Location and Condition of Key Habitats

To address Element 2, location and relative condition of key habitats and community types essential to the conservation of species of greatest conservation need (SGCN), we first mapped habitats at both the state (Fig. 1) and section level (see section maps of vegetation conservation targets) using the NW ReGap land cover map for the 5-state region (Oregon, Washington, Idaho, Montana, and Wyoming). We used the US National Vegetation Classification (NVC), Northwest Regional Gap Analysis Land Cover, and Natural Resources Conservation Service Wetland Classification System as the underlying framework for classifying vegetation. To predict ecological condition (i.e., viability), we used a statewide GIS-based landscape integrity model that incorporated stressors known to directly and indirectly affect ecosystem condition and function. We provide narrative descriptions of key habitats (i.e., vegetation conservation targets) in Appendix E. SWAP Vegetation Conservation Target Abstracts. Throughout the SWAP, we used the PLANTS Database (NRCS 2016) for standardized information about the vascular plants, mosses, liverworts, hornworts, and lichens of the US and its territories.

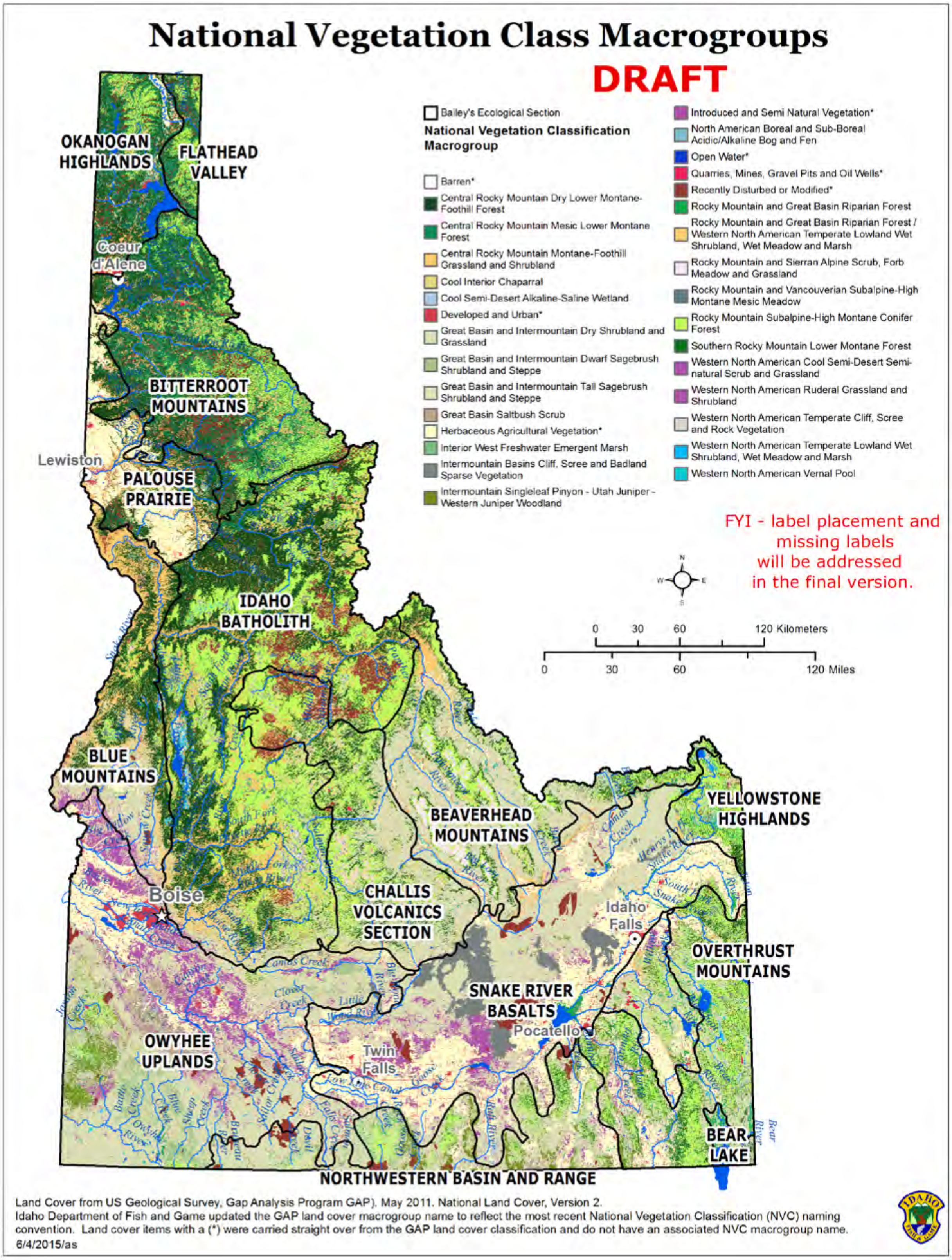


Fig. 1. Map of Idaho vegetation conservation targets

Landscape Integrity Model

Landscape-scale assessment of ecological condition has been widely applied at the national level (Comer and Hak 2012; Faber–Langendoen et al. 2006) and in various states. Landscape-scale condition assessments operate on the premise that human land uses such as agriculture, industrial, residential, commercial, transportation, utilities, mining, timber harvest, water management, and others are predictive of finer-scale condition. Most landscape-scale GIS analyses use a similar list of spatial layer inputs to calculate metrics for condition analyses.

For Idaho, a raster-based landscape integrity model analogous to those for Montana (Vance 2009), Colorado (Lemly et al. 2011), and the US (Comer and Hak 2012; Faber–Langendoen et al. 2006) was built. Complete methods are found in Murphy et al. (2012). Spatial layers used in the landscape integrity model had statewide coverage and were downloaded from the statewide geospatial data clearinghouse, the Interactive Numeric and Spatial Information Data Engine for Idaho (INSIDE) (http://inside.uidaho.edu/index.html), or obtained from various state or federal agencies. A complete list of spatial layers used in the landscape integrity model and sources of the GIS data are listed in Murphy et al. (2012). NW ReGAP landcover (2009) was the most current Idaho land use map and thus chosen for the model. Each input was snapped to a 30-m^2 raster layer. High-resolution layers were incomplete for some important potential condition indicators of ecological condition, including herbicide or pesticide use, livestock grazing, noxious weed abundance, nutrient and sediment loading, off-highway vehicle use, and recent energy development (e.g., wind turbines). The NW ReGAP (2009) pasture/hay cover type was the only representation of areas grazed by livestock. NW ReGAP (2009) was also used to represent areas of nonnative plant species invasion.

Spatial analysis in ArcGIS was used to calculate the presence of human land use and disturbance (i.e., stressor) metrics for each 30-m^2 pixel across Idaho. The disturbance value for each pixel incorporated an inverse distance weighted model based on the assumption that ecological condition will be poorer in areas with the most cumulative human activities and disturbances (Comer and Hak 2012; Faber–Langendoen et al. 2006; Lemly et al. 2011; Vance 2009). Condition improves as one moves toward least-developed areas, typically in a predictable pattern (distance-decay function). For simplicity, the model assumed that land uses or stressors within 50 m had twice the impact than disturbances 50–100 m away (e.g., Vance 2009). Land uses and stressors >100 m away were assumed to have negligible impact. Because not all land uses or stressors affect condition the same way, a weighting scheme for each land use or stressor was determined based on published literature (e.g., Comer and Hak 2012; Rocchio and Crawford 2009; Vance 2009). Weighting coefficients from Landscape Development Intensity indices (Brown and Vivas 2005; Durkalec et al. 2009; Fennessy et al. 2007) and hydrogeomorphic assessment of riverine floodplain functions in the Northern Rocky Mountains (Hauer et al. 2002) were adapted (Murphy et al. 2012).

The condition value for each pixel was then calculated based on all input rasters. For example, the value for a pixel with a 2-lane highway and railroad within 50 m, and a home and urban park between 50 and 100 m, is calculated as follows:

Stressor	Weighting coefficient ×	Distance factor =	Impact
2-lane highway =	7.81	2	15.62
railroad =	7.81	2	15.62
single family home—low density =	6.91	1	6.91
recreation / open space – medium intensity =	4.38	1	4.38
		Total Disturbance Value =	42.53

The total disturbance value was multiplied by 100 for converting to integer values for the final raster layer, resulting in landscape integrity model values that ranged from 0 to 14,055.

Condition Ranking

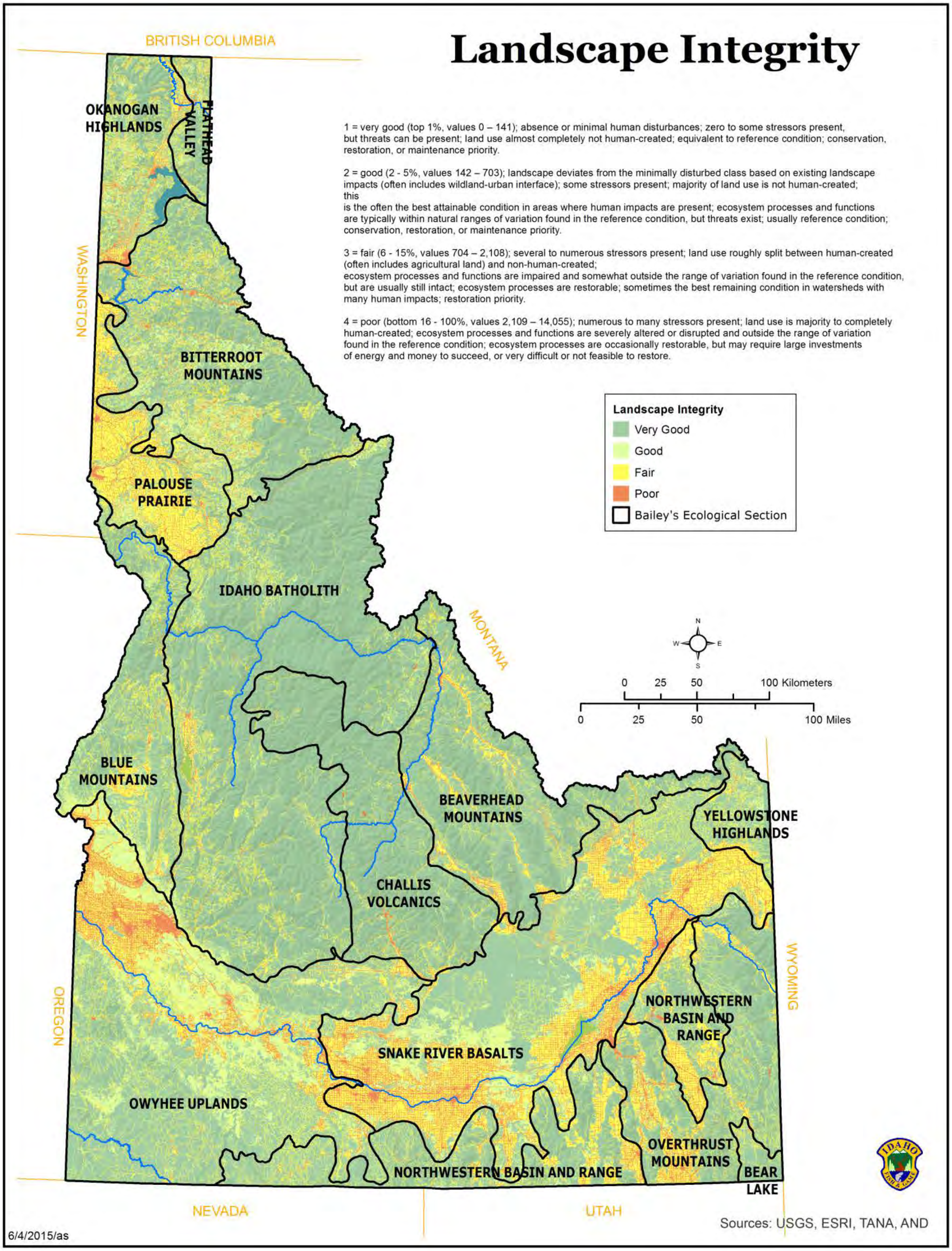
Each pixel's disturbance value was ranked relative to all others in Idaho using methods analogous to Stoddard et al. (2005), Fennessy et al. (2007), Mita et al. (2007), Troelstrup and Stueven (2007), and Lemly et al. (2011). We used an arbitrary ranking scale based on expert judgment and nonquantitative examination of the disturbance value distribution. Any scale can be applied based on assessment needs. For the Idaho SWAP, we used 4 condition categories based on the value range in the landscape integrity model:

1 = *very good* (top 1%, values 0–141): absence of, or minimal, human disturbance; zero to some stressors and threats present; on-the-ground condition can be negatively impacted by localized, but controllable, invasive species or site-specific land uses (e.g., livestock grazing); overall land use almost completely not human-created; ecosystem processes and functions are typically within natural ranges of variation; conservation, restoration, or maintenance priority.

2 = *good* (2–5%, values 142–703): landscape deviates from the minimally-disturbed class due to existing impacts (common in the wildland-urban interface); some stressors and threats present; most land use is not human-created but localized impacts can be present; often the best attainable condition where human impacts are present; ecosystem processes and functions are usually within natural range of variation; conservation, restoration, or maintenance priority.

3 = *fair* (6–15%, values 704–2,108): several to many stressors present; land use roughly split between human-altered (often includes agricultural land) and minimally disturbed; ecosystem processes and functions are impaired and somewhat outside the range of variation found in the reference condition, but are usually still intact; ecosystem processes are restorable; sometimes the best remaining condition in watersheds with many human impacts; restoration priority.

4 = *poor* (bottom 16–100%, values 2,109–14,055): many stressors present; land use is majority to completely human-created; ecosystem processes and functions are severely altered or disrupted and outside the range of variation found in the reference condition; ecosystem processes are occasionally restorable, but may require large investments of energy and money to succeed, or are difficult or not feasible to restore.


Landscape Integrity
1 = very good (top 1%, values 0 – 141); absence or minimal human disturbances; zero to some stressors present, but threats can be present; land use almost completely not human-created; equivalent to reference condition; conservation, restoration, or maintenance priority.
2 = good (2 - 5%, values 142 – 703); landscape deviates from the minimally disturbed class based on existing landscape impacts (often includes wildland-urban interface); some stressors present; majority of land use is not human-created; this is the often the best attainable condition in areas where human impacts are present; ecosystem processes and functions are typically within natural ranges of variation found in the reference condition, but threats exist; usually reference condition; conservation, restoration, or maintenance priority.
3 = fair (6 - 15%, values 704 – 2,108); several to numerous stressors present; land use roughly split between human-created (often includes agricultural land) and non-human-created; ecosystem processes and functions are impaired and somewhat outside the range of variation found in the reference condition, but are usually still intact; ecosystem processes are restorable; sometimes the best remaining condition in watersheds with many human impacts; restoration priority.
4 = poor (bottom 16 - 100%, values 2,109 – 14,055); numerous to many stressors present; land use is majority to completely human-created; ecosystem processes and functions are severely altered or disrupted and outside the range of variation found in the reference condition; ecosystem processes are occasionally restorable, but may require large investments of energy and money to succeed, or very difficult or not feasible to restore.
Landscape Integrity
Very Good
Good
Fair
Poor
Bailey's Ecological Section
BRITISH COLUMBIA
WASHINGTON
MONTANA
OREGON
WYOMING
NEVADA
UTAH
OKANOGAN HIGHLANDS
FLATHEAD VALLEY
BITTERROOT MOUNTAINS
PALOUSE PRAIRIE
IDAHO BATHOLITH
BLUE MOUNTAINS
BEAVERHEAD MOUNTAINS
YELLOWSTONE HIGHLANDS
CHALLIS VOLCANICS
NORTHWESTERN BASIN AND RANGE
SNAKE RIVER BASALTS
OWYHEE UPLANDS
OVERTHRUST MOUNTAINS
BEAR LAKE
NORTHWESTERN BASIN AND RANGE
N
W
E
S
0 25 50 100 Kilometers
0 25 50 100 Miles
Sources: USGS, ESRI, TANA, AND
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