

**The Butterflies  
of  
San Juan Island National Historical Park**

**Final Report of a  
Survey Conducted May-September 2003**

**Submitted February 2004**

**by**

**Robert Michael Pyle  
369 Loop Road, Gray's River, WA 98621  
360-465-2539**

## **Table of Contents**

Abstract.....	
Rationale and Objectives.....	
Methods.....	
Results.....	
Narrative Report of Field Surveys.....	
Habitat Inventory.....	
Host Plant and Nectar Plant Inventory.....	
Annotated List of Butterfly Species Found and Suspected to Occur.....	
Prominent Diurnal Moths of SJINHP.....	
Special Discussion of Island Marble.....	
Management Implications.....	
Conclusion and Recommendations for Further Work.....	
Appendix I: Inventory of Specimens Taken.....	
Appendix II: Checklist of San Juan County Butterflies (By Island).....	
Appendix III: Data Summary.....	
Appendix IV: Illustrations.....	
References Cited.....	
Acknowledgments.....	

### Abstract

The butterflies of San Juan Island National Historical Park were surveyed throughout the flight season of 2003, during five several-day field visits. Most areas and all habitat types were sampled under a range of seasonal regimes. Most of the anticipated species (32) were located, and hostplant and nectar source usage recorded. Particular attention was paid to the San Juan Island endemic Island Marble (*Euchloe ausonides insulana*), whose known range was extended and first indigenous hostplant documented. We found several new species for the county, the island, and the park unit. We conclude that the butterfly fauna of SJINHP should be considered rich for its size and location, with one world endemic and several additional species of note, offering specific management needs and opportunities that are here discussed. Predictions are made for additional species to be found, and suggestions extended for further work.

### Rationale and Objectives

A thorough study has never been made of the butterfly fauna of the San Juan Island Archipelago. In fact, little concentrated collecting has been carried out there. A number of the most important records date from the mid-twentieth century, when Emily Henriksen collected on Orcas Island. Other records have generated from various biologists spending time at Friday Harbor Laboratories. Otherwise, sampling has been sporadic and modest. Even so, lepidopterists have long recognized that despite their small land area, the San Juans offered inviting butterfly habitat due to their position in the rain shadow of the Olympic Mountains and the amount of open, well-flowered habitats. In a study of Washington butterfly ecogeography, Pyle (1976, 1982) demonstrated that the county fauna as known falls high on the species/area curve for the state (that is, has a high number of species relative to its area). Yet until recently, with few exceptions, sampling has been restricted to occasional visits of transient collectors.

In 1998, while conducting prairie butterfly surveys for the Washington Department of Natural Resources, John Fleckenstein visited American Camp at the San Juan Island National Historical Park. In the spring of 1998, he collected specimens of a butterfly hitherto thought to be extinct since 1908, the only known specimens having occupied Vancouver Island (Fleckenstein, 1999). The Island Marble was formally described as *Euchloe ausonides insulana* by Guppy and Shepard (2002). Subsequent visits by Fleckenstein and others demonstrated that the newly rediscovered taxon utilized invasive alien species of mustards as larval hostplants, and that its conservation might involve significant management challenges.

In view of these discoveries, staff of San Juan Island National Historical Park (hereafter SJINHP) determined the advisability of contracting a thorough survey of the butterflies of the park, both American and English Camp units. Hence the present study, whose purpose was described as being to "conduct intensive field study of butterfly populations and habitats in San Juan Island National Historical Park."

## **Methods**

The survey was undertaken by means of five site visits spanning the flight season of Western Washington butterflies. Four of the visits were conducted by the author and principal investigator and his field assistant (R. M. and T. L. Pyle), accompanied by two experienced local volunteers (Kurt and Eleanor McMillen). One of the visits, due to a health crisis, was conducted in surrogate by the McMillens and a third experienced butterfly surveyor from Colorado (Janet Chu), under the P. I.'s instructions.

Each visit involved one day devoted to American Camp habitats, one day to English Camp, and one or two days follow-up in additional American Camp or nearby extra-park locales. Field work involved extensive on-foot survey in which every butterfly encountered was observed and identified on the wing or alighted if possible, many were netted, hand-examined, and released unharmed, and a small number were collected for further study. The greatest possible variety of habitats was surveyed, with special attention to host and nectar plants suspected of harboring expected species. We made no attempt to conduct Pollard Walks or other transect studies, which are useful for establishing relative abundance, but are far less effective for investigating species diversity. In other words, the survey team went all-out to apply its extensive experience to the deepest and broadest possible survey of the entire park in the available time. Bait traps were employed for sampling hibernant species during the final visit, involving substantial effort and yielding limited results.

Park observations were augmented throughout the season through daily surveys taken by the McMillens in their Cattle Point garden; frequent walks by the investigators and S. Vernon at the Cattle Point and Lighthouse area managed by DNR; and by thorough literature search, correspondence with other field workers, and examination of historic collections by the P. I. These sources are cited in the appendices.

## **Results**

Butterfly research is highly dependent upon the weather, since the subjects retire to sheltered positions during rain and seldom fly in cloudy conditions. This fact represented both a challenge and a gamble for the current study. Fortunately, we experienced favorable or acceptable conditions for each site visit, with mostly sunny weather, some cloud and fog, and little precipitation. Wind sometimes hindered the work, but not overall. We can report that the objectives of the survey were realized almost in full. We found nearly all of the expected species, and some surprises. Many ecological observations were made, including host and nectar plant associations for most of the recorded species. Range extensions, new host records, management insights, and questions for further study all came to light. We now have a good picture of SJINHP butterflies, and a good idea of what additional species should be present. Detailed findings appear in the following sections.

## Narrative Report of Field Surveys

### **First Visit: May 5-8, 2003**

The initial visit was accompanied by excellent weather and succeeded in meeting most of the spring objectives. The first late afternoon was given to exploring pine forests east of the visitor center, south of Cattle Point Road. Pine-fir savannah with much rose and hawthorn; strawberry and English daisy flowers abundant on the floor. A fresh female Silvery Blue netted and released among a carpet of *Vicia sativa* represented the second record for this butterfly on the island.

May 6 began bright and sunny but cool. The usual complement of observers, R. and T. Pyle, and K. and E. McMillen, began with walks at the DNR Cattle Point Interpretive Area, where pink thrift and *Sedum lanceolatum* were blooming, but no butterflies appeared. West from the lighthouse through the Cattle Point NRCA (DNR), Silvery Blues and a Milbert's Tortoiseshell flew among the backslope lupines. A fresh male Island Marble appeared and was netted and released, an eastward range extension; no mustards of any kind were obvious. Among abundant lupine along the bluff trail from the lighthouse west, male and female Silvery Blues were not uncommon, especially in sheltered swales and hollows; fresh to medium-worn. *Vicia sativa* and two species of *Lupinus* all bloomed among thick grasses and horsetails; all three could be Silvery Blue hostplants. Puget Blues, a rare Puget Trough species, were sought but not found.

The rest of the morning was spent investigating South Beach and the first several heads and coves extending west along the Strait from there. A large colony of Western Tailed Blues, male and female on the wing, occupied the northern beach margins, using both common vetch (*Vicia sativa*) and beach pea (*Lathyrus japonica*). A fresh Anise Swallowtail nectared on *Amsinkia*. Lots of *Brassica* grew around the beach margin; Island Marbles frequented these and the series of sheltered swales west of South Beach. Nectaring observations were made on abundant sources of several species. With marbles appearing in good numbers, one pair was vouchered.

We made a diagonal transect toward the Redoubt, noting many *Viola adunca* plants that should be examined for fritillaries in the summer. Hawthorn, Himalayan Blackberry, and Bracken fern are invading this grassland with the violets. Nearer the Redoubt, Tumblemustard (*Sisymbrium altissimum*) becomes more abundant than the Rape (*Brassica campestris*), with some small cresses below neither abundant nor robust, doubtful as marble hosts (note: marbles are known to feed only on members of the mustard family as caterpillars). One Island Marble in stiff breeze at the Redoubt at midday was probably nectaring on *Zygadenus*, an excellent nectar plant which was abundant in full bloom in the parking circle and all around the American Camp summit.

After lunch, RMP with botanist Amy Lambert investigated the American Camp slopes southward from the Redoubt. Ochre Ringlets and Mylitta Crescents appeared in small numbers and Island Marbles quartered the slopes, where both alien mustards are well established. I tallied at least forty marbles walking up and back, and the others saw still more. We visited the northernmost and smaller of two willow-dominated cove-walls along the bluffs, finding both Satyr Anglewing (nettle-feeding) and Mourning Cloak (willow-feeding, visiting a sap flow), the second island record. Working the main

footpath from the Redoubt to the bluffs, TLP and EMcM spotted what appeared to be a checkered skipper, which at the time seemed anomalous and intriguing. At the Redoubt, a fresh pair of Anise Swallowtails were mating out of the breeze, three hosts nearby.

At 4 P.M., we examined a loop from the Jakle's Lagoon parking area through the forest to Jakle's Lagoon, around the bay shore for some distance, and back on a different forest path. Apart from Spring Azures and Silvery Blues at the trailhead, in spite of numerous nectar and host sources, and high diversity of birds and orchids, this section was largely absent of butterflies. This is not unusual for the denser woods. The sunnier exposures, especially fir and cedar points with open bluffs and shores, warrant additional examination. Once on the south-facing slope of Mt. Finlayson, we saw Mylitta Crescents and Tailed Blues going to roost.

The second full day, May 7, again clear and sunny, was spent at English Camp, on the oak meadows, Young Hill, the cultural sites, and the southwest boundary area. As hoped, we immediately found Propertius Skippers at the cemetery and other locations below the Garry Oaks on the lower slopes of Young Hill. A very fresh male nectared at length on Camas Lily within the picket fence below the great oak in the cemetery. This was only the second time this species has been confirmed on San Juan Island. The native junipers were checked for Cedar Hairstreaks, unknown but possible in the islands, but not found. We attended to the oak meadows with the upcoming prescribed burning in mind, locating no specialized grassland butterflies and few native plants of concern, though plenty of mostly alien nectar. The west-facing slopes of Young Hill, where mossy balds are well-flowered with indigenous alliums, saxifrages, and *Plectritis*, looked conducive but in fact evidenced few butterflies.

Toward the summit, Spring Azures became increasingly abundant. A series of glades extends easterly from the summit. At one of these, six+ azures were visiting moss for moisture. K. & E. McM both sighted a very dark nymphalid in this glade, most likely the uncommon Oreas Anglewing, seen previously on Young Hill by a Washington Butterfly Association field trip in 2002. One indeterminate tiger swallowtail also flew through. RMP had a fleeting look at a possible hesperiine (grass-feeding) skipper at the lookout, and a very important capture was made at the lookout by TLP. We had been examining stands of *Sedum spathulifolium* in hopes of finding Moss's Elfins. One male was netted, and being a male and the first island record, collected. One more was seen. This is the second record for the species in the county (known from Orcas Island more than fifty years ago) and the first for San Juan Island.

An almost-certain Green Comma was sighted but not captured at the base of the trail near the cemetery. Lunching at the English Camp parking lot, we again observed but failed to catch a likely Green Comma (= Faun Anglewing). From 3-4 P.M. we investigated the cultural area of English Camp as the day grew hazy and cooler. KMcm netted the only Sara's Orange-tip we would see, below the Officer's Quarters. From 4-5 P.M. we quartered the open, partly oak-meadow area along the south boundary of the park, west of West Valley Road. From the abundant *Geum macrophyllum* I was hopeful of finding Two-banded Rural Skippers, and the grasses (including some fescue) suggested the possibility of spring hesperiine skippers, but none of either turned up. Masses of spent eggs and second instar larvae of Elegant Day Moths occupied snowberry bushes.

The third day, May 8, was again devoted to American Camp. During the morning we sampled the pine forests and grassy/weedy glades among the pines, across Cattle Point Road from the visitor center and easterly. The intermittent structure of meadow-glade and forest edge provides excellent butterfly habitat in general. In the event, two significant discoveries presented themselves. After much searching, in a glade deep in the woods, RMP found Two-banded Rural Skippers basking and nectaring on *Fragaria* (strawberry), which is also the most likely hostplant here in the absence of *Geum macrophyllum*. Unaware at the time that S. Vernon had recorded this species at Cattle Point, I thought this was the first record for any checkered skipper in the San Juan Islands. Nonetheless, the male I collected is the first known voucher specimen from the county. We would later find the species in several additional locales.

The second important find was one of two species that feed on *Pinus contorta* as larvae. The large glade near the road (with picnic tables) featured a rich mixed border of deciduous trees and shrubs including native Crabapple and Red Currant, hosting some bunches of tent caterpillars (*Malacosoma* spp.). At 11:20 A.M., glassing the flowers of a large crabapple, I clearly observed a Pine Elfin nectaring near the top, and watched it for several minutes. Another probable Pine Elfin was sighted flying rapidly around pine tips near the picnic tables. Though Pine Elfins are probably more widespread on pines in the park, this is the first record for the species on San Juan Island. The butterflies most evident in the glades were fresh Ochre Ringlets, of which one male voucher was taken.

At noon, we made a targeted re-survey of the Redoubt area, South Beach, and slopes in between. After much searching, we found the checkered skipper seen the previous day. I had some thought it might be a disjunct population of Common Checkered Skippers, restricted to eastern Washington in the state (as are marblewings, except here), but occurring coastward at Cascade Head in Oregon. The habitat, quite dry and open, seemed more appropriate for that species. In fact it turned out to be Two-banded Checkered Skippers; and though they were using the path for basking and patrolling, they were chiefly found in moist pockets dominated by Dewberry (*Rubus ursinus*), on which they nectared, and which seems to be a new host plant record too. Additional nectar records were obtained for several species across the well-flowered slopes to the east, where the mix of natives and exotics is complex. In particular, the violets, strawberries, dewberries, and other valuable, indigenous nectar and host plants were abundant along the southeast edge of the largest Himalayan Blackberry thickets northwest of the South Beach bluffs. Large, colorful Ochre Ringlets abounded in the lush grasses among piles of glacial erratics southeast of the Redoubt. At South Beach a Satyr Anglewing -- one of three nettle-feeding nymphs here -- haunted the nettle-and-umbel patch ringed by a split-rail fence near the parking area.

After 2 P.M., salal verges north of the park entrance were examined for Brown Elfins, without success. Next, we investigated the open scrub area across the access road from the 4th of July Beach horse trailer parking area. Here, Two-banded Checkered Skippers were associated primarily with strawberries, both as nectar source and (probably) host plant. One pair mated on a sedge head.

At 4 P.M., RMP walked the shore, inner edges, and uplands of Old Town Lagoon. To my great surprise, I nearly trod upon an Island Marble perched for evening roosting (forewings drawn well down between hindwings) on a flowerhead of *Amsinkia*, facing

west. This was the first record of the species north and east of Cattle Point Road, and the first more closely associated with Griffin Bay than the Strait of Juan de Fuca. The individual remained undisturbed and was photographed (see Illustrations). The nearest known host in evidence was dispersed *Brassica* on the slope running up to the road. A second marble was spotted by TLP near the Jakle's Lagoon trailhead, on the path down to Old Town Lagoon. This male basked on *Rubus ursinus* and investigated spent heads of Camas, prior to roosting.

A final visit was paid to South Beach, where nothing was visiting overripe cantaloupe bait we had left. Tailed blues were roosting, very obvious with their silvery undersides in the late sun, in grasses and Beach Pea. There were scores of these, in twos, threes, and sixes, up to eight roosting communally in the same plant. Yet this colony constituted only the second record for the county, the first for San Juan Island.

For the first visit, a total of 16 species was recorded, with four additional, unconfirmed sight records.

### **Second Visit: 22-26 June 2003**

The second visit encountered rain (unusual at this season) during the night of the 22nd and the morning of the 23rd. The rest of the period was sunny, 60s and 70s, with light wind. Conditions in this rain-shadow zone were of course much drier than during the May visit, with much of the flora having desiccated or gone over. The butterflies, as expected, were reduced in number and diversity from the spring season. Nonetheless, substantial nectar resources remained or began (especially weedy and native composites, brambles, monocots including *Allium* and *Brodiaea*, and sandverbena; ringlets were recorded nectaring on eight species of plants). Certain species of butterflies appeared or came into their full flight, particularly *Vanessa* and *Limenitis* (ladies and admirals). Results with the island marble, *Euchloe ausonides insulana*, were fairly dramatic and surprising, including discovery of a new hostplant that is a native species. The 23rd began at Eagle Point, upshore from the Park, to examine some habitat of interest while the weather settled down. Ochre Ringlets were more numerous than before. Around a willow spring, two anticipated willow-feeders appeared: Lorquin's Admiral and Western Tiger Swallowtail, both of which we would see in various park localities. For example, several Lorquin's Admirals basked and defended territories around a stand of elms and cherries across the lawn from the American Camp visitor center.

In the early afternoon, we explored the Sandverbena dunes and blowouts south of Pickett's Lane, above South Beach and opposite the great rabbit warren in American Camp. Yellow Sandverbena is highly fragrant and an excellent nectar plant. Though it was in prolific bloom, and attended by many species and individuals of bees, few butterflies evidenced. The first, a fresh West Coast Lady well observed, has been recorded on the island chiefly at Cattle Point by S. Vernon. The second, not nectaring but flying among the Sandverbena in a blowout, was a female Island Marble, netted and released. The dunes here held stands of Tumblemustard, on which RMP and TLP found several third and fourth instar marble larvae on leaves and seed pods. We examined peppergrass (*Lepidium* spp.) clumps here, without finding larvae, though one was feeding on Tumblemustard right above the peppergrass.



Over lunch at the north end of South Beach, I attempted a brief oviposition experiment, caging a female marble with fresh plants of both *Sisymbrium altissimum* and *Lepidium* spp. She ignored both. We found no marble larvae on the desiccating Rape here, but Red-winged Blackbirds were busy cracking the pods for the oily seeds, an activity that could level some mortality toward the pod-like pupae. Two dramatic diurnal moths flew over here, an Elegant Day Moth and a Ranchman's Tiger Moth. Some Beach Pea and Common Vetch were still blooming, but the Tailed Blues were entirely over.

Later into the afternoon, we worked the slopes south of the Redoubt, and the coastline to the west. Island Marble larvae from third to fifth instar occupied both Tumblemustard and Rape in several locations from the rim of the Redoubt to just above the bluffs. The former plant was much more obvious than it was in May, the latter less so. At the Dewberry patch where the checkered skippers were found, the skippers were finished, but it was possible to ascertain that they had occupied both male and female stands of *Rubus*. A dramatic instance of insect predation was observed when an Elegant Day Moth flew overhead and a large aeschnid dragonfly (darner) went for it and successfully took it. It flew about with the big moth neither flapping nor struggling for a minute before disappearing over the slope. Dragonflies are probably significant lepidopteran predators throughout the park.

Northward along the bluffs, the cove-head flora looked extremely inviting for butterflies in terms of nectar and hosts. In particular, Gumweed (*Grindelia*) and Spurry (*Sperulina*) bloomed in nectiferous clumps, and patches of native fescues (preferred hostplants for several specialist skippers) were obvious among the other grasses and forbs. But apart from the ringlets, only one worn Purplish Copper turned up here. At a large willow cove, two Lorquin's Admirals tussled over territory; and back at the Redoubt, a single, very worn Painted Lady basked along the rim, catching the late sun.

June 24th was devoted to English Camp, beginning with a re-ascent of the very dry Young Hill, the morning clear at 65 degrees F. and rising. The lower site was virtually free of butterflies. But in the summit glades, we witnessed a remarkable assemblage of both Western and Pale Tiger Swallowtails and a Lorquin's Admiral engaged in mass interaction (twos, threes, fours, and once eight together). This consisted mostly of males investigating one another as possible females or contesting possession of the best sunny perches and glide-paths for encountering females; and the occasional female flying through and stirring up all the others. Or the admiral would sortie from its perch, giving the swallowtails a new target. They would circle and circle; then, finally alighting, they basked until stimulated to launch again. There was no nectaring on the available *Brodiaea*, *Allium*, and *Hypochaeris*, but perhaps later on the pink honeysuckle in bud high in the basking trees. RMP netted a male Western Tiger to check for orange lunules that might indicate introgression from Canadian Swallowtails, but orange scaling was minimal.

Fifteen to twenty feet up in a tall Ocean Spray in the third glade east of the summit, at noon, a female Spring Azure oviposited on flower heads. At the lookout, where RMP might have seen a hesperiine skipper in May, EMcM had another possible sighting; but again it was indeterminate. On the trail down we found no elfin larvae on stonecrop, but a female Western Tiger appeared to be ovipositing on Big-leaf Maple.

At the English Camp parking lot, our first Red Admirable was nectaring on bramble blossom alongside both tiger swallowtails.

The lane from the English Camp approach road northward into the NPS maintenance area strikes us as worthwhile butterfly habitat. This day, Pale Tigers were nectaring on *Rubus laciniata*. Large junipers here should be checked for Cedar Hairstreaks in April and May. The dry Parade Ground produced the first Ochre Ringlet of the day, a surprise in itself given its abundance at American Camp, nectaring on clover. The only butterfly in the nectar-rich Formal Garden was a female Purplish Copper basking on clover beneath scabious, but the *Scabiosa* was also frequented by several bumblebee-mimicking Clearwing Sphinx Moths.

At 4 P.M., we surveyed the south boundary oak grassland area. Here Ochre Ringlets were common, especially in shorter, finer grasses in the southwest corner. Pale Tiger Swallowtails nectared on brambles and frequented alders in the edges, a hostplant. Adults of the Elegant Day Moths seen in May as young larvae were now on the wing. We noted asters budded in a shallow swale, worth checking when in bloom later on.

On June 25th, our survey centered on the Lighthouse lupine stands, where we found all blues to be over. There followed a transect of the length of Mt. Finlayson, on a trail from the SE end near the park boundary. There was more nectar present than appeared to be the case from a distant view of the sere habitat, but few butterflies evident apart from abundant Ochre Ringlets. A modest series of these was collected for comparison with series from Orcas Island and elsewhere in western Washington, in hope of better defining the so-called Island Ringlet (the subspecies known as *Coenonympha tullia insulana*). Hundreds of the tiger-striped larvae of introduced Cinnabar Moths were feeding on the alien weed Tansy Ragwort, for which purpose the moths were introduced.

At noon, at the Jakle's Lagoon trailhead, a possible hybrid of the Western and Pale Tiger Swallowtails was nectaring on escaped *Vinca major*. From there we progressed to Old Town Lagoon strand. RMP and KMcM worked from Fourth of July Beach downbeach, while TLP and KMcM traversed the strand from the Jakle's end. First we found peppergrass, taller than that in the dunes; then an Island Marble flew up from among the driftwood, very near where I saw the first one at this locality in May. It flew over the log flat of the desiccating lagoon, then back to the beach drift.

RMP checked the large Silverweed/Yarrow/sedge meadow above the lagoon, recording ringlets, a female Lorquin's admiral, and a male Purplish Copper around its host *Rumex*. Back at the beach, the second party arrived, TLP having caught both a male and a female marble near the southeast end of the lagoon. The male was very fresh, with soft wings. This made me begin to wonder whether there could be a second generation in progress. We searched the Sea Rocket (*Cakile* spp.) for larvae, as a possible marble host. TLP found a fourth or fifth instar caterpillar of a Cabbage butterfly (which uses *Cakile* all up and down the Washington coast). I placed the live female marble on a *Cakile* flowerhead, but she did not oviposit.

Then RMP spotted a big fifth instar larva of an Island Marble on the peppergrass, head down (see illustrations). The peppergrass was growing among *Salicornia* and Dodder behind the driftwood. Next, TLP found a third instar a few yards away, feeding on a seed pod; then another. Eventually, we found five larvae. This circumspedition of Old Town Lagoon greatly extended our knowledge of the endemic marblewing. First, the

evidence of fresh males and a range of larvae at this late date strongly suggests bivoltinism (double-broodedness) -- a trait known in this species only in coastal California, and nowhere in the Northwest. Second, the new hostplant was later keyed by botanist Cathy Maxwell as Puget Sound Peppergrass (*Lepidium virginicum* var. *menziesii*), a native plant of the immediate region's coastlines. This represents the first indigenous foodplant ever recorded for this remarkable and rediscovered disjunct taxon. There was much peppergrass on the west side of the lagoon as well as the driftwood side; yarrow sticks would make suitable pupation sites for marble larvae in the meadow, the lee sides of logs on the strand.

A late-day reconnaissance (4 P.M.) at South Beach revealed a grown marble larva on Rape behind the restroom, further fueling the double-brooded hypothesis. Along the beach eastward below the bluff, only ringlets were seen, with one visiting a very rarely used nectar plant, *Rosa nutkana*. In this area, A. Lambert had earlier found Purplish Coppers common.

At the McMillens' home at Cattle Point Estates, during this visit, Lorquin's Admiral and Pale Tiger Swallowtail eggs and larvae were present on Ocean Spray in the garden. This native shrub is probably one of their major hosts on the island, and likely the most important Spring Azure host by far, from our observations. EMcM observed the admiral eggs laid on tips of the leaves of mostly small, deer-cropped plants, on June 25. Also at this locale, TLP observed a Western Meadow Fritillary on 24 June; E&KMCM had earlier seen one between Cattle Point Road and the lighthouse. This species no doubt also occurs in the nearby Third Lagoon vicinity and in other forest edge situations.

On the morning of 26 June prior to departure, we again sampled the area I call the Pinery, the pine glades near the entrance where work encampments sometimes occur. The moist and sedgy road verges furnished a good supply of nectar of several sorts, and I searched hard for the Dun Skipper, unknown in the islands, for which the habitat seemed highly suitable. Several of the species found earlier appeared in the adjacent weedy field, all generalists. A total of 15 species was recorded for the second visit, with one more possibility. Eight are new from the first visit, amounting to 24 species recorded to date.

### Third Visit: July 31

The third visit, though unplanned, was made opportunistically at the end of a Canadian trip. As expected, this period added little to the fauna as already surveyed, as it lies between the spring and late summer/fall emergences. Nonetheless, some valuable information was recovered. Hot, clear weather followed a cool morning. The day was spent at American Camp.

We began at the Redoubt at 9 A.M., 60°F, with a cool southwest breeze. The first butterfly to appear was a new species for the survey that would henceforth be the most abundant and ubiquitous (as it is throughout western Washington), the Woodland Skipper. Mylitta Crescents were also present in increasing numbers. The nectar complement had changed to Goldenrod, Yarrow, Pearly Everlasting, Tansy Ragwort, thistle, and other weedy composites. The second generation of Ochre Ringlets was out, very pale in color, and one male was collected. Raptors were far more active than butterflies along the breezy bluffs. The heads of some of the coves were sheltered, warm,

moist and nectar-rich. New broods of other nymphs were out as well: a fresh Red Admirable basked on the driftwood, a fresh Mourning Cloak haunted Scouler's Willows, and a fresh Painted Lady appeared above Grandma's Cove. A small stand of Garry Oak between there and the Laundress's Quarters should be checked for Propertius Duskywings in spring. Elegant Day Moths shot all over the cultural area, very fast, bright, and erratic. One large, worn female Anise Swallowtail flew around the Redoubt in search of umbels. TLP & EMcM watched a Red Admirable ovipositing on Stinging Nettle near the visitor center, and full-grown larvae of Elegant Day Moths in the path and on Snowberry.

Indigenous asters (probably *A. subspicatus*) were not yet blooming in the scrub across the road from the 4th of July Beach horse trailer parking area. These asters were one of our primary targets, for they can host crescents and nectar various species. Along the beach toward Old Town Lagoon, lots of Cabbage Whites frequented the Sea Rocket, and coppers and admirals were about. Many clumps of peppergrass were checked, and nearby driftwood logs, but no sign of Island Marble larvae or pupae were found.

The Sandverbenas dunes along Pickett's Lane showed only a day-flying noctuid moth nectaring on the Sandverbenas. At the north end of South Beach, a thicket around a spring at the base of the bluff supported Lorquin's Admirals in the willows.

Back at Cattle Point Estates, the larvae of Lorquin's Admirals and Pale Tiger Swallowtails were continuing to develop on the Ocean Spray. The McMillens had also a Gray Hairstreak on Rock Rose on July 9, and the first Woodland Skippers in the third week of July. On the 21st, butterflying the area of the Cattle Point Estates water desalination plant near the park's eastern boundary, they tallied Pine and Cabbage whites, and Satyr Anglewing. Counting the hairstreak, the survey now stood at 27 species.

#### **Fourth Visit: August 18-21**

Due to a serious medical emergency, RMP and TLP were unable to conduct the planned August survey. Most fortunately, their field collaborators and hosts Kurt and Eleanor McMillen volunteered to conduct this portion of the survey according to RMP's suggestions. They were ably assisted by another volunteer colleague, experienced lepidopterist Janet Chu of Colorado, who has taken part in butterfly surveys in Rocky Mountain National Park for several summers. The surveyors found field conditions chiefly warm, clear, and dry, after cool morning fogs.

On August 18, from 5:30-6 P.M., Woodland Skippers were nectaring in numbers on Sea Rocket, brambles, and thyme at the Cattle Point NRCA.

The morning of August 19 was given to re-visits of both Old Town and Jakle's Lagoons, beginning at the JL parking area. The Old Town butterflies were ringlets, coppers, and skippers, and the primary nectar source was Canadian Thistle. All taller peppergrass had gone over, but some shorter, clumpier peppergrass was still in bloom. No evidence of Island Marbles in any stage. A Cabbage White and two Pine Whites (just coming into their peak flight period) were tallied on the trail to Jakle's Lagoon. Puget Sound Peppergrass, still in bloom, was noted on the peninsula defining Jakle's Lagoon, pushing the potential range of Island Marbles still farther east on the bay side of the park.

Pine Whites also appeared at 4th of July Beach picnic area. In the horse camp area south of the northeast corner of the park, the asters were finally in bloom, skippers

and ringlets were nectaring on them, coppers basking on Queen Anne's Lace. JC had a possible sight record of a Western White. The observer knows this species in Colorado, but as it evaded capture and would be an island record and second county record, it should be considered a "possible" until confirmed with a voucher. JC also found a moth larva on aster, and has submitted a detailed description, which has been sent to Dr. Lars Crabo for possible identification. The caterpillar was parasitized, though still feeding; three hours later it was gone.

The party spent the rest of the afternoon (after 2:30 P.M.) examining the Sandverbena dunes, the South Beach spring, and the quadrangle from the Redoubt to the bluff trail to Grandma's Cove and back to the Redoubt. Woodland Skippers, Ochre Ringlets, Cabbage Whites, and an Elegant Day Moth were the extent of the fauna sighted, except for one highly important find at the spring. This moist and nectiferous site lies directly below the grasslands noted in May to have a dense stand of Blue Violets (*Viola adunca*). A particular objective of this visit was to seek species of greater fritillaries (genus *Speyeria*) that might feed on the violets. The only previous indication of a *Speyeria* in SJINHP occurred in 1988, when co-investigator Thea Pyle observed one at Old Town Lagoon while on a recreational visit. The party visiting South Beach on August 19 put up a big fritillary at the spring thicket below the violet bluff, and Janet Chu caught it. On my instructions, this specimen (a male, therefore not prejudicial to the population) was collected. It is the Valley Silverspot (= Zerene Fritillary), a state Sensitive taxon lost from much of its former range. While it has been recorded on Orcas Island and on San Juan Island in the past, there are no other recent records, and its presence is significant for conservation.

August 20 took the group to the English Camp unit. Following the fire, and in this dry season, very few butterflies were encountered--only coppers and skippers, and the addition of Pine Whites in the burn area, summit, and summit glades. The same species were noted in various locations around the cultural area, with the addition of Ochre Ringlets, and in the south boundary grasslands. The most dramatic sighting, however, demonstrated a superb example of "watchable wildlife" at the height of the visitor season: in the formal garden, the party counted up to 200 bright and active Woodland Skippers nectaring especially on pink *Scabiosa* flowers and secondarily on heliotrope and Cosmos, all of these being inspired choices for a butterfly garden.

It is worth noting that the party recorded eight species in the public gardens at Roche Harbor at midday: Woodland Skipper, Western Tiger Swallowtail, Pine White, Cabbage White, Purplish Copper, Satyr Anglewing, Red Admirable, and Painted Lady. While all these are common species, it does demonstrate the importance of moisture and concentrated nectar to butterflies during the arid San Juan summer.

On the morning of August 21, Third Lagoon was visited. A patch of Gumweed and ambrosia hosted Red Admiral, Woodland Skippers, and Purplish Copper. Skippers, ringlets, Pine Whites, and an Elegant Day Moth were on the wing in the fire camp pinery. One unusual Woodland Skipper female was collected to be certain of the species. Walking from South Beach to the lighthouse, only Ochre Ringlets made a presence.

Additional August records kept by the McMillens at Cattle Point Estates included the netting of the first Pine White of the season on August 7, a West Coast Lady on the 27th, and a Painted Lady on the 30th. Their September observations consisted of most of

the species mentioned in the fourth visit, plus the dramatic find on September 23 at the Lighthouse meadows of one or two American Painted Ladies, one of which they netted and took home alive for my examination. This and the Valley Silverspot raised the total number of species surveyed to 29 species.

### **Fifth Visit: September 25-27**

RMP and TLP arrived late in the day on the 25th, with equipment for bait-trapping pre-hibernant nymphalids, a technique often useful in autumn. The morning of 26 September came clear with a light breeze, rapidly warming. The fruit mash was prepared from overripe bananas and pears, smeared on plastic placed over a cardboard platform that is suspended beneath a poleless butterfly net which is in turn hung from a branch. Normally if butterflies come to the bait, they become enmeshed in the net rather than escaping when they seek to depart in satiety. The first trap was hung beneath an arching willow branch behind the American Camp visitor center at 10 A.M., prior to departing for English Camp.

At 11 A.M. we started up Young Hill, and by noon had set up the second bait trap. It was hung from a Douglas-fir branch in the middle of the chain of glades east of the summit, where the Oreas Anglewing was probably spotted in May 2003 and observed by WBA in May of 2002. We descended through the burned slopes, where the only butterflies seen were three or four Purplish Coppers spotted by KMcM. Small numbers of Mylitta Crescents and Purplish Coppers were encountered here and there around English Camp, including one female copper along with a male Woodland Skipper on heliotrope in the formal garden, but not the numbers of August.

Bell Point had not previously been surveyed due to Young Hill occupying most of the English Camp visit time, and because its heavily forested nature militates against likely butterfly abundance or diversity. This time, however, we walked the coastal Bell Point Trail as far as a peninsula dominated by *Salicornia*. The significant though dispersed stand of *Juniperus scopulorum* above the beach, and the Oregon Grape beneath, argue strongly in favor of a search for Cedar Hairstreaks in springtime.

I had high hopes for the Douglas asters in the swale of the south boundary site, both as a nectar source and a possible host of Field Crescents. Indeed these were in bloom in numbers. In the event, only one female copper and one female Painted Lady were found; but these asters should be both monitored and enhanced in the future.

At 6 P.M. RMP recovered the bait trap on Young Hill. It was in the shade, but the air temperature was still in the 70s. To my surprise, there were no insects at the bait--no butterflies, no yellowjackets, nor any flies or ants. At American Camp, at 7 P.M., the bait trap contained one butterfly: an extremely dark individual of *Polygonia satyrus*, the Satyr Anglewing. I took it back to base alive for closer examination, which confirmed that determination. I also examined the *Vanessa* netted earlier by EMcM, and confirmed her identification of it as *Vanessa virginiensis*, the American Painted Lady. This is a highly notable datum, both as the San Juan county record, and as the first western Washington occurrence north of Seattle/Bremerton ever documented for this species.

September 27th began with a cool fog, but by the time we got into the field at 10:30 A.M., the fog had cleared and the temperature had risen into the low 70s, with a

light breeze. The first site surveyed was the extensive Canada Thistle patch on the path to the lighthouse in the Cattle Point NRCA. Coppers, crescents, and ringlets present. We released the female American Painted Lady netted on September 25 by EMcM, and she flew away vigorously, apparently unharmed by the experience. The species' hostplant, Pearly Everlasting, grew nearby, though not in the abundance it achieved on the grasslands and bluffs south of the Redoubt; so there was hope she would be able to lay more eggs. The survivorship of this species over the winter this far north is unknown.

From there we moved to the Mt. Finlayson trail, where we hung the third bait trap from a large Douglas-fir at the forest edge. A Milbert's Tortoiseshell and a Red Admirable flew through as we were setting up, both excellent respondents to bait traps, possibly drawn by the odor of the fruit. This increased expectations for the final trap.

At noon, we called on the visitor center and showed the Satyr Anglewing captured the night before to rangers Darlene and Mike, while discussing its biology. Then we photographed and released the butterfly among the cherries and willows where it was caught. It behaved robustly, as it should have, well-fed for its hibernation. Then the fourth trap was set up at the horse camp scrub northwest of 4th of July Beach. It was hung from a willow in the forest edge along the park boundary. Then the Nootka Rose scrub, with much blooming aster, was thoroughly surveyed with no butterflies whatever sighted. The number of introduced Cross Spiders (*Aranea diademata*) were, however, immensely abundant, presenting any aerial insects with a serious predation threat.

At South Beach, we observed many Cabbage Whites around the Sea Rocket, one Painted Lady, and a number of (possibly third generation) Mylitta Crescents and Ochre Ringlets, especially around the spring thicket where the Zerene Fritillary had been caught. Over lunch, we visited with Susan Vernon, whose records of butterfly observations at and near Cattle Point enhance this report. In particular we discussed observations she made of sulphurs along the Lighthouse Trail toward the west, the species of which we were unable to determine with confidence.

Beginning at 2:30, at 77°F and full sun, we split up to survey different parts of American Camp. RMP walked the bluffs from South Beach to the main path to the Redoubt. Ochre Ringlets were abundant in the grasslands; a fresh female Mylitta Crescent and a worn male Purplish Copper appeared as well, and the McMillens reported a Mourning Cloak on the flats above one of the willow coves. There was a great deal of Pearly Everlasting blooming, boding well for late nectarers and for American Painted Ladies should they colonize.

At 4:15 P.M., there were only flies on the bait station at the horse camp scrub, and no butterflies among the asters. At 4:30 P.M. the Finlayson bait station had yellowjackets only. From 5-6 P.M. we surveyed the Lighthouse bluffs from the memorial bench to the Canada Thistle patch north of the lighthouse. The thistles had mostly gone over, but both sexes of Mylitta Crescents and Purplish Coppers were still resident. Three large nymphs were seen: a probable West Coast Lady cruised the bluffs at the Finlayson overlook; a fresh Painted Lady nectared on Himalayan Blackberry blossom among willows at the beginning of the lighthouse path by the interpretive board; and as I walked back along Cattle Point Road toward the Cattle Point Interpretive Area, what appeared to be a California Tortoiseshell (first for the survey, if so) flew south to north past the trail entrance and across the road and fields toward Cattle Point homes. Between 7 and 7:30

P.M. I took down the bait traps at the horse camp scrub and Finlayson; neither contained any butterflies.

On September 28, after RMP and TLP departed, EMcM saw another American Painted Lady nectaring on Bashful Dahlia in her garden, along with Painted Lady and Red Admirable. She netted, photographed, and released it. This individual was a male, therefore a different individual from the one caught and released previously, and the second county record. Then on the 29th, the EMcM noticed an unfamiliar butterfly in their garden. She netted it, KMCM photographed it, and the butterfly was released. The McMillens correctly determined it to be a California Tortoiseshell, thus confirming the record. The final butterfly of the season was a Red Admirable seen on Escalonia by EMcM on October 19.

### **Habitat Inventory**

The habitats most favorable to butterflies in San Juan Island National Historical Park will clearly be determined by the host and nectar plants present to a large degree. However, butterflies respond to other habitat characteristics as well, including solar and wind exposure, elevation, moisture, predators, soils, overstory, shrub layer, ground cover, disturbance, anthropogenic factors such as pesticides, and succession. The generalized desirable state for many species is open or edgy sunny habitat rich in nectar sources, with an array of larval hostplants and a moisture source nearby. Beyond that, factors of specialization come into play. This said, the distinct habitats we discerned in and near the park, as they relate to the butterfly fauna, were these:

#### **American Camp**

1. Roberts' Redoubt. As the highest point, it is a frequent hilltopping site for many species, thus important in courtship and orientation. The dense and diverse wildflower community in spring (especially Death Camas) enhances the site both as butterfly production and viewing habitat.

2. Grasslands radiating out from Redoubt. Many species utilize these. Clearly the condition of this steppe vis a vis rabbits and invasive alien plants affects the butterflies, although some of these plants also offer important ecological service (see Management). The single most important elements of the grasslands are the Blue Violets and the fact that they are indeed grassland and not savannah or woodland. The Island Marble is most abundant in this section. The habitat complexifies toward the coastal bluffs, with various restricted areas demonstrating great abundance of native wildflowers including Chocolate and Camas lilies. Moist hollows dominated by Dewberry (*Rubus ursinus*) are important for Two-banded Checkered Skippers, and stands of gumweed, spurry, and Pearly Everlasting comprise major nectaries. Where fescues dominate the grassland, in a few locations near the bluff trail, the potential exists for specialist spring skippers.



3. Coastal coves and hollows, from South Beach westerly. These ten or twelve invaginations in the coastline along the Strait of Juan de Fuca offer the most reliably wind-sheltered, sun-trapping, moisture-retentive habitats in the entire park. A high proportion of the species present utilize these herb-rich heat pockets. Interestingly, each has a different character and features a somewhat different fauna. The two or three cove-heads dominated by Scouler's Willow are, for example, very important for the several salicivores. Stands of Beach Pea and Common Vetch, especially at South Beach's north end, support a very large colony of western Tailed Blues, right down to the tideline. The fenced nettlebed at the South Beach picnic area is an important habitat component for the three large, attractive nettle-feeding species, and the spring area above it is butterfly-rich.

4. Rabbit warrens west of Pickett's Lane. The generalist species exploit low-growing weeds and nectar sources to some degree, but if the warrens have more than marginal significance for any butterflies we did not detect it.

5. Dunes and blowouts east of Pickett's Lane. The extensive growth of Sandverbena in these sandilands presents a major potential nectarfield, exploited by hymenopterans as well as Lepidoptera. Uncommon Dune Morning Glories that proliferate here may be visited by crepuscular species of sphinx moths and other moths co-adapted with it. There are many peppergrass plants in the dunes, but their species is not certain and no use of them by Island Marbles has been found.

6. Grasslands, bluffs, and lupine folds of Cattle Point. This habitat extends into and includes the DNR Cattle Point Natural Resource Conservation Area, the lighthouse precincts, and the Cattle Point interpretive area. This area is obviously volatile in terms of erosion, and wind-challenged for butterflies. S. Vernon's surveys have shown its value for butterfly diversity nonetheless. The lupines are particularly important here for blues.

7. Forest edges of Mt. Finlayson. The margins of the Douglas-fir/Ocean Spray association that dominates the south side of the forest offers protected patchy habitat, enhanced by the adjacent grasslands along the summit ridge. The moister, cooler interior and north side of the Finlayson forest is less conducive to most species, but furnishes glades that nymphs (and perhaps some spring lycaenids not yet found) may utilize.

8. Lagoons, driftwood, and sedge/grass meadows along Griffin Bay. The graded swards above Old Town Lagoon, their dominant species of grass or sedge changing with elevation and distance from the shore, may represent one of the chief indigenous grasslands in the park. While no specialized hesperiine skippers were found among them, they remain a possibility. Coppers and ringlets are well established, and other species use the area incidentally. But the primary interest of this habitat lies at its lower fringes, among the higher driftwood and along the actual strand above mean high tide, where Puget Sound Peppergrass grows and supports the only known colony of Island Marbles utilizing an indigenous hostplant. Cabbage Whites thrive here on Sea Rocket.

9. Fourth of July Beach picnic area. The open lawn, well-flowered with English Daisies, surrounded by low scrub including Nootka Rose, Ocean Spray, and Douglas Aster, briefly hosts many vicariant (= passing through) butterflies.

10. Horse trailer parking area scrubland and forest edge. This extensive shrubland extends westward into the pine and fir forests. Its wooded margin contains a good diversity of native hardwood trees and shrubs that support several of the larger nymphalids, while the open area is dominated by rose, hawthorn, snowberry, and Ocean Spray, over a rich grass-and-forb community including much naturalized English Daisy and one of the largest stands of Douglas Aster, which may yet prove productive of greater diversity of butterflies than we found.

11. Pineries along either side of Cattle Point Road in the northwest sector. Most of American Camp north of the visitor center, on both sides of Cattle Point Road, consists of *Pinus contorta* forest interspersed with shrubland, marshy seeps, and grassy glades. This habitat hosts Pine whites and Pine Elfins in the canopy and young trees, and Silvery Blues, Two-banded Checkered Skippers, and other smaller species in the glades.

12. Mixed habitat around visitor center and cultural area. The mixture of mown grasslands, deciduous forest edge, and swampy thorn-thicket rich in nettles provides suitable plant material and shelter for anglewings, admirables, swallowtails, and several other species colorful and prominent enough for visitor attention. The area lacks a concentrated nectar source, such as the formal garden at English Camp, which would enhance the interpretive value of this fauna.

### English Camp

13. Cemetery and Oak Meadows. The combination of mature Garry oaks and a variety of ground-level nectar plants, including Camas, makes this a very favorable habitat for the oak-obligate Propertius Duskywing skipper (see "Management"). However, the grass and herbaceous community is species-poor and dominated by alien invasives, rendering the meadows fairly depauperate of butterflies. Some fescues, but mostly invasive annual grasses. There is however an abundance of native *Marah*, whose deep roots should not be killed by prescribed burns, and this provides a good nectar source for spring butterflies that happen through or breed in the area.

14. South slope, Young Hill. Madrona, oak, and juniper grow in an inclined savannah on the upper south-facing slope, each a potential host for specialized butterflies (though the Brown Elfin and Cedar Hairstreak have not yet been found in the park). Mossy balds bearing good stands of fine grasses, *Plectritis*, saxifrages, camas, cress, vetch, and shooting star are considered indicative of good spring butterfly conditions elsewhere.

15. Summit area, Young Hill. Like most of the hill, this area has much Ocean Spray, one of the most versatile hostplants in the park, supporting Lorquin's Admiral, Pale Tiger Swallowtail, and Spring Azure. Grassy sites near the overlook, though subject to much

visitor trampling, may support specialized spring-flying hesperiine skippers (two possible sightings). One of the most important micro-habitats is the stonecrop patch on bedrock. Moss's Elfin, only the second known occurrence here in the San Juan Islands, is a *Sedum* feeder. North of the summit lies a string of glades among Douglas-fir and mixed hardwoods, where both species of tiger swallowtails patrol in impressive abundance.

16. North-northeast slope, Young Hill. A subset of the glades and balds referred to above occur on the north-facing slope. These are moister than the south-facing balds, yet high enough to be sunny. They are licheniferous and support big stands of *Plectritis* which makes excellent nectar-beds. Grass-skipppers and more lycaenids may be found here.

17. Oak grassland, southwest boundary sector. The open zone south of the forest line and west of the West Valley Road is mostly weedy, with much thistle, coarse grasses, and succeeding brush including Himalayan Blackberry. It has some oaks, but retains little indigenous quality. The subtle swale in the western portion, replete with native asters, is of interest; and several large crabapples provide fine spring nectar. The grassland has a good population of Ochre Ringlets and Woodland Skippers, no specialists.

18. Maintenance area. The lanes and trails from the English Camp parking lot, where they traverse the NPS service area, make a sun-dappled vegetational mosaic hospitable to several common species of butterflies including anglewings, crescents, and swallowtails. Large junipers here and elsewhere may have butterfly importance (see below).

19. Parade Ground. The broad acres of mowed lawn spackled with *Bella perennis* growing as a cushion plant are good for ringlets, Woodland Skippers, and wanderers.

20. Formal garden. As the most concentrated nectar reservoir, the formal garden consists of a thoroughly artificial but valuable butterfly resource. The large numbers of Woodland Skippers visiting the scabious, heliotrope, and cosmos in late summer could provide an excellent interpretive resource; and at any time in sunny weather, visitors are likely to see butterflies as well as the plants that attract them. The garden will remain a magnet to monitor from time to time in any ongoing faunal survey.

21. Bell Point trail, shoreline along Garrison Bay. Vicariant butterflies move along shorelines, visiting beach *Salicornia* and other nectar sources. The primary aspects of this habitat that recommend it for careful study are the presence of healthy native junipers and Oregon grape beneath them. The disjunct junipers could prove to be a host for Cedar Hairstreaks here, whose favorite spring nectar source in southern Olympic National Park is Oregon grape. Brown Elfins should also be sought on the Madronas.

22. Northern half, English Camp. The Bell Point peninsula and the large acreage between the Bell Point Trail and the eastern boundary consists largely of dense Douglas-fir forest. Swallowtails will occur along the edges, and Pine Whites among the canopy. On the whole, this is not butterfly-friendly territory. Pockets of other habitat undoubtedly occur within this forest, as yet undetected, and will warrant further investigation.

## Host Plant and Nectar Plant Inventory

Numerous nectar sources and probable larval hostplants were recorded. Exotics, such as *Myosotis discolor* and *Vicia sativa*, provided many of the nectar visits, as did natives such as *Camas* and *Amsinkia*. Hostplant services too are delivered both by natives and introduced species. In the following lists, the plant is given first (sources: Hitchcock, 1976; Pojar & MacKinnon, 1994), followed by the species that use it. Host associations are based on our observations and Pyle (2000), and include plants found on the survey or suspected to occur. Nectar visits are those we actually observed in and around SJINHP.

### Hostplants (by plant)

(\* = conjectural species)

#### **Cupressaceae**

Western Redcedar (*Thuja plicata*) Cedar Hairstreak\*

Rocky Mountain Juniper (*Juniperus scopulorum*) possible for Cedar Hairstreak\*

#### **Pinaceae**

Douglas-fir (*Pseudotsuga menziesii*) Pine White

Shore Pine (*Pinus contorta*) Pine White, Pine Elfin

#### **Salicaceae**

Scouler's Willow (*Salix scouleriana*) Western Tiger Swallowtail, Mourning Cloak

#### **Betulaceae**

Red Alder (*Alnus rubra*) Pale Tiger Swallowtail, Lorquin's Admiral, possible for Green Comma

#### **Fagaceae**

Garry Oak (*Quercus garryana*) Propertius Duskywing

#### **Urticaceae**

Stinging Nettle (*Urtica dioica*) Satyr Anglewing, Milbert's Tortoiseshell, Red Admirable

#### **Polygonaceae**

Docks (*Rumex*, all spp.) Purplish Copper

#### **Fumariaceae (inc. in Papaveraceae in Pojar et al)**

Pacific Bleeding Heart (*Dicentra formosa*)\* Clodius Parnassian\*

#### **Brassicaceae (= Cruciferae)**

Bitter Cress (*Cardamine* spp.) Probable for Sara's Orangetip

Rock Cress (*Arabis* spp.) Probable for Sara's Orangetip

Field Mustard (*Brassica campestris*) Island Marble

Tumble Mustard (*Sisymbrium altissimum*) Island Marble

Sea Rocket (*Cakile edentula/maritima*) Cabbage White

Puget Sound Peppergrass (*Lepidium virginicum menziesii*) Island Marble

Peppergrass (*Lepidium* spp.) Western White\*

#### **Crassulaceae**

Broad-leaved Stonecrop (*Sedum spathulifolium*) Moss's Elfin

#### **Grossulariaceae**

Various currants (*Ribes* spp.) Oreas Anglewing

#### **Rosaceae**

Pacific Crabapple ( <i>Malus fusca</i> )	Tent Caterpillar
Bitter Cherry ( <i>Prunus emarginata</i> )	Probably Western and Pale Tiger Swallowtails, Lorquin's Admiral (oviposited in McM garden)
Ocean Spray ( <i>Holodiscus discolor</i> )	Spring Azure (most important (sole?) foodplant here, oviposition observed); Pale Tiger Swallowtail and Lorquin's Admiral (oviposition, larvae in McM garden for both)
Dewberry ( <i>Rubus ursinus</i> )	<i>Suspected</i> for Two-banded Checkered Skipper (new host)
Coastal Strawberry ( <i>Fragaria chiloensis</i> )	Two-banded Checkered Skipper
Large-leaved Avena ( <i>Geum macrophyllum</i> )	Two-banded Checkered Skipper
Silverweed ( <i>Potentilla pacifica</i> )	Probable for Purplish Copper
<b>Fabaceae (=Leguminosae)</b>	
Beach Pea ( <i>Lathyrus japonicus</i> )	Western Tailed Blue (New host)
Giant Vetch ( <i>Vicia gigantea</i> )	Western Tailed Blue
Common Vetch ( <i>Vicia sativa</i> )	Western Tailed Blue, Silvery Blue
Lupine ( <i>Lupinus spp.</i> )	Silvery Blue
(L. littoralis (Seashore Lupine), L. polyphyllus (Large-leaved Lupine), L. polycarpus (Small-flowered Lupine) all present; uncertain which spp. used, perhaps all three)	
Clovers ( <i>Trifolium spp.</i> )	Orange and Clouded Sulphurs (if present)
(T. repens (White Clover), T. pratense (Red Clover), T. wormskjoldii (Springbank Clover) all present)	
various legumes	Gray Hairstreak
<b>Aceraceae</b>	
Big-leaf Maple ( <i>Acer macrophyllum</i> )	Western Tiger Swallowtail
<b>Rhamnaceae</b>	
Ceanothus spp. *	California Tortoiseshell (may not breed here)
Cascara ( <i>Rhamnus purshiana</i> )	Possible for California Tortoiseshell
<b>Malvaceae</b>	
Various mallows	West Coast Lady, Gray Hairstreak
<b>Violaceae</b>	
Early Blue Violet ( <i>Viola adunca</i> )	Zerene Fritillary
Violet ( <i>Viola spp.-- glabella?</i> )	Western Meadow Fritillary
<b>Apiaceae (=Umbelliferae)</b>	
Cow Parsnip ( <i>Heracleum lanatum</i> )	Anise Swallowtail
Queen Anne's Lace ( <i>Daucus carota</i> )	Anise Swallowtail (rarely)
Sea Watch ( <i>Angelica lucida</i> )	Anise Swallowtail
Yampah ( <i>Perideridia gairdneri</i> )	Anise Swallowtail
Desert Parsley ( <i>Lomatium spp.</i> )	Anise Swallowtail
(and other umbels)	
<b>Ericaceae</b>	
Madrona ( <i>Arbutus menziesii</i> )	Brown Elfin*
Salal ( <i>Gaultheria shallon</i> )	Brown Elfin*
<b>Scrophulariaceae</b>	

Harsh Paintbrush (*Castilleja hispida*)\* Taylor's Checkerspot\*

**Plantaginaceae**

Various plantains (*Plantago* spp.) Taylor's Checkerspot\*

**Caprifoliaceae**

Common Snowberry (*Symphoricarpos albus*) Elegant Day Moth

**Asteraceae (=Compositae)**

Douglas Aster (*Aster subspicatus*) Possible for Field Crescent\*

Pearly Everlasting (*Anaphilus margaritacea*) American Lady

Canada Thistle (*Cirsium arvense*) Mylitta Crescent, Painted Lady

Tansy Ragwort (*Senecio jacobaeae*) Cinnabar Moth

Bull Thistle (*Cirsium vulgare*) Mylitta Crescent, Painted Lady

Various composites Gray Hairstreak

**Gramineae**

Grasses (*Festuca, Lolium, Bromus* spp.) Juba Skipper\*, Oregon Skipper\*

Various grasses, native and naturalized Woodland Skipper, Island Ochre Ringlet

**Hostplants (by butterfly)**

(\* = conjectural host)

Propertius Duskywing

Two-banded Checkered Skipper

Juba Skipper\*

Oregon Skipper\*

Woodland Skipper

Clodius Parnassian\*

Anise Swallowtail

Western Tiger Swallowtail

Pale Tiger Swallowtail

Pine White

Cabbage White

Island Marble

Sara's Orangetip

Western Sulphur\*

Orange Sulphur\*

Clouded Sulphur \*

Purplish Copper

Cedar Hairstreak\*

Brown Elfin\*

Moss's Elfin

Western Pine Elfin

Gray Hairstreak

Western Tailed Blue

Spring Azure

Garry Oak

Dewberry\*, Coastal Strawberry, Large-leaved  
Avens

Grasses (*Festuca, Lolium, Bromus* spp.)

Grasses (*Festuca, Lolium, Bromus* spp.)

Various grasses, native and naturalized

Pacific Bleeding Heart

Cow Parsnip, Queen Anne's-Lace, Sea Watch,  
Desert Parsley, Yampah, other umbels

Scouler's Willow, Bitter Cherry, Big-leaf Maple

Red Alder, Bitter Cherry, Ocean Spray

Douglas-fir, Shore Pine

Sea Rocket, other crucifers

Field Mustard, Tumble Mustard, Puget Sound

Peppergrass

Bitter Cress, Rock Cress

*Lupinus* spp., Common Vetch

*Trifolium* spp.

*Trifolium* spp.

*Rumex*, all spp., Silverweed\*

Western Redcedar, Rocky Mountain Juniper

Madrona, Salal

Broad-leaved Stonecrop

Shore Pine

Legumes, roses, mallows, many others

Beach Pea, Giant Vetch, Common Vetch

Ocean Spray

Silvery Blue	<i>Lupinus</i> spp., Common Vetch
Zerene Fritillary	Early Blue Violet
Western Meadow Fritillary	<i>Viola</i> spp.-- <i>glabella</i> *?
Mylitta Crescent	Canada Thistle, Bull Thistle
Field Crescent*	Douglas Aster*
Satyr Anglewing	Stinging Nettle
Green Comma	Scouler's Willow
Oreas Anglewing	<i>Ribes</i> spp.
Mourning Cloak	Red Alder, Scouler's Willow
Milbert's Tortoiseshell	Stinging Nettle
California Tortoiseshell	<i>Ceanothus</i> spp., Cascara*
Painted Lady	Canada Thistle, Bull Thistle
West Coast Lady	Malvaceae spp.
Red Admirable	Stinging Nettle
American Lady	Pearly Everlasting
Lorquin's Admiral	Scouler's Willow, Red Alder, Bitter Cherry, Ocean Spray
Ochre Ringlet	Various grasses, native and naturalized
Elegant Day Moth	Common Snowberry
Snowberry Clearwing Sphinx Moth	Common Snowberry
Ranchman's Tiger Moth	
Cinnabar Moth	Tansy Ragwort
Tent Caterpillar	Pacific Crabapple

### **Nectar Plants (by plant)**

(listing means observed nectar visit; "possible" & "probable" mean alighting with degrees of uncertainty about actually nectaring)

#### **Nyctaginaceae**

Yellow Sandverbena (*Abronia latifolia*)      Woodland Skipper, possible Island Marble,  
West Coast Lady, Ochre Ringlet, noctuid

#### **Portulacaceae**

Miner's Lettuce (*Claytonia perfoliata*)      Western Tailed Blue

#### **Caryophyllaceae**

Field Chickweed (*Cerastium arvense*)      possible Island Marble

#### **Ranunculaceae**

Western Buttercup (*Ranunculus occidentalis*)      Spring Azure

#### **Brassicaceae (= Cruciferae)**

Field Mustard (*Brassica campestris*)      Island Marble

Tumble Mustard (*Sisymbrium altissimum*)      Island Marble

Sea Rocket (*Cakile maritima/edulenta*)      Woodland Skipper, probable Island Marble,  
Cabbage White, Purplish Copper, Mylitta  
Crescent, West Coast Lady

#### **Geraniaceae**

Filaree (*Erodium cicutarium*)      Western Tailed Blue

**Rosaceae**Pacific Crabapple (*Malus fusca*)

Pine Elfin

Dewberry (*Rubus ursinus*)

Two-banded Checkered Skipper, Mylitta Crescent

Himalayan Blackberry (*Rubus discolor*)

Woodland Skipper, Western and Pale Tiger Swallowtails, Painted Lady, Red Admirable, Ochre Ringlet

European Blackberry (*Rubus laciniata*)

Pale Tiger Swallowtail

Nootka Rose (*Rosa nutkana*)

probable Ochre Ringlet

Coastal Strawberry (*Fragaria chiloensis*)

Two-banded Checkered Skipper, Spring Azure

**Fabaceae (=Leguminosae)**Common Vetch (*Vicia sativa*)

Propertius Duskywing, Western Tailed Blue Ochre Ringlet

White Clover (*Trifolium repens*)**Apiaceae (=Umbelliferae)**

Queen Anne's Lace

Purplish Copper

**Boraginaceae**Seaside Fiddleneck (*Amsinkia spectabilis*)

Anise Swallowtail, possible Island Marble

Yellow-and-blue Forget-Me-Not (*Myosotis discolor*)?Spring Azure? **check** Island Marble, Western Tailed Blue**Caprifoliaceae**Common Snowberry (*Symphoricarpos albus*)

Ochre Ringlet

Oregon Grape (*Mahonia nervosa*)

Cedar Hairstreak\*

**Cucurbitaceae**Manroot (*Marah oreganus*)

probable Propertius Duskywing, Purplish Copper

**Asteraceae (=Compositae)**Hairy Cat's Ear (*Hypochaeris radicata*)

Woodland Skipper, Pine White, Mylitta Crescent, Ochre Ringlet

Yarrow (*Achillea millifolia*)

Cabbage White, Island Marble, Mylitta Crescent, Ochre Ringlet

Puget Sound Gumweed (*Grindelia integrifolia*)

Purplish Copper, Red Admirable, Ochre Ringlet

Canada Goldenrod (*Solidago canadensis*)

Woodland Skipper, Ochre Ringlet

Pearly Everlasting (*Anaphalus margaritacea*)

Woodland Skipper, Purplish Copper, Mylitta Crescent, Ochre Ringlet

Douglas Aster (*Aster subspicatus*)

Woodland Skipper, Ochre Ringlet

Canada Thistle (*Carduum canadense*)

Woodland Skipper, Western Tiger Swallowtail, Purplish Copper, Mylitta Crescent, American Painted Lady, Painted Lady, Ochre Ringlet



Smooth Hawksbeard ( <i>Crepis capillaris</i> )	Woodland Skipper
Tansy Ragwort ( <i>Senecio jacobaeae</i> )	Mylitta Crescent, Ochre Ringlet
Silver Burweed ( <i>Ambrosia chamissonis</i> )	Woodland Skipper

#### **Liliaceae**

Death Camas ( <i>Zygadenus venenosus</i> )	probable Island Marble
Common Camas ( <i>Camassia quamash</i> )	Propertius Duskywing

#### **Ornamentals: Naturalized in Park and Cultivated**

(English Camp Formal Garden, Cattle Point, Roche Harbor, and Friday Harbor gardens)

#### **Apiaceae (= Cruciferae)**

Dame's Rocket ( <i>Hesperis matronalis</i> )	Western Tiger Swallowtail
Pink Rock Rose ( <i>Cistus</i> )	Pale Tiger Swallowtail, Gray Hairstreak

#### **Saxifragaceae**

Escallonia ( <i>Escallonia</i> )	Red Admirable, Lorquin's Admiral
----------------------------------	----------------------------------

#### **Buddlejaceae**

Butterfly Bush ( <i>Buddleia davidii</i> )	Woodland Skipper, Western Tiger Swallowtail, Satyr Anglewing, Red Admirable, Lorquin's Admiral, Monarch
--	---

#### **Apocynaceae**

Small Periwinkle ( <i>Vinca minor</i> )	Western/Pale Tiger Swallowtail possible hybrid
---	--

#### **Boraginaceae**

Heliotrope ( <i>Heliotropium</i> )	Woodland Skipper, Purplish Copper
------------------------------------	-----------------------------------

#### **Menthaceae (=Labiatae)**

Thyme ( <i>Thymus</i> )	Woodland Skipper
Lavender ( <i>Lavandula</i> )	Woodland Skipper
Oregano ( <i>Origanum</i> )	Woodland Skipper
?Paryopene	Woodland Skipper

#### **Asteraceae (= Compositae)**

Scabious ( <i>Scabiosa</i> )	Woodland Skipper, Purplish Copper, Snowberry Clearwing Sphinx Moth
Cosmos ( <i>Cosmos</i> )	Woodland Skipper
Dahlia (four varieties of collarets with open centers)	Cabbage White, American Painted Lady Painted Lady, Red Admirable
Marigold ( <i>Tagetes</i> )	West Coast Lady
Yarrow (Coronation Gold) ( <i>Achillea</i> )	Pine White
Shasta Daisy ( <i>Chrysanthemum maximum</i> )	Pine White
Ox-eye Daisy ( <i>Chrysanthemum leucanthemum</i> )	Purplish Copper
English Daisy ( <i>Bella perennis</i> )	Spring Azure, Ochre Ringlet

#### **Other substances utilized**

Scouler's Willow sap	Mourning Cloak
dew on moss	Spring Azure
banana/pear bait	Satyr Anglewing

**Nectar Plants (by butterfly)**

includes possibles & probables

Proterops Duskywing  
Two-banded Checkered Skipper  
Woodland Skipper

Anise Swallowtail  
Western Tiger Swallowtail

Pale Tiger Swallowtail

Pine White

Cabbage White  
Island Marble

Purplish Copper

Cedar Hairstreak\*  
Moss's Elfin  
Western Pine Elfin  
Gray Hairstreak  
Western Tailed Blue  
Spring Azure

Myiitta Crescent

Satyr Anglewing  
Mourning Cloak  
American Lady  
Painted Lady

Common Vetch , Manroot, Common Camas  
Dewberry, Coastal Strawberry  
Yellow Sandverbena, Sea Rocket,  
Himalayan Blackberry, Hairy Cat's Ear,  
Canada Goldenrod, Pearly Everlasting,  
Douglas Aster, Canada Thistle, Smooth  
Hawksbeard, Silver Burweed, Butterfly  
Bush, Heliotrope, Thyme, Lavender,  
Oregano, ?Paryopene?, Scabious, Cosmos  
Seaside Fiddleneck

Himalayan Blackberry, Canada Thistle,  
Dame's Rocket, Small Periwinkle  
Himalayan Blackberry, European  
Blackberry, Pink Rock Rose, Small  
Periwinkle

Hairy Cat's Ear, Yarrow (Coronation Gold),  
Shasta Daisy

Sea Rocket, Yarrow, Dahlia  
Death Camas, Yellow Sandverbena, Field  
Chickweed, Seaside Fiddleneck, Tumble  
Mustard, Field Mustard, Sea Rocket,  
Common Forget-Me-Not , Yarrow ,  
Death Camas

Sea Rocket, Queen Anne's Lace, Manroot,  
Puget Sound Gumweed, Pearly Everlasting,  
Canada Thistle, Heliotrope, Scabious,  
Ox-eye Daisy  
Oregon Grape

Pacific Crabapple  
Pink Rock Rose  
Miner's Lettuce, Common Vetch  
Western Buttercup, Filaree, Coastal  
Strawberry, English Daisy, dew on moss  
Sea Rocket, Dewberry, Hairy Cat's Ear,  
Yarrow, Pearly Everlasting, Canada Thistle,  
Tansy Ragwort  
Butterfly Bush, banana/pear bait  
Scouler's Willow sap  
Canada Thistle, Dahlia  
Himalayan Blackberry, Canada Thistle,  
Dahlia

West Coast Lady  
Red Admirable

Ochre Ringlet

Monarch\*  
Clearwing Sphinx Moth

Yellow Sandverbena, Sea Rocket, Marigold  
Himalayan Blackberry, Puget Sound  
Gumweed, Escallonia, Butterfly Bush,  
Dahlia  
Yellow Sandverbena, Himalayan  
Blackberry, Nootka Rose, White Clover,  
Common Snowberry, Hairy Cat's Ear,  
Yarrow, Puget Sound Gumweed, Canada  
Goldenrod, Pearly Everlasting, Douglas  
Aster, Canada Thistle, Tansy Ragwort,  
English Daisy  
Butterfly Bush  
Scabious

### **Species with High Nectar Potential**

(Observed in park, with no visits recorded)

Black Cap ( <i>Rubus leucodermis</i> )	Potential esp. for swallowtails
Hairy Honeysuckle ( <i>Lonicera hispidula</i> )	Potential esp. for swallowtails
Harvest Brodiaea ( <i>Brodiaea coronaria</i> )	Potential esp. for swallowtails
Wild Onion ( <i>Allium</i> spp.)	Grassland, with Brodiaea
Sea Blush ( <i>Plectritis congesta</i> )	Young Hill balds
European Centaury ( <i>Centaureum erythraea</i> )	Common in disturbed grasslands
Self Heal ( <i>Prunella vulgaris</i> )	Wood edges
Veronica ( <i>Veronica</i> spp.)	Lawns, moist areas
Stinking Chamomile ( <i>Anthemus cotula</i> )	Disturbed areas
Pacific Sanicle ( <i>Sanicula crassicaulis</i> )	Common in Finlayson forest edge
Western Starflower ( <i>Trientalis latifolia</i> )	Common in Finlayson forest edge
Beach Sandspurry ( <i>Spergularia macrotheca</i> )	Headlands, American Camp
Sea Pink/Thrift ( <i>Armeria maritima</i> )	Headlands, Cattle Point

### **Annotated List of Butterfly Species Found in SJINHP and Vicinity**

(C/R = New County Record obtained in this survey; I/R = New Island Record)

Hesperiidae: Skippers

1. *Erynnis propertius*, Propertius' Duskywing

Several, Young Hill, oak meadows in May. **Second I/R.** Otherwise known from Orcas. Generally distributed on Oregon Oak in WWA, but patchy. This is a significant occurrence; should be sought elsewhere on island.

2. *Pyrgus ruralis*, Two-banded Rural Skipper

Several sites among pine glades, mesic sites bluffward of Redoubt, NE corner of American Camp, Cattle Point, in May. **Second I/R.** Common in much of WWA, but little known in the islands.

(*Hesperia juba*, Juba Skipper) and (*Hesperia colorado oregonia*, Oregon Skipper)

Two possible sightings atop of Young Hill, neither reliable. Both species have been recorded in the islands, the latter around Friday Harbor Labs. Juba can appear anywhere, Oregon should be sought among better quality grasslands.

3. *Ochlodes sylvanoides*, Woodland Skipper

Ubiquitous in WWA in late summer, common throughout the park.

Papilionidae: Swallowtails

4. *Papilio zelicaon*, Anise Swallowtail

Several, mostly around Redoubt. Probably double-brooded, as it often is near the coast, unlike desert or high country. Widespread and adaptable, spring and fall.

5. *Papilio rutulus*, Western Tiger Swallowtail

**Second I/R.** Common in forest edge habitats, especially atop Young Hill.

Flies late spring into summer.

6. *Papilio eurymedon*, Pale Tiger Swallowtail

Common in Ocean Spray habitats, especially atop Young Hill. Spring-summer.

Pieridae: Whites, Marbles, and Sulphurs

7. *Neophasia menapia*, Pine White

**Second I/R.** Variable abundance in late summer-fall around pines and Douglas-firs. Conspicuously weak, fluttery flight, often high among evergreen foliage.

8. *Pieris rapae*, Cabbage White

Several at hosts' house, Cattle Point; one larva on sea rocket, Old Town Lagoon.

The only introduced European butterfly in the park. Can appear anywhere.

(*Pontia occidentalis*, Western White

Possible sight record by J. Chu, August 19, 4th of July horse trailer scrub. A vicariant species in WWA that could be seen in any open habitat.

9. *Euchloe ausonides insulanus*, Island Marble

NRCA near Lighthouse, Redoubt and slopes to the south, South Beach, Old Town Lagoon, trailhead for Jakle's Lagoon: at least 100 individuals sighted. Seems to be double-brooded, flying in early May and again in June. See special section.

10. *Anthocharis sara*, Sara's Orangetip

One male, English Camp nr. Officers' Quarters. Likely much more widespread; a spring flier that should respond to management on oak meadows.

(*Colias eurytheme*, Orange Sulphur) and

(*Colias philodice*, Clouded Sulphur) and

(*Colias occidentalis*, Western Sulphur)

S. Vernon had sight records) of sulphurs on 03 October 1999 and 21 September 2003 on Lighthouse Trail and South Beach. As *Colias* are not reliably discriminable on the wing, they must be considered tentative on the park/ island/ county lists. The Orange Sulphur invades WWA from EWA every summer and fall, the Clouded Sulphur to a lesser degree. The Western Sulphur was originally described from the Gulf of Georgia; it flies earlier and is no longer known from any maritime colonies except one tenuous station near Dungeness, found and last seen by RMP in 1975)

Lycaenidae: Coppers, Hairstreaks, and Blues

11. *Lycaena helloides*, Purplish Copper

Several at hosts' garden at Cattle Point and numerous on the flats south of South Beach (observed by A. Lambert) in June. Worn males encountered in several *Rumex*-rich American Camp sites, and one fresh female in the English Camp formal garden. A colony occurs on Silverweed at Old Town Lagoon. Common and opportunistic around WWA from spring to fall.

12. *Incisalia mossii*, Moss's Elfin

**I/R, second C/R.** One male netted, another sighted, on a mossy bald between Young Hill summit and the forest path down; around *Sedum spathulifolium* stands. A significant park occurrence of an uncommon butterfly, active in early spring. Not seen previously in the islands since the 1950s on Orcas.

13. *Incisalia eryphon*, Western Pine Elfin

**I/R, second C/R.** Not seen previously in the islands since the 1950s on Orcas. One sighted nectaring on *Malus*, one more seen among pines, in glades NE of American Camp entrance. Probably not uncommon on Shore Pines in April-May.

14. *Strymon melinus*, Gray Hairstreak

Highly generalist and adaptable, can appear anywhere, spring-fall. Several records in various habitats.

15. *Everes amyntula*, Western Tailed Blue

**Second I/R.** Found previously only by the WBA group in May 2002, the species is highly abundant at South Beach on Common Vetch and Beach Pea, where it roosts conspicuously in late afternoon. Occurs widely through the park in spring.

16. *Celastrina (argiolus) echo*, Spring Azure (= Echo Blue)

Many sites, especially wooded edges on Young/Finlayson hills. All populations appear to be associated with Ocean Spray, though highly polyphagous elsewhere in moister regimes. A single, abundant spring brood detected.

17. *Glaucopsyche lygdamus*, Silvery Blue

**Second I/R, second C/R.** Pines near entrance on common vetch, bluffs near lighthouse on perennial lupines, Jakle's Lagoon trailhead on vetch and/or annual lupines. As on mainland, not uncommon but patchy in early spring.

Nymphalidae: Brush-Foots

18. *Speyeria zerene bremnerii*, Valley Silverspot (= Zerene Fritillary)

**Second I/R.** This conspecific of the federally threatened Oregon Silverspot is a Washington Candidate and federal Species of Concern, having declined greatly in the Puget Trough. All island populations should be considered significant for conservation, along with their host Early Blue Violets. One park sighting in 1994 by TLP, one specimen taken on August 19 by the South Beach spring by J. Chu.

19. *Boloria epithore*, Western Meadow Fritillary

**I/R.** Observed twice near Cattle Point; though only sight records, the species is distinctive. Probably occurs on violets in Jakle Lagoon/Finlayson forest edges. Widespread in WWA woodlands where violets occur.

20. *Phyciodes mylitta*, Mylitta Crescent  
One of the most common butterflies in WWA, a generalist on various thistles. Several sites at both American Camp and English Camp, most common on slope and bluffs S of Redoubt. Double-brooded, spring and late summer-fall.
21. *Polygonia satyrus*, Satyr Anglewing  
Individuals recorded on willows in steep cove due south of Redoubt; at Cattle Point; in the nettlebed at South Beach; American Camp visitor center; and at English Camp parking lot. Probably wherever nettles occur.
22. *Polygonia faunus*, Green Comma (= Faun Anglewing)  
Two sight records, one by English Camp cemetery, another at English Camp parking lot. Should be confirmed, but considered reliable. Common hibernant in many WWA woodland glades and edges in spring, midsummer, and fall.
23. *Polygonia oreas*, Oreas Anglewing  
**Second I/R.** One probable individual seen atop Young Hill, not netted. This is the rarest of the anglewings, and would not normally be counted as a sight record unless ventrum seen well at rest; but was recorded in same location one year previously by WBA field team, and therefore considered reliable.
24. *Nymphalis antiopa*, Mourning Cloak  
One individual seen in same *Salix scouleriana* grove noted above for *P. satyrus* in May; another in September above South Beach. Not uncommon WWA hibernant in willowy locales.
25. *Nymphalis (Aglaia) milberti*, Milbert's Tortoiseshell  
One on headlands near lighthouse, one south of Redoubt, one at Cattle Point, May-June. Common hibernating resident of nettlebeds throughout WWA.
26. *Nymphalis californica*, California Tortoiseshell  
**Second I/R.** One likely sight records at Cattle Point, a second netted and released nearby, both September. Usually a resident of *Ceanothus*-bearing areas in the Cascades, but expands into WWA in high population/dispersion years.
27. *Vanessa virginiensis*, American Lady  
**I/R, C/R.** Twice recorded at Cattle Point near lighthouse and in garden. A rare butterfly in WWA, especially in northern counties. This is a significant park record and range expansion, and more should be sought on Pearly Everlasting.
28. *Vanessa cardui*, Painted Lady  
**I/R.** One worn individual afternoon-basking on rim of Redoubt, another seen in Cattle Point garden. This cosmopolitan species occurs in highly variable numbers depending on the magnitude of the northward immigration and the number of local school releases.
29. *Vanessa annabella*, West Coast Lady  
One basking among sandverbena south of Pickett's Lane; one more likely sight record in pinery glade N of Cattle Pt. Rd. beyond the American Camp entrance. Several seen along Lighthouse trail by S. Vernon. Unpredictable occurrence all over WWA, where various mallows appear.

30. *Vanessa atalanta*, Red Admirable

**Second I/R.** One nectaring on Himalaya Blackberry at English Camp parking lot, others at Cattle Point. Nonresident, annual immigrant, often a common summer breeder where nettles grow.

31. *Limenitis lorquini*, Lorquin's Admiral

Many seen along wood-edges and crossing open habitats in nearly all areas of the park. One of the most common summer butterflies. Usually associated primarily with willows, but here uses Ocean Spray abundantly as well.

32. *Coenonympha tullia insulana*, Ochre Ringlet (= Island Ringlet)

Abundant on most grasslands throughout the park both in spring and summer-fall, with at least two broods. The one notable absence was from the Young Hill oak meadows; will probably return after management. An order of magnitude more abundant than any other dry-season butterflies.

**Species Known from/near San Juan Island that Should be Sought in SJINHP:**

(Many of these are considered unlikely due moisture, altitude, and isolation. An asterisk (\*) indicates the species considered most likely to be found in future sampling.)

\**Epargyreus clarus*, Silver-spotted Skipper

Whatcom Co.; uncommon in WWA, on various legumes, shrubs, spring-summer.

*Erynnis persius*, Persius Duskywing

Clallam Co.; common in much of WWA in forest clearings, spring-summer.

\**Erynnis icelus*, Dreamy Duskywing

Mt. Dallas, SJI, 1976; a spring flier in moist situations, spring-summer.

*Carterocephalus palaemon*, Arctic Skipper

Clallam/Jefferson cos., moist grassy places, spring-summer.

\**Hesperia colorado oregonia*, Oregon Skipper

Friday Harbor, SJI, 1930; Mt. Constitution, Orcas Is., 1960; grasslands, spring.

\**Hesperia juba*, Juba Skipper

Friday Harbor, SJI, 1930; Mt. Constitution, Orcas Is., 1922; grasslands.

*Polites sonora*, Sonora Skipper

Clallam, Whatcom cos. Meadows and grassy edges, early summer.

*Euphyes vestris*, Dun Skipper

Whatcom Co. Sedgy swales and woodland margins, summer.

\**Parnassius clodius*, Clodius Parnassius

Kanaka Bay, SJI, 1924; Orcas Is., 1949; requires Bleeding Heart.

\**Pontia occidentalis*, Western White

Orcas Is., 1950; vicariant.

*Pieris marginalis*, Margined White

Ubiquitous in WWA woodland glades and edges; absence in SJI may be real.

\**Colias eurytheme*, Orange Sulphur

Skagit Co.; late summer, especially around Red Clover or Alfalfa.

*Colias philodice*, Clouded Sulphur

Whatcom, Island, Clallam cos.; late summer, around Red Clover or Alfalfa.

- Colias occidentalis*, Western Sulphur  
Dungeness, Clallam Co., 1975; early-midsummer, native legumes.
- Satyrium sylvinum*, Sylvan Hairstreak  
Clallam Co.; possible among willows in summer.
- \**Mitoura grynea*, Cedar Hairstreak  
Whatcom, Clallam cos.; could be present on Western Redcedars and junipers.
- \**Incisalia augustinus*, Brown Elfin  
Doe Bay, Orcas Is., 1921; should be sought in spring around Salal.
- Plebejus saepiolus*, Greenish Blue  
Clallam, Whatcom cos; possible in places with clover and wet meadows.
- Icaricia icarioides blackmorei*, Puget Blue  
Whatcom Co., this species of concern is not yet known in N Puget Trough.
- \**Speyeria cybele*, Great Spangled Fritillary  
Clallam, Whatcom cos.; around stands of violets in midsummer.
- Phyciodes pulchella*, Field Crescent  
Collected by D. McCorkle near Friday Harbor Laboratory in 1962 (confirmed).  
Known elsewhere in western Washington only from montane and alpine habitats, its appearance on San Juan Island is a mystery. As the species feeds on asters in the larval stage, the aster patches in SJINHP might turn out to harbor the species.
- Euphydryas editha taylori*, Taylor's Checkerspot  
A state and federal candidate for listing, extinct in B.C., this is a taxon of great conservation concern. A large colony formerly occurred on Long Island, a mile or so from Cattle Point (RMP, 1979) but has not been checked since. Potential paintbrush hostplant has been noted at MarVista Resort on False Bay, northwest of American Camp. The species' occurrence in the park is unlikely, but should be watched out for carefully in May, around paintbrush or plantain stands.
- Polygonia gracilis* (= *zephyrus*), Zephyr Anglewing  
Clallam, Whatcom cos. Usually higher, but could occur in coolest areas.
- Cercyonis pegala*, Common Wood Nymph  
Clallam Co.; common in much of WWA, but apparently absent from Whidbey Is. and all islands to its north. Almost certainly would have been seen in the survey.
- Oeneis nevadensis gigas*, Great Arctic  
Mt. Constitution, Orcas Is. 1948. Unlikely to be found on SJI's lower mountains.
- Danaus plexippus*, Monarch  
One individual was photographed in Friday Harbor on July 23, 2002, by Ron Keeshan. This might or might not have been the result of a wedding or school release. Wild Monarchs can turn up anywhere in WWA in summer, but will not breed here for lack of milkweed hostplants.



### **Prominent Diurnal Moths of SJINHP**

#### *Pseudohazis eglanterina*, Elegant Day Moth

Individuals were seen along Mt. Finlayson, over the Redoubt grasslands (where one of these fast, colorful, large and bulky moths was observed being taken on the wing by an aeshnid dragonfly), and in the SE border grasslands of English Camp, where larvae were found snowberry. Resemble erratic fritillaries on the wing.

#### *Haemeris diffinis*, Snowberry Clearwing Sphinx Moth

Several of these big bumblebee-mimic, diurnal sphinx moths nectared on Scabiosa in the English Camp formal garden.

#### *Platyrepia virginalis*, Ranchman's Tiger Moth

One of these large, handsome, brown-and-yellow tigers, diurnal and generalist, flew through the picnic area at South Beach's northern end.

#### *Tyria jacobaeae*, Cinnabar Moth

European, introduced for control of tansy ragwort, this brilliant scarlet diurnal moth is frequently remarked by visitors to parks and rural lands. Hundreds of the tiger-striped larvae were observed on the fairly sparse ragwort (*Senecio jacobaeae*) near the east end of Mt. Finlayson.

Several species of diurnal noctuids (owlet moths) and geometrids (inch-worm moths) are often seen in the park as well. Some of these might rarely be mistaken for butterflies.

### **Special Discussion of The Island Marble**

The Large Marble (*Euchloe ausonides*) generally occurs east of the Cascade Range in Washington and British Columbia, shifts westward in southern Oregon, and flies near the coast as well as eastward in California. The only maritime population formerly known in the upper Northwest occupied parts of Vancouver and Gabriola Islands, B. C. Not since 1908 has this population been seen, and just thirteen specimens remained to tell of it (Guppy and Shepard, 2000; Pyle, 2000). John Fleckenstein, sampling American Camp as part of a joint DNR/WDFWL prairie butterfly survey, turned up some whites that proved, upon examination, to be marblewings (Fleckenstein, 1999). Subsequently, Guppy and Shepard provided the taxon with a name, *Euchloe ausonides insulana*, the Island Marble (Guppy and Shepard, 2000). A distinctive subspecies in complete genetic isolation, the Island Marble represents one of the most dramatic examples in the North America fauna of a narrowly endemic taxon. It is still unknown beyond southernmost San Juan Island, and its entire future seems to depend upon management within San Juan Island National Historical Park.

On our first visit, on May 6, 2003, we found the Island Marble numerous in American Camp from Roberts' Redoubt south to the bluffs on the Strait of Juan de Fuca, particularly mid-slope and again in sheltered coves along the bluffs extending from South Beach westerly. All concentrations were found in proximity of dense or dispersed stands of Common Rape or Field Mustard (*Brassica campestris*). While modest amounts of a small, unidentified cress and a species of *Cardamine* (fide A. Lambert) were noted in the same district, no attention seemed to be paid these crucifers by the marbles, whereas they nectared on and frequented both Rape and Tumble Mustard (*Sisymbrium altissimum*).

Apparent range extensions for the butterfly were made as follows: one male on the grasslands of the DNR-administered Cattle Point Natural Resource Conservation Area, a few hundred yards west of the Lighthouse; one individual roosting for the night on *Amsinkia* among the tideline driftwood at OldTown Lagoon; and one freshly emerged male going to roost below the Jakle Lagoon trailhead toward Old Town Lagoon. No crucifers were observed near the Lighthouse; dispersed Rape occurred on the slope between Cattle Point Road and the two latter sightings. Prior to this survey, the butterfly had not been reported north of Cattle Point Road or east of the park boundary.

On the second visit we expected the flight of the marbles to be finished. However, we found one fairly fresh female over the sandverbena south of Pickett's Lane on June 23rd. No adults were seen near South Beach, the shore bays to the north, or anywhere on the Redoubt grasslands, where they had been numerous in May. But on the afternoon of June 25th, along the Old Town Lagoon shore and vicinity where two males had been found roosting during the first visit, we found a number of adults on the wing, right along the driftwood-tideline. Two of these were netted and released: a fresh female, and a very fresh, just eclosed (soft-winged) male. This was followed by the discovery of larvae on Puget Sound Peppergrass (*Lepidium virginicum* var. *menziesii*) on the bayside, the first native hostplant ever documented for this taxon.

The presence of fresh adults so late in the season suggests three possibilities: the existence of a second generation of Island Marbles; an extremely attenuated single generation, with emergence weighted toward the latter end of the flight period at this bay side site, in the lee and therefore moister than the exposed southern side of American Camp; or some combination or variation thereof.

Bivoltinism (double-broodedness) has never been demonstrated for this species in Washington, but the coastal populations in California are known to produce a second generation (fide J. W. Tilden, 1965). J. A. Scott (1986) lists the species as generally single-brooded, but with two flights (March-April and L May-June) in lowland N. California. The reality at American Camp may involve a combination of these factors, with a stretched-out spring emergence followed by a second flight where conditions permit (overlapping generations, or facultative bivoltinism). It is also possible that the San Juan population of *Euchloe ausonides insulanus* has adapted to the park's unique circumstances by developing a split population: univoltine on the uplands, utilizing the annual spring crucifers; bivoltine on the bayshore, employing the perennial species on the moister side of the peninsula. Alternatively, the butterflies may move between the two areas, expressing a facultative (opportunistic) second brood where hostplants permit.

Larvae were found as follows during the June 22-26 survey visit:

- One 3rd instar (instars = molting stages, five in all; these were estimated) on *Sisymbrium altissimum*, sandverbena dunes south of Pickett's Lane.
- One 2nd, one 4th on *Sis. alt.*, below SW rim of Redoubt.
- Several more 3rd, 4th, 5th (final) on *Sis. alt.* along trail to shore from Redoubt, feeding on flowerparts and seedpods.
- One 5th on seed pod of *Brassica campestris* behind the comfort station at South Beach.
- One 3rd, one 5th on *Bras. camp.* N of main Redoubt-to-shore trail.

We assume that these larvae were offspring of the early spring adults and will have pupated for the duration of the year until the following flight season. James Miskelly (pers. com.) noted many eggs and larvae on *Brassica campestris* in May.

--Five larvae, 3rd-5th, on Puget Sound Peppergrass (*Lepidium virginicum* var. *menziesii*) (det. C. Maxwell) among driftwood on the shore of Old Town Lagoon -- this is a new host for *E. ausonides*, and the first indigenous host for *E. a. insulanus*. The larvae were feeding on silicles (seedpods).

Other plant/marble observations:

1) On the whole, *Sisymbrium* was much more apparent in June than *Brassica*; the opposite was true in May. Both are known hosts for *E. ausonides* elsewhere.

2) *Lepidium virginicum* var. *menziesii* is apparently a native plant here, known to occur in beach habitats on Vancouver Island, the Gulf Islands, and the northern Olympic Peninsula. *Lepidium* also appeared on the sand habitats south of the South Beach approach; these were shorter and more compact, perhaps moisture-stressed or a different species. A brief field experiment was conducted in which a captive female was exposed to both this *Lepidium* and *Sisymbrium*; she oviposited on neither before being released. J. A. Scott has recorded the related species *Lepidium densiflorum* var. *bourgeanum* as a known host for *E. ausonides* elsewhere.

3) The other crucifer present among the Old Town Lagoon shore-drift is Sea Rocket or Beach Radish (*Cakile* spp.). Many plants were searched for larvae, but only one Cabbage White larva was found on the Sea Rocket. Succulent and halophytic, this plant supports populations of *Pieris rapae* along many Washington shorelines. It should continue to be searched for marble larvae, on both sides of the American Camp/Cattle Point peninsula, as it would dramatically extend the available resources for *E. a. insulana* in the park. The species still needs to be determined; both European (*C. maritima*) and American (*C. edentula*) sea rockets were introduced to western beaches (Barbour & Rodman, 1970).

4) Another crucifer present in the Redoubt area has been identified by botanist Cathy Maxwell as *Teesdalia nudicaulis*, a European mustard. No larvae were found on this, nor did the adults pay it any attention. The same was true of a small species of *Cardamine* pointed out to us by Amy Lambert.

In summary, the known range of the Island Marble has been extended, as has its flight period, and the known hosts have been increased from two to three species of crucifers. An interesting possibility arises with the detection of an indigenous beach mustard (*Lepidium virginicum* var. *menziesii*) as a hostplant. Perhaps the originally discovered population on southern Vancouver Island was not a denizen of the oak meadows after all, as has been supposed; but a resident of the beach, wandering individuals of which were encountered in upland (oak meadow) situations. And if the beach population represents the aboriginal condition on San Juan Island, the upland and headland population of today might have been founded by wanderers from Old Town

Lagoon having discovered and colonized introduced mustards. Such a hypothesis would accord with the randomly dispersive habits of the adults, and account for our inability so far to locate native hostplants upslope.

In any case, the present population of the Island Marble in SJINHP seems to be substantial and thriving. On a high-priority basis, detailed autecological studies of the butterfly should be performed to determine the actual brood situation, hostplant preference and survivorship, and other factors, prior to execution of any large-scale management modifications. Above all, the relative abundance of the Island Marble should be monitored annually to ensure that it is not declining.

### **Twelve Major Management Implications**

1) Although an indigenous host has now been found, the Island Marble is still largely associated with two alien mustards, and it is unclear to what degree the population depends upon them. It would be unwise to undertake management that greatly reduces Rape and Tumblemustard until the biology of the butterfly and its hosts are better known.

2) Invasive weed reduction and grassland restoration at American Camp south and east of the Redoubt is complicated by the disturbance history, the marble/mustard association, and the intricate admixture of natives such as Camas, Chocolate Lily, and Early Blue Violet with alien grasses, forbs, and brambles. In particular:

a) In actions taken to reduce Himalayan Blackberry (*Rubus discolor*), great care must be taken to avoid disturbing or removing dense stands of the native Dewberry (*Rubus ursinus*), which often grows very nearby but is easily discriminated. The Dewberry is a highly important nectar plant to many butterflies and bumblebees, and seems to be the larval hostplant for the newly found checkered skipper (*Pyrgus ruralis*). (Note: this open, mostly xeric habitat seemed a very strange one for *P. ruralis*, which normally occupies moist, woodland-edge situations. But it is using mesic pockets here supporting stands of desirable plants including *R. ursinus*, *Artemisia suksdorfii*, and *Fritillaria lanceolata*. The likely host association of the skipper with Dewberry is new, and perhaps quite rare.) *R. discolor* is still fairly sparse and quite compact, and might respond well to cutting and stump-spraying; good results have been obtained using a new organic herbicide with concentrated acetic acid. The main thing will be to make sure the crews can distinguish the two species of *Rubus*, and know where the violets grow.

b) One of the most notable finds was a dense stand of Blue Violet (*Viola adunca*) growing among grasses and forbs on the slope in a line between the large glacial erratics and rock pile east of the Redoubt and South Beach. This violet hosts the larvae of the uncommon Zerene Fritillary subspecies known as the Valley Silverspot. Additional, as-yet undetected species of fritillaries might also use these violets. This is also an area being invaded, loosely so far, by Himalayan Blackberry. The removal of the alien bramble will have to be done with precision and care, so as not to adversely affect the violets -- which were, by the way, the ONLY violets of any species we observed

anywhere on San Juan Island the entire season. They are most easily seen when blooming in May-June.

c) Where native fescues dominate the grass cover, these areas too should be dealt with carefully. While the Island Ochre Ringlet (*Coenonympha tullia insulana*) seems to be adapted to an array of grasses as hostplants, the presence of specialized hesperiine (grass-feeding) skippers may depend upon indigenous bunchgrasses versus coarse or invasive annual grasses.

3) With respect to the proposed burning at English Camp in the oak meadows on and below Young Hill, the conflicts with butterflies and their hostplants are apparently not as severe as is often the case in controlled burn situations. The meadows are heavily disturbed, dominated largely by alien invaders. There seems to be little native fescue or scrophulariaceous plant cover that would be concerns, and we found no prairie butterfly species of concern with the exception of the Propertius Skipper, a Garry Oak obligate. Manroot is one of the main natives, along with patchy Camas, Chocolate Lily, and a few others. Though a good nectar source, Manroot is quite fire tolerant. Annual lupines, forget-me-nots, and vetch comprise excellent nectar sources, but fire should not harm them. Our primary concerns for fire managers are these:

a) In the lower meadows would be to avoid any mortality to either Garry Oaks (which are not overly abundant and show little recruitment) or to Western Juniper (still less common). The former is the required host for the Propertius Duskywing, extremely limited in the islands; and the latter a potential host for the Juniper/Cedar Hairstreak (*Mitoura grynea*), not yet found in the islands. Sampling after the 2003 burn gave no cause for concern; regrowth in 2004 should show enhanced growth of grasses and forbs.

b) When burning resumes at Young Hill, great care should be taken not only for the oaks themselves, but to avoid burning around or beneath the oaks as much as possible. This is because the overwintering larvae hibernate among the fallen oak leaves, and pupation probably occurs in spring in the duff around the trees as well. So the oaks could remain intact, but the butterfly (one of the real rarities of the park and the islands) could still be harmed or extirpated if the leaf litter beneath the oaks were thoroughly burnt. If fire management increases the incidence of Camas, this will aid the skipper, which nectars preferentially on Camas. Hence the cemetery enclosure itself is a perfect little habitat for the skipper, with the big oak above, its undergrowth little disturbed, and abundant Camas blooming beneath.

c) At higher elevations on Young Hill, the mossy/grassy balds support many more native plants, including good stands of saxifrages, Shooting Star, *Allium*, and *Plectritis*, as well as native grasses. Great care should be taken that fire treatments do not escape uphill to these balds or summit glades, nor to rock faces supporting mats of Broad-leaved Stonecrop (*Sedum spathulifolium*), the host of the new island discovery, Moss's Elfin.

d) As for the oak meadows/grasslands along the southwest boundary of the English Camp unit, burning should be considered to enhance the floristic mix. While some native asters and avens occur in the moister wood-edge and swale, the field as a whole is dominated by Himalayan blackberry, thistles, snowberry, rose, and invasive Yorkshire fog grass (*Holcus lanatus*). Care should be taken to protect large individuals of native crabapple near the northwestern corner. Collaborator Janet Chu suggests that grazing goats might represent an excellent initial management regime for this field.

e) If controlled burns are to be employed at American Camp, the same cautions apply mentioned above for Dewberry and Early Blue Violets. Fritillary habitats are particularly sensitive to fire (Swengel, 2003), so the violet stands should be carefully mapped and protected from fire. Pearly Everlasting, however, a prime late-season nectar plant and the hostplant of the rare American Lady, would likely respond well to burns.

4) Continuing management of the pinewoods near the American Camp entrance should aim to maintain the open glade network, especially with smaller, protected glades where Western Buttercup and Pacific Strawberry thrive and Salal has edge exposure. Pacific Crabapple (*Malus fusca*) should be protected and encouraged among the pines. Western Pine Elfin populations will benefit from young, sun-exposed pines and abundant nectar. In fact, wherever sunny glades are opened in dense canopy zones (Mt. Finlayson and the northern half of English Camp, for example), opportunities for butterfly basking and host/nectar plant proliferation will be favored. Edge-zones in general favor the growth of Ocean Spray (*Holodiscus discolor*), apart from nettle the single most useful caterpillar hostplant in the park (Pale Tiger Swallowtail, Spring Azure, Lorquin's Admiral).

5) Since Canada Thistle is another management target at both units, NPS should be aware that this invasive alien serves as a welcome caterpillar hostplant for two of the most attractive butterflies in the park, the Mylitta Crescent and the Painted Lady (when it is present, in good immigration years). It is also one of the best butterfly nectar sources for swallowtails and others. These are common butterflies and I would not urge the abandonment of thistle control to encourage them; however, if Canada Thistle remains at some level, at least it is good to know that it provides substantial ecological service for several butterflies. And if thistlebeds can be tolerated in some sites, they will be justified in terms of butterflies. This is true too of alien vetches, forget-me-nots, and several other nectiferous but non-native forbs (see nectar section).

6) Along the same lines, Stinging Nettle (*Urtica dioica=lyallii*) is a native species, and not usually a management concern. However, since visitors dislike nettle, some park managers eradicate it near facilities or trails. I strongly urge SJINHP managers to maintain and encourage nettle, since it is the sole larval hostplant for three of the park's most beautiful and "watchable wildlife" species of butterflies--the Red Admirable, the Satyr Anglewing, and Milbert's Tortoiseshell (all of which were recorded during this survey). An excellent situation obtains at South Beach, where a split rail fence separates parking and picnic spots from a large stand of nettles (where we saw Satyr Anglewings). This should be maintained, and could be emulated elsewhere.

7) Rabbit impacts have no doubt affected butterfly populations in the grasslands. It is hard to say exactly how. The extant warrens are probably visited for their weedy annual nectar plants, but may not offer many breeding habitat opportunities. Rabbits may have been helpful in removing biomass and preventing the succession of shrubby vegetation over much of the grasslands. Where abundant, however, they likely favor adaptive invasives over more specialized native herbs.

8) Dunes south of Pickett's Lane support heavy stands of Yellow Sandverbena, a desirable nectar plant for various species. Many of these plants have been left standing high on their roots by blowouts. This plant should be encouraged in any management plans affecting the dunes area.

9) Old Town Lagoon and vicinity supports some of the most intact native plant communities, including notably the strand/driftwood habitat where the Island Marble subsists on Puget Sound Peppergrass. No immediate threats seem evident, other than atypically high tides and storms, for which these organisms are likely adapted. No plans for this area should be contemplated without careful consideration of the special biota.

10) Roberts' Redoubt receives heavy visitation by both humans and butterflies. Hilltopping Anise Swallowtails and others, basking Painted Ladies, courting and breedings marbles, and ringlets nectaring on snowberry in the north-side trench are among the recorded examples. The split-rail fenced enclosure in the parking area is very important in protecting the prolific flowering stand of Death Camas. Present conditions should be maintained insofar as possible. As for the other cultural areas, the formal garden at English Camp should be maintained with its current species mix of flowers. Another butterfly garden should be considered for the American Camp Visitor Center, perhaps based on cottage gardens that probably graced the historic camp. And both *Bella perennis* and white clover should continue to be encouraged on the Parade Ground and other lawns at both units, with no herbicide applications.

11) Young Hill Summit area, English Camp. Visitor foot-traffic has trampled mossy balds and native grass stands near the summit and lookout. For the most part this is fairly concentrated, and similar habitats farther from the trail have not been affected. The stonecrop stands are mostly out of reach as well. The series of butterfly-rich glades radiating northwesterly from the summit have not yet been heavily impacted. If usage should spread and intensify, visitor control on top of Young Hill might need to be revisited, both for wildflowers and butterflies. But at current levels and concentrations, impacts seem acceptable.

12) Beach and bluff erosion. One of the most significant areas in and near the park consists of the bluff-faces, coves, headlands, and bluff-top meadows along the entire southern shore of American Camp and extending along Lighthouse Trail into the DNR NRCA at Cattle Point. Given their sun-trap situation and floristic diversity, the coves from South Beach to Grandma's Cove are extremely important to maintain as they are. Lupine-dominated hollows and meadows atop the bluffs, all the way east to the

lighthouse, are important for blues, potential sulphurs, and others. Cooperative management discussions should be held with DNR, since the Island Marble was turned up by this survey on the NRCA east of the park boundary.

All of these habitats are, of course, at ultimate risk from backward beach erosion and slope failure. Further slumping and invagination of the western coves will probably just renew these useful, wind-protected and sunny habitats, which are heavily occupied by Island Marbles. The higher, steeper, more friable, slopes to the east, often at the angle-of-repose, are volatile and dynamic with no permanent colonies. Lupines should continue to colonize backward from the shifting lip. Since Cattle Point Road itself may at some point come under threat from these forces, we investigated the habitat around the zone of shallowest shoreline security, which coincides with the eastern border of SJINHP. We found no great cause for concern from a habitat standpoint, should the road ever require realignment inland. The Island Marble has not appeared in this area, and the uphill slopes are extensively homogenous, with disturbed grasslands abutting the dense Douglas-fir forests of Mt. Finlayson.

In short, I recommend maintaining all crucifers for now, protecting oaks and junipers aggressively, and attacking Himalayan Blackberry and other invasives on a targeted basis rather than with broadcast herbicides or large fires that could damage Dewberry, violets, fescues, and other valuable neighbors.) For relevant background on the general subject of butterfly conservation management, see New, Thomas, Pyle, Thomas, and Hammond (1995) and Swengel (2003).

### **Conclusions and Recommendations for Further Work**

The San Juan Islands support more butterflies (44 spp.) than most other areas of similar size in the north-maritime Northwest, largely because of their position in the rain shadow of the Olympic Mountains. San Juan Island is highest in documented diversity (38 spp.), even though the higher elevation and moister conditions on Mt. Constitution, Orcas Island, support some species absent from San Juan. The two units of San Juan Island National Historical Park, though occupying less than five per cent of the island's area, support at least 32 spp., or 84% of the known butterfly fauna of the entire island, and this figure will likely rise with additional survey. This survey confirms the following conclusions and recommendations:

- 1) The butterfly fauna of SJINHP represents a significant assemblage of butterfly species and a substantial interpretive resource. Park personnel should be acquainted with these results and invited to incorporate butterflies in the interpretive services offered visitors.
- 2) The Island Marble is present and reasonably thriving at American Camp, over a broader range than was previously appreciated. It is one of the most narrowly restricted endemics of American butterflies, and as such, an obviously high conservation priority. If its numbers fall, and if invertebrate listing resumes, its federal listing under ESA will be a foregone conclusion.



3) The most significant management challenges for SJINHP butterflies involve control of alien invasive plants in the restoration of coastal grasslands and oak meadows. In particular, the fact that two such aliens are also two of three known hostplants for the Island Marble makes the management of these adventitious mustards especially difficult.

4) Several other rarities and conservation targets occur in the park, notably the *Propertius* Duskywing, Moss's Elfin, and the Valley Silverspot. Their conservation depends upon their hostplants and habitats, respectively oaks (and their under under-duff), stonecrop-bearing bluffs, and Early Blue Violets in American Camp grasslands.

5) Intentional fires should have little detrimental impact on butterfly conservation in the park, particularly if the management recommendations given above are followed. On the other hand, if controlled burns result in better quality grassland with more acreage of indigenous grasses and density of native forbs, several butterflies currently rare or absent from the park could expand, colonize, or otherwise greatly benefit. Butterflies are, however, highly susceptible to local extirpation by fire; so other means of removing invasive biomass should also be explored, and sensitive microhabitats (such as violet stands in grassland) should not be burned completely, intensely, or frequently.

6) The survey should be continued on an ad hoc basis, utilizing volunteers, agency biologists, students, amateur lepidopterists, and members of the Washington Butterfly Association. Their cooperation should be welcomed and participation invited. Several additional species should be sought, as described above. Observation and photography should suffice for most IDs, with catch-and-release permitted on occasion, and limited collection permitted if colonies are located of any uncertain taxa. Habitat and seasonal coverage, while extensive in this survey, should be expanded as opportunity allows.

7) The previous recommendation notwithstanding, collecting of the Island Marble should be prevented within the park, unless for carefully considered scientific purposes. Collecting is very seldom a serious conservation concern for insects, almost all real risks relating to habitat modification (New, et al 1995) However, the area of habitat is small enough, the butterfly rare enough, and its potential desirability great enough among collectors, that the population might conceivably be affected by intensive collecting. Individuals given permits to sample or catch and release should be instructed to avoid netting Island Marbles unless otherwise taking part in annual monitoring for the species..

8) Of greatest urgency, annual monitoring of the Island Marble should be undertaken, and detailed studies initiated of the marbles' ecology and population biology. I recommend this be accomplished by a graduate student with suitable skills and experience, under the supervision of an appropriately knowledgeable major professor of conservation biology and/or Lepidoptera field studies. This will give the best opportunity for informed management decisions in the future.

### Appendix I: Inventory of Specimens Taken

(All specimens have been assigned NPS labels and curated to NCNP standards; they are presently on loan to Burke Museum, University of Washington, J. P. Pelham, Curator.)

- 1) *Pyrgus ruralis*, Two-banded Checkered Skipper  
male, 8 May 03, small pinery glade n. of fire camp, T34N R3W S11. Coll. RMP.
- 2) *Pyrgus ruralis*, Two-banded Checkered Skipper  
female, 8 May 03, pinery glade nr. fire camp, T34N R3W S11. Coll. TLP.
- 3) *Ochlodes sylvanoides*, Woodland Skipper  
female, 21 August 03, pinery glade nr. fire camp, T34N R3W S11. Coll. J. Chu.
- 4) *Euchloe ausonides insulanus*, Island Marble  
small male, 6 May 03, 1st cove n. of S. Beach. T34N R3W S12. Coll. RMP.
- 5) *Euchloe ausonides insulanus*, Island Marble  
female voucher, 6 May 03, 3rd cove n. of S. Beach. T34N R3W S12. Coll. RMP.
- 6) *Euchloe ausonides insulanus*, Island Marble  
large male, 6 May 03, s. of Redoubt. T34N R3W S12. Coll. RMP.
- 7) *Incisalia mossii*, Moss's Elfin  
male, 7 May 03, trail just below Young Hill Summit. T36N R4W S25. Coll. TLP.
- 8) *Speyeria zerene bremnerii*, Valley Silverspot  
male, 19 August 03, spring at n. end of South Beach. T34 R3W S12. Coll. J. Chu.
- 9) *Coenonympha tullia insulanus*, Island Ochre Ringlet  
8 May 03, pinery glade nr. fire camp, T34N R3W S11. Coll. RMP.
- 10-11) *Coenonympha tullia insulanus*, Island Ochre Ringlet  
23 June 03, Eagle Point (outside Park). T34 R3W S11. Coll. RMP.
- 12-17) *Coenonympha tullia insulanus*, Island Ochre Ringlet  
26 June 03, Mt. Finlayson trail. T34N R2W S6. Coll. RMP.
- 18) *Coenonympha tullia insulanus*, Island Ochre Ringlet  
31 July 03, Redoubt to Bluffs trail. T34N R3W S12. Coll. RMP.

(These Island Ringlets were collected for comparison with samples from Orcas Island to elucidate the integrity of subspecies *C. t. insulana* relative to mainland populations.)

- 19) unidentified noctuid moth  
26 September 03, in bait trap at American Camp visitor center. Coll. RMP.

## Appendix II: Checklist of San Juan Islands Butterflies (By Island)

(Note: All islands are in San Juan County, except Cypress Is., which is in Skagit County. Detailed records are held in the Washington Butterfly Data Base (WDFWL) or with the author. Most records are based on specimens or catch and release, though some are sight records, usually by known reliable observers. All Crane Is. records are sight only.)

(SJ = San Juan; O = Orcas; L = Lopez; S = Shaw; C = Cypress; W = Waldron; Y = Yellow; Lg = Long; S = Sentinel; Cr = Crane)

1. <i>Erynnis icelus</i> , Dreamy Duskywing	SJ
2. <i>Erynnis propertius</i> , Propertius Duskywing	SJ, O
3. <i>Pyrgus ruralis</i> , Two-banded Rural Skipper	SJ
4. <i>Hesperia colorado</i> , Western Branded Skipper	SJ, O
5. <i>Hesperia juba</i> , Juba Skipper	SJ
6. <i>Ochlodes sylvanoides</i> , Woodland Skipper	SJ, O, Cr
7. <i>Parnassius clodius</i> , Clodius Parnassius	SJ, O
8. <i>Papilio zelicaon</i> , Anise Swallowtail	SJ, O, Cr
9. <i>Papilio rutulus</i> Western Tiger Swallowtail	SJ, O, Cr
10. <i>Papilio eurymedon</i> , Pale Tiger Swallowtail	SJ, O, Cr
11. <i>Neophasia menapia</i> , Pine White	SJ, O, L, Cr
12. <i>Pieris occidentalis</i> Western White	O
13. <i>Pieris rapae</i> , Cabbage White	SJ, O, Cr, L
14. <i>Euchloe ausonides insulanus</i> , Island Marble	SJ
15. <i>Anthocharis sara</i> , Sara's Orangetip	SJ, W, Y, Cr
( <i>Colias</i> spp.) sulphur spp.	SJ (sight)
16. <i>Lycaena helloides</i> , Purplish Copper	SJ, O
17. <i>Incisalia mossii</i> , Moss's Elfin	SJ, O
18. <i>Incisalia eryphon</i> , Pine Elfin	SJ
19. <i>Incisalia augustinus</i> , Brown Elfin	O
20. <i>Strymon melinus</i> , Gray Hairstreak	SJ, O
21. <i>Everes amyntula</i> , Western Tailed Blue	SJ, L
22. <i>Celastrina (argiolus) echo</i> , Spring Azure	SJ, O, Cr, L
23. <i>Glaucopsyche lygdamus</i> , Silvery Blue	SJ
24. <i>Speyeria zerene bremnerii</i> , Zerene Fritillary	SJ, O, C
25. <i>Speyeria hydaspe rhodope</i> Hydaspe Fritillary	O, Cr
26. <i>Boloria epithore</i> , Western Meadow Fritillary	SJ, O
27. <i>Phyciodes mylitta</i> , Mylitta Crescent	SJ, O, L
28. <i>Phyciodes pulchella</i> , Field Crescent	SJ
29. <i>Euphydryas editha taylori</i> , Taylor's Checkerspot	Lg
30. <i>Polygonia satyrus</i> , Satyr Anglewing	SJ, O, C, Cr
31. <i>Polygonia faunus</i> , Faun Anglewing	SJ, C
32. <i>Polygonia oreas</i> , Oreas Anglewing	SJ, O
33. <i>Nymphalis antiopa</i> , Mourning Cloak	SJ
34. <i>Nymphalis milberti</i> , Milbert's Tortoiseshell	SJ, O, W, Cr
35. <i>Nymphalis californica</i> , California Tortoiseshell	SJ, C

36. <i>Vanessa cardui</i> , Painted Lady	SJ, O, Cr
37. <i>Vanessa annabella</i> , West Coast Lady	SJ, O
38. <i>Vanessa atalanta</i> , Red Admirable	SJ, O, Cr
39. <i>Vanessa virginiensis</i> , American Lady	SJ
40. <i>Limenitis lorquini</i> , Lorquin's Admiral	SJ, O, Cr
41. <i>Coenonympha tullia insulana</i> , Ochre Ringlet	SJ, O
42. <i>Oeneis nevadensis gigas</i> , Great Arctic	O
43. <i>Danaus plexippus</i> , Monarch	SJ

### Appendix III: Data Summary

#### County records obtained in this survey and related research:

*Vanessa virginiensis*, American Lady  
*Danaus plexippus*, Monarch

#### San Juan Island Records obtained in this survey and related research:

*Incisalia eryphon*, Western Pine Elfin  
*Boloria epithore*, Western Meadow Fritillary  
*Vanessa cardui*, Painted Lady  
*Vanessa annabella*, West Coast Lady  
*Vanessa virginiensis*, American Lady  
*Danaus plexippus*, Monarch

#### Additional Confirmatory Records of Seldom-reported Species

*Erynnis propertius*, Propertius Duskywing  
*Pyrgus ruralis*, Two-banded Checkered Skipper  
*Papilio rutulus*, Western Tiger Swallowtail  
*Papilio eurymedon*, Pale Tiger Swallowtail  
*Euchloe ausonides insulanus*, Island Marble  
*Strymon melinus*, Gray Hairstreak  
*Everes amyntula*, Western Tailed Blue  
*Speyeria zerene bremnerii*, Valley Silverspot  
*Nymphalis antiopa*, Mourning Cloak  
*Nymphalis californica*, California Tortoiseshell  
*Glaucopsyche lygdamus*, Silvery Blue  
*Vanessa atalanta*, Red Admirable

### Records Provided to Lepidopterists' Season's Summary for 2003

SAN JUAN COUNTY RECORDS: First and second county and island records and additional confirmatory records of seldom-sampled species. RMP = Robert M. Pyle; TLP = Thea L. Pyle; WBA refers to a multi-party Washington Butterfly Association field trip report; other observers as noted.

*Erynnis propertius*

Oak meadows below Young Hill, English Camp, San Juan Island National Historical Park, San Juan Island, T36N R4W S25, 22 May 2002. WBA, FIRST ISLAND RECORD.

Cemetery, English Camp, San Juan Island National Historical Park, San Juan Island, T36N R4W S25, 7 May 2003. RMP/TLP, SECOND ISLAND RECORD.

*Pyrgus ruralis*

East Meadow, Cattle Point, San Juan Island, T34N R2W S8, 17 April 2000. SUSAN VERNON, FIRST ISLAND RECORD.

West Side Road, San Juan Island, 22 May 2002. WBA, SECOND ISLAND RECORD.

.5 mi. seaward of Robert's Redoubt, American Camp; and Fourth of July Beach Horse Camp, both San Juan Island National Historical Park, T34N R3W S12, 8 May 2003. TLP/RMP.

Pinewoods near NE of entrance to American Camp, San Juan Island National Historical Park, T34N R3W S11, 8 May 2003. RMP.

*Papilio rutulus*

West Side Road, San Juan Island, 22 May 2002. WBA, SECOND COUNTY & FIRST ISLAND RECORD.

Summit of Young Hill, English Camp, San Juan Island National Historical Park, T36N R4W S25, 650 feet, 24 June 2003. RMP/TLP, SECOND ISLAND RECORD.

*Papilio eurymedon*

West Side Road, San Juan Island, 22 May 2002. WBA, SECOND ISLAND RECORD.

Summit of Young Hill, English Camp, San Juan Island National Historical Park, T36N R4W S25, 650 feet, 24 June 2003. RMP/TLP.

*Euchloe ausonides insulana*

Several areas on both Strait and Bay sides of American Camp, San Juan Island National Historical Park, T34N R3W S1 & S12. New population, Old Town Lagoon, adults 6-8 May and 25 June, RMP/TLP. Apparently bivoltine; larvae on first indigenous hostplant recorded, *Lepidium virginicum* var. *menziesii* (otherwise known on alien mustards).

*Incisalia mossii*

Summit of Young Hill, English Camp, San Juan Island National Historical Park, T36N R4W S25, 650 feet, 7 May 2003. TLP, SECOND COUNTY RECORD, FIRST ISLAND RECORD.

*Incisalia eryphon*

Pinewoods NE of entrance to American Camp, San Juan Island National Historical Park, T34N R3W S1, 8 May 2003. RMP, FIRST ISLAND RECORD. Nectaring on native crabapple, *Malus fusca*.

*Strymon melinus*

Lighthouse Trail, San Juan Island, T34N R2W S8, 29 August May 1998. SUSAN VERNON, FIRST ISLAND RECORD.

Blockhouse, Cattle Point, San Juan Island, T34N R2W S8, 18 April 2000. SUSAN VERNON, SECOND ISLAND RECORD.

*Everes amyntula*

West Side Road, San Juan Island, 22 May 2002. WBA, SECOND COUNTY & FIRST ISLAND RECORD.

South Beach Rd, American Camp, San Juan Island National Historical Park. T34N R3W S12, 6 May 2003. TLP/RMP, SECOND ISLAND RECORD. Large colony on both *Vicia sativa* and *Lathyrus japonica*.

*Glaucopsyche lygdamus*

W. of Zylstra Lake, San Juan Island. T35N R3W SW 1/4 S17, May 17, 2002. BILL YAKE, COUNTY AND ISLAND RECORD.

Pinewood W of Cattle Point Rd, 1 mi E. entrance to American Camp, San Juan Island National Historical Park, T34N R3W S2. 5 May 2003, TLP, SECOND COUNTY AND ISLAND RECORD.

Lighthouse Trail, San Juan Island, T34N R2W S8, 6 May 2003. TLP/RMP.

*Boloria epithore*

Cattle Point, San Juan Island, T34N R2W S8, 6 June 2003. KURT & ELEANOR MCMILLEN, netted and released. FIRST ISLAND RECORD.

Cattle Point Estates, San Juan Island, T34N R2W S8, 23 June 2003. TLP. SECOND ISLAND RECORD.

*Speyeria zerene bremnerii*

American Camp above n. end of South Beach, San Juan Island National Historical Park, T34N R3W S12. 19 August 2003, JANET CHU.

*Polygonia oreas*

Summit of Young Hill, English Camp, San Juan Island National Historical Park, T36N R4W S25, 650 feet. 22 May 2002. WBA, FIRST ISLAND RECORD.

*Nymphalis californica*

Cattle Point Estates, San Juan Island, T34N R2W S8, 29 September 2003. KURT & ELEANOR McMILLEN, netted, photographed, and released. SECOND ISLAND RECORD.

*Nymphalis antiopa*

Small cove on coast trail SW of Redoubt, American Camp, San Juan Island National Historical Park, T34N R3W S11, 6 May 2003. RMP, SECOND ISLAND RECORD. Patrolling a grove of *Salix scouleriana*.

*Vanessa virginiensis*

Cattle Point NRCA near Lighthouse, San Juan Island, T34N R2W S8, 25 September 2003, KURT & ELEANOR McMILLEN, netted, photographed, and released. COUNTY & ISLAND RECORD.

Cattle Point Estates, San Juan Island, T34N R2W S8. 28 September 2003. KURT & ELEANOR McMILLEN, netted, photographed, and released. SECOND COUNTY & ISLAND RECORD.

*Vanessa cardui*

Cattle Point NRCA, San Juan Island, T34N R2W S8, 9 August 1998 and 13 September 1999. SUSAN VERNON, FIRST & SECOND ISLAND RECORDS.

Robert's Redoubt, San Juan Island National Historical Park, T34N R3W S12, 23 June 2003. RMP.

*Vanessa annabella*

Cattle Point NRCA, Lighthouse Trail, San Juan Island, T34N R2W S8, 9 August, 5 October, and 24 November 1998. SUSAN VERNON, FIRST & SECOND ISLAND RECORDS, LATE RECORD.

Rabbit warren E side Pickett's Lane, American Camp, San Juan Island National Historical Park, T34N R3W S12, 23 June 2003. RMP.

*Vanessa atalanta*

Cattle Point NRCA, San Juan Island, T34N R2W S8, 15 September 1998. SUSAN VERNON, FIRST ISLAND RECORD.

Young Hill, English Camp, San Juan Island National Historical Park, T36N R4W S25, 650 feet. 22 May 2002. WBA, SECOND ISLAND RECORD.

*Coenonympha tullia*

American Camp, San Juan Island, T34N R3W S12, 31 July 1997. JOHN FLECKENSTEIN, FIRST ISLAND RECORD. Many records since.

*Danaus plexippus*: Friday Harbor, San Juan Island, T35N R3W S24, 20 July 2003.

Photographed. RON KEESHAN, COUNTY RECORD.

#### **Appendix IV: Illustrations**

**Cover:** One of the coves west of South Beach, Strait of Juan de Fuca

**Plate One:** Island Marble, dorsum, on Dewberry; ventrum, on Fiddleneck.

**Plate Two:** Island Marble larva on Field Mustard; on Tumblemustard.

**Plate Three:** Island Marble larva on Puget Sound Peppergrass; the plant.

**Plate Four:** Island Marble on Sea Rocket; habitat of Island Marble at Old Town Lagoon.

**CD-Rom of these illustrations included.**

**All photographs by R. M. and T. L. Pyle**



## References Cited

- Barbour, Michael G. and James E. Rodman. 1970. Sage of the West coast sea-rockets, *Cakile edulenta* ssp. *californica* and *C. maritima*. *Rhodora* 72: 370-85.
- Fleckenstein, John W. 1999. 1997, 1998 project summary Puget prairie butterfly surveys. Department of Natural Resources, Natural Heritage Program. unpub. 11 pp.
- Fleckenstein, John W. Undated. Unpublished "San Juan County Survey" butterfly data summary.
- Guppy, Crispin S. & Jon H. Shepard. 2001. *Butterflies of British Columbia*. University of British Columbia Press.
- Hinchliff, John. 1996. *An Atlas of Washington Butterflies*. Oregon State University Bookstore.
- Hitchcock, C. Leo & Arthur Cronquist. 1976 (revised ed.) *The Flora of the Pacific Northwest*. University of Washington Press.
- McMillen, Kurt and Eleanor. 2003-04. Unpublished butterfly sighting lists and related personal communications.
- Miskelly, James. Undated. Unpublished San Juan County butterfly survey summary.
- New, T., J. A. Thomas, R. M. Pyle, C. D. Thomas, and P. C. Hammond. 1995. Butterfly conservation management. *Annual Review of Entomology* 40: 57-83.
- Pojar & MacKinnon, 1994,
- Pyle, Robert Michael. 1974. *Watching Washington Butterflies*. Seattle Audubon Society.
- Pyle, Robert Michael. 1976. *Ecogeography of Lepidoptera Conservation*. Yale University Ph.D.. thesis, publ. by University Microfilms.
- Pyle, Robert Michael. 1982. Butterfly ecogeography and biological conservation in Washington. *Atala* 8: 1-26 (the Xerces Society, Portland).
- Scott, James A. 1986. *The Butterflies of North America: A Natural History and Field Guide*. Stanford University Press.
- Swengel, Ann. 2003. Butterflies and ecosystem management. North American Butterfly Association (6 pp.), and numerous other papers on butterflies and fire.
- Tilden, J. W. 1965. *Butterflies of the San Francisco Bay Region*. University of California Press.
- Vernon, Susan. Undated. Unpublished "Notes on the occurrence of butterflies at Cattle Point NRCA, San Juan Island, Washington, 1998-2000" and related personal communications.
- Yake, Bill. Undated. Unpublished "San Juan Island butterfly sightings" data sheet.

## Acknowledgments

Most of all, I wish to thank my field partner and collaborator on these surveys, Thea Linnaea Pyle, to whom this report is also dedicated. Her extraordinarily observant attention in the field greatly enhanced the results of our work, as did her careful editing. We are immensely grateful to park neighbors Kurt & Eleanor McMillen, who not only furnished our lodgings (and many meals) throughout these visits, but also took part in the survey most productively, including the times between our visits. They and Janet Chu conducted the fourth visit in our stead when a medical emergency prevented our coming, allowing the survey to go ahead uninterrupted, an effort we appreciate more than we can express. Susan Vernon contributed her valuable field records to the survey, and additional data were provided by John Fleckenstein, Ann Potter, Bill Yake, James Miskelly, and the Washington Butterfly Association. Harley Adamson kindly loaned Emily Henriksen's historic Orcas Island specimens. Amy Lambert furnished helpful field company and botanical expertise, and Cathy Maxwell made key cruciferous plant species identifications for us. David Myers most generously digitized and printed the color illustrations. Kelly Cahill facilitated curation and accession of specimens, and Jonathan Pelham assisted with expert determinations and ongoing studies of the material. Finally, Bill Gleason and all of his NPS colleagues at San Juan Island National Historical Park and in the region made our work both possible and pleasant, from contracts and permits to maps and logistics, and with their kind reception on the ground. We appreciate the opportunity to add to our understanding of San Juan butterflies through this survey.