for map not available:	Data Sensitive?	Justification	Geographic range this applies to:	Date restriction imposed:
Done	-	Prepared with GeoCAT using Montero-Castro data (2019).	-	-	-	-	-

Biogeographic Realms

Biogeographic Realm: Neotropical

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Mexico -> Chiapas	Extant	Native	-	Resident

Population

There is no information available about the population of *Solanum pulverulentifolium*.

Population Information

Current Population Trend: Unknown

Habitats and Ecology

Solanum pulverulentifolium is a shrub or tree of 3-10 m tall and stems grow up to 16 cm in diameter. It grows at an altitude range of 1200-1700 m. It occurs in pine-oak forest associated with *Quercus*, *Pinus* and *Liquidambar* (Roe 1967, Montero-Castro 2019).

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
1.4. Forest -> Forest - Temperate	Resident	Suitable	-

Continuing Decline in Habitat

Continuing decline in area, extent and/or quality of habitat?	Qualifier	Justification
Yes	Projected	According to a niche modeling analysis made for this species, it is projected that during the next 30 years the available area with the necessary conditions for the development of this species will suffer a reduction of approximately 14 percent.

Systems

System: Terrestrial

Plant Specific

Plant Growth Forms
Shrub - large
Tree - small

Use and Trade

General Use and Trade Information

There is no information available about the use and trade of *Solanum pulverulentifolium*.

Threats

Solanum pulverulentifolium develops is the pine-oak forest; this ecosystem has been strongly affected due to deforestation, agriculture, forest fires, livestock and climate change (CONABIO 2019). In the period from 1970 to 1990, Mexico lost 14% of the coniferous forests (Sánchez *et al.* 2003). Particularly in the state of Chiapas, the strongest threats are deforestation, human settlements, livestock and agriculture, where shade coffee crops are very frequent (Navarrete *et al.* 2010). In addition, some research reveals that in the state of Chiapas native forests suffered a 50% reduction in the period from 1975 to 2000 (Cayuela *et al.* 2006). In 2017, 726,361.21 hectares were affected by forest fires, Chiapas being one of the states with the largest number of fires (CONAFOR 2017). At the national level, the state of Chiapas is among the main livestock producers (SIAP 2017).

Threats Classification Scheme

Threat	Timing	Scope	Severity	Impact Score
1.1. Residential & commercial development -> Housing & urban areas	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
2.1.3. Agriculture & aquaculture -> Annual & perennial non-timber crops -> Agro-industry farming	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
2.3.3. Agriculture & aquaculture -> Livestock farming & ranching -> Agro-industry grazing, ranching or farming	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7
5.3.4. Biological resource use -> Logging & wood harvesting -> Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
7.1.1. Natural system modifications -> Fire & fire suppression -> Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7

Conservation

According to the collection records, *Solanum pulverulentifolium* is found in the Parque Nacional Cañón del Sumidero (Chiapas) and Parque Nacional Lagunas de Montebello (Chiapas). There are no current *ex situ* sites worldwide (BGCI 2019).

Conservation Actions In- Place

Conservation sites identified	Note
Yes, over part of range	-

Occur in at least one PA	Note
Yes	*Solanum pulverulentifolium* is found within the following protected natural areas: Parque Nacional Cañón del Sumidero and Parque Nacional Lagunas de Montebello.

Percentage of population protected by PAs (0-100)	Note
21-30	Most of the records reported for *Solanum pulverulentifolium* are outside of protected natural areas.

Subject to ex-situ conservation	Note
No	There are no current ex situ sites worldwide.

Subject to recent education and awareness programmes	Note
Unknown	-

Included in international legislation	Note

Unknown	-

Important Conservation Actions Needed

Conservation Actions	Note
6.1. Livelihood, economic & other incentives -> Linked enterprises & livelihood alternatives	-
6.4. Livelihood, economic & other incentives -> Conservation payments	-

Research Needed

Research	Note
3.4. Monitoring -> Habitat trends	-

Evaluación No. 27

Lycianthes connata - J. L. Gentry

PLANTAE - TRACHEOPHYTA - MAGNOLIOPSIDA - SOLANALES - SOLANACEAE - *Lycianthes connata*

Common Names: No Common Names
Synonyms: No Synonyms

Taxonomic Note:
According to Tropicos (2019) and The Plant List (2019), *Lycianthes connata* J.L. Gentry is an accepted name for this species. This species is recognized by its geminated, papiraceous, slightly pubescent leaves. Fleshy calyx with 10 appendages that form a continuum that is reflected in the fruit. Uneven anthers with pores clearly visible at the apex, forming a loose cone (Reyes 2015).

Red List Status
VU - Vulnerable, B2ab(iii); D2 (IUCN version 3.1)

Red List Assessment

Assessment Information

Regions: Global

Assessment Rationale

Lycianthes connata is an endemic shrub from Mexico and Guatemala. In Mexico, this species is distributed in the states of Chiapas and Oaxaca, while in Guatemala it has been collected in the departments of Alta Verapaz and Huehuetenango. The taxon has an extent of occurrence of 81,667.637 km² and an area of occupancy of 108 km². However, it is likely that the AOO is higher than calculated, remaining below 500 km². It is calculated to occur in between three to five locations. The main threats for the taxon range are deforestation, agriculture, forest fires, human settlements and cattle raising. *Lycianthes connata* is assessed as Vulnerable (VU).

Distribution

Geographic Range

Lycianthes connata is an endemic shrub from Mexico and Guatemala (Gentry & Standley 1974, Reyes 2015). In Mexico, this species is distributed in the states of Chiapas and Oaxaca (Rodríguez 2004, Martínez *et al.* 2017), while in Guatemala it has been collected in the departments of Alta Verapaz and Huehuetenango (Gentry & Standley 1974). The taxon has an extent of occurrence of 81,667.637 km² and an area of occupancy of 108 km². However, it is likely that the AOO is higher than calculated, remaining below 500 km². It is calculated to occur in between three to five locations. The main threats for the taxon range are deforestation, agriculture, forest fires, human settlements and cattle raising.

Area of Occupancy (AOO)

Estimated area of occupancy (AOO) - in km2	Justification
108	AOO calculated with GeoCAT using Montero-Castro data (2019) and GBIF (2019).

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO)- in km2	EOO estimate calculated from Minimum Convex Polygon	Justification
81667.637	true	EOO calculated with GeoCAT using Montero-Castro data (2019).

Locations Information

Number of Locations	Justification
8	The main threats for the taxon range are deforestation, agriculture, forest fires, human settlements and cattle raising.

Very restricted AOO or number of locations (triggers VU D2)

Very restricted in area of occupancy (AOO) and/or # of locations	Justification
Yes	This species is calculated to occur in between three to five locations.

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 1800

Elevation Upper Limit (in metres above sea level): 3000

Biogeographic Realms

Biogeographic Realm: Neotropical

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Guatemala	Extant	Native	-	Resident
Mexico -> Chiapas	Extant	Native	-	Resident
Mexico -> Oaxaca	Extant	Native	-	Resident

Population

There is no information available about the population of *Lycianthes connata*.

Habitats and Ecology

Lycianthes connata is a shrub to 2-7 m tall. It grow at an altitude range of 1800-3000 m. It lives in pine-oak forest and mountain cloud forest associated with *Magnolia*, *Quercus*, *Podocarpus*, *Drimys, Persea Turpinia, Platanus, Styrax* and *Oreopanax* (Reyes 2015, Montero-Castro data 2019).

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
1.4. Forest -> Forest - Temperate	Resident	Suitable	-
1.9. Forest -> Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Continuing Decline in Habitat

Continuing decline in area, extent and/or quality of habitat?	Qualifier	Justification
Yes	Projected	According to an analysis of niche models performed for this species, it is projected that during the next 30 years the available area with the necessary conditions for the development of this species will suffer a non-significant reduction of approximately 15 percent.

Systems

System: Terrestrial

Plant Specific

Plant Growth Forms
Shrub - large
Shrub - small

Use and Trade

General Use and Trade Information

There is no information available about the use and trade of *Lycianthes connata*.

Threats

In Mexico, the different types of vegetation have been strongly affected due to the change in land use, mainly for agriculture and livestock, climate change and excessive extraction of flora and fauna, which affects the capacity of the ecosystem to maintain its functioning, in addition to the growth of urban areas, forest fires and logging called "ant", which is carried out to obtain firewood and charcoal (FMCN 2009, CONABIO 2019). It has been estimated that Mexico has lost more than 50% of its original coverage. The rate of deforestation reported for 1993-2002 was 523,639 hectares per year (FMCN 2009). *Lycianthes connata* occurs in the mountain cloud forest. In Mexico, these forests occupy less than 1% of the national territory, which is why it is considered the most threatened terrestrial ecosystem (CONABIO 2010, González-Espinosa *et al.* 2012). Particularly in the state of Chiapas, the strongest threats are deforestation, human settlements, livestock and agriculture, where shade coffee crops are very frequent (Navarrete *et al.* 2010). In addition, some research reveals that in the state of Chiapas native forests suffered a 50% reduction in the period from 1975 to 2000 (Cayuela *et al.* 2006). Another type of vegetation where *Lycianthes connata* develops is the pine-oak forest, this ecosystem has been strongly affected due to deforestation, agriculture, forest fires, livestock and climate change (CONABIO 2019). In the period from 1970 to 1990, Mexico lost 14% of the coniferous forests, while the hardwood forests suffered a reduction of 9.3% (Sánchez *et al.* 2003). In 2017, 726,361.21 hectares were affected by forest fires, being Chiapas and Oaxaca some of the states with the highest number of fires (CONAFOR 2017).

Threats Classification Scheme

Threat	Timing	Scope	Severity	Impact

				Score
1.1. Residential & commercial development -> Housing & urban areas	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
2.1.3. Agriculture & aquaculture -> Annual & perennial non-timber crops -> Agro-industry farming	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
2.3.2. Agriculture & aquaculture -> Livestock farming & ranching -> Small-holder grazing, ranching or farming	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
2.3.3. Agriculture & aquaculture -> Livestock farming & ranching -> Agro-industry grazing, ranching or farming	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7
5.3.1. Biological resource use -> Logging & wood harvesting -> Intentional use: (subsistence/small scale) [harvest]	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
5.3.4. Biological resource use -> Logging & wood harvesting -> Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
7.1.1. Natural system modifications -> Fire & fire suppression -> Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7

Conservation

According to the collection records, this species is found within the following protected natural areas: Reserva de la Biósfera El Triunfo (Chiapas) and Parque Regional Municipal Todos Santos Cuchamatán (Guatemala). The number of *ex situ* sites worldwide is one (BGCI 2019).

Conservation Actions In- Place

Conservation sites identified	Note
Yes, over part of range	-

Occur in at least one PA	Note
Yes	This species is found within the following protected natural areas: Reserva de la Biósfera El Triunfo (Chiapas) and Parque Regional Municipal Todos Santos Cuchamatán (Guatemala).

Percentage of population protected by PAs (0-100)	Note
1-10	Collection records of this species within protected natural areas are very scarce, so most of their distribution is outside them.

Subject to ex-situ conservation	Note
Yes	The number of ex situ sites worldwide is one.

Important Conservation Actions Needed

Conservation Actions	Note
6.1. Livelihood, economic & other incentives -> Linked enterprises & livelihood alternatives	-
6.4. Livelihood, economic & other incentives -> Conservation payments	-

Research Needed

Research	Note
3.4. Monitoring -> Habitat trends	-

Evaluación No. 28

Lycianthes hypoleuca - Standl.

PLANTAE - TRACHEOPHYTA - MAGNOLIOPSIDA - SOLANALES - SOLANACEAE - *Lycianthes hypoleuca*

Common Names: No Common Names
Synonyms: Solanum hypoleucum (Standl.) C.V. Morton

Taxonomic Note:
According to Tropicos (2019) and The Plant List (2019), *Lycianthes hypoleuca* Standl. is an accepted name for this species.

Red List Status
VU - Vulnerable, D2 (IUCN version 3.1)

Red List Assessment

Assessment Information

Date of Assessment: 2019-05-29

Regions: Global

Assessment Rationale

Lycianthes hypoleuca is an endemic shrub, scandent shrub or vine from Mexico, Guatemala, Belize and Honduras. In Mexico, this species is distributed in the southeastern states such as Chiapas, Campeche and Quintana Roo, in Guatemala it has been reported for the Petén department, in Belize, it is found in the districts of Cayo and Toledo, while in Honduras it has been reported for the department of Comayagua. The taxon has an extent of occurrence of 47,790.366 km² and an area of occupancy of 116 km². However, it is likely that the AOO is higher than calculated, remaining below 500 km². It is calculated to occur in between four to six locations. The main threats for the taxon range are deforestation, agriculture, forest fires, human settlements, cattle raising and tourism. *Lycianthes hypoleuca* is assessed as Vulnerable (VU).

Distribution

Geographic Range

Lycianthes hypoleuca is an endemic shrub, scandent shrub or vine from Mexico, Guatemala and Belize (Gentry & Standley 1974, Reyes 2015, GBIF 2019). In Mexico, this species is distributed in the southeastern states such as Chiapas, Campeche and Quintana Roo (Villaseñor 2016, Martínez et al. 2017, Montero-Castro data 2019), in Guatemala it has been reported for the Petén department (Gentry & Standley 1974, GBIF 2019) while in Belize, it is found in the districts of Cayo and Toledo (GBIF 2019). The taxon has an extent of occurrence of 47,790.366 km² and an area of occupancy of 116 km². However, it is likely that the AOO is higher than calculated, remaining below 500 km². It is calculated to occur in between four to six locations. The main threats for the taxon range are deforestation, agriculture, forest fires, human settlements, cattle raising and tourism.

Area of Occupancy (AOO)

Estimated area of occupancy (AOO) - in km2	Justification

116	AOO calculated with GeoCAT using Montero-Castro data (2019) and GBIF (2019).

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO)- in km2	EOO estimate calculated from Minimum Convex Polygon	Justification
47790.366	-	EOO calculated with GeoCAT using Montero-Castro data (2019) and GBIF (2019).

Locations Information

Number of Locations	Justification
12	The main threats for the taxon range are deforestation, agriculture, forest fires, human settlements, cattle raising and tourism.

Very restricted AOO or number of locations (triggers VU D2)

Very restricted in area of occupancy (AOO) and/or # of locations	Justification
No	It is calculated to occur in between four to six locations.

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 100

Elevation Upper Limit (in metres above sea level): 700

Map Status

Map Status	Use map from previous assessment	How the map was created, including data sources/methods used:	Please state reason for map not available:	Data Sensitive?	Justification	Geographic range this applies to:	Date restriction imposed:
Done	-	Prepared with GeoCAT using Montero-Castro data (2019) and GBIF (2019).	-	-	-	-	-

Biogeographic Realms

Biogeographic Realm: Neotropical

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Belize	Extant	Native	-	Resident
Guatemala	Extant	Native	-	Resident
Mexico -> Campeche	Extant	Native	-	Resident
Mexico -> Chiapas	Extant	Native	-	Resident
Mexico -> Quintana Roo	Extant	Native	-	Resident

Population

There is no information available about the population of *Lycianthes hypoleuca*.

Habitats and Ecology

Lycianthes hypoleuca is a shrub, scandent shrub or vine of 2 to 5 m. tall. It grow at an altitude range of 100-700 m. It lives in rainforests associated with *Alseis*, *Aspidosperma, Bursera, Lonchocarpus, Manilkara, Pithecellobium* and *Vitex* (Gentry & Standley 1974, Montero-Castro data 2019). It grows usually on limestone hillsides (Gentry & Standley 1974).

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
1.5. Forest -> Forest - Subtropical/Tropical Dry	Resident	Suitable	-
1.6. Forest -> Forest - Subtropical/Tropical Moist Lowland	Resident	Suitable	-

Continuing Decline in Habitat

Continuing decline in area, extent and/or quality of habitat?	Qualifier	Justification
Yes	Projected	According to an analysis of niche models performed for this species, it is projected that during the next 30 years the available area with the necessary conditions for the development of this species will suffer a fairly significant reduction of approximately 56 percent.

Systems

System: Terrestrial

Plant Specific

Plant Growth Forms
Shrub - large
Vines

Use and Trade

General Use and Trade Information

There is no information available about the use and trade of *Lycianthes hypoleuca*.

Threats

Lycianthes hypoleuca develops in rainforests. In Mexico, rainforests have been strongly affected due to the change in land use destined mainly for agriculture and livestock, climate change and excessive extraction of flora and fauna, which affects the capacity of the ecosystem to maintain its functioning in addition to the growth of urban areas, forest fires and logging called "ant", which is carried out to obtain firewood and charcoal (FMCN 2009, CONABIO 2019). It has been estimated that Mexico has lost more than 50% of its original coverage. The rate of deforestation reported for 1993-2002 was 523,639 hectares per year, with tropical rainforests being the most affected (FMCN 2009). Particularly in the state of Chiapas, the strongest threats are deforestation, human settlements, livestock and agriculture, where shade coffee crops are very frequent (Navarrete *et al.* 2010). In addition, some research reveals that in the state of Chiapas native forests suffered a 50% reduction in the period from 1975 to 2000 (Cayuela *et al.* 2006). In 2017, 726,361.21 hectares were affected by forest fires, with the state of Chiapas having one of the highest number of fires (CONAFOR 2017). In Mexico, the state of Chiapas is among the main livestock producers (SIAP 2017). The states of Campeche and Quintana Roo are among the most visited by tourists. The state of Campeche has several archaeological zones, being Calakmul the most visited of all, because of this phenomenon the hotel industry suffered an increase since in the year 2000 there were reported 137 hotels and for the year 2014 it increased to 324 (Campeche 2016). The causes of the loss of biodiversity in Guatemala are related to economic activities especially agriculture and livestock as well as forest fires and human settlements (INAB & IARNA-URL 2012, CONAP 2014). It is estimated that during the period 2006-2010 the forest cover had a loss of 38,597 hectares per year due to deforestation, while during the period 2001-2012 there were 758,382 forest fires affecting around 115,385 hectares of forest with an average of 9,613 ha / year (CONAP 2014).

Threats Classification Scheme

Threat	Timing	Scope	Severity	Impact Score
1.1. Residential & commercial development -> Housing & urban areas	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
2.1.3. Agriculture & aquaculture -> Annual & perennial non-timber crops -> Agro-industry farming	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
2.3.2. Agriculture & aquaculture -> Livestock farming & ranching -> Small-holder grazing, ranching or farming	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
2.3.3. Agriculture & aquaculture -> Livestock farming & ranching -> Agro-industry grazing, ranching or farming	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7
5.3.1. Biological resource use -> Logging & wood harvesting -> Intentional use: (subsistence/small scale) [harvest]	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
5.3.4. Biological resource use -> Logging & wood harvesting -> Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
7.1.1. Natural system modifications -> Fire & fire suppression -> Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7

Conservation

According to the distribution points, *Lycianthes hypoleuca* is found within some protected natural areas: Reserva de la Biósfera Calakmul (Campeche), Reserva de Biósfera Maya (Guatemala) and Noj Kaax H´Men Elijio Panti Forest Reserve (Belize). There are not current ex situ sites worldwide (BGCI 2019).

Conservation Actions In- Place

Conservation sites identified	Note
Yes, over part of range	-

Occur in at least one PA	Note
Yes	*Lycianthes hypoleuca* is found within some protected natural areas: Reserva de la Biósfera Calakmul (Campeche), Reserva de Biósfera Maya (Guatemala), Noj Kaax H´Men Elijio Panti Forest Reserve (Belize) and Columbia Forest Reserve (Belize).

Percentage of population protected by PAs (0-100)	Note
1-10	The protected natural areas where *Lycianthes hypoleuca* is found have few collection records.

Subject to ex-situ conservation	Note
No	There are not current ex situ sites worldwide.

Important Conservation Actions Needed

Conservation Actions	Note
6.1. Livelihood, economic & other incentives -> Linked enterprises & livelihood alternatives	-
6.4. Livelihood, economic & other incentives -> Conservation payments	-

Research Needed

Research	Note
3.4. Monitoring -> Habitat trends	-

Evaluación No. 29

Lycianthes manantlanensis - A.Rodr. & O.Vargas

PLANTAE - TRACHEOPHYTA - MAGNOLIOPSIDA - SOLANALES - SOLANACEAE - *Lycianthes manantlanensis*

Common Names: Naranjillo (Spanish; Castilian)
Synonyms: No Synonyms

Taxonomic Note:
According to Tropicos (2019) and The Plant List (2019), *Lycianthes manantlanensis* Aarón Rodr. & O. Vargas is an accepted name for this species. This taxon is morphologically similar to *Lycianthes barbatula*, *Lycianthes geminifora* and *Lycianthes orogenes* (Rodríguez & Vargas 2002).

Red List Status
VU - Vulnerable, D2 (IUCN version 3.1)

Red List Assessment

Assessment Information

Date of Assessment: 2019-06-08

Regions: Global

Assessment Rationale

Lycianthes manantlanensis is an endemic shrub or small tree from Mexico, which has been collected in the Sierra de Cacoma, Jalisco, at the western end of the Trans-Mexican Volcanic Belt. It is also known for the Sierras de Manantlán and Coalcomán (Michoacán) in the Sierra Madre del Sur, as well as for the states of Oaxaca and Chiapas in southern Mexico. The species has an extent of occurrence of 173,718.615 km² and an area of occupancy of 84 km². It is calculated to occur in between three to five locations. The main threats for the species range are deforestation, agriculture, forest fires, human settlements and cattle raising. *Lycianthes manantlanensis* is assessed as Vulnerabe (VU).

Distribution

Geographic Range

Lycianthes manantlanensis is an endemic shrub or small tree from Mexico, which has been collected in the Sierra de Cacoma, Jalisco, at the western end of the Trans-Mexican Volcanic Belt. It is also known for the Sierras de Manantlán and Coalcomán (Michoacán) in the Sierra Madre del Sur, as well as for the states of Oaxaca and Chiapas in southern Mexico (Rodríguez & Vargas 2002, Villaseñor 2016, Martínez *et al.* 2017). The species has an extent of occurrence of 173,718.615 km² and an area of occupancy of 84 km². However, it is likely that the AOO is higher than calculated, remaining below 500 km². It is calculated to occur in between three to five locations. The main threats for the species range are deforestation, agriculture, forest fires, human settlements and cattle raising.

Area of Occupancy (AOO)

Estimated area of occupancy (AOO) - in	Justification

km2	
84	AOO calculated with GeoCAT using Montero-Castro data (2019).

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO)- in km2	EOO estimate calculated from Minimum Convex Polygon	Justification
173718.615	-	EOO calculated with GeoCAT using Montero-Castro data (2019).

Locations Information

Number of Locations	Justification
11	The main threats for the species range are deforestation, agriculture, forest fires, human settlements and cattle raising.

Very restricted AOO or number of locations (triggers VU D2)

Very restricted in area of occupancy (AOO) and/or # of locations	Justification
No	It is calculated that the species occurs between three to five locations.

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 800

Elevation Upper Limit (in metres above sea level): 1650

Map Status

Map Status	Use map from previous assessment	How the map was created, including data sources/methods used:	Please state reason for map not available:	Data Sensitive?	Justification	Geographic range this applies to:	Date restriction imposed:
Done	-	Prepared with GeoCAT using Montero-Castro data (2019).	-	-	-	-	-

Biogeographic Realms

Biogeographic Realm: Neotropical

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Mexico -> Chiapas	Extant	Native	-	Resident
Mexico -> Jalisco	Extant	Native	-	Resident
Mexico -> Michoacán	Extant	Native	-	Resident
Mexico -> Oaxaca	Extant	Native	-	Resident

Population

There is no information available about the population of *Lycianthes manantlanensis*.

Habitats and Ecology

Lycianthes manantlanensis is a shrub or small tree of 1-6 m tall, it grows in the transition zone between the subdeciduous tropical forest and the cloud forest, in an altitudinal range of 800-1650 m. It grows in association with *Ardisia revoluta*, *Inga eriocarpa*, *Magnolia iltisiana*, *Populus guzmanantlensis*, *Quercus insignis*, and *Siparuna andina*. It also grows in the cloud forest where it is associated with *Balmea stormae*, *Beilschmiedia pendula*, *Calatola laevigata*, *Capparis mollicella*, *Cedrela odorata*, *Cinnamomum pachypodum*, *Coccoloba barbadensis*, *Dendenden arboreus*, *Guarea glabra*, *Juglans major*, *Licaria triandra*, *Malvaviscus arboreus*, *Nectandra glabrescens*, *Picrasma Mexican, Prunus serotina* subsp. *capuli*, *Robinsonella speciosa*, *Trichillia americana*, *Trophis racemosa*, and *Urera caracasana* (Rodríguez & Vargas 2002).

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
1.4. Forest -> Forest - Temperate	Resident	Suitable	-
1.5. Forest -> Forest - Subtropical/Tropical Dry	Resident	Suitable	-
1.9. Forest -> Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Continuing Decline in Habitat

Continuing decline in area, extent and/or quality of habitat?	Qualifier	Justification
Yes	Projected	According to an analysis of niche models performed for this species, it is projected that during the next 30 years the available area with the necessary conditions for the development of this species will suffer a fairly significant reduction of approximately 48 percent.

Systems

System: Terrestrial

Plant Specific

Plant Growth Forms
Shrub - large
Shrub - small
Tree - small

Use and Trade

General Use and Trade Information

There is no information available about the use and trade of *Lycianthes manantlanensis*.

Threats

The mountain cloud forest is one the sites where *Lycianthes manantlanensis* is found. This forest type in Mexico is extended less than 1% of the national territory, which is the reason it is considered the most threatened terrestrial ecosystem (CONABIO 2010, González-Espinosa *et al.* 2012). Another type of vegetation where *Lycianthes manantlanensis* develops is the tropical decidous forest. This type of vegetation is very characteristic of some areas of the country because it covers large areas (Rzedowski 2006). The tropical deciduous forest is one of the most representative types of vegetation due to the vast surface it occupies, however the permanence of this type of vegetation is strongly threatened due to agricultural and livestock expansion, in addition to the establishment of large-scale cash crops. It is important to mention that due to its characteristics, the deciduous tropical forest is less attractive compared to other types of vegetation, so there are fewer opportunities for its conservation (Meave *et al.*, 2012). In 2017, 726,361.21 hectares were affected by forest fires, with Michoacán, Jalisco, Chiapas and Oaxaca being the states with the highest number of fires (CONAFOR 2017). In Mexico, the states of Jalisco, Chiapas and Michoacán are among the main livestock producers (SIAP 2017).Some of the causes of the loss of biodiversity in the state of Jalisco have been the increase in population, about 9% of natural vegetation has been eliminated as a direct consequence of demographic growth, while another of the threats presented in the state is the change of land use for agricultural or livestock purposes associated with forest fires (CONABIO 2017). In recent years, the growing demand for tequila by consumers has caused an increase in the cultivation of agave in some areas of the state of Jalisco, resulting in significant changes in the landscape (Gerritsen *et al.*, 2011). According to the CONANP study (2010), the rate of habitat transformation in the Manantlán Biosphere Reserve (Jalico-Colima) is increasing. In the 2000-2005 period, a large number of hectares of forest were transformed due to deforestation for the introduction of pastures and agricultural areas, with the forest of oak and the medium-deciduous forest being the most affected, with 274 and 161 hectares lost, respectively.

Threats Classification Scheme

Threat	Timing	Scope	Severity	Impact Score
1.1. Residential & commercial development -> Housing & urban areas	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
2.1.3. Agriculture & aquaculture -> Annual & perennial non-timber crops -> Agro-industry farming	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
2.3.2. Agriculture & aquaculture -> Livestock farming & ranching -> Small-holder grazing, ranching or farming	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
2.3.3. Agriculture & aquaculture -> Livestock farming & ranching -> Agro-industry grazing, ranching or farming	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
5.3.1. Biological resource use -> Logging & wood harvesting -> Intentional use: (subsistence/small scale) [harvest]	Ongoing	Minority (<50%)	Rapid Declines	Medium Impact: 6
5.3.4. Biological resource use -> Logging & wood harvesting -> Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
7.1.1. Natural system modifications -> Fire & fire suppression -> Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7

Conservation

According to the collection points, *Lycianthes manantlanensis* is found within some natural protected areas: Reserva de la Biósfera Sierra de Manantlán (Jalisco) and Reserva de la Biósfera El Triunfo (Chiapas). There are not current *ex situ* sites worldwide (BGCI 2019).

Conservation Actions In- Place

Conservation sites identified	Note
Yes, over part of range	-

Occur in at least one PA	Note
Yes	*Lycianthes manantlanensis* is found within some natural protected areas: Reserva de la Biósfera Sierra de Manantlán (Jalisco) and Reserva de la Biósfera El Triunfo (Chiapas).

Percentage of population protected by PAs (0-100)	Note
11-20	Although *Lycianthes manantlanensis* is found within two protected natural areas, most records are outside of them.

Subject to ex-situ conservation	Note
No	There are not current ex situ sites worldwide.

Important Conservation Actions Needed

Conservation Actions	Note
6.1. Livelihood, economic & other incentives -> Linked enterprises & livelihood alternatives	-
6.4. Livelihood, economic & other incentives -> Conservation payments	-

Research Needed

Research	Note
1.2. Research -> Population size, distribution & trends	-
3.4. Monitoring -> Habitat trends	-

Evaluación No. 30

Lycianthes pilifera - (Benth.) Bitter

PLANTAE - TRACHEOPHYTA - MAGNOLIOPSIDA - SOLANALES - SOLANACEAE - *Lycianthes pilifera*

Common Names: No Common Names
Synonyms: Solanum piliferum Benth.

Taxonomic Note:
According to Tropicos (2019) and The Plant List (2019), *Lycianthes pilifera* (Benth.) Bitter is an accepted name for this species. This species is distinguished by its brownish, simple, acute trichomes and showy flowers with white to purple entire corollas and equal stamens. The lustrous, dark purple fruits with large dark seeds are also unusual (Dean & Reyes 2018).

Red List Status
VU - Vulnerable, B1ab(iii)+2ab(iii); D2 (IUCN version 3.1)

Red List Assessment

Assessment Information

Date of Assessment: 2019-06-08

Regions: Global

Assessment Rationale

Lycianthes pilifera is an endemic shrub or small tree from Mexico, it is only distributed in the state of Oaxaca. The species has an extent of occurrence of 6,411.426 km² and an area of occupancy of 232 km². However, it is likely that the AOO is higher than calculated, remaining below 500 km². It is calculated to occur in between three to five locations. The main threats for the taxon range are deforestation, agriculture, forest fires, human settlements and cattle raising. *Lycianthes pilifera* is assessed as Vulnerable (VU).

Distribution

Geographic Range

Lycianthes pilifera is an endemic shrub or small tree from Mexico, it is only distributed in the state of Oaxaca (Martínez *et al.* 2017, Dean & Reyes 2018). The species has an extent of occurrence of 6,411.426 km² and an area of occupancy of 232 km². However, it is likely that the AOO is higher than calculated, remaining below 500 km². It is calculated to occur in between three to five locations. The main threats for the taxon range are deforestation, agriculture, forest fires, human settlements and cattle raising.

Area of Occupancy (AOO)

Estimated area of occupancy (AOO) - in km2	Justification
232	AOO calculated with GeoCAT using Montero-Castro data (2019).

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO)- in km2	EOO estimate calculated from Minimum Convex Polygon	Justification
6411.426	true	EOO calculated with GeoCAT using Montero-Castro data (2019).

Locations Information

Number of Locations	Justification
8	The main threats for the taxon range are deforestation, agriculture, forest fires, human settlements and cattle raising.

Very restricted AOO or number of locations (triggers VU D2)

Very restricted in area of occupancy (AOO) and/or # of locations	Justification
No	*Lycianthes pilifera* occur in between three to five locations.

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 1700

Elevation Upper Limit (in metres above sea level): 3000

Map Status

Map Status	Use map from previous assessment	How the map was created, including data sources/methods used:	Please state reason for map not available:	Data Sensitive?	Justification	Geographic range this applies to:	Date restriction imposed:
Done	-	Prepared with GeoCAT using Montero-Castro data (2019).	-	-	-	-	-

Biogeographic Realms

Biogeographic Realm: Neotropical

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Mexico -> Oaxaca	Extant	Native	-	Resident

Population

There is no information available about the population of *Lycianthes pilifera*.

Habitats and Ecology

Lycianthes pilifera is a shrub or small tree of 1.5 to 5 m tall. It grow at an altitude range of 1700-3000 m. It lives in mountain cloud forest and pine-oak forest. It develops in humid places on black and brown soils with abundant organic matter (Montero-Castro data 2019).

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
1.4. Forest -> Forest - Temperate	Resident	Suitable	-
1.9. Forest -> Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Continuing Decline in Habitat

Continuing decline in area, extent and/or quality of habitat?	Qualifier	Justification
Yes	Projected	According to an analysis of niche models performed for this species, it is projected that during the next 30 years the available area with the necessary conditions for the development of this species will suffer a fairly significant reduction of approximately 53 percent.

Systems

System: Terrestrial

Plant Specific

Plant Growth Forms
Shrub - large
Shrub - small
Tree - small

Use and Trade

General Use and Trade Information

There is no information available about the use and trade of *Lycianthes pilifera*.

Threats

The threats that have been observed for this species are deforestation, agriculture, forest fires, human settlements and livestock. The mountain cloud forest is one the sites where *Lycianthes pilifera* is found. This forest type in Mexico is extended less than 1% of the national territory, which is the reason it is considered the most threatened terrestrial ecosystem (CONABIO 2010, González-Espinosa *et al.* 2012). Another type of vegetation where *Lycianthes pilifera* develops is the pine-oak forest, this ecosystem has been strongly affected due to deforestation, agriculture, forest fires, livestock and climate change (CONABIO 2019). In the period from

1970 to 1990, Mexico lost 14% of the coniferous forests (Sánchez *et al.* 2003). In 2017, 726,361.21 hectares were affected by forest fires, with Oaxaca being one of the states with the largest area affected (CONAFOR 2017).

Threats Classification Scheme

Threat	Timing	Scope	Severity	Impact Score
1.1. Residential & commercial development -> Housing & urban areas	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
2.1.3. Agriculture & aquaculture -> Annual & perennial non-timber crops -> Agro-industry farming	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
2.3.2. Agriculture & aquaculture -> Livestock farming & ranching -> Small-holder grazing, ranching or farming	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
2.3.3. Agriculture & aquaculture -> Livestock farming & ranching -> Agro-industry grazing, ranching or farming	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7
5.3.1. Biological resource use -> Logging & wood harvesting -> Intentional use: (subsistence/small scale) [harvest]	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
5.3.4. Biological resource use -> Logging & wood harvesting -> Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
7.1.1. Natural system modifications -> Fire & fire suppression -> Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7

Conservation

According to the collection records, *Lycianthes pilifera* is not found within any protected natural area. There are not current *ex situ* sites worldwide (BGCI 2019).

Conservation Actions In- Place

Conservation sites identified	Note
No	-

Occur in at least one PA	Note
No	*Lycianthes pilifera* is not found within any protected natural area.

Subject to ex-situ conservation	Note
Yes	There are not current ex situ sites worldwide.

Important Conservation Actions Needed

Conservation Actions	Note
6.1. Livelihood, economic & other incentives -> Linked enterprises & livelihood alternatives	-
6.4. Livelihood, economic & other incentives -> Conservation payments	-

Research Needed

Research	Note
1.2. Research -> Population size, distribution & trends	-
3.4. Monitoring -> Habitat trends	-

Evaluación No. 31

Lycianthes quichensis - (J.M.Coult. & Donn.Sm.) Bitter

PLANTAE - TRACHEOPHYTA - MAGNOLIOPSIDA - SOLANALES - SOLANACEAE - *Lycianthes quichensis*

Common Names: Chilete (Spanish; Castilian), Coshel (Spanish; Castilian), Coxel (Spanish; Castilian), Flor de rosa (Spanish; Castilian), Quilete (Spanish; Castilian), Tomatillo blanco (Spanish; Castilian)
Synonyms: Solanum quichense J.M.Coult. & Donn.Sm.; Lycianthes obliquifolia Standl.

Taxonomic Note:
According to Tropicos (2019) and The Plant List (2019), *Lycianthes quichensis* (J. M. Coult. & Donn. Sm.) Bitter is an accepted name for this species.

Red List Status
VU - Vulnerable, D2 (IUCN version 3.1)

Red List Assessment

Assessment Information

Date of Assessment: 2019-05-15

Regions: Global

Assessment Rationale

Lycianthes quichensis is an endemic shrub from Mexico and Guatemala. In Mexico, this species is distributed in the state of Chiapas, while in Guatemala it is found in the departments of Chimaltenango, Huehuetenango, Quetzaltenango, Quiché and Sacatepéquez. The taxon has an extent of occurrence of 22,800.372 km² and an area of occupancy of 144 km². However, it is likely that the AOO is higher than calculated, remaining below 500 km². It is calculated to occur in between four to six locations. The main threats for the taxon range are deforestation, agriculture, forest fires, human settlements and cattle raising. *Lycianthes quichensis* is assessed as Vulnerable (VU).

Distribution

Geographic Range

Lycianthes quichensis is an endemic shrub from Mexico and Guatemala (Gentry & Standley 1974, GBIF 2019, Montero-Castro data 2019). In Mexico, this species is distributed in the state of Chiapas, while in Guatemala it is found in the departments of Chimaltenango, Huehuetenango, Quetzaltenango, Quiché and Sacatepéquez (Gentry & Standley 1974, Villaseñor 2016, Martínez *et al.* 2017, Montero-Castro data 2019). The taxon has an extent of occurrence of 22,800.372 km² and an area of occupancy of 144 km². However, it is likely that the AOO is higher than calculated, remaining below 500 km². It is calculated to occur in between four to six locations. The main threats for the taxon range are deforestation, agriculture, forest fires, human settlements and cattle raising.

Area of Occupancy (AOO)

Estimated area of occupancy (AOO) - in km2	Justification

144	AOO calculated with GeoCAT using Montero-Castro data (2019) and GBIF (2019).

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO)- in km2	EOO estimate calculated from Minimum Convex Polygon	Justification
22800.372	true	EOO calculated with GeoCAT using Montero-Castro data (2019) and GBIF (2019).

Locations Information

Number of Locations	Justification
12	The main threats for the taxon range are deforestation, agriculture, forest fires and human settlements.

Very restricted AOO or number of locations (triggers VU D2)

Very restricted in area of occupancy (AOO) and/or # of locations	Justification
No	The number of locations calculated is between four to six.

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 1900

Elevation Upper Limit (in metres above sea level): 3900

Map Status

Map Status	Use map from previous assessment	How the map was created, including data sources/methods used:	Please state reason for map not available:	Data Sensitive?	Justification	Geographic range this applies to:	Date restriction imposed:
Done	-	Prepared with GeoCAT using Montero-Castro data (2019) and GBIF (2019).	-	-	-	-	-

Biogeographic Realms

Biogeographic Realm: Neotropical

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Guatemala	Extant	Native	-	Resident
Mexico -> Chiapas	Extant	Native	-	Resident

Population

There is no information available about the population of *Lycianthes quichensis*.

Habitats and Ecology

Lycianthes quichensis is a shrub to 1 to 5 m tall. It grow at an altitude range of 1900-3900 m. It lives in mountain cloud forest, pine-oak forest and Abies forest associated with *Quercus*, *Pinus* and *Abies* (Gentry & Standley 1974, Montero-Castro data 2019).

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
1.4. Forest -> Forest - Temperate	Resident	Suitable	-
1.9. Forest -> Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Continuing Decline in Habitat

Continuing decline in area, extent and/or quality of habitat?	Qualifier	Justification
Yes	Projected	According to an analysis of niche models performed for this species, it is projected that during the next 30 years the available area with the necessary conditions for the development of this species will suffer a fairly significant reduction of approximately 57 percent.

Systems

System: Terrestrial

Plant Specific

Plant Growth Forms
Shrub - large
Shrub - small

Use and Trade

General Use and Trade Information

There is no information available about the use and trade of *Lycianthes quichensis*.

Threats

Lycianthes quichensis develops is the mountain cloud forest. In Mexico, these forests occupy less than 1% of the national territory, which is why it is considered the most threatened terrestrial ecosystem (CONABIO 2010, González-Espinosa *et al.* 2012). Particularly in the state of Chiapas, the strongest threats are deforestation, human settlements, livestock and agriculture, where shade coffee crops are very frequent (Navarrete *et al.* 2010). In addition, some research reveals that in the state of Chiapas native forests suffered a 50% reduction in the period from 1975 to 2000 (Cayuela *et al.* 2006). Another type of vegetation where *Lycianthes quichensis* develops is the temperate forest, this ecosystem has been strongly affected due to deforestation, agriculture, forest fires, livestock and climate change (CONABIO 2019). In the period from 1970 to 1990, Mexico lost 14% of the coniferous forests, while the hardwood forests suffered a reduction of 9.3% (Sánchez *et al.* 2003). In 2017, 726,361.21 hectares were affected by forest fires, Chiapas being one of the states with the highest number of fires (CONAFOR 2017). In Mexico, the state of Chiapas is among the main livestock producers (SIAP 2017). The causes of the loss of biodiversity in Guatemala are related to economic activities, especially agriculture and livestock, as well as forest fires and human settlements (INAB & IARNA-URL 2012, CONAP 2014). It is estimated that during the period 2006-2010 the forest cover lost 38,597 hectares per year due to deforestation, while during the period 2001-2012, there were 758,382 forest fires affecting around 115,385 hectares of forest with an average of 9,613 ha/year (CONAP 2014).

Threats Classification Scheme

Threat	Timing	Scope	Severity	Impact Score
1.1. Residential & commercial development -> Housing & urban areas	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
2.1.3. Agriculture & aquaculture -> Annual & perennial non-timber crops -> Agro-industry farming	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
2.3.3. Agriculture & aquaculture -> Livestock farming & ranching -> Agro-industry grazing, ranching or farming	Ongoing	Minority (<50%)	Rapid Declines	Medium Impact: 6
5.3.4. Biological resource use -> Logging & wood harvesting -> Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
7.1.1. Natural system modifications -> Fire & fire suppression -> Increase in fire frequency/intensity	Ongoing	Minority (<50%)	Rapid Declines	Medium Impact: 6

Conservation

According to distribution points, *Lycianthes quichensis* is found within Reserva de la Biosfera El Triunfo (Chiapas) and Reserva de la Biosfera Volcán Tacaná (Chiapas). The number of *ex situ* sites worldwide is two (BGCI 2019).

Conservation Actions In- Place

Conservation sites identified	Note
Yes, over part of range	-

Occur in at least one PA	Note
Yes	*Lycianthes quichensis* is found within Reserva de la Biosfera El Triunfo (Chiapas) and Reserva de la Biosfera Volcán Tacaná (Chiapas).

Percentage of population protected by PAs (0-100)	Note
1-10	The part of the population of this species that is within the protected natural areas is very small.

Subject to ex-situ conservation	Note
Yes	The number of ex situ sites worldwide is two.

Important Conservation Actions Needed

Conservation Actions	Note
6.1. Livelihood, economic & other incentives -> Linked enterprises & livelihood alternatives	-
6.4. Livelihood, economic & other incentives -> Conservation payments	-

Research Needed

Research	Note
3.4. Monitoring -> Habitat trends	-

Evaluación No. 32

Solanum brevipedicellatum - K.E.Roe

PLANTAE - TRACHEOPHYTA - MAGNOLIOPSIDA - SOLANALES - SOLANACEAE – *Solanum brevipedicellatum*

Common Names: No Common Names
Synonyms: No Synonyms

Taxonomic Note:
According to Tropicos (2019), *Solanum brevipedicellatum* K.E. Roe is an accepted name for this species. *Solanum brevipedicellatum* is a very distinct species and easily recognized by the large leaves, very short or apparent lack of pedicels at anthesis, and the strong exsertion of the corolla from the calyx before anthesis (Roe 1967).

Red List Status
VU - Vulnerable, B2ab(iii) (IUCN version 3.1)

Red List Assessment

Assessment Information

Date of Assessment: 2020-02-13

Assessor(s): Valentín-Martínez, D. & Rodríguez Contreras, A.

Reviewer(s): Samain, M.-S. & Oldfield, S.

Regions: Global

Assessment Rationale

Solanum brevipedicellatum is a shrub or small tree from Mexico and Guatemala. The extent of occurrence is 305,914.838 km². The area of occupancy of the taxon is 116 km². The taxon has ten locations and the main threats that the distribution area presents are deforestation, agriculture, forest fires, livestock and human settlements. *Solanum brevipedicellatum* is assessed as Vulnerable (VU).

Distribution

Geographic Range

Solanum brevipedicellatum is a shrub or small tree from Mexico and Guatemala (Roe 1967). In Mexico it is distributed in the states of Colima, Jalisco, Chiapas and Tabasco (Villaseñor 2016, Martínez *et al.* 2017, Montero-Castro 2019), while in Guatemala it is located in the departments of Chimaltenango and Quezaltenango (Gentry & Standley 1974). The extent of occurrence is 305,914.838 km². The area of occupancy of the taxon is 116 km², but it is likely that the AOO of the species is a little higher than estimated, if the collection efforts were increased. The taxon has ten locations and the main threats that the distribution area presents are deforestation, agriculture, forest fires, livestock and human settlements.

Area of Occupancy (AOO)

Estimated area of occupancy (AOO) - in km2	Justification
116	AOO calculated with GeoCAT using Montero-Castro data (2019).

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO)- in km2	EOO estimate calculated from Minimum Convex Polygon	Justification
305914.838	true	EOO calculated with GeoCAT using Montero-Castro data (2019).

Locations Information

Number of Locations	Justification
10	The main threats that the distribution area presents are deforestation, agriculture, forest fires, livestock ranching and human settlements

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 1000

Elevation Upper Limit (in metres above sea level): 2200

Map Status

Map Status	Use map from previous assessment	How the map was created, including data sources/methods used:	Please state reason for map not available:	Data Sensitive?	Justification	Geographic range this applies to:	Date restriction imposed:
Done	-	Prepared with GeoCAT using Montero-Castro data (2019).	-	-	-	-	-

Biogeographic Realms

Biogeographic Realm: Neotropical

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Guatemala	Extant	Native	-	Resident
Mexico -> Chiapas	Extant	Native	-	Resident
Mexico -> Colima	Extant	Native	-	Resident

Mexico -> Jalisco	Extant	Native	-	Resident
Mexico -> Tabasco	Extant	Native	-	Resident

Population

Solanum brevipedicellatum is a fairly rare species in Guatemala and Chiapas, it grows as very scattered individual shrubs and trees. In contrast it is very abundant in Jalisco (Roe 1967).

Population Information

Current Population Trend: Unknown

Habitats and Ecology

Solanum brevipedicellatum is a shrub or small tree of 2-12 m tall and the stems develop up to 31 cm in diameter. It grows at an altitude range of 1000-2200 m. It occurs in mountain cloud forest, pine-oak forest and rarely in tropical dry forest associated with *Alnus*, *Carpinus*, *Fraxinus, Quercus* and *Podocarpus*. It grows on the slopes and wet canyons in shallow clay brown soils (Roe 1967, Montero-Castro data 2019).

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
1.4. Forest -> Forest - Temperate	Resident	Suitable	-
1.5. Forest -> Forest - Subtropical/Tropical Dry	Resident	Suitable	-
1.9. Forest -> Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Continuing Decline in Habitat

Continuing decline in area, extent and/or quality of habitat?	Qualifier	Justification
Yes	Projected	According to a niche modeling analysis, it is projected that during the next 30 years the available area with the necessary conditions for the development of this species will suffer a reduction of approximately 48 percent.

Systems

System: Terrestrial

Plant Specific

Plant Growth Forms
Shrub - large
Tree - small

Use and Trade

General Use and Trade Information

There is no information about the use and trade of *Solanum brevipedicellatum*.

Threats

Solanum brevipedicellatum occurs in the mountain cloud forest. In Mexico, these forests occupy less than 1% of the national territory, which is why it is considered the most threatened terrestrial ecosystem (CONABIO 2010, González-Espinosa *et al.* 2012). Particularly in the state of Chiapas, the strongest threats are deforestation, human settlements, livestock and agriculture, where shade coffee crops are very frequent (Navarrete *et al.* 2010). In addition, some research reveals that in the state of Chiapas native forests suffered a 50% reduction in the period from 1975 to 2000 (Cayuela *et al.* 2006). Another type of vegetation where *Solanum brevipedicellatum* develops is the pine-oak forest; this ecosystem has been strongly affected (CONABIO 2019). In the period from 1970 to 1990, Mexico lost 14% of the coniferous forests, while the hardwood forests suffered a reduction of 9.3% (Sánchez *et al.* 2003). *Solanum brevipedicellatum* also grows in the tropical deciduous forest. The permanence of this type of vegetation is strongly threatened due to agricultural and livestock expansion, in addition to the establishment of large-scale commercial crops. It is important to mention that due to it is phenological characteristics, the tropical deciduous forest has a lower value compared to other types of vegetation, so there are fewer opportunities for its conservation (Meave *et al.* 2012).

Threats Classification Scheme

Threat	Timing	Scope	Severity	Impact Score
1.1. Residential & commercial development -> Housing & urban areas	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
2.1.3. Agriculture & aquaculture -> Annual & perennial non-timber crops -> Agro-industry farming	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
2.3.2. Agriculture & aquaculture -> Livestock farming & ranching -> Small-holder grazing, ranching or farming	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
2.3.3. Agriculture & aquaculture -> Livestock farming & ranching -> Agro-industry grazing, ranching or farming	Ongoing	Minority (<50%)	Rapid Declines	Medium Impact: 6
5.3.1. Biological resource use -> Logging & wood harvesting -> Intentional use: (subsistence/small scale) [harvest]	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
5.3.4. Biological resource use -> Logging & wood harvesting -> Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
7.1.1. Natural system modifications -> Fire & fire suppression -> Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7

Conservation

According to the collection records, *Solanum brevipedicellatum* occurs in the Reserva de la Biósfera Sierra de Manantlán (Jalisco), Área de protección de Flora y Fauna El Jabalí (Colima) and Reserva de la Biósfera El Triunfo (Chiapas). This species was evaluated as Endangered (EN) in The Red List of Mexican Cloud Forest Trees (González-Espinosa *et al.* 2011). There are no current *ex situ* sites worldwide (BGCI 2019).

Conservation Actions In- Place

Conservation sites identified	Note
Yes, over part of range	-

Occur in at least one PA	Note
Yes	*Solanum brevipedicellatum* grows in Reserva de la Biósfera Sierra de Manantlán (Jalisco),

	Área de protección de Flora y Fauna El Jabalí (Colima) and Reserva de la Biósfera El Triunfo (Chiapas).

Percentage of population protected by PAs (0-100)	Note
1-10	Although three protected natural areas harbour this species, most of the reported records lay outside of them.

Subject to ex-situ conservation	Note
No	There are no current ex situ sites worldwide.

Subject to recent education and awareness programmes	Note
Unknown	-

Included in international legislation	Note
Unknown	-

Important Conservation Actions Needed

Conservation Actions	Note
6.1. Livelihood, economic & other incentives -> Linked enterprises & livelihood alternatives	-
6.4. Livelihood, economic & other incentives -> Conservation payments	-

Research Needed

Research	Note
3.4. Monitoring -> Habitat trends	-

Evaluación No. 33

Lycianthes anomala - Bitter

PLANTAE - TRACHEOPHYTA - MAGNOLIOPSIDA - SOLANALES - SOLANACEAE - *Lycianthes anomala*

Common Names: No Common Names
Synonyms: No Synonyms

Taxonomic Note:
According to Tropicos (2019), *Lycianthes anomala* Bitter is an accepted name for this species. *Lycianthes anomala* is a very poorly understood species, for which Bitter created the subgenus Syngenesis due to dehiscent anthers by longitudinal, intrinsic indentations. This characteristic would suggest the separation of the *Lycianthes* species, however in all the rest of its characteristics it is a typical member of a group of species centered around *Lycianthes heteroclita* and *Lycianthes synanthera* (Nee 1986).

Red List Status
LC - Least Concern, (IUCN version 3.1)

Red List Assessment

Assessment Information

Assessor(s): Valentín-Martínez, D.

Institution(s): Botanic Gardens Conservation International

Regions: Global

Assessment Rationale

Lycianthes anomala is a shrub, scandent shrub or small tree from Mexico, Costa Rica, Nicaragua and Panama. The taxon has an extent of occurrence (EOO) of 389,222.073 km² and an area of occupancy (AOO) of 140 km². It is calculated to occur in four locations. The main threats for the taxon range are deforestation, agriculture, forest fires, cattle raising and human settlements. *Lycianthes anomala* is assessed as Least Concern (LC).

Distribution

Geographic Range

Lycianthes anomala is a shrub, scandent shrub or small tree from Mexico, Costa Rica, Nicaragua and Panama (Reyes 2015, Dean & Reyes 2018, Tropicos 2019). In Mexico, this species is distributed in the states of Oaxaca and Veracruz (Rodríguez 2004, Villaseñor 2016, Martínez *et al.* 2017); in Nicaragua it has been reported for the departments of Boaco, Matagalpa and Río San Juan; in Costa Rica it has been collected in the department of Cartago while in Panama it has been reported in the provinces of Chiriquí and Colón (GBIF 2019, Tropicos 2019). The taxon has an extent of occurrence (EOO) of 389,222.073 km² and an area of occupancy (AOO) of 140 km². However, it is likely that the AOO is higher than calculated if collection efforts intensify. It is calculated to occur between thirteen to fifteen locations. The main threats for the taxon range are deforestation, agriculture, forest fires, cattle raising and human settlements.

Area of Occupancy (AOO)

Estimated area of occupancy (AOO) - in km2	Justification
140	AOO calculated with GeoCAT using Montero-Castro data (2019) and GBIF (2019).

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO)- in km2	EOO estimate calculated from Minimum Convex Polygon	Justification
389222.073	true	EOO calculated with GeoCAT using Montero-Castro data (2019) and GBIF (2019).

Locations Information

Number of Locations	Justification
13-15	The main threats for the taxon range are deforestation, agriculture, forest fires, cattle raising and human settlements.

Very restricted AOO or number of locations (triggers VU D2)

Very restricted in area of occupancy (AOO) and/or # of locations	Justification
No	This species is calculated to occur between thirteen to fifteen locations.

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 200

Elevation Upper Limit (in metres above sea level): 1400

Map Status

Map Status	Use map from previous assessment	How the map was created, including data sources/methods used:	Please state reason for map not available:	Data Sensitive?	Justification	Geographic range this applies to:	Date restriction imposed:
Done	-	Prepared with GeoCAT using Montero-Castro data (2019) and GBIF (2019).	-	-	-	-	-

Biogeographic Realms

Biogeographic Realm: Neotropical

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Costa Rica	Extant	Native	-	Resident
Mexico	Extant	Native	-	Resident
Mexico -> Oaxaca	Extant	Native	-	Resident
Mexico -> Veracruz	Extant	Native	-	Resident
Nicaragua	Extant	Native	-	Resident
Panama	Extant	Native	-	Resident

Population

There is no information available about the population size of *Lycianthes anomala*.

Population Information

Current Population Trend: Unknown

Habitats and Ecology

Lycianthes anomala is a shrub, scandent shrub or small tree to 2-10 m tall. It grow at an altitude range of 200-1400 m. It lives in rain forests. It grows on black clay soils with limestone. Flowering occurs during the months of May to August, while it is in fruit during the month of October (Nee 1986, Reyes 2015, Montero-Castro data 2019, Tropicos 2019).

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
1.6. Forest -> Forest - Subtropical/Tropical Moist Lowland	-	Suitable	-

Continuing Decline in Habitat

Continuing decline in area, extent and/or quality of habitat?	Qualifier	Justification
Yes	Projected	According to an analysis of niche models performed for this species, it is projected that during the next 30 years the available area with the necessary conditions for the development of this species will suffer a reduction of approximately 23 percent.

Systems

System: Terrestrial

Plant Specific

Plant Growth Forms
Shrub - large

Tree - small
Vines

Use and Trade

General Use and Trade Information

There is no information available about the use and trade of *Lycianthes anomala*.

Threats

Lycianthes anomala develops in rainforests. In Mexico, this type of vegetation has been strongly affected due to the change in land use, mainly for agriculture and livestock, climate change and excessive extraction of flora and fauna, which affects the capacity of the ecosystem to maintain its functioning, in addition to the growth of urban areas, forest fires and logging called "ant", which is carried out to obtain firewood and charcoal (FMCN 2009, CONABIO 2019). It has been estimated that Mexico has lost more than 50% of its original coverage. The rate of deforestation reported for 1993-2002 was 523,639 hectares per year, with tropical rainforests being the most affected (FMCN 2009). The loss of biodiversity in Costa Rica is caused by different threats, of which we can mention the change in land use due to agricultural and livestock activities, the illegal extraction of natural resources, forest fires, the increase in urban areas and infrastructure and climate change (SINAC 2014). The causes of the loss of biodiversity in Panama are associated with economic activities, the decrease in forest cover is caused by the expansion of agricultural and livestock areas, mainly in places with high poverty rates, in addition to the growth of the areas urban and tourist. Although the rate of deforestation at the national level was reduced during the period 1992-2000, there are still areas of the country with strong pressure due to the logging of timber species. It is important to mention that one of the threats that drive deforestation are mining activities, since the extraction of gold and copper in the open generates great damage to ecosystems (ANAM 2014).

Threats Classification Scheme

The threats to this species are unknown. false

Threat	Timing	Scope	Severity	Impact Score
1.1. Residential & commercial development -> Housing & urban areas	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
2.1.3. Agriculture & aquaculture -> Annual & perennial non-timber crops -> Agro-industry farming	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
2.3.3. Agriculture & aquaculture -> Livestock farming & ranching -> Agro-industry grazing, ranching or farming	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7
5.3.1. Biological resource use -> Logging & wood harvesting -> Intentional use: (subsistence/small scale) [harvest]	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
5.3.4. Biological resource use -> Logging & wood harvesting -> Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
7.1.1. Natural system modifications -> Fire & fire suppression -> Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7

Conservation

According to the collection records, *Lycianthes anomala* is within the protected natural areas: Parque Nacional Cañón del Río Blanco (Veracruz), Reserva Natural Cerro Mombachito La Vieja (Nicaragua) and Parque Nacional Chagres (Panama). There are not current *ex situ* sites worldwide (BGCI 2019).

Conservation Actions In- Place

Conservation sites identified	Note
Yes, over part of range	-

Occur in at least one PA	Note
Yes	*Lycianthes anomala* is within the protected natural areas: Parque Nacional Cañón del Río Blanco (Veracruz), Reserva Natural Cerro Mombachito La Vieja (Nicaragua) and Parque Nacional Chagres (Panama).

Percentage of population protected by PAs (0-100)	Note
1-10	Although *Lycianthes anomala* has a wide distribution, it is not found within many natural protected areas.

Subject to ex-situ conservation	Note
No	There are not current ex situ sites worldwide.

Subject to recent education and awareness programmes	Note
Unknown	-

Included in international legislation	Note
Unknown	-

Important Conservation Actions Needed

Conservation Actions	Note
6.1. Livelihood, economic & other incentives -> Linked enterprises & livelihood alternatives	-
6.4. Livelihood, economic & other incentives -> Conservation payments	-

Research Needed

Research	Note
3.4. Monitoring -> Habitat trends	-

Evaluación No. 34

Lycianthes armentalis - J.L.Gentry

PLANTAE - TRACHEOPHYTA - MAGNOLIOPSIDA - SOLANALES - SOLANACEAE - *Lycianthes armentalis*

Common Names: No Common Names
Synonyms: No Synonyms

Taxonomic Note:
According to Tropicos (2019), *Lycianthes armentalis* J. L. Gentry is an accepted name for this species. This species has been confused with *Lycianthes sideroxyloides* Schlecht. in herbaria. It differs from that species by its longer calyx appendages, unequal stamens, and fewer flowers in the inflorescences (Gentry & Standley 1974).

Red List Status
LC - Least Concern, (IUCN version 3.1)

Red List Assessment

Assessment Information

Date of Assessment: 2019-05-21

Assessor(s): Valentín-Martínez, D. & Rodríguez Contreras, A.

Reviewer(s): Samain, M.-S.

Regions: Global

Assessment Rationale

Lycianthes armentalis is a shrub, small tree or climbing shrub from Mexico, Guatemala, Belize and Honduras. The taxon has an extent of occurrence of 506,658.421 km² and an area of occupancy of 352 km². It is not currently experiencing any severe impact, and no significant future threats have been identified for the taxon. *Lycianthes armentalis* is assessed as Least Concern (LC).

Distribution

Geographic Range

Lycianthes armentalis is an endemic shrub, small tree or climbing shrub from Mexico, Guatemala, Belize and Honduras. In Mexico, this species is distributed in the Southern and southeast Mexico states Oaxaca, Chiapas, Veracruz, Campeche, Yucatán and Quintana Roo; in Guatemala it has been reported for the departments of Baja Verapaz, Huehuetenango and Petén; in Belize in the department of Cayo while in Honduras near the cities of San Pedro Sula and Tegucigalpa (Gentry & Standley 1974, Nee 1986, Villaseñor 2016, Martínez *et al.* 2017, GBIF 2019, Montero-Castro data 2019). The taxon has an extent of occurrence (EOO) of 506,658.421 km² and an area of occupancy (AOO) of 352 km².

Area of Occupancy (AOO)

Estimated area of occupancy (AOO)	Justification

- in km2	
352	AOO calculated with GeoCAT using Montero-Castro data (2019) and GBIF (2019).

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO)- in km2	EOO estimate calculated from Minimum Convex Polygon	Justification
506658.421	true	EOO calculated with GeoCAT using Montero-Castro data (2019) and GBIF (2019).

Very restricted AOO or number of locations (triggers VU D2)

Very restricted in area of occupancy (AOO) and/or # of locations	Justification
No	It is estimated that this species occurs in more than twenty locations.

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 0

Elevation Upper Limit (in metres above sea level): 1300

Map Status

Map Status	Use map from previous assessment	How the map was created, including data sources/methods used:	Please state reason for map not available:	Data Sensitive?	Justification	Geographic range this applies to:	Date restriction imposed:
Done	-	Prepared with GeoCAT using Montero-Castro Data (2019) and GBIF (2019).	-	-	-	-	-

Biogeographic Realms

Biogeographic Realm: Neotropical

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Belize	Extant	Native	-	Resident

Guatemala	Extant	Native	-	Resident
Honduras	Extant	Native	-	Resident
Mexico	Extant	Native	-	Resident
Mexico -> Campeche	Extant	Native	-	Resident
Mexico -> Chiapas	Extant	Native	-	Resident
Mexico -> Oaxaca	Extant	Native	-	Resident
Mexico -> Quintana Roo	Extant	Native	-	Resident
Mexico -> Veracruz	Extant	Native	-	Resident
Mexico -> Yucatán	Extant	Native	-	Resident

Population

There is no information available about the population size of *Lycianthes armentalis*.

Population Information

Current Population Trend: Unknown

Habitats and Ecology

Lycianthes armentalis is a shrub, small tree or climbing shrub to 1-7 m tall. It grow at an altitude range of 0-1300 m. It lives in oak forest, tropical deciduous forest and rainforests associated with *Quercus*, *Manilkara, Trichilia* and *Bursera*. It grows on the slopes of the hills on black and brown soils, both clayey and stony (Gentry & Standley 1974, Nee 1986, Montero-Castro data 2019). Flowering occurs during the month of July (Nee 1986).

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
1.4. Forest -> Forest - Temperate	Resident	Suitable	-
1.5. Forest -> Forest - Subtropical/Tropical Dry	Resident	Suitable	-
1.6. Forest -> Forest - Subtropical/Tropical Moist Lowland	Resident	Suitable	-

Continuing Decline in Habitat

Continuing decline in area, extent and/or quality of habitat?	Qualifier	Justification
Yes	-	According to an analysis of niche models performed for this species, it is projected that during the next 30 years the available area with the necessary conditions for the development of this species will suffer a reduction of approximately 6 percent.

Systems

System: Terrestrial

Plant Specific

Plant Growth Forms
Shrub - large
Shrub - small
Tree - small
Vines

Use and Trade

General Use and Trade Information

No use/trade information for this species: true

There is no information available about the use and trade of *Lycianthes armentalis*.

Threats

Lycianthes armentalis has been recorded many times. Adittionally, there are still areas of well conserved habitat. Despite change in land use is occurring across its range, it is not considered to currently be significantly impacted by the habitat loss.

Threats Classification Scheme

Threat	Timing	Scope	Severity	Impact Score
2.1.3. Agriculture & aquaculture -> Annual & perennial non-timber crops -> Agro-industry farming	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
2.3.3. Agriculture & aquaculture -> Livestock farming & ranching -> Agro-industry grazing, ranching or farming	Ongoing	Minority (<50%)	Rapid Declines	Medium Impact: 6
5.3.4. Biological resource use -> Logging & wood harvesting -> Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
6.1. Human intrusions & disturbance -> Recreational activities	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5

Conservation

According to the distribution points (GBIF 2019, Montero-Castro 2019), *Lycianthes armentalis* is found within some protected natural areas: Reserva de la Biosfera Los Tuxtlas (Veracruz), Parque Nacional Cañon del Sumidero (Chiapas), Reserva de la Biosfera Calakmul (Campeche), Reserva de la Biosfera Sian Ka´an (Quintana Roo), Reserva de Biosfera Maya (Guatemala) and Biotopo del Quetzal (Guatemala). There are not current *ex situ* sites worldwide (BGCI 2019).

Conservation Actions In- Place

Conservation sites identified	Note
Yes, over part of range	-

Occur in at least one PA	Note

Yes	*Lycianthes armentalis* is found within some protected natural areas: Reserva de la Biosfera Los Tuxtlas (Veracruz), Parque Nacional Cañon del Sumidero (Chiapas), Reserva de la Biosfera Calakmul (Campeche), Reserva de la Biosfera Sian Ka´an (Quintana Roo), Reserva de Biosfera Maya (Guatemala) and Biotopo del Quetzal (Guatemala).

Percentage of population protected by PAs (0-100)	Note
31-40	Although *Lycianthes armentalis* is found in several protected natural areas, most of the records are found in Reserva de la Biosfera Calakmul (Campeche).

Subject to ex-situ conservation	Note
No	There are not current ex situ sites worldwide.

Important Conservation Actions Needed

Conservation Actions	Note
6.1. Livelihood, economic & other incentives -> Linked enterprises & livelihood alternatives	-
6.4. Livelihood, economic & other incentives -> Conservation payments	-

Research Needed

Research	Note
3.4. Monitoring -> Habitat trends	-

Evaluación No. 35

Lycianthes arrazolensis - (J.M.Coult. & Donn.Sm.) Bitter

PLANTAE - TRACHEOPHYTA - MAGNOLIOPSIDA - SOLANALES - SOLANACEAE - *Lycianthes arrazolensis*

Common Names: No Common Names
Synonyms: Solanum arrazolense J.M.Coult. & Donn.Sm.

Taxonomic Note:
According to Tropicos (2019), *Lycianthes arrazolensis* (J. M. Coult. & Donn. Sm.) Bitter is an accepted name for this species. *Lycianthes arrazolensis* is a species very similar morphologically with *Lycianthes tricolor* and its relation has been a little conflictive since it is difficult to distinguish them if you do not have ripe fruit and in some cases hybridization is suspected, so more studies are needed in this regard than resolve the relationships between these species (Reyes 2015).There is a wide range of morphological variation within *Lycianthes arrazolensis*, especially in leaf size, leaf shape, and density of pubescence. This is particularly true of populations in the state of Oaxaca and Guerrero where small-leaved forms with very dense pubescence as well as large-leaved forms with sparse pubescence are found. The populations with larger leavesand sparser pubescence are usually found below 1,500 m, while those with denser pubescence are usually found above 2,000 m (Dean *et al.* 2017).

Red List Status
LC - Least Concern, (IUCN version 3.1)

Red List Assessment

Assessment Information

Date of Assessment: 2019-05-27

Regions: Global

Assessment Rationale

Lycianthes arrazolensis is a shrub from Mexico, Guatemala, El Salvador, Honduras and Nicaragua. In Mexico, this species is distributed in the states of Jalisco, Michoacán, Mexico State, Guerrero, Morelos, Oaxaca and Chiapas, in Guatemala it is found in the departments of Alta Verapaz, Sacatepéquez, Quetzaltenango, Chimaltenango and Huehuetenango, it has also been reported for the departments of Baja Verapaz, San Marcos, Sololá, Chiquimula and Suchitepéquez, in El Salvador it is found in the departaments of Ahuachapán, Sonsonate, Santa Ana, La Libertad, El Salvador, Cuscatlán and Morazán, while in Honduras it has been reported for the departaments of Lempira, Ocotepeque and Tegucigalpa. The taxon has an extent of occurrence (EOO) of 399,140.935 km² and an area of occupancy (AOO) of 512 km². It is calculated to occur in between ten to twelve locations. The main threats for the taxon range are deforestation, agriculture, forest fires, human settlements and cattle raising. *Lycianthes arrazolensis* is assessed as Least Concern (LC).

Distribution

Geographic Range

Lycianthes arrazolensis is a shrub from Mexico, Guatemala, El Salvador, Honduras and Nicaragua (Gentry & Standley 1974, Dean *et al.* 2017, GBIF 2019, Montero-Castro data 2019, Tropicos 2019). In Mexico, this species is distributed in the states of Jalisco, Michoacán, Mexico State, Guerrero, Morelos, Oaxaca and Chiapas, in Guatemala it is found in the departments of Alta Verapaz, Sacatepéquez, Quetzaltenango, Chimaltenango and

Huehuetenango, it has also been reported for the departments of Baja Verapaz, San Marcos, Sololá, Chiquimula and Suchitepéquez, in El Salvador it is found in the departaments of Ahuachapán, Sonsonate, Santa Ana, La Libertad, El Salvador, Cuscatlán and Morazán, while in Honduras it has been reported for the departaments of Lempira, Ocotepeque and Tegucigalpa (Gentry & Standley 1974, Villaseñor 2016, Martínez *et al.* 2017, GBIF 2019, Montero-Castro data 2019). The taxon has an extent of occurrence (EOO) of 399,140.935 km² and an area of occupancy (AOO) of 512 km².

Area of Occupancy (AOO)

Estimated area of occupancy (AOO) - in km2	Justification
512	AOO calculated with GeoCAT using Montero-Castro data (2019) and GBIF (2019).

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO)- in km2	EOO estimate calculated from Minimum Convex Polygon	Justification
399140.935	true	EOO calculated with GeoCAT using Montero-Castro data (2019) and GBIF (2019).

Very restricted AOO or number of locations (triggers VU D2)

Very restricted in area of occupancy (AOO) and/or # of locations	Justification
No	This species has an area of occupancy of 332 km2 and it is calculated to occur in more than twenty locations.

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 500

Elevation Upper Limit (in metres above sea level): 3000

Map Status

Map Status	Use map from previous assessment	How the map was created, including data sources/methods used:	Please state reason for map not available:	Data Sensitive?	Justification	Geographic range this applies to:	Date restriction imposed:
Done	-	Prepared with GeoCAT using Montero-Castro data (2019) and GBIF (2019).	-	-	-	-	-

Biogeographic Realms

Biogeographic Realm: Neotropical

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
El Salvador	Extant	Native	-	Resident
Guatemala	Extant	Native	-	Resident
Honduras	Extant	Native	-	Resident
Mexico	Extant	Native	-	Resident
Mexico -> Chiapas	Extant	Native	-	Resident
Mexico -> Guerrero	Extant	Native	-	Resident
Mexico -> Jalisco	Extant	Native	-	Resident
Mexico -> Michoacán	Extant	Native	-	Resident
Mexico -> Morelos	Extant	Native	-	Resident
Mexico -> México State	Extant	Native	-	Resident
Mexico -> Oaxaca	Extant	Native	-	Resident
Nicaragua	Extant	Native	-	Resident

Population

There is no information available about the population of *Lycianthes arrazolensis*.

Population Information

Current Population Trend: Unknown

Habitats and Ecology

Lycianthes arrazolensis is a shrub to 1-4 m tall. It grow at an altitude range of 500-3000 m. It lives in oak forest, pine forest, pine-oak forest, abies-pine forest, mountain cloud forest and deciduous or semi-deciduous tropical forest associated with *Quercus*, *Pinus, Abies, Alnus, Cleyera, Clethra, Carpinus, Liquidambar* and *Piper*. It grows on the humid and shaded hillsides and ravines of the hills on brown and black soils, both clayey and sandy (Gentry & Standley 1974, Dean et al. 2017, Montero-Castro 2019, Tropicos 2019). This species has been collected in flower during the months of February to October while the specimens collected in fruit have been reported during the course of the year January-December (Dean *et al.* 2017).

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
1.4. Forest -> Forest - Temperate	Resident	Suitable	-
1.5. Forest -> Forest - Subtropical/Tropical Dry	Resident	Suitable	-
1.9. Forest -> Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Continuing Decline in Habitat

Continuing decline in area, extent and/or	Qualifier	Justification

quality of habitat?		
Yes	Projected	According to an analysis of niche models performed for this species, it is projected that during the next 30 years the available area with the necessary conditions for the development of this species will suffer a fairly significant reduction of approximately 47 percent.

Systems

System: Terrestrial

Plant Specific

Plant Growth Forms
Shrub - large
Shrub - small

Use and Trade

General Use and Trade Information

No use/trade information for this species: true

There is no information available about the use and trade of *Lycianthes arrazolensis*.

Threats

Lycianthes arrazolensis develops is the mountain cloud forest. In Mexico, these forests occupy less than 1% of the national territory, which is why it is considered the most threatened terrestrial ecosystem (CONABIO 2010, González-Espinosa *et al.* 2012). Particularly in the state of Chiapas, the strongest threats are deforestation, human settlements, livestock and agriculture, where shade coffee crops are very frequent (Navarrete *et al.* 2010). In addition, some research reveals that in the state of Chiapas native forests suffered a 50% reduction in the period from 1975 to 2000 (Cayuela *et al.* 2006). Another type of vegetation where *Lycianthes arrazolensis* develops is the temperate forest, this ecosystem has been strongly affected due to deforestation, agriculture, forest fires, livestock and climate change (CONABIO 2019). In the period from 1970 to 1990, Mexico lost 14% of the coniferous forests, while the hardwood forests suffered a reduction of 9.3% (Sánchez et al. 2003). In 2017, 726,361.21 hectares were affected by forest fires, with the states of Michoacán, Mexico State, Jalisco, Chiapas and Oaxaca having the highest number of fires (CONAFOR 2017). In Mexico, the states of Jalisco, Chiapas and Michoacán are among the main livestock producers (SIAP 2017). The causes of the loss of biodiversity in Guatemala are related to economic activities especially agriculture and livestock as well as forest fires and human settlements (INAB & IARNA-URL 2012, CONAP 2014). It is estimated that during the period 2006-2010 the forest cover had a loss of 38,597 hectares per year due to deforestation, while during the period 2001-2012 there were 758,382 forest fires affecting around 115,385 hectares of forest with an average of 9,613 ha / year (CONAP 2014).The loss of biodiversity in Honduras is mainly due to the destruction or fragmentation of the habitat as a result of deforestation, infrastructure construction and pollution in general, as well as fragmentation, other frequent threats are the overexploitation of resources and the global climate change. In the country, coniferous forests are classified as vulnerable, although it has been documented that they generate the most environmental services in the country. The change in land use implies the conversion of forests to agricultural and livestock fields, which are considered as the main causes of deforestation. Honduras has one of the highest rates of deforestation in the world, it is estimated that between 34,000 and 58,000 hectares are lost annually as a result of illegal logging and other improper forest management practices; another major negative impact is forest fires, it is estimated that more than 62,000 hectares of forest are affected annually (DiBio 2017).

Threats Classification Scheme

Threat	Timing	Scope	Severity	Impact

				Score
2.1.3. Agriculture & aquaculture -> Annual & perennial non-timber crops -> Agro-industry farming	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
2.3.3. Agriculture & aquaculture -> Livestock farming & ranching -> Agro-industry grazing, ranching or farming	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7
5.3.2. Biological resource use -> Logging & wood harvesting -> Intentional use: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
5.3.4. Biological resource use -> Logging & wood harvesting -> Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8

Conservation

According to the collection points, *Lycianthes arrazolensis* is found within some protected natural areas: Área de protección de flora y fauna Corredor Biológico Chichinautzin (Morelos), Reserva de la Biosfera El Triunfo (Chiapas), Reserva de la Biosfera Volcán Tacaná (Chiapas), Parque Nacional Montecristo (El Salvador), Parque Nacional Cerro Verde (El Salvador), Parque Nacional Celaque (Honduras) and Reserva Natural Tisey-La Estanzuela (Nicaragua). There are not current *ex situ* sites worldwide (BGCI 2019).

Conservation Actions In- Place

Conservation sites identified	Note
Yes, over part of range	-

Occur in at least one PA	Note
Yes	*Lycianthes arrazolensis* is found within some protected natural areas: Área de protección de flora y fauna Corredor Biológico Chichinautzin (Morelos), Reserva de la Biosfera El Triunfo (Chiapas), Reserva de la Biosfera Volcán Tacaná (Chiapas), Parque Nacional Montecristo (El Salvador), Parque Nacional Cerro Verde (El Salvador), Parque Nacional Celaque (Honduras) and Reserva Natural Tisey-La Estanzuela (Nicaragua).

Percentage of population protected by PAs (0-100)	Note
21-30	Although *Lycianthes arrazolensis* is found in several protected natural areas, collection records for this species within protected areas are very few.

Subject to ex-situ conservation	Note
No	There are not current ex situ sites worldwide.

Subject to recent education and awareness programmes	Note
Unknown	-

Included in international legislation	Note
Unknown	-

Important Conservation Actions Needed

Conservation Actions	Note
6.1. Livelihood, economic & other incentives -> Linked enterprises & livelihood alternatives	-

6.4. Livelihood, economic & other incentives -> Conservation payments	-

Research Needed

Research	Note
3.4. Monitoring -> Habitat trends	-

Evaluación No. 36

Lycianthes geminiflora - (M.Martens & Galeotti) Bitter

PLANTAE - TRACHEOPHYTA - MAGNOLIOPSIDA - SOLANALES - SOLANACEAE - *Lycianthes geminiflora*

Common Names: Hierba mora (Spanish; Castilian)
Synonyms: *Solanum geminiflorum* M.Martens & Galeotti

Taxonomic Note:
According to Tropicos (2019) and The Plant List (2019), *Lycianthes geminiflora* (M. Martens & Galeotti) Bitter is an accepted name for this species. *Lycianthes geminiflora* is closely related to *Lycianthes heteroclita*, but occurs at higher elevations and has a smaller calyx. The relationship between the two species needs study (Dean & Reyes 2018).

Red List Status
LC - Least Concern, (IUCN version 3.1)

Red List Assessment

Assessment Information

Date of Assessment: 2019-05-29

Regions: Global

Assessment Rationale

Lycianthes geminiflora is an endemic shrub or small tree from Mexico. In Mexico, this species is distributed in the states of Chiapas, Hidalgo, Oaxaca, Puebla and Veracruz. The taxon has an extent of occurrence of 129,384.328 km² and an area of occupancy of 196 km². However, it is likely that the AOO is higher than calculated, remaining below 500 km². It is calculated to occur in between five to seven locations. The main threats for the taxon range are deforestation, agriculture, forest fires, human settlements and cattle raising. *Lycianthes geminiflora* is assessed as Least Concern (LC).

Distribution

Geographic Range

Lycianthes geminiflora is an endemic shrub or small tree from Mexico (Nee 1986, Reyes 2015, Dean & Reyes 2018, Montero-Castro data 2019). In Mexico, this species is distributed in the states of Chiapas, Hidalgo, Oaxaca, Puebla and Veracruz (Nee 1986, Rodríguez 2004, Villaseñor 2016, Martínez *et al.* 2017, Montero-Castro data 2019). The taxon has an extent of occurrence of 129,384.328 km² and an area of occupancy of 196 km². However, it is likely that the AOO is higher than calculated, remaining below 500 km². It is calculated to occur in between five to seven locations. The main threats for the taxon range are deforestation, agriculture, forest fires, human settlements and cattle raising.

Area of Occupancy (AOO)

Estimated area of occupancy (AOO) - in km2	Justification

196	AOO calculated with GeoCAT using Montero-Castro data (2019) and GBIF (2019).

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO)- in km2	EOO estimate calculated from Minimum Convex Polygon	Justification
129384.328	true	EOO calculated with GeoCAT using Montero-Castro data (2019) and GBIF (2019).

Locations Information

Number of Locations	Justification
15	-

Very restricted AOO or number of locations (triggers VU D2)

Very restricted in area of occupancy (AOO) and/or # of locations	Justification
No	The taxon has an area of occupancy of 196 km2 and it is calculated to occur in between five to seven locations.

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 800

Elevation Upper Limit (in metres above sea level): 2600

Map Status

Map Status	Use map from previous assessment	How the map was created, including data sources/methods used:	Please state reason for map not available:	Data Sensitive?	Justification	Geographic range this applies to:	Date restriction imposed:
Done	-	Prepared with GeoCAT using Montero-Castro data (2019) and GBIF (2019).	-	-	-	-	-

Biogeographic Realms

Biogeographic Realm: Neotropical

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Mexico -> Chiapas	Extant	Native	-	Resident
Mexico -> Hidalgo	Extant	Native	-	Resident
Mexico -> Oaxaca	Extant	Native	-	Resident
Mexico -> Puebla	Extant	Native	-	Resident
Mexico -> Veracruz	Extant	Native	-	Resident

Population

There is no information available about the population of *Lycianthes geminiflora*.

Habitats and Ecology

Lycianthes geminiflora is a shrub or samall tree to 1-6 m tall and with a stem up to 10 cm in diameter. It grow at an altitude range of 800-2600 m. It lives in pine-oak forest, mountain cloud forest, tropical deciduous forest and rainforests associated with *Quercus*, *Pinus, Liquidambar, Carpinus caroliniana, Juglans pyriformis, Cojoba arborea, Ulmus mexicana* and *Oreomunnea mexicana* (Nee 1986, Reyes 2015, Montero-Castro data 2019). It grows on the slopes and humid gullies of the hills, on red, black and yellow soils, both rocky and clayey (Montero-Castro data 2019). The flowering of this species occurs throughout the year, but mainly during the months of May and June (Nee 1986).

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
1.4. Forest -> Forest - Temperate	Resident	Suitable	-
1.5. Forest -> Forest - Subtropical/Tropical Dry	Resident	Suitable	-
1.6. Forest -> Forest - Subtropical/Tropical Moist Lowland	Resident	Suitable	-
1.9. Forest -> Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Continuing Decline in Habitat

Continuing decline in area, extent and/or quality of habitat?	Qualifier	Justification
Yes	Projected	According to an analysis of niche models performed for this species, it is projected that during the next 30 years the available area with the necessary conditions for the development of this species will suffer a fairly significant reduction of approximately 52 percent.

Systems

System: Terrestrial

Plant Specific

Plant Growth Forms
Shrub - large
Tree - small

Use and Trade

General Use and Trade Information

There is no information available about the use and trade of *Lycianthes geminiflora*.

Threats

Lycianthes geminiflora develops in rainforests. In Mexico, rainforests have been strongly affected due to the change in land use destined mainly for agriculture and livestock, climate change and excessive extraction of flora and fauna, which affects the capacity of the ecosystem to maintain its functioning in addition to the growth of urban areas, forest fires and logging called "ant", which is carried out to obtain firewood and charcoal (FMCN 2009, CONABIO 2019). It has been estimated that Mexico has lost more than 50% of its original coverage. The rate of deforestation reported for 1993-2002 was 523,639 hectares per year, with tropical rainforests being the most affected (FMCN 2009). Another type of vegetation where *Lycianthes geminiflora* develops is the tropical decidous forest. This type of vegetation is very characteristic of some areas of the country because it covers large areas (Rzedowski 2006). Particularly in the state of Oaxaca, the tropical deciduous forest is one of the most representative types of vegetation due to the vast surface it occupies, however the permanence of this type of vegetation is strongly threatened due to agricultural and livestock expansion, in addition to the establishment of large-scale cash crops. It is important to mention that due to its characteristics, the deciduous tropical forest is less attractive compared to other types of vegetation, so there are fewer opportunities for its conservation (Meave et al., 2012). Another of the types of vegetation where *Lycianthes geminiflora* develops is the mountain cloud forest. In Mexico, these forests occupy less than 1% of the national territory, which is why it is considered the most threatened terrestrial ecosystem (CONABIO 2010, González-Espinosa *et al.* 2012). Particularly in the state of Chiapas, the strongest threats are deforestation, human settlements, livestock and agriculture, where shade coffee crops are very frequent (Navarrete *et al.* 2010). In addition, some research reveals that in the state of Chiapas native forests suffered a 50% reduction in the period from 1975 to 2000 (Cayuela *et al.* 2006). In 2017, 726,361.21 hectares were affected by forest fires, being Puebla, Chiapas and Oaxaca three of the states with the largest number of fires (CONAFOR 2017). In Mexico, the states of Veracruz and Chiapas are among the main livestock producers (SIAP 2017).

Threats Classification Scheme

Threat	Timing	Scope	Severity	Impact Score
1.1. Residential & commercial development -> Housing & urban areas	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
2.1.3. Agriculture & aquaculture -> Annual & perennial non-timber crops -> Agro-industry farming	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
2.3.3. Agriculture & aquaculture -> Livestock farming & ranching -> Agro-industry grazing, ranching or farming	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7
5.3.1. Biological resource use -> Logging & wood harvesting -> Intentional use: (subsistence/small scale) [harvest]	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
5.3.4. Biological resource use -> Logging & wood harvesting -> Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
7.1.1. Natural system modifications -> Fire & fire suppression -> Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7

Conservation

According to the collection records, *Lycianthes geminiflora* is found in the protected natural area: Parque Nacional Los Marmoles (Hidalgo). There are not current ex situ sites worldwide (BGCI 2019).

Conservation Actions In- Place

Conservation sites identified	Note
Yes, over part of range	-

Occur in at least one PA	Note
Yes	*Lycianthes geminiflora* is found in some protected natural areas: Parque Nacional Los Marmoles (Hidalgo), Reserva de la Biosfera La Sepultura (Chiapas) and Reserva de la Biosfera El Triunfo (Chiapas).

Percentage of population protected by PAs (0-100)	Note
1-10	The natural areas in which *Lycianthes geminiflora* is found have very few records.

Subject to ex-situ conservation	Note
No	There are not current ex situ sites worldwide.

Important Conservation Actions Needed

Conservation Actions	Note
6.1. Livelihood, economic & other incentives -> Linked enterprises & livelihood alternatives	-
6.4. Livelihood, economic & other incentives -> Conservation payments	-

Research Needed

Research	Note
3.4. Monitoring -> Habitat trends	-

Evaluación No. 37

Lycianthes surotatensis - Gentry

PLANTAE - TRACHEOPHYTA - MAGNOLIOPSIDA - SOLANALES - SOLANACEAE - *Lycianthes surotatensis*

Common Names: No Common Names
Synonyms: No Synonyms

Taxonomic Note:
According to Tropicos (2019) *Lycianthes surotatensis* Gentry is an accepted name for this species, however The Plant List (2019) considers it an unresolved name. *Lycianthes surotatensis* is very similar to *Lycianthes tricolor* in its pedicel length and corolla size. It differs from that species in having unnotched seeds and having glandular pubescence at least on the pedicels or calyx. In addition, the calyx length and calyx appendage length are usually longer in *Lycianthes surotatensis*. When this species was described by Gentry, he did not note the presence of glandular trichomes on the type specimen and concentrated instead on the dentate margins that are present on some of the leaves of the type specimen. However, the trichomes on the leaves, pedicels, and calyx of the type specimen are clearly glandular, and the character of the dentate leaf margins is not consistently present within the species and sometimes can occur in other species of series Tricolores (Dean *et al.* 2017).

Red List Status
LC - Least Concern, (IUCN version 3.1)

Red List Assessment

Assessment Information

Regions: Global

Assessment Rationale

Lycianthes surotatensis is an endemic shrub from Mexico, it is distributed in the states of Colima, Guerrero, Jalisco, Mexico State, Michoacán, Nayarit, Oaxaca, Querétaro, Sinaloa and Sonora. The species has an extent of occurrence of 519,964.285 km² and an area of occupancy of 180 km². It is calculated to occur in between five to six locations. The main threats for the taxon range are deforestation, agriculture, forest fires, human settlements and cattle raising. *Lycianthes surotatensis* is assessed as Least Concern (LC).

Distribution

Geographic Range

Lycianthes surotatensis is an endemic shrub from Mexico, it is distributed in the states of Colima, Guerrero, Jalisco, Mexico State, Michoacán, Nayarit, Oaxaca, Querétaro, Sinaloa and Sonora (Villaseñor 2016, Dean *et al.* 2017, Martínez *et al.* 2017). The species has an extent of occurrence of 519,964.285 km² and an area of occupancy of 180 km². However, it is likely that the AOO is higher than calculated, remaining below 500 km². It is calculated to occur in between five to six locations. The main threats for the taxon range are deforestation, agriculture, forest fires, human settlements and cattle raising.

Area of Occupancy (AOO)

Estimated area of occupancy (AOO) - in km2	Justification

180	AOO calculated with GeoCAT using Montero-Castro data (2019).

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO)- in km2	EOO estimate calculated from Minimum Convex Polygon	Justification
519964.285	true	EOO calculated with GeoCAT using Montero-Castro data (2019).

Locations Information

Number of Locations	Justification
15	The main threats for the taxon range are deforestation, agriculture, forest fires, human settlements and cattle raising.

Very restricted AOO or number of locations (triggers VU D2)

Very restricted in area of occupancy (AOO) and/or # of locations	Justification
No	This species occur in between five to six locations.

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 600

Elevation Upper Limit (in metres above sea level): 2200

Map Status

Map Status	Use map from previous assessment	How the map was created, including data sources/methods used:	Please state reason for map not available:	Data Sensitive?	Justification	Geographic range this applies to:	Date restriction imposed:
Done	-	Prepared with GeoCAT using Montero-Castro data (2019).	-	-	-	-	-

Biogeographic Realms

Biogeographic Realm: Neotropical

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Mexico -> Colima	Extant	Native	-	Resident
Mexico -> Guerrero	Extant	Native	-	Resident
Mexico -> Jalisco	Extant	Native	-	Resident
Mexico -> Michoacán	Extant	Native	-	Resident
Mexico -> México State	Extant	Native	-	Resident
Mexico -> Nayarit	Extant	Native	-	Resident
Mexico -> Oaxaca	Extant	Native	-	Resident
Mexico -> Querétaro	Extant	Native	-	Resident
Mexico -> Sinaloa	Extant	Native	-	Resident
Mexico -> Sonora	Extant	Native	-	Resident

Population

There is no information available about the population of *Lycianthes surotatensis*.

Habitats and Ecology

Lycianthes surotatensis is a shrub to 1-3 m tall. It grow at an altitude range of 600-2200 m. It lives in pine-oak forest, oak forest, mountain cloud forest, tropical deciduous forest and tropical sub-deciduous forest associated with *Magnolia*, *Tilia*, *Carpinus*, *Ficus*, *Meliosma, Prunus*, *Quercus*, *Urera, Zinowiewia, Cupania dentata* and *Malvaviscus arboreus*. It grows on the shady canyons, ravines, and moist gullies on yellow and clay soils. This species has been collected in flower during the months of March to December and in fruit during February to December (Dean *et al.* 2017, Montero-Castro data 2019).

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
1.4. Forest -> Forest - Temperate	Resident	Suitable	-
1.5. Forest -> Forest - Subtropical/Tropical Dry	Resident	Suitable	-
1.9. Forest -> Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Continuing Decline in Habitat

Continuing decline in area, extent and/or quality of habitat?	Qualifier	Justification
Yes	Projected	According to an analysis of niche models performed for this species, it is projected that during the next 30 years the available area with the necessary conditions for the development of this species will suffer a reduction of approximately 26 percent.

Systems

System: Terrestrial

Plant Specific

Plant Growth Forms
Shrub - large
Shrub - small

Use and Trade

General Use and Trade Information

There is no information available about the use and trade of *Lycianthes surotatensis*.

Threats

In Mexico, the different types of vegetation have been strongly affected due to the change in land use, mainly for agriculture and livestock, climate change and excessive extraction of flora and fauna, which affects the capacity of the ecosystem to maintain its functioning, in addition to the growth of urban areas, forest fires and logging called "ant", which is carried out to obtain firewood and charcoal (FMCN 2009, CONABIO 2019). It has been estimated that Mexico has lost more than 50% of its original coverage. The rate of deforestation reported for 1993-2002 was 523,639 hectares per year (FMCN 2009). *Lycianthes surotatensis* occurs in the mountain cloud forest. In Mexico, these forests occupy less than 1% of the national territory, which is why it is considered the most threatened terrestrial ecosystem (CONABIO 2010, González-Espinosa *et al.* 2012). Another type of vegetation where *Lycianthes surotatensis* develops is the pine-oak forest, this ecosystem has been strongly affected due to deforestation, agriculture, forest fires, livestock and climate change (CONABIO 2019). In the period from 1970 to 1990, Mexico lost 14% of the coniferous forests, while the hardwood forests suffered a reduction of 9.3% (Sánchez *et al.* 2003). The tropical decidous forest is very characteristic of some areas of the country because it covers large areas (Rzedowski 2006). Particularly in the state of Oaxaca, the tropical deciduous forest is one of the most representative types of vegetation due to the vast surface it occupies. However, the permanence of this type of vegetation is strongly threatened due to agricultural and livestock expansion, in addition to the establishment of large-scale cash crops. It is important to mention that due to its characteristics, the deciduous tropical forest is less attractive compared to other types of vegetation, so there are fewer opportunities for its conservation (Meave *et al.* 2012). Some of the causes of the loss of biodiversity in the state of Jalisco have been the increase in population, about 9% of natural vegetation has been eliminated as a direct consequence of demographic growth, while another of the threats present in the state is the change of land use for agricultural or livestock purposes associated with forest fires (CONABIO 2017). In recent years, the growing demand for tequila by consumers has caused an increase in the cultivation of agave in some areas of the state of Jalisco, resulting in significant changes in the landscape (Gerritsen *et al.* 2011). In 2017, 726,361.21 hectares were affected by forest fires, with Guerrero, Jalisco, Mexico State, Michoacán and Oaxaca being some of the states with the highest number of fires (CONAFOR 2017).

Threats Classification Scheme

Threat	Timing	Scope	Severity	Impact Score
1.1. Residential & commercial development -> Housing & urban areas	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
2.1.3. Agriculture & aquaculture -> Annual & perennial non-timber crops -> Agro-industry farming	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
2.3.3. Agriculture & aquaculture -> Livestock farming & ranching -> Agro-industry grazing, ranching or farming	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7
5.3.1. Biological resource use -> Logging & wood harvesting -> Intentional use: (subsistence/small scale) [harvest]	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
5.3.4. Biological resource use -> Logging & wood harvesting -> Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8

7.1.1. Natural system modifications -> Fire & fire suppression -> Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7

Conservation

According to the collection records, this species is found within the following protected natural areas: Reserva de la Biósfera Sierra Gorda (Querétaro) and Reserva de la Biósfera Sierra de Manantlán (Jalisco). The number of *ex situ* sites worldwide is one (BGCI 2019).

Conservation Actions In- Place

Conservation sites identified	Note
Yes, over part of range	-

Occur in at least one PA	Note
Yes	This species is found within the following protected natural areas: Reserva de la Biósfera Sierra Gorda (Querétaro) and Reserva de la Biósfera Sierra de Manantlán (Jalisco).

Percentage of population protected by PAs (0-100)	Note
11-20	Although there are several natural protected areas throughout their distribution, these species are mostly outside them.

Subject to ex-situ conservation	Note
Yes	The number of ex situ sites worldwide is one.

Important Conservation Actions Needed

Conservation Actions	Note
6.1. Livelihood, economic & other incentives -> Linked enterprises & livelihood alternatives	-
6.4. Livelihood, economic & other incentives -> Conservation payments	-

Research Needed

Research	Note
3.4. Monitoring -> Habitat trends	-

Evaluación No. 38

Lycianthes tricolor - (Sessé & Moc. ex Dunal) Bitter

PLANTAE - TRACHEOPHYTA - MAGNOLIOPSIDA - SOLANALES - SOLANACEAE - *Lycianthes tricolor*

Common Names: No Common Names
Synonyms: *Solanum tricolor* Sessé & Moc. ex Dunal; *Lycianthes tricolor* (Dunal) Bitter var. *primoaurata* Bitter.; *Lycianthes tricolor* (Dunal) Bitter var. *hirsutior* Bitter.; *Lycianthes tricolor* (Dunal) Bitter var. *flavidipila* Bitter.; *Solanum monodynamum* Visiani.; *Solanum nyctaginoides* Dunal.; *Solanum pilosissimum* M. Martens & Galeotti.; *Solanum quadriflorum* M. Martens & Galeotti.

Taxonomic Note:
According to Tropicos (2019) and The Plant List (2019), *Lycianthes tricolor* (Sessé & Moc. Ex Dunal) Bitter is an accepted name for this species. *Lycianthes tricolor* has been confused with *Lycianthes arrazolensis*, from which it can be separated based on seed characters. In addition, usually the flowering pedicels of *Lycianthes tricolor* are 1.3–3.3 mm long (becoming much longer in fruit), and this characteristic can be helpful in identifying specimens that lack seeds. However, shorter pedicels (rarely as short as 0.8 mm long) are present on several Guatemalan and Chiapas specimens (Dean *et al.* 2017).

Red List Status
LC - Least Concern, (IUCN version 3.1)

Red List Assessment

Assessment Information

Regions: Global

Distribution

Geographic Range

Lycianthes tricolor is an endemic shrub or vine from Mexico and Guatemala, it is distributed in the states of Chiapas, Guerrero, Jalisco, Michoacán and Oaxaca (Villaseñor 2016, Dean *et al.* 2017), while in Guatemala it has been collected in the departments of Chimaltenango, Guatemala, Huehuetenango, Quezaltenango, Quiché, Sacatepéquez, San Marcos, Sololá and Totonicapán (Gentry & Standley 1974). The species has an extent of occurrence of 157,522.931 km² and an area of occupancy of 184 km². It is calculated to occur in seventeen locations. The main threats for the taxon range are deforestation, agriculture, forest fires, cattle raising and human settlements.

Area of Occupancy (AOO)

Estimated area of occupancy (AOO) - in km2	Justification
184	AOO calculated with GeoCAT using Montero-Castro data (2019).

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO)- in km2	EOO estimate calculated from Minimum Convex Polygon	Justification

157522.931	true	EOO calculated with GeoCAT using Montero-Castro data (2019).

Locations Information

Number of Locations	Justification
17	The main threats for the taxon range are deforestation, agriculture, forest fires, cattle raising and human settlements.

Very restricted AOO or number of locations (triggers VU D2)

Very restricted in area of occupancy (AOO) and/or # of locations	Justification
No	This species is calculated to occur in between five to eight locations.

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 1700

Elevation Upper Limit (in metres above sea level): 3000

Map Status

Map Status	Use map from previous assessment	How the map was created, including data sources/methods used:	Please state reason for map not available:	Data Sensitive?	Justification	Geographic range this applies to:	Date restriction imposed:
Done	-	Prepared with GeoCAT using Montero-Castro data (2019).	-	-	-	-	-

Biogeographic Realms

Biogeographic Realm: Neotropical

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Guatemala	Extant	Native	-	Resident
Mexico -> Chiapas	Extant	Native	-	Resident
Mexico -> Guerrero	Extant	Native	-	Resident
Mexico -> Jalisco	Extant	Native	-	Resident

Mexico -> Michoacán	Extant	Native	-	Resident
Mexico -> Oaxaca	Extant	Native	-	Resident

Population

There is no information available about the population of *Lycianthes tricolor*.

Habitats and Ecology

Lycianthes tricolor is a shrub to 1-4 m tall, sometimes vining or arching through neighboring vegetation. It grow at an altitude range of 1700-3000 m. It lives in pine-oak forest, mountain cloud forest, *Abies* forest and disturbed agricultural areas associated with *Clethra* and *Piper*. It grows on the slopes and ravines of the hills (Gentry & Standley 1974, Dean *et al.* 2017, Montero-Castro data 2019).

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
1.4. Forest -> Forest - Temperate	Resident	Suitable	-
1.9. Forest -> Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Continuing Decline in Habitat

Continuing decline in area, extent and/or quality of habitat?	Qualifier	Justification
Yes	Projected	According to an analysis of niche models performed for this species, it is projected that during the next 30 years the available area with the necessary conditions for the development of this species will suffer a fairly significant reduction of approximately 52 percent.

Systems

System: Terrestrial

Plant Specific

Plant Growth Forms
Shrub - large
Shrub - small

Use and Trade

General Use and Trade Information

There is no information available about the use and trade of *Lycianthes tricolor*.

Threats

Lycianthes tricolor occurs in the mountain cloud forest. In Mexico, these forests occupy less than 1% of the national territory, which is why it is considered the most threatened terrestrial ecosystem (CONABIO 2010, González-Espinosa *et al.* 2012). Particularly in the state of Chiapas, the strongest threats are deforestation,

human settlements, livestock and agriculture, where shade coffee crops are very frequent (Navarrete *et al.* 2010). In addition, some research reveals that in the state of Chiapas native forests suffered a 50% reduction in the period from 1975 to 2000 (Cayuela *et al.* 2006). Another type of vegetation where *Lycianthes tricolor* develops is the pine-oak forest, this ecosystem has been strongly affected due to deforestation, agriculture, forest fires, livestock and climate change (CONABIO 2019). In the period from 1970 to 1990, Mexico lost 14% of the coniferous forests, while the hardwood forests suffered a reduction of 9.3% (Sánchez et al. 2003). In 2017, 726,361.21 hectares were affected by forest fires, being Chiapas, Guerrero, Michoacán and Oaxaca some of the states with the highest number of fires (CONAFOR 2017). The causes of the loss of biodiversity in Guatemala are related to economic activities, especially agriculture and livestock, as well as forest fires and human settlements (INAB & IARNA-URL 2012, CONAP 2014). It is estimated that during the period 2006-2010 the forest cover had a loss of 38,597 hectares per year due to deforestation, while during the period 2001-2012 there were 758,382 forest fires affecting around 115,385 hectares of forest with an average of 9,613 ha/year (CONAP 2014).

Conservation

According to the collection records, *Lycianthes tricolor* is within the protected natural areas: Reserva de la Biósfera Sierra de Manantlán (Jalisco), Reserva de la Biósfera Volcán Tacaná (Chiapas) and Área de Uso Multiple Cuenca de Lago Atitlán (Guatemala). The number of *ex situ* sites worldwide is one (BGCI 2019).

Conservation Actions In- Place

Conservation sites identified	Note
Yes, over part of range	-

Occur in at least one PA	Note
Yes	*Lycianthes tricolor* is within the protected natural areas: Reserva de la Biósfera Sierra de Manantlán (Jalisco), Reserva de la Biósfera Volcán Tacaná (Chiapas) and Área de Uso Multiple Cuenca de Lago Atitlán (Guatemala).

Percentage of population protected by PAs (0-100)	Note
1-10	The reported collections for this species within the protected natural areas are very few with respect to their total distribution.

Subject to ex-situ conservation	Note
Yes	The number of ex situ sites worldwide is one.

Important Conservation Actions Needed

Conservation Actions	Note
6.1. Livelihood, economic & other incentives -> Linked enterprises & livelihood alternatives	-
6.4. Livelihood, economic & other incentives -> Conservation payments	-

Research Needed

Research	Note
3.4. Monitoring -> Habitat trends	-

Evaluación No. 39

Solanum atitlanum - Roe

PLANTAE - TRACHEOPHYTA - MAGNOLIOPSIDA - SOLANALES - SOLANACEAE - *Solanum atitlanum*

Common Names: Tabaquillo (Spanish; Castilian)
Synonyms: No Synonyms

Taxonomic Note:
According to Tropicos (2019), *Solanum atitlanum* K. E. Roe is an accepted name for this species. *Solanum atitlanum* seems to be closely related to *Solanum axillifolium*. It is distinguished by the frequent absence o axillary leaves on mature plants, comparatively small, usually violet corollas and whitish or grayish tomentum on young stems (Roe 1967).

Red List Status
LC - Least Concern, (IUCN version 3.1)

Red List Assessment

Assessment Information

Date of Assessment: 2020-02-13

Assessor(s): Valentín-Martínez, D. & Rodríguez Contreras, A.

Reviewer(s): Samain, M.-S. & Oldfield, S.

Regions: Global

Assessment Rationale

Solanum atitlanum is an endemic shrub or small tree from Mexico, Guatemala, Honduras and Nicaragua. The extent of occurrence is 118,804.144 km². The area of occupancy of the taxon is 192 km². The taxon has between ten to twelve locations and the main threats that the distribution area presents are deforestation, agriculture, forest fires, livestock and human settlements. *Solanum atitlanum* is assessed as Least Concern (LC).

Distribution

Geographic Range

Solanum atitlanum is a shrub or small tree from Mexico, Guatemala, Honduras and Nicaragua (Gentry & Standley 1974, Roe 1967, Tropicos 2019). In Mexico it is present in the state of Oaxaca (Villaseñor 2016, Martínez *et al.* 2017). In Guatemala it is distributed in the departments of Huehuetenango, Alta Verapaz, Quezaltenango, Chimaltenango, Sololá, Guatemala and Santa Rosa (Gentry & Standley 1974, GBIF 2019). In Honduras it is located in the departments of Ocotepeque and Santa Bárbara (GBIF 2019), while in Nicaragua it has been registered from the departments of Madriz, Estelí, Jinotega, Nueva Segovia and Metagalpa (GBIF 2019, Tropicos 2019). The extent of occurrence is 118,804.144 km². The area of occupancy of the taxon is 192 km², but it is likely that the AOO of the species is a little higher than estimated, if the collection efforts were increased. The taxon has between ten to twelve locations and the main threats that the distribution area presents are deforestation, agriculture, forest fires, farming and human settlements.

Area of Occupancy (AOO)

Estimated area of occupancy (AOO) - in km2	Justification
192	AOO calculated with GeoCAT using GBIF data (2019).

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO)- in km2	EOO estimate calculated from Minimum Convex Polygon	Justification
118804.144	true	EOO calculated with GeoCAT using GBIF data (2019).

Locations Information

Number of Locations	Justification
12	The main threats that the distribution area presents are deforestation, agriculture, forest fires, farming and human settlements.

Very restricted AOO or number of locations (triggers VU D2)

Very restricted in area of occupancy (AOO) and/or # of locations	Justification
No	The taxon has between ten to twelve locations.

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 600

Elevation Upper Limit (in metres above sea level): 2000

Map Status

Map Status	Use map from previous assessment	How the map was created, including data sources/methods used:	Please state reason for map not available:	Data Sensitive?	Justification	Geographic range this applies to:	Date restriction imposed:
Done	-	Prepared with GeoCAT using GBIF data (2019).	-	-	-	-	-

Biogeographic Realms

Biogeographic Realm: Neotropical

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Guatemala	Extant	Native	-	Resident
Honduras	Extant	Native	-	Resident
Mexico -> Oaxaca	Extant	Native	-	Resident
Nicaragua	Extant	Native	-	Resident

Population

There is no information about the population dynamics of *Solanum atitlanum*.

Population Information

Current Population Trend: Unknown

Habitats and Ecology

Solanum atitlanum is a shrub or small tree of 2-15 m tall and stems up to 13 cm in diameter. It grows at an altitude range of 600-2000 m (Roe 1967, Tropicos 2019). It occurs in mountain cloud forest and pine forest associated with *Alnus acuminata*, *Juglans* and *Quercus*. It grows on the slopes of the hills (IBUNAM 2019). In Nicaragua, flowering occurs from July to October, while it can be found in fruit from August to November (Tropicos 2019).

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
1.4. Forest -> Forest - Temperate	Resident	Suitable	-
1.9. Forest -> Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Continuing Decline in Habitat

Continuing decline in area, extent and/or quality of habitat?	Qualifier	Justification
Yes	Projected	Based on a niche modeling analysis, it is projected that during the next 30 years the available area with the necessary conditions for the development of this species will suffer a reduction of approximately 50 percent.

Systems

System: Terrestrial

Plant Specific

Plant Growth Forms
Shrub - large
Tree - small

Use and Trade

General Use and Trade Information

There is no information about the use and trade of *Solanum atitlanum*.

Threats

In Guatemala, the causes of biodiversity decline are related to agriculture and farming, as well as forest fires and human settlements (INAB & IARNA-URL 2012, CONAP 2014). During the period 2006-2010, the forest coverage lost 38,597 hectares per year due to deforestation. In addition, during the period 2001-2012, there were 758,382 forest fires affecting around 115,385 hectares with an average of 9,613 ha/year (CONAP 2014). Likewise, the loss of biodiversity in Honduras is mainly due to the destruction or fragmentation of the habitat as a result of deforestation, infrastructure construction and pollution. Other frequent threats are the overexploitation of resources and the global climate change. Land use change implies the conversion of forests to agricultural and livestock fields, which are considered as the main causes of deforestation. Honduras has one of the highest rates of deforestation in the world; it is estimated that between 34,000 and 58,000 hectares are lost annually as a result of illegal logging and other improper forest management practices. Another major negative impact is forest fires; it is estimated that more than 62,000 hectares of forest are affected annually (DiBio 2017).

Threats Classification Scheme

Threat	Timing	Scope	Severity	Impact Score
1.1. Residential & commercial development -> Housing & urban areas	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
2.1.3. Agriculture & aquaculture -> Annual & perennial non-timber crops -> Agro-industry farming	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
2.3.2. Agriculture & aquaculture -> Livestock farming & ranching -> Small-holder grazing, ranching or farming	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
2.3.3. Agriculture & aquaculture -> Livestock farming & ranching -> Agro-industry grazing, ranching or farming	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7
5.3.1. Biological resource use -> Logging & wood harvesting -> Intentional use: (subsistence/small scale) [harvest]	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
5.3.4. Biological resource use -> Logging & wood harvesting -> Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
7.1.1. Natural system modifications -> Fire & fire suppression -> Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7

Conservation

According to the collection records, *Solanum atitlanum* occurs within the following protected natural areas: Área de Uso Multiple Cuenca de Lago Atitlán (Guatemala), Parque Nacional Celaque (Honduras), Reserva Natural Tepesomoto (Nicaragua), Reserva Natural Miraflor (Nicaragua) and Reserva Natural Volcán Yalí (Nicaragua). There are no current *ex situ* sites worldwide (BGCI 2019).

Conservation Actions In- Place

Conservation sites identified	Note

Yes, over part of range	-

Occur in at least one PA	Note
Yes	*Solanum atitlanum* occurs within the following protected natural areas: Área de Uso Multiple Cuenca de Lago Atitlán (Guatemala), Parque Nacional Celaque (Honduras), Reserva Natural Tepesomoto (Nicaragua), Reserva Natural Miraflor (Nicaragua) and Reserva Natural Volcán Yalí (Nicaragua).

Percentage of population protected by PAs (0-100)	Note
11-20	Although *Solanum atitlanum* grows within the boundaries of several natural protected areas, most collection records are reported outside them.

Subject to ex-situ conservation	Note
No	There are no ex situ sites worldwide.

Subject to recent education and awareness programmes	Note
Unknown	-

Included in international legislation	Note
Unknown	-

Subject to any international management/trade controls	Note
Unknown	-

Important Conservation Actions Needed

Conservation Actions	Note
6.1. Livelihood, economic & other incentives -> Linked enterprises & livelihood alternatives	-
6.4. Livelihood, economic & other incentives -> Conservation payments	-

Research Needed

Research	Note
3.4. Monitoring -> Habitat trends	-

Evaluación No. 40

Solanum chiapasense - K.E.Roe

PLANTAE - TRACHEOPHYTA - MAGNOLIOPSIDA - SOLANALES - SOLANACEAE - *Solanum chiapasense*

Common Names: No Common Names
Synonyms: No Synonyms

Taxonomic Note:
According to Tropicos (2019), *Solanum Chiapasense* K.E. Roe is an accepted name for this species. *Solanum chiapasense* apparently is closely related to *Solanum pulverulentifolium* but can be distinguished by its dark green instead of whitish upper leaf surfaces, larger calyx lobes, and weaker corolla exsertion from the calyx at anthesis (Roe 1967).

Red List Status
LC - Least Concern, (IUCN version 3.1)

Red List Assessment

Assessment Information

Date of Assessment: 2020-02-13

Assessor(s): Valentín-Martínez, D. & Rodríguez Contreras, A.

Reviewer(s): Samain, M.-S. & Oldfield, S.

Regions: Global

Assessment Rationale

Solanum chiapasense is a shrub or small tree from Mexico and Guatemala. The extent of occurrence is 54,984.690 km². The area of occupancy of the taxon is 104 km². The taxon has twelve locations. It is projected that this species will be favored by the disturbance. *Solanum chiapasense* is assessed as Least Concern (LC).

Distribution

Geographic Range

Solanum chiapasense is a shrub or small tree from Mexico and Guatemala (Roe 1967). In Mexico it is distributed in the states of Chiapas and Oaxaca (Villaseñor 2016, Martínez *et al.* 2017), while in Guatemala it is located in the department of Huehuetenango (Gentry & Standley 1974). The extent of occurrence is 54,984.690 km². The area of occupancy of the taxon is 104 km², but it is likely that the AOO of the species is a little higher than estimated, if the collection efforts were increased. The taxon has twelve locations.

Area of Occupancy (AOO)

Estimated area of occupancy (AOO) - in km2	Justification
104	AOO calculated with GeoCAT using Montero-Castro data

(2019).

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO)- in km2	EOO estimate calculated from Minimum Convex Polygon	Justification
54984.690	true	EOO calculated with GeoCAT using Montero-Castro data (2019).

Locations Information

Number of Locations	Justification
12	The main threats that the distribution area presents are deforestation, agriculture, forest fires, livestock ranching and human settlements.

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 600

Elevation Upper Limit (in metres above sea level): 2100

Map Status

Map Status	Use map from previous assessment	How the map was created, including data sources/methods used:	Please state reason for map not available:	Data Sensitive?	Justification	Geographic range this applies to:	Date restriction imposed:
Done	-	Prepared with GeoCAT using Montero-Castro data (2019).	-	-	-	-	-

Biogeographic Realms

Biogeographic Realm: Neotropical

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Guatemala	Extant	Native	-	Resident
Mexico -> Chiapas	Extant	Native	-	Resident
Mexico -> Oaxaca	Extant	Native	-	Resident

Population

There is no information available about the population of *Solanum chiapasense*.

Population Information

Current Population Trend: Unknown

Habitats and Ecology

Solanum chiapasense is a shrub or small tree of 2-12 m tall and the stems grow up to 8 cm in diameter. It grows at an altitude range of 600-2100 m. It occurs in pine-oak forest, oak forest and tropical subdeciduous forest associated with *Quercus, Styrax, Oreopanax, Bursera* and *Heliocarpus*. It grows on slopes on rocky and calcareous soils (Roe 1967, Montero-Castro data 2019).

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
1.4. Forest -> Forest - Temperate	Resident	Suitable	-
1.5. Forest -> Forest - Subtropical/Tropical Dry	Resident	Suitable	-

Systems

System: Terrestrial

Plant Specific

Plant Growth Forms
Shrub - large
Shrub - small
Tree - small

Use and Trade

General Use and Trade Information

There is no information about the use and trade of *Solanum chiapasense*.

Threats

Although the different types of vegetation where *Solanum chiapasense* grows have been affected by agricultural and livestock activities (Cayuela 2006, Navarrete et al. 2010, CONABIO 2019), it is projected that this species will be favored by the disturbance.

Threats Classification Scheme

Threat	Timing	Scope	Severity	Impact Score
1.1. Residential & commercial development -> Housing & urban areas	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
2.1.3. Agriculture & aquaculture -> Annual & perennial non-timber crops -> Agro-industry farming	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
2.3.2. Agriculture & aquaculture -> Livestock farming &	Ongoing	Minority	Slow,	Low

ranching -> Small-holder grazing, ranching or farming		(<50%)	Significant Declines	Impact: 5
2.3.3. Agriculture & aquaculture -> Livestock farming & ranching -> Agro-industry grazing, ranching or farming	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7
5.3.1. Biological resource use -> Logging & wood harvesting -> Intentional use: (subsistence/small scale) [harvest]	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
5.3.4. Biological resource use -> Logging & wood harvesting -> Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
7.1.1. Natural system modifications -> Fire & fire suppression -> Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7

Conservation

According to the collection records, *Solanum chiapasense* is found in the Parque Nacional Cañón del Sumidero (Chiapas), Parque Nacional Lagunas de Montebello (Chiapas) and Reserva de la Biósfera El Triunfo (Chiapas). There are no current *ex situ* sites worldwide (BGCI 2019).

Conservation Actions In- Place

Conservation sites identified	Note
Yes, over part of range	-

Occur in at least one PA	Note
Yes	*Solanum chiapasense* grows in the Parque Nacional Cañón del Sumidero (Chiapas), Parque Nacional Lagunas de Montebello and Reserva de la Biósfera El Triunfo (Chiapas).

Percentage of population protected by PAs (0-100)	Note
1-10	Most of the collection records of this species are found outside protected natural areas.

Subject to ex-situ conservation	Note
No	There are no current ex situ sites worldwide.

Subject to recent education and awareness programmes	Note
Unknown	-

Included in international legislation	Note
Unknown	-

Important Conservation Actions Needed

Conservation Actions	Note
6.1. Livelihood, economic & other incentives -> Linked enterprises & livelihood alternatives	-
6.4. Livelihood, economic & other incentives -> Conservation payments	-

Research Needed

Research	Note
3.4. Monitoring -> Habitat trends	-

Evaluación No. 41

Solanum mitlense - Dunal

PLANTAE - TRACHEOPHYTA - MAGNOLIOPSIDA - SOLANALES - SOLANACEAE - *Solanum mitlense*

Common Names: Coyotomatl (Spanish; Castilian)
Synonyms: No Synonyms

Taxonomic Note:
According to Tropicos (2019), *Solanum mitlense* Dunal is an accepted name for this species. *Solanum mitlense* has a dimorphic effect of juvenile forms with respect to mature forms, so it is likely that this species is confused (Roe 1966).

Red List Status
LC - Least Concern, (IUCN version 3.1)

Red List Assessment

Assessment Information

Date of Assessment: 2020-02-13

Assessor(s): Valentín-Martínez, D. & Rodríguez Contreras, A.

Reviewer(s): Samain, M.-S. & Oldfield, S.

Regions: Global

Assessment Rationale

Solanum mitlense is an endemic shrub or small tree from Mexico. The taxon has an extent of occurrence of 81,445.916 km² and an area of occupancy of 152 km². It is calculated to occur in between fifteen to eighteen locations. The main threats for the taxon range are deforestation and agriculture. Despite change in land use is occurring across its range, it is not considered to currently be significantly impacted by the habitat loss. *Solanum mitlense* is assessed as Least Concern (LC).

Distribution

Geographic Range

Solanum mitlense is an endemic shrub or small tree from Mexico. This species is distributed in the states of Michoacán, Guerrero, Mexico, Puebla and Oaxaca (Standley 1924, Rodríguez 2004, Villaseñor 2016, Martínez *et al.* 2017). The taxon has an extent of occurrence of 81,445.916 km² and an area of occupancy of 152 km². However, it is likely that the AOO is higher than calculated. It is calculated to occur in between fifteen to eighteen locations. The main threats for the taxon range are deforestation, agriculture, forest fires, cattle raising and human settlements.

Area of Occupancy (AOO)

Estimated area of occupancy (AOO) - in km2	Justification
152	AOO calculated with GeoCAT using Montero-Castro data (2019).

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO)- in km2	EOO estimate calculated from Minimum Convex Polygon	Justification
81445.916	true	EOO calculated with GeoCAT using Montero-Castro data (2019).

Very restricted AOO or number of locations (triggers VU D2)

Very restricted in area of occupancy (AOO) and/or # of locations	Justification
No	This species occurs in between fifteen to eighteen locations.

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 800

Elevation Upper Limit (in metres above sea level): 2500

Map Status

Map Status	Use map from previous assessment	How the map was created, including data sources/methods used:	Please state reason for map not available:	Data Sensitive?	Justification	Geographic range this applies to:	Date restriction imposed:
Done	-	Prepared with GeoCAT using Montero-Castro data (2019).	-	-	-	-	-

Biogeographic Realms

Biogeographic Realm: Neotropical

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Mexico -> Guerrero	Extant	Native	-	Resident
Mexico -> Michoacán	Extant	Native	-	Resident

Mexico -> México State	Extant	Native	-	Resident
Mexico -> Oaxaca	Extant	Native	-	Resident
Mexico -> Puebla	Extant	Native	-	Resident

Population

There is no information about the population of *Solanum mitlense*.

Population Information

Current Population Trend: Unknown

Habitats and Ecology

Solanum mitlense is a shrub or small tree of 3-5 m tall (Standley 1924). It grows at an elevation range of 800-2500 m. It occurs in pine-oak forest, oak forest, tropical deciduous forest and xerophytic scrub. It grows on the slopes of hills, on clay, sandy and limestone soils (Montero-Castro data 2019).

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
1.4. Forest -> Forest - Temperate	Resident	Suitable	-
1.5. Forest -> Forest - Subtropical/Tropical Dry	Resident	Suitable	-
3.5. Shrubland -> Shrubland - Subtropical/Tropical Dry	Resident	Suitable	-

Continuing Decline in Habitat

Continuing decline in area, extent and/or quality of habitat?	Qualifier	Justification
Yes	Projected	According to a niche modeling analysis, it is projected that during the next 30 years the available area with the necessary conditions for the development of this species will suffer a reduction of approximately 18 percent.

Systems

System: Terrestrial

Plant Specific

Plant Growth Forms
Shrub - large
Tree - small

Use and Trade

General Use and Trade Information

There is no information available about the use and trade of *Solanum mitlense*.

Threats

Solanum mitlense has been recorded many times. Additionally, there are still areas of well-conserved habitat. Despite change in land use is occurring across its range, it is not considered to currently be significantly impacted by the habitat loss.

Threats Classification Scheme

Threat	Timing	Scope	Severity	Impact Score
1.1. Residential & commercial development -> Housing & urban areas	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
2.1.3. Agriculture & aquaculture -> Annual & perennial non-timber crops -> Agro-industry farming	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
2.3.2. Agriculture & aquaculture -> Livestock farming & ranching -> Small-holder grazing, ranching or farming	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
2.3.3. Agriculture & aquaculture -> Livestock farming & ranching -> Agro-industry grazing, ranching or farming	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7
5.3.1. Biological resource use -> Logging & wood harvesting -> Intentional use: (subsistence/small scale) [harvest]	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
5.3.4. Biological resource use -> Logging & wood harvesting -> Unintentional effects: (large scale) [harvest]	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
7.1.1. Natural system modifications -> Fire & fire suppression -> Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7

Conservation

According to the collection records, *Solanum mitlense* is found within the following protected natural areas: Área de Protección de Recursos Naturales Z.P.F.T.C.C. de los ríos Valle de Bravo, Malacatepec, Tilostoc and Temascaltepec (Mexico State). The number of *ex situ* sites worldwide is one (BGCI 2019).

Conservation Actions In- Place

Conservation sites identified	Note
Yes, over part of range	-

Occur in at least one PA	Note
Yes	*Solanum mitlens* grows in the Área de Protección de Recursos Naturales Z.P.F.T.C.C. de los ríos Valle de Bravo, Malacatepec, Tilostoc and Temascaltepec (México State) and Parque Nacional Cañón del Río Blanco (Veracruz).

Percentage of population protected by PAs (0-100)	Note
1-10	Although there are some protected natural areas within the *Solanum mitlense* distribution, most of the collection records are located outside of them.

Subject to ex-situ conservation	Note

Yes	The number of ex situ sites worldwide is one.

Subject to recent education and awareness programmes	Note
Unknown	-

Included in international legislation	Note
Unknown	-

Important Conservation Actions Needed

Conservation Actions	Note
6.1. Livelihood, economic & other incentives -> Linked enterprises & livelihood alternatives	-
6.4. Livelihood, economic & other incentives -> Conservation payments	-

Research Needed

Research	Note
3.4. Monitoring -> Habitat trends	-

Evaluación No. 42

Solanum pubigerum - Dunal

PLANTAE - TRACHEOPHYTA - MAGNOLIOPSIDA - SOLANALES - SOLANACEAE - *Solanum pubigerum*

Common Names: Hierba del perro (Spanish; Castilian), Capulincillo (Spanish; Castilian), Chichimeca (Spanish; Castilian), Fruta de schara (Spanish; Castilian), Hierba del negro (Spanish; Castilian), Veneno de perro (Spanish; Castilian)
Synonyms: *Solanum cervantesii* var. *erythrocarpum* Kuntze; *Solanum cervantesii* ssp. *glabrum* (Dunal) C.V. Morton ex S. Knapp & et al.; *Solanum dichotomum* M. Martens & Galeotti; *Solanum divaricatum* M. Martens & Galeotti; *Solanum glabrum* Dunal; *Solanum irazuense* Standl. & L.O. Williams; *Solanum leptanthum* Dunal; *Solanum martensii* Dunal; *Solanum modestum* Roem. & Schult.; *Solanum cervantesii* Lag.; *Solanum lineatum* Sessé & Moc.

Taxonomic Note:
According to Tropicos (2019), *Solanum pubigerum* Dunal is an accepted name for this species. *Solanum pubigerum* is extremely similar to *Solanum aligerum*, with which it overlaps widely in central Mexico and Central America. The two species can be very difficult to distinguish, however, *Solanum pubigerum* has simple trichomes along the central rib instead of dendritic trichomes concentrated in the armpit veins or in the entire leaf blade in addition to the flowers are smaller and with the calyx lobes deltate rather than quadrate (Knapp 2013).

Red List Status
LC - Least Concern, (IUCN version 3.1)

Red List Assessment

Assessment Information

Date of Assessment: 2020-02-14

Assessor(s): Valentín-Martínez, D. & Rodríguez Contreras, A.

Reviewer(s): Samain, M.-S. & Oldfield, S.

Regions: Global

Assessment Rationale

Solanum pubigerum is a shrub or small tree from Mexico, Guatemala and Costa Rica. The taxon has an extent of occurrence of 909,304.931 km² and an occupancy area of 936 km². Despite change in land use is occurring across its range, it is not considered to currently be significantly impacted by the habitat loss. *Solanum pubigerum* is assessed as Least Concern (LC).

Distribution

Geographic Range

Solanum pubigerum is a shrub or small tree from Mexico, Guatemala and Costa Rica (Knapp 2013). In Mexico it is distributed in the states of Chiapas, Guanajuato, Guerrero, Hidalgo, Jalisco, Mexico, Mexico City, Michoacán, Morelos, Oaxaca, Puebla, Querétaro, San Luis Potosí, Tamaulipas, Tlaxcala, Veracruz and Zacatecas

(Nee 1993, CONABIO 2004, Rodríguez 2004, Villaseñor 2016, Martínez *et al.*, 2017), mainly in the Trans-Mexican Volcanic Belt. In Guatemala it is found in the departments of Chimaltenango, Huehuetango and Quezaltenango (Gentry & Standley 1974), while in Costa Rica it is located in the provinces of San José and Cartago (GBIF 2019). The extent of occurrence is 909,304.931 km². The area of occupancy of the taxon is 936 km².

Area of Occupancy (AOO)

Estimated area of occupancy (AOO) - in km2	Justification
936	AOO calculated with GeoCAT using Montero-Castro data (2019).

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO)- in km2	EOO estimate calculated from Minimum Convex Polygon	Justification
909304.931	true	EOO calculated with GeoCAT using Montero-Castro data (2019).

Very restricted AOO or number of locations (triggers VU D2)

Very restricted in area of occupancy (AOO) and/or # of locations	Justification
No	It is estimated that this species has over 25 locations.

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 1200

Elevation Upper Limit (in metres above sea level): 3300

Map Status

Map Status	Use map from previous assessment	How the map was created, including data sources/methods used:	Please state reason for map not available:	Data Sensitive?	Justification	Geographic range this applies to:	Date restriction imposed:
Done	-	Prepared with GeoCAT using Montero-Castro data (2019).	-	-	-	-	-

Biogeographic Realms

Biogeographic Realm: Neotropical

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Costa Rica	Extant	Native	-	Resident
Guatemala	Extant	Native	-	Resident
Mexico -> Chiapas	Extant	Native	-	Resident
Mexico -> Guanajuato	Extant	Native	-	Resident
Mexico -> Guerrero	Extant	Native	-	Resident
Mexico -> Hidalgo	Extant	Native	-	Resident
Mexico -> Jalisco	Extant	Native	-	Resident
Mexico -> Michoacán	Extant	Native	-	Resident
Mexico -> Morelos	Extant	Native	-	Resident
Mexico -> México Distrito Federal	Extant	Native	-	Resident
Mexico -> México State	Extant	Native	-	Resident
Mexico -> Oaxaca	Extant	Native	-	Resident
Mexico -> Puebla	Extant	Native	-	Resident
Mexico -> Querétaro	Extant	Native	-	Resident
Mexico -> San Luis Potosí	Extant	Native	-	Resident
Mexico -> Tamaulipas	Extant	Native	-	Resident
Mexico -> Tlaxcala	Extant	Native	-	Resident
Mexico -> Veracruz	Extant	Native	-	Resident
Mexico -> Zacatecas	Extant	Native	-	Resident

Population

There is no information available about the population of *Solanum pubigerum*.

Population Information

Current Population Trend: Unknown

Habitats and Ecology

Solanum pubigerum is a shrub or small tree of 1-5 m tall. It grows at an altitude range of 1200-3300 m. It occurs in pine-oak forest and mountain cloud forest associated with *Alnus*, *Crataegus*, *Quercus* and *Pinus*. It grows on the slopes of the hills, on black, red, clayey, rocky and sandy soils (Knapp 2013, Montero-Castro data 2019).

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
1.4. Forest -> Forest - Temperate	Resident	Suitable	-

1.9. Forest -> Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	-

Continuing Decline in Habitat

Continuing decline in area, extent and/or quality of habitat?	Qualifier	Justification
Yes	Projected	According to a niche modeling analysis, it is projected that during the next 30 years the available area with the necessary conditions for the development of this species will suffer a reduction of approximately 40 percent.

Systems

System: Terrestrial

Plant Specific

Plant Growth Forms
Shrub - large
Shrub - small
Tree - small

Use and Trade

General Use and Trade Information

There is no information available about the use and trade of *Solanum pubigerum*.

Threats

Solanum pubigerum has been registered in several countries. In addition, there are still well-preserved habitat areas. Although there is a change in land use throughout its range, it is currently not considered to be significantly affected by habitat loss.

Threats Classification Scheme

Threat	Timing	Scope	Severity	Impact Score
1.1. Residential & commercial development -> Housing & urban areas	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
2.1.3. Agriculture & aquaculture -> Annual & perennial non-timber crops -> Agro-industry farming	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8
2.3.3. Agriculture & aquaculture -> Livestock farming & ranching -> Agro-industry grazing, ranching or farming	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7
5.3.1. Biological resource use -> Logging & wood harvesting -> Intentional use: (subsistence/small scale) [harvest]	Ongoing	Minority (<50%)	Slow, Significant Declines	Low Impact: 5
5.3.4. Biological resource use -> Logging & wood harvesting -> Unintentional effects: (large scale)	Ongoing	Majority (50-90%)	Very Rapid Declines	High Impact: 8

[harvest]				
7.1.1. Natural system modifications -> Fire & fire suppression -> Increase in fire frequency/intensity	Ongoing	Majority (50-90%)	Rapid Declines	Medium Impact: 7

Conservation

According to the collection records, *Solanum pubigerum* is found within some protected natural areas: Área de protección de flora y fauna Sierra de Álvarez (San Luis Potosí), Reserva de la Biósfera Sierra Gorda (Querétaro), Parque Nacional Los Mármoles (Hidalgo), Parque Nacional El Chico (Hidalgo), Reserva de la Biósfera Mariposa Monarca (Michoacán), Área de protección de recursos naturales Z.P.F.T.C.C. de los ríos Valle de Bravo, Malacatepec, Tilostoc and Temascaltepec (Mexico State), Área de protección de flora y fauna Nevado de Toluca (Mexico State) and Parque Nacional Cañón de Río Blanco (Veracruz). This species was evaluated as Least Concern (LC) in The Red List of Mexican Cloud Forest Trees (González-Espinosa *et al.* 2011). The number of *ex situ* sites worldwide is three (BGCI 2019).

Conservation Actions In- Place

Conservation sites identified	Note
Yes, over part of range	-

Occur in at least one PA	Note
Yes	*Solanum pubigerum* is found within some protected natural areas: Área de protección de flora y fauna Sierra de Álvarez (San Luis Potosí), Reserva de la Biósfera Sierra Gorda (Querétaro), Parque Nacional Los Mármoles (Hidalgo), Parque Nacional El Chico (Hidalgo), Reserva de la Biósfera Mariposa Monarca (Michoacán), Área de protección de recursos naturales Z.P.F.T.C.C. de los ríos Valle de Bravo, Malacatepec, Tilostoc and Temascaltepec (Mexico State), Área de protección de flora y fauna Nevado de Toluca (Mexico State) and Parque Nacional Cañón de Río Blanco (Veracruz).

Percentage of population protected by PAs (0-100)	Note
11-20	Although *Solanum pubigerum* is found within several protected natural areas, most collection records have been reported outside these areas.

Subject to ex-situ conservation	Note
Yes	There are three ex situ sites worldwide.

Subject to recent education and awareness programmes	Note
Unknown	-

Included in international legislation	Note
Unknown	-

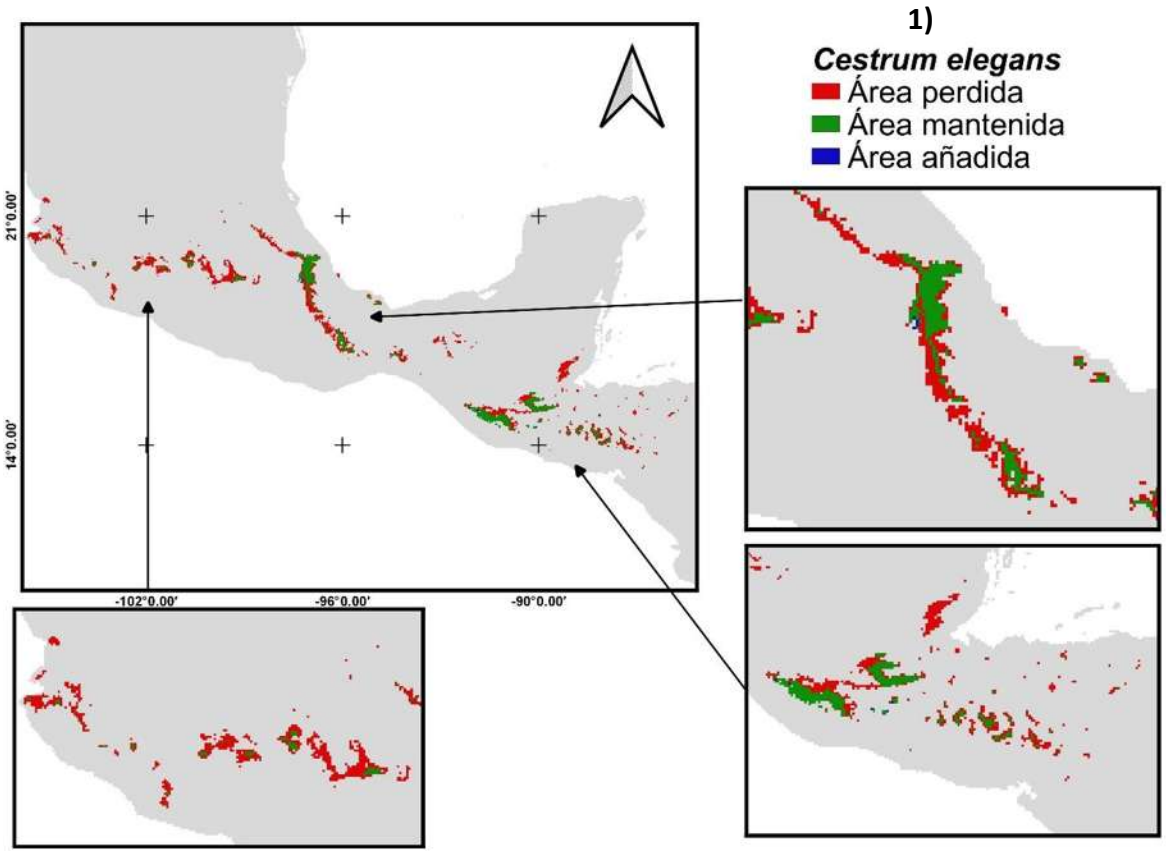
Important Conservation Actions Needed

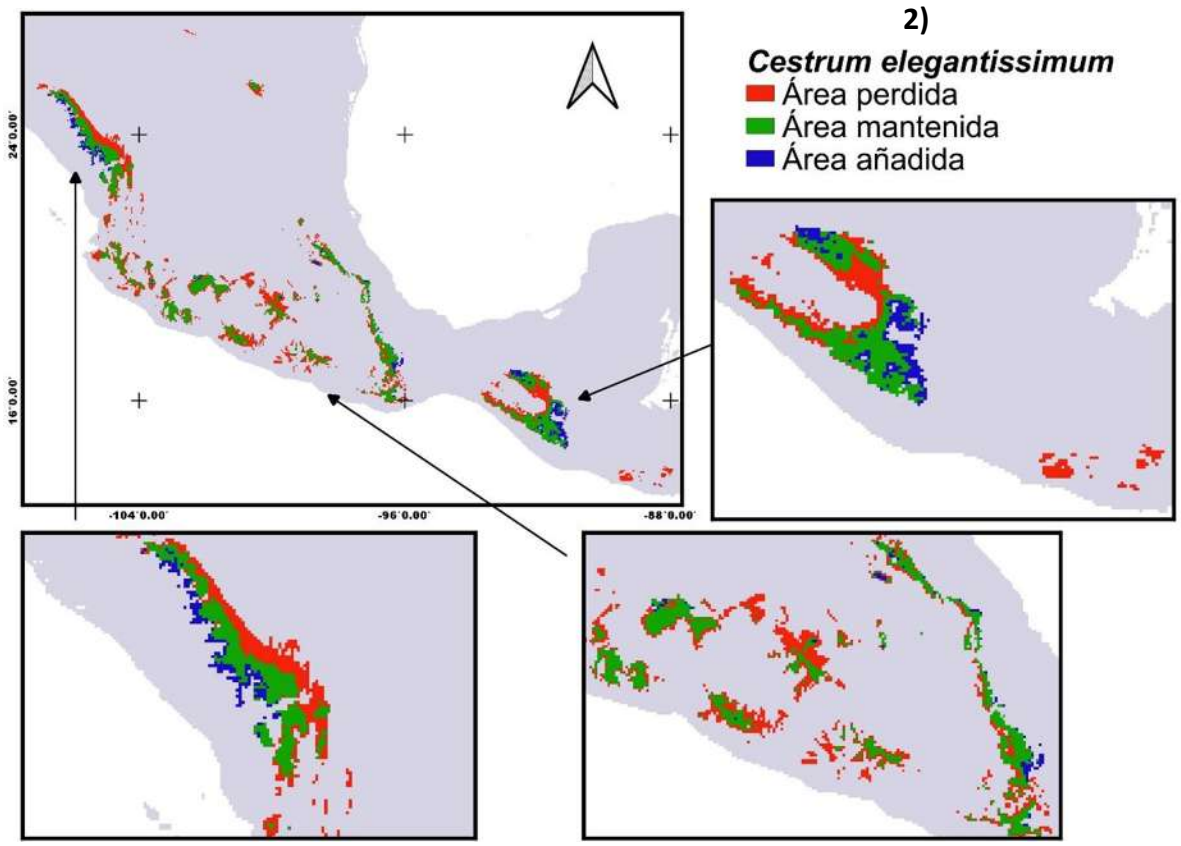
Conservation Actions	Note
6.1. Livelihood, economic & other incentives -> Linked enterprises & livelihood alternatives	-
6.4. Livelihood, economic & other incentives -> Conservation payments	-

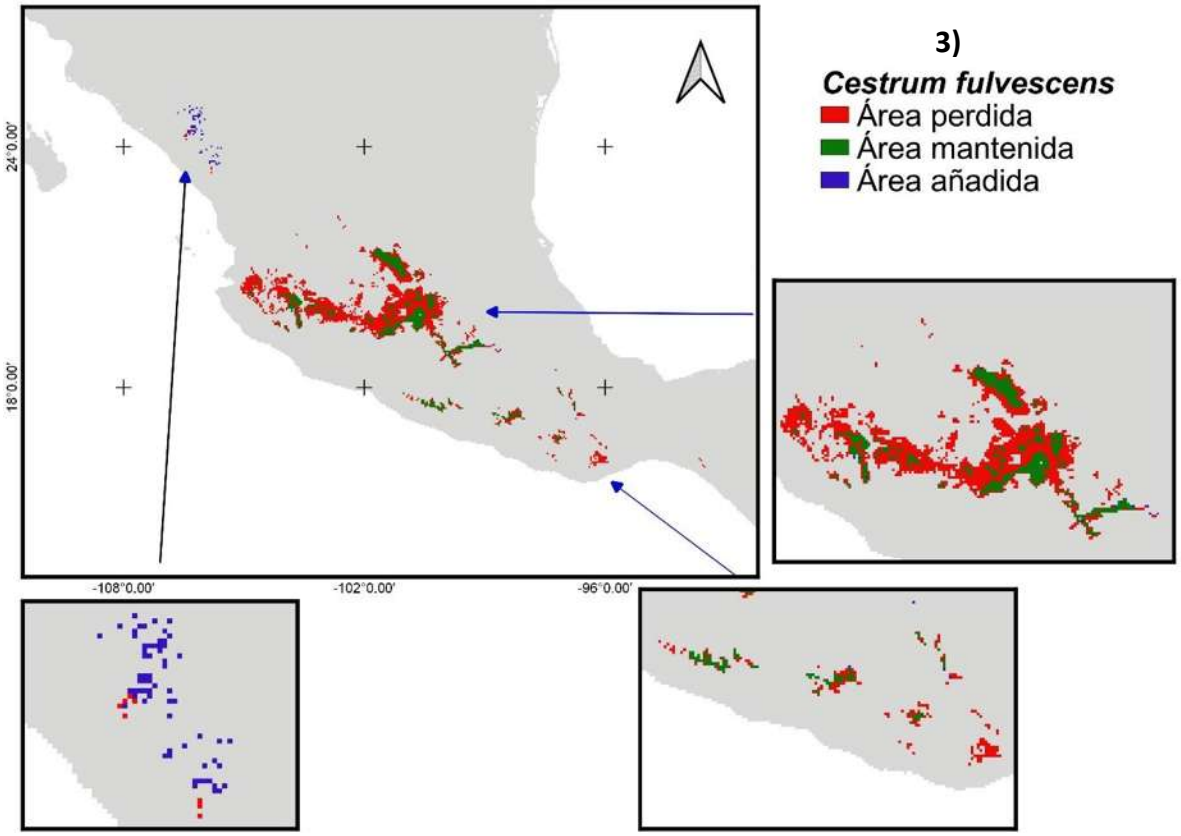
Research Needed

Research	Note
3.4. Monitoring -> Habitat trends	-

Apéndice 3. Distribución potencial para las especies de *Cestrum*, *Lycianthes*, *Solanum* y *Witheringia*. El área marcada en color rojo representa el espacio perdido, el área verde la zona que se mantiene y el color azul las zonas nuevas donde se presentaran las condiciones necesarias para la especie hacia el año 2050.






3)
Cestrum fulvescens
Área perdida
Área mantenida
Área añadida
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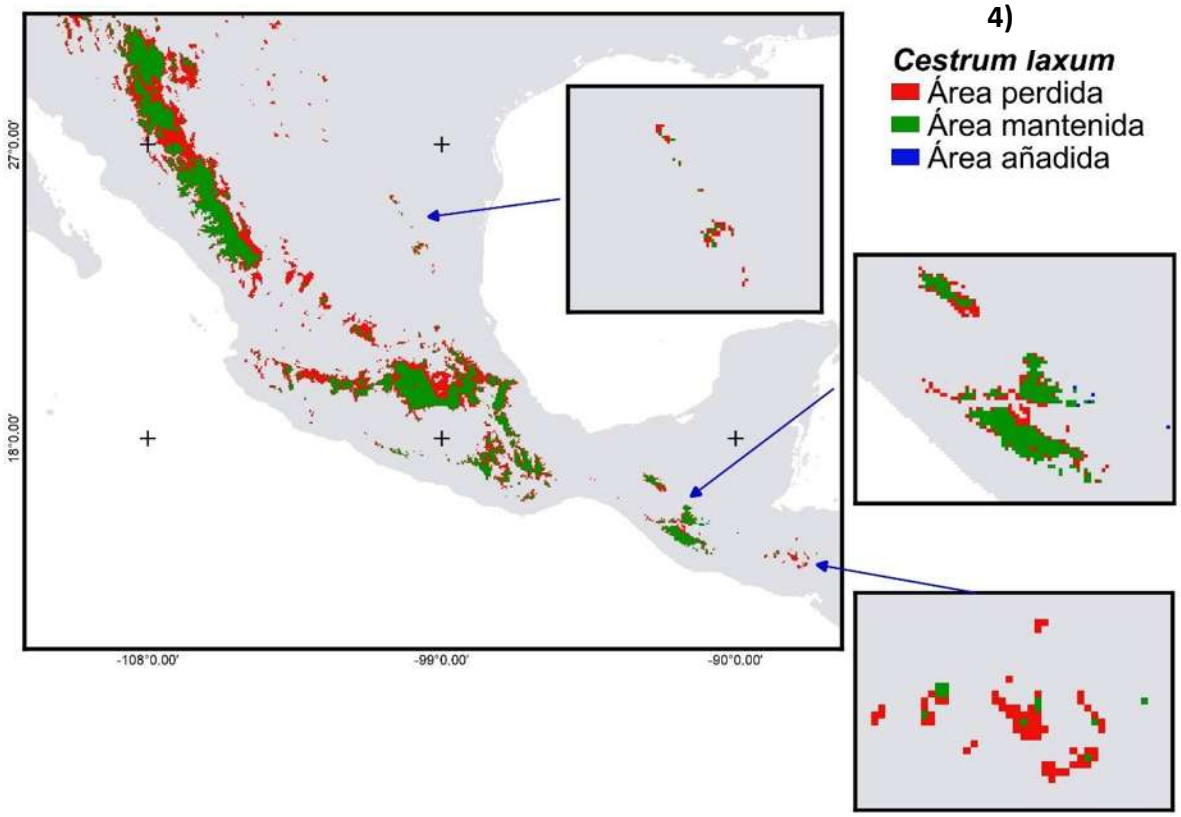
18°0.00'
-108°0.00'
-102°0.00'
-96°0.00'


4)
Cestrum laxum
Área perdida
Área mantenida
Área añadida
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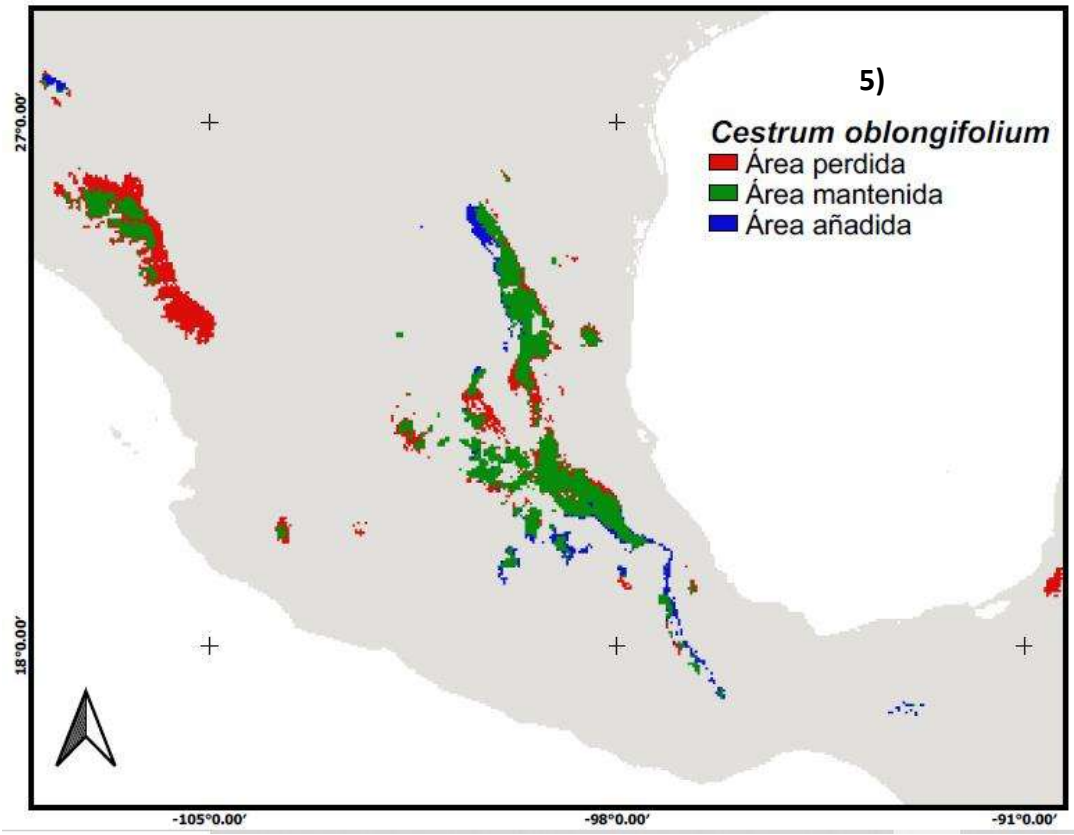
18°0.00'
-108°0.00'
-99°0.00'
-90°0.00'


5)
Cestrum oblongifolium
Área perdida
Área mantenida
Área añadida
27°0.00'
18°0.00'
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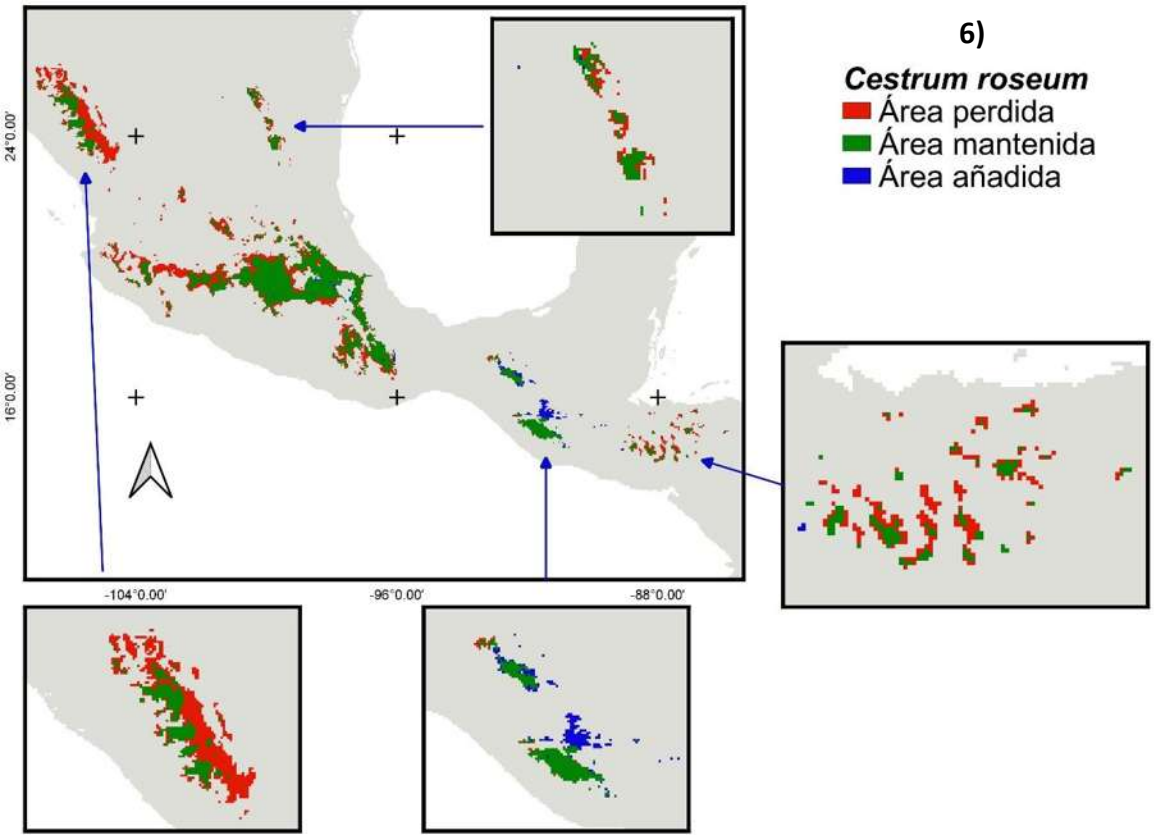
-98°0.00'
-91°0.00'


6)
Cestrum roseum
Área perdida
Área mantenida
Área añadida
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16°0.00'
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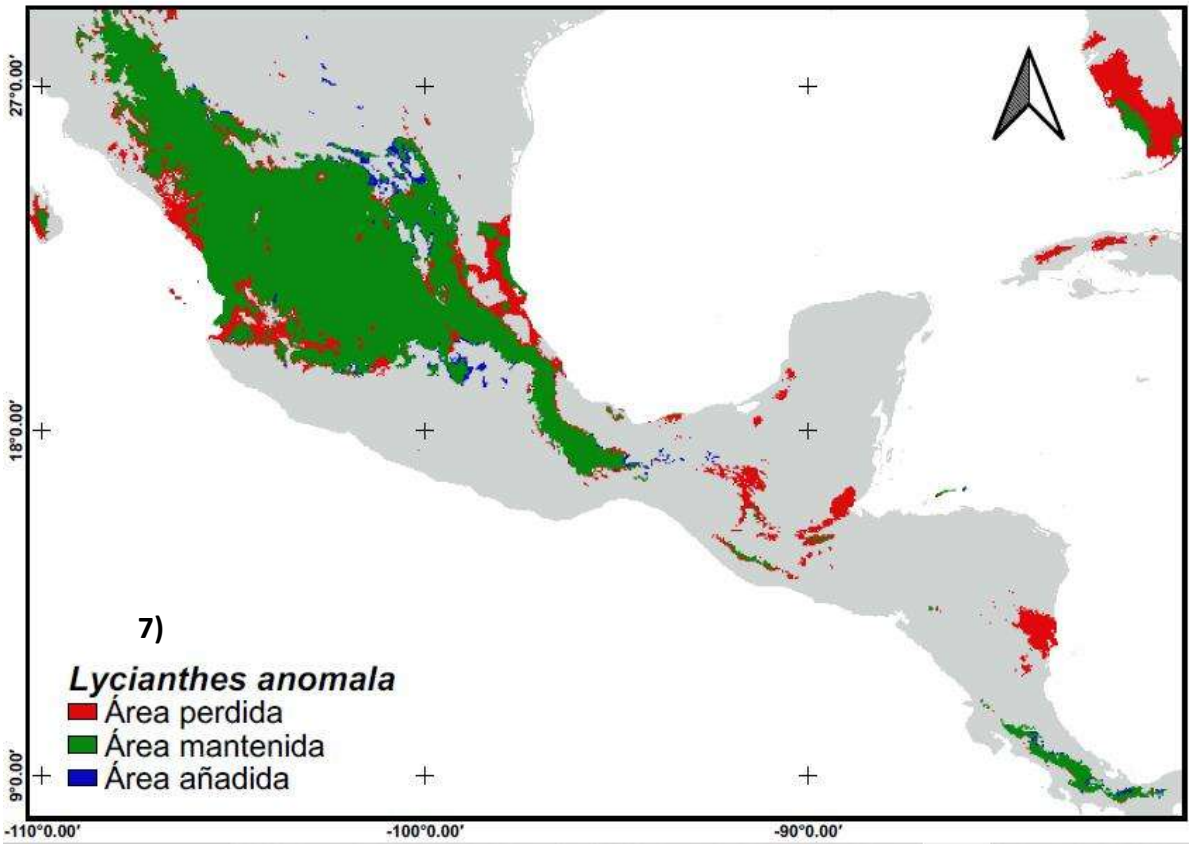
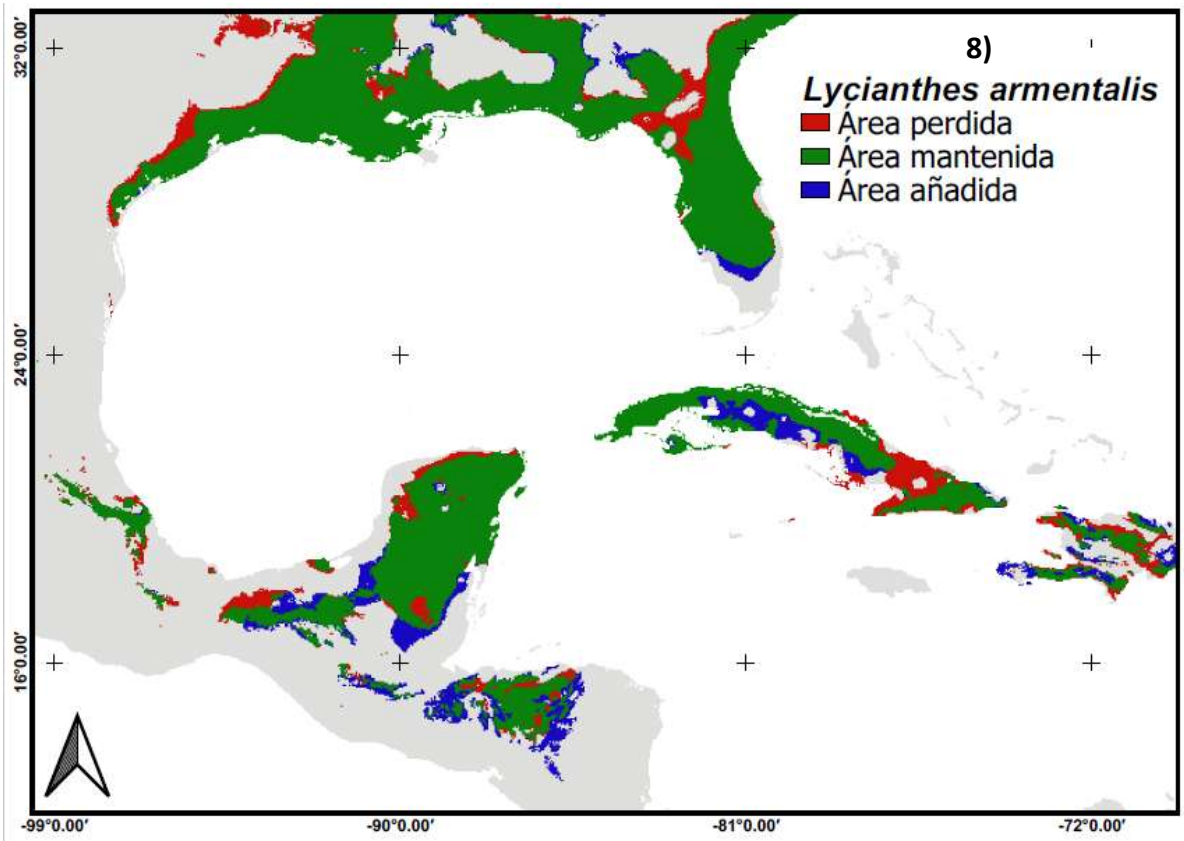
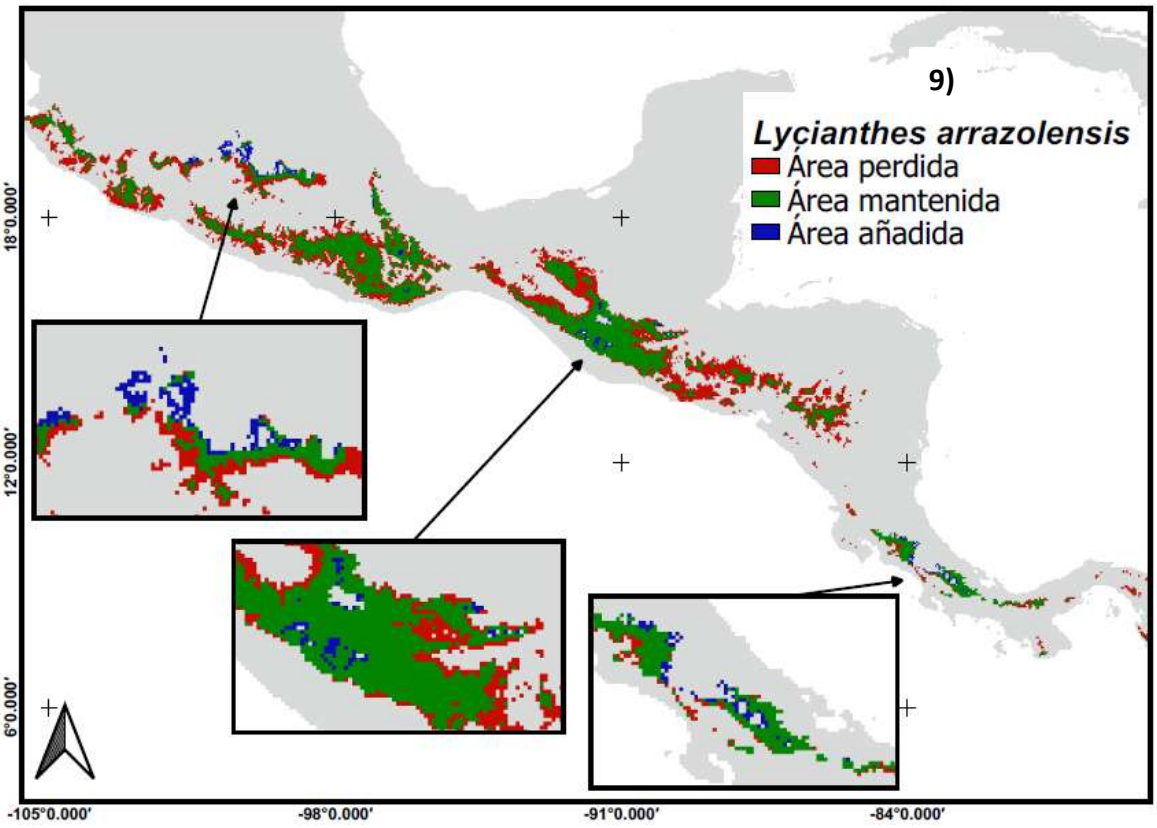
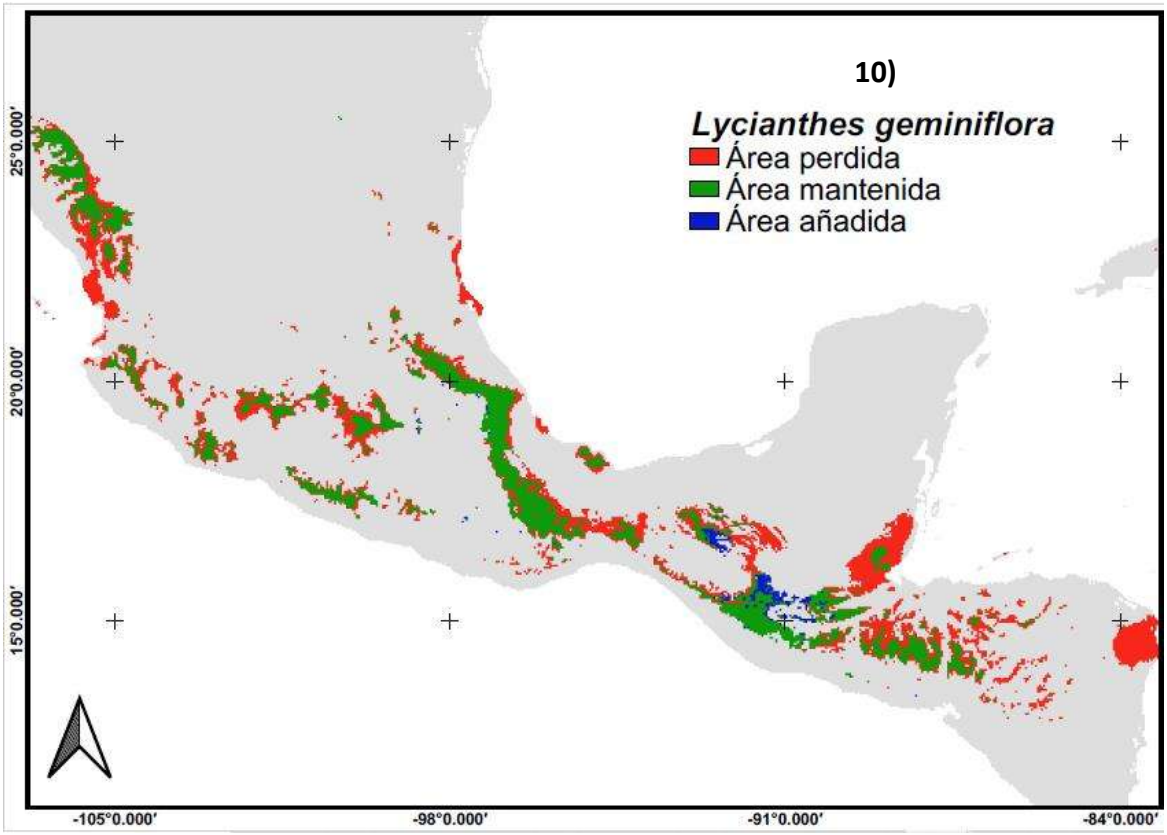
-96°0.00'
-88°0.00'

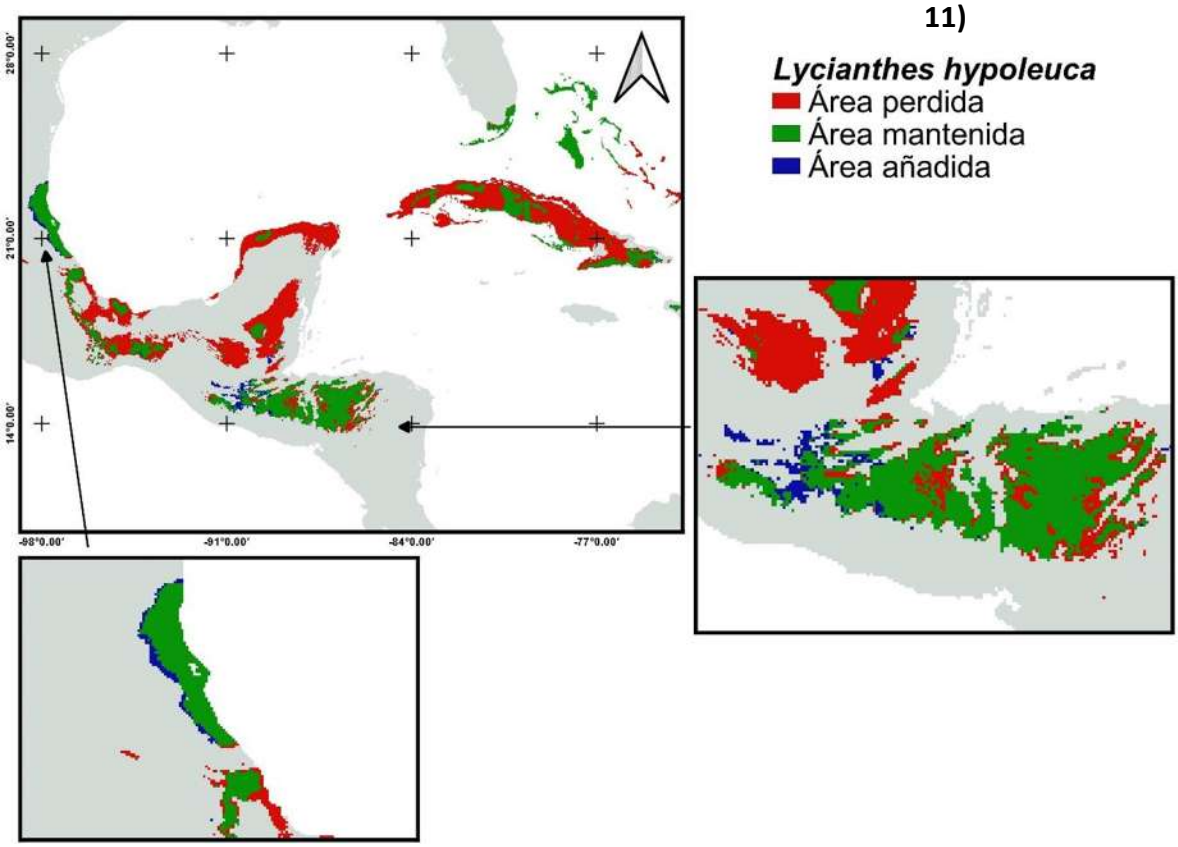

27°0.00'
18°0.00'
9°0.00'
-110°0.00'
-100°0.00'
-90°0.00'
7)
Lycianthes anomala
Área perdida
Área mantenida
Área añadida


32°0.00'
24°0.00'
16°0.00'
-99°0.00'
-90°0.00'
-81°0.00'
-72°0.00'
8)
Lycianthes armentalis
Área perdida
Área mantenida
Área añadida

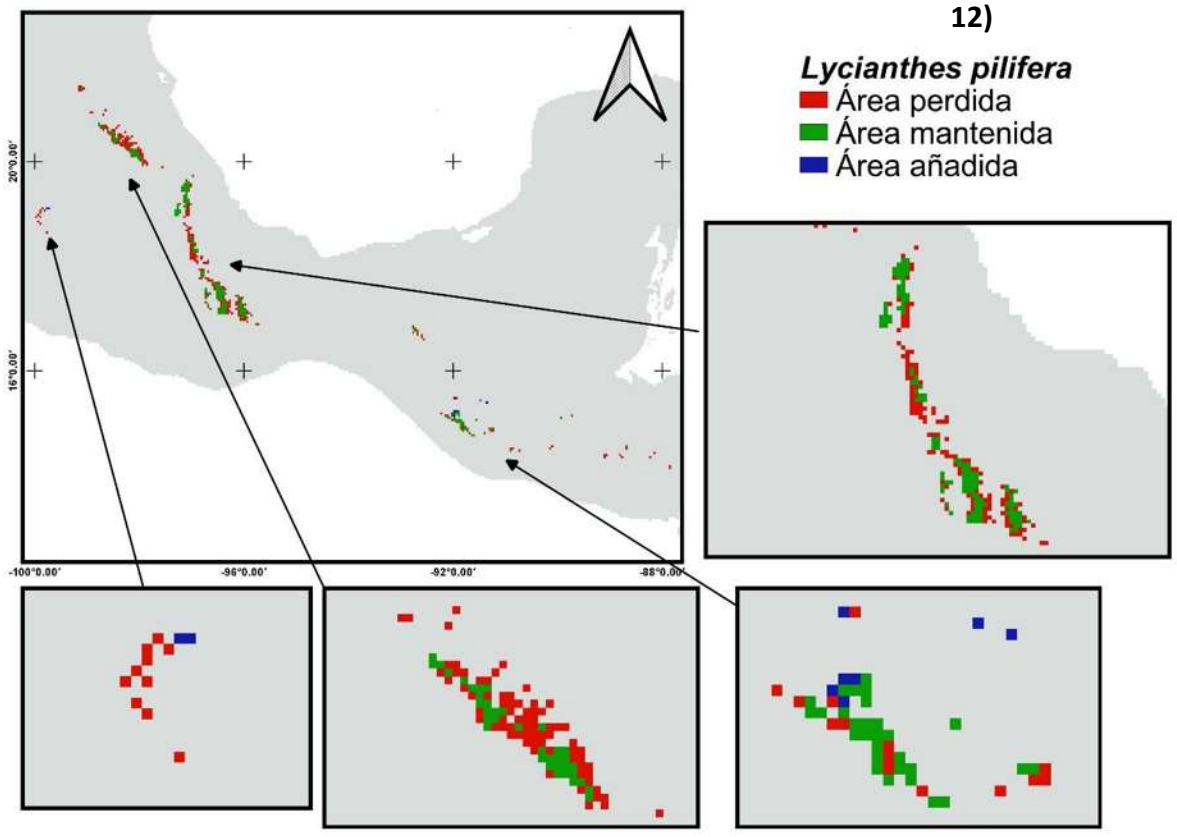

9)
Lycianthes arrazolensis
Área perdida
Área mantenida
Área añadida
18°0.000'
12°0.000'
6°0.000'
-105°0.000'
-98°0.000'
-91°0.000'
-84°0.000'


10)
Lycianthes geminiflora
Área perdida
Área mantenida
Área añadida
25°0.000'
20°0.000'
15°0.000'
-105°0.000'
-98°0.000'
-91°0.000'
-84°0.000'

11)


Lycianthes hypoleuca
Área perdida
Área mantenida
Área añadida
28°0.00'
21°0.00'
14°0.00'
-98°0.00'
-91°0.00'
-84°0.00'
-77°0.00'

12)


Lycianthes pilifera
Área perdida
Área mantenida
Área añadida
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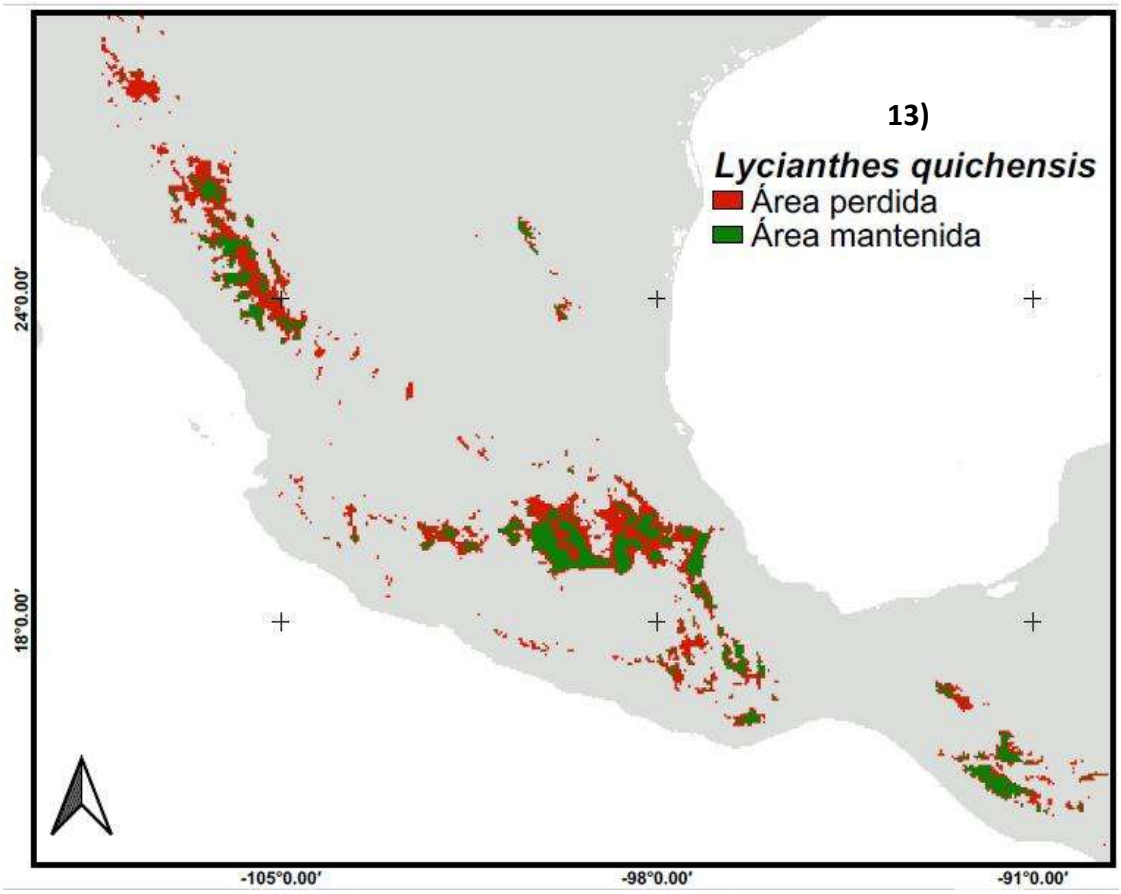
-96°0.00'
-92°0.00'
-88°0.00'


13)
Lycianthes quichensis
Área perdida
Área mantenida
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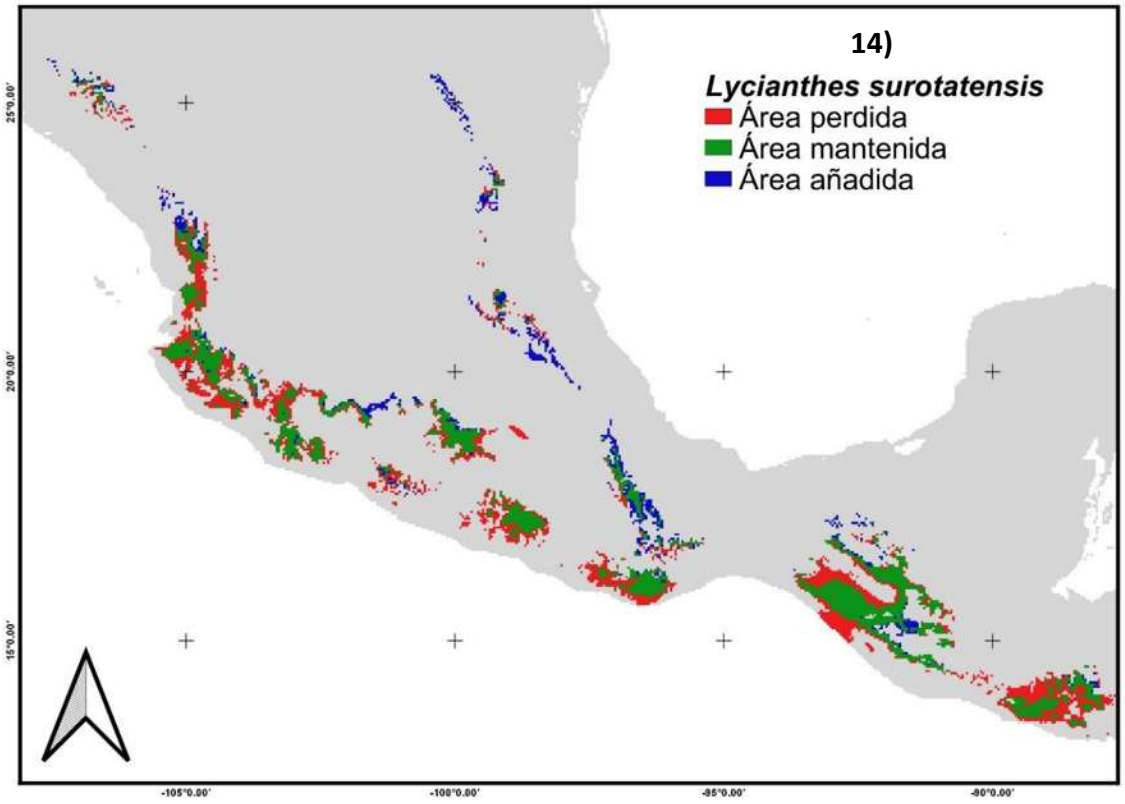
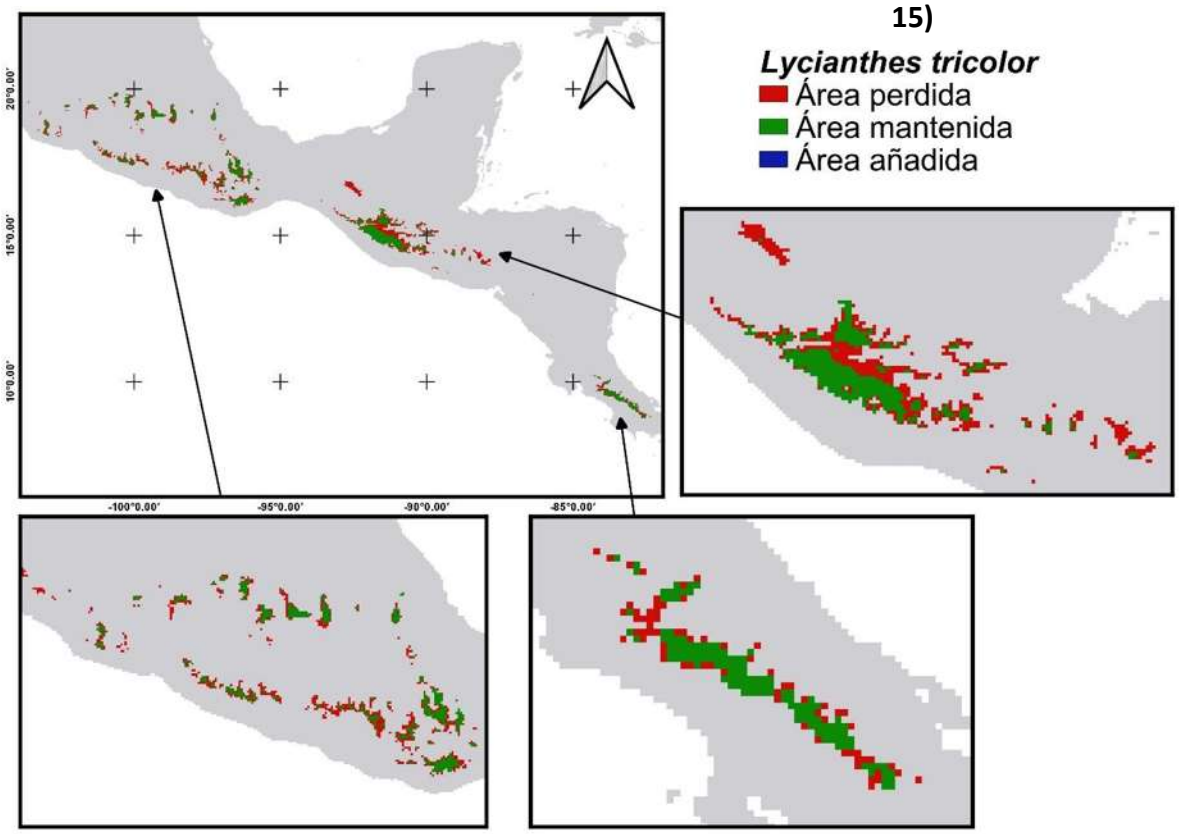
-91°0.00'


14)
Lycianthes surotatensis
Área perdida
Área mantenida
Área añadida

15)


Lycianthes tricolor
Área perdida
Área mantenida
Área añadida
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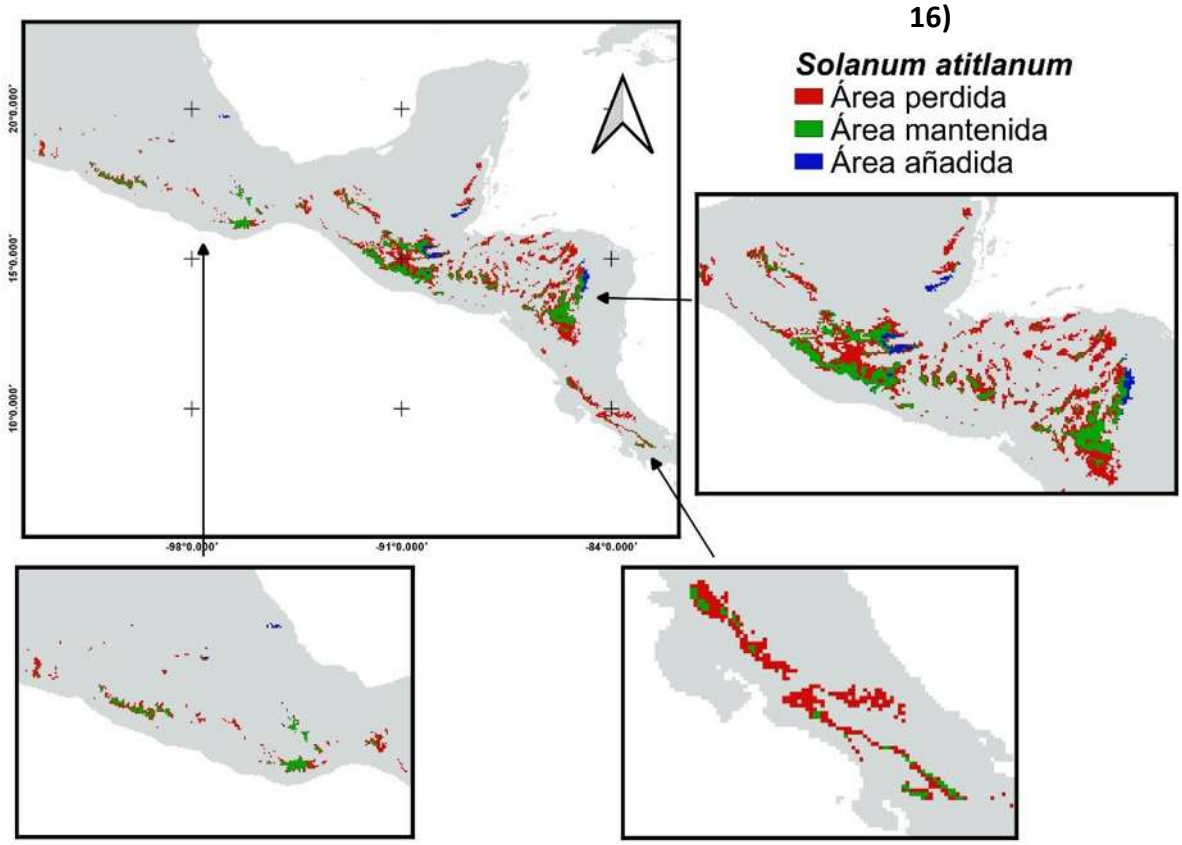
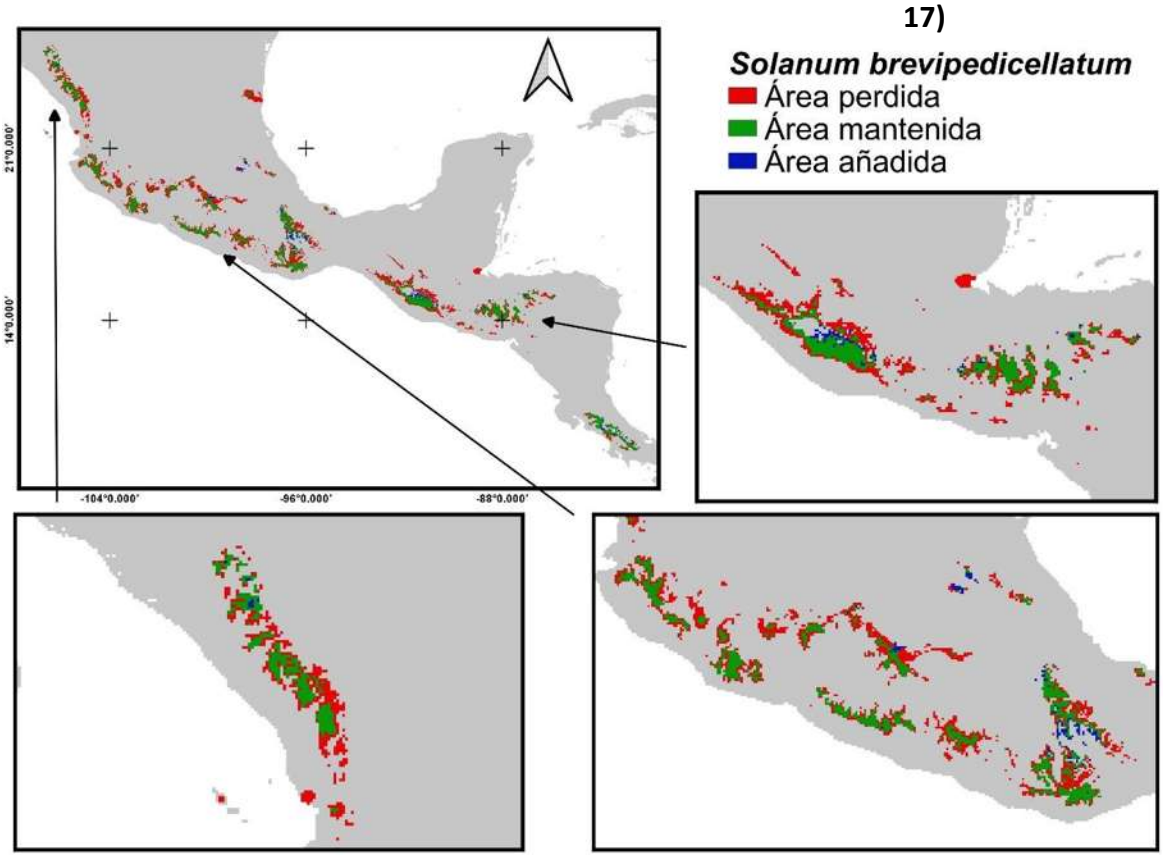
-95°0.00'
-90°0.00'
-85°0.00'

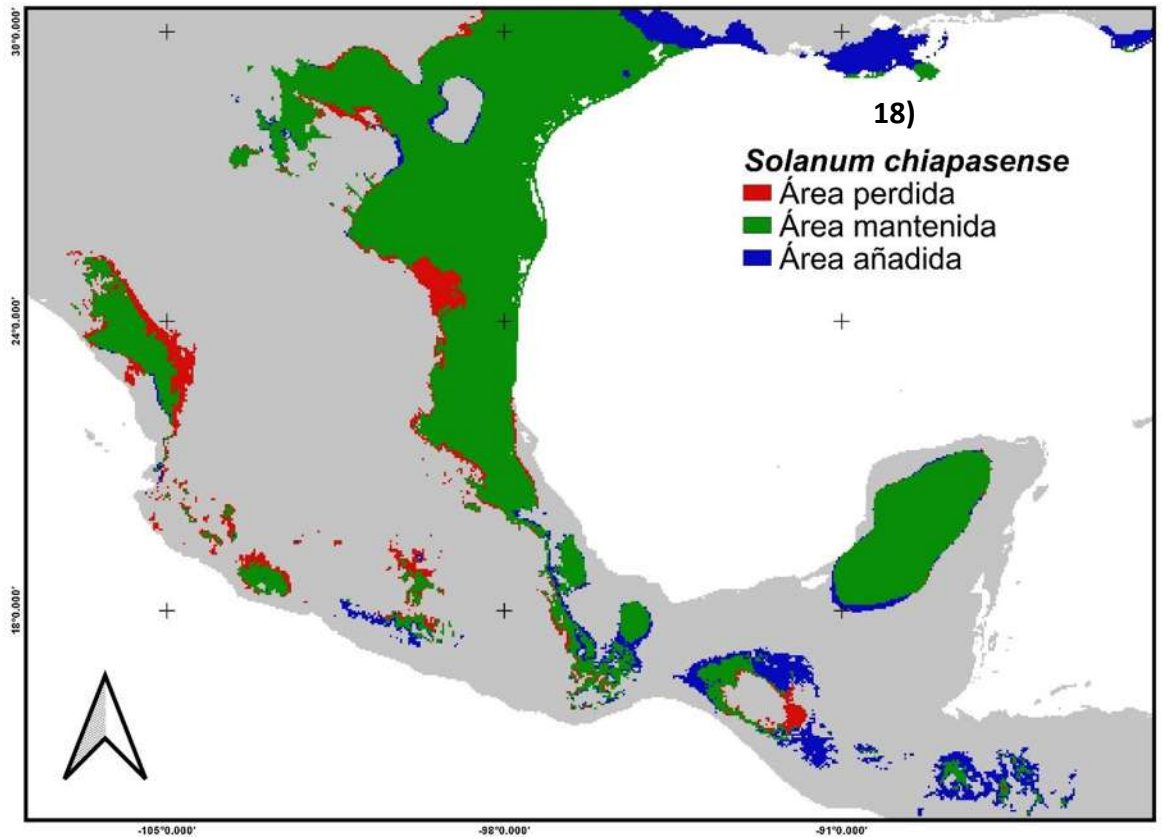
16)

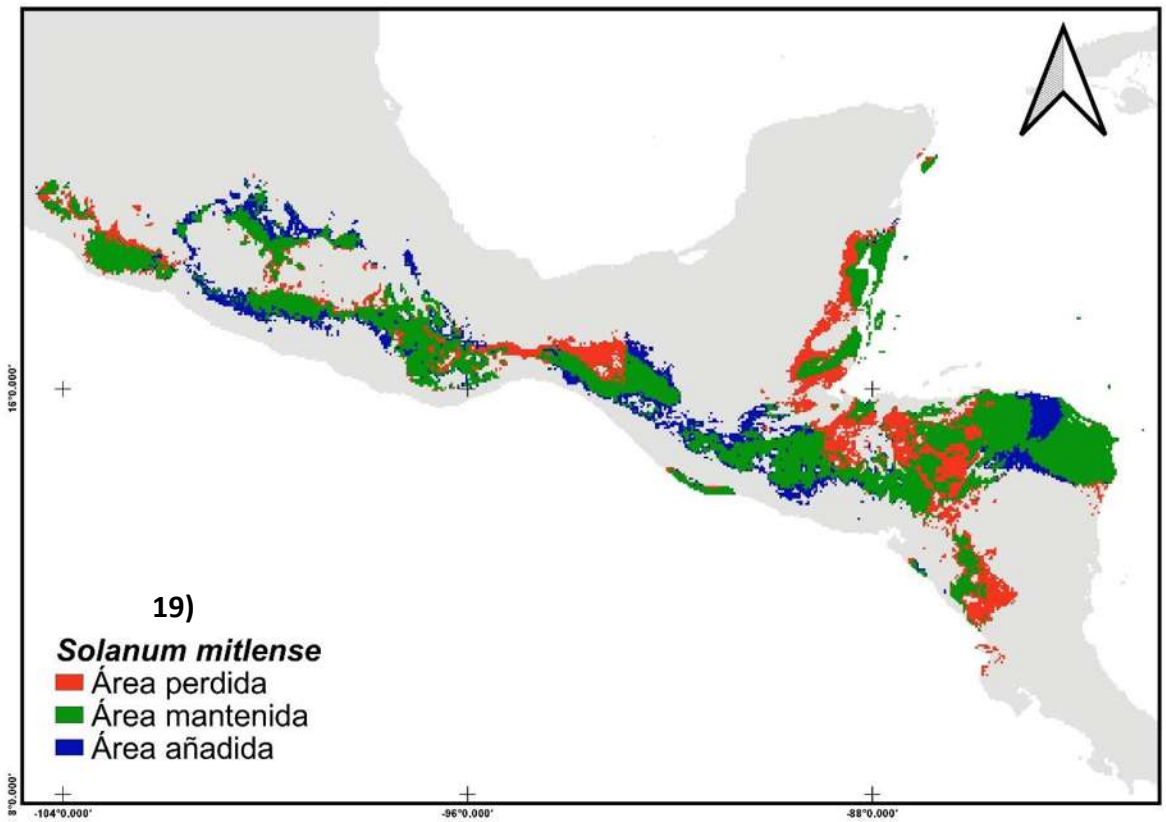

Solanum atitlanum
Área perdida
Área mantenida
Área añadida
20°0.000'
15°0.000'
10°0.000'
-98°0.000'
-91°0.000'
-84°0.000'

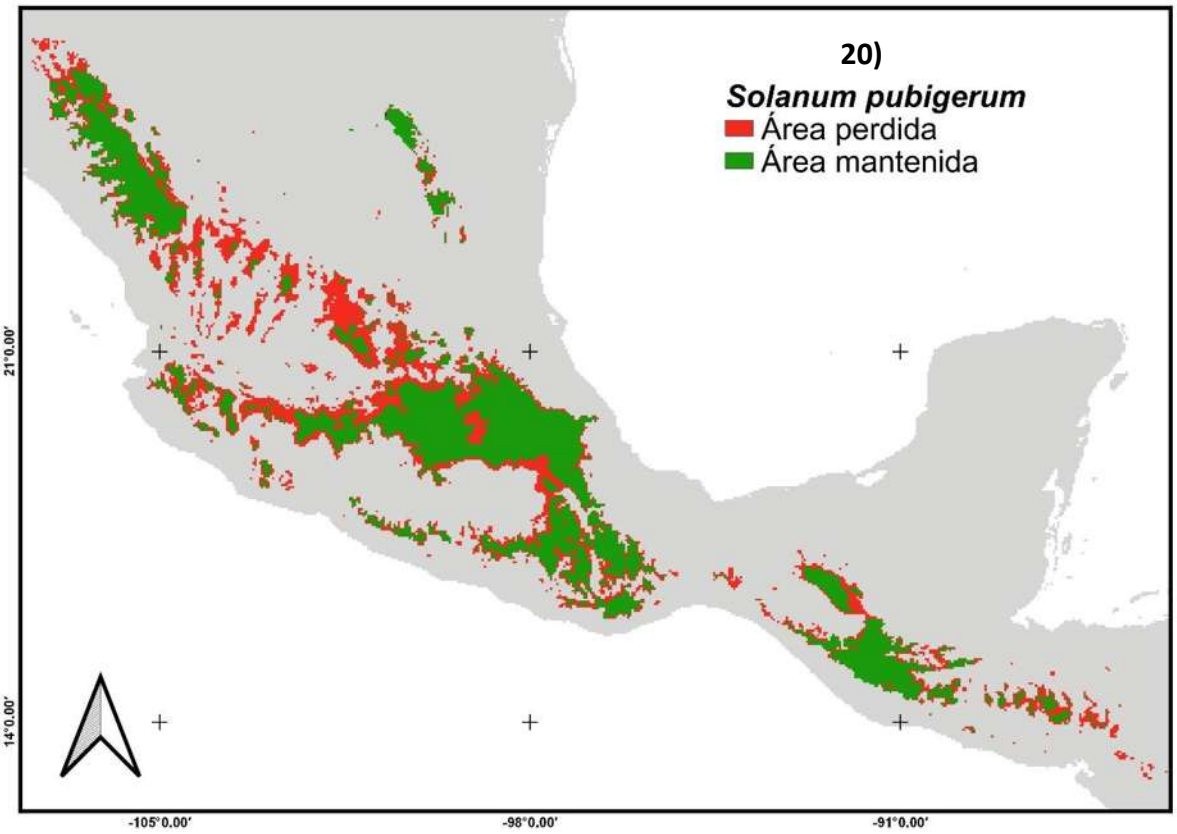
17)


Solanum brevipedicellatum
Área perdida
Área mantenida
Área añadida
21°0.000'
14°0.000'
-104°0.000'
-96°0.000'
-88°0.000'

18)


Solanum chiapasense
Área perdida
Área mantenida
Área añadida
30°0.000'
24°0.000'
18°0.000'
-105°0.000'
-98°0.000'
-91°0.000'


19)
Solanum mitlense
Área perdida
Área mantenida
Área añadida
-104°0.000'
-96°0.000'
-88°0.000'


20)
Solanum pubigerum
Área perdida
Área mantenida
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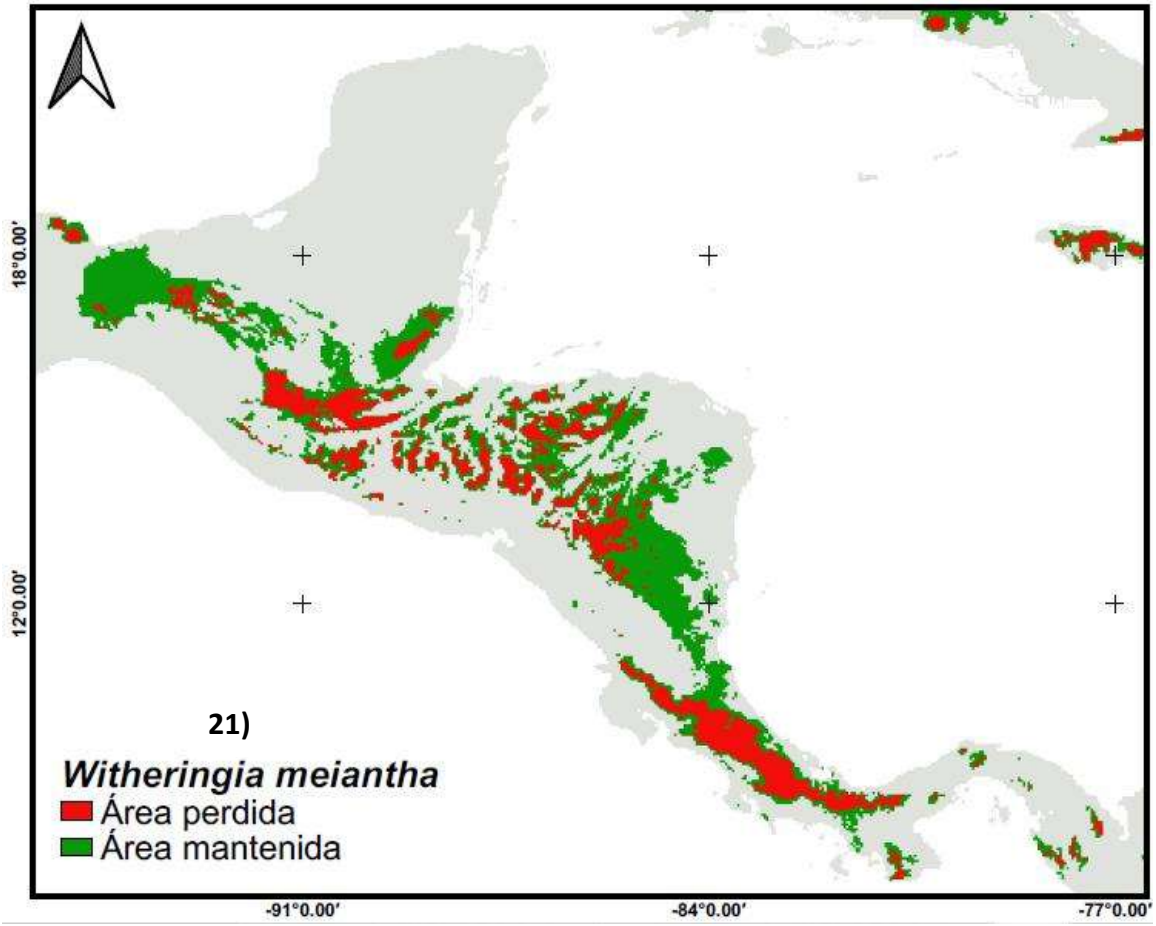
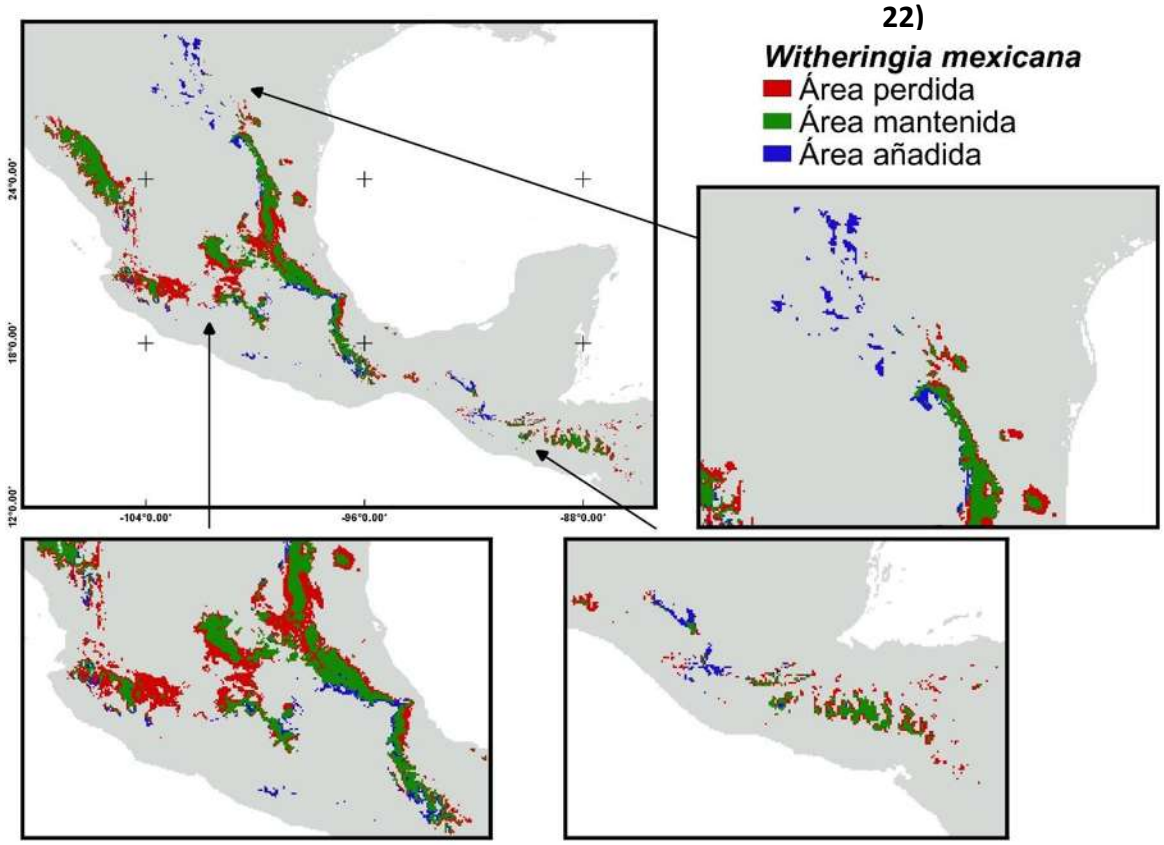
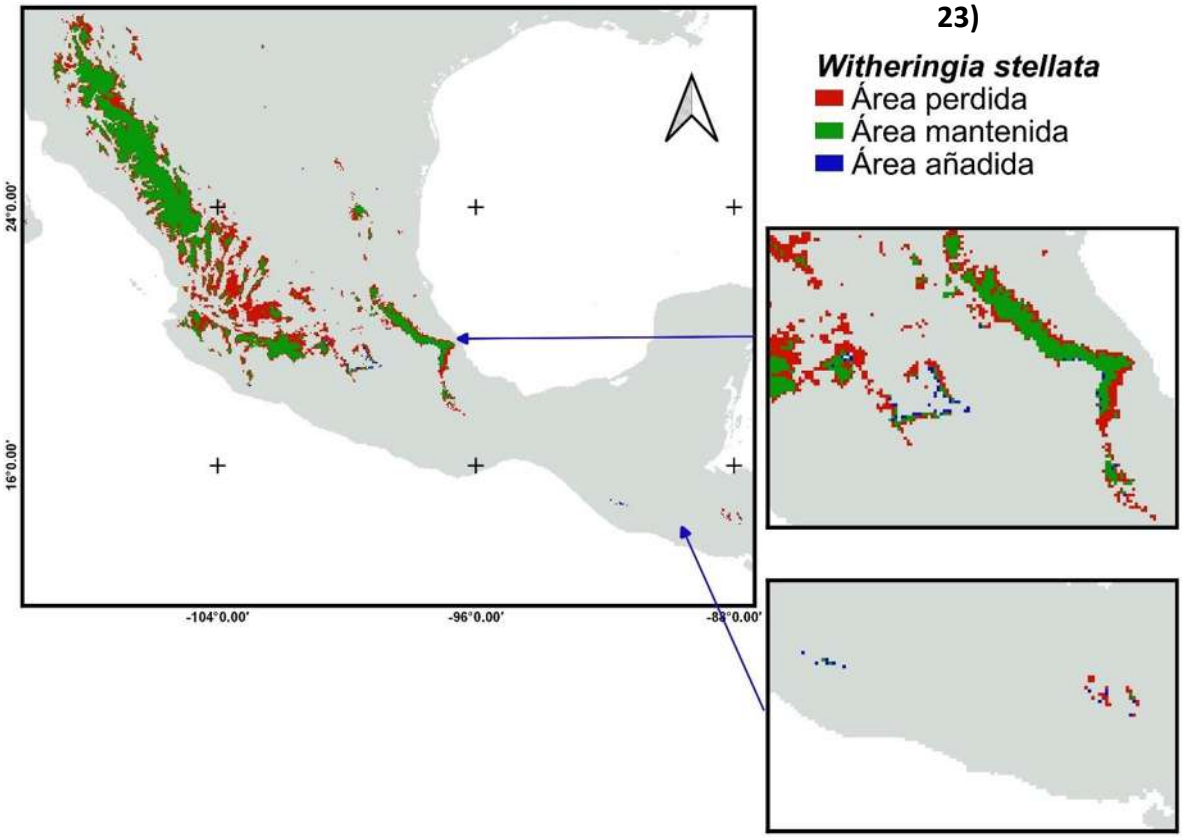
14°0.00'
-105°0.00'
-98°0.00'
-91°0.00'


18°0.00'
12°0.00'
-91°0.00'
-84°0.00'
-77°0.00'
21)
Witheringia meiantha
Área perdida
Área mantenida


22)
Witheringia mexicana
Área perdida
Área mantenida
Área añadida
24°0.00'
18°0.00'
12°0.00'
-104°0.00'
-96°0.00'
-88°0.00'


23)
Witheringia stellata
Área perdida
Área mantenida
Área añadida
24°0.00'
16°0.00'
-104°0.00'
-96°0.00'