BEFORE THE SECRETARY OF THE INTERIOR

Petition to list the Siuslaw Hairy-Necked Tiger Beetle (*Cicindela hirticollis siuslawensis*) as a Federally Threatened or Endangered Species under the Endangered Species Act

Photo of Siuslaw hairy-necked tiger beetle at Sutton Creek, July 20, 2009, by Sarina Jepsen, Xerces Society

Center for Biological Diversity and
Xerces Society for Invertebrate Conservation
Petitioners

November 9th, 2020

NOTICE OF PETITION

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Pursuant to Section 4(b) of the Endangered Species Act ("ESA"), 16 U.S.C. § 1533(b); Section 553(e) of the Administrative Procedure Act, 5 U.S.C. § 553(e); and 50 C.F.R. § 424.14(a), the Center for Biological Diversity and the Xerces Society for Invertebrate Conservation hereby petition the Secretary of the Interior, through the United States Fish and Wildlife Service ("FWS," "Service"), to protect the Siuslaw hairy-necked tiger beetle (*Cicindela hirticollis siuslawensis* Graves, Krejci, and Graves, 1988) under the ESA as a threatened or endangered species. Petitioner also requests that critical habitat be designated for the tiger beetle concurrently with the listing, pursuant to 16 U.S.C. § 1533(a)(3)(A) and 50 C.F.R. § 424.12.

FWS has jurisdiction over this petition. This petition sets in motion a specific process, placing definite response requirements on the FWS. Specifically, the Service must issue an initial finding as to whether the petition "presents substantial scientific or commercial information indicating that the petitioned action may be warranted." 16 U.S.C. § 1533(b)(3)(A). FWS must make this initial finding "[t]o the maximum extent practicable, within 90 days after receiving the petition."

The Center for Biological Diversity ("Center") is a nonprofit, public interest environmental organization dedicated to the protection of imperiled species as well as the habitat and climate they need to survive through science, policy, law, and creative media. The Center is supported by more than 1.7 million members and online activists throughout the country. The Center works to secure a future for all species, great or small, hovering on the brink of extinction.

The Xerces Society for Invertebrate Conservation ("Xerces") is an international nonprofit organization that protects the natural world through the conservation of invertebrates and their habitats. Xerces works to raise awareness about the plight of invertebrates and to gain protection for the most vulnerable species before they decline to a level at which recovery is impossible.

The Center and Xerces submit this petition on behalf of our staff and our members who hold an interest in protecting the Siuslaw hairy-necked tiger beetle and its habitat.

Submitted this 9th day of November 2020

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Executive Summary

The Siuslaw hairy-necked tiger beetle (*Cicindela hirticollis siuslawensis* Graves, Krejci, and Graves, 1988) is a rare subspecies that is absent from most of its historic and potential habitat. Historically, this subspecies was found in several locations along the Oregon coast, such as Twin Rocks in Tillamook County, Waldport in Lincoln County, and Siltcoos Outlet in Lane County, as well as in select areas of the California and Washington coastlines (Graves et al. 1988 pp. 671–672; Pearson et al. 2006 p. 74). Unfortunately, over the past 80 years, the Siuslaw hairy-necked tiger beetle has been extirpated from five of six historically occupied areas along the Oregon coast alone, including multiple Counties.

The Siuslaw hairy-necked tiger beetle is in danger of extinction throughout its range and must be listed as an endangered or threatened subspecies under the ESA to protect it from extinction. In 2009, of the six historically occupied areas along the Oregon coast, the Siuslaw hairy-necked tiger beetle was only found in one; specifically, 49 sites were surveyed and adult Siuslaw hairy-necked tiger beetles were found in very low abundances at 17 (35%). Seven of the 17 sites with Siuslaw hairy-necked tiger beetles in 2009 (~41.2%) were concentrated along a 10.5 mile stretch of the BLM managed New River Area of Critical Environmental Concern, a relatively inaccessible area protected from recreational off-highway vehicle (OHV) activity and much of which is designated as Critical Habitat for the federally threatened western snowy plover. The Siuslaw hairy-necked tiger beetle is also known from two locations in Washington state but has not been known from California in recent years.

Siuslaw hairy-necked tiger beetles live in areas where freshwater meets the Pacific Ocean, particularly near and along the edges of river mouths or other fresh water outflows. The tiger beetle hunts, mates, and lays eggs in open sand and therefore is threatened by activities that disrupt and destroy this habitat. The Siuslaw hairy-necked tiger beetle is threatened by recreation on beaches, including foot traffic and OHV use, development, invasive species, climate change and sea level rise, habitat fragmentation and inadequacy of regulatory mechanisms. The Siuslaw hairy-necked tiger beetle populations are now found primarily in areas with low levels of foot traffic and little to no vehicular traffic. To conserve this rare subspecies and prevent its extinction, habitat needs for the Siuslaw hairy-necked tiger beetle must be protected and regulated, an action only possible if it is federally protected by the Endangered Species Act.

Introduction

Tiger beetles are aptly named in that they are fierce predators as both adults and larvae. Adults are fast and mobile hunters that run across the sand in short bursts or short hopping flight movements to chase prey; they run so fast that they need to stop after short bursts to visually relocate their prey before continuing the pursuit (Pearson & Vogler 2001 p. 10). Adult tiger beetles use their sharp, sickle-shaped mandibles to catch prey, which consists of other

invertebrates of catchable size, and then chew it with predigested enzymes before it is ingested (Pearson & Vogler 2001 pp. 10–11). Larvae are sit and wait hunters that remain with their head flushed with the sand surface, plugging their burrow opening; when an insect or other small invertebrate walks near them, the larva will reach up to half of its body length out of its burrow and capture its prey with its mandibles and bring it to the bottom of the burrow to consume it (Pearson & Vogler 2001 p. 11).

Named after the Siuslaw Native Americans and Siuslaw River of the central Oregon coast (Graves et al. 1988 p. 672), the Siuslaw hairy-necked tiger beetle (*Cicindela hirticollis siuslawensis* Graves, Krejci, and Graves 1988), also known as the Siuslaw sand tiger beetle, hunts its prey in coastal areas where fresh water meets ocean beaches and surrounding riparian areas. The Siuslaw hairy-necked tiger beetle is metallic brownish green to dark green in color with thin cream-colored markings along the elytra (Graves et al. 1988 pp. 648, 671; Pearson et al. 2015 pp. 79, Plate 5). Adult hairy-necked tiger beetles are active in the spring (April to late June), when they mate and lay eggs, and again in late summer (August to September), when new adults emerge; hairy-necked tiger beetles have a fast development time compared to other tiger beetles (Pearson et al. 2006 p. 75).

Historically, the Siuslaw hairy-necked tiger beetle was found in several locations along the Oregon coast, such as Twin Rocks in Tillamook County, Waldport in Lincoln County, and Siltcoos Outlet in Lane County, as well as in select areas of the California and Washington coastlines (Graves et al. 1988 pp. 671–672; Pearson et al. 2006 p. 74, 2015 p. 79). Unfortunately, over the past 80 years, the Siuslaw hairy-necked tiger beetle has been extirpated from the majority of its habitat primarily by human activity (Hietala-Henschell & McMullen 2018). The majority of the Siuslaw hairy-necked tiger beetles are now concentrated in small populations in relatively protected areas along the Oregon coast, many of which are critical habitat for the western snowy plover (Bureau of Land Management 2004 p. xiii).

The Siuslaw hairy-necked tiger beetle is imperiled by loss of habitat, recreational use of beaches including foot traffic and OHV use, climate change and sea level rise, inbreeding depression, invasive species and harmful management practices. There are no existing regulatory mechanisms which are adequate to protect the Siuslaw hairy-necked tiger beetle. As such, the Siuslaw hairy-necked tiger beetle requires the protection of the Endangered Species Act to ensure its habitat requirements are adequately considered and to ameliorate threats to its survival.

Natural History

Taxonomy

Cicindela hirticollis siuslawensis Graves, 1988 is a valid subspecies (Pearson et al. 2015 p. 79; Integrated Taxonomic Information System 2020 p. 1). Tiger beetles in the genus *Cicindela* have been considered part of the Coleopteran family Carabidae and subfamily Cicindelinae in the past but recent work has again has elevated the genus to the family Cicindelidae in the tribe

Cicindelini (Duran & Gough 2020 pp. 1–5). The Siuslaw hairy-necked tiger beetle is a subspecies of *Cicindela hirticollis,* commonly known as the hairy-necked tiger beetle, and was first described as a subspecies of *C. hirticollis* by Graves et al. (1988 p. 671). There are no other recorded *C. hirticollis* subspecies at the current Siuslaw hairy-necked tiger beetle sites, and the subspecies is completely physically and reproductively isolated from populations other subspecies of *C. hirticollis* (Graves et al. 1988 p. 656; Pearson et al. 2006 p. 74). The Siuslaw hairy-necked tiger beetle can occur with *C. oregona* and *C. bellissima* and potentially *C. repanda*, but it is distinguished from these species due to its large tufts of white hair on the thorax, its longer, thinner mandibles, and more 'G' vs "C" shaped front (or humeral) maculations (Pearson et al. 2006 pp. 64–82).

Description

Adult hairy-necked tiger beetles are 10-15 mm long with tufts of long white hair on the side of the thorax and cream-colored maculae or markings on the elytra, with the front (or humeral) maculations in the shape of the capital letter 'G' (Graves et al. 1988 pp. 648, 671; Pearson et al. 2006 p. 71). Adult tiger beetles have large eyes, as an adaptation to visual hunting, that makes their head wider than their thorax as well as an inner pair of functional, membranous wings under their elytra, or hardened outer wings (Pearson & Vogler 2001 p. 10). Adult Siuslaw hairy-necked tiger beetles range from brownish green to dark green in color with thin elytra maculae separated by relatively wide gaps, with the middle maculae elbowed and complete and the hook of the humeral 'G' absent or diminished compared to that of other *C. hirticollis* subspecies (Graves et al. 1988 pp. 648, 671; Pearson et al. 2015 pp. 79, Plate 5) (Figure 1). All Cicindelid larvae are grub-like with white and membranous integument and a highly sclerotized head with six small eyes and large mandibles (Pearson & Vogler 2001 p. 11) (Figure 1). Tiger beetle larvae also have two hooks on the fifth abdominal segment, which are used to hold them up in their burrows during hunting (Pearson & Vogler 2001 pp. 11–13).

Life Cycle and Behavior

Tiger beetles have four life stages: egg, larva, pupa, and adult (Pearson & Vogler 2001 pp. 28–36). Adult hairy-necked tiger beetles are active in the spring (April to late June), when they mate and lay eggs and again in late summer (August to September), when new adults emerge; hairy-necked tiger beetles have a fast development time compared to other tiger beetles (Pearson et al. 2006 p. 75). Adult hairy-necked tiger beetles generally mate in the spring, after they come out of diapause or pupation and live about 8-10 weeks (Pearson & Vogler 2001 pp. 35–36; Pearson et al. 2006 p. 75). After at least nine days of development, larvae hatch from the egg and undergo three growth stages, or instars, digging burrows between 8-20 cm deep and 1-4 mm across generally at the site of oviposition; the larvae deepen and widen their burrows as they grow (Pearson & Vogler 2001 p. 33; Pearson et al. 2006 p. 75). For temperate tiger beetles in general, the first instar larvae grow for 1-3 weeks until molting into the second instar in which it

grows for another 4-8 weeks before molting into the third instar that grows for several months to years, depending on food availability before pupating for 18-30 days (Pearson 1988 p. 129; Pearson & Vogler 2001 pp. 33–35). If pupation occurs before the winter, adult hairy-necked tiger beetles will diapause in winter and emerge the following year to mate and lay eggs, otherwise third instar larvae plug their burrows and diapause before emerging the following year to complete their development (Pearson & Vogler 2001 pp. 28–36; Pearson et al. 2006 p. 75). Because of this, both adult and larval Siuslaw hairy-necked tiger beetles can be present at any given time.

Adult tiger beetles are fast and mobile hunters that run across the sand in short bursts or short hopping flight movements to chase prey; they run so fast that they need to stop after short bursts to visually relocate their prey before continuing the pursuit (Pearson & Vogler 2001 p. 10). Adult tiger beetles use their sharp, sickle-shaped mandibles to catch prey, which consists of other invertebrates of catchable size, and then chew it with predigested enzymes before it is ingested (Pearson & Vogler 2001 pp. 10–11).

Male tiger beetles approach females in short sprints before mating and remain in amplexus for several minutes to hours to mate guard post-copulation by affixing mandibles to the side of the female's thorax, resulting in the pair being more vulnerable to predation or human activity (Pearson & Vogler 2001 pp. 155–157, 163–164) (Figure 1). Adult female tiger beetles oviposit in the sand, creating shallow holes and depositing one 2-4 mm egg per hole coated in a sticky layer to help it stay in place (Pearson & Vogler 2001 p. 32). Because they have a very narrow range of moisture tolerance, hairy-necked tiger beetle females will select burrowing areas with about 20% (range of 10-30%) sand moisture near freshwater and in areas with little disturbance (Pearson & Vogler 2001 p. 32; Cornelisse & Hafernik 2009 pp. 499–501). During the summer, Siuslaw hairy-necked tiger beetle adults appear to create temporary burrows as shelters at night (Figure 2) and become active once the sand temperature reaches 20 degrees Celsius (Mazzacano et al. 2010 pp. 4–5).

Figure 1. Left: Siuslaw hairy-necked tiger beetle mating pair, with male mate guarding post-copulation and Right: *Cicindela* sp. larva. Photos by Sarina Jepsen, The Xerces Society.

Figure 2. Tiger beetle adult shelters in dry sand. Left: Siuslaw hairy-necked tiger beetle adult in front of a temporary burrow and Right: several temporary adult burrows. Photos by Sarina Jepsen, Xerces Society.

Tiger beetle larvae will generally construct a burrow at the site of oviposition, but if the moisture levels become intolerable, hairy-necked tiger beetle larvae will crawl across the sand and dig a new burrow in a more favorable location (Pearson & Vogler 2001 pp. 32–35; Pearson et al. 2006 pp. 74–75). Larvae are sit and wait hunters that remain with their head flushed with the sand surface, plugging their burrow opening; when an insect or other small invertebrate walks near them, the larva will reach up to half of its body length out of its burrow to capture its prey then bring it to the bottom of the burrow to consume it (Pearson & Vogler 2001 p. 11). There is evidence that the size of adult tiger beetles, and the fecundity of females, is dependent on the amount of food they eat in the larval stages (Pearson & Knisley 1985 pp. 164–166).

Habitat Requirements

Hairy-necked tiger beetles in general have strict habitat associations and are not found outside of their typical habitat (Graves et al. 1988 p. 648). Siuslaw hairy-necked tiger beetles live only in areas where freshwater meets the Pacific Ocean, particularly near and along river mouths or other fresh water outflows (Mazzacano et al. 2010 p. 19). According to Mazzacano et al. (2010 p. 19), adult core habitat is "firm, flat, moist sand at and near the water's edge, close to the outflow but also upstream; and the sloping edges of dunes, just above the high-water mark." Adults appear to prefer the darker sand flats in the backwater or slack water areas within these habitats, areas often characterized by a thin layer of light algae and dark, almost reddish sand (Mazzacano et al. 2010 p. 19). The moist, darker sand areas are compact enough for adults to run easily and see and capture prey, as well as mate. These areas also contain or are adjacent to suitable oviposition sites (Graves et al. 1988 p. 648). See Figures 3 and 4 below of preferred habitat. Adults venture into the drier, upland sloping dune areas apparently to hide and create their overnight shelters and are hypothesized to be the sites of adult overwintering (Mazzacano et al. 2010 p. 19). Larvae are found in a wider area of the floodplain, but always in burrows in the sand with a consistently moist subsurface (Graves et al. 1988 p. 647; Pearson et al. 2006 p. 75).

Figure 3. Siuslaw hairy-necked tiger beetle habitat at New River ACEC. Left: New River Breach 3 (Hammond Breach) and Right: New River Breach 4 (Bono/Clay Island). Photos by Candace Fallon, Xerces Society.

Figure 4. Siuslaw hairy-necked tiger beetle habitat in the Oregon Dunes National Recreation Area. Left: Sutton Creek and Right: Tahkenitch Creek. Photos by Sarina Jepsen, Xerces Society.

As mentioned above, larvae will generally construct a burrow at the site of oviposition and while larvae are able to dig new burrows if the site becomes unsuitable, it puts them at great risk of predation and/or desiccation and thus is not a frequent occurrence (Pearson & Vogler 2001 pp. 32–35; Pearson et al. 2006 pp. 74–75). As a result, the oviposition site preference by adult female tiger beetles is an important habitat suitability component for hairy-necked tiger beetles. Adult female hairy-necked tiger beetles tend to select areas of fine sand with 20% moisture and partial shade in which to oviposit (Cornelisse & Hafernik 2009 pp. 499–501). In addition, larval burrows are not found in areas subjected to high compaction, either due to death of any present eggs or larvae or because adult females avoid laying eggs in areas of high compaction (Cornelisse & Hafernik 2009 pp. 501–502). Siuslaw hairy-necked tiger beetle larval burrows are found in moist, firm sand near freshwater outflow areas and occasionally in slightly dryer sand further from stream, but not in areas with dense vegetation (Mazzacano et al. 2009 p.

7). Larval burrows may occur in high density, especially in sheltered areas such as the lee of driftwood but only in areas with a lack of compaction caused by human foot or off-highway vehicle traffic (Figure 5) (Mazzacano et al. 2009 p. 7; Fallon & Jepsen 2015 p. 7).

Figure 5. Tiger beetle larval burrows in wet sand. Photos by Sarina Jepsen, Xerces Society

Historic and Current Distribution

Historic Distribution

The Siuslaw hairy-necked tiger beetle historically occurred at the mouths of rivers along the Pacific coast from northern California to Hauser, Coos County (Co.), Oregon to Moclips, Grays Harbor Co., Washington with (Graves et al. 1988 pp. 671–672; Pearson et al. 2006 p. 74). Prior to 1979, the Siuslaw hairy-necked tiger beetle was recorded at the following areas in Oregon; Tillamook Co. (Neskowin, Sand Lake, Twin Rocks, Pacific City, and Woods), Lincoln Co. (Yaquina Bay, Newport, Waldport), Lane Co. (Florence, Siltcoos Outlet, and Westlake), and Coos Co. (Hauser) (Leffler 1979 p. 723; Graves et al. 1988 p. 672; Mazzacano et al. 2009 pp. 4, 28) and in Washington state; Grays Harbor Co. and Pacific Co. (Leffler 1979 p. 723; Graves et al. 1988 p. 672) (Table 1). Here, we use "areas" to refer to the larger expanse of land that the Siuslaw hairy-necked tiger beetle was historically known from and "sites" to refer to the specific places within those areas that were systematically surveyed in recent years.

Table 1. Historic (pre-1979) areas of the Siuslaw hairy-necked tiger beetle, adapted from Mazzacano et al. (2009 Appendix B).

State	County	Area
Oregon	Coos	Hauser, Oregon Dunes National Recreation Area
Oregon	Lane	3 Mi. North of Florence
Oregon	Lane	Westlake
Oregon	Lane	Siltcoos Outlet
Oregon	Lincoln	Waldport

Oregon	Lincoln	Yaquina Bay
Oregon	Lincoln	Newport
Oregon	Tillamook	Neskowin
Oregon	Tillamook	Pacific City
Oregon	Tillamook	Sand Lake
Oregon	Tillamook	Twin Rocks
Oregon	Tillamook	Woods
Washington	Grays Harbor	Moclips
Washington	Pacific	Ocean Park
California	Humboldt	Eureka

Current Distribution and Population Status

Recently, the Siuslaw hairy-necked tiger beetle has been considered extirpated from most historic areas (Pearson et al. 2006 p. 74; Knisley et al. 2014 p. 130). The most recent surveys confirmed that the beetle is rare and absent from most of the historic as well as potential habitat surveyed in Oregon (Mazzacano et al. 2009 pp. 8, 18, 2010 p. 2; Knisley et al. 2014 p. 130). In 2009, the Xerces Society surveyed 49 sites along the length of the Oregon coast, chosen based on their presence in the historic areas and their viability as Siuslaw hairy-necked tiger beetle habitat (Mazzacano et al. 2009 p. 18). The 2009 surveys included six known historic areas in Oregon: Waldport (Lincoln Co.); Pacific City, Sand Lake, and Twin Rocks (Tillamook Co.); and Florence and Siltcoos Bay (Lane Co.). Siuslaw hairy-necked tiger beetle adults were found in only one of these historic areas, Siltcoos Outlet, and in low abundances at only 17 (35%) of 49 survey sites (Table 2) (Mazzacano et al. 2009 p. 8).The beetle was absent from all other historical areas surveyed: Florence, Waldport, Pacific City, Twin Rocks, Sand Lake (Mazzacano et al. 2009 pp. 11–12, 24–27, Mazzacano et al. 2009 p. 8, 2010 p. 10), and Hauser (Jepsen et al. 2011 pp. 3–8). Thus, the Siuslaw hairy-necked tiger beetle has apparently been extirpated from Tillamook and Lincoln Counties as well as Hauser and Florence in Oregon.

Seven of the 17 (~41.2%) recently occupied Oregon sites were concentrated along a 10.5 mile stretch of the New River Area of Critical Environmental Concern (ACEC) (Mazzacano et al. 2009 pp. 18–19, all, 2010 p. 2,10-18; Fallon & Jepsen 2015 p. 5), and considered one of the last remaining wild places along the Oregon coast (Bureau of Land Management 2004 p. xiii). Four of the seven sites at New River are within one mile of each other (Fallon & Jepsen 2015 p. 9). The remote New River ACEC areas in Curry and Coos County were also the most populous sites; across all sites within the New River area, 102 adult Siuslaw hairy-necked tiger beetles were observed in 2009, 434 in 2010, and 130 in 2014 (Mazzacano et al. 2009 pp. 16–17, 2010 pp. 10–14). Mazzacano et al. (2009 pp. 16–17) found one singular Siuslaw hairy-necked tiger beetle at Floras Lake in Curry County in 2009, but none in 2010, leading the researchers to suspect that it had merely flown over from a nearby population along New River in 2009 in

addition to the fact that Floras Lake experiences high levels of recreation (Mazzacano et al. 2010 p. 10).

In 2011, the Xerces Society surveyed three suitable habitat sites near Hauser, Oregon in Coos County, a historic Siuslaw hairy-necked tiger beetle area, and found no adults, perhaps due to high levels of OHV use at the sites (Jepsen et al. 2011 pp. 3–7). Outside of New River Breach in the ACEC, few adults were seen in Coos County and it was noted that Siuslaw hairy-necked tiger beetles are typically absent in areas of high levels of foot and OHV traffic, even in areas that appear to be high quality habitat (Mazzacano et al. 2009 pp. 9–18, 2010 p. 2). The six sites in Coos, Douglas, and Lane Counties within the Siuslaw National Forest are part of an area known as the Oregon Dunes National Recreation Area (ODNRA), a 40 mile long, 1.5 mile wide area between Coos Bay-North Bend in the south and Sutton Creek in the north. In addition to the 2009 survey, the Siuslaw hairy-necked tiger beetle was found at Sutton Creek in 2012 (Westcott 2020; Labonte 2020).

In sum, in Oregon, the beetles are restricted within 82 miles in Lane, Douglas, Coos, and Curry Counties primarily in areas with no OHV traffic and little foot traffic at New River ACEC and in the ODNRA (Mazzacano et al. 2009 pp. 12–13, 2010 pp. 6, 10; Knisley et al. 2014 p. 130; Fallon & Jepsen 2015 p. 5) (Figure 6). At the landscape scale, the small and isolated nature of extant populations, coupled with small patches of habitat, leave the Siuslaw hairy-necked tiger beetle inherently vulnerable to extinction (Cornelisse et al. 2013 p. 6; Fallon & Jepsen 2015 p. 20). Few tiger beetles successfully colonize new areas, as most are limited to short flights or running over short distances of 100-500 meters (Pearson & Vogler 2001 p. 141; Pearson et al. 2006 p. 186; Hudgins et al. 2011 pp. 311–312). Between-site distances for the 2009 survey ranged between four and 33 miles (Mazzacano et al. 2009 p. 8), significantly further than typical tiger beetle dispersal. When tiger beetle adults are able to migrate between sites even at a rate of one per 50 adult females, population growth increases and the probability of extinction is reduced by 5-10% (Cornelisse et al. 2013 p. 6), yet very few of the Siuslaw hairy-necked tiger beetle populations are estimated to be at 50 adults, let alone 50 adult females. Other than Siltcoos River Outlet (114 adults) and Tahkenitch (53 adults), there has never been more than 50 individuals found at any one site (Tenmile Creek's two sites had 51 in 2010 and there were 75 in 2009 across five breaches, 434 across five breaches and 10 "gaps" at New River ACEC in 2010, and 130 across four breaches in 2014) (Mazzacano et al. 2009, 2010; Jepsen et al. 2011; Fallon & Jepsen 2015 p. 8).

No occupied sites are currently known from BLM or USFS lands in Washington (Black et al. 2007 p. 2; Hietala-Henschell & McMullen 2018 p. 5). However, the beetle was found at Griffiths Priday State Park, Grays Harbor, Washington in 2008 (Steffens 2009 pp. 3–7) and at Midway Beach, Pacific County, Washington in 2011 (Paulson 2011 pp. 1–2) (Figure 6). In addition, there are no recent records of Siuslaw hairy-necked tiger beetles from California (Black et al. 2007 p. 2). To the best of the petitioners' knowledge, systematic surveys of historic areas and other suitable habitat have not been conducted in Washington or California in recent years.

Table 2. Current sites of extant Siuslaw hairy-necked tiger beetle populations and the corresponding land managing agency, Bureau of Land Management (BLM), United States Forest Service, Siuslaw National Forest (USFS-SNF), Oregon Parks and Recreation Department (OPRD), and Washington State Parks (WSP). Federally managed areas are in gray. The number of adults was roughly estimated in 2009 at all Oregon sites and systematically in 2010 over expanded areas only at federally managed sites in Oregon (Mazzacano et al. 2009, 2010; Fallon & Jepsen 2015 pp. 5, 8). Washington reports at Grays Harbor and Pacific County sites are from Steffens (2009) and Paulson (2011), respectively. X = present but no estimate of abundance.

Siuslaw hairy-necked tiger beetle occupied sites	**County**	**Manager**	**# Adults 2009**	**# Adults 2010**	**# Adults 2014**
Griffiths Priday State Park	Grays Harbor	WSP	X (2008)		
Midway Beach	Pacific	WSP		X (2011)	
Sutton Creek	Lane	USFS-SNF	2	0	
Siltcoos River Outlet	Lane	USFS-SNF	5	114	
Tahkenitch Creek	Douglas	USFS-SNF	5	53	
Umpqua Spit	Douglas	USFS-SNF			X
Tenmile Creek (2 sites)	Coos	USFS-SNF	10	51	
Johnson Creek	Coos	OPRD	4		
Bandon State Natural Area (3 sites: Crooked, China, and Twomile Creeks)	Coos	OPRD	7		
New River (Lost Lake Trail)	Coos	BLM/Private	27		
New River Breach (5 sites in 2009, 5 sites plus “gaps” in 2010, 4 sites in 2014)	Coos/Curry	BLM/Private (Breach 5)	75	434	130
Floras Lake	Curry	BLM, OPRD	1	0	

Figure 6. Current and historic distribution of the Siuslaw hairy-necked tiger beetle in Washington, Oregon, and California map from Fallon and Jepsen (2015 p. 6).

Conservation Status

The ESA is a "comprehensive scheme with the 'broad purpose' of protecting endangered and threatened species." Ctr. for Biological Diversity v. U.S. Bureau of Land Mgmt., 698 F.3d 1101, 1106 (9th Cir. 2012) (quoting Babbitt v. Sweet Home, 515 U.S. 687, 698 (1995)). Congress' plain intent in enacting the ESA was "to halt and reverse the trend toward species

extinction." Tenn. Valley Auth. v. Hill, 437 U.S. 153, 184 (1978). In doing so, the ESA requires that "all Federal departments and agencies *shall* seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of [these] purposes." 16 U.S.C. § 1531(c)(1) (2012). Endangered and threatened species are "afforded the highest of priorities." Tenn. Valley Auth., 437 U.S. at 174. Endangered species are species that are "in danger of extinction throughout all or a significant portion of its range," and threatened species, species that are "likely to become endangered species within the foreseeable future" and are listed for protection pursuant to section 4 of the ESA. 16 U.S.C. § 1532(6), 1532(20), 1533.

The Siuslaw hairy-necked tiger beetle has been recognized as imperiled or needing protection by international and state entities. The tiger beetle has a rounded global NatureServe rank of T1 (critically imperiled), a US status of N1N2 (critically imperiled/imperiled), and S1S2 (critically imperiled/imperiled) in Oregon and S1 (critically imperiled) in Washington with an overall threat of "very high to medium" and long-term population decline of > 70% (NatureServe Explorer 2020 pp. 1–2). The tiger beetle is considered critically imperiled/imperiled (S1S2) by the state of Oregon (USFS & BLM 2019a row 212) and it went from an Oregon Biodiversity Information Center (ORBIC) List 2 ranking in 2015 to a higher ORBIC "List 1: Threatened or Endangered Throughout Range contains taxa that are threatened with extinction or presumed to be extinct throughout their entire range" in 2019 (USFS & BLM 2019a row 212; Oregon Biodiversity Information Center 2019 pp. 5, 32). It has a critically imperiled (S1) status in Washington state where it is also a Species of Greatest Conservation Need (Washington Department of Fish and Wildlife 2018 p. 7). In a review of the status of tiger beetles of the United States, Knisley et al. (2014 pp. 103, 130) assigned the Siuslaw hairy-necked tiger beetle a rarity grade of 'imperiled' with a high risk of extinction due to its extirpation from historic areas, recent declines, and significant threat from recreational activity on remaining populations.

The ESA states that a species shall be determined to be endangered or threatened based on any one of five factors (16 U.S.C. § 1533 (a)(1)): 1) the present or threatened destruction, modification, or curtailment of its habitat or range; 2) overutilization for commercial, recreational, scientific, or educational purposes; 3) disease or predation; 4) the inadequacy of existing regulatory mechanisms; and 5) other natural or manmade factors affecting its continued existence. The Siuslaw hairy-necked tiger beetle is imperiled by factors one, four, and five. The best available science shows that the beetle is in danger of extinction due to a very restricted range with a limited number of populations, low abundances, reliance on a rare habitat type, and imminent threats of development, recreation, sea level rise, and lack of existing regulatory mechanisms, among others, that will destroy its habitat if immediate conservation measures are not taken to protect the subspecies.

Present or Threatened Destruction, Curtailment, or Modification of Habitat or Range

Due to specific habitat requirements of *C. hirticollis* spp., specifically sand texture, compaction, and moisture levels, the Siuslaw hairy-necked tiger beetle habitat is susceptible to habitat destruction and degradation (Pearson et al. 2006 p. 74; Cornelisse & Hafernik 2009 pp. 499–501). Habitat loss, degradation, and fragmentation have likely destroyed much of the Siuslaw hairy-necked tiger beetle's historic range, and they now appear to be absent from the northern and southern extents of their range in Oregon due to continued habitat loss and degradation, as outlined below (Mazzacano et al. 2010 pp. 1–37; Knisley et al. 2014 p. 130).

Habitat Loss and Fragmentation via Development

Habitat loss via coastal development has restricted Siuslaw hairy-necked tiger beetle populations to a handful of sites. Beach stabilization and development has eliminated many open, sandy beach areas in California, Oregon, and Washington; for instance, snowy plover nesting habitat, found in the same general areas to that used by Siuslaw hairy-necked tiger beetle, has declined by 68% in recent years (Stinson 2016 p. 7). Specifically, Oregon's population has grown in recent decades and has resulted in increased coastal land values, development, and human activities, such as ranching and cranberry farming (Bureau of Land Management 2004 pp. 5, 14–15). Between 2010 and 2019, Lane County's population grew by 8.6%, Douglas County's population grew by 3.1%, Coos County's population grew by 2.3%, and Curry County's population grew by 2.5% (United States Census Bureau 2019). The extirpated Twin Rocks and Waldport historic areas border rows of houses and motels, as does Johnson Creek, which recently had a very small population of Siuslaw hairy-necked tiger beetles (Mazzacano et al. 2009 pp. 9, 11, 14–15).

Due to the Siuslaw hairy-necked tiger beetle's specific habitat requirements, populations are separated into smaller populations that are separated from each other by areas of unsuitable habitat (Graves et al. 1988 p. 648). Habitat destruction or degradation, such as via development or OHV activity, further fragments Siuslaw hairy-necked tiger beetle populations, potentially resulting in the inability of adults to disperse between habitat patches along the coast. Few tiger beetles have successfully colonized new areas, as most are limited to short flights or running over short distances (Pearson & Vogler 2001 p. 141; Pearson et al. 2006 p. 186); one study showed tiger beetles dispersed a maximum of 481 meters, with a mean of 118.2 meters (Hudgins et al. 2011 pp. 311–312). Between-site gaps for the 2009 survey ranged between four and 33 miles (Mazzacano et al. 2009 p. 8), significantly further than typical tiger beetle dispersal. At the landscape scale, the small and isolated nature of extant populations, coupled with relatively small patches of habitat, leave the Siuslaw hairy-necked tiger beetle inherently vulnerable to extinction (Cornelisse et al. 2013 p. 6; Fallon & Jepsen 2015 p. 20).

Off-Highway Vehicles (OHVs)

Surveys indicate that the Siuslaw hairy-necked tiger beetle populations are significantly smaller or completely absent from beaches with moderate to heavy OHV use (Mazzacano et al. 2009, 2010; Fallon & Jepsen 2015 p. 20). While some tiger beetle species can benefit from a low level of recreation, OHVs can cause extirpation of tiger beetle populations, especially those found on coastal beaches and sand dune areas (Knisley 2011 p. 45). OHV activity is suspected to have caused extirpation of the Siuslaw hairy-necked tiger beetle from some areas of the Oregon and Washington coast (Knisley 2011 p. 45; Fallon & Jepsen 2015 p. 8).

OHV use impacts more area and occurs at a higher speed than other forms of recreation. Recreation at high speeds (e.g. 18-22 mph) disrupts tiger beetle adult behavior significantly more often and to a greater degree than recreation at slower speeds (5-8 mph), causing adults to fly further away from a foraging or mating area (Cornelisse & Duane 2013 pp. 1451–1453). Displacement from their central foraging and mating areas requires the beetles to expend more energy both escaping the threat and returning to their habitat (Cornelisse & Duane 2013 p. 1455). OHV use has also been shown to reduce soil moisture (Knisley 2011 p. 48) and increase soil compaction, which also reduces soil pore space and moisture, impacting adult female oviposition and/or larval survival (Cornelisse & Hafernik 2009 pp. 501–502). Further, OHV activity can directly kill or injure adult tiger beetles and repeated use can significantly impact larval activity and development and degrade the larval habitat (Knisley 2011 pp. 46–48).

The ODNRA, where the Siuslaw hairy-necked tiger beetle has been found in six sites (Sutton Creek, Siltcoos River Outlet, Tahkenitch Creek, Umpqua Spit, and two sites at Tenmile Creek) allows motorized recreation within three designated areas; from north to south, they are: from one mile south of Florence to Siltcoos Beach Road, from the Siuslaw National Forest boundary to the Douglas-Coos County line, and from Tenmile Creek to Horsfall Road (Siuslaw National Forest 2020a, 2020b, 2020c; Burns 2020 p. 9). The number of OHVs in the ODNRA has increased from 2010 to 2016 from around 29,000 to 33,000 with a range of 27,000-35,000 over those six years, not counting OHV use coming from private, state, and county camping facilities and properties nearby (Burns 2020 p. 142). Thus, OHV use occurs between Siuslaw hairy-necked tiger beetle sites within the ODNRA with allowed speeds of 25 miles per hour (Siuslaw National Forest 2020a).

Mazzacano et al. (2009) and Jepsen et al. (2011) noted evidence of OHV activity in several surveyed sites. The sites where OHV tracks were found but Siuslaw hairy-necked tiger beetle was not were: Clatsop Spit, Sand Lake, Ona Beach State Park, Threemile Creek, Whiskey Run Creek, Hubbard Creek (Mazzacano et al. 2009 pp. 9–18), and three surveyed sites at the historic site of Hauser, OR, within the ODNRA (Jepsen et al. 2011, pp. 3-6, Figure 7). Sand Lake, a historic Siuslaw hairy-necked tiger beetle is close to a campground and shows evidence of OHV activity (Mazzacano et al. 2009 pp. 9–13). OHV tracks were also found at China Creek, Tahkenitch, and Siltcoos River, where only one, five, and five Siuslaw hairy-necked tiger beetle adults were found, respectively, in 2009 (Mazzacano et al. 2009 pp. 13–15). In Washington,

Midway Beach experiences a high level of OHV traffic during razor clam season in the spring when it draws hundreds of thousands of people to Washington coasts (Stinson 2016 pp. 8, 10).

Figure 7. A historic record exists for Hauser, OR, for the Siuslaw hairy-necked tiger beetle. The closest suitable habitat to Hauser was surveyed in 2011 within the ODNRA, but the beetle was not detected. Photos taken in 2011 illustrate the beetle's likely historic habitat along ephemeral wetlands within the ODNRA, which now have heavy OHV use, as seen in the above four photos. Photos by Sarina Jepsen, Xerces Society.

OHV use for Predator Management

OHVs are not permitted on lands within the New River ACEC with the exception of their use for administrative access and other specially permitted scientific research, monitoring, resource protection, and restoration projects (Fallon & Jepsen 2015 p. 19). In addition, as part of their snowy plover management activities, the BLM uses OHVs for fencing and sign placement, monitoring, maintenance, and predator control several times every week from March through September (Bureau of Land Management 2004 p. 755; Fallon & Jepsen 2015 p. 19). To avoid snowy plover habitat, they often drive through the firm, wet sand, which is prime location for Siuslaw hairy-necked tiger beetle larval burrows (Mazzacano et al. 2009 pp. 15, 20).

Harassing and deterring predators are the management techniques that are most likely to negatively impact the Siuslaw hairy-necked tiger beetle, particularly techniques that involve OHV patrolling and habitat disturbance, as is permitted for raven/crows, gulls, and raptors

(APHIS Wildlife Services 2002 chap. 2, pp. 19–20). The plan applies to the following areas, essentially overlapping with the Siuslaw hairy-necked tiger beetle's currently or historically occupied habitat: Sutton, Siltcoos, Overlook, Tahkenitch, Tenmile, Coos Bay North Spit, Bandon, New River, and Floras Lake located in Lane, Douglas, Coos, and Curry counties (Frounfelker & Brown 2002 p. 2). Similar to Oregon, Washington Code (WAC 352-37-030) prohibits OHVs on dry sand areas of the beach where snowy plover nesting occurs, but allows OHV use on the wet, packed sand portion of the beaches (Stinson 2016 p. 8). In 2013, Washington began a predator management program that involved hazing or targeted dispersal and lethal removal of crows and ravens (Stinson 2016 pp. iii, 9). While predator management is an important component of snowy plover protection, Fallon and Jepsen (2015) created a New River ACEC site management plan that includes protective measures for the Siuslaw hairy-necked tiger beetle, such as a focused effort to avoid areas of moist, firm sand adjacent to New River as well as training predator control employees to identify adult tiger beetles and larval burrows, so that the impacts from OHVs can be avoided or minimized (Fallon & Jepsen 2015 p. 24).

Breaching and Sand Excavation

In the New River ACEC, the Siuslaw hairy-necked tiger beetle is negatively impacted by breaching. Breaching is the breaking of natural or man-made dams on the New River to alleviate flooding, improve general river health, and flush sediments out of the river (Fallon & Jepsen 2015 p. 18). While the river will naturally break through built up sand in times of heavy rainfall, the river is periodically mechanically breached to reach the ocean. Breaching changes the flow of the river and bed formation and can cause sedimental build up and/or drying of channels north of the breach (the natural flow direction of the river) (Bureau of Land Management 2004 p. 21).

There are a few restrictions that determine when the river can be breached: the river must be at least 15.5 feet high before February 15th, before the snowy plover restrictions begin, and juvenile Coho salmon are in the river (Fallon & Jepsen 2015 p. 18). When these conditions are reached, earthmovers are brought in to excavate the dunes alongside the river and create a "plug" for the dam that is then removed by an earthmover when the river reaches the 15.5 foot level so that it flows to the ocean (Fallon & Jepsen 2015 p. 18). Thus, breaching generally occurs in the winter when larvae and adult beetles are overwintering in burrows. The action of breaching can move large quantities of sand mechanically from Siuslaw hairy-necked tiger beetle habitat, destroying habitat and larval and adult burrows, likely killing larvae and at least greatly disrupting overwinter adults (Fallon & Jepsen 2015 pp. 20–22). Further, the sand movement and deposition may indirectly impact the beetles by having a negative impact on prey availability by removing or burying prey populations and their habitats (Fallon & Jepsen 2015 p. 22).

Since 1998, the BLM has implemented an annual habitat restoration project on the New River ACEC foredune designed to provide breeding and wintering habitat for the threatened western snowy plover (Bureau of Land Management 2004 p. 16; Wright 2014 pers. comm.). Each site is generally excavated with large earthmovers every two to three years to flatten dunes

and push material against the back dune to prevent ocean overwash (Wright 2014 pers. comm.). With the exception of the temporary breach locations, a 50-foot buffer of European beachgrass is left along the east side of the dune (Bureau of Land Management 2004 p. 73); these actions reduce tiger beetle habitat (Fallon & Jepsen 2015 pp. 19, 23) and remaining European beachgrass is a threat to the Siuslaw hairy-necked tiger beetle as described below. The ODNRA management plan also includes creating plover habitat by mechanically depositing dredge spoils in the estuaries of Sutton Creek, Siltcoos River, Tahkenitch Creek, and Tenmile Creek using signs (Siuslaw National Forest 1994a chap. 3, p. 60), which can harm the Siuslaw hairy-necked tiger beetle by covering their habitat areas, including overwintering adults and larvae, if they are not delineated or taken into account prior to excavation.

Invasive Species

Tiger beetles need open areas to thermoregulate, hunt, and lay eggs and so are threatened by invasive plants that preclude and take over bare soil (Knisley et al. 2014 pp. 100–103, 127, 138). European beachgrass (*Ammophila arenaria*) was introduced in the 1930s and planted in the 1950s by the USFS and BLM to stabilize dunes (Oregon Dunes Restoration Collaborative 2018 pp. 14–15; Burns 2020 p. 6). European beachgrass now dominates the dune system throughout the ODNRA and New River ACEC and, in Washington, Midway and Copalis beaches are affected to some degree (Fallon & Jepsen 2015 p. 8; Stinson 2016 p. 6; Oregon Dunes Restoration Collaborative 2018 pp. 14–21; Burns 2020 p. 6).

European beachgrass builds unnaturally high sand dunes at the front of the beach by capturing sand grains at the base of its leaves and it spreads via an extensive underground rhizome system (Bureau of Land Management 2004 pp. 32–33; Fallon & Jepsen 2015 pp. 20–21; Burns 2020 p. 6). This dune stabilization and subsequent ecological succession reduces the amount of open sand habitat for the Siuslaw hairy-necked tiger beetle throughout its range (Bureau of Land Management 2004 p. 32; Fallon & Jepsen 2015 pp. 20–21; Burns 2020 p. 8). Invasive beachgrass make Siuslaw hairy-necked tiger beetle habitat unsuitable where it forms dense stands, reducing overall habitat availability and forcing recreationists and wildlife to share a smaller strip of open sand (Knisley et al. 2014 pp. 100–103, 127, 138; Burns 2020 p. 6). Siuslaw hairy-necked tiger beetle has been able to coexist with the sparse, native vegetation, and other coastal hairy-necked tiger beetles have been known to oviposit near native vegetation but never near invasive European beachgrass (Cornelisse & Hafernik 2009 pp. 501–502).

Yellow flag iris (*Iris pseudacorus*) has also recently become invasive at New River, where it outcompetes native riparian vegetation in Siuslaw hairy-necked tiger beetle habitat (Wright 2015, pers. comm.). This perennial species can spread by seed or underground rhizomes and poses many of the same threats to tiger beetle populations as outlined for European beachgrass above. More recently, American beachgrass (*Ammophila breviligulata* - native to the East Coast and Great Lakes region) has become established at a number of locations along the Oregon coast and may become a threat in the near future (Fallon & Jepsen 2015 pp. 20–21).

Bulldozing for Invasive Species Control

Since 2002, the BLM has implemented a yearly exotic and noxious weeds eradication project throughout the New River ACEC (Bureau of Land Management 2004 pp. 72–73). Bulldozing to remove beachgrass can occur annually at New River ACEC, depending on available funds (Wright 2014 pers. comm.). In the ODNRA, the management plan directs control of European beachgrass with a "more intense" treatment in foredune areas which includes considering "mechanical removal with heavy or farm type equipment" as well as the consideration of deposition of dredge material to control the beachgrass, specifically near the mouths of the Siltcoos River, Tenmile Creek, and Tahkenitch Creek (Siuslaw National Forest 1994a chap. 3, pp. 13–16), which align with the Siuslaw hairy-necked tiger beetle habitat areas. This type of mechanical removal and deposition of dredge material with large equipment compacts Siuslaw hairy-necked tiger beetle habitat and can directly kill or disrupt adult beetles or larval burrows within or near the vegetative and deposition areas, unless it is done in such a way as to avoid compacting soil and depositing sand on areas occupied by the beetle.

The Oregon Dunes Restoration Collaborative (ODRC) plans to restore the Oregon Dunes by eliminating invasive beachgrass from Florence to near North Bend, 47 miles south as well as the Sutton Recreation Area managed by the BLM in the north and has recently been approved (Oregon Dunes Restoration Collaborative 2018 p. 35; Burns 2020 pp. 3–4). Like removal activity at New River ACEC, the ODRC plans to remove vegetation mechanically by bulldozer, in addition to other methods, using a "scalp and bury technique" that involves "removing vegetation and sand at least three to four feet below the base of the plants" that is then "covered by three to four feet of "clean" foredune sand that contains very few, if any, European beachgrass rhizomes" moving "large volumes" of sand (Burns 2020 pp. 11–12). Mechanical removal is planned at Siuslaw hairy-necked tiger beetle sites, including Siltcoos, Tahkenitch, Umpqua Spit, and Tenmile sites within the ODNRA (Burns 2020 pp. 17–30, Table 2 and Maps). These removal methods are concerning for the Siuslaw hairy-necked tiger beetle in that their burrows, the deepest of which only go to around 20 cm deep into the sand, could be dug up during vegetation removal and during collection of clean sand to bury the invasive species.

While invasive species control, especially of European beach grass, and maintenance of bare ground habitat is vital to the conservation of the Siuslaw hairy-necked tiger beetle, the beetle and its habitat must be considered in invasive vegetation removal, otherwise methods can be detrimental to the species. Fallon and Jepsen (2015) created a site management plan focused on the Siuslaw hairy-necked tiger beetle for the New River ACEC BLM site. In the plan, they lay out methods for invasive vegetation removal that will be protective of the Siuslaw hairy-necked tiger beetle, focusing on hand removal and consideration of the beetle's life stages in timing and location of vegetation removal (Fallon & Jepsen 2015 pp. 23–24).

Other Natural or Manmade Factors Affecting the Continued Existence of the Species

Human Disturbance

Human disturbance has been shown to impact tiger beetles in several negative ways when not managed to avoid their habitats and sensitive life cycle periods. Human disturbance, including hiking, compacts sand where tiger beetle larvae burrow and also significantly disrupts tiger beetle behavior (Cornelisse & Duane 2013 pp. 1452–1453). Tiger beetles expend energy maintaining an internal body temperature just below their lethal limit (~48°C), often aggregating on wet soil for thermoregulation (Pearson & Lederhouse 1987 pp. 249–250). The relatively constant thermal energy tiger beetles receive in flat, open habitats also allows them to maintain an optimal foraging temperature and to visually locate and capture prey (Schultz 1998 p. 445; Layne et al. 2006 p. 4299). When a tiger beetle that forages in open areas, like the Siuslaw hairy-necked tiger beetle, flies away from a disturbance (i.e. recreationist), the beetle leaves a microenvironment of high thermal quality to one of low thermal quality and expends energy escaping the disturbance (Schultz 1998 pp. 445, 448–449). This behavioral response also takes the beetle away from an area of optimal foraging, leading to reduced prey capture, which has been shown to significantly decrease the number of eggs produced by female tiger beetles (Pearson & Knisley 1985 pp. 164–165).

Tiger beetle larvae immediately retreat into their burrows upon human disturbance, resulting in the disruption of larval foraging (Pearson & Vogler 2001 p. 11, Cornelisse pers. obs.). Larval foraging disruption results in less food consumed and in turn slower development times and lower mass of pupae and adults, decreasing fecundity and survival of the population (Pearson & Knisley 1985 pp. 164–167). In addition, larval burrows are not found in areas subjected to high compaction due to repeated human trampling, either due to death of any present eggs or larvae or because adult females avoid laying eggs in areas of high human activity and compaction (Cornelisse & Hafernik 2009 pp. 501–502).

In Mazzacano et al. (2009), several Siuslaw hairy-necked tiger beetle sites were noted to experience high levels of human use. Humans are also more likely to utilize the firm, wet sand in which Siuslaw hairy-necked tiger beetle burrows than the drier sand higher in the dunes and in fact are directed to do so by the land management agencies (BLM, USFS, and OPRD). Floras Lake, where only one Siuslaw hairy-necked tiger beetle was seen in 2009 and none in 2010, was noted to have high levels of foot traffic and dog walking with one larval burrow surrounded by foot prints (Mazzacano 2009 row 12). According to the BLM, recreation at Floras Lake has increased in recent years and resulted in changes in beach morphology that has even precluded western snowy plover nesting (Bureau of Land Management 2004 p. 115). There is heavy foot traffic at other sites where Siuslaw hairy-necked tiger beetles recently occurred, including China Creek, Devil's Kitchen, and Johnson Creek, the latter of which is also impacted by housing development (Mazzacano et al. 2009 pp. 14–15; Mazzacano 2009 rows 7, 10, 17).

At least four of the six historic areas where the Siuslaw hairy-necked tiger beetle was not found in recent surveys experience moderate to high levels of foot traffic; Twin Lakes is currently dammed, the water is stagnant, and there is evidence of substantial human use, Sand Lake is close to a campground and experiences high human traffic, the Waldport and Florence sites are degraded and show high levels of human activity (Mazzacano et al. 2009 pp. 9–13). The Siuslaw hairy-necked tiger beetle has been extirpated from these historic areas. Siltcoos River, the only historical site in Oregon in which the Siuslaw hairy-necked tiger beetle is still found is relatively undisturbed (Mazzacano et al. 2009 p. 13, 2010 pp. 9–10). In Washington, Midway and Copalis beaches, sites with recent tiger beetle observations, also experience human disturbances, including by off-leash dogs, vehicles, bicycles, horseback riders and clam diggers (Stinson 2016 p. 6).

Inbreeding Depression

The lack of connectivity between populations results in lower gene flow between populations and lower effective population size, loss of genetic diversity, reduced fecundity, and ultimately inbreeding depression and subsequent extinction (Nieminen et al. 2001 p. 237; Miller et al. 2014; Müller et al. 2018 pp. 6889–6890). Inbreeding is the increased likelihood of mating among closely related individuals, which occurs frequently in small and isolated populations, and inbreeding depression is the resulting loss of fitness (Vogler et al. 1993 pp. 148–149; Müller et al. 2018 pp. 6889–6890). Inbreeding depression results in the increased phenotypic expression of recessive deleterious mutations and can become evident in offspring after one or several generations of inbreeding and is linked to changes in physical, chemical, and behavioral traits in insects (Müller et al. 2018 pp. 6890, 6894).

Low heterozygosity, or different types of alleles, among populations and thus increased differentiation between populations has been shown in rare tiger beetles that inhabit coastal beach areas (Vogler et al. 1993 pp. 145–148; Aunins et al. 2020 pp. 1, 7), like the Siuslaw hairy-necked tiger beetle. Vogler et al. (1993 pp. 146–148) found low genetic variation within populations of the threatened Northeastern beach tiger beetle (*C. dorsalis dorsalis*), even with population levels peaking at 1800 to several thousand individuals, much higher than those found for the Siuslaw hairy-necked tiger beetle.

Though no formal study has been conducted, there is evidence that Siuslaw hairy-necked tiger beetles are experiencing mutations that cause physical deformities, potentially as a result of inbreeding due to small population sizes (Mazzacano et al. 2009 pp. 20–21). Siuslaw hairy-necked tiger beetle individuals at three different sites throughout its Oregon range were found to have visible deformities; at Siltcoos River Outlet one individual appeared mutated, with abnormal, curled elytra; at a New River site one individual had deformed wings, and at Johnson Creek, one pale individual was found to have a seriously malformed body and only one eye, with the head retracted abnormally into the thorax (Figure 8) (Mazzacano et al. 2009 pp. 13–16).

These deformities were not observed in the other less rare *Cicindela* spp. in the areas (Mazzacano et al. 2009 pp. 13–16; Mazzacano 2009), though the surveys that were conducted

were targeting the Siuslaw hairy-necked tiger beetle, and not the co-occurring species. It was hypothesized that the deformities were not due to environmental factors, but rather a factor specific to the Siuslaw hairy-necked tiger beetle, such as small and/or isolated populations. Continued habitat fragmentation and small population sizes could lead to poor genetic health, reduced fitness (e.g. genetic disorders, susceptibility to disease), and reduced resilience to stochastic events (e.g. flooding) and climate change.

Figure 8. Mutated adult Siuslaw hairy-necked tiger beetle at Johnson Creek (Mazzacano et al. 2009 p. 15).

Climate Change

Human activities have increased global average temperatures 0.8-1.2°C above pre-industrial levels with a trend of about 0.2°C per decade due to past and current emissions (Intergovernmental Panel on Climate Change 2018 p. 4). At current emissions rates, global temperatures will increase by 1.5°C between 2030-2052, increasing the incidence of severe weather events and exacerbating temperature and precipitation extremes (Intergovernmental Panel on Climate Change 2018 pp. 4, 8–9). Oregon's climate is projected to be warmer and wetter by 2100 with the coast experiencing higher wave heights, more powerful winter storms, and major ocean shoreline erosion (Stout 2009 p. 2; Retallack et al. 2016 p. 6). In Washington, coastal habitats are particularly vulnerable to sea level rise, beach erosion, and storm surges which may cause declines in important habitat (Stinson 2016 p. 6).

Flooding and Sea Level Rise

The projections for the precipitation and warming for the Pacific Northwest (PNW) vary, but there is a general consensus that there will be at least a 1-2% increase in annual precipitation, and several models predict a much higher increase in rainfall (Retallack et al. 2016 pp. 7–8). Winter storms are also thought to increase in Oregon due to a northward shift of the North Pacific storm track (Stout 2009 p. 2; Retallack et al. 2016 p. 1). On the PNW coast specifically, more frequent and stronger winter storms with high wave heights that accelerate erosion are expected (Stout 2009 p. 2). Coastal river and streams, the Siuslaw hairy-necked tiger beetle's habitat, are expected to carry increased runoff from greater winter storms, increasing severity of flooding, exacerbated by inundation by increased tidal elevation (Stout 2009 p. 3).

Sea levels are projected to rise significantly along the coast of Washington, Oregon, and California; specifically by 8-23 cm in 2030 (relative to 2000 levels), 18-48 cm in 2050, and 50-140 cm by 2100 (National Research Council 2012 pp. 4, 102–103). An increase in sea level is also likely to exacerbate the effects of storms by increasing wave height, which would negatively impact any intact coastal ecosystems (National Research Council 2012 pp. 64, 107). Since coastal beaches, cliffs, and dunes take the brunt of wave force, erosion rates along the coast will increase with taller and more forceful waves (National Research Council 2012 p. 107). Flooding and sea level rise are a threat to the survival of Siuslaw hairy-necked tiger beetle larvae and overwintering adults that are unable to relocate during flooding events.

As many tiger beetles inhabit open areas near water, they are subjected to periodic flooding and larvae are known to be able to withstand some inundation (Brust et al. 2005 pp. 973–974). One study found that third instar larvae of *C. hirticollis hirticollis* had a LT_{50} of 79.1 hours (±15.8) in hypoxic conditions and 177 hours (± 26), or about a week, in aerated water; moreover, the seashore population's LT_{50} was significantly shorter when compared to a riverine population (Brust et al. 2005 p. 975). Adults survived up to 72 hours in immersion with a LT_{50} of 35 hours (± 7) (Brust et al. 2005 pp. 975–976). Thus, while coastal tiger beetles are adapted to withstand inundation for a short period of time, which reflects population level adaptations, for the same reason, tiger beetles are sensitive to hydrologic changes and many water-edge species, including several subspecies of *C. hirticollis*, have declined due to human-caused changes in water levels (Brust et al. 2005 pp. 974–978).

As a coastal subspecies that exists in a very narrow niche, the Siuslaw hairy-necked tiger beetle is highly threatened by habitat loss due to inundation from increased winter storms, wave height, tidal elevation, and sea level rise. The Siuslaw hairy-necked tiger beetle's main habitat is along the New River ACEC and its confluence with two- and ten-mile creeks. New River runs parallel to the ocean and already experiences influxes of seawater over low areas of the foredune that separates the river from the sea (Bureau of Land Management 2004 p. 20), inundating the beach and tiger beetle habitat. Typically, in the dry season of the summer and early fall, stream flow reduces, wind blows sand across the river mouth from the ocean, causing salinity levels to drop (Bureau of Land Management 2004 p. 21). Changing salinity levels also threaten the Siuslaw hairy-necked tiger beetle because females have been shown to have species-specific preferences for the pH and salinity levels during oviposition site choice (Cornelisse & Hafernik 2009 pp. 499–500).

Coastal Erosion

The combination of coastal erosion and real estate development on the coast decreases the amount of open shore habitat available to the Siuslaw hairy-necked tiger beetle. Seawalls or structures built to combat coastal erosion and loss of beach and property degrade tiger beetle habitat and lead to loss of populations (Knisley 2011 p. 54). In Washington, coastal erosion in the Siuslaw hairy-necked tiger beetle habitat areas has been occurring in recent decades, with a loss of 1 m/year in 29% of coastal areas and 3 m/year in 23% of coastal areas (Ruggiero et al.

2013 p. 30). Coastal erosion in Oregon has been occurring at a much higher rate within the past few decades than in the past two hundred years and over a wider extent (Ruggiero et al. 2013), including at all of the sites surveyed by Mazzacano et al. (2009).

At Floras Lake, the coastline has been eroding at an average rate of 0.3 m/year in recent years with 24% of the area eroding at a rate of more than 1 m/year, potentially due to this area being a hotspot for El Niño impacts (Ruggiero et al. 2013 p. 33). At New River, Johnson Creek, and Twomile Creek sites, 39% of the coastline has been eroding in recent years with 6% of the coastline eroding at a rate of more than 1 m/year (Ruggiero et al. 2013 p. 30). Also, the mouth of the New River, which is prime habitat for Siuslaw hairy-necked tiger beetle, is shifting north, and the places of accretion and erosion are shifting as well (Ruggiero et al. 2013 pp. 33–34). Over the long term, 97% of the area including China Creek and Devil's Kitchen was experiencing erosion at an average rate of 0.4 m/year (Ruggiero et al. 2013 p. 29). At Tenmile Creek, Siltcoos River, and Tahkenitch, and Florence, 54% of the coast has been eroding with 8% at a rate of more than 1 m/year in recent years (Ruggiero et al. 2013 p. 30).

Inadequacy of Existing Regulatory Mechanisms

Seven of the extant sites surveyed and occupied in 2009 occur on BLM land and are concentrated along New River and the associated Floras Lake. Six of the 2009 sites are on USFS land: Sutton Creek, Siltcoos River, Tahkenitch Creek, Umpqua Spit, and Tenmile Creek (in two locations), though it is important to note that much smaller populations occurred at sites on USFS-owned land than along New River. The remaining sites are managed by OPRD and WSP, with the exception of two sites on private land (New River Breach 5 and Lost Lake Trail) (Fallon & Jepsen 2015 p. 5). The Siuslaw hairy-necked tiger beetle is classified as a Forest Service Region 6 and Oregon/Washington BLM Sensitive Species (USFS & BLM 2019b ll. 44, Inverts tab, 2019a row 212). These lists recognize the rarity and high degree of threat experience by the Siuslaw hairy-necked tiger beetle but are not regulatory mechanisms.

USFS: Oregon Dunes National Recreation Area

The designation of the Siuslaw hairy-necked tiger beetle as a Forest Service Region 6 sensitive species has not protected it thus far and it needs the stronger protection of the ESA. The USFS manages the ODNRA, the area that contains the recently occupied Siuslaw hairy-necked tiger beetle habitat in the Siuslaw National Forest; the current management plan was completed in 1994 (Siuslaw National Forest 1994a p. 1). The goals of the ODNRA include providing a "broad range of high-quality recreation settings and opportunities" consistent with an ecosystem management approach and "high-quality ORV recreation experiences" (Siuslaw National Forest 1994a chap. 3, p. 1) while at the same time striving to "maintain or enhance diverse habitats that support viable populations of all native and desirable introduced species. Provide habitat needed to aid recovery of threatened or endangered species in accordance with approved plans" (Siuslaw National Forest 1994a chap. 3, p. 2). The plan's criteria for maintenance of Region 6 sensitive

species "to prevent potential federal listing" include conducting field surveys every two years to determine any "apparent decline in population" and "more than 10% habitat loss" (Siuslaw National Forest 1994a Table IV-9E). The ODNRA management plan included surveying five species/year, but it is unclear if the Siuslaw hairy-necked tiger beetle is being monitored, although monitoring is not a regulatory mechanism per se (Siuslaw National Forest 1994b pt. B-2). Further, thresholds do not automatically trigger management actions to ameliorate any threat, but rather an evaluation that leads to further investigation to determine whether there is a need to take corrective action, amend the management plan, revise the output schedule, or initiate revision of the management plan (Siuslaw National Forest 1994a p. IV–34).

The management plan does contain guidelines for protecting listed threatened and endangered species, specifically (Siuslaw National Forest 1994a chap. 3, pp. 57–58). Thus, because the Siuslaw hairy-necked tiger beetle is not listed, it is not protected by the management plan. The amount of habitat managed for protected, endangered, threatened, and sensitive species is 1,250 acres, 1,010 of which is specifically managed for the snowy plover (Siuslaw National Forest 1994a chap. 2, pp. 4, 10; chap. 3, pp. 10–13). While the 1,010 acres protected for the snowy plover may provide some protection to the beetle, their general habitats do not overlap, and some management activities that are undertaken to protect the snowy plover – such as OHV use for predator control on wet sand, breaching, and excavation – can be detrimental to the tiger beetle if the beetle's needs are not take into account. Further, in some cases, the management plan may reduce the tiger beetle's habitat, such as with the goal to "plant native species to increase riparian cover" in riparian habitats, which would result in a reduction of open sandy habitat (Siuslaw National Forest 1994a chap. 3, p. 12). Thus, for the Siuslaw hairy-necked tiger beetle and its specific habitats to be adequately protected under the ODNRA management plan, it needs to be listed under the ESA as threatened or endangered.

Regulation of OHVs

To regulate OHV use, the ODNRA management plan outlines monitoring criteria that includes thresholds for recreation overuse or non-compliance that would trigger evaluation (Siuslaw National Forest 1994a Table IV-4B). The thresholds of measured criteria include: more than 150 recorded OHV use outside of designated areas or non-compliance with designated route requirements in one year, less than 80% permit compliance with dispersed camping permitted system, and disturbance of OHVs exceeding "acceptable limits" measured by the amount of environmental disturbance as sampled four times per year (Siuslaw National Forest 1994a Table IV-4B). Enforcement of ODNRA regulations is done through encouraging compliance via education, interpretation, facility designs, management standards, and citations for non-compliance, but the plan states that compliance relies "heavily on self-policing by NRA visitors and groups" (Siuslaw National Forest 1994a chap. 2, p. 5).

The final Record of Decision designating official motorized vehicle trails in the ODNRA was completed in 2015 (Ingersoll 2015; Burns 2020 p. 30). Major OHV use is allowed in Management Area (MA) 10 (B) that has "large areas of open sand and managed primarily for

OHV use" and MA 10 (C) that allows OHVs on designated routes which include "major access points to the open sand" (Ingersoll 2015 p. 5). In 2015, the USFS recognized that an "extensive network of unauthorized, user-developed routes continues to be used and additional routes have probably developed" and these "routes have not been enforced as closed" and "responsible riders cannot reliably tell where riding is appropriate" (Ingersoll 2015 p. 6). Thus, they reallocated 518 acres from MA 10 (C) to 10 (B), opening these lands to "cross-country OHV use" that included 46 miles of user-developed routes (Ingersoll 2015 p. 8). Due to concerns that these new areas would impact native vegetation, the final decision focused OHV use on parts of MA 10 (C) that were historically open sand (Ingersoll 2015 p. 11), which may have been formerly inhabited by Siuslaw hairy-necked tiger beetles.

Invasive Species Control

The ODNRA management plan directs control of European beachgrass near the mouths of the Siltcoos River, Tenmile Creek, and Tahkenitch Creek (Siuslaw National Forest 1994a chap. 3, p. 16). The plan calls for removal and control of European beachgrass as well as to introduce native plants, with a "more intense" treatment in foredune areas that contain European beachgrass which includes the considered use of "mechanical removal with heavy or farm type equipment" as well as the consideration of deposition of dredge material to control the beachgrass (Siuslaw National Forest 1994a chap. 3, pp. 13–15). The approved Biological Assessment (BA) for ODRC's Dunes Restoration Project includes vegetation treatments within 40 project units that encompass 13,836.2 acres (Burns 2020 p. 11). The Environmental Assessment (EA) for the Dune Restoration project examined the Siuslaw hairy-necked tiger beetle in light of the no action project alternative and concluded:

> "Under the no action alternative there would be no disturbance to habitat but the continued spread of non-native invasive vegetation within beach, foredune, deflation plain and open sand dune areas may further limit suitable habitat available to this species. Therefore, the no action alternative is likely to contribute to a trend towards federal listing or cause a loss of viability to the population or species." (Siuslaw National Forest 2019 p. 24)… "Overall mechanical, manual and herbicide treatments are expected to benefit the species by creating more of the open sand areas with little to no vegetative cover that the species requires." (Siuslaw National Forest 2019 p. 39).

Thus, the Dunes Restoration Plan could, if carried out and successful, reduce and prevent expansion of invasive vegetation like European beachgrass, but the methods could be detrimental to the Siuslaw hairy-necked tiger beetle, as outlined in the threats section.

The ODRC BA examines the impacts of the actions on the endangered Western snowy plover as well as the threatened Pacific marten (*Martes caurina*), which at the time of analysis was a candidate species (Burns 2020 p. 3). Protections provided for the snowy plover and Pacific marten are not protective of the Siuslaw hairy-necked tiger beetle. To avoid disturbance to

snowy plovers, the BA states that mechanical treatments will not occur within 0.25 miles of occupied snowy plover nesting areas from March 15-September 15 (Burns 2020 p. 31); however, this provision does not protect the Siuslaw hairy-necked tiger beetle because both overwintering adults and diapausing or pupating larvae are present in the sand from September 16-March 14. The Pacific marten's habitat consists of forest and dense shrub with a preference for habitat cover of greater than 75% (Burns 2020 pp. 56–57), and so does not overlap with the Siuslaw hairy-necked tiger beetle.

The "Project Design Criteria" (PDC) of the restoration project BA does mention the Siuslaw hairy-necked tiger beetle; first under the "Dunes Fire/Fuels" criteria #404 it says "Avoid piling slash or brush on or near Forest Sensitive invertebrate (Siuslaw hairy-necked tiger beetle, Costal Greenish blue butterfly, Seaside hoary elfin butterfly) habitat" and the second is under "Wildlife PDCs, General" #605 and states "Prior to Project implementation, Forest Sensitive invertebrate (Siuslaw hairy-necked tiger beetle, Coastal greenish blue butterfly, Seaside hoary elfin butterfly) habitat would be delineated and avoided by compaction from vehicles/heavy equipment, trampling, herbicide spray (wiping preferred), or other disturbance, where practical" (Siuslaw National Forest 2019 pp. 11, 39; Burns 2020 pp. 89–90). The first PDC (#404) is mitigation for burning of vegetation, which is not expected to impact the Siuslaw hairy-necked tiger beetle at the level of the mechanical removal, which is not mitigated with this provision. The later PDC does provide some language about avoiding the tiger beetle's habitat, but does not give clear methods or assign an expert to delineating the beetle's habitat and it is unclear if this is a voluntary mitigation mechanism or one that will be enforced by the USFS. Further, the later PDC lists compaction from vehicles and trampling as well as "other disturbance" but does not specifically discuss how the Siuslaw hairy-necked tiger beetle will be protected from mechanical removal and spreading of mass quantities of their soil habitat and how such impacts will be monitored during and after the project is completed.

The project is also likely to increase recreation to the Siuslaw hairy-necked tiger beetle habitat in the ODNRA as the proposed vegetation removal will make open sand habitat "much more visible to the recreating public and may encourage more visitation to these areas. Increased visitor use may result in the increased trampling of adult and larval burrows. Trampling could lead to the decline and extirpation of some local populations," as stated in the project's EA (Siuslaw National Forest 2019 p. 39).

BLM: New River ACEC

The BLM manages the Siuslaw hairy-necked tiger beetle recently occupied sites in the New River ACEC. The ACEC is specially managed to "protect and prevent irreparable damage to important, unique, and significant historic, cultural, and scenic values; fish or wildlife resources; and natural systems or processes; or to protect life and safety from natural hazards" with a goal to "manage habitat for biodiversity (i.e. full range of native species, habitats, and ecological processes) and ecosystem health with special emphasis on sensitive wildlife" and for recreational activities to the extent compatible with that goal (Bureau of Land Management 2004

pp. xiii–xiv, 209). The SRMA plan is also contained in the overall ACEC management plan to ensure recreation is managed with the goals and objectives of the ACEC (Bureau of Land Management 2004 pp. xv–xvi).

The Siuslaw hairy-necked tiger beetle is not mentioned or considered in the latest (2004) final New River ACEC Management Plan (Bureau of Land Management 2004). The BLM has a monitoring and evaluation process to guide recreational use management and monitoring that includes "costal dune habitat, riparian vegetation, river hydro-dynamics, the Western Snowy Plover, coho salmon, western lily, silvery phacelia, and pink sand-verbena;" thus, they did not include monitoring for impacts to the Siuslaw hairy-necked tiger beetle and, except for the Western snowy plover, "these programs are not specifically geared toward identifying the effects of visitor use activities" (Bureau of Land Management 2004 p. 179).

In 2015, a Site Management Plan (SMP) was completed for the Siuslaw hairy-necked tiger beetle within the New River ACEC (Fallon & Jepsen 2015). The SMP states that while overlap with snowy plover habitat likely provides some level of protection, the beetle is more frequently observed on the wet sand adjacent to outflows, whereas snowy plover habitat usually consists of nesting sites in the drier sand areas and foraging areas at the tideline (Fallon & Jepsen 2015 pp. 22–23). The three major SMP goals and their specific management actions are: 1. Maintain open habitat free of invasive vegetation by hand removal that avoids trampling and done during periods of reduced adult and larval activity; 2. Restore native dune habitat by planting native vegetation and keeping vegetative cover low and bare ground high; and 3. Limit vehicle and pedestrian access by avoiding driving OHVs through and allowing camping on occupied tiger beetle habitat and train snowy plover predator control employees to avoid adult and larval tiger beetle areas (Fallon & Jepsen 2015 pp. 23–25). The SMP also includes several research needs and long-term population monitoring (Fallon & Jepsen 2015 pp. 25–28). Thus far, the BLM conducts annual presence/absence surveys of the Siuslaw hairy-necked tiger beetle on the New River ACEC breaches and reported that while some breaches are remaining open, European beach grass has spread on others, but that they have not "used 'cats' on the beach since 2017, and are spot spraying with herbicide to control" the beach grass (Wright 2020). As such, the BLM is partially following the SMP to protect the beetle.

The BLM began the scoping process to update the New River ACEC management plan because the ACEC "has experienced changes in vegetation patterns, invasive species, federally protected species, and recreation use trends" (Bureau of Land Management 2016a p. 1). The issues that would be evaluated under a new environmental assessment would be actions that would potentially or likely impact the Siuslaw hairy-necked tiger beetle and its habitat, including expanding parking, constructing a new building, providing better trail connectivity and accessibility, improving recreational access including hiking, and expanding the approved breach footprint (Bureau of Land Management 2016a p. 1). The plan update was in preparation with scoping in 2016-2017, ongoing analysis in 2019, and an estimated completed decision record in 2020, but it was cancelled and withdrawn (Bureau of Land Management 2017 p. 10, 2019 p. 6,

2020 p. 1). It is unknown if planned activities proceeded without completion of an environmental review and therefore review of any impacts to the Siuslaw hairy-necked tiger beetle.

The BLM Coos Bay District operates under its Resource Management Plan and the final Environmental Impact Statement in 2016 of the BLM RMP lists the Siuslaw hairy-necked tiger beetle as "other wildlife" but under all of the alternatives, including the chosen alternative, it is listed as "no change" to its habitat and so impacts to the beetle are not analyzed further (Bureau of Land Management 2016b p. 1672).

Endangered Species Act

While the beach closures to protect Western snowy plover may prevent some recreational beach use, which would benefit the Siuslaw hairy-necked tiger beetle, that protection is limited due to different habitat preferences, with the plovers using dry sand and the tiger beetles using wet sand. In the New River ACEC, designated dry sand portions of the beach above mean high tide are closed to the public from March 15 through September 15 to protect nesting endangered Western snowy plovers (Bureau of Land Management 2004 p. 173). Similarly, because of concerns for nesting plovers from March 15 through September 15, boaters are asked not to disembark on the west side of the river due to the adjacent dry-sand restricted areas on the foredune (Bureau of Land Management 2004 p. 59). In the ORDNA, there are four beaches designated as plover nesting beaches that restrict certain activities from March 15 to September 15 and also includes the North Umpqua spit area as of 2020, as well as Baker Beach and Sutton area, Siltcoos area, Oregon Dunes Day Use Area, Tahkenitch area, and Ten Mile Creek area (Siuslaw National Forest 2020d pp. 1–3, 2020e map). However, despite closures in the dry sand areas for nesting, the wet, hard-packed sand areas are open to foot traffic. These wet, hard-packed sand areas are frequented by the Siuslaw hairy-necked tiger beetle for oviposition, mating, and foraging and thus they are not specifically protected from recreation by this snowy plover management action. Similar to Oregon, Washington Code (WAC 352-37-030) prohibits OHVs on dry sand areas of the beach where snowy plover nesting occurs, but allows OHV use on the wet, packed sand portion of the beaches (Stinson 2016 p. 8).

Oregon State Regulations

The Siuslaw hairy-necked tiger beetle has been documented near Crooked Creek, China Creek, and Twomile Creek within the Bandon State Natural Area (SNA). The tiger beetle was also documented near Johnson Creek just north of the SNA. These areas are all managed by the OPRD. Bandon SNA allows foot traffic and horseback riding, but no beach camping and from March 15-September 15 only allows dogs, kites, bikes, pedestrians, and horseback riding on wet sand for snowy plover management (Oregon State Parks 2020a pp. 1–2, 2020b). Thus, while the Siuslaw hairy-necked tiger beetles are protected from OHV use in the Bandon SNA, they are impacted by other forms of recreation even during the snowy plover closures due to the opening of wet sand areas.

As a SNA, Bandon is part of the Oregon Natural Areas Plan, which lists the Siuslaw hairy-necked tiger beetle as a "special species" which stems from the ORBIC list of special status species (Kagan et al. 2015 pp. 8–9). As the Siuslaw hairy-necked tiger beetle is an ORBIC species List 1 (threatened or endangered throughout), it is included in the Natural Areas Plan and its "Representation" is listed as Bandon SNA (Kagan et al. 2015 p. 50). The SNAs are designated to "(1) To protect examples of terrestrial and aquatic ecosystems; (2) to serve as gene pool reserves; (3) to serve as benchmarks against which the influences of human activities may be compared; and (4) to provide outdoor laboratories for research and education" (Kagan et al. 2015 p. 13). The management goals for the SNAs include restoration and response to threats, like climate change, regional human population growth, OHVs, grazing, etc. (Kagan et al. 2015 p. 19). Thus, while the methods for accomplishing these goals are vague, there is some potential for it to benefit the Siuslaw hairy-necked tiger beetle, but the plan is not a regulatory mechanism and thus inadequate to prevent the beetle from extinction.

The ODFW does not include the Siuslaw hairy-necked tiger beetle as a strategy species in the Oregon Conservation Strategy (Oregon Department of Fish and Wildlife 2020).

Washington State Regulations

The Siuslaw hairy-necked tiger beetle has recently been found on Midway Beach, which is a mix of private land and Grayland State Park as well as in Copalis Beach, which is part of Griffith-Priday State Park. Both areas are managed by the WSP. Griffith-Priday State Park allows razor clam collecting by permit and foot traffic as well as mountain biking (Washington State Parks 2020a pp. 1–3). Grayland State Park has a marine camping park with camp sites on the ocean front as well as allows clamming and crabbing by permit and foot traffic (Washington State Parks 2020b pp. 1–2). The Washington State Parks and Recreation Commission Strategic Plan for 2021-2031 includes a strategy to "protect ecosystems and habitat for long-term sustainability by improving land assessments and inventories of habitats and species. Work with government agencies, tribes, volunteers and non-profit conservation organizations to enhance the function of ecosystems within the parks" (Washington State Parks 2020c p. 8). While this measure could assist in protecting Siuslaw hairy-necked tiger beetle habitat, it does not specify the tiger beetle or its habitat as needing protection nor does it contain regulatory mechanisms, so it is not adequate to protect the beetle in Washington State Parks.

The overarching management plan for rare species in Washington is the Washington State Wildlife Action Plan (SWAP) meant to "identify actions needed to conserve wildlife and their habitats before species become too rare and restoration efforts too costly" (Washington Department of Fish and Wildlife 2015 pts. 1–1). As a consequence of not having sufficient financial resources to adequately address all of the Species of Greatest Conservation Need (SGCN) and fund their needed conservation actions, the WDFW prioritized species (Washington Department of Fish and Wildlife 2015 pts. 1–5, 1–6). The SWAP lists the Siuslaw hairy-necked tiger beetle as a SGCN but *not* under the Priority Habitats and Species Program (PHS), as such the SWAP shows there is a need for conservation action but does not imply WDFW will

prioritize action (Washington Department of Fish and Wildlife 2015 pts. 3–41, 1–6). Further, the SWAP is only an informational document for land managers and state employees, has no recommended concrete actions, and its use is voluntary. The SWAP does not have the force of law, nor has it resulted in any enforceable laws or regulations regarding habitat designation, take, or even monitoring programs for the Siuslaw hairy-necked tiger beetle.

The ocean beaches are considered 'Shorelines of Statewide Significance' under Washington's Shoreline Management Act (SMA). Preferred uses, in order of priority, are to "recognize and protect the state wide interest over local interest; preserve the natural character of the shoreline; result in long term over short term benefit; protect the resources and ecology of the shoreline; increase public access to publicly owned shoreline areas; and increase recreational opportunities for the public in the shoreline area" (RCW 90.58.020). The SMA establishes a balance of authority between local and state government, with cities and counties as the primary regulators (Stinson 2016 p. 7). Thus, while the SMA could result in some protective measures for the Siuslaw hairy-necked tiger beetle, it does not *per se* provide protection for the subspecies.

Request for critical habitat

We urge the Service to designate critical habitat for the Siuslaw hairy-necked tiger beetle concurrent with its listing. Congress recognized that the protection of habitat is essential to the recovery and/or survival of listed species, stating that: "classifying a species as endangered or threatened is only the first step in ensuring its survival. Of equal or more importance is the determination of the habitat necessary for that species' continued existence… If the protection of endangered and threatened species depends in large measure on the preservation of the species' habitat, then the ultimate effectiveness of the Endangered Species Act will depend on the designation of critical habitat." H. Rep. No. 94-887 at 3 (1976). Critical habitat is an effective and important component of the ESA, without which the Siuslaw hairy-necked tiger beetle's chance for survival significantly diminishes.

Conclusion

In this petition we have reviewed the best scientific and commercial information available regarding the status of and threats faced by Siuslaw hairy-necked tiger beetle. We have determined that the subspecies is only found in one historic area and at very low abundances throughout its range. Specifically, adult Siuslaw hairy-necked tiger beetles were found at 17 (35%) of 49 potential sites and seven of those 17 Oregon sites (~41.2%) are concentrated along at 10.5 mile stretch of the New River ACEC in one of the last remaining wild places along the Oregon coast. The beetles are now thought to be restricted within an 82-mile-long stretch in Lane, Douglas, Coos, and Curry Counties in Oregon primarily in areas with no OHV traffic and little foot traffic and two locations in Washington state. The ESA requires that the Service promptly issue an initial finding as to whether this petition "presents substantial scientific or

commercial information indicating that the petitioned action may be warranted" (16 U.S.C. § 1533(b)(3)(A)).

There is no question that protecting the Siuslaw hairy-necked tiger beetle is warranted under the act as it is imperiled by 1) the present or threatened destruction, modification, or curtailment of its habitat or range; 4) the inadequacy of existing regulatory mechanisms; and 5) other natural or manmade factors affecting its continued existence. Its threats include loss of habitat, recreation and OHV use, climate change and sea level rise, inbreeding depression, invasive species and harmful management practices. There are no existing regulatory mechanisms which are adequate to protect the Siuslaw hairy-necked tiger beetle and in fact many meant to protect or restore its habitat could be detrimental without ESA protection. The Service must act promptly to protect this subspecies and to designate critical habitat in order to prevent its extinction and reverse its precipitous decline in range and habitat.

Please contact us at the numbers and email addresses below if you have any questions or need any clarification on the information in this petition.

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