

DOCKETED

Docket Number:	21-SIT-01
Project Title:	21-SIT-01, SB100 Implementation Planning for SB100 Resource Build
TN #:	249093
Document Title:	Presentations - Workshop Overview and Land Use in Electric System Planning
Description:	CEC Staff Presentations for the Commissioner Workshop on Land Use Screens_March 13, 2023
Filer:	susan fleming
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	3/10/2023 3:31:53 PM
Docketed Date:	3/10/2023



Workshop Overview and Land Use in Electric System Planning

Siting, Transmission, and Environmental Protection Division

Presenter: Erica Brand

Date: March 13, 2023



Two Key Topics in Today's Discussion

- Land-use screens to estimate resource potential
 - In this context, land-use screens are used to refine raw resource potential to technical potential (for utility-scale solar, onshore wind, and geothermal) for input into capacity expansion modeling.
 - Examples include Integrated Resource Planning and SB 100 modeling.
 - The first part of today's workshop will focus on proposed updates to the land-use screens for resource potential.
- Busbar mapping
 - CEC performs environmental and land-use evaluation for the California Public Utilities Commission's (CPUC) busbar mapping process.
 - The second half of today's workshop will focus on current methods and a discussion of options for updates.



Workshop Objectives

- Present proposed modifications to the draft land-use screens for resource potential in response to public and agency feedback to October 2022 draft.
- Provide additional opportunity for public engagement and comment before finalizing the staff report and concluding of this cycle of updates to the land-use screens for electric system planning.
- Create opportunity for early feedback into scope of potential changes to the environmental and land-use evaluation methodology for the CPUC's busbar mapping process.



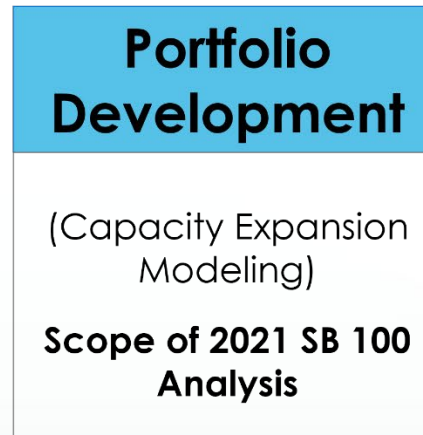
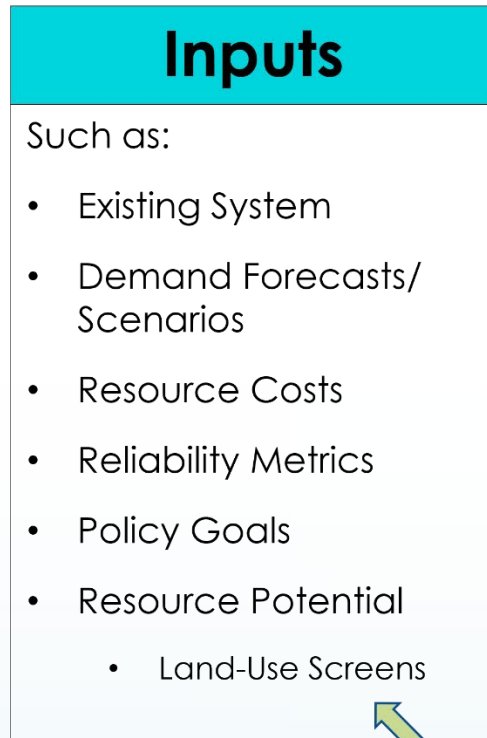
Land Use in Resource Planning



The use of land-use screens in resource planning increases transparency in decision making and supports early identification of issues or barriers to development, which supports long-term reliability in planning for long-lead time investments, such as transmission.



Land-Use Screens in SB 100 Resource Planning Modeling Framework



*2021 Report SB 100 Core Scenario
Projected Mix of Resources*

	Existing Resources		Projected New Resources	
	2019*	2030**	2045**	
Solar (Utility-Scale)	12.5 GW	16.9 GW	69.4 GW	
Solar (Customer)	8.0 GW	12.5 GW	28.2 GW	
Storage (Battery)	0.2 GW	9.5 GW	48.8 GW	
Storage (Long Duration)	3.7 GW	0.9 GW	4.0 GW	
Wind (Onshore)	6.0 GW	8.2 GW	12.6 GW	
Wind (Offshore)	0 GW	0 GW	10.0 GW	
Geothermal	2.7 GW	0 GW	0.1 GW	
Biomass	1.3 GW	0 GW	0 GW	
Hydrogen Fuel Cells	0 GW	0 GW	0 GW	
Hydro (Large)	12.3 GW	N/A ¹	N/A ¹	
Hydro (Small)	1.8 GW	N/A ¹	N/A ¹	
Nuclear	2.4 GW	N/A ¹	N/A ¹	

To refine resource potential for large-scale resources (solar, wind, geothermal)



SB 100 Land-Use Activities

Define and map a set of high-level land-use assumptions to estimate technical potential
(Core Land-Use Screen)

Refine data for mapping the resource build of each portfolio to assess environmental and land-use impacts and tradeoffs. (Examples may include total land area for generation and transmission (acres), impacts to defined metrics, or geographic areas).

SB 100 Report Development

Establish Inputs and Assumptions

Portfolio Development

Model Portfolios

Evaluate Portfolios

Finalize Report

Implement Recommendations

SB 100 Terrestrial
Climate Resilience
Study Screen



Land-Use Activities Timeline

- Land-Use Screens Data Update
 - January 2022 – 2022 Integrated Energy Policy Report (IEPR) Update Notice
 - February 2022 – Joint Agency Workshop on SB 100 and Land-Use
 - April 2022 – IEPR Workshop on the California Energy Planning Library
 - October 2022 – IEPR Workshop on Land-Use Screens
 - March 2023 – Commissioner Workshop on Land-Use Screens
 - Spring 2023 – Aim to finalize this cycle of updates to the land-use screens for Integrated Resource Planning and SB 100 Inputs and Assumptions
 - Final Staff Report on Land-Use Screens for Resource Potential
 - Final Web Mapping Application Data Viewer
 - Final Geospatial Data
- Other Land-Use Activities
 - Spring 2023 – Collaborate with the CPUC on updates to Busbar Mapping methodology
 - Spring 2023 – late 2024 – Develop land-use evaluation and resource build mapping methods for 2025 joint agency SB 100 report and conduct analyses



Proposed Updates to Land-Use Screens for Statewide Renewable Resource Potential

Siting, Transmission, and Environmental Protection Division

Presenters: Erica Brand and Saffia Hossainzadeh

Date: March 13, 2023



Intended Use of Information

The models and land-use screens are for use in electric system planning, including SB 100 modeling and integrated resource planning.

The geospatial land-use screens inform high-level estimates of technical renewable resource potential for electric system planning and should not be used, on their own, to guide siting of generation projects nor assess project-level impacts.

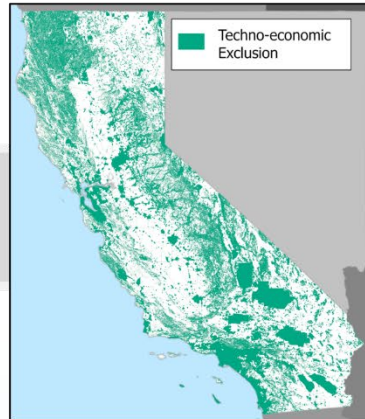


Key Steps in Estimating Renewable Resource Potential

Land-use screens are used to estimate utility-scale resource potential for input to capacity expansion modeling



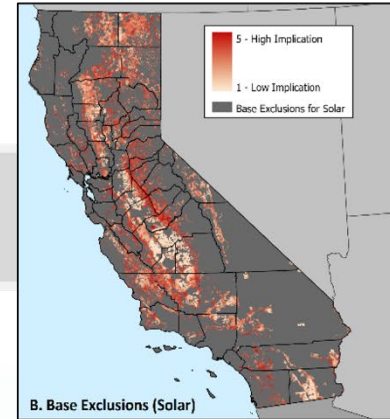
Example of statewide solar irradiance data



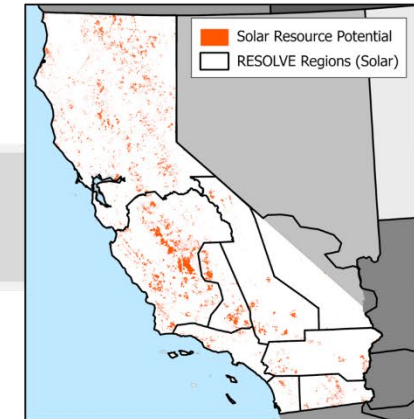
Techno-Economic Exclusion Layer (CPUC)



Protected Area Layer (CEC)



CEC applies additional environmental and land-use spatial data to refine resource potential estimates



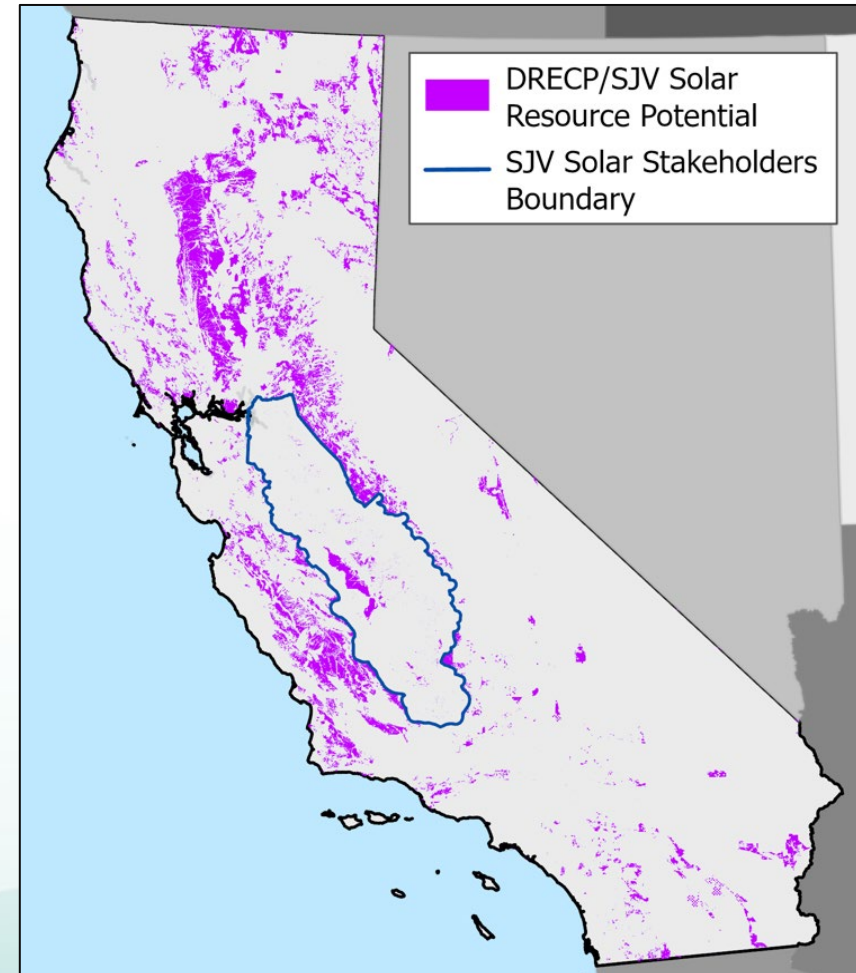
Areas that remain after application of the geospatial data are summed by transmission zone. Generating capacity is calculated using area to MW ratio of 7 acres per MW. The black lines depict RESOLVE regions from the CPUC's Integrated Resource Planning process.



Land-Use Screen (2016-2022)

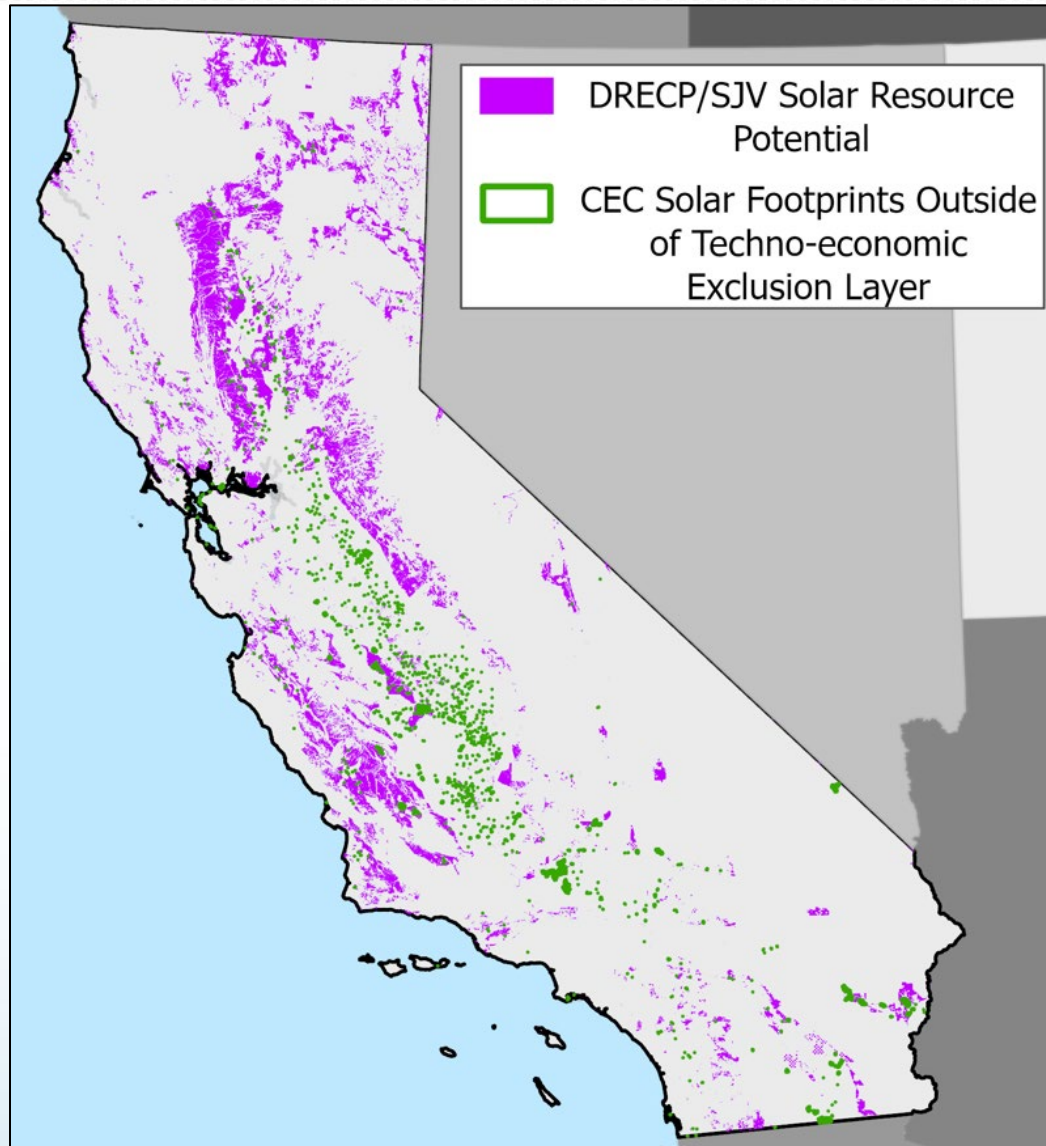
Desert Renewable Energy Conservation Plan/San Joaquin Valley Screen (DRECP/SJV Screen)
Used in: Integrated Resource Planning (IRP) and SB 100 modeling for the 2021 Joint Agency Report
Included the following components:
Techno-economic exclusion layer (CPUC)
RETI Category 1 Exclusions (black areas: legally and legislatively prohibited)
RETI Category 2 Exclusions (yellow areas, example: critical habitat)
Within the Desert Renewable Energy Conservation Plan (DRECP) Area, excluded all land use allocations except Development Focus Areas (DFA). Did not differentiate DFAs by technology type.
Within the San Joaquin Valley (SJV), excluded all lands except the ~500k acres of Priority Least Conflict, Least Conflict, and Potential Least Conflict identified in this <u>planning process</u> .

Solar resource potential identified in the DRECP/SJV screen.
Map source: CEC staff with data provided by the CPUC.





Land-Use Screen (2016-2022), continued



- In early 2022, the CEC announced that the land-use screens would be updated to incorporate new information.
- Depicted in **green** are solar project footprints outside of the techno-economic exclusion layer in an attempt to filter the dataset to capture only utility-scale solar.
- Projects were identified in late 2022 and relied upon recent aerial imagery from 2020 through 2022.
- Sentinel-2 satellite imagery from January 2023 was also used to identify most recent projects.



October 2022: Draft Land-Use Screens Update

- Held an IEPR Workshop to present a draft staff report documenting proposed data and methodological updates and receive stakeholder comments.
- The CEC received 27 docketed comments and 9 public comments.
- The CEC staff takeaways:
 - Additional public process steps helpful.
 - Add additional datasets to the Protected Area Layer.
 - Include discussion about solar resource potential in "Critically Overdrafted Basins," as defined by the Sustainable Groundwater Management Act.
 - Additional land-use evaluation exploring land-use-related non-energy benefits of distributed energy resources needed in the next SB 100 report.



October 2022: Proposed Land-Use Screens

Land-Use Screen 1
Included the following components:
Techno-economic exclusion layer (CPUC)
Protected Area Layer
Biodiversity Index Model (Threshold: 2.75*)
Cropland Index Model (Threshold: Jenks, 7.4*)
Results (Statewide Potential):
Utility-Scale Solar: 5.3 Million Acres (650 GW)
Land-Based Wind: 2.3 Million Acres (25 GW)

Land-Use Screen 2
Included the following components:
Techno-economic exclusion layer (CPUC)
Protected Area Layer
Biodiversity Index Model (Threshold: 2.5*)
Cropland Index Model (Threshold: Jenks, 7.4*)
Intactness and Distance Model (Threshold: 3.0*)
Results (Statewide Potential):
Utility-Scale Solar: 2.6 Million Acres (320 GW)
Land-Based Wind: 1.1 Million Acres (12 GW)

Land-Use Screen 3
Included the following components:
Techno-economic exclusion layer (CPUC)
Protected Area Layer
Biodiversity Index Model (Threshold: 2.5*)
Cropland Index Model (Threshold: Jenks, 7.4*)
ACE Climate Resilience data (CDFW) (ranks 4 and 5)
Results (Statewide Potential):
Utility-Scale Solar: 3.1 Million Acres (370 GW)
Land-Based Wind: 1.3 Million Acres (14 GW)

The October 2022 proposal is documented in a [draft staff report](#) and [workshop slide deck](#).

Power densities of 30 MW/km² and 2.7 MW/km² were used to convert area to electrical power generation for solar and wind, respectively.

*Areas above the threshold not included in technical resource potential estimates



March 2023: Summary of Proposed Modifications

- Two land-use screens to inform resource potential estimates for onshore wind and utility-scale solar.
 1. Core Land-Use Screen
 2. SB 100 Climate Study Screen
- A proposed approach to land-use evaluation and resource potential estimation for geothermal energy resources.
- Data updates and method changes.



March 2023: Draft Land-Use Screens

Core Land-Use Screen
Proposed use: IRP and SB 100 modeling
Includes the following components:
Revised Techno-economic exclusion layer (CPUC)
Revised Protected Area Layer
Cropland Index Model* (Threshold: Mean, 7.7**)
Terrestrial Intactness Model (Threshold: Mean, 0.3**)
Biological Planning Priorities: ACE Biodiversity (rank 5), ACE Connectivity (ranks 4 & 5), ACE Irreplaceability (ranks 4 & 5), Wetlands from CA Nature Habitat and Land Cover (FVEG Derived), USFWS Critical Habitat
Results (Statewide Resource Potential):
Utility-Scale Solar: 5.4 Million acres (780 GW)
Land-Based Wind: 3.4 Million acres (84 GW)

SB 100 Climate Study Screen
Proposed use: Study scenario in 2025 SB 100 Report
Includes the following components:
Revised Techno-economic exclusion layer (CPUC)
Revised Protected Area Layer
Cropland Index Model* (Threshold: Mean, 7.7**)
Terrestrial Intactness Model (Threshold: Mean, 0.3**)
Biological Planning Priorities: ACE Biodiversity (rank 5), ACE Connectivity (ranks 4 & 5), ACE Irreplaceability (ranks 4 & 5), Wetlands from CA Nature Habitat and Land Cover (FVEG Derived), USFWS Critical Habitat
ACE Terrestrial Climate Resilience (ranks 4 & 5)
Results (Statewide Resource Potential):
Utility-Scale Solar: 3.8 Million acres (540 GW)
Land-Based Wind: 2.5 Million acres (63 GW)

*Not applied to wind resources

**Areas above the threshold not included in technical resource potential estimates

Power densities of 7 acres/MW and 40 acres/MW are used to convert area to electrical power generation for solar and wind, respectively.



Proposed Updates to Data and Methods Draft Land-Use Screens for Resource Potential March 2023



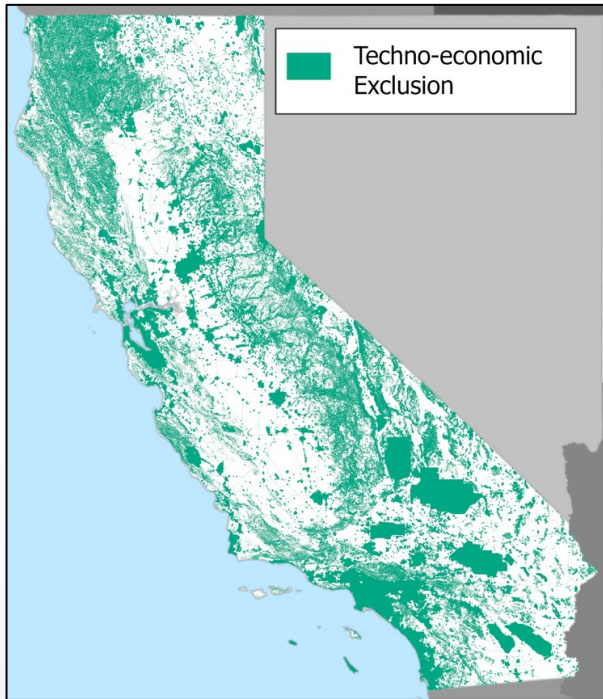
Proposed Modifications

1. Base Exclusions
2. Protected Area Layer
3. Framework for the DRECP Area
4. CEC Cropland Model
5. Terrestrial Landscape Intactness
6. Biodiversity Data

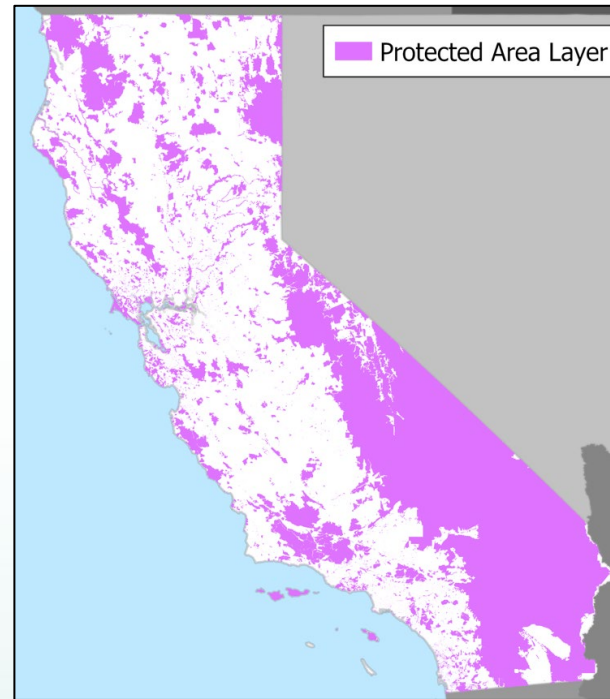


Proposed Updates to Base Exclusions

1. Use updated techno-economic exclusion layer from the CPUC.
2. Add additional datasets to the Protected Area Layer.



Updated techno-economic layer from the CPUC. Source: CEC staff with data provided by the CPUC.



Updated Protected Area Layer, additions described in the following slide. Source: CEC staff.



Proposed Additions to Protected Area Layer

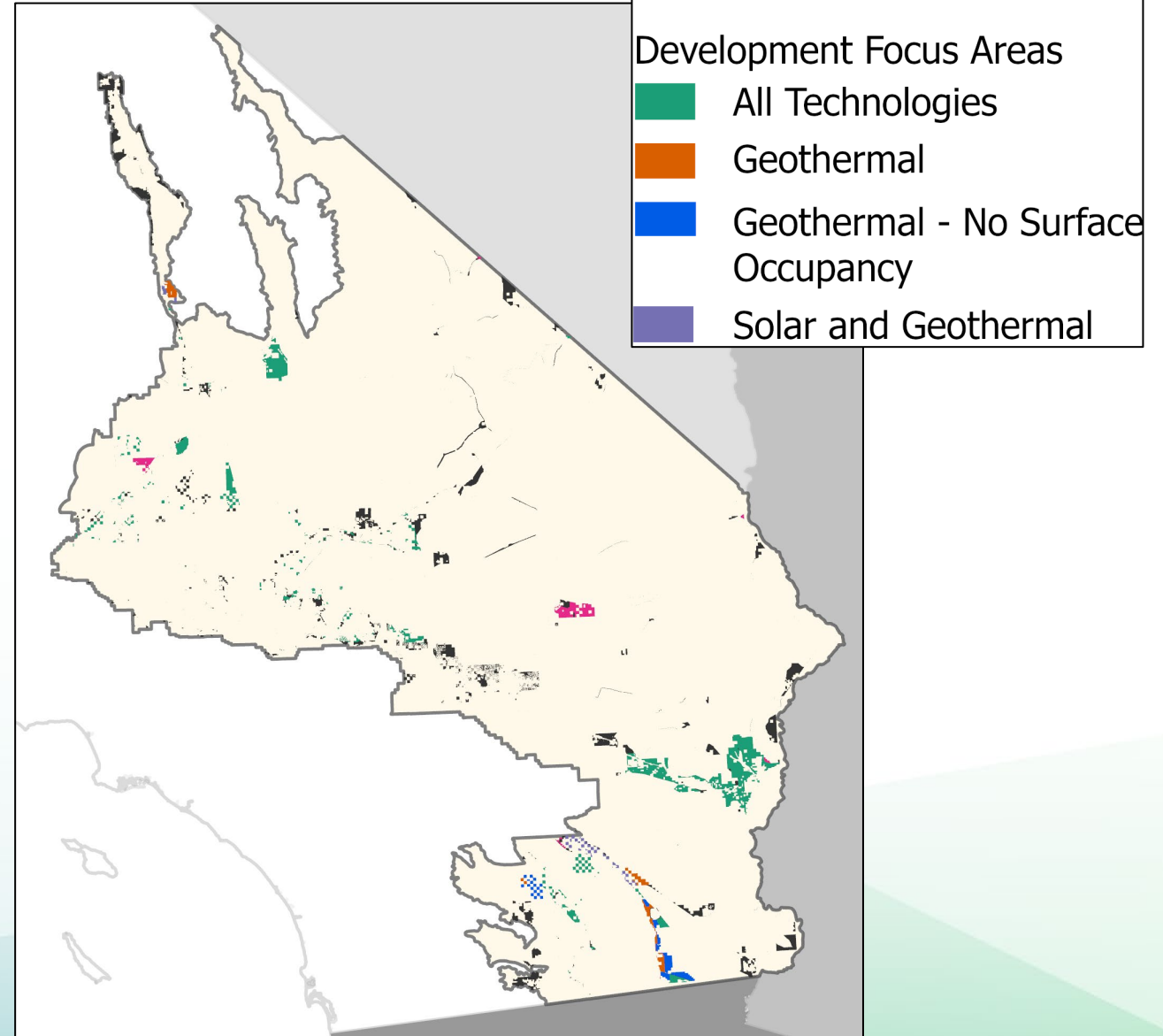
- Protected Areas (Solar - October Draft)
- Molok Luyuk Expansion (Berryessa Snow Mtn NM)
- Mono Basin Ntnl Forest Scenic Area
- Alabama Hills Ntnl Conservation Area
- Vinagre Wash Special Management Area
- Local Lands (CPAD and PAD-US CBI)
- Off-Highway Vehicle Recreation Area
- Extensive Recreation Management Area
- Special Recreation Management Area
- California Desert Ntnl Conservation Lands
- BLM ACECs (Most Complete)
- BLM Wild and Scenic River Corridors
- Special Interest Management Area (USFS)





DRECP Area

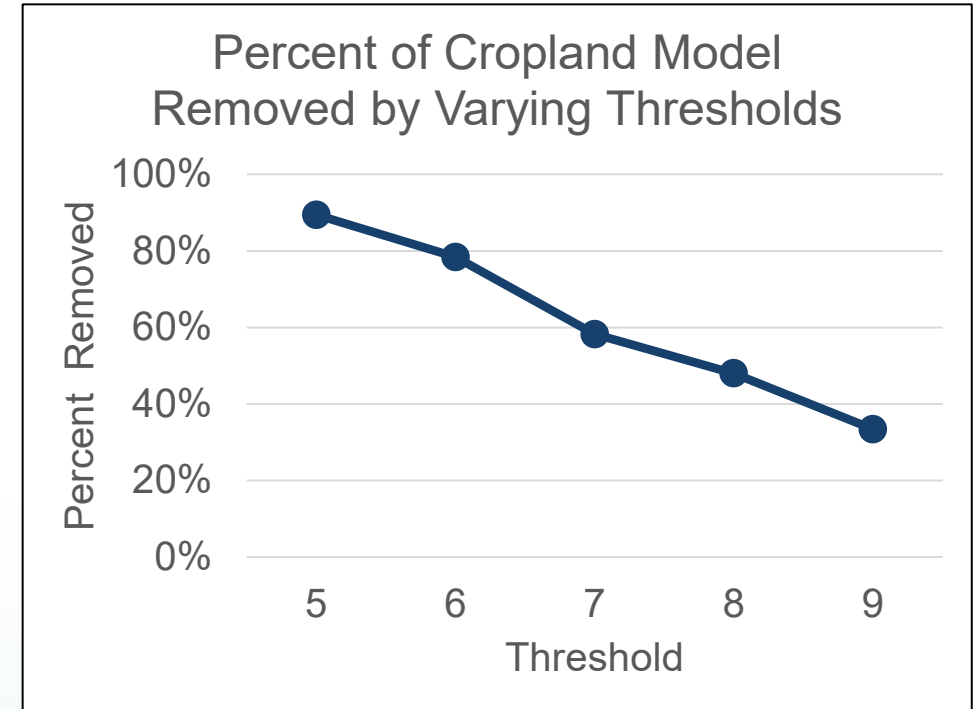
- Based on feedback, staff propose the following changes to the framework for estimating renewable resource technical potential within the DRECP Area:
 - Include all Development Focus Areas (DFA), Variance Process Lands (VPL), and General Public Lands (GPL) in resource potential estimates.
 - Correctly partition DFAs by technology type.
 - Apply land-use screens to refine resource potential estimates.





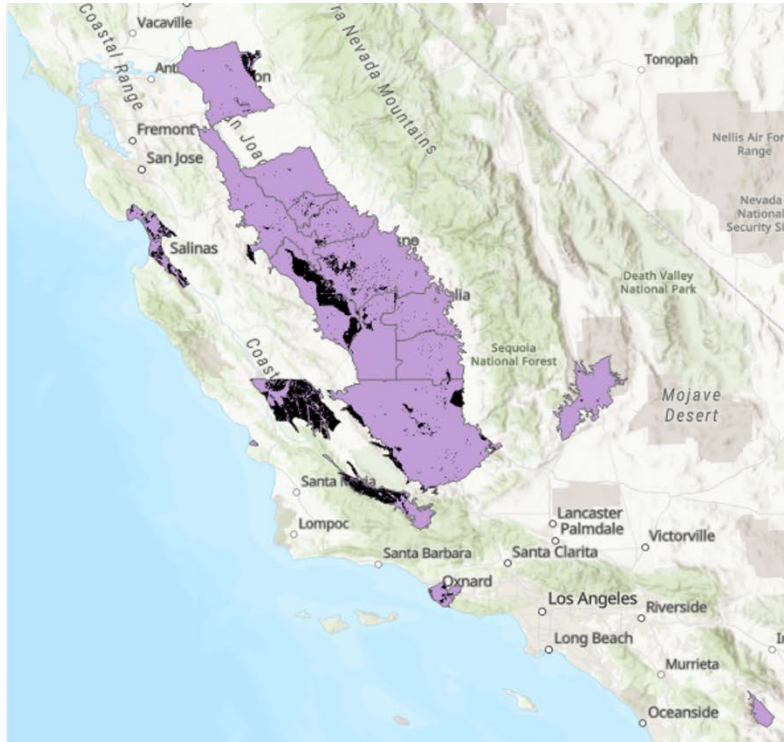
Proposed Updates to CEC Cropland Model

- Change CEC Cropland Model threshold from Jenks Natural Breaks (7.4) to the Mean Value (7.7).
- Propose to not apply the CEC Cropland Model to wind resource potential estimates.

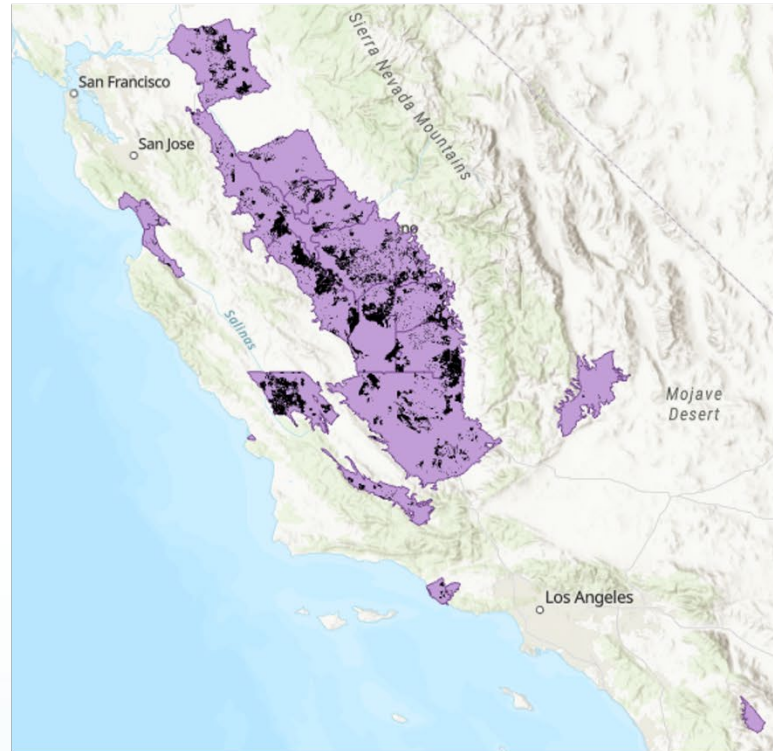




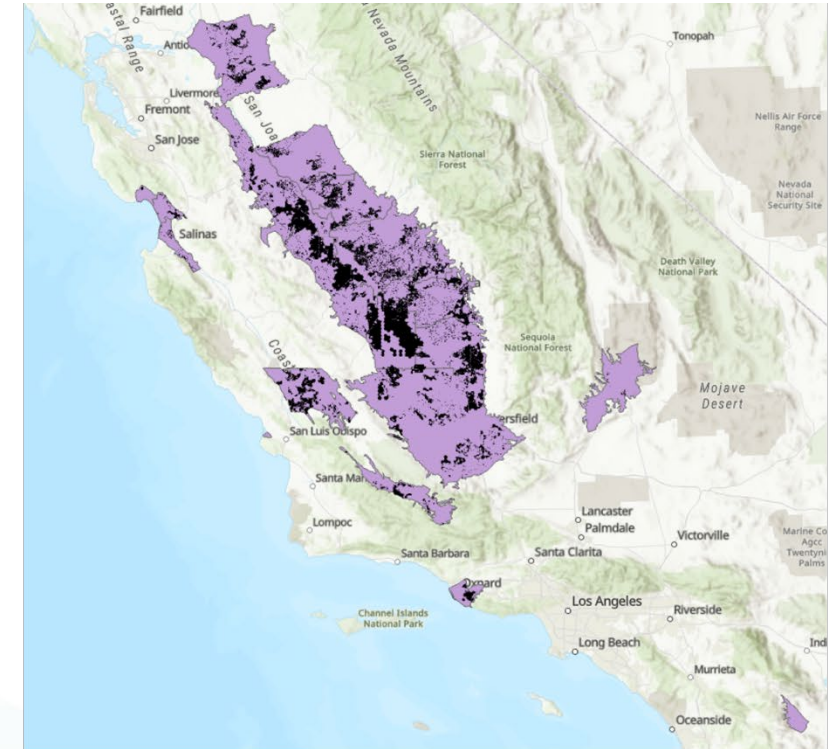
Solar Resource Potential and Critically Overdrafted Basins





DRECP SJV Screen
920,000 Acres



Draft Land Use Screen 1
(October 2022 draft)
1.3 Million Acres



Proposed Core Land Use Screen
(March 2023 draft)
1.6 Million Acres

-  = Critically Overdrafted Basins
-  = Solar Resource Technical Potential



Proposed Updates to Terrestrial Landscape Intactness

- **What is Terrestrial Landscape Intactness?** Measure of human impacts in landscape. Factors include agriculture, urban development, natural resource extraction, invasive species, linear development and point development.
- The October 2022 draft proposal included a CEC Intactness and Distance to a Protected Area Model.
- Staff propose to apply the Conservation Biological Institute (CBI) Landscape Intactness Model directly to refine resource potential.



Proposed Updates to Biodiversity Data

- The October 2022 draft proposal included the use of a draft CEC Biodiversity model.
- The model incorporated Areas of Conservation Emphasis (ACE) data from the California Department of Fish and Wildlife (CDFW).
- Staff propose to apply the ACE data directly to refine resource potential estimates, as described in the following slides.
- Staff propose to include Critical Habitat in the statewide land-use screens.



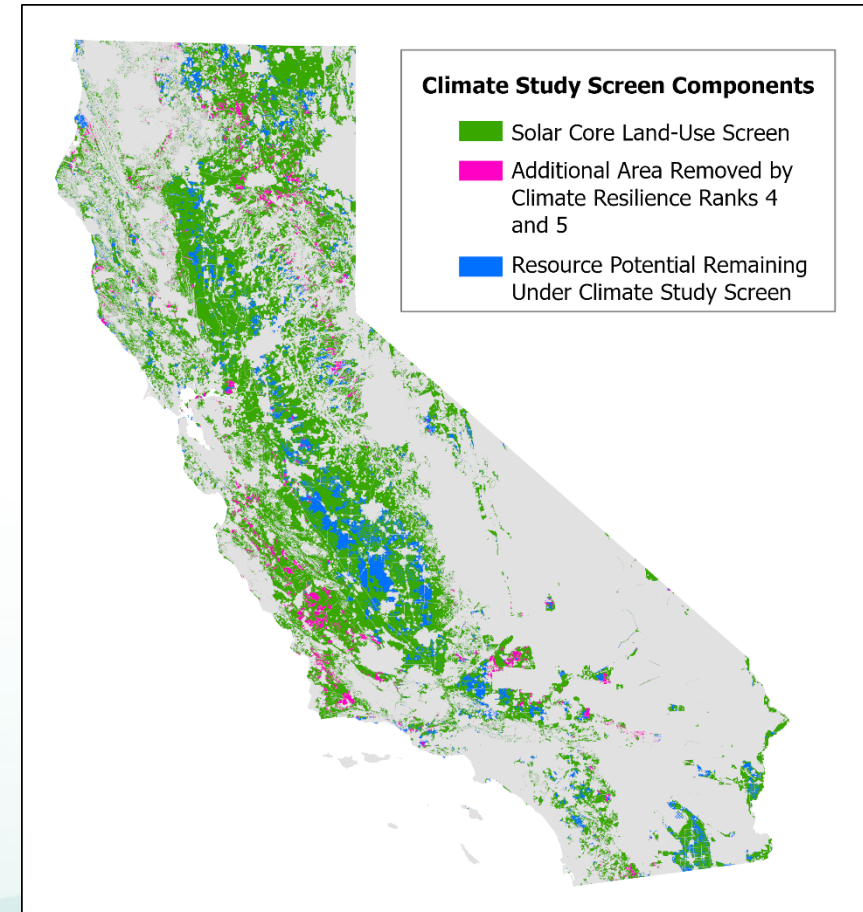
Biodiversity Datasets

- Staff propose to apply the following datasets directly to refine renewable resource technical potential estimates for utility-scale solar and land-based wind. Together, this information is grouped as **Biological Planning Priorities**:
 - **ACE Biodiversity (rank 5)**
 - Overall species biodiversity
 - **ACE Connectivity (ranks 4 and 5)**
 - Mapped corridors or linkages, and the juxtaposition to large contiguous natural areas
 - **ACE Irreplaceability (ranks 4 and 5)**
 - Rare and Endemic Species
 - **USFWS Critical Habitat (including Bi-State Sage Grouse Proposed Habitat)**
 - Threatened or Endangered Species
 - **Wetlands from CA Nature Habitat and Land Cover (FVEG Derived)**
 - More comprehensive wetlands category



SB 100 Climate Study Screen

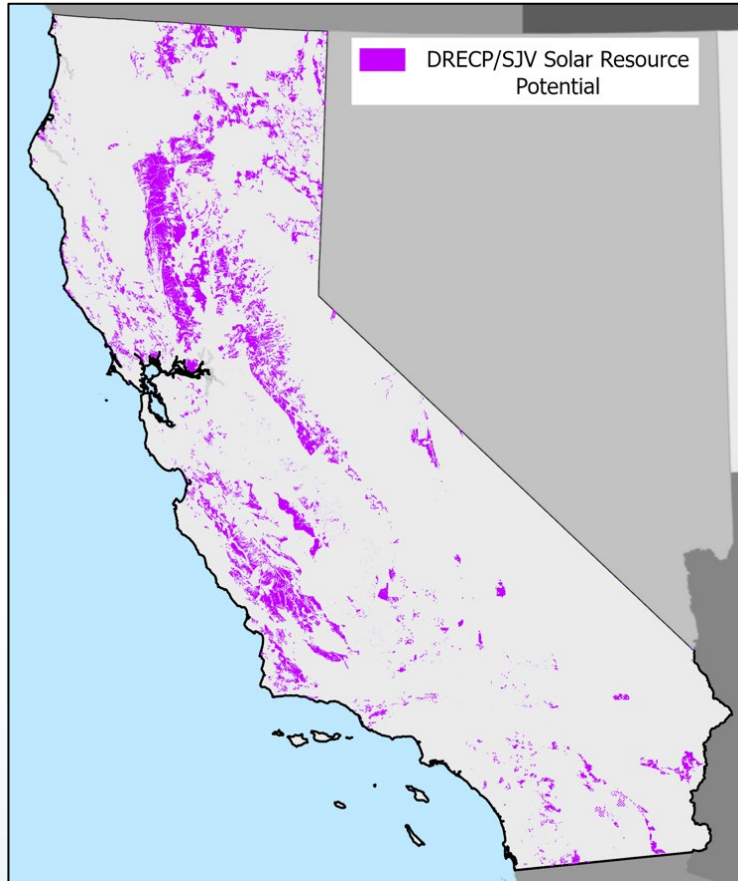
- Includes all components of the Core Land Use Screen, plus the addition of ACE Climate Resilience (ranks 4 and 5)
- “Future system modeling and land-use impacts must be coordinated with any recommendations from the Climate Smart Strategy called for in Executive Order N-82-20 and the AB 32 Scoping Plan.” (Source: 2021 SB 100 Report, Page 114)



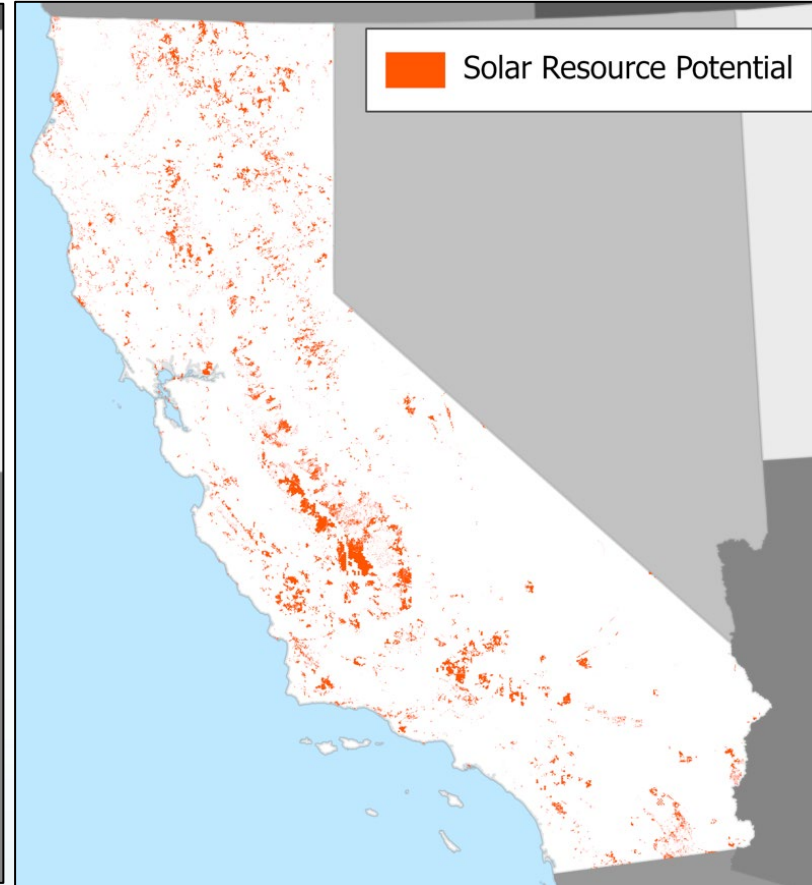


Draft Land-Use Screens: Solar Resource Potential

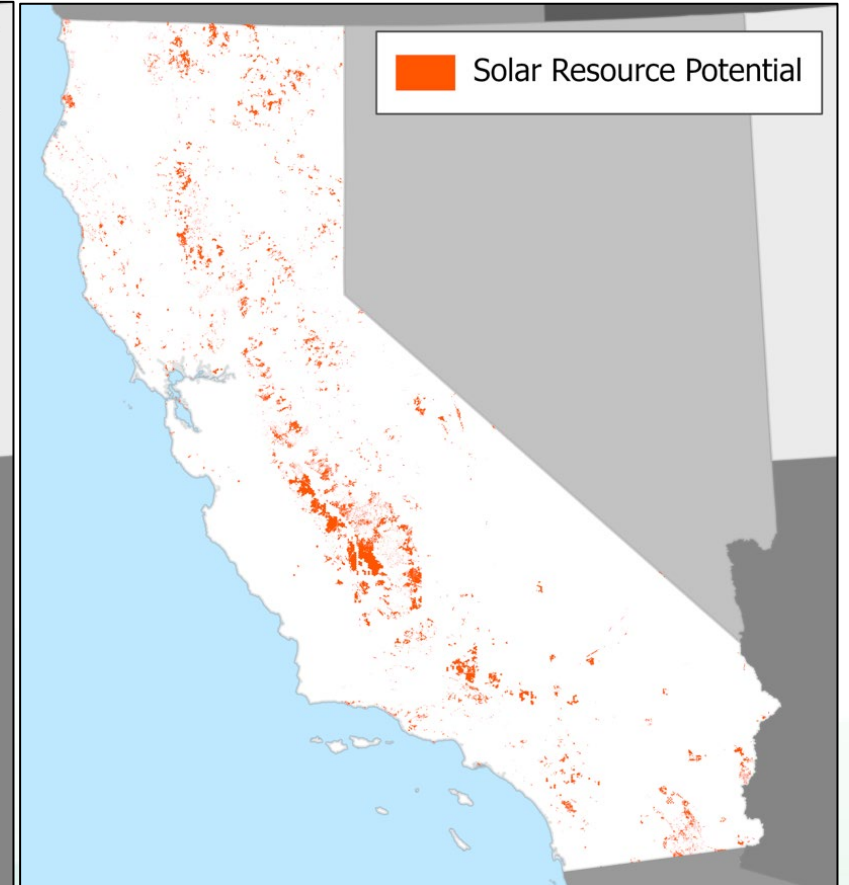
DRECP/SJV Screen



Core Land-Use Screen



SB 100 Climate Study Screen

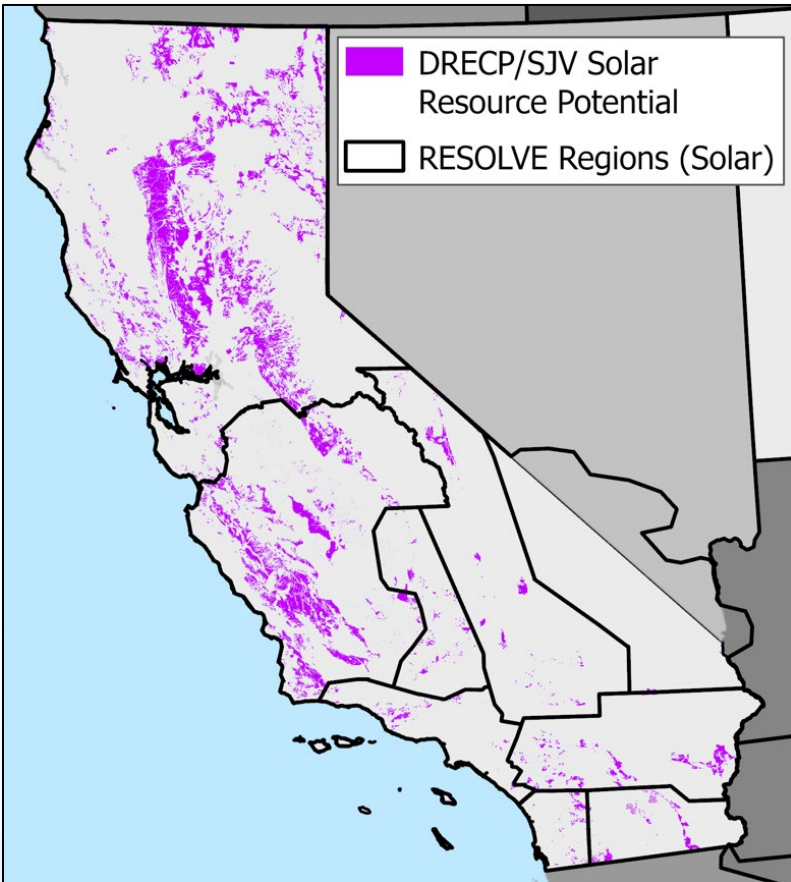


These maps reflect an **interim geoprocessing step** in estimating technical renewable resource potential. This high-level analysis is intended to guide broad energy planning decisions. It is not intended to substitute for detailed site-specific analysis and consideration by appropriate land-use authorities regarding the compatibility of potential renewable energy projects.

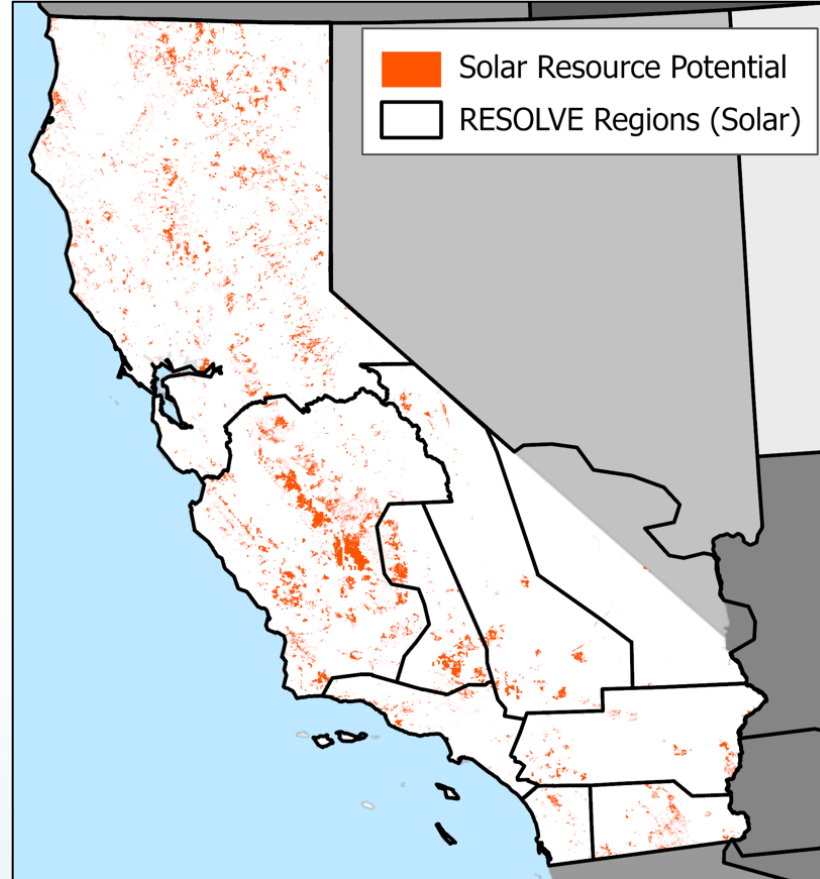


Draft Land-Use Screens: Solar Resource Potential and RESOLVE Regions

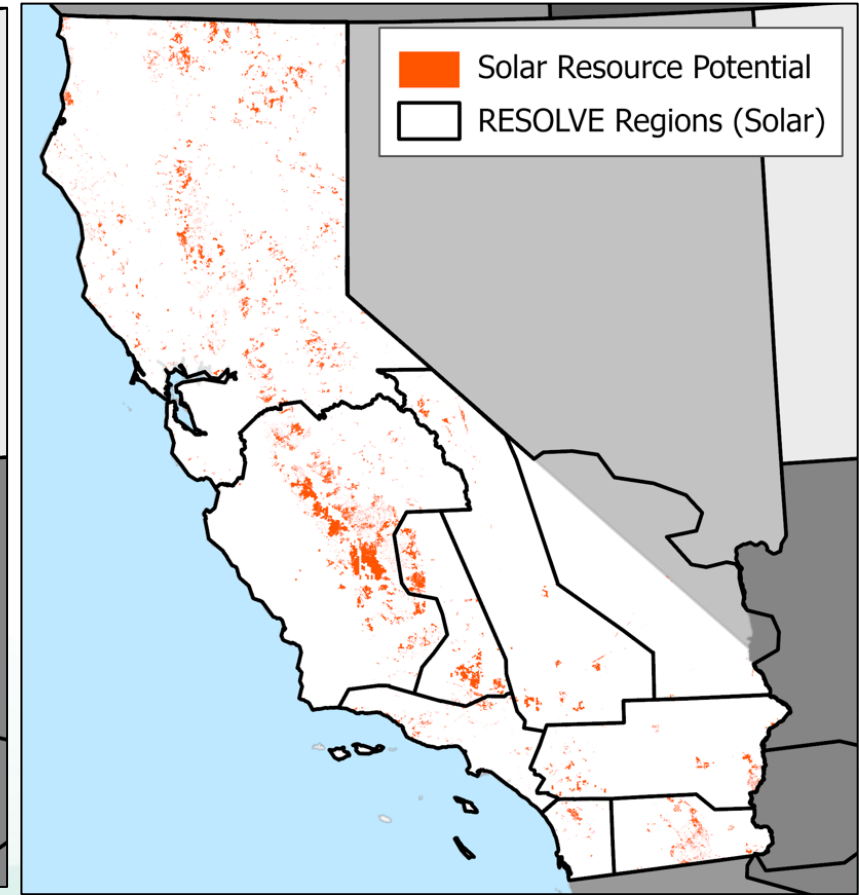
DRECP/SJV Screen



Core Land-Use Screen



SB 100 Climate Study Screen



These maps reflect an **interim geoprocessing step** in estimating technical renewable resource potential. This high-level analysis is intended to guide broad energy planning decisions. It is not intended to substitute for detailed site-specific analysis and consideration by appropriate land-use authorities regarding the compatibility of potential renewable energy projects.



Draft Land-Use Screens – Solar Final Result

RESOLVE Resource Area	Total Acres in RESOLVE Area	Total Acres that meet screening criteria (Core)	Percent of RESOLVE Area with resource potential (Core)	Core Land-Use Screen (GW)	SB 100 Climate Study Screen (GW)
GREATER IMPERIAL	3,517,200	194,406	6	28	25
GREATER TEHACHAPI	4,348,975	432,006	10	62	54
NORTHERN CA	40,912,417	2,212,169	5	316	202
RIVERSIDE	7,734,698	179,064	2	26	21
GREATER KRAMER	12,194,413	290,543	2	42	24
SAN DIEGO	1,637,652	50,758	3	7	6
GREATER LA METRO	3,974,182	121,042	3	17	13
SPGE	18,696,796	1,892,363	10	270	188
SNV ELDORADO DESERT*	7,696,578	11,476	0	1.6	1.2

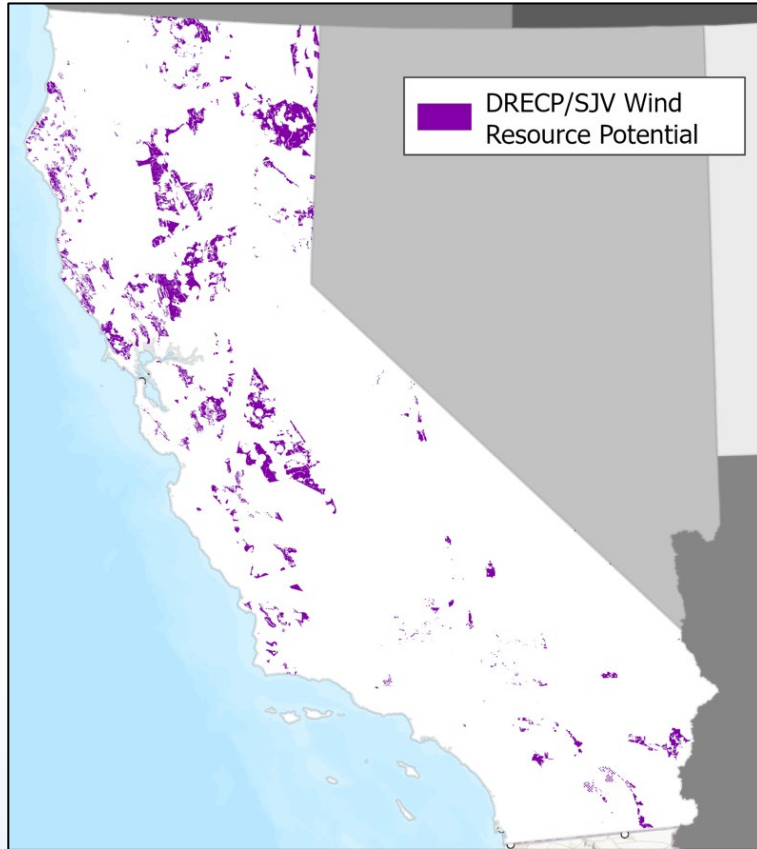
Note: Area to resource potential conversion factor: 7 acres/MW

*Area calculations are limited to within California.

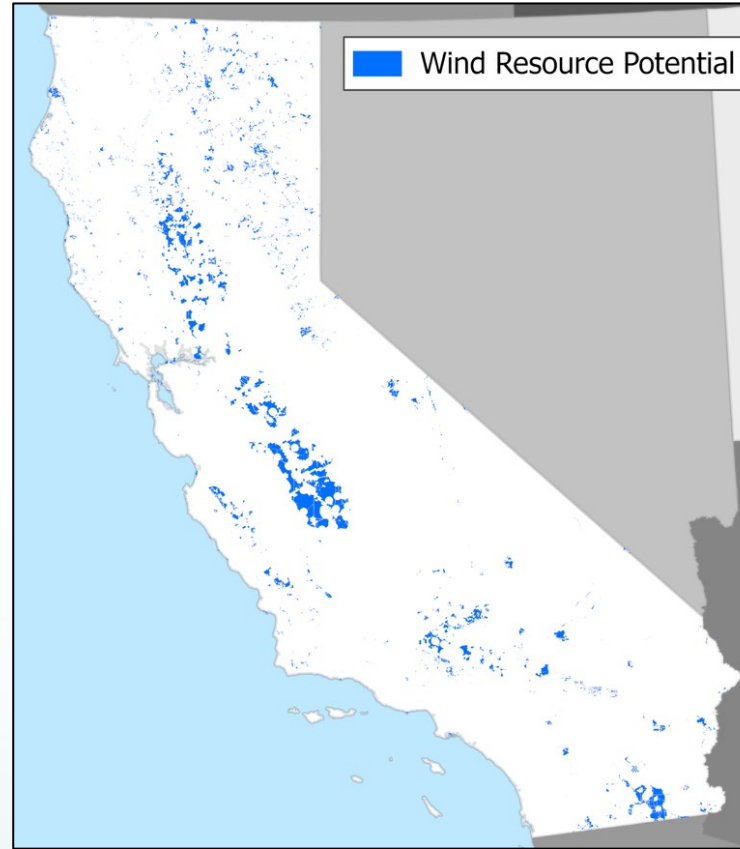


Draft Land-Use Screens: Wind Resource Potential

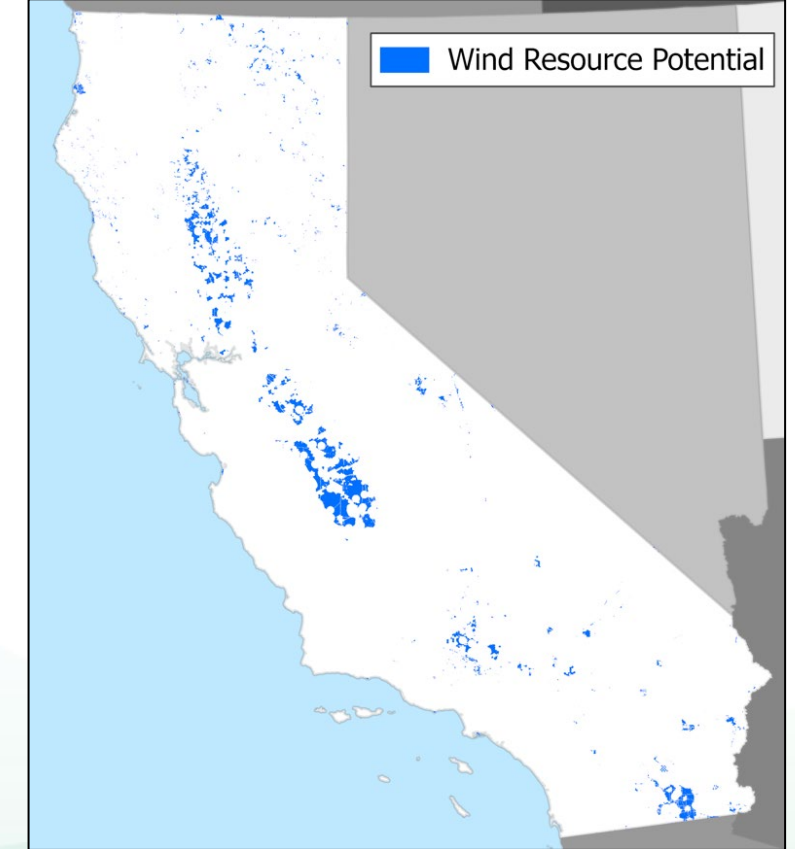
DRECP/SJV Screen



Core Land-Use Screen



SB 100 Climate Study Screen

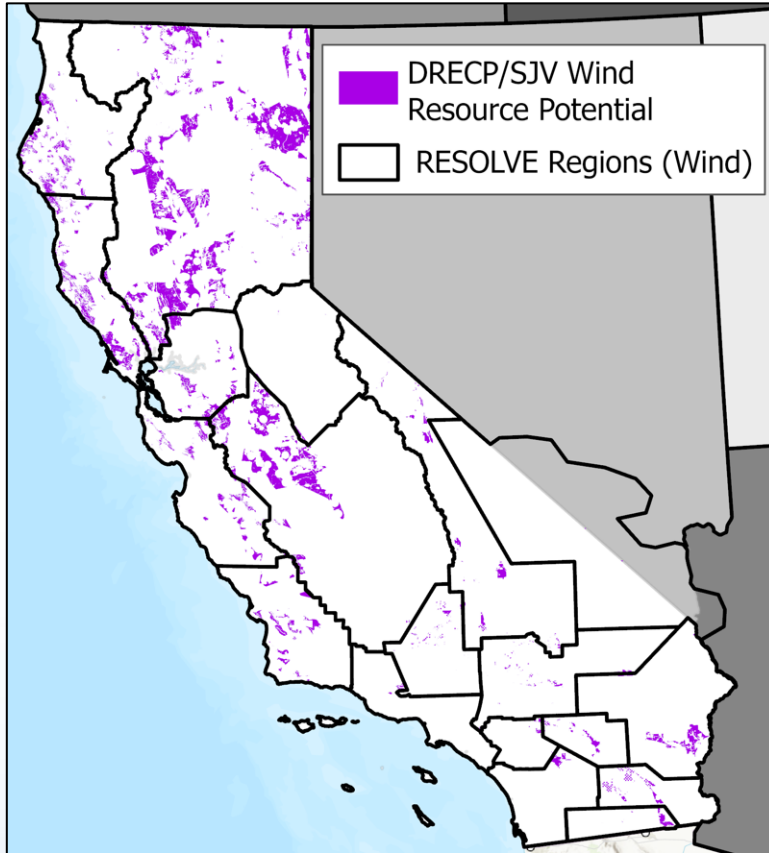


These maps reflect an **interim geoprocessing step** in estimating technical renewable resource potential. This high-level analysis is intended to guide broad energy planning decisions. It is not intended to substitute for detailed site-specific analysis and consideration by appropriate land-use authorities regarding the compatibility of potential renewable energy projects.



Draft Land-Use Screens: Wind Resource Potential and RESOLVE Regions

DRECP/SJV Screen



Core Land-Use Screen



SB 100 Climate Study Screen



These maps reflect an **interim geoprocessing step** in estimating technical renewable resource potential. This high-level analysis is intended to guide broad energy planning decisions. It is not intended to substitute for detailed site-specific analysis and consideration by appropriate land-use authorities regarding the compatibility of potential renewable energy projects.



Draft Land-Use Screens – Wind Final Result

RESOLVE Resource Area	Total Acres in RESOLVE Area	Total Acres that meet screening criteria (Core)	Percent of RESOLVE Area with resource potential (Core)	Core Land Use Screen (GW)	SB 100 Climate Study Screen (GW)
Central_Valley_North_Los_Banos	14,650,801	1,025,062	7	26	25
El_Dorado_Mariposa	5,064,281	49,756	1	1	0.5
Greater_LA	2,840,673	6,228	0	0.2	0.1
Greater_SD	2,563,494	11,731	0	0.7	0.1
Humboldt	4,995,199	91,207	2	2	2
Kern_Greater_Carrizo	3,831,717	75,609	2	2	0
Mendocino_Marin	3,601,340	62,968	2	2	1
Northern_California	23,171,973	1,029,171	4	26	17
Peninsula_Monterey	4,378,517	93,617	2	2	0.2
Solano	3,383,155	162,151	5	4	3
Southern_NV_Eldorado	6,502,585	5,904	0	0.1	0.1
Tehachapi	2,751,692	183,112	7	5	4

Note: Area to resource potential conversion factor: 40 acres/MW

*Area calculations are limited to within California.



Geothermal slides



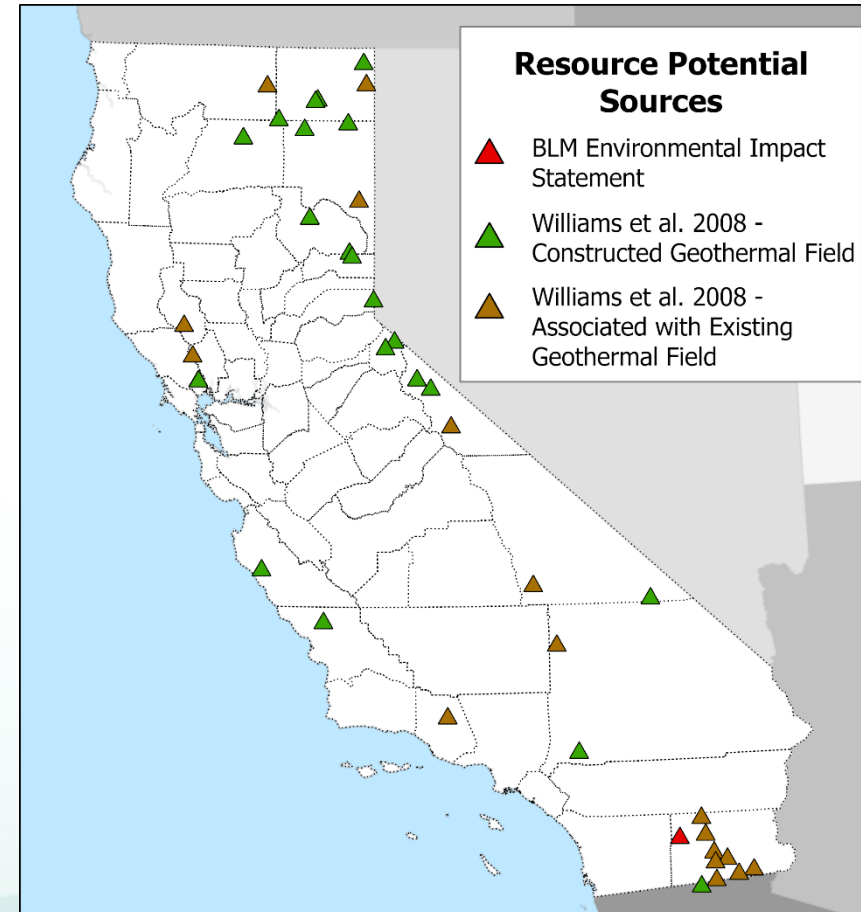
Geothermal Resource Analysis

- Utilize hydrothermal resources: subsurface reservoirs where geologic conditions are hot, wet, and permeable. Steam drives turbines that generate electricity.
- Differs from solar and wind because it occurs in discrete mapped areas while wind and solar generally occur at a landscape scale
- Spatial footprint of resource potential defines the area where the resource could be developed, not the area that would ultimately be developed for power generation.



Identification of Geothermal Resource Potential

- Resource potential estimates given by the USGS Assessment of Identified Geothermal Resources (Williams et al. 2008a and Williams et al. 2008b)
- Include estimate from BLM Environmental Impact Statement for Truckhaven

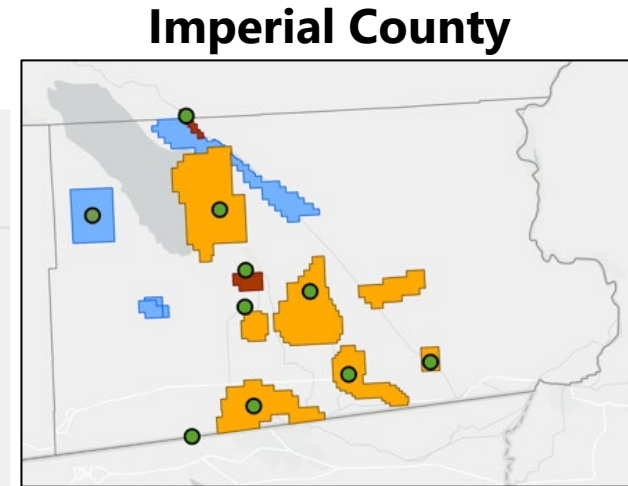
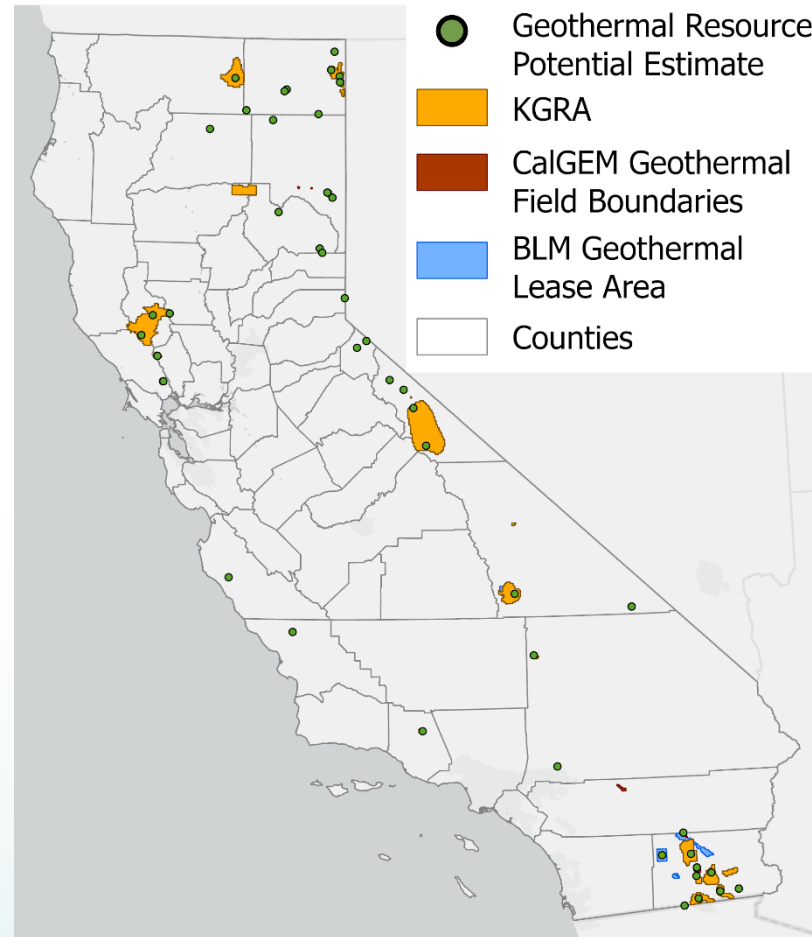


Total: 5,444 MW



Surface Extent of Geothermal Systems

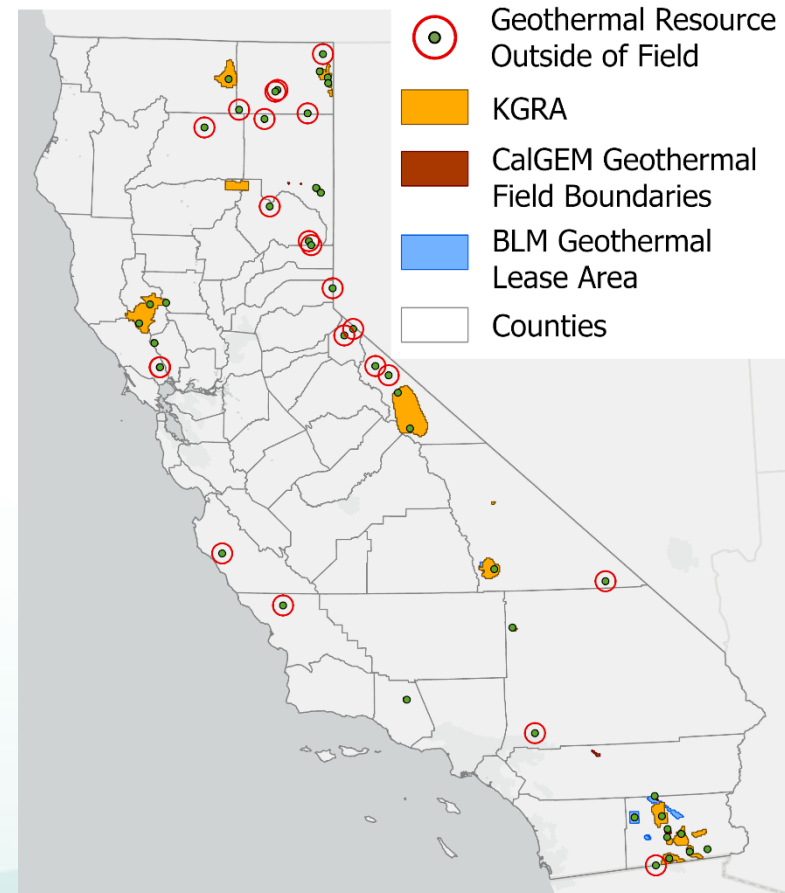
- Needed for applying land-use screens (refining resource potential)
- Needed for Busbar Mapping (IRP)
- Used mapped limits of geothermal fields and KGRAs by Dept of Conservation (2002) and CalGEM Field Boundaries (2020)
- BLM Geothermal Leasing Areas (2010)





Remaining Resources Outside of Geothermal Fields

- Needed for applying land-use screens (refining resource potential)
- Needed for Busbar Mapping (IRP)
- Used mapped limits of geothermal fields and KGRAs by Dept of Conservation (2002) and CalGEM Field Boundaries (2020)
- BLM Geothermal Leasing Areas (2010)

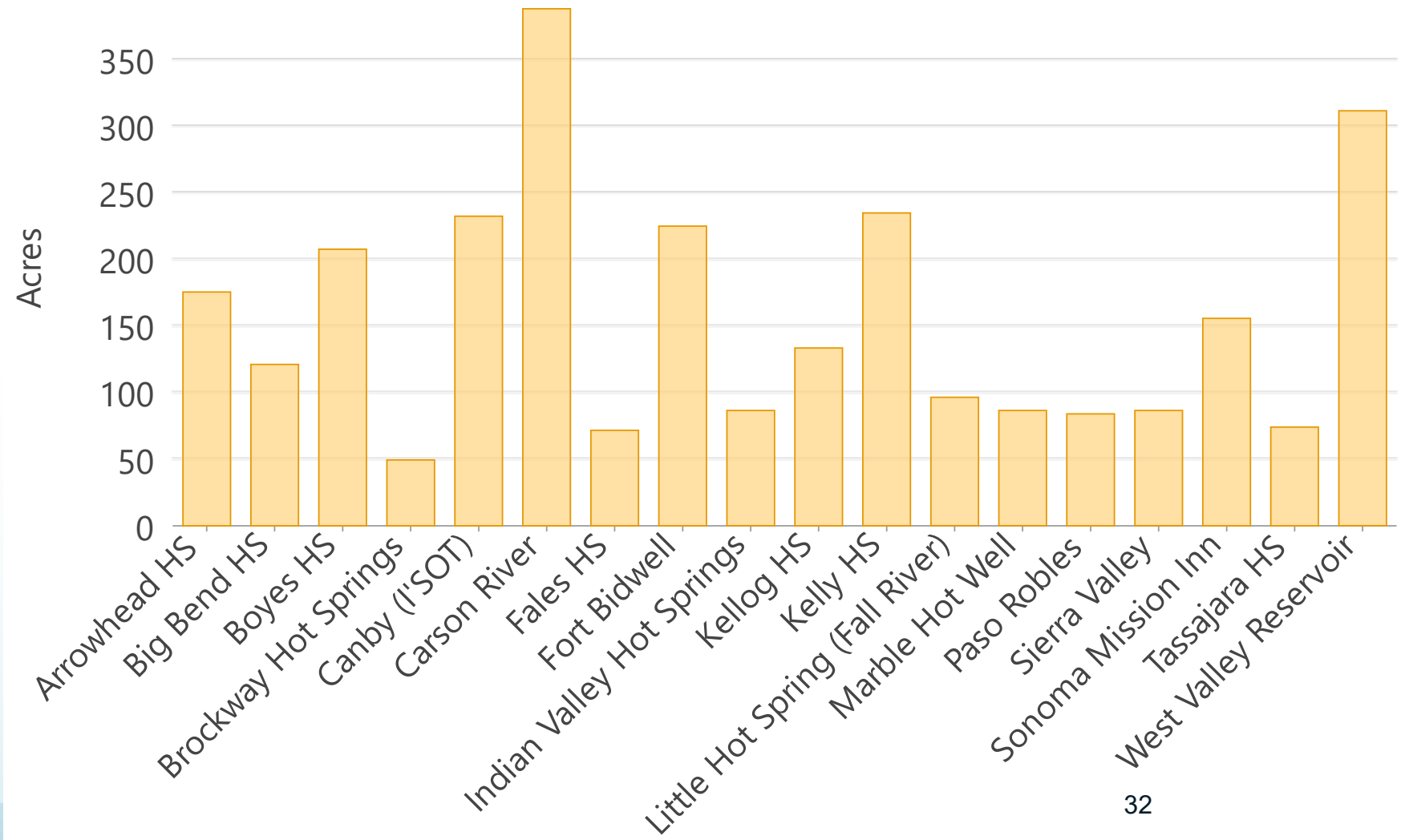


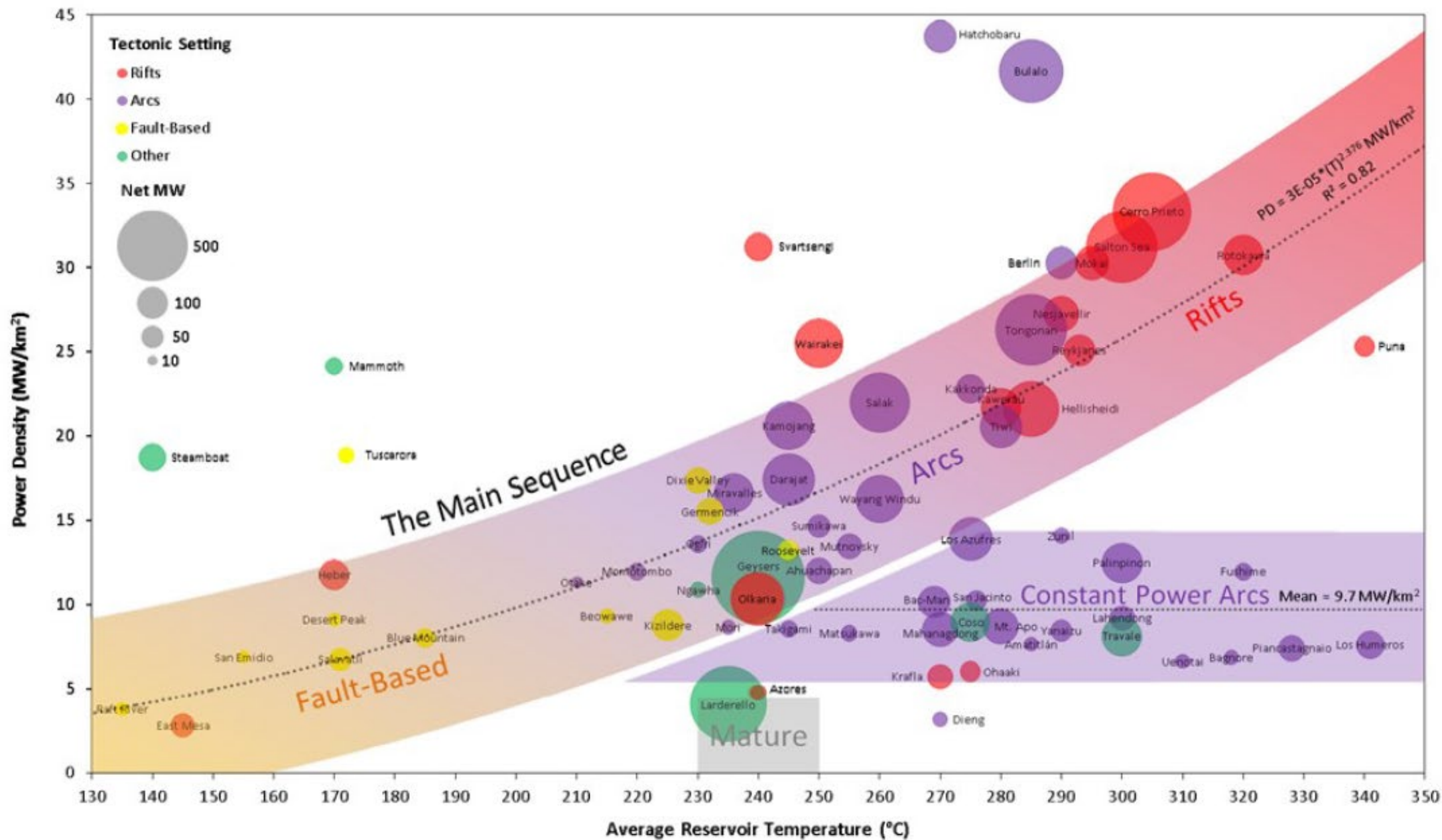


Constructing Extent of Geothermal Fields

Buffer out point location an appropriate radius to reach the estimated electrical power potential using a power density, 10 MW/km²

Constructed Surface Area of Geothermal Fields

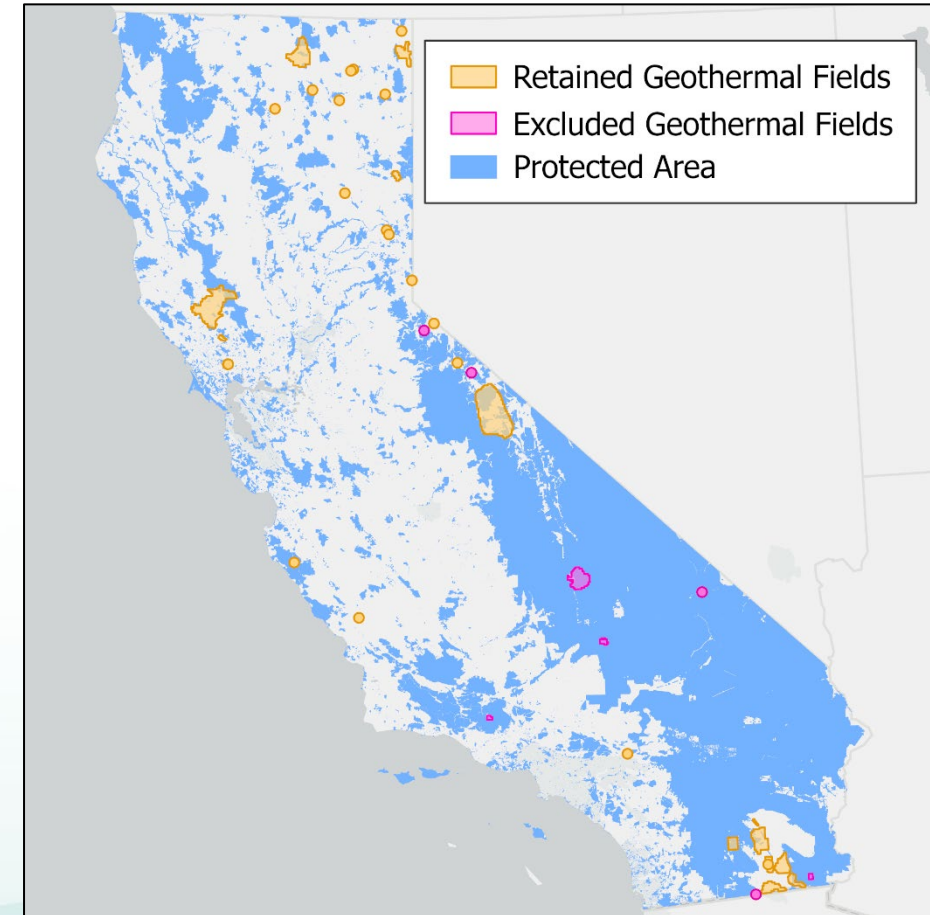






Proposed Land-Use Screening Method for Geothermal

When a geothermal field is entirely within a protected area, then its resource potential is excluded from consideration in statewide planning.

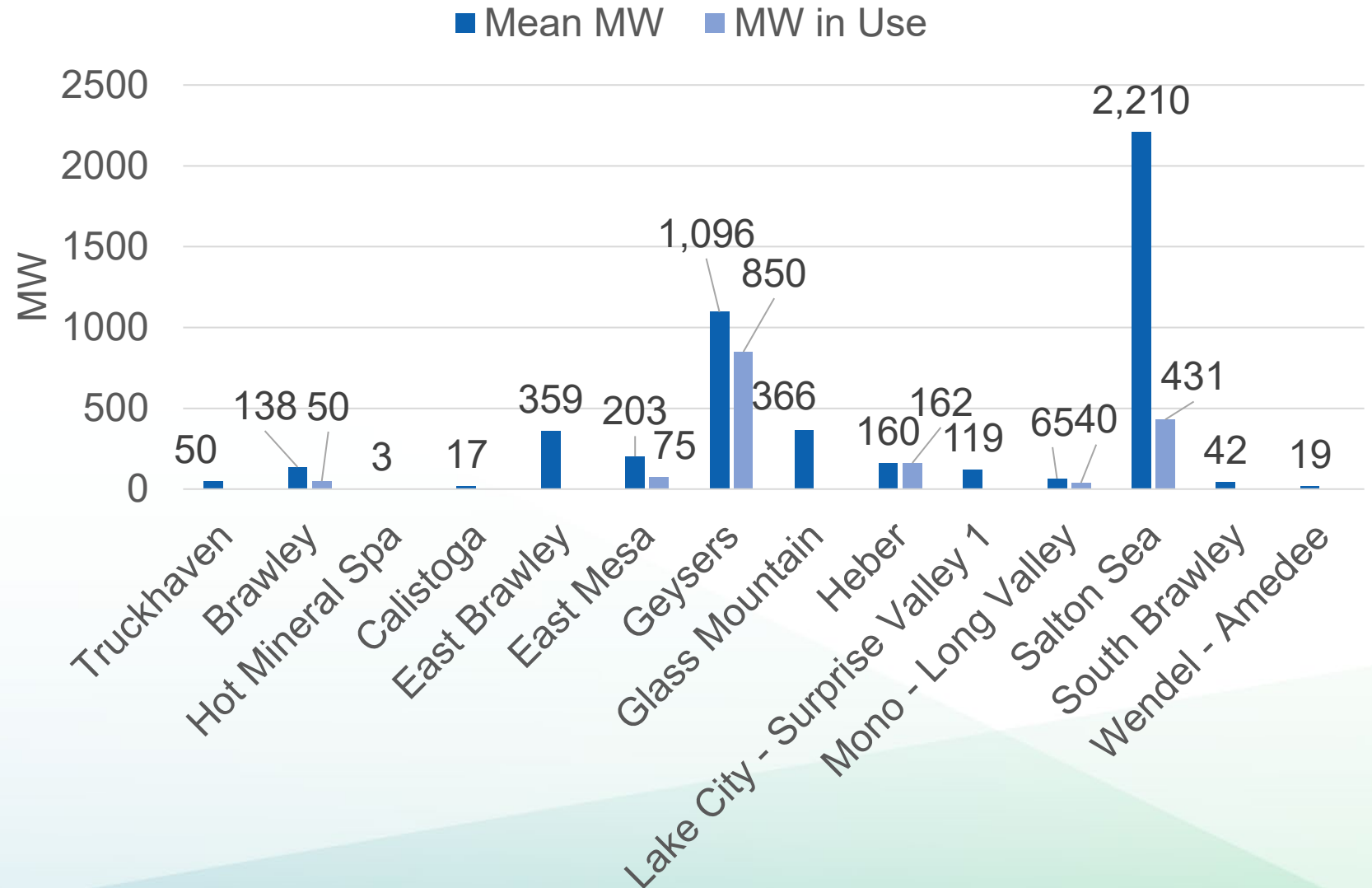


Constructed geothermal fields are not drawn to scale.



Geothermal Resource in Production

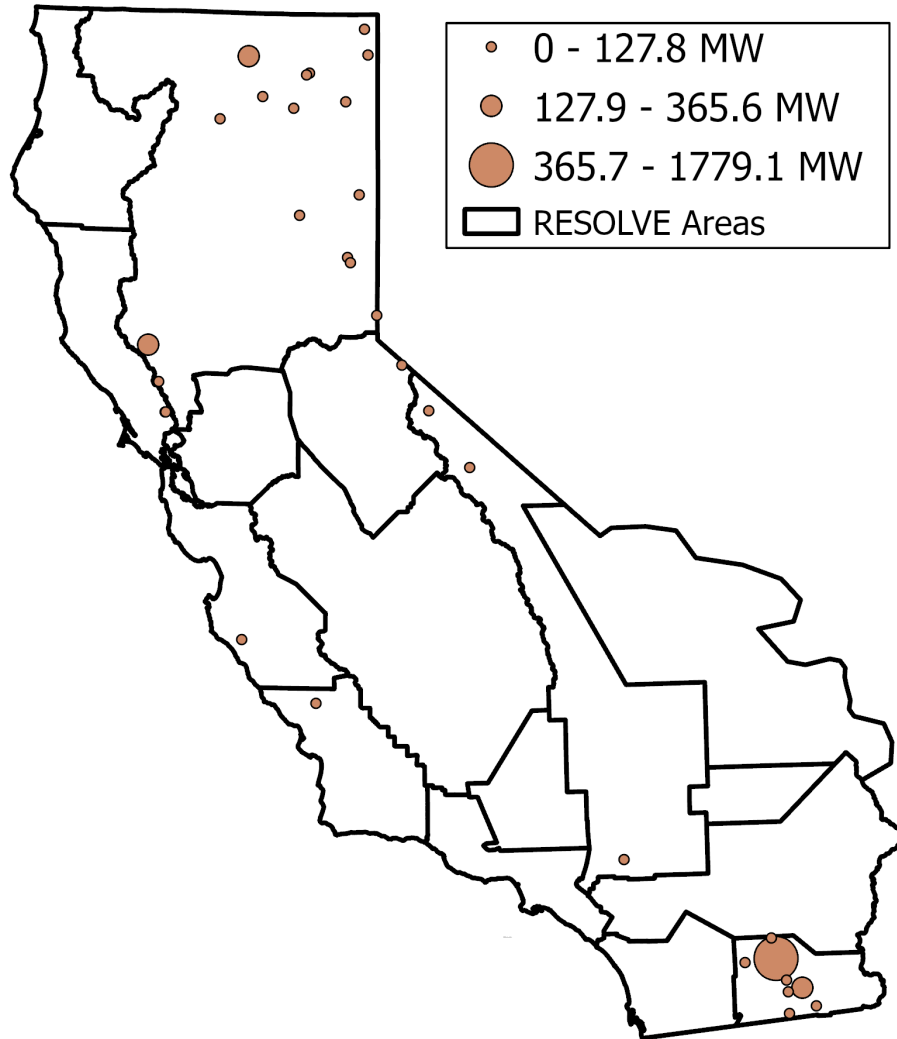
- Quarterly Fuel and Energy Report (QFER) tracks power plants greater than 1 MW.
- Nameplate capacities were used for all sites except for the Geysers, which was determined by Lovekin et al. 2004.



Net Undeveloped
Resource Potential:
3,354 MW



Net Undeveloped Technical Resource Potential



Resource Area	Net Potential (MW)
Northern_California	834
Mendocino_Marin	15
El_Dorado_Mariposa	16
Greater_Kramer	35
Peninsula_Monterey	3
Kern_Greater_Carrizo	3
Greater_Imperial	2,448

Total: 3,354 MW



Summary of Proposed Land-Use Screens

Screen and Technology	Statewide Acreage (Millions)	Statewide Renewable Resource Potential	Proposed Uses
Utility-Scale Solar (Core Land-Use Screen)	5.4	780 GW	IRP + SB 100 Core Cases
Utility-Scale Solar (SB 100 Climate Study Screen)	3.8	540 GW	SB 100 Sensitivity Case
Land-Based Wind (Core Land-Use Screen)	3.4	84 GW	IRP + SB 100 Core Cases
Land-Based Wind (SB 100 Climate Study Screen)	2.5	63 GW	SB 100 Sensitivity Case
Geothermal	N/A	3,354 MW	IRP + All SB 100 Cases



End



References and Appendices



References

1. Wilmarth, Maxwell, Stimac, James and Ganefianto, Gugi. 2020. "Power Density in Geothermal Fields, 2020 Update." Proceedings World Geothermal Congress 2020.
2. Williams, Colin F., Reed, Marshall J., Mariner, Robert H., DeAngelo, Jacob, Galanis, S. Peter, Jr. 2008. "Assessment of moderate- and high-temperature geothermal resources of the United States: U.S. Geological Survey Fact Sheet 2008-3082." 4 p.
3. Williams, C.F., Reed, M.J., and Mariner, R.H., 2008, A review of methods applied by the U.S. Geological Survey in the assessment of identified geothermal resources: U.S. Geological Survey Open-File Report 2008-1296, 27 p. [<http://pubs.usgs.gov/of/2008/1296/>]
4. Lovekin, James W., Subir K. Sanyal, Christopher W. Klein. 2004. "New Geothermal Site Identification and Qualification." Richmond, California: California Energy Commission: Public Interest Energy Research Program. Accessed September 14, 2022.
5. *Geothermal Map of California*, S-11. California Department of Conservation, 2002. <https://www.conservation.ca.gov/calgem/geothermal/maps/Pages/index.aspx>
6. CalGEM Field Admin Boundaries (2020): https://gis.conservation.ca.gov/server/rest/services/CalGEM/Admin_Bounds/MapServer



Addendum: Protected Area Layer

Dataset/Category	Subset of Dataset Used	URL
PAD-US (CBI Edition)	National Parks, GAP Status 1 and 2, State Parks, Wildlife Management Areas, etc.	https://databasin.org/datasets/64538491f43e42ba83e26b849f2cad28 .
Conservation Easements		www.CALands.org/cced
CPAD	Open Spaces and Parks under city or county level	https://www.calands.org/cpad/ .
Terrestrial 30x30 Conserved Areas	Gap Status 1 and 2	https://www.californianature.ca.gov/datasets/CANature::30x30-conserved-areas-terrestrial/about
BLM National Landscape Conservation System	<ul style="list-style-type: none"> Wilderness Areas, Wilderness Study Areas and Other Related Lands with Wilderness Characteristics, National Monuments, National Conservation Lands, and Similar designations Wild and Scenic Rivers Conservation Lands of the California Desert¹ 	https://gbp-blm-egis.hub.arcgis.com/datasets/BLM-EGIS::blm-ca-wilderness-areas https://gbp-blm-egis.hub.arcgis.com/datasets/BLM-EGIS::blm-ca-wilderness-study-areas https://gbp-blm-egis.hub.arcgis.com/datasets/BLM-EGIS::blm-ca-national-monuments-nca-forest-reserves-other-poly/ https://gis.blm.gov/caarcgis/rest/services/NCL/BLM_CA_WildandScenicRivers/FeatureServer 1. Bureau of Land Management, personal communication, November 2, 2022.



Addendum: Protected Area Layer (continued)

Dataset/Category	Subset of Dataset Used	URL
Other BLM Protected Areas	Areas of Critical Environmental Concern (ACECs), Recreation Management Areas (SRMA, ERMA, OHV Designated Areas), including Vinagre Wash Special Recreation Management Area ² , National Scenic Areas, including Alabama Hills National Scenic Area ² , Greater Sage-Grouse Habitat Management Areas	https://gbp-blm-egis.hub.arcgis.com/datasets/BLM-EGIS::blm-ca-off-highway-vehicle-designations https://gbp-blm-egis.hub.arcgis.com/datasets/BLM-EGIS::blm-ca-areas-of-critical-environmental-concern https://gbp-blm-egis.hub.arcgis.com/datasets/BLM-EGIS::blm-az-area-of-critical-environmental-concern-polygon https://eplanning.blm.gov/public_projects/lup/103343/143707/176908/NVCA_Approved_RMP_Amendment.pdf ² Bureau of Land Management, personal communication, November 2, 2022.
Inventoried Roadless Areas		https://www.fs.usda.gov/detail/roadless/2001roadlessrule/maps/?cid=stelprdb5382437
USFS Special Interest Management Areas	Research Natural Areas, Recreation Areas, National Recreational Trail, Experimental Forest, Scenic Area	https://data-usfs.hub.arcgis.com/datasets/usfs::special-interest-management-areas-feature-layer/about
Mono Basin NFSA	Mono Basin National Scenic Area	https://pcta.maps.arcgis.com/home/item.html?id=cf1495f8e09940989995c06f9e290f6b#overview
Proposed Molok Yuluk Extension		CalWild, personal communication, January 19, 2023.



Land-Use Screens Source Data

Data Source	URL
CBI Intactness Model	https://databasin.org/datasets/e3ee00e8d94a4de58082fdb91248a65/
ACE Terrestrial Biodiversity	https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=150831&inline
ACE Terrestrial Connectivity	https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=150835&inline
ACE Terrestrial Irreplaceability	https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=150816&inline
ACE Climate Resilience	https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=150836&inline
USFWS Critical Habitats	https://hub.arcgis.com/maps/fws::fws-hq-es-critical-habitat/about
Bi-State Sage Grouse Proposed Critical Habitat	https://drive.google.com/file/d/1ah7EpMswZArX6PfpwaB2ICX-VLoCh3SO/view?usp=sharing (from https://www.bistatesagegrouse.com/general/page/maps-gis)
Wetlands from CA Nature Habitat and Land Cover (FVEG Derived)	https://www.californianature.ca.gov/maps/habitat-and-land-cover-fveg-derived
USGS Identified Geothermal Systems (Williams et al. 2008)	https://certmapper.cr.usgs.gov/server/rest/services/geothermal/westus_favorability_systems/MapServer/0



Draft Land-Use Screens Map Viewer

Siting, Transmission, and Environmental Protection Division

Presenter: Travis David

Date: March 13, 2023



Intended Use of the Map Viewer

- Make draft land-use screen results and input datasets accessible to stakeholders in an **internet browser map viewer** and available for **download**.
- The goals are to provide **transparency** to the data and methodology behind the draft Land-Use Screens and help **assist stakeholders in preparing written comments**.
- Note this viewer is **not currently live**. CEC intends to make the viewer live **Tuesday, March 14, 2023**.






How to Access

- The map viewer web link will be posted to the Land-Use Screens Workshop website.
 - <https://www.energy.ca.gov/event/workshop/2023-03/commissioner-workshop-land-use-screens>
- Data will be available for download in the CEC GIS Open Data website
 - <https://cecgis-caenergy.opendata.arcgis.com/>
 - This site is linked to in the map viewer







Map Viewer



1. Navigation

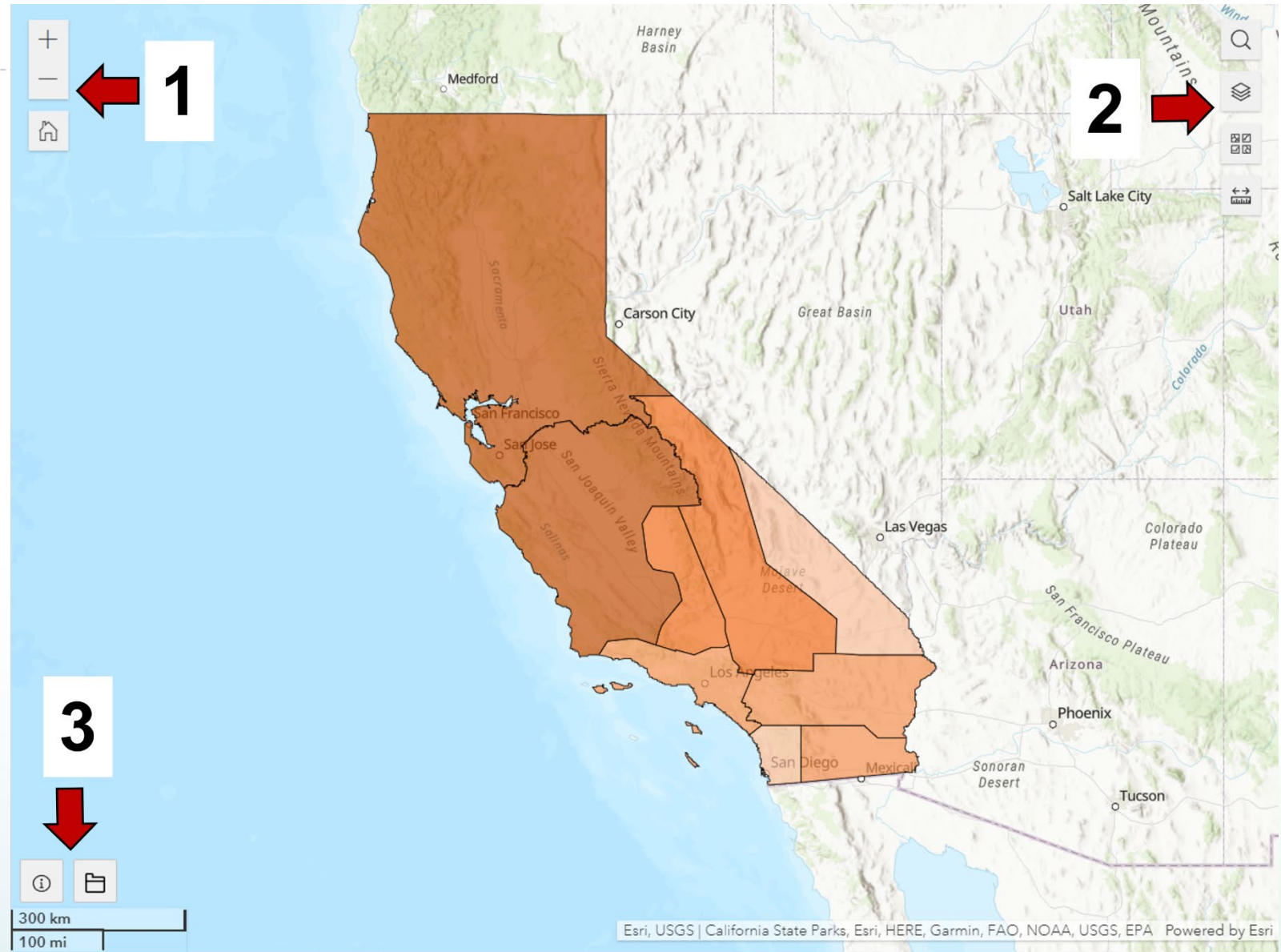
-  Zoom In
-  Zoom Out
-  Default Zoom

2. Interaction

-  Search Address or Location
-  Layer List and Legend
-  Select Basemap
-  Measure Line or Area

3. Information

-  Map Viewer Information
-  Metadata and Data Download





Layer List



Layers ✕

Layer

Legend

▶

Existing Electric Infrastructure

▶

Regions

▶

Results

▶

Base Exclusions

▶

Protected Areas

▶

Technoeconomic Exclusions (Draft CPUC Layers)

▶

Intactness

▶

Crop Suitability

▶

ACE Climate Resilience (Ranks 4 & 5)

▶

Biological Planning Priorities

Toggle active layers



On



Off

Layers ✕

Layer

Legend

Results

Solar Resource Potential by RESOLVE Region Core Scenario

Core Scenario Resource Potential (MW)

> 61,715 - 316,024

> 27,772 - 61,715

> 7,251 - 27,772

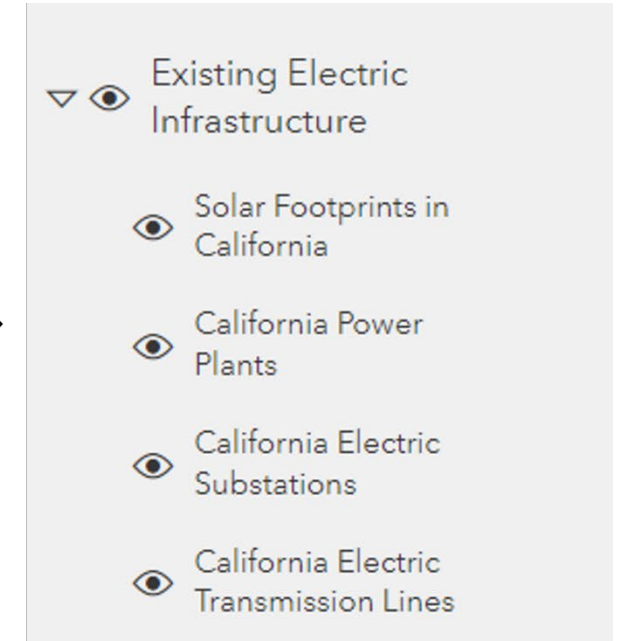
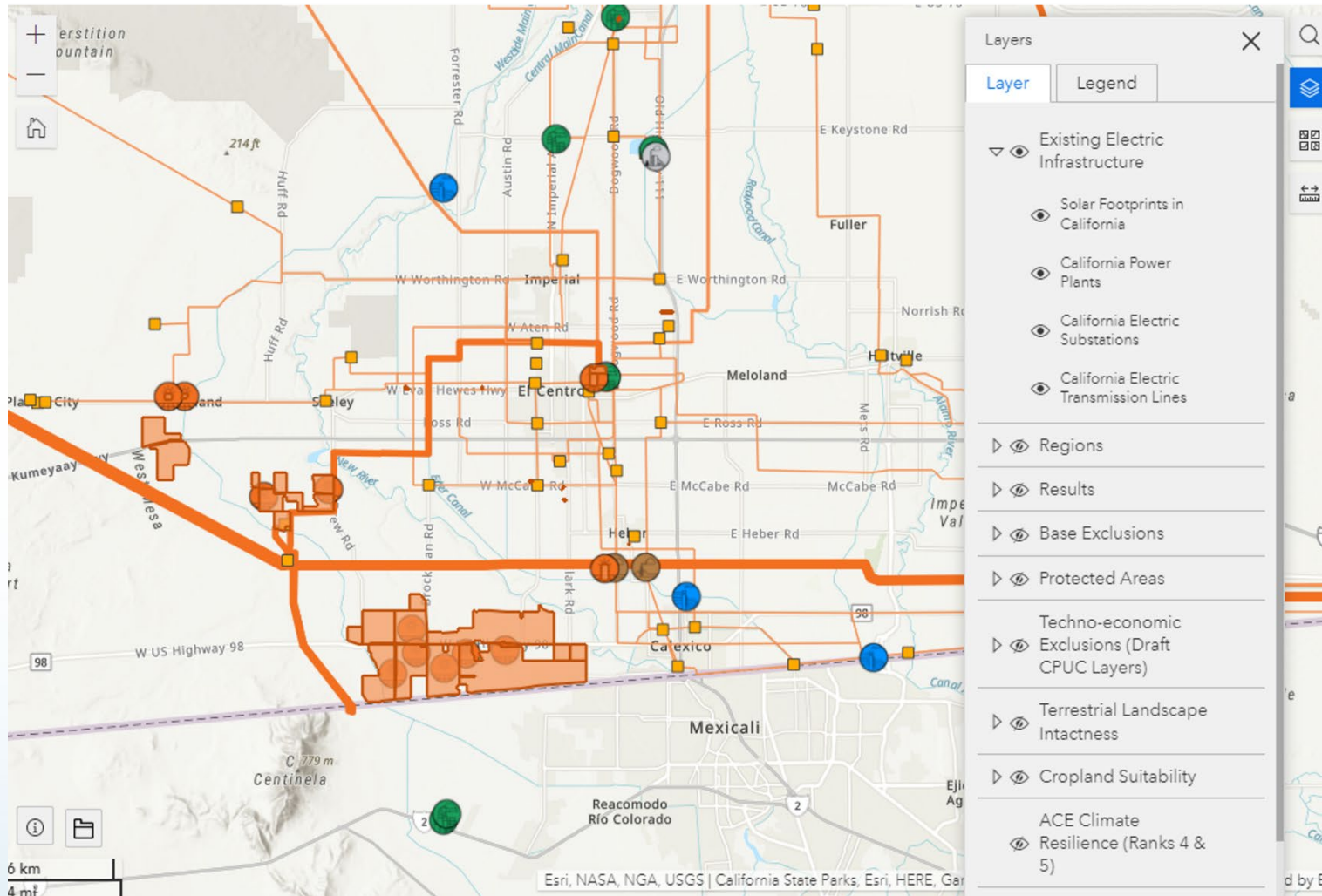
1,639 - 7,251

Shows what the mapped symbols represent



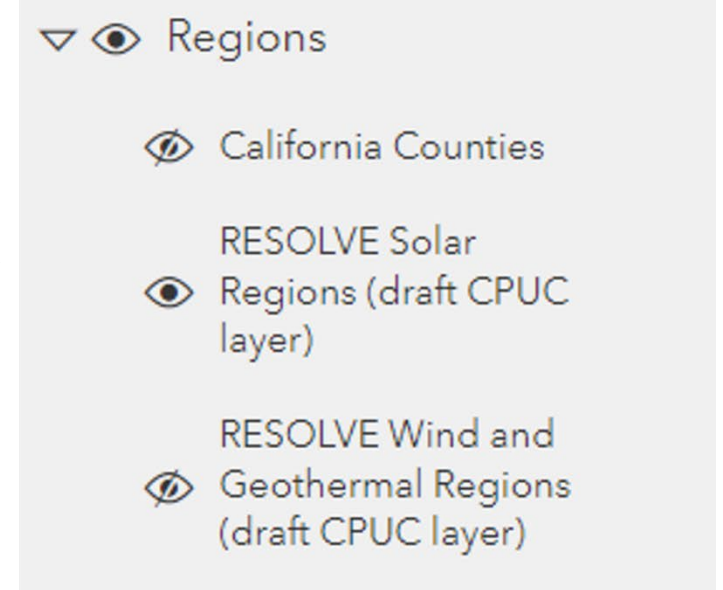
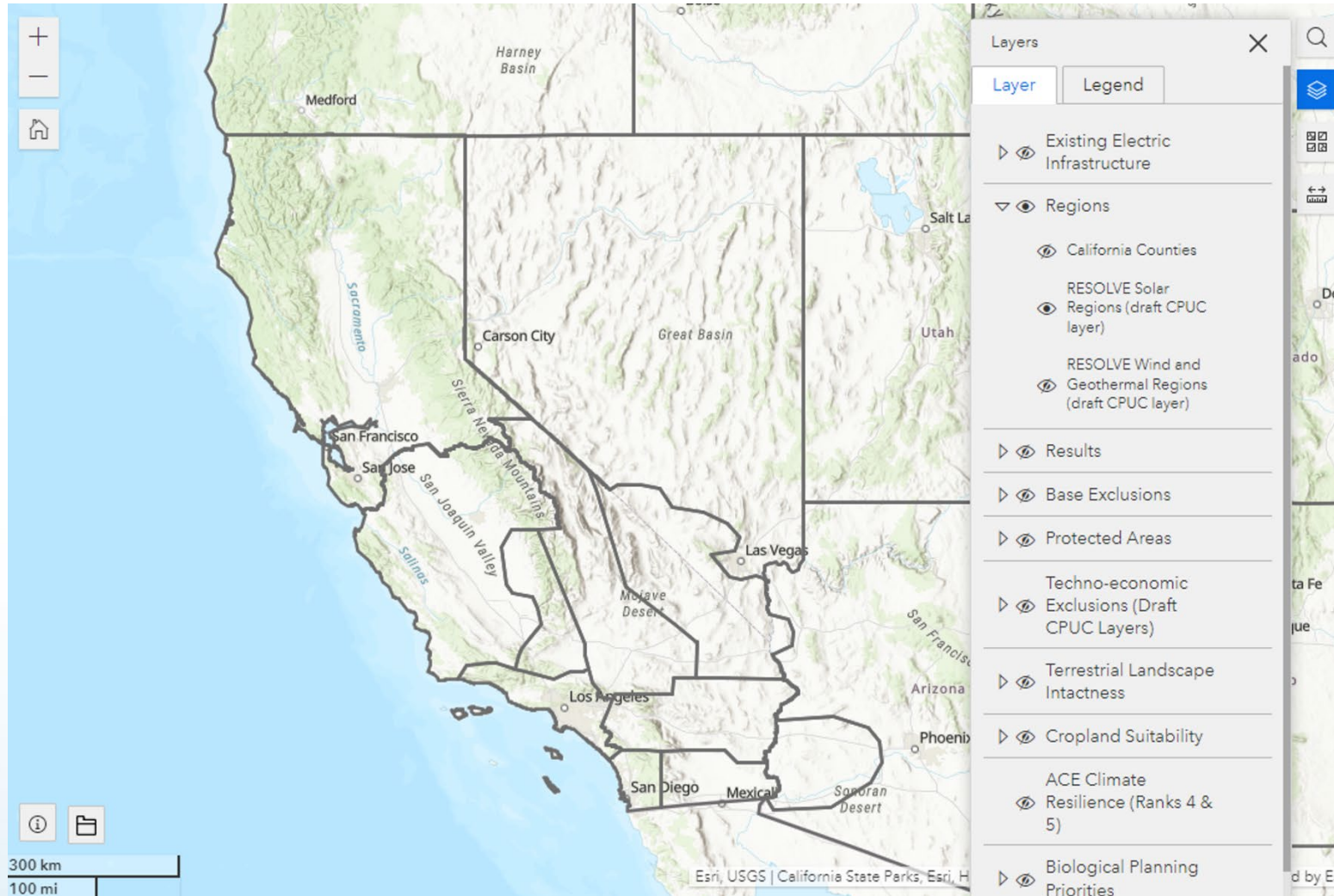


Existing Electric Infrastructure



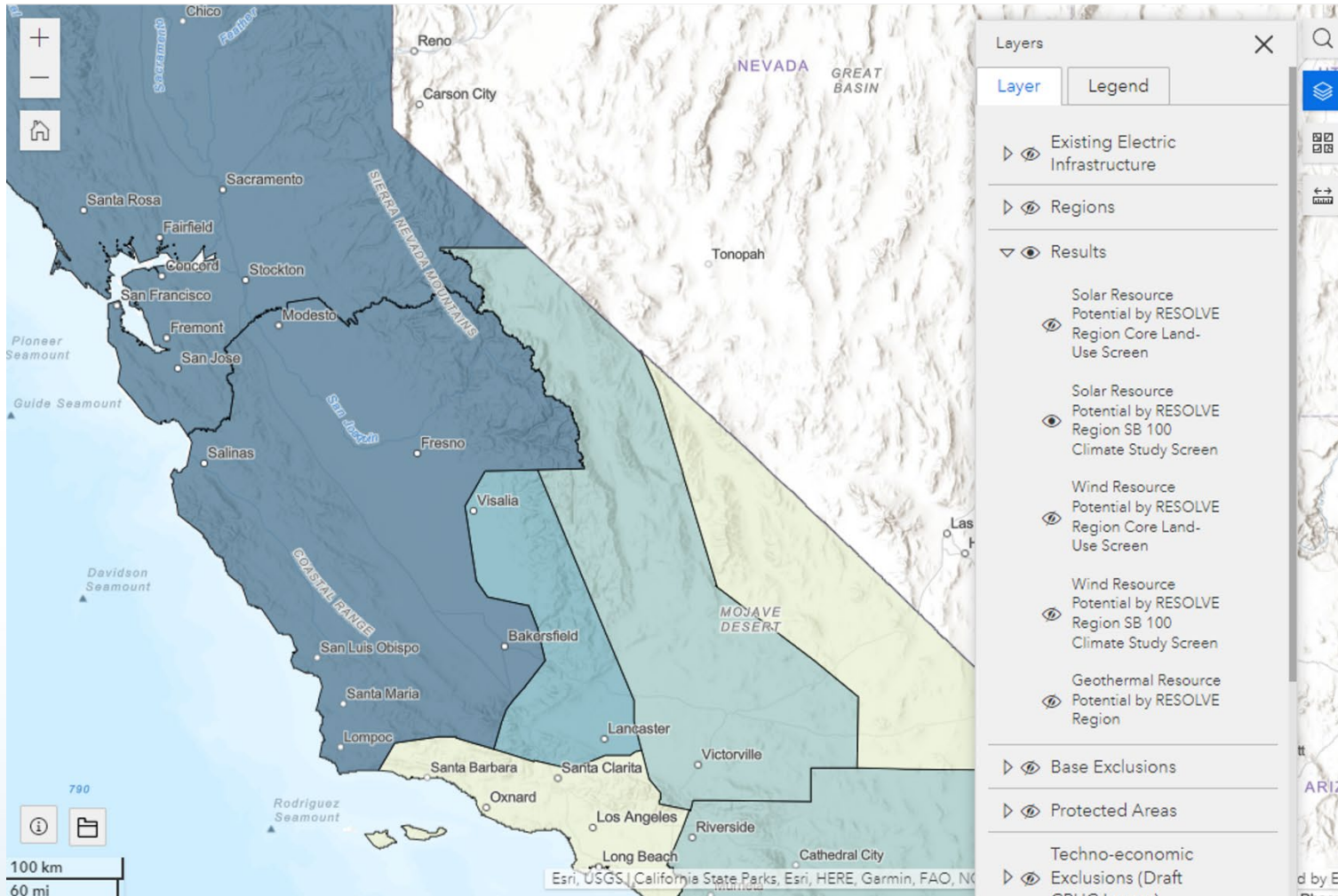


Regions





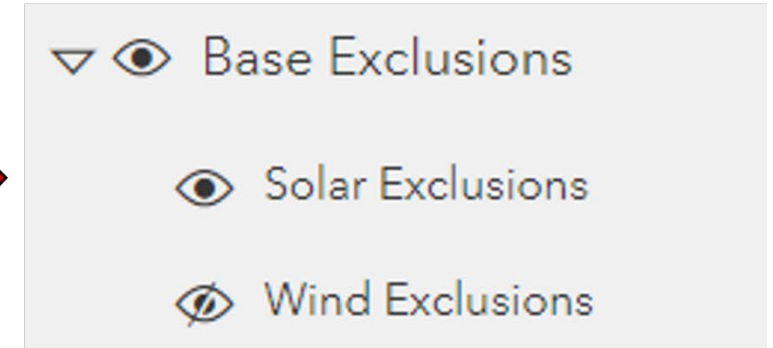
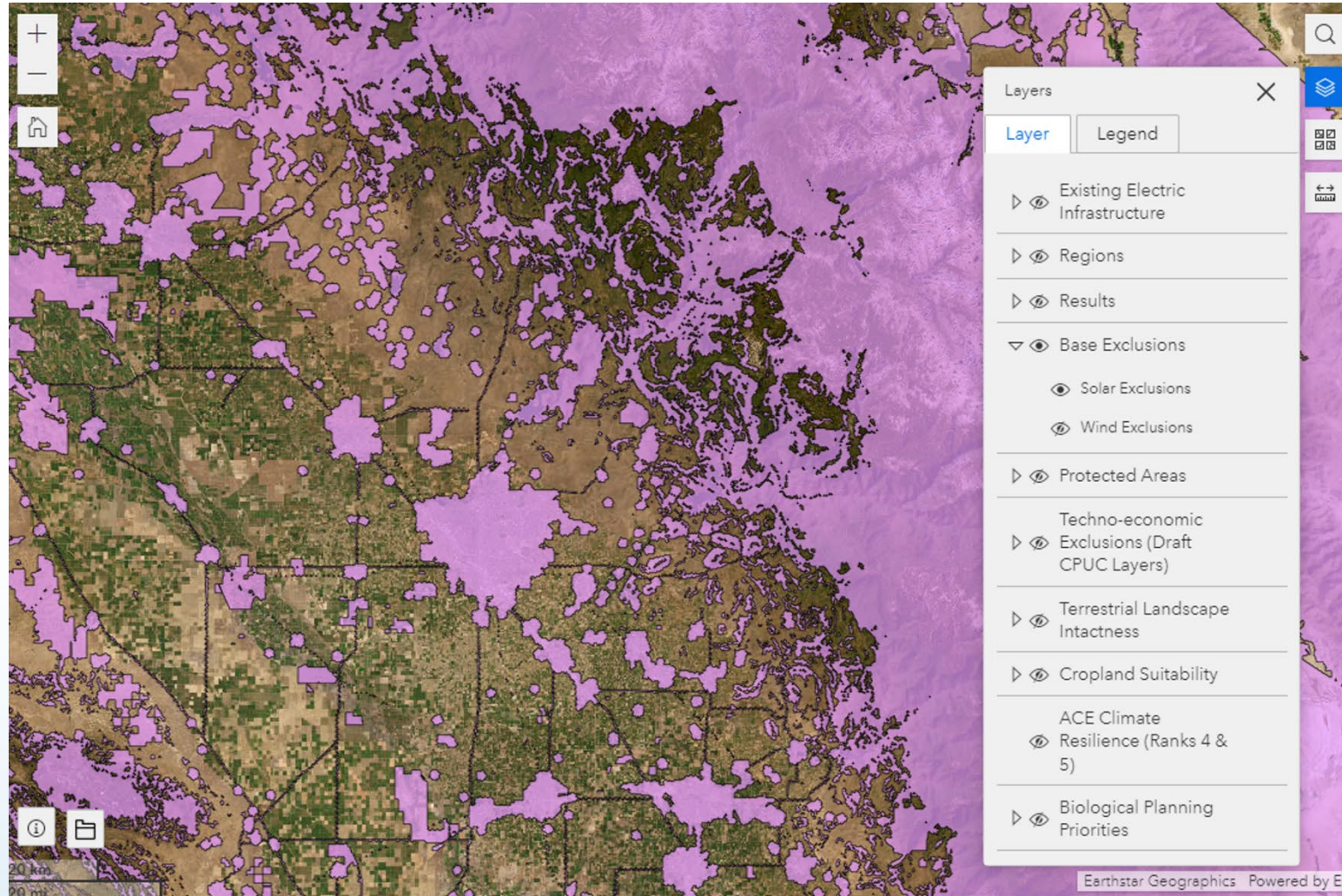
Results



- Results
-  Solar Resource Potential by RESOLVE Region Core Scenario
 -  Solar Resource Potential by RESOLVE Region Sensitivity Scenario
 -  Wind Resource Potential by RESOLVE Region Core Scenario
 -  Wind Resource Potential by RESOLVE Region Sensitivity Scenario
 -  Geothermal Resource Potential by RESOLVE Region

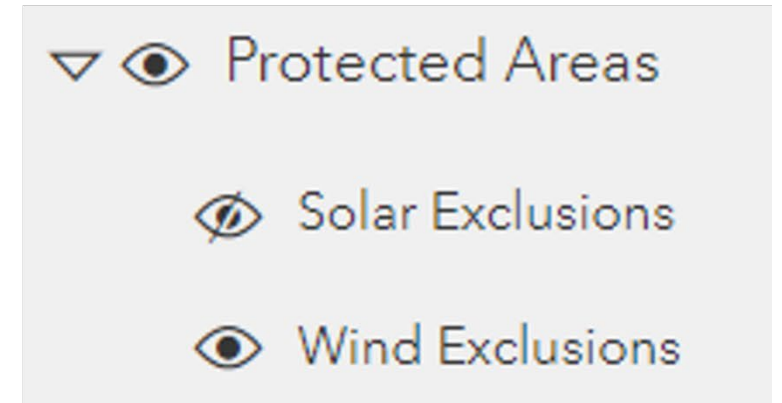
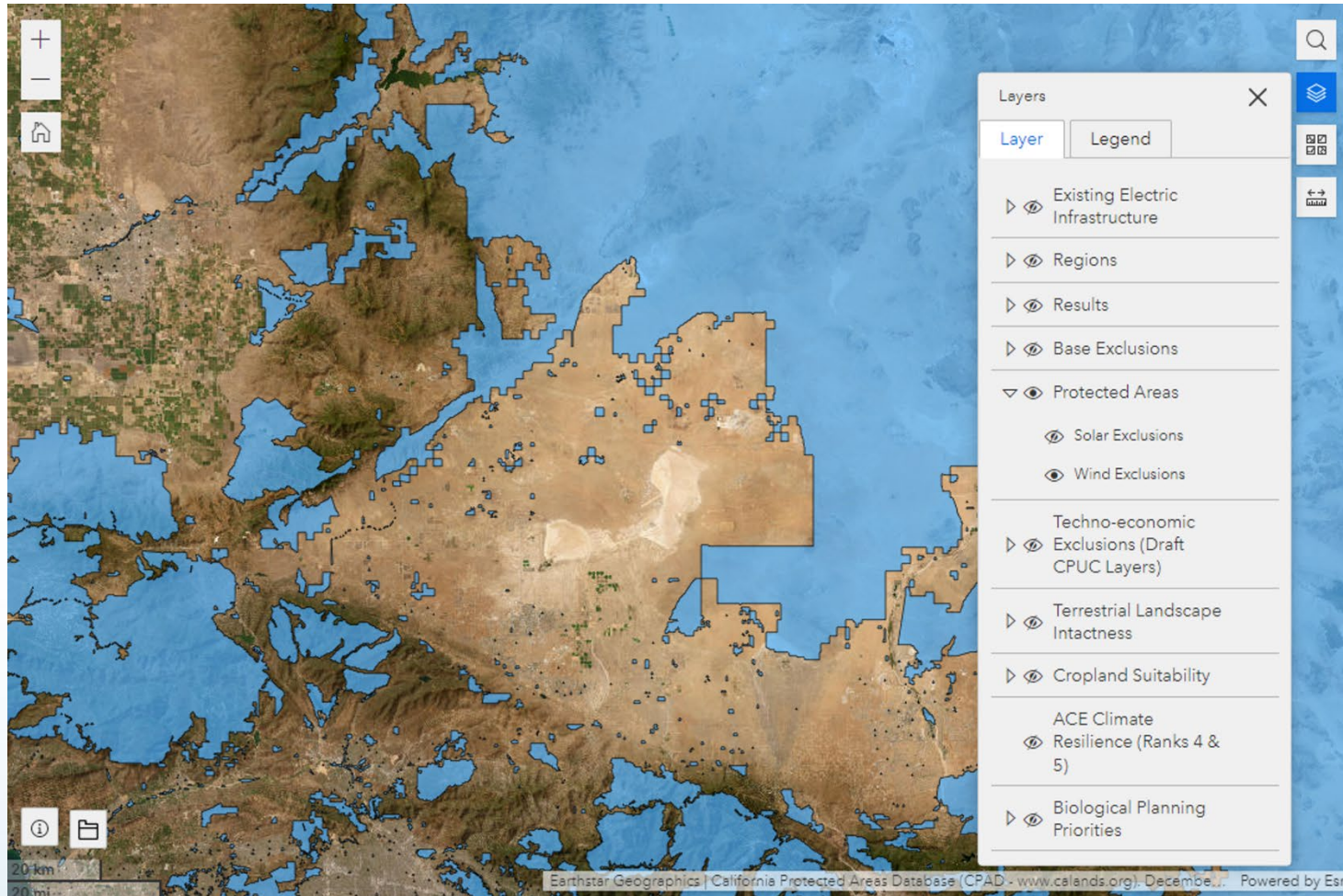


Base Exclusions



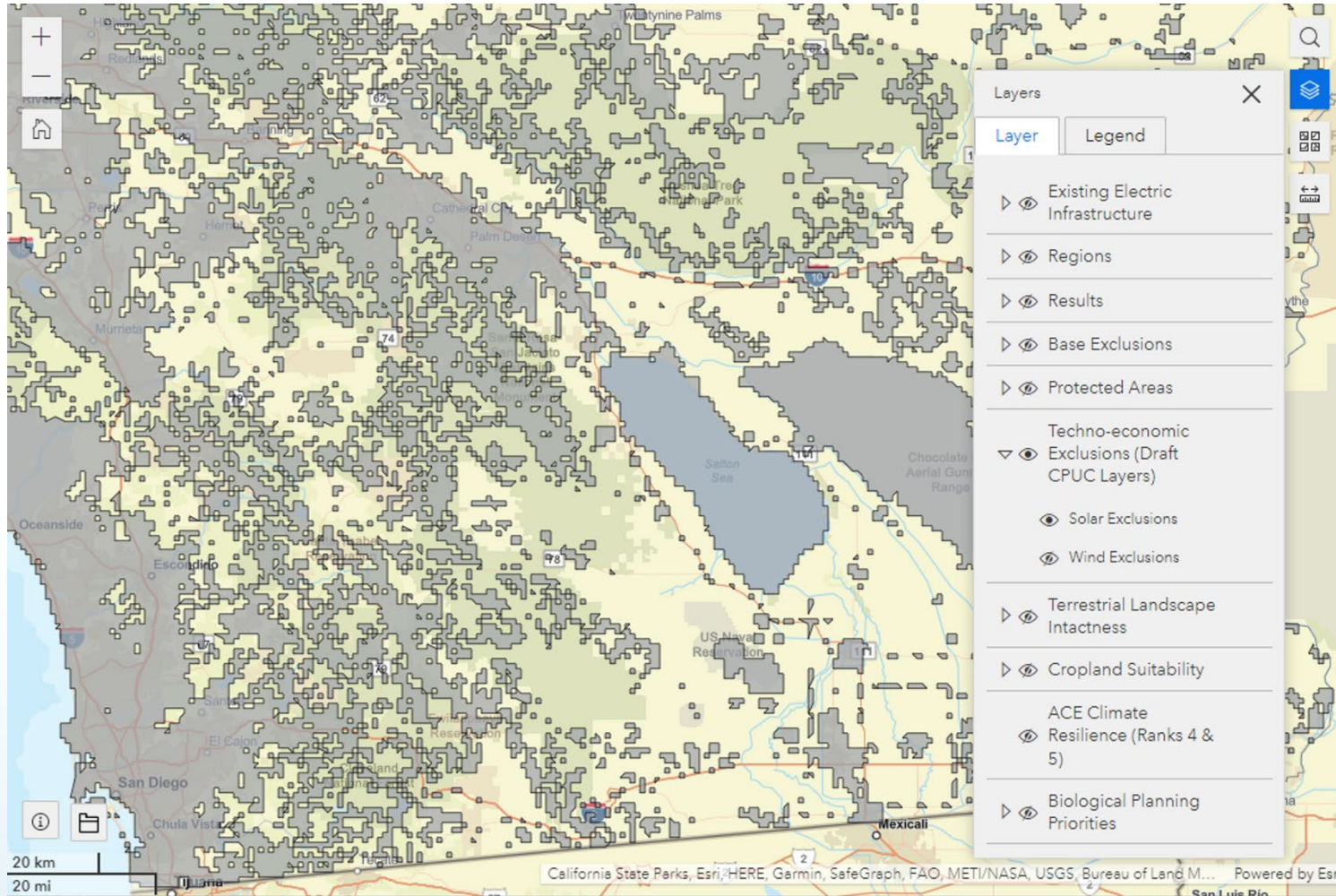


Protected Areas





Techno-Economic Exclusions

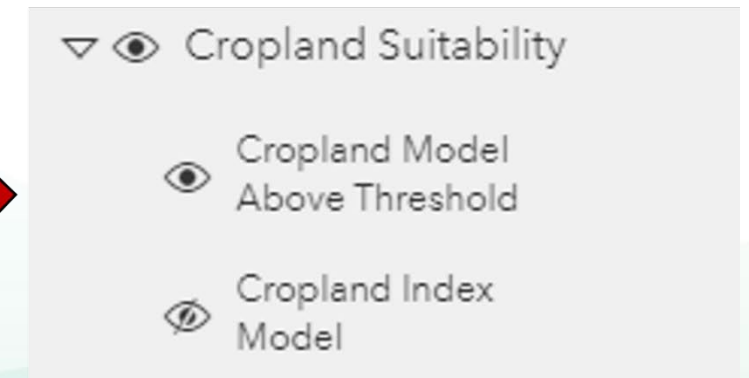
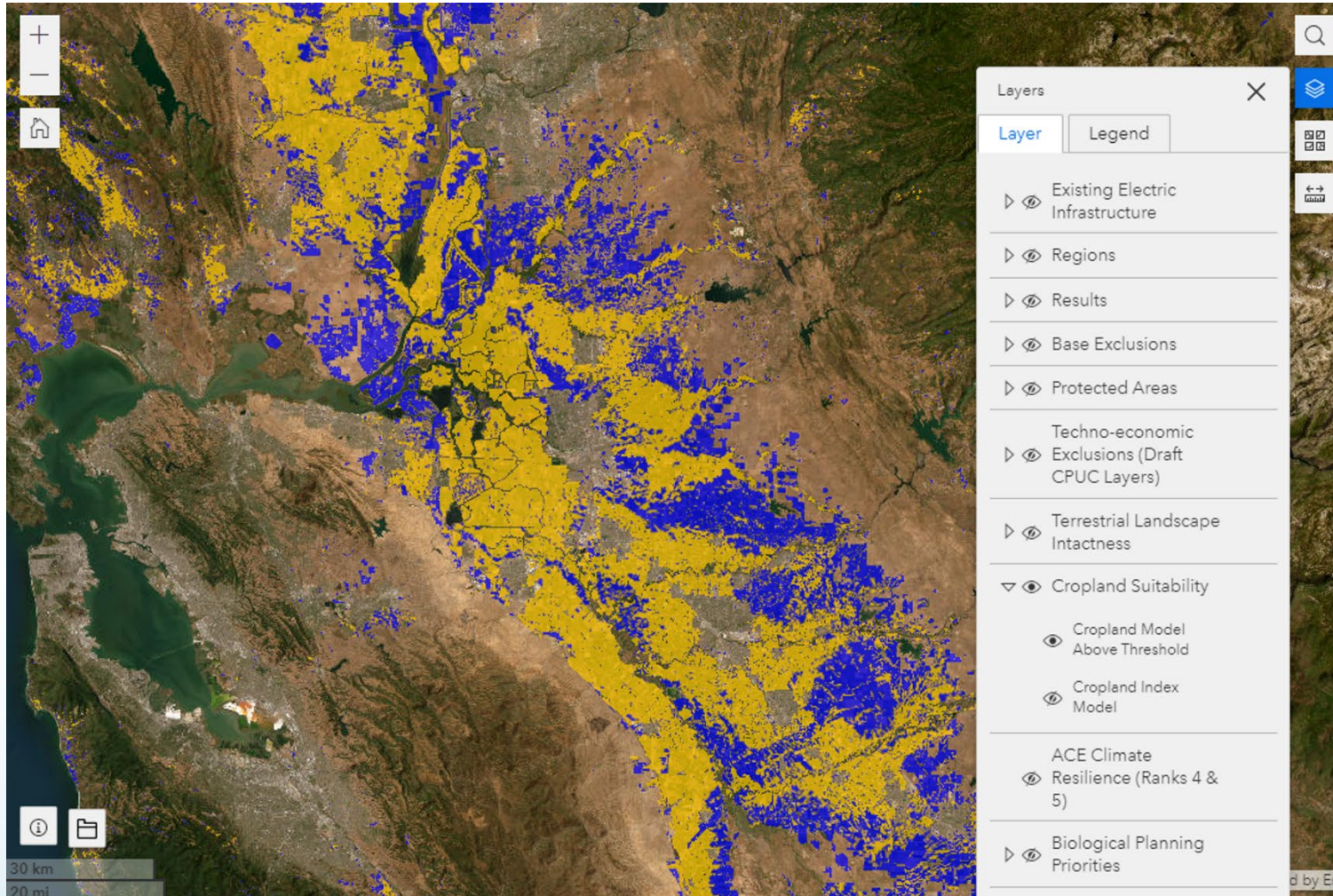


Techno-economic Exclusions (Draft CPUC Layers)

- ☒ Solar Exclusions
- ☒ Wind Exclusions

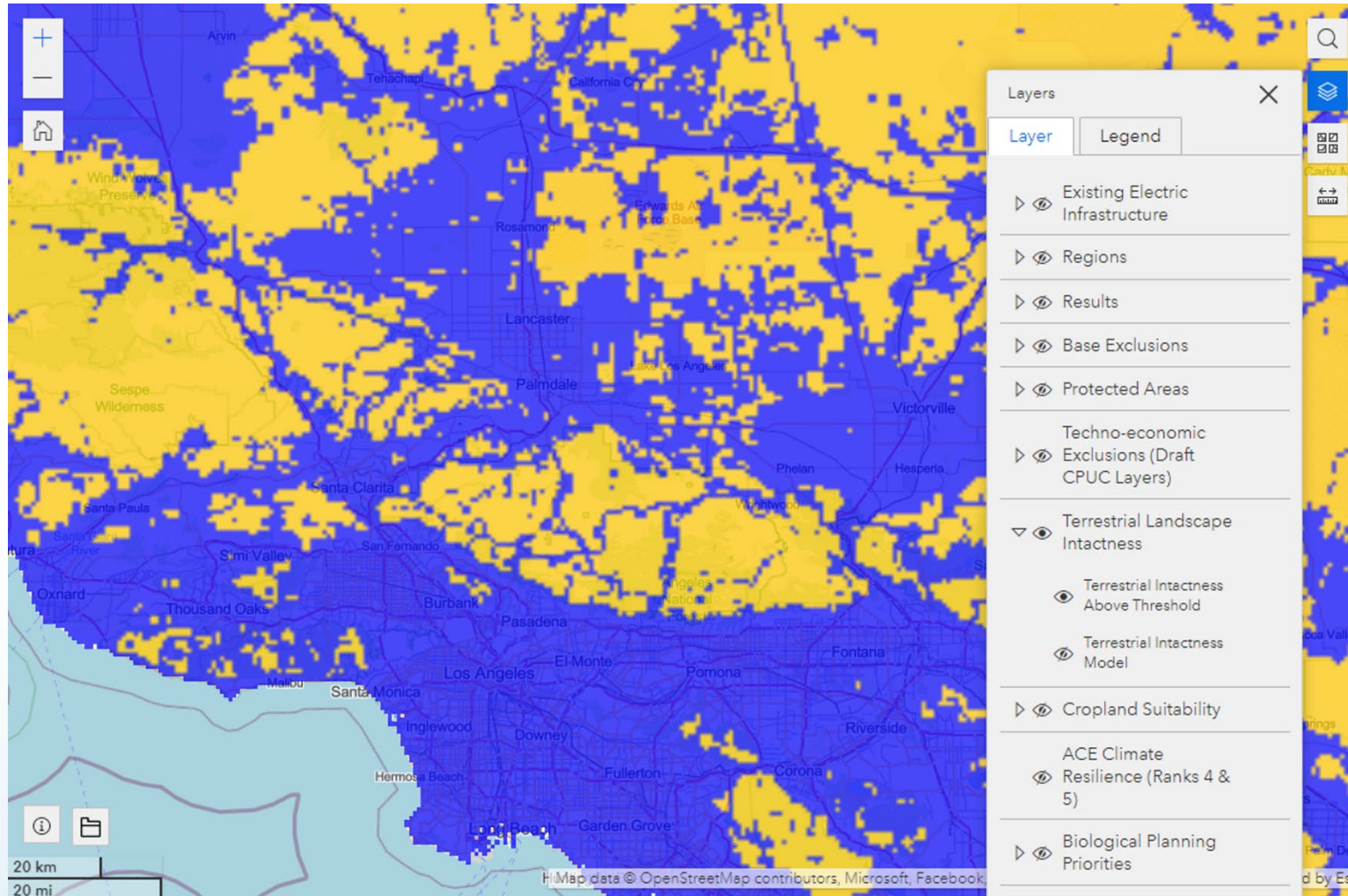


Cropland Model



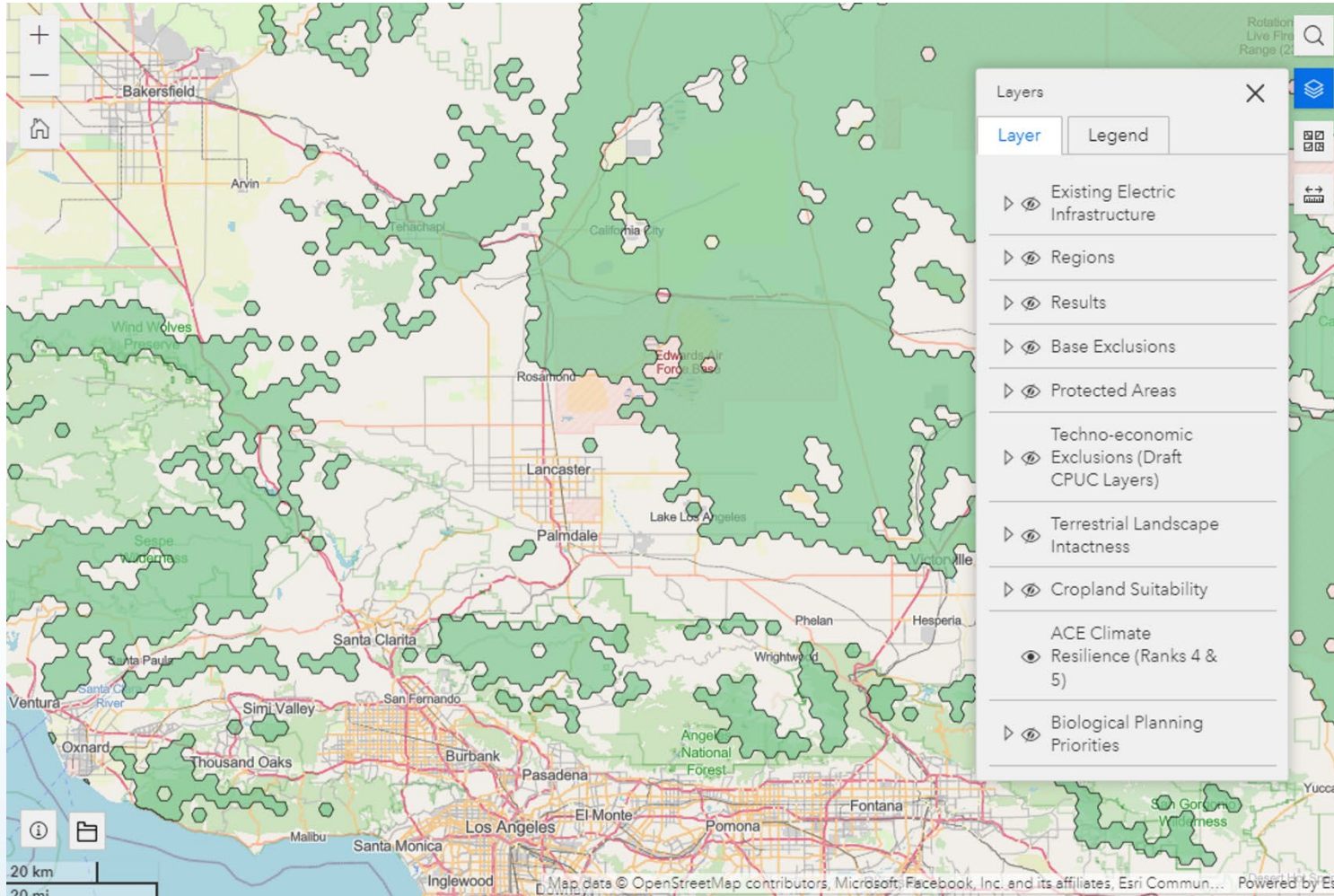


Terrestrial Landscape Intactness





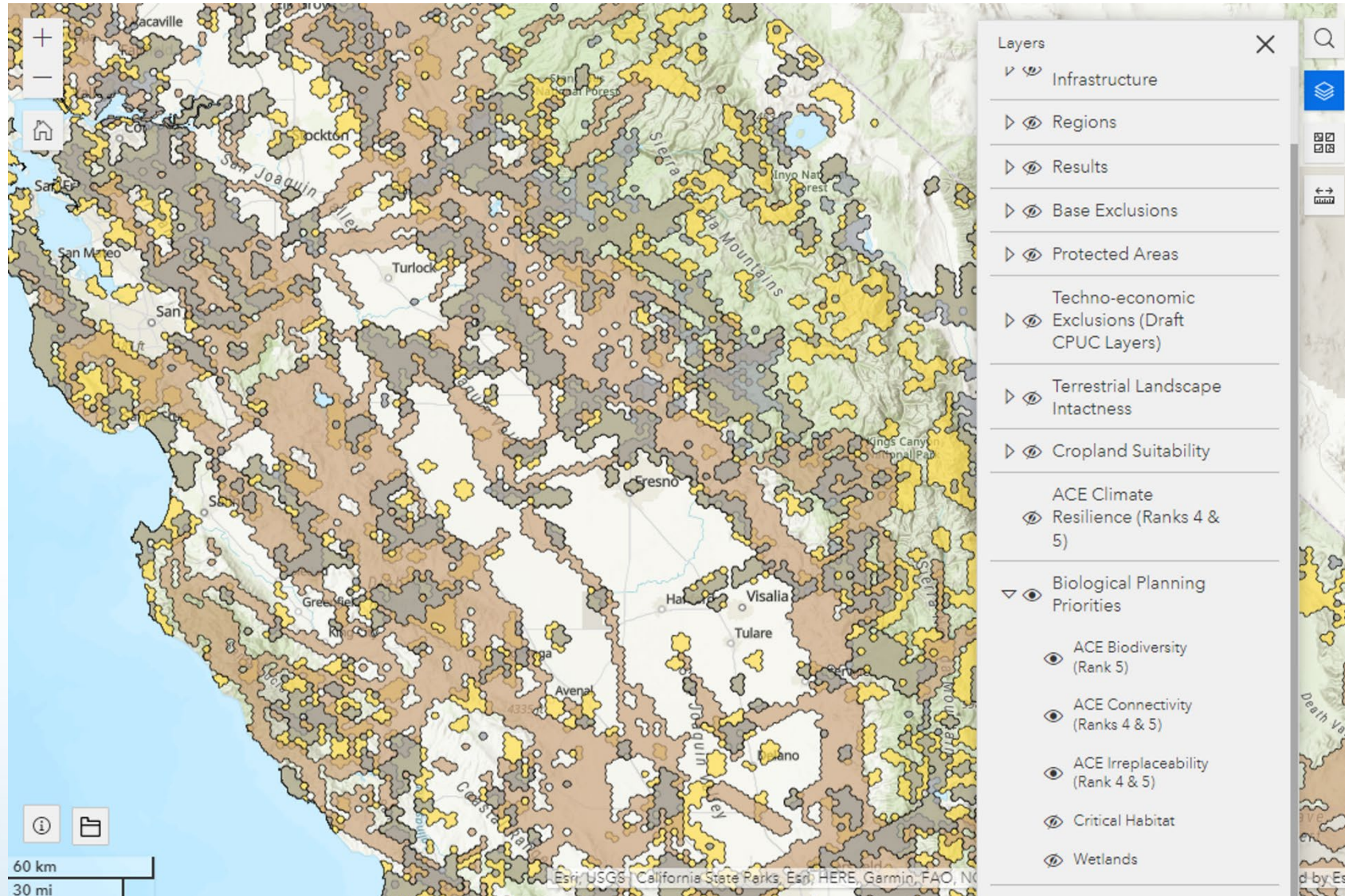
Terrestrial Climate Resilience



ACE Climate
Resilience (Ranks 4 &
5)



Biological Planning Priorities



Biological Planning Priorities

- ACE Biodiversity (Rank 5)
- ACE Connectivity (Ranks 4 & 5)
- ACE Irreplaceability (Rank 4 & 5)
- Critical Habitat
- Wetlands



Metadata and Download Entry Page



All

Data

Documents

Apps & Maps

Filters

Reset

1 - 14 of 14 results

Relevance ▾

Category: NEVI ×

Content Type ^

- ☐ PDF
- ☐ Feature Layer
- ☐ Web Mapping Application
- ☐ Web Experience

Categories ^

Apply category

- ☒ NEVI
- ☐ PDF Maps
- ☐ Administrative Boundaries
- ☐ Web Mapping Application
- ☐ Energy Infrastructure

More ▾

Data

Metropolitan Planning Organization Boundaries

California Energy Commission | THoang_CAEnergy

The metropolitan planning organization (MPO) polygon feature class provides California MPO legislative boundaries, primarily for regional planning applications. Data downloaded in February...

Type: Feature Layer

Last Updated: March 1, 2023

Rows: 18

Tags: NEVI, CAOpenData, California Energy Commission, C...

Data

Regional Transportation Planning Agencies

California Energy Commission | THoang_CAEnergy

The list of California Transportation Planning Agencies is current as of February, 2014, provided by Division of Transportation Planning, Office of Regional and Interagency Planning. With the...

Type: Feature Layer

Rows: 43



Metadata and Download View Page



CALIFORNIA
ENERGY COMMISSION

Metropolitan Planning Organization Boundaries



Private Member ⓘ
California Energy Commission

Summary

The mpo_2013 polygon feature class provides California Metropolitan Planning Organization (MPO) legislative boundaries, primarily for regional planning applications.

[View Full Details](#)

[Download](#)

Details



Dataset
Feature Layer



March 1, 2023
Info Updated



March 1, 2023
Data Updated



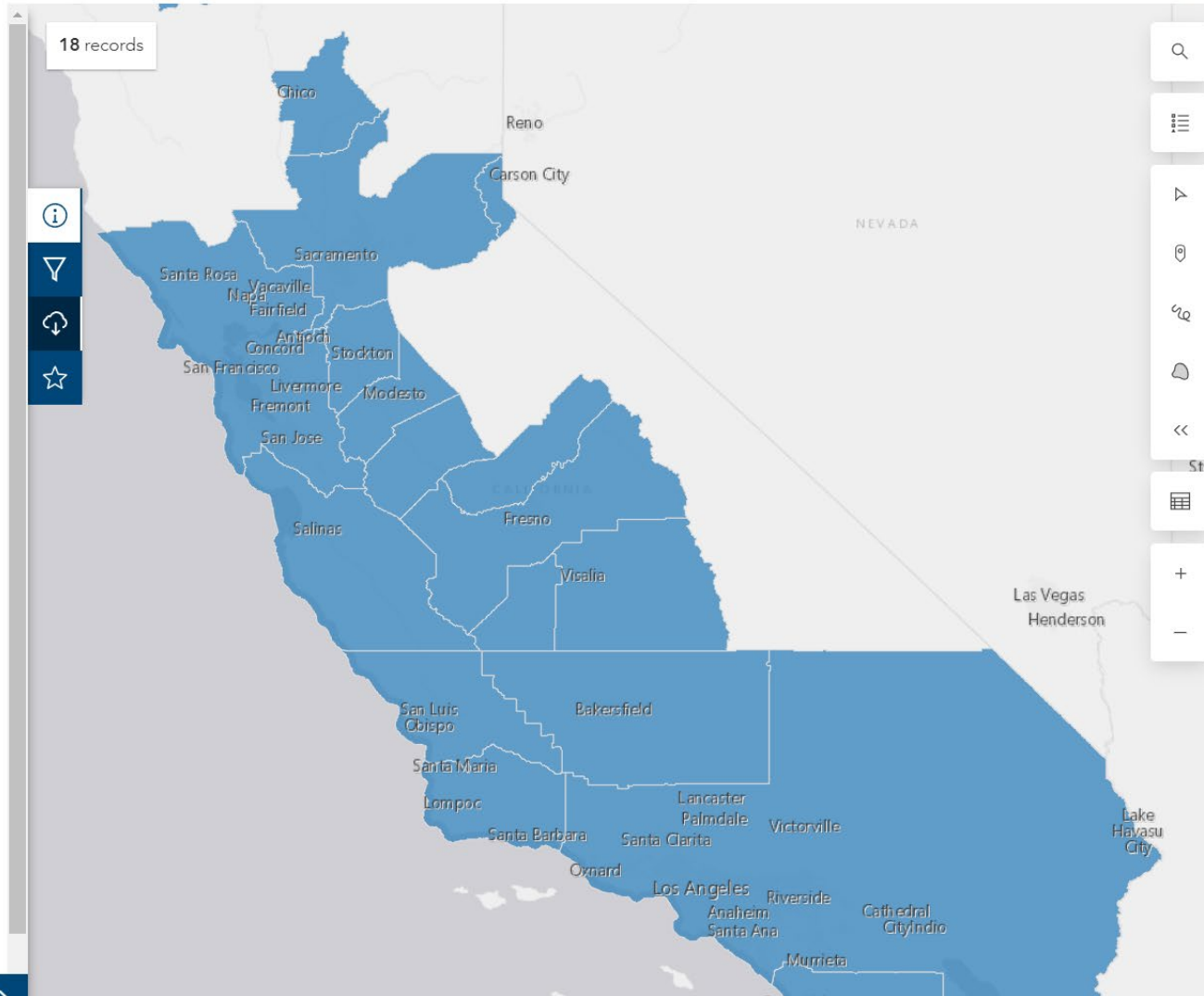
March 1, 2023
Published Date



18 Records
[View data table](#)



Public
Anyone can see this content





Non-Residential Solar Footprints in the State of California

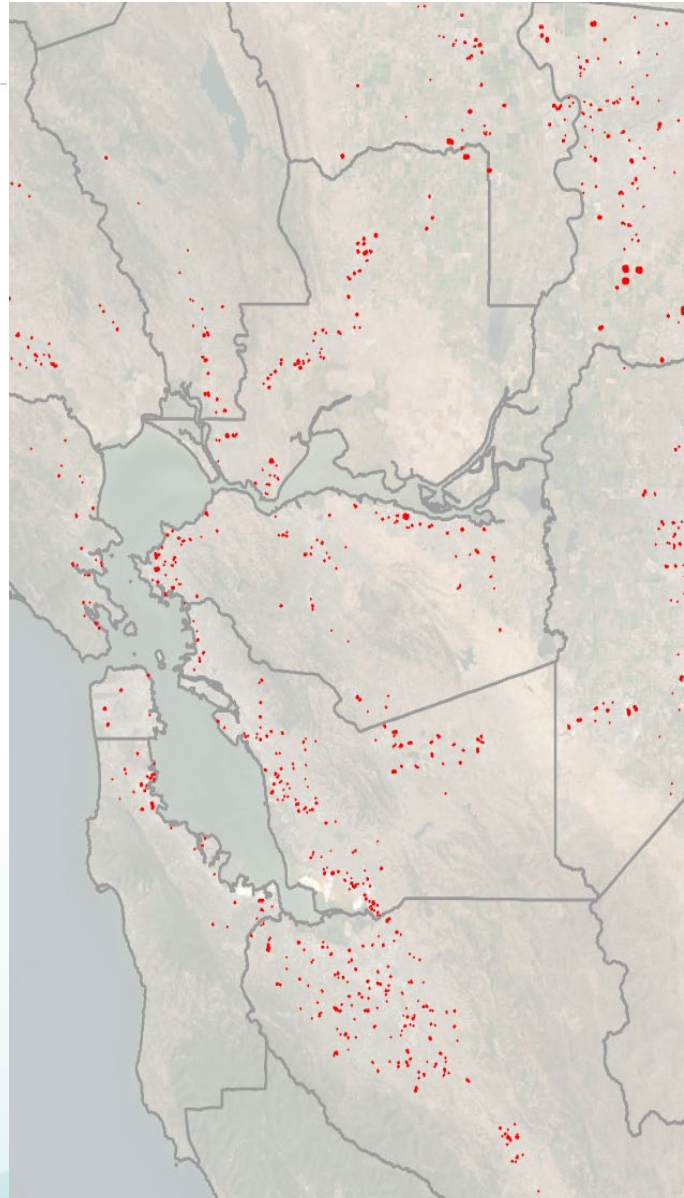
Presenter: Gabriel Blossom

Date: March 13, 2023



Overview

- A GIS dataset that represents non-residential solar footprints in California
- Captures the facility “footprint” of a solar collection area. Areas approximately ½ acre or larger.
- Parking lots, large building and warehouse rooftops, medium to large solar fields.
- Includes both rural and urban areas.
- Last updated: February 2023





History

Need

- Public comments from the October 2022 IEPR Commissioner Workshop on Land Use Screens requested CEC to include existing non-residential solar facilities locations in the screens.
- CEC Staff found that available solar footprint datasets lacked many known facilities and was incomplete. Many large facilities were missing, and other areas were misidentified.



Methods

- Guide Layers: Layers used to identify existing solar resources
 - Quarterly Fuel and Energy Report (QFER)
 - [California Solar Footprints \(2017\) from Conservation Biology Institute](#)
 - UC Berkeley Solar Points ([Utility-Scale Solar, 2022 Edition](#))
 - Kruitwagen et al. 2021 ([Nature article and supplemental material](#))
- Imagery: Imagery interpretation for most of California.
 - ESRI imagery (dates vary)
 - National Agriculture Imagery Program (NAIP) aerial (2020)
 - Sentinel-2, 10m resolution (January 2023)
- Digitization
 - Two analysts
 - By Counties
 - Second round (Urban Areas)
 - QFER solar plants and Sentinel-2
- Final Merge and Attributes



Results and observations

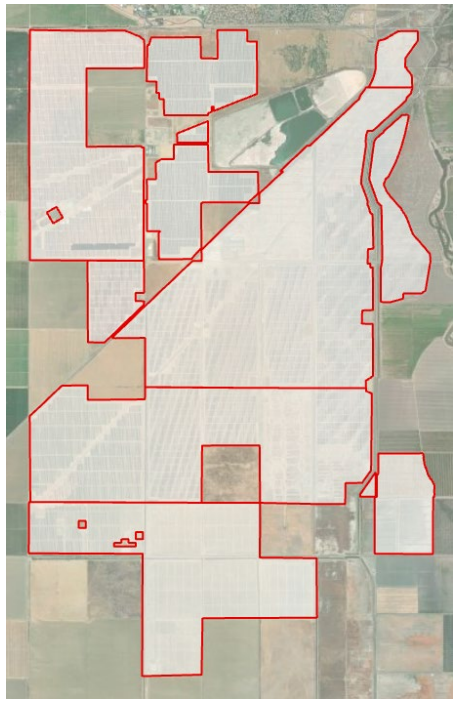
- Results: 5,435 footprints identified. Mean size of 23 acres, as of February 2023. 128,790 Acres total.
- A fast rate of solar development in the State of California was noted. Many footprint areas were identified while under construction or were missing from one year's imagery and present the next. This observation was common.
- Large areas of warehousing in Southern California are missing rooftop solar. These areas tended to be in older districts.
- Rooftop and parking lot solar are more common in newly developed areas.
- Solar gradually becomes less dense moving south the north.
- Most school grounds have significant solar footprints.
- Many farms and feedlots have small/medium solar facilities (1-5 acres).
- Parking lot solar on asphalt can be difficult to identify in high resolution color imagery.



Parking Lot
(Under Construction)



LA Warehouse Solar

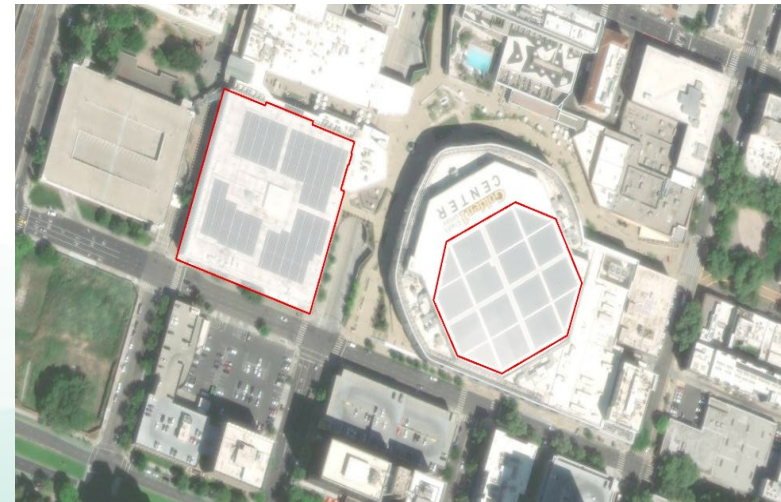


Utility-Scale (Farm)

Medium (Farm)

Rooftop and Ground (Large Warehouse and Medium Scale Ground)

Utility-Scale (Desert)



Rooftop and Parking
(Sacramento IKEA/ Walmart)

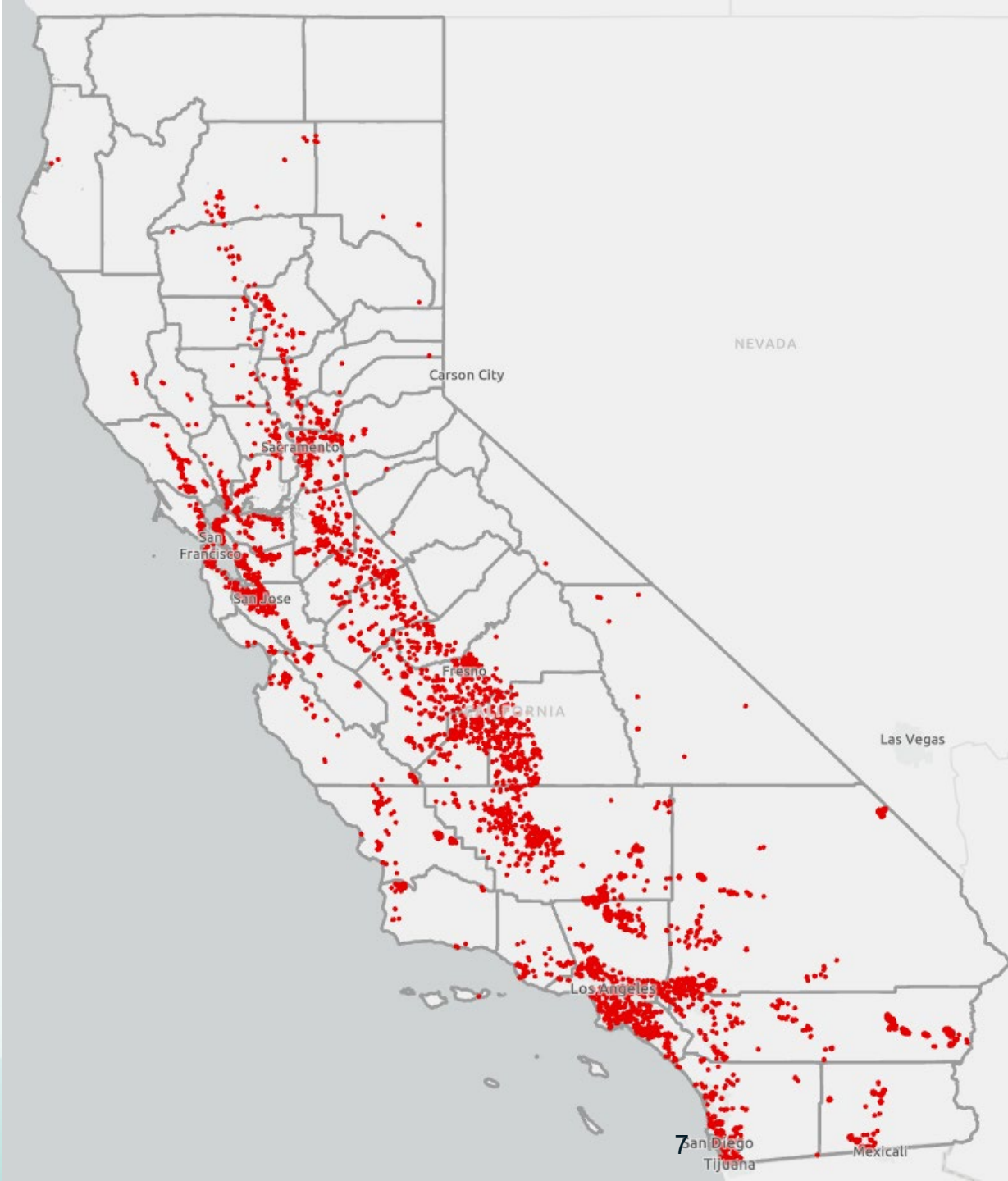
Parking (School)

Rooftop (City Core, Go KINGS!)



Next Steps

- The draft solar footprints dataset will be publicly released on March 14, 2023, with the Draft SB 100 Land-Use Screens Data Viewer
- Classify the existing shapes into types (ongoing)
- Add a date identified field
- Set up an update schedule
- Please contact gis@energy.ca.gov for questions





Land-Use Evaluation for Busbar Mapping: Current Methods and Evaluating Options for Updates

Presenter: Saffia Hossainzadeh
Siting, Transmission, and Environmental Protection Division
Date: March 13, 2023



Two Key Topics in This Presentation

- Overview of current land-use and environmental evaluation methods for busbar mapping.
- Scoping potential changes to the land-use evaluation methods for busbar mapping.
 - New assessments
 - Questions for the public to consider on geospatial data and metrics

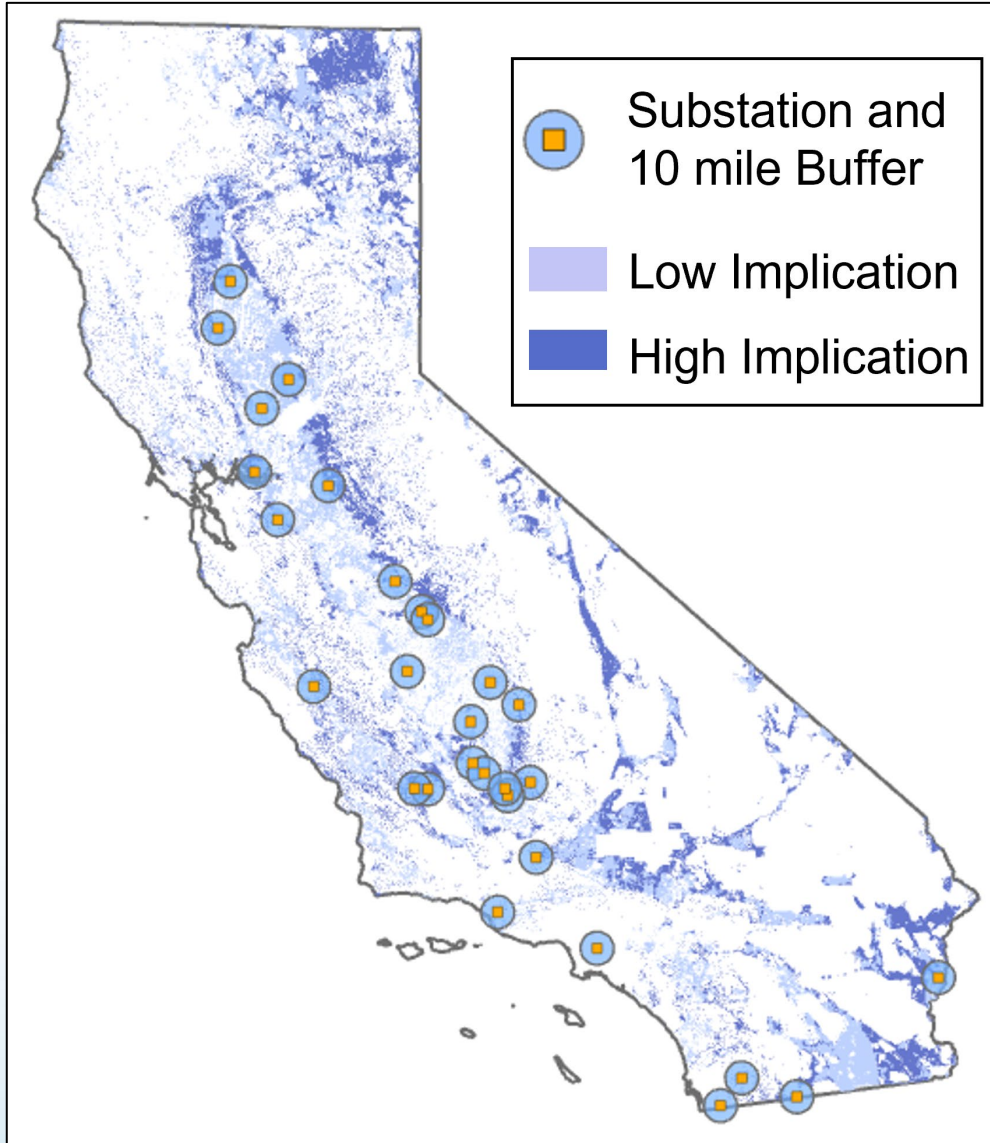


Overview of Current Methods

- CPUC disaggregates geographically coarse zonal results from RESOLVE to specific substations for transmission analysis
- CEC Performs Land-Use Evaluation:
 - Resource Potential Area for each Technology
 - Environmental Implications Model or Land-Use Screens
 - Calculate Metrics on Area Around Substation
- Report back to CPUC metrics on environmental and land-use characteristics of proposed resource allocation to substations



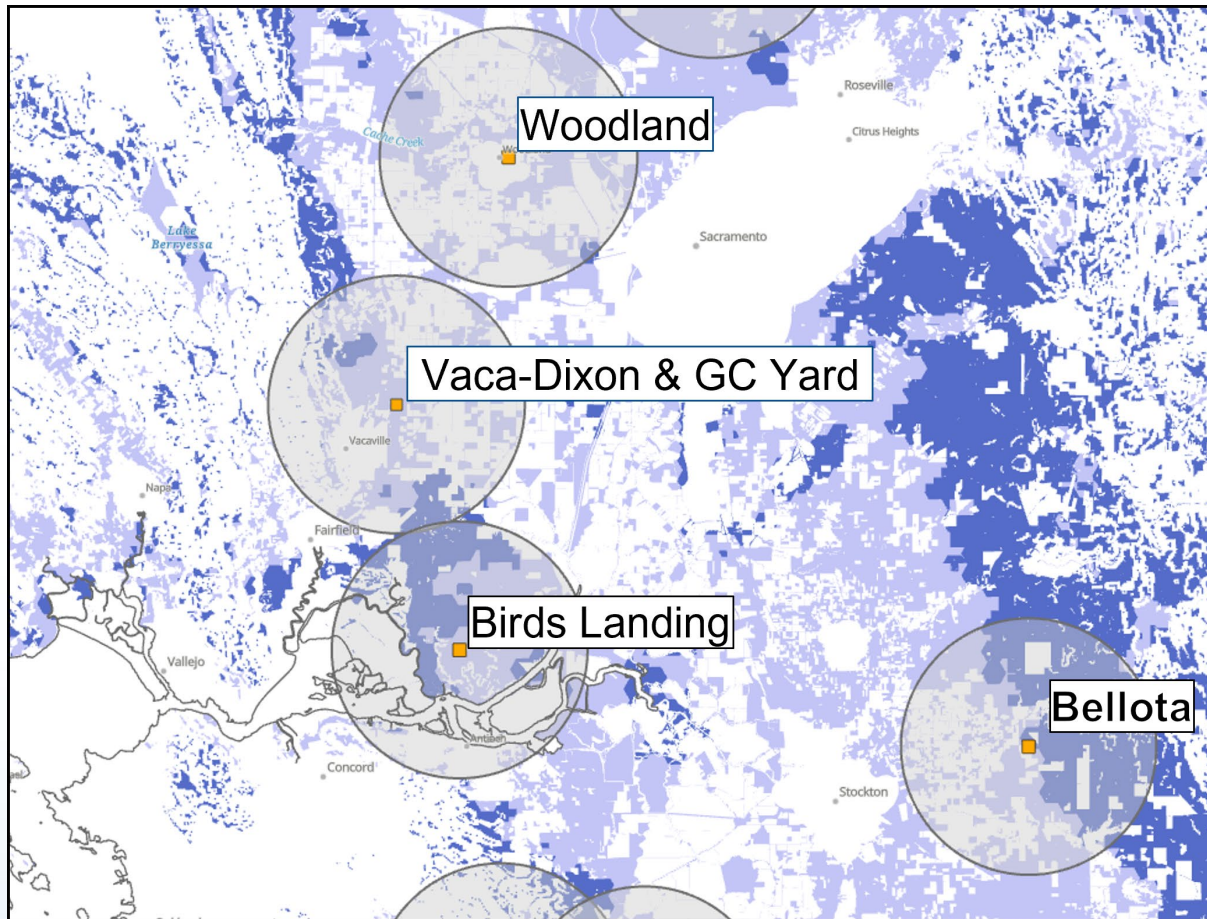
Defining the Study Area



- CPUC provides list of substations intended for additional capacity for each technology
- Intersect each buffered area with Technical Resource Potential Map and Environmental Implications Model
 - Suitability Model using ACE Biodiversity, Connectivity, and CBI Terrestrial Landscape Intactness



Metrics Generation: Land Available

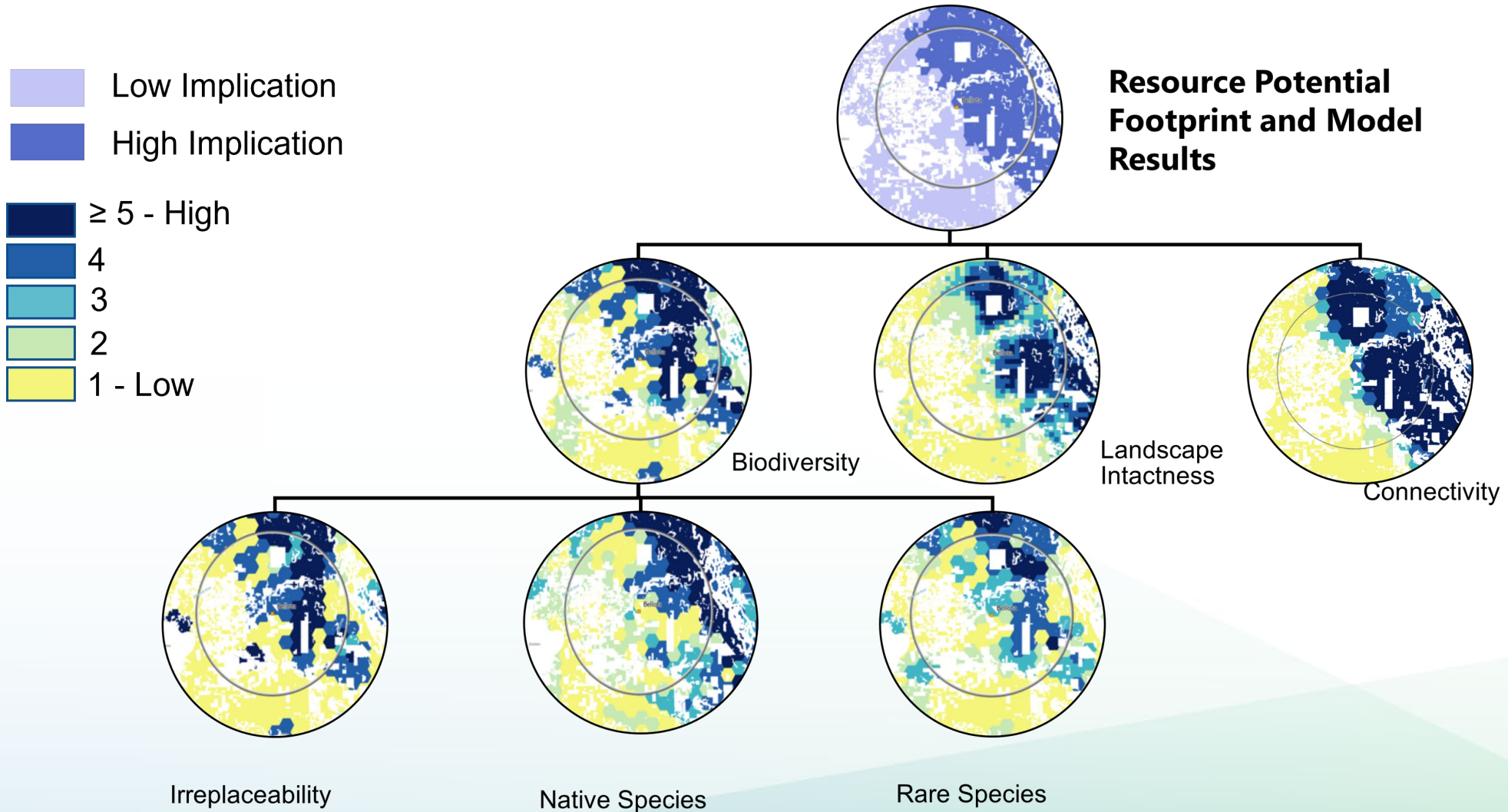


Low Implication High Implication

- How many acres of resource potential within 10 mile buffer?
- Is it compatible with suggested resource allocation?
- Assume 7 acres/MW for solar, 40 acres/MW for wind technology
- **Resource Build:** Total Resource Area, Percent of low implication land that the allocated MW will require



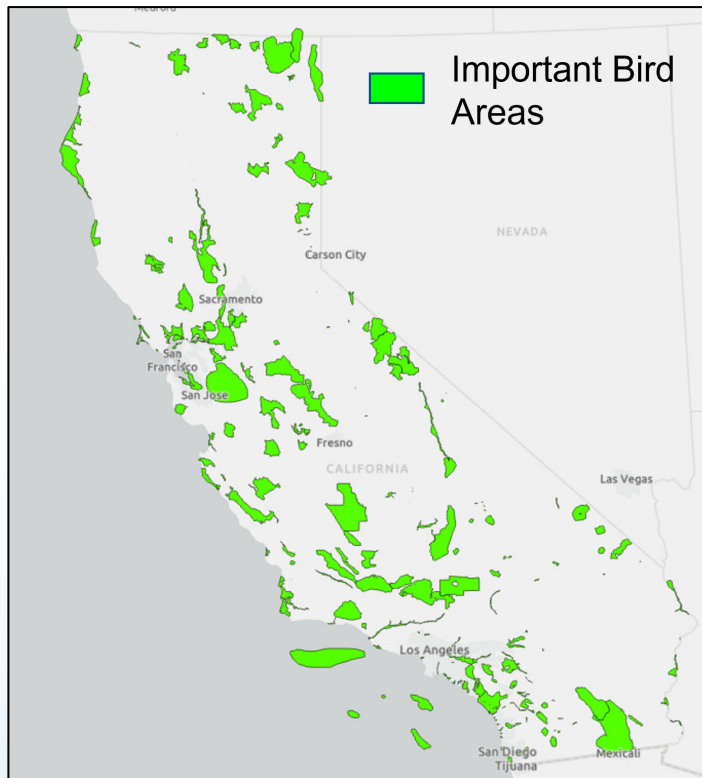
Individual Components of Environmental Implications



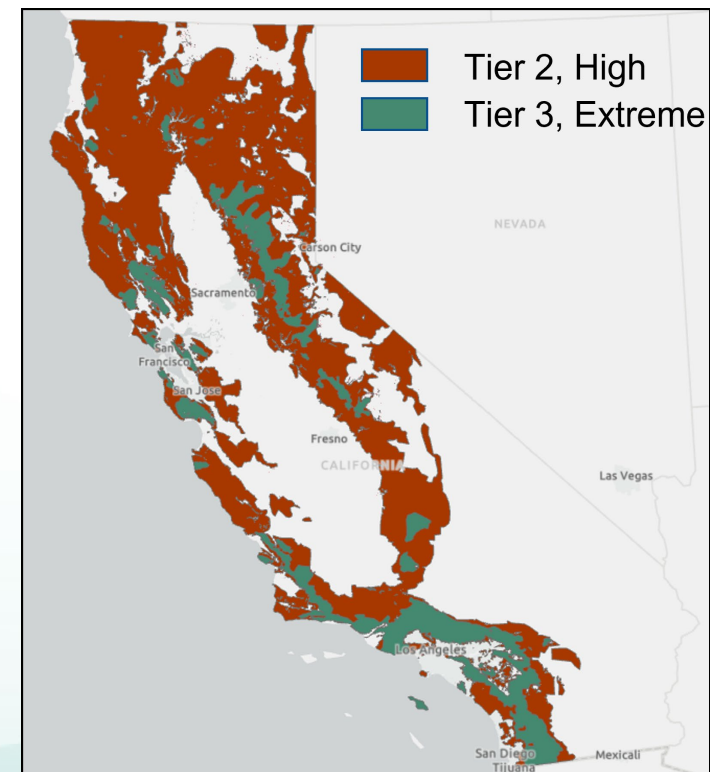


Stand-Alone Data Sets

Audubon Important Bird Areas³

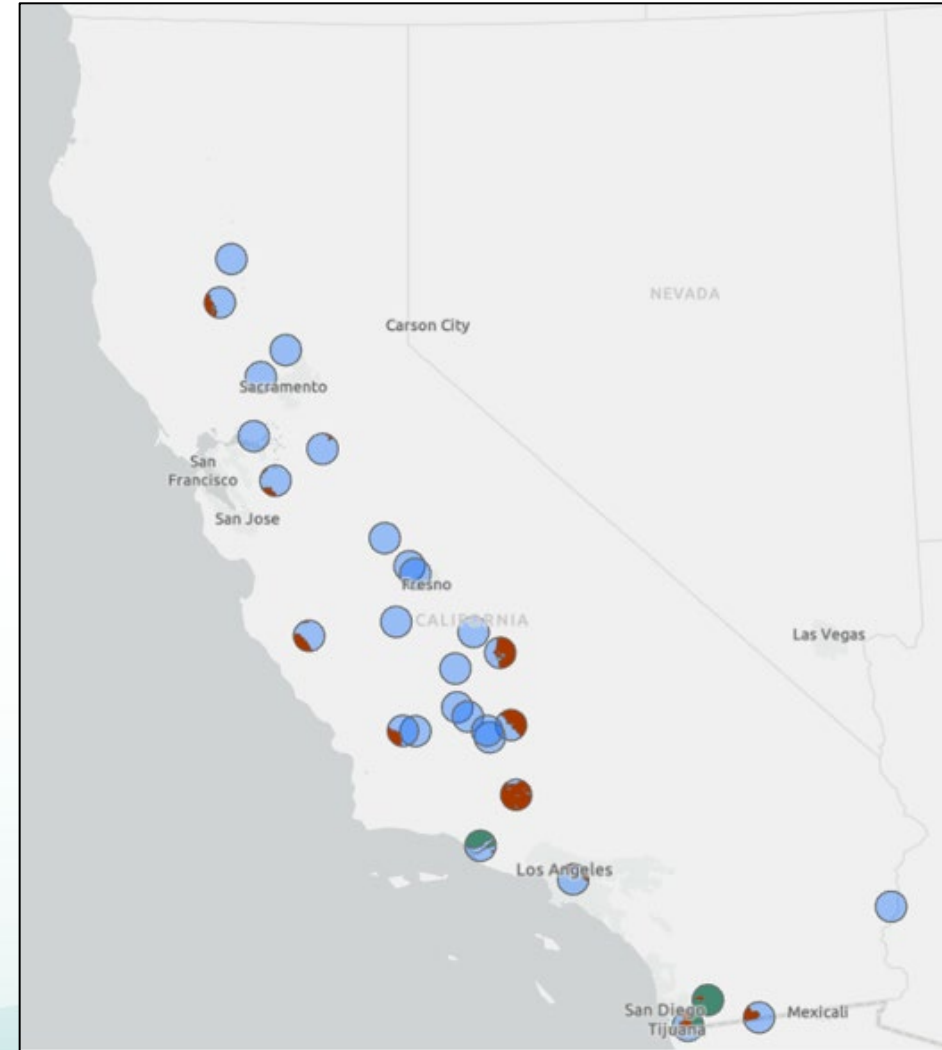
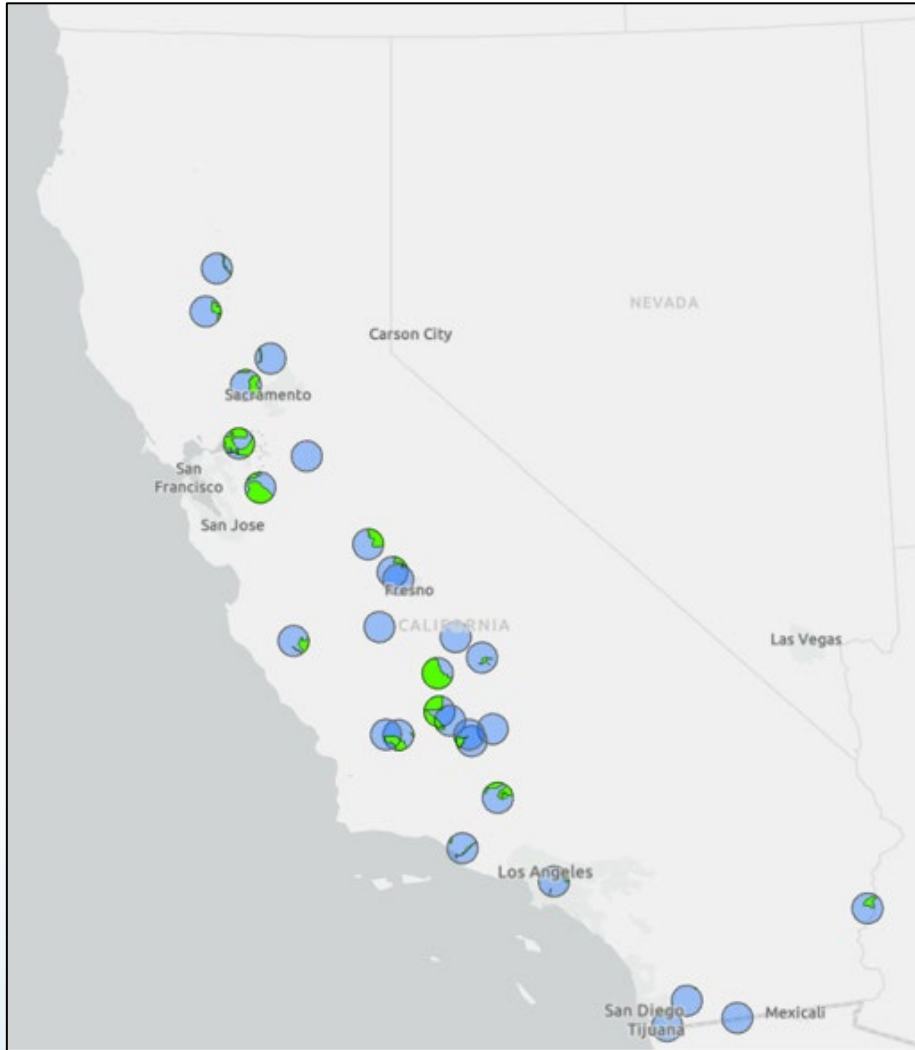


CPUC High Fire Threat Districts⁴





Intersect with Substation Buffers





Bellota Substation

Percent of Low Implication Build

19%

Percent High Characteristic of Ecological, Environmental and Biological Factors

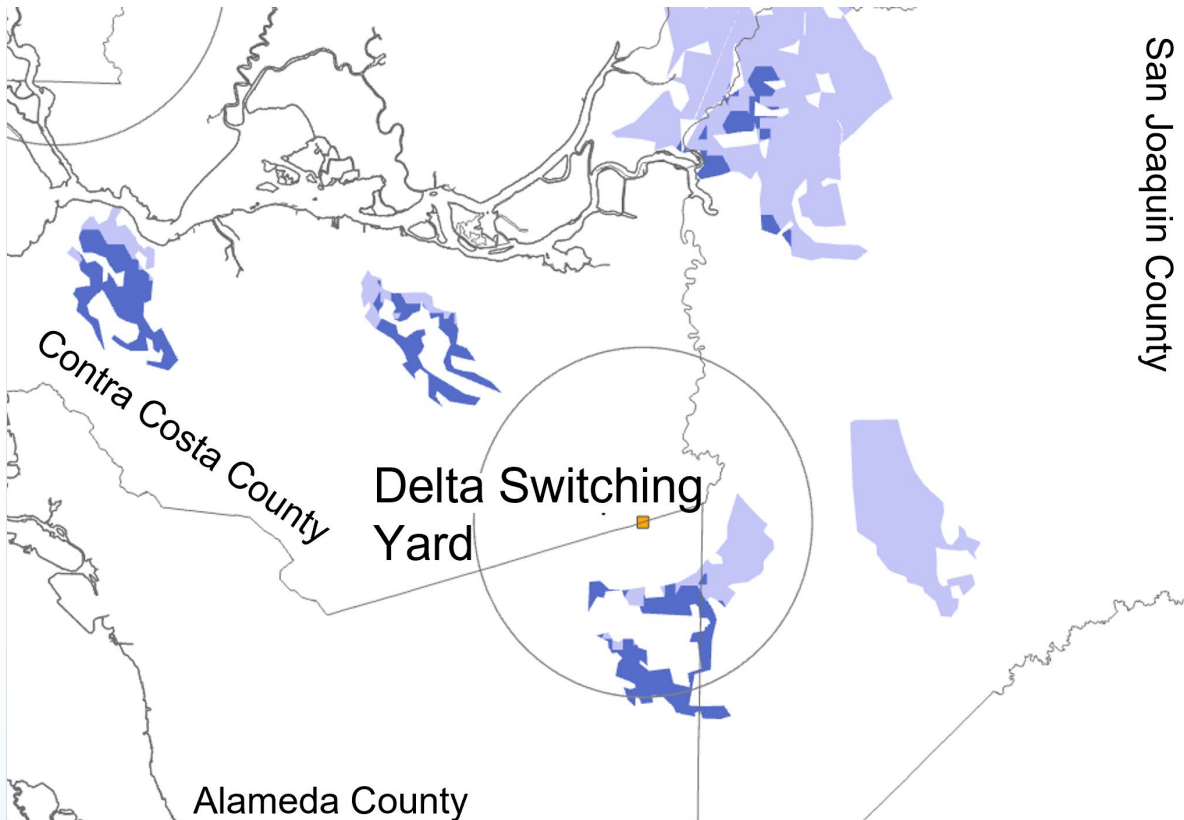
Biodiversity	55%
Connectivity	41%
Intactness	42%
Natural Landscape Blocks	40%
Irreplaceability	51%
Native Species Richness	34%
Rarity	28%

Percent Cover of High Fire Threat and Important Bird Areas

Sum of Tiers 2 and 3 (High and Extreme Fire Threat)	3%
Important Bird Area	0%



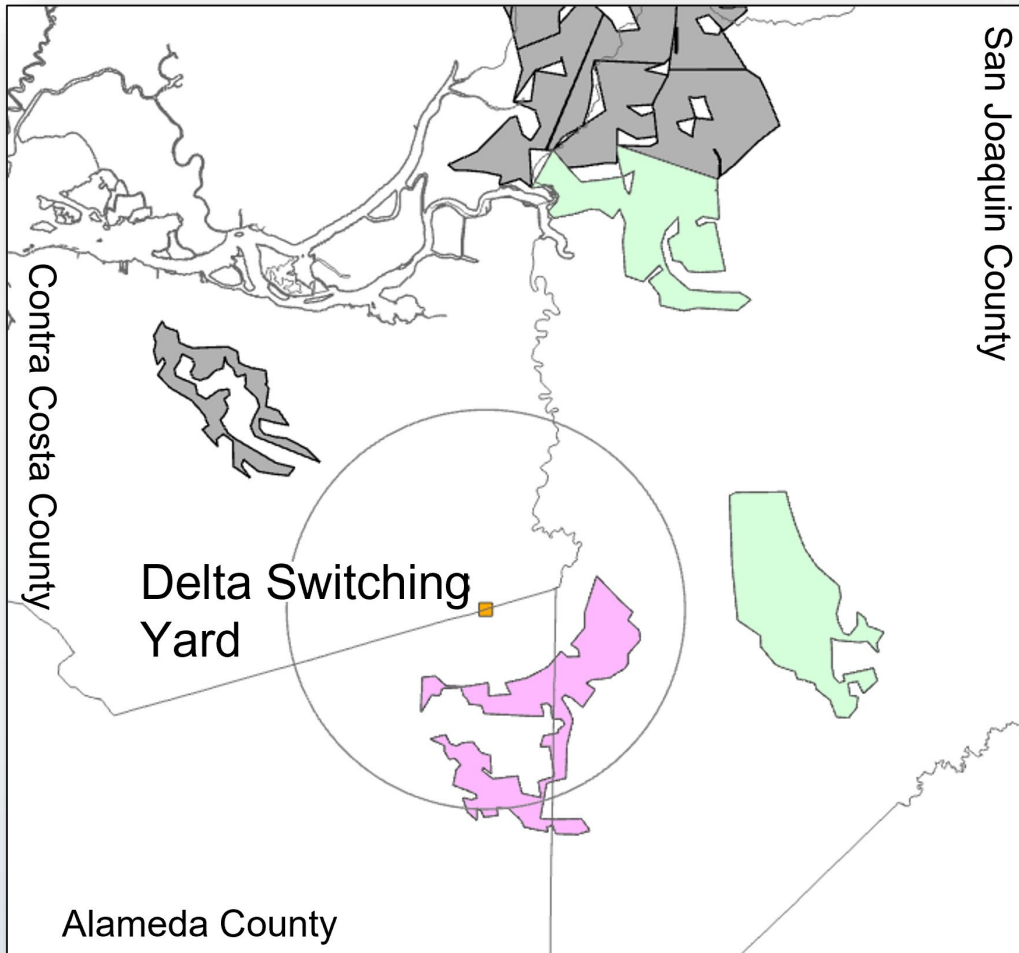
Adjusted Method for Wind Technologies



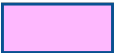
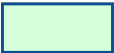

- Start with an intersection of wind resource areas to substation buffer
- Manually match wind resource polygons to substation even if outside of buffer radius
 - Proximity and within same transmission zone/grouping
- Calculate Land-Use Environmental Metrics on those areas



Example: Manual Assignment of Wind Resource Polygons to Substation

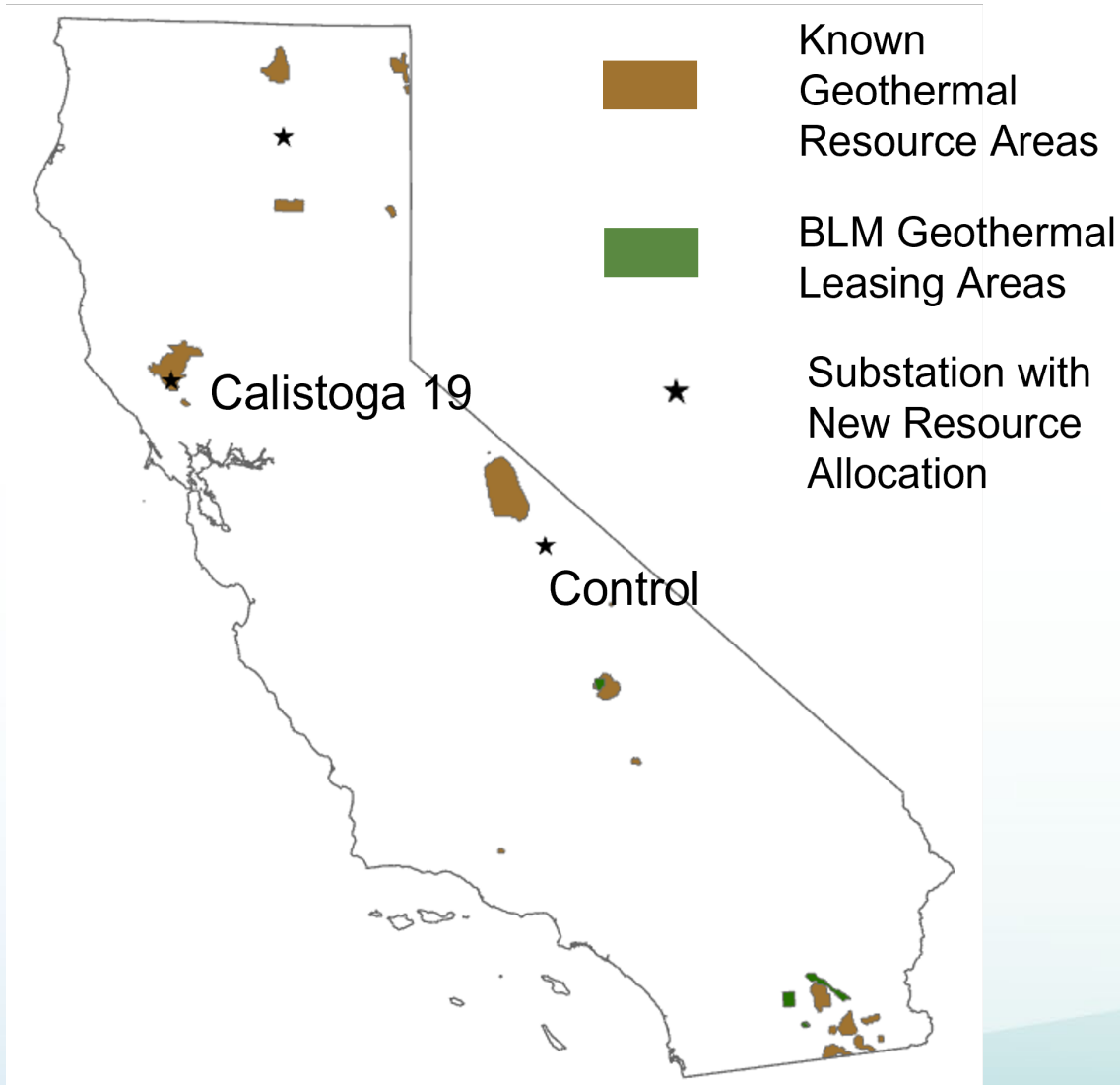


Can add as many as are needed to fulfill the desired resource allocation

-  Wind Resource Polygons Intersected by Substation
-  Wind Resource Polygons Manually Chosen for Substation
-  Other Wind Resource Polygons under Consideration



Geothermal



- Even more spatially constrained
- Apply Environmental Implications Model results to nearest geothermal resource potential field
- Calculate metrics to report back to the CPUC
- 5 acres/MW conversion factor
- Calculate IBA and Fire Threat percentages in field, no buffers



Non-Compliance Flags

Available Land Area (3a)

Level-3 Non-Compliance Threshold:

- If resource allocation results in more than 100% of total resource potential (footprint) available

Level-2 Non-Compliance Threshold:

- If resource allocation results in more than 100% of low implication land area

Environmental Impact (3b)

Level-3 Non-Compliance Threshold:

- If four or more of the ecological, environmental and biological factors exceeds 75% of the total resource potential available
- If two or more of the ecological, environmental and biological factors exceeds 95% of the total resource potential available

Level-2 Non-Compliance Threshold:

- If resource allocation results in more than 50% of low implication land
- If two or more of the ecological, environmental and biological factors exceeds 75%
- If one or more of the ecological, environmental and biological factors exceeds 95%



Summary

- CPUC provides a list of substations and their proposed resource allocation
- CEC uses resource potential maps to spatially define areas that are available for solar, wind or geothermal energy build
- CEC further evaluates the buffered area around each substation in terms of environmental implications and risk factors throughout the buffer.
- CEC returns metrics to CPUC to elucidate any issues with resource allocation or to flag potential non-compliance with Criteria 3a or 3b (Land-Use and Environmental Impacts).



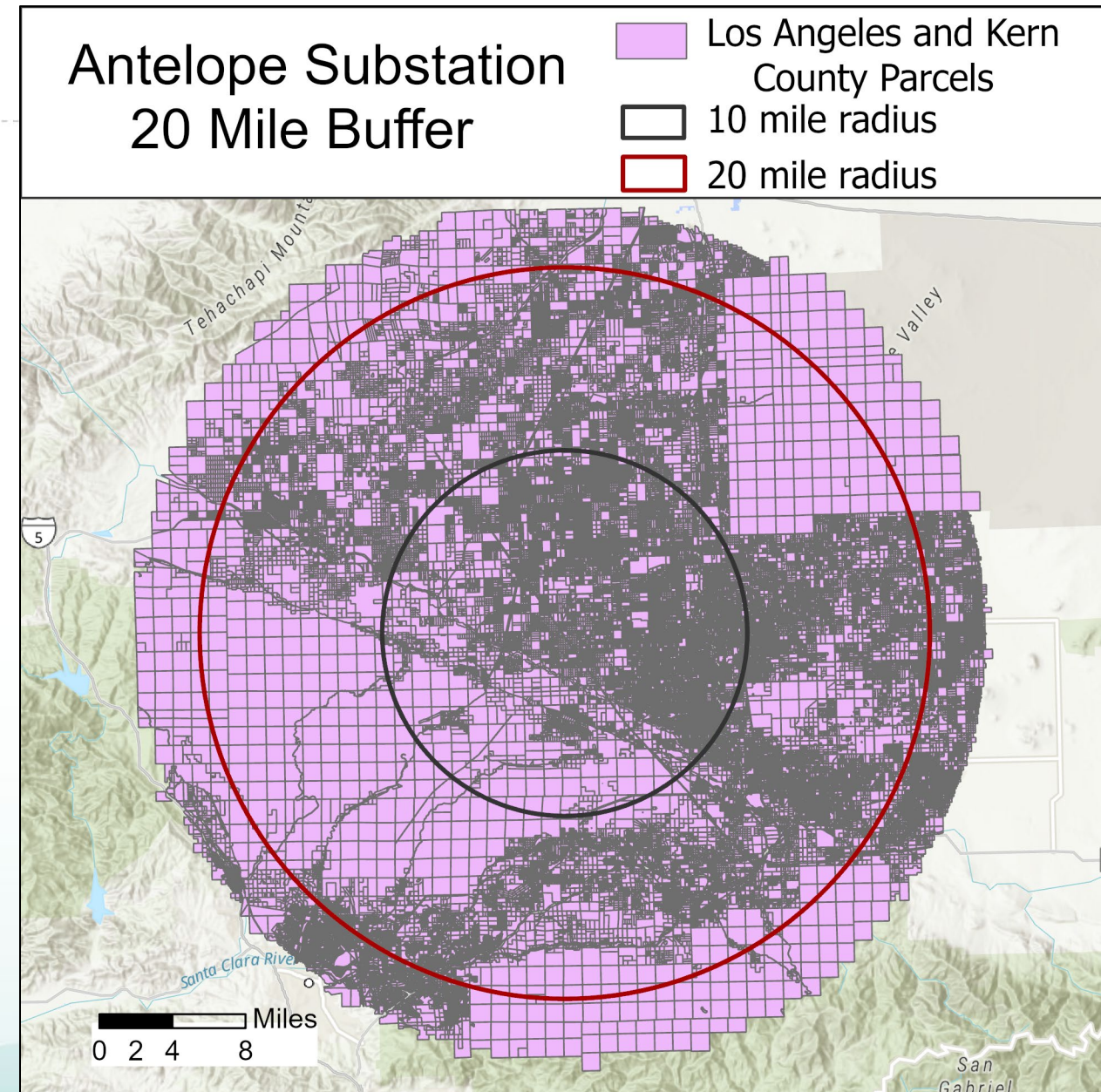
Potential New Assessments

- Parcelization
- Existing project footprint
- Distance to a protected area
- Almost surrounded by a protected area



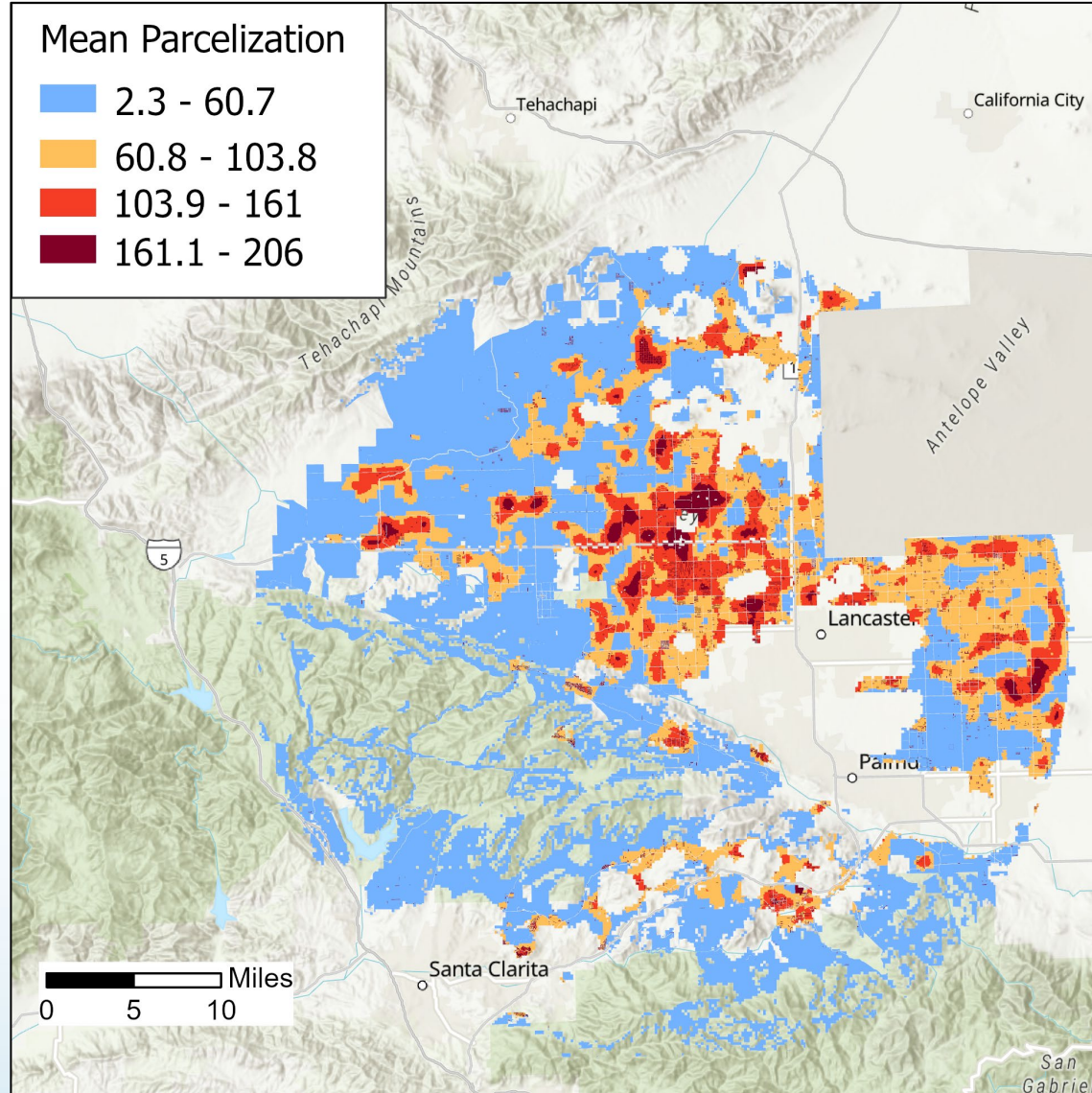
Parcels

- County Assessors: Tax APN Number
- A significant factor in developing large solar projects is parcelization of land
- Can be costly/timely if area has large number of small-sized parcels
- "Parcel Density" can be estimated
- Lower the density, more favorable area for developers





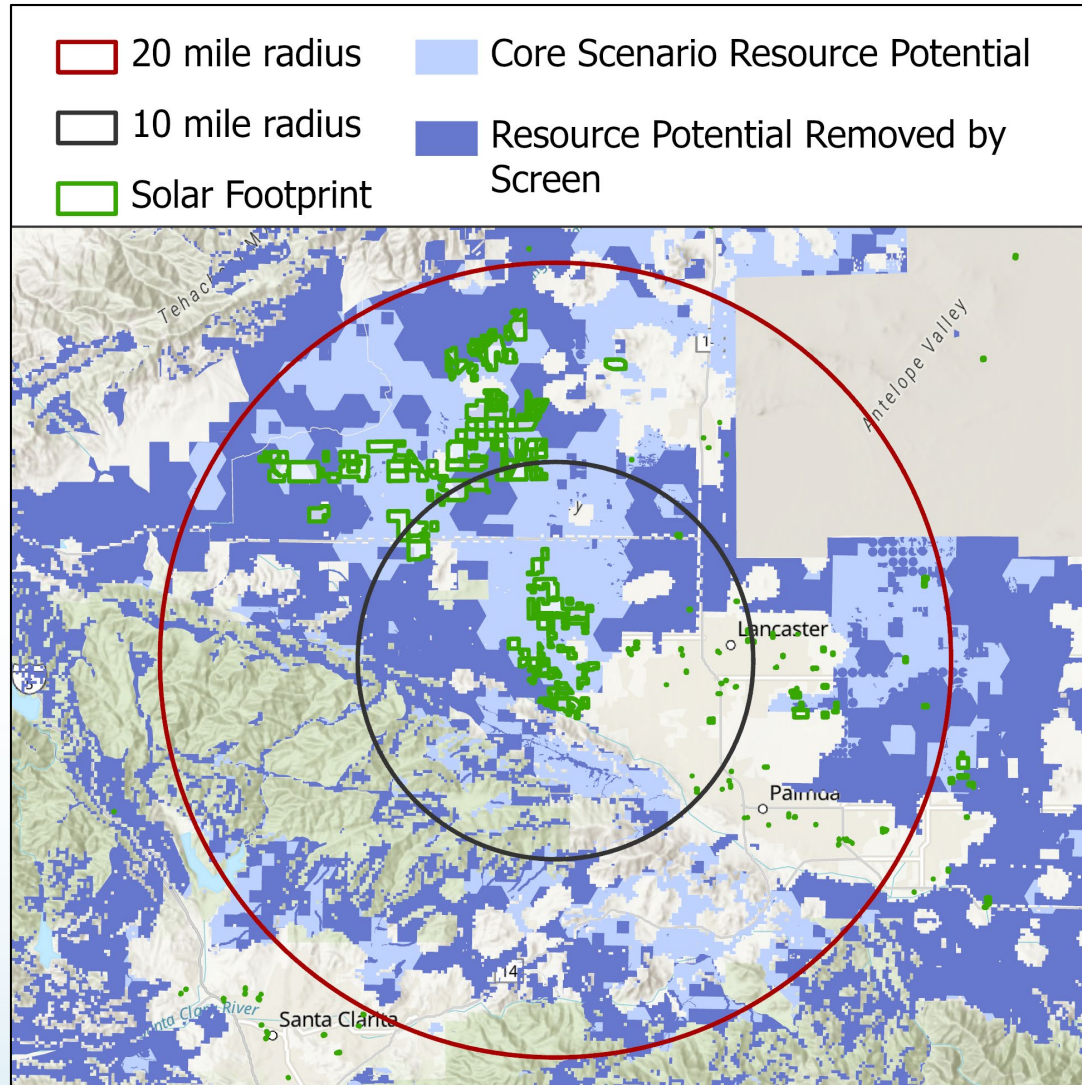
Measure of Parcelization



Apply measure of parcelization to resource potential footprint



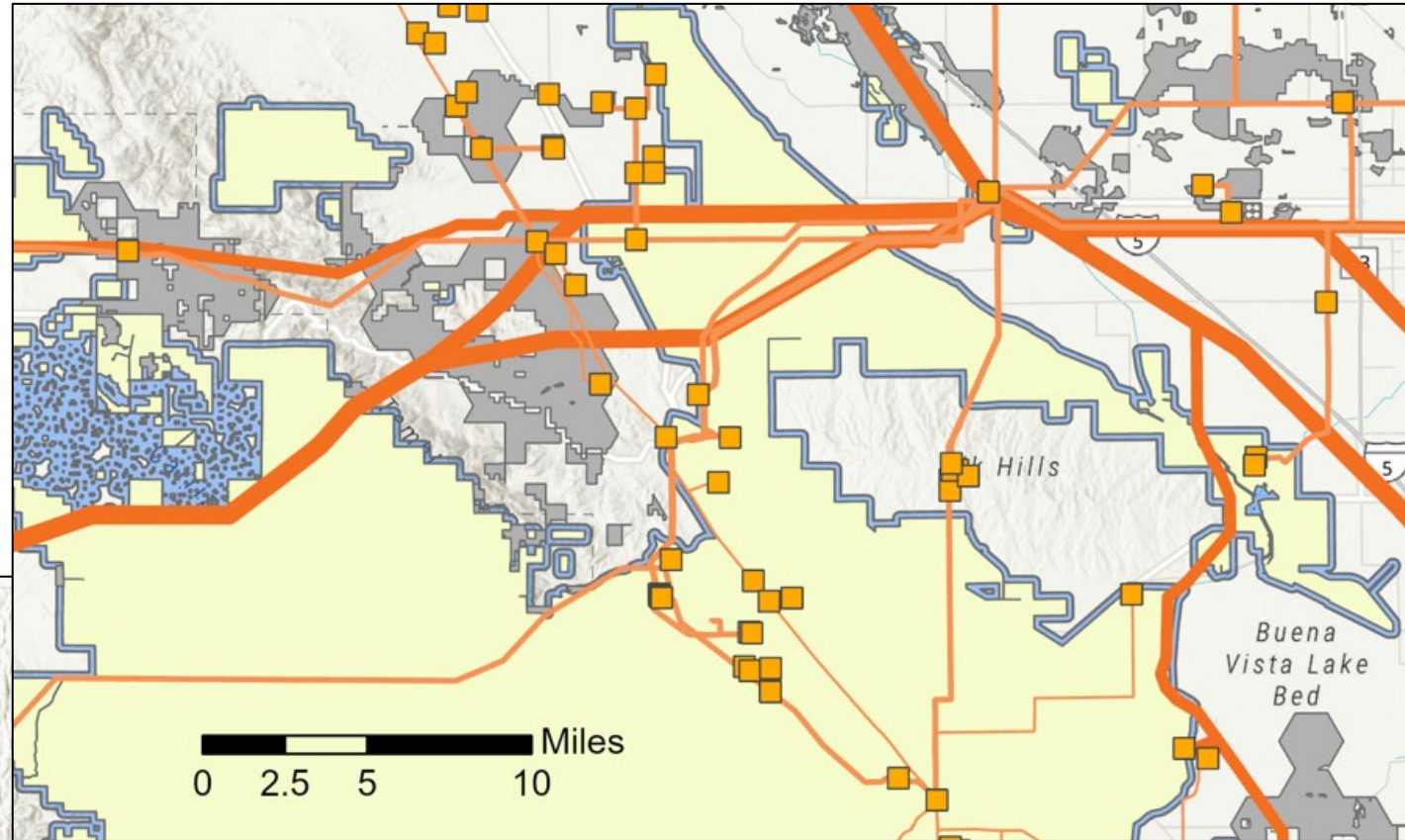
Existing Solar Footprints



- Solar footprints could eliminate a significant portion of the technical resource potential
- 15% of low implication resource potential area (within 20 miles of the substation) is covered by existing solar footprints (52,000 acres)



Distance to a Protected Area



- Substation
- Transmission Line
 - Smaller than 110 kV
 - 110 - 161 kV
 - 220 - 287 kV
 - 345 - 500 kV
- Protected Area Layer (Solar)
- Solar Resource Potential (Core)
- Protected Area Layer: Buffer 1000ft



Percent of Resource Area near or surrounded by a protected area



Questions for the Public to Consider

1. What geospatial data could be used in the determination of available land area for substation-level capacity additions for transmission planning?
2. Should the geospatial areas identified in the Core Land-Use Screen be used in busbar mapping to quantify available land area around a substation? Should additional datasets be considered given that busbar mapping occurs at a finer-scale resolution than the statewide land-use screens for resource potential? If so, what datasets?
3. How might the CEC update the environmental and land-use evaluation to be able to evaluate decisions across multiple land-use objectives?
4. What environmental and land-use metrics could the CEC report back to the CPUC?



References

1. Areas of Conservation Emphasis. California Department of Fish and Wildlife. 2018. Accessed 2018 <https://wildlife.ca.gov/Data/Analysis/Ace>
2. Degagne, R., J. Brice, M. Gough, T. Sheehan, and J. Strittholt. Terrestrial Landscape Intactness 1 km, California. Conservation Biology Institute, December 2016. From DataBasin.org: <https://databasin.org/datasets/e3ee00e8d94a4de58082fdb91248a65>
3. California Important Bird Areas. Audubon. 2016. <https://ca.audubon.org/conservation/california-important-bird-areas-gis-data-and-methods>
4. CPUC Fire-Threat Map. State of California – Public Utilities Commission. 2021. https://files.cpuc.ca.gov/safety/fire-threat_map/2018/PrintablePDFs/8.5X11inch_PDF/CPUC_Fire-Threat_Map_final.pdf