AMERICAN BIRD CONSERVANCY

Bringing back the birds

28 January 2019

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BOEM California Intergovernmental Renewable Energy Task Force
Bureau of Ocean Energy Management (BOEM)
Office of Strategic Resources
760 Paseo Camarillo (Suite 102)
Camarillo, California 93010

RE: Commercial Leasing for Wind Power Development on the Outer Continental Shelf (OCS) Offshore California—Call for Information and Nominations (Call)
http://www.regulations.gov Docket No. BOEM-2018-0045

Dear Ms. Thurston,

We appreciate the effort that the BOEM California Intergovernmental Renewable Energy Task Force has made to engage the public, scientists, and non-governmental organizations in BOEM's collaborative, data-based planning process for wind energy offshore California. We are writing to provide comments and highlight information about marine birds found in the vicinity of the three wind energy Call Areas proposed for Commercial Leasing on the Outer Continental Shelf (OCS) offshore California.

American Bird Conservancy is a 501(c)(3), non-profit membership organization whose mission is to conserve native birds and their habitats, working throughout the Americas to safeguard the rarest bird species, restore habitats, and reduce threats. American Bird Conservancy supports the effort to combat climate change, decrease air pollution, and reduce our dependence on fossil fuels through responsible renewable energy development. However, wind turbines can have adverse impacts on birds, particularly threatened and endangered species. We believe that birds and wind power can co-exist if the wind industry adopts practices and standards that protect birds.

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California's marine birds are integral components of marine ecosystems, are emblematic species of our state, and contribute to our vibrant coastal tourism economy. California's economy is reliant on a vibrant marine and coastal ecosystem. Bird-watching people contribute over $40 billion to the national economy[1] and, together birders and waterfowl hunters spend over $3 billion in California[2]. Environmental impacts to these ecosystems are potentially damaging to coastal economies and the habitats and species that depend on these resources.

Bird-Smart Wind Energy

American Bird Conservancy's bird-smart wind energy policy[3] provides a strategy to prioritize early decision-making steps in wind energy development: "avoid when planning, minimize while designing, reduce at construction, compensate during operation, and restore as part of decommissioning" (according to the "mitigation hierarchy"[4]).

American Bird Conservancy supports wind power development when it is bird-smart, which means following six principles:

(1) proper siting of turbines away from high-bird-collision-risk areas;
(2) independent, transparent pre-and-post-construction monitoring of bird impacts;
(3) effective construction and operation minimization of bird mortality by wind energy facilities;
(4) mitigation to compensate for any unavoidable bird mortality and habitat loss from wind energy development;
(5) evaluation of wind energy as part of a complete analysis on all feasible renewable alternatives; and
(6) environmental compliance with a rigorous local, state, and federal regulatory framework.

The current status of the California offshore wind energy planning process places it in the siting stages for the three Call Areas: Humboldt Bay, Morro Bay and Diablo Canyon. Therefore, we begin this comment with our recommendations specific to siting of the California Call Areas. Then we proceed with more general recommendations on the best practices to abide by bird-smart principles 1-6.

[1] Carver, E. 2013. Birding in the United States: A demographic and economic analysis. United States Fish and Wildlife Service (Report 2011-1). https://www.fws.gov/southeast/pdf/report/birding-in-the-united-states-a-demographic-and-economic-analysis.pdf
[2] Tables 18 and 31 in: U.S. Fish and Wildlife Service and U.S. Census Bureau. 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. U.S. Department of the Interior and U.S. Department of Commerce. https://www.census.gov/prod/2013pubs/fhw11-ca.pdf
[3] https://abcbirds.org/program/wind-energy-and-birds/learn-more/
[4] May. R. (2017). "Mitigation for birds" in Perrow, M. (Ed.). Wildlife and Wind Farms-Conflicts and Solutions, Volume 2: Onshore: Monitoring and Mitigation. Pelagic Publishing Ltd. pp 124-144.

Recommendations for the California Call Areas

The data/science core team of the BOEM California Intergovernmental Renewable Energy Task Force has led a commendable effort to get scientifically peer-reviewed marine bird data onto the California Offshore Wind Energy Gateway Databasin[5]. We reviewed the material gathered by this team and, using the data that were made publicly available on that website, we compiled several maps (Appendix A, Figs. 1-32). A challenge inherent to the data that we used is that they are presented as averages across multiple years, therefore, we were unable to make inference on the persistence of seabird "hotspots" (areas of predictably important foraging or migratory paths) over time or within seasonal time windows (e.g., peak migration). The ocean is a characteristically dynamic environment and environmental volatility is likely to increase with climate change. It is important that BOEM consider the predictability of hotspots, and the potential for their distributions to change within the 30-year time frame of these leases. Further site-specific surveys and predictive mapping will be needed for us to be able to make comprehensive recommendations.

We encourage BOEM to continue to strive for a transparent process in informing the site characterization with respect to the bird species affected and minimizing risk to birds. Data prioritization is an important issue that BOEM needs to spearhead, to ensure that important datasets are not ignored. While BOEM has called for researchers to submit their data to the Databasin, this can be a time-consuming task without much incentive. It is the agency's prerogative to reach out to researchers for access to all marine bird data. To maximize transparency of this process, it is also necessary that BOEM report what data they use (and how) to inform the site characterization of the Call Areas. While the data collection effort by BOEM is commendable, it is difficult for stakeholders to make certain that all relevant data were collected and appropriately used. Transparency in this process will facilitate this assessment.

While qualitative maps may help with an early evaluation of risk, proper siting decisions need to be based on quantitative data across the entire area of interest, whenever possible. We discourage the use of qualitative, anecdotal information that is not necessarily representative of underlying data, in favor of predictive maps from larger-scale systematic efforts. Best practice is to sample the site at an appropriate spatial and temporal resolution (e.g., seasonal transects for at least a couple of years – see Bird-smart Principle 2, Monitoring section below). For example, a predictive map would be useful from the PaCSEA data (Appendix A, Fig. 26) to help draw inference to seabird distributions in the un-sampled areas between transects. In considering the spatial extent of the data range, we are concerned that the southern portion of the Diablo Canyon Call Area is not sampled or under-sampled by most of the surveys in the Databasin. Further, while pelagic bird IBAs may draw attention to some species of importance, they are by no means representative of the entire community of marine birds vulnerable to impacts from the wind energy areas. Additional site-specific studies will be necessary, and evidence-based predictive maps will need to be considered with their corresponding effort to avoid overrepresentation of vulnerable species in highly-sampled areas and underrepresentation in sparsely-sampled areas. We

[5] https://caoffshorewind.databasin.org/

strongly urge BOEM to make decisions based on quantitative assessments of survey and tracking data that sample the wind energy areas in a systematically rigorous and un-biased manner.

In identifying what species are most vulnerable to the three proposed Call Areas, BOEM needs to consider both abundant and rare species. Several species are highly abundant off the California coast and are observed in large flocks / hotspots throughout all three Call Areas (e.g., Red-throated Loons, Sooty Shearwaters[6]). Seasonal pulses of migratory birds can number in the tens to hundreds of thousands: As many as 33,000 Red-throated Loons passed Pigeon Pt. (Monterey Bay, CA) during one month[7], and flocks of 100,000 to 500,000 Sooty Shearwaters regularly occur throughout the California shelf waters from May to September[8]. There also exist a few rare species that frequent the Call Areas, including Laysan, Black-footed[9], and Short-tailed Albatross[10, 11]. Some of these rare species are relatively small-bodied, making detection more challenging, but are of high global or regional conservation concern (e.g. Ashy Storm-petrel, Least Tern, Marbled Murrelet).

Efforts have begun to quantify the vulnerability of species to offshore wind energy in California[12], and these need to be expanded to model collision risk (i.e., see pre-construction Monitoring section below). While we encourage the innovation of technology used to monitor and deter collisions[13], these techniques are currently insufficient to detect mortalities in the offshore realm, particularly for rare species. A suite of site-specific pre-construction surveys (e.g., boat-based, radar, tracking, and high-definition digital aerial) will be necessary to accurately and precisely estimate the vulnerability of both rare and abundant species to the Call Areas in question (see Monitoring below).

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[6] Shaffer, S. A. et al. 2006. Migratory shearwaters integrate oceanic resources across the Pacific Ocean in an endless summer. Proceedings of the National Academy of Sciences, 103(34), 12799-12802.
[7] Roberson, D. 2002. Monterey Birds (Second Edition). Monterey Peninsula Audubon Society.
[8] Briggs, K. T., Tyler, W. B., Lewis, D. B., & Carlson, D. R. 1987. Bird communities at sea off California: 1975 to 1983 (No. 598.2 BIR). Cooper Ornithological Society.
[9] Guy, T. J. et al. 2013. Overlap of North Pacific albatrosses with the US west coast groundfish and shrimp fisheries. Fisheries research, 147, 222-234.
[10] Robert M. Suryan and Kathy J. Kuletz. 2018. Distribution, Habitat Use, and Conservation of Albatrosses in Alaska. Iden 72:156-164
[11] Orben, R. A., Connor, A. J., Suryan, R. M., Ozaki, K., Sato, F., & Deguchi, T. 2018. Ontogenetic changes in at-sea distributions of immature short-tailed albatrosses Phoebastria albatrus. Endangered Species Research, 35, 23-37.
[12] Kelsey, E. C., Felis, J. J., Czapanskiy, M., Pereksta, D. M., & Adams, J. (2018). Collision and displacement vulnerability to offshore wind energy infrastructure among marine birds of the Pacific Outer Continental Shelf. Journal of environmental management, 227, 229-247
[13] Dirksen, S. 2017. Review of Methods and Techniques for Field Validation of Collision Rates and Avoidance Amongst Birds and Bats at Offshore Wind Turbines. 47 p. https://tethys.pnnl.gov/sites/default/files/publications/Dirksen-2017.pdf

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Humboldt Bay

Wind energy development in the Humboldt Bay Call Area would be most concerning along the northeastern edge of the site, due to the exposure of several marine bird species (gulls, jaegers, shearwaters, petrels, fulmars, alcids, cormorants, pelicans, and albatrosses, Appendix A, Figs. 2-26). According to American Bird Conservancy's Seabird Maps and Information for Fisheries tool (SMIF), approximately 57 species of seabirds, sea ducks, and waterbirds occur in this area. Marbled Murrelets and Short-tailed Albatrosses are the two federally-listed Threatened and Endangered species that have been known to frequent this general region. The area falls adjacent to prime Marbled Murrelet foraging habitat – this species is federally-listed as Threatened and is highly elusive. Black-footed albatrosses are also vulnerable to development in this Call Area[9]. Albatrosses and petrels exhibit gliding flight behaviors and their flight heights increase to within rotor height during high winds[14]. We request that BOEM publish the lease blocks comprising these wind energy areas as a GIS data layer (currently the GIS layer represents only the wind energy area outline). We recommend that BOEM restrict activities or remove the lease blocks corresponding to the northeastern edge of the Call Area. We will be able to suggest more specifics once provided with further site-specific survey coverage and predictive mapping.

Morro Bay

We recommend that the Morro Bay North wind energy area (North of the Morro Bay Call Area) be removed from the map completely – it abuts the Monterey Bay National Marine Sanctuary (Appendix A, Fig. 1) and is a region of high abundance of migratory and resident seabirds. Approximately 53 bird species occur in this area (SMIF), and several (gulls, shearwaters, petrels, alcids, cormorants, and pelicans, Figs 2-20)[15] are at risk from development in this wind energy area, particularly in summer (Fig. 3) and winter (Fig. 5). For example, this is prime habitat for migratory Sooty Shearwaters, as highlighted by the Piedras Blancas IBA, which overlaps the Southeast corner of the Morro Bay Call Area. Sooty Shearwaters reach greatest abundance in May, June, or July each year, when statewide totals reach an estimated "instantaneous" figure of 2.7 to 4.7 million[8]. Adams et al. (2012) demonstrated that hotspots for Sooty Shearwaters occur in the southern boundary of the Monterey Bay National Marine Sanctuary, and within San Simeon, Morro, and San Luis Bays[16]. This is also an important foraging area for migratory Laysan Albatrosses[7], as well as resident Ashy Storm-petrels, which breed along the southern California

[14] Ainley, D, Porzig, Zajanc and LB Spear 2015. Seabird flight behavior and height in response to altered wind strength and direction. Marine Ornithology 43: 25–36.

[15] Sims, A.E. 2010. Atlas of sensitive species of the Morro Bay area. Morro Bay National Estuary Program, Morro Bay, California, and California Department of Parks and Recreation, San Luis Obispo Coast District, San Simeon. https://www.mbnep.org/wp-content/uploads/2014/12/Atlas_Sensitive_Species_of_Morro_Bay_Area.pdf

[16] Adams, J., C. MacLeod, R. M. Suryan, K. David Hyrenbach, J. T. Harvey. 2012. Summer-time use of west coast US National Marine Sanctuaries by migrating sooty shearwaters (Puffinus griseus).

coast[17]. A small number of Threatened Marbled Murrelets are known to occur in the Morro Bay to San Simeon area[18].

Diablo Canyon

This call area has 53 bird species, including hotspots of the aforementioned Sooty Shearwater, as well as the globally-listed Vulnerable Pink-footed Shearwater, a Chilean migrant and a focus of the Trilateral Agreement for NAFTA (Commission for Environmental Cooperation). Pink-footed Shearwater also is listed as Endangered by the Species at Risk Act (SARA) in Canada, the Bonn Agreement (Convention on Migratory Species, Annex 1), and by the International Agreement on the Conservation of Albatrosses and Petrels (ACAP, Annex 1).

We recommend further survey coverage to cover the southern portion of this Call Area. The Southeast corner of the Diablo Canyon Call Area overlaps with the Point Sal IBA, which is noted as prime habitat for Pink-footed Shearwaters.

Additional ***site-specific research*** and ***predictive mapping*** is needed to determine the vulnerability of birds to the three proposed Call Areas, and whether they should be further reduced in size. Proper siting will help to ease the ensuing regulatory and decision-making process, as it relates to monitoring, minimization, and mitigation (see sections below).

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[17] Parker, M.W., 2016. Conservation action plan for ashy storm-petrels (Oceanodroma homochroa) in California and Baja California. Unpublished report, California Institute of Environmental Studies, Davis, CA. 93 p.
[18] Henkel, L., 2004. At-Sea Distribution of Marbled Murrelets in San Luis Obispo County, California. Final Report to the Oiled Wildlife Care Network. March 2004

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Bird-smart Principle 1: proper siting of turbines away from high-bird-collision-risk areas

The first best practice step in wind energy planning, with regard to bird impacts, is to conduct an independent pre-construction risk assessment at the proposed site to carefully evaluate the exposure and vulnerability of birds to turbines and their associated infrastructure[19]. It is good practice to avoid areas in or near sites where birds concentrate, during migration or other times of year. Such high risk regions include Important Bird Areas, marine protected areas, and breeding concentrations or movement corridors. These require additional evaluation to assess the suitability of siting wind turbines.

It is also best practice to determine the total number of species potentially affected, including any state, federal or globally-listed species of concern, and to avoid siting energy development in areas that are defined as habitat for these migratory, threatened and endangered birds. Offshore wind facilities should not be placed near populations of rare or endangered species, large breeding colonies, or in major migratory pathways. The definition of “near” may vary from species to species, as some birds travel long distances to forage (e.g. Laysan Albatross, Sooty Shearwater). In addition, the ocean is a dynamic habitat and conditions (e.g., upwelling, concentration of food species) can change over time and space, thus influencing the distribution and concentration of wildlife. Special attention should be paid to wind development near seabird nesting islands where the birds could be at risk of collision, particularly by light-attraction when transiting between at sea foraging grounds and their colony sites. Among these sites are the CA Channel Islands, Farallones and Año Nuevo Islands, and the numerous islets and sea stacks that comprise the Federally protected California Coastal National Monument (Bureau of Land Management).

We are pleased that, according to the posted notice, “BOEM will utilize information received in response to the Call to assist with verification of migratory periods, persistent or seasonally occurring oceanic habitat features associated with marine birds, mammals, sea turtles, and fish, and periods of high species abundance or diversity that may occur within the Call Areas.” American Bird Conservancy has developed a variety of tools to assist in the conservation planning effort. The Seabird Maps and Information for Fisheries tool (SMIF) provides a list and summary of the 64 seabird species found offshore the coast of California in the vicinity of the Humboldt Bay, Morro Bay, and Diablo Canyon Call Areas. We also responded to BOEM’s request for FY19 Research Priorities & Potential Study Ideas, with suggestions specific to seabirds.

To aid wind energy project developers, American Bird Conservancy has created a Wind Risk Assessment Map identifying levels of risk throughout the country. Areas that are not suitable for wind development are indicated in red. If developers choose to proceed in areas of moderate risk (orange on the map), they should follow stringent monitoring, minimization, and mitigation requirements (e.g., seasonal shutdowns, i.e., curtailment). For example, the design of movement corridors through or around wind energy arrays, via micro-siting, can help to enable turbine avoidance. Developers could also consider

[19] Dewitt, A.L., and Langston, R.H.W. 2006. Assessing the impacts of wind farms on birds. Ibis 148: 29-42.

reducing turbine number and density, and selecting turbine sizes with a rotor swept zone that minimizes collision risk, based on at-risk species. There exists a tradeoff in energy output, where few, large turbines have equivalent capacity to a large matrix of small turbines. A reduction in turbine number and/or density may help to minimize collision or displacement risk, as long as the rotor zone remains outside the range of flight heights of at-risk species. While well-sited wind facilities require extensive resource investment at an early stage, they provide the best outcome with the least conflict – poorly sited turbines make the rest of the development process much more difficult.

Bird-smart Principle 2: independent, transparent pre-and-post-construction monitoring of bird impacts

American Bird Conservancy's bird-smart best practice includes an independent body to assess risk in pre- and post-construction monitoring of bird deaths. This guideline removes the external perception of potential under-reporting of injury, and conflicts of interest due to company self-reporting. Studies should include consultation with avian experts that are not paid employees of wind energy companies, but who are intimately familiar with the local avifauna and their habitats. Independent studies can be supported through a mitigation fund, as described below (Mitigation section). Best practice also is the transparent implementation of these studies to allow for public input and review of their design and results, as our nation's birds are a public trust resource.

Bird-smart wind power should employ a site-specific monitoring plan that is federally and state reviewed and approved (e.g., an ***Avian Protection Plan***). A monitoring plan should be included in all Construction and Operation Plans, and reviewed during the NEPA process. An effective plan covers at least 5-10 years and requires independent, transparent, site-specific studies that use standard pre- and post-construction "Before, After – Control, Impact" (BACI) or "Before-After Gradient" (BAG) protocols. These methods set a comprehensive annual baseline against which post-construction studies can be evaluated, to quantify the cumulative impacts of wind turbines on birds. With oversight from regulatory agencies, the plan should be modified on an annual basis, to inform the adaptive management process for improved operational minimization and mitigation. For example, at the first (and only) offshore wind farm in the US, located off the coast of Block Island, Rhode Island, Deepwater Wind reports the results of their monitoring plan to the US Army Corps of Engineers (USACE), USFWS, and Rhode Island Coastal Resource Management Council (CRMC). These organizations review the information annually, and modify the plan as appropriate.

Pre-construction assessments should last at least 2 years and use all existing available bird study data, providing sufficient site-specific data to best account for detection probability, local environmental variability and bird movements at the appropriate spatial/temporal resolution. Implementing a suite of methods is necessary to assess displacement sensitivity (e.g., boat and aerial surveys, with tracking studies), as well as collision vulnerability (e.g., radar combined with vibration/bioacoustics collision sensors). In the case of birds, abundance (exposure) is one factor, along with vulnerability and hazard, contributing to risk[20, 21]. Estimating the potential impact of one wind energy facility in a site-specific study is very different from assessing the impact of several facilities in the same area in a strategic study[22]. Government regulators need to develop a comprehensive process for assessing cumulative impacts when making wind energy development decisions[23].

Displacement

Avoidance behavior displayed by some birds around wind facilities suggests that, even if they don't collide with wind turbines, birds may experience habitat loss, particularly from large wind farms[24]. Advancements in tracking technology have made it possible to identify behavioral avoidance of wind turbines by individual birds. For example, GPS tracking can be used on large birds (e.g., > 200g) to quantify fine- and macro-scale movements, with a special focus on altitudes within the rotor-swept zone. Alternatively, nanotags are miniaturized tracking devices attached on small birds that are detected by receiving towers throughout the Motus Wildlife Tracking System network. This tool uses automated digital telemetry to estimate the macro-exposure of smaller birds to wind energy development, such as wind energy area crossings[25].

Surveys that assess avian exposure to wind energy development can also address displacement vulnerability. To estimate abundance at a micro-spatiotemporal scale, developers should deploy continuous turbine-mounted acoustic monitors to detect the calls of passing birds and bats. Radar, aerial surveys, and boat-based surveys estimate the abundance and distribution of birds at a macro-spatial scale. Radar should be monitored on a continuous (daily) basis to detect large birds and flocks at altitudes within the rotor zone. Traditional (observer) aerial or high-resolution digital aerial surveys should be run on a monthly basis, and weekly during peak movement periods; digital aerial surveys can be used to estimate altitudes within the rotor zone. Boat-based surveys have the advantage of detecting bird behaviors and should also operate on a monthly basis, weekly during peak movement.

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[20] Marques, A.T., Batalha, H., Rodrigues, S., Costa, H., Ramo Pereira, M.J., Fonseca< C., Mascarenhas, M., and Bernardino, J. 2014. Understanding bird collisions at wind farms: An updated review of the causes and possible mitigation strategies. Biological Conservation 179: 40-52.

[21] Fox, A.D., Desholm, M., Kahlert, Christensen, T.J., and Petersen, I.K. 2006. Information needs to support environmental impact assessment of the effects of European marine offshore wind farms on birds. Ibis 148: 129-144.

[22] Busch, M., Kannen, A., Garthe, S., and Jessup, M. 2013. Consequences of a cumulative perspective on marine environmental impacts: offshore wind farming and seabirds at North Sea scale in context of the EU Marine Strategy Framework Directive. Ocean and Coastal Management 71: 213-224

[23] Goodale, W. and Milman, A. 2014. Cumulative adverse effects of offshore wind energy development on wildlife. Journal of Environmental Planning and Management. 59: 1-21

[24] Garthe, S., Markones, N. & Corman, AM. 2017. Possible impacts of offshore wind farms on seabirds: a pilot study in Northern Gannets in the southern North Sea. J Ornithol. 158: 345

[25] Loring PH, McLaren JD, Smith PA, Niles LJ, Koch SL, Goyert HF, Bai H. 2018. Tracking movements of threatened migratory rufa Red Knots in U.S. Atlantic Outer Continental Shelf Waters. Sterling (VA): US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2018-046. 145 p. https://espis.boem.gov/Final Reports/BOEM_2018-046.pdf

All site-specific avian exposure surveys should follow BACI or BAG protocols within the wind energy area (i.e., treatment) and a reference area (i.e., control plots). Careful selection of reference areas requires a representative sample of the wind energy area consistent with standard environmental variables – such as water depth, productivity, and distance to shore. Mendel et al. (2019)[26] used a BACI approach with 14 years of pre-construction data and 3 years of post-construction data from boat-based and aerial surveys. They showed that wind facilities in the North Sea caused a loss (i.e., reduction and redistribution) of loon habitat, which could lead to indirect long-term effects on their populations.

Collisions

Flight height of a given species is considered the most important factor in determining that species' collision risk[27] and avoidance potential[28]. A radar study around the Great Lakes conducted by the U.S. Fish and Wildlife Service[29] suggests that many migratory birds often fly at lower levels than once thought, and this may be true of other birds as well. For seabirds that use dynamic soaring, such as albatrosses, flight height and behavior are positively related to wind speed and direction[14]. Gannets, gulls (including kittiwakes), and terns also fly within rotor height and have shown particularly high collision and displacement vulnerability scores[12, 30]. Advancements in digital aerial survey technology[31] and the use of drones[32] in the last couple of years have shown that boat surveys underestimate flight heights, therefore many collision and displacement vulnerability scores are likely to be even higher than estimated in these previous studies. American Bird Conservancy encourages the USFWS, Department of Energy (DOE), BOEM, and other U.S. natural resource agencies to further study the species-specific collision risk and avoidance potential to offshore wind energy development in California on federally-protected birds and their habitats.

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[26] Mendel, B. Schwemmer, P., Peschko, V., Müller, S., Schwemmer, H., Mercker, M., Garthe, S. 2019. Operational offshore wind farms and associated ship traffic cause profound changes in distribution patterns of Loons (*Gavia* spp.). Journal of Environmental Management Volume 231: 429-438

[27] Band, B. 2012. Using a collision risk model to assess bird collision risks for offshore wind farms. http://www.bto.org/sites/default/files/u28/downloads/Projects/Final_Report_SOSS02_Band1ModelGuidance.pdf

[28] Furness, R.W., Wade, H.M., and Masden, E.A. 2013. Assessing vulnerability of marine bird populations to offshore wind farms. Journal of Environmental Management 119: 56-66

[29] Bowden, T. S., E. C. Olson, N. A. Rathbun, D. C. Nolfi, R. L. Horton, D. J. Larson, and Gosse, J.C. 2015. Great Lakes avian radar technical report Huron and Oceana Counties, Michigan. Biological Technical Publication BTP-R3011-2015. http://digitalmedia.fws.gov/cdm/ref/collection/document/id/2092

[30] Willmott, J. C. R., G. Forcey, and A. Kent. 2013. The Relative Vulnerability of Migratory Bird Species to Offshore Wind Energy Projects on the Atlantic Outer Continental Shelf: An Assessment Method and Database. Final Report to the U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs. OCS Study BOEM 2013-207. 275 pp. https://www.boem.gov/ESPIS/5/5319.pdf

[31] Johnston, A., & Cook, S. C. P. (2016). How High Do Birds Fly?: Development of Methods and Analysis of Digital Aerial Data of Seabird Flight Heights. British Trust for Ornithology, Report No. 676, 53pp. https://www.bto.org/research-data-services/publications/research-reports/2016/how-high-do-birds-fly-development-methods

[32] Harwood, A. J., Perrow, M. R. and Berridge, R. J. (2018), Use of an optical rangefinder to assess the reliability of seabird flight heights from boat-based surveyors: implications for collision risk at offshore wind farms. J. Field Orn.

Pre-construction assessments should involve site-specific collision risk modeling, based on avian exposure to the wind energy area (i.e., distribution and abundance), hazards imposed by the turbine parameters (i.e., based on rotor zone), and vulnerability (i.e., based on life history parameters such as flight height and other bird behaviors, including foraging and migratory activity).

Post-construction studies should run for at least 5 years (long enough to determine the efficacy of, and make needed revisions to, operational minimization measures). They must employ mathematical models that best account for variations in local conditions and the relative difficulty of locating bird carcasses in different conditions, particularly due to scavenging by predators. Standardized mortality statistics should be calculated via the Generalized Fatality Estimator, GenEst. Innovations in advanced technologies are under development to monitor bird strikes with turbines[33]. Turbine-mounted systems include vibration/bioacoustics and multi-sensor (MUSE) wildlife detection systems; radar and infrared camera Thermal Animal Detection Systems (TADS); accelerometers, microphones, and video cameras (WT-Bird).

Rigorous metrics are needed to improve upon existing methods of pre-construction risk assessment and post-construction mortality studies, particularly offshore[34]. Determination of post-construction mortality for birds is more difficult in the offshore realm than onshore, since carcasses will be immediately lost in the water, thus precluding species identification and determination of actual numbers taken. American Bird Conservancy strongly encourages research on new technologies that will test and verify accurate pre-construction risk assessment and post-construction mortality monitoring at offshore wind facilities.

In summary, site characterization and assessment studies need to follow ***"Before, After – Control, Impact"*** or ***"Before-After Gradient"*** protocols (i.e., with appropriately-selected ***control plots*** adjacent to the lease area for comparison). Such studies should be ***independent*** from the leasing industries and be systematically designed to accurately and precisely quantify the ***collision and displacement vulnerability*** of protected birds to offshore wind energy development.

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[33] Dirksen, S. 2017. Review of Methods and Techniques for Field Validation of Collision Rates and Avoidance Amongst Birds and Bats at Offshore Wind Turbines. 47 p. https://tethys.pnnl.gov/sites/default/files/publications/Dirksen-2017.pdf

[34] Bailey, H., Brookes, K.L., and Thompson, P.M. 2014. Assessing environmental impacts of offshore wind farms: Lessons learned and recommendations for the future. Aquatic Biosystems 10 (8)

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Bird-smart Principle 3: effective construction and operational minimization of bird mortality by wind energy facilities

Several cost-effective strategies can be taken to minimize bird mortalities, although further innovation and testing is needed[35]. Improving existing methods is an important factor in taking a science-based approach to wind-energy development, since "…technologies to minimize impacts at operational facilities for most species are either in early stages of development or simply do not exist" (DOE EERE 2014). The collective challenge is to have precaution-based minimization that seeks to increase the resilience of the populations in the absence of empirical evidence of mortality. American Bird Conservancy encourages research on ways to minimize the effects of wind turbines on birds, including ways to detect and cease (i.e., feather, curtail) wind turbine rotation when large numbers of birds are present, as well as employ appropriate measures that do not attract birds[36].

Bird-smart wind power uses the ***best technology*** and ***management practices*** to avoid harm to birds. Effective construction and operation minimization should be implemented as part of the monitoring plan to reduce bird fatalities. Examples include burying transmission lines in high risk areas, following Avian Power Line Interaction Committee (APLIC) standards for above-ground transmission lines, and using un-guyed rather than guyed meteorological towers. Electrical cables can pose a significant risk to birds through collisions and electrocution[37]. Sonic and visual deterrents (e.g., flight diverters, markers on associated infrastructure, or specialized light spectrum deterrent devices using UV or red/blue LED lights or lasers). Attractant removal is also good practice, such as anti-perching devices and lighting that minimizes nighttime migratory bird collision mortality (such as flashing lights).

Operational curtailment (i.e., feathering, or shutting-down turbines) is necessary during high risk (i.e., poor visibility weather) and peak movement periods (e.g., nocturnal, seasonal migration, or post-breeding season). Offshore marine environments are particularly dynamic and can change rapidly with changing weather conditions, such as strong wind and fog. Measures need to be taken into account to accommodate changing distributions in bird hotspots, as a result of weather conditions and climate change. Existing detection-and-curtailment systems (e.g., IdentiFlight and DTBird) detect eagles and activate warning sounds prior to curtailment within seconds. For breeding seabirds that regularly transit between island nest sites and open-ocean feeding areas, seasonal closures, buffers or corridors around colony sites should be considered to minimize wind impacts.

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[35] Wang, S., Wang, S. and Smith, P. 2015. Ecological impacts of wind farms on birds: Questions, hypotheses, and research needs. Renewable and Sustainable Energy Reviews 44: 599_607

[36] May, R., Reitan, O., Bevanger, K., Lorentsen, S. H., & Nygård, T. 2015. Mitigating wind-turbine induced avian mortality: sensory, aerodynamic and cognitive constraints and options. Renewable and Sustainable Energy Reviews, 42, 170-181

[37] Manville, A.M. 2005. Bird strikes and electrocutions at power lines, communication towers, and wind turbines: State of the art and state of the science-Next steps toward mitigation. USDA Forest Service Gen. Tech. Rep. PSW-GTR-191: 1051-1064

Adaptive management is necessary to determine the monitoring, minimization, and mitigation plan's efficacy, and revise operational minimization measures, such that when parameters are exceeded they trigger required remedies (e.g., sage grouse planning is updated when habitat loss is exceeded). Given regulatory flexibility, minimization efforts could involve an adaptive post-construction matrix design, for example, where floating offshore turbines may be re-located under circumstances where bird distributions shift dramatically. However, poorly-sited turbines must be avoided else face heightened monitoring, minimization, and mitigation restrictions.

Bird-smart Principle 4: mitigation to compensate for any unavoidable bird mortality and habitat loss from wind energy development

Following efforts by developers to properly site wind energy facilities and minimize bird mortalities, further harm to birds can be unavoidable. In these situations, bird-smart wind power redresses the loss of any birds or habitat, to a net benefit standard. This means that developers must find ways to produce enough birds to offset the losses imposed by collisions, displacement, and the cumulative effects of wind turbines. Examples include predator control and restoration of disturbed habitat post-construction and post-decommission (e.g., replanting of native vegetation, removal of non-native predators). Best practice is that developers buy into a mitigation fund, for example via an HCP or other MOU with the USFWS. This can be used to support conservation and independent research on the vulnerability of birds to the wind energy facilities, or studies designed to improve monitoring and minimization through technology innovation.

Compensation should also include ***acquiring additional habitat*** for migratory birds, such as off-site habitat conservation projects at wintering grounds, National Wildlife Refuges, and/or marine protected areas. Under a Section 10 ESA consultation, landowners or developers can apply for Incidental Take Permits (ITP) to engage in Safe Harbor Agreements, Candidate Conservation Agreements, and HCPs (e.g., Great Plains Wind Energy HCP). Offshore wind energy involves Section 7 ESA consultation, meaning that an ITP could include restoration to breeding colonies, such as that which occurred at the Bird Island Roseate Tern colony in 2017. American Bird Conservancy supports such actions that help in the recovery trajectory for endangered species.

American Bird Conservancy recommends that wind energy companies also enter into an agreement with local/regional science-based birding and conservation organizations to reduce and redress any unavoidable bird loss. To mitigate the effects of the proposed Morro Bay wind energy project, Castle Wind LLC has entered into an agreement with the local commercial fishing community, to offset the anticipated impacts to the fishing community by the wind facilities (see p. 31). Bird-watching businesses contribute substantially to the economy of California[38], and "pelagic birding tours can be an alternative

[38] BBC Research & Consulting, 2011. California Outdoor Recreation Economic Study: Statewide Contributions and Benefits. Prepared for California State Parks.

source of income to many fishermen that have been hard-hit by disappearing fish stocks"[39]. Additionally, Vineyard Wind has set a precedent for protective measures and a $3 million mitigation fund to support research about the critically Endangered North Atlantic Right Whale. A ***bird mitigation fund*** could support independent research on the vulnerability of birds to wind energy facilities offshore California, the development of collision monitoring and deterrent technology, habitat acquisition for birds, and other compensatory conservation actions.

Bird-smart Principle 5: evaluation of wind energy as part of a complete analysis on all feasible renewable alternatives

Given all of the aforementioned impacts of wind energy on birds, it is good practice that project developers conduct a complete feasibility analysis to determine whether other renewable alternatives may be more appropriate at their proposed sites. Alternative energy sources, such as distributed solar energy (i.e., photovoltaic panels on preexisting structures such as houses or other buildings), can require less infrastructure, such as power lines, and have less impact on birds. In 2011, the Bureau of Land Management and the California Public Utilities Commission considered distributed solar as a feasible alternative to three energy projects in San Diego County (BLM/CPUC EIS). California is an example of a state that invested so heavily in solar that it is exporting its power to other states[40]. A complete **feasibility analysis** would determine the need and justification for additional energy capacity generated from other renewable sources, including wind energy.

Bird-smart Principle 6: environmental compliance with a rigorous local, state, and federal regulatory framework

In the US, birds are protected federally from incidental take by wind turbines under the Endangered Species Act (ESA), Bald and Golden Eagle Protection Act (BGEPA), and Migratory Bird Treaty Act (MBTA). Despite efforts to weaken the ESA and MBTA, these laws have a record of success. A recent interpretation of the MBTA exonerates developers from incidental take of migratory birds – this is extremely insufficient, under litigation, and opposed by several organizations and members of congress. Members of American Bird Conservancy's policy team are working towards developing a process of protecting migratory birds similar to the Bald and Golden Eagle Protection Act (BGEPA). Additionally, we have been actively involved in the National Environmental Policy Act (NEPA) process to ensure that Environmental Assessments (EA) and Environmental Impact Statements (EIS) include adequate measures to monitor, minimize, and mitigate bird mortalities. American Bird Conservancy is particularly

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https://www.parks.ca.gov/pages/795/files/ca%20outdoor%20rec%20econ%20study-statewide%2011-10-11%20for%20posting.pdf

[39] Sekercioglu, C. H. 2003. Conservation through commodification. Birding, 35(4), 394-402. http://sekercioglu.biology.utah.edu/PDFs/Sekercioglu%202003%20Birding_Conservation%20through%20commodification.pdf

[40] Penn, I. 2017. California invested heavily in solar power. Now there's so much that other states are sometimes paid to take it. L.A. Times, 22 Jun. https://www.latimes.com/projects/la-fi-electricity-solar/

concerned about the effects of wind turbines on rare species, including those listed as Threatened and Endangered. The California Department of Fish and Wildlife has confirmed that "California law continues to provide robust protections for birds, including a ***prohibition on incidental take*** of migratory birds"[41].

American Bird Conservancy works with legislators to improve the existing policy and regulatory framework designed to protect birds. We also collaborate with state and federal agencies to provide guidelines for energy developers. In 2011, the US Fish and Wildlife Service published voluntary guidelines for developing wind energy on land. American Bird Conservancy favors mandatory, rather than voluntary guidelines for wind energy that effectively protect our nation's native birds from this rapidly expanding industry, both on and offshore. In 2015, American Bird Conservancy petitioned the Department of the Interior to develop a rulemaking process and mandatory permitting system – this was endorsed by several partner groups. Guidance for developing offshore wind energy is currently under review by the USFWS, which is a step in the right direction. We urge a precautionary approach when it comes to wind energy compliance with avian guidelines and regulations. BOEM has issued guidelines for avian surveys[42] as well as Construction and Operation Plans[43]. We encourage BOEM to treat these guidelines as mandatory and continue to engage stakeholders in updating these guidelines.

Build capacity

We commend BOEM's participation in regional planning to guide leasing decisions, with state and federal oversight, as has occurred with the U.S. National Offshore Wind Strategy[44]. Organization of an independent ***avian stakeholder advisory group*** is key to the regional planning process. An independent avian stakeholder advisory group should be charged with a variety of tasks throughout the wind energy planning and operation process. This group makes informed decisions about the potential impacts of offshore wind energy development, contributes to the NEPA process, encourages regional planning, and establishes mandatory guidelines and best management practices. It also helps to identify knowledge/data gaps, interpret data, methods, and results from the monitoring plan, and assess cumulative impacts. The group provides transparency by disseminating data and results to public, and also ensures multi-agency oversight. It should assess the need for incidental take permits, recommend adaptive management of operations, and help to develop and implement the mitigation fund. As an example, the New York State Energy Research and Development Authority (NYSERDA) has developed an Environmental Technical Working Group (ETWG) to pursue similar goals. Such existing groups may be used as a foundation to structure future groups dedicated to regional issues nationwide. We highly recommend that the BOEM California Intergovernmental Renewable Energy Task Force establish such an advisory group.

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[41] https://oag.ca.gov/system/files/attachments/press-docs/20181129mbta-advisory3.pdf
[42] https://www.boem.gov/Avian-Survey-Guidelines/
[43] https://www.boem.gov/COP-Guidelines/
[44] DOE. 2016. A national offshore wind strategy: Facilitating the development of the offshore wind industry in the United States. Department of Energy, Washington, DC. https://www.boem.gov/National-Offshore-Wind-Strategy/

We welcome the opportunity to provide comment and offer our participation in: the development of an avian protection plan; identification of potential mitigation projects to be supported by a bird mitigation fund; participation in an avian stakeholder advisory group; and providing future comment on decision-making process relative to sustainable wind-energy development in California. We are optimistic that a bird-smart approach will help to guide offshore energy development while benefiting both birds and people. Additionally, given the government shutdown, federal workers have been unavailable to clarify questions pertinent to the Call. Therefore, we encourage BOEM to consider an extension of the comment period to help ensure that all resources are available for an informed review process.

Sincerely,

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American Bird Conservancy
Washington, DC
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https://abcbirds.org/program/wind-energy-and-birds/

Hannah M. Nevins
American Bird Conservancy Seabird Program Director, Santa Cruz, CA

Appendix A

Using the data that were made publicly available on the California Offshore Wind Energy Gateway Databasin, American Bird Conservancy compiled several maps (Figs. 1-32), with the following marine bird data layers overlaid on the wind energy call areas:

1. BOEM's wind energy call areas and bathymetry (Fig. 1)
2. Point Blue Conservation Science[1]: California Current System predicted average abundance of seabirds, Spring, Summer, Fall, Winter 1997-2008 (Fig. 2-20)
3. TOPP (Tagging of Pacific Predators) Program, Scott Shaffer et al.: Black-footed Albatross Utilization Distribution, California Current, 2003-2009 (Fig. 21)
4. USGS, PaCSEA[2]: Pacific Continental Shelf Environmental Assessment (PaCSEA): aerial seabird and marine mammal surveys off northern California, Oregon, and Washington, 2011-2012 (Fig. 26)
5. Adams, J., Felis, J.J., Mason, J.W., and Takekawa, J.Y., 2015, Pacific Continental Shelf Environmental Assessment (PaCSEA): aerial seabird and marine mammal surveys off northern California, Oregon, and Washington, 2011-2012.
6. RG Ford Consulting Company: Seabird Survey Compilation: Observations from various surveys between 1975 and 2008, Spring, Summer, Fall, Winter (Figs. 22-25, 27-30)
7. RG Ford Consulting Company: Marine Bird Density and Diversity, 1980 – 2001 (Fig. 31-32)

[1] Nur, Nadav, Jahncke, J., Herzog, M., Howar, J., Hyrenbach, K., Zamon, J., Ainley, D., Wiens, J., Morgan, K., Ballance, L., and Stralberg, D. 2011. Where the wild things are: predicting hotspots of seabird aggregations in the California Current System. Ecological Applications 21(6):2241-2257

[2] Adams, J., Felis, J.J., Mason, J.W., and Takekawa, J.Y., 2015, Pacific Continental Shelf Environmental Assessment (PaCSEA): aerial seabird and marine mammal surveys off northern California, Oregon, and Washington, 2011-2012.

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Tel: 202-234-7181 | Fax: 202-888-7496 | abc@abcbirds.org | www.abcbirds.org

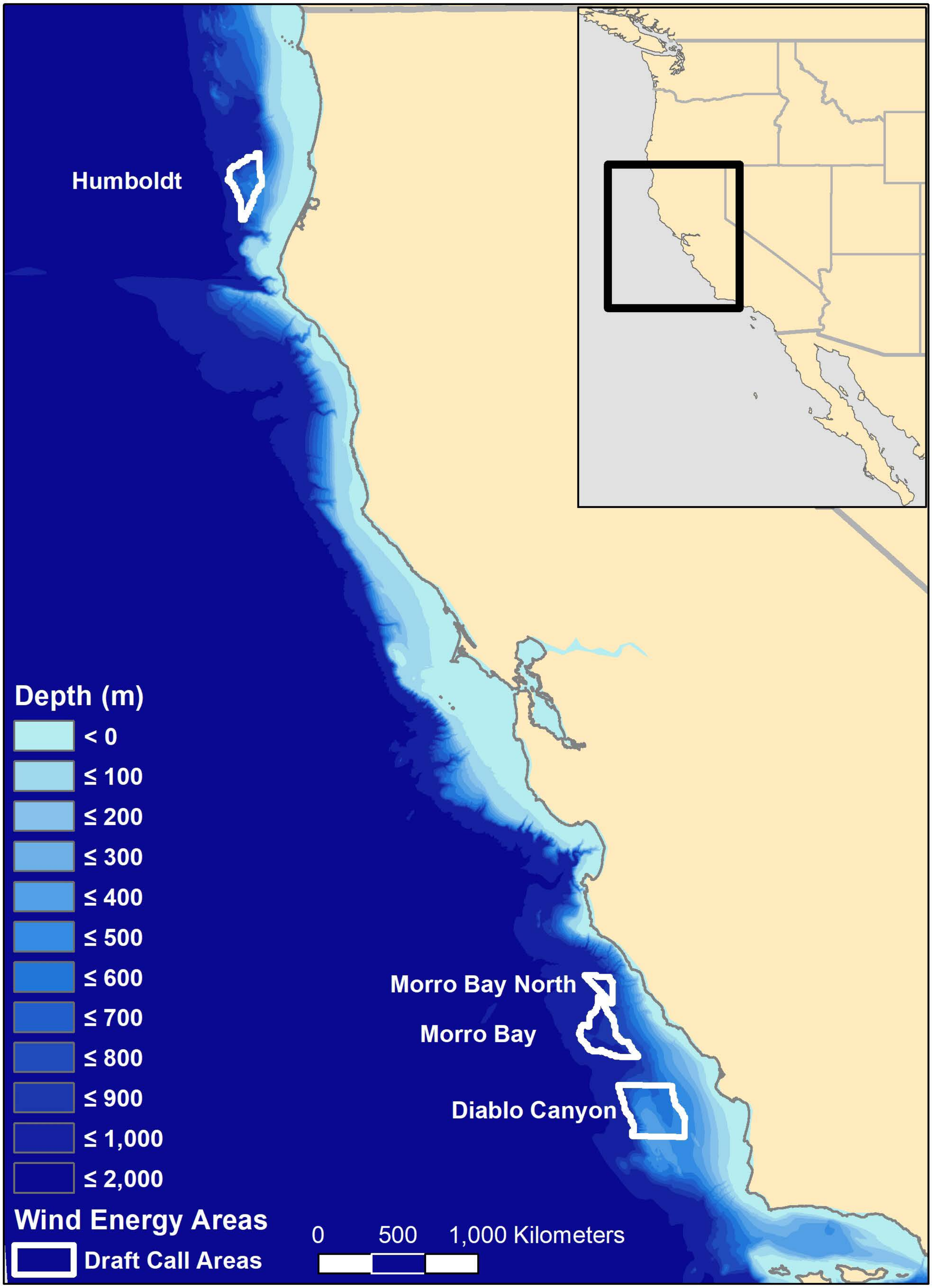


Figure 1. California wind energy call areas and bathymetry.

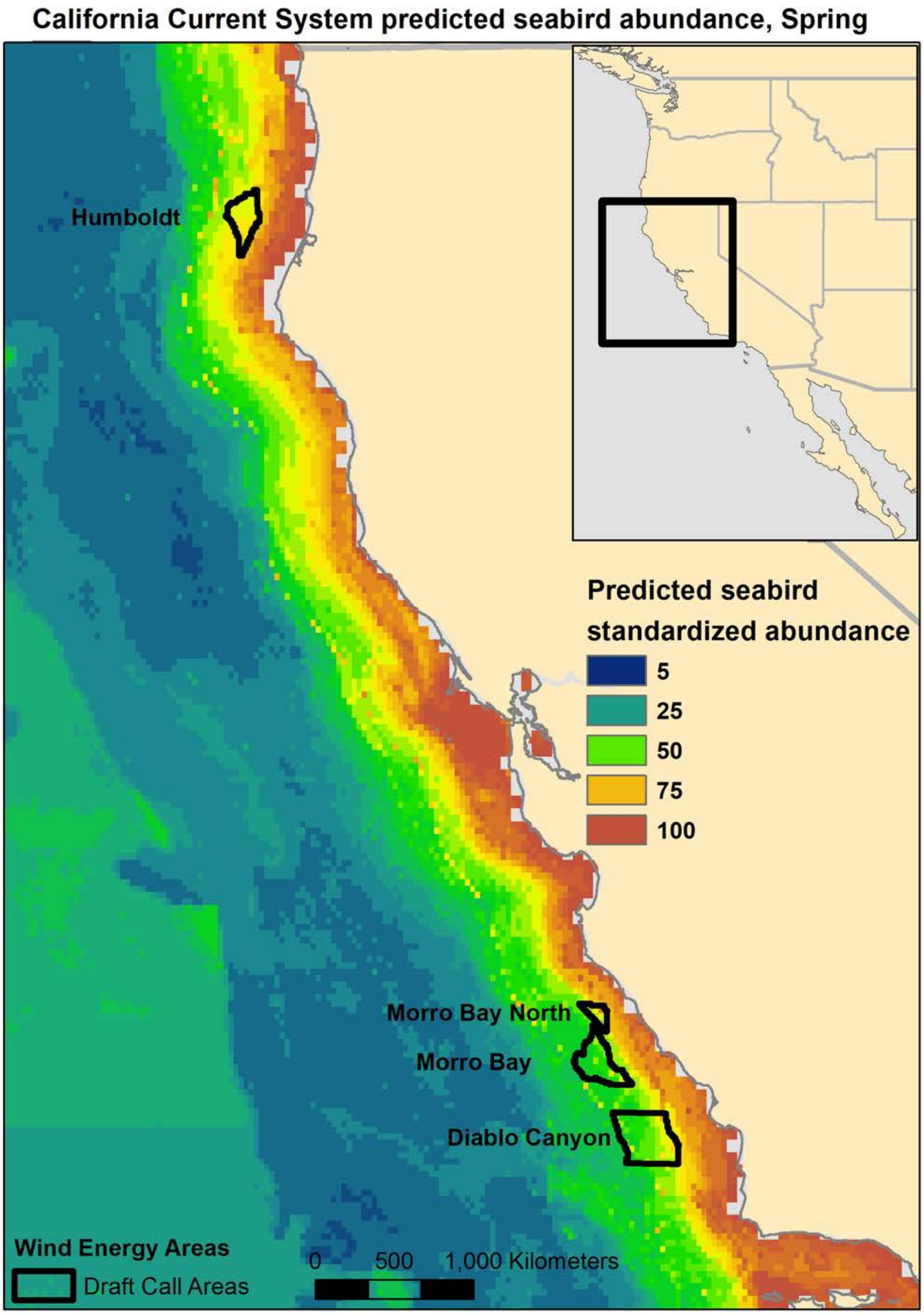

California Current System predicted seabird abundance, Spring
Humboldt
Predicted seabird
standardized abundance
5
25
50
75
100
Morro Bay North
Morro Bay
Diablo Canyon
Wind Energy Areas
Draft Call Areas
0 500 1,000 Kilometers

Figure 2

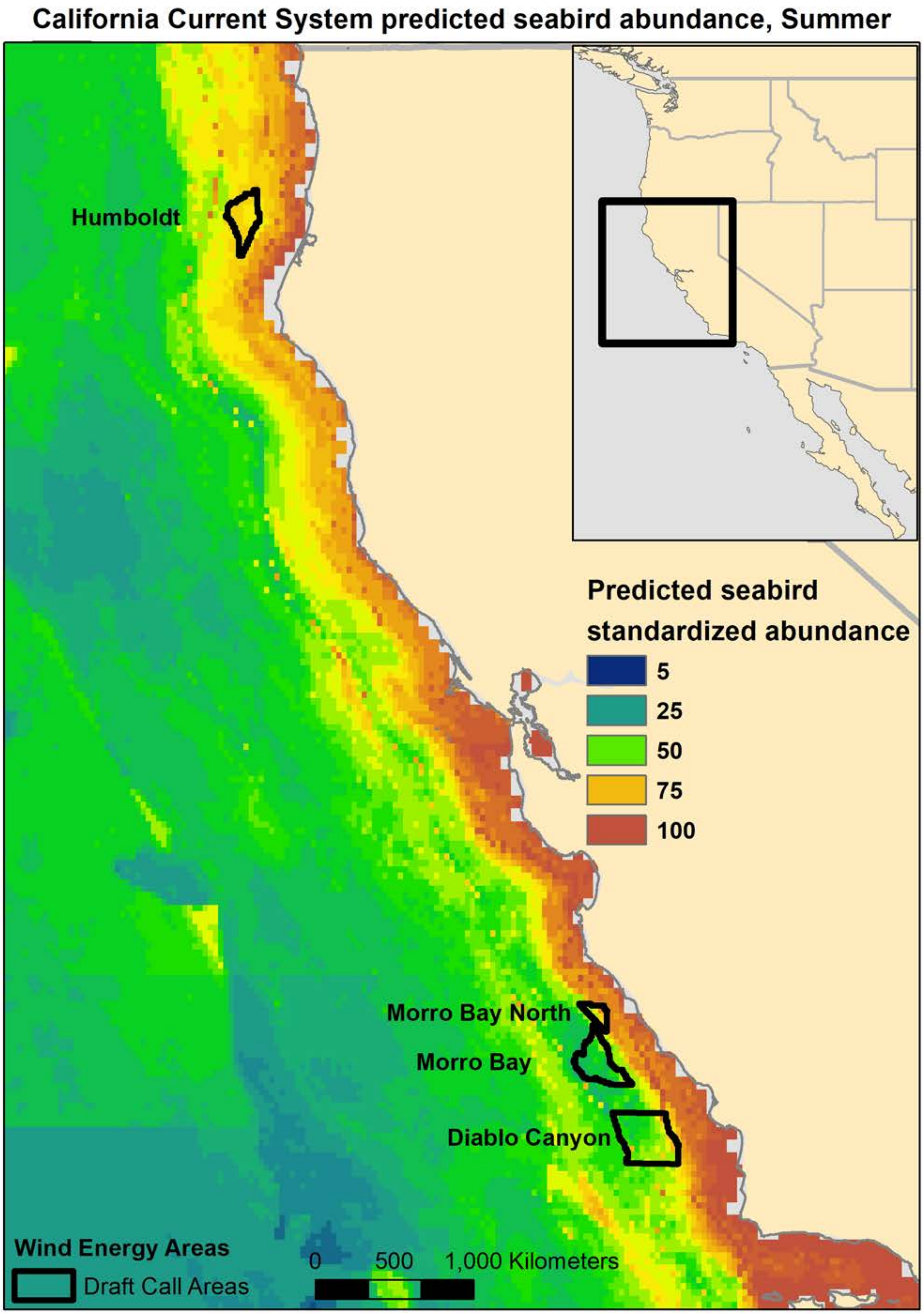

California Current System predicted seabird abundance, Summer
Humboldt
Predicted seabird
standardized abundance
5
25
50
75
100
Morro Bay North
Morro Bay
Diablo Canyon
Wind Energy Areas
Draft Call Areas
0
500
1,000 Kilometers

Figure 3

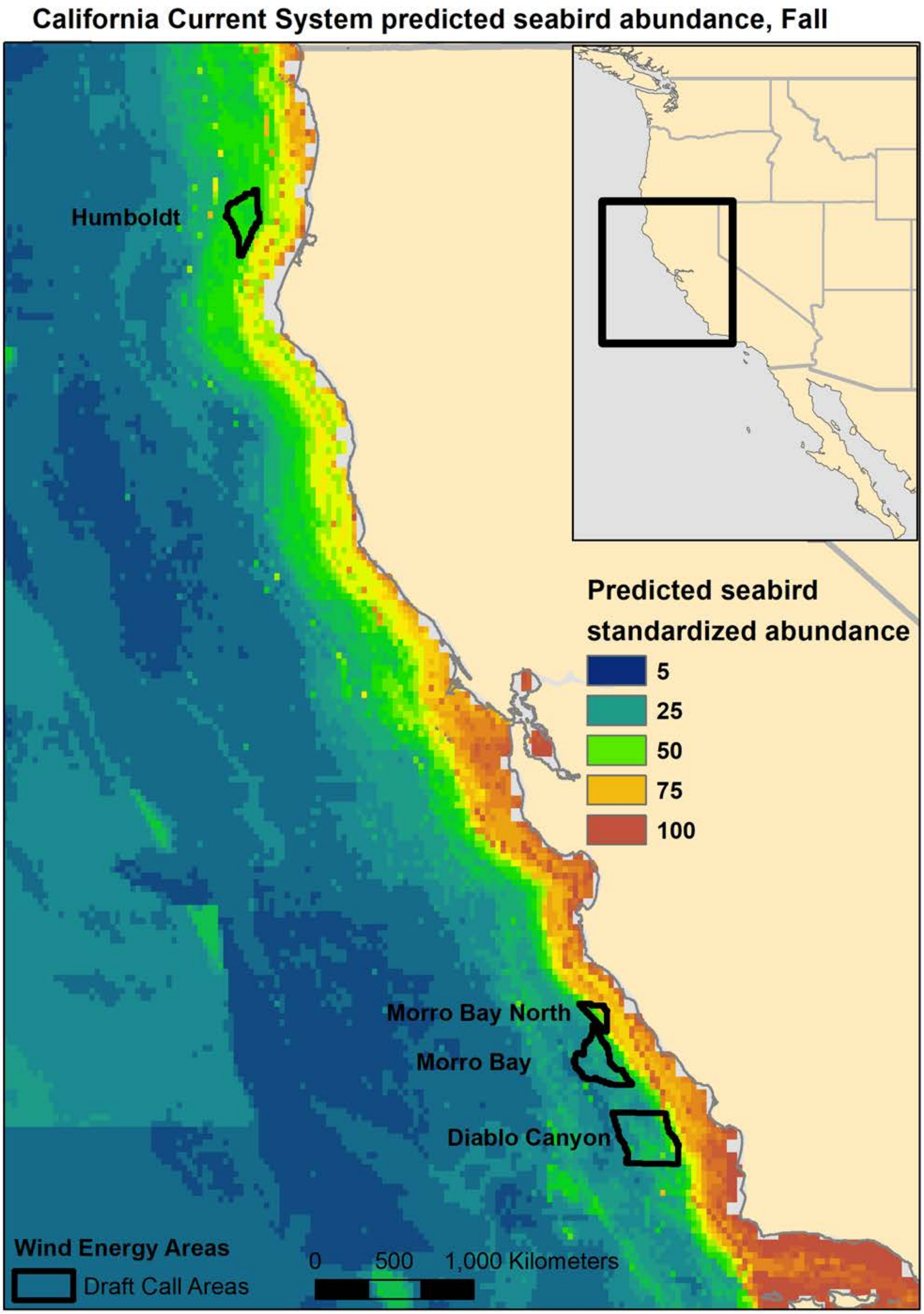

California Current System predicted seabird abundance, Fall
Humboldt
Predicted seabird
standardized abundance
5
25
50
75
100
Morro Bay North
Morro Bay
Diablo Canyon
Wind Energy Areas
Draft Call Areas
0 500 1,000 Kilometers

Figure 4

California Current System predicted seabird abundance, Winter

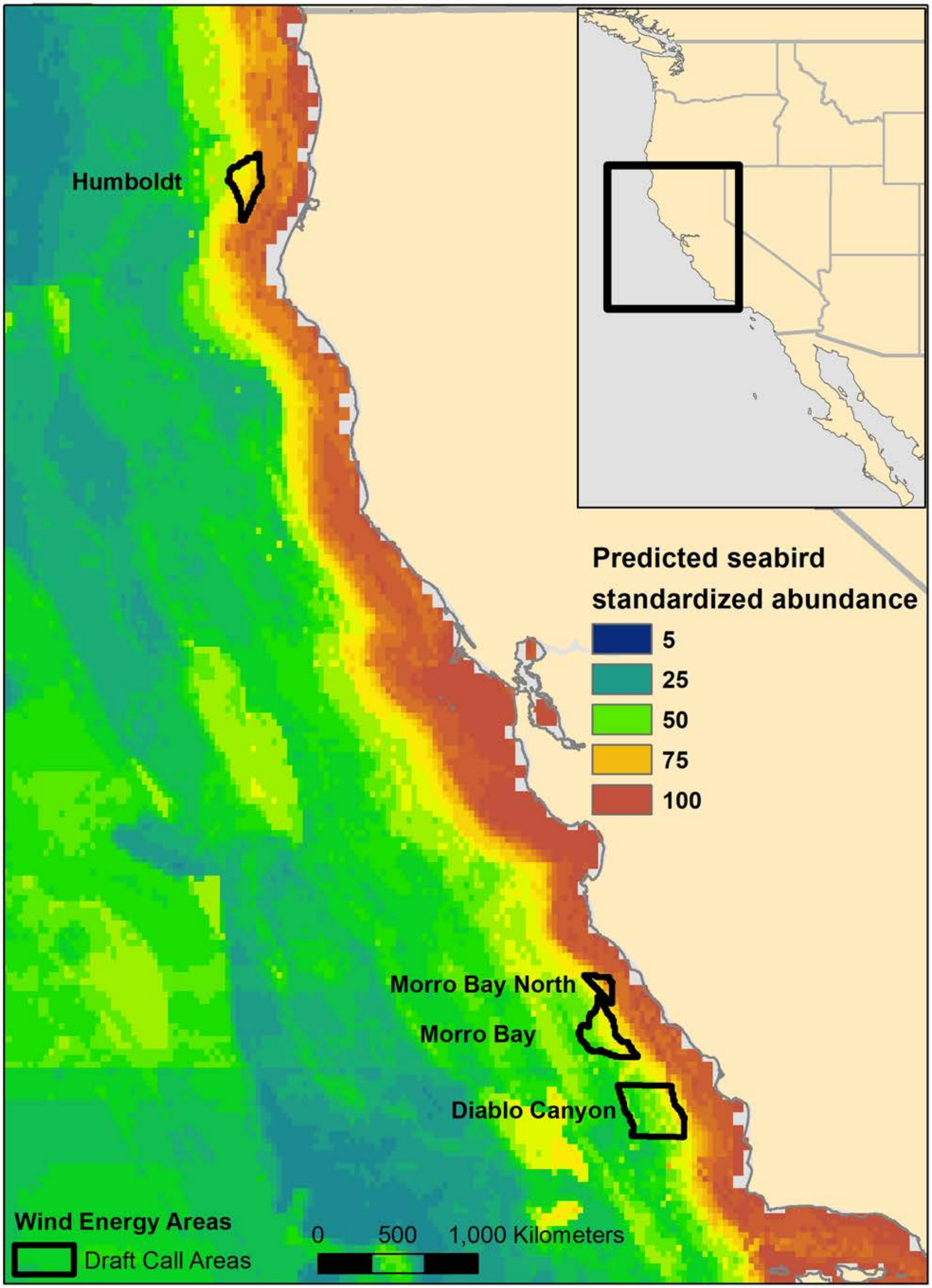
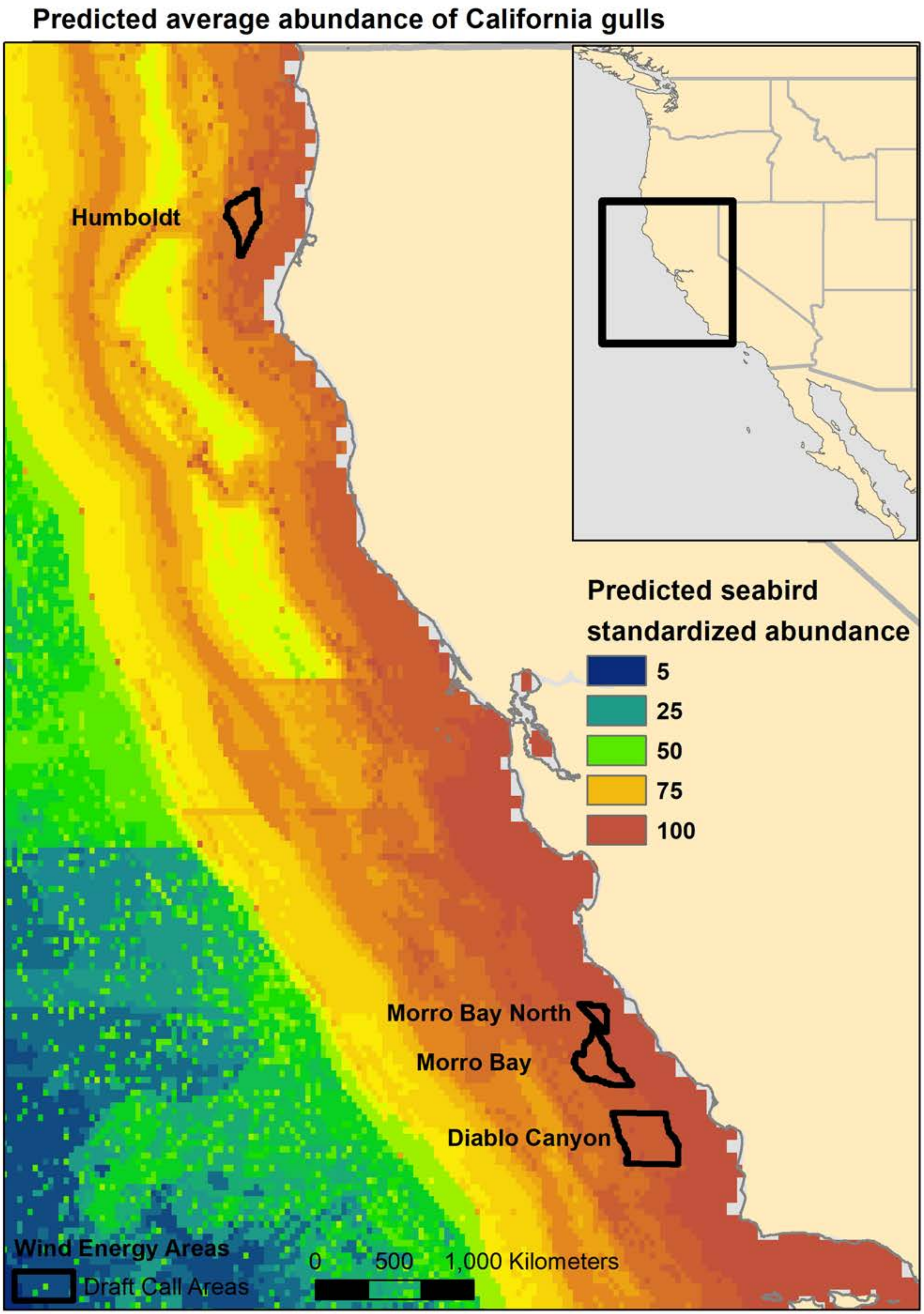


Figure 5



Predicted average abundance of California gulls
Humboldt
Predicted seabird
standardized abundance
5
25
50
75
100
Morro Bay North
Morro Bay
Diablo Canyon
Wind Energy Areas
Draft Call Areas
0 500 1,000 Kilometers

Figure 6

Predicted average abundance of herring gulls

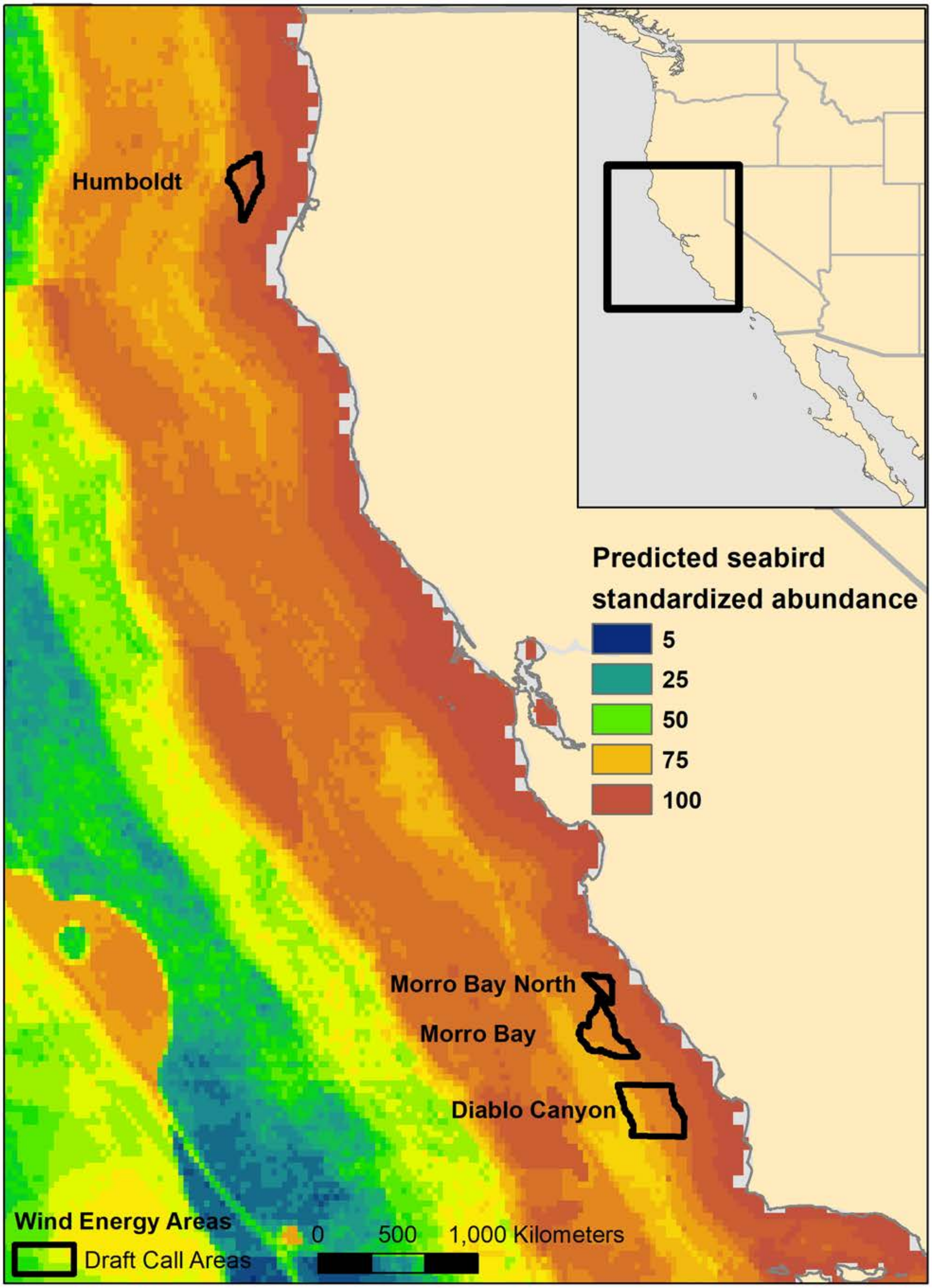


Figure 7

Predicted average abundance of glaucous-winged gulls

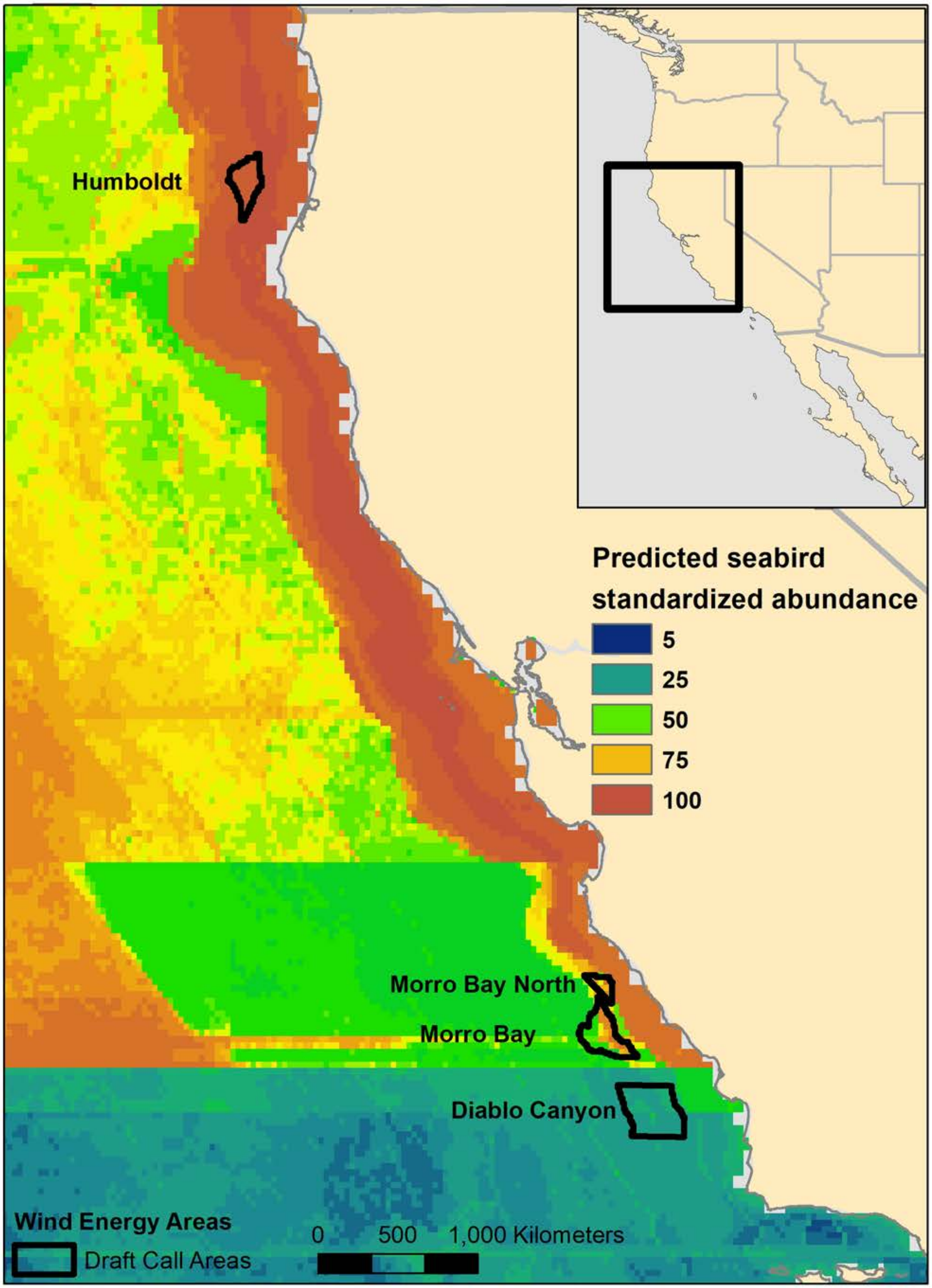


Figure 8

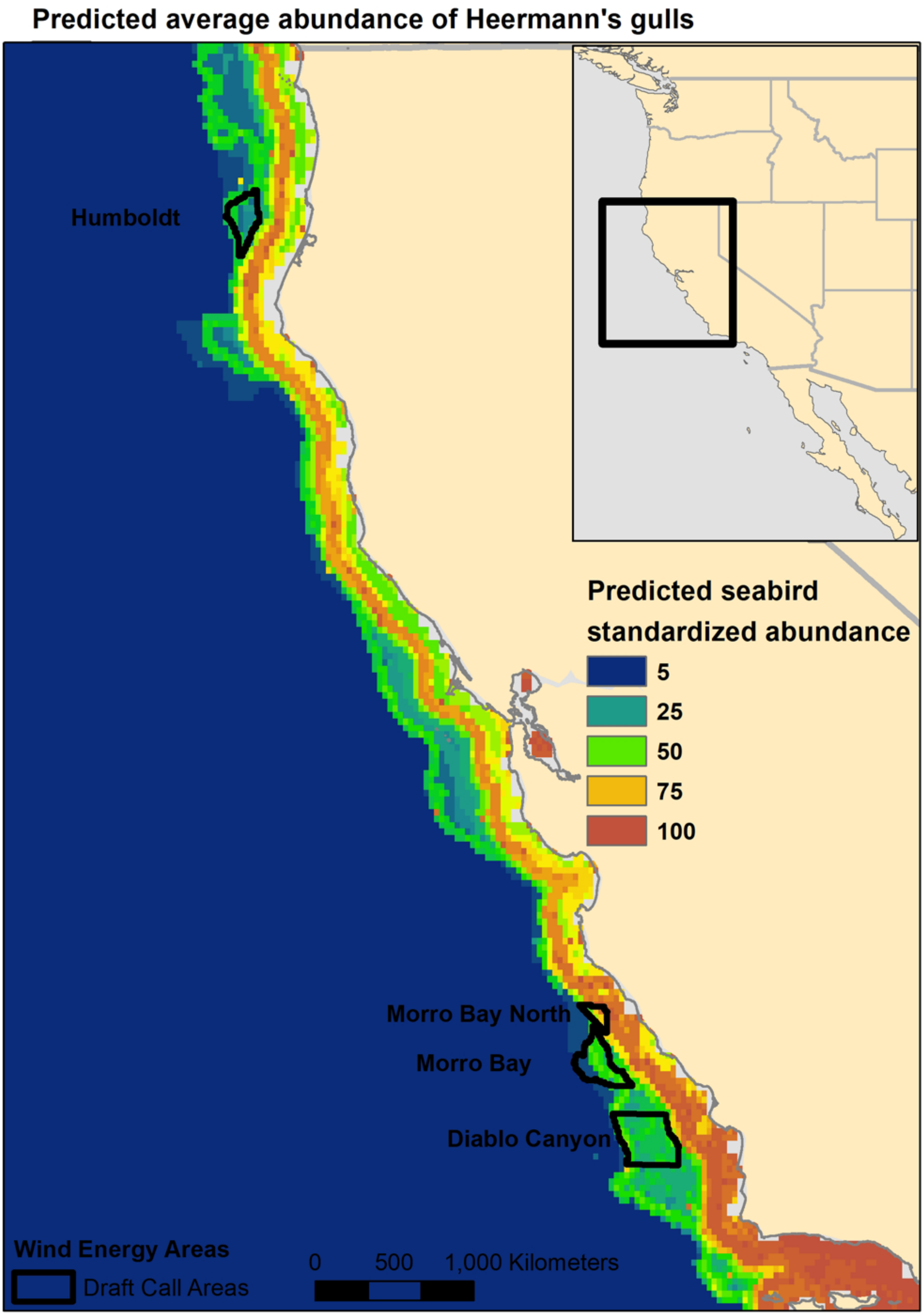

Predicted average abundance of Heermann's gulls
Humboldt
Predicted seabird standardized abundance
5
25
50
75
100
Morro Bay North
Morro Bay
Diablo Canyon
Wind Energy Areas
Draft Call Areas
0
500
1,000 Kilometers

Figure 9

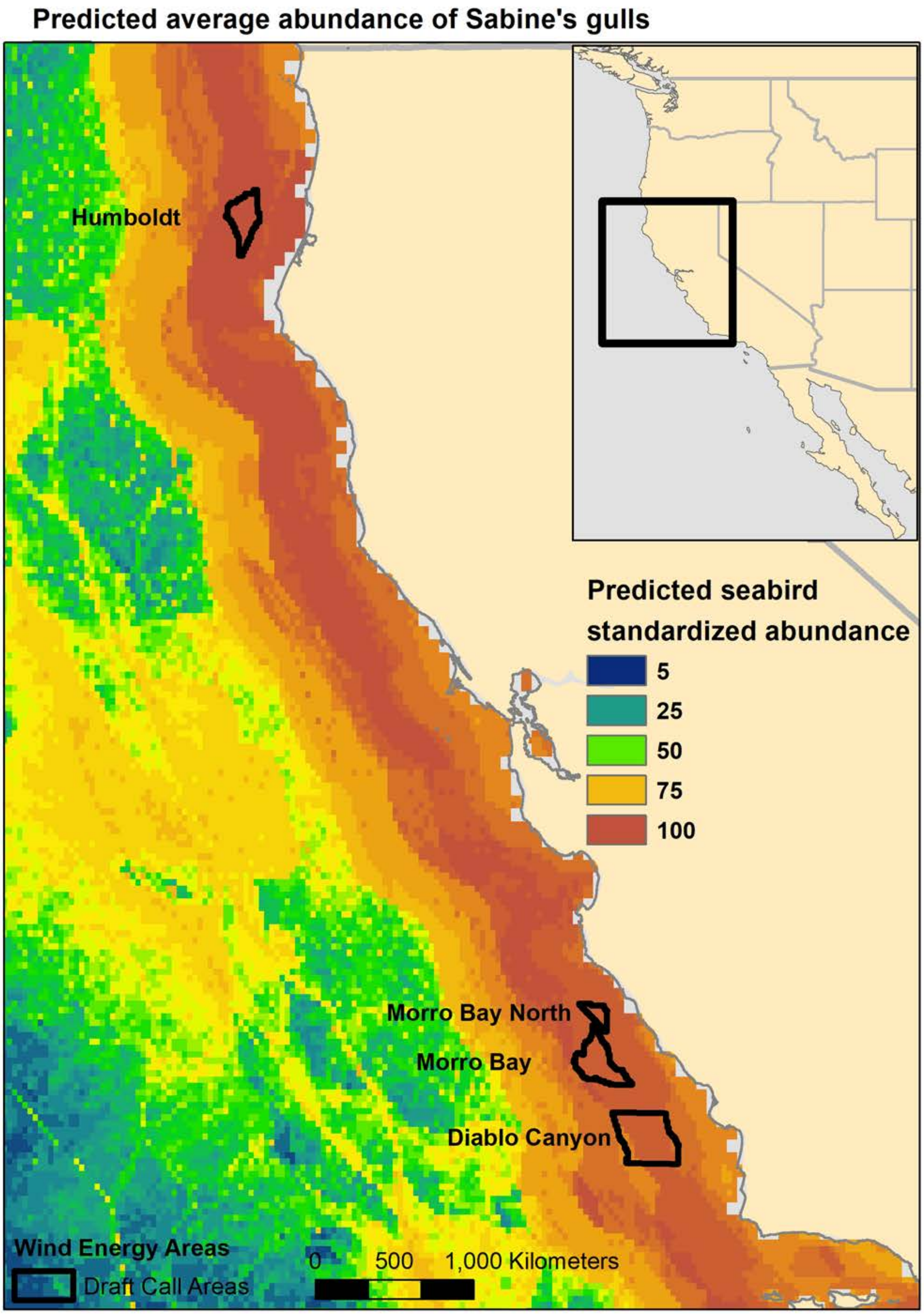

Predicted average abundance of Sabine's gulls
Humboldt
Predicted seabird standardized abundance
5
25
50
75
100
Morro Bay North
Morro Bay
Diablo Canyon
Wind Energy Areas
Draft Call Areas
0 500 1,000 Kilometers

Figure 10

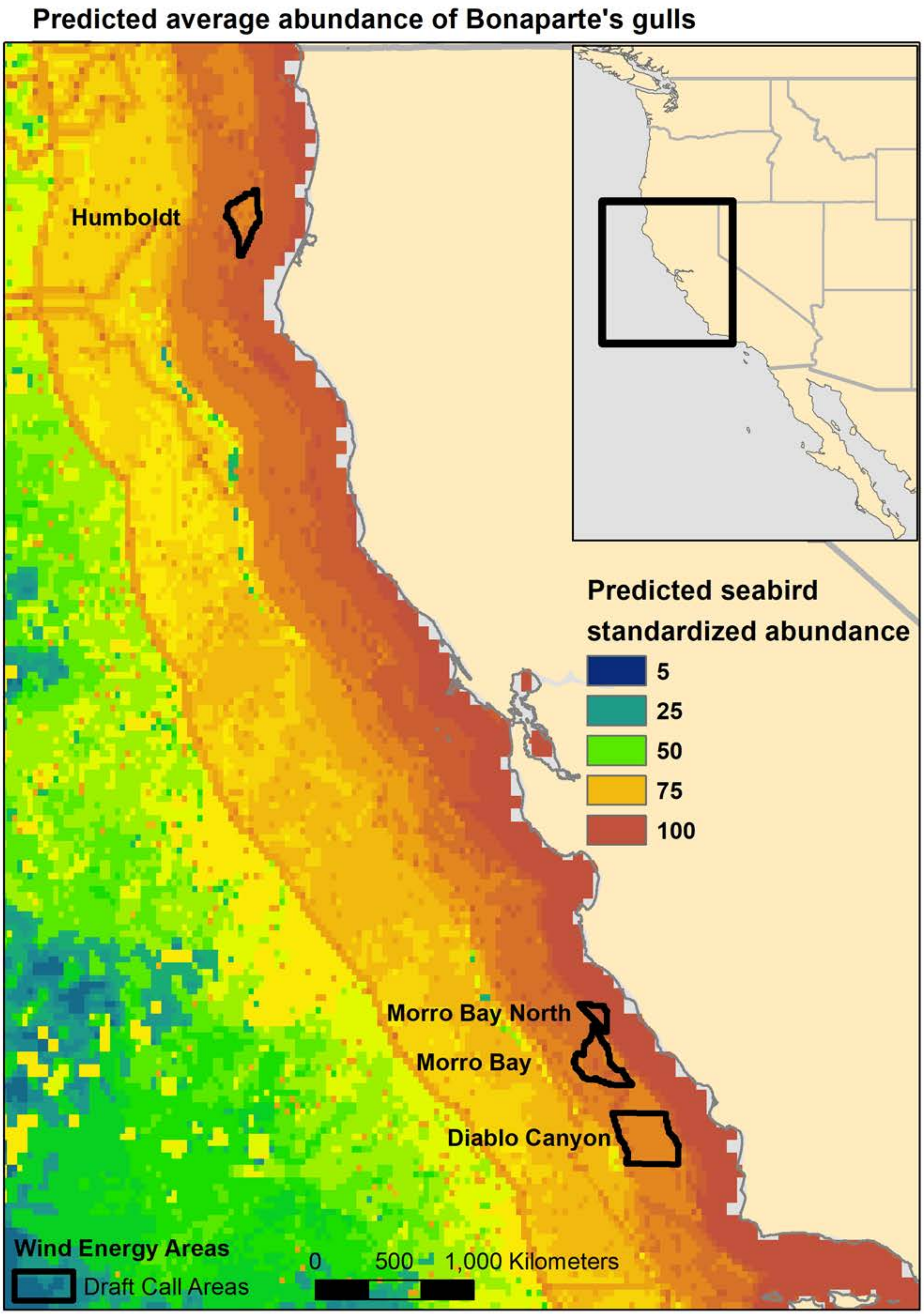

Predicted average abundance of Bonaparte's gulls
Humboldt
Predicted seabird standardized abundance
5
25
50
75
100
Morro Bay North
Morro Bay
Diablo Canyon
Wind Energy Areas
Draft Call Areas
0 500 1,000 Kilometers

Figure 11

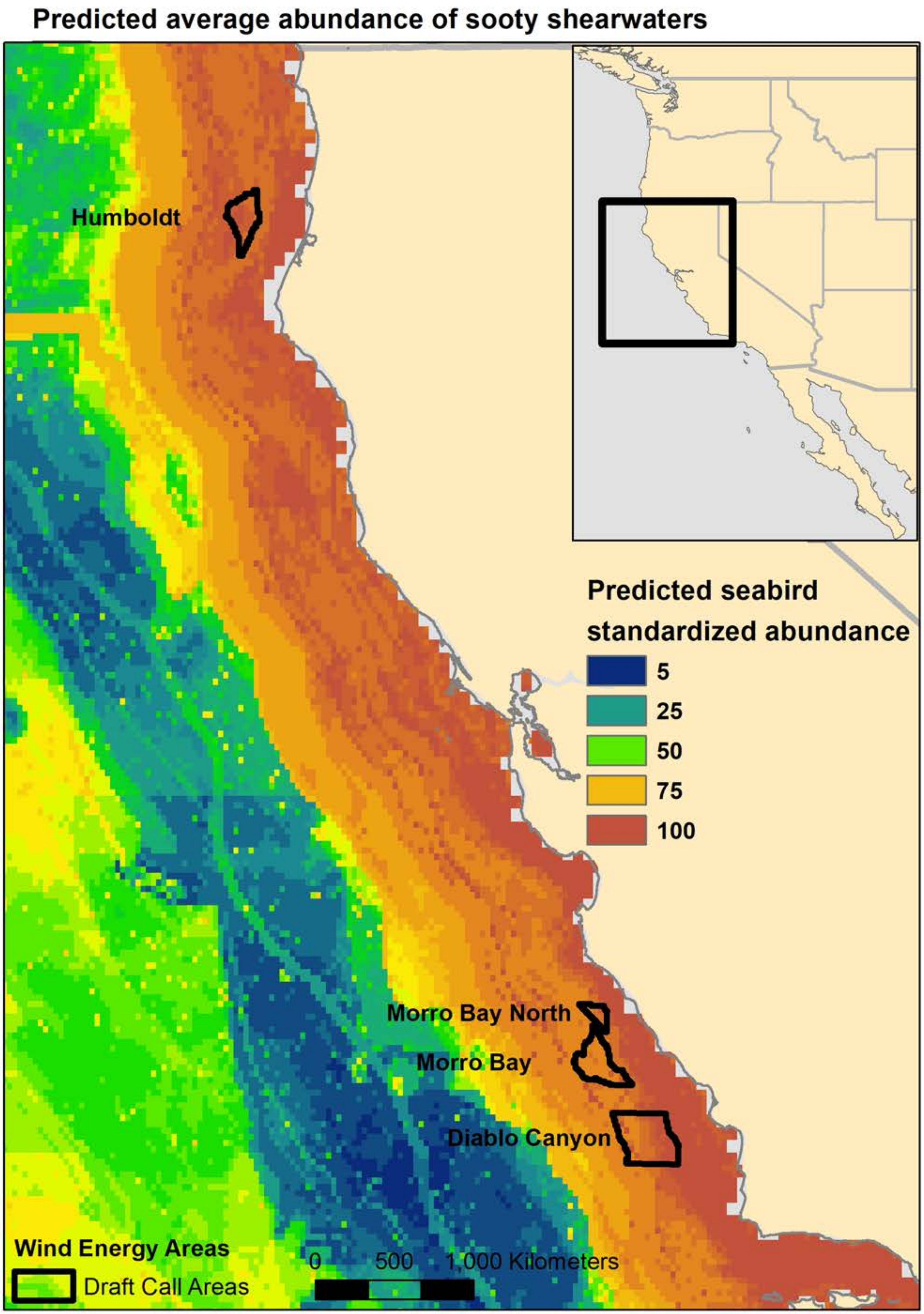

Predicted average abundance of sooty shearwaters
Humboldt
Predicted seabird standardized abundance
5
25
50
75
100
Morro Bay North
Morro Bay
Diablo Canyon
Wind Energy Areas
Draft Call Areas
0 500 1,000 Kilometers

Figure 12

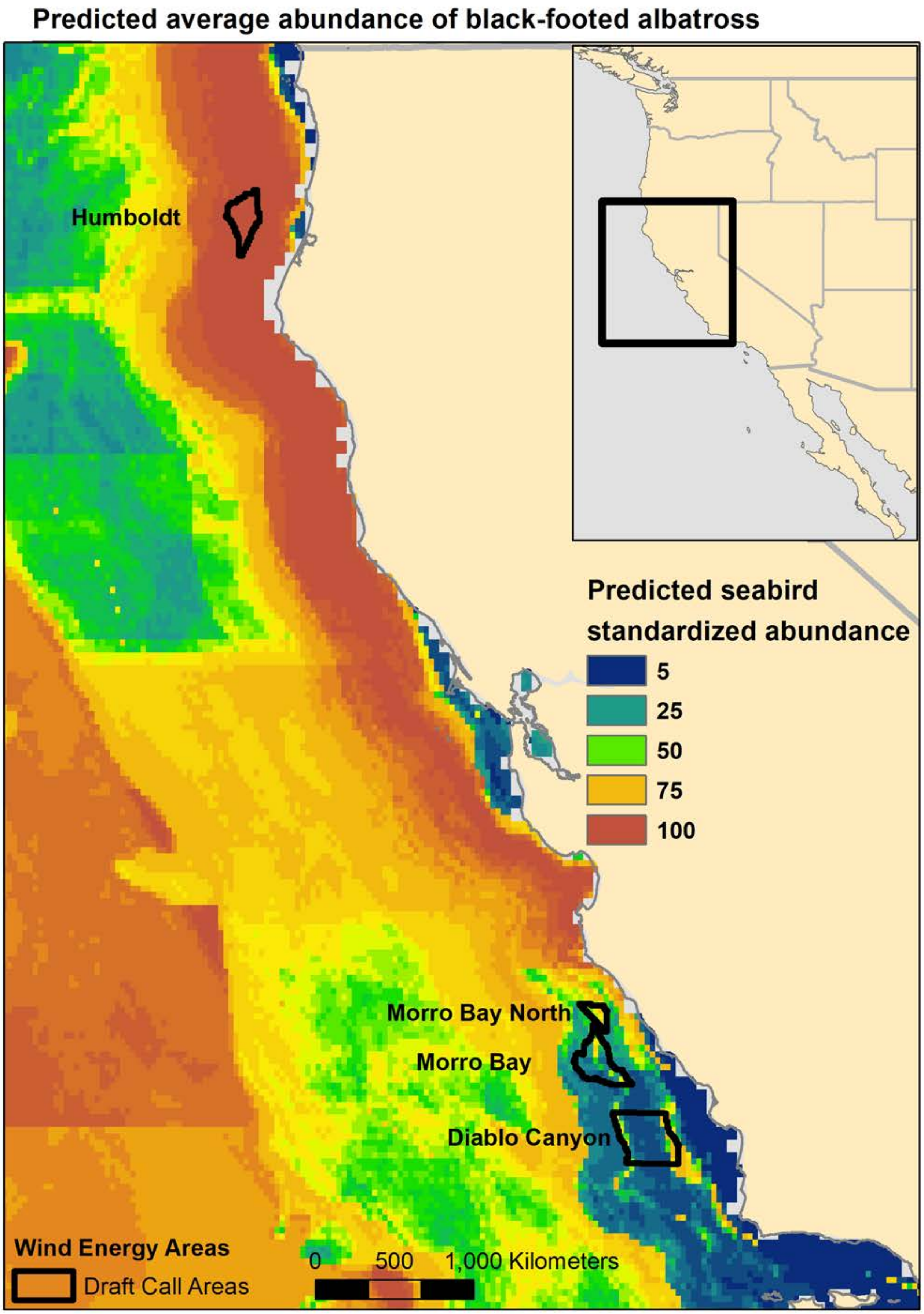

Predicted average abundance of black-footed albatross
Humboldt
Predicted seabird
standardized abundance
5
25
50
75
100
Morro Bay North
Morro Bay
Diablo Canyon
Wind Energy Areas
Draft Call Areas
0
500
1,000 Kilometers

Figure 13

Predicted average abundance of Leach's storm-petrels

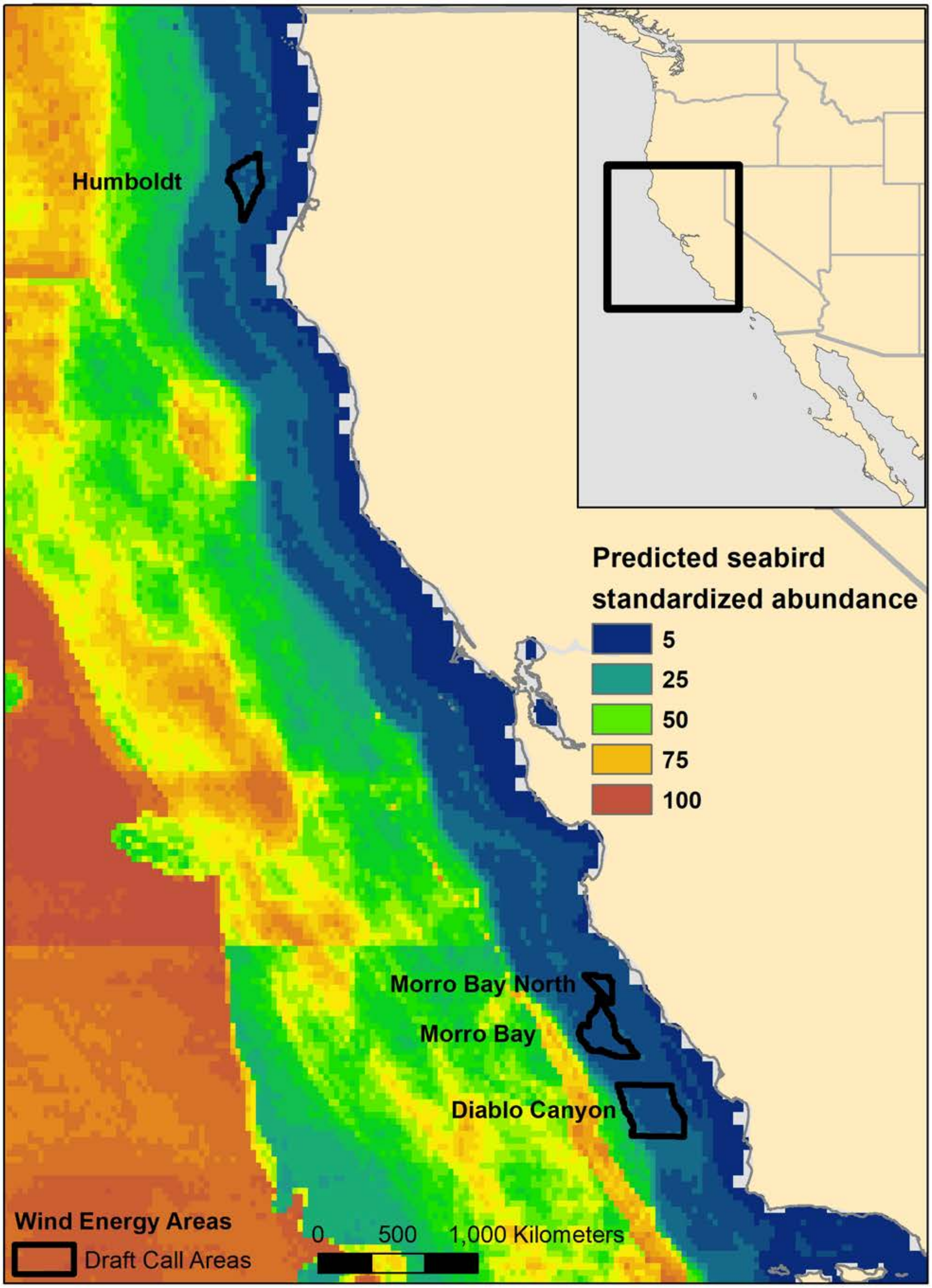


Figure 14

Predicted average abundance of fork-tailed storm-petrels

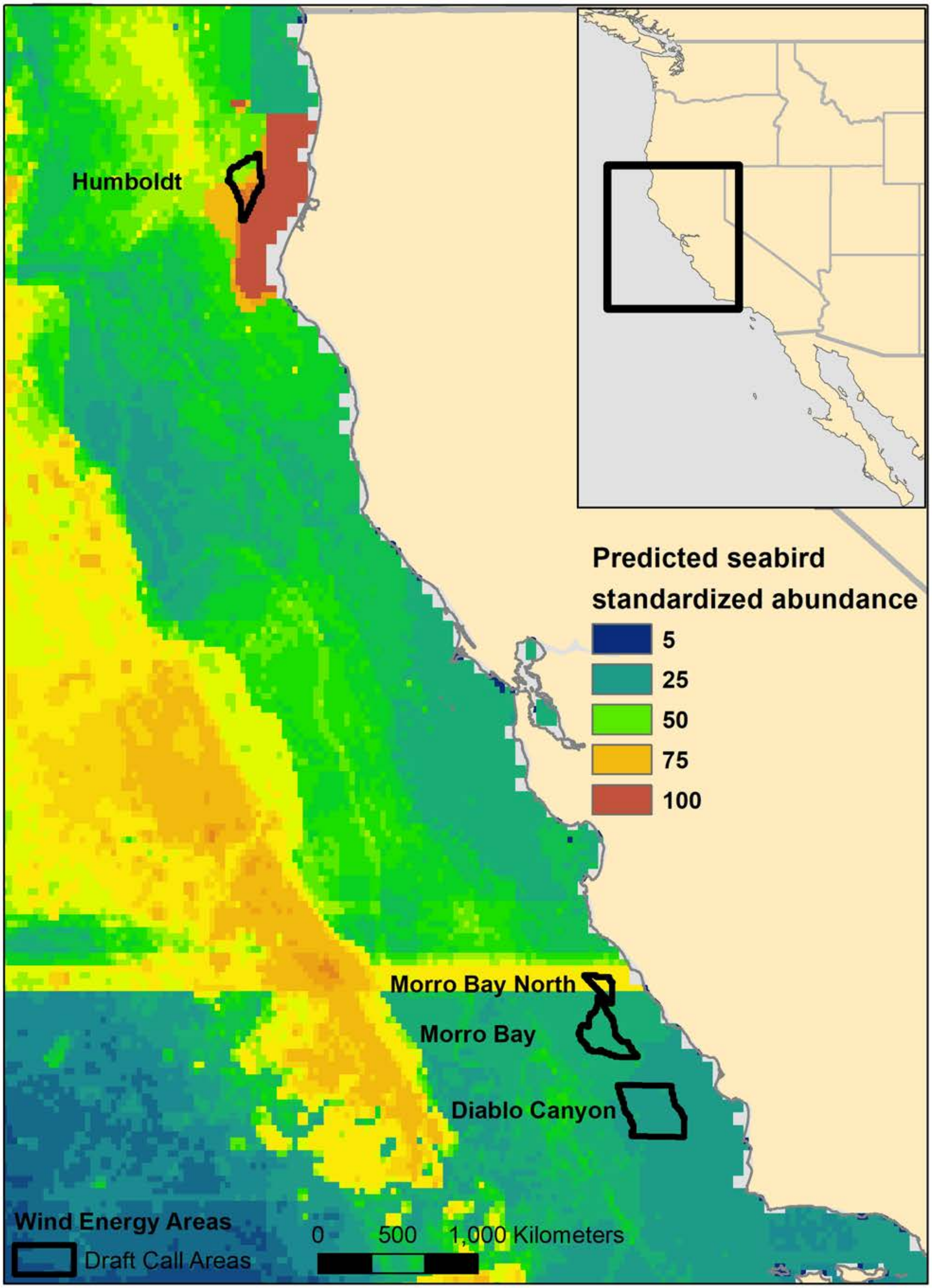


Figure 15

Predicted average abundance of red-necked phalaropes

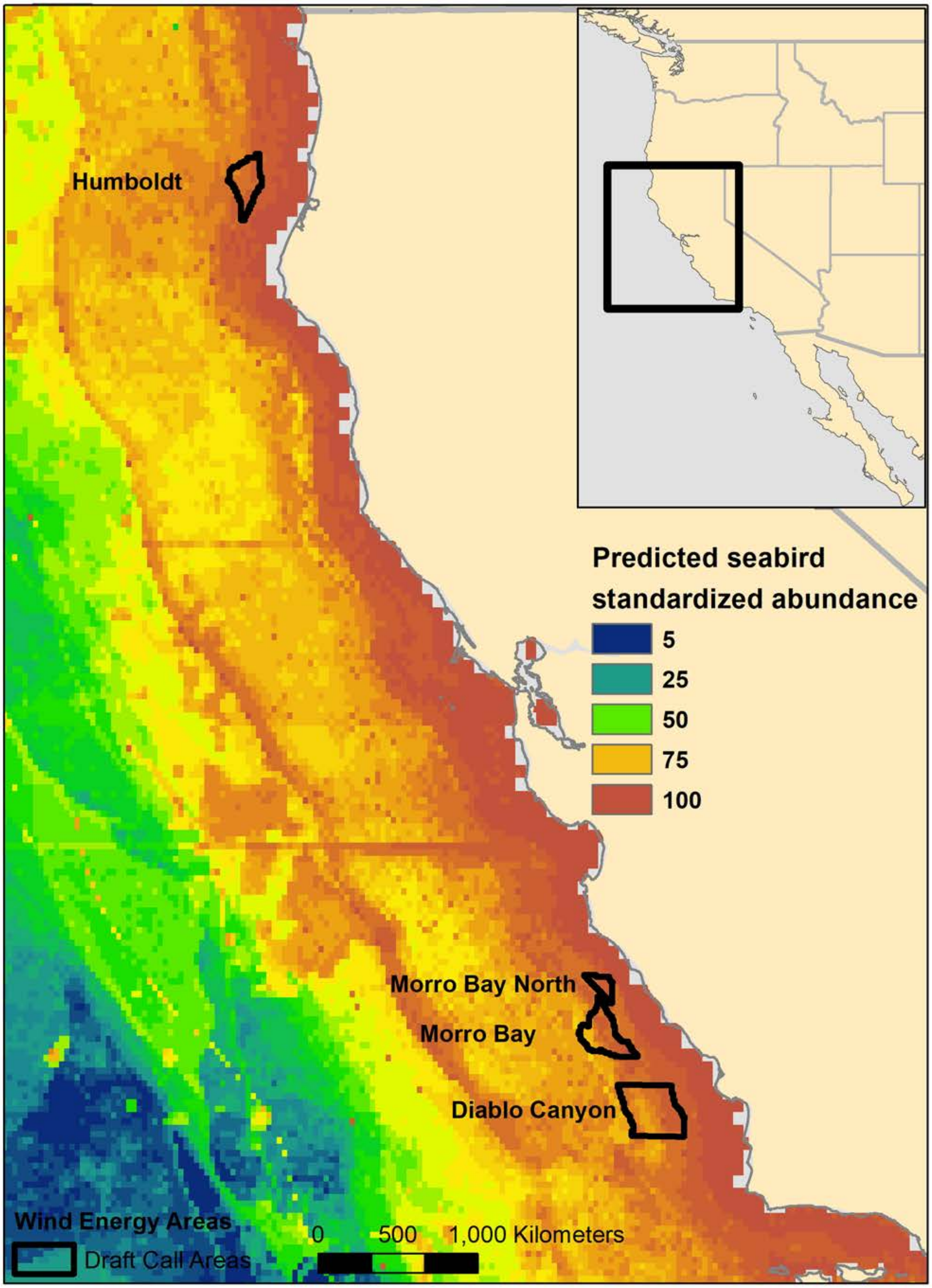


Figure 16

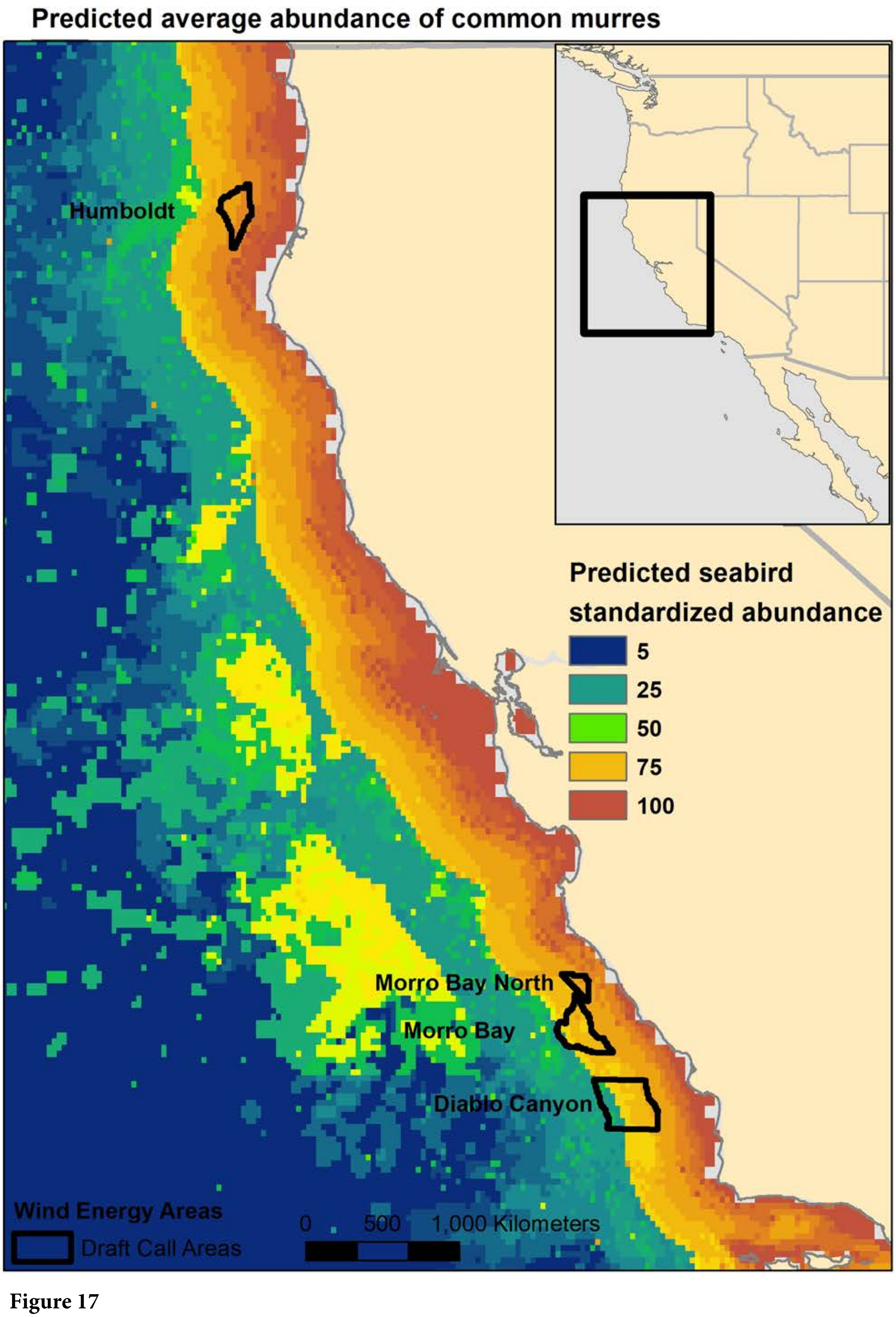

Predicted average abundance of common murres
Humboldt
Predicted seabird standardized abundance
5
25
50
75
100
Morro Bay North
Morro Bay
Diablo Canyon
Wind Energy Areas
Draft Call Areas
0
500
1,000 Kilometers

Figure 17

Predicted average abundance of Cassin's auklets

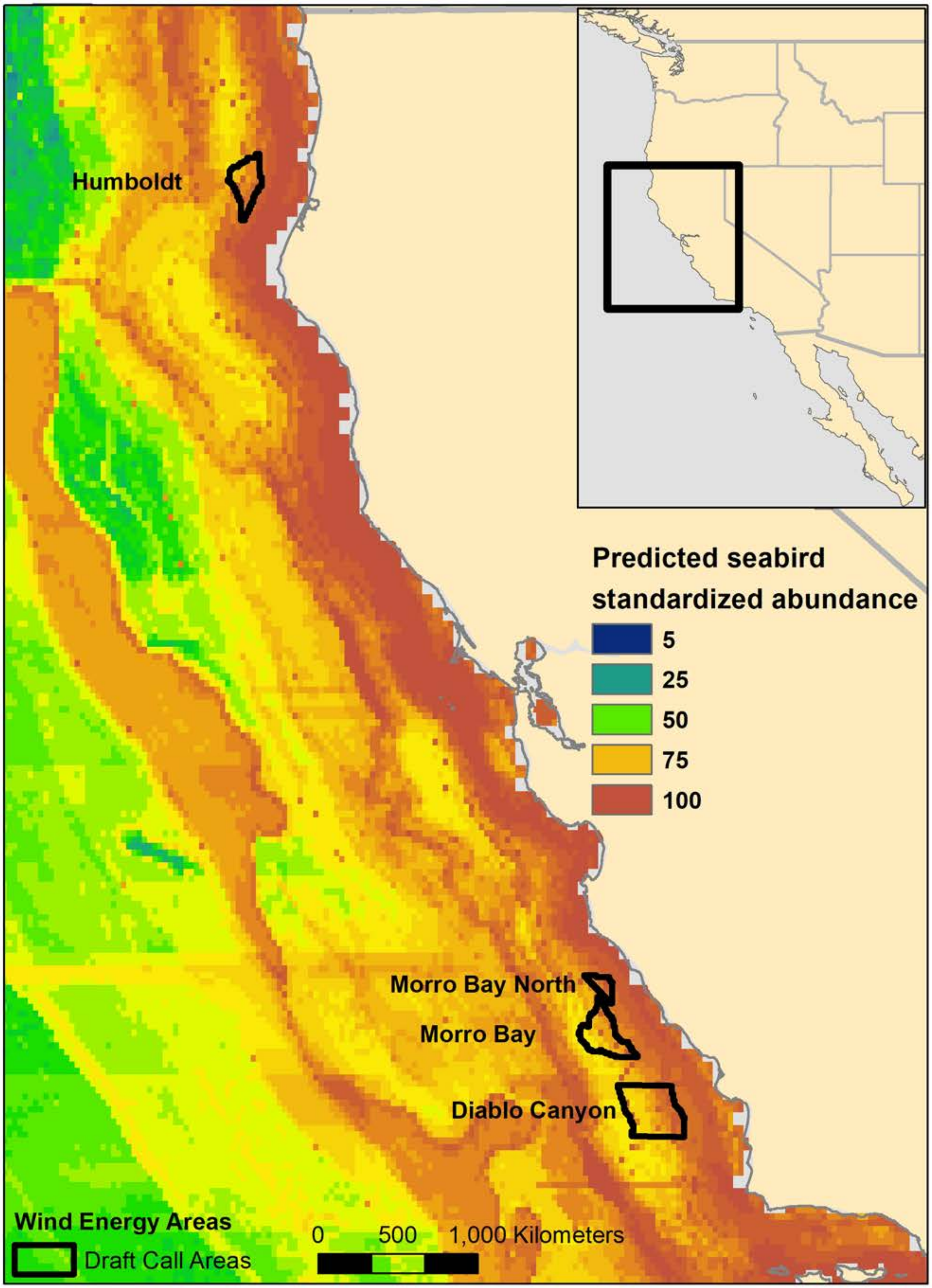


Figure 18

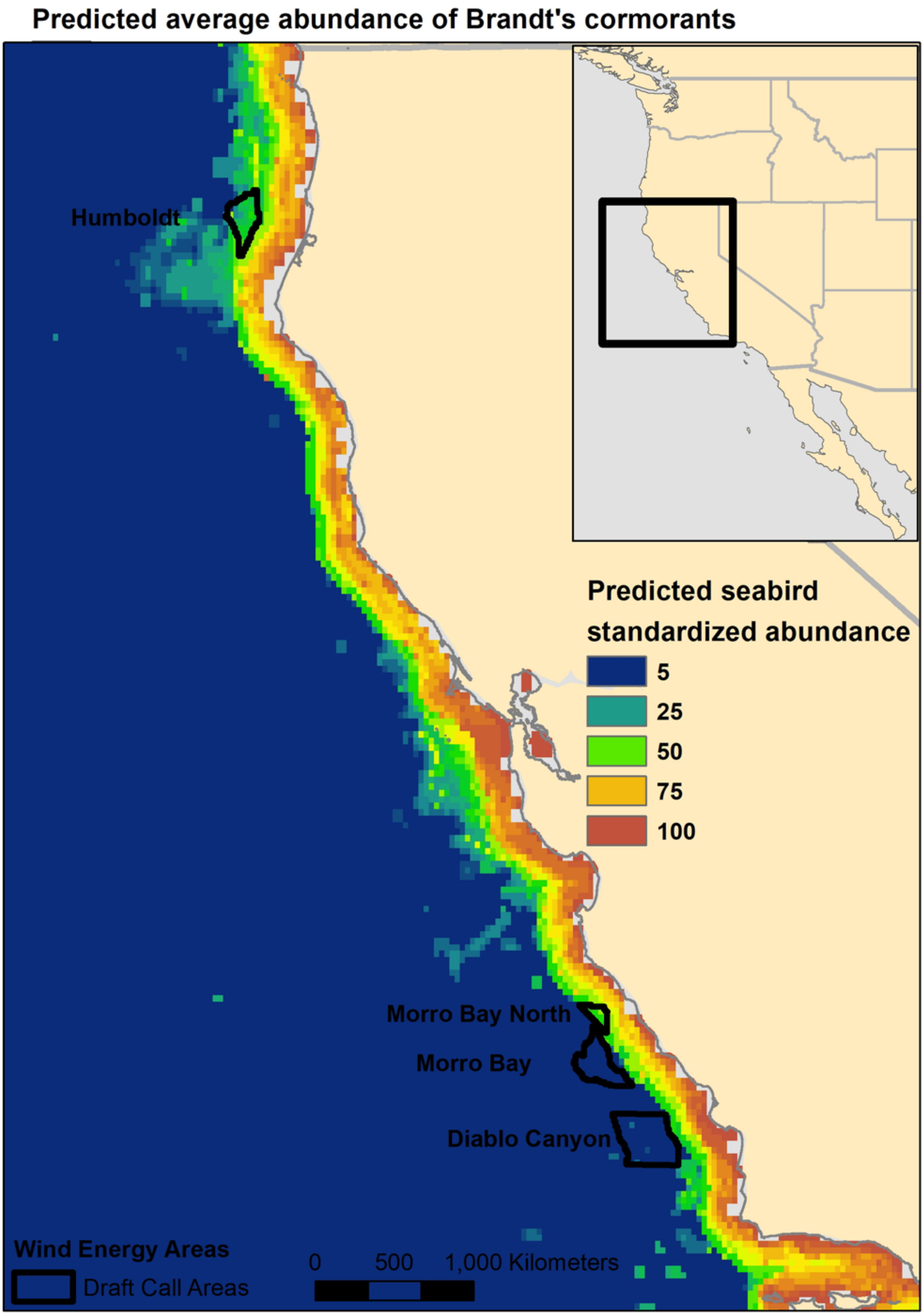

Predicted average abundance of Brandt's cormorants
Humboldt
Morro Bay North
Morro Bay
Diablo Canyon
Predicted seabird standardized abundance
5
25
50
75
100
Wind Energy Areas
Draft Call Areas
0 500 1,000 Kilometers

Figure 19

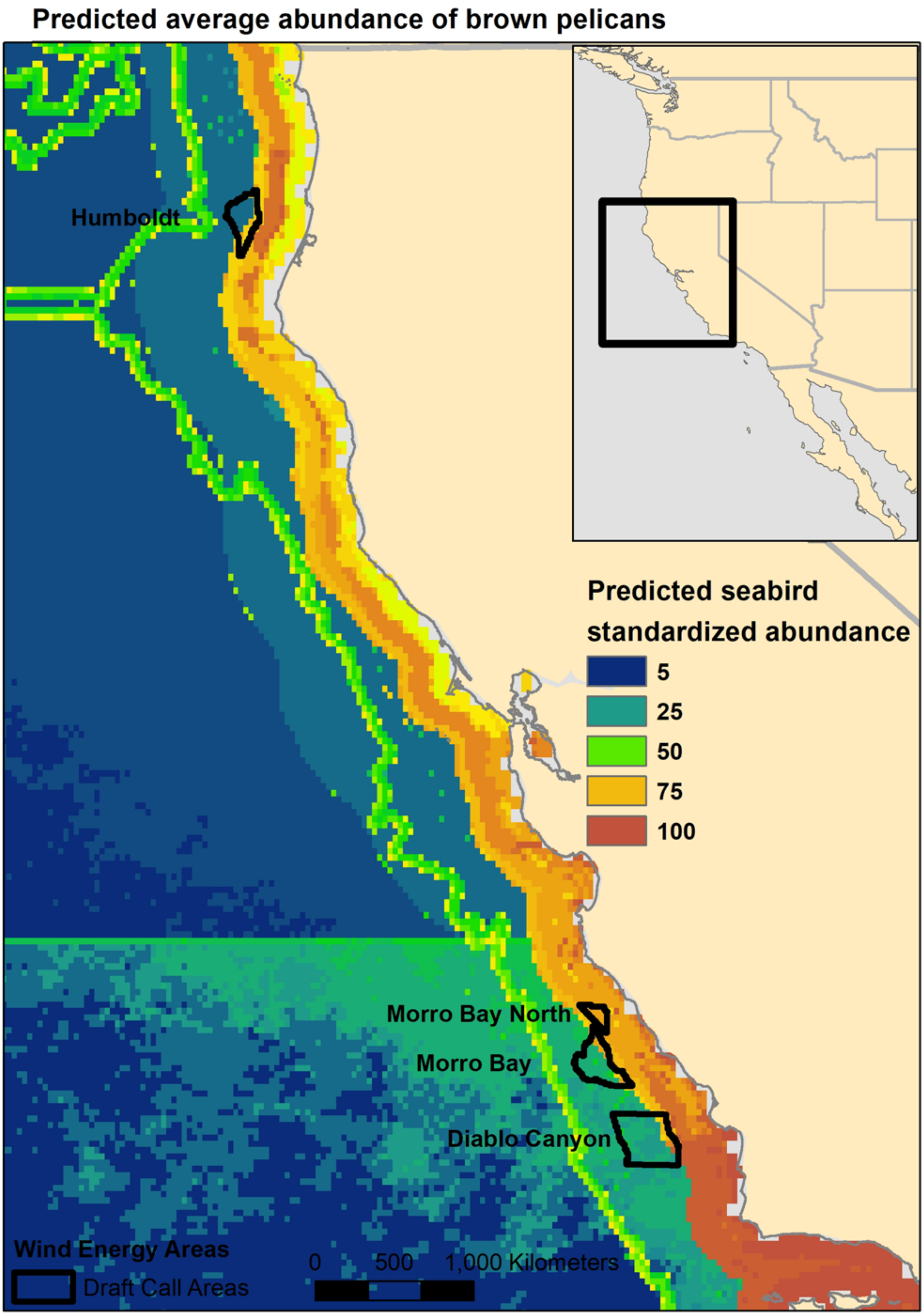

Predicted average abundance of brown pelicans
Humboldt
Morro Bay North
Morro Bay
Diablo Canyon
Predicted seabird
standardized abundance
5
25
50
75
100
Wind Energy Areas
Draft Call Areas
0
500
1,000 Kilometers

Figure 20

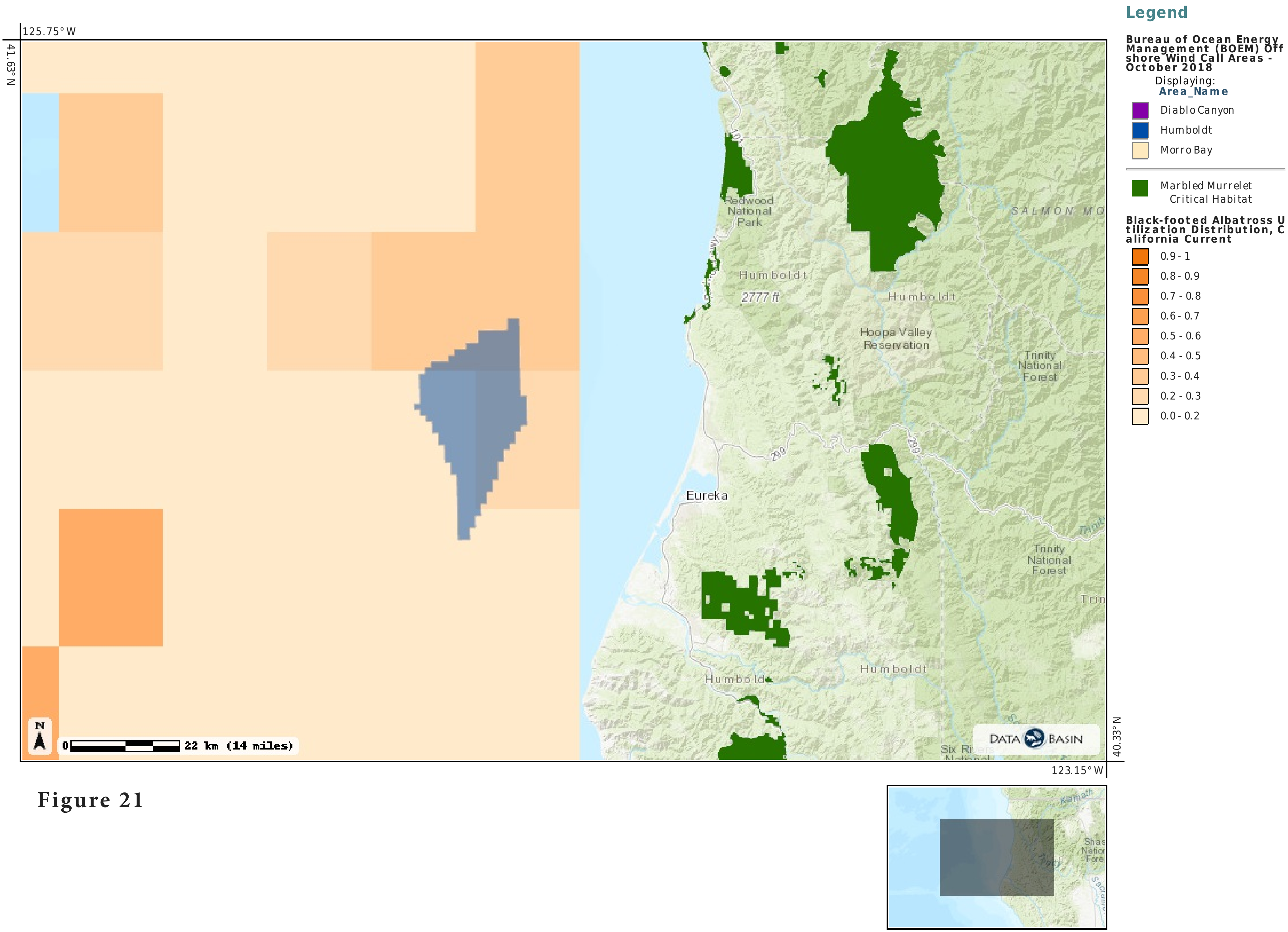
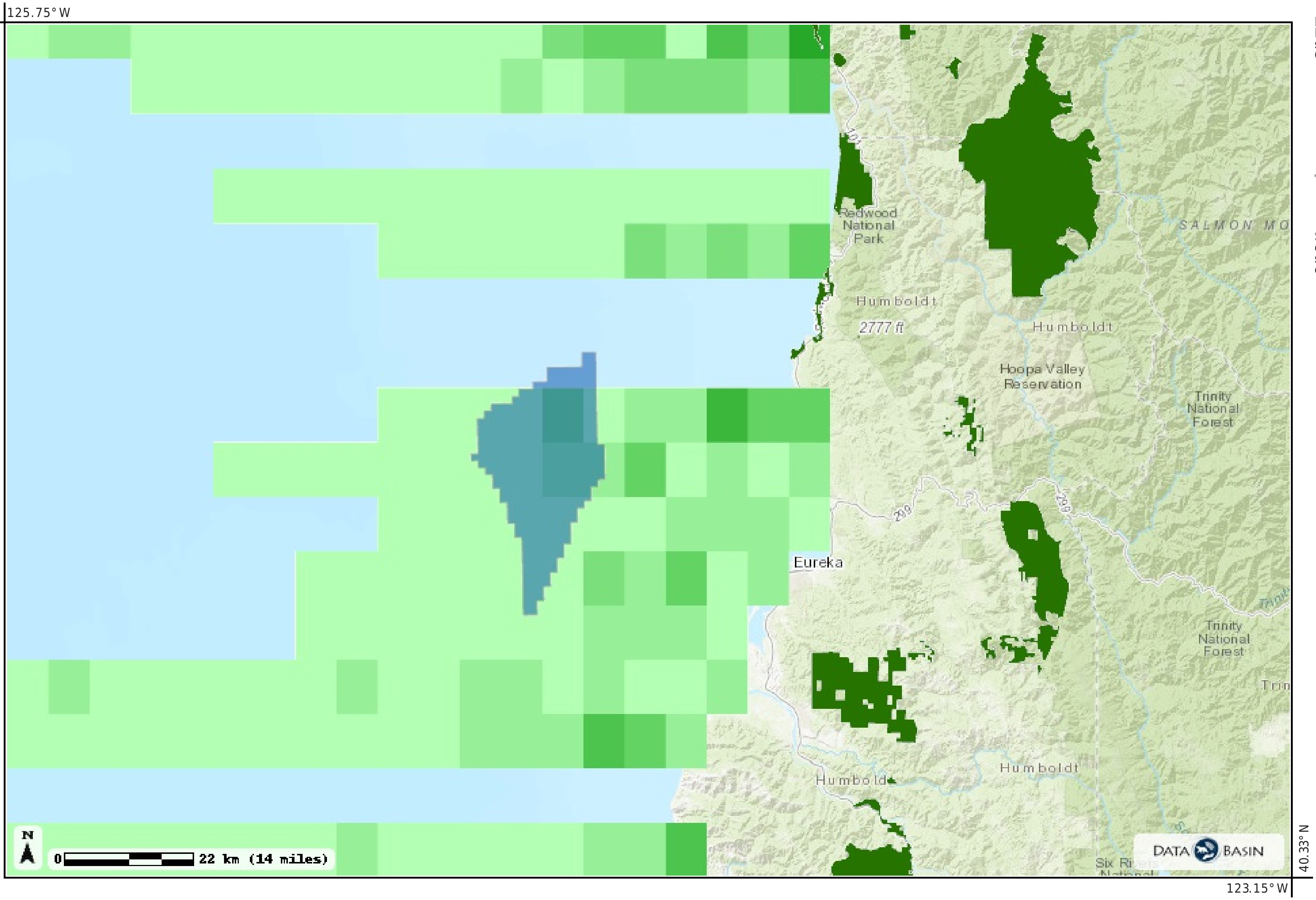
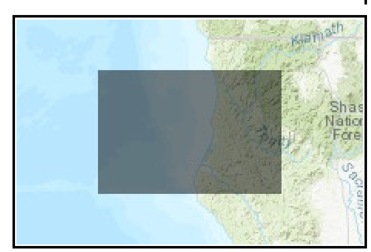

Legend
Bureau of Ocean Energy Management (BOEM) Offshore Wind Call Areas - October 2018
Displaying:
Area_Name
Diablo Canyon
Humboldt
Morro Bay
Marbled Murrelet Critical Habitat
Black-footed Albatross Utilization Distribution, California Current
0.9 - 1
0.8 - 0.9
0.7 - 0.8
0.6 - 0.7
0.5 - 0.6
0.4 - 0.5
0.3 - 0.4
0.2 - 0.3
0.0 - 0.2
125.75° W
41.63° N
40.33° N
123.15° W
Redwood National Park
Humboldt
2777 ft
Hoopa Valley Reservation
Trinity National Forest
Eureka
Humboldt
DATA BASIN
0 22 km (14 miles)
N

Figure 21





Legend

Bureau of Ocean Energy Management (BOEM) Offshore Wind Call Areas - October 2018
Displaying: Area_Name
Diablo Canyon
Humboldt
Morro Bay

Marbled Murrelet Critical Habitat

Seabird Spring Survey Compilation: Observations from various surveys between 1975 and 2008
Displaying: All Birds
0 - 15
15 - 40
40 - 80
80 - 150
150 - 280
280 - 450
450 - 750
750 - 1250
1250 - 2500
2500 - 10000

Figure 22

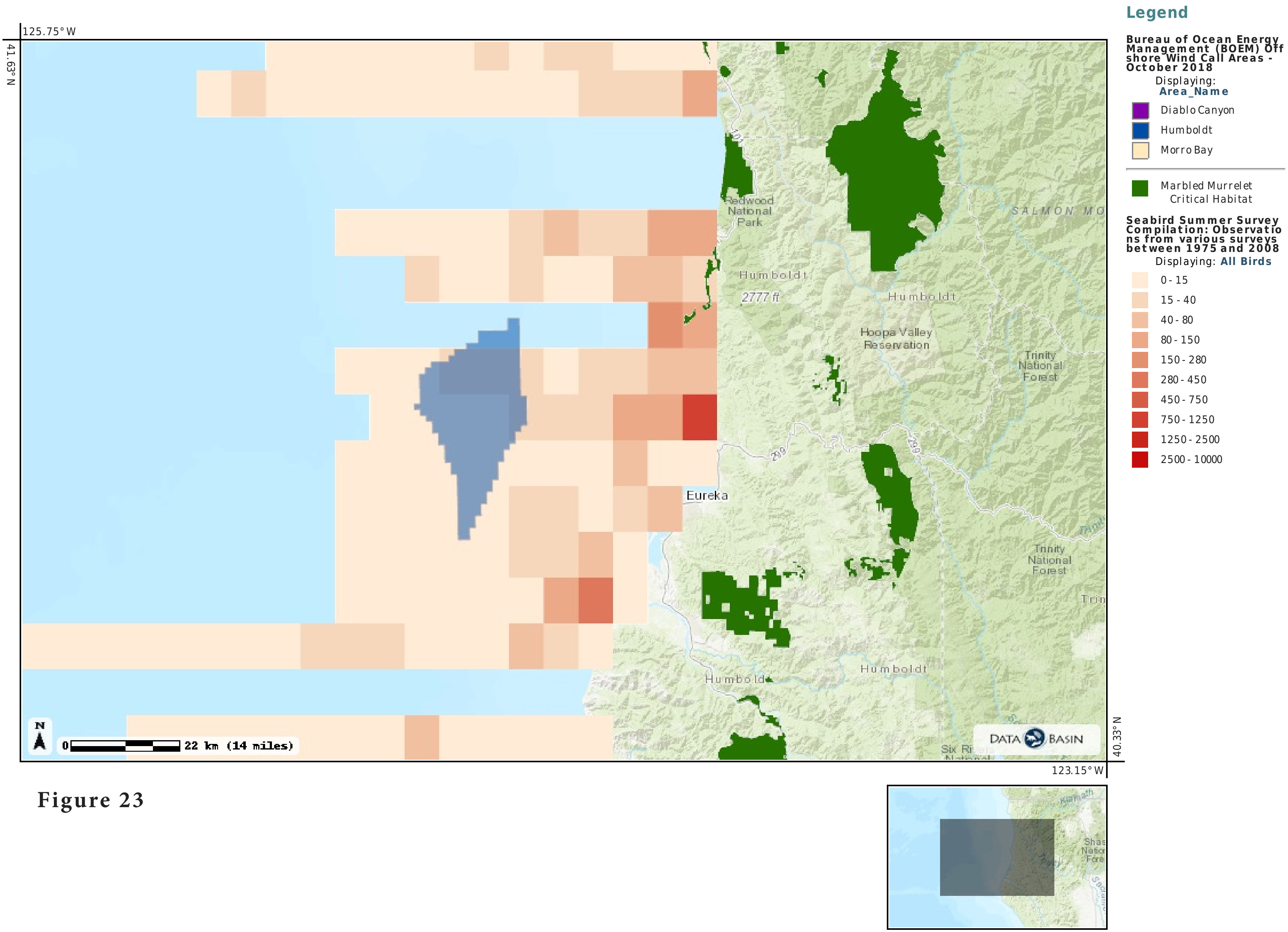
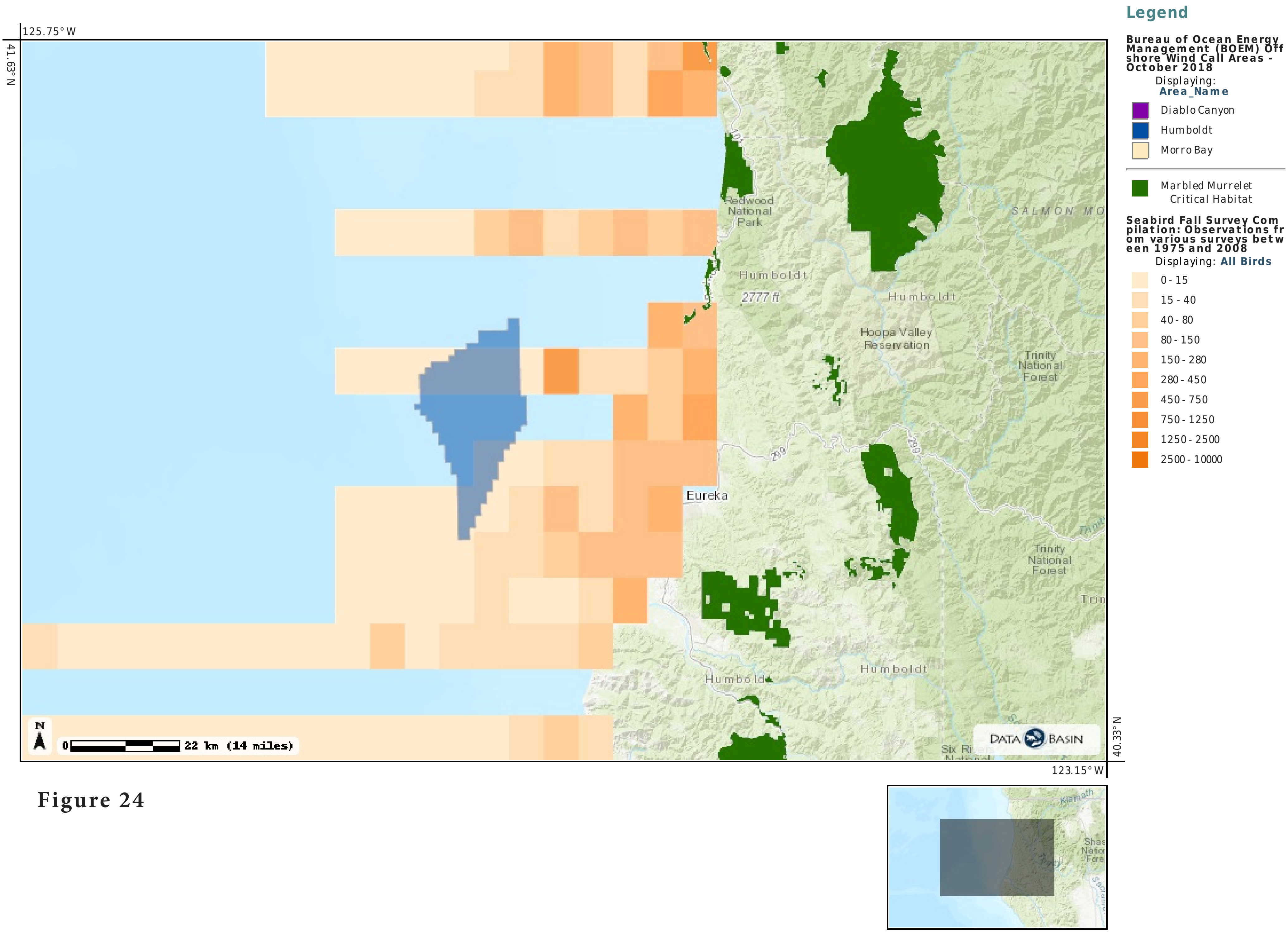

125.75° W
41.63° N
40.33° N
123.15° W
Legend
Bureau of Ocean Energy Management (BOEM) Offshore Wind Call Areas - October 2018
Displaying: Area_Name
Diablo Canyon
Humboldt
Morro Bay
Marbled Murrelet Critical Habitat
Seabird Summer Survey Compilation: Observations from various surveys between 1975 and 2008
Displaying: All Birds
0 - 15
15 - 40
40 - 80
80 - 150
150 - 280
280 - 450
450 - 750
750 - 1250
1250 - 2500
2500 - 10000
Redwood National Park
Humboldt
2777 ft
Hoopa Valley Reservation
Trinity National Forest
Eureka
0 22 km (14 miles)
DATA BASIN

Figure 23



125.75° W
41.63° N
40.33° N
123.15° W
Redwood National Park
Humboldt
2777 ft
Hoopa Valley Reservation
Trinity National Forest
Eureka
Humboldt
SALMON MO
0 22 km (14 miles)
N
DATA BASIN
Legend
Bureau of Ocean Energy Management (BOEM) Off shore Wind Call Areas - October 2018
Displaying: Area_Name
Diablo Canyon
Humboldt
Morro Bay
Marbled Murrelet Critical Habitat
Seabird Fall Survey Compilation: Observations from various surveys between 1975 and 2008
Displaying: All Birds
0 - 15
15 - 40
40 - 80
80 - 150
150 - 280
280 - 450
450 - 750
750 - 1250
1250 - 2500
2500 - 10000

Figure 24

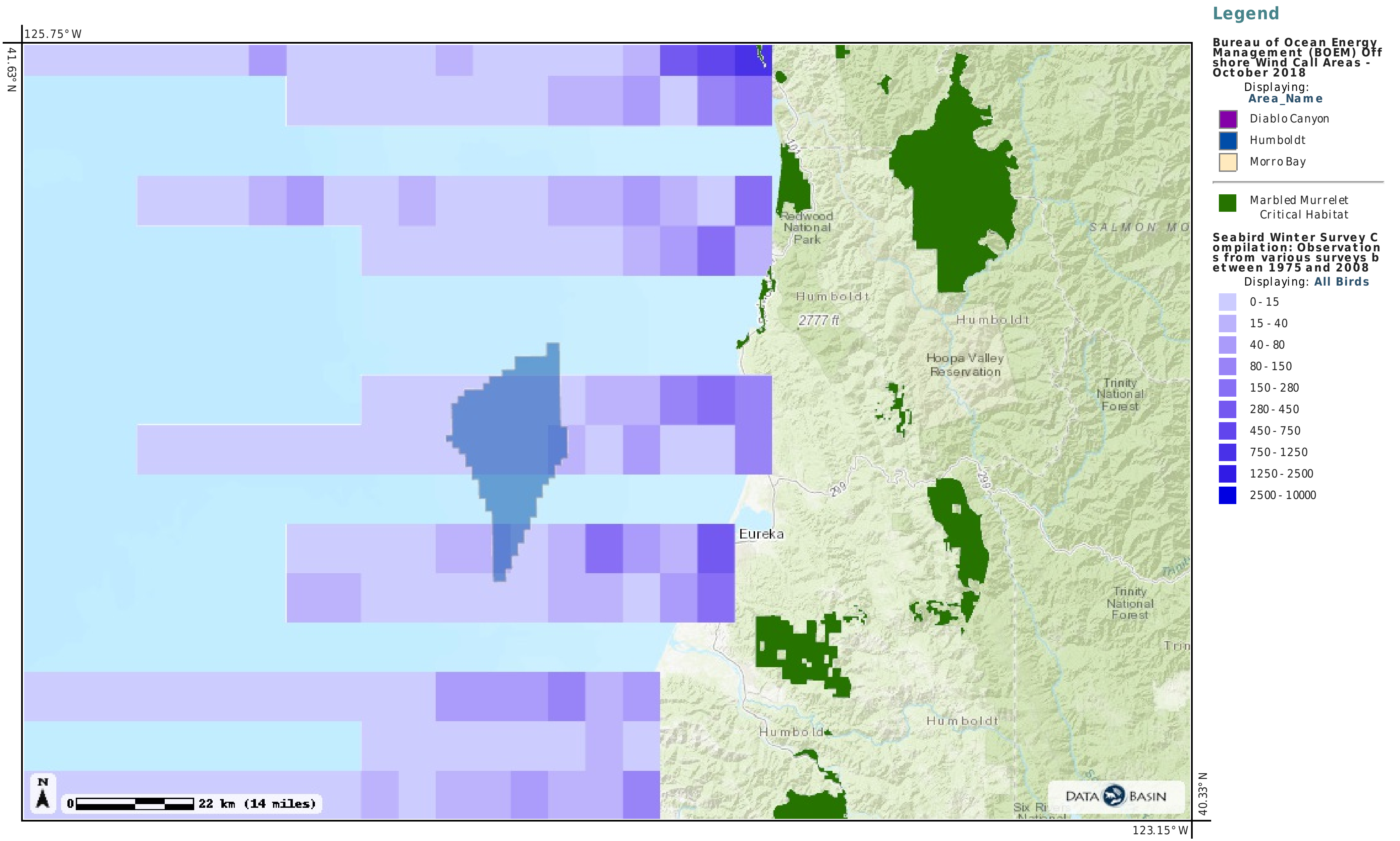

125.75° W
41.63° N
40.33° N
123.15° W
Redwood National Park
Humboldt
2777 ft
Humboldt
Hoopa Valley Reservation
Trinity National Forest
Trinity National Forest
SALMON MO
Eureka
Humboldt
Humboldt
Six Rivers
DATA BASIN
N
0 22 km (14 miles)
Legend
Bureau of Ocean Energy Management (BOEM) Offshore Wind Call Areas - October 2018
Displaying: Area_Name
Diablo Canyon
Humboldt
Morro Bay
Marbled Murrelet Critical Habitat
Seabird Winter Survey Compilation: Observations from various surveys between 1975 and 2008
Displaying: All Birds
0 - 15
15 - 40
40 - 80
80 - 150
150 - 280
280 - 450
450 - 750
750 - 1250
1250 - 2500
2500 - 10000

Figure 25

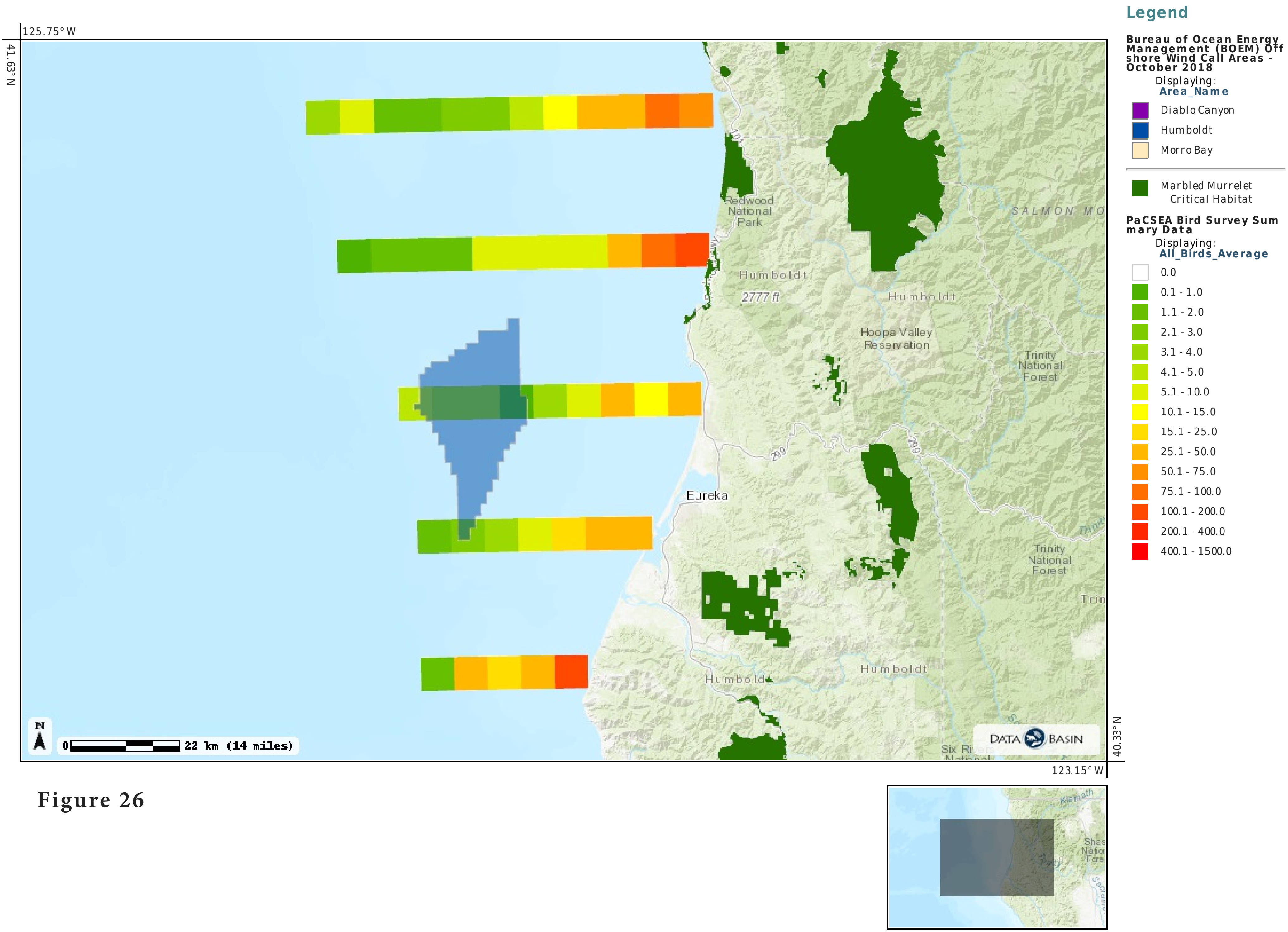
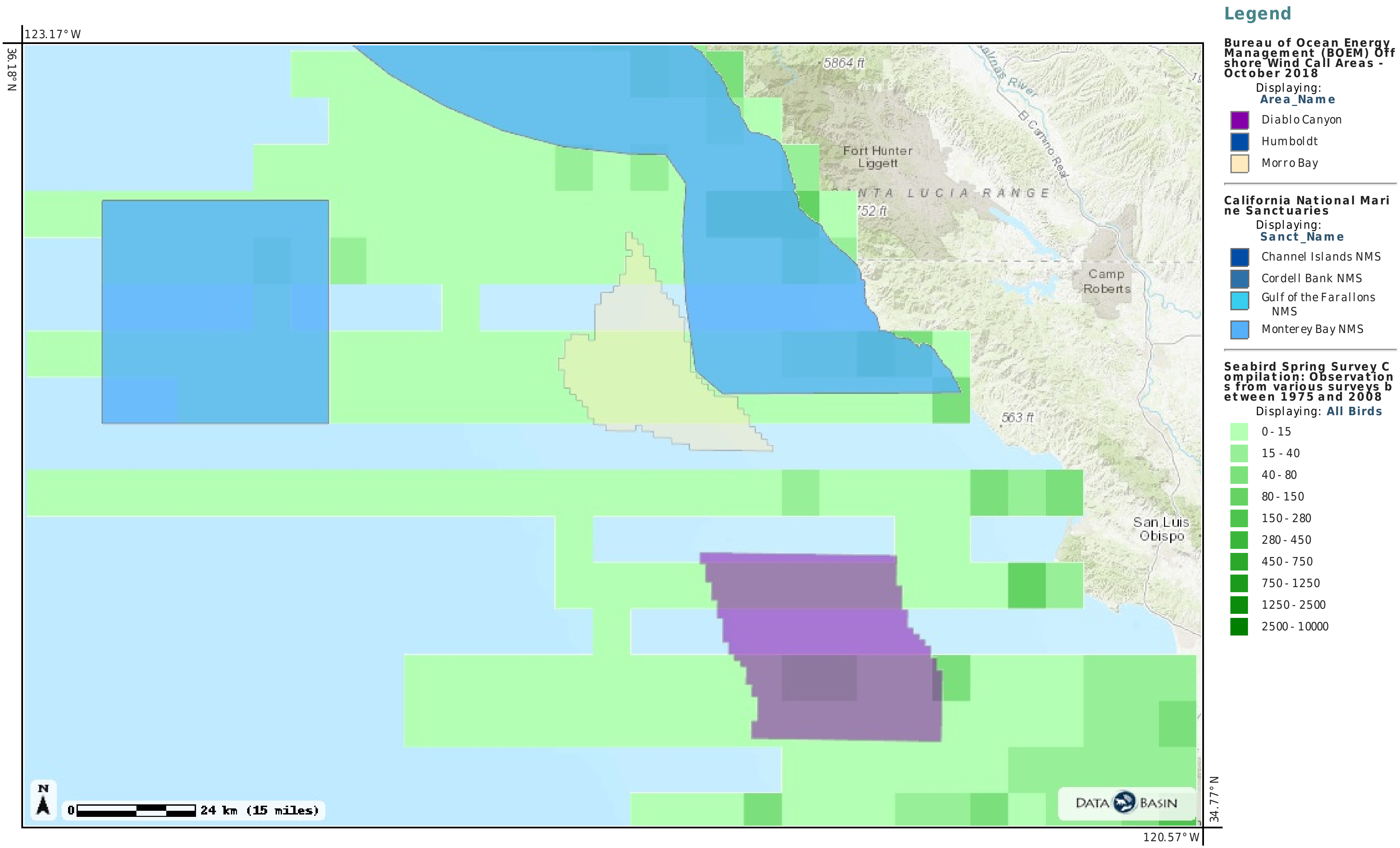

125.75° W
41.63° N
40.33° N
123.15° W
Redwood National Park
Humboldt
2777 ft
Humboldt
Hoopa Valley Reservation
Trinity National Forest
Trinity National Forest
SALMON MO
Eureka
Humboldt
Humboldt
0 22 km (14 miles)
N
DATA BASIN
Legend
Bureau of Ocean Energy Management (BOEM) Offshore Wind Call Areas - October 2018
Displaying:
Area_Name
Diablo Canyon
Humboldt
Morro Bay
Marbled Murrelet Critical Habitat
PaCSEA Bird Survey Summary Data
Displaying:
All_Birds_Average
0.0
0.1 - 1.0
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1 - 10.0
10.1 - 15.0
15.1 - 25.0
25.1 - 50.0
50.1 - 75.0
75.1 - 100.0
100.1 - 200.0
200.1 - 400.0
400.1 - 1500.0

Figure 26



Legend
Bureau of Ocean Energy Management (BOEM) Offshore Wind Call Areas - October 2018
Displaying: Area_Name
Diablo Canyon
Humboldt
Morro Bay
California National Marine Sanctuaries
Displaying: Sanct_Name
Channel Islands NMS
Cordell Bank NMS
Gulf of the Farallons NMS
Monterey Bay NMS
Seabird Spring Survey Compilation: Observations from various surveys between 1975 and 2008
Displaying: All Birds
0 - 15
15 - 40
40 - 80
80 - 150
150 - 280
280 - 450
450 - 750
750 - 1250
1250 - 2500
2500 - 10000
123.17° W
36.18° N
120.57° W
34.77° N
5864 ft
Fort Hunter Liggett
SANTA LUCIA RANGE
El Camino Real
Camp Roberts
563 ft
San Luis Obispo
N
0
24 km (15 miles)
DATA BASIN

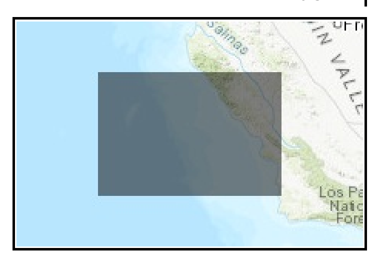


Figure 27

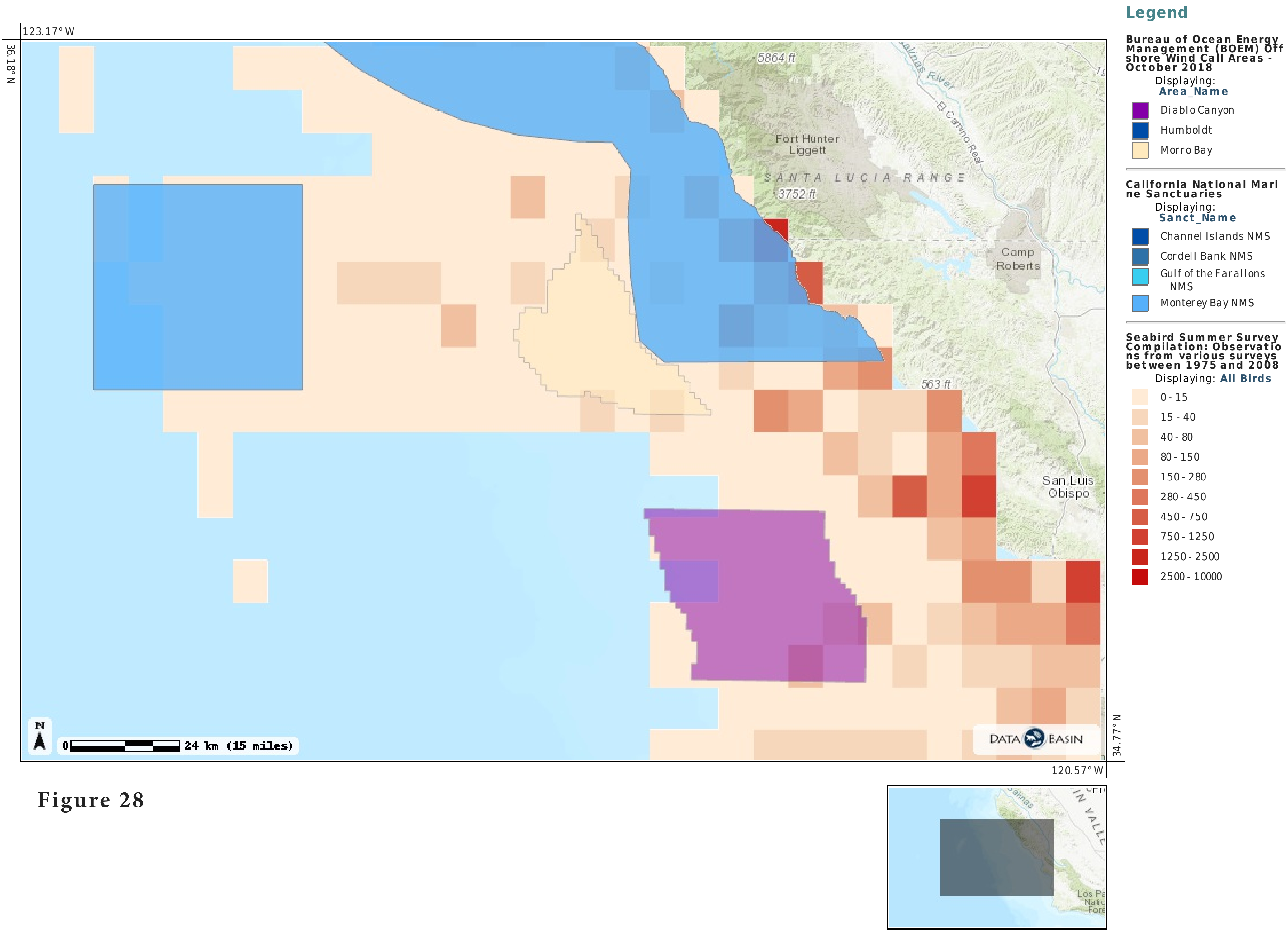
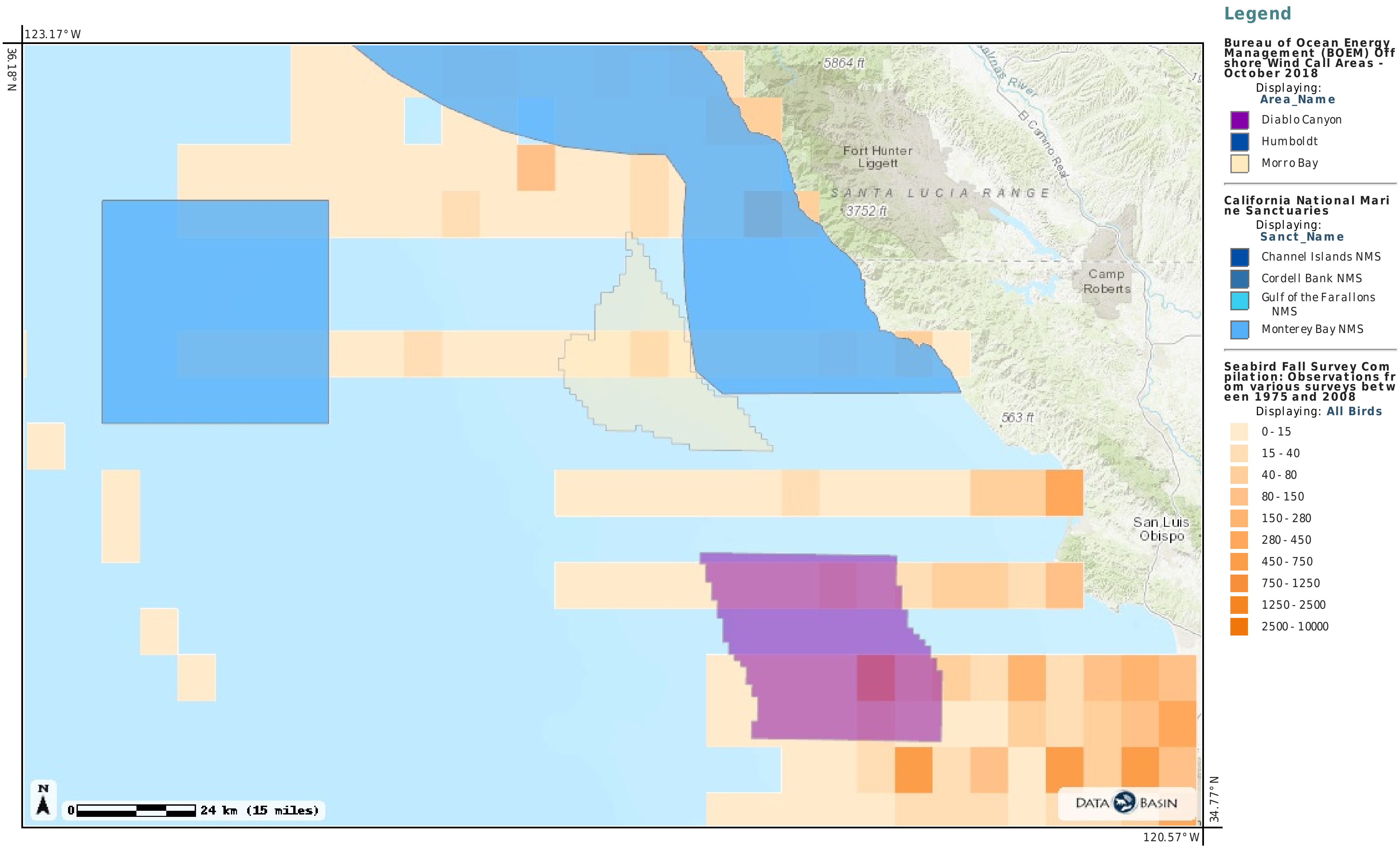

123.17° W
36.18° N
5864 ft
Salinas River
El Camino Real
Fort Hunter Liggett
SANTA LUCIA RANGE
3752 ft
Camp Roberts
563 ft
San Luis Obispo
N
0
24 km (15 miles)
DATA BASIN
120.57° W
34.77° N
Legend
Bureau of Ocean Energy Management (BOEM) Offshore Wind Call Areas - October 2018
Displaying: Area_Name
Diablo Canyon
Humboldt
Morro Bay
California National Marine Sanctuaries
Displaying: Sanct_Name
Channel Islands NMS
Cordell Bank NMS
Gulf of the Farallons NMS
Monterey Bay NMS
Seabird Summer Survey Compilation: Observations from various surveys between 1975 and 2008
Displaying: All Birds
0 - 15
15 - 40
40 - 80
80 - 150
150 - 280
280 - 450
450 - 750
750 - 1250
1250 - 2500
2500 - 10000

Figure 28


123.17° W
36.18° N
34.77° N
120.57° W
5864 ft
Fort Hunter Liggett
SANTA LUCIA RANGE
3752 ft
Salinas River
El Camino Real
Camp Roberts
563 ft
San Luis Obispo
0 24 km (15 miles)
N
DATA BASIN
Legend
Bureau of Ocean Energy Management (BOEM) Offshore Wind Call Areas - October 2018
Displaying: Area_Name
Diablo Canyon
Humboldt
Morro Bay
California National Marine Sanctuaries
Displaying: Sanct_Name
Channel Islands NMS
Cordell Bank NMS
Gulf of the Farallons NMS
Monterey Bay NMS
Seabird Fall Survey Compilation: Observations from various surveys between 1975 and 2008
Displaying: All Birds
0 - 15
15 - 40
40 - 80
80 - 150
150 - 280
280 - 450
450 - 750
750 - 1250
1250 - 2500
2500 - 10000

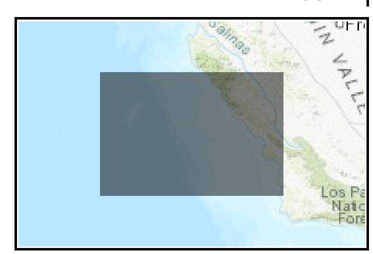


Figure 29

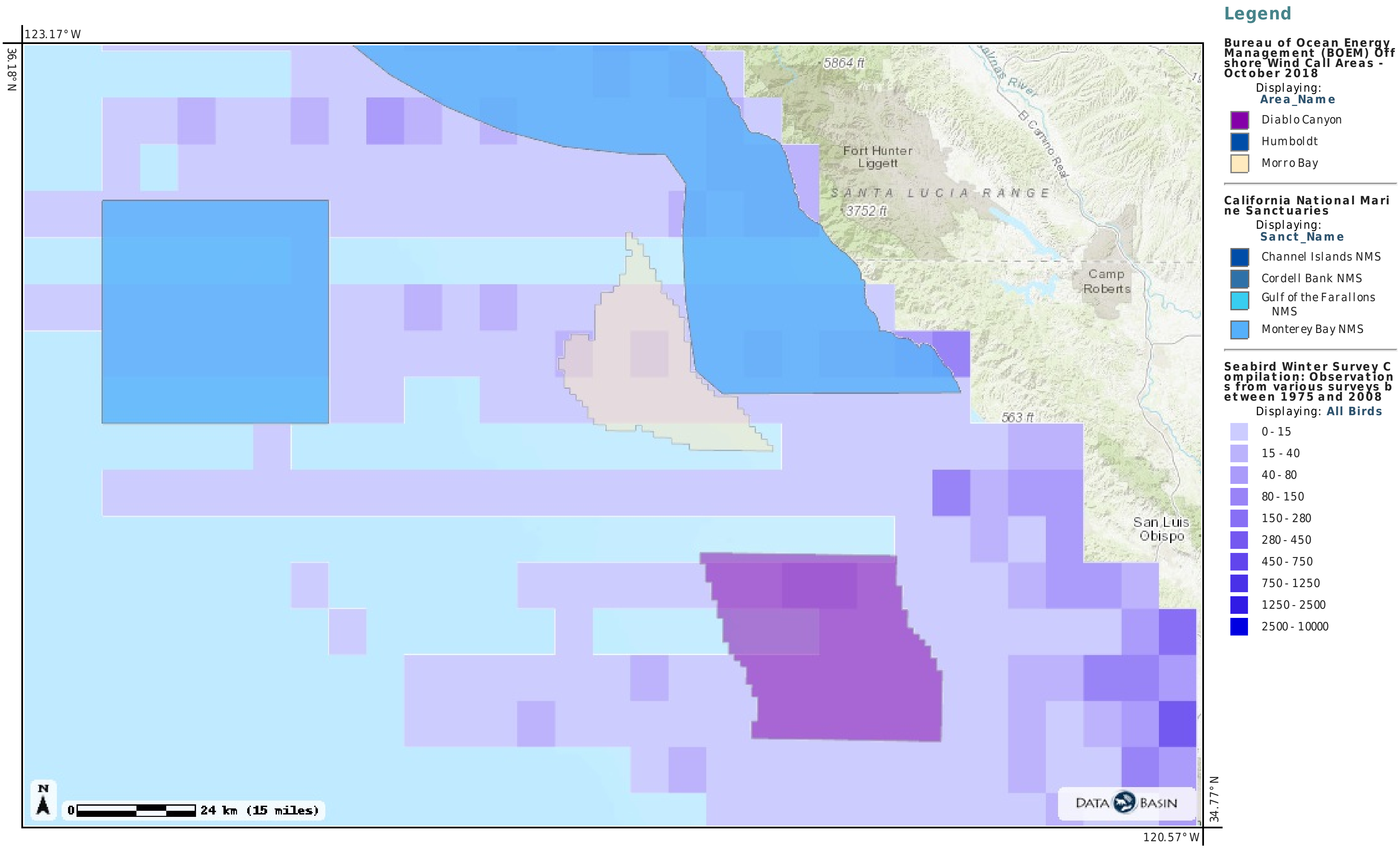
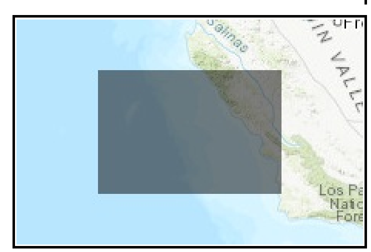
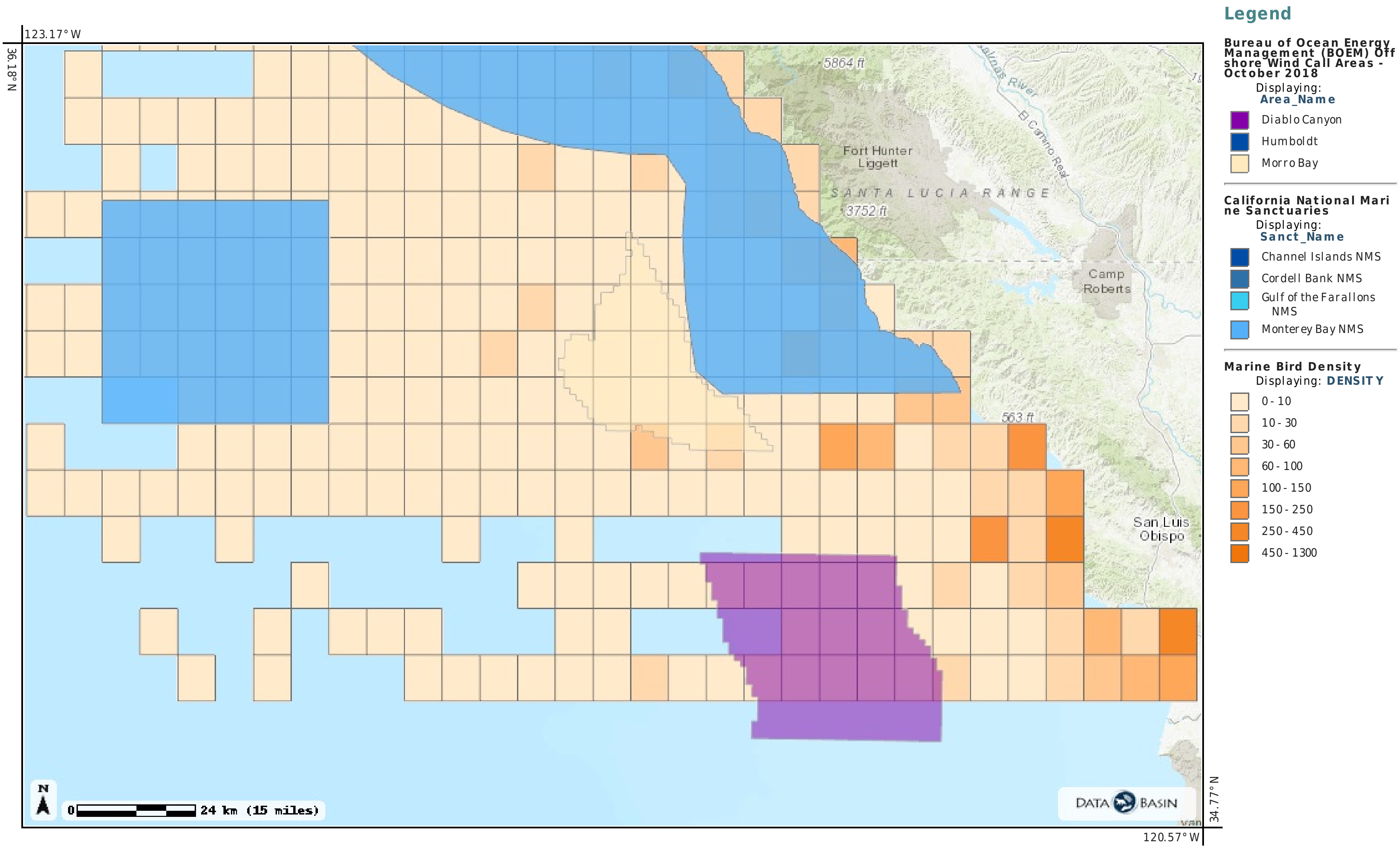

123.17° W
36.18° N
5864 ft
Fort Hunter Liggett
SANTA LUCIA RANGE
3752 ft
Salinas River
El Camino Real
Camp Roberts
563 ft
San Luis Obispo
N
0
24 km (15 miles)
DATA BASIN
120.57° W
34.77° N
Legend
Bureau of Ocean Energy Management (BOEM) Off shore Wind Call Areas - October 2018
Displaying: Area_Name
Diablo Canyon
Humboldt
Morro Bay
California National Marine Sanctuaries
Displaying: Sanct_Name
Channel Islands NMS
Cordell Bank NMS
Gulf of the Farallons NMS
Monterey Bay NMS
Seabird Winter Survey Compilation: Observations from various surveys between 1975 and 2008
Displaying: All Birds
0 - 15
15 - 40
40 - 80
80 - 150
150 - 280
280 - 450
450 - 750
750 - 1250
1250 - 2500
2500 - 10000

Figure 30




123.17° W
36.18° N
34.77° N
120.57° W
5864 ft
Salinas River
El Camino Real
Fort Hunter Liggett
SANTA LUCIA RANGE
3752 ft
Camp Roberts
563 ft
San Luis Obispo
N
0
24 km (15 miles)
DATA BASIN
Legend
Bureau of Ocean Energy Management (BOEM) Offshore Wind Call Areas - October 2018
Displaying: Area_Name
Diablo Canyon
Humboldt
Morro Bay
California National Marine Sanctuaries
Displaying: Sanct_Name
Channel Islands NMS
Cordell Bank NMS
Gulf of the Farallons NMS
Monterey Bay NMS
Marine Bird Density
Displaying: DENSITY
0 - 10
10 - 30
30 - 60
60 - 100
100 - 150
150 - 250
250 - 450
450 - 1300

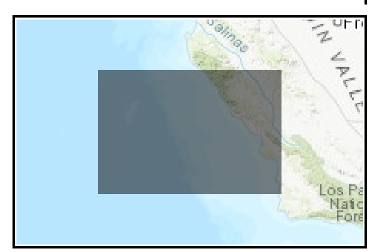
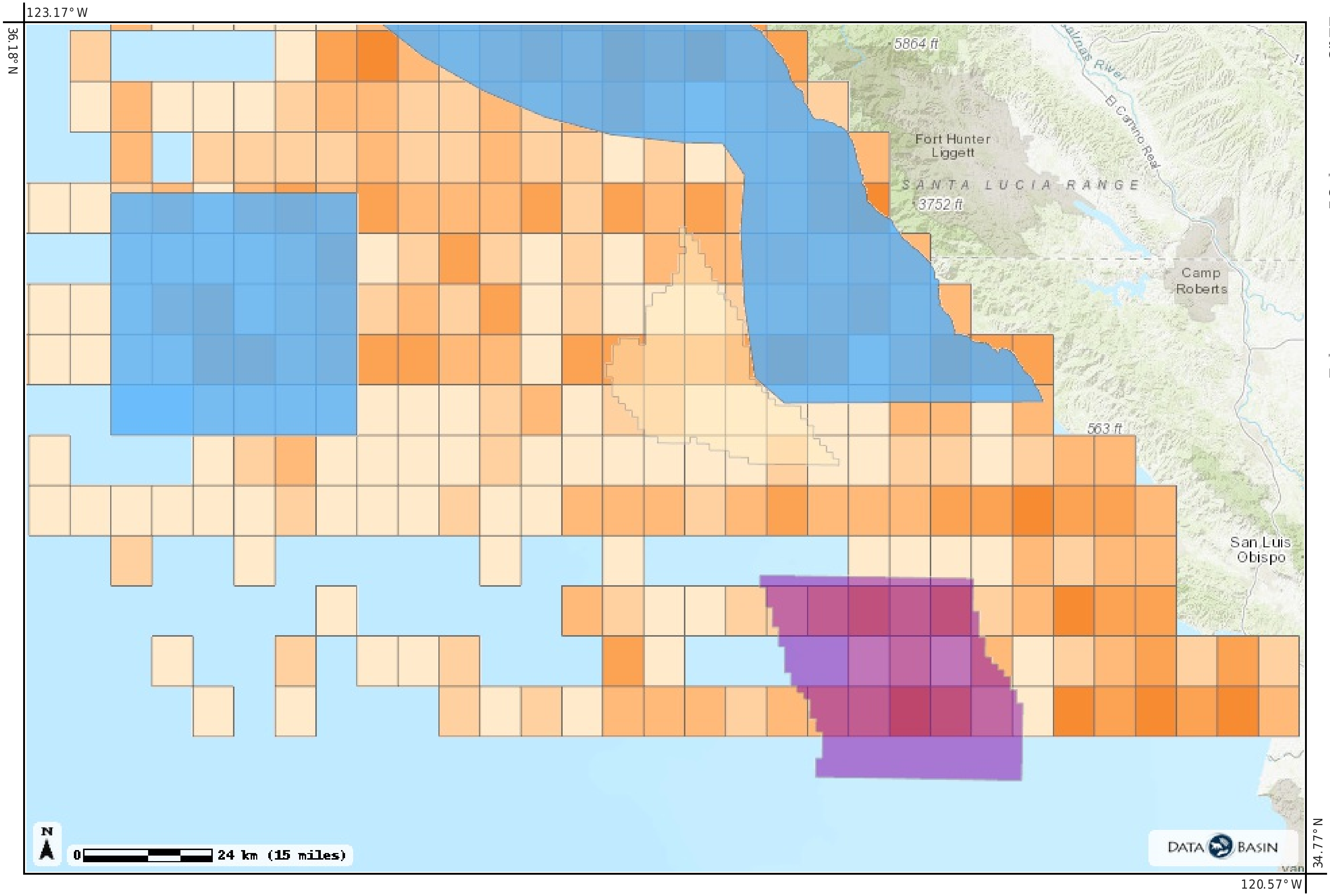


Figure 31



Legend

Bureau of Ocean Energy Management (BOEM) Offshore Wind Call Areas - October 2018

Displaying: **Area_Name**

- Diablo Canyon
- Humboldt
- Morro Bay

California National Marine Sanctuaries

Displaying: **Sanct_Name**

- Channel Islands NMS
- Cordell Bank NMS
- Gulf of the Farallons NMS
- Monterey Bay NMS

Marine Bird Diversity

Displaying: **DIVERSITY**

- 0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0

Figure 32