

***Euchloe ausonides insulanus* Guppy and Shepard, 2001**  
**Island Marble**  
**(Pieridae: Anthocharinae: Anthocharini)**

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## SUMMARY

The Island Marble is limited to one small population with a very limited number of individuals. Its former range and available habitat has been reduced to a fraction of what it once was, and continues to be threatened by development, invasive plants, and the use of herbicides. There are no existing regulations in place to protect these butterflies or their habitat. Without immediate attention this species could go extinct.

### CONSERVATION STATUS

**Xerces Red List Status: Critically Imperiled**

**Other Rankings:**

Canada – Species at Risk Act:	Extirpated
Canada – provincial status:	None
Mexico:	N/A
USA – Endangered Species Act:	None
USA – state status:	None
NatureServe:	T1
IUCN Red List:	N/A

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## SPECIES PROFILE

### DESCRIPTION

**Adult:** The Island Marble (*Euchloe ausonides insulanus*) is a subspecies of the Large Marble, *Euchloe ausonides* (Lucas), a medium sized butterfly in the family Pieridae (whites), subfamily Pierinae. The wingspan is approximately 45 mm (1.75 in.). Like other members of the *Euchloe ausonides* species, the dorsal wings are creamy white with black patterning on the forewing tip and a thin, black rectangle with light, white over-scaling in the dorsal forewing cell (Pyle 2002). Ventrally, the hind wing and forewing tip are patterned with distinctive, yellow-green marbling that crosses the yellow veins (Pyle

2002), with the marbled marks occurring in large patches with equally large white patches between them (Guppy and Shepard 2001). Females are often yellowish, and may reflect ultraviolet (Guppy and Shepard 2001). The island marble is distinguished from other members of the species by having all dark markings expanded dorsally and wing bases strongly shadowed, the marbling ventrally broadened, and more yellow coloration (Pyle 2002). Additionally, it is the largest subspecies belonging to the species. The flight of this butterfly is straight, fluttering, and usually fast. When basking, the wings are closed (displaying the marbling) and oriented sideways to the sun. Although no other marbles overlap in range with this subspecies, it could be confused with other white butterflies in the region: the Pine White (*Neophasia menapia*), the Cabbage White (*Pieris rapae*), and Sara's Orangetip (*Anchocharis sara*). Both the Pine White and the ubiquitous Cabbage White can be distinguished from the Island Marble by the lack of marbling on the ventral side of the wings. Sara's Orangetip has ventral marbling on the wings, but is clearly distinguished from the Island Marble by the bright orange tips of the dorsal forewings.

Immature: The larvae of this species are steely-blue grading into green below, striped bright yellow down the back and along the sides and peppered black all over (Pyle 2002). The pupae of this species are long, slender, and tan with brown stripes, with the ventrum bowed and the head drawn out into a horn (Pyle 2002). The eggs of this subspecies are greenish-white maturing to red, then brown (Lambert 2005).

#### **TAXONOMIC STATUS**

*Euchloe ausonides insulanus* Guppy and Shepard, 2001. Common names include Island Large Marble and Marbré Insulaire.

#### **LIFE HISTORY**

The Island Marble is a univoltine butterfly, undergoing just one brood per season. Cruciferous annuals (mustards) are the primary host plants for this subspecies, specifically the native Tall Pepperweed (*Lepidium virginicum* var. *menziesii*) and the non-native Field Mustard (*Brassica campestris* L.) and Tall Tumble Mustard (*Sisymbria altissimum* L.) (Lambert 2005). As outlined in the following paragraph excerpted from Lambert (2005), the life cycle of this butterfly is closely associated with the phenology of the host plants (Lambert 2005):

In early April, shortly after *Brassica campestris* leaves and flowering stalks emerge, adults begin to eclose from diapausing pupae. Weather permitting, males begin patrolling hillsides in search of females and within 4-7 days mating and ovipositing begin. Females lay single eggs usually on unopened, terminal flower buds, but eggs can also be found on stems, flowers and leaves of host plants. Based on preliminary data, adults live approximately 6-9 days. Greenish-white eggs mature from red to brown in 6-12 days. Eggs hatch in May as terminal buds begin to flower. During this time, all three species of host plants overlap in their development, adults are active, and larval resources are plentiful. As larvae mature instars I-III remain on the same raceme to feed on terminal buds, flowers

and developing fruits; instars IV and V continue to feed on fruits until their food plant is defoliated or going to seed at which time they are forced to leave their primary food plant and search for supplementary hosts nearby. By June, larvae complete development and begin searching for pupation sites. Unlike other *E. ausonides* species (Opler 1974), pupation does not occur on the host plant but instead in surrounding vegetation. Larvae ‘walk’ approximately 2-5 meters from their food plant, attach themselves to the base of senescing grasses such as *Holcus lanatus*, or in the case of lagoon populations, perennials such as *Salicornia virginica*, pupate and enter diapause until the following spring.

#### **DISTRIBUTION AND ABUNDANCE**

The Island Marble was historically found on Gabriola Island and on Vancouver Island (British Columbia) from Nanaimo in the north, southward along the eastern edge of the island to Beacon Hill Park, Victoria (Environment Canada 2001, Shepard 2000). Eleven collections were made between 1858 and 1908. It was recorded only at lower elevations, and was apparently never common on Vancouver Island (Environment Canada 2001). It had not been seen since 1908 and was believed extinct.

In 1998, a small population of the island marble was found at San Juan Island National Historical Park American Camp on San Juan Island in Washington State. In 2005, two hundred twenty-five surveys were conducted at 150 distinct localities including potential grassland habitat on more than 16 islands and within 6 counties of Washington by staff from the Washington Department of Fish and Wildlife, Washington Department of Natural Resources, US Fish and Wildlife Service, the Xerces Society, and local volunteers. As a result of these searches, Island Marble butterflies were found at eleven new locations (nine on San Juan Island and two on Lopez Island), although none of the sites had more than five individuals. The surveys also helped determine the extent of the original population at San Juan Island National Historical Park American Camp. The vast majority of the butterflies – and the only viable populations - are located at American Camp. Many of the individuals found at the new locations are likely strays from this main site. San Juan and Lopez Islands in Washington comprise this taxon's sole global occurrence, making it one of the most restricted United States' endemic species.

BLM and U.S. Forest Service Land: There is a small population located on BLM land at the southern tip of San Juan Island, adjacent to the San Juan Island National Historic Park.

**Abundance:** The total population of the Island Marble (at all sites) is estimated to be less than 2,000 individuals.

#### **HABITAT**

The butterfly inhabits open coastal lowlands including grasslands, sand dunes and tidal lagoons. All habitat types are distinguished by the presence of cruciferous host plants (*Brassica campestris*, *Sisymbrium altissimum* and *Lepidium virginicum* var. *menziesii*), full sunlight, and some type of topographic relief (e.g. bluffs, ridges or dunes) (Lambert

2005). Dry, shallow-soiled, grassy slopes and balds do not appear hospitable to this subspecies, as searches have failed to locate the Island Marble or its food plants in such habitat (Miskelly & Potter 2009).

The following paragraph, excerpted from Lambert 2005, describes appropriate habitat for larval host plants of the Island Marble and lists additional plants that provide resources for this butterfly:

*Brassica campestris* occurs most frequently in areas dominated by grasses such as *Holcus lanatus*, *Agrostis tenuis* and *Poa pratensis*. *Sisymbrium altissimum* also occurs in grasslands especially in disturbed areas along trails and road edges. In addition to *B. campestris* and *S. altissimum*, a variety of native forbs flourish near rocky outcrops including: *Cerastium arvense*, *Ranunculus californicus*, *Zygadenus venenosus*, and *Brodiaea howellii*. Several of these species provide important nectar and landing resources for adults patrolling hillsides for mates. Nectar plants and roosting sites associated with dune habitat include *Leymus mollis*, *Abronia latifolia* and *Amsinkia intermedia*. Lastly, three tidal lagoons along the north shore of American Camp support *E. ausonides insulanus* populations. The third host plant, *Lepidium virginicum* var. *menziesii* inhabits intermediate beaches between rising lagoons and tidal shoreline. *Salicornia virginica*, *Cakile maritima*, and *Achillea millefolium* are also present and provide habitat important to different life stages of *E. ausonides insulanus*. For example, the base of *Salicornia virginica* provides structure for larvae pupation and *Cakile maritima* inflorescence provides nectar for adults.

Additionally, the Island Marble has recently been seen nectaring on *Erodium cicutarium* (Common Stork's-bill) and *Rubus ursinus* (Trailing Blackberry) (Miskelly & Potter 2009).

## **THREATS**

The Island Marble is a rare, narrowly distributed species subject to a wide variety of threats:

Improper management practices: Managing habitat for rare and endangered species is always complex, but given the small population sizes of the Island Marble, this species may be particularly susceptible to management practices used in native prairie restoration, such as mowing, herbicide use, and controlled fire. Recent observations indicate that this butterfly is directly threatened by the following management practices: improperly timed mowing, cultivation, livestock grazing, and selective removal of host plants (Miskelly & Potter 2009). Although certain techniques can be useful in restoring habitat or native prairie plants, if applied in the wrong way or at the wrong time they can be detrimental to restoring native animal species, such as the Island Marble. For example, mowing can be lethal to sessile larvae or pupae, and hand-pulling of invasive plants may trample eggs, larvae, or pupae (Erhardt 1985).

Pesticides: Herbicides and insecticides, if not carefully applied, can have direct and indirect negative impacts on this species, including lethal and sublethal effects to one or more life stages, and cause damage to host plants. In either case, the effects of improperly applied pesticides may further reduce population sizes. Of particular concern is Btk (*Bacillus thuringiensis* var. *kurstaki*), a Lepidoptera-specific larvicide that has become the pesticide of choice to treat defoliators such as the Asian gypsy moth (Wagner and Miller 1995). A bacterium, Btk kills lepidopteran larvae by multiplying in the gut, releasing toxic substances, and eventually causing the larvae to stop feeding. Since Btk has been shown to drift at toxic concentrations for distances greater than two miles from target spray areas (Barry *et al.* 1993; Whaley *et al.* 1998), aerial spraying of even relatively small areas with Btk can have significant adverse effects on nearby Island Marble populations. Because Island Marble larvae are active during the springtime Btk application period, the threat of Btk is heightened for this species.

Fire suppression and prairie succession: Among the most urgent threats to western prairie species is the succession of prairie to native shrub-land or forest, a process which occurs when the historical prairie disturbance regime (e.g. fire) has been suppressed. Prairies in the southern Puget Sound of Washington have been lost at an average rate of approximately 100 acres per year since the 1850s due to the rapid conversion of grassland to Douglas-fir forest (Kruckeberg 1991). In the San Juan archipelago the coastal grassland communities are being similarly encroached by Douglas-fir, rose, and snowberry. Succession of sites to woody plants decreases butterfly populations via a reduction of host plants at these sites. Additionally, fire suppression increases tree density and combustible fuel loads, rendering the habitat susceptible to catastrophic, large scale, and high temperature fires (Huntzinger 2003). A single fire event in an area where this species is concentrated could extirpate an entire population. Likewise, controlled burns could inadvertently threaten this species, and if executed, must be done so only with extreme caution-- fires are likely to be lethal to larvae, pupae, and adults (Dana 1991, Schultz and Crone 1998).

Invasive species: Invasion and dominance of native grasslands by exotic plants (in this region, Himalayan Blackberry and non-native grasses) is a common issue that threatens grassland butterflies (Warren, 1993; Schultz, 1998). Invasive species dramatically change the structure of prairies, often forming tall, dense patches that shade out butterfly host plants and compete for water and nutrients.

Habitat Alteration: Any habitat alteration which destroys, fragments, degrades, or reduces food supplies or over-wintering sites can harm this species. Permanent loss of habitat through conversion of native grassland to urban and residential land has been identified as the single largest threat to the prairies in the western United States, and both residential development and landscaping have been identified as major threats to the Island Marble (Miskelly & Potter 2005). San Juan Island, where most of the Island Marble butterflies have been found, has the largest and fastest growing human population in the San Juan archipelago.

In addition to destroying habitat, development can fragment remaining habitat into pieces that are too small or too distant to support healthy metapopulation structures. As small, isolated populations get smaller and more separated from adjacent populations, the pool of local genetic material shrinks and breeding between closely related individuals can result in inbreeding depression, a fitness reduction which lowers the population's ability to survive and reproduce. Small populations may also be less resilient to environmental change, and have a greater risk of extirpation due to stochastic events such as fire or unusually wet or dry years. With less than 2,000 individuals located in one small geographic area, the Island Marble is likely already experiencing reduced gene flow among populations, and increased susceptibility to local population extirpation.

Road development and maintenance: Several of the sites where Island Marble is found are adjacent to roads. Routine roadside maintenance generally involves herbicide application or mowing, which can reduce or even eliminate populations of the Island Marble butterfly. In 2005, roadside mowing cut mustard plants, some of which were occupied by the Island Marble, at three Island Marble sites (Eagle cove development, Old Johnson Road, and Fisherman Bay) (Miskelly & Potter 2005). Road redevelopment projects at American Camp could also have a negative impact on this butterfly if not carefully designed and managed.

Storm tides: Because several of the Island Marble sites are coastal, storm tides flooding near-shore habitat pose a threat (Miskelly & Potter 2005). In early 2006 a very large tide occurred that negatively impacted at least one Island Marble site (Ann Potter 2006, *pers. comm.*). A large winter storm could have severe consequences on small populations of this butterfly.

Over-collecting: Rare butterflies are often the target of collectors and the rarity of the Island Marble makes it particularly vulnerable to poaching. Butterflies outside American Camp are likely more susceptible to over collecting (Miskelly & Potter 2005) than those inside the Park, where collecting is illegal. Collecting even a small number of Island Marble individuals could significantly reduce the production of offspring.

Field research activities: Although increasing our knowledge of prairie ecology is vital to successful butterfly conservation, research itself can be a threat. Extensive research activities may detrimentally impact butterfly eggs, larvae, pupae, and habitat (Ehrlich and Murphy 1987). For example, increased foot traffic in fragile habitats can crush butterfly larvae, and collection of voucher specimens may further reduce small population sizes. Miskelly & Potter (2005) identified research as a potential threat at the third lagoon site at American Camp.

Recreation: According to the Park Service, more than 250,000 people visit the San Juan Island National Historical Park (American and English Camps) annually. Areas inhabited by Island Marble may be impacted by many recreation activities. Hikers, cyclists and horses may crush or uproot plants or kill butterfly larvae, and seeds of invasive species may be spread by vehicle tires (including bikes) and horse manure.

Predators and parasites: Although predation and parasitism are normal population stressors, these threats are intensified when populations are small (as with Island Marble) and the loss of even a few individuals affects the viability of the population.

Deer and Rabbits:

Deer populations are extremely high on San Juan Island and there is a large rabbit population at American Camp. Deer predation (by way of browsing on the mustard plants where eggs and larvae develop) is a common threat at all of the known Island Marble sites. Likewise, rabbit grazing is a potential threat at sites in and around American Camp where these introduced animals have created an extensive system of warrens and greatly disturbed and denuded the surrounding vegetation (Miskelly & Potter 2005).

**CONSERVATION STATUS**

With only one known population, this butterfly is extremely vulnerable to extinction. There are currently no federal, state or local regulations that can be applied to directly protect the Island Marble or its habitat.

**CONSERVATION NEEDS**

Distribute the recent WDFW/USFW Island Marble Identification Brochure (Hays 2009) to encourage public awareness and the reporting of any sightings of this subspecies. Protect and appropriately manage the habitat at all sites where this butterfly is found, and avoid management operations which would negatively influence any aspect of this species' life cycle or habitat. Manage native prairie composition and structure using proper timing and technique in an effort to achieve desired results for both plant and animal species. BLM managers: consult with experts at the Washington Department of Fish and Wildlife to develop a conservation plan for the population site on BLM land (at the southern tip of San Juan Island, adjacent to the San Juan Historic Park).

**RESEARCH NEEDS**

Life history studies should be undertaken, as should research into impacts on the butterfly and its habitat of management actions.

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**RESOURCES**

**CONTACTS**

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#### **WEBSITES**

The Xerces Society for Invertebrate Conservation, Endangered Species Conservation Program: <http://www.xerces.org/endangered-species/>

Island Marble Species Profile: <http://www.xerces.org/island-marble/>