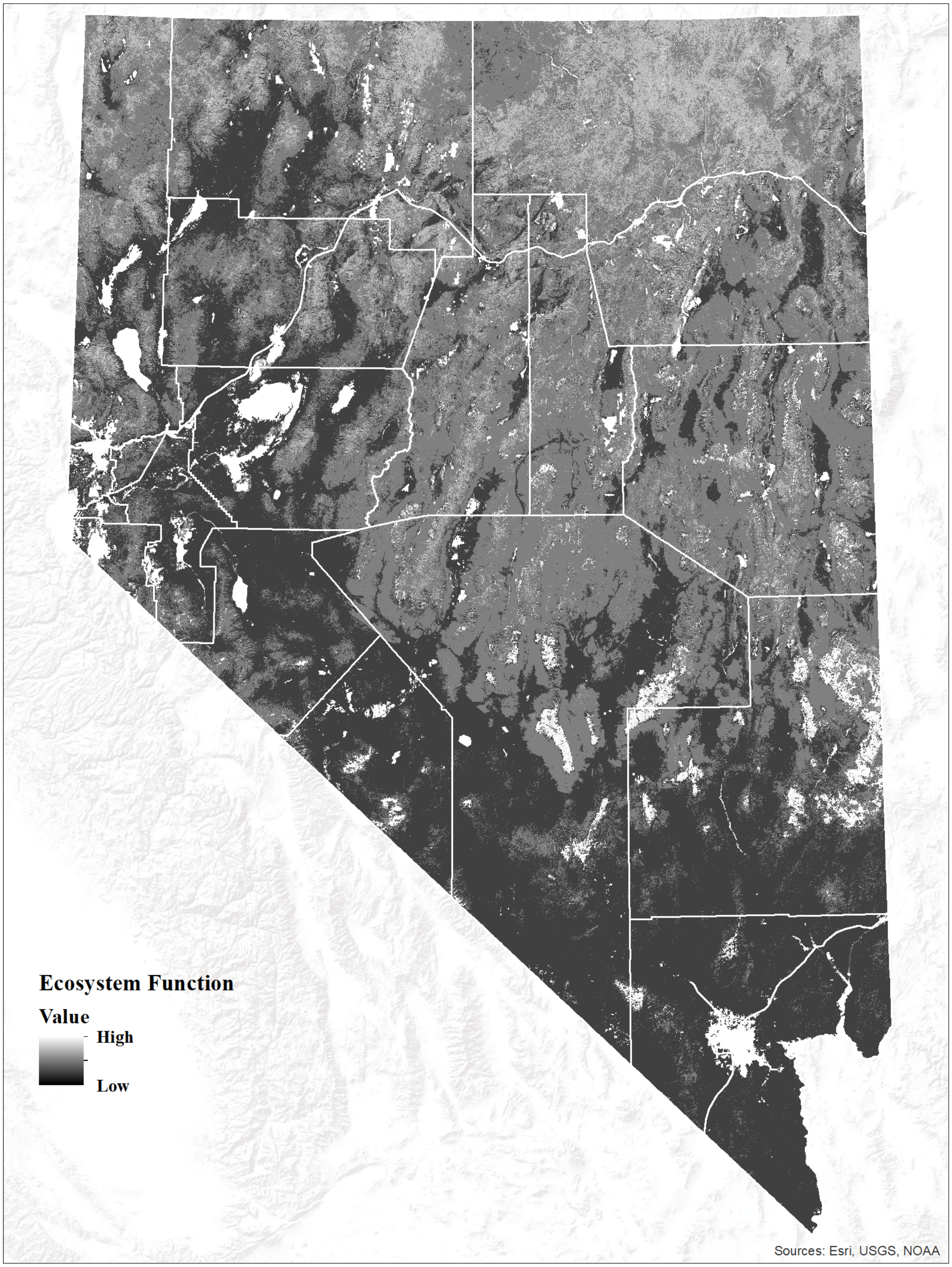
Sagebrush Ecosystem Program
Priority Areas for Invasive Annual Grass Treatments and Funding

Areas in the sagebrush ecosystem that are highly functioning but at risk for annual grass expansion are critically important for preventative and proactive weed management. These core areas need to be identified, protected, and expanded to reduce wildfire occurrence and annual grass conversion.

Areas with a lack of annual invasive grasses and healthy native plant communities are more resistant to annual grass conversion and wildfire occurrence than areas with compromised communities. This map has identified areas which have a low percent cover of annual invasive herbaceous plants, high percent cover of perennial grasses and sagebrush, and high sage grouse survival. These are high function areas. Low function areas represent the opposite of each attribute.



The cost of converting disturbed ecosystems from low to high function in Nevada is daunting given the scope of annual grass invasion. A triage-based approach where additional funds acquired for invasive annual grass treatment should be placed in areas that best benefit core ecosystems and expands that core. To accomplish this triage-based approach, areas where ecosystem function is changing, and where high value function are being reduced need to be identified. The following map identifies those *transitional* areas.

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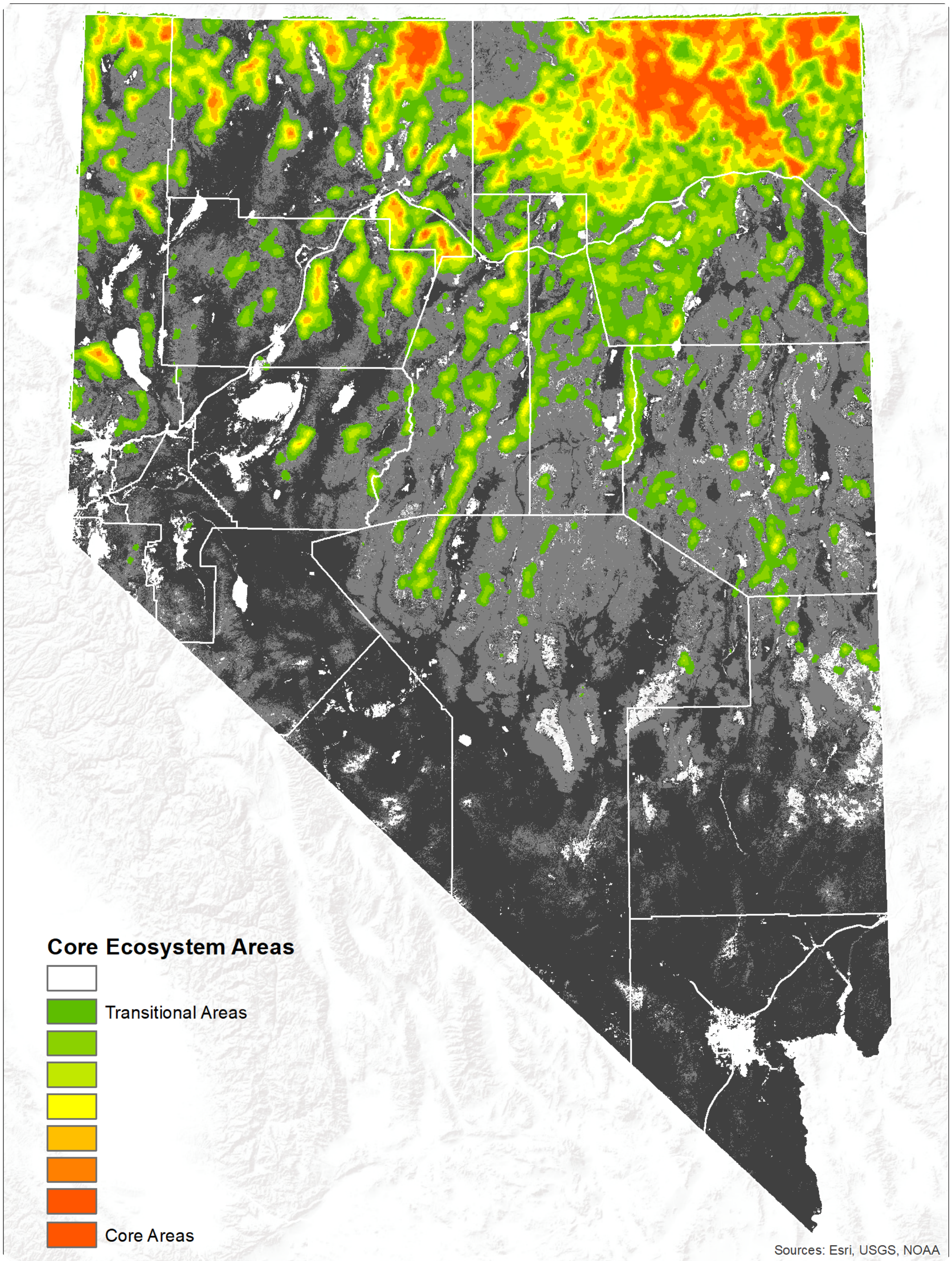
In this map, areas which are interspersed with medium functional values are highlighted. Areas in red are core areas that remain highly functional. Yellow and green areas are beginning to experience mixed functional values and an elevated risk of annual grass expansion. These are the *transitional* areas.

The core areas (red) are where preventative measures are most needed. Transitional areas (yellow & green) are where proactive measures will best benefit and expand the core when fine fuels that accommodate large fires are reduced.



This map will be used by the Sagebrush Ecosystem Program in funding acquisition and development activities. Core and transitional areas represent where mapping, treatment, and monitoring of invasive annual grasses should be prioritized to reduce the risk of wildfire and annual grass conversion.

A high-resolution version of this map is available on the Sagebrush Ecosystem Program website under "Credit System -CCS Tools." The layer is also available as a shapefile upon request. Contact the SETT for more information or assistance.

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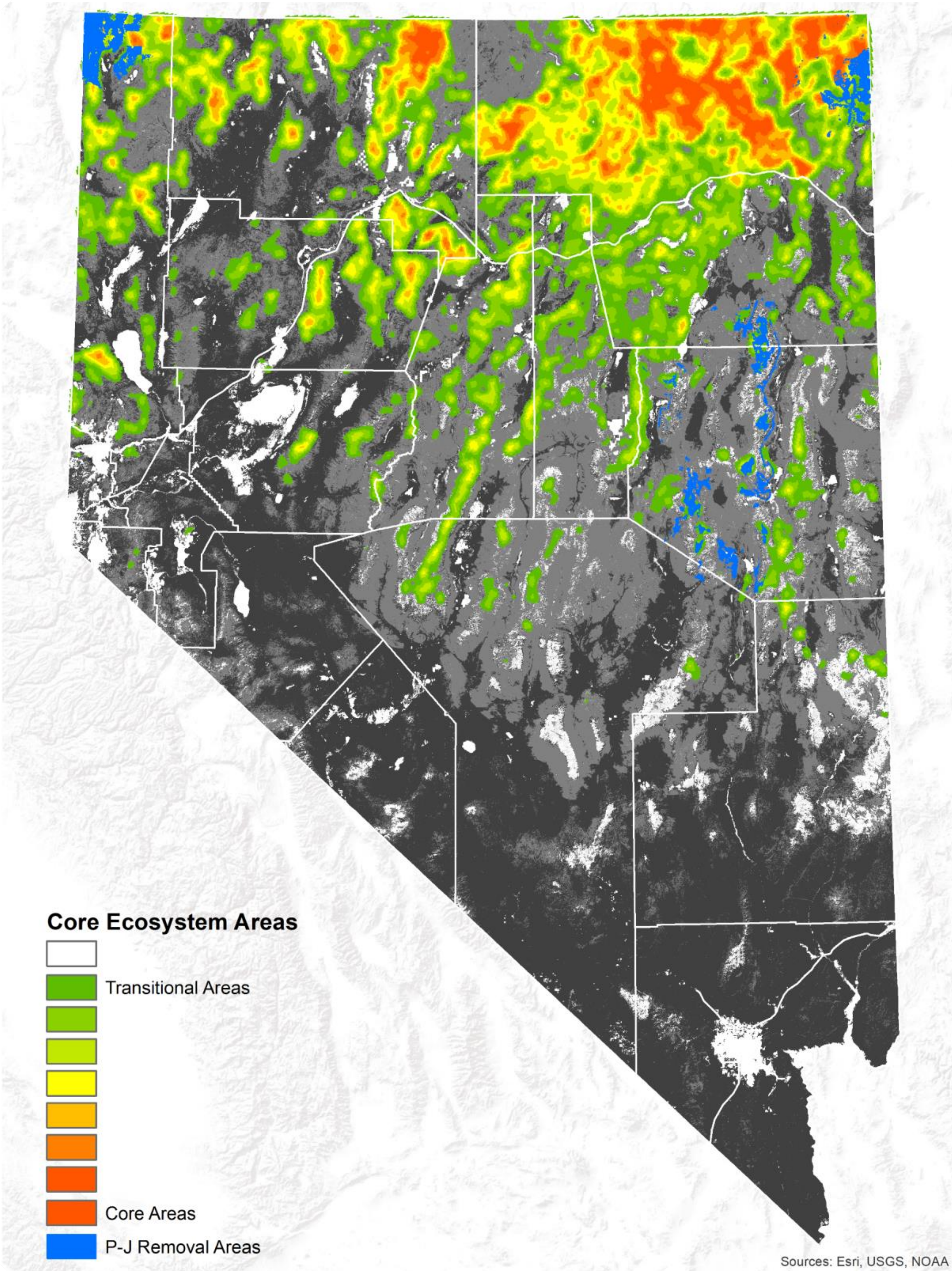
Sagebrush Ecosystem Program
Priority Areas for Invasive Annual Grass Treatments and Conifer Removal

In this map, areas which are of high value to sage grouse yet have either pinyon or juniper trees present (blue) are shown. Pinyon-Juniper communities can be detrimental to sage grouse. These areas have been ranked by the Conservation Planning Tool* and represent where conifer removal efforts can be prioritized for sage grouse.

Where core areas and P-J removal areas align represent opportunities for very valuable conservation actions.

*See Coates et al. 2018 for more details about the Conservation Planning Tool. (https://doi.org/10.1002/eap.1690)



This map will be used by the Sagebrush Ecosystem Program in funding acquisition and development activities. Core and transitional areas represent where mapping, treatment, and monitoring of invasive annual grasses should be prioritized to reduce the risk of wildfire and annual grass conversion. P-J removal areas represent where PJ could be removed for maximum effect and cost/benefit.

A high-resolution version of this map is available on the Sagebrush Ecosystem Program website under "Credit System -CCS Tools." The layer is also available as a shapefile upon request. Contact the SETT for more information or assistance.

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Technical Process:

The SETT wished to identify core areas in Nevada important from both a sagebrush ecosystem and a sage grouse perspective that are currently functional but at risk from increased wildfire and annual grass conversion specifically. These areas should be high priority for triage-based, strategic weed treatment activities. Three GIS products that have relevance to sagebrush ecosystem health and fire risk and occurrence were selected for a simplistic analysis. An annual herbaceous layer[1], a perennial grass layer[2], and a sagebrush layer[1]. Each of these layers modeled percent cover over a 30m scale. Sage grouse reproductive success[3] had a small contribution to the overall model as well. It was assumed that higher sagebrush and perennial grass cover indicated a better functioning/resilient ecosystem, while higher annual grass cover was assumed to be less functional/resilient and put areas significantly at risk for wildfire. The layers were reclassified according to the structure in table 1. A weighted overlay was then performed with the weights indicated in table 1. Weighted overlay analyses add layers together multiplied by their respective weights, resulting in a suitability surface based on criteria given.

Table 1. Reclassification system and weights used in weighted overlay analysis.

Layer	0-10%	11-20%	21-30%	31-40%	41-100%	Weight
Annual Herbaceous	5	4	3	2	1	35%
Perennial Herbaceous	1	2	3	4	5	35%
Sagebrush	1	2	3	4	5	20%
Sage Grouse	16 index classes were divided into 5 classes					10%

The resulting layer represented a suitability surface with values representing ecosystem functional score with 1 being low function/high risk, and 5 was high function/lower risk. To further visualize where contiguous areas of high function values were being interspersed with lower function/higher risk values, a kernel smoothing density function was applied to classes 4 and 5 and overlaid on the suitability layer. This enabled the visualization of areas where ecosystem function is in transition, and where proactive weed treatments may have the greatest effect to protect and expand core areas.

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[1] Rigge, Matthew B., Homer, Collin G., Cleeves, L., Meyer, Debbie K., Bunde, Brett, Shi, Hua, Xian, George, Schell, S., Bobo, M., Quantifying western U.S. rangelands as fractional components with multi-resolution remote sensing and in situ data: Remote Sensing, v. 12, no. 3, at https://doi.org/10.3390/rs12030412

[2] Allred, B.W., B.T. Bestelmeyer, C.S. Boyd, C. Brown, K.W. Davies, L.M. Ellsworth, T.A. Erickson, S.D. Fuhlendorf, T.V. Griffiths, V. Jansen, M.O. Jones, J. Karl, J.D. Maestas, J.J. Maynard, S.E. McCord, D.E. Naugle, H.D. Starns, D. Twidwell, and D.R. Uden. 2020. Improving Landsat predictions of rangeland fractional cover with multitask learning and uncertainty. bioRxiv:2020.06.10.142489. http://dx.doi.org/10.1101/2020.06.10.142489

[3] O'Neil, S.T., Coates, P.S., Brussee, B.E., Ricca, M.A., Espinosa, S.P., Gardner, S.C. and Delehanty, D.J. 2020. Wildfire and the ecological niche: diminishing habitat suitability for an indicator species within semi-arid ecosystems. Glob Change Biol. Accepted Author Manuscript. doi:10.1111/gcb.15300