INTRODUCTION
Located within a 100-accre Metro-owned natural area along the lower Willamette River, a groundwater-fed lake contains a densely vegetated floating mat of peat that rises and falls as water levels change. The fen, perched upon a forested basin terrace above the Willamette River, began as a depression scoured 15,000 years ago by the Missoula Floods and evolved through slow deposition of dissolved minerals and decomposing vegetation eventually forming a layer of peat within the perennial lake. Several seasonal ponds lie near the lake within the forested setting which is bordered by rural residential properties. Taking thousands of years to form, fen-wetland ecosystems are rare nationwide (EPA 2021). Their unique groundwater regime and chemistry, along with floating vegetated mats of peat, support diverse and rare plant and wildlife communities. The fen is the last of its kind in the Willamette Valley and is vulnerable to threats posed by urban influences that could alter its fragile biochemistry. Here we will present how determining a fen’s bio-physical characteristics contributes to its preservation. An Unmanned Aircraft System (UAS) coupled outflow pathways. Surface-drainage pathways were mapped in detail following a desktop GIS-based exercise ground-truthed by a team. The composition of terrestrial and aquatic vegetation communities was measured manually in the field. FEN EXTENT
Tracking the spatial extent of the fen system, particularly the lake and its floating mat, are important in detecting fen degradation and ensuring its preservation. An Unmanned Aircraft System (UAS) coupled with targeted field reconnaissance was used to create a detailed baseline map of the fen system and the thickness of the floating mat was measured manually in the field. VEGETATION
The composition of terrestrial and aquatic vegetation communities is a major KEA of the fen system. Field surveys were conducted to: (1) provide a baseline of existing terrestrial and aquatic vegetation communities, (2) identify rare plant and associations, and (3) identify invasive woody species for eventual removal. Voucher specimens were deposited in the Portland State University Herbarium.

METHODS
Metro’s goal was to assess the fen’s watershed inputs and bio-physical characteristics by studying its hydrology, water and soil chemistry, vegetation community, and fen extent and composition. Metrics were developed to measure site-specific Key Ecological Attributes (KEAs), features that if missing or altered would lead to the loss of a particular conservation target over time. Data collection and analyses benefited from input from technical experts.

HYDROLOGY
The quantity and pathways of hydrologic inputs—rainfall, surface runoff, and groundwater discharge—can alter the fen’s health and overall existence. Surface runoff and groundwater discharge were measured in detail following a desktop GIS-based exercise ground-truthed by a comprehensive field survey. Water levels and temperatures in the lake, a nearby seasonal pond, and nearby groundwater monitoring points were gaged continuously to further evaluate seasonal inflow and outflow pathways.

WATER QUALITY
Unique water chemistry is a defining characteristic of a fen. To capture seasonal and diurnal fluctuations in water quality, a probe (Hydrolab DSS - Multiparameter Data Sonde) was deployed for 48 hours each quarter to measure temperature, dissolved oxygen, turbidity, and pH levels. Grab samples were collected during the probe deployments and analyzed in the laboratory for constituents considered to significantly exceed nutrient loading: ammonia, nitrogen, phosphorus, and chlorophyll a.

SOIL QUALITY
Soil conditions are intrinsically linked to fen health, being both a sink and source of dissolved elements. Assessment of soils included soil textures, bedrock depth, organic content (peat present and texture), and chemical properties (pH, nutrients, and major cations).

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LOOKING AHEAD
Encroachment by woody plants is the most urgent management concern, with Acer rubrum, Betula pendula, and Vaccinium corymbosum the most problematic invaders. Maintenance of future peat-forming processes and fen vegetation could be affected by projected higher summer temperatures and other factors like nutrient input. Ongoing monitoring of the fen’s health is helping to assess its condition, detect future trends, determine sources of potential degradation, and inform preservation of this unique habitat. It may also provide recommendations for restoring disturbed fens elsewhere.