SPECIES FACT SHEET

Scientific Name: *Gomphus kurilis* (Hagen in Selys 1858)
Common Name: Pacific Clubtail
Phylum: Arthropoda
Class: Insecta
Order: Odonata
Suborder: Anisoptera
Family: Gomphidae (clubtails)

Conservation Status:
Global Status (1990): G4
Rounded Global Status: G4 – Apparently Secure
National Status (United States): N4
State Statuses: California (SNR), Nevada (SNR), **Oregon (S4)**, Idaho (not ranked). In **Washington** it is ranked as **S1**: Critically imperiled because of extreme rarity or because it is somehow especially vulnerable to extinction or extirpation.
(NatureServe 2008, Paulson 2007a).

Technical Description:
Adult: A medium-sized (45-50 mm; 1.8-2 in.) dragonfly in the family Gomphidae. Adults in this family are characterized by having separated eyes and the last segments of the abdomen usually enlarged. This species has a green face, blue eyes, black legs, and black abdomen with yellow on the dorsal (top) surface of each segment, and large, yellow spots on the underside of abdominal segments 8 and 9 (Gordon and Kerst 2005). The presence of conspicuous pale markings on the sides of the thorax that are wider than the dark stripes in between is diagnostic of this species. Also, the dark stripe under the hindwing base is much narrower than the dark stripe at the base of the forewing (Paulson 2007a).

Immature: *Gomphus* larvae can be identified as follows: prementum and palpal lobes flat (as opposed to cup-shaped), wing pads parallel, antennae with 4 segments, the third of which is cylindrical and elongate (as opposed to flat and short), abdominal segment 8 with anterolateral sclerites, and sternum of last abdominal segment usually wider than long (Tennessen 2007). Species identification is difficult for a non-expert.

Life History:
Adults fly during mid-summer; Washington specimens (adults) have been collected between 4 June and 12 August (Paulson 2007b). The flight period of a single adult is relatively short - one week to perhaps more than a month. Species overwinter as larvae. Depending on conditions,

individuals probably spend more than one winter as larvae. Larvae feed on aquatic animals, including invertebrates and possibly small vertebrates. Adults feed on flying insects. NatureServe (2008) designates sightings more than 3 kilometers (1.9 miles) apart as separate populations, but little is known about their dispersal and colonization ability. This species is a strong flier and may be a good colonist, able to reach sites several kilometers apart. Upon emergence from the larval stage, young adults (tenerals) may wander for a time before returning to their larval site or another suitable area to mate. Some adults will usually be present at locations where the species reproduces.

Range, Distribution, and Abundance:

Range-wide: Records are on the west side of the Cascades from the Seattle area of Washington, south through western Oregon and through the northern half of California. More common in Oregon and California than in Washington.

Washington: Two populations are known: east side of Black Lake, Thurston Co., and south side of Ice House Lake, Skamania Co., although confirmation of this species' current status at Black Lake is needed (Paulson 2008, *pers. comm.*). There are historical records (one from 1933, one undated) from Lake Washington in the Seattle area, King Co. (Paulson 2007b), but sporadic surveys of Lake Washington in recent years have not found this species (Paulson 2008, *pers. comm.*).

Oregon: Relatively common in central and southern Oregon (Paulson 2008, pers. comm.), occurring north to the central Willamette Valley (Johnson and Valley 2005) at sites from sea-level to 1463 m (4800 ft). Particularly abundant at streams in the Western Interior Valleys (between the Cascade Range and the coast), and also has a stronghold at the Klamath Basin in the Eastern Cascades (Johnson and Valley 2005). It is common on the South Umpqua River, in the Illinois River valley and on the lower Sprague and Klamath Rivers just north of the California border (Johnson 2008, pers. comm.). There are no records in northern Oregon, a few records in Linn Co. (Gordon and Kerst 2005), and the species is relatively common south of Benton, Linn, and Deschutes Counties. It is fairly common in the southern Willamette Valley in Lane County, and has been seen near the mainstem of the Willamette River in Alton Baker Park (in Eugene) and the Coast Fork at Mt. Pisgah (southeast of Eugene). It has also been found in ponds within one mile of the Willamette River (Gordon and Kerst 2005). Outside of these areas, the species is found very locally, such as at Freeway Lakes, Linn Co. (the northernmost location in Oregon), Little Cultus Lake in the central Cascades, and a couple spots on the southern coast (Johnson, 2008 pers. comm.). The species is suspected to occur on the Rogue River and

the North Fork and mainstem of the Umpqua River, although currently there are no records from those streams, possibly due to lack of survey attention during the species' flight period (Johnson, 2008, *pers. comm.*). The species has not been encountered at Crater Lake National Park, despite ongoing survey work since 2004 (Lyons, 2008, *pers. comm.*).

Forest Service/BLM lands (Washington): No sites are known from National Forests or other federal land in WA, but the Ice House Lake population is in the near vicinity of Mt. Hood and Gifford Pinchot National Forests. The Black Lake population is also in the vicinity of Gifford Pinchot land (Cowlitz Ranger District).
(Oregon): Relatively large number of populations in central and southern Oregon on both BLM and FS land.

Abundance estimates of this species are not known.

Habitat Associations:
In Washington, this species is found at lentic sites, including ponds, lakes, and slow streams. The habitat range in Oregon is wider, including sand-bottomed lakes, rock-bottomed lakes, muddy ponds, large, swift rivers, slow, eutrophic rivers, slow streams. This species can apparently tolerate some degree of habitat degredation, including agricultural and livestock run-off and associated algal blooms (Johnson and Valley 2005, Johnson 2008, *pers. comm.*). Larvae burrow in mud or sand and ambush prey. Adults bask on the ground near water and on vegetation or on the ground if away from water (Valley 2005). Population sites in Washington are below 50 meters (164 ft.) elevation, with the exception of the King Co. record, which was at 610 m (2000 ft.). Sites in Oregon range up to 1463 m (4800 ft.).

Threats:
Although Oregon supports a fairly large number of population sites for this species, there are few and possibly declining numbers of sites in Washington, and it is unclear if population sizes in either state are also declining.

Habitat disturbance and degradation are the main threats to this species. The larvae of this species require fine substrate for normal burrowing behavior. Road construction, building construction, and logging-related activities in the watershed degrade aquatic substrate through increased erosion and sediment delivery (Rothrock *et al.* 1998). The loss of trees through timber harvest poses additional threats, since trees provide (1) shade that maintains lower water temperatures for larvae and (2) foraging and nighttime roosting areas for adults (Packauskas 2005).

Locally, watershed cattle grazing and agricultural pollution pose additional threats to this species. Grazing by livestock not only reduces the amount of vegetation available for perching and emerging, but also has deleterious impacts on water quality, including increases in nutrient levels due to introduction of livestock waste material into waters, and increases in temperature, sediment, and turbidity due to trampling and bank alteration (Agouridis *et al.* 2005, Mazzacano and Black 2008). Although this species has been found in agriculturally polluted habitat, insecticides, herbicides, and other contaminants carried in agricultural run-off and wind drift may have serious consequences for the reproductive potential and long-term survival of this species. Organic pollution and toxic chemicals have been recognized as a threat to members of this family (Paulson 2008, *pers. comm.*).

Global climate change may further threaten the long-term survival of this species. Projected changes in this region include increased frequency and severity of seasonal flooding and droughts, reduced snowpack to feed river flow, increased siltation, and increased air and water temperatures (Field *et al.* 2007), all of which could impact this species' habitat unfavorably. Moreover, since many aspects of odonate survival (e.g. development, phenology, immune function, pigmentation, and behavior) are sensitive to changes in temperature, global climate change is predicted to have serious consequences on this taxon (Hassall and Thompson 2008).

It is not known if disease and predation are serious threats to this species, but stocking of non-native fish species for commercial or recreational purposes could negatively impact population survival, since the larvae may not be adapted to co-exist with such predators.

Conservation Considerations:

Inventory: This species is known widely throughout western Oregon and probably does not require further immediate sampling in the state (Paulson 2008, *pers. comm.*). It is rare in Washington, being known from only a few slow-water breeding sites. The broader habitat use in Oregon, including large, swift rivers and streams, suggests that the species may have a wider distribution in Washington than is currently documented. Additional survey work, particularly at the varied aquatic habitats around and between the existing Washington sites, may reveal more Washington populations. Future surveys should also focus on establishing the status of this species at known and historic Washington sites. The last known record of this species in Lake Washington (Seattle area) was in 1933. Dr. Paulson has looked unsuccessfully for this species in Lake Washington, but considering the very large size of the lake and

the brief flight season of this species, its presence could have easily gone unnoticed (Paulson 2008, *pers. comm.*). The last record of this species from Black Lake (Thurston Co.) was in 2000, and the site has not been surveyed since. Ice House Lake (Skamania Co.) appears to have a current population of this species, although its stability at the site is unknown. The species wasn't encountered when the site was revisited in the summer of 2003 (Paulson 2008, *pers. comm.*), but one individual was documented in 2007 (Johnson 2008, *pers. comm.*). Re-evaluation of this species' status at these sites is critical to identifying both its current distribution and its conservation needs. Abundance estimates for this species at new and recorded sites would also assist future conservation efforts, since population size is important in evaluating the stability of a species at a given locality.

Management: Protect all known sites and their associated watersheds from practices that would adversely affect any aspect of the odonate life-cycle. Since the largest proportion of an odonate's life is spent as an aquatic larva, protecting the larval stage is most critical for the species' success (Packauskas 2005). Maintain water quality and water levels at known sites and in other potential habitat in Washington. Focus fish management on retention of the native species with which the insect community is adapted to co-exist; avoid or minimize stocking of non-native species. Adaptive land management practices, such as conserving and restoring riparian buffers around known aquatic habitats and fencing to exclude livestock, may help protect this species from the impacts of grazing and agriculture (Packauskas 2005).

Version 2:
Prepared by: Sarah Foltz
Xerces Society for Invertebrate Conservation
Date: October 2008

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Xerces Society for Invertebrate Conservation
Date: October 2008

Version 1:
Prepared by: John Fleckenstein
Natural Heritage Program
Washington Department of Natural Resources
Date: January 2006

Edited by: Rob Huff
Conservation Planning Coordinator
FS/BLM-Portland

Date: June 2007

ATTACHMENTS:

(1) References
(2) List of pertinent or knowledgeable contacts
(3) Maps of Global Range/Conservation Status and Oregon/Washington Distribution
(4) Photographs of Adult (lateral and dorsal view), Emerging Adult, and Larva (dorsal view)
(5) Odonata (Anisoptera) Survey Protocol, including specifics for this species

ATTACHMENT 1: References:

Abbott, J.C. 2007. "*Gomphus kurilis* records." OdonataCentral: An online resource for the distribution and identification of Odonata. *Texas Natural Science Center, The University of Texas at Austin* 3 Oct. 2008 < http://www.odonatacentral.org.>.

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Paulson, D. 2007a. "Washington Odonata." *Slater Museum of Natural History.* Oct. 2007. University of Pugut Sound. 6 Oct. 2008 <http://www.ups.edu/x7041.xml>.

Paulson, D. 2007b. "Field Key to Adult Washington Dragonflies (Odonata)." *Slater Museum of Natural History.* Jan. 2007. University of Pugut Sound. 2 Oct. 2008 <http://www.ups.edu/x6518.xml>.

Paulson, Dennis. 2008. Personal communication: E-mail exchange with Sarah Foltz regarding Pacific Northwest odonates.

Rothrock, J. A., Barten P. K., and Ingman, G. L. 1998. Land use and aquatic biointegrity in the Blackfoot River watershed, Montana. Journal of the American Water Resources Association 34 (3): 565-581.

Tennessen, K. 2007. Odonata Larvae of the Pacific Northwest: An Identification Manual. Created for use in a taxonomic workshop sponsored by the Xerces Society and held at Evergreen State College, Olympia, Washington, March 16-18, 2007.

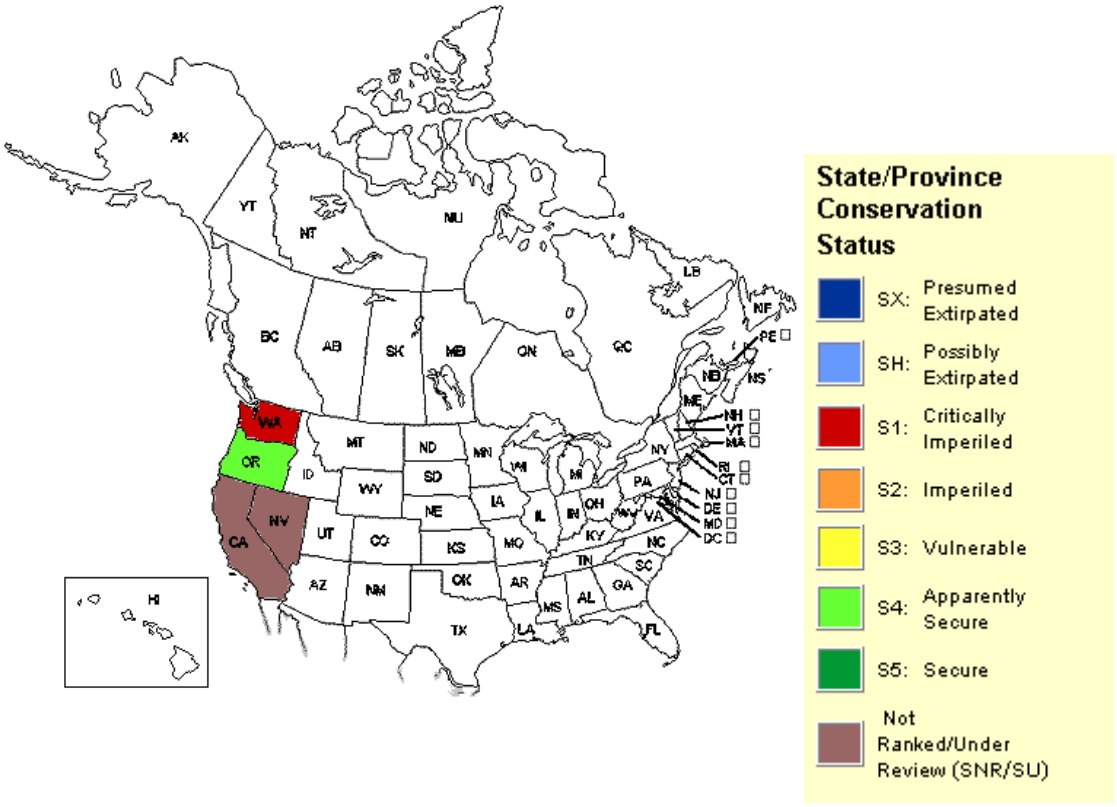
Valley, Steve. 2005. E-mail exchange with John Fleckenstein regarding odonates.

ATTACHMENT 2: List of pertinent, knowledgeable contacts:

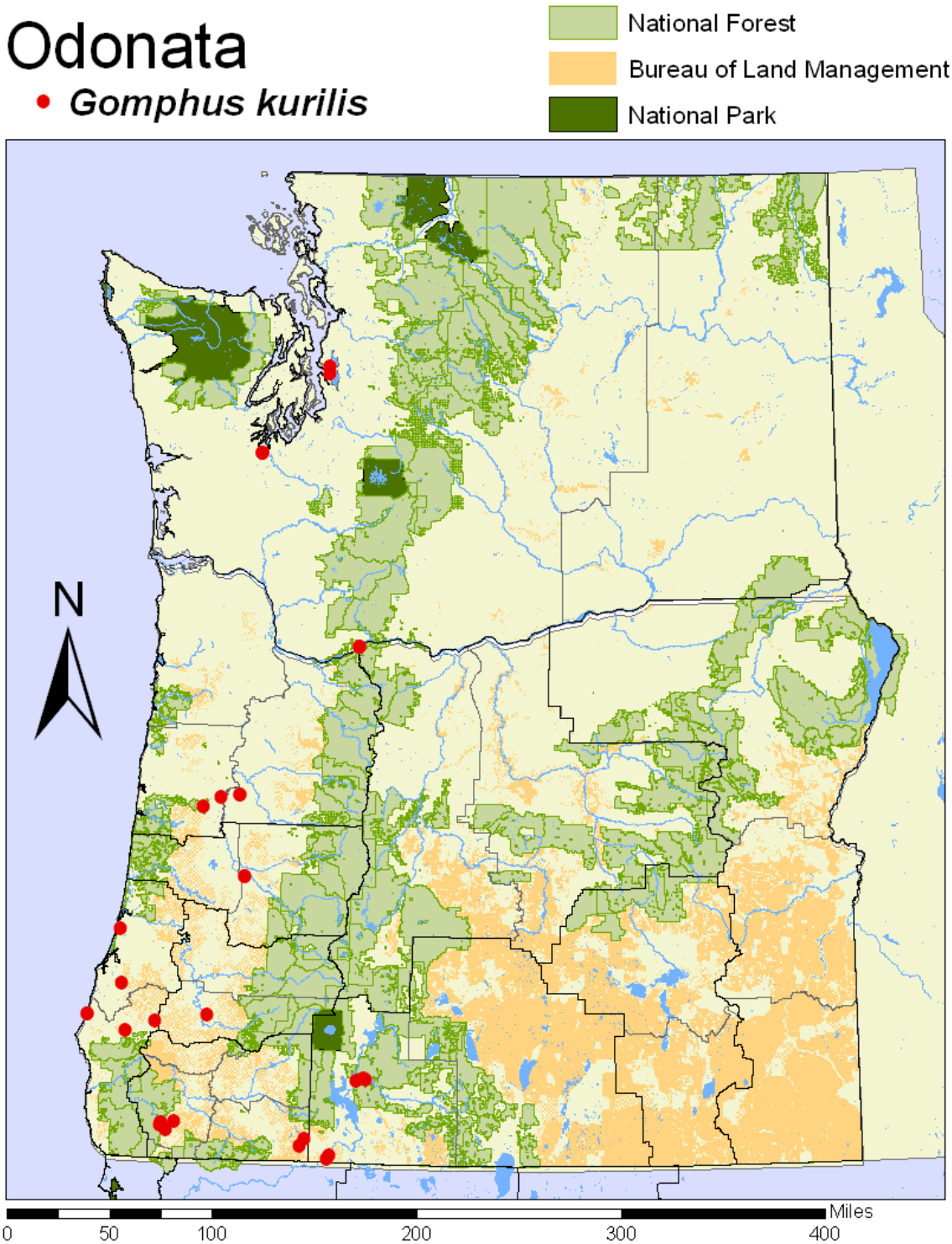
Dennis Paulson
Steve Valley
Ken Tennessen
John Abbott

Jim Johnson

ATTACHMENT 3: Maps of Global Range/Conservation Status and Oregon/Washington Distribution:



Gomphus kurilis North American State/Province Distribution and Conservation Status. Map by NatureServe 2008. NOTE: This species also occurs in Idaho (Valley Co.) although not yet ranked by NatureServe or shown in this map.



Records of *Gomphus kurilis* in Washington and Oregon, relative to USFS and BLM lands. BLM District boundaries are shown in black, and Resource Area boundaries are shown in grey.

ATTACHMENT 4: Photographs of Adult (dorsal and lateral views) and larva (dorsal view):

Gomphus kurilis adult male, dorsal view. Females are nearly identical in coloration. Photograph (digital scan in life) by Dennis Paulson.

Gomphus kurilis adult male, lateral view. Females are nearly identical in coloration. Photograph (digital scan in life) by Dennis Paulson.

Congeneric *Gomphus exilis* larva. No photo-documentation available for *G.kurilis* larva. Photograph by Giff Beaton.

ATTACHMENT 5: Odonata (Anisoptera) Survey Protocol, including specifics for this species:

Survey Protocol

Taxonomic group:
Odonata

Species:
Gomphus kurilis

Where:
Adult odonates can be found feeding in range of terrestrial habitats, but are most effectively sampled at the aquatic habitat where they mate and oviposit. Ponds, streams, rivers, lake shores, marshes, bogs, and fens support a range of odonate diversity. Some species (e.g. *Gomphus kurilis*) frequent a variety of habitats, while others (e.g. *Leucorrhinia borealis*) have highly specific preferences with regard to substrate, vegetation, and water quality. For species-specific habitat information, see the section at the end of this protocol.

When:
Adults are surveyed in summer, during the often-short window of their documented flight period. Adult odonates are most active in warm temperatures, and usually begin to fly at the aquatic habitat with the morning sun. Depending on the species, males arrive as early as 9 am and leave as late as 6 pm. Females tend to arrive several hours later, after the males have established their mating territories (Campanella 1975). In the high temperatures of the late afternoon, some species seek shade in trees and vegetation.

Although larvae are present all summer, it is preferable to sample later in the season (i.e. just prior to and during the early part of adult emergence), when a higher proportion of the more easily identified late larval instars will be found.

Adult Surveys:
Use a long-handled, open-mesh aerial net, light enough to be swung rapidly. Triplehorn and Johnson (2005) recommend a 300-380 mm diameter net with a handle at least 1 m long.

Approach the site quietly, observing the environment and natural behaviors occurring prior to sampling. Note the number of different species present, and what their flight patterns are. This will help in predicting the movement of target species, and in evaluating whether the site has been surveyed "exhaustively" (i.e. all species observed at the site have been collected or photodocumented). Since dragonflies are wary of humans and readily leave an area when disturbed, it is important to be as discreet in your movements as possible, at all times.

Watch vegetation, logs, tree-trunks, and large, flat rocks for perched individuals, particularly those in the Gomphidae and Libellulidae families. Since dragonflies are powerful fliers and notoriously challenging to catch, try to quietly photo-document specimens prior to attempting to capture. Use a camera with good zoom or macrolens, and focus on the aspects of the body that are the most critical to species determination (i.e. dorsum of abdomen, abdominal terminalia (genitalia), pleural thoracic markings, wing markings, eyes and face). For helpful tips, see the article "Photographing Dragonflies" (Nikula 1997) available at: http://www.odenews.org/PhotoArticle.htm (last accessed: 25 Oct. 2008).

When stalking perched individuals, approach slowly from behind, covering your legs and feet with vegetation, if possible (dragonflies see movement below them better than movement at their level). When chasing, swing from behind, and be prepared to pursue the insect. A good method is to stand to the side of a dragonfly's flight path, and swing

out as it passes. After capture, quickly flip the top of the net bag over to close the mouth and prevent the insect from escaping. Once netted, most insects tend to fly upward, so hold the mouth of the net downward and reach in from below when retrieving the specimen. Collected specimens should be placed on ice in a cooler long enough to slow their movement (a few minutes), and then set on a log or stone and comprehensively photographed until the subject starts to stir. Specimens to be preserved should be placed alive, wings folded together, in glassine or paper envelopes, as they lose color rapidly once killed. Record the eye color and locality/collection data on the envelope, including longitude and latitude if possible.

Acetone, which helps retain bright colors, is recommended for killing odonates. Glassine envelopes with the lower corner clipped and the specimen inside should be soaked in acetone for 24 hours (2 to 4 hours for damselflies) and then removed, drained, and air-dried. The resulting specimens are extremely brittle, and can be stored in envelopes, pinned with wings spread, or pinned sideways to conserve space. Mating pairs in tandem or copula should be indicated and stored together, if possible. Collection labels should include the following information: date, time of day, collector, detailed locality (including water-body, geographical coordinates, mileage from named location, elevation, etc.), and detailed habitat/behavior (e.g. “perched on log near sandy lake shore”). Complete determination labels include the species name, sex (if known), determiner name, and date determined.

Relative abundance surveys can be achieved by timed watches at designated stations around a site. We recommend between 5 and 10 stations per site, each covering one square meter of habitat, and each monitored for 10 to 15 minutes. Stations should be selected in areas with the highest odonate usage, and spread out as evenly as possible throughout the site. During and one minute prior to the monitoring period, observers should remain very still, moving only their eyes and writing hand. Recorded information should include start and end times, weather, species, sex, and behavior (e.g. male-male interaction, pair in tandem). Observations occurring near, but outside of, the designated station should be included but noted as such.

Catch and marked-release methods can help evaluate population sizes, species life-span, and migration between sites. This strategy (most appropriate if several sites are being surveyed repeatedly throughout a season) involves gently numbering the wing with a fine-tip permanent marker before release.

Larval Surveys:

When surveying for larvae, wear waders, and use care to avoid disrupting the stream banks, vegetation, and habitat. Depending on the habitat, a variety of nets can be useful. D-frame nets are the most versatile, as they can be used in both lotic and lentic habitats. Kick-nets are only useful when sampling stream riffles, and small aquarium nets are most effective in small pools. If desired, relative abundance between sites or years can be estimated by standardizing sampling area or sampling time. When the use of a D-frame net is not feasible (e.g. in areas that have very dense vegetation, little standing water, and/or deep sediment), an alternative sampling device, such as a stovepipe sampler, can be used. This cylindrical enclosure trap (~34 cm in diameter and 60 cm in height) is quickly forced down through the water/vegetation and firmly positioned in the bottom substrate. Material and organisms are then removed by hand using small dip nets (Turner and Trexler 1997).

Net contents are usually dumped or rinsed into shallow white trays to search for larvae more easily, as they are quite cryptic and can be difficult to see if they are not moving. White ice-cube trays may also aid in field sorting. Voucher collection should be limited to late instar larvae, which can be most readily identified. If necessary, early instars can be reared to later stages or adulthood in screened buckets/aquaria with tall grasses added for emergence material. However, since the rearing process often takes many trials to perfect, it is only recommended if knowledge of species' presence-absence status at a particular site is critical, and few-to-no late instars or adults are found.

Voucher specimens can be either (1) preserved on-site in sample vials filled with 80% ethanol, or (2) brought back from the field in wet moss/paper-towels, killed in boiling water, cooled to room temperature, and transferred to 80% ethanol. Although the latter method is more time intensive, it is recommended for maximum preservation of internal anatomy (Triplehorn and Johnson 2005). Live specimens should be separated by size during sorting to reduce cannibalism/predation.

Although easily overlooked, larval exuviae left on rocks, sticks, or vegetation on which the adult emerged are valuable for species documentation. These cast-off exoskeletons of the final larval instar can be identified to species using larval traits, and offer a unique, conservation-sensitive sampling method for odonates (Foster and Soluk 2004). Since exuviae indicate the presence of successful breeding populations at a particular locale, their habitat data can be very informative, and should be documented with as much care as that of larvae and adults.

Species-specific survey details:

Gomphus kurilis

Inventory: This species is known widely throughout western Oregon and probably does not require further immediate sampling in the state (Paulson 2008, *pers. comm.*). It is rare in Washington, known from only a few slow-water breeding sites. The broader habitat use in Oregon, including large, swift rivers and streams, suggests that the species may have a wider distribution in Washington than is currently documented. Additional survey work, particularly at the varied aquatic habitats around and between the existing Washington sites, may reveal more Washington populations. Future surveys should also focus on establishing the status of this species at known and historic Washington sites. The last known record of this species in Lake Washington (Seattle area) was in 1933. Dr. Paulson has looked for this species in Lake Washington with no luck, but considering the very large size of the lake and the brief flight season of this species, its presence could have easily gone unnoticed (Paulson 2008, *pers. comm.*). The last record of this species from Black Lake (Thurston Co.) was in 2000, and the site has not been surveyed since. Ice House Lake (Skamania Co.) appears to have a current population of this species, although its stability at the site is unknown. The species wasn't encountered when the site was revisited in the summer of 2003 (Paulson 2008, *pers. comm.*), but one individual was documented in 2007 (Johnson 2008, *pers. comm.*). Re-evaluation of this species' status at these sites is critical to identifying both its current distribution and its conservation needs. Abundance estimates for this species at new and known sites would also assist future conservation efforts, since population size is important in evaluating the stability of a species at a given locality.

Sites should be surveyed midday, between June and August, and approached quietly in search of perched adults. Members of this family are frequently found sitting in the open on sandy beaches, stones, or shoreline leaves, but tend to be quite skittish and, when disturbed, rarely return to the same perch (Nikula 1997). This species commonly basks on the ground, both near and away from water, and on vegetation near water (Valley 2005).

While researchers are visiting sites and collecting adults and exuviae, detailed habitat data should also be acquired, including substrate type, water source, water velocity, and presence/use of canopy cover (Packauskas 2007).

References (Survey Protocol Only):

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Packauskas, R.J. "Hudsonian Emerald Dragonfly (*Somatochlora hudsonica*): a technical conservation assessment." 24 Aug. 2007. *USDA Forest Service, Rocky Mountain Region.* 16 Oct. 2008 <http://www.fs.fed.us/r2/projects/scp/assessments/hudsonianemeralddragonfly.pdf >

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Triplehorn, C. and N. Johnson. 2005. Introduction to the Study of Insects. Thomson Brooks/Cole, Belmont, CA. 864pp.

Turner, A.M. and J.C. Trexler. 1997. Sampling Aquatic Invertebrates from Marshes: Evaluating the Options. Journal of the North American Benthological Society 16(3): 694-709.

Valley, S. 2005. Personal communication. E-mail exchange with John Fleckenstein regarding odonates.