May 24, 2016

Mr. Bob Anderson, Chair
Lessard-Sams Outdoor Heritage Council
100 Rev. Dr. Martin Luther King Jr. Blvd.
State Office Building, Room 95
St. Paul, Minnesota 55155

Dear Chair Anderson:

We would like to thank the Lessard-Sams Outdoor Heritage Council (LSOHC) for its interest and initiative toward understanding outcomes of the Outdoor Heritage Fund (OHF). Specifically, we're referring to your inclusion of a new question on the ML2017 Call for Requests: *"Identify indicator species and associated quantities this habitat will typically support."* We agree with your desire to understand OHF outcomes in measures beyond acres and dollars; and we want to share with you how we, and many other partners, answered this question, along with the challenges and concerns in addressing it.

To approach this year's question, Department of Natural Resources (DNR) staff with expertise in prairie, forest, wetland, and aquatic habitat worked to identify key species and metrics that can be used to answer your question by DNR, Board of Water and Soil Resources (BWSR), many of our partners, and any other organization that would like to use them. The metrics are derived from existing data sources and/or scientific literature, but are necessarily gross averages. It is important to emphasize that the estimates provided are not accurate at a site-specific scale. Therefore, they are not intended to be used to score or rank requests, but represent the best information we have for immediate support to the Council's objective.

As you know, fish and wildlife experts have long sought to quantify how much a species will be benefitted by a particular management strategy on a prescribed land area. Additionally, there are a myriad of factors other than habitat, such as predation and weather, which have significant influences on fish and wildlife populations. Despite the challenges of measuring, estimating and projecting outcomes, we remain interested in jointly developing an approach that collectively assesses the completed and ongoing outcomes of the OHF consistent with the prescribed Constitutional purposes.

We have discussed this challenge with many of our conservation partners, including: Ducks Unlimited, Minnesota Valley Trust, Minnesota Deer Hunters Association, Great River Greening, Minnesota Land Trust, The Mississippi River Headwaters Board, The Nature Conservancy, Pheasants Forever, Minnesota Trout Unlimited, Audubon Minnesota, American Bird Conservancy, Fox Lake Conservation League, and other organizations. We all plan to use the same basis to answer the Call for Requests' question, and we are all in agreement about the approach for this year and the complexity embedded in this particular question. On behalf of the many conservation partners required to successfully accomplish OHF objectives, we are all committed to working with the Council to develop a consistent, adaptive, long-
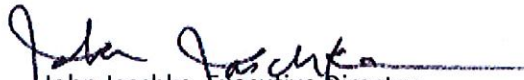
term solution towards measuring constitutional outcomes of restoring, protecting, and enhancing prairies, forests, wetlands, and aquatic and other habitats.

We look forward to beginning that conversation. As always, thanks for the important and enduring work you do for the benefit of Minnesota's landscapes and citizens.

Sincerely,

Tom Landwehr, Commissioner
Department of Natural Resources

John Jaschke, Executive Director
Board of Soil and Water Resources

c: Mark Johnson, LSOHC Executive Director

LSOHC FY2018 Call for Requests Question: Identify indicator species and associated quantities this habitat will typically support (250 words):

DNR staff, in consultation with a variety of experts in NGOs and other agencies, have compiled a select group of indicator species and associated quantities to be used by any applicant to answer the question above. The metrics are derived from existing data sources and/or scientific literature, but are necessarily gross averages. It is important to emphasize that the estimates provided are not accurate at a site-specific scale. Therefore, they are not intended to be used to score or rank requests, but represent the best information we have for immediate support to the Council's objective. Species are organized by habitat type. Language has been written to be used directly in applications, if the applicant wishes.

Forests

In response to the 2016 LSOHC proposal request for examples of indicator species associated with forest protection, restoration, or enhancement projects, three species have been temporarily identified to represent various forest habitats: Ovenbird, Golden-winged Warbler, and white-tailed deer. Depending on the habitat, a project may want to list one or more of the species; each account is less than 250 words. By using just the bolded language, all three species may be incorporated where necessary. Note that density values are simply averages and will vary spatially and temporally.

Ovenbird

Ovenbirds (*Seiurus aurocapilla*) are found in upland forests statewide; typically in relatively mature forest but can also be found in younger forests. Deciduous, mixed coniferous-deciduous, and coniferous forests may be suitable. Ovenbirds nest on the ground in leaf litter. This species has been identified as a priority species to monitor, as an indication of the health of mature forest uplands, within the area represented by the LSOHC Northern Forest planning section[1]. **While territories vary in size and may overlap[2], an average of 10 pairs for every 10 hectares may be translated to roughly 16 pairs for every 40 acres.**

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[1] Pfannmuller, L. A. (2014*). Blueprint for Minnesota Bid Conservation.* Audubon Minnesota. St. Paul, MN. Retrieved from:
http://mn.audubon.org/sites/g/files/amh601/f/boreal_hardwood_transition_minnesota_conservation_plan_10-22-2014.pdf

[2] Porneluzi, Paul, M. A. Van Horn and T.M. Donovan. 2011. Ovenbird (*Seiurus aurocapilla*), *The Birds of North America Online* (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu.ezp2.lib.umn.edu/bna/species/088

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Golden-winged Warblers

Suggested by the USFWS as a species representative of shrubland systems in the Upper Midwest[3], Golden-winged Warblers (*Vermivora chrysoptera*) are also recognized as a Minnesota Species in Greatest Conservation Need (stewardship species) due to the relatively large percentage of the global population that breeds within the state. **Often associated with shrubland habitat and regenerating forests, more current research indicates a variety of forest habitats are required by Golden-winged Warblers (a matrix of shrubby wetlands and uplands, regenerating forests, and mature forests)[2]**. The range map for the Golden-winged Warbler in Minnesota covers a good portion of the LSOHC Northern Forest planning section. **While territories vary in size, an average of 4 pairs for every 10 hectares[4,5] may be translated to roughly 6 pairs for every 40 acres**.

White-tailed deer

White-tailed deer (*Odocoileus virginianus*) use a wide variety of forested habitats, are found throughout Minnesota, and are an important game species in the state. Deer have also been suggested as potential ecological indicators for forest systems[6]. **In the 33 forested deer permit areas for which deer densities are estimated, covering most of the LSOHC Northern Forest section, the six-year average (2010-2015) for pre-fawn deer densities across all deer permit areas is 13 deer per square mile of land (excluding water)[7]. This translates to 0.02 deer (pre-fawning) per acre of forest land habitat or roughly 1 deer (pre-fawning) for every 50 acres of land**. On average, densities within the Forest/Prairie Transition, Metropolitan Area, and Southeast Forest LSOHC planning sections will be higher than those in the Northern Forest. Note that pre-fawn estimates provide an indication of deer numbers when they are at their seasonal low (spring).

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[3] U.S. Fish and Wildlife Service. 2014. *Selecting surrogate species for Strategic Habitat Conservation in the Upper Midwest Great Lakes geography.* Bloomington, MN: Powers, N., Brouder, M., Blomquist, S., Potter, B., Dingledine, J., Deloria, C., Soulliere, G., Kerr, T., Steiger-Meister, K.

[4] Confer, John L., Patricia Hartman and Amber Roth. 2011. Golden-winged Warbler (*Vermivora chrysoptera*), *The Birds of North America Online* (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu.ezp2.lib.umn.edu/bna/species/020

[5] http://www.nrri.umn.edu/mnbirds/accounts.htm

[6] Hanley, T.A. (1996). Potential role of deer (Cervidae) as ecological indicators of forest management. *Forest Ecology and Management, 88,* 199-204.

[7] D'Angelo, G. J., & Giudice, J. H. (2015). Monitoring Population Trends of White-tailed Deer in Minnesota. *In: Status of Wildlife Populations,* Minnesota DNR. St. Paul, MN

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Prairies and Grasslands

In response to the 2016 LSOHC proposal request for examples of indicator species associated with forest protection, restoration, or enhancement projects, four species have been temporarily identified to represent various prairie/grassland habitats: pheasant, prairie chicken, bobolink, grasshopper sparrow, and monarch butterfly.

Pheasant

By looking at the ratios of CRP acres in Minnesota to pheasant harvest, we can estimate that every three acres of grassland habitat has the potential to produce one harvested pheasant rooster.

Prairie Chickens

According to the research literature and personal observations in Minnesota, prairie chickens require a minimum of 320 acres of high quality grasslands with no areas hostile to grassland wildlife (woodlots, farmsteads, etc) near these grasslands. For every 320 acre patch of high quality grassland in the prairie chicken range in the northwest part of the state, we can expect there to be a lek, or booming ground. The average size of booming grounds in Minnesota is roughly 11 males.

Bobolink and Grasshopper Sparrow

The breeding territory size of bobolinks and grasshopper sparrows is 1.7 and 2.1 acres respectively in high quality habitat in Wisconsin. If all of the habitat was occupied, a 100 acres of habitat could potentially hold approximately 60 and 48 pairs of bobolinks and grasshopper sparrows respectively.

Monarch Butterfly

Research from the University of Minnesota has shown that it takes approximately 30 milkweed result in one monarch butterfly contributing to the overwintering Mexican population. Grasslands can have between 100-250 milkweed stems per acre. An acre of restored or enhanced grassland could potentially contribute 3 to 8 monarchs to the population.

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Wetlands and Shallow Lakes

In response to the 2016 LSOHC proposal request for examples of indicator species associated with forest protection, restoration, or enhancement projects, two species have been temporarily identified to represent various wetland/shallow lake habitats: mallards and trumpeter swans.

Mallards

A commonly used indicator species for numerous waterfowl plans due to (1) extensive research that has occurred with this species on many aspects of its life history, habitat requirement and response to management, and (2) the fact that it is representative of the "typical" upland nesting duck. Both Joint Venture waterfowl plans that cover Minnesota – the Prairie Pothole Joint Venture and the Upper Mississippi River and Great Lakes Region Joint Venture (UMRGLRJV) – use the mallard as a focal species. The biological model used in the UMRGLRJV to estimate habitat needs to support mallard population growth uses a simple but accepted rate of 1 mallard pair per hectare (1 mallard pair per 2.47 acres) of wetland habitat (noting that upland habitat for nesting is also obviously needed).

Trumpeter swans

Trumpeter swans are a readily recognizable feature on wetlands and their restoration is a modern wildlife management success story. Trumpeter swans are strictly territorial on their breeding areas with shoreline complexity and food availability being factors in defining the area being defended. Though reported territories can range in size from 1.5 - >100 hectares, a reasonable expectation is that 1 trumpeter swan pair would be supported by each 150 acres of wetlands protected, restored, or enhanced.

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Aquatic Species

The information below is intended to be used to help answer the indicator species quantities question under the Narrative tab of the ML2017 LSOHC proposal form. MN DNR has identified abundance values for common indicator species that could be used for various aquatic habitats. We have drafted a common narrative that all proposals can use, along with a table of habitat specific numbers for potential indicator species. Depending on the locations of proposed projects, you may only use a subset of the potential species. Project managers should feel free to use only a subset of the table.

Common narrative:

The table below provides general averages for potential aquatic indicator species in Minnesota. These averages are generated from available data and published sources, and do not capture the variability inherent in populations of fish and mussels. Natural populations, including healthy populations with good habitat, vary among locations, and also rise and fall within lakes and rivers. Most fish surveys conducted by DNR produce an index of abundance (catch per unit effort) rather than a population estimate.

Aquatic system	Indicator	Ave number or biomass	Other criteria
Trout stream-SE	Brook trout Brown trout	100 lbs/acre 130 lbs/acre	
Trout stream-NE	Trout, all species	40 lbs/acre	
Lakes	Walleye Muskie Northern pike	2 adults/acre 0.2 adults/acre 10 adults/acre	
Tullibee lakes	Tullibee/cisco		Sampling does not provide a reliable number of individuals, but assessment netting provides an indicator of cisco presence, and the presence of multiple year classes provides evidence that cisco are continuing to reproduce.
Warmwater rivers	sauger Channel catfish Mussels, all species	2 lbs/acre 116/acre 8000/acre	
Prairie streams	Topeka shiner	1810/acre	

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Sources:

<u>*Trout streams:*</u>

Southeast- Thorn et al. (1997) [NAJFM-17:860-872]

Northeast-Thorn and Anderson 2001-MNDNR Fish Management report 35

<u>*Lakes:*</u>

Minnesota lakes contain different fish communities, but common indicator species for lakes likely to acquisition targets include walleye, muskellunge, and northern pike. Numbers from the table were generated from the following sources:

Walleye- median adult/acres estimates from unpublished data, MNDNR data and Fond du Lac Natural Resources.

Muskellunge- Minnesota Department of Natural Resources (MNDNR). 2008. Long range plan for muskellunge and large northern pike management through 2020.

Northern pike- Pierce et al. 2003. Density dependent growth and size structure of northern pike populations. NAJFM 23:331-339. Pierce, R. B. 2012. Northern pike; ecology, conservation, and management history. The University of Minnesota Press, Minneapolis.

Tullibee Lakes- Tullibee (cisco) are an important indicator for deep, clear lakes. For protection in tullibee lakes, the goal is to maintain oxygen and temperature profile suitable for tullibee. Cisco require cool water with sufficient hypolimnetic (below the summer thermocline) oxygen. Sampling does not provide a reliable number of individuals, but assessment netting provides an indicator of cisco presence, and the presence of multiple year classes provides evidence that cisco are continuing to reproduce.

<u>*Warmwater rivers.*</u>

Sauger- Carlander, K.D. 1955. Standing crops of named fishes in North American lakes and reservoirs. J. Fish. Res. Board Canada 12:543-570

Channel Catfish- Blank, A.J. 2012. Channel catfish population dynamics, abundance estimates, and short term trends in the Platte River, Nebraska. Dissertations & Theses in Natural Resources. Paper 56.

Freshwater mussels- Bright, R.C., C. Gatenby, R. Heisler, E. Plummer, K. Stramer, and W. Ostlie. 1990. A survey of the mussels of the Pomme de Terre and Chippewa Rivers, Minnesota, 1990. Minnesota Department of Natural Resources. 142 pp.

Topeka Shiner- Dahle, S. P. 2001. Studies of Topeka shiner (Notropis Topeka) life history and distribution in Minnesota. Unpublished report, Minnesota Department of Natural Resources. 75 pp.

1.1   .... moves to amend S.F. No. 2527, the first engrossment, as amended,
1.2   as follows:
1.3   Page 40, after line 9, insert:

1.4   " Sec. 9. **EVALUATION RECOMMENDATIONS.**
1.5   By January 15, 2017, the Lessard-Sams Outdoor Heritage Council must submit
1.6   recommendations to the chairs and ranking minority members of the house of
1.7   representatives and senate committees and divisions with jurisdiction over the environment
1.8   and natural resources and the outdoor heritage fund on methods to evaluate the outcomes
1.9   and effectiveness of projects funded by the outdoor heritage fund in achieving the purposes
1.10 under article XI, section 15, of the Minnesota Constitution, including recommendations on
1.11 the amount of funds that should be spent annually on evaluation.
1.12 "Page 40, before line 10, insert:

1.13   "ARTICLE 2
1.14   CLEAN WATER FUND

1.15   Section 1. **EVALUATION RECOMMENDATIONS.**
1.16 By January 15, 2017, the Clean Water Council must submit recommendations to
1.17 the chairs and ranking minority members of the house of representatives and senate
1.18 committees and divisions with jurisdiction over the environment and natural resources and
1.19 the clean water fund on methods to evaluate the outcomes and effectiveness of projects
1.20 funded by the clean water fund in achieving the purposes under article XI, section 15, of
1.21 the Minnesota Constitution, including recommendations on the amount of funds that
1.22 should be spent annually on evaluation.
1.23 "Page 41, after line 24, insert:

1.24 " Sec. 2. **EVALUATION RECOMMENDATIONS.**
1.25 By January 15, 2017, the commissioner of natural resources, in cooperation with the
1.26 Metropolitan Council and the Greater Minnesota Regional Parks and Trails Commission,
2.1   must submit recommendations to the chairs and ranking minority members of the
2.2   house of representatives and senate committees and divisions with jurisdiction over the
2.3   environment and natural resources and the parks and trails fund on methods to evaluate
2.4   the outcomes and effectiveness of projects funded by the parks and trails fund in achieving
2.5   the purposes under article XI, section 15, of the Minnesota Constitution, including
2.6   recommendations on the amount of funds that should be spent annually on evaluation.
2.7   "Page 45, after line 11, insert:

2.8   " Sec. 2. **EVALUATION RECOMMENDATIONS.**
2.9   By January 15, 2017, the Minnesota State Arts Board, in cooperation with the
2.10 Minnesota Historical Society, regional arts councils, and other recipients of money from
2.11 the arts and cultural heritage fund, must submit recommendations to the chairs and ranking
2.12 minority members of the house of representatives and senate committees and divisions with
2.13 jurisdiction over the arts and cultural heritage fund on methods to evaluate the outcomes
2.14 and effectiveness of projects funded by the arts and cultural heritage fund in achieving