

Oregon Parks and Recreation Camping & Dark Skies

Update
March 27, 2023

Bill Kowalik
bill.kowalik@darksky.org

Michael McKeag
michael.mckeag@darksky.org

DarkSky Oregon

www.darkskyoregon.org

TO PRESERVE THE MAGNIFICENT DARK SKIES
OF OREGON AND DIMINISH LIGHT POLLUTION
FOR THE HEALTH, SAFETY AND WELL-BEING
OF ALL LIFE

As of March 2023, IDA is rebranded as “DarkSky”
and IDA Oregon is now “DarkSky Oregon”



Summary

This analysis concludes that OPRD is better endowed with potential dark sky park locations than previously believed.

This is an update of a GIS project by IDA Oregon to identify those Oregon Parks and Recreation Department properties that could qualify as International Dark Sky Parks. Qualification as a Dark Sky Park is based in part on meeting a required level of night sky darkness. That darkness is achieved in areas that are relatively unaffected by light pollution. Another requirement is that people are allowed to be present at night, so we limit the analysis to properties that allow camping. This analysis uses skyglow models derived from night time images acquired by a NASA satellite sensor (VIIRS) to estimate how dark the night sky is at each location.

The previous GIS study by IDA Oregon used a night sky model that was published in 2016, [The New World Atlas of Artificial Sky Brightness](#). That model provided the estimated level of light pollution above the natural level of night sky brightness. That data is also included in this update.

Significantly, we also now incorporate [skyglow model data from David Lorenz](#) of the University of Wisconsin. He has graciously provided skyglow model results based on the annual satellite images for each of the nine years between 2013 and 2021. These model results estimate the total night sky brightness, not the amount of light pollution above the natural level. As such, these model results can be compared more directly with the night sky brightness measurements from the Sky Quality Meters (SQMs) deployed by IDA Oregon and OPRD at several State Parks in Oregon over the past few years.

In the previous GIS study using the 2016 published model data, we identified 33 OPRD properties with suitably dark skies that also allow camping. This current update suggests that that earlier dark sky model data was too restrictive. The new night sky models identify those 33 properties as well, and also includes 16 additional dark sky properties that allow camping, for a total of 49.

Pages at the end in “Background” provide helpful information about this work.

Table of night sky brightness data for OPRD properties which allow camping.

Properties in black font in the first column are the dark sky properties that were previously recognized by use of the “2016 New Sky Brightness data”. These are also identified in this update as having night skies dark enough for dark sky park certification.

Properties in red font in the first column are 16 newly identified as having dark skies in this update. They each have an estimated dark sky reading on the 2021 D Lorenz model of greater than 21.2 mags/arcsecond² after adjustment to the SQM data – see the last column on the right.

Properties in blue font in the first column have camping, but their night skies are estimated to be too light polluted for dark sky park certification.

Note: Several of the dark sky sites have anomalous night sky brightness values.

- 1) Farewell Bend shows a significant brightness increase between 2013 to 2018. Analysis of that suggests the increase is due to new lighting just south of that location.
- 2) Humbug Mountain has three separate parcels, labelled as North, Central and South. The South parcel is largest, furthest from Port Orford and is darkest.
- 3) The digital file for Jackson F. Kimball seems incorrect – we adjusted it according to the area of the park shown on Google Maps.

See details in the “Background” slides at the end.

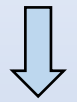
NAME	DESIGNATION	USE_TYPE	2015 Global mean	2013 D Lorenz mean	2021 D Lorenz mean	Difference 2013-2021	IDA Oregon SQM Average 2021	Difference 2021 D Lorenz-SQM Average	2021 D Lorenz Adjusted to SQM
Champoeg	State Heritage Area	Camping	0.469	20.21	20.11	0.10			20.03
Champoeg	State Heritage Area	Camping	0.386	20.36	20.27	0.09			20.18
Milo McIver	State Park	Camping	0.259	20.72	20.57	0.15			20.48
Devil's Lake	State Recreation Area	Camping	0.323	20.79	20.74	0.05			20.65
Devil's Lake	State Recreation Area	Camping	0.209	20.87	20.78	0.09			20.69
Tumalo	State Park	Camping	0.235	20.78	20.80	-0.03			20.71
South Beach	State Park	Camping	0.216	20.79	20.85	-0.06			20.76
Harris Beach	State Park	Camping	0.296	20.66	20.85	-0.20			20.76
Luckiamute	State Natural Area	Camping	0.166	21.03	21.02	0.01			20.93
Valley of the Rogue	State Park	Camping	0.113	21.16	21.10	0.06			21.01
LL "Stub" Stewart	State Park	Camping	0.090	21.40	21.37	0.03	21.30	0.07	21.28
Ainsworth	State Park	Camping	0.082	21.43	21.41	0.03			21.32
Silver Falls	State Park	Camping	0.061	21.48	21.43	0.05			21.34
Smith Rock	State Park	Camping	0.065	21.51	21.45	0.06			21.36
Mayer	State Park	Camping	0.113	21.52	21.47	0.05			21.38
Memaloose	State Park	Camping	0.064	21.59	21.52	0.07			21.43
Jessie M. Honeyman	State Park	Camping	0.056	21.62	21.58	0.03			21.49
Farewell Bend	State Recreation Area	Camping	0.019	21.82	21.61	0.21			21.52
Beverly Beach	State Park	Camping	0.036	21.66	21.63	0.03			21.54
Sunset Bay	State Park	Camping	0.044	21.64	21.64	0.00			21.55
Bullards Beach	State Park	Camping	0.050	21.69	21.67	0.02			21.58
Nehalem Bay	State Park	Camping	0.044	21.69	21.68	0.02			21.59
Viento	State Park	Camping	0.036	21.68	21.68	0.00			21.59
The Cove Palisades	State Park	Camping	0.029	21.70	21.68	0.02			21.59
Beachside	State Recreation Site	Camping	0.035	21.71	21.69	0.02			21.60
LaPine	State Park	Camping	0.019	21.76	21.72	0.04			21.63
Cascara - Fall Creek	State Recreation Area	Camping	0.025	21.73	21.73	0.00			21.64
Clyde Holliday	State Recreation Site	Camping	0.018	21.78	21.74	0.04			21.65
Fisherman's Point - Fall Creek	State Recreation Area	Camping	0.023	21.74	21.74	0.00			21.65
Humbug Mountain North	State Park	Camping	0.018	21.81	21.74	0.06			21.65
Umpqua Lighthouse	State Park	Camping	0.037	21.79	21.75	0.03			21.66
Deschutes River	State Recreation Area	Camping	0.016	21.79	21.76	0.03			21.67
Detroit Lake	State Recreation Area	Camping	0.024	21.73	21.76	-0.04			21.67
Cape Lookout	State Park	Camping	0.016	21.82	21.79	0.02			21.70
Detroit Lake	State Recreation Area	Camping	0.017	21.79	21.81	-0.01			21.72
Succor Creek	State Natural Area	Camping	0.017	21.83	21.81	0.02			21.72
Saddle Mountain	State Natural Area	Camping	0.016	21.83	21.82	0.01			21.73
Oswald West	State Park	Camping	0.016	21.83	21.83	0.00			21.74
Alfred A. Loeb	State Park	Camping	0.019	21.82	21.83	-0.01			21.74
Lake Owyhee	State Park	Camping	0.014	21.85	21.84	0.02			21.75
Cascadia	State Park	Camping	0.013	21.84	21.84	0.00			21.75
Emigrant Springs	State Heritage Area	Camping	0.012	21.83	21.85	-0.02			21.76
Prineville Reservoir	State Park	Camping	0.009	21.90	21.87	0.03	21.80	0.07	21.78
Joseph H. Stewart	State Recreation Area	Camping	0.010	21.89	21.88	0.01			21.79
Humbug Mountain Central	State Park	Camping	0.009	21.91	21.89	0.02			21.80
Deschutes River SSW	State Recreation Area	Camping	0.007	21.91	21.90	0.02			21.81
Wallowa Lake	State Park	Camping	0.003	21.92	21.90	0.02			21.81
Deschutes River SSW	State Recreation Area	Camping	0.006	21.92	21.91	0.01			21.82
Red Bridge	State Wayside	Camping	0.008	21.91	21.91	0.00			21.82
Carl G. Washburne	State Park	Camping	0.006	21.92	21.92	0.00			21.83
White River Falls	State Park	Camping	0.006	21.92	21.92	0.00			21.83
Collier	State Park	Camping	0.004	21.92	21.93	-0.01			21.84
Goose Lake	State Recreation Area	Camping	0.001	21.94	21.94	0.00			21.85
Catherine Creek	State Park	Camping	0.005	21.94	21.94	0.00			21.85
Cottonwood Canyon	State Park	Camping	0.003	21.96	21.94	0.02	21.81	0.13	21.85
Minam	State Recreation Area	Camping	0.004	21.95	21.94	0.01			21.85
Cape Blanco	State Park	Camping	0.003	21.96	21.95	0.01			21.86
Humbug Mountain South	State Park	Camping	0.003	21.96	21.95	0.01			21.86
Arizona Beach	State Recreation Site	Camping	0.003	21.96	21.96	0.00			21.87
Bates	State Park	Camping	0.001	21.96	21.96	0.00			21.87
Jackson F. Kimball	State Recreation Site	Camping	0.002	21.96	21.96	0.00			21.87
Ukiah-Dale Forest	State Scenic Corridor	Camping	0.002	21.97	21.97	0.00			21.88
Unity Lake	State Recreation Site	Camping	0.002	21.97	21.98	0.00	Average=	0.09	21.89

Night Sky too bright for certification



Dark Sky Park

Cutoff (21.2)



Night Sky dark enough for certification

Units in the “2015 Global mean” column are millicandelas per meter²

Units in these columns are magnitudes per arcsecond²



Table of night sky brightness data for OPRD properties which allow camping.

Same data as on the previous page, but sorted alphabetically by the name of the OPRD property.

Properties in black font in the first column are the dark sky properties that were previously recognized by use of the “2016 New Sky Brightness data”. These are also identified in this update as having night skies dark enough for dark sky park certification.

Properties in red font in the first column are 16 newly identified as having dark skies in this update. They each have an estimated dark sky reading on the 2021 D Lorenz model of greater than 21.2 mags/arcsecond² after adjustment to the SQM data – see the last column on the right.

NAME	DESIGNATION	USE_TYPE	2015 Global mean	2013 DLorenz mean	2021 DLorenz mean	Difference 2013-2021	2021 DLorenz Adjusted to SQM
Ainsworth	State Park	Camping	0.082	21.43	21.41	0.03	21.32
Alfred A. Loeb	State Park	Camping	0.019	21.82	21.83	-0.01	21.74
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Umpqua Lighthouse	State Park	Camping	0.037	21.79	21.75	0.03	21.66
Unity Lake	State Recreation Site	Camping	0.002	21.97	21.98	0.00	21.89
Viento	State Park	Camping	0.036	21.68	21.68	0.00	21.59
Wallowa Lake	State Park	Camping	0.003	21.92	21.90	0.02	21.81
White River Falls	State Park	Camping	0.006	21.92	21.92	0.00	21.83

Note: The color scale on this page grades within each column from green, marking the park with the darkest night sky (Unity Lake), to red marking the park with the least dark night sky, but which still qualifies as a dark sky park (L.L. Stub Stewart).

Note: This table includes the 33 OPRD properties previously identified with dark skies. Those are listed in black font in the first column. Several of those properties have separate parcels (Humbug Mountain, Detroit Lake, Deschutes River) which are listed separately in the table, totaling 37 properties.

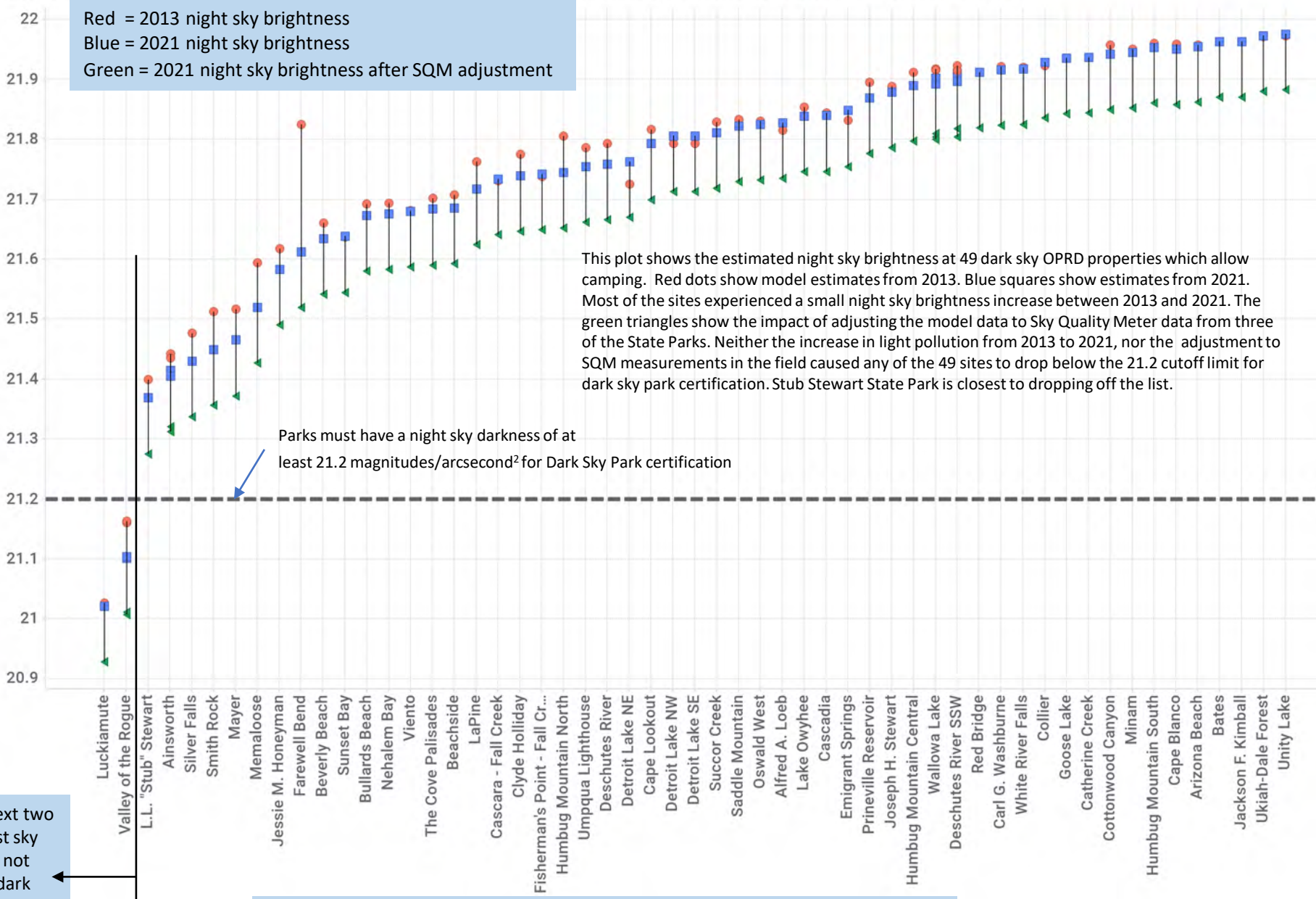
Units in the “2015 Global mean” column are millicandelas per meter²

Units in these columns are magnitudes per arcsecond²



↑
Darker
Magnitudes per Arc Second Squared
Brighter
↓

Red = 2013 night sky brightness
Blue = 2021 night sky brightness
Green = 2021 night sky brightness after SQM adjustment



This plot shows the estimated night sky brightness at 49 dark sky OPRD properties which allow camping. Red dots show model estimates from 2013. Blue squares show estimates from 2021. Most of the sites experienced a small night sky brightness increase between 2013 and 2021. The green triangles show the impact of adjusting the model data to Sky Quality Meter data from three of the State Parks. Neither the increase in light pollution from 2013 to 2021, nor the adjustment to SQM measurements in the field caused any of the 49 sites to drop below the 21.2 cutoff limit for dark sky park certification. Stub Stewart State Park is closest to dropping off the list.

Parks must have a night sky darkness of at least 21.2 magnitudes/arcsecond² for Dark Sky Park certification

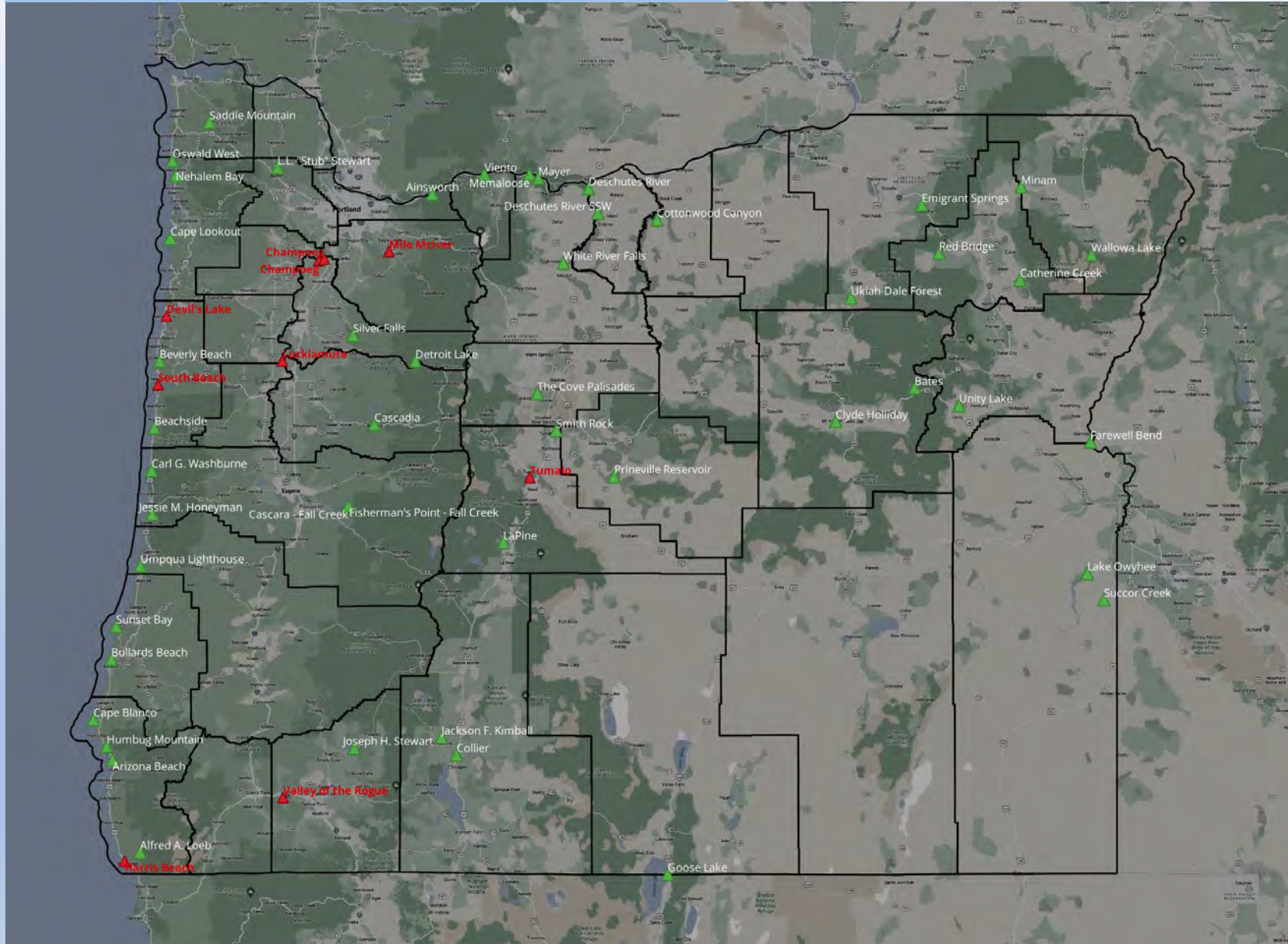
The next two darkest sky parks- not quite dark enough.

49 Oregon Parks & Recreation Properties that allow Camping and have Dark Skies

Locations of OPRD Properties with Camping

▲ Camping and Dark Skies

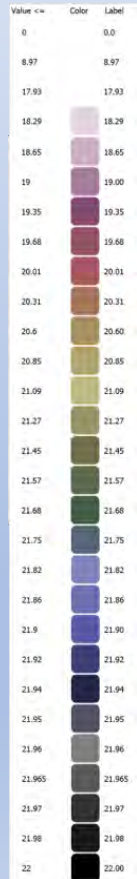
▲ Camping and Skies currently too Bright for Dark Sky Certification



Locations of OPRD Properties with Camping

Camping and Dark Skies

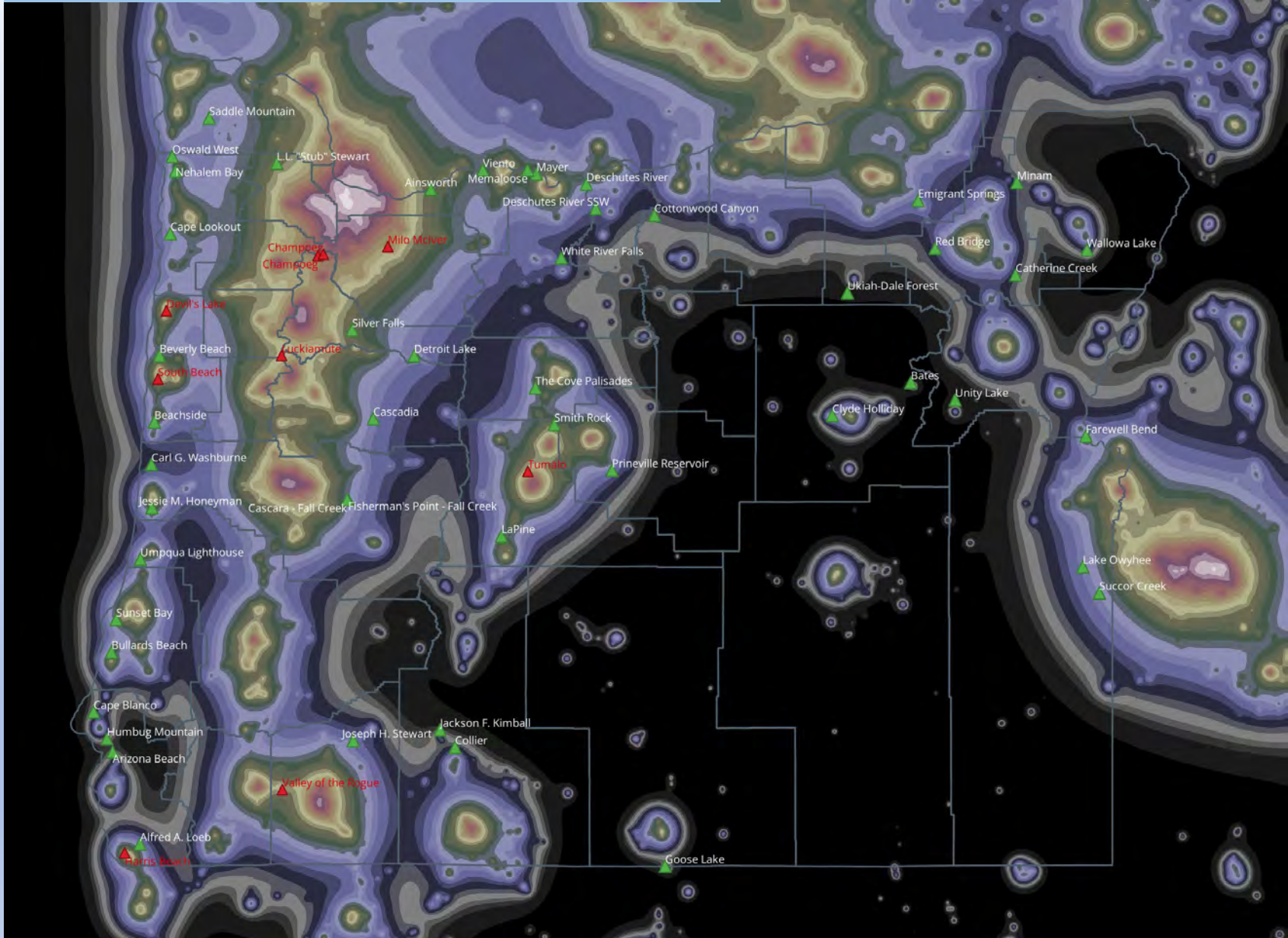
Camping and Skies currently too Bright for Dark Sky Certification



More light pollution



More pristine night skies

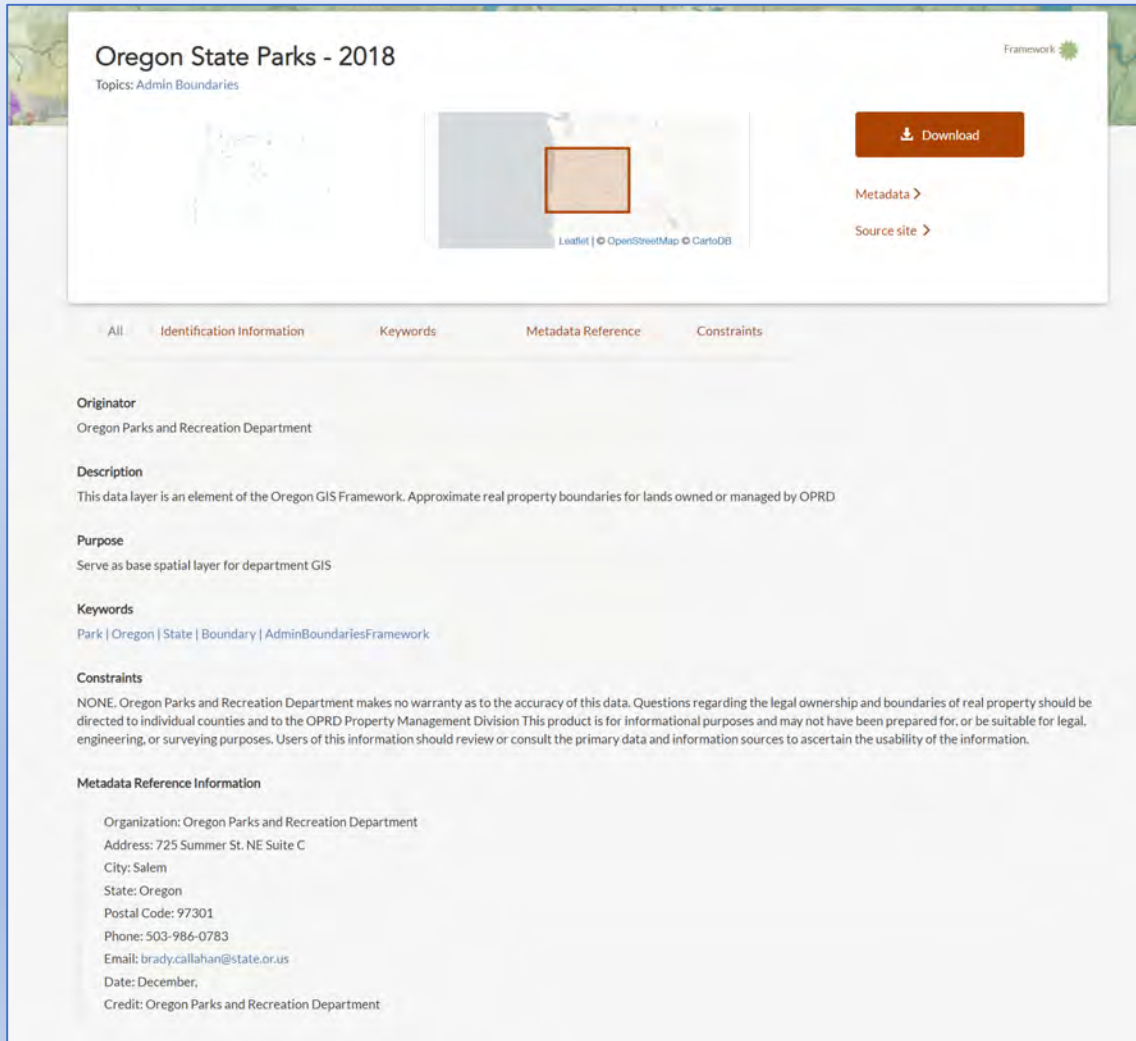


Background Slides Follow

This project uses OPRD property data downloaded from this public data source

<https://spatialdata.oregonexplorer.info/geoportal/details?id=9c0ea569f3c647bbb57c15342f782a63>

The most recent data publicly available is from 2018



Oregon State Parks - 2018
Topics: Admin Boundaries

Framework

Download

Metadata >

Source site >

All Identification Information Keywords Metadata Reference Constraints

Originator
Oregon Parks and Recreation Department

Description
This data layer is an element of the Oregon GIS Framework. Approximate real property boundaries for lands owned or managed by OPRD

Purpose
Serve as base spatial layer for department GIS

Keywords
Park | Oregon | State | Boundary | AdminBoundariesFramework

Constraints
NONE. Oregon Parks and Recreation Department makes no warranty as to the accuracy of this data. Questions regarding the legal ownership and boundaries of real property should be directed to individual counties and to the OPRD Property Management Division This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.

Metadata Reference Information

Organization: Oregon Parks and Recreation Department
Address: 725 Summer St. NE Suite C
City: Salem
State: Oregon
Postal Code: 97301
Phone: 503-986-0783
Email: brady.callahan@state.or.us
Date: December,
Credit: Oregon Parks and Recreation Department

This project used QGIS, Excel, Spotfire and PowerPoint software to create and display the results in this file.

The 2018 GIS file containing the OPRD vector property information was imported to QGIS. Model data from raster night sky brightness maps was extracted from each OPRD property polygon. The mean night sky brightness from each polygon for each of several night sky models is reported in this study.

Data from the Sky Quality Meters deployed at the four Oregon State Parks is from this [IDA Oregon report](#).

What's the story about light pollution in Oregon? What's an SQM? Why is light pollution an issue?

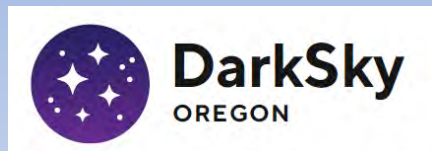
[DarkSky Oregon's recent report](#) can help to answer these questions and more.

Adjustment of skyglow models to SQM measurements from the ground

An issue with the VIIRS data is the sensor's inability to see visible blue light. Given the wide introduction of outdoor LED lamps in the past decade that appear white to our eyes, which indicates that they emit significant amounts of blue light, it is recognized that the VIIRS data under-report upwelling light from the ground, and that models based on it will therefore under-report the amount of skyglow.

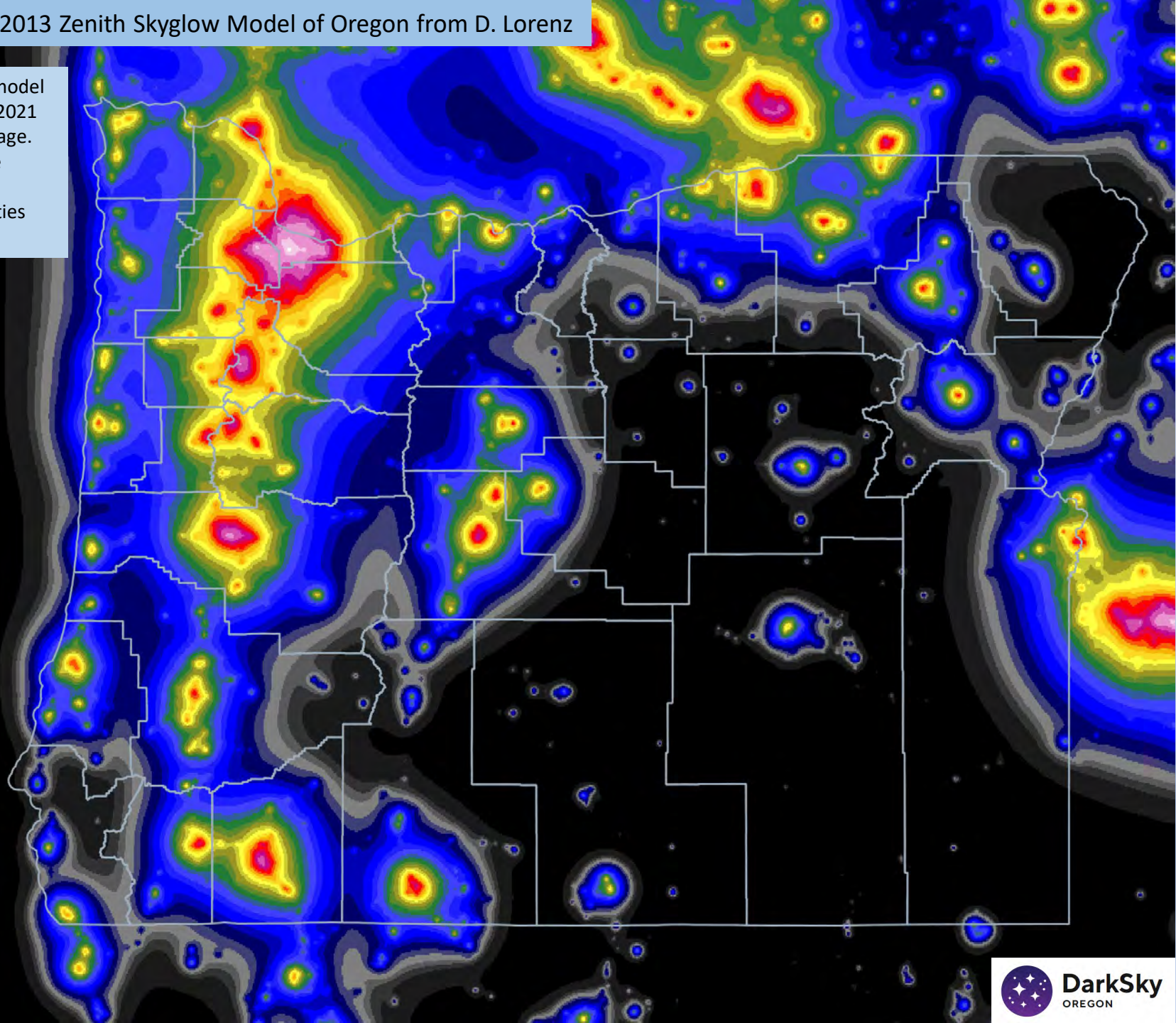
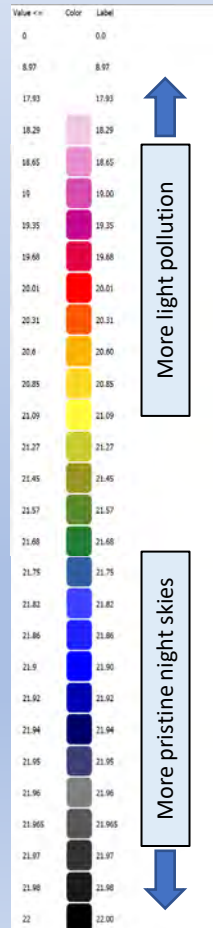
However, the Sky Quality Meters that we employ at the four State Parks do measure visible blue light. The SQMs measure brighter night skies compared to the estimates from the D. Lorenz models. The difference may be attributable to the blue light issue. We accordingly adjust the model data to the SQM data. Other sky brightness models which employ different atmospheric and light propagation parameters will yield slightly different results and may more closely match our ground-based SQM measurements without the need for adjustment.

The adjustment brightens the night sky estimates at all of the 49 locations with camping and dark skies, but all of them are still darker than the Dark Sky Park threshold. While these modeled night sky estimates based on the night time satellite images identify potential Dark Sky Parks, ground-based measurements of the night sky are required to make a definitive assessment.

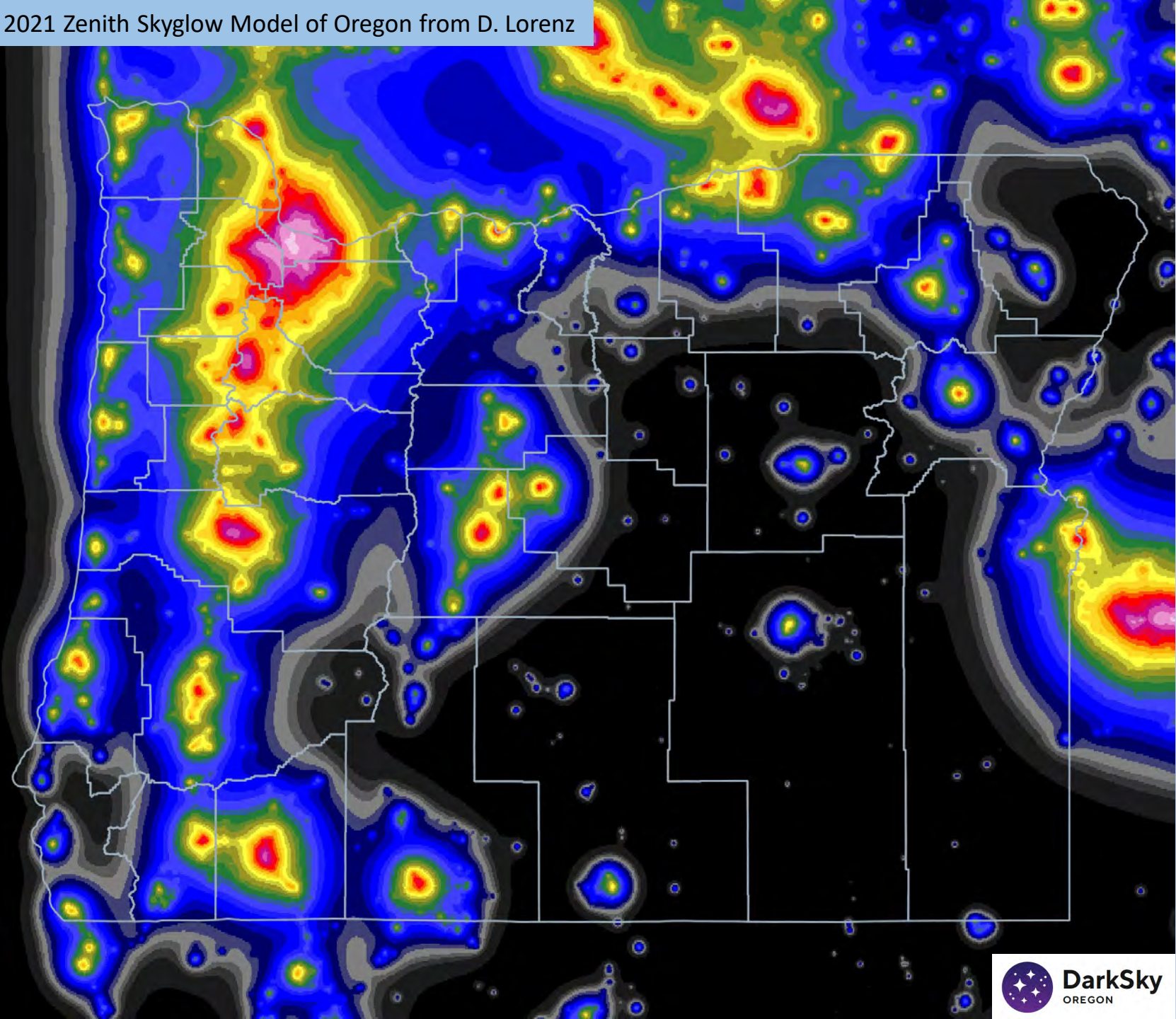
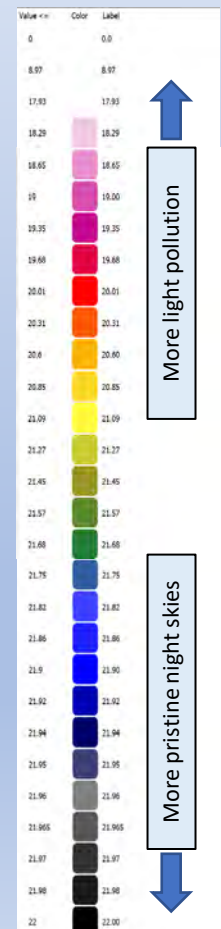


2013 Zenith Skyglow Model of Oregon from D. Lorenz

Compare this 2013 model of skyglow with the 2021 model on the next page. Light pollution at the zenith has expanded outward from the cities across Oregon.



2021 Zenith Skyglow Model of Oregon from D. Lorenz

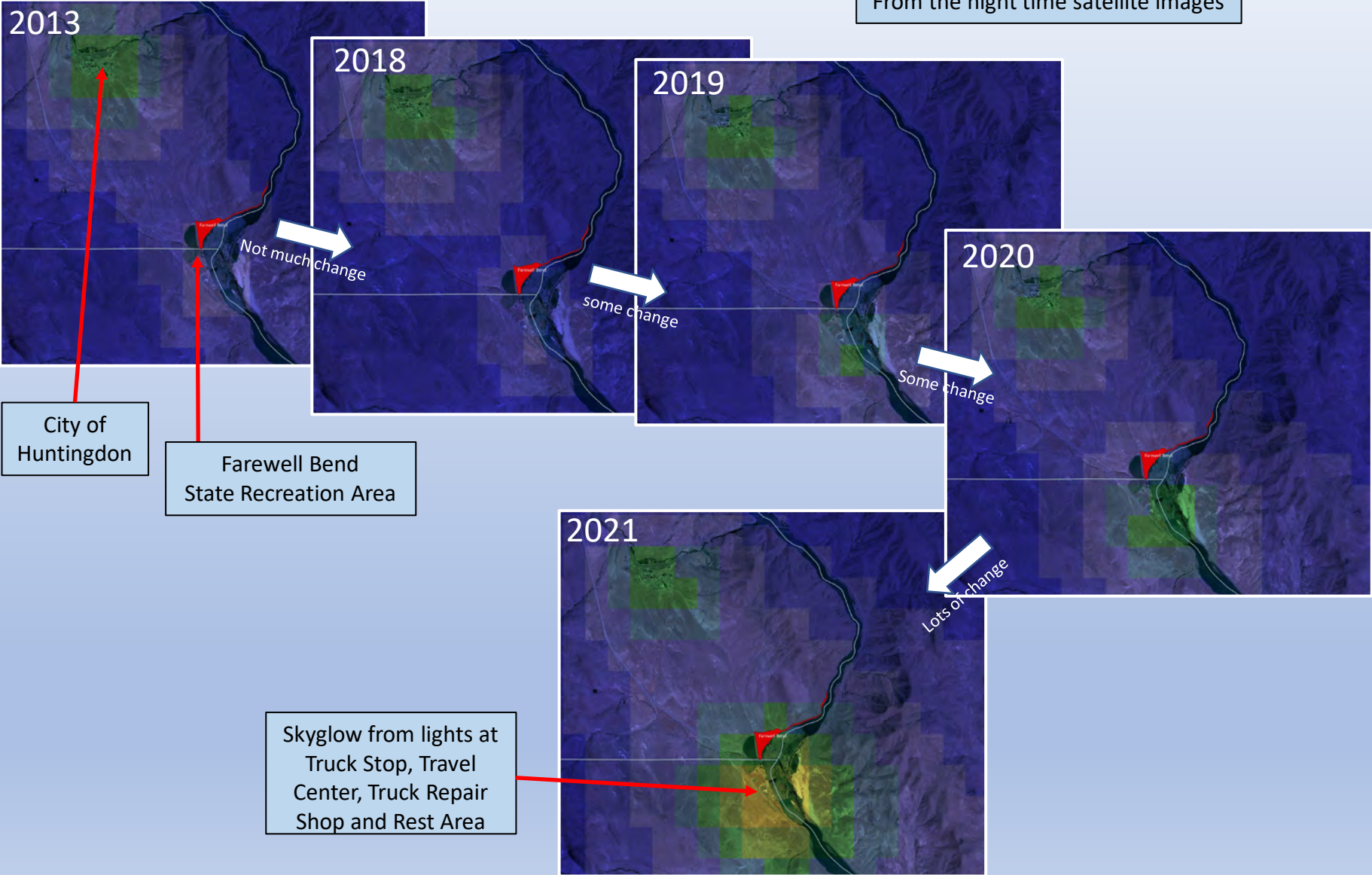


Farewell Bend State Recreation Area

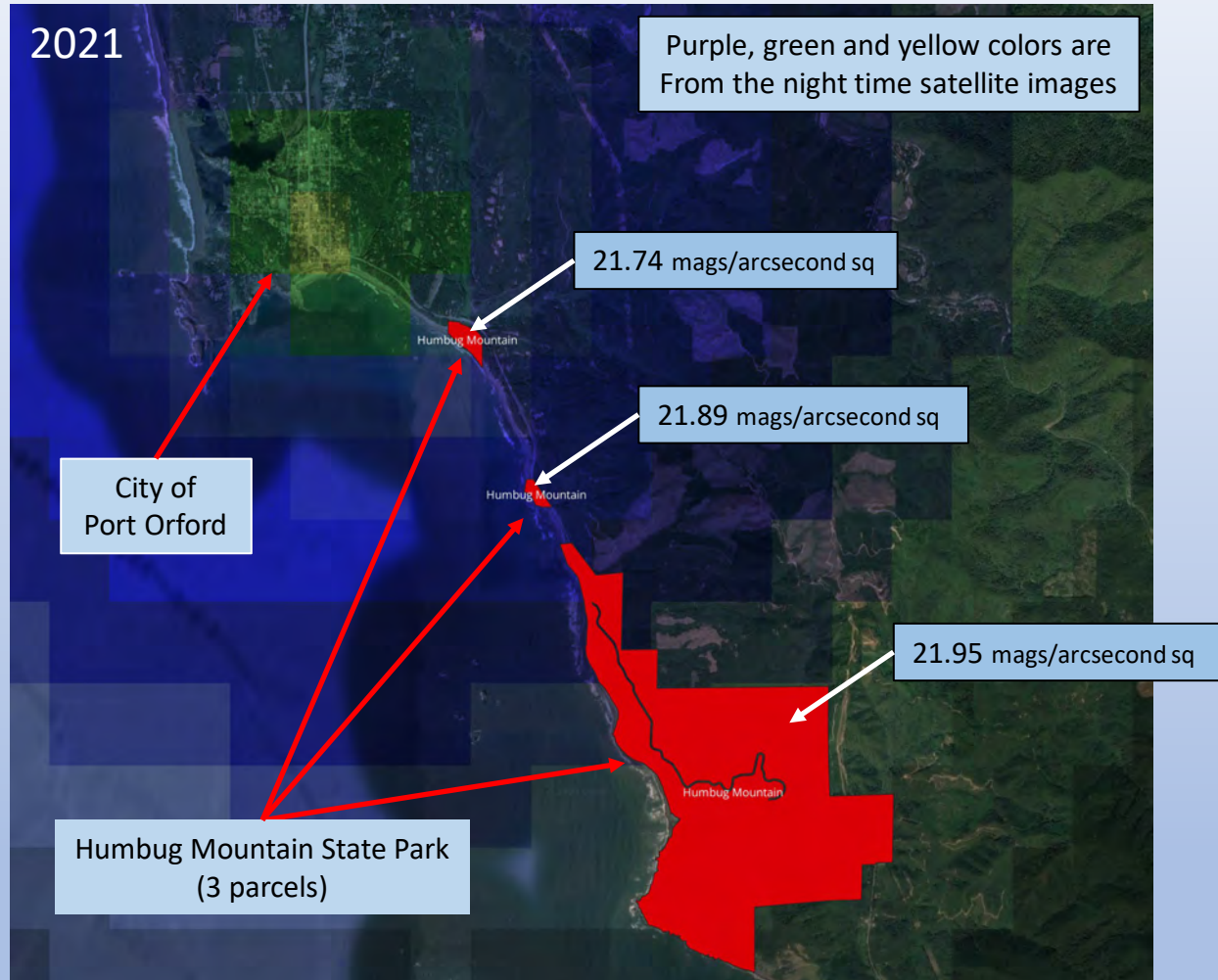
Skyglow increased dramatically between 2018 and 2021

Skyglow from the City of Huntingdon hardly changed

Purple, green and yellow colors are
From the night time satellite images



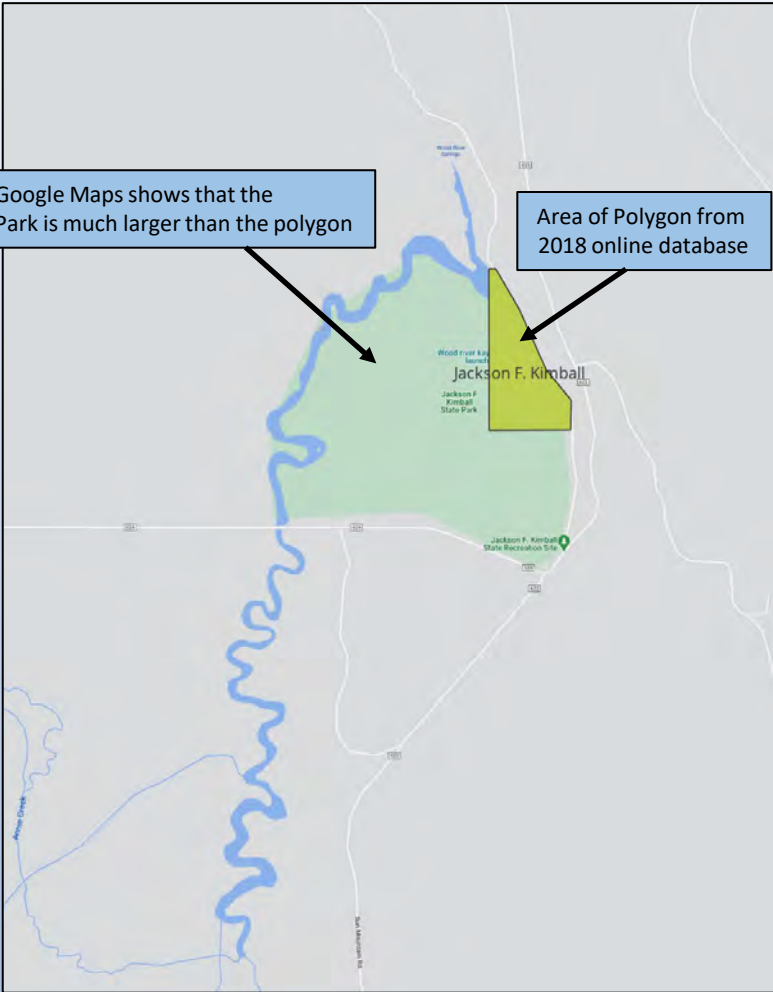
Humbug Mountain State Park is composed of 3 land parcels.
The parcels have darker night sky, the further they are from Port Orford.



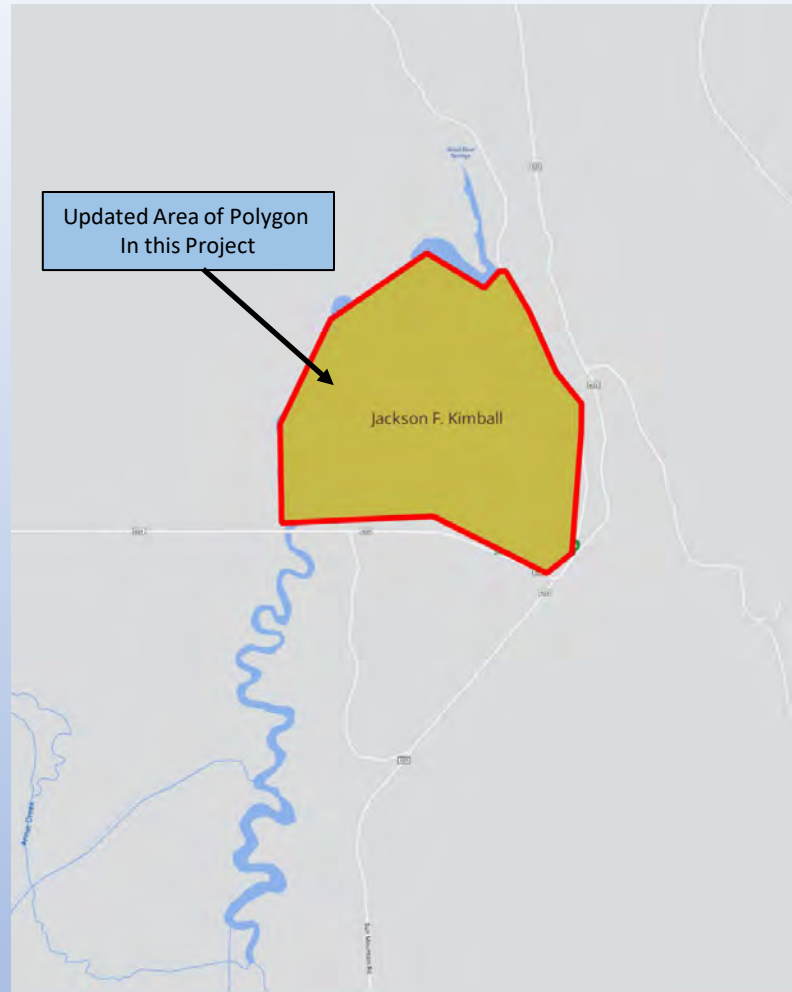
Jackson F. Kimball State Park – incorrect polygon?

Google Maps shows that the Park is much larger than the polygon

Area of Polygon from 2018 online database



Updated Area of Polygon In this Project





DarkSky

New organization name and branding as of March 2023
formerly The International Dark-Sky Association

www.darksky.org

The recognized authority on light pollution

Combating light pollution worldwide

DarkSky Goals

- Activate advocates to lead movement-building DarkSky Public Policies
- DarkSky Approved – expansion of certification programs
- Integrate DarkSky principles into global conservation themes – global climate change
- Establish International Dark Sky Places - conservation program that recognizes and promotes excellent stewardship of the night sky
- Education & Outreach - light pollution & ecology, human health, energy waste, night sky heritage



www.darkskyoregon.org



DarkSky
OREGON

New organization name and branding as of March 2023
formerly The Oregon Chapter of IDA

A legal non-profit subsidiary of IDA

Mission - To preserve Oregon's magnificent dark skies and to diminish light pollution for the health, safety, and well-being of all life

- DarkSky Oregon Projects
 - Facilitate International Dark Sky Places – support communities and parks
 - Oregon Skyglow Measurement Network – measure light pollution
 - Education & Outreach - light pollution & ecology, human health, energy waste, night sky heritage
 - Public Policy – promote quality lighting at night, input on lighting ordinances
- Organization
 - Originated 2019
 - Five board members - Central Oregon, Columbia Gorge, Portland
 - Seeking representatives from the other regions of Oregon



www.darkskyoregon.org