■ 3. Amend § 414.1380 by adding paragraphs (e)(6)(v)(A) and (B) to read as follows:

§ 414.1380 Scoring.

* * * * *

(e) * * *

(6) * * *

(v) * * *

(A) Other cost measures. MIPS eligible clinicians who are scored under facility-based measurement are not scored on cost measures described in paragraph (b)(2) of this section.

(B) [Reserved]

* * * * *

Elizabeth J. Gramling,

Executive Secretary to the Department, Department of Health and Human Services.

[FR Doc. 2023–04961 Filed 3–14–23; 8:45 am]

BILLING CODE 4120–01–P

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R5–ES–2021–0029; FF09E21000 FXES1111090FEDR 234]

RIN 1018–BF69

Endangered and Threatened Wildlife and Plants; Endangered Species Status for Bog Buck Moth

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), determine endangered status under the Endangered Species Act of 1973 (Act), as amended, for the bog buck moth (*Hemileuca maia menyanthevora*) (=*H. iroquois*), a moth that occurs in Oswego County, New York, and Ontario, Canada. This rule adds the bog buck moth to the List of Endangered and Threatened Wildlife and applies the protections of the Act to this species. We have determined that designation of critical habitat for the bog buck moth is not prudent at this time.

DATES: This rule is effective April 14, 2023.

ADDRESSES: This final rule is available on the internet at *https://www.regulations.gov.* Comments and materials we received, as well as supporting documentation we used in preparing this rule, are available for public inspection at *https://www.regulations.gov* at Docket No. FWS–R5–ES–2021–0029.

FOR FURTHER INFORMATION CONTACT: Ian Drew, Acting Field Supervisor, U.S. Fish and Wildlife Service, New York Field Office, 3817 Luker Road, Cortland, NY 13045; telephone 607–753–9334. Individuals in the United States who are deaf, deafblind, hard of hearing, or have a speech disability may dial 711 (TTY, TDD, or TeleBraille) to access telecommunications relay services. Individuals outside the United States should use the relay services offered within their country to make international calls to the point-of-contact in the United States.

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule. Under the Act, a species warrants listing if it meets the definition of an endangered species (in danger of extinction throughout all or a significant portion of its range) or a threatened species (likely to become endangered within the foreseeable future throughout all or a significant portion of its range). If we determine that a species warrants listing, we must list the species promptly and designate the species' critical habitat to the maximum extent prudent and determinable. We have determined that the bog buck moth meets the definition of an endangered species; therefore, we are listing it as such. We have determined that designating critical habitat is not prudent at this time. Listing a species as an endangered or threatened species can be completed only by issuing a rule through the Administrative Procedure Act rulemaking process (5 U.S.C. 551 *et seq.*).

What this document does. This final rule adds the bog buck moth (*Hemileuca maia menyanthevora*) (=*H. iroquois*) to the List of Endangered and Threatened Wildlife.

The basis for our action. Under the Act, we may determine that a species is an endangered species or a threatened species because of any of five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. We have determined that the bog buck moth is endangered due to a combination of factors. Bog buck moth populations undergo boom and bust cycles and are highly vulnerable to threats during the bust phase (Factor E). All populations are isolated from one another (Factor E). All extant populations are experiencing some degree of habitat alteration from invasive plant species and habitat succession (Factor A). Flooding may drown various life stages of the bog buck moth or reduce suitable habitat either by directly making it unavailable (under water) or reducing survival and growth of bog buckbean, an important food source for the bog buck moth larvae (Factor A). Flooding has increased at one New York population over the past several years due to increased winter and spring precipitation from climate change and high Great Lakes water levels (Factor E). Water level management has altered or has the potential to alter several bog buck moth sites (Factor A). Additionally, the sedentary nature of the bog buck moth means that colonization of neighboring fens does not occur naturally, further limiting the species' ability to respond to stochastic changes (Factor E).

Section 4(a)(3) of the Act requires the Secretary of the Interior (Secretary) to designate critical habitat concurrent with listing to the maximum extent prudent and determinable. We have determined that designating critical habitat for the bog buck moth is not prudent because the moth co-occurs with another species that is highly collected and designating critical habitat for the moth would increase the risk of collection for the other species. In addition, the methods used to collect the co-occurring species can be expected to cause harm to the bog buck moth from disturbance and trampling of individuals (eggs, larvae, pupae) and to vegetation necessary as a host plant and for sheltering of all life stages. This disturbance can also be expected to damage vegetation necessary for any potential reintroductions of moths at the currently unoccupied site.

Previous Federal Actions

Please refer to the October 14, 2021, proposed listing rule (86 FR 57104) for a detailed description of previous Federal actions concerning the bog buck moth.

Peer Review

A species status assessment (SSA) team prepared an SSA report for the bog buck moth. The SSA team, composed of Service biologists and a New York State Department of Environmental Conservation (NYSDEC) biologist, conducted the SSA in consultation with other species experts. The SSA report represents a compilation of the best scientific and commercial data available concerning the status of the species, including the impacts of past, present, and future factors (both negative and beneficial) affecting the species.

In accordance with our joint policy on peer review published in the **Federal Register** on July 1, 1994 (59 FR 34270), and our August 22, 2016, memorandum updating and clarifying the role of peer review of listing actions under the Act, we sought the expert opinions of six appropriate specialists regarding the SSA report. We received four responses. The peer reviews can be found at *https://regulations.gov.* In preparing the proposed rule, we incorporated the results of these reviews, as appropriate, into the SSA report, which was the foundation for the proposed rule and this final rule.

Summary of Changes From the Proposed Rule

We reviewed the public comments we received during the comment period on the proposed rule (86 FR 57104; October 14, 2021) and relevant information that became available since the proposed rule published. Based on that review, we do not make any substantive changes to the proposed rule in this final rule; we make only minor clarifications and elaborate on our rationale for concluding that the designation of critical habitat is not prudent at this time for the bog buck moth.

I. Final Listing Determination

Background

The bog buck moth is a large diurnal moth native to fens (groundwater-fed wetlands) in Oswego County, New York (NY), and Ontario, Canada. A thorough review of the taxonomy, life history, and ecology of the bog buck moth is presented in the SSA report (Service 2021, pp. 6–25), which is available at *https://www.regulations.gov* at Docket No. FWS–R5–ES–2021–0029.

Taxonomy

The bog buck moth is a silk moth (family = Saturniidae) in the buck moth genus (*Hemileuca*). The bog buck moth was first identified as a variant of the *maia* species group within *Hemileuca* in 1977 by John Cryan and Robert Dirig from four sites (two populations) along the southeast shore of Lake Ontario in Oswego County, NY, but was not formally named at that time (Legge *et al.* 1996, p. 86; Pryor 1998, p. 126; Cryan and Dirig 2020, p. 3). Four additional sites (two populations) were discovered in 1977 in eastern Ontario (Committee on the Status of Endangered Wildlife in Canada [COSEWIC] 2009, p. 7). Multiple common names have been used since then (*e.g.,* bogbean buckmoth, Cryan's buckmoth, fen buck moth).

For many years, the bog buck moth's taxonomic status has been confusing and uncertain. The bog buck moth was classified as part of the *Hemileuca maia* complex, which is a broadly distributed group of closely related taxa including *H. maia, H. lucina, H. nevadensis,* among others (Tuskes *et al.* 1996, p. 111). Tuskes *et al.* (1996, pp. 120–121) further refined the description of populations of buck moths in the Great Lakes region, including the bog buck moth, as the *H. maia* complex of Great Lakes Region populations. Kruse (1998, p. 109) included *H. maia* and *H. nevadensis* as part of the Great Lakes complex; however, using genomewide single nucleotide polymorphisms (SNPs), Dupuis *et al.* (2018, p. 6) and Dupuis *et al.* (2020, p. 3) show that *H. nevadensis* is restricted to the west. The Annotated Taxonomic Checklist of the Lepidoptera of North America (Pohl *et al.* 2016, p. 735) included the Great Lakes populations of buck moths as part of *H. maia* (based on Tuskes *et al.* 1996), pending species-level taxonomic classification.

Recently, Dupuis *et al.* (2018, pp. 5–7) and Dupuis *et al.* (2020, pp. 2–3) used SNPs and found unambiguous results supporting the conclusion that both Ontario and Oswego County, NY, populations are part of the bog buck moth lineage that is divergent from *Hemileuca lucina, H. peigleri, H. slosseri,* and all other *H. maia.* They also found clear differentiation between the group formed by the Ontario and Oswego County, NY, populations and the group formed by the Wisconsin and Michigan populations (Dupuis *et al.* 2020, p. 3).

In 2020, Pavulaan (2020, entire) was first to formally describe the bog buck moth as *Hemileuca maia menyanthevora* and stated that it may actually represent a full species. Pavulaan (2020, pp. 8–14) considered host plant use and morphology for the designation and included the Oswego County (NY), Marquette and Ozaukee County (Wisconsin), and Ontario fens as part of the range. All specimens that Pavulaan used for describing morphology were from one location in Oswego County, NY, and he relied on host plant use discussed in Kruse (1998, entire) for inclusion of the two Wisconsin sites (Pavulaan pers. comm., 2020). Subsequently, Cryan and Dirig (2020, pp. 26–31) named the bog buck moth as *H. iroquois* and included only the Oswego County, NY, and Ontario populations in the designation. After reviewing the genetic information presented in Dupuis *et al.* 2020 (entire), we concluded that the Wisconsin sites are genetically distinct from the New York and Ontario sites. Official scientific naming follows the rule of publication priority under the International Code of Zoological Nomenclature; therefore, the official name of the bog buck moth is *H. maia menyanthevora* with the junior synonym of *H. iroquois.* We conclude that the bog buck moth is a valid taxon for consideration for listing under the Act (16 U.S.C. 1531 *et seq.*).

Based upon the strong evidence provided by Dupuis *et al.* (2018, entire; 2020, entire), we consider the current range of *Hemileuca maia menyanthevora* as Oswego County, NY, and Ontario, Canada. The historical range also included Jefferson County, NY (see below). We find this genetic evidence documented by Dupuis *et al.* markedly more persuasive than the host plant information that Pavulaan (2020, entire; pers. comm., 2020) relied upon when he included the Wisconsin sites in his designation without specimens from those sites. The Oswego County, NY, and Ontario range is consistent with the range described when the Service originally considered the bog buck moth (*Hemileuca* sp.) as a Category 2 candidate in 1991 (56 FR 58804, November 21, 1991). It is also consistent with the range described by NatureServe (2020, pp. 1–4), COSEWIC (2009, pp. 5, 7), and Cryan and Dirig (2020, entire).

Physical Description, Life History, and Range

Bog buck moth adults have black bodies and black/gray translucent wings with wide, white wing bands and an eyespot (COSEWIC 2009, p. 5; NatureServe 2015, p. 4). Bog buck moths have forewing lengths of 22 to 36 millimeters (mm) (0.9 to 1.4 inches (in)) (Tuskes *et al.* 1996, p. 121; Pavulaan 2020, p. 9). Males and females are generally similar in appearance with a few morphological differences. Similar to all saturniids, males have highly branched, feather-like antennae with receptors that respond to female pheromones (Tuskes *et al.* 1996, p. 14), and females have simple antennae. Males also have a red-tipped abdomen while females do not; males are also slightly smaller than females (COSEWIC 2009, p. 5). In addition, both male and female adults are larger than other *Hemileuca maia* and have similar highly translucent wings as *H. lucina.* White wing bands are much larger than other *H. maia* (Cryan and Dirig 2020, p. 26; Pavulaan 2020, p. 9).

Late instar larvae are dark with reddish orange branched urticating (stinging) spines dorsally, and a reddish-brown head capsule and prolegs (COSEWIC 2009, p. 6). Initially egg rings are light green (Cryan and Dirig 2020, p. 26) and fade to light brown or tan (Sime 2020, pers. comm.). Mature larvae are

usually predominantly black with small white dots and lack yellow markings compared to other *Hemileuca maia* (COSEWIC 2009, p. 6; NatureServe 2015, p. 4; Cryan and Dirig 2020, p. 26).

The bog buck moth is restricted to open, calcareous, low shrub fens containing large amounts of *Menyanthes trifoliata* (COSEWIC 2009, p. 10) (referred to herein as bog buckbean, but also known as bogbean or buckbean). Fens are classified along a gradient that ranges from rich fens to poor fens based on their water chemistry and plant community structure. Rich fens receive more mineral-rich groundwater than poor fens, which results in higher conductivity, pH, and calcium and magnesium ion concentrations (Vitt and Chee 1990, p. 97). The sites in New York are considered medium fens (New York Natural Heritage Program [NYNHP] 2020a, p. 3). Medium fens are fed by waters that are moderately mineralized, with pH values generally ranging from 4.5 to 6.5 (Olivero 2001, p. 15). Medium fens often occur as a narrow transition zone between a stream or lake and either a swamp or an upland community (Olivero 2001, p. 15). The dominant species in medium fens are usually woolly-fruit sedge (*Carex lasiocarpa*) and sweetgale (*Myrica gale*), with a variety of characteristic shrubs and herbs generally less than 5 meters (m) (16.4 feet (ft)) in height (NYNHP 2020b, pp. 5–11). Bog rosemary (*Andromeda glaucophylla*), leatherleaf (*Chamaedaphne calyculata*), cranberry (*Vaccinium macrocarpon*), spatulate-leaved sundew (*Drosera intermedia*), three-way sedge (*Dulichium arundinaceum* var. *arundinaceum*), and green arrow arum (*Peltandra virginica*) are characteristic only of medium fens, compared to any of the other calcareous fens found in New York (Olivero 2001, p. 14).

In Ontario, the bog buck moth is found in calcareous fens with bog buckbean. The fens are either low shrub dominated by sweetgale, bog birch (*Betula pumila*), bog willow (*Salix pedicellaris*) and other willows, but with patches of open fen dominated by sedges and water horsetail (*Equisetum fluviatile*), or primarily open fens dominated by sedges such as woolly-fruit sedge, smooth sawgrass (*Cladium mariscoides*), and American common reed (*Phragmites australis* ssp. *americanus*) surrounded by conifer swamp (COSEWIC 2009, p. 10).

The life cycle of a bog buck moth is similar to other *Hemileuca* species and generally completed within 1 year (Tuskes *et al.* 1996, p. 103). Nonfeeding adults emerge in the fall. Males and females differ in flight patterns, with males flying large, circular paths and females making short, low, direct frequent flights (Pryor 1998, p. 133). Adult males fly for longer periods as well, covering the open area of the fen for approximately 10 minutes compared to females flying short distances lasting a matter of seconds (Pryor 1998, p. 133). After mating, female buck moths lay one large cluster of eggs on sturdy stems of a variety of plant species. The eggs overwinter until the following spring when they hatch into larvae. While early instar larvae rely primarily on the host plant bog buckbean (Stanton 2000, p. 2), eggs are never laid on these plants as they die back each year rendering them unavailable for overwintering. Pupation occurs by mid-July, and the pupal stage lasts about 2 months. While not documented in bog buck moth, in other *Hemileuca* species (including *H. maia maia*), individual pupae may remain dormant until the following fall or possibly the fall after that (Cryan and Dirig 1977, p. 10; Tuskes *et al.* 1996, pp. 103, 114).

All populations are located within the beds of former glacial Lake Iroquois (Cryan and Dirig 2020, p. 27) and Champlain Sea (COSEWIC 2009, p. 9). The present distribution may be relict populations as a result of a postglacial expansion by *Hemileuca* from western North America, and subsequent isolation in fens and bogs as forests gradually reclaimed postglacial wetland habitats (Pryor 1998, p. 138). Glacial retreat left suitable habitat in disjointed patches (Gradish and Tonge 2011, p. 6). Based on genetic findings, bog buck moth populations may have been more historically widespread along the wetlands around Lake Ontario (Dupuis *et al.* 2020, p. 4).

While we do not have a full understanding of the historical distribution of the bog buck moth, there are records from three populations in New York and two in Ontario, Canada. Currently, there are four populations known. In Canada, the White Lake population comprises two sites or subpopulations (White Lake North and White Lake South). The Richmond Fen population comprises two sites or subpopulations (Richmond Fen North and Richmond Fen South). In the United States, the Lakeside population occurs along the eastern shore of Lake Ontario in Oswego County, NY, and comprises five sites or subpopulations (referred to as Lakeside 1 to Lakeside 5). To the southwest, the Oswego Inland Site population occurs in Oswego County, NY, and is a single site with two fen openings with metapopulation dynamics operating at a smaller scale. The fifth historically known population located in Jefferson County, NY, was identified based on specimens collected in the 1950s, but the site is no longer suitable for the bog buck moth. There are no other known populations of bog buck moth in New York State (Service 2021, pp. 27, 63–64). The bog buck moth is sedentary (nonmigratory) and therefore present within suitable habitat year-round with small movements of 0.5 kilometers (km) (0.3 miles (mi)) within suitable habitat described as ''common'' (NatureServe 2015, p. 5). While bog buck moth populations were previously described as individuals separated by areas of unsuitable habitat greater than 2 km (1.24 mi) or areas of suitable habitat greater than 10 km (6.2 mi) with some infrequent dispersal events at slightly longer distances between unsuitable patches (NatureServe 2015, p. 5), movements are now described as ''should be capable of flying several to many kilometers, but seldom leaves habitat'' NatureServe (2020, p. 5). In New York, some movement likely occurs between sites that are close together. Isolation of populations is likely increased by the short-lived adult stage (not much time for adults to fly far) (COSEWIC 2009, p. 15). Adult females that do make short flights are laden with hundreds of eggs.

Bog buck moth dispersal events have not been historically observed. However, adult bog buck moths have the potential to disperse with strong winds or powered flight if surrounding vegetation does not impede them (Pryor 1998, p. 138). More recently, three males were captured in unsuitable habitat located between the Lakeside 1 and Lakeside 2 sites in New York (Stanton 2004, p. 7), supporting the theory that some movement outside of suitable habitat can occur but well within the 2-km (1.24-mi) distance discussed above. We conclude that most movements are likely to be limited to the highly localized fen habitat but that infrequent male dispersal events of a few kilometers are possible. In addition, although we would expect most wind events to primarily disperse males due to their longer localized flights, even less frequent, but possibly longer, wind dispersal events of either sex may occur.

It is unlikely that other bog buck moth populations exist besides the ones mentioned above. Fairly extensive but unsuccessful searches for bog buck moths have been conducted at other potentially suitable wetland habitats in Ontario, and no new sites have been found (COSEWIC 2009, pp. 9–10). Given the degree of interest by naturalists in these natural areas and the diurnal habits of this large distinctive species, the probability of undiscovered Ontario

bog buck moth populations is low (COSEWIC 2009, p. 10).

The story is similar in New York State. Researchers sought out additional populations during years of exploring the bed of former glacial Lake Iroquois and its tributaries and outlets, and while they found some fens with bog buckbean, they found no additional sites with bog buck moths (Cryan and Dirig 2020, pp. 4–5). In addition, researchers have visited fens in New York for many years and likely would have observed the highly conspicuous larvae on bog buckbean or adult male moths, which are readily visible due to their lengthy, localized flight pattern, had they been present.

Regulatory and Analytical Framework

Regulatory Framework

Section 4 of the Act (16 U.S.C. 1533) and the implementing regulations in title 50 of the Code of Federal Regulations set forth the procedures for determining whether a species is an endangered species or a threatened species, issuing protective regulations for threatened species, and designating critical habitat for endangered and threatened species. In 2019, jointly with the National Marine Fisheries Service, the Service issued a final rule that revised the regulations in 50 CFR part 424 regarding how we add, remove, and reclassify endangered and threatened species and the criteria for designating listed species' critical habitat (84 FR 45020; August 27, 2019). On the same day, the Service also issued final regulations that, for species listed as threatened species after September 26, 2019, eliminated the Service's general protective regulations automatically applying to threatened species the prohibitions that section 9 of the Act applies to endangered species (84 FR 44753; August 27, 2019).

The regulations that are in effect and therefore applicable to this final rule are 50 CFR part 424, as amended by (a) revisions that we issued jointly with the National Marine Fisheries Service in 2019 regarding both the listing, delisting, and reclassification of endangered and threatened species and the criteria for designating listed species' critical habitat (84 FR 45020; August 27, 2019); and (b) revisions that we issued in 2019 eliminating for species listed as threatened species are September 26, 2019, the Service's general protective regulations that had automatically applied to threatened species the prohibitions that section 9 of the Act applies to endangered species (84 FR 44753; August 27, 2019).

The Act defines an ''endangered species'' as a species that is in danger of extinction throughout all or a significant portion of its range, and a ''threatened species'' as a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. The Act requires that we determine whether any species is an endangered species or a threatened species because of any of the following factors:

(A) The present or threatened destruction, modification, or curtailment of its habitat or range;

(B) Overutilization for commercial, recreational, scientific, or educational purposes;

(C) Disease or predation;

(D) The inadequacy of existing regulatory mechanisms; or

(E) Other natural or manmade factors affecting its continued existence.

These factors represent broad categories of natural or human-caused actions or conditions that could have an effect on a species' continued existence. In evaluating these actions and conditions, we look for those that may have a negative effect on individuals of the species, as well as other actions or conditions that may ameliorate any negative effects or may have positive effects.

We use the term ''threat'' to refer in general to actions or conditions that are known to or are reasonably likely to negatively affect individuals of a species. The term ''threat'' includes actions or conditions that have a direct impact on individuals (direct impacts), as well as those that affect individuals through alteration of their habitat or required resources (stressors). The term ''threat'' may encompass—either together or separately—the source of the action or condition or the action or condition itself.

However, the mere identification of any threat(s) does not necessarily mean that the species meets the statutory definition of an ''endangered species'' or a ''threatened species.'' In determining whether a species meets either definition, we must evaluate all identified threats by considering the expected response by the species, and the effects of the threats—in light of those actions and conditions that will ameliorate the threats—on an individual, population, and species level. We evaluate each threat and its expected effects on the species, then analyze the cumulative effect of all the threats on the species as a whole. We also consider the cumulative effect of the threats in light of those actions and conditions that will have positive effects on the species, such as any existing regulatory mechanisms or conservation efforts. The Secretary determines whether the species meets the definition of an ''endangered species'' or a ''threatened species'' only after conducting this cumulative analysis and describing the expected effect on the species now and in the foreseeable future.

The Act does not define the term ''foreseeable future,'' which appears in the statutory definition of ''threatened species.'' Our implementing regulations at 50 CFR 424.11(d) set forth a framework for evaluating the foreseeable future on a case-by-case basis. The term ''foreseeable future'' extends only so far into the future as the Services can reasonably determine that both the future threats and the species' responses to those threats are likely. In other words, the foreseeable future is the period of time in which we can make reliable predictions. ''Reliable'' does not mean ''certain''; it means sufficient to provide a reasonable degree of confidence in the prediction. Thus, a prediction is reliable if it is reasonable to depend on it when making decisions.

It is not always possible or necessary to define the foreseeable future as a particular number of years. Analysis of the foreseeable future uses the best scientific and commercial data available and should consider the timeframes applicable to the relevant threats and to the species' responses to those threats in view of its life-history characteristics. Data that are typically relevant to assessing the species' biological response include species-specific factors such as lifespan, reproductive rates or productivity, certain behaviors, and other demographic factors.

Analytical Framework

The SSA report documents the results of our comprehensive biological review of the best scientific and commercial data regarding the status of the species, including an assessment of the potential threats to the species. The SSA report does not represent our decision on whether the species should be listed as an endangered or threatened species under the Act. However, it does provide the scientific basis that informs our regulatory decisions, which involve the further application of standards within the Act and its implementing regulations and policies.

To assess bog buck moth viability, we used the three conservation biology principles of resiliency, redundancy, and representation (Shaffer and Stein 2000, pp. 306–310). Briefly, resiliency is the ability of the species to withstand environmental and demographic stochasticity (for example, wet or dry,

warm or cold years), redundancy is the ability of the species to withstand catastrophic events (for example, drought, large pollution events), and representation is the ability of the species to adapt to both near-term and long-term changes in its physical and biological environment (for example, climate conditions, pathogens). In general, species viability will increase with increases in resiliency, redundancy, and representation (Smith et al. 2018, p. 306). Using these principles, we identified the species' ecological requirements for survival and reproduction at the individual, population, and species levels, and described the beneficial and risk factors influencing the species' viability.

The SSA process can be categorized into three sequential stages. During the first stage, we evaluated the individual species' life-history needs. The next stage involved an assessment of the historical and current condition of the species' demographics and habitat characteristics, including an explanation of how the species arrived at its current condition. The final stage of the SSA involved making predictions about the species' responses to positive and negative environmental and anthropogenic influences. Throughout all of these levels, we used the best available information to characterize viability as the ability of a species to sustain populations in the wild over time. We use this information to inform our regulatory decision.

The following is a summary of the key results and conclusions from the SSA report; the full SSA report can be found at Docket FWS–R5–ES–2021–0029 on *https://www.regulations.gov*.

Summary of Biological Status and Threats

For this final rule, we reviewed the biological condition of the species and its resources, and the threats that influence the species' current and future condition, in order to assess the species' overall viability and the risks to that viability.

We note that, by using the SSA framework to guide our analysis of the scientific information documented in the SSA report, we have not only analyzed individual effects on the species, but we have also analyzed their potential cumulative effects. We incorporate the cumulative effects into our SSA analysis when we characterize the current and future condition of the species. To assess the current and future condition of the species, we undertake an iterative analysis that encompasses and incorporates the threats individually and then accumulates and evaluates the effects of all the factors that may be influencing the species, including threats and conservation efforts. Because the SSA framework considers not just the presence of the factors, but to what degree they collectively influence risk to the entire species, our assessment integrates the cumulative effects of the factors and replaces a standalone cumulative effects analysis.

Individual, Subpopulation, and Species Needs

The primary requirements for individual bog buck moths include suitable conditions that support fen ecosystems; perennial plants with bare sections of sturdy, small stems above substrate near bog buckbean to provide shelter for eggs; the presence of bog buckbean and other plants to provide shelter and food for larvae; and appropriate flying weather of warm fall days with periods of no rain and low winds during the adult life stage.

Bog buck moths require medium fens (Olivero 2001, p. 15) with a variety of shrubs and herbs, including the bog buckbean, that are generally less than 5 m (16.4 ft) in height (NYNHP 2020b, pp. 5–11). Bog buck moths also depend on shifting mosaics of early successional fen habitat created by regular disturbance (such as periodic flooding) (Cryan and Dirig 2020, p. 28). Without disturbances, as with other early successional habitats, vegetation succession will occur; however, in fens with intact hydrology, this succession occurs very slowly.

The bog buck moth is univoltine (single adult flight period). The flight period lasts 4 weeks, generally from mid-September to October (Pryor 1998, p. 134; Stanton 2000, p. 15; Schmidt 2020, pers. comm.). Adults are diurnal (fly during the day), avoiding cooler fall night temperatures (Tuskes *et al.* 1996, p. 12; Pryor 1998, p. 133). Bog buck moths fly when temperatures are generally above 68 degrees Fahrenheit (°F) (20 degrees Celsius (°C)) and when winds are less than 24 kilometers per hour (kmph) (15 miles per hour (mph)) (Stanton 1998, pp. 19–20, 29).

Female bog buck moths mate once and deposit eggs (Pryor 1998, p. 129; Stanton 1998, p. 8) around bare sections of rigid, vertical plant stems (Stanton 2000, p. 11). Unlike other *Hemileuca* species (Tuskes *et al.* 1996, p. 103), bog buck moths do not lay eggs on their primary larval host plants (Legge *et al.* 1996, p. 88; Stanton 2000, pp. 2, 11). Eggs overwinter and hatch into larvae in the spring.

Bog buck moth larvae require bog buckbean and other host plant species. During the early instars, bog buckbean is the primary food source for the larvae; however, later instars will feed on a larger variety of host plants. Overall, bog buckbean is essential, but other foodplants may be important, particularly in later larval stages. Please refer to the SSA report for a list of documented larval host plants and oviposition plants (Service 2021, pp. 13–14).

Healthy or highly resilient populations are those that are able to respond to and recover from stochastic events (*e.g.,* flooding, storms) and normal year-to-year environmental variation (*e.g.,* temperature, rainfall). Simply said, healthy populations are those able to sustain themselves through good and bad years. For the SSA, we defined viability as the ability of the species to sustain populations in the wild over time. The bog buck moth needs multiple healthy populations (resiliency). The more populations, and the wider the distribution of those populations (redundancy), the less likely that the species as a whole will be negatively impacted if an area of the species' range is negatively affected by a catastrophic event, and the more likely that natural gene flow and ecological processes will be maintained (Wolf *et al.* 2015, pp. 205–206). Species that are well distributed across their historical range are less susceptible to the risk of extinction as a result of a catastrophic event than species confined to smaller areas of their historical range.

Furthermore, diverse and widespread populations of bog buck moth may contribute to the adaptive diversity (representation) of the species if redundant populations are adapting to different conditions. In considering what may be important to capture in terms of representation for the bog buck moth, we identified two primary means of defining bog buck moth diversity: genetic differences and potential adaptation to variation in climatic conditions across latitudinal gradients.

Gene flow is influenced by the degree of connectivity and landscape permeability (Lankau *et al.* 2011, p. 320). Gene flow may be somewhat limited among bog buck moth populations due to their rare and patchy distributions and sedentary (nonmigratory) behavior. The Oswego Inland Site population is genetically distinct from the nearest of the Lakeside populations (which is about 30 km (18.6 mi) away), although there is or was likely some limited migration between them (Buckner *et al.* 2014, pp. 510–512). In addition, while an unambiguously close relationship was found between the bog buck moth specimens from

Ontario and the populations in Oswego County, NY, both of these populations formed distinct sister clusters (Dupuis *et al.* 2020, pp. 2–3). Maintaining populations in both Canada and New York is important to conserve this genetic diversity.

The bog buck moth has a fairly narrow distribution; however, Lake Ontario influences local climatic conditions, and, at more northern latitudes, the Canadian populations experience colder winters. In Ottawa, Canada, average monthly temperatures range from 5.4 to 21.6 °F (−14.8 to −5.8 °C) in January to 60 to 79.7 °F (15.5 to 26.5 °C) in July, and average yearly snowfall is 88 in (2.23 m). In Oswego, NY (directly on Lake Ontario), temperatures range from 18 to 30 °F (−7.8 to –1.1 °C) in January to 63 to 79 °F (17.2 to 26.1 °C) in July, and average yearly snowfall is 141 in (3.58 m). Adult males have been documented to fly 3 to 5 days earlier at the Oswego Inland Site compared to Lakeside 2, potentially due to the climate-tempering effects of Lake Ontario on the Lakeside 2 site (Stanton 1998, p. 26). Maintaining populations across historical latitudinal and climatic gradients increases the likelihood that the species will retain the potential for adaptation over time. Local adaptation to temperature, precipitation, host plants, and community interactions has been identified for butterflies and is anticipated for the bog buck moth (Aardema *et al.* 2011, pp. 295–297).

Risk Factors for the Bog Buck Moth

The primary factors currently influencing bog buck moth population health are inherent factors (*e.g.,* narrow habitat niche) and several external factors resulting in loss or alteration of habitat or directly influencing demographic rates. As discussed above, bog buck moths are found in medium fens. Medium fens are listed as imperiled or vulnerable in New York (NYNHP 2020b, p. 2). Threats to medium fens include hydrological change, habitat alteration in the adjacent landscape, development, and recreational overuse (NYNHP 2020b, p. 3). Fens are especially sensitive to relatively small changes in hydrology (van Diggelen *et al.* 2006, p. 159). Additionally, several medium fens where bog buck moths occur in New York are negatively impacted by invasive species, such as purple loosestrife (*Lythrum salicaria*), common reed (*Phragmites australis*), and buckthorn (*Rhamnus* spp.) (NYNHP 2020b, p. 3). In Canada, the most significant threat to the bog buck moth is habitat degradation either due to alteration of the water regime within the species' habitat or the invasion of habitat by nonnative plant species (COSEWIC 2009, p. 18; Environment Canada 2015, p. 7). Several sources of habitat alteration identified at bog buck moth sites are discussed below. We do not fully understand the cause of declines at bog buck moth sites, and so it is likely that additional factors (*e.g.,* predation, disease, pesticides) are important. For a comprehensive discussion of the primary factors as well as these other likely stressors, please refer to chapter 3 of the SSA report (Service 2021, pp. 26–50).

Change in Water Levels

Water level changes can directly kill individuals (*e.g.,* flooding of pupae) or result in changes in habitat suitability and availability. Flooding can result in reductions in suitable oviposition sites, larval food sources and shelter, or pupation sites. Below, we discuss water management as it pertains to the Canadian and U.S. populations.

Water Level Management—Canadian Populations

Both White Lake subpopulations are influenced by manipulation of the White Lake outlet dam in the town of White Lake (Schmidt 2020, pers. comm.), and large fluctuations may cause mortality (COSEWIC 2009, p. 18). Alteration of the water regime can be mitigated or avoided through appropriate water management policies, actions, and land stewardship techniques; however, there were no clear prescriptive actions provided (Environment Canada 2015, p. 7). The Strategy for the Bogbean Buckmoth in Ontario (Ontario Recovery Strategy) includes recovery actions to understand the specific hydrology of Richmond Fen wetlands and the White Lake wetlands and to work with stakeholders to mitigate impacts from land use change, particularly water level manipulation at White Lake (Gradish and Tonge 2011, pp. 12–13). We have no information to indicate these actions have been initiated to date, and Ontario's 5-year review of the bog buck moth (OMNRF 2017, pp. 11–17) does not mention anything about these specific actions. However, through regulation, Ontario formally designated ''habitat'' for the bog buck moth in 2014 (Environment Canada 2015, p. 9). Environment Canada then adopted the description of bog buck moth ''habitat'' as ''critical habitat'' in the Federal recovery strategy (Environment Canada 2015, p. 10). The designation includes a list of activities that alter the fen's water regime as those likely to destroy critical habitat for the bog buck moth (Environment Canada 2015, p. 17). We will discuss more information about Ontario and Canadian laws and regulations in *Conservation Measures,* below.

Water Level Management—U.S. Populations

Water level management resulted in the extirpation of a Jefferson County, NY, population in the 1970s (Bonanno and White 2011, p. 9) by flooding the fen habitat and creating a freshwater marsh. The site is currently being maintained by the New York State Office of Parks, Recreation and Historic Preservation as a marsh for flood control, septic system management, and New York State-listed endangered black tern (*Chlidonias niger*) habitat (Bonanno 2020, pers. comm.). However, it is no longer suitable habitat for the bog buck moth. The Lakeside population is currently influenced by water levels associated with management of Lake Ontario through regulation of the Moses-Saunders hydroelectric dam and precipitation events. The St. Lawrence River is located at the northeast end of Lake Ontario and is the natural outlet for the Great Lakes. Approximately 160 km (100 mi) downstream from Lake Ontario are the structures used to control the flow from Lake Ontario, most of which is used by the Moses-Saunders powerhouses (IJC 2014, p. 4). The International Joint Commission (IJC) and its International Lake Ontario–St. Lawrence River Board (Board) oversee management of these flows.

The Lake Ontario water level changes in response to the difference between the supply it receives and its outflow. The supply is uncontrolled, and the use of the Moses-Saunders Power Dam to change outflow provides some control over Lake Ontario water levels, but there are limits to the amount of water that can be released (IJC 2014, p. 5). Most of the episodic changes in Great Lakes water levels over the past century are attributable to corresponding changes in annual precipitation (Gronewold and Stow 2014, p. 1084). Prior to the construction of the dams on the St. Lawrence River, recorded lake levels of Lake Ontario from 1860 to 1960 show a pattern of variation with highs and lows captured within each decade or so (Wilcox *et al.* 2008, p. 302). The historical range of monthly average water levels was more than 1.8 m (6 ft) between low and high levels, and the IJC recommended regulating within a narrow 1.2-m (4-ft) target from April to November (IJC 2014, p. 8). This has resulted in compressing the range of Lake Ontario water levels to 0.7 m (2.3 ft) from 1.5 m (5 ft) (Wilcox *et al.* 2008,

p. 302). The IJC (2014, p. 43) found that regulation of Lake Ontario has restricted the natural fluctuation of its water levels, both in terms of reducing its extremes and year-to-year variability.

The existing shoreline vegetation of the Great Lakes depends on regular fluctuation in water levels (Keddy and Reznicek 1986, p. 35). Fluctuating water levels increase the area of shoreline vegetation and the diversity of vegetation types and plant species (Keddy and Reznicek 1986, p. 35). High lake levels periodically eliminate dense-canopy emergent plants, and low lake levels allow less competitive understory species to grow (Keddy and Reznicek 1986, entire; Wilcox *et al.* 2008, p. 301).

Stabilization of Lake Ontario water levels after the construction of the Moses-Saunders Power Dam may have subsequently increased cattail (*Typha* spp.) dominance (Rippke *et al.* 2010, p. 814). Specifically, lack of low lake levels shifted the competitive advantage to the taller cattails, resulting in loss of large expanses of sedge/grass meadows (Wilcox *et al.* 2008, p. 316). The IJC (2014, p. 43) found that the compressed lake level range has allowed trees and shrubs to grow closer to the water, and cattails and other emergent plants that tolerate persistent flooding to expand their range up the shoreline, reducing the sedge meadow plants that occurred in between. Increased cattails have been documented at Lakeside bog buck moth subpopulations including Lakeside 3 and Lakeside 4 (Bonanno 2020, pers. comm.; Sime 2019, p. 38). These changes in vegetation from *Carex* spp., sweet-gale, herbs, and shrubs to cattail marsh result in overall habitat loss through permanent reductions in the amount of suitable oviposition sites, larval food sources, and pupal habitat.

In addition to the changes in vegetation discussed above, water levels can directly impact survival of bog buck moth in various life stages. The Lakeside population includes sites that have been described as physically ''protected wetlands'' located behind sandbars and connected to Lake Ontario by intermittent or indirect surface water openings or ground water (Vaccaro *et al.* 2009, p. 1038). Water levels in these sites are greatly influenced by precipitation and highly variable depending on their unique connection to Lake Ontario (Vaccaro *et al.* 2009, p. 1045). Barrier beaches along Lake Ontario restrict flow out of the wetlands, causing water levels to rise sharply in response to local precipitation events in the ''protected wetlands'' (Vaccaro *et al.* 2009, p. 1045). These sharp rises can result in flooding events. Although flood events may be related to water level management, they are more strongly connected to precipitation events (Gronewold and Stow 2014, p. 1084) and are further discussed below under *Climate Change.*

In addition to the larger scale water level management of Lake Ontario, more localized water level management may influence bog buck moth sites. Water levels may be influenced by impoundments (human or beaver) or roads that restrict flow into or out of the fens. Restriction of flow into fens results in drying of sites and increases in shrubs. Taller shrubs shade out bog buckbean, reducing optimal larval host plants.

One example of localized water level influences is the impact of a road at the Lakeside 1 and Lakeside 2 sites. Historically connected, these two sites became separated due in part to the construction of a road in the mid-1950s and impoundment in an adjacent management area (Bonanno 2006, p. 8). Fen habitat contracted from 6 to 2 ha (15 to 5 ac) at the Lakeside 1 site and 32.4 to 24.7 ha (80 to 61 ac) at the Lakeside 2 site from 1998 to 2001 (Olivero 2001, p. 10). This was corroborated with personal observations by Bonanno (2014, p. 6), who found that vegetation in the Lakeside 1 site was succeeding to a black spruce-tamarack bog forest with deep sphagnum, taller shrubs, and scarce bog buckbean. At the Lakeside 2 site, succession is documented to the point where significant habitat restoration is required (Bonanno 2014, p. 5; 2015, p. 7; 2016, p. 8).

Water levels on Lake Ontario have no direct effect on the Oswego Inland Site population, and we are unaware of any smaller scale water level management at this site; however, temperature, precipitation, and evaporation potential will impact hydrology (Stanton 2004, p. 11) (see *Climate Change,* below).

Change in Vegetation

Both invasive species and succession can reduce the number of suitable oviposition plants and/or larval host plants that are available for the bog buck moth. Invasive species and later successional plants directly compete for space and nutrients or shade out bog buckbean. Changes in the quality or quantity of bog buckbean are a potential cause of documented declines in bog buck moths in New York (Stanton 2004, p. 11).

We evaluated the relative threats posed by invasive understory species and determined that *Typha* spp., common reed, and glossy buckthorn (*Frangula alnus*) are currently the primary species that could affect population-level dynamics of the bog buck moth. Common reed is abundant across the northern hemisphere, including most of the United States and the southern portions of Canada (Galatowitsch *et al.* 1999, pp. 739–741). Native fen plants like *Myrica gale* are reduced with the presence of common reed (Richburg *et al.* 2001, p. 253).

Glossy buckthorn is a shrub of Eurasian origin that is aggressive in bogs and fens. Drier portions or less frequently inundated sections of wetlands with available hummock surfaces are more readily invaded (Berg *et al.* 2016, p. 1370). Glossy buckthorn displaces or shades out native fen plant species (Fiedler and Landis 2012, pp. 41, 44, 51). Bog buckbean typically does not grow well in shade (Hewett 1964, p. 730), although it can be found in shaded areas of some fens (Helquist 2020, pers. comm.). Glossy buckthorn transpiration in mid-summer has been shown to lower the water table (Godwin 1943, p. 81), resulting in faster decomposition rates and reduction of hummocks in sites (Fiedler and Landis 2012, pp. 41, 44, 51). Sites with glossy buckthorn also have lower soil pH, although it is unclear whether buckthorn invaded these areas more frequently or created this change (Fiedler and Landis 2012, p. 51).

As stated above, in Canada, the primary threat to bog buck moth populations includes habitat degradation from cattails, common reed, and glossy buckthorn (COSEWIC 2009, p. 18; Gradish and Tonge 2011, pp. 6–7; Environment Canada 2015, p. 7). These plants occur in or adjacent to all Ontario sites and pose an ongoing and future threat of habitat reduction. While invasive plant species have been found within or near all four sites where the bog buck moth is known to occur in Ontario, the risk posed by these species can be assessed regularly through targeted monitoring, and, to the extent feasible, invasive plant control can be employed as appropriate and necessary to help mitigate this threat (Environment Canada 2015, p. 7). Invasive vegetation control would likely require long-term management.

These species are also documented at the New York sites. For example, glossy buckthorn makes up a substantial portion of the shrubby component at Lakeside 5 and is present at the Oswego Inland Site (Bonanno 2006, p. 7; 2013, p. 2). Cattail had been expanding at the Oswego Inland Site, and Bonanno (2013, p. 2) noted the only obvious change in potential drivers of vegetation was the large expansion of a subdivision along the lakeshore. Narrow-leaved cattail (*Typha angustifolia*) encroachment at the Oswego Inland Site

has been managed sporadically prior to 2016, and annually from 2016 to 2020 (Helquist 2020, pers. comm.). Other invasive species management projects have also been undertaken at the Oswego Inland Site and Lakeside 5; however, invasive plants remain at these sites. In addition, several clones of both the introduced and the native *Phragmites* spp. occur near bog buck moth habitat at Lakeside 3 (Bonanno 2004, p. 9).

There may be multiple sources of vegetation succession, including natural succession from early successional to late successional plant species, as well as human-induced or accelerated succession from sources such as increased nutrient input (enrichment) and altered wetland hydrology (discussed above under *Change in Water Levels*). Here, we provide some additional details about nutrient input.

Fens are characterized by a very low supply of nitrogen and phosphorous (Bedford and Godwin 2003, p. 614), and many fens in New York are degraded by altered hydrology or by nitrate moving in ground water, by phosphate adsorbed to sediment in runoff, or by altered water chemistry caused by development within fen watersheds (Drexler and Bedford 2002, p. 278; Bedford and Godwin 2003, p. 617). Nutrient loading of a fen in New York (not a bog buck moth site) resulted in reductions in species richness of both vascular plants and bryophytes and increases in monotypic stands of bluejoint grass (*Calamagrostis canadensis*), lake sedge (*Carex lacustris*), hairy willow herb (*Epilobium hirsutum*), and broadleaf cattail (*Typha latifolia*), especially in an area adjacent to a farm field (Drexler and Bedford 2002, pp. 276–278). Dense cover reduces fen biodiversity through direct space competition, or by reducing seedling growth from decreased available light and increased litter layer (Jensen and Meyer 2001, pp. 173–179).

Increased nutrient inputs have been documented at both the Lakeside and Oswego Inland Site populations (Service 2021, p. 36). The Lakeside 3 and 4 sites are adjacent to a recreational vehicle (RV) campground that may contribute to nutrient enrichment encouraging growth of the invasive common reed. The Lakeside 2 site is subject to surface water inputs from the adjacent pond, the Lakeside 1 site is surrounded by seasonal camps and an RV campground, and the Lakeside 5 site is abutted by a very large RV campground. The Oswego Inland Site has seen recent residential development along the lake shoreline.

Parasitoids

Parasitoids are small insects whose immature stages develop within or attached to their host insects. Unlike parasites, which typically feed upon hosts without killing them, parasitoids eventually kill their hosts. Most saturniids are attacked during the larval stage, and late instar larvae often suffer heavy losses (Tuskes *et al.* 1996, pp. 25–27). For the bog buck moth, parasitism of egg masses has been documented; while larval parasitoids have not been directly observed, they are also believed to be the cause of mortality (COSEWIC 2009, p. 17).

Nearly all of the bog buck moth egg masses found at the Lakeside 1 site since 1996 were parasitized by the native wasp *Anastatus furnissi* (Burks) (Stanton 2000, p. 4), and it is plausible that the wasp was the primary mortality factor at other Lakeside subpopulations (Stanton 2000, p. 13). Wasp parasitism of egg masses has also been documented at the Oswego Inland Site (Sime 2019, p. 15). The parasitism rates do not appear to be density-dependent, as parasitism levels have been consistent at the Lakeside and Oswego Inland Site populations at 25 to 30 percent of egg clusters affected per year since 2009, while bog buck moth populations have undergone dramatic fluctuations in that time period (Sime 2019, p. 15).

Larval parasitoids are common in *Hemileuca* species (Tuskes *et al.* 1996, p. 103). Parasitoids can include native and nonnative species, such as the native ichneumonid wasp *Hyposoter fugitivus* (Say) and tachinid fly *Leschenaultia fulvipes* (Bigot), and the introduced tachinid fly *Compsilura concinnata* (Meigen) for the control of gypsy moths (*Lymantria dispar*). Although *C. concinnata* is likely present at the Canadian sites, no evidence of parasitism of bog buck moth has been reported (Wood 2020, pers. comm., as cited in COSEWIC 2009, p. 14). Parasitism is assumed to be occurring at the Canadian populations (COSEWIC 2009, p. 17). Similarly, while not documented at the bog buck moth sites in the United States, we find the New York populations are likely to be susceptible to larval parasitism from the tachinid fly and other parasitoids and observed boom/bust cycles may be related to such parasitism. A 2016 report identified a crash of adult bog buck moths at the Oswego Inland Site after abundant larvae of all sizes were observed in May and June. The report suggested further investigation into larval or pupal parasitoids as a possible cause (Bonanno 2016, p. 5).

If bog buck moths are not killed by predators (*e.g.,* small mammals and other invertebrates) or parasitoids, larval behavior may still be affected by the presence of predators or parasitoids. Early instar larvae tend to stay together and defend themselves, while late instar larvae disperse, leading to increased subdivision of clusters (Cornell *et al.* 1987, p. 387). At sites with higher predator or parasitoid densities, bog buck moth larvae likely experience slower growth rates, prolonged development, and reduced body mass (Stamp and Bowers 1990, p. 1037) because they would be forced to forage closer to the center of plants where it is cooler and where older, lower quality leaves are present.

Climate Change

While there are many possible effects to bog buck moths from climate change into the future, here we focus on the effects to bog buck moths from observed changes in precipitation and temperature to date.

Lake Ontario water levels naturally fluctuate within and among years; however, record high water levels have recently occurred, resulting in impacts to bog buck moth sites. Between 1951 and 2017, the total precipitation with the Great Lakes Basin increased by approximately 14 percent with heavy precipitation events increasing by 35 percent (Great Lakes Integrated Sciences and Assessments Program 2019, entire). After 15 years of below-average water levels on Lake Superior and Lake Michigan-Huron, water levels of the upper Great Lakes started rising in 2013 and have been well above average for several years (Board 2020, p. 7). With all of the Great Lakes water levels above or near record-highs, the increase represented an unprecedented volume of water in the Great Lakes system funneled into Lake Ontario and out the St. Lawrence River (Board 2020, p. 7), resulting in the Lakeside population fens being vulnerable to flooding for an extended period of time. Flooding that negatively impacts bog buck moths can be described as longer duration flooding, as long-term flooding of bog buck moth fens submerges vegetation and makes the site unsuitable for most life stages and may directly kill individuals. In contrast, periodic flooding that is shorter in duration helps maintain habitat suitability. Furthermore, bog buck moth eggs can tolerate short-term submersion but are not viable after long-term flooding events (Service 2021, p. 34).

Two high-water events across the entire Great Lakes basin caused by above-normal precipitation (January to

May 2017, and November 2018 through May 2019) compounded the already high-water levels in the Great Lakes basin (Board 2020, pp. 6–9). These events resulted in long-term submersion of bog buck moth eggs and subsequent crashes in adult flights at Lakeside 5. In addition to changes in water levels, climate change has also brought about changes in temperature. The Ontario Ministry of the Environment (2011, p. 1) reported the average temperature in Ontario has gone up by as much as 2.5 °F (1.4 °C) since 1948. Similarly, between 1951 and 2017, the average annual temperature in the Great Lakes Region has increased by 2.3 °F (1.3 °C) (GLISA 2019, entire). We have no detailed studies to assess whether observed declines in bog buck moth counts of the U.S. populations are related to these increased annual temperatures. However, seasonal changes in temperature can influence the form of precipitation and snowpack in winter and shifts in phenology. For example, the timing of fall flights may be shifting to later in September. Bog buck moth monitoring windows have been September 12 to 26 at the Oswego Inland Site and September 18 to October 1 at the Lakeside sites since surveys began, and in recent years there has been little or no activity near the beginning of the survey window (Bonanno 2019, pp. 1–2).

Throughout the Great Lakes Basin, average winter minimum and maximum temperatures increased from 1960 to 2009 by 3.24 and 1.98 °F (1.8 and 1.1 °C), respectively (Suriano *et al.* 2019, pp. 6–8). Increased winter temperatures are associated with decreases in Great Lakes ice cover and increases in winter precipitation occurring as rain. Increased temperatures may also reduce snowpack, impacting bog buck moth food sources. During the first half of the 20th century, the Great Lakes basin experienced an increase in snowfall; however, snowfall has declined through the latter half of the 20th and early 21st centuries (Baijnath-Rodino *et al.* 2018, p. 3947). Similarly, snow depth in the Great Lakes Basin reduced approximately 25 percent from 1960 to 2009 (Suriano *et al.* 2019, p. 4). Trends during this timeframe are variable by subbasin, and there were no significant trends for the Lake Ontario subbasin (Suriano *et al.* 2019, p. 5). At a finer scale (1 degree latitude by 1 degree longitude grids), there were also no significant changes observed for snow depth or snowfall for the grid along Lake Ontario that includes the bog buck moth sites, but there was a significant increase of the number of ablation events (*i.e.,* snow mass loss from melt, sublimation, or evaporation) (Suriano *et al.* 2019, pp. 6–7). These events are associated with rapid snow melt and often lead to localized flooding.

Snowpack reductions lead to longer periods of frost, earlier disappearance of standing water, deeper frost levels, and reduced bog buckbean biomass (Benoy *et al.* 2007, pp. 505–508). Reduced bog buckbean will negatively affect bog buck moth larval growth and survival.

Reduced snowpack can also impact bog buck moths directly; however, limited research is available on the impacts to bog buck moth associated with the presence, depth, and duration of winter snow. The presence of a consistent seasonal snowpack can prevent freeze-thaw cycles. While bog buck moths overwinter in the egg stage, which is less vulnerable to freezing than other life stages, they may also periodically overwinter in the pupal stage, which would be vulnerable to these cycles. Their egg-clustering habit may decrease the amount of egg surface exposed to ambient conditions and reduce the possibility of desiccation (Stamp 1980, p. 369). However, eggs that are not covered by snowpack are exposed to increased risk of predation.

Increased temperatures in winter and early spring may lead to earlier egg hatch. As temperatures have increased, many insects have been emerging earlier (temperature-induced emergence) (Patterson *et al.* 2020, p. 2), resulting in phenological mismatch with host plants. For example, Karner blue butterfly (*Lycaeides melissa samuelis*) larvae have been known to hatch earlier than the host plant, wild blue lupine (*Lupinus perennis*), after unseasonably warm late-winter temperatures (Patterson *et al.* 2020, p. 6). Similar to the Karner blue butterfly, bog buck moth early instar larvae rely on specific host plants and are at greater risk of impacts from phenological mismatch than species with wide host plant usage. Earlier spring hatch followed by subsequent spring freezes also increases the risk of mortality of early instar larvae.

Overall, interacting changes in temperature and precipitation are highly influential in terms of flooding or drying out bog buck moth sites. There may be additional compounding effects from changes in temperature associated with shifts in phenology or reduced snowpack, but we lack sufficient information on those potential relationships.

Conservation Measures

New York Populations

The bog buck moth was listed as endangered by the State of New York in 1999 and is protected by New York's Environmental Conservation Law (Consolidated Laws of New York, chapter—Environmental Conservation, article 11, title 5, section 11–0535) and the New York Code of Rules and Regulations (NYCRR) in title 6, subchapter J, part 182. An incidental take permit is required for any proposed project that may result in a take of bog buck moths, including, but not limited to, actions that may kill or harm individual animals or result in the adverse modification, degradation, or destruction of habitat occupied by the bog buck moth. Additionally, the bog buck moth is a Species of Greatest Conservation Need in the NYSDEC's Comprehensive Wildlife Conservation Strategy (NYSDEC 2005, appendix 5, pp. 14–17; NYSDEC 2015, not numbered). NYSDEC has a draft recovery plan for the bog buck moth (Bonanno and White 2011, entire) that has not been finalized.

All known populations are in conservation ownership (*i.e.,* State or private lands managed for conservation) and are protected from direct negative impacts to their habitat (*e.g.,* wetland fill associated with roads or development). Habitat management has been conducted at a few of these sites, but invasive plants and/or vegetation succession have reduced the amount of available habitat at most sites and remain an ongoing threat. The State of New York provides protection for wetlands greater than 12.4 acres in size or of unusual local importance (NYSDEC 1997, p. 5). Regulated activities within the wetland or adjacent buffer require permits from the NYSDEC. In addition, in accordance with section 404 of the Clean Water Act (33 U.S.C. 1251 *et seq.*), the U.S. Army Corps of Engineers has the authority to regulate discharge of dredged or fill material into waters of the United States, including wetlands of any size. In New York, placing fill into bogs and fens is not authorized under the Nationwide Permit Program.

Canadian Populations

The bog buck moth was recommended for listing as endangered by COSEWIC in 2009 (COSEWIC 2009, entire), listed as endangered under the Ontario Endangered Species Act in 2010, and listed as endangered on Schedule 1 of the Species at Risk Act (SARA) in 2012. These listings provided the bog buck moth protection from

being killed, harmed, harassed, captured, or taken in Canada.

The Ontario Ministry of Natural Resources and Forestry (Ministry) published a recovery strategy for the bog buck moth on December 7, 2011 (Gradish and Tonge 2011, entire). Major actions identified in the plan include improving monitoring standards for the bog buck moth, assessing the risk posed by invasive species, and evaluating the hydrology of the species' habitat. In 2017, the Ministry published a 5-year review of progress towards the protection and recovery of the bog buck moth (Ministry 2017, pp. 11–17). Initial progress has been made towards assessing the risk posed to the bog buck moth by invasive species and, where appropriate, implementing invasive species control within and adjacent to occupied fen ecosystems.

Bog buck moth habitat has generally been afforded protection from authorized damage or destruction in Canada since the species was listed in Ontario in 2010. Bog buck moth habitat is further protected through Ontario habitat regulation and Federal critical habitat protection. Section 41(1)(c) of SARA requires that recovery strategies include an identification of the species' ''critical habitat,'' to the extent possible, as well as examples of activities that are likely to result in its destruction (Environment Canada 2015, p. 9). Environment Canada (2015, p. 10) adopted the description of the bog buck moth ''habitat'' under section 24.1.1.1 of Ontario Regulation 242/08 as ''critical habitat'' in the Federal recovery strategy. The area defined under Ontario's habitat regulation contains the biophysical attributes required by the bog buck moth to carry out its life processes. To meet specific requirements of SARA, the biophysical attributes of critical habitat were further detailed in the Federal strategy (Environment Canada 2015, p. 11). However, under SARA, specific requirements and processes are set out regarding the finalization of protection of critical habitat and whether the prohibition against destruction of critical habitat is extended to any non-Federal land. Protection of critical habitat under SARA was to be assessed following publication of the final bog buck moth Federal recovery strategy (Environment Canada 2015, p. 10). There is no indication that this assessment has occurred to date.

Current Condition

Similar to other *Hemileuca* species, bog buck moth populations (and subpopulations) experience boom and bust cycles. Table 1 and figure 1, below, summarize male peak flight counts at four U.S. subpopulations. Three of the subpopulations have crashed and not recovered.

TABLE 1—BOG BUCK MOTH FALL FLIGHT INFORMATION FOR THE OSWEGO INLAND SITE AND THREE LAKESIDE SUBPOPULATIONS, NY, 22-YEAR RECORD

[Data are site mean of 5-minute counts on the peak date. Zero means a search was made, no moths seen. Empty cells indicate no data were collected at that site that year. Cells with counts higher than 100 are highlighted. Data from Bonanno (2018, p. 4; 2019, p. 4) and Bonanno and Rosenbaum (2020, p. 2).]

Date	Oswego inland site	Lakeside		
		Lakeside 5	Lakeside 3	Lakeside 2
1998	171.3			242.4
1999	49.6		10.6	109.4
2000	7.1		14.8	26.8
2001	16.4		18.6	4.8
2002	37.1		3.3	2.2
2003	46		22.5	6.3
2004	153.2	64.6	21.2	20.2
2005	87.3	51.1		14.4
2006	81.9	126.8		26.3
2007	93.7	65.9	212.0	50.0
2008	63	23.0	5.8	14.2
2009	70	48.7	0.7	14.3
2010				10.0
2011	20.2	141.1	0.1	9.4
2012	18.9	46.0	3.0	1.0
2013	21.4	1.0	0.3	0
2014	126.5	3.8	0	0
2015	98.7	6.7		0
2016	5.0	27.7	0	0
2017	0.7	53.3		
2018	0	30.7	[1] >0	0
2019	0	44.4	0	
2020	0			

[1] (2 total moths).

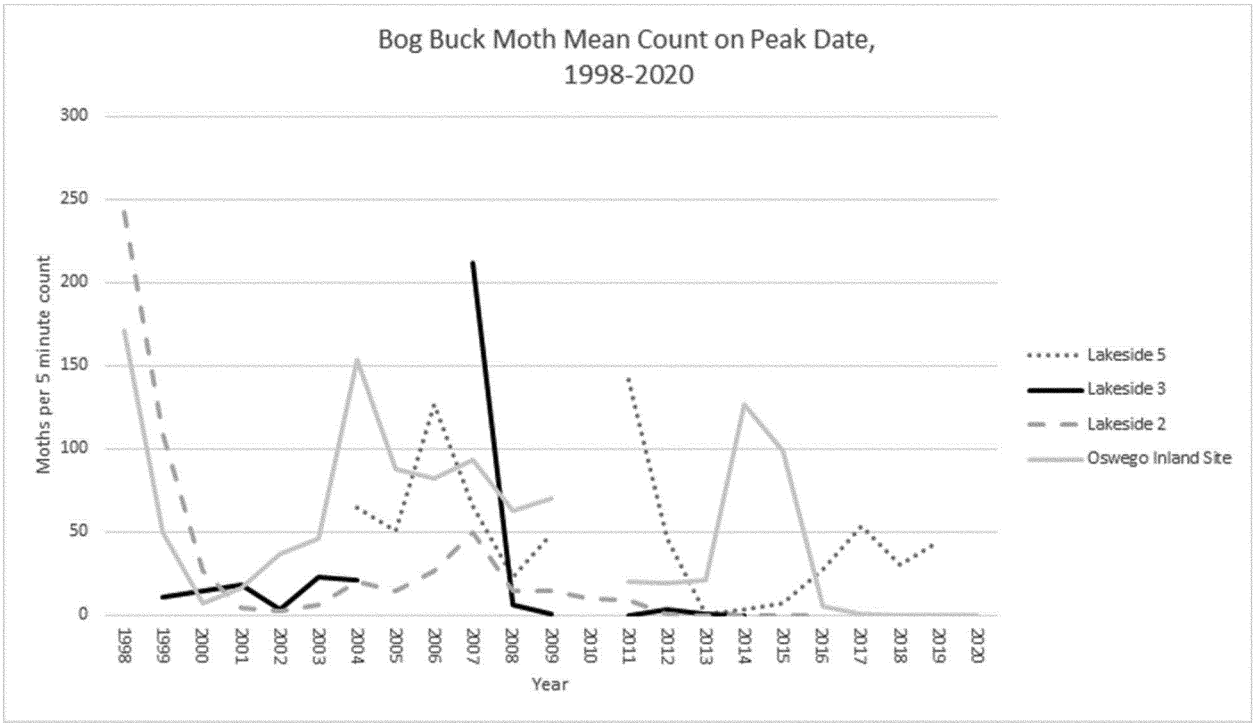

Figure 1. Mean male bog buck moth peak counts (1998–2020). Data from Bonanno (2018, p. 4; 2019, p. 4) and Bonanno and Rosenbaum (2020, p. 2).

In Canada, the status of many of the populations is unknown due to a lack of surveys. Of the four sites found in Canada, only two were recently surveyed. The subpopulation at Richmond Fen South was visited in 2019, when an estimated minimum of 1,500 early instar larvae were found in a small portion of core habitat. Another site visit to the same location in early July 2020 documented the presence of hundreds of mid-instar larvae. At White Lake North, more than 100 adult moths were observed in mid-September 2020. Prior to 2020, larval surveys were conducted, and larvae were last observed in 2016, with no surveys in 2017, and larvae were absent in 2018 and 2019. The status of the two other subpopulations in Canada (Richmond Fen North and White Lake South) is unknown because no surveys have been conducted at those sites.

It is unlikely that there are other bog buck moth populations besides the ones mentioned above. Fairly extensive but unsuccessful searches for bog buck moths have been conducted at other potentially suitable wetland habitat in Ontario, and no new sites have been found (COSEWIC 2009, pp. 9–10). COSEWIC (2009, p. 10) found that, given the degree of interest by naturalists in these natural areas and the diurnal habits of this large distinctive species, the probability of undiscovered Ontario buck moth populations is low.

The circumstances are similar in New York. Cryan and Dirig (2020, pp. 4–5) described several years of exploring the bed of former glacial Lake Iroquois and its tributaries and outlets, and while they found some fens with bog buckbean, they found no additional sites with bog buck moth. In addition, researchers had visited New York fens for many years and likely would have observed the highly conspicuous larvae on the bog buckbean or flying adult males had they been present. Bonanno and White (2011, p. 10) describe multiple visitations to possible habitat by NYNHP and researchers familiar with the bog buck moth without locating any individuals.

We evaluated the bog buck moth's current condition by assessing whether there were multiple, sufficiently resilient populations spread across its geographical extent to maintain its ecological and genetic diversity and withstand catastrophic events (see table 2, below). Information to date suggests that bog buck moths are genetically structured across their range, and we determined that the breadth of adaptive diversity can be captured by two representative units, Canadian and United States.

TABLE 2—ECOLOGICAL REQUIREMENTS FOR SPECIES-LEVEL VIABILITY

3Rs	Requisites	Metric
Resiliency (able to withstand stochastic events).	Healthy populations	Populations with: • Both sexes present. • Sufficient survival of all life stages. • Sufficient number of bog buck moths to survive bust portion of boom and bust cycles. • Stable to increasing trend over last 10 years (10 generations). • Multiple occupied suitable habitat patches within metapopulation. • Sufficient habitat size. • Sufficient habitat quality. • Intact hydrology and ecological processes.
Representation (to maintain evolutionary capacity).	Maintain adaptive diversity	Healthy populations distributed across areas of unique adaptive diversity (*e.g.,* across latitudinal gradients) with sufficient connectivity for periodic genetic exchange.
Redundancy (to withstand catastrophic events).	Sufficient distribution of healthy populations. Sufficient number of healthy populations.	Sufficient distribution to guard against catastrophic events significantly compromising the species' adaptive diversity. Adequate number of healthy populations to buffer against catastrophic losses of adaptive diversity.

We lacked specific demographic rates for most locations for most years; therefore, we used alternative metrics for assessing population resiliency (number of bog buck moth adult males observed, presence of bog buck moth at multiple subpopulations) and the condition of the supporting habitat (habitat quality) (see table 3, below).

TABLE 3—METRICS FOR SCORING BOG BUCK MOTH POPULATION CONDITION

Condition	Sufficient number	Connectivity	Suitable habitat
Unknown	Unknown	Unknown	Unknown.
Extirpated	Not applicable	Not applicable	Habitat is completely unsuitable due to alteration or loss.
Presumed Extirpated	No moths or any other life stage were observed during multiple subsequent surveys.	Not applicable	Habitat present and can be suitable or unsuitable given "sufficient N" results.
Poor	Negative trend over last 10 years	No subpopulations or if subpopulations are present each subpopulation did not have at least one >0 count within the last 5 years.	Insufficient suitable habitat for any of the life stages: • Insufficient bog buckbean (<4% areal coverage). • Relatively limited oviposition sites. • Lack of suitable pupation sites.
Good	Neutral or positive trend over last 10 years.	Multiple subpopulations and >0 count for each subpopulation within the last 5 years.	Sufficient suitable habitat for all life stages: • Sufficient bog buckbean (>4% areal coverage). • Relatively abundant oviposition sites. • Suitable pupation sites.

As discussed above, we are aware of five bog buck moth populations, two in Canada and three in New York. We are unaware of any changes to the distribution in Canada; however, we have information from only two of the four subpopulations. In New York, the Jefferson County site was converted to a marsh, having been impounded decades ago by beavers, then maintained by management for park flooding control, septic management, and black tern habitat (Bonanno 2020, pers. comm.). Of the Lakeside subpopulations, only the Lakeside 5 site remains extant. Lastly, the Oswego Inland Site population was recently presumed to be extirpated.

Using our ranking methods mentioned above, we find that for all the bog buck moth populations in the U.S. Representative Unit, one population has been extirpated since the 1970s, one is now presumed extirpated, and one is in poor condition (see table 4, below). The Lakeside population has experienced multiple sources of habitat loss and degradation, and remaining bog buck moths have faced high flood years. While these may or may not be the true cause of declines and site-level extirpations, they likely contributed to them. The cause of decline and the bog buck moth's inability to rebound at the Oswego Inland Site is unclear, as flooding has not been a concern at this site and seemingly suitable habitat remains. Similar declines at sites with apparently suitable habitat have been documented for another endangered fen species, the Poweshiek skipperling (*Oarisma poweshiek*), suggesting that other factors (*e.g.,* contaminants, climate change, disease, and low levels of genetic diversity) may be driving the current distribution and losses (Pogue *et al.* 2019, pp. 383–386).

In the Canadian Representative Unit, both populations are in unknown/likely good condition. This assessment has a high degree of uncertainty given that it is based on current knowledge from half of the associated Canadian Representative Unit subpopulations

(one out of the two subpopulations for each population). Most recently, Richmond Fen South had hundreds of mid-instar larvae in early July 2020, with ample suitable habitat. Richmond Fen North has not had any recent moth or larval surveys, but observations during a site visit in 2015 suggested that the habitat remains in good condition. At White Lake North, more than 100 bog buck moth adults were observed in September 2020. Prior to that, surveys were based on larvae, with larvae last observed in 2016 and none seen in 2018 or 2019. There is no information on White Lake South. Although both populations have been described as unknown/likely good, invasive species such as cattails, common reed, and glossy buckthorn have been identified in the habitat and are likely to have a negative effect and reduce the resiliency of these populations (COSEWIC 2009, p. 18; Gradish and Tonge 2011, pp. 6–7; Environment Canada 2015, p. 7).

Overall, three subpopulations (White Lake North, Richmond Fen South, and Lakeside 5) associated with three separate populations are known to have remaining bog buck moths. While some genetic diversity remains through the current existence of at least one subpopulation within each of the representative units, there is no redundancy of healthy populations in the U.S. Representative Unit, and there is uncertainty about the status of the Canadian Representative Unit.

TABLE 4—SUMMARY OF BOG BUCK MOTH'S CURRENT CONDITION

3Rs	Requisites	Metric	Current condition
Resiliency (able to withstand stochastic events).	Healthy populations	Populations with: • Both sexes present. • Sufficient survival of all life stages. • Sufficient number of bog buck moths to survive bust portion of boom and bust cycles. • Stable to increasing trend over last 10 years (10 generations). • Multiple occupied suitable habitat patches within metapopulation. • Sufficient habitat size. • Sufficient habitat quality. • Intact hydrology and ecological processes.	Poor. Of the five historically known populations: • one is extirpated; • one is presumed extirpated; • one is in poor condition; and • two are in unknown/likely good condition.
Representation (able to maintain evolutionary capacity).	Maintain adaptive diversity	Healthy populations distributed across areas of unique adaptive diversity (*e.g.,* across latitudinal gradients) with sufficient connectivity for periodic genetic exchange.	Poor. There are two potentially healthy populations in the Canadian Representative Unit and none in the U.S. Representative Unit.
Redundancy (able to withstand catastrophic events).	Sufficient distribution of healthy populations.	Sufficient distribution to guard against catastrophic events significantly compromising species adaptive diversity.	Poor. See above.
	Sufficient number of healthy populations.	Adequate number of healthy populations to buffer against catastrophic losses of adaptive diversity.	Poor. See above.

Future Condition

As part of the SSA, we developed two future condition scenarios to capture the range of uncertainties regarding future threats and the projected responses by the bog buck moth. Our scenarios assumed increased winter and spring precipitation, increased annual temperatures, and either continuation or increases in invasive plant species and succession. Because we have determined that the current condition of the bog buck moth is consistent with an endangered species (see Determination of Bog Buck Moth's Status, below), we are not presenting the results of the future scenarios in this rule; however, under both scenarios, the future condition is projected to worsen. Please refer to the SSA report (Service 2021, pp. 67–83) for the full analysis of future scenarios.

Summary of Comments and Recommendations

In the proposed rule published on October 14, 2021 (86 FR 57104), we requested that all interested parties submit written comments on the proposal by December 13, 2021. We also contacted appropriate Federal and State agencies, scientific experts and organizations, and other interested parties and invited them to comment on the proposal. A newspaper notice inviting general public comment was published for multiple days in the Syracuse Post Standard (New York). We did not receive any requests for a public hearing. All substantive information regarding the listing of bog buck moth that was provided during peer reviews and the comment period has been incorporated directly into this final rule, as appropriate.

Peer Reviewer Comments

As discussed under Peer Review, above, we received responses from 4 peer reviewers and 11 partners, including Federal and State partners, Canadian partners, and scientists with expertise in fen ecology and bog buck moth biology. We reviewed all comments we received from the peer reviewers and partners for substantive issues and new information regarding the information contained in the SSA report. The peer reviewers and partners generally concurred with our methods and conclusions, and provided additional information, clarifications, and suggestions to improve the final SSA report.

Public Comments

Comment: Multiple commenters did not agree with our determination that a designation of critical habitat for the bog buck moth was not prudent, providing various reasons why they believed that we should designate critical habitat for the species. These reasons included the utility of critical habitat in addressing the threats to the species of limited range and local water regulation.

Commenters further suggested that critical habitat could be designated with limited detail and at a sufficiently high scale to minimize harm from precise identification of location.

Response: Based on these comments, we elaborate on our reasoning to better explain the decision for a not-prudent determination for the designation of critical habitat for the bog buck moth in this final rule. The bog buck moth currently occurs in Canada and New York State. However, critical habitat can only be designated in the United States (50 CFR 424.12(g)). Thus, our critical habitat assessment only considered the two New York populations. Since the publication of the proposed rule (86 FR 57104; October 14, 2021), the collection threats affecting the co-occurring species have not abated. The publication of detailed maps of the bog buck moth occurrences would facilitate unauthorized collection and trade of the co-occurring species. Because the bog buck moth is found in wetlands, if we designated critical habitat, we would not be able to avoid identifying the individual fens where the species occurs. In other words, it is not possible for us to meet the Act's requirements for designating critical habitat at a scale that would not reveal the location of occupied wetlands. Moreover, any increase in human activities, including collection, within the habitat for the two remaining New York populations can be expected to cause harm to the bog buck moth from disturbance and trampling of individuals (eggs, larvae, pupae) and to vegetation necessary as a host plant and for sheltering of all life stages.

Designation of critical habitat is just one of many tools available for bog buck moth conservation. Other tools include the listing decision itself, habitat management and restoration by the Service and our partners (*e.g.,* Federal agencies, nongovernmental organizations, and the NYSDEC), research, and possibly captive management. As of the effective date of this rule (*see* **DATES**, above), any Federal actions that impact any of the subpopulations of the occupied Lakeside population will undergo section 7 consultation regardless of critical habitat designation. The Lakeside population is made up of sites currently under State or nongovernmental organization protection and management. The Oswego Inland Site population (presumed extirpated) is protected by a nongovernmental organization, and we do not anticipate frequent Federal actions in adjacent uplands that would result in a nexus for consultation, even if the site were to be designated as critical habitat. Moreover, we would anticipate that any activities with Federal involvement (*e.g.,* restoring habitat for future possible reintroduction of the bog buck moth) would benefit the site rather than result in adverse effects to the habitat. Lastly, State and Federal wetlands protections are in place for all of the sites, and no section 404 Clean Water Act permits are authorized in bogs and fens in New York (refer to *Conservation Measures,* above, for further analysis). Accordingly, our reasoning for a not-prudent finding in our proposed rule continues to be applicable to this final rule.

One commenter mentioned the limited distribution and concentration of bog buck moth habitat and the potential effects of water level regulation on Lake Ontario on the species. While we recognize the restricted range of the species, limited range alone is not sufficient for designating critical habitat where we have determined that such designation is not prudent on other grounds. We agree that flooding of sites can impact bog buck moths. However, periodic flooding is important to reset vegetation succession at these sites. Past management of Lake Ontario has prevented these periodic flushing events. In recent years, the major drivers of water level in these sites include heavy precipitation events causing flooding or alteration of fens resulting in drying and vegetation succession. See *Change in Water* Levels, above, for more information. As discussed above, any Federal actions that may affect the Lakeside population will be subject to consultation under section 7 of the Act due to the presence of the species.

Determination of Bog Buck Moth's Status

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations (50 CFR part 424) set forth the procedures for determining whether a species meets the definition of an endangered species or a threatened species. The Act defines an ''endangered species'' as a species in danger of extinction throughout all or a significant portion of its range, and a ''threatened species'' as a species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. The Act requires that we determine whether a species meets the definition of endangered species or threatened species because of any of the following factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence.

Status Throughout All of Its Range

After evaluating threats to the species and assessing the cumulative effect of the threats under the Act's section 4(a)(1) factors, we have determined that the bog buck moth is at risk of extinction now throughout its range due to a combination of factors. Bog buck moth populations undergo boom and bust cycles and are highly vulnerable to stochastic events or threats during the bust phase (Factor E). All populations are isolated from one another and cannot repopulate extirpated sites (Factor E). We find that past and ongoing stressors, including habitat alteration due to water level management on Lakeside sites, vegetative succession and invasive plant species (Factor A), and death of individuals due to flooding (Factor E), have caused and are highly likely to continue to cause a decline in the species' viability through reduction of resilience, redundancy, and representation to such a degree that the species is particularly vulnerable to extinction presently and is highly likely to become more vulnerable to extinction. We do not fully understand the cause of declines at bog buck moth sites, and so it is likely that additional factors are important, such as inherent factors (*e.g.,* narrow habitat niche) (Factor E), parasitoids (Factor E), predation (Factor C), disease (Factor C), and pesticides (Factor E).

Of the three historical U.S. populations, two have been extirpated or are presumed extirpated. The Jefferson County population was extirpated due to habitat conversion in the 1970s. The reason for the extirpation of the Oswego Inland Site population is unclear, as the habitat still appears suitable. For the remaining U.S. population, the Lakeside population, the overall condition is poor with four of the five sites (Lakeside 1–4) presumed extirpated. Lakeside 5 is the last site with a confirmed moth population as of 2019. However, even this site is considered to be in poor condition with severe habitat degradation.

The Canadian populations comprise two potentially healthy populations. However, there is high uncertainty about their status. Unlike the New York populations, no standardized transect counts are available to assess long-term trends. In addition, we have information

on just two of the four subpopulations associated with these populations. While there are bog buck moths known at two of these subpopulations and suitable habitat remains, invasive plant species are present at these sites and active management is not underway.

All of the extant bog buck moth populations are currently facing a multitude of threats including water level changes, succession, and invasive species. Additionally, other factors, including parasitoids, predation, disease, and pesticides, as well as the species' limited dispersal range and small numbers, likely play a role in its decline. As studies in the New York population have shown, attempts at managing and controlling the spread of invasive plants or woody plants from succession in fens have proven to be extremely labor intensive and have limited effect. We find that the magnitude and imminence of threats facing the bog buck moth place the species in danger of extinction now, and therefore we find that threatened status is not appropriate. Thus, after assessing the best available information, we determine that the bog buck moth is in danger of extinction throughout all of its range.

Status Throughout a Significant Portion of Its Range

Under the Act and our implementing regulations, a species may warrant listing if it is in danger of extinction or likely to become so in the foreseeable future throughout all or a significant portion of its range. We have determined that the bog buck moth is in danger of extinction throughout all of its range, and accordingly did not undertake an analysis of any significant portion of its range. Because the bog buck moth warrants listing as endangered throughout all of its range, our determination does not conflict with the decision in *Center for Biological Diversity* v. *Everson,* 435 F. Supp. 3d 69 (D.D.C. 2020) (*Everson*), which vacated the provision of the Final Policy on Interpretation of the Phrase ''Significant Portion of Its Range'' in the Endangered Species Act's Definitions of ''Endangered Species'' and ''Threatened Species'' (Final Policy) (79 FR 37578, July 1, 2014) providing that if the Services determine that a species is threatened throughout all of its range, the Services will not analyze whether the species is endangered in a significant portion of its range.

Determination of Status

Our review of the best available scientific and commercial information indicates that the bog buck moth meets the Act's definition of an endangered species. Therefore, we are listing the bog buck moth as an endangered species in accordance with sections 3(6) and 4(a)(1) of the Act.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened species under the Act include recognition as a listed species, planning and implementation of recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing results in public awareness, and conservation by Federal, State, Tribal, and local agencies, private organizations, and individuals. The Act encourages cooperation with the States and other countries and calls for recovery actions to be carried out for listed species. The protection required by Federal agencies, including the Service, and the prohibitions against certain activities are discussed, in part, below.

The primary purpose of the Act is the conservation of endangered and threatened species and the ecosystems upon which they depend. The ultimate goal of such conservation efforts is the recovery of these listed species, so that they no longer need the protective measures of the Act. Section 4(f) of the Act calls for the Service to develop and implement recovery plans for the conservation of endangered and threatened species. The goal of this process is to restore listed species to a point where they are secure, self-sustaining, and functioning components of their ecosystems.

Recovery planning consists of preparing draft and final recovery plans, beginning with the development of a recovery outline, and making it available to the public within 30 days of a final listing determination. The recovery outline guides the immediate implementation of urgent recovery actions and describes the process to be used to develop a recovery plan. Revisions of the plan may be done to address continuing or new threats to the species, as new substantive information becomes available. The recovery plan also identifies recovery criteria for review of when a species may be ready for reclassification from endangered to threatened (''downlisting'') or removal from protected status (''delisting''), and methods for monitoring recovery progress. Recovery plans also establish a framework for agencies to coordinate their recovery efforts and provide estimates of the cost of implementing recovery tasks. Recovery teams (composed of species experts, Federal and State agencies, nongovernmental organizations, and stakeholders) are often established to develop recovery plans. When completed, the recovery outline, draft recovery plan, and the final recovery plan will be available on our website (*https://www.fws.gov/program/endangered-species*), or from our New York Field Office (*see* **FOR FURTHER INFORMATION CONTACT**).

Implementation of recovery actions generally requires the participation of a broad range of partners, including other Federal agencies, States, Tribes, nongovernmental organizations, businesses, and private landowners. Examples of recovery actions include habitat restoration (*e.g.,* restoration of native vegetation), research, captive propagation and reintroduction, and outreach and education. The recovery of many listed species cannot be accomplished solely on Federal lands because their ranges may occur primarily or solely on non-Federal lands. To achieve recovery of these species requires cooperative conservation efforts on private, State, and Tribal lands.

Once this species is listed, funding for recovery actions will be available from a variety of sources, including Federal budgets, State programs, and cost-share grants for non-Federal landowners, the academic community, and nongovernmental organizations. In addition, pursuant to section 6 of the Act, the State of New York will be eligible for Federal funds to implement management actions that promote the protection or recovery of the bog buck moth. Section 8(a) of the Act (16 U.S.C. 1537(a)) authorizes the provision of limited financial assistance for the development and management of programs that the Secretary of the Interior determines to be necessary or useful for the conservation of endangered or threatened species in foreign countries. Sections 8(b) and 8(c) of the Act (16 U.S.C. 1537(b) and (c)) also authorize the Secretary to encourage conservation programs for listed species found outside the United States, and to provide assistance for such programs, in the form of personnel and the training of personnel. Information on our grant programs that are available to aid species recovery can be found at: *https://www.fws.gov/service/financial-assistance.*

Please let us know if you are interested in participating in recovery efforts for the bog buck moth. Additionally, we invite you to submit any new information on this species whenever it becomes available and any information you may have for recovery

planning purposes (*see* **FOR FURTHER INFORMATION CONTACT**).

Section 7(a) of the Act requires Federal agencies to evaluate their actions with respect to any species that is listed as an endangered or threatened species and with respect to its critical habitat, if any is designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of any endangered or threatened species or destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into consultation with us.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to endangered wildlife. The prohibitions of section 9(a)(1) of the Act, codified at 50 CFR 17.21, make it illegal for any person subject to the jurisdiction of the United States to take (which includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect; or to attempt any of these) endangered wildlife within the United States or on the high seas. In addition, it is unlawful to import; export; deliver, receive, carry, transport, or ship in interstate or foreign commerce in the course of commercial activity; or sell or offer for sale in interstate or foreign commerce any species listed as an endangered species. It is also illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Certain exceptions apply to employees of the Service, the National Marine Fisheries Service, other Federal land management agencies, and State conservation agencies.

Federal agency actions that may require conference or consultation or both (as described above) include management and any other landscape-altering activities on lands near bog buck moth subpopulations.

We may issue permits to carry out otherwise prohibited activities involving endangered wildlife under certain circumstances. Regulations governing permits are codified at 50 CFR 17.22. With regard to endangered wildlife, a permit may be issued for the following purposes: For scientific purposes, to enhance the propagation or survival of the species, and for incidental take in connection with otherwise lawful activities. The statute also contains certain exemptions from the prohibitions, which are found in sections 9 and 10 of the Act.

It is our policy, as published in the **Federal Register** on July 1, 1994 (59 FR 34272), to identify to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the Act. The intent of this policy is to increase public awareness of the effect of a final listing on proposed and ongoing activities within the range of the listed species. Based on the best available information, the following actions are unlikely to result in a violation of section 9, if these activities are carried out in accordance with existing regulations and permit requirements; this list is not comprehensive: Normal recreational hunting, fishing, or boating activities that are carried out in accordance with all existing hunting, fishing, and boating regulations and that follow reasonable practices and standards.

Based on the best available information, the following activities may potentially result in a violation of section 9 of the Act if they are not authorized in accordance with applicable law; this list is not comprehensive:

(1) Unauthorized collecting, handling, possessing, selling, delivering, carrying, or transporting of the bog buck moth, including import or export across State lines and international boundaries, except for properly documented antique specimens of the taxon at least 100 years old, as defined by section 10(h)(1) of the Act;

(2) Unauthorized modification, removal, or destruction of the wetland vegetation, soils, or hydrology in which the bog buck moth is known to occur;

(3) Unauthorized discharge of chemicals or fill material into any wetlands in which the bog buck moth is known to occur; and

(4) Unauthorized release of biological control agents that attack any life stage of the bog buck moth, including parasitoids, herbicides, pesticides, or other chemicals, in habitats in which the bog buck moth is known to occur.

Questions regarding whether specific activities would constitute a violation of section 9 of the Act should be directed to the New York Field Office (*see* **FOR FURTHER INFORMATION CONTACT**).

II. Critical Habitat

Background

Critical habitat is defined in section 3 of the Act as:

- The specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the Act, on which are found those physical or biological features
  - Essential to the conservation of the species, and
  - Which may require special management considerations or protection; and
- Specific areas outside the geographical area occupied by the species at the time it is listed, upon a determination that such areas are essential for the conservation of the species.

Our regulations at 50 CFR 424.02 define the geographical area occupied by the species as an area that may generally be delineated around species' occurrences, as determined by the Secretary (*i.e.,* range). Such areas may include those areas used throughout all or part of the species' life cycle, even if not used on a regular basis (*e.g.,* migratory corridors, seasonal habitats, and habitats used periodically, but not solely by vagrant individuals).

Conservation, as defined under section 3 of the Act, means to use and the use of all methods and procedures that are necessary to bring an endangered or threatened species to the point at which the measures provided pursuant to the Act are no longer necessary. Such methods and procedures include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transplantation, and, in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, may include regulated taking.

Critical habitat receives protection under section 7 of the Act through the requirement that Federal agencies ensure, in consultation with the Service, that any action they authorize, fund, or carry out is not likely to result in the destruction or adverse modification of critical habitat. The designation of critical habitat does not affect land ownership or establish a refuge, wilderness, reserve, preserve, or other conservation area. Designation also does not allow the government or public to access private lands, and designation does not require implementation of restoration, recovery, or enhancement measures by non-Federal landowners. Where a landowner requests Federal agency funding or authorization for an action that may affect a listed species or critical habitat, the Federal agency would be required to consult with the Service under section 7(a)(2) of the Act. However, even if the Service were to

conclude that the proposed activity would likely result in destruction or adverse modification of the critical habitat, the Federal action agency and the landowner are not required to abandon the proposed activity, or to restore or recover the species; instead, they must implement ''reasonable and prudent alternatives'' to avoid destruction or adverse modification of critical habitat.

Section 4 of the Act requires that we designate critical habitat on the basis of the best scientific data available. Further, our Policy on Information Standards Under the Endangered Species Act (published in the **Federal Register** on July 1, 1994 (59 FR 34271)), the Information Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Pub. L. 106–554; H.R. 5658)), and our associated Information Quality Guidelines provide criteria, establish procedures, and provide guidance to ensure that our decisions are based on the best scientific data available. They require our biologists, to the extent consistent with the Act and with the use of the best scientific data available, to use primary and original sources of information as the basis for recommendations to designate critical habitat.

Prudency Determination

Section 4(a)(3) of the Act, as amended, and implementing regulations (50 CFR 424.12) require that, to the maximum extent prudent and determinable, the Secretary shall designate critical habitat at the time the species is determined to be an endangered or threatened species. On August 27, 2019, we revised our regulations at 50 CFR part 424 to further clarify when designation of critical habitat may not be prudent (84 FR 45020; August 27, 2019) (the 2019 Revisions). The 2019 Revisions (50 CFR 424.12(a)(1)) state that the Secretary may, but is not required to, determine that a designation would not be prudent in the following circumstances:

- The species is threatened by taking or other human activity and identification of critical habitat can be expected to increase the degree of such threat to the species;
- The present or threatened destruction, modification, or curtailment of a species' habitat or range is not a threat to the species, or threats to the species' habitat stem solely from causes that cannot be addressed through management actions resulting from consultations under section 7(a)(2) of the Act;
- Areas within the jurisdiction of the United States provide no more than negligible conservation value, if any, for a species occurring primarily outside the jurisdiction of the United States;
- No areas meet the definition of critical habitat; or
- The Secretary otherwise determines that designation of critical habitat would not be prudent based on the best scientific data available.

In the proposed listing rule (86 FR 57104; October 14, 2021), we preliminarily determined that designation of critical habitat for bog buck moth would not be prudent (see 86 FR 57121). We invited public comment and requested information on the threats of taking or other human activity on bog buck moth and its habitat, and on the extent to which critical habitat designation might increase those threats. During the comment period, we received comments that identified the need to provide additional rationale for the not-prudent determination. After review and consideration of the comments we received, we restate our determination that the designation of critical habitat for the bog buck moth is not prudent, in accordance with 50 CFR 424.12(a)(1). Our rationale for this determination is that within the New York populations, the bog buck moth co-occurs with another federally listed species that was listed, in part, due to collection pressure, which has not abated and has been documented recently in New York. Additionally, at the time the other species was listed, collection pressure resulted in a determination that designating critical habitat was not prudent. Designating critical habitat for the bog buck moth would undermine the not-prudent determination that was previously made for the other co-occurring listed species. Designation of critical habitat requires the publication of a narrative description of specific critical habitat areas and maps in the **Federal Register** and in the Code of Federal Regulations. Any critical habitat maps developed for the species would have to be sufficiently detailed to show the specific habitat where the bog buck moth is found and the vicinity in which the fen is found. This degree of specificity would be such that someone specifically looking for the area would be able to find the particular fen using widely available mapping software and imagery. We find that the publication of maps and descriptions outlining the locations of bog buck moth would provide heretofore unavailable precise location information for the co-occurring species and likely lead to additional unauthorized collection and, therefore, an increase in the illegal trade of the co-occurring species. Moreover, we find that providing information that increases the collection risk of the co-occurring species would result in degradation of habitat for both the co-occurring species and the bog buck moth. There have been past cases of illegal collection in New York State of the co-occurring species that contributed to habitat degradation (*e.g.,* trampling of vegetation). If pursuit and collection of the co-occurring species occurs in bog buck moth habitat, that activity can be expected to cause harm to the bog buck moth from disturbance and trampling of individuals (eggs, larvae, pupae) and to vegetation necessary as a host plant and for sheltering of all life stages.

Accordingly, we have determined that the designation of critical habitat for the bog buck moth would provide a heretofore unavailable link to the precise locations of a co-occurring listed species and would result in increased collection risk to the co-occurring species; therefore, the designation of critical habitat for the bog buck moth would reasonably be expected to increase the degree of threats from human activity to the co-occurring species and to the bog buck moth and its habitat. Therefore, we find that the designation of critical habitat is not prudent for the bog buck moth, in accordance with 50 CFR 424.12(a)(1)(i) and (v).

Required Determinations

Government-to-Government Relationship With Tribes

In accordance with the President's memorandum of April 29, 1994 (Government-to-Government Relations with Native American Tribal Governments; 59 FR 22951), Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments), and the Department of the Interior's manual at 512 DM 2, we readily acknowledge our responsibility to communicate meaningfully with recognized Federal Tribes on a government-to-government basis. In accordance with Secretarial Order 3206 of June 5, 1997 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act), we readily acknowledge our responsibilities to work directly with Tribes in developing programs for healthy ecosystems, to acknowledge that Tribal lands are not subject to the same controls as Federal public lands, to remain sensitive to Indian culture, and to make information available to Tribes.

There are no known Tribal lands with bog buck moth populations.

References Cited

A complete list of references cited in this rulemaking is available on the internet at *https://www.regulations.gov* and upon request from the New York Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Authors

The primary authors of this rule are the staff members of the Service's Species Assessment Team and the New York Field Office.

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Plants, Reporting and recordkeeping requirements, Transportation, Wildlife.

Regulation Promulgation

Accordingly, we amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:

PART 17—ENDANGERED AND THREATENED WILDLIFE AND PLANTS

■ 1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361–1407; 1531–1544; and 4201–4245, unless otherwise noted.

■ 2. Amend § 17.11, in paragraph (h), by adding an entry for ''Moth, bog buck'' to the List of Endangered and Threatened Wildlife in alphabetical order under Insects to read as follows:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Common name	Scientific name	Where listed	Status	Listing citations and applicable rules
*	*	*	*	*
INSECTS				
*	*	*	*	*
Moth, bog buck	*Hemileuca maia menyanthevora* (=*H. iroquois*)	Wherever found.	E	88 FR [Insert **Federal Register** page where the document begins], March 15, 2023.
*	*	*	*	*

Martha Williams,

Director, U.S. Fish and Wildlife Service.

[FR Doc. 2023–05012 Filed 3–14–23; 8:45 am]

BILLING CODE 4333–15–P