
Conservation and management of three imperiled West Coast butterflies: Bay, Quino, and Taylor's checkerspots

Don Edwards San Francisco Bay National Wildlife Refuge

Environmental Education Center
1751 Grand Blvd, Alviso, CA 95002

This workshop was organized by the following organizations:



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Edith's Checkerspot Workshop | Day 1 | January 28th, 2014

8:00	Building Open <i>Coffee & tea available in lobby</i>	
8:30	Welcome	Scott Hoffman Black, <i>Xerces Society</i>
8:45	Subspecies Intro/Overview	
8:45	Phenology, topography, and population dynamics of the Bay checkerspot butterfly	Stu Weiss <i>Creekside Science</i>
9:05	Idiosyncratic Ecological, Biological, and Behavioral Aspects of the Quino Checkerspot (<i>Euphydryas editha quino</i>) Adapted to Diverse Environmental and Climatological Conditions within its Southern Range	Ken Osborne <i>Osborne Biological Consulting</i>
9:25	Taylor's Checkerspot Introduction (Rangewide)	Elspeth Hilton Kim <i>Center for Natural Lands Management</i>
	Overview of Taylor's Checkerspot in British Columbia	Jenny Heron <i>BC Ministry of the Environment</i>
9:45	<i>Break</i>	
10:00	Habitat Restoration & Management	
10:00	Nonnative Grass Invasions on Bay Checkerspot Butterfly Habitat	James Quenelle <i>Creekside Science</i>
10:20	Habitat Restoration/Management options available for Quino	James Gannon <i>Bureau of Land Management</i>
	Challenges with Managing and Monitoring Quino Checkerspot Butterfly	Kim Klementowski <i>Center for Natural Lands Management</i>
10:40	Restoring Habitat in South Puget Sound for Reintroduction of Taylor's Checkerspot Butterflies	Peter Dunwiddie <i>Center for Natural Lands Management</i>
11:00	Discussion	Moderated by Scott Hoffman Black
11:50	Lunch (provided)	
12:45	Institutional and Regulatory Landscape	
12:45	Bay	TBD
1:05	A Regional Approach to Management of Quino checkerspot in Western San Diego County	Yvonne Moore <i>San Diego Management & Monitoring Program</i>
	The Regulatory Landscape for Quino	Eric Porter <i>Carlsbad FWS</i>
1:25	Discussion	Moderated by Scott Hoffman Black
2:15	<i>Break</i>	
2:30	Advocacy, Media, and Education	
2:30	Advocacy, media, and conservation of the Bay checkerspot butterfly	Stu Weiss <i>Creekside Science</i>
2:50	The Importance of Engaging The Public, Local and State and Federal Agencies and Other Stakeholders in Listed Species Conservation	Scott Hoffman Black <i>Xerces Society</i>
3:10	Discussion	Moderated by Scott Hoffman Black
4:00	Adjourn <i>Building closes at 4:30 pm</i>	

Edith's Checkerspot Workshop | Day 1 | January 28th, 2014

8:00 Building Open
Coffee & tea available in lobby

8:30 am -8:45 am | Welcome & Introductions

8:30 Welcome
Scott Hoffman Black, Xerces Society

Individual Introductions
Provide Name, Organization, Focus Area/Activity

8:45 am -9:45 am | Subspecies Introduction and Overview

Goal: To provide status, biological overview, natural history and current conservation actions for each subspecies to inform the group for future presentations and discussions.

8:45 Phenology, topography, and population dynamics of the Bay checkerspot butterfly
Stu Weiss, Creekside Science

Bay checkerspot butterfly population dynamics are driven by the phenological relationship between butterfly emergence and hostplant senescence, which determines prediapause larval survival rates. Phenological variation across complex terrain buffers populations. A 29 year population record at Kirby Canyon, supplemented by shorter records across much of the range of the butterfly, shows how this mechanism has played out through population booms and busts, and identifies key weather variables.

Stuart B. Weiss, Ph.D. is Chief Scientist of Creekside Center for Earth Observation and has been studying the Bay checkerspot butterfly since 1979. Creekside Science was founded by Drs. Stuart Weiss and Paul Rich in 2006 to apply the latest science and technology to address challenging conservation problems. The organization specializes in experimental design, field measurement, and quantitative analysis. Our clients include city, state, and federal agencies, private companies, academic institutions, and non-profit organizations.

9:05 Idiosyncratic Ecological, Biological, and Behavioral Aspects of the Quino Checkerspot (*Euphydryas editha quino*) Adapted to Diverse Environmental and Climatological Conditions within its Southern Range
Ken Osborne, Osborne Biological Consulting

Quino has traditionally been understood as having only *Plantago erecta*-driven ecology. Quino remains with more extensive, numerous, and substantial population sites than either Bay or Taylor's subspecies of *E. editha*. Metapopulation Dynamics on *Plantago*-based ecology, are similar to Bay checkerspot with discrete habitat patches and unique geological constraints. Quino ecology differs from Bay checkerspot perhaps owing to differences in reliability of annual precipitation in its range, having a volatile eruptive boom-bust population dynamic, high adult vagility and dispersal, Hilltopping as a prominent mating strategy, potential multiple year larval diapause, and a range extension into central Baja Norte recently discovered to double the known Quino latitudinal distribution (representing a ca. ten percent southward expansion of the known North American latitudinal distribution of *E. editha*!). I briefly discuss the basic elements of the Metapopulation Resource Base and discuss the (*cont'd on next page*)

(cont'd from previous page) geological constraints on habitat particular to Quino (on *Plantago*). I will introduce, describe and discuss the High Elevation Ecological Segregate of Quino; on novel hosts *Collinsia*, *Antirrhinum*, *Cordylanthus*; on granitic soils of the peninsular range; where resultant quino populations appear to be more stable in population fluctuation, of lower population density; with Hilltopping and high vagility likely critical to ecological success. I present a model of feedback and interaction between the two major ecological segregates on a regional scale which may explain the maintenance of the *Plantago* segregate by reinitiative immigration from more stable populations.

Entomologist Ken Osborne provides biological consulting services as Osborne Biological Consulting. Research specializations and conservation interests range across various insect taxonomic groups.

9:25 Taylor's Checkerspot Introduction and Overview (Rangewide)
Elspeth Hilton Kim, Center for Natural Lands Management

This talk will provide a broad overview of the conservation status and natural history of Taylor's checkerspot, as well as a review of recent and ongoing conservation actions being undertaken by the conservation community in British Columbia, Washington, and Oregon.

Elspeth Hilton Kim is the Conservation Coordinator at the Center for Natural Lands Management's South Sound Program. Elspeth's role focuses on supporting prairie-oak cooperative conservation initiatives in the Willamette Valley –Puget Sound-Georgia Basin (WPG) ecoregion. The Center for Natural Lands Management is a nonprofit organization that protects sensitive biological resources through professional, science based stewardship of mitigation and conservation lands in perpetuity. The South Sound Program conserves prairies, oak woodlands and freshwaters in the South Sound.

Overview of Taylor's Checkerspot in British Columbia
Jenny Heron, British Columbia Ministry of the Environment

Taylor's Checkerspot was thought extirpated from British Columbia until it was recorded from a recent clearcut on Denman Island in 2005. This talk will give an overview of the ongoing conservation work for the butterfly by the recovery group, including preliminary planning for habitat restoration and translocation to historic sites.

Jennifer Heron is the provincial invertebrate conservation specialist with the B.C. Ministry of Environment. She directs and manages the provincial approach to invertebrate conservation, including the development and implementation of provincial legislation, policy, and standards for the conservation, and recovery of invertebrate species at risk, their habitats and ecosystems, and to keep these species from becoming at risk. She works with other invertebrate specialists to develop recovery-planning approaches and assign conservation status ranks to invertebrate groups. She chairs the provincial Garry Oak Invertebrates Recovery Implementation Group Taylor's Checkerspot Recovery Working Group.

9:45 **Break (15 minutes)**
Snacks available in lobby

10:00 am -12:00 pm | Habitat Restoration and Management

Goal: What are the biggest habitat obstacles for each subspecies? What are the strategies to overcome them and what have the outcomes been?

10:00 Nonnative Grass Invasions on Bay Checkerspot Butterfly Habitat

James Quenelle, Creekside Science

Nonnative grass invasions onto serpentine soils, driven in part by nitrogen deposition, pose the greatest threat to existing Bay checkerspot butterfly habitat. Cattle grazing has been a vital tool in limiting many of these exotic grasses on Bay checkerspot habitat on Coyote Ridge. However, because Barbed goatgrass (*Aegilops triuncialis*) can be harmful to cattle, a relatively recent invasion of this species onto Coyote Ridge poses additional challenges to land managers of this habitat. At Edgewood County Park, where infrastructure and policies are not conducive to grazing, mowing is the most pragmatic and effective treatment for nonnative grasses.

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10:20 Challenges with Managing and Monitoring Quino Checkerspot Butterfly

Kim Klementowski, Center for Natural Lands Management

The boom-bust metapopulation dynamics of the Quino checkerspot butterfly combined with habitat loss due to rapid development have created many challenges for the perpetual monitoring and management of this species and its remaining habitat. This presentation will provide two case studies that highlight 10 years of monitoring, summarize management actions taken, and demonstrate the need for additional research in order to ensure that management actions will benefit existing and future populations.

Kim Klementowski is a Preserve Manager with the Center for Natural Lands Management. She manages preserves in Western Riverside and Orange Counties that have been set aside as mitigation for various federal and state listed species, including over 4,000 acres of Quino checkerspot butterfly habitat. The Center for Natural Lands Management is a nonprofit organization that protects sensitive biological resources through professional, science based stewardship of mitigation and conservation lands in perpetuity.

Habitat Restoration/Management options available for Quino

James Gannon, BLM

This talk will discuss habitat restoration and management options available for the Quino.

James Gannon is a Prescribed Fire and Fuels Specialist at the Bureau of Land Management.

10:40 Restoring Habitat in South Puget Sound for Reintroduction of Taylor's Checkerspot Butterflies

Peter Dunwiddie, Center for Natural Lands Management

There is only a single "wild" Taylor's Checkerspot population surviving in the Puget Lowlands of Washington. Therefore, aggressive efforts are being taken to establish (*cont'd on next page*)

(cont'd from previous page) populations at other sites in the region. This talk will describe actions we are taking to enhance the suitability of various sites where Checkerspots are being, or will be, introduced.

The Center for Natural Lands Management is a nonprofit organization that protects sensitive biological resources through professional, science based stewardship of mitigation and conservation lands in perpetuity. The South Sound Program conserves prairies, oak woodlands and freshwaters in the South Sound. Peter Dunwiddie is an ecologist with CNLM working on various issues related to rare species management, habitat restoration, invasive species control, and prescribed burning.

11:00 Discussion
Moderated by Scott Hoffman Black, Xerces Society

11:50 **Lunch (55 minutes)**
Food and beverage provided in lobby

12:45 pm -2:15 pm | Institutional and Regulatory Landscape

Goal: How can practitioners capitalize on listing to provide maximum return for recovery?

12:45 The Institutional Landscape of Bay Checkerspot Butterfly Conservation: A Whirlwind History and Tour
Stu Weiss, Creekside Science

A historical narrative of Bay checkerspot conservation highlights the complexities of the institutional landscape with a series of failures and successes. Numerous government agencies, private industry, non-governmental organizations, academic institutions, and individuals have been involved over several decades. Outcomes depend on the institutions and people involved and channeling motivations and incentives toward effective conservation. The culmination of institutional efforts is found in the Santa Clara Valley Habitat Plan, which was recently adopted and is in implementation.

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1:05 A Regional Approach to Management of Quino checkerspot in Western San Diego County
Yvonne Moore, San Diego Management and Monitoring Program

A regional program exists in San Diego Co. that provides funding for management and monitoring of sensitive species across existing and proposed conservation plan boundaries. In 2013, the SDMMP prepared a Management Strategic Plan (MSP) for the western San Diego region which included goals and objectives for management of QCB within the MSP area. The QCB was categorized as an "SL" species, meaning the species is at risk of loss entirely on Conserved Lands in the MSP area. The goal for the species is to protect, (cont'd on next page)

(cont'd from previous page) restore, and enhance QCB habitat within currently occupied and historically occupied sites and the landscape connections between them to create resilient occurrences and to allow for potential reintroduction to ensure persistence over the long-term (>100 years). Objectives include preparing and implementing a 5-year implementation plan, developing BMPs for habitat restoration, establishing a seed bank and bulking seed, and implementing pre-fire management actions.

The SDMMMP is a science based program seeking to provide a coordinated approach to management and biological monitoring of lands in San Diego that have been conserved through various programs including the MSCP, the MHCP, the TransNet EMP, and various other conservation and mitigation efforts. As the coordinator for the SDMMMP, Yvonne Moore is responsible for facilitating communication regarding the implementation of coordinated management and monitoring efforts among contractors, wildlife agencies, jurisdictions, researchers, lands managers, and other regional stakeholders as identified in multiple strategic plans including the Management Strategic Plan, Connectivity Monitoring Strategic Plan, and Invasive Plant Strategic Plan.

The Regulatory Landscape for Quino

Eric Porter, US Fish and Wildlife Service, Carlsbad

This talk will describe the regulatory landscape for Quino throughout its range. The Quino falls within several regional habitat conservation plans and has different protections afforded it in each plan.

Eric Porter works for the Carlsbad Fish and Wildlife Office (Fish and Wildlife Service) as a biologist with primary responsibility for section 7 consultations and habitat conservation plans with an emphasis on insects.

1:25 Discussion

Moderated by Scott Hoffman Black, Xerces Society

2:15 **Break (15 minutes)**

Snacks available in lobby

2:30 pm -4:00 pm | Advocacy, Media, and Education

Goal: What are the tools for agency and non-profit personnel to promote endangered butterfly conservation through various means. How can we have the biggest impact?

2:30 Advocacy, media, and conservation of the Bay checkerspot butterfly

Stu Weiss, Creekside Science

Bringing conservation issues to the public and decision makers requires engagement with advocacy and media. Such engagement has been critical for moving conservation of the Bay checkerspot butterfly forward. A selective review of advocacy and media (print and television) successes will highlight strategies that have worked over the years.

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(cont'd from previous page) –nology to address challenging conservation problems. The organization specializes in experimental design, field measurement, and quantitative analysis. Our clients include city, state, and federal agencies, private companies, academic institutions, and non-profit organizations.

- 2:50 The Importance of Engaging The Public, Local and State And Federal Agencies And Other Stakeholders in Listed Species Conservation
Scott Hoffman Black, Xerces Society

In order to effectively conserve listed species the USFWS and conservation organizations should reach out broadly to a variety of stockholders. I will briefly discuss how local citizens, conservation groups and the USFWS worked effectively advocated for better roadside management for the Fender's blue butterfly, how scientists have been the leaders in pushing for effective conservation measures for the Salt Creek Tiger Beetle and how the USDA Natural Resource Conservation Service partnered with academic scientists and the Xerces Society to fund restoration for the Karner blue butterfly.

Scott Hoffman Black is an ecologist and the Executive Director with the Xerces Society for Invertebrate Conservation in Portland, Oregon. He also serves as the Chair of the International Union for Conservation of Nature (IUCN) Butterfly Specialist Group, Chair of the Migratory Dragonfly Partnership and Vice Chair of the Monarch Joint Venture. Scott has a graduate degree in ecology from Colorado State University. He has extensive experience in endangered species conservation, pollinator conservation, macroinvertebrate monitoring, and forest and range management issues. Scott has authored over 200 scientific and popular publications, co-authored two books and contributed chapters to several others, dozens of reports on land management issues and his work has been featured in newspapers, magazines, books and on radio and television. He has presented to universities across the United States, as well as to international meetings and the National Academy of Sciences. Scott has received several awards including the 2011 Colorado State University College of Agricultural Sciences Honor Alumnus Award and National Forest Service Wings Across Americas 2012 Butterfly Conservation Award.

- 3:10 Discussion
Moderated by Scott Hoffman Black, Xerces Society

- 4:00 Adjourn**

Edith's Checkerspot Workshop | Day 2 | January 29th, 2014

- 8:00 Building Open *Coffee & tea available in lobby*
- 8:30 Reintroductions: The How and The Why**
- 8:30 Getting Started with the Quino Checkerspot Butterfly, *Euphydryas editha quino*, at the San Diego Zoo Paige Howorth
San Diego Zoo
- 8:50 Considerations in Production Scale Rearing of Taylor's Checkerspot for Reintroduction Karen Lewis
Oregon Zoo
- 9:10 Reintroducing Taylor's Checkerspot: Descent and Rebirth of the Dark Sister Mary Linders
WA Dept. of Fish and Wildlife
- 9:30 *Break*
- 9:40 Bay Checkerspot Butterfly Reintroduction at Edgewood Preserve and Tulare Hill Christal Niederer
Creekside Science
- 10:00 Quino Reintroduction Planning Beau MacDonald
Urban Wildlands Group
Eric Porter
Carlsbad Fish and Wildlife Service
- 10:20 Discussion Moderated by Scott Hoffman Black
- 11:10 Lunch (provided)**
- 12:00 Climate Change and Beyond, Managing for Species in the 21st Century**
- 12:00 Nitrogen Overdose: The Biggest Environmental Change (Almost) Nobody Has Heard Of Stu Weiss
Creekside Science
- 12:20 Changing Distribution Patterns of Quino Checkerspot in Response to a Changing Environment Kristine Preston
USGS
- 12:40 The Rise and Fall of Taylor's Checkerspot on Denman Island, BC: Observations from a Rapidly Changing Landscape Nick Page
Raincoast Applied Ecology
- 1:00 Discussion Moderated by Scott Hoffman Black
- 1:50 *Break*
- 2:00 Wrap Up Discussion**
Moderated by Scott Hoffman Black, Xerces Society
- 4:00 Adjourn** *Building closes at 4:30 pm*

Edith's Checkerspot Workshop | Day 2 | January 29th, 2014

8:00 Building Open
Coffee & tea available in lobby

8:30 am -11:10 am | Reintroductions: The How and the Why

Goal: To discuss what strategy is being used for reintroduction and why.

8:30 Getting Started with the Quino Checkerspot Butterfly, *Euphydryas editha quino*, at the San Diego Zoo
Paige Howorth, San Diego Zoo

Discussion on the short pilot program at the zoo with a non-releasable population of quino checkerspot butterfly larvae

As the head of the Entomology Department at San Diego Zoo Global, Paige Howorth is responsible for the stewardship and management of our invertebrate animal collection, facilities and staff, including two insect conservation programs. San Diego Zoo Global is a not-for-profit organization that operates the San Diego Zoo, the San Diego Zoo Safari Park, and the San Diego Zoo Institute for Conservation Research. It is the largest zoological membership association in the world, with more than 250,000 member households and 130,000 child memberships, representing more than a half million people. The 100-acre (40-hectare) Zoo is home to over 3,700 rare and endangered animals representing more than 650 species and subspecies, and a prominent botanical collection with more than 700,000 exotic plants. Our mission statement: San Diego Zoo Global is committed to saving species worldwide by uniting our expertise in animal care and conservation science with our dedication to inspiring passion for nature.

8:50 Considerations in production scale rearing of Taylor's checkerspot for reintroduction
Karen Lewis, Oregon Zoo

This talk will focus on what it takes to rear animals *en masse* and how that is different from working with a research population, including: captive breeding and population management, review of our life stage survival stats, the relationship between survival and setting of production targets, providing enough food for larvae, and expansion of rearing to multiple facilities to increase capacity and decrease risk.

The Oregon Zoo is the largest tourist attraction in Oregon and SW Washington with over 1.5 million visitors per year. The zoo covers 64-acres, and holds almost 2,000 individual animals (not including caterpillars!) from over 200 species. Karen Lewis is the Conservation Research Associate at the Zoo and a member of the Conservation Research Staff. We are responsible for coordinating the NW species recovery projects as well as oversight of the behavioral, endocrine, animal welfare, and conservation research that is conducted at the zoo.

9:10 Reintroducing Taylor's Checkerspot: Descent And Rebirth Of The Dark Sister
Mary Linders, Washington Department of Fish and Wildlife

State-endangered in Washington and endangered under the ESA, Taylor's checkerspot (*Euphydryas editha taylori*) is the third subspecies of Edith's checkerspot to gain federal recognition for its dramatic and perilous decline. Reduced to a single population, *E. e. taylori* was nearly extirpated in the Puget lowlands of western Washing- (*cont'd on next page*)

(cont'd from previous page) –ton, a region that remains the stronghold for native grasslands of the Georgia Basin, Puget Trough, and Willamette Valley ecoregions. But a female captured as a voucher specimen in 2003 laid eggs, launching a world of new potential. Yet hundreds of butterfly (re)introductions in the past century shed little light on a successful path forward (Oates and Warren 1990, Thomas 1989, Schultz et al. 2008). With little more than a “sandbox” of habitat in which to work, we initiated release trials using several life stages, and found that releasing postdiapause larvae produced favorable results. Our reintroduction project objective is to establish at least three new checkerspot populations at three Puget lowland sites in the next decade. Reintroductions are now underway at several sites. Since 2008, releases have produced juvenile and adult butterflies with apparently normal foraging, basking, mating and ovipositioning behaviors. We have demonstrated successful reproduction and persistence in the absence of continued release. We have also developed long-term monitoring and population goals, and the monitoring methods needed to achieve them.

The mission of the Washington Department of Fish and Wildlife is to protect, preserve and perpetuate fish, wildlife and ecosystems while providing sustainable fish and wildlife recreational and commercial opportunities. Unlike many states, Washington's definition of fish and wildlife includes all invertebrates. Mary Linders is a rare species recovery biologist focused on recovery of threatened and endangered species in the Puget lowland prairies of western Washington.

9:30 Break (10 minutes)

Snacks available in lobby

9:40 Bay checkerspot butterfly reintroduction at Edgewood Preserve and Tulare Hill

Christal Niederer, Creekside Science

This talk will discuss Creekside Science's reintroduction efforts of Bay checkerspot to two locations: Edgewood and Tulare Hill. Included in this talk will be a review of population declines at each site, habitat management/restoration, physical efforts of reintroduction, and monitoring. Lessons learned and the current assessment of success will also be discussed.

Christal Niederer is a biologist for Creekside Science, where she has worked for eight years. Christal has been involved with another butterfly reintroduction in the Bay Area (Mission Blue). She works mainly in serpentine grasslands, focusing on rare species and weed management. Creekside Science was founded by Drs. Stuart Weiss and Paul Rich in 2006 to apply the latest science and technology to address challenging conservation problems. The organization specializes in experimental design, field measurement, and quantitative analysis. Our clients include city, state, and federal agencies, private companies, academic institutions, and non-profit organizations.

10:00 Quino Reintroduction Planning

Beau MacDonald, Urban Wildlands Group

Eric Porter, Carlsbad Fish and Wildlife Service (Q & A)

This talk will present an update to the 2012 Captive Propagation and Release Plan for Quino Checkerspot Butterfly (Longcore & Bonebrake, The Urban Wildlands Group). Discussion of the opportunities, challenges, and uncertainties associated with reintroduction of Quino checkerspot, followed by Q & A from an ecological and regulatory perspective.

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The Urban Wildlands Group, based in Los Angeles, is dedicated to the protection of species, habitats, and ecological processes in urban and urbanizing areas. Beau MacDonald has worked with UWG since 2004 as an applied biogeographer specializing in habitat suitability modeling, GIS, and data QA/QC, and is involved with various types of research for multiple projects.

10:20 Discussion
Moderated by Scott Hoffman Black, Xerces Society

11:10 Lunch (50 minutes)
Food and beverage provided in lobby

12:00 am -1:50 pm | Climate Change and Beyond, Managing for Species in the 21st Century
Goal: As we face ever changing landscapes due to changes in the environment, we must create a vision for what we're working towards and incorporate new and unforeseen changes into our strategy for attaining what we envision.

12:00 Nitrogen overdose: the biggest environmental change (almost) nobody has heard of
Stu Weiss, Creekside Science

The global nitrogen cycle is the most disrupted biogeochemical cycle. Local manifestations of "nitrogen overdose" are highlighted with the Bay checkerspot butterfly, where nutrient-poor soils are enriched by atmospheric dry deposition of reactive nitrogen and become susceptible to non-native grass invasions in the absence of grazing and other habitat management. The basics of atmospheric deposition, ecosystem impacts, and the course of turning the discovery into conservation actions will be covered.

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12:20 Changing Distribution Patterns of Quino checkerspot in Response to a Changing Environment
Kristine Preston, United States Geological Survey

The distribution of Quino checkerspot in coastal southern California has shifted away from the coast since the 1930s and more recently has expanded eastward into higher elevation foothills of the Peninsular Ranges. Early extinctions along the coastal plain and valleys appear related to land use and a decline in wildflowers coinciding with an increase in invasive non-native grasses and forbs. More recent expansions into the foothills since the late 1990s are more closely associated with climate variables than to land use. This upward shift in elevation is consistent with models predicting Quino checkerspot distributions under altered climate conditions.

Kristine Preston provides science support for the San Diego Management and Monitoring Program (SDMMP). In a previous position at UC Riverside's Center for Conservation Biology, she developed models predicting Quino checkerspot habitat distributions and local population extinctions/expansions in relation to changing environmental conditions. (cont'd on next page)

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(cont'd from previous page) Working with the SDMMMP team, she is currently developing habitat models for Quino checkerspot that are at a fine enough resolution to inform monitoring and management activities in western San Diego County. These activities include restoring Quino checkerspot habitat to allow for more resilient populations and greater connectivity between occurrences.

12:40 The Rise and Fall of Taylor's Checkerspot on Denman Island, BC: Observations from a Rapidly Changing Landscape

Nick Page, Raincoast Applied Ecology

Taylor's Checkerspot rapidly expanded into early successional habitats created by large-scale forest harvesting on Denman Island, BC. It exploited unusual host-plant resources composed mainly of native wetland Veronica species. The population thrived from the mid 2000s to 2010 when it was the most abundant butterfly species encountered during surveys. The population has declined precipitously in the past three years, although the exact causes are not known. The presentation will discuss the unique characteristics of Canada's only Taylor's Checkerspot population.

Nick Page is a professional biologist with Raincoast Applied Ecology. He has a master's degree in plant ecology and works on a range of conservation planning projects in BC's south coast. He has been involved in surveys, stewardship, and recovery planning for Taylor's Checkerspot since 2007.

1:00 Discussion

Moderated by Scott Hoffman Black, Xerces Society

1:50 Break (10 minutes)

Snacks available in lobby

2:00 pm -4:00 pm | Wrap Up Session

Goal: How can the region (West Coast) as a whole work together more and how can we improve our efforts for all Edith's checkerspots? Include discussion of research needs, funding and identify other unmet needs.

2:00 Discussion

Moderated by Scott Hoffman Black, Xerces Society

3:30 Action Setting

Moderated by Scott Hoffman Black, Xerces Society

4:00 Adjourn