UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

OCT 19 2017

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

MEMORANDUM

SUBJECT: Availability of Modeling Data and Associated Technical Support Document for the EPA's Preliminary 2028 Visibility Air Quality Modeling

FROM: Richard A. Wayland
Director, Air Quality Assessment Division

TO: Regional Air Division Directors

Through this memorandum, the U.S. Environmental Protection Agency's (EPA) Office of Air Quality Planning and Standards is communicating the availability of preliminary 2028 visibility modeling data and results, providing an associated technical support document (TSD), and explaining the limitations of these modeling results. The goal of this modeling was to project 2028 visibility conditions and source sector contribution information for each mandatory Class I federal area/IMPROVE site. The EPA conducted this preliminary visibility modeling with the intention of informing the regional haze state implementation plan (SIP) development process for the second implementation period.[1] As discussed in more detail below, there are a number of uncertainties associated with these modeling results, but we are releasing this information as the next step towards informing the technical basis for future regional haze SIPs.

Summary of Preliminary Modeling Results

The attached TSD details the EPA's modeling platform, modeling results, model performance issues, and uncertainties in these modeling results. Specifically, the document contains information on the 2011 base year model performance, 2028 projected visibility impairment, comparison of the 2028 projected visibility impairment with the unadjusted uniform rate of progress line (glidepath),[2] and 2028 source apportionment results. The TSD includes the

[1] On January 10, 2017 (82 FR 3078), the EPA revised the Regional Haze Rule to clarify and streamline certain planning requirements for states. The rule also extended the deadline for second implementation period plans by three years, to July 31, 2021, but did not change the dates for the beginning and end of the implementation period. The second implementation period ends in 2028.

[2] The TSD compares the projected 2028 visibility level to the unadjusted glidepath for each Class I area because we expect stakeholders to be interested in this comparison. No adjustments have been made for impacts from international anthropogenic sources or wildland prescribed fires, as would be an option under the Regional Haze

modeling results for each Class I area (represented by IMPROVE sites) to provide an understanding of the unique situation in each area.

One overarching observation from this modeling is the small magnitude of both observed and predicted light extinction on the 20% most anthropogenically impaired days and the 20% clearest days in certain areas, particularly areas in the western U.S. In assessing model performance, the EPA observed that the model bias is highly variant across the continental U.S. For example, nitrate is generally overpredicted in the northern states and underpredicted in the southern states. Despite this variability in model performance, we observed that the model bias is generally smaller (better performance) on the 20% most anthropogenically impaired days when compared with the 20% haziest days. This is as expected, since a focus on the 20% most anthropogenically impaired days avoids days highly affected by wildfires and dust storms, the impacts of which can be more challenging to model.

Visibility at most eastern Class I areas on the 20% most anthropogenically impaired days is projected to be below the unadjusted glidepath in 2028, with a relatively higher percentage of the light extinction due to domestic anthropogenic sources. At many western Class I areas, visibility is projected to be above the unadjusted glidepath. However, at most of the western areas, the projections relative to the unadjusted glidepath are uncertain because of greater uncertainties associated with certain sources of the light extinction (in particular, boundary conditions) [3] and in some cases, poor model performance.

Limitations of The Preliminary Model Results

Based on our assessment of these results, we identified a number of uncertainties and model performance issues that should be addressed in future EPA, state, multistate, or stakeholder modeling that may be used in SIP development. Despite these uncertainties, the EPA is releasing this information to begin the necessary collaborative work with states, tribes, multi-jurisdictional organizations, and federal land managers. The EPA's goal is that this information, along with future collaborative work, will improve the technical foundation of air quality modeling so that it may be useful in regional haze SIP development for the second implementation period. For example, model performance is relatively good and model uncertainty is relatively low for some Class I areas, particularly in the eastern US. The modeling results for some of these sites may provide a reasonably accurate initial assessment of 2028 visibility levels and source sector

Rule. The relevance of this comparison to SIP development is beyond the scope of this modeling, and stakeholders with questions about this should consult the January 10, 2017, *Federal Register* notice and their Regional Office for more details. For the purpose of this comparison, we have used values of natural visibility conditions calculated according to the draft recommended method in the draft EPA guidance document "Draft Guidance for the Second Implementation Period of the Regional Haze Rule" posted at https://www.epa.gov/visibility/regional-haze-guidance-technical-support-document-and-data-file. Thus, these values of natural visibility conditions and the associated glidepaths are not themselves products of this modeling effort.

[3]Because boundary conditions in this modeling cannot be separated between anthropogenic and natural sources and because the modeling domain boundary is quite close to the U.S. border in some places such that recirculation of U.S. emissions back into the U.S. could not be explicitly distinguished, it is not possible to use these modeling results to adjust the glidepath for international anthropogenic impacts even as a pro forma analysis. We recommend against attempting to use these modeling results to adjust the glidepath for prescribed fire impacts due to the uncertainties described in this memo and the TSD.

contributions. For most Class I areas; however, we recommend using this initial modeling only as a first step in the process of evaluating the technical support needed to develop technically sound regional haze SIPs for the second implementation period. States should consult with their EPA Regional Office to determine the usefulness of the model results for any particular Class I area.

Next Steps

While the EPA cannot at this time commit to resolving all of the identified issues and re-running this modeling, the EPA is committed to participating in collaborative discussions with interested stakeholders to work together to improve the scientific foundation necessary to support regional haze SIP development.

We have identified several aspects of this initial modeling that should be improved upon through coordination with interested stakeholders. These include, but are not limited to:

- *Expanded domain size* to reduce the impact of the boundary conditions assumptions on predictions, especially near the domain edge.
- *Updated emission inventory and projections for certain sectors* (e.g., remove Clean Power Plan assumptions from emission inputs, update oil and gas projections, etc.).
- *Updated boundary conditions* based on more recent information about international emissions as well as additional modeling to help quantify and distinguish anthropogenic and natural international contributions.
- *Improved treatment of fire and fugitive dust emissions* in the model.
- *Treatment of secondary organic aerosols (SOA)* should be reviewed and SOA tagged separately in the source apportionment modeling.
- *Estimation of "natural visibility conditions"* used in the glidepath framework should be further reviewed and can be informed by the findings of further modeled source apportionment modeling.

Given the multiple areas needing improvement, we reiterate our commitment to work collaboratively with interested stakeholders to build upon this initial step in informing second implementation period regional haze SIPs. We look forward to continuing to work with the EPA regional offices; state, local, and tribal air agencies; and other interested stakeholders to improve upon this initial modeling as part of future collaborative efforts.

The TSD is available electronically on the EPA's SCRAM website (https://www3.epa.gov/ttn/scram/reports/2028_Regional_Haze_Modeling-TSD.pdf). A summary map and set of site-specific summary plots from the TSD is also attached to this memo. Questions and requests for the detailed data used to generate summary plots (Excel spreadsheets) should be sent to Brian Timin of the EPA's Air Quality Modeling Group at timin.brian@epa.gov. The EPA will also provide all associated inputs and outputs for this initial modeling via hard drives to those who request it (total file size of approximately 19 TB).

2028 Glidepath Deviation Map and IMPROVE Site Summary Plots

2028 Glidepath Deviation Map

Air quality modeling was used to project 2028 visibility levels at individual Class I areas (represented by Interagency Monitoring of Protected Visual Environments [IMPROVE] monitoring sites) and to estimate emissions sector contributions to 2028 PM concentrations and visibility. The projected 2028 PM concentrations were converted to light extinction coefficients and then to deciviews to then evaluate visibility progress. The future year 2028 deciview projections can be compared to the unadjusted visibility "glidepath" at each Class I area.[1]

The 2028 visibility contribution information by major emissions source sector was calculated using CAMx particulate source apportionment technology (PSAT). The sector contribution information helps to better understand the sources of future visibility impairment (including domestic anthropogenic, domestic natural, and international anthropogenic and natural sources).

Figure A-1 below combines 2011 model performance information, a representation of the deviation (in deciviews) from the 2028 unadjusted glidepath, and an uncertainty calculation. The map includes the 2028 projected deciview deviation from the glidepath (color; blue and red), a qualitative representation of model skill (size of gray color), and whether or not uncertainty, represented by alternative projections, is large enough to potentially change the sign of the glidepath deviation for IMPROVE sites in the lower 48 states (vertical bar). Each component is described in more detail as follows:

- Each colored dot represents the IMPROVE station's deviation from the 2028 glidepath for the top 20% most impaired days (red: above; blue: below). The deviation is calculated as the difference between the projected 2028 deciview values compared to the glidepath.
- The size of each colored dot (blue, red) is sized inversely proportional to the root mean square error (RMSE) for averaged extinction by species (as the blue/red gets smaller, the grey gets larger).[2] RMSE ranks sites by magnitude and composition skill using extinction weighted predictions and observations, and is used in a qualitative sense for comparing site model performance.

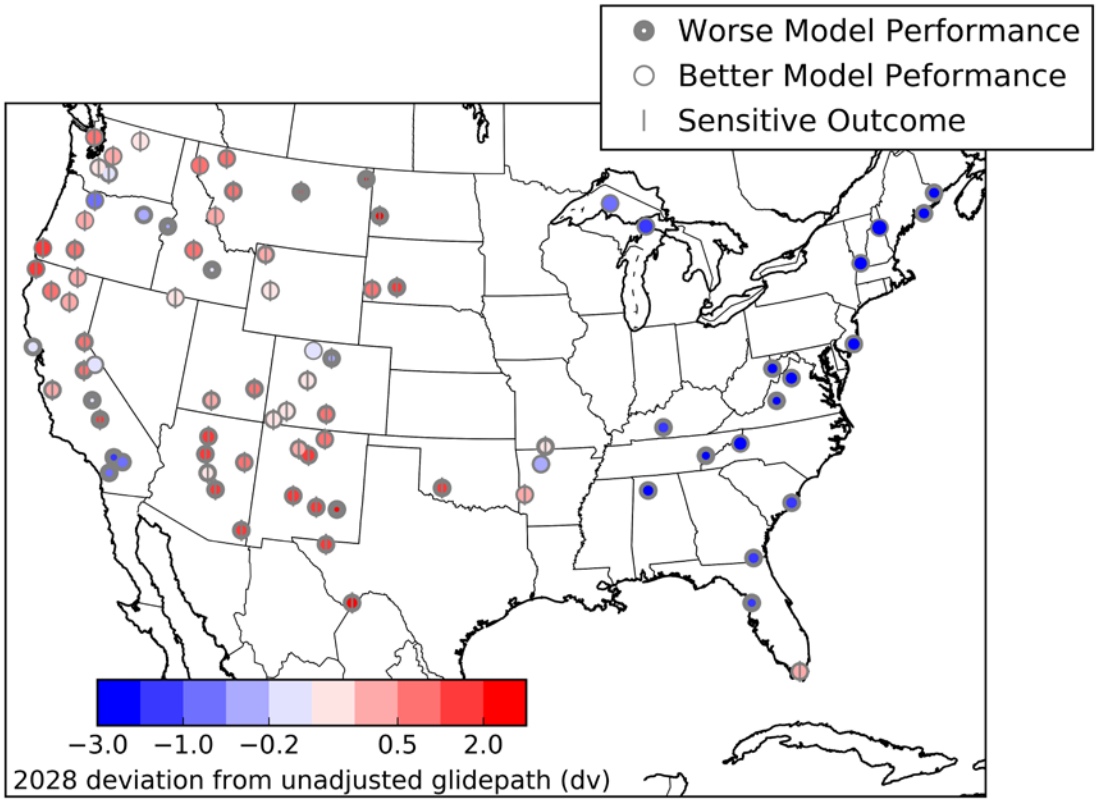
[1] While the regional haze rule requires future year projected visibility impairment be compared to the glidepath, it does not require the reasonable progress goals (RPGs) be on or below the glidepath. However, the rule has different requirements depending on whether the projected RPG value is above or below the glidepath. See 40 CFR 51.308(f)(3)(ii) and (iii) for more information.

[2] See the modeling TSD for more details on the calculation.

- The presence of a vertical bar on some dots represent the potential for boundary condition assumptions to change the sign of the deviation. When a vertical bar is present, the sign can change due to assumptions in boundary conditions alone. We use two alternative assumptions about future boundary conditions to create a range of 2028 projections (see the modeling TSD for more details on the "range" calculations).

A relatively large boundary contribution and/or poor model performance will lead to a relatively large 2028 range of uncertainty. The range is relatively small (and therefore less uncertain) if model performance is generally good and the boundaries contribution is small. When the site range crosses the glidepath, the uncertainty is sufficient to change the sign of the deviation (i.e., blue vs red) and a vertical bar is overlaid on the IMPROVE sites circle.

Figure A-1- Map of deviation from the 2028 glidepath at IMPROVE sites[3], with additional 2011 model performance and uncertainty information.



[3] The map shows results at IMPROVE sites where a 2028 glidepath could be calculated. Note that many IMPROVE sites represent more than one Class I area.

If the sign of the deviation can change and/or model performance is particularly poor, confidence in the projection is low. There are two major features that can be seen in the map. First, Class I areas east of the Mississippi river tend to be significantly below the glidepath (with the exception of the Everglades in South Florida), model performance is frequently good, and the binary results (being above or below the glidepath) are insensitive to the boundary condition assumptions. West of the Mississippi river, results are more mixed. For example, several sites in Southern California are projected to be below the glidepath, have low model skill, and are also insensitive to boundary conditions. Over large areas in the west; however, the deviation from the glidepath is positive (above the glidepath), model performance is relatively good, but the result *is* sensitive to assumptions in the boundary conditions.

IMPROVE Site Summary Plots

The following plots provide a summary of relevant observational and modeling data at each IMPROVE station. To help orient the reader, each figure is labeled with the main Class I area represented by the IMPROVE site and has an inset map with a red dot to indicate the geographic location of the IMPROVE station.

- The 2009-2013 observed annual average light extinction values (1/Mm) on the 20% most impaired days are shown as (up to 5) black dots with the 5-year average as a horizontal blue line over the same time period.

- For the 2011 year, the average observed magnitude and composition of extinction (on the 20% most impaired days) is indicated by the left-most stacked bar. The 2011 observation is broken down into Rayleigh (light blue), sea salt (blue), organic carbon matter (green), elemental carbon (black), ammonium sulfate (yellow), ammonium nitrate (red), fine crustal material (purple) and coarse mass (brown). Rayleigh scattering is site-specific, depending on the site elevation (higher elevation has lower Rayleigh scattering). It varies between 8 and 12 Mm^{-1} for all areas and does not vary by day or year.

- Also for 2011 year, the second stacked bar shows the CAMx modeled PM light extinction composition on the 20% most impaired days. The observed sea salt scattering has been copied over to the modeling results (we are not using modeled sea salt) and the site-specific Raleigh scattering is also used directly and does not change between the base and future.

- A species-specific relative response factor was calculated using the raw 2011 simulated PM species concentrations and the raw 2028 simulated PM species concentrations and used to project observations. The effective net relative change in extinction between 2011 and 2028 is visualized by the blue dashed line connecting the 5-year average (solid horizontal blue line) with the top of the 2028 stacked bar (in some cases, the blue dashed line does not exactly hit the top of the 2028 stacked bar because the plots are shown in extinction, but the actual 2028 projections are calculated in deciviews, which is a log function). See the modeling technical support document (TSD) for more details on the calculations.

- The shades of grey in the 2028 stacked bar represent source apportionment emissions summary categories to represent United States Anthropogenic, “Mixed”, International Anthropogenic, and Natural sources. The “Mixed” category is most often dominated by modeled boundary conditions, which can be a combination of sources including natural, recirculated U.S. pollution, off-shore activity, and trans-hemispheric anthropogenic. See Table 1 below for the definition of the “emissions summary categories” and the modeling TSD for more details.

Table 1 Source apportionment emissions summary categories

Emissions Summary Category	Emissions Sectors (PSAT tags)	Notes
US Anthropogenic	On-road mobile, Non-road mobile, EGUs, NonEGU point, Oil and Gas, Nonpoint (area), Commercial marine (onshore), Prescribed fires, Agricultural fires, Rail, Residential Wood combustion (RWC)	Most certain contributors to US anthropogenic visibility.
International	Anthropogenic Canada and Mexico	Contribution from Canadian and Mexican emissions within the 12km CONUS domain
Natural	Biogenic, Wildfires (domainwide), Sea salt	Most certain contributors to natural visibility
"Mixed"	Boundary conditions, Fugitive dust, Offshore (commercial marine and oil platforms), Secondary organics	Each of these sectors are particularly uncertain regarding their representation in the model, including their relative contribution of natural vs. international vs. US anthropogenic sources. Need further discussion and assessment to improve our understanding of the contributions.

- The "2028 US anthropogenic percentage" is a fraction of the total projected non-Rayleigh extinction. The U.S. anthropogenic sources are then normalized by this fraction and further identified in the pie chart, where unique categories total to ≥75% and the remaining are indicated as "US Anthro Other." Thus, the sector percentages in the pie chart represent that sector's percentage of total U.S. anthropogenic extinction.

- The "Range" (the top and bottom of the whisker on the 2028 stacked bar) for 2028 extinction is an attempt to put bounds on projections that result from model skill and assumptions. We use two alternative projections to bound the projected future: (1) the boundary conditions are accurate and (2) the boundary conditions will be reduced by 50% between 2011 and 2028. See the modeling TSD for more details on the "range" calculations.

Table 2 Sector category abbreviations in the summary plots

Summary plot US anthropogenic sector abbreviations	**Full sector name**
EGU	Electric generating units (EGU)
NonEGU_Pt	NonEGU point sources
Oil_Gas	Oil and gas (point and nonpoint)
Ag_Fires	Agricultural fires
Rail	Rail
RWC	Residential wood combustion
Non_point	Nonpoint (area) sources
On_road	On-road mobile
CMV	Commercial marine vessels (onshore)
Non_road	Non-road mobile
Prescribed_Fires	Prescribed fires

Figure A-2 Location of Federal Class I areas

Figure A-3 Map of IMPROVE network regions used in the summary plots

Source: 2011 IMPROVE Report http://vista.cira.colostate.edu/Improve/spatial-and-seasonal-patterns-and-temporal-variability-of-haze-and-its-constituents-in-the-united-states-report-v-june-2011

Northwest

- Mount Rainier National Park (WA)(MORA1)
- Glacier Peak Wilderness (WA) and North Cascades National Park (WA)(NOCA1)
- Olympic National Park (WA)(OLYM1)
- Pasayten Wilderness (WA)(PASA1)
- Alpine Lake Wilderness (WA)(SNPA1)
  Goat Rocks Wilderness (WA) and Mount Adams Wilderness (WA)(WHPA1)

Regional visibility model performance and contribution summary on the 20% most impaired days

Most important ambient PM species contribution to visibility (on 20% most impaired days)	Sulfate, organic carbon
Model visibility performance summary (on 20% most impaired days)	Generally good performance, dominated by sulfate. Nitrate overpredicted at MORA and WHPA.
Uncertainty in sector contributions	High “mixed” sector contribution percentage (all sites > 60%).
2028 US anthropogenic percent contribution	7-18%
Largest US anthropogenic sector contributions	Residential wood and nonEGU point

Due to uncertainties in the modeling, the 2028 regional haze results should be used with caution. In particular, the modeling results (including the estimated 2028 US anthropogenic contributions) are most uncertain at sites with poor visibility model performance and/or high “mixed” (boundary conditions, fugitive dust, offshore, and secondary organics) contributions.

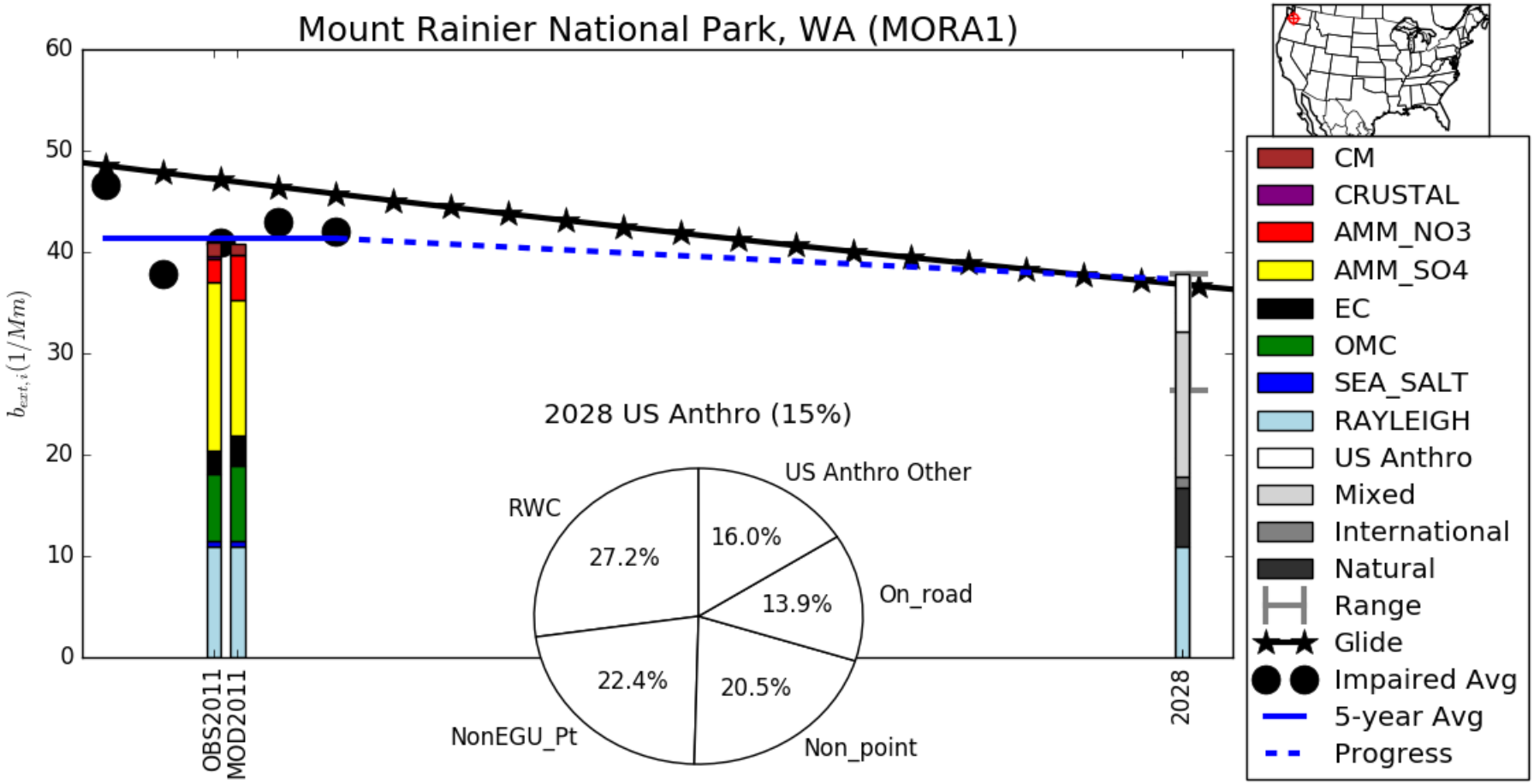


Figure 1: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Mount Rainier National Park (WA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

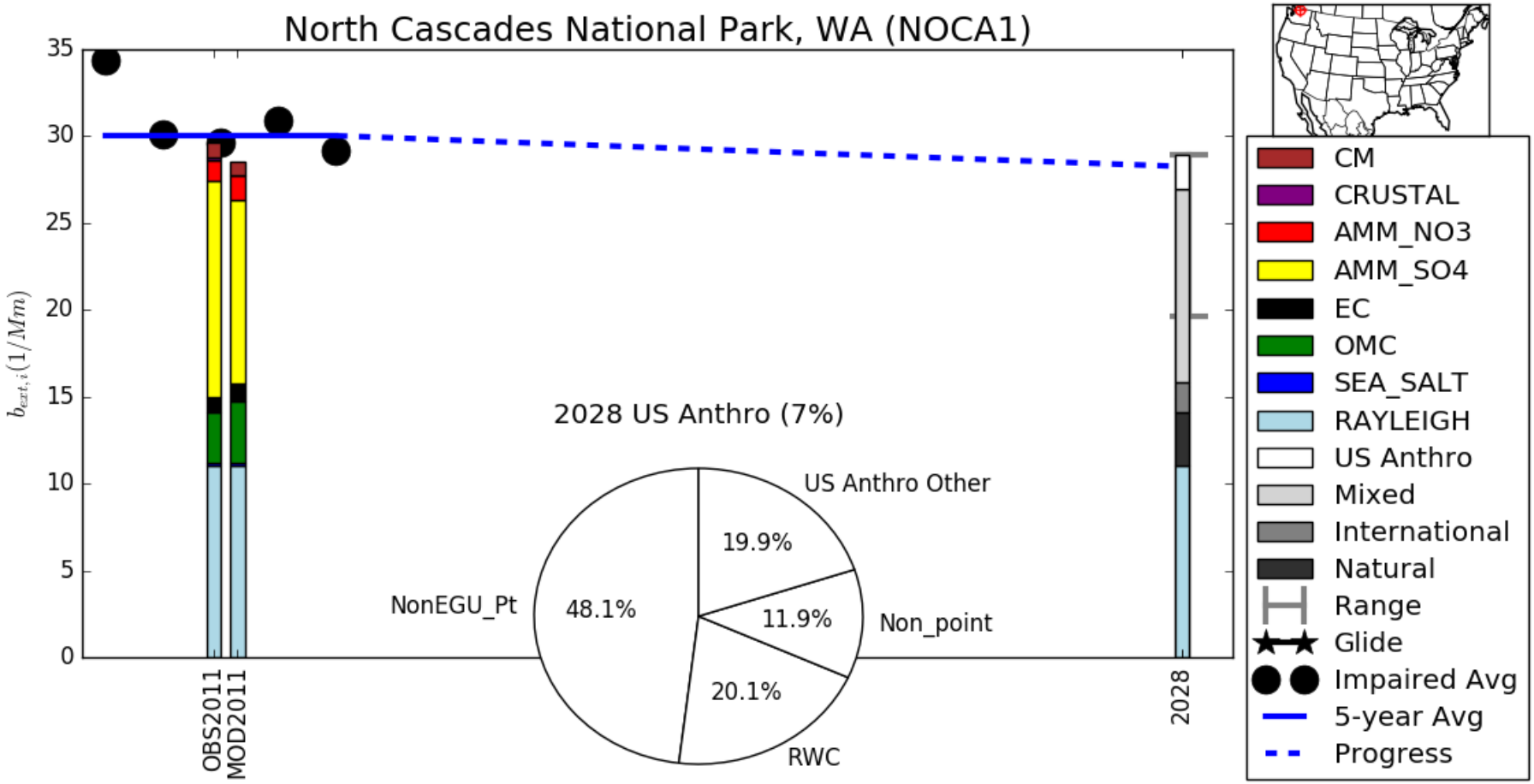


Figure 2: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Glacier Peak Wilderness (WA) and North Cascades National Park (WA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

A glidepath could not be calculated for this site due to incomplete ambient IMPROVE data in the 2000-2004 baseline period.

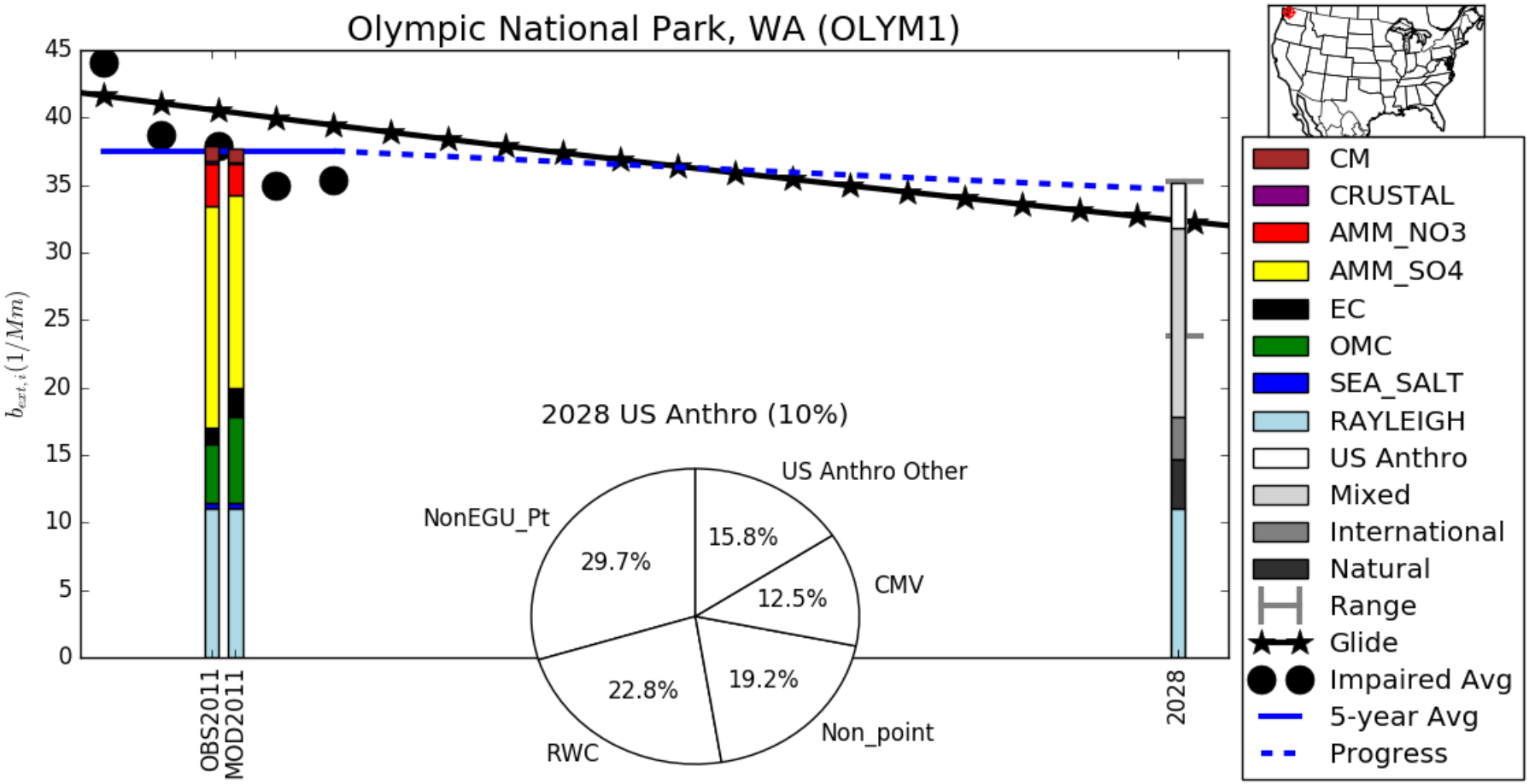


Figure 3: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Olympic National Park (WA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

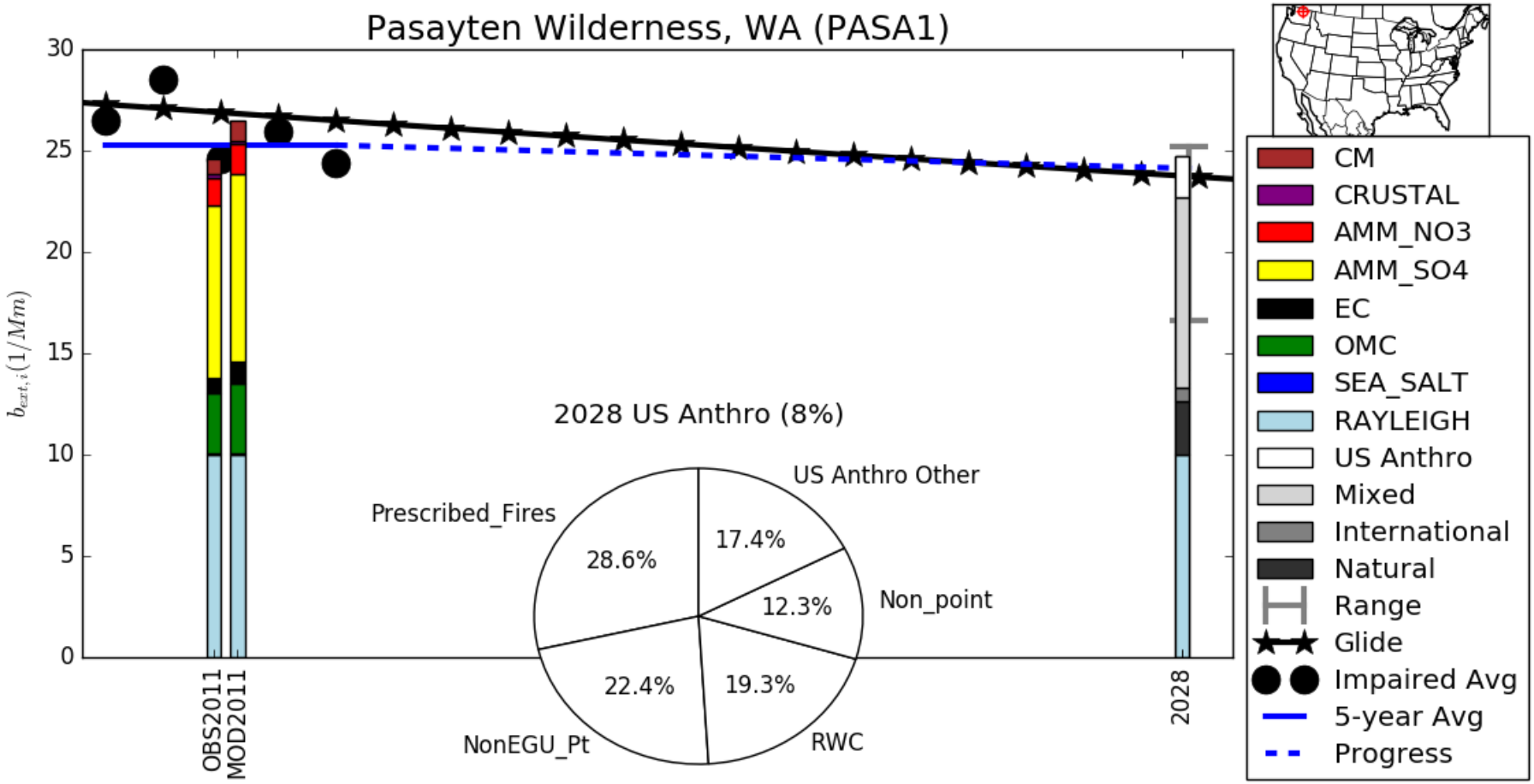


Figure 4: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Pasayten Wilderness (WA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

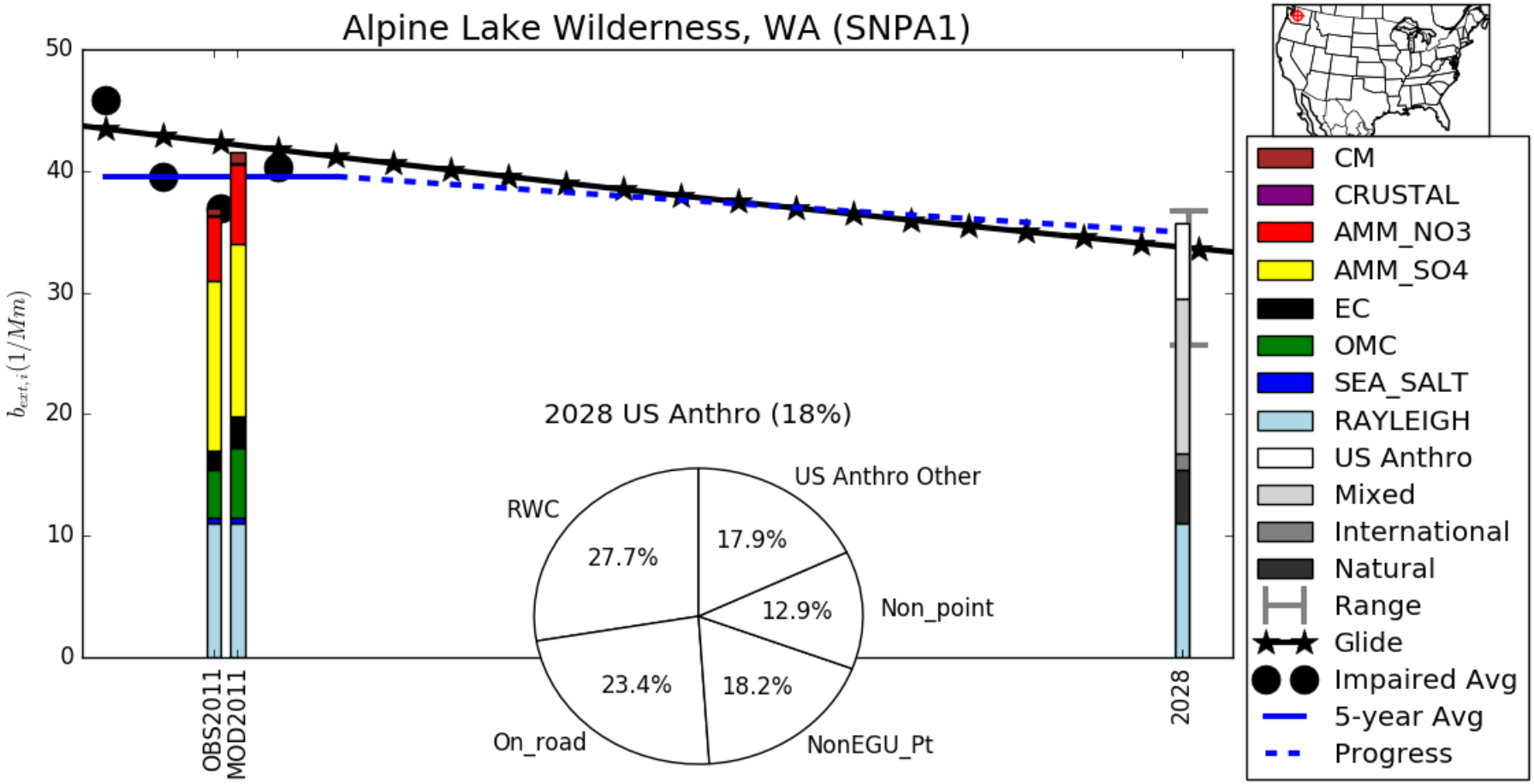


Figure 5: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Alpine Lake Wilderness (WA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

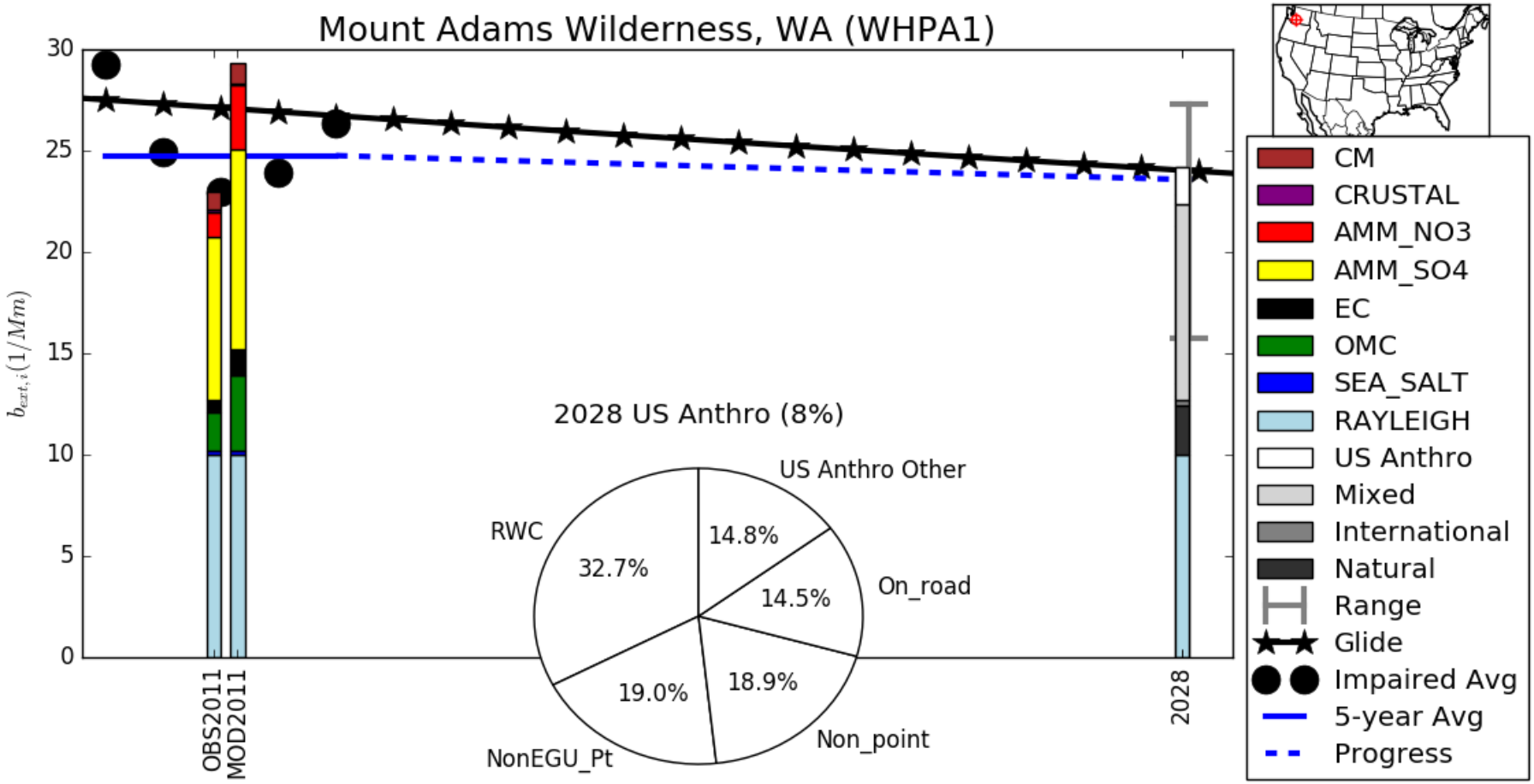


Figure 6: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Goat Rocks Wilderness (WA) and Mount Adams Wilderness (WA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

Oregon and Northern California

- Desolation Wilderness (CA) and Mokelumne Wilderness (CA)(BLIS1)
- Crater Lake National Park (OR), Diamond Peak Wilderness (OR), Gearhart Mountain Wilderness (OR), and Mountain Lakes Wilderness (OR)(CRLA1)
- Kalmiopsis Wilderness (OR)(KALM1)
- Lava Beds National Monument (CA) and South Warner Wilderness (CA)(LABE1)
- Caribou Wilderness (CA), Lassen Volcanic National Park (CA), and Thousand Lakes Wilderness (CA)(LAVO1)
- Mount Hood Wilderness (OR)(MOHO1)
- Redwood National Park (CA)(REDW1)
- Mount Jefferson Wilderness (OR), Mount Washington Wilderness (OR), and Three Sisters Wilderness (OR)(THSI1)
- Marble Mountain Wilderness (CA) and Yolla Bolly Middle Eel Wilderness (CA)(TRIN1)

Regional visibility model performance and contribution summary on the 20% most impaired days

Most important ambient PM species contribution to visibility (on 20% most impaired days)	Sulfate, organic carbon High sea salt at REDW1
Model visibility performance summary (on 20% most impaired days)	Generally good performance, with small biases.
Uncertainty in sector contributions	High “mixed” sector contribution percentage (all sites > 59%).
2028 US anthropogenic percent contribution	5-15%
Largest US anthropogenic sector contributions	Nonpoint, nonEGU point, and Residential wood

Due to uncertainties in the modeling, the 2028 regional haze results should be used with caution. In particular, the modeling results (including the estimated 2028 US anthropogenic contributions) are most uncertain at sites with poor visibility model performance and/or high “mixed” (boundary conditions, fugitive dust, offshore, and secondary organics) contributions.

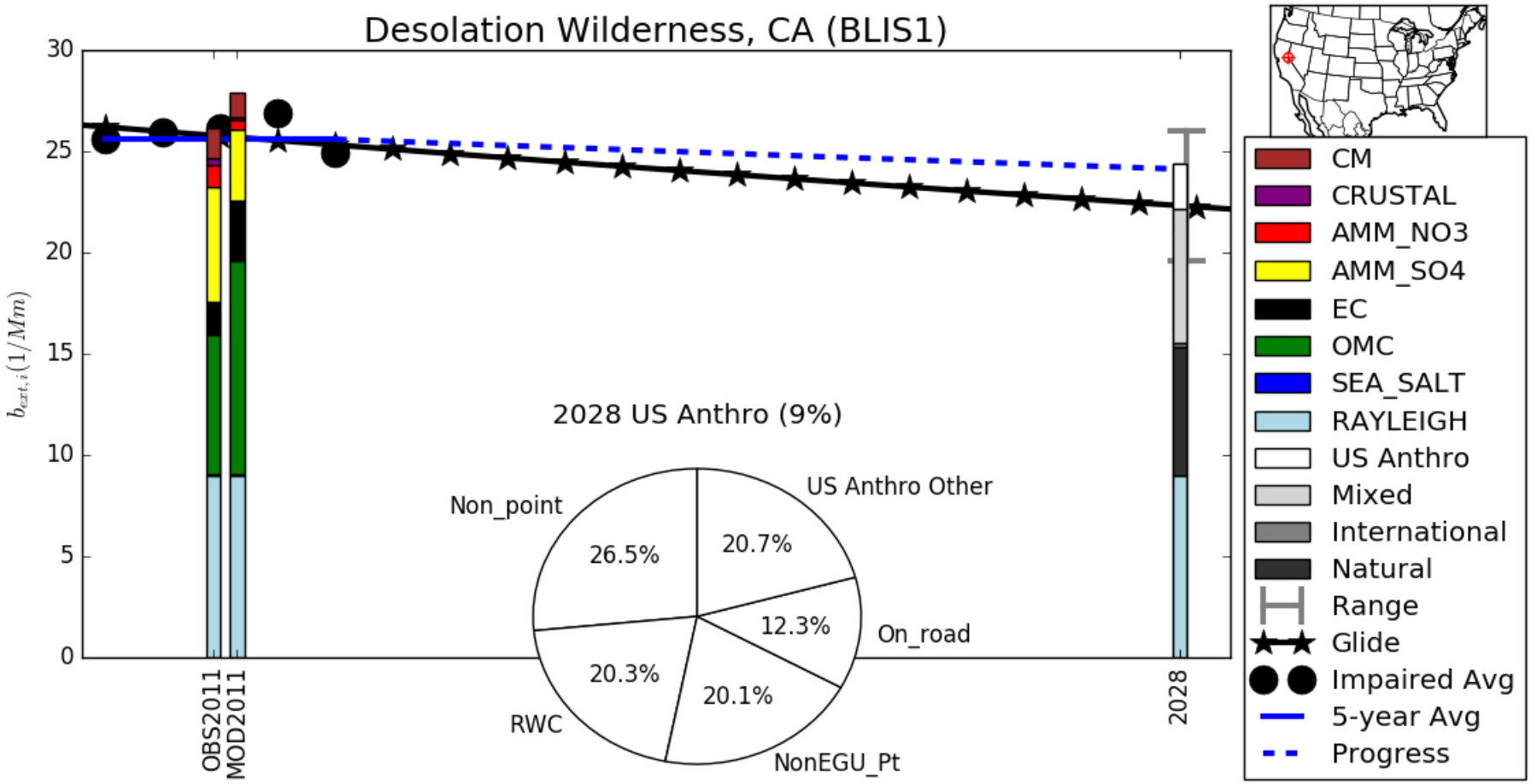


Figure 7: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Desolation Wilderness (CA) and Mokelumne Wilderness (CA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

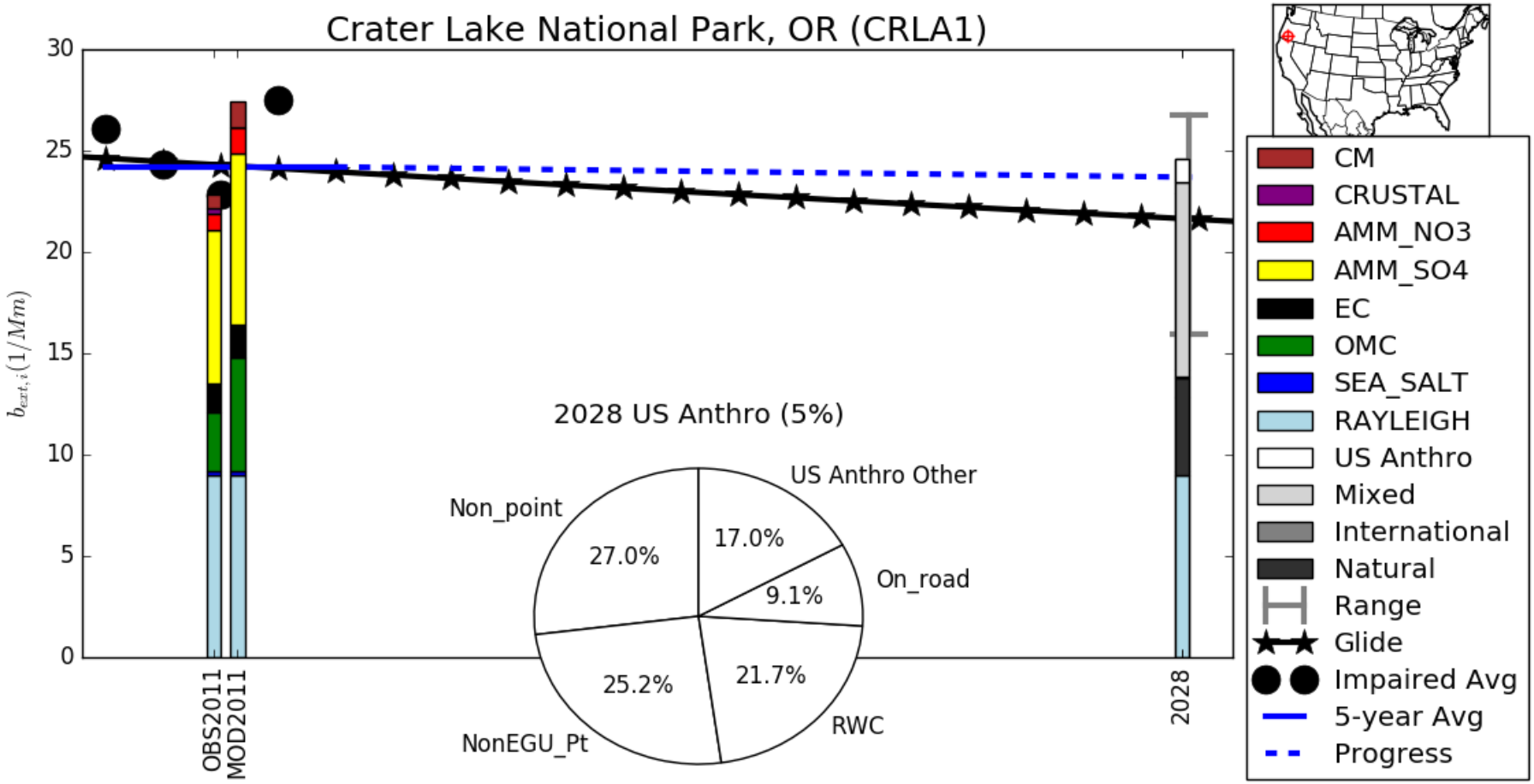


Figure 8: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Crater Lake National Park (OR), Diamond Peak Wilderness (OR), Gearhart Mountain Wilderness (OR), and Mountain Lakes Wilderness (OR).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

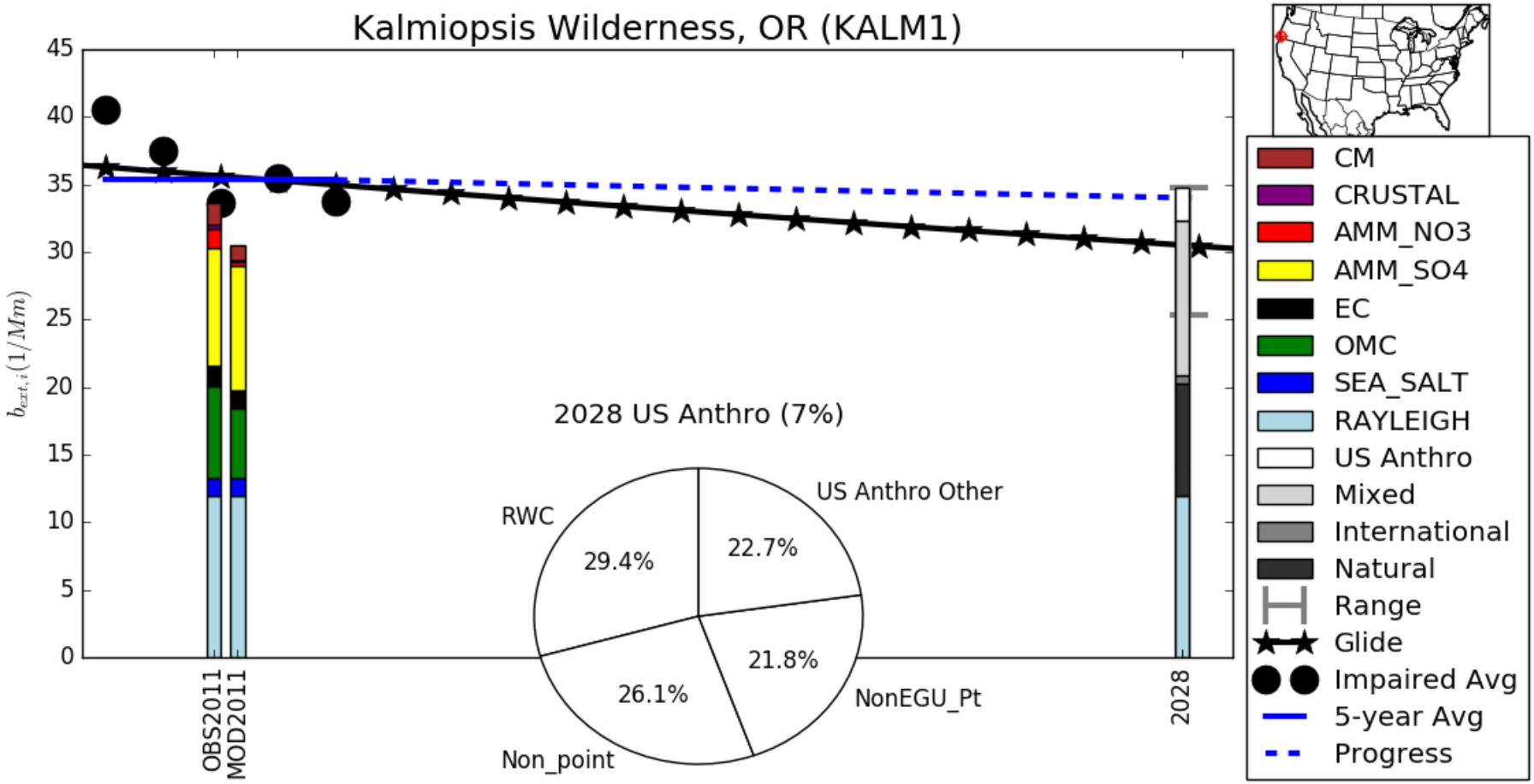


Figure 9: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Kalmiopsis Wilderness (OR).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

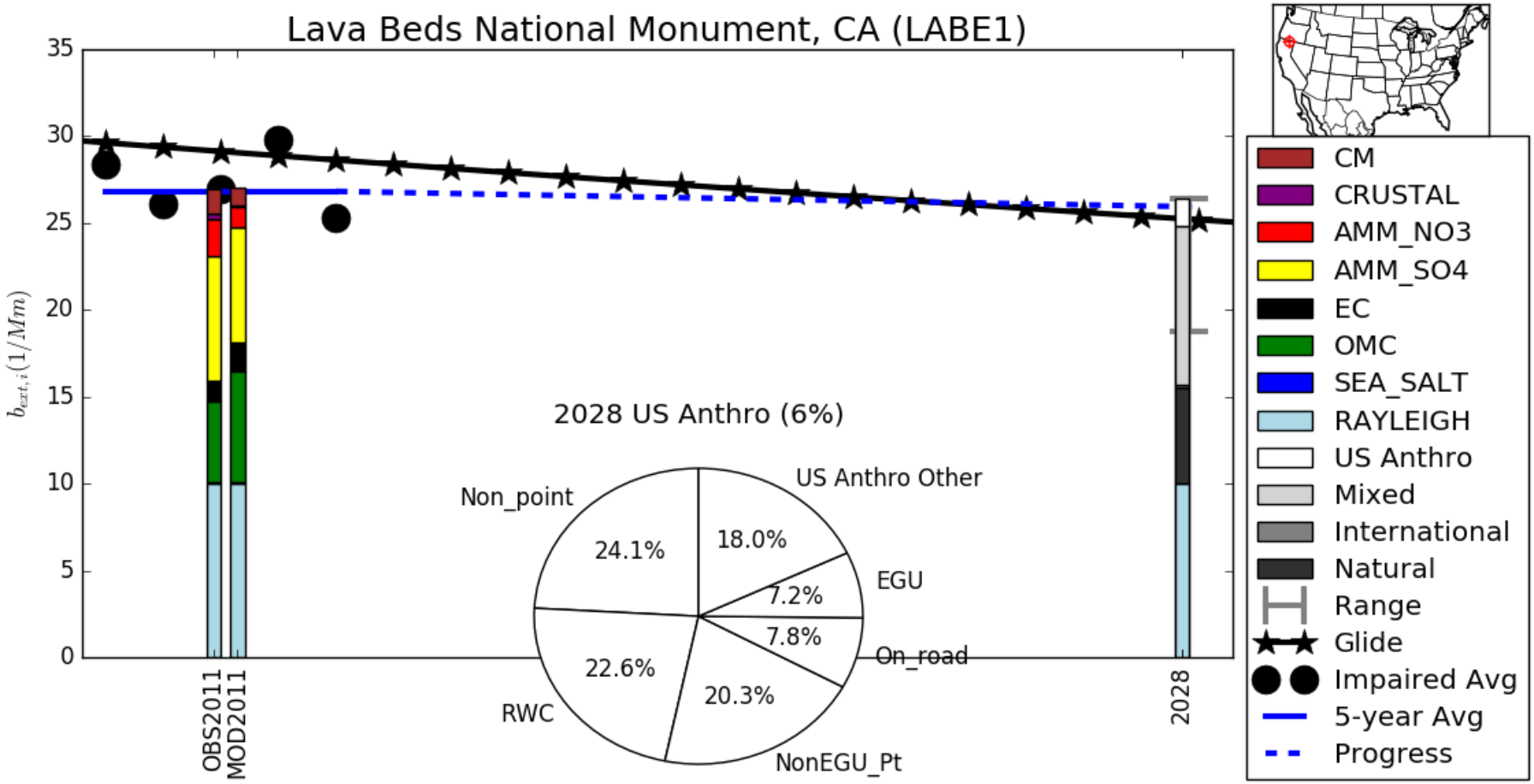


Figure 10: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Lava Beds National Monument (CA) and South Warner Wilderness (CA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

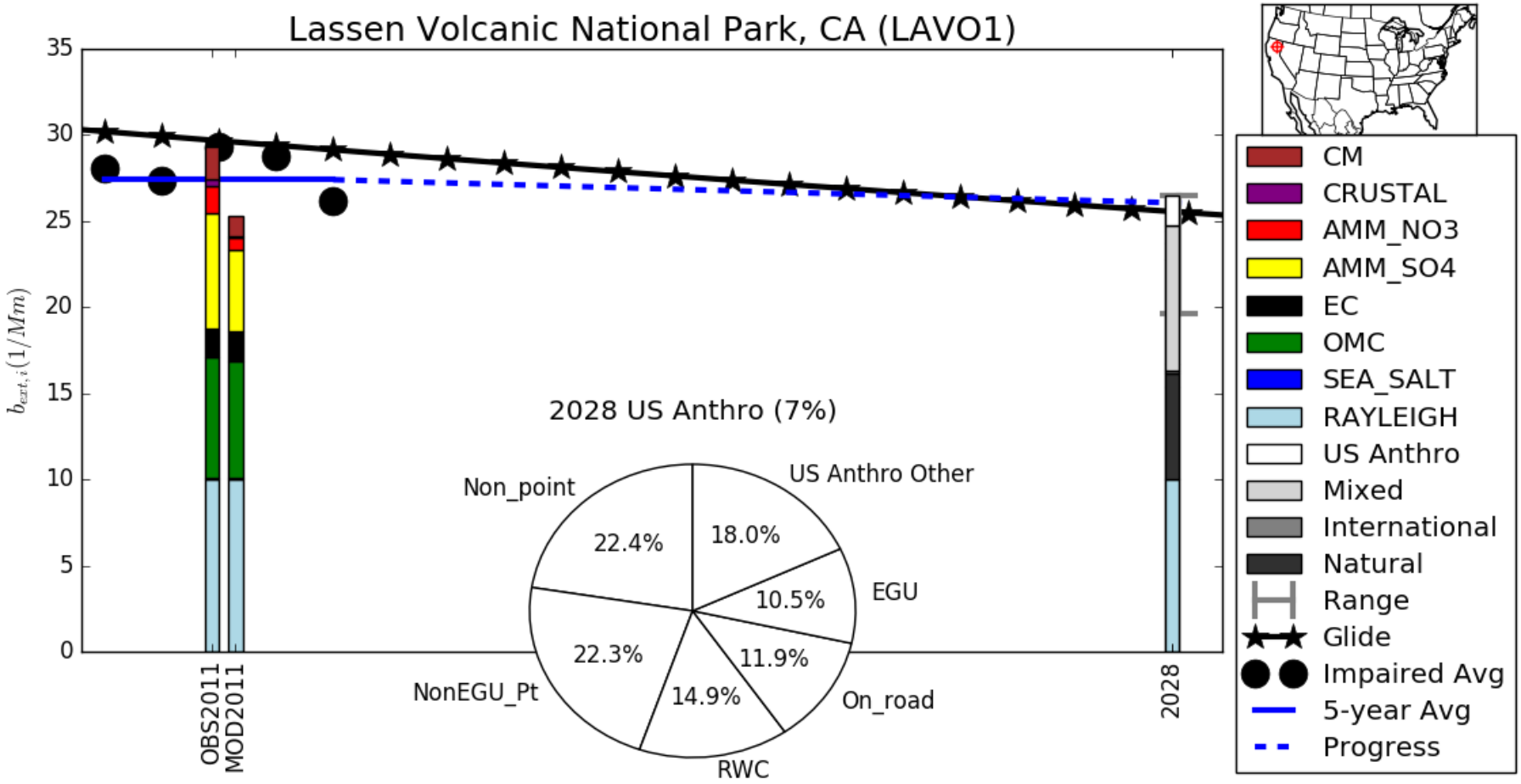


Figure 11: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Caribou Wilderness (CA), Lassen Volcanic National Park (CA), and Thousand Lakes Wilderness (CA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

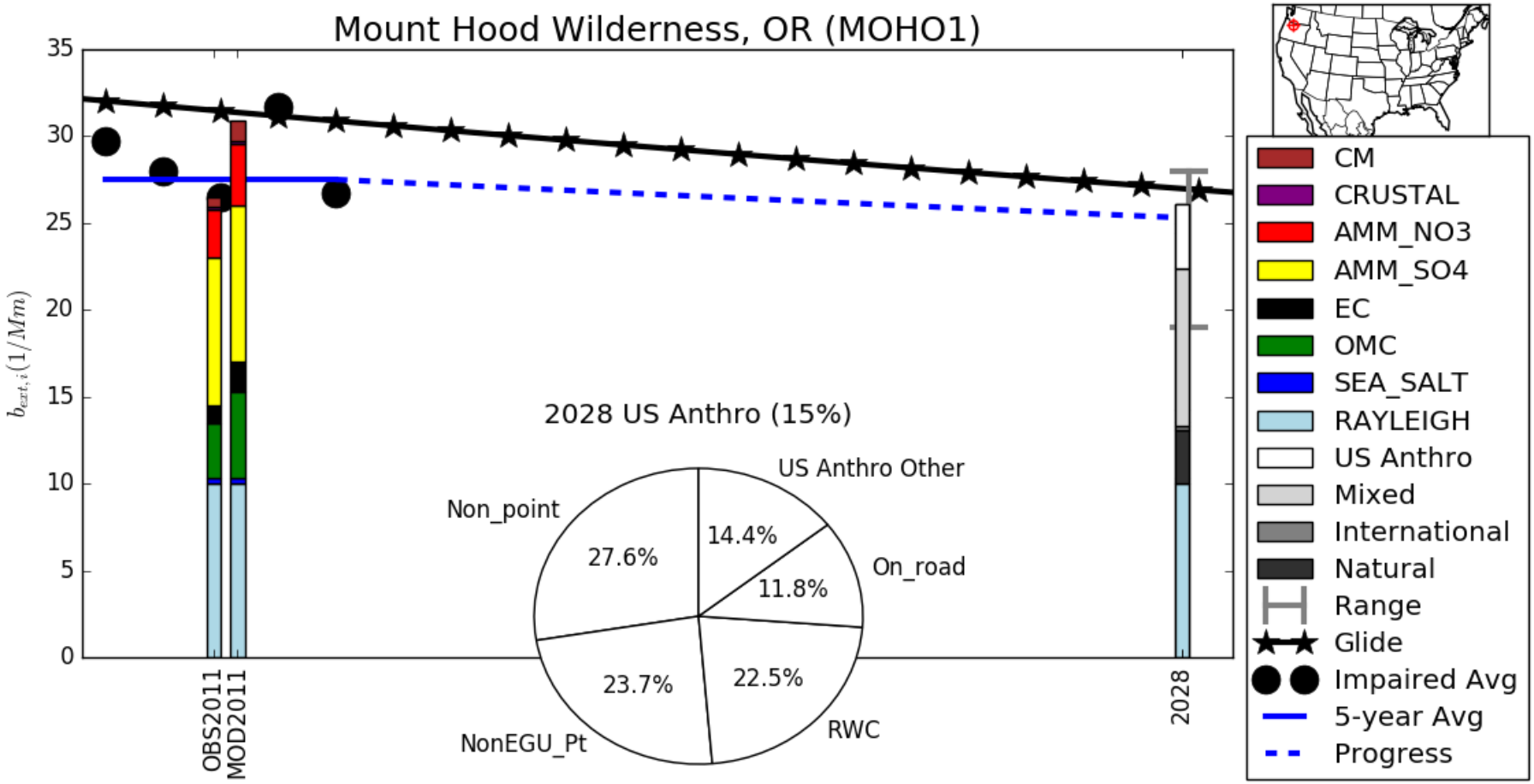


Figure 12: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Mount Hood Wilderness (OR).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

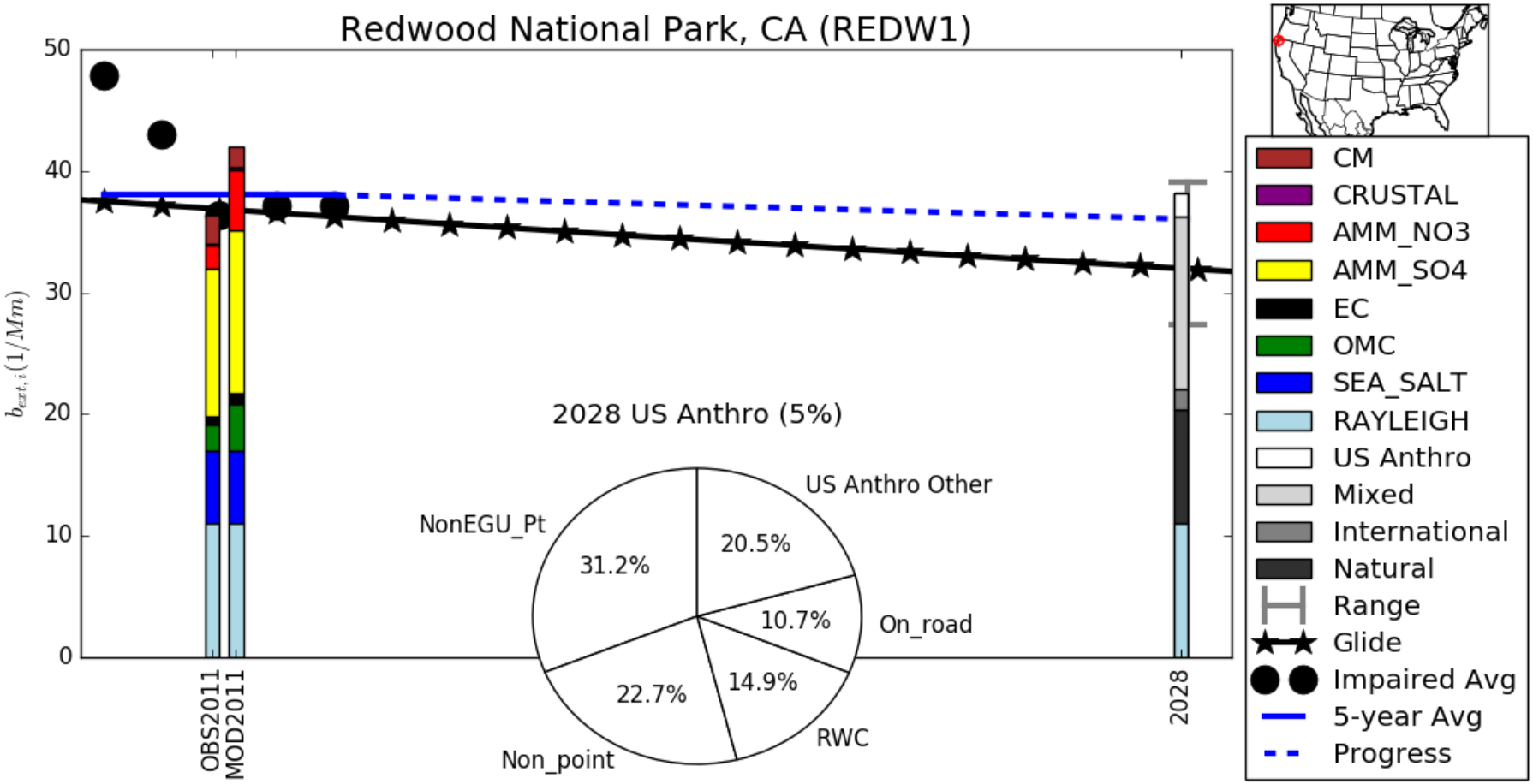


Figure 13: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Redwood National Park (CA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

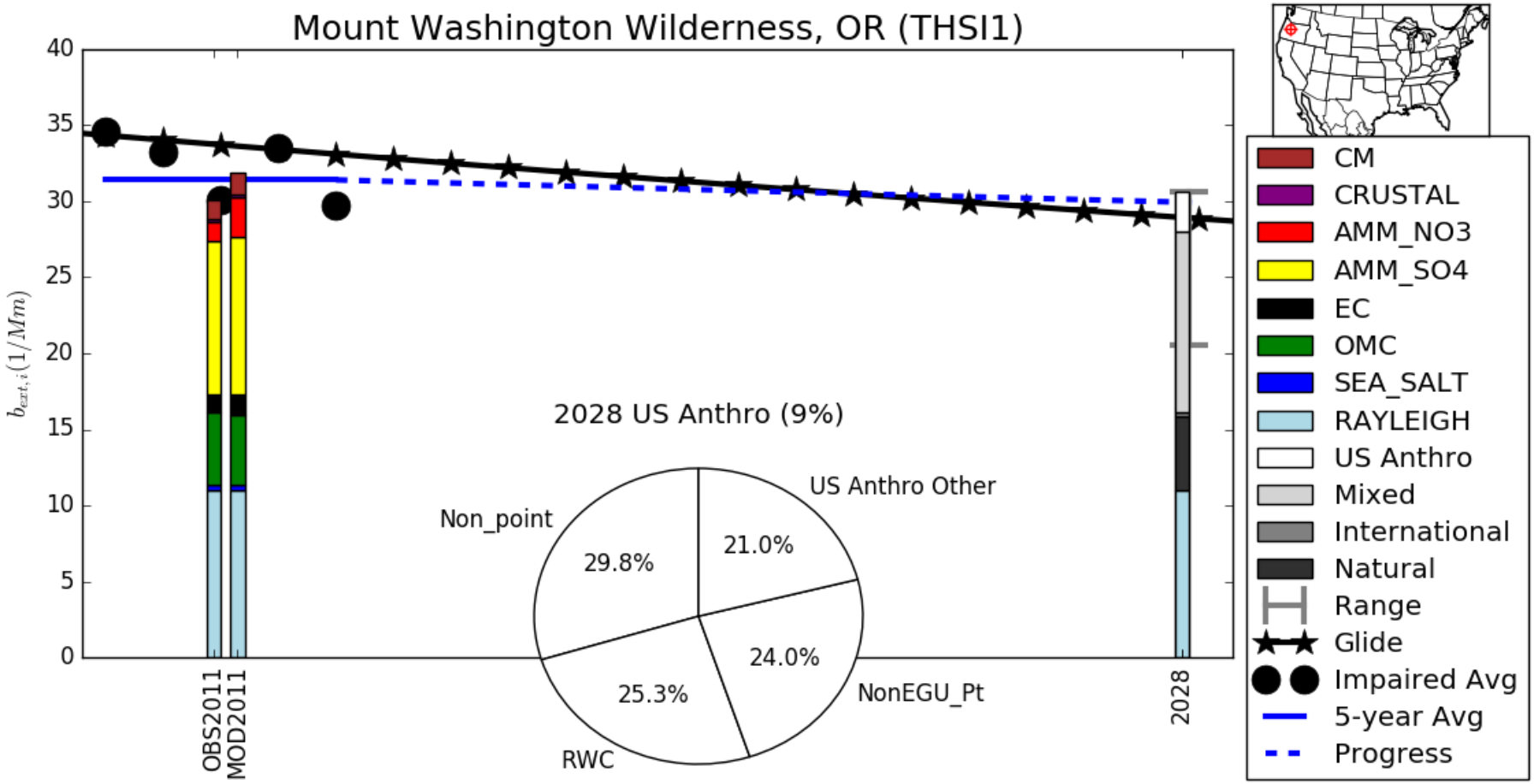


Figure 14: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Mount Jefferson Wilderness (OR), Mount Washington Wilderness (OR), and Three Sisters Wilderness (OR).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

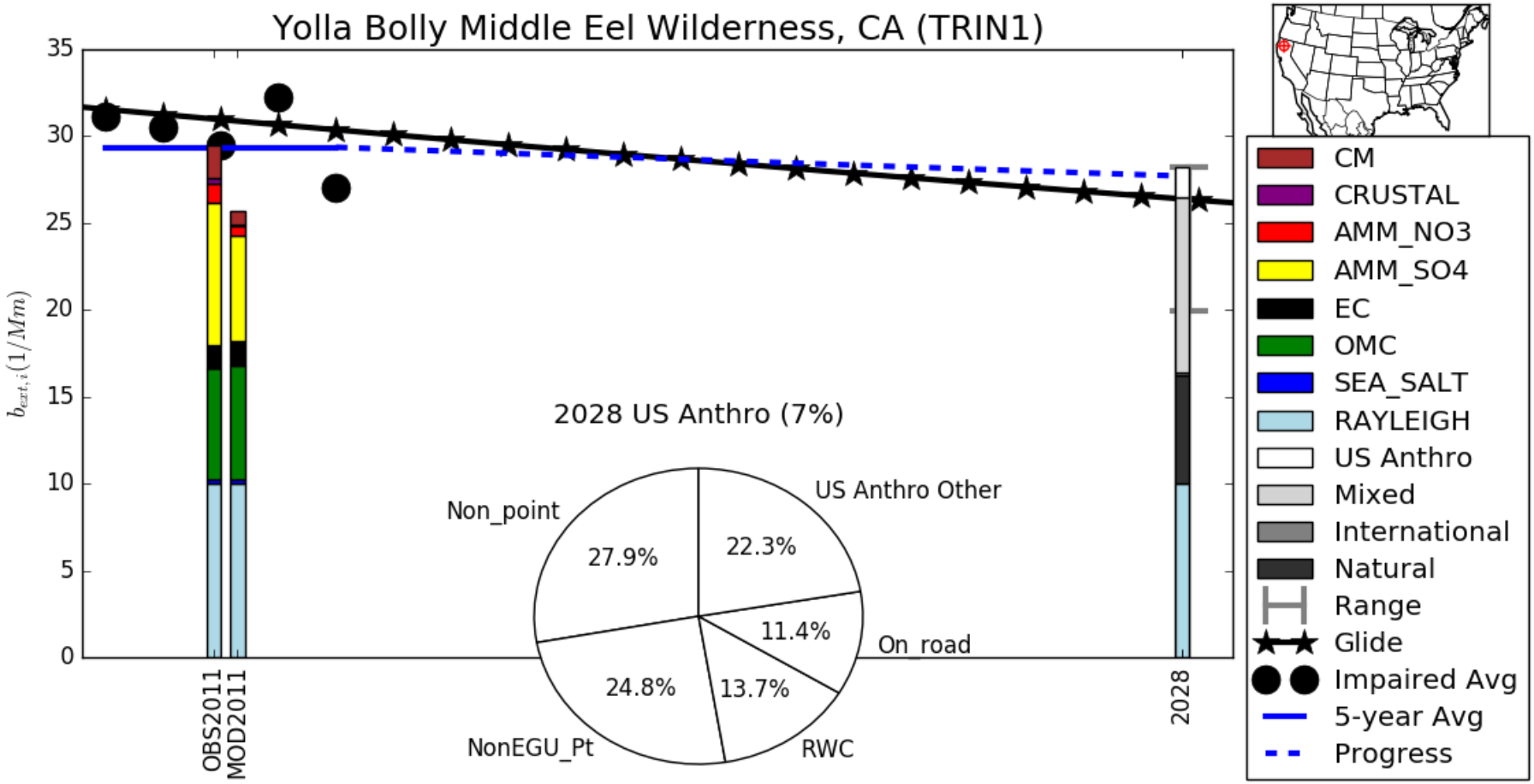


Figure 15: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Marble Mountain Wilderness (CA) and Yolla Bolly Middle Eel Wilderness (CA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

California Coast

- Pinnacles National Monument (CA) and Ventana Wilderness (CA)(PINN1)
- Point Reyes NS (CA)(PORE1)
- San Rafael Wilderness (CA)(RAFA1)

Regional visibility model performance and contribution summary on the 20% most impaired days

Most important ambient PM species contribution to visibility (on 20% most impaired days)	Sulfate, nitrate, relatively high sea salt
Model visibility performance summary (on 20% most impaired days)	Sulfate underpredicted at PINN1 and RAFA1, nitrate underpredicted at PORE1 and RAFA1, coarse mass underpredicted at RAFA
Uncertainty in sector contributions	High "mixed" sector contribution percentage (49%-67%).
2028 US anthropogenic percent contribution	14-28%
Largest US anthropogenic sector contributions	Nonpoint, nonEGU point, On-road, and Residential wood

Due to uncertainties in the modeling, the 2028 regional haze results should be used with caution. In particular, the modeling results (including the estimated 2028 US anthropogenic contributions) are most uncertain at sites with poor visibility model performance and/or high "mixed" (boundary conditions, fugitive dust, offshore, and secondary organics) contributions.

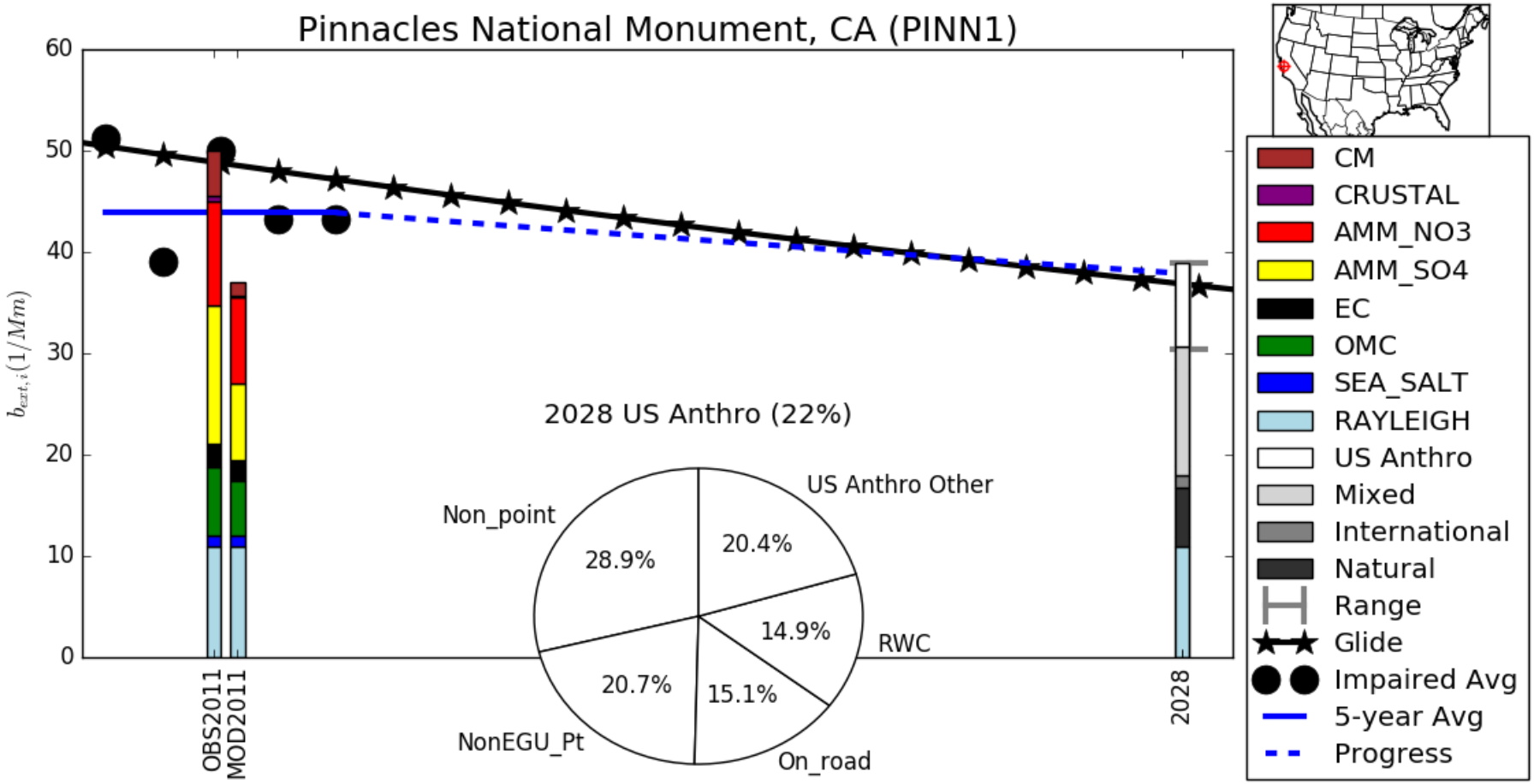


Figure 16: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Pinnacles National Monument (CA) and Ventana Wilderness (CA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

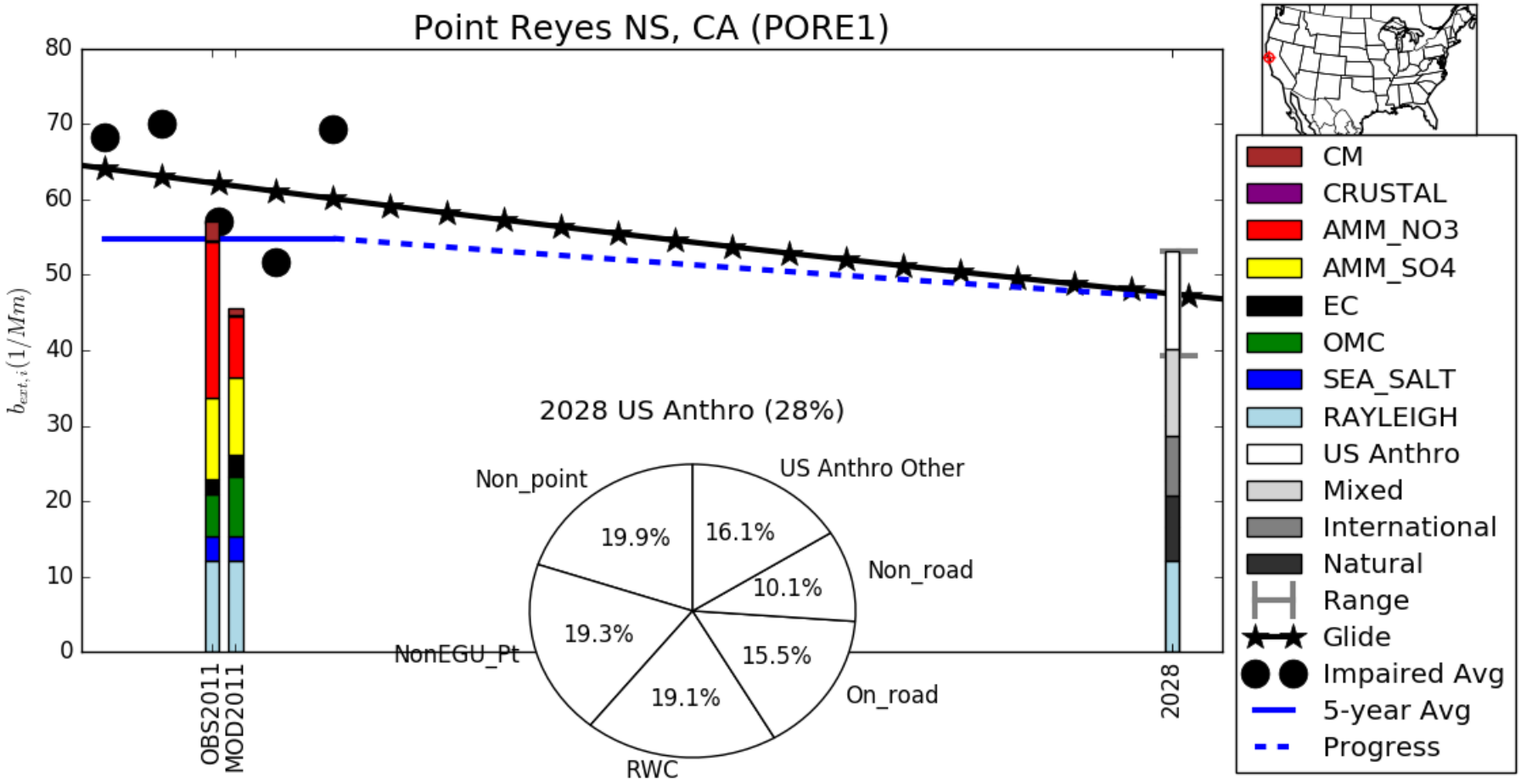


Figure 17: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Point Reyes NS (CA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

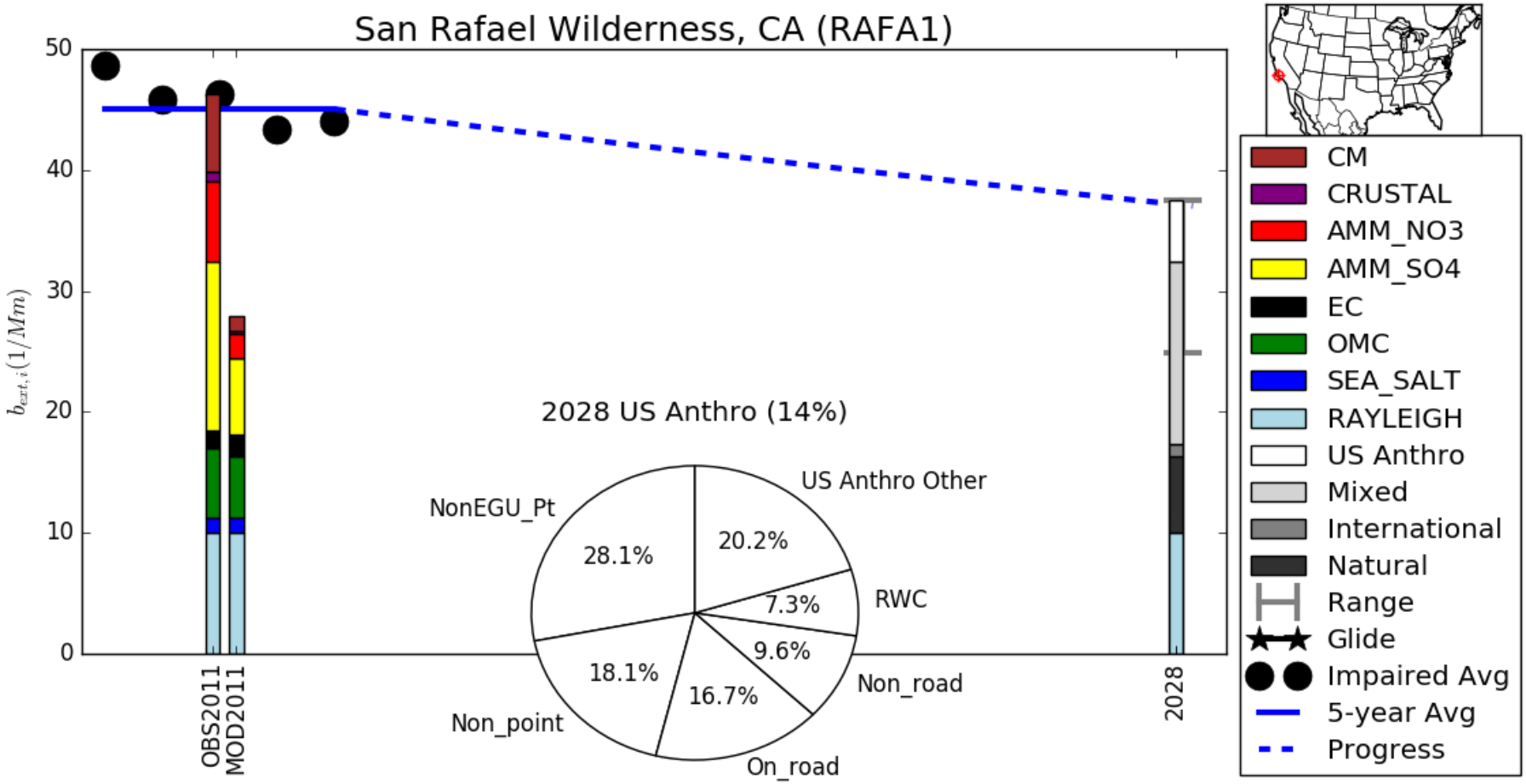


Figure 18: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at San Rafael Wilderness (CA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

A glidepath could not be calculated for this site due to incomplete ambient IMPROVE data in the 2000-2004 baseline period.

Sierra Nevada

- Dome Land Wilderness (CA)(DOME1)
- Hoover Wilderness (CA)(HOOV1)
- Ansel Adams Wilderness (Minarets) (CA), John Muir Wilderness (CA), and Kaiser Wilderness (CA)(KAIS1)
- Kings Canyon National Park (CA) and Sequoia National Park (CA)(SEQU1)

Emigrant Wilderness (CA) and Yosemite National Park (CA)(YOSE1)

Regional visibility model performance and contribution summary on the 20% most impaired days

Most important ambient PM species contribution to visibility (on 20% most impaired days)	Sulfate, nitrate
Model visibility performance summary (on 20% most impaired days)	Very large sulfate and nitrate underpredictions, except at HOOV1 SEQU1 is the worst performing site in the country (especially large underprediction of nitrate)
Uncertainty in sector contributions	High “mixed” sector contribution percentage (49%-67%).
2028 US anthropogenic percent contribution	10-26%
Largest US anthropogenic sector contributions	Nonpoint, nonEGU point, On-road, and Residential wood

Due to uncertainties in the modeling, the 2028 regional haze results should be used with caution. In particular, the modeling results (including the estimated 2028 US anthropogenic contributions) are most uncertain at sites with poor visibility model performance and/or high “mixed” (boundary conditions, fugitive dust, offshore, and secondary organics) contributions.

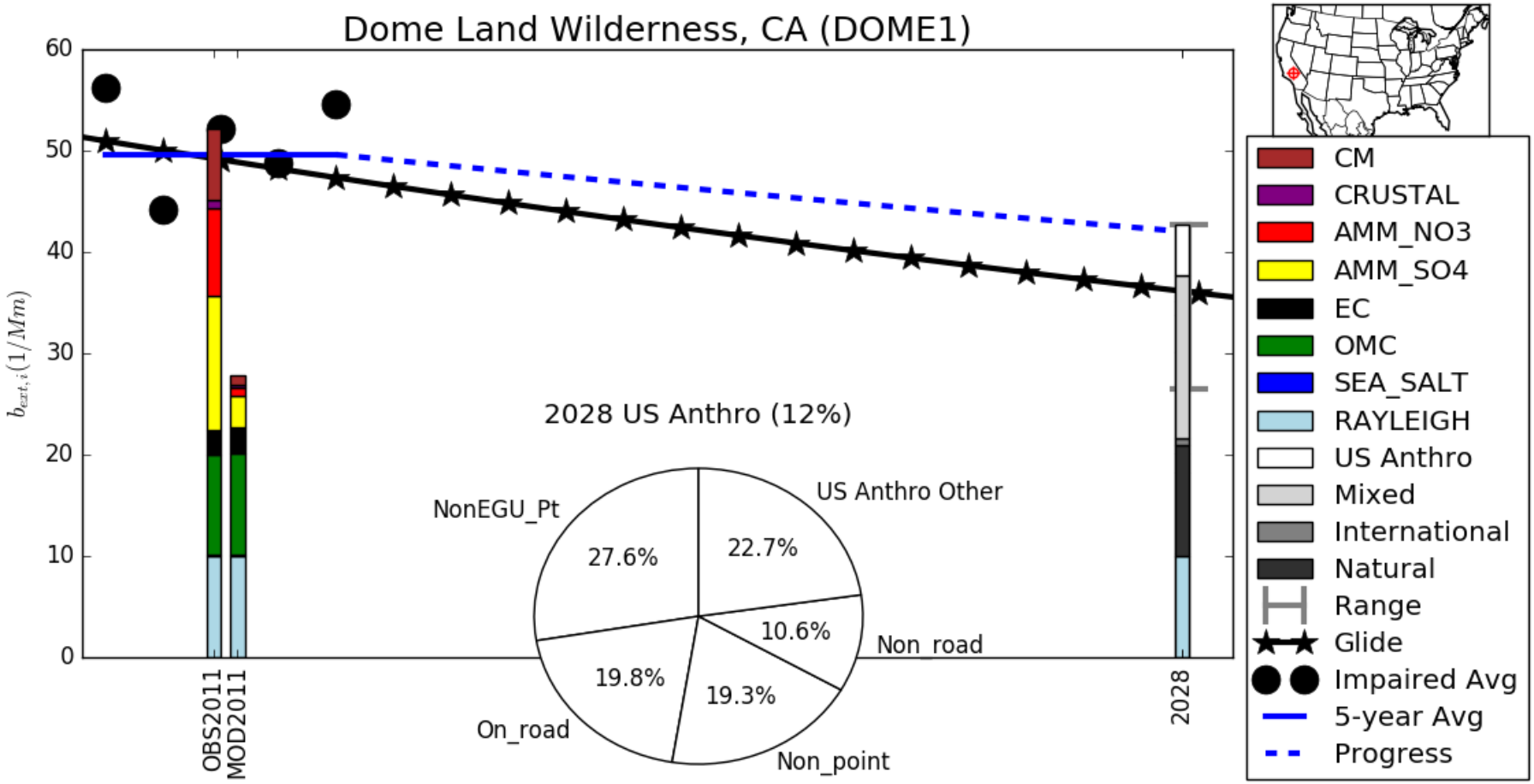


Figure 19: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Dome Land Wilderness (CA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

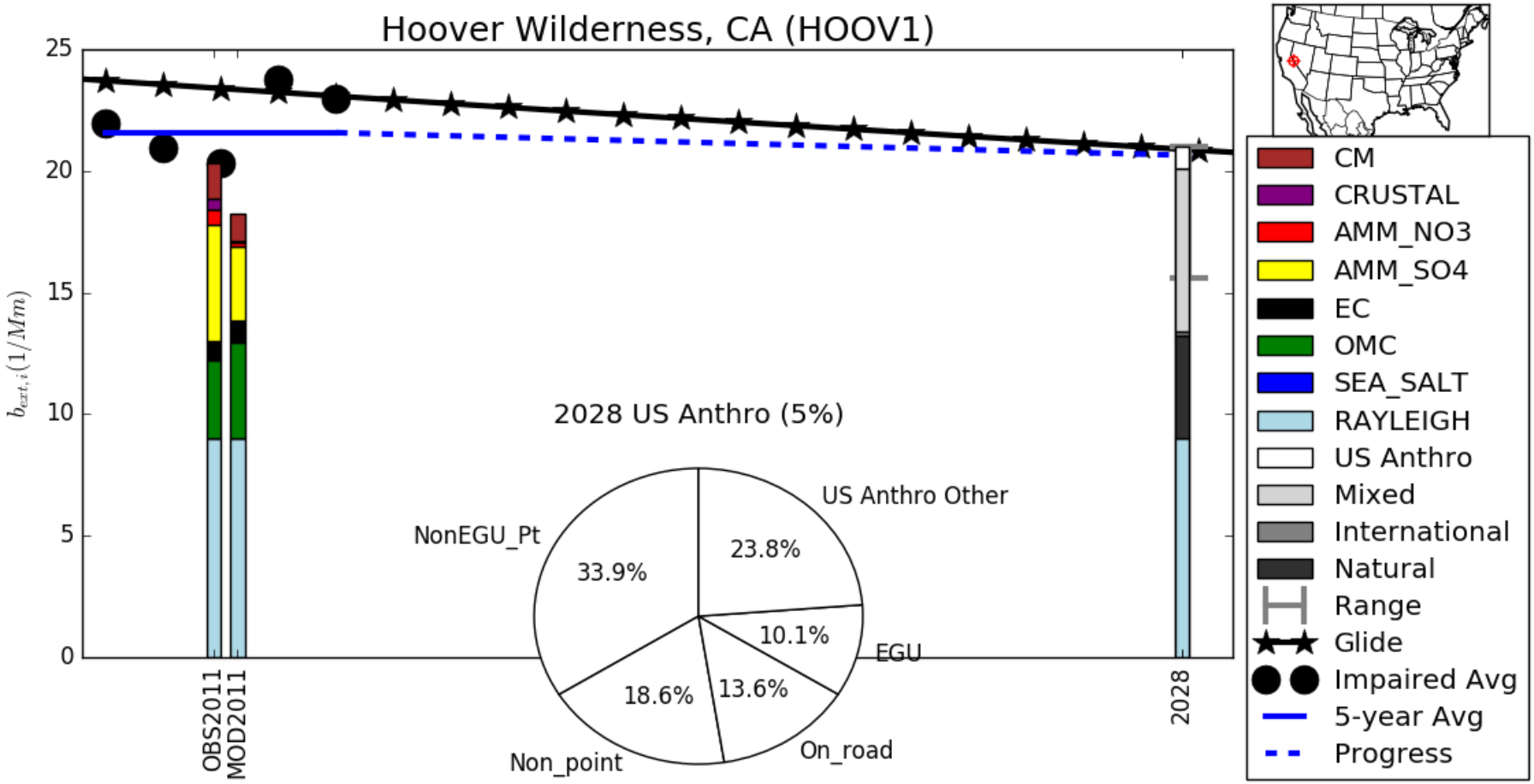


Figure 20: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Hoover Wilderness (CA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

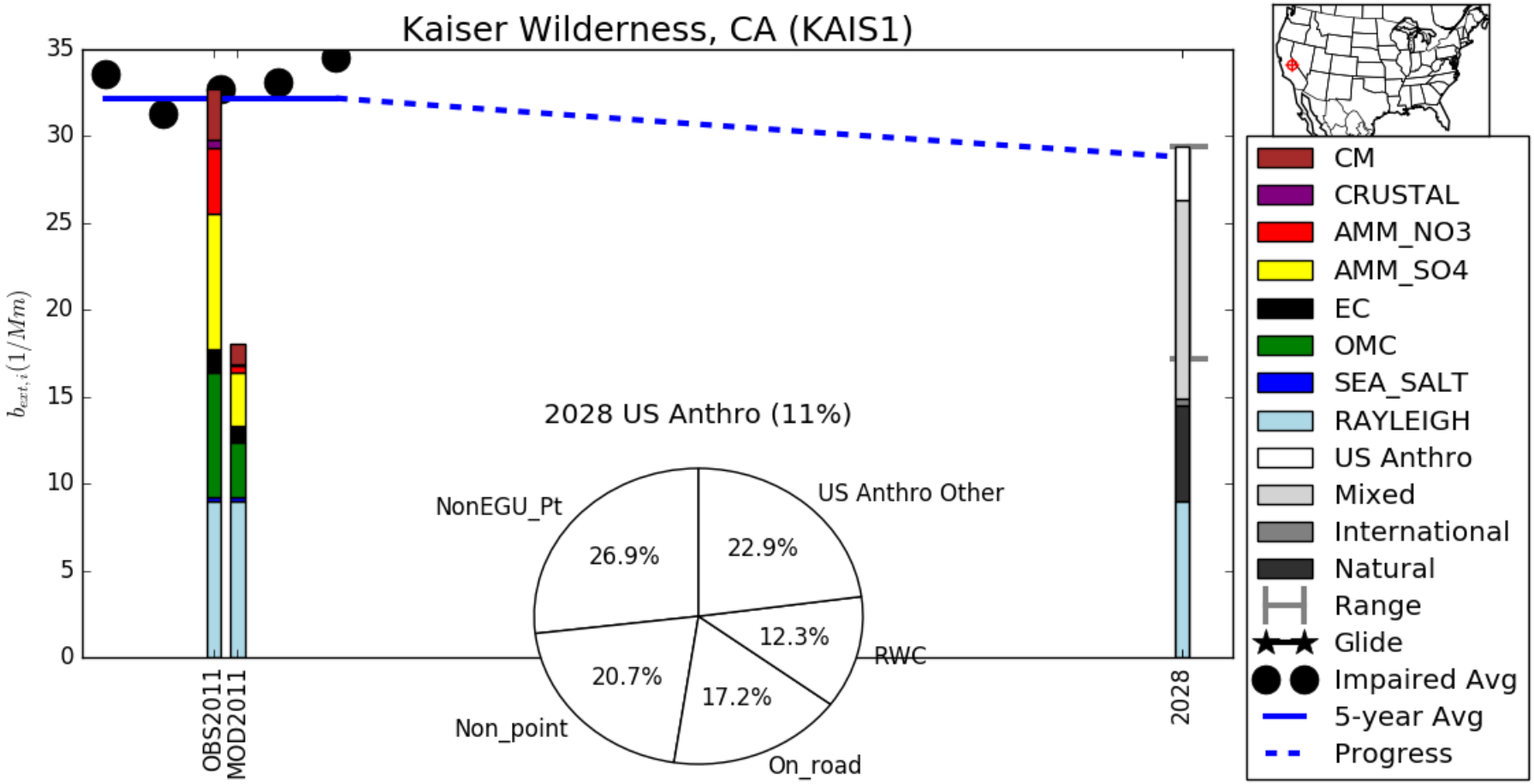


Figure 21: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Ansel Adams Wilderness (Minarets) (CA), John Muir Wilderness (CA), and Kaiser Wilderness (CA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

A glidepath could not be calculated for this site due to incomplete ambient IMPROVE data in the 2000-2004 baseline period.

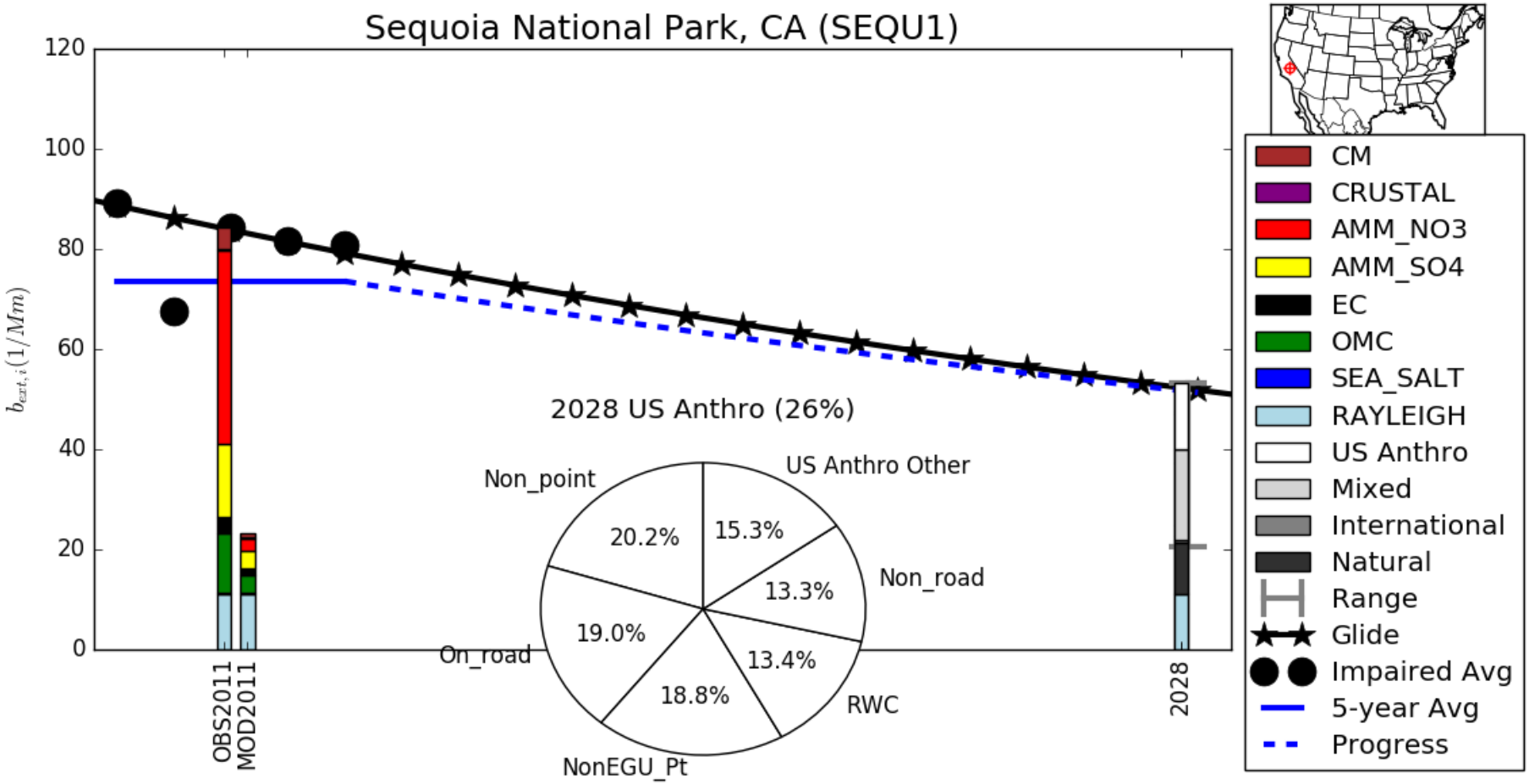


Figure 22: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Kings Canyon National Park (CA) and Sequoia National Park (CA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

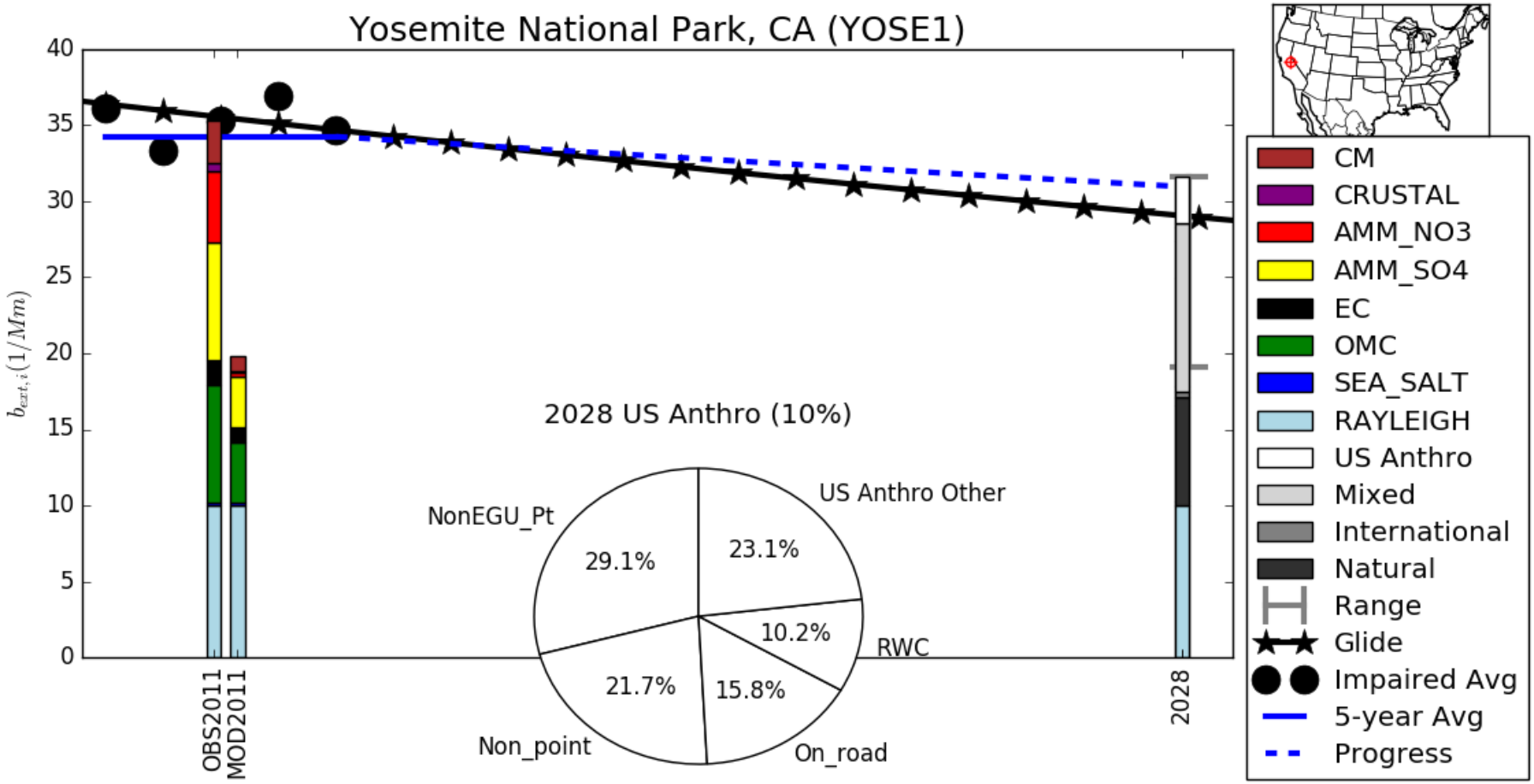


Figure 23: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Emigrant Wilderness (CA) and Yosemite National Park (CA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

Southern California

- Agua Tibia Wilderness (CA)(AGTI1)
- Joshua Tree National Monument (CA)(JOSH1)
- Cucamonga Wilderness (CA) and San Gabriel Wilderness (CA)(SAGA1)
- San Gorgonio Wilderness (CA) and San Jacinto Wilderness (CA)(SAGO1)

Regional visibility model performance and contribution summary on the 20% most impaired days

Most important ambient PM species contribution to visibility (on 20% most impaired days)	Sulfate, nitrate
Model visibility performance summary (on 20% most impaired days)	Large nitrate underpredictions, except at SAGA1 Sulfate underpredicted at AGTI1
Uncertainty in sector contributions	Relatively high "mixed" sector contribution percentage (44%-59%).
2028 US anthropogenic percent contribution	20-37%
Largest US anthropogenic sector contributions	Nonpoint, nonEGU point, On-road, and Non-road

Due to uncertainties in the modeling, the 2028 regional haze results should be used with caution. In particular, the modeling results (including the estimated 2028 US anthropogenic contributions) are most uncertain at sites with poor visibility model performance and/or high "mixed" (boundary conditions, fugitive dust, offshore, and secondary organics) contributions.

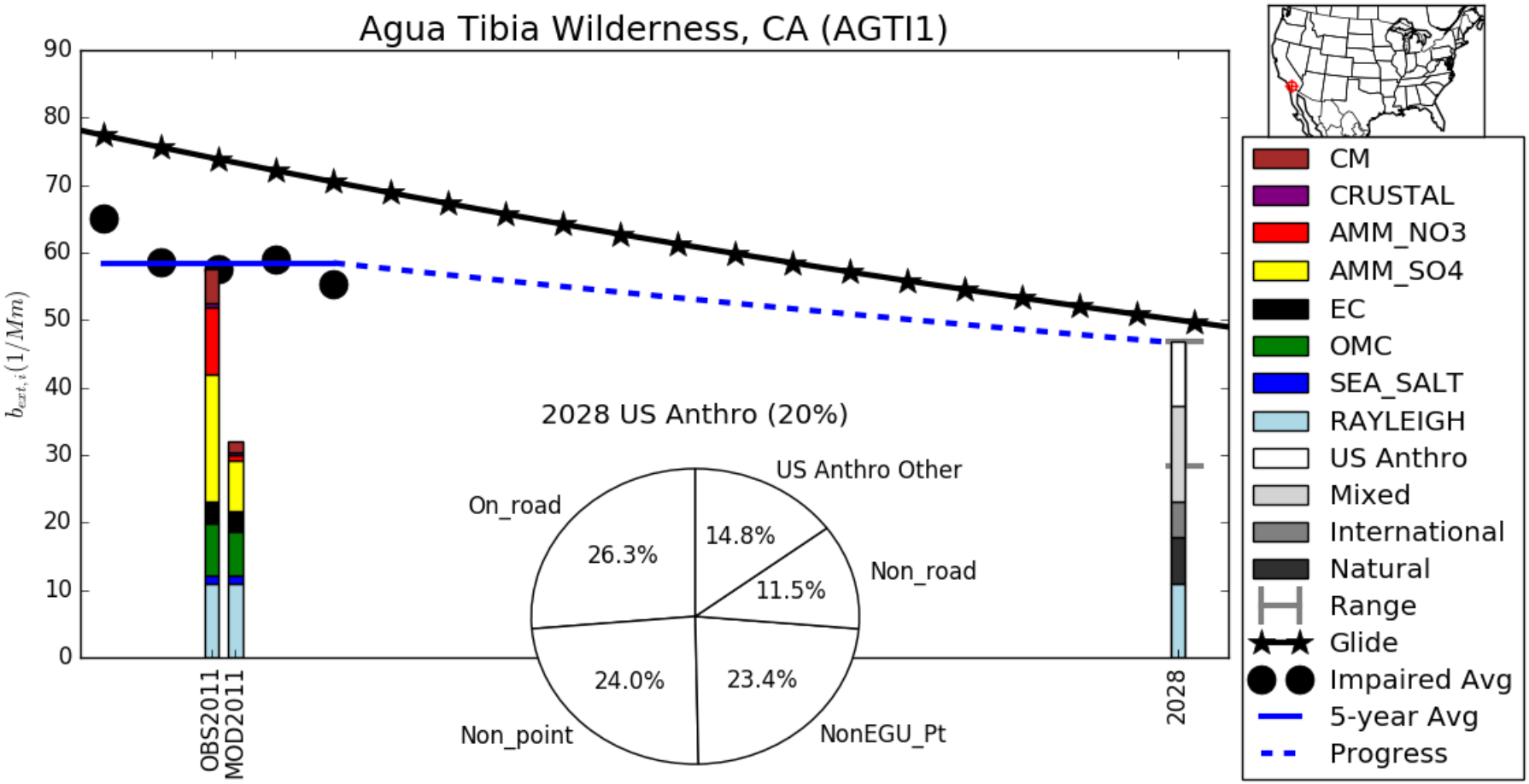


Figure 24: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Agua Tibia Wilderness (CA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

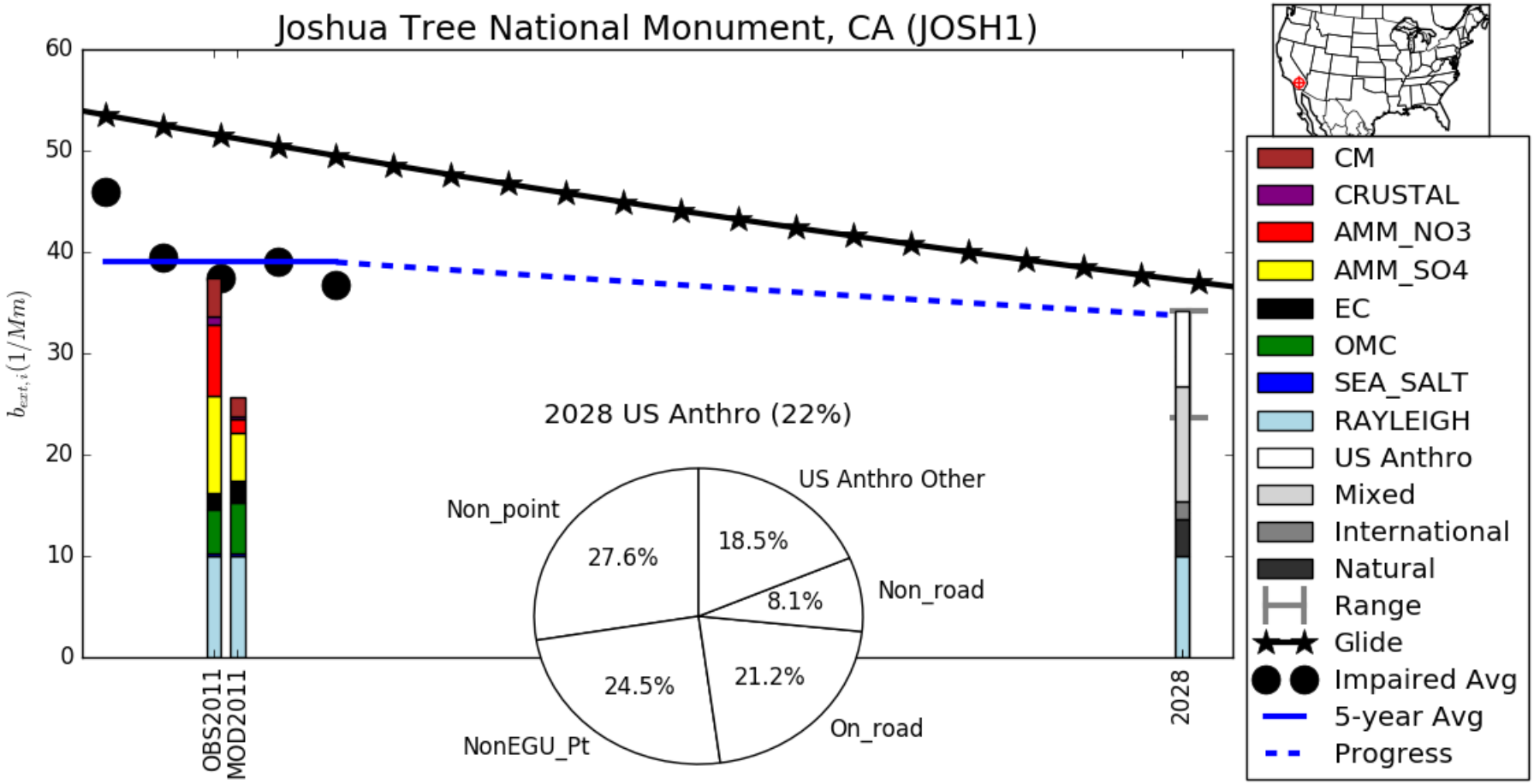


Figure 25: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Joshua Tree National Monument (CA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

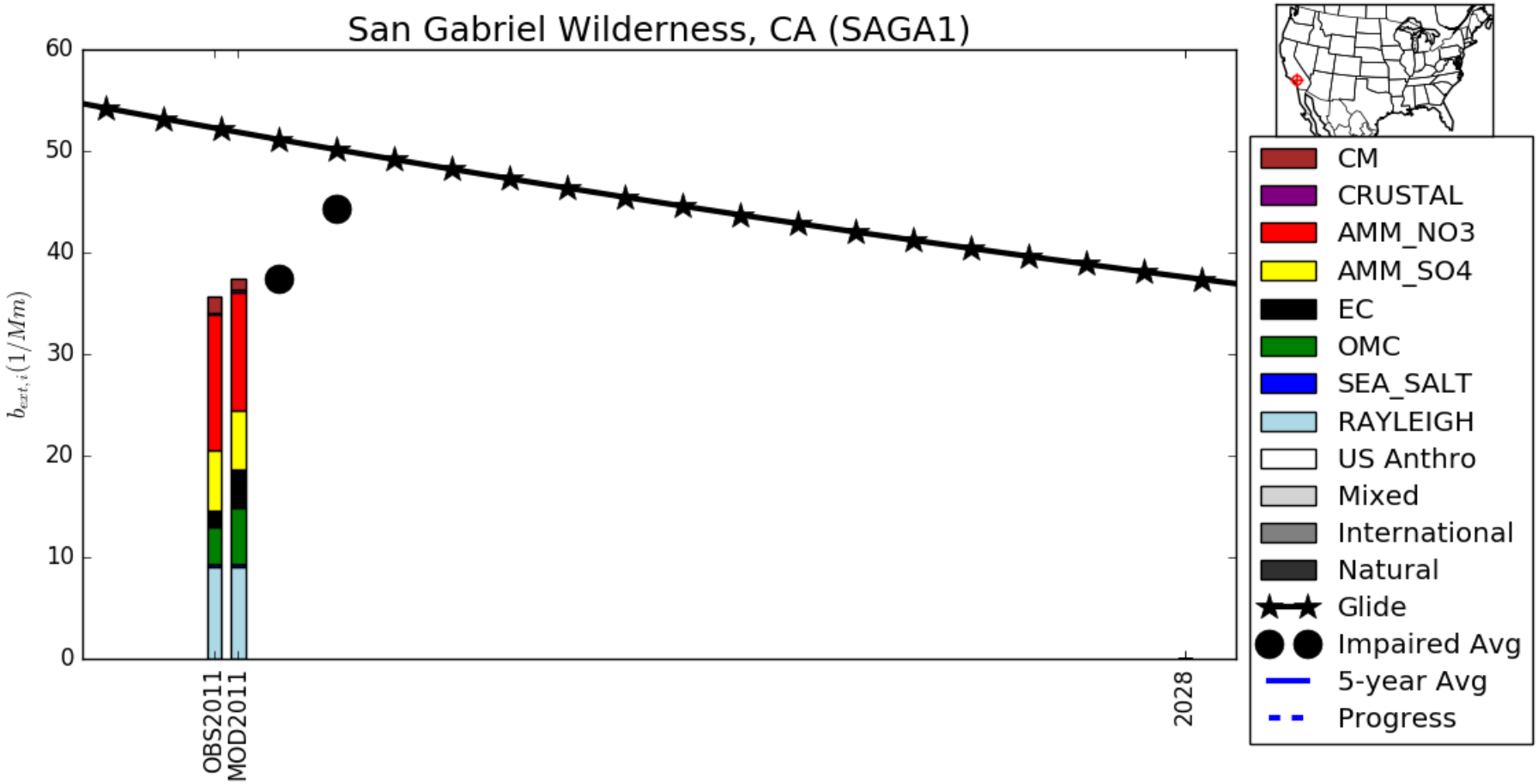


Figure 26: 2011 IMPROVE observations and 2011 CAMx model predictions at Cucamonga Wilderness (CA) and San Gabriel Wilderness (CA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

A 2028 visibility projection could not be calculated for this site due to incomplete ambient IMPROVE data in 2011.

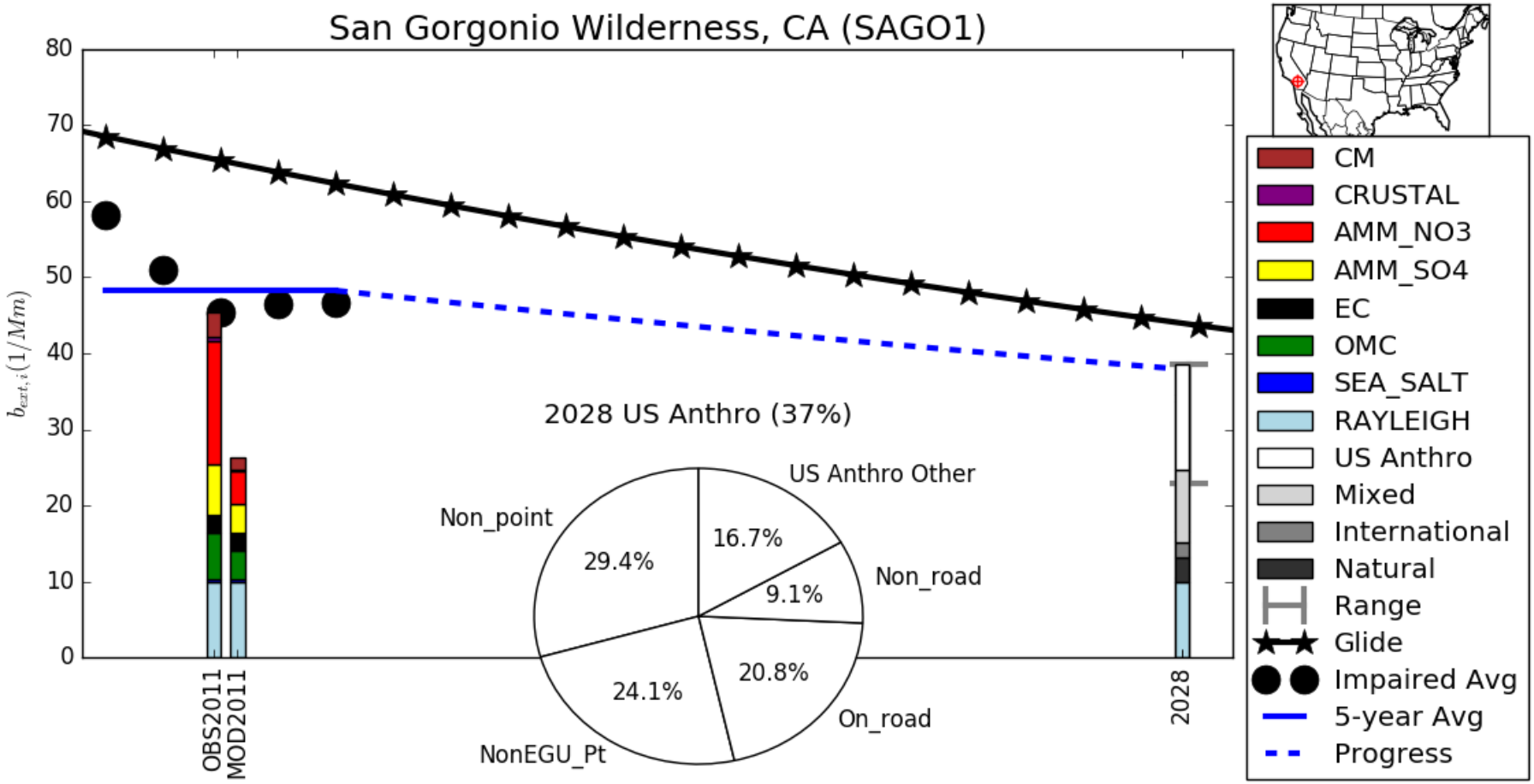


Figure 27: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at San Gorgonio Wilderness (CA) and San Jacinto Wilderness (CA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

Northern Rocky Mountains

- Bridger Wilderness (WY) and Fitzpatrick Wilderness (WY)(BRID1)
- Cabinet Mountains Wilderness (MT)(CABI1)
- Gates of the Mountains Wilderness (MT)(GAMO1)
- Glacier National Park (MT)(GLAC1)
- Bob Marshall Wilderness (MT), Mission Mountains Wilderness (MT), and Scapegoat Wilderness (MT)(MONT1)
- North Absaroka Wilderness (WY) and Washakie Wilderness (WY)(NOAB1)
- Anaconda-Pintler Wilderness (MT) and Selway-Bitterroot Wilderness (MT)(SULA1)
- Grand Teton National Park (WY), Red Rock Lakes (WY), Teton Wilderness (WY), and Yellowstone National Park (WY)(YELL2)

Regional visibility model performance and contribution summary on the 20% most impaired days

Most important ambient PM species contribution to visibility (on 20% most impaired days)	Sulfate, organic carbon, nitrate
Model visibility performance summary (on 20% most impaired days)	Performance generally good Large nitrate underprediction at YELL2
Uncertainty in sector contributions	High “mixed” sector contribution percentage (>60% at all sites except MONT1 [52%]).
2028 US anthropogenic percent contribution	4-10%
Largest US anthropogenic sector contributions	Residential wood, Nonpoint, nonEGU point, On-road (at YELL2), EGU and Oil & gas (at BRID1), Prescribed fires (at CABI1)

Due to uncertainties in the modeling, the 2028 regional haze results should be used with caution. In particular, the modeling results (including the estimated 2028 US anthropogenic contributions) are most uncertain at sites with poor visibility model performance and/or high “mixed” (boundary conditions, fugitive dust, offshore, and secondary organics) contributions.

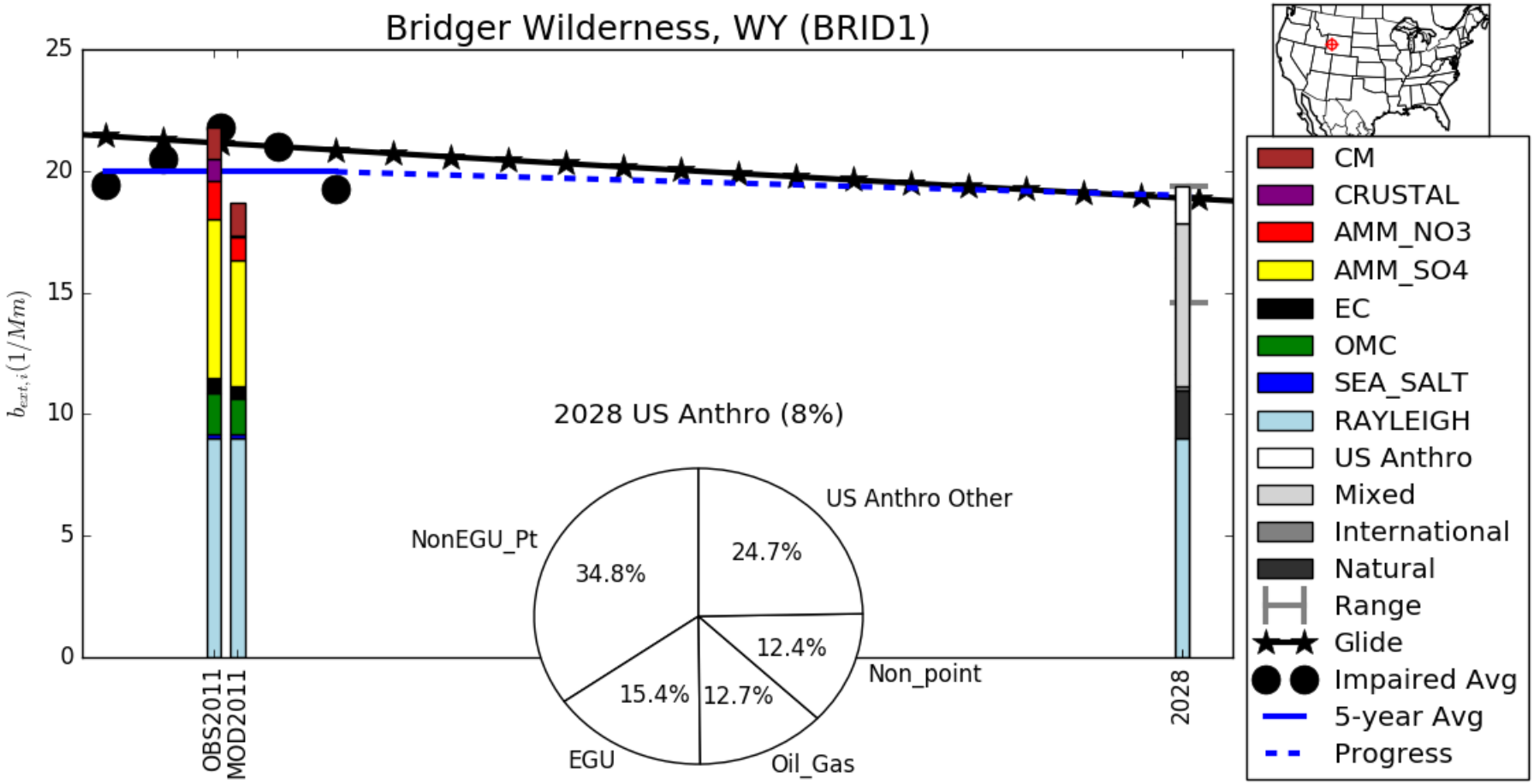


Figure 28: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Bridger Wilderness (WY) and Fitzpatrick Wilderness (WY).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

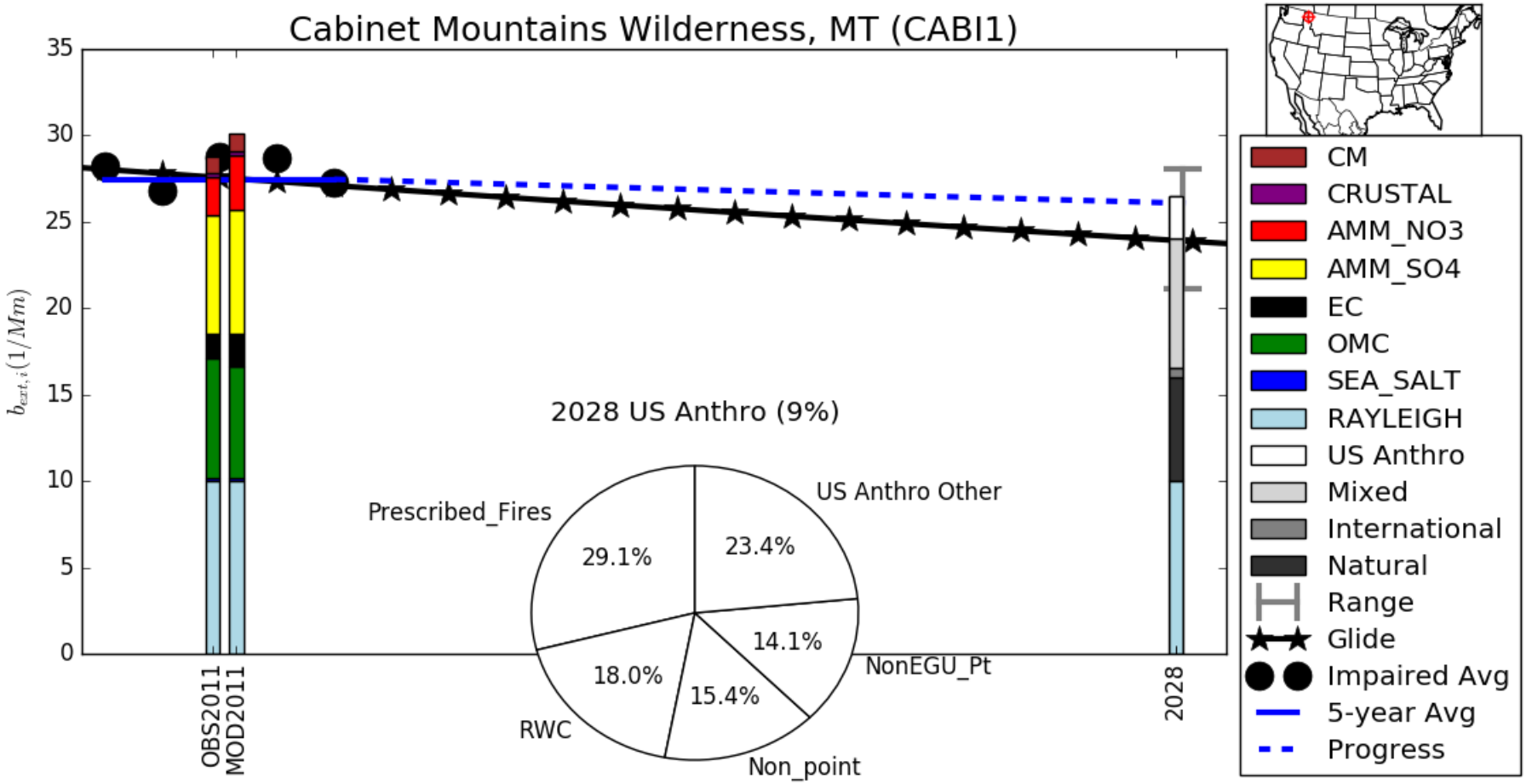


Figure 29: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Cabinet Mountains Wilderness (MT).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

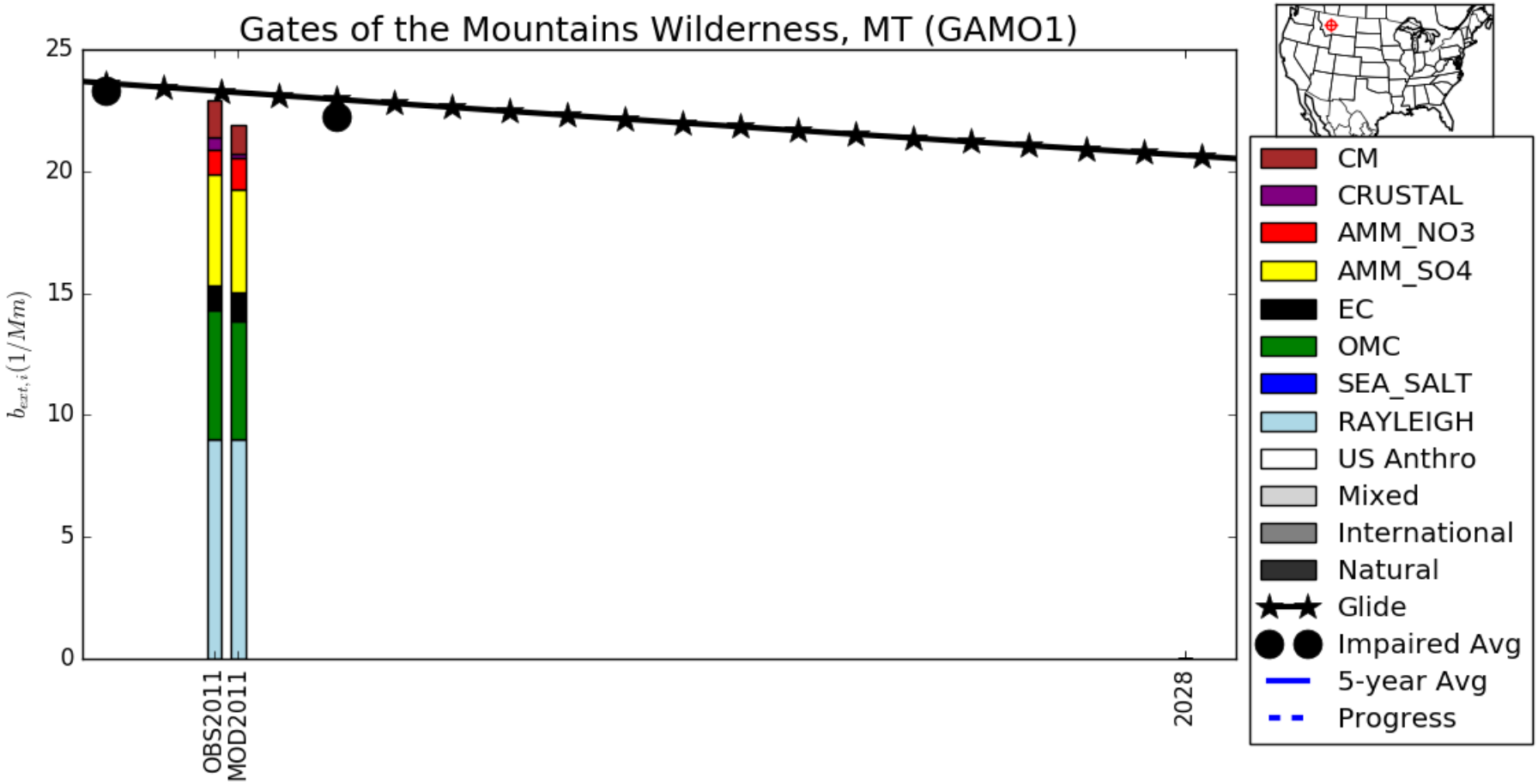


Figure 30: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Gates of the Mountains Wilderness (MT).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

A 2028 visibility projection could not be calculated for this site due to incomplete ambient IMPROVE data in 2011.

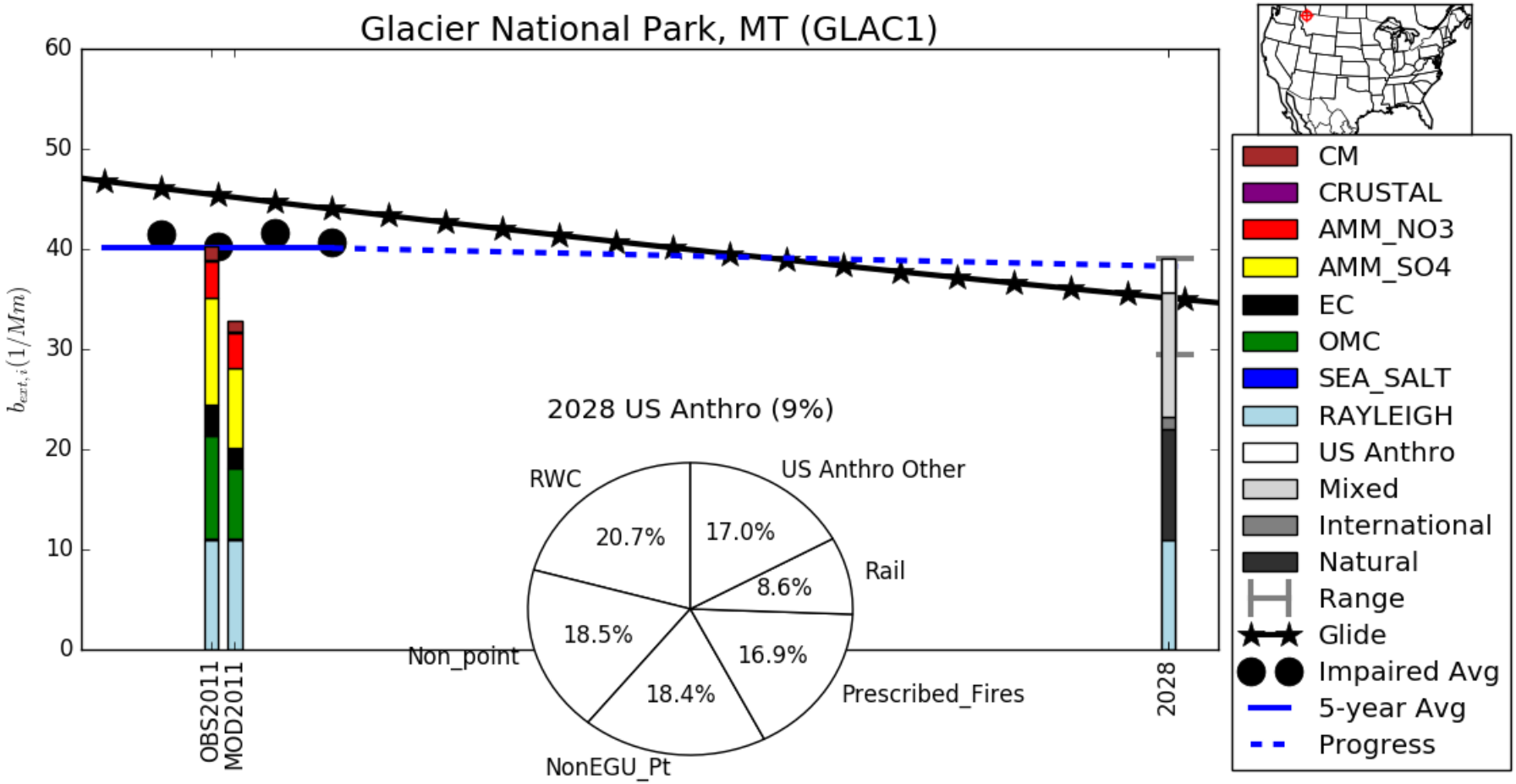


Figure 31: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Glacier National Park (MT).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

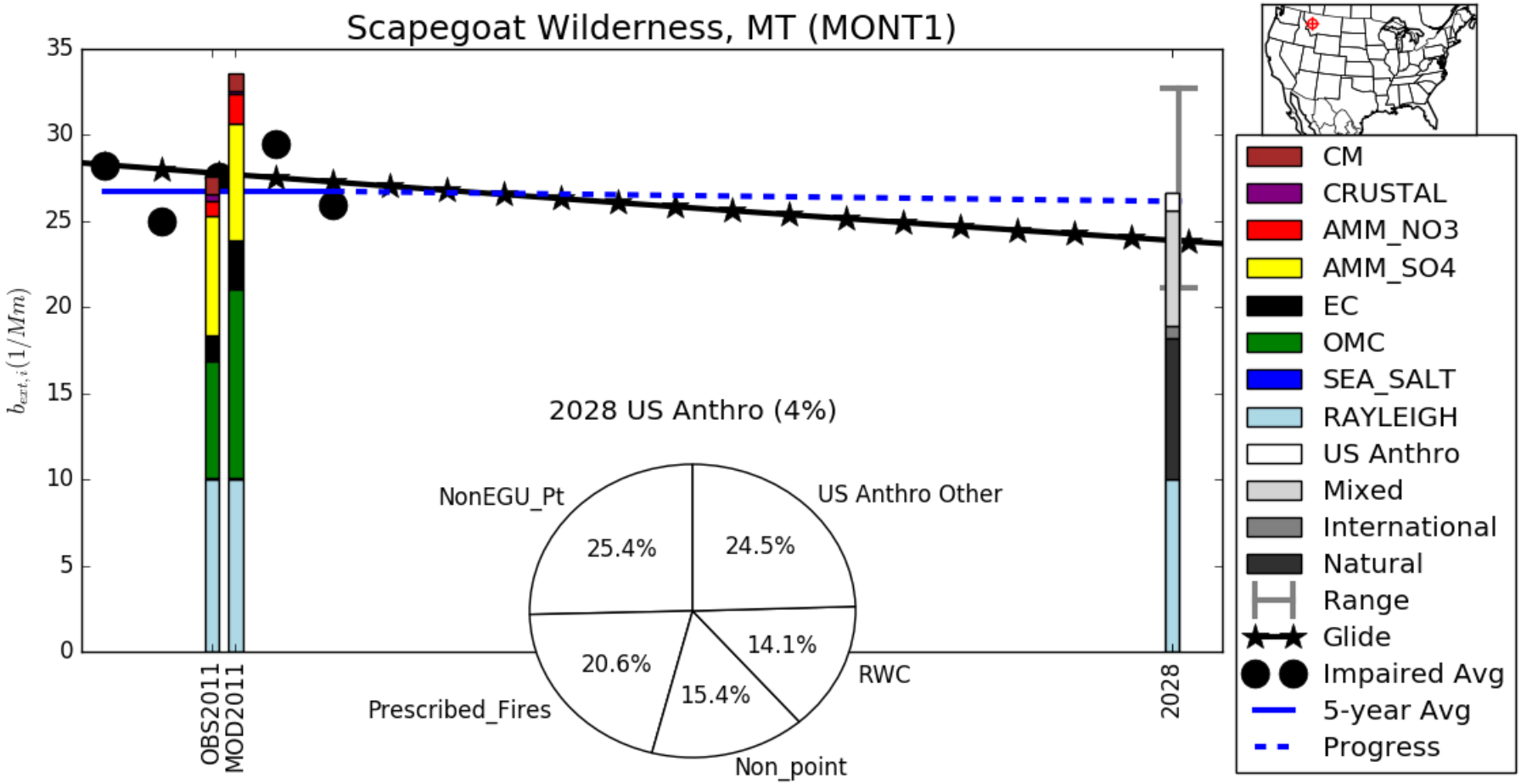


Figure 32: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Bob Marshall Wilderness (MT), Mission Mountains Wilderness (MT), and Scapegoat Wilderness (MT).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

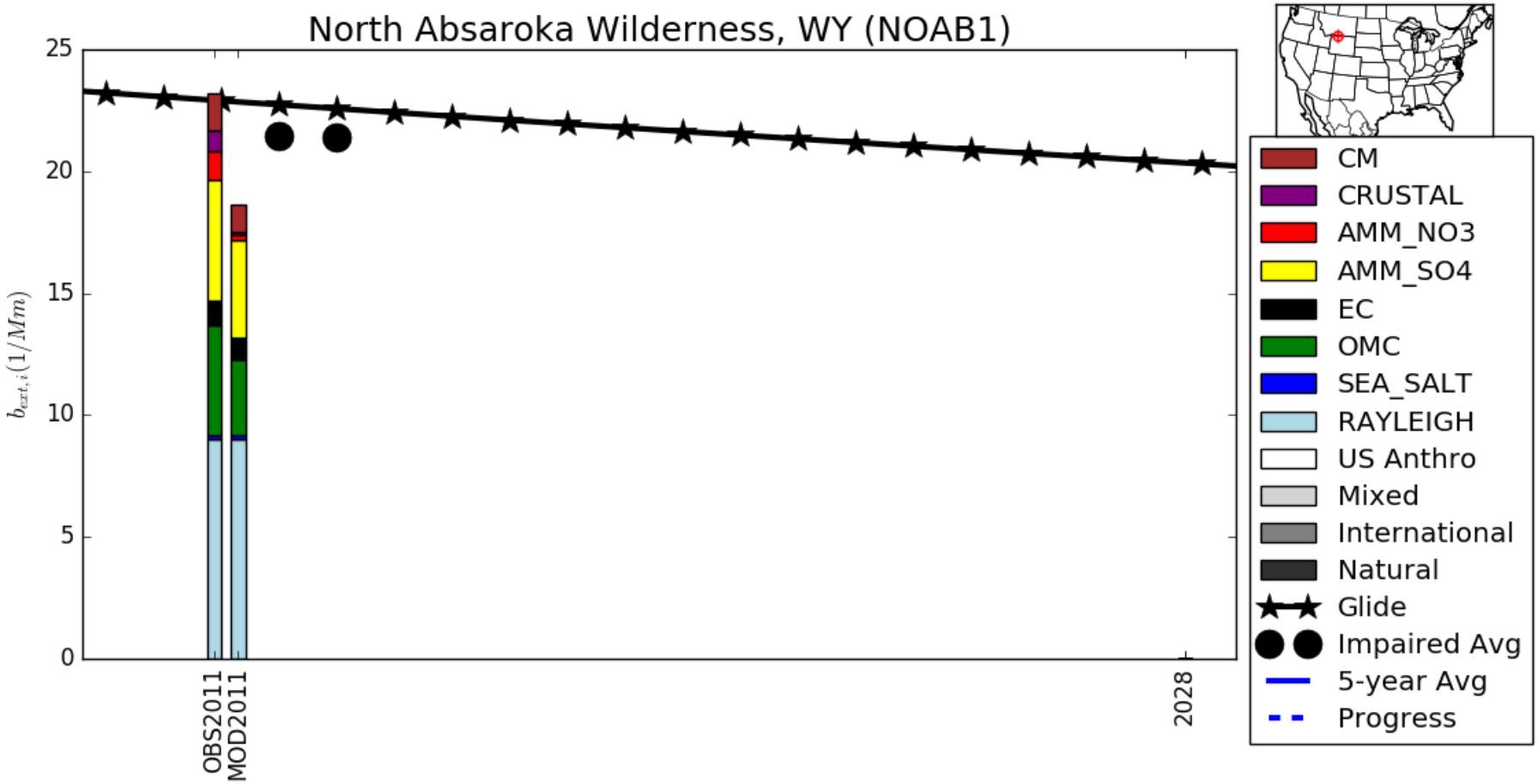


Figure 33: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at North Absaroka Wilderness (WY) and Washakie Wilderness (WY).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

A 2028 visibility projection could not be calculated for this site due to incomplete ambient IMPROVE data in 2011.

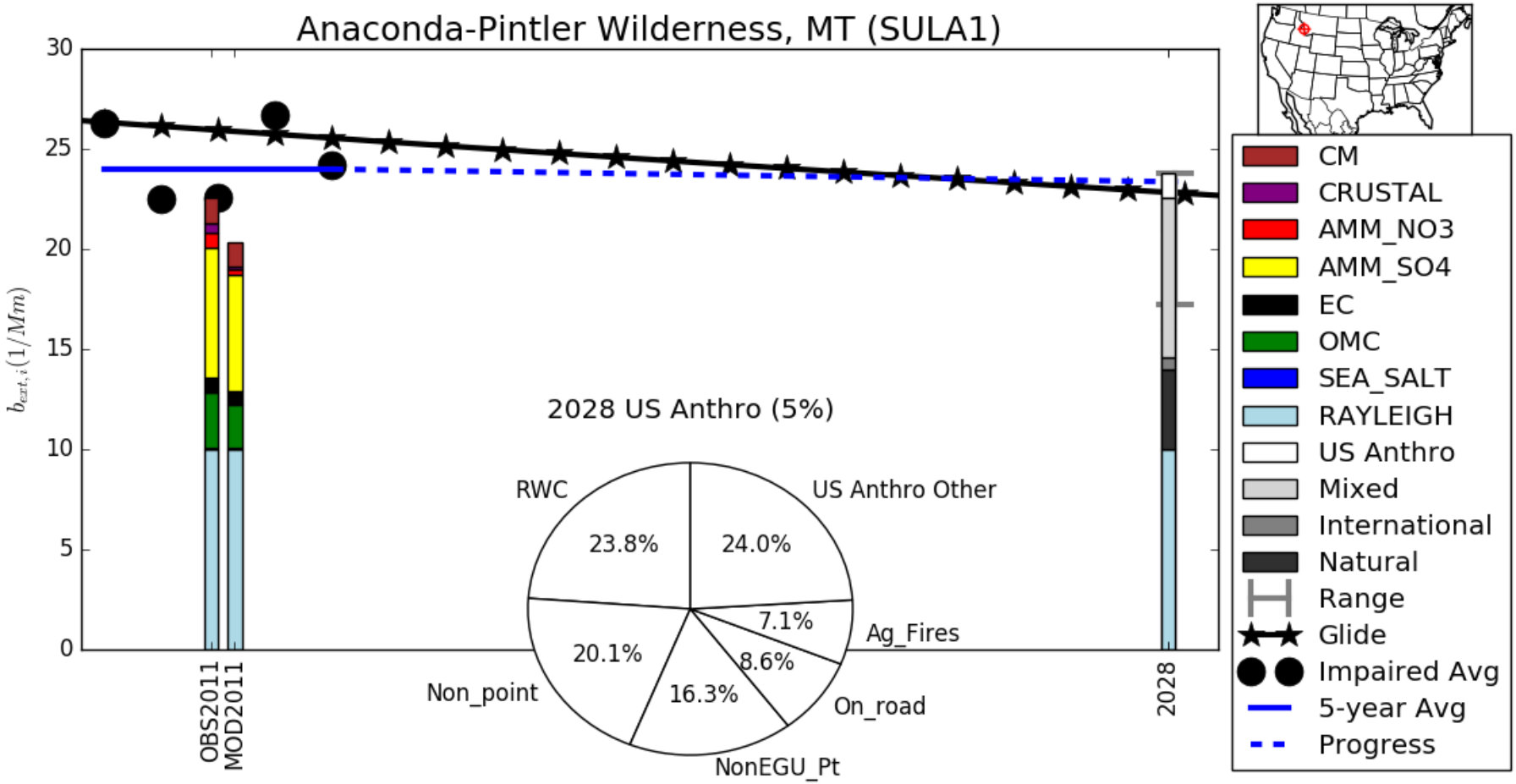


Figure 34: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Anaconda-Pintler Wilderness (MT) and Selway-Bitterroot Wilderness (MT).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

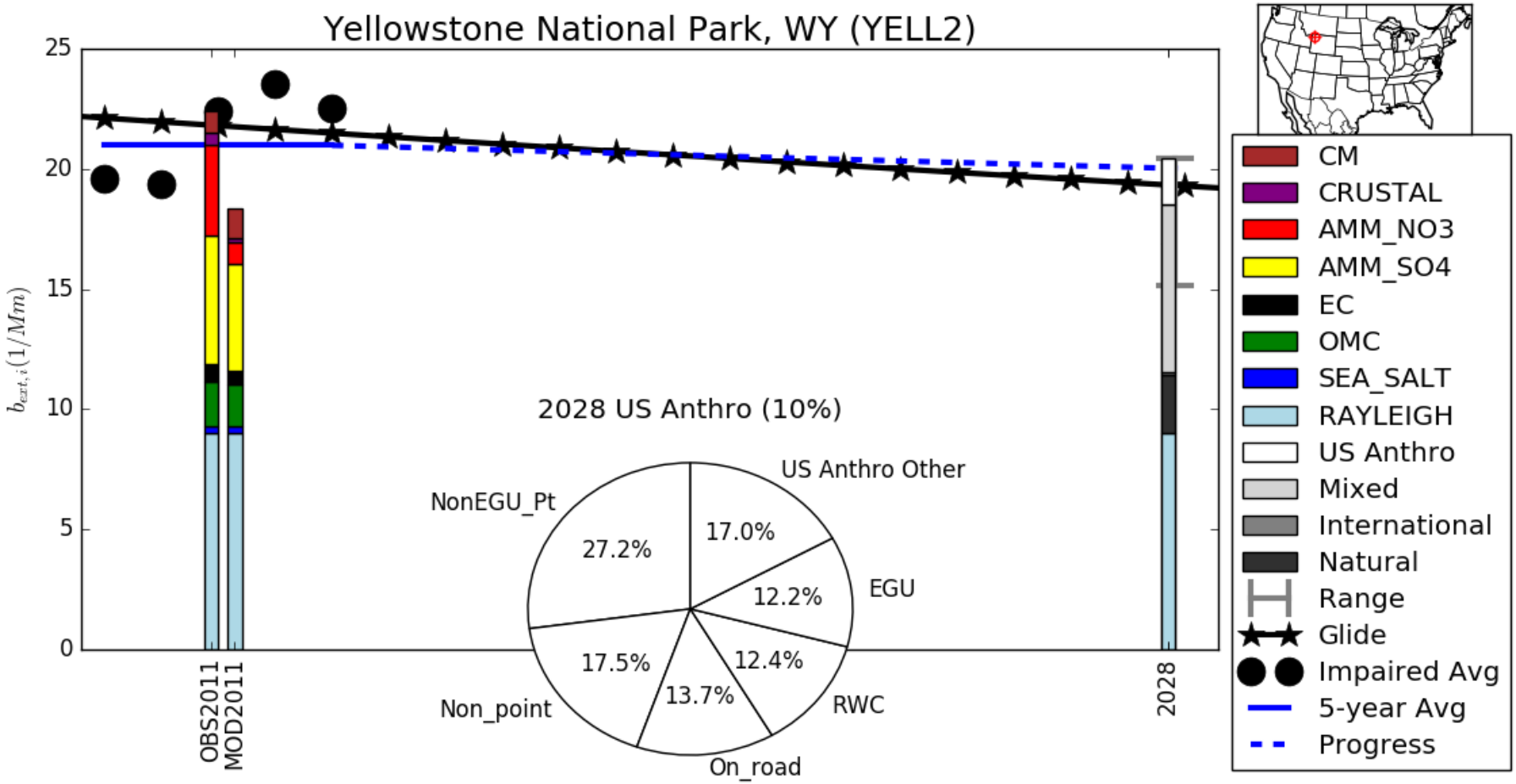


Figure 35: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Grand Teton National Park (WY), Red Rock Lakes (WY), Teton Wilderness (WY), and Yellowstone National Park (WY).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

Hells Canyon and Great Basin

- Craters of the Moon National Monument (ID)(CRMO1)
- Hells Canyon Wilderness (OR)(HECA1)
- Sawtooth Wilderness (ID)(SAWT1)
- Eagle Cap Wilderness (OR) and Strawberry Mountain Wilderness (OR)(STAR1)
- Jarbidge Wilderness (NV)(JARB1)

Regional visibility model performance and contribution summary on the 20% most impaired days

Most important ambient PM species contribution to visibility (on 20% most impaired days)	Nitrate, sulfate, organic carbon
Model visibility performance summary (on 20% most impaired days)	Large nitrate underprediction at CRMO1, HECA1, and STAR1 Much smaller nitrate contribution at SAWT1 and JARB1
Uncertainty in sector contributions	High "mixed" sector contribution percentage (>60% at all sites except HECA1 [52%]).
2028 US anthropogenic percent contribution	12-23% at CRMO1, HECA1, and STAR1 4% at SAWT1 and JARB1
Largest US anthropogenic sector contributions	Residential wood, Nonpoint, nonEGU point, On-road (largest component at CRMO1 and HECA1)

Due to uncertainties in the modeling, the 2028 regional haze results should be used with caution. In particular, the modeling results (including the estimated 2028 US anthropogenic contributions) are most uncertain at sites with poor visibility model performance and/or high "mixed" (boundary conditions, fugitive dust, offshore, and secondary organics) contributions.

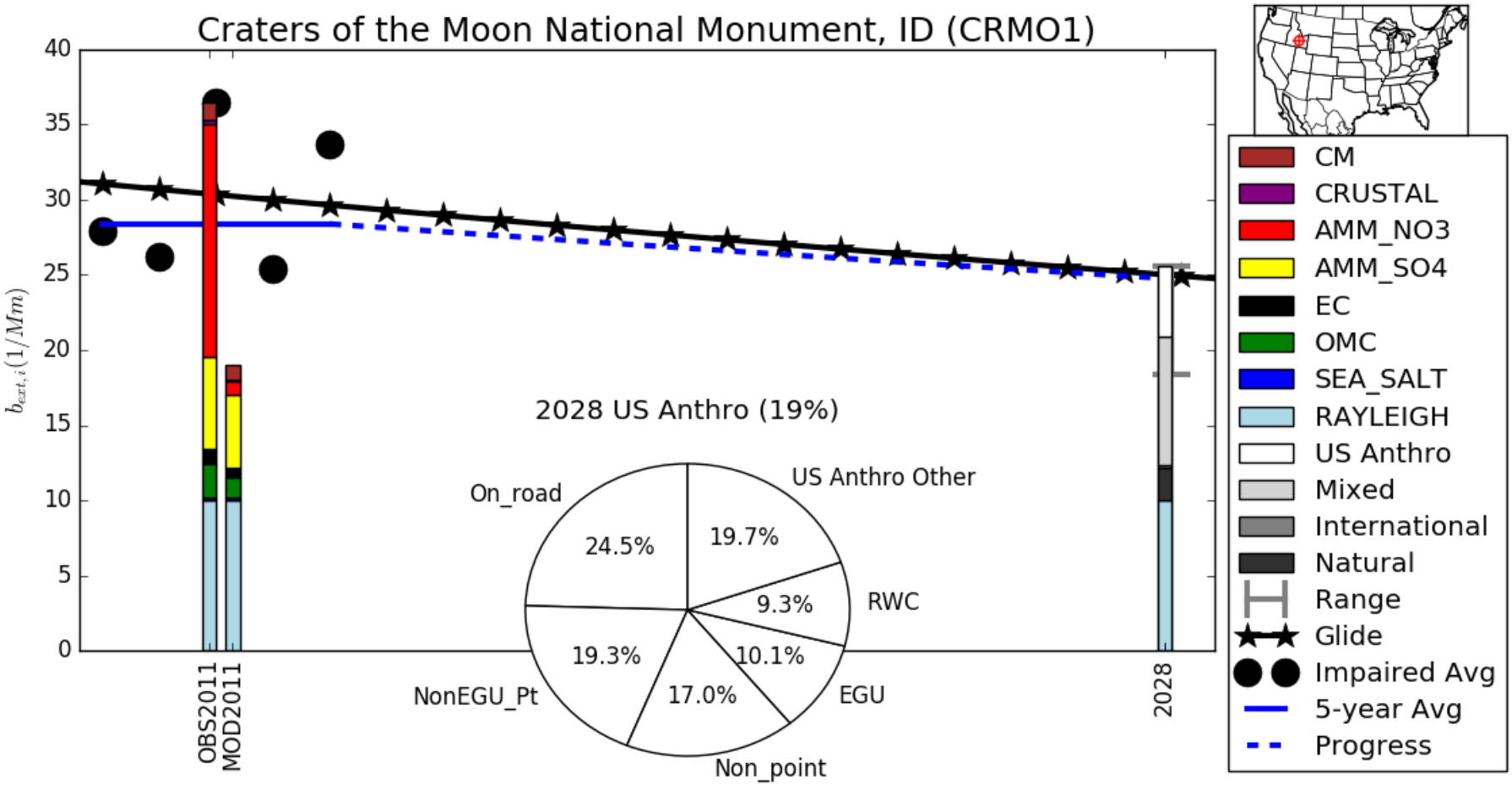


Figure 36: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Craters of the Moon National Monument (ID).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

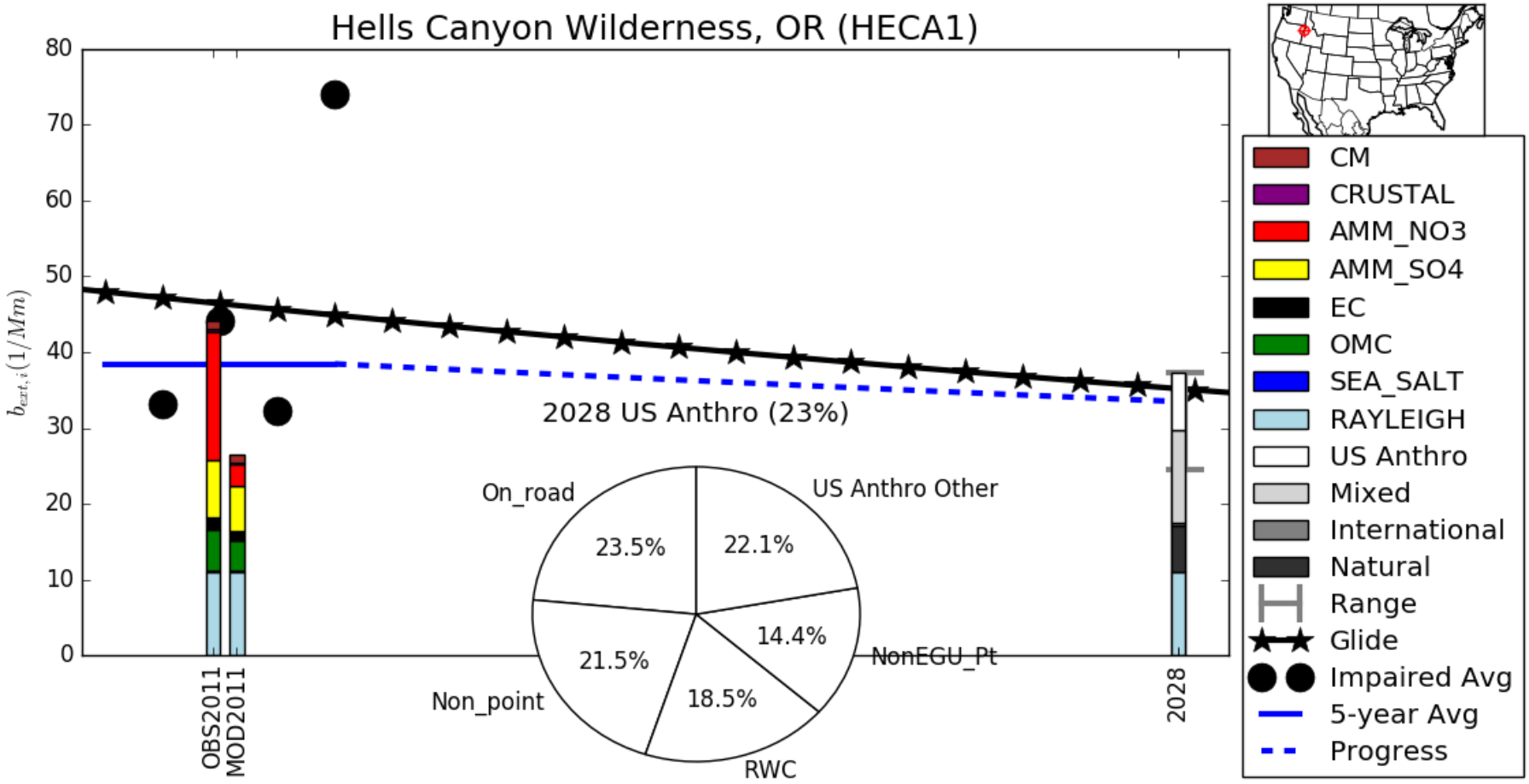


Figure 37: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Hells Canyon Wilderness (OR).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

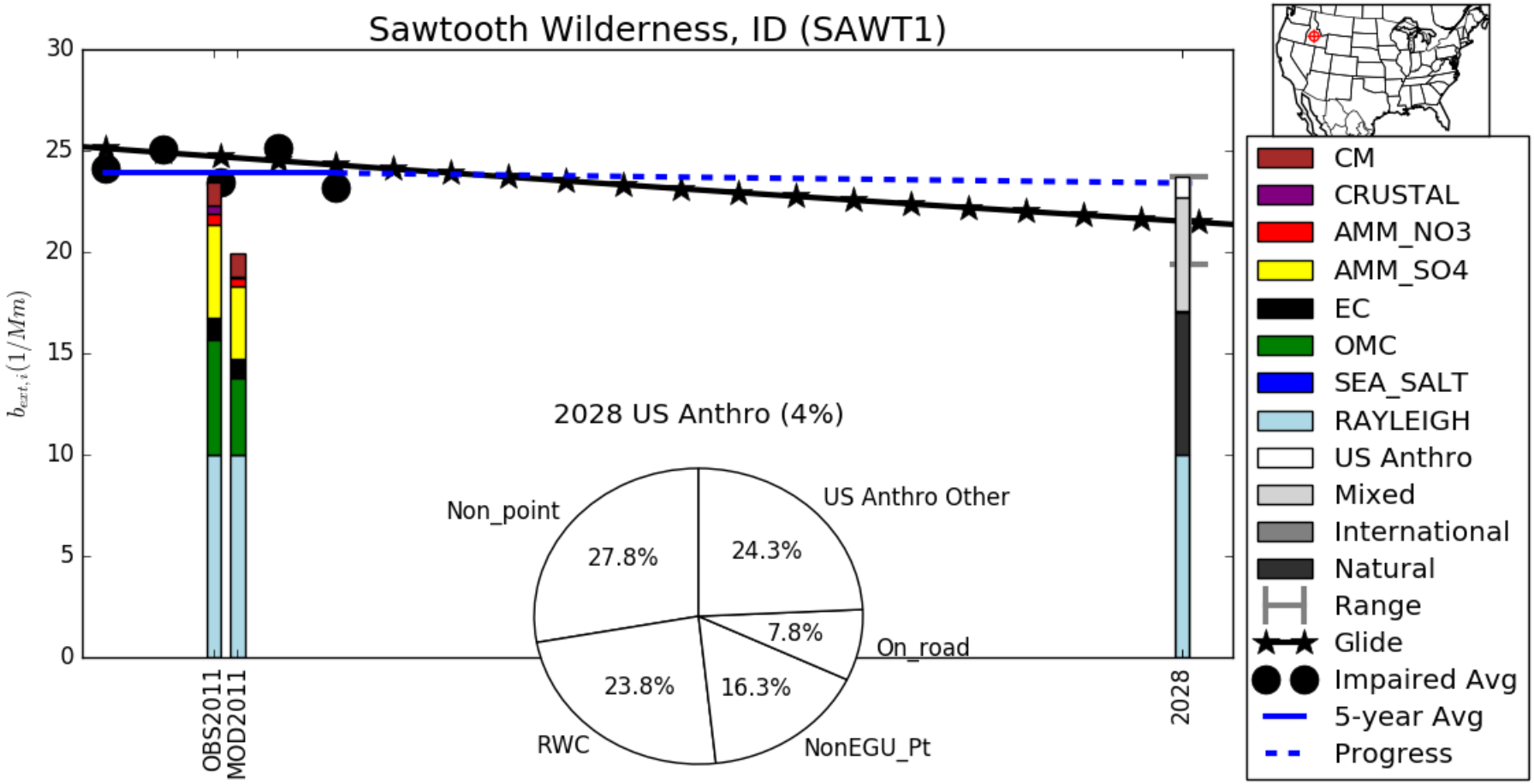


Figure 38: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Sawtooth Wilderness (ID).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

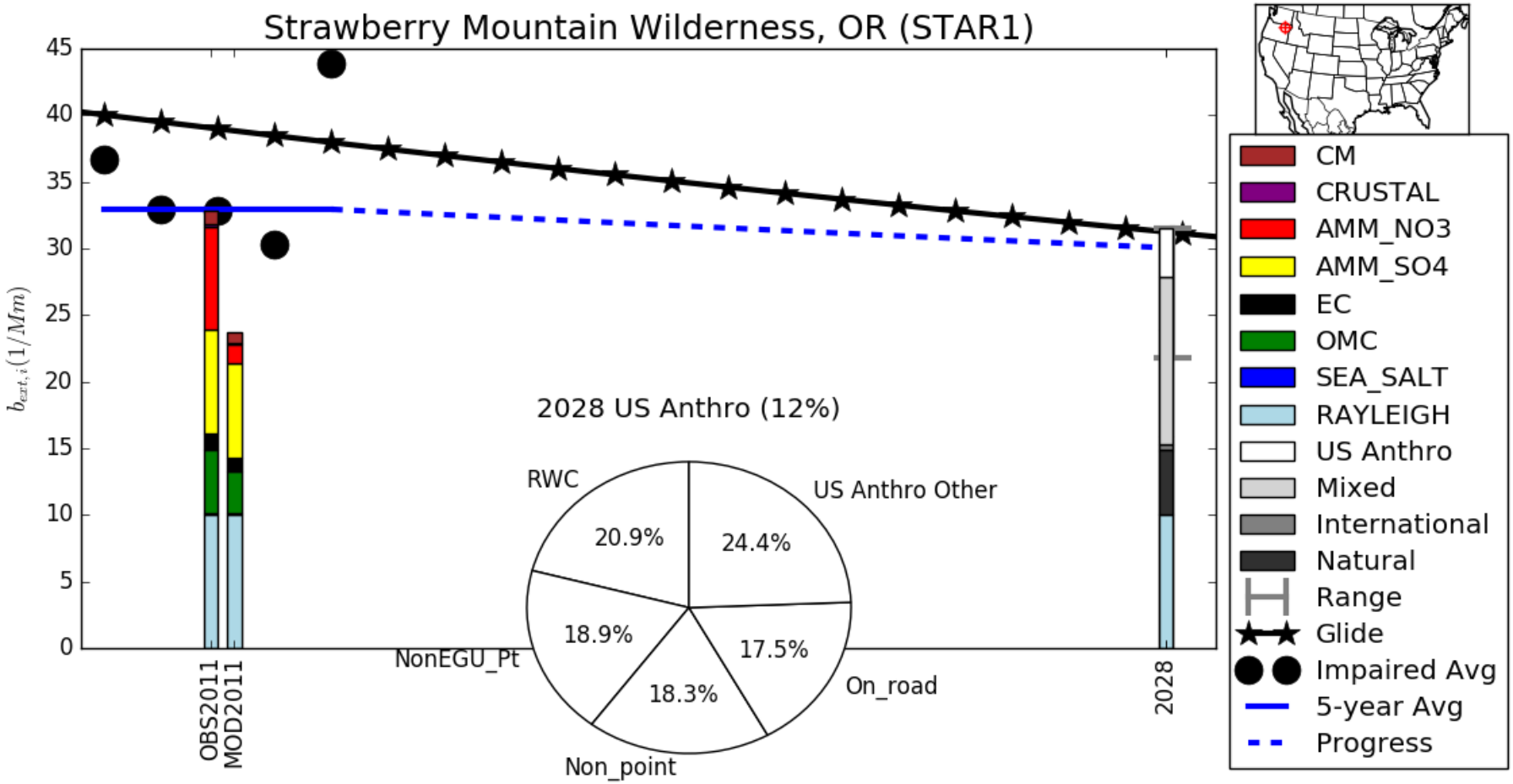


Figure 39: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Eagle Cap Wilderness (OR) and Strawberry Mountain Wilderness (OR).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

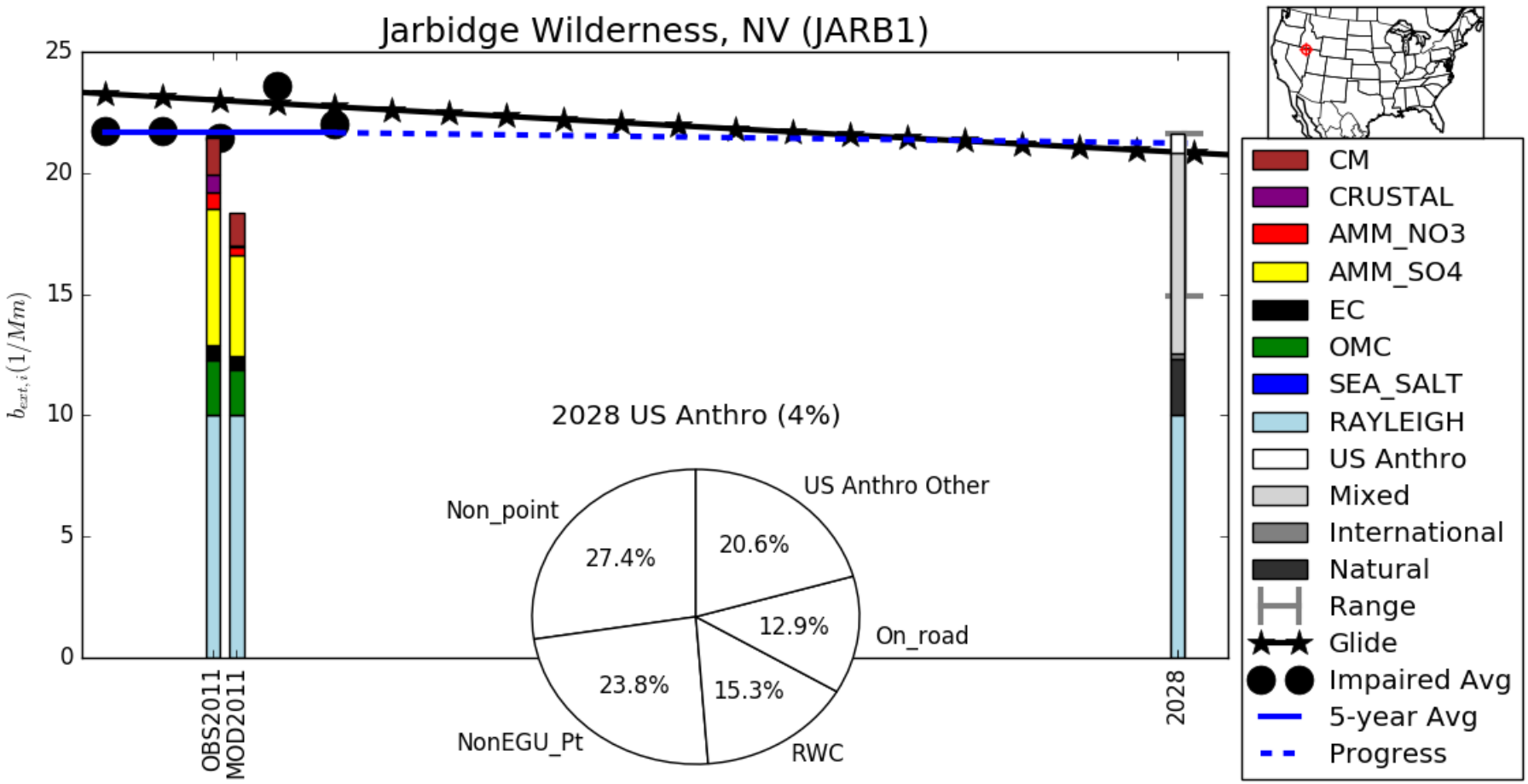


Figure 40: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Jarbidge Wilderness (NV).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

Central Rocky Mountains

- Great Sand Dunes National Monument (CO)(GRSA1)
- Mount Zirkel Wilderness (CO) and Rawah Wilderness (CO)(MOZI1)
- Rocky Mountain National Park (CO)(ROMO1)
- Pecos Wilderness (NM) and Wheeler Peak Wilderness (NM)(WHPE1)
  Eagles Nest Wilderness (CO), Flat Tops Wilderness (CO), Maroon Bells-Snowmass Wilderness (CO), and West Elk Wilderness (CO)(WHRI1)

Regional visibility model performance and contribution summary on the 20% most impaired days

Most important ambient PM species contribution to visibility (on 20% most impaired days)	Sulfate, organic carbon, coarse mass (at GRSA1)
Model visibility performance summary (on 20% most impaired days)	Sulfate generally underpredicted, organic carbon overpredicted at ROMO1, coarse mass underpredicted at GRSA1
Uncertainty in sector contributions	High “mixed” sector contribution percentage (>60% at all sites except ROMO1 [49%]).
2028 US anthropogenic percent contribution	10-17%
Largest US anthropogenic sector contributions	EGU, nonEGU point, Oil & gas

Due to uncertainties in the modeling, the 2028 regional haze results should be used with caution. In particular, the modeling results (including the estimated 2028 US anthropogenic contributions) are most uncertain at sites with poor visibility model performance and/or high “mixed” (boundary conditions, fugitive dust, offshore, and secondary organics) contributions.

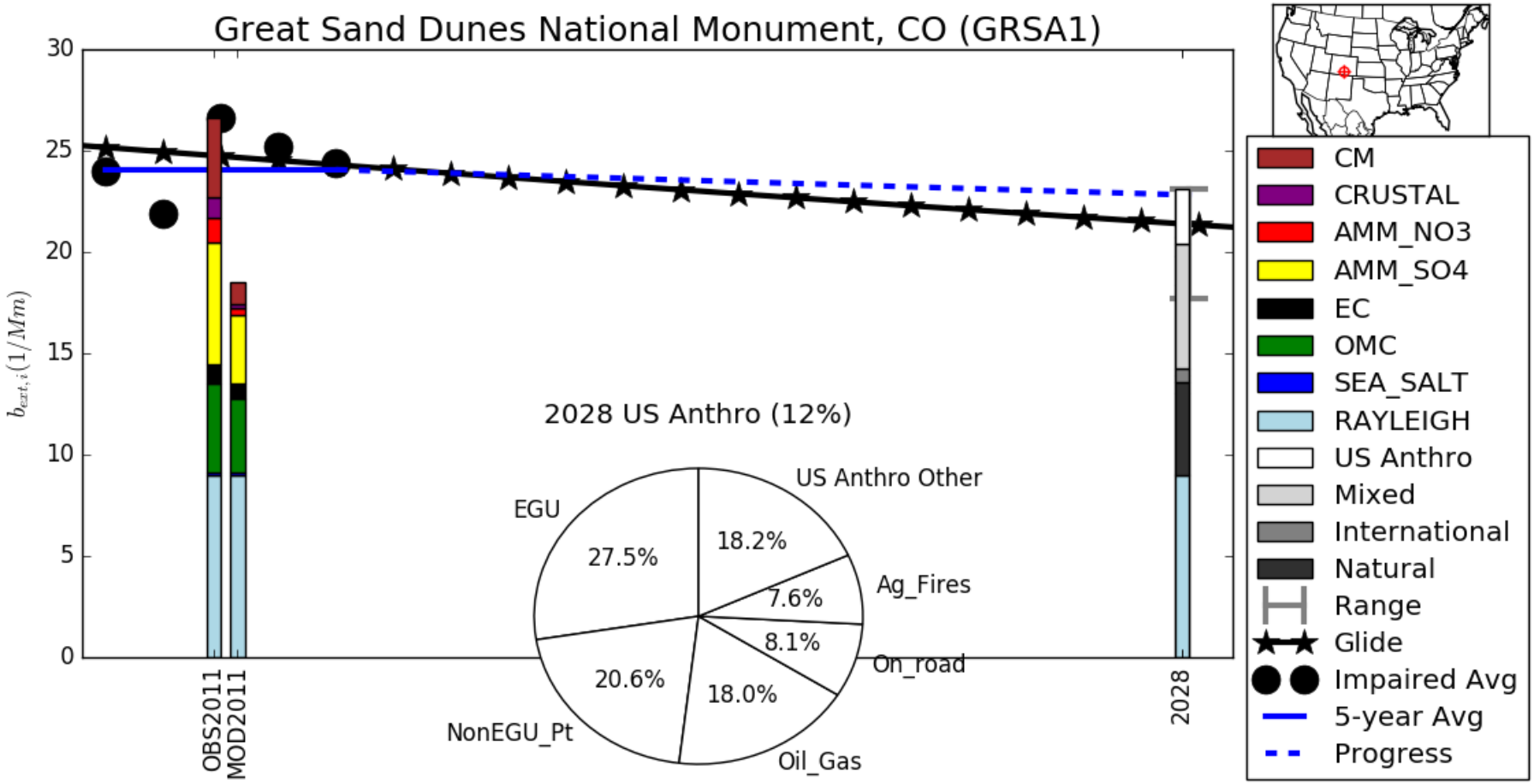


Figure 41: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Great Sand Dunes National Monument (CO).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

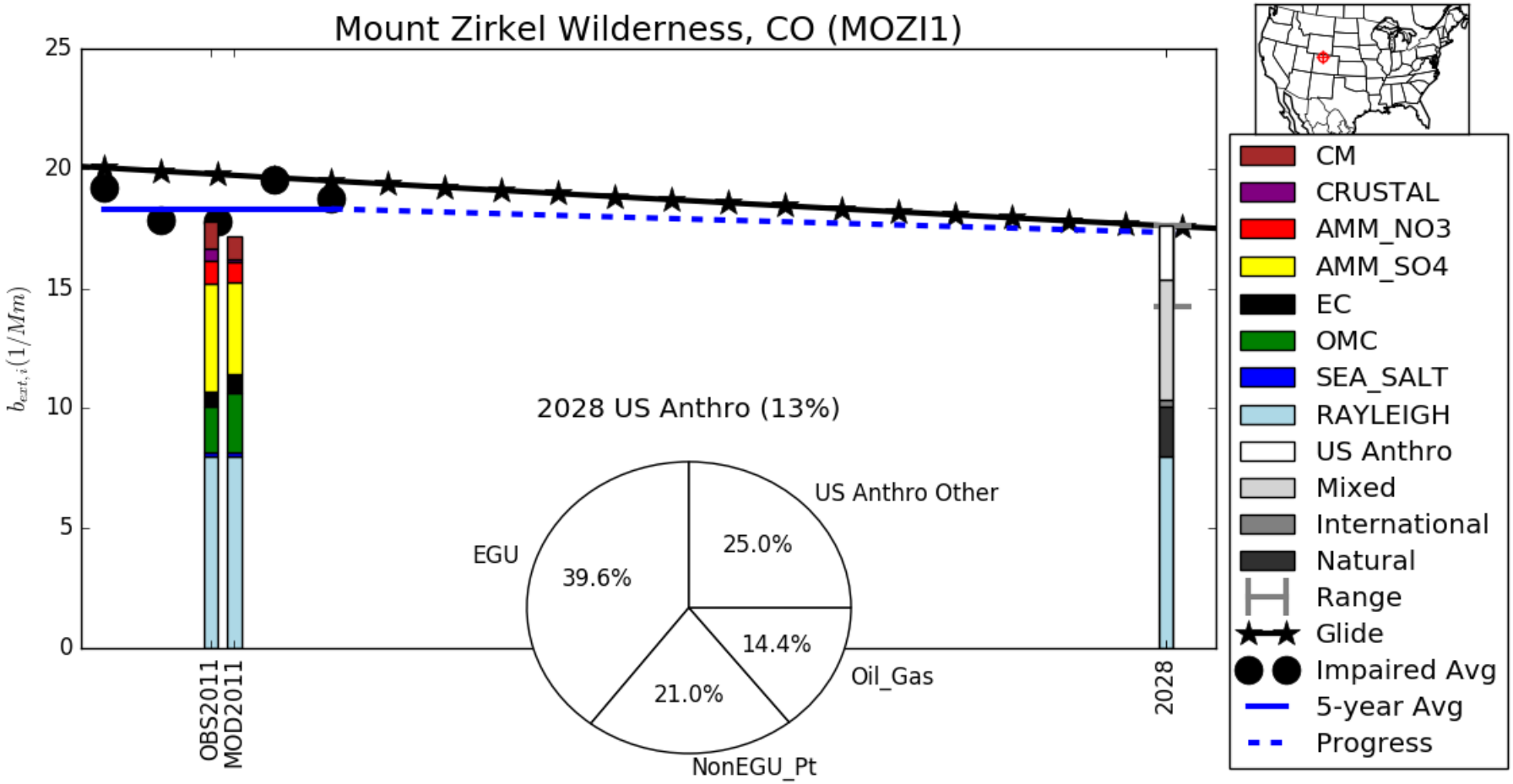


Figure 42: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Mount Zirkel Wilderness (CO) and Rawah Wilderness (CO).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

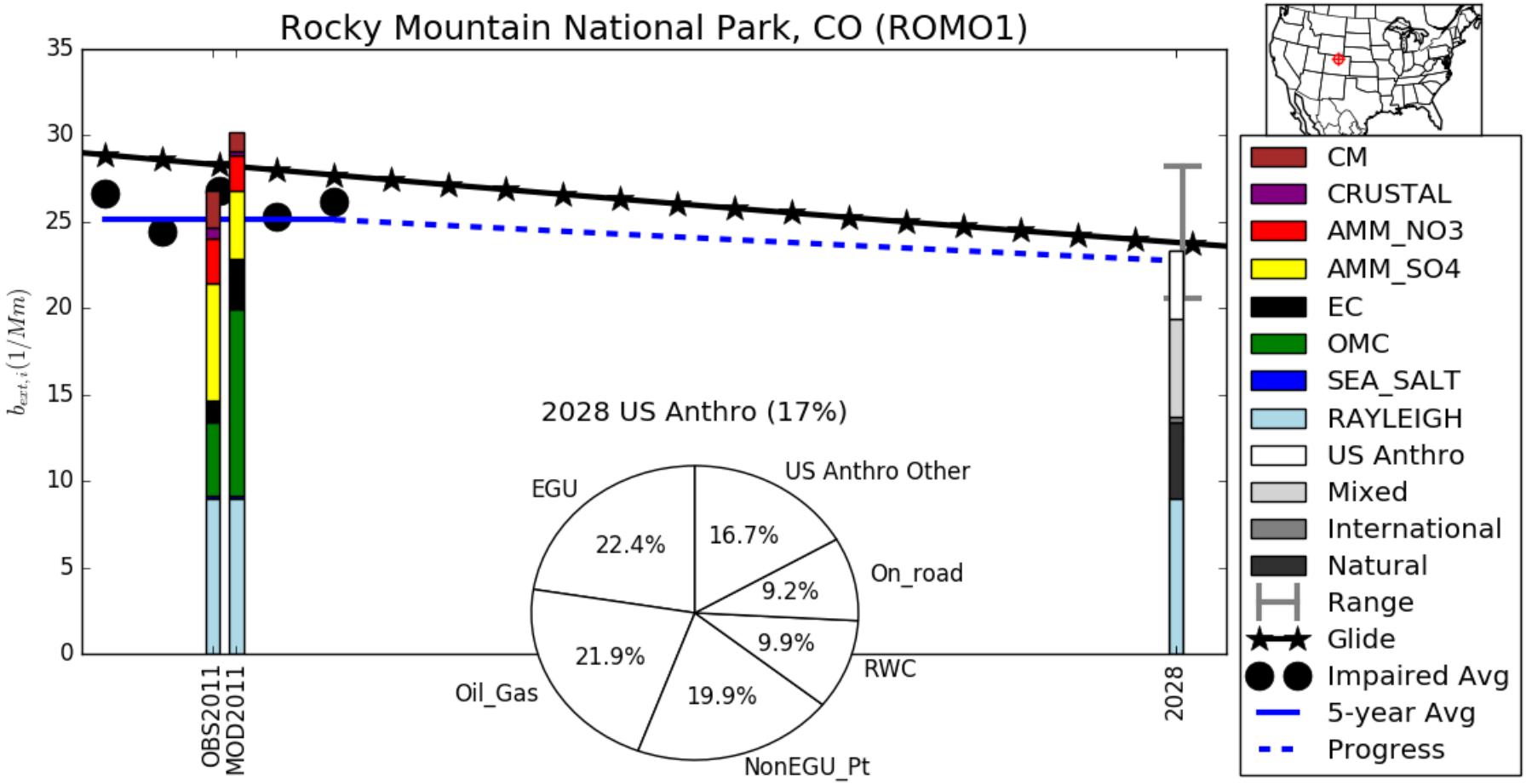


Figure 43: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Rocky Mountain National Park (CO).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

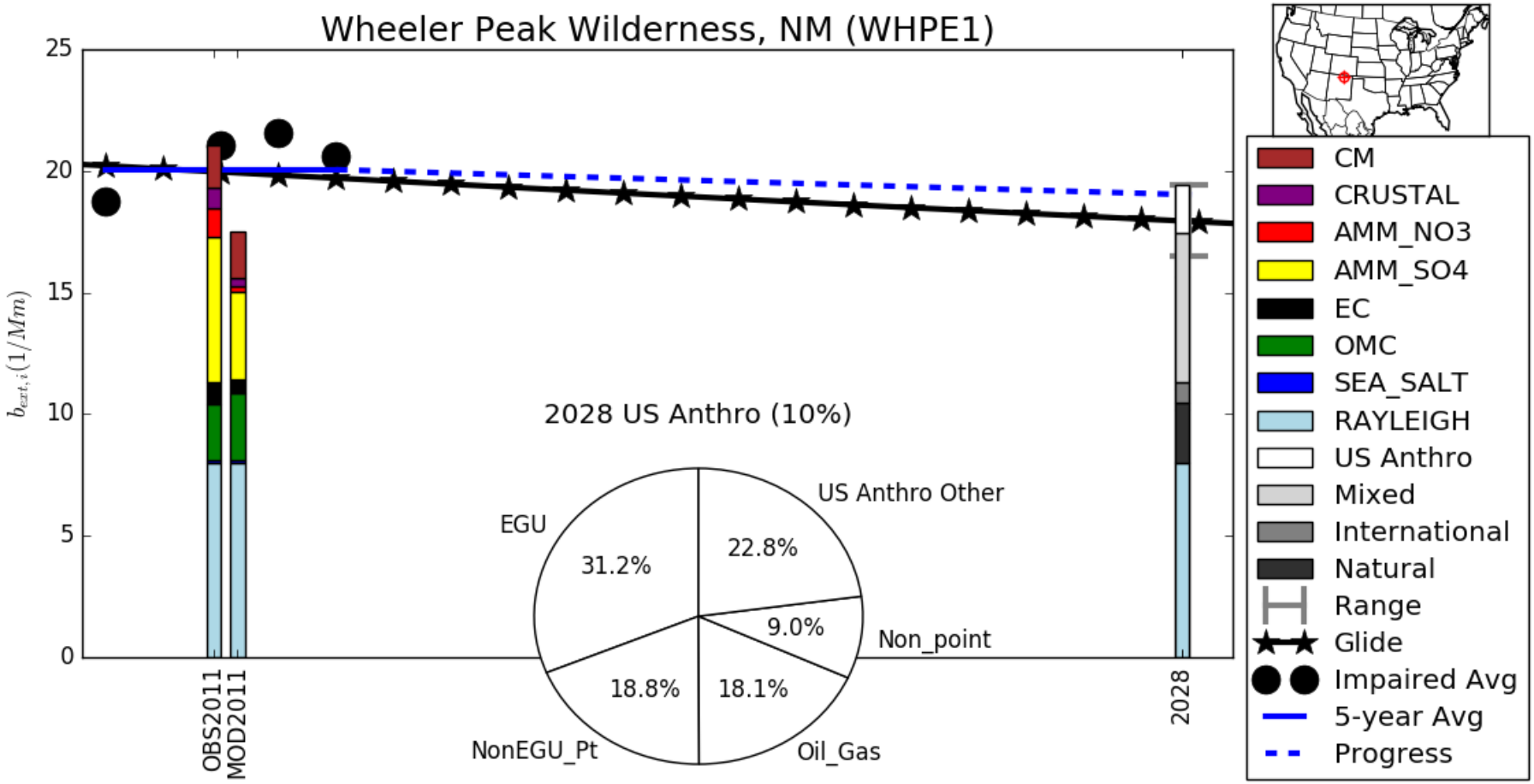


Figure 44: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Pecos Wilderness (NM) and Wheeler Peak Wilderness (NM).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

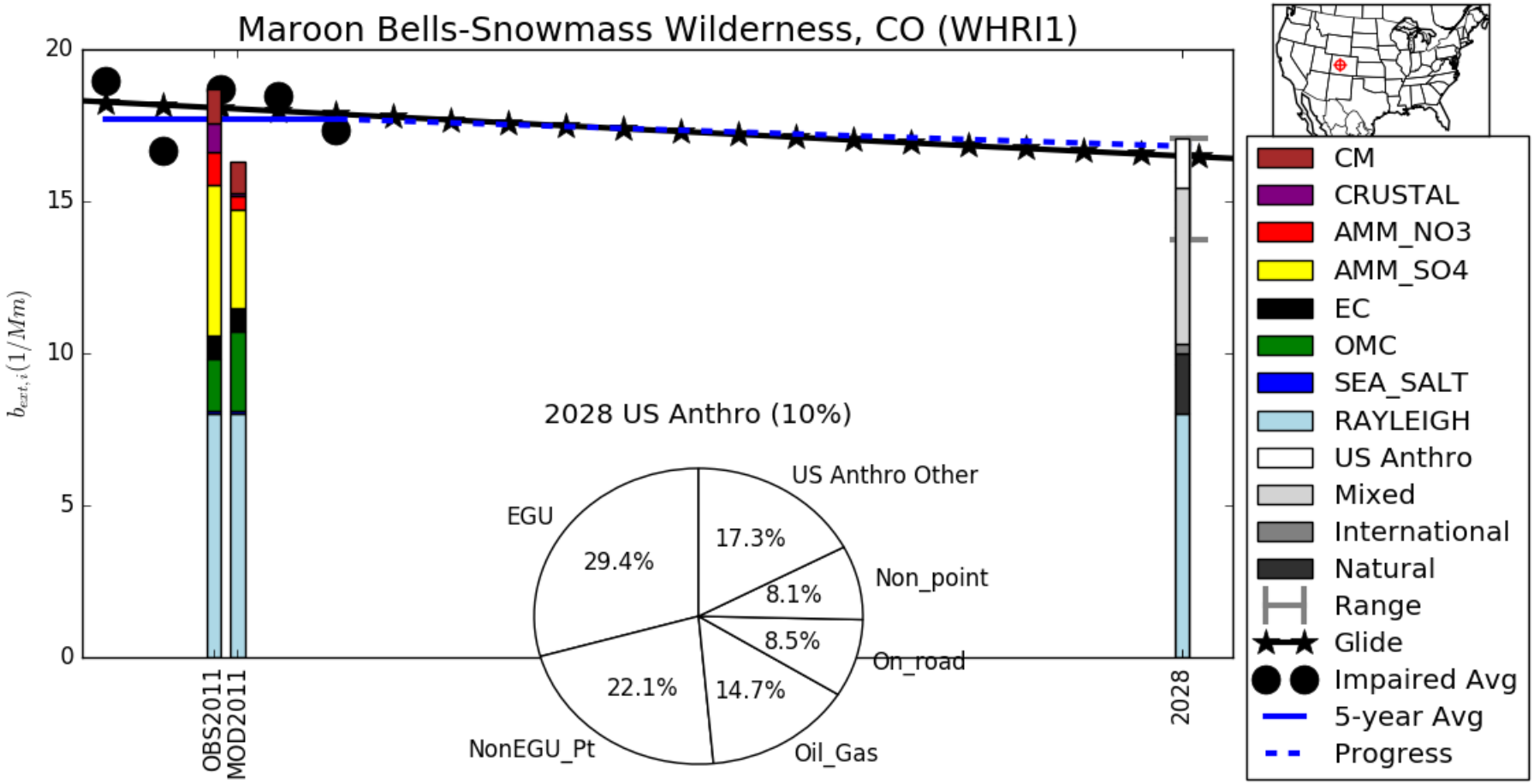


Figure 45: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Eagles Nest Wilderness (CO), Flat Tops Wilderness (CO), Maroon Bells-Snowmass Wilderness (CO), and West Elk Wilderness (CO).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

Colorado Plateau

- Bandelier National Monument (NM)(BAND1)
- Bryce Canyon National Park (UT)(BRCA1)
- Arches National Park (UT) and Canyonlands National Park (UT)(CANY1)
- Capitol Reef National Park (UT)(CAPI1)
- Grand Canyon National Park (AZ)(GRCA2)
- Mesa Verde National Park (CO)(MEVE1)
- San Pedro Parks Wilderness (NM)(SAPE1)
- Black Canyon of the Gunnison National Monument (CO), La Garita Wilderness (CO), and Weminuche Wilderness (CO)(WEMI1)
  Zion National Park (UT)(ZICA1)

Regional visibility model performance and contribution summary on the 20% most impaired days

Most important ambient PM species contribution to visibility (on 20% most impaired days)	Sulfate, coarse mass, nitrate (at BRCA1, CANY1, and CAPI1)
Model visibility performance summary (on 20% most impaired days)	Sulfate underpredicted, nitrate severely underpredicted at most sites, especially BRCA1, CANY1, CAPI1, GRCA2,
Uncertainty in sector contributions	High “mixed” sector contribution percentage (>58% at all sites).
2028 US anthropogenic percent contribution	7-17%
Largest US anthropogenic sector contributions	EGU, nonEGU point, Oil & gas

Due to uncertainties in the modeling, the 2028 regional haze results should be used with caution. In particular, the modeling results (including the estimated 2028 US anthropogenic contributions) are most uncertain at sites with poor visibility model performance and/or high “mixed” (boundary conditions, fugitive dust, offshore, and secondary organics) contributions.

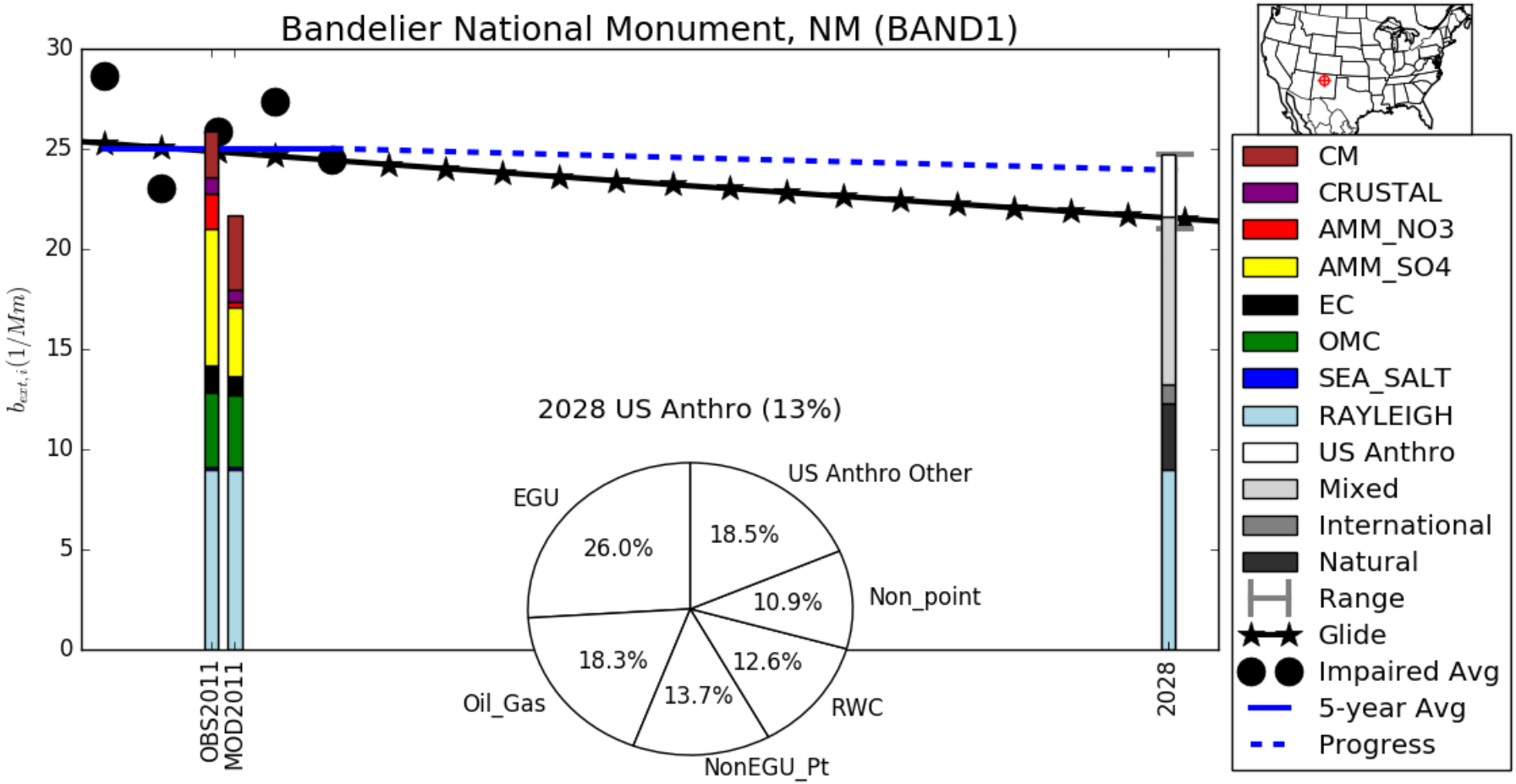


Figure 46: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Bandelier National Monument (NM).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

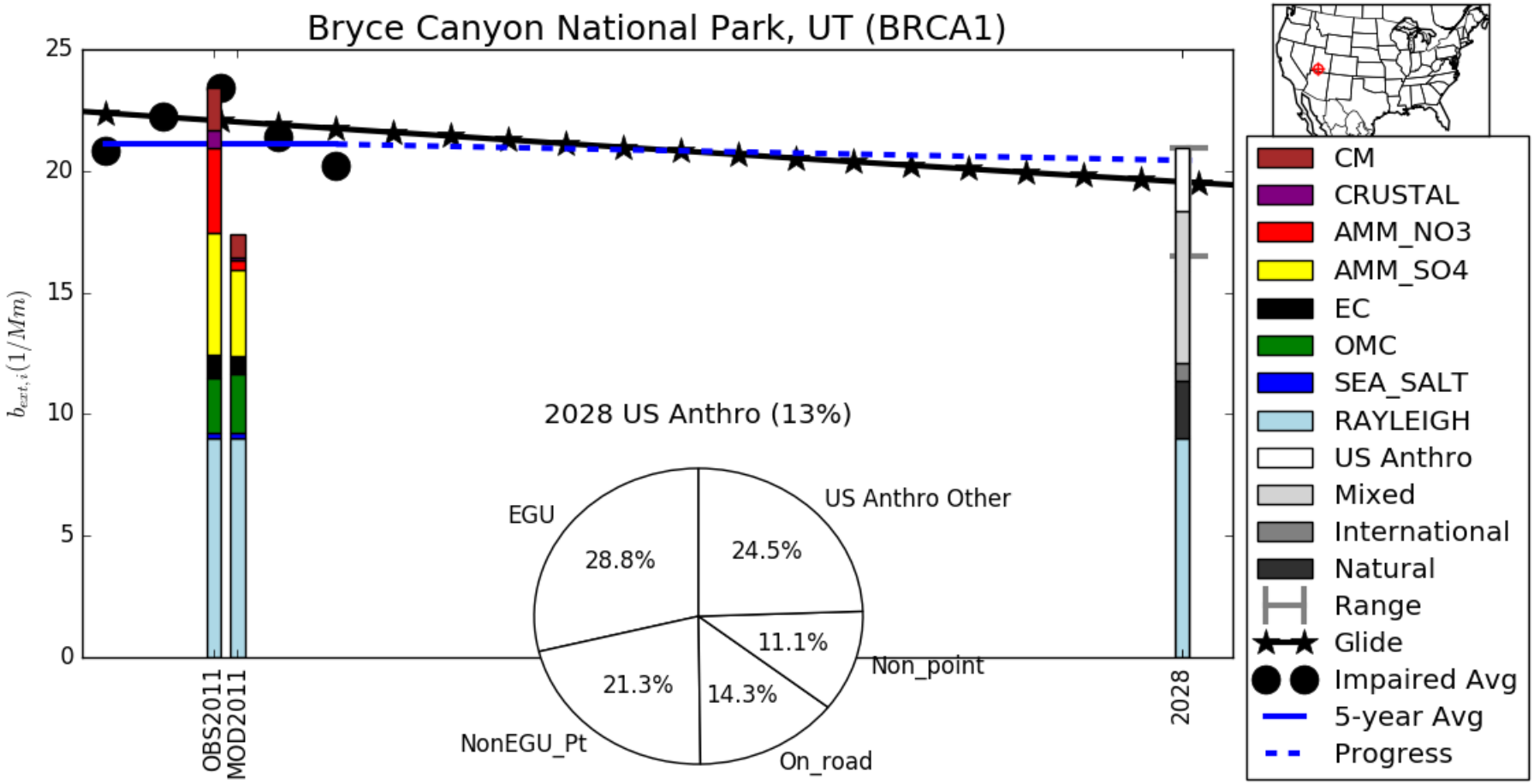


Figure 47: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Bryce Canyon National Park (UT).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

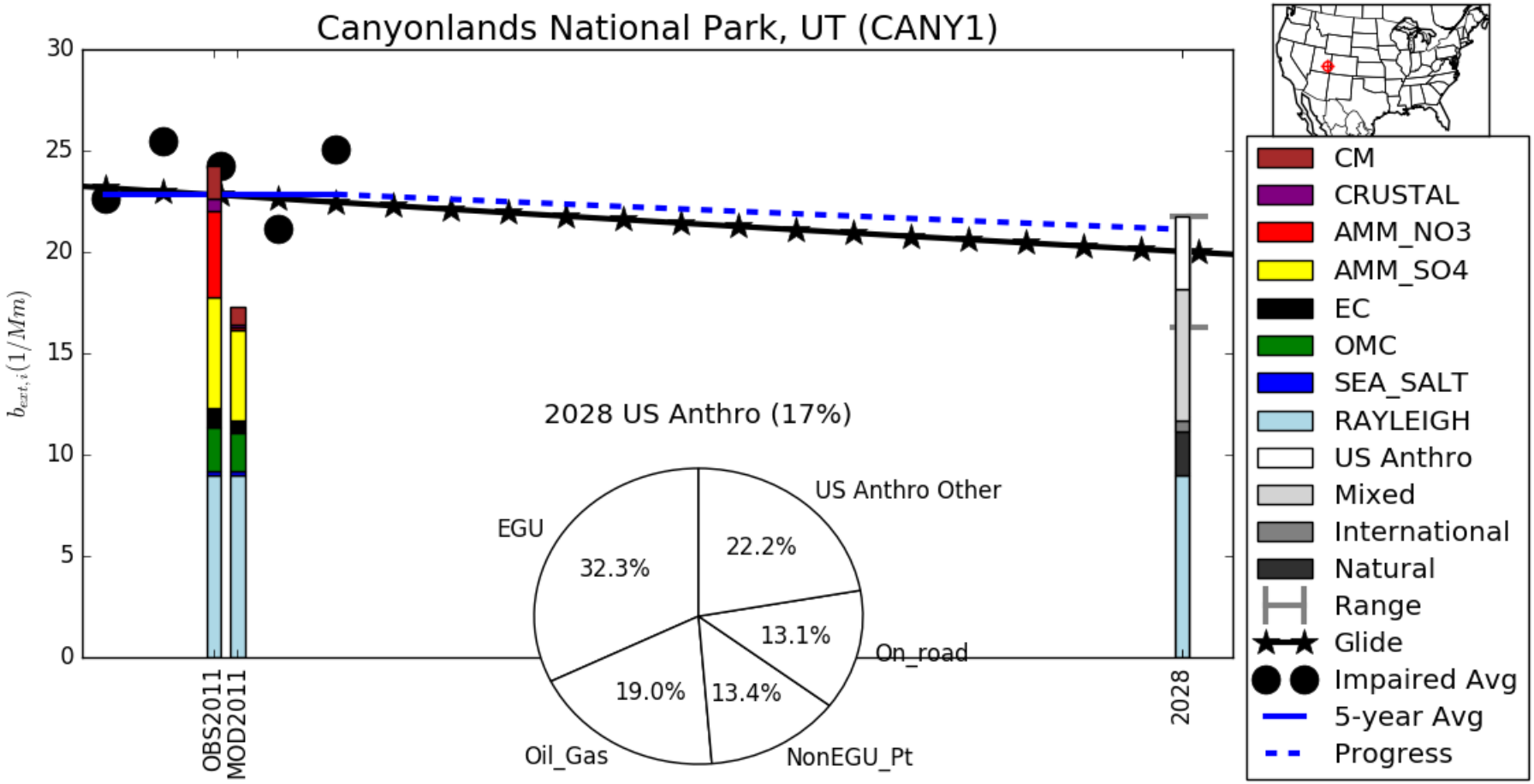


Figure 48: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Arches National Park (UT) and Canyonlands National Park (UT).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

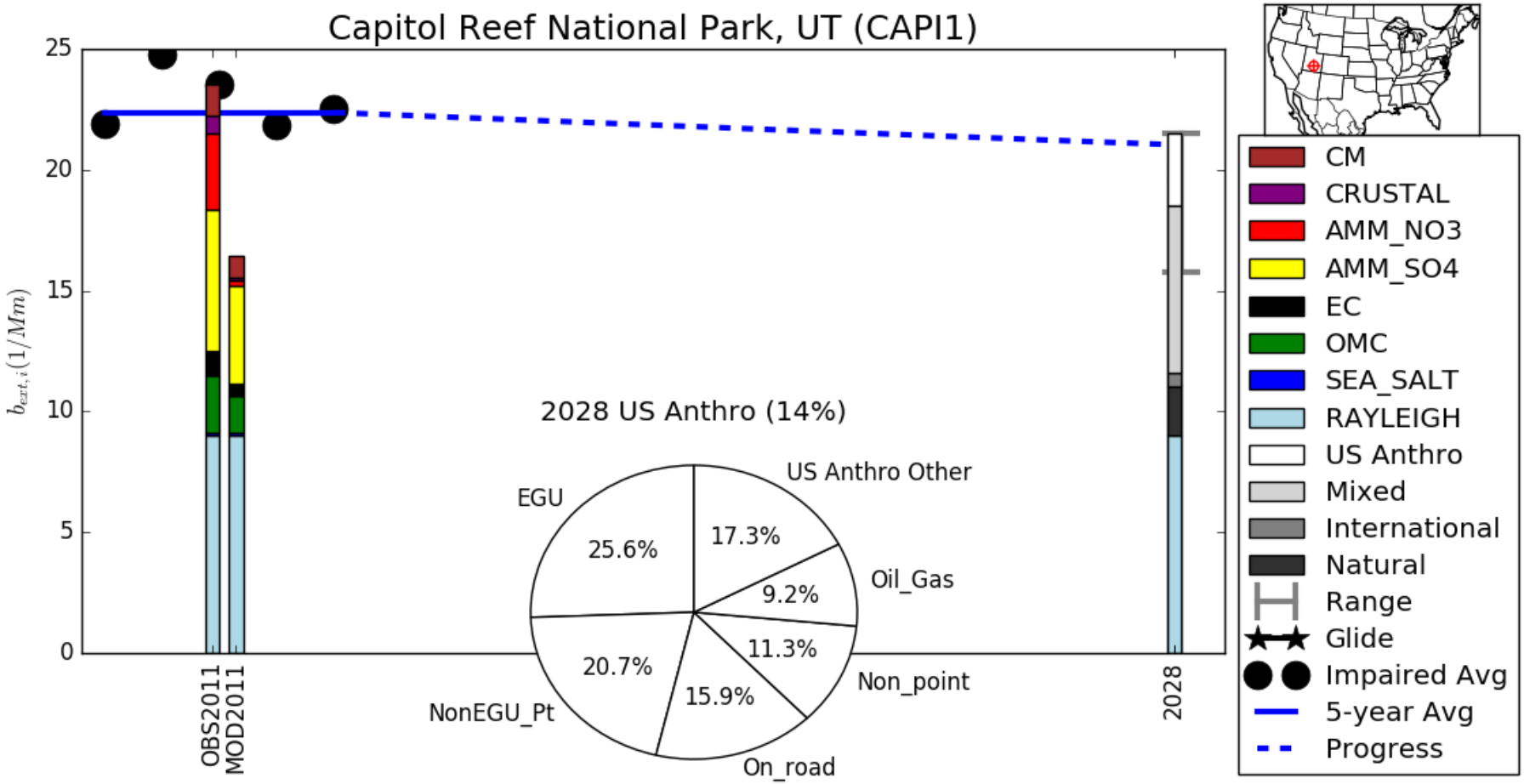


Figure 49: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Capitol Reef National Park (UT).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

A glidepath could not be calculated for this site due to incomplete ambient IMPROVE data in the 2000-2004 baseline period.

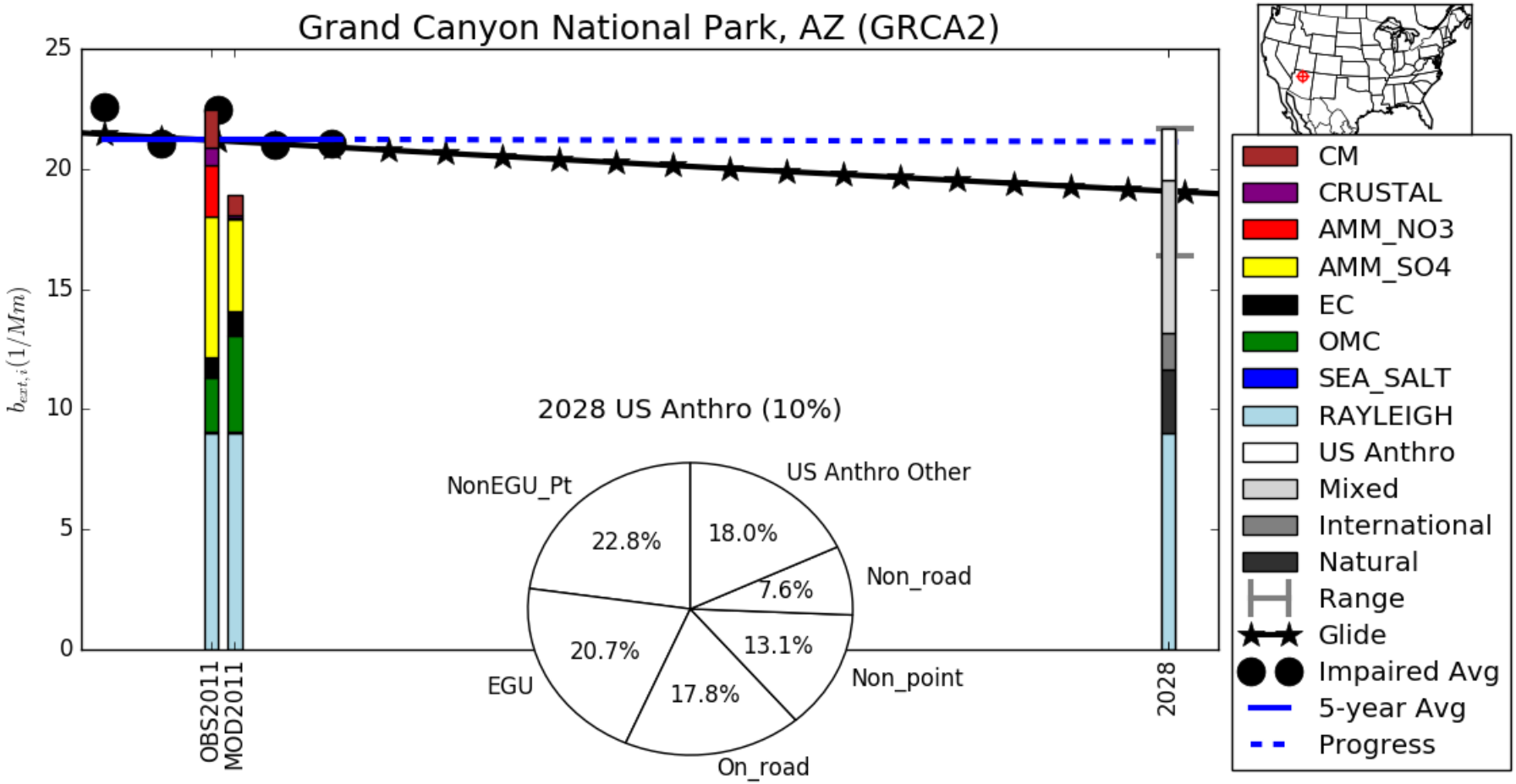


Figure 50: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Grand Canyon National Park (AZ).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

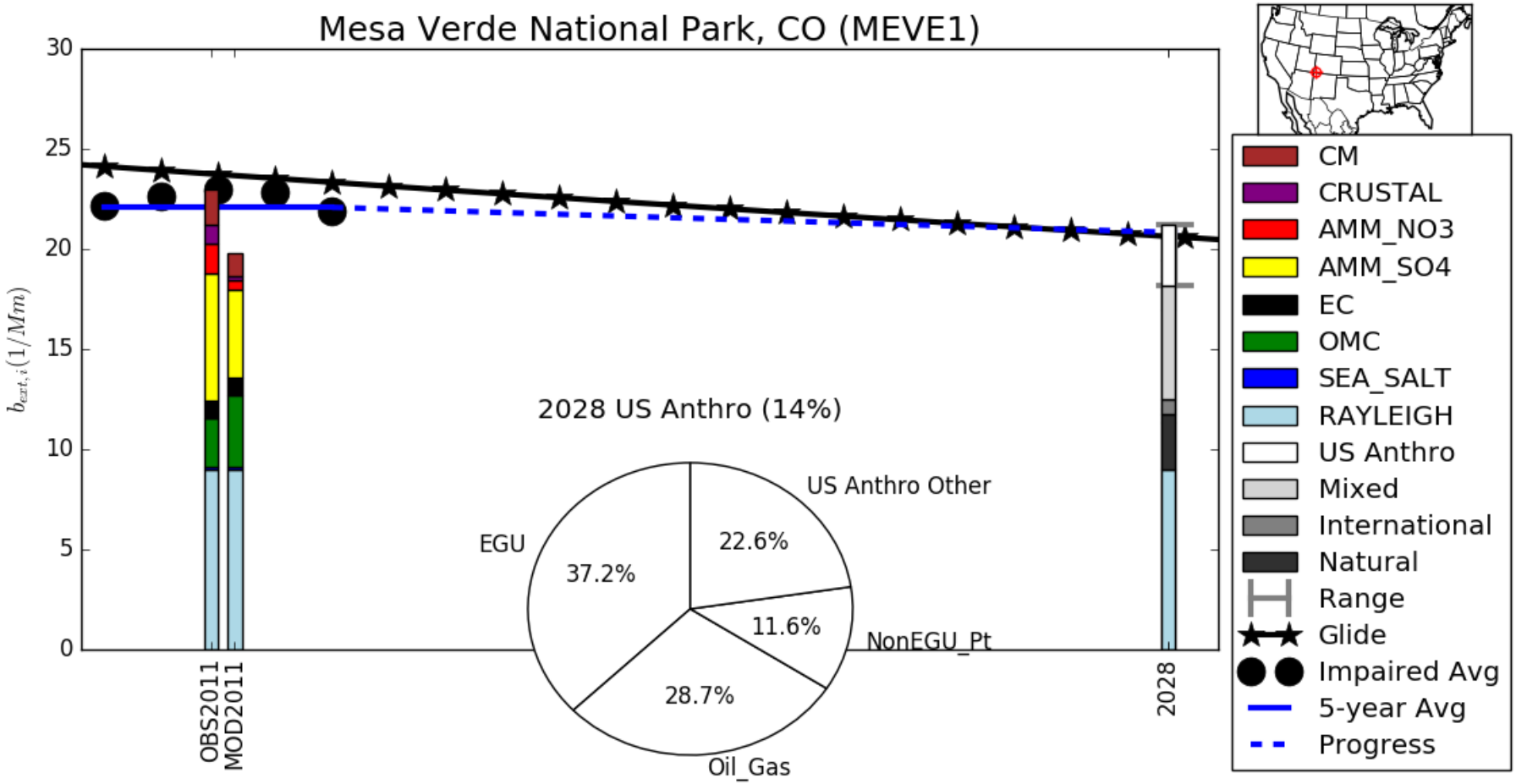


Figure 51: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Mesa Verde National Park (CO).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

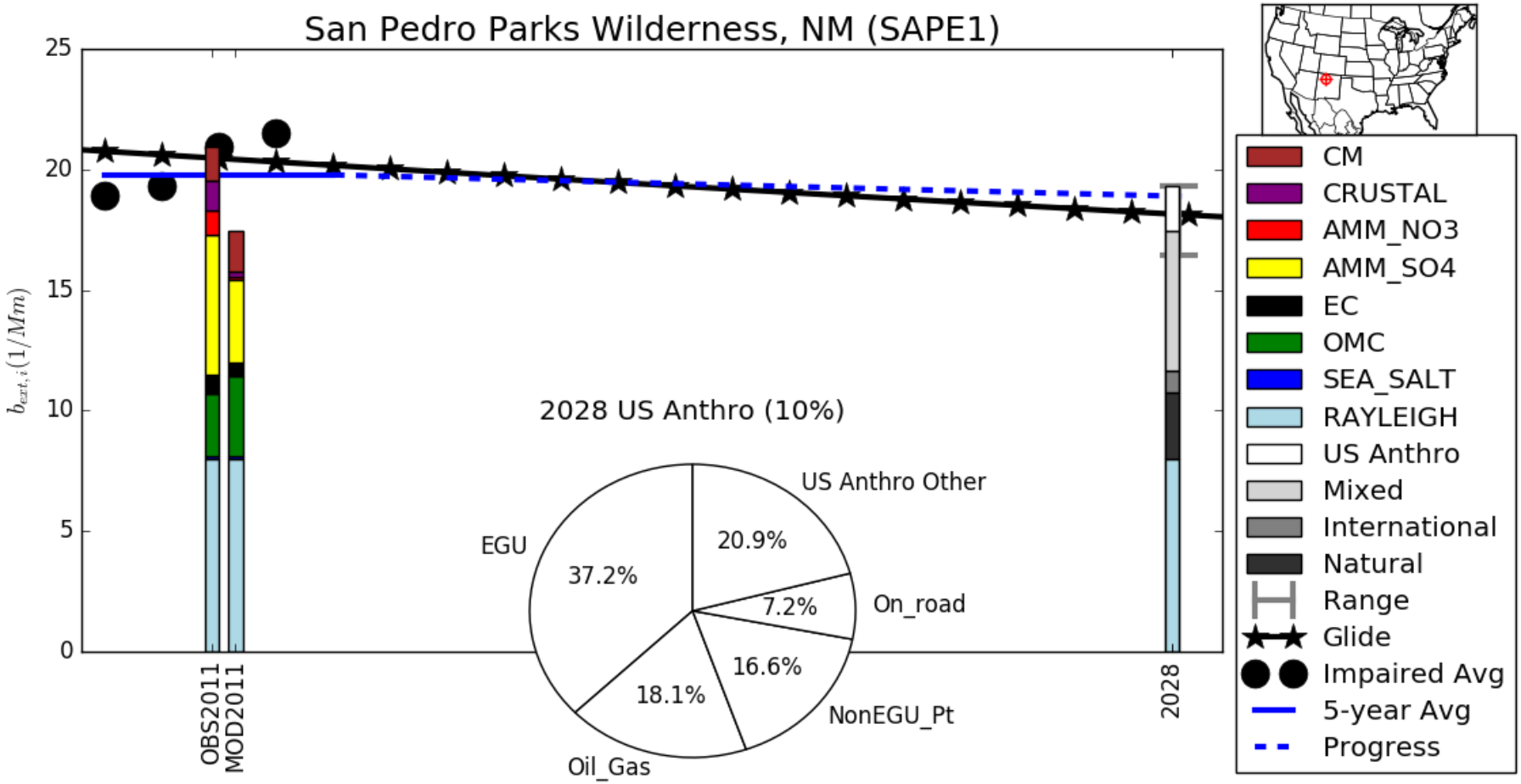


Figure 52: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at San Pedro Parks Wilderness (NM).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

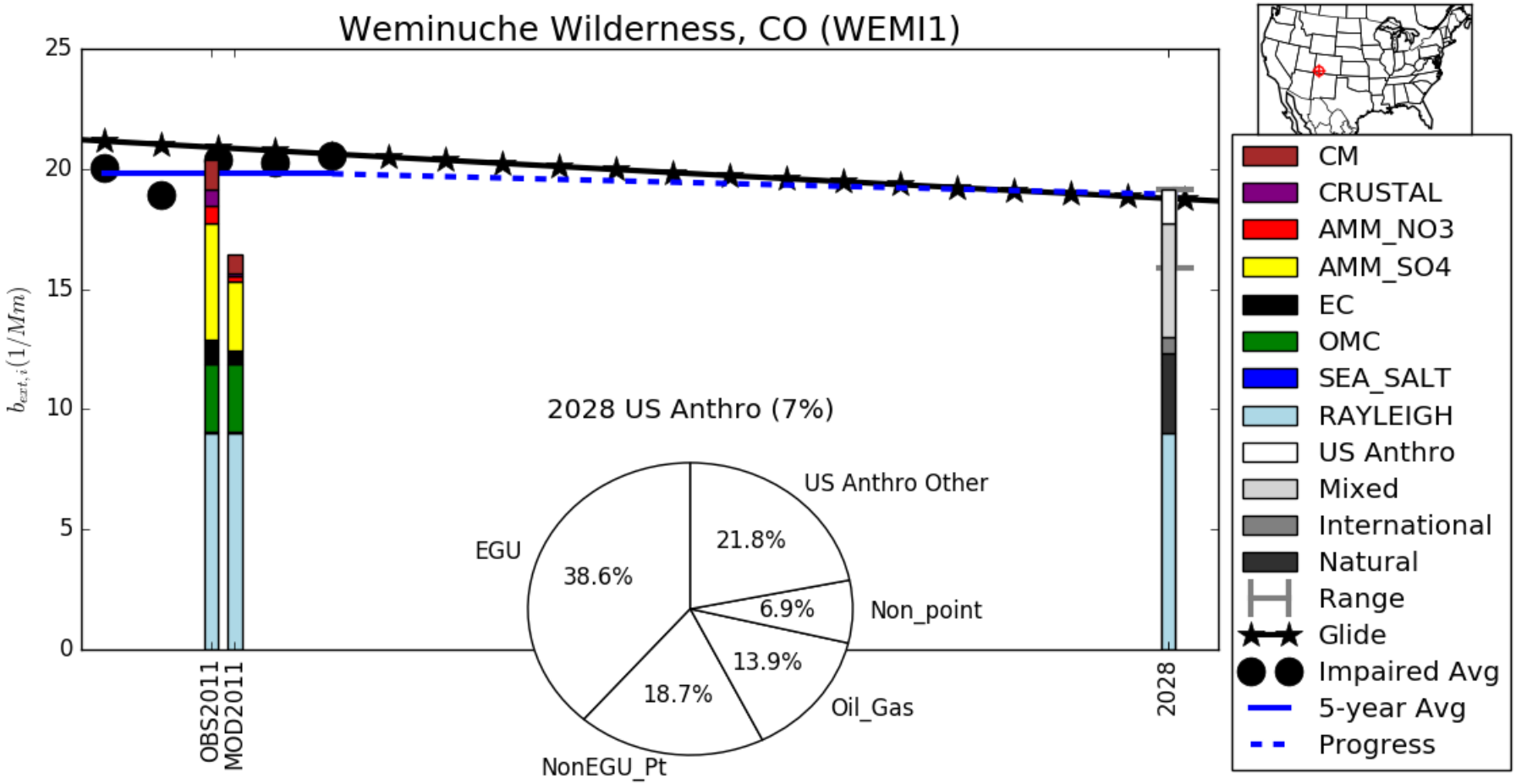


Figure 53: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Black Canyon of the Gunnison National Monument (CO), La Garita Wilderness (CO), and Weminuche Wilderness (CO).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

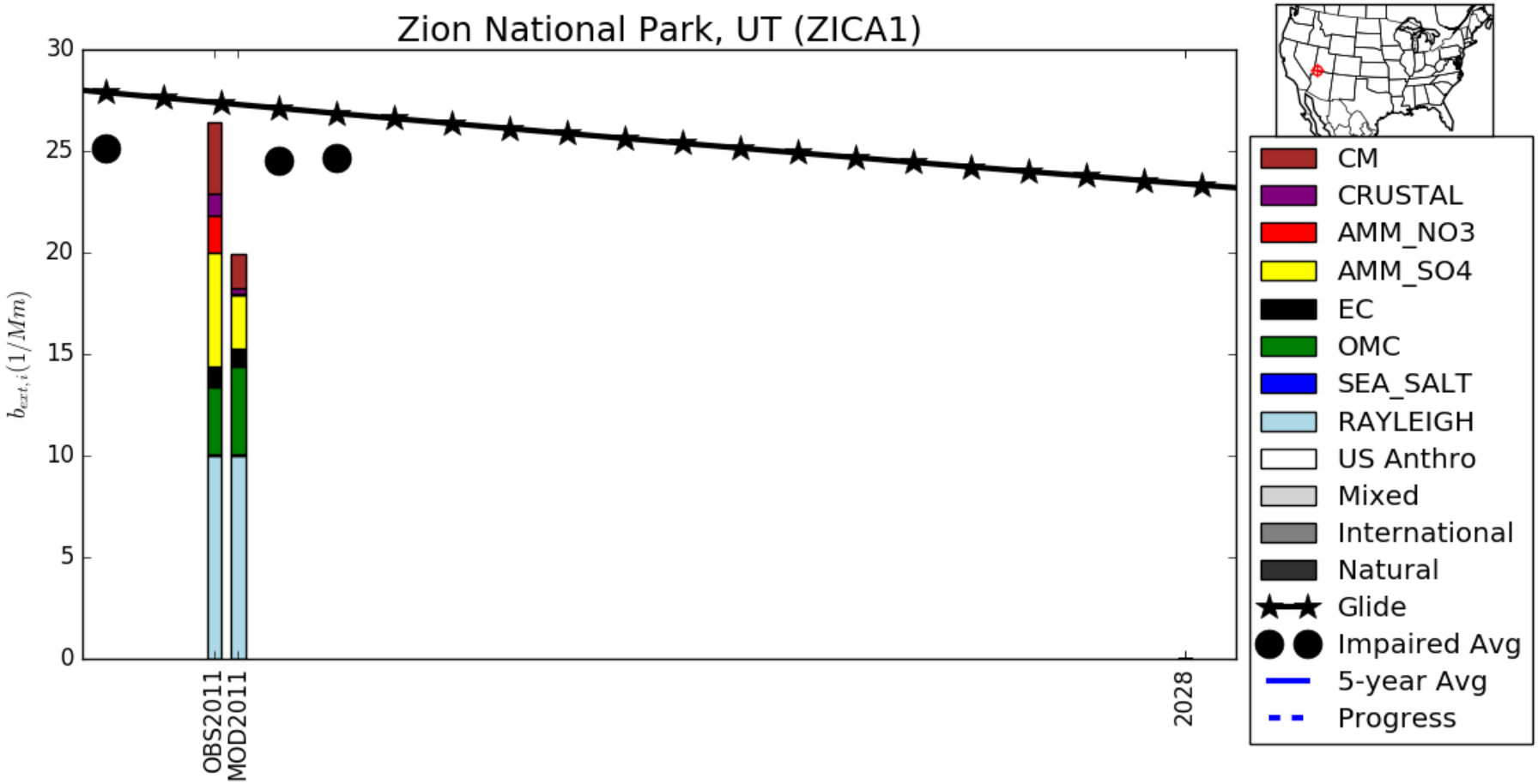


Figure 54: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Zion National Park (UT).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

A 2028 visibility projection could not be calculated for this site due to incomplete ambient IMPROVE data in 2011.

Mogollon Plateau and Southern Arizona

- Mount Baldy Wilderness (AZ)(BALD1)
- Bosque del Apache (NM)(BOAP1)
- Gila Wilderness (NM)(GICL1)
- Mazatzal Wilderness (AZ) and Pine Mountain Wilderness (AZ)(IKBA1)
- Petrified Forest National Park (AZ)(PEFO1)
- Sierra Ancha Wilderness (AZ)(SIAN1)
- Sycamore Canyon Wilderness (AZ)(SYCA2)
- Superstition Wilderness (AZ)(TONT1)
- White Mountain Wilderness (NM)(WHIT1)
- Chiricahua National Monument (AZ), Chiricahua Wilderness (AZ), and Galiuro Wilderness (AZ) (CHIR1)
- Saguaro National Monument (AZ) (SAGU1)

Regional visibility model performance and contribution summary on the 20% most impaired days

Most important ambient PM species contribution to visibility (on 20% most impaired days)	Sulfate, coarse mass, nitrate (at BOAP1 and IKBA1)
Model visibility performance summary (on 20% most impaired days)	Sulfate underpredicted, nitrate severely underpredicted at most sites, especially Boap1 and IKBA1, coarse mass underpredicted
Uncertainty in sector contributions	High “mixed” sector contribution percentage (>58% at all sites).
2028 US anthropogenic percent contribution	7-12%
Largest US anthropogenic sector contributions	EGU, nonEGU point, Oil & gas, and on-road

Due to uncertainties in the modeling, the 2028 regional haze results should be used with caution. In particular, the modeling results (including the estimated 2028 US anthropogenic contributions) are most uncertain at sites with poor visibility model performance and/or high “mixed” (boundary conditions, fugitive dust, offshore, and secondary organics) contributions.

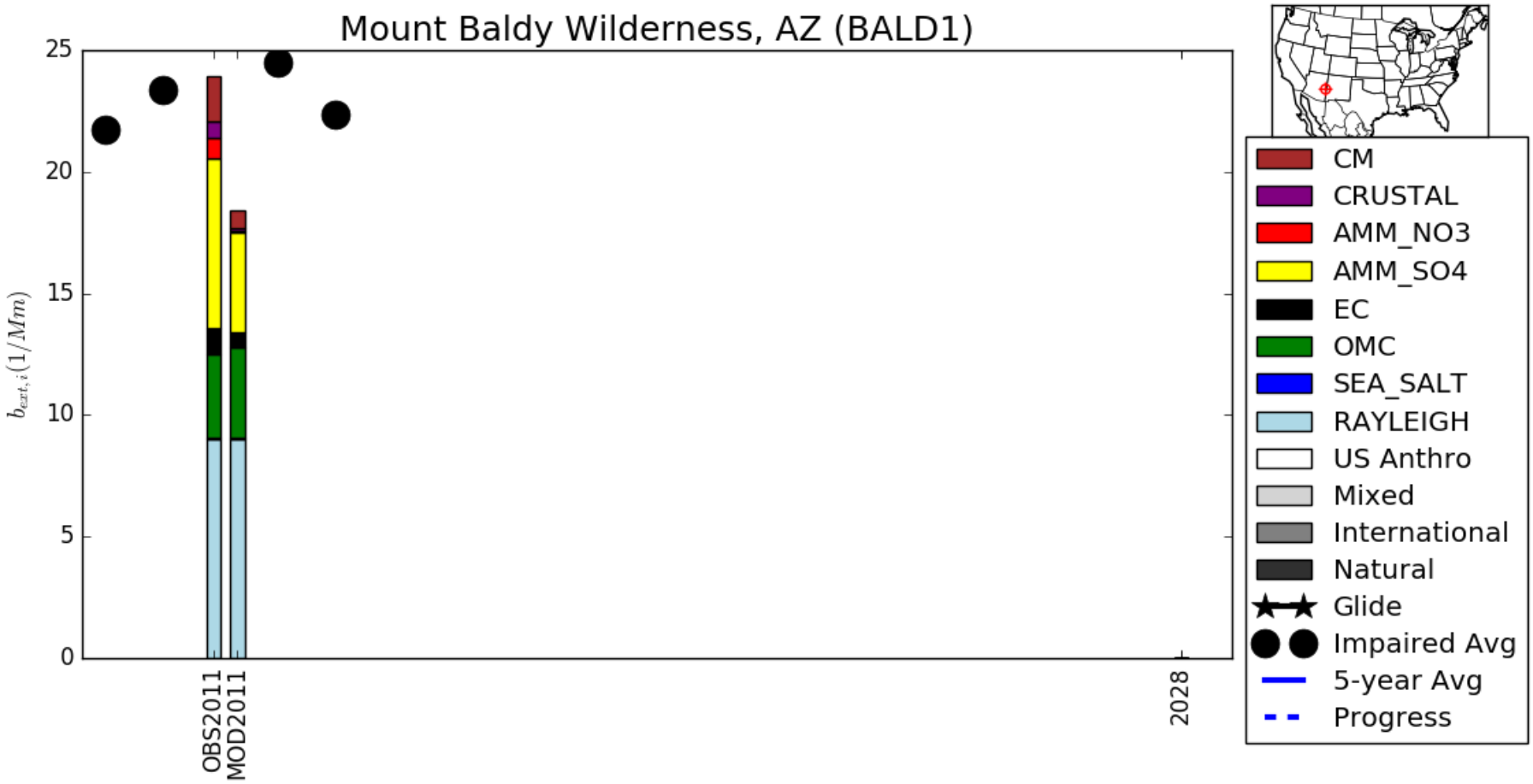


Figure 55: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Mount Baldy Wilderness (AZ).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

A glidepath could not be calculated for this site due to incomplete ambient IMPROVE data in the 2000-2004 baseline period.

A 2028 visibility projection could not be calculated for this site due to incomplete ambient IMPROVE data in 2011.

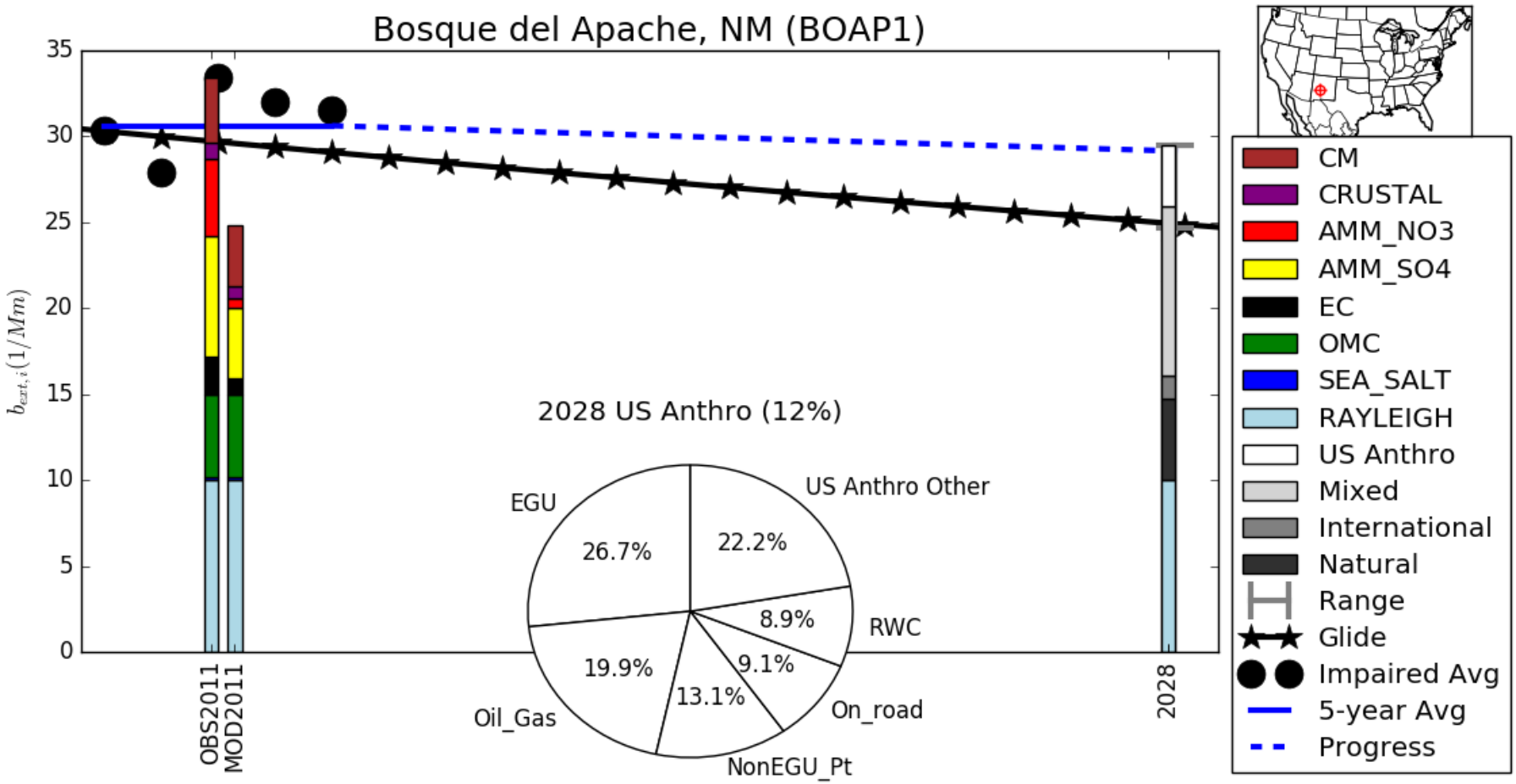


Figure 56: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Bosque del Apache (NM).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

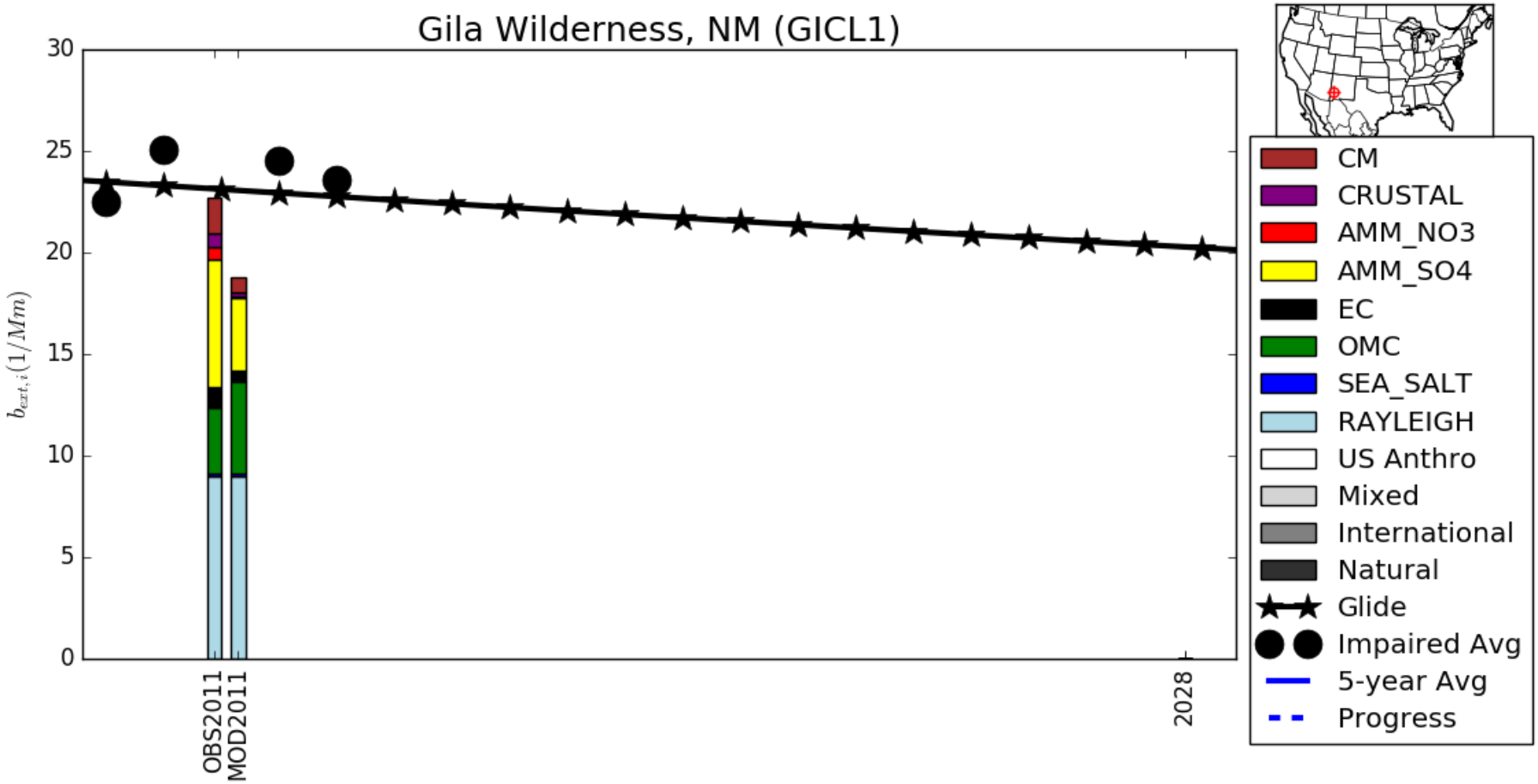


Figure 57: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Gila Wilderness (NM).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

A 2028 visibility projection could not be calculated for this site due to incomplete ambient IMPROVE data in 2011.

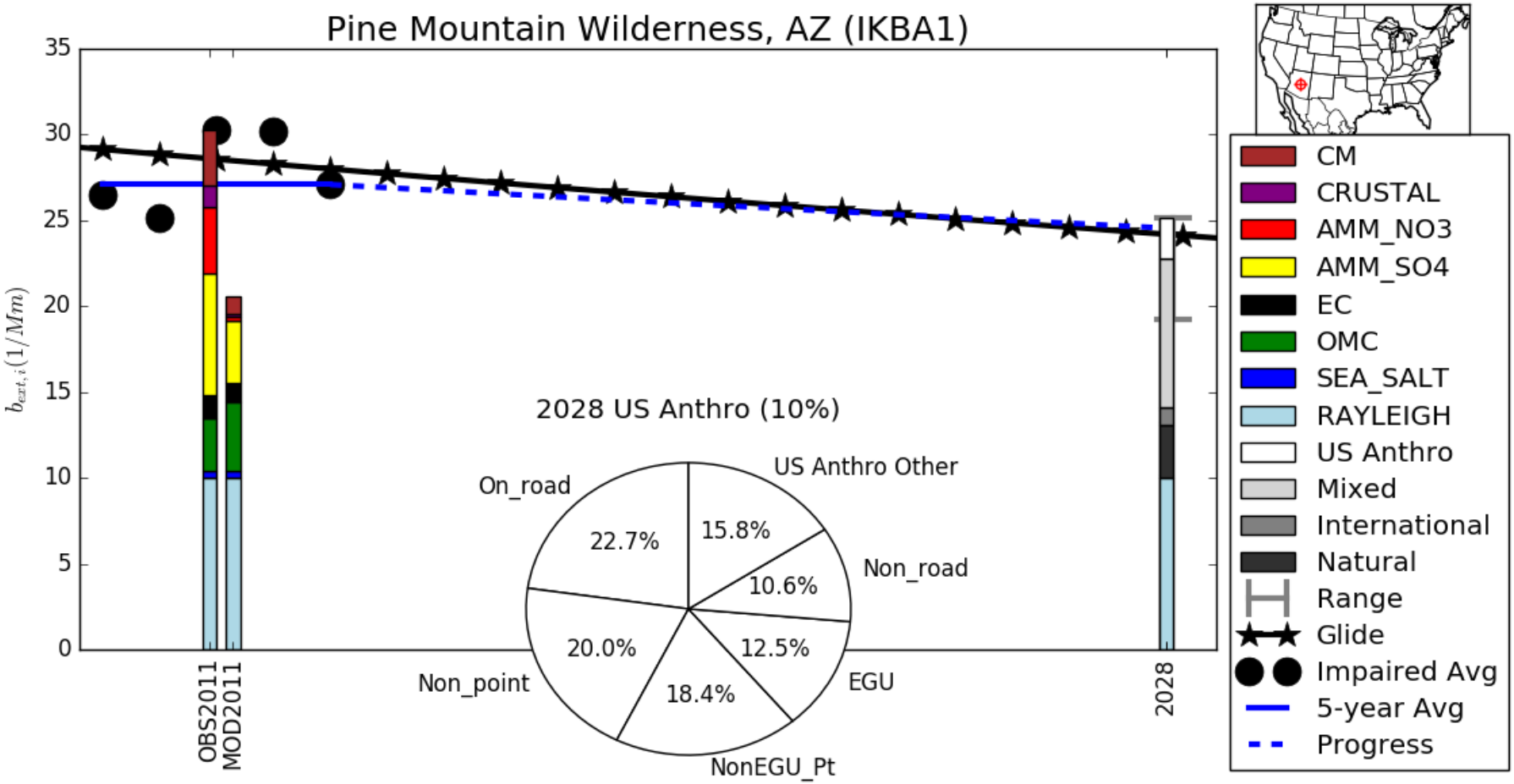


Figure 58: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Mazatzal Wilderness (AZ) and Pine Mountain Wilderness (AZ).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

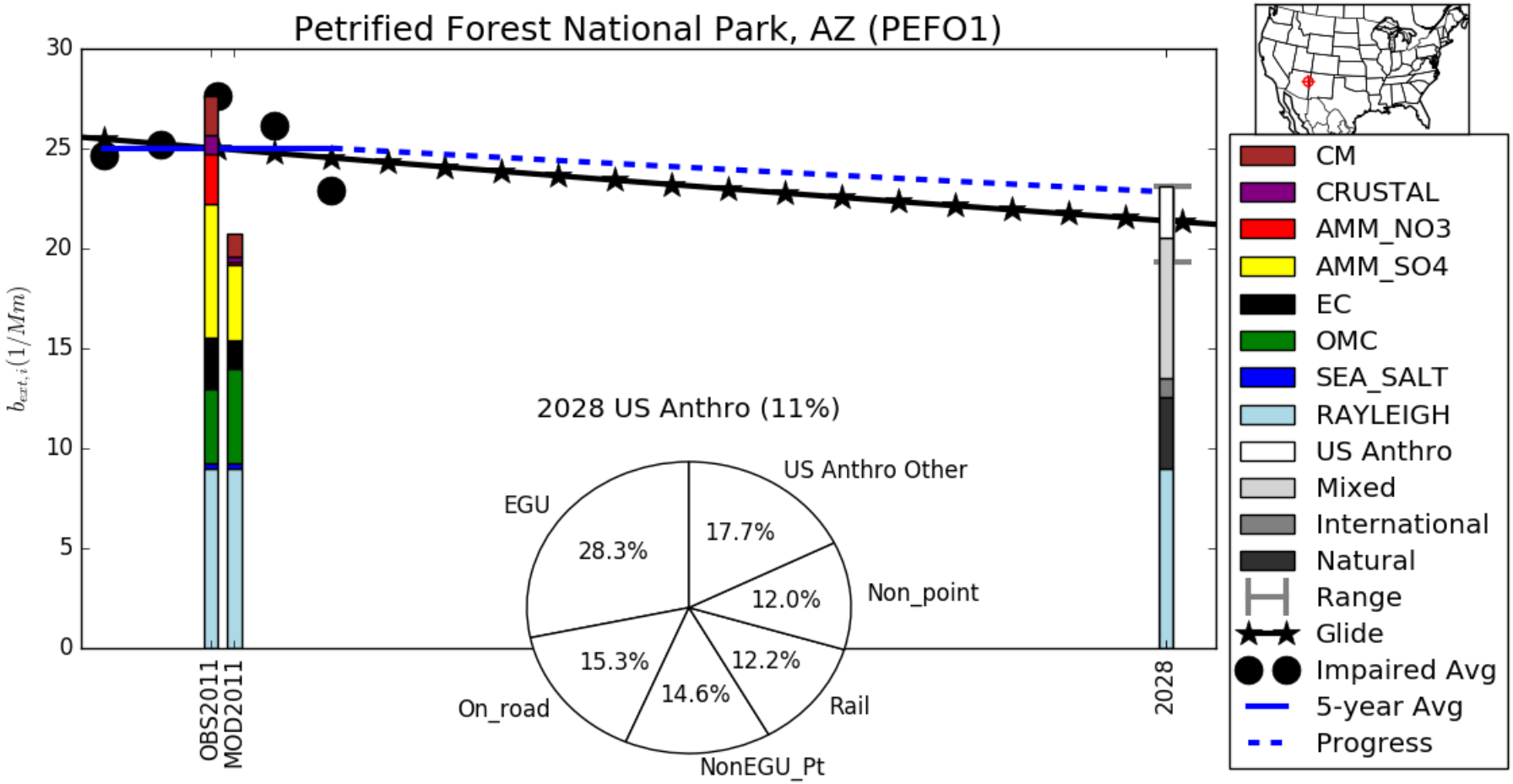


Figure 59: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Petrified Forest National Park (AZ).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

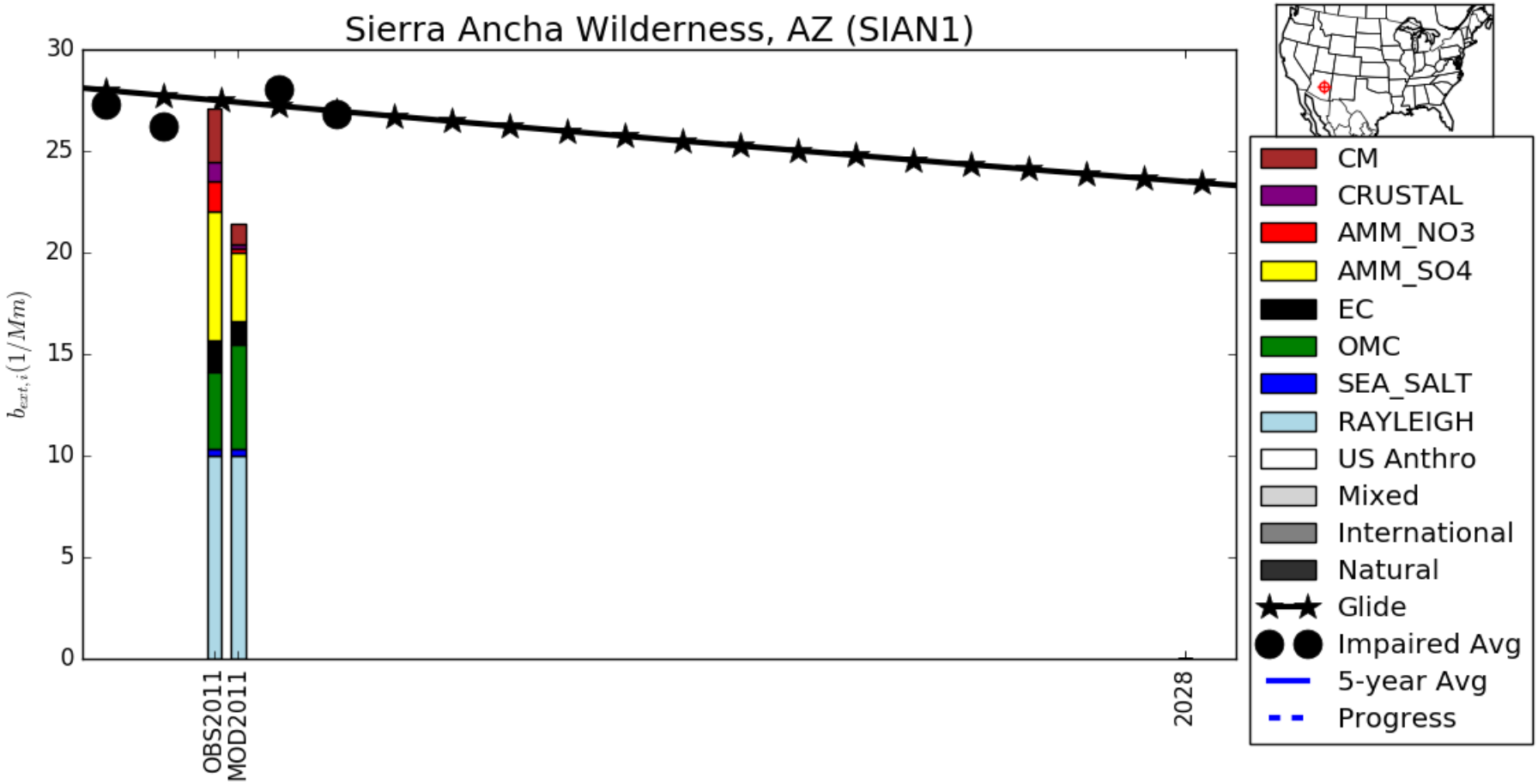


Figure 60: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Sierra Ancha Wilderness (AZ).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

A 2028 visibility projection could not be calculated for this site due to incomplete ambient IMPROVE data in 2011.

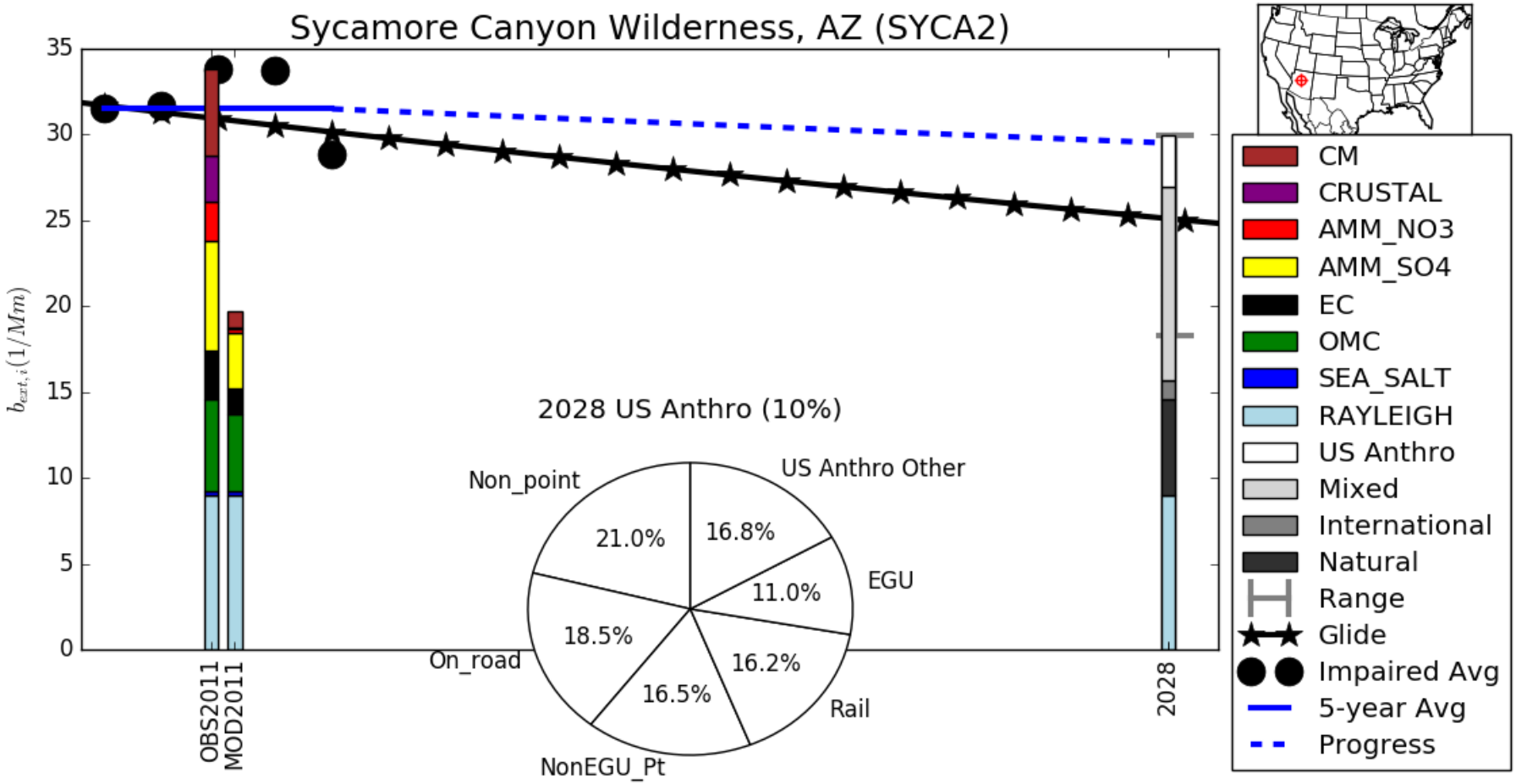


Figure 61: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Sycamore Canyon Wilderness (AZ).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

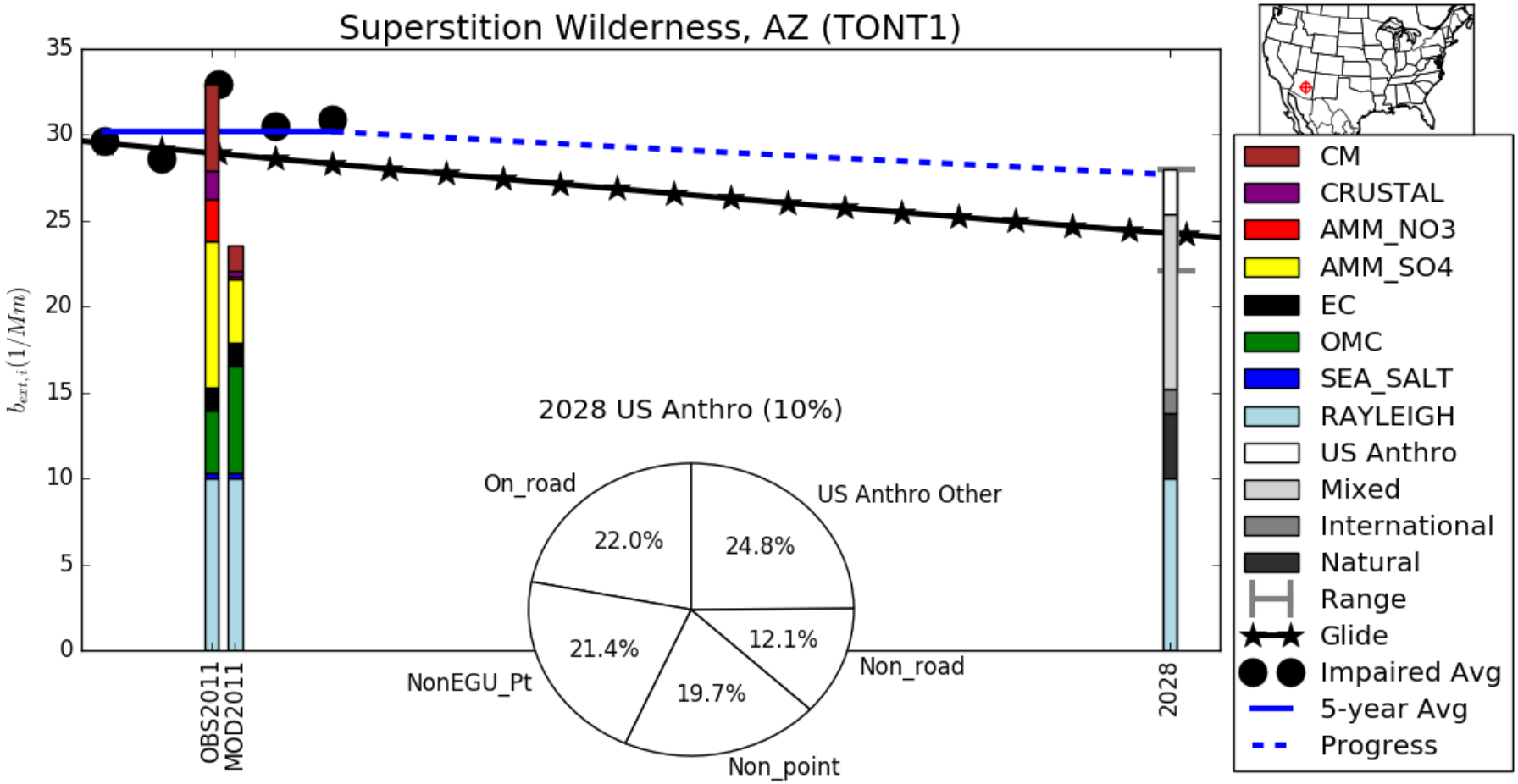


Figure 62: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Superstition Wilderness (AZ).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

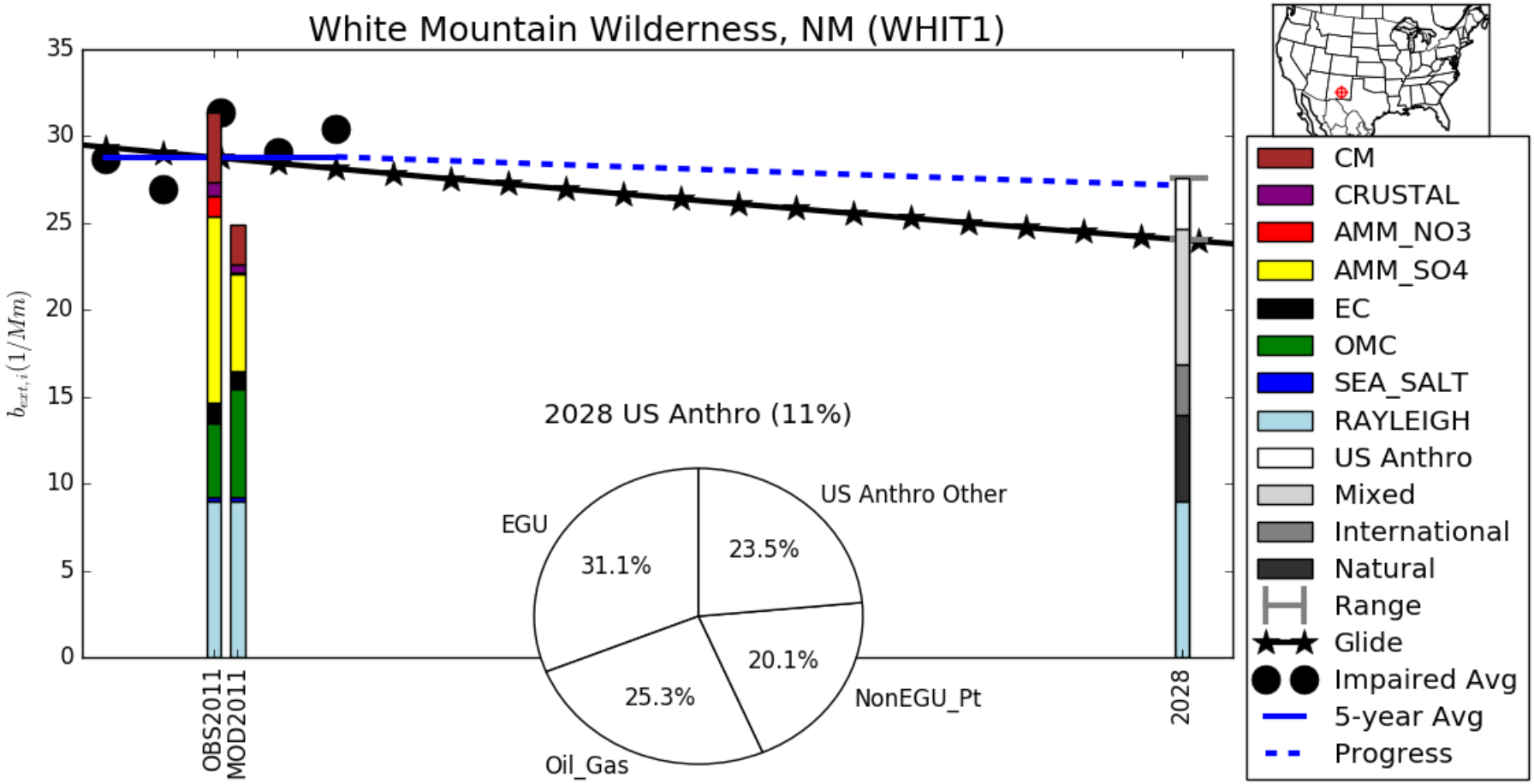


Figure 63: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at White Mountain Wilderness (NM).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

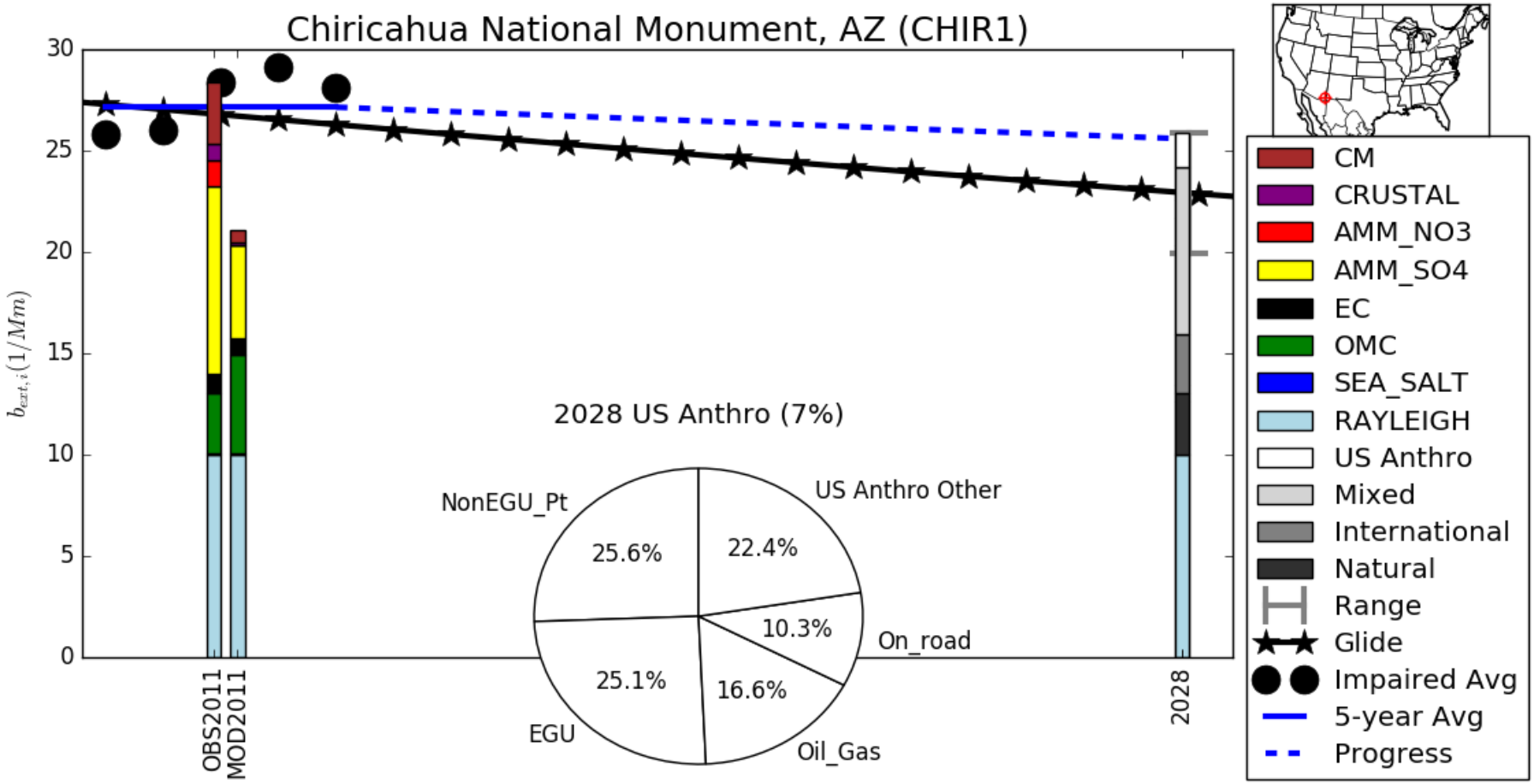


Figure 64: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Chiricahua National Monument (AZ), Chiricahua Wilderness (AZ), and Galiuro Wilderness (AZ).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

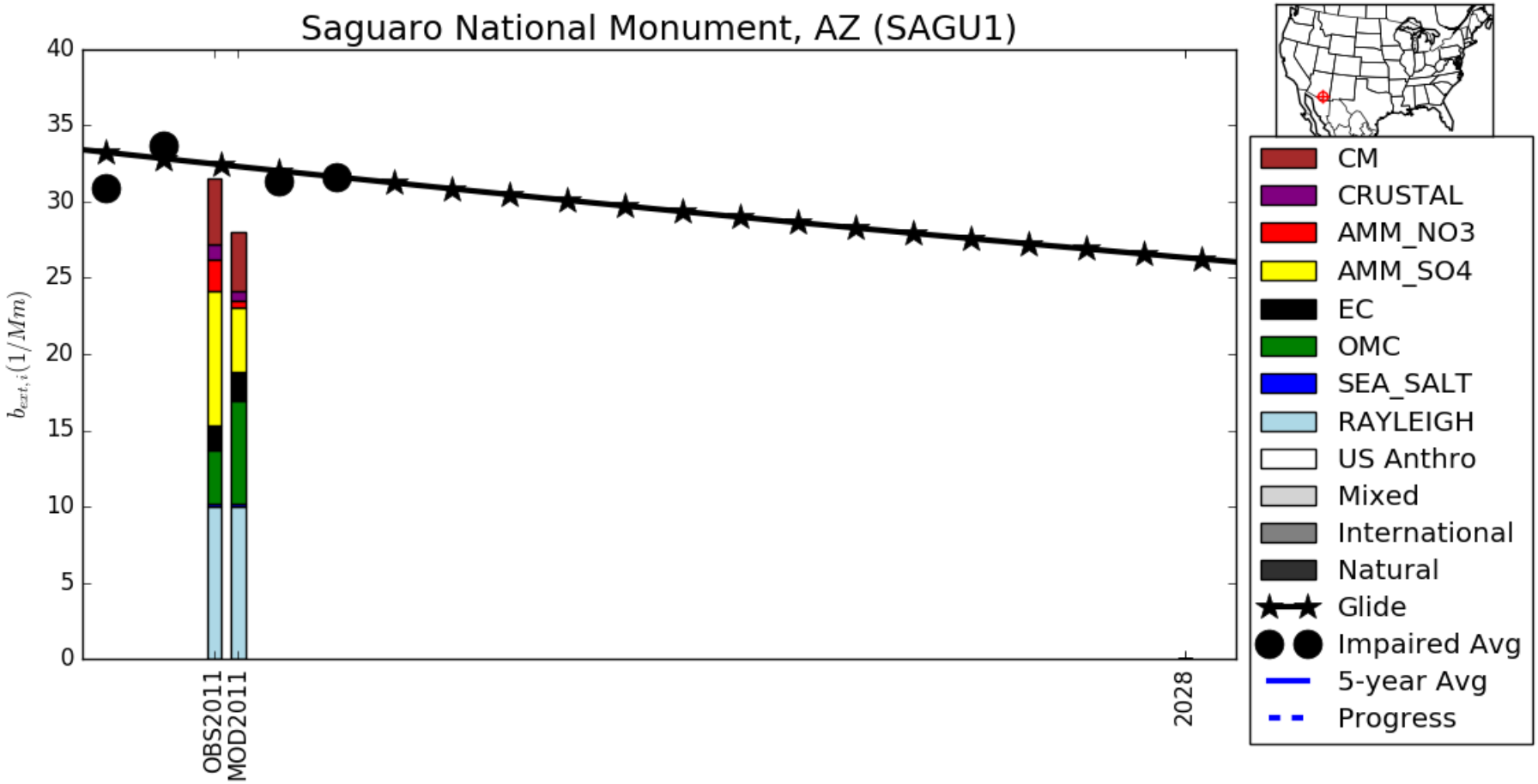


Figure 65: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Saguaro National Monument (AZ).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

A 2028 visibility projection could not be calculated for this site due to incomplete ambient IMPROVE data in 2011.

West Texas

- Big Bend National Park (TX)(BIBE1)
- Carlsbad Caverns National Park (TX) and Guadalupe Mountains National Park (TX)(GUMO1)
- Salt Creek (NM)(SACR1)

Regional visibility model performance and contribution summary on the 20% most impaired days

Most important ambient PM species contribution to visibility (on 20% most impaired days)	Sulfate, coarse mass, nitrate (at SACR1)
Model visibility performance summary (on 20% most impaired days)	Sulfate and nitrate underpredicted, coarse mass underpredicted (except overpredicted at SACR1)
Uncertainty in sector contributions	High "mixed" sector contribution percentage (>56% at all sites).
2028 US anthropogenic percent contribution	6-20%
Largest US anthropogenic sector contributions	EGU, nonEGU point, and Oil & gas

Due to uncertainties in the modeling, the 2028 regional haze results should be used with caution. In particular, the modeling results (including the estimated 2028 US anthropogenic contributions) are most uncertain at sites with poor visibility model performance and/or high "mixed" (boundary conditions, fugitive dust, offshore, and secondary organics) contributions.

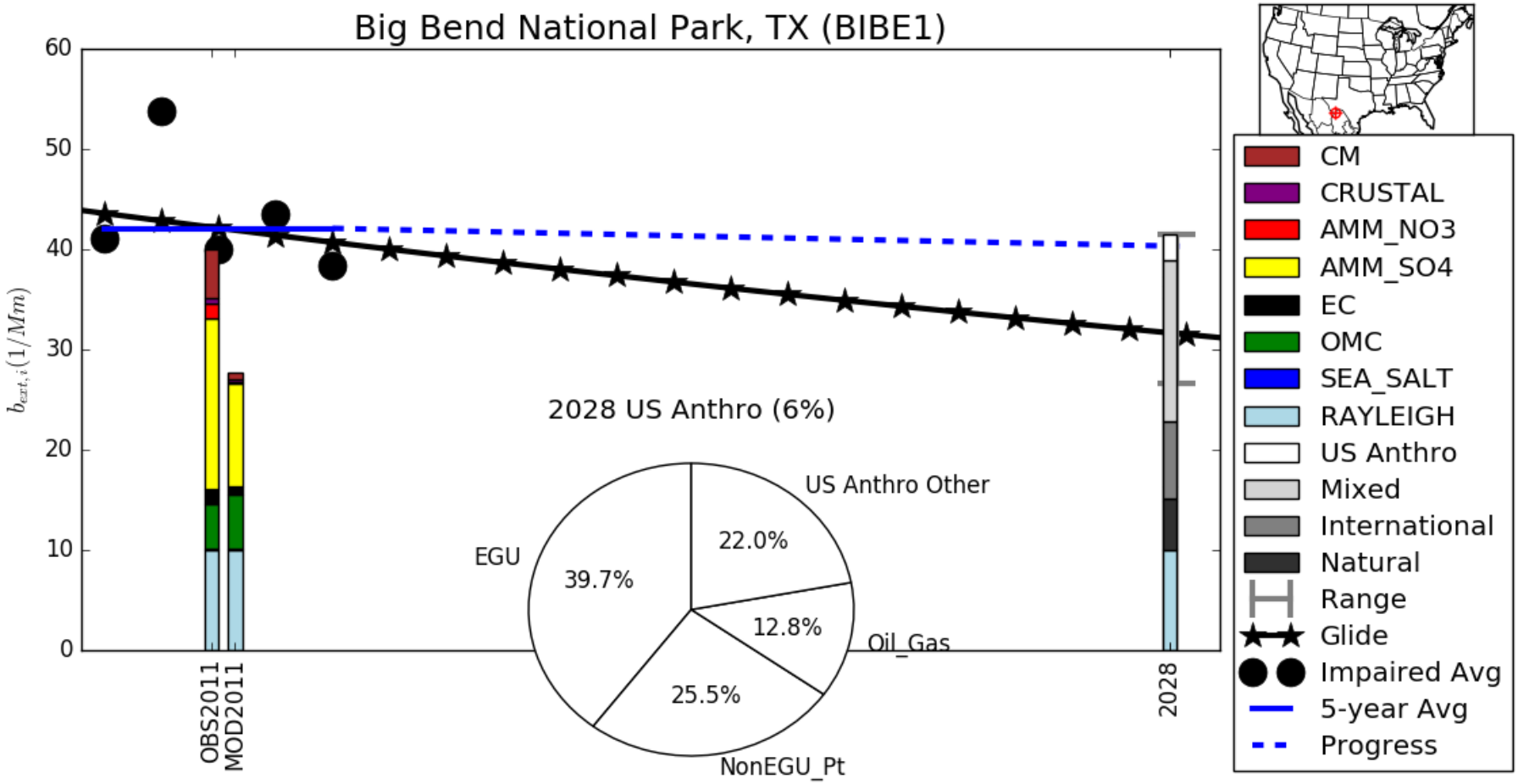


Figure 66: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Big Bend National Park (TX).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

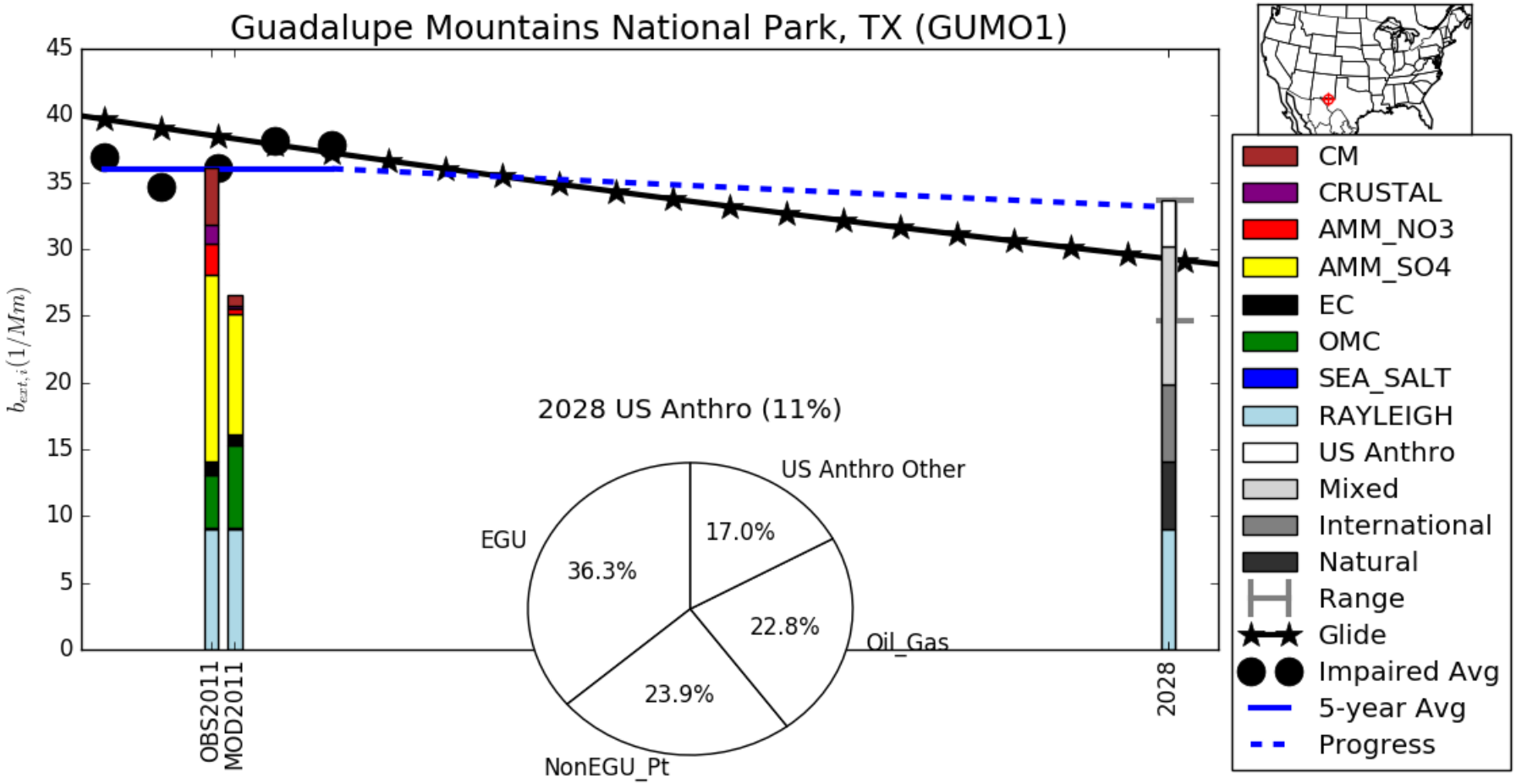


Figure 67: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Carlsbad Caverns National Park (TX) and Guadalupe Mountains National Park (TX).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

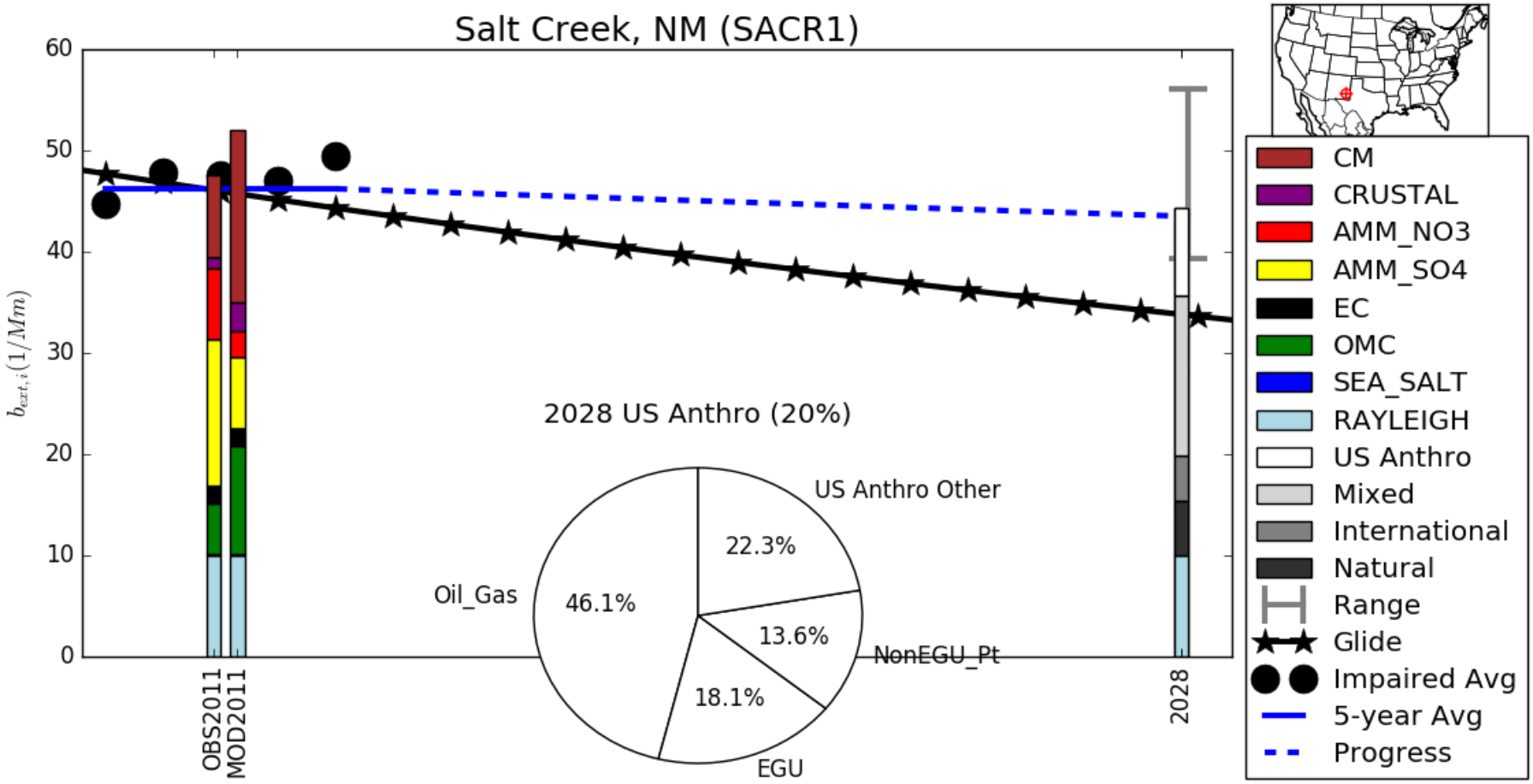


Figure 68: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Salt Creek (NM).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

Northern Great Plains

- Badlands National Park (SD)(BADL1)
- Lostwood (ND)(LOST1)
- Medicine Lake (MT)(MELA1)
- Theodore Roosevelt National Park (ND)(THRO1)
- UL Bend (MT)(ULBE1)
- Wind Cave National Park (SD)(WICA1)

Regional visibility model performance and contribution summary on the 20% most impaired days

Most important ambient PM species contribution to visibility (on 20% most impaired days)	Sulfate, nitrate
Model visibility performance summary (on 20% most impaired days)	Sulfate underpredicted, nitrate overpredicted
Uncertainty in sector contributions	High “mixed” sector contribution percentage (63%-68% except 47% at WICA1 and 54% at BADL1).
2028 US anthropogenic percent contribution	18-19% except 9% at ULBE1
Largest US anthropogenic sector contributions	EGU, Oil & gas, and nonEGU point

Due to uncertainties in the modeling, the 2028 regional haze results should be used with caution. In particular, the modeling results (including the estimated 2028 US anthropogenic contributions) are most uncertain at sites with poor visibility model performance and/or high “mixed” (boundary conditions, fugitive dust, offshore, and secondary organics) contributions.

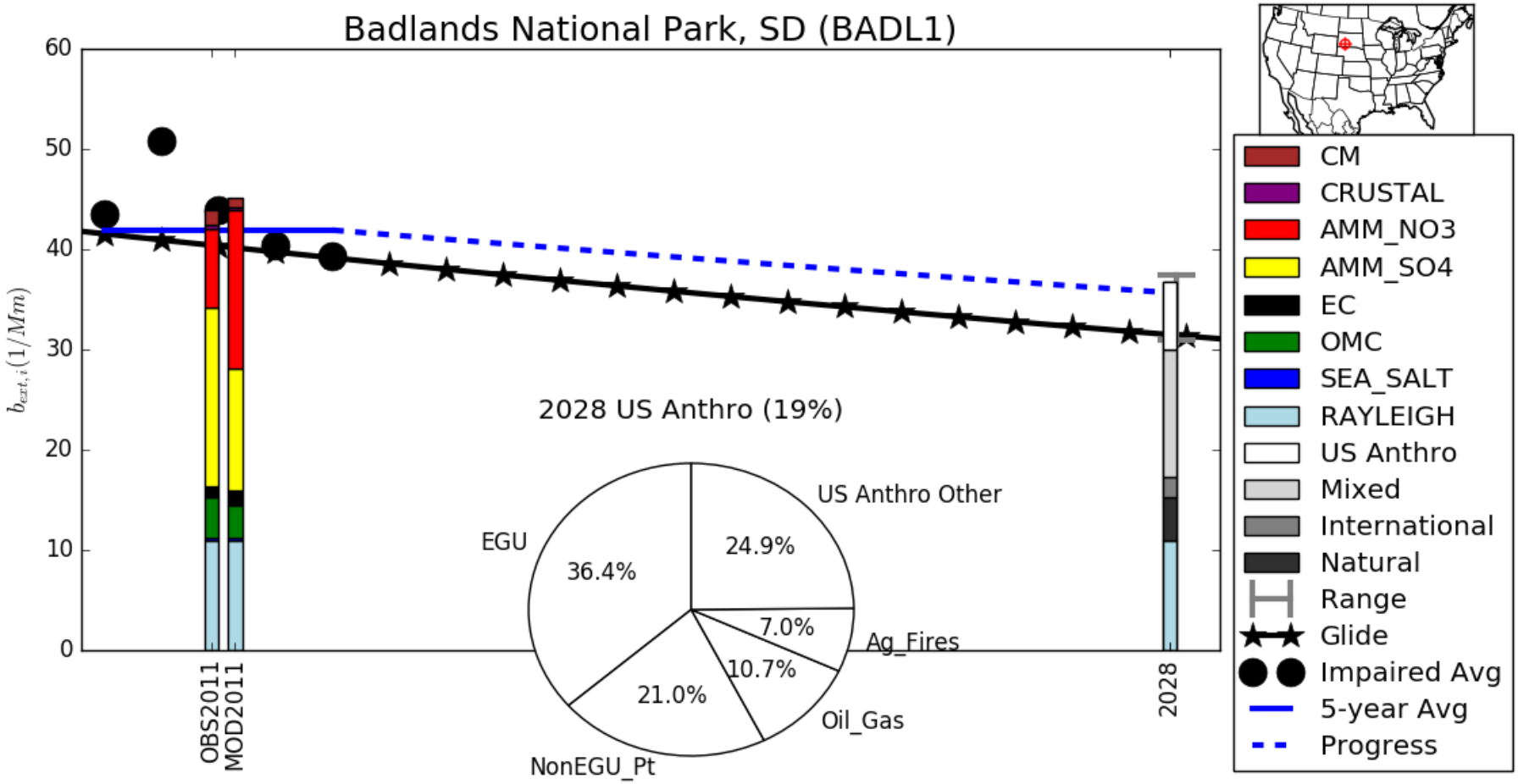


Figure 69: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Badlands National Park (SD).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

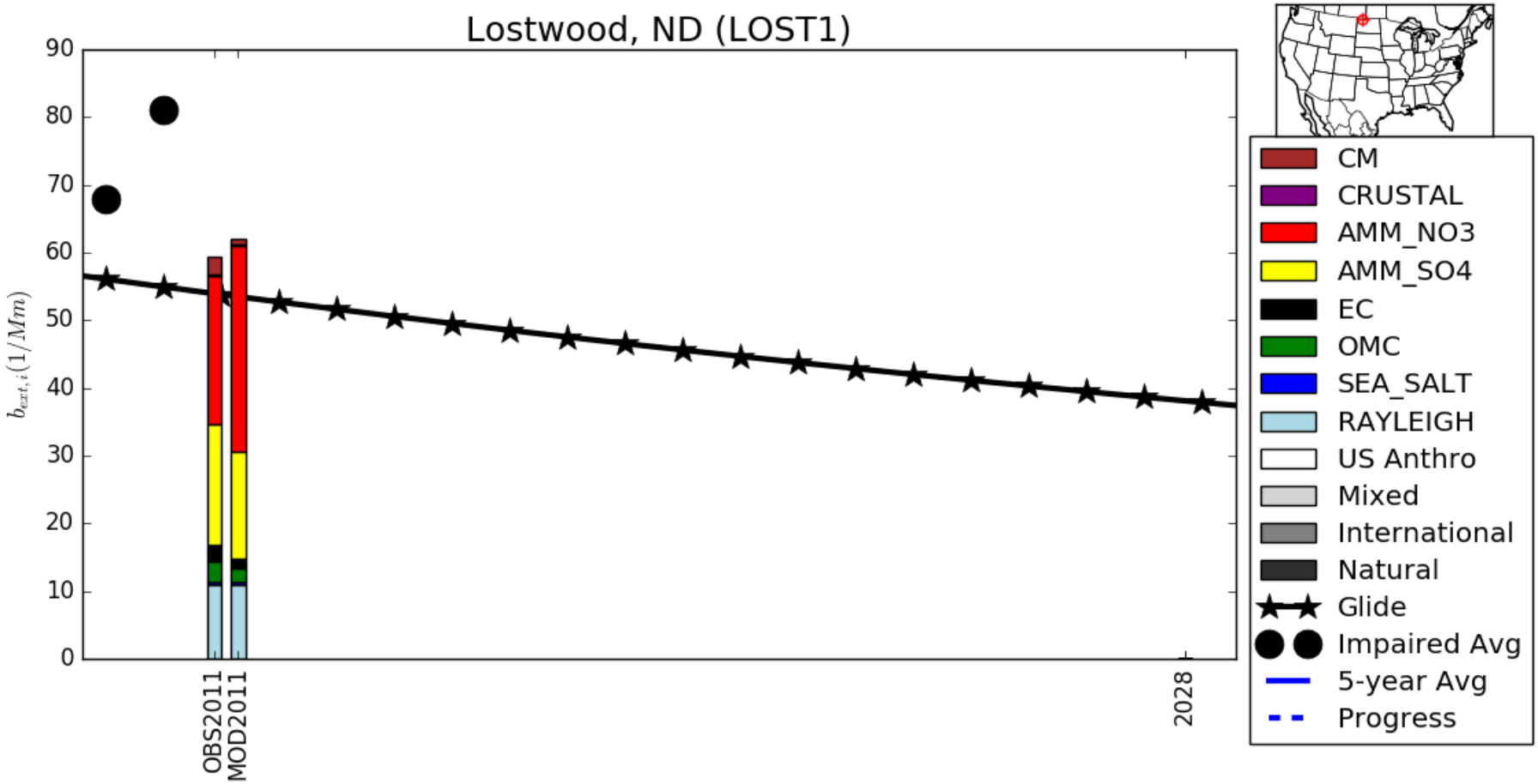


Figure 70: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Lostwood (ND).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

A 2028 visibility projection could not be calculated for this site due to incomplete ambient IMPROVE data in 2011.

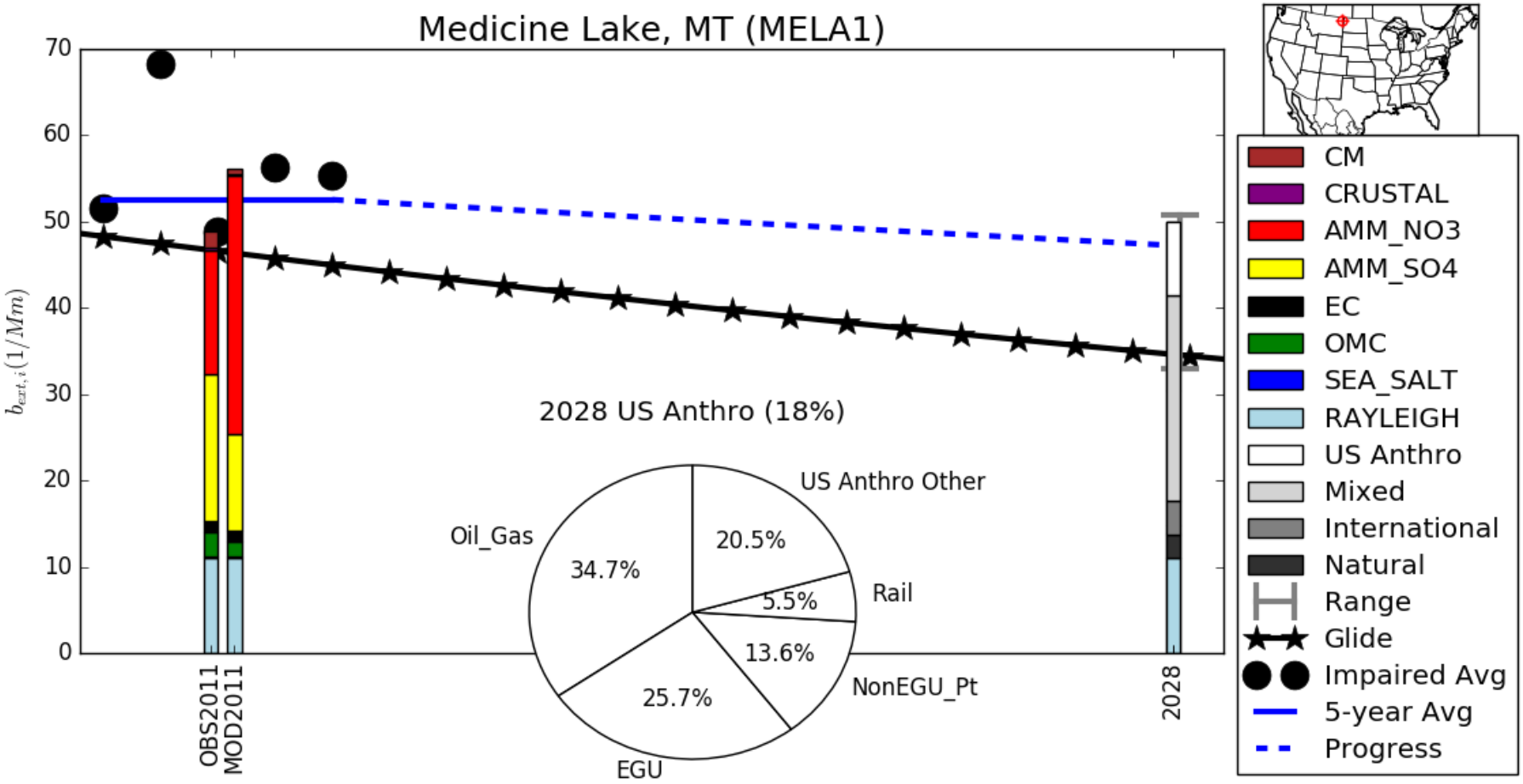


Figure 71: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Medicine Lake (MT).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

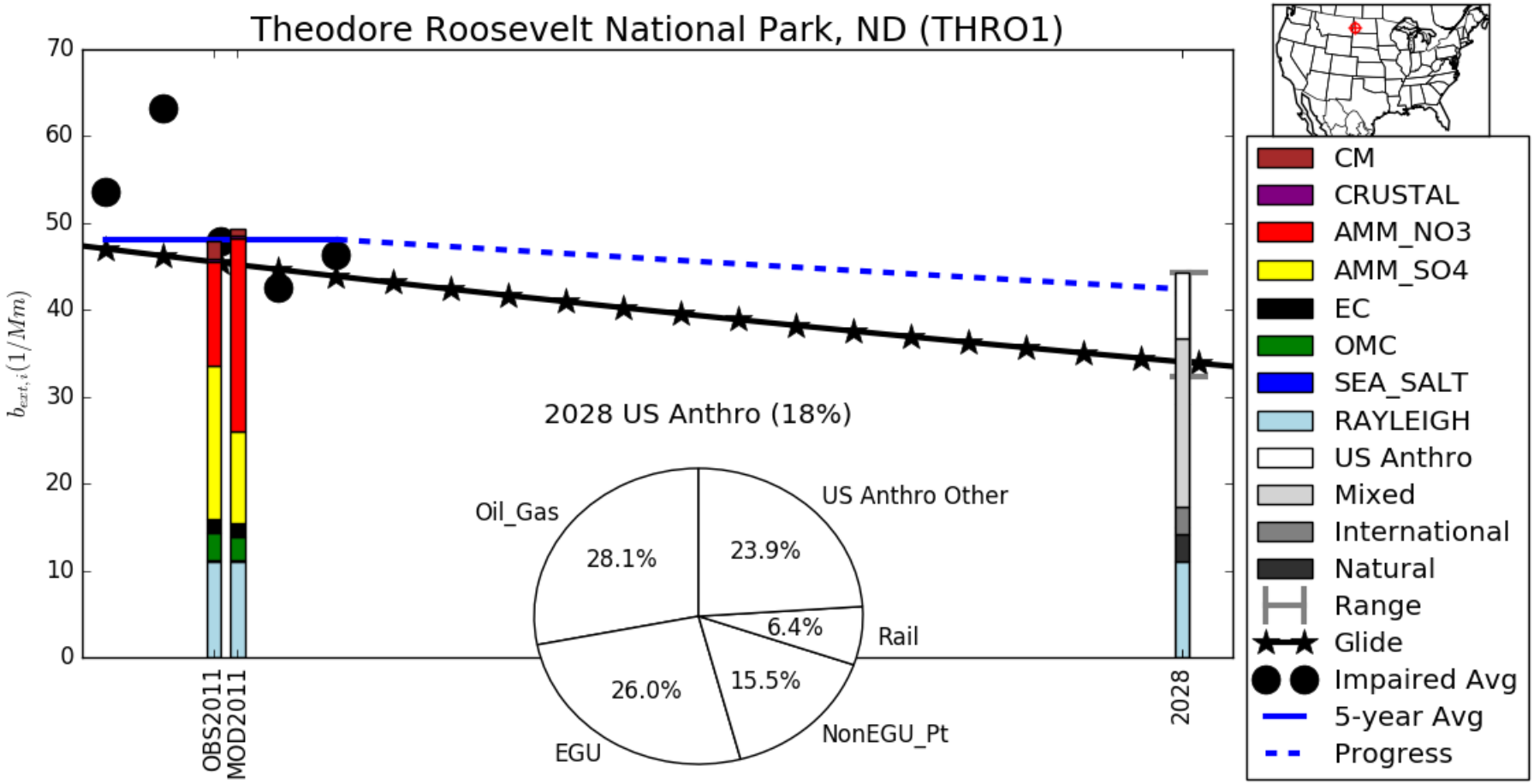


Figure 72: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Theodore Roosevelt National Park (ND).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

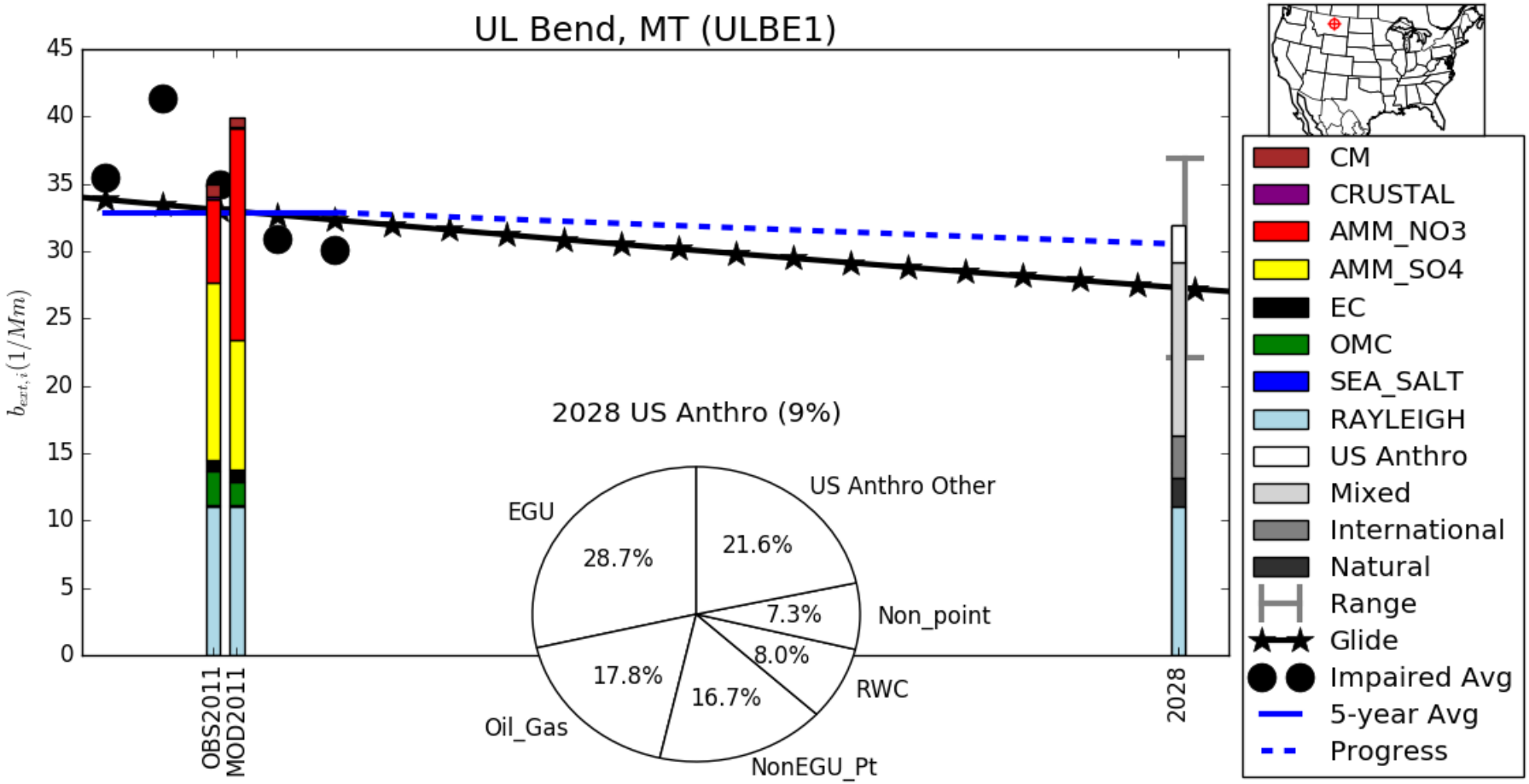


Figure 73: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at UL Bend (MT).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

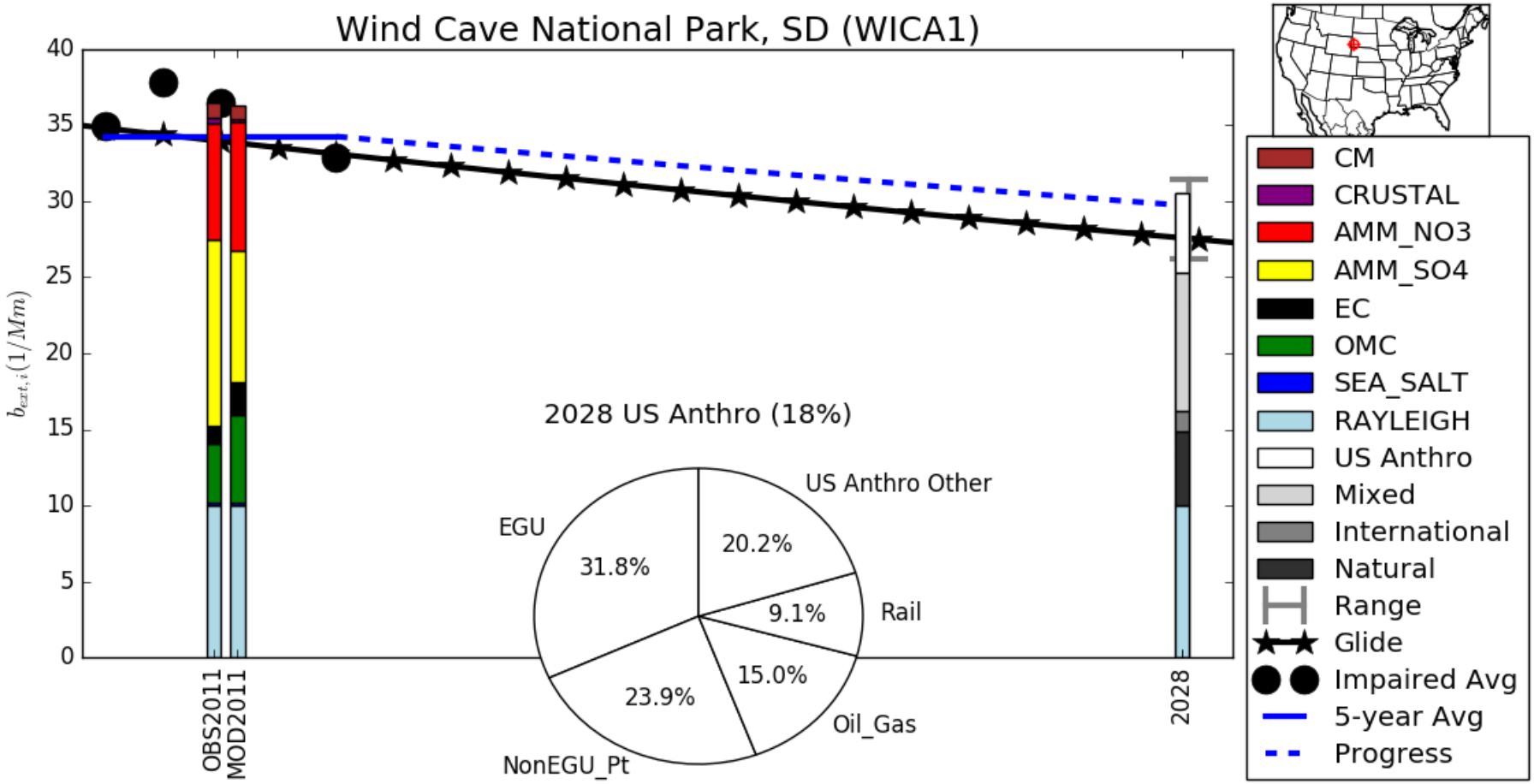


Figure 74: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Wind Cave National Park (SD).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

Mid South

- Caney Creek Wilderness (AR)(CACR1)
- Hercules-Glades Wilderness (MO)(HEGL1)
- Upper Buffalo Wilderness (AR)(UPBU1)
- Wichita Mountains (OK)(WIMO1)

Regional visibility model performance and contribution summary on the 20% most impaired days

Most important ambient PM species contribution to visibility (on 20% most impaired days)	Sulfate, nitrate
Model visibility performance summary (on 20% most impaired days)	Sulfate underpredicted, nitrate underpredicted at HEGL1 and WIMO1
Uncertainty in sector contributions	Relatively low “mixed” sector contribution percentage (26%-44%).
2028 US anthropogenic percent contribution	30-47%
Largest US anthropogenic sector contributions	EGU, nonEGU point, and Oil & gas

Due to uncertainties in the modeling, the 2028 regional haze results should be used with caution. In particular, the modeling results (including the estimated 2028 US anthropogenic contributions) are most uncertain at sites with poor visibility model performance and/or high “mixed” (boundary conditions, fugitive dust, offshore, and secondary organics) contributions.

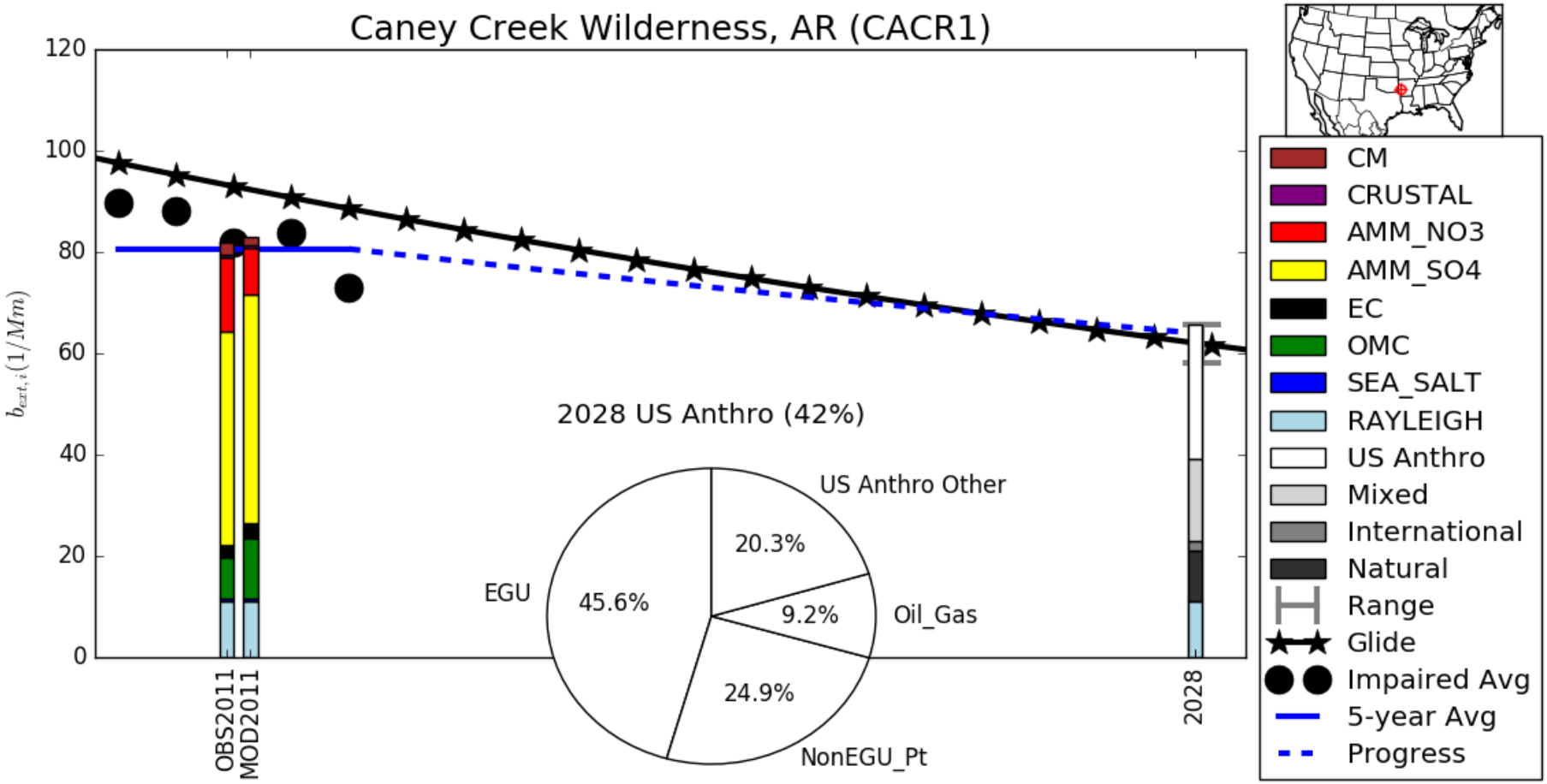


Figure 75: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Caney Creek Wilderness (AR).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

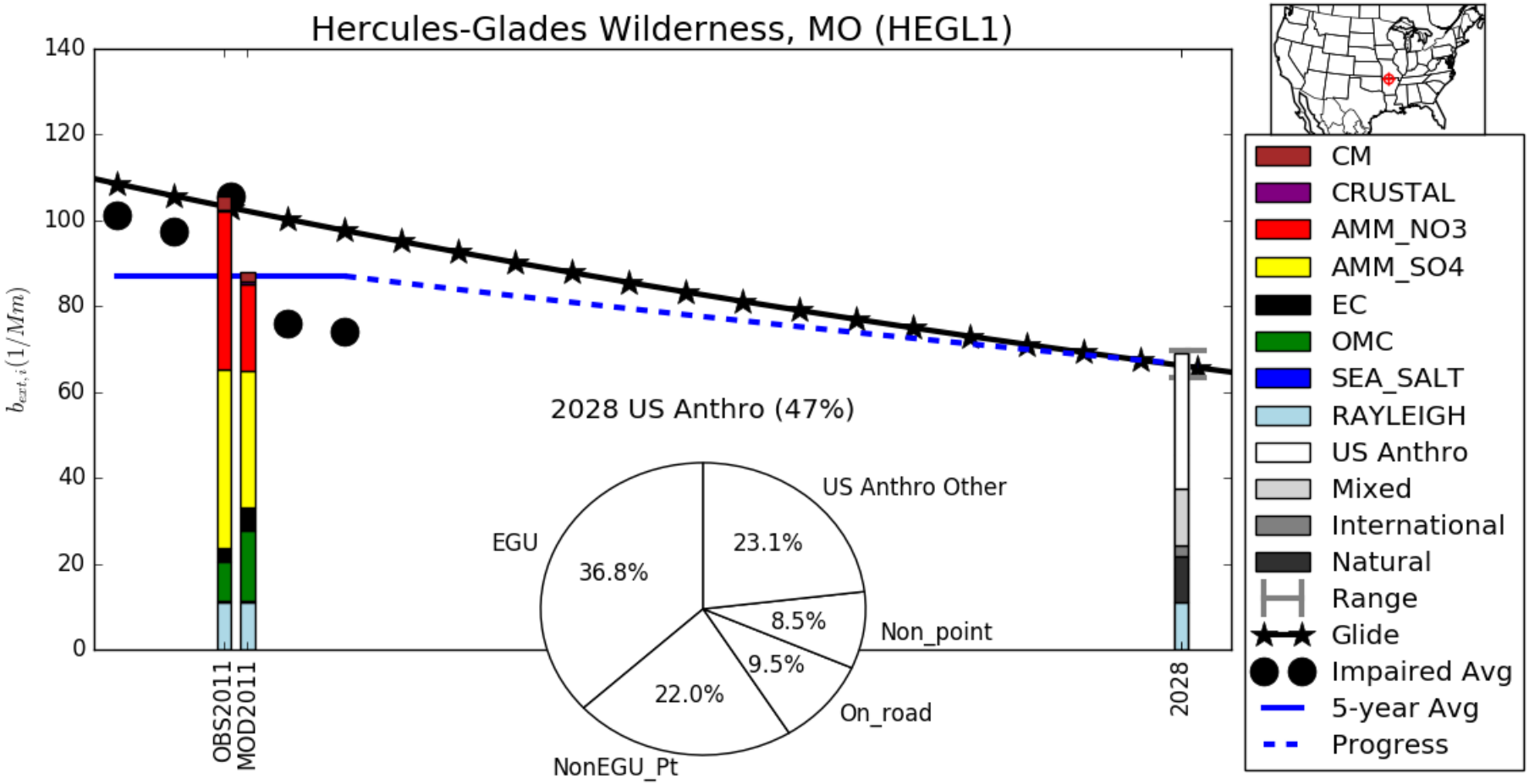


Figure 76: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Hercules-Glades Wilderness (MO).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

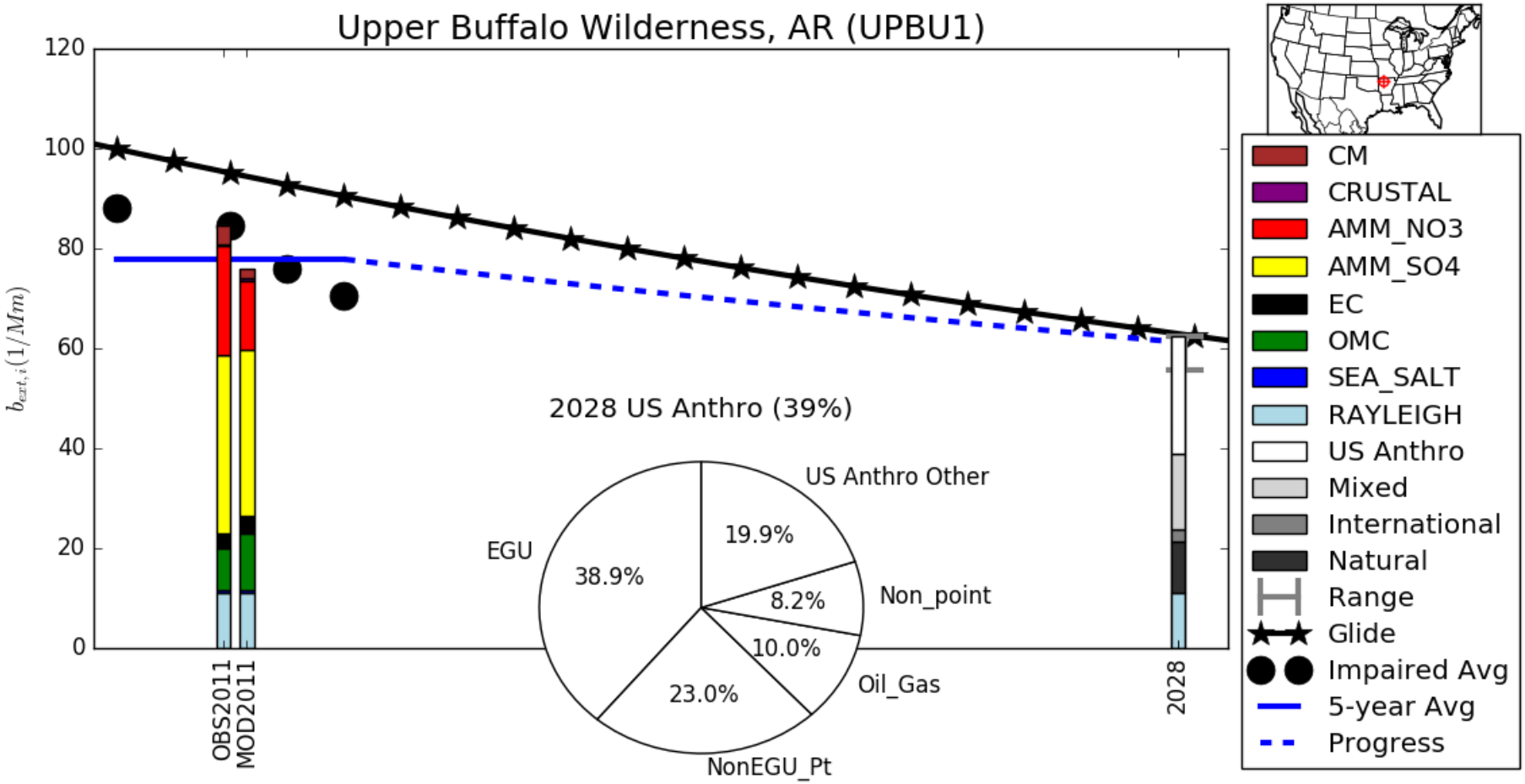


Figure 77: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Upper Buffalo Wilderness (AR).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

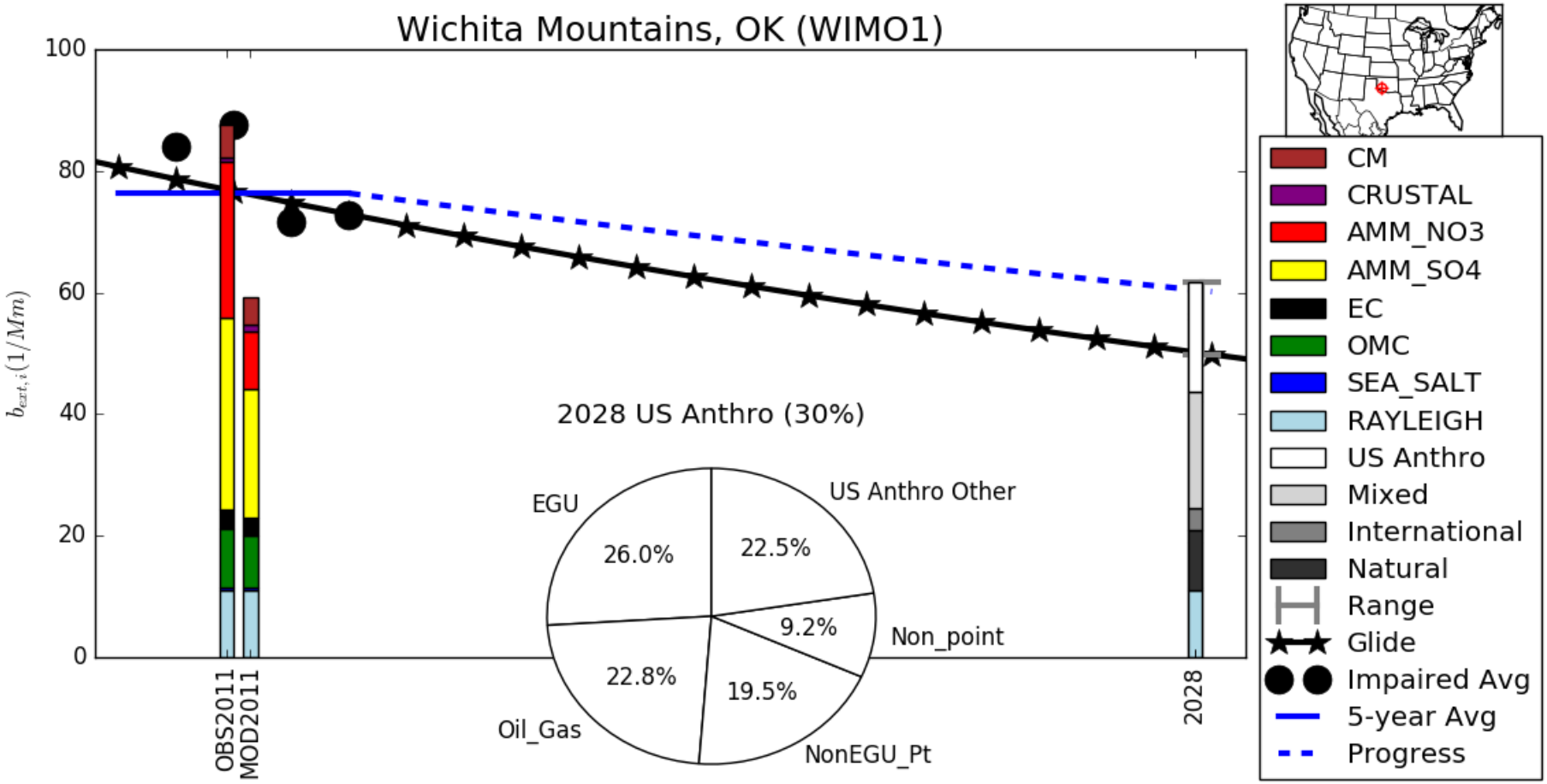


Figure 78: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Wichita Mountains (OK).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

Boundary Waters

- Boundary Waters Canoe Area (M N)(BOWA1)
- Isle Royale National Park (MI)(ISLE1)
- Seney (MI)(SENE1)
- Voyageurs National Park (MN)(VOYA2)

Regional visibility model performance and contribution summary on the 20% most impaired days

Most important ambient PM species contribution to visibility (on 20% most impaired days)	Sulfate, nitrate
Model visibility performance summary (on 20% most impaired days)	Performance generally good
Uncertainty in sector contributions	Relatively low “mixed” sector contribution percentage (31%-35%).
2028 US anthropogenic percent contribution	41-50%
Largest US anthropogenic sector contributions	NonEGU point, EGU, and RWC

Due to uncertainties in the modeling, the 2028 regional haze results should be used with caution. In particular, the modeling results (including the estimated 2028 US anthropogenic contributions) are most uncertain at sites with poor visibility model performance and/or high “mixed” (boundary conditions, fugitive dust, offshore, and secondary organics) contributions.

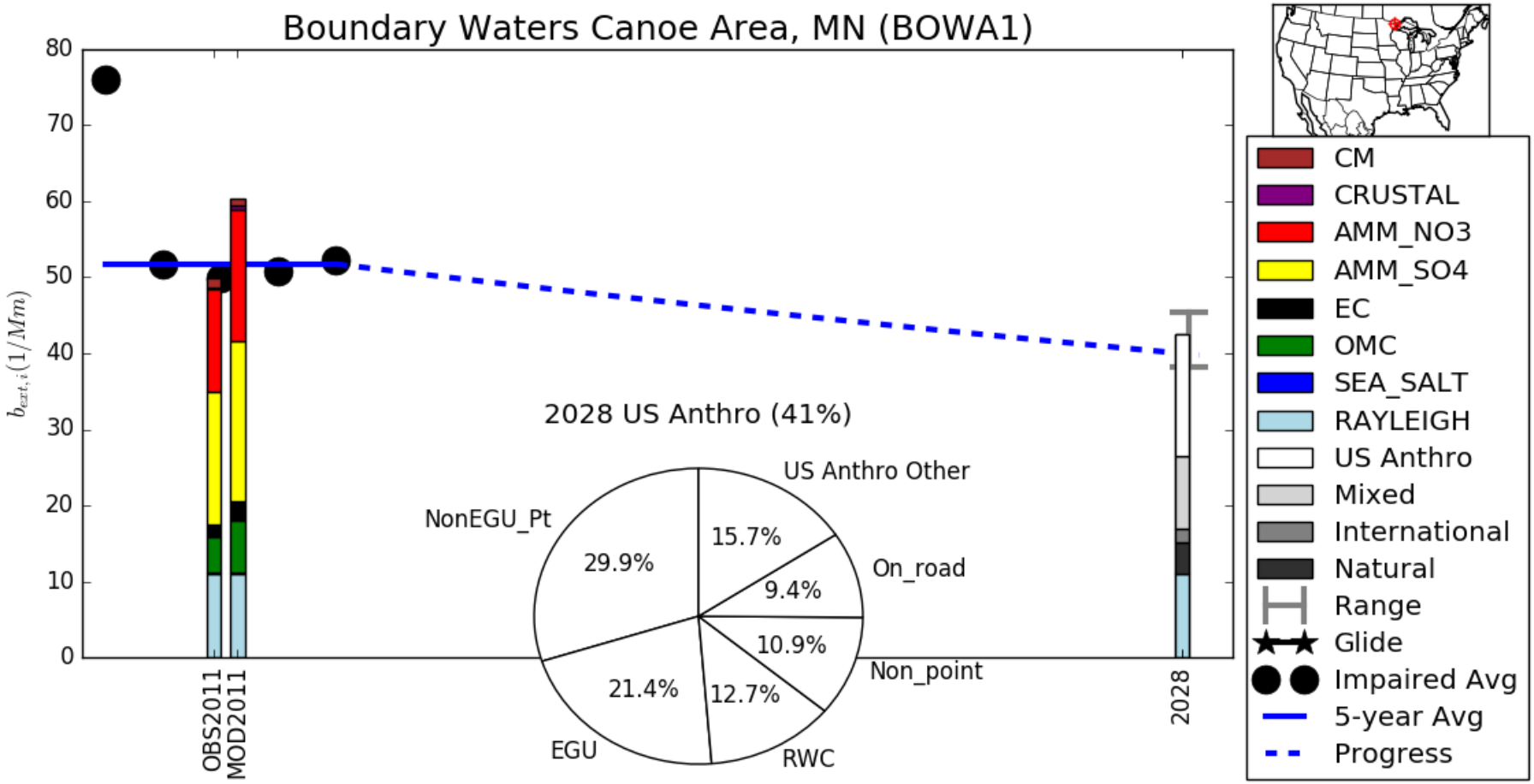


Figure 79: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Boundary Waters Canoe Area (MN).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

A glidepath could not be calculated for this site due to incomplete ambient IMPROVE data in the 2000-2004 baseline period.

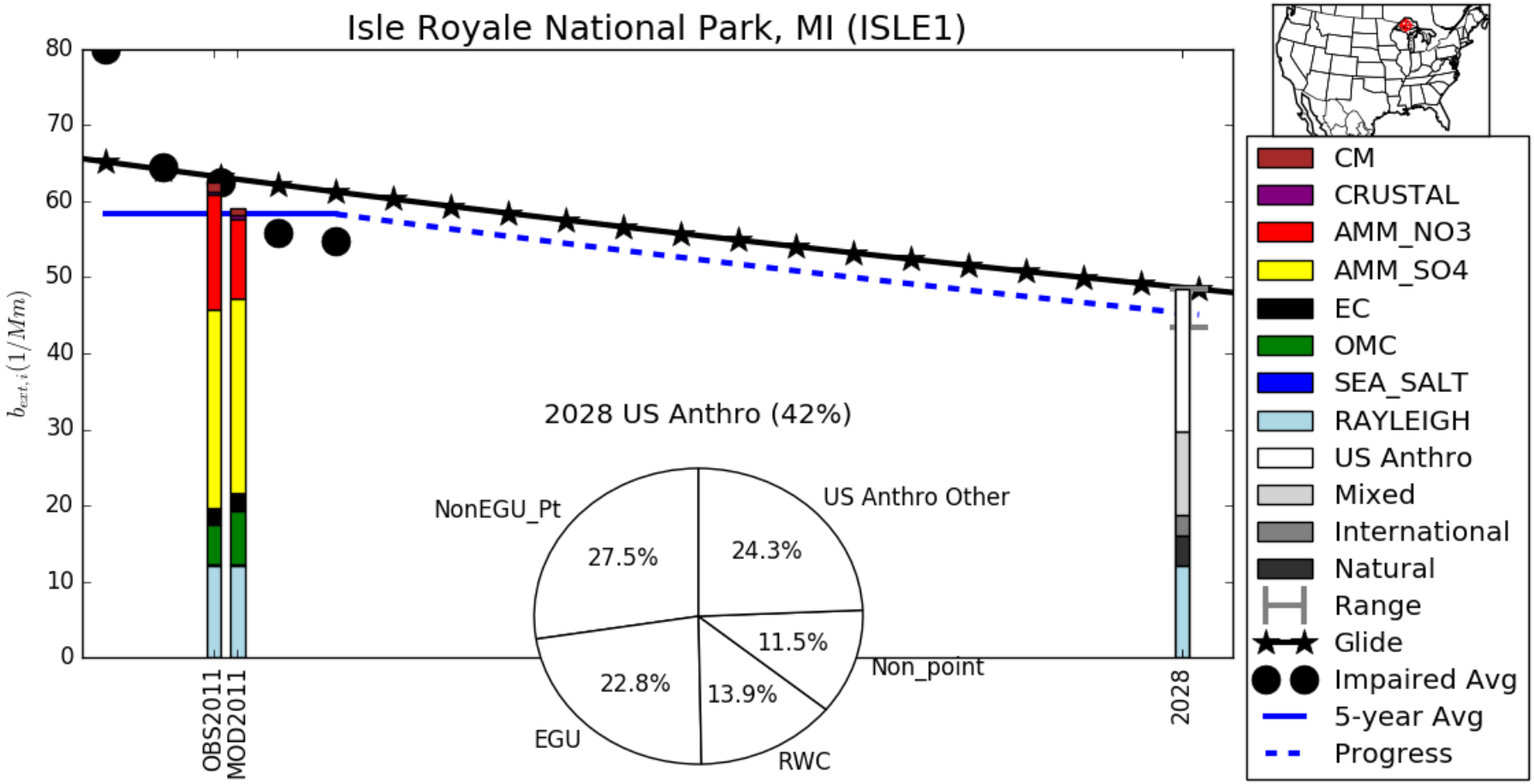


Figure 80: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Isle Royale National Park (MI).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

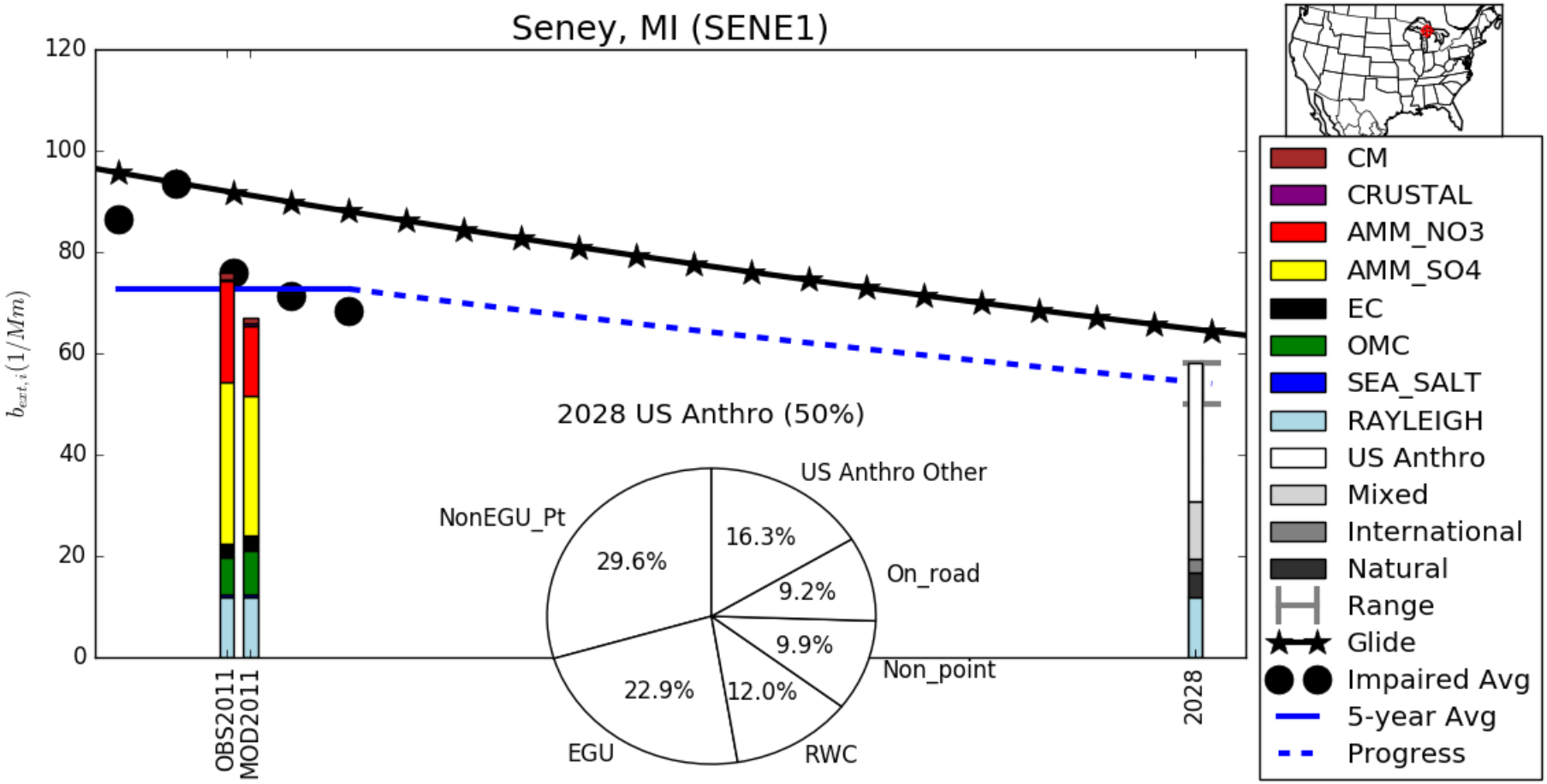


Figure 81: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Seney (MI).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

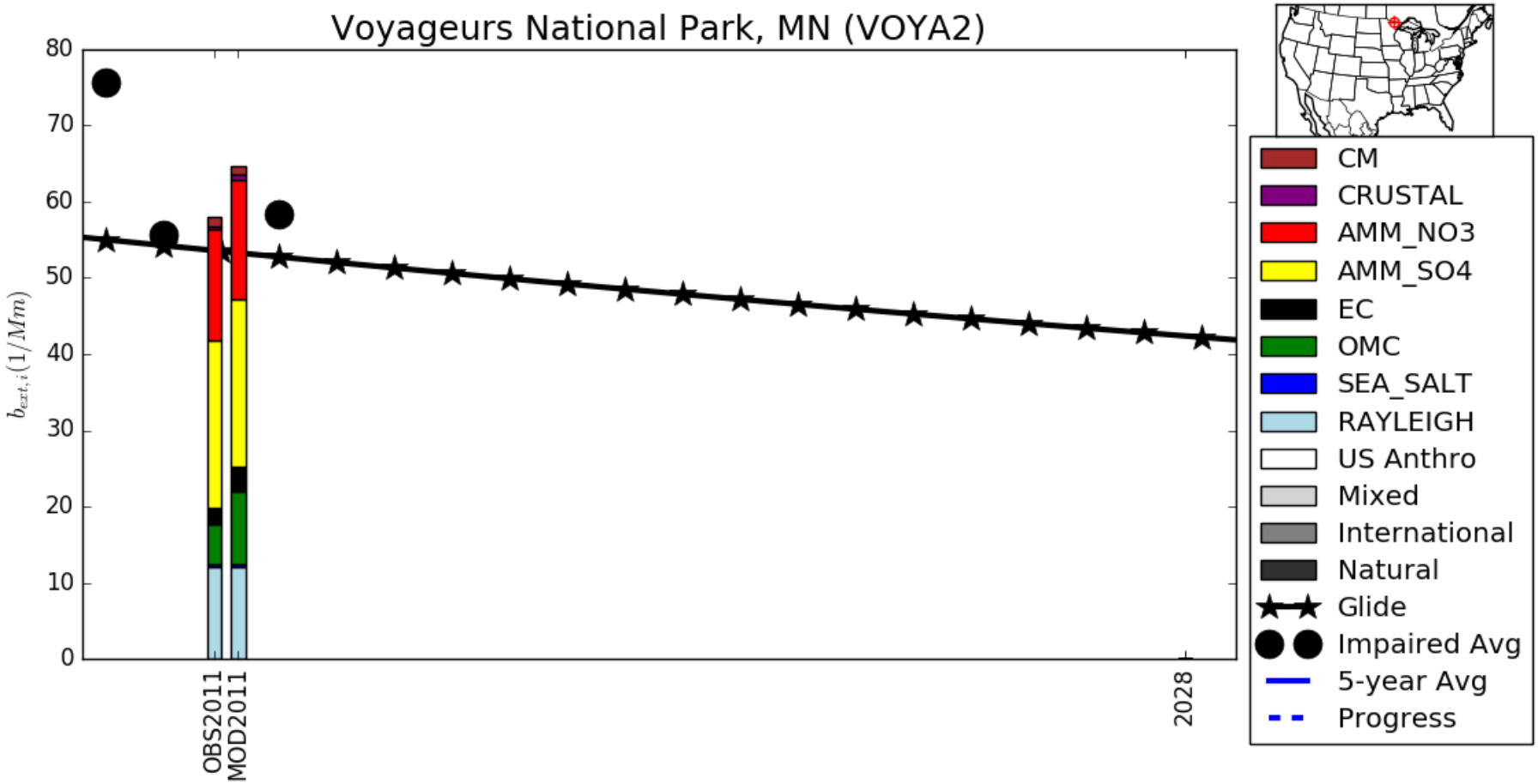


Figure 82: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Voyageurs National Park (MN).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

A 2028 visibility projection could not be calculated for this site due to incomplete ambient IMPROVE data in 2011.

Appalachia

- Cohutta Wilderness (GA)(COHU1)
- Dolly Sods Wilderness (WV) and Otter Creek Wilderness (WV)(DOSO1)
- Great Smoky Mountains National Park (TN) and Joyce-Kilmer-Slickrock Wilderness (TN)(GRSM1)
- James River Face Wilderness (VA)(JARI1)
- Linville Gorge Wilderness (NC)(LIGO1)
- Shenandoah National Park (VA)(SHEN1)
- Shining Rock Wilderness (NC)(SHRO1)
- Sipsey Wilderness (AL)(SIPS1)

Regional visibility model performance and contribution summary on the 20% most impaired days

Most important ambient PM species contribution to visibility (on 20% most impaired days)	Dominated by sulfate, smaller amount of organic carbon
Model visibility performance summary (on 20% most impaired days)	Performance generally good, but sulfate underpredicted
Uncertainty in sector contributions	Relatively low “mixed” sector contribution percentage (26%-34%).
2028 US anthropogenic percent contribution	42-54%
Largest US anthropogenic sector contributions	EGU and nonEGU point

Due to uncertainties in the modeling, the 2028 regional haze results should be used with caution. In particular, the modeling results (including the estimated 2028 US anthropogenic contributions) are most uncertain at sites with poor visibility model performance and/or high “mixed” (boundary conditions, fugitive dust, offshore, and secondary organics) contributions.

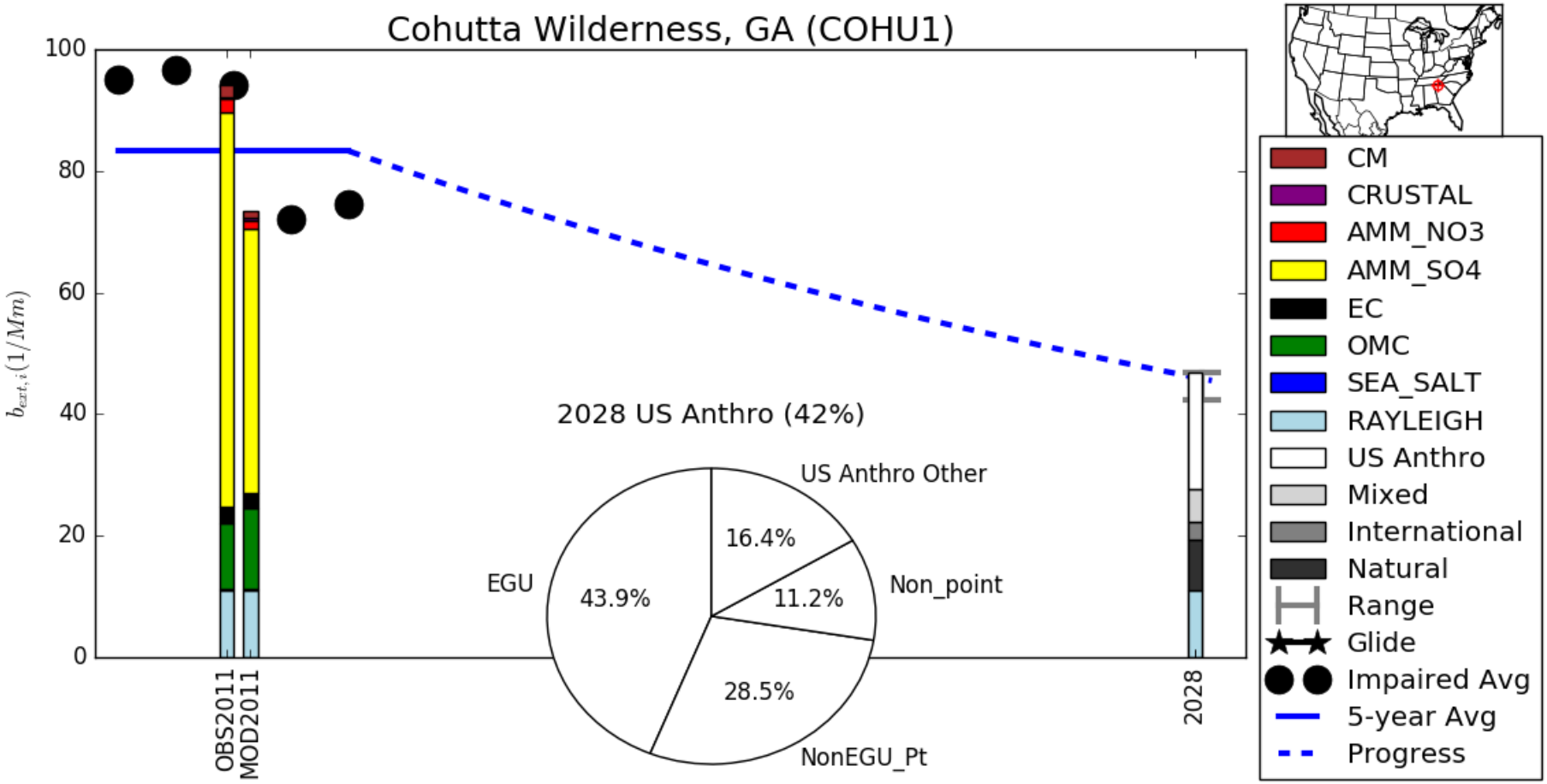


Figure 83: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Cohutta Wilderness (GA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

A glidepath could not be calculated for this site due to incomplete ambient IMPROVE data in the 2000-2004 baseline period.

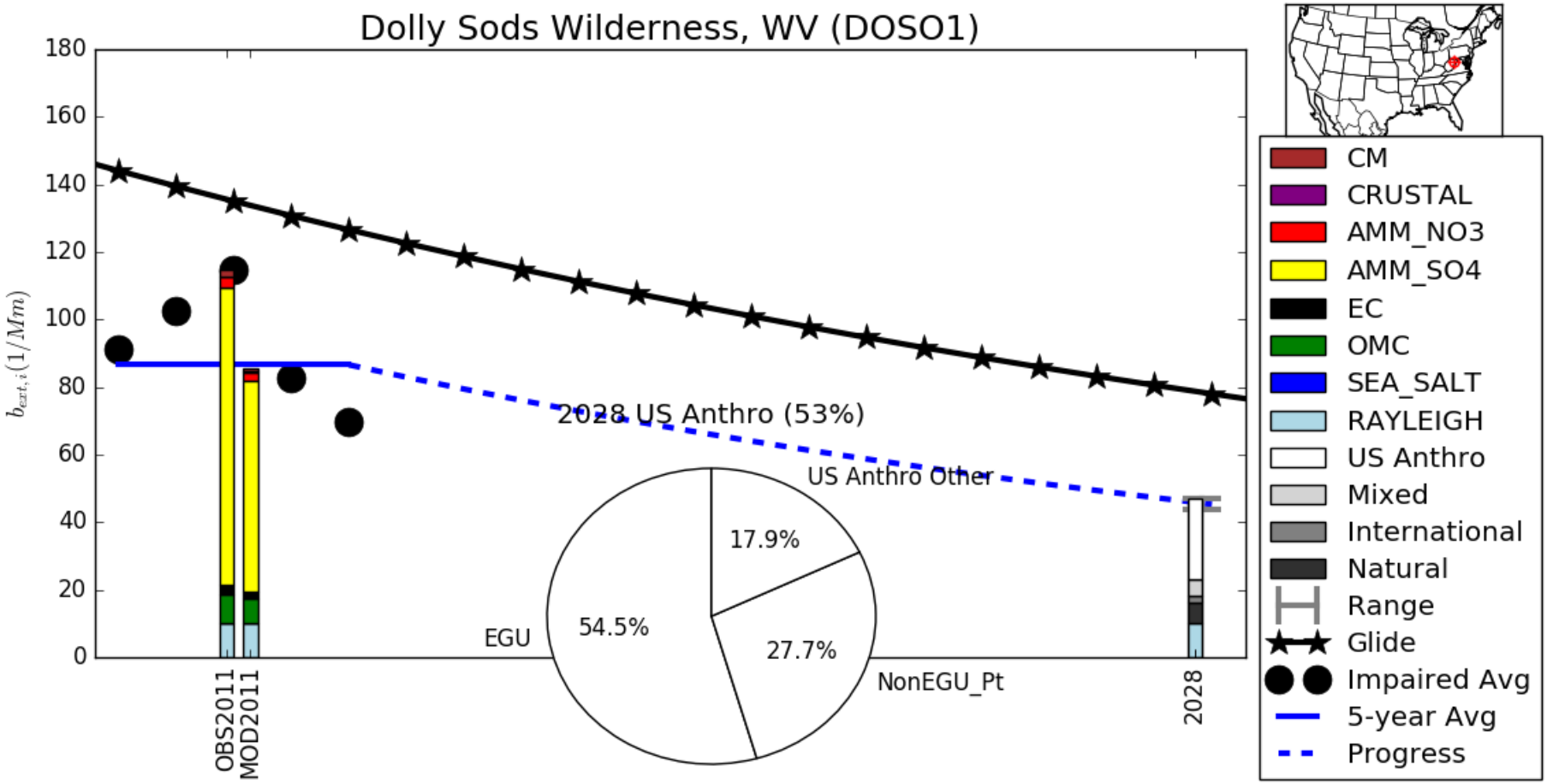


Figure 84: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Dolly Sods Wilderness (WV) and Otter Creek Wilderness (WV).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

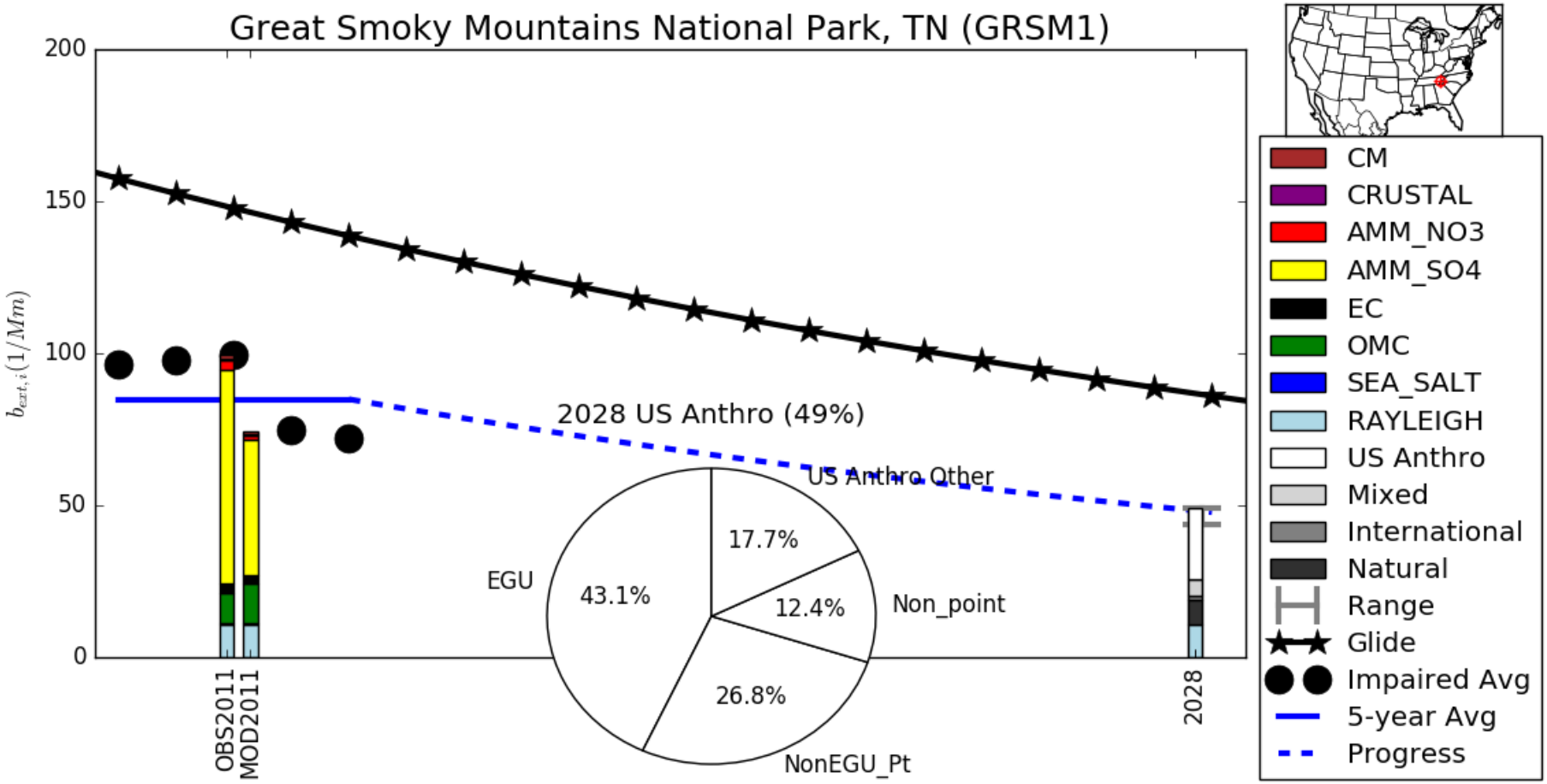


Figure 85: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Great Smoky Mountains National Park (TN) and Joyce-Kilmer-Slickrock Wilderness (TN).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

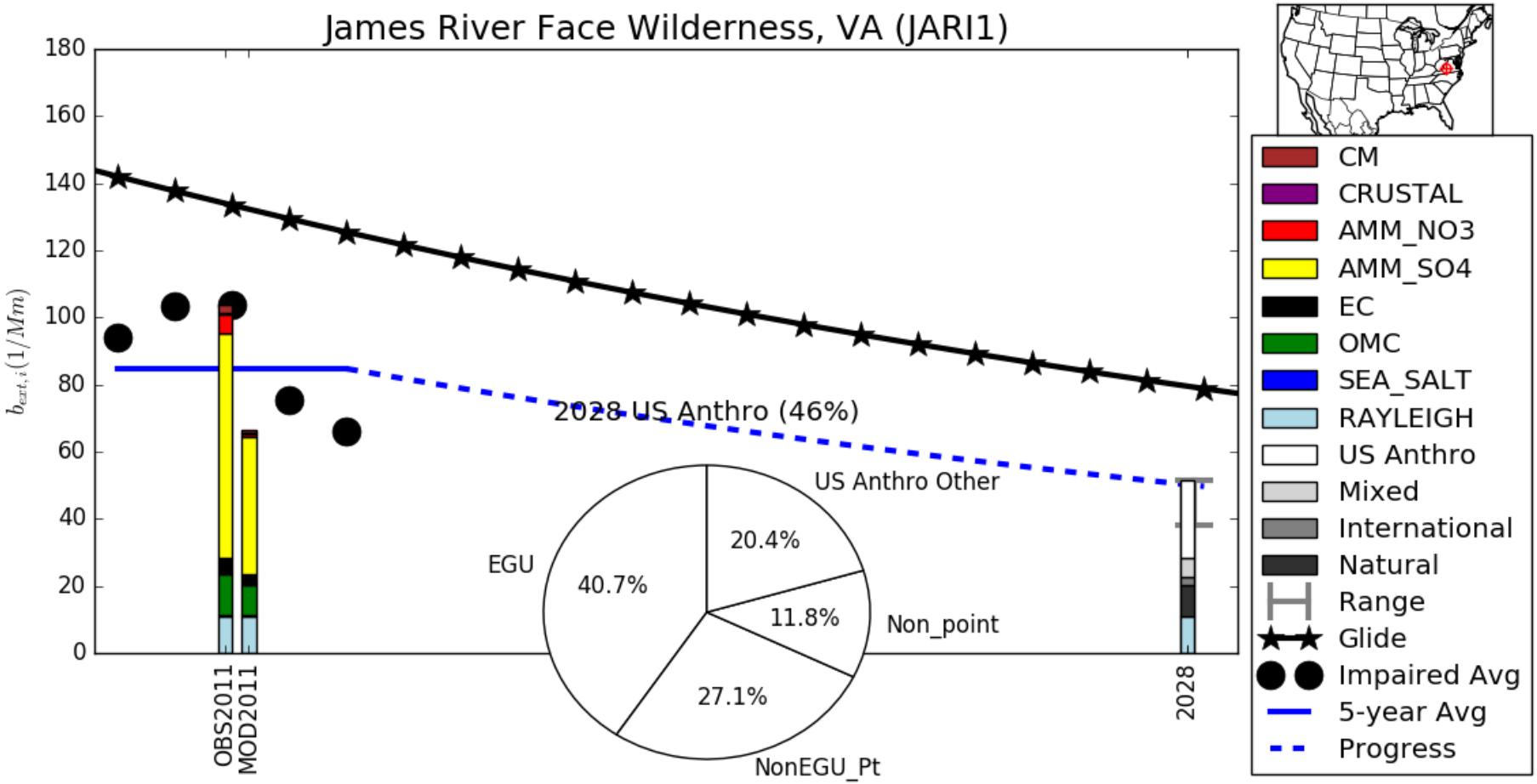


Figure 86: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at James River Face Wilderness (VA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

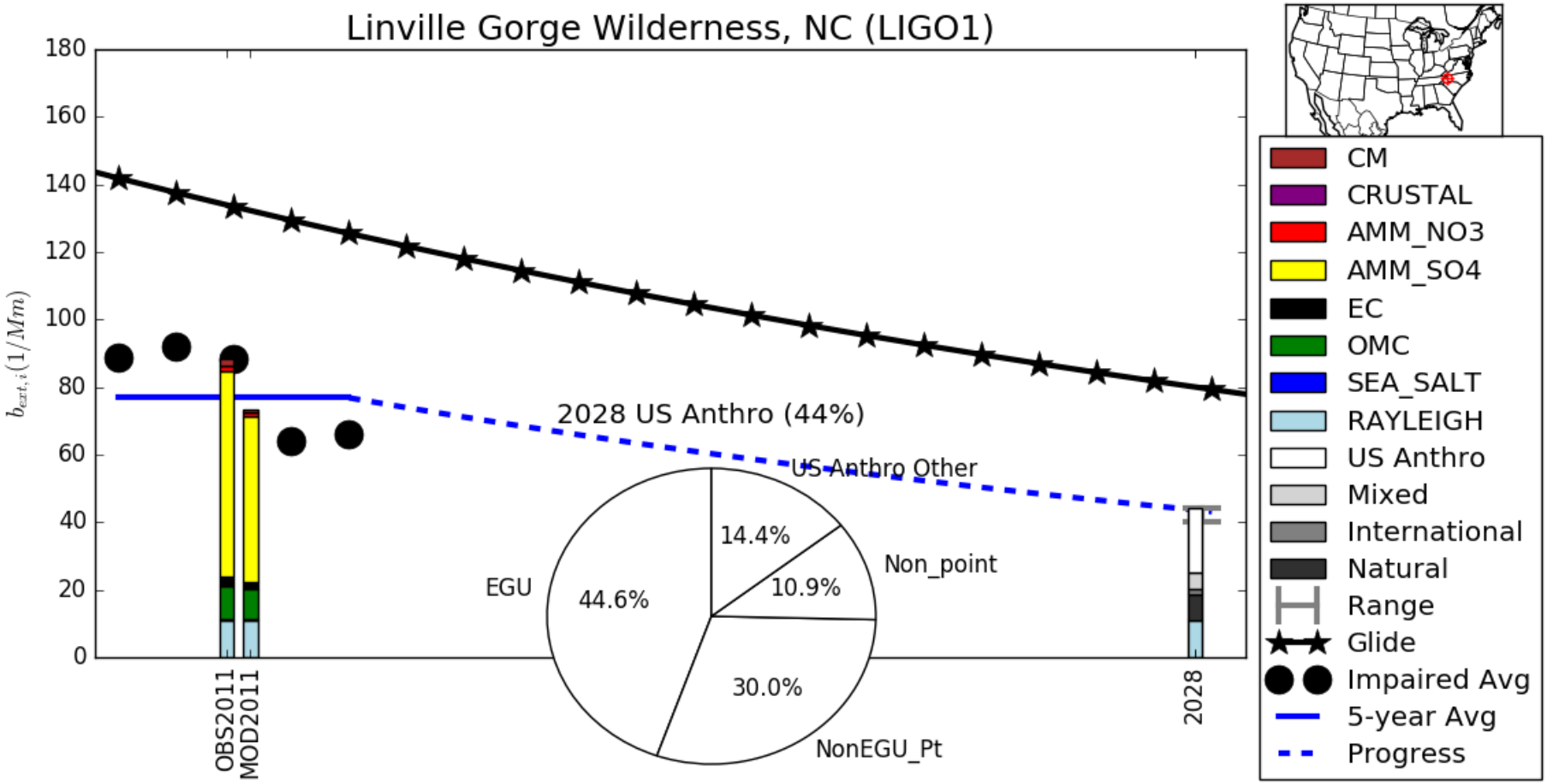


Figure 87: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Linville Gorge Wilderness (NC).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

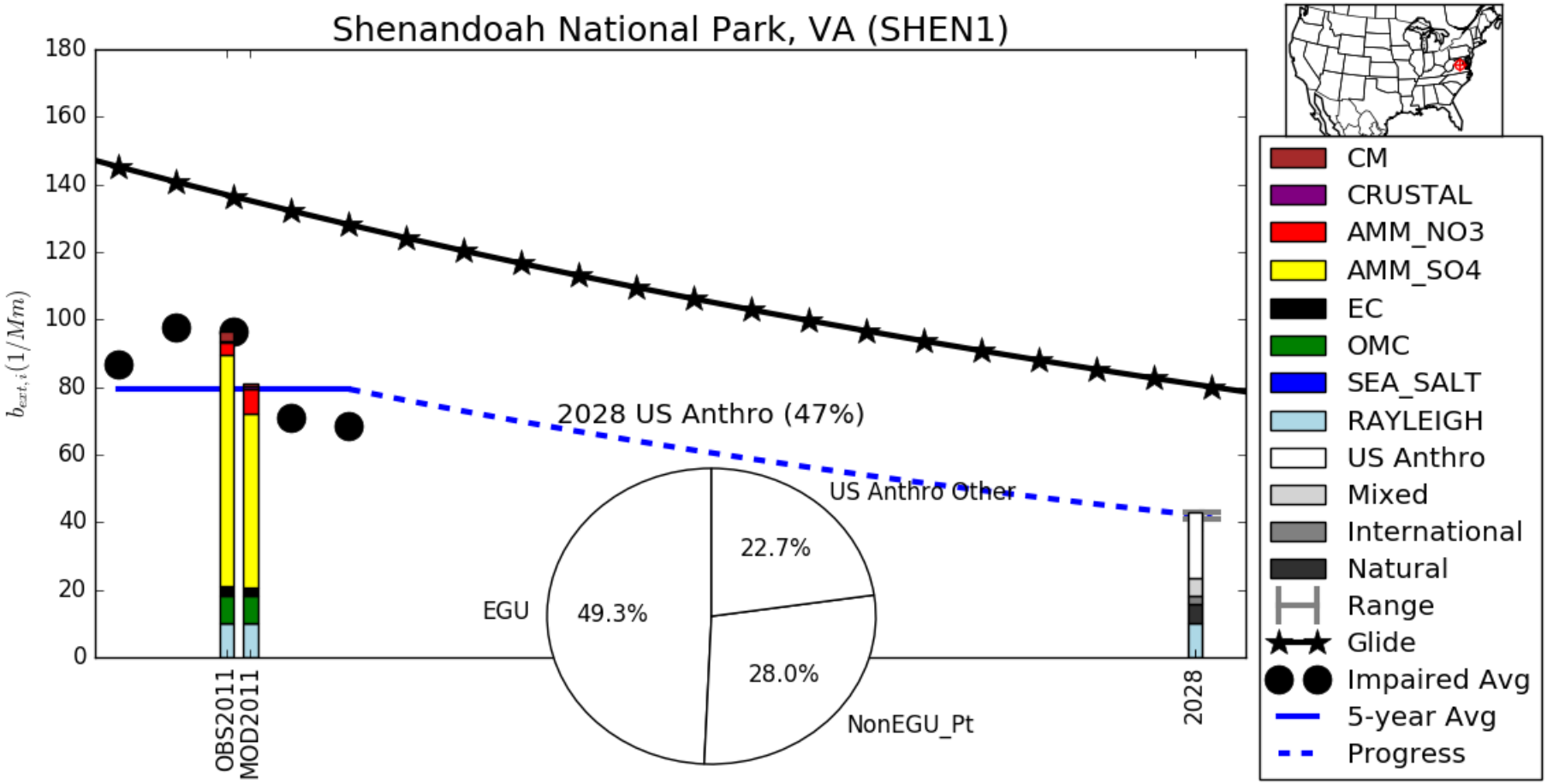


Figure 88: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Shenandoah National Park (VA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

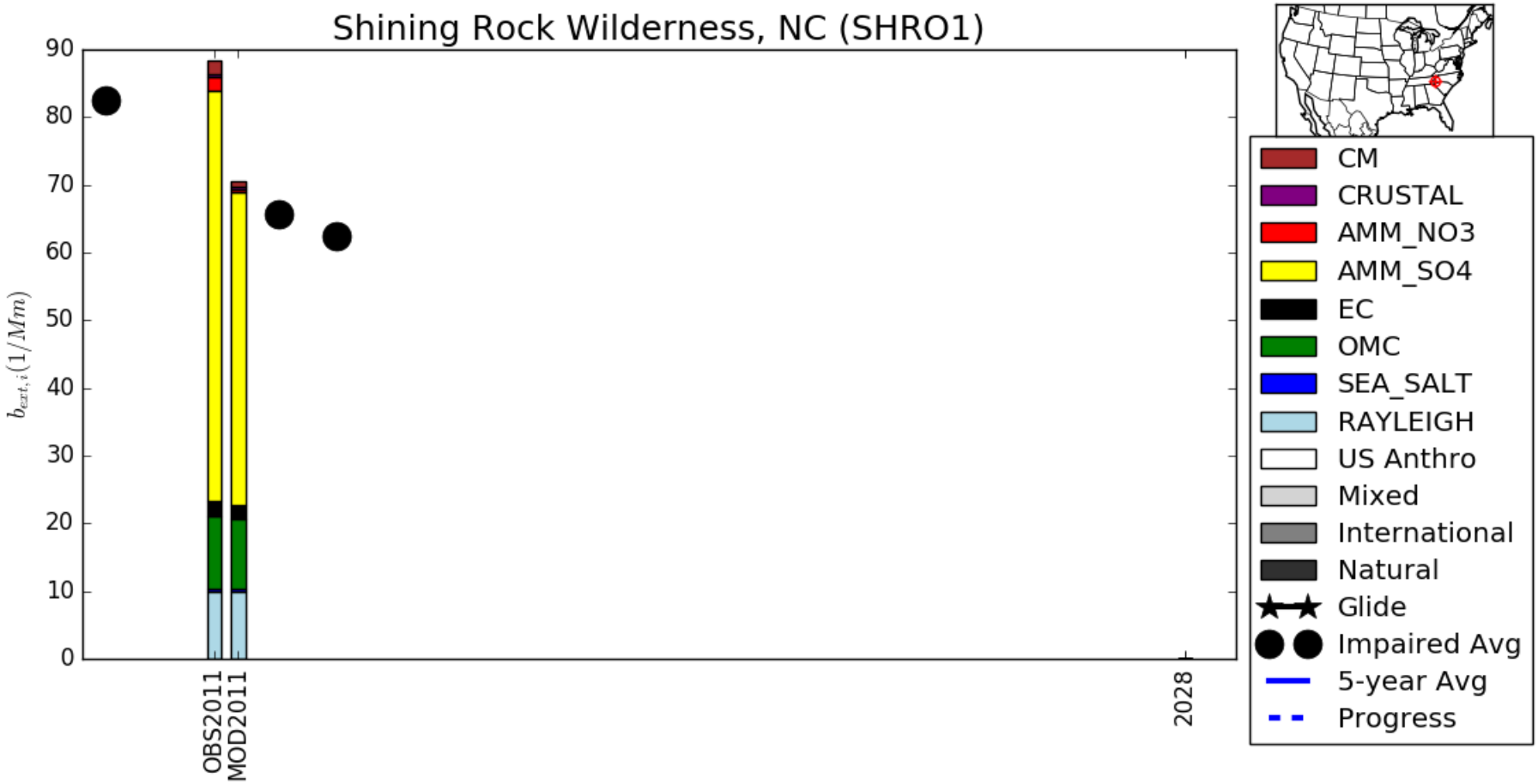


Figure 89: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Shining Rock Wilderness (NC).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

A glidepath could not be calculated for this site due to incomplete ambient IMPROVE data in the 2000-2004 baseline period. A 2028 visibility projection could not be calculated for this site due to incomplete ambient IMPROVE data in 2011.

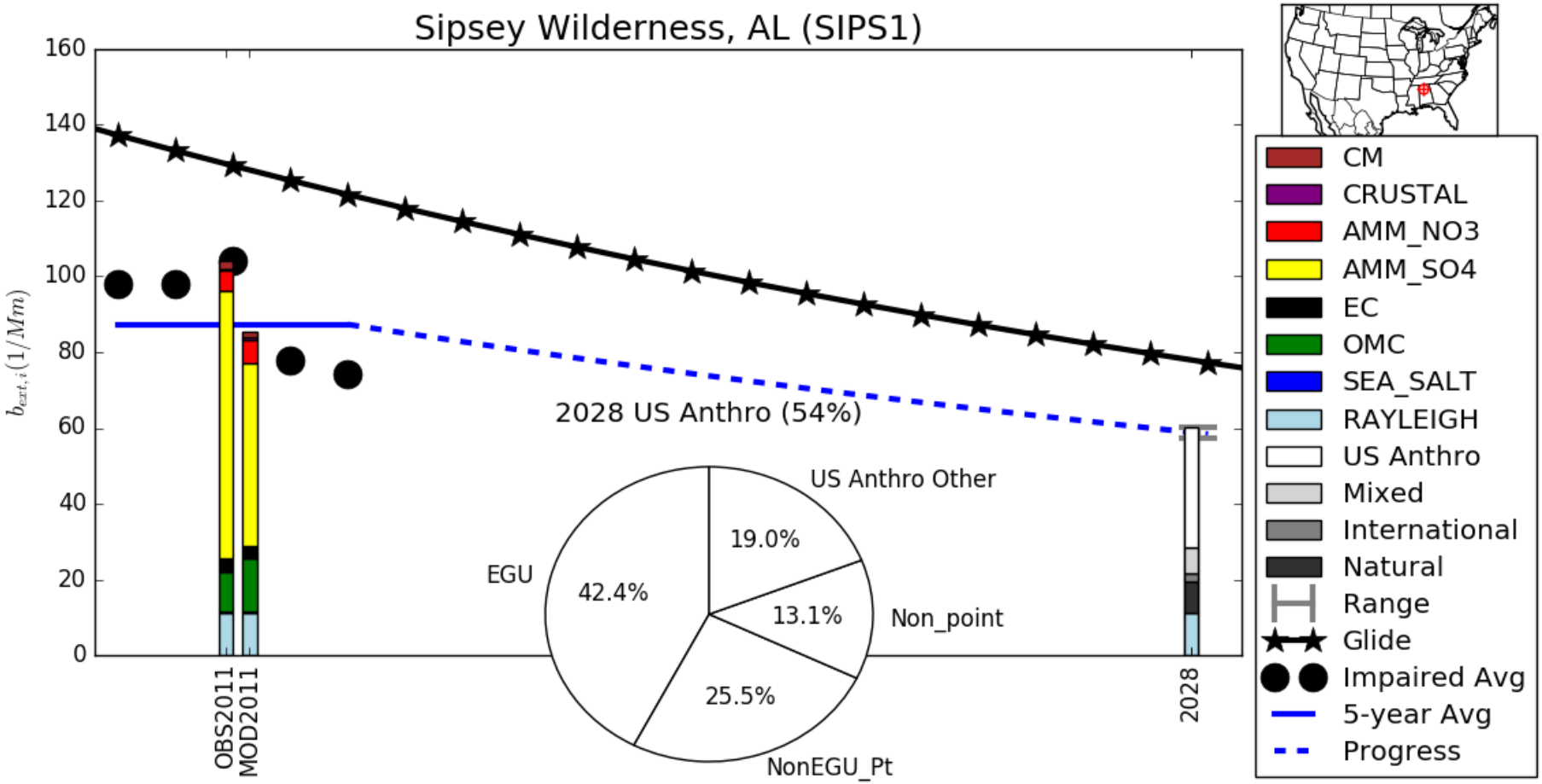


Figure 90: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Sipsey Wilderness (AL).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

Ohio River Valley

- Mammoth Cave National Park (KY)(MACA1)
- Mingo (MO)(MING1)

Regional visibility model performance and contribution summary on the 20% most impaired days

Most important ambient PM species contribution to visibility (on 20% most impaired days)	Sulfate, nitrate
Model visibility performance summary (on 20% most impaired days)	Performance generally good, but sulfate underpredicted
Uncertainty in sector contributions	Low “mixed” sector contribution percentage (22%-25%).
2028 US anthropogenic percent contribution	53-61%
Largest US anthropogenic sector contributions	EGU, and nonEGU point

Due to uncertainties in the modeling, the 2028 regional haze results should be used with caution. In particular, the modeling results (including the estimated 2028 US anthropogenic contributions) are most uncertain at sites with poor visibility model performance and/or high “mixed” (boundary conditions, fugitive dust, offshore, and secondary organics) contributions.

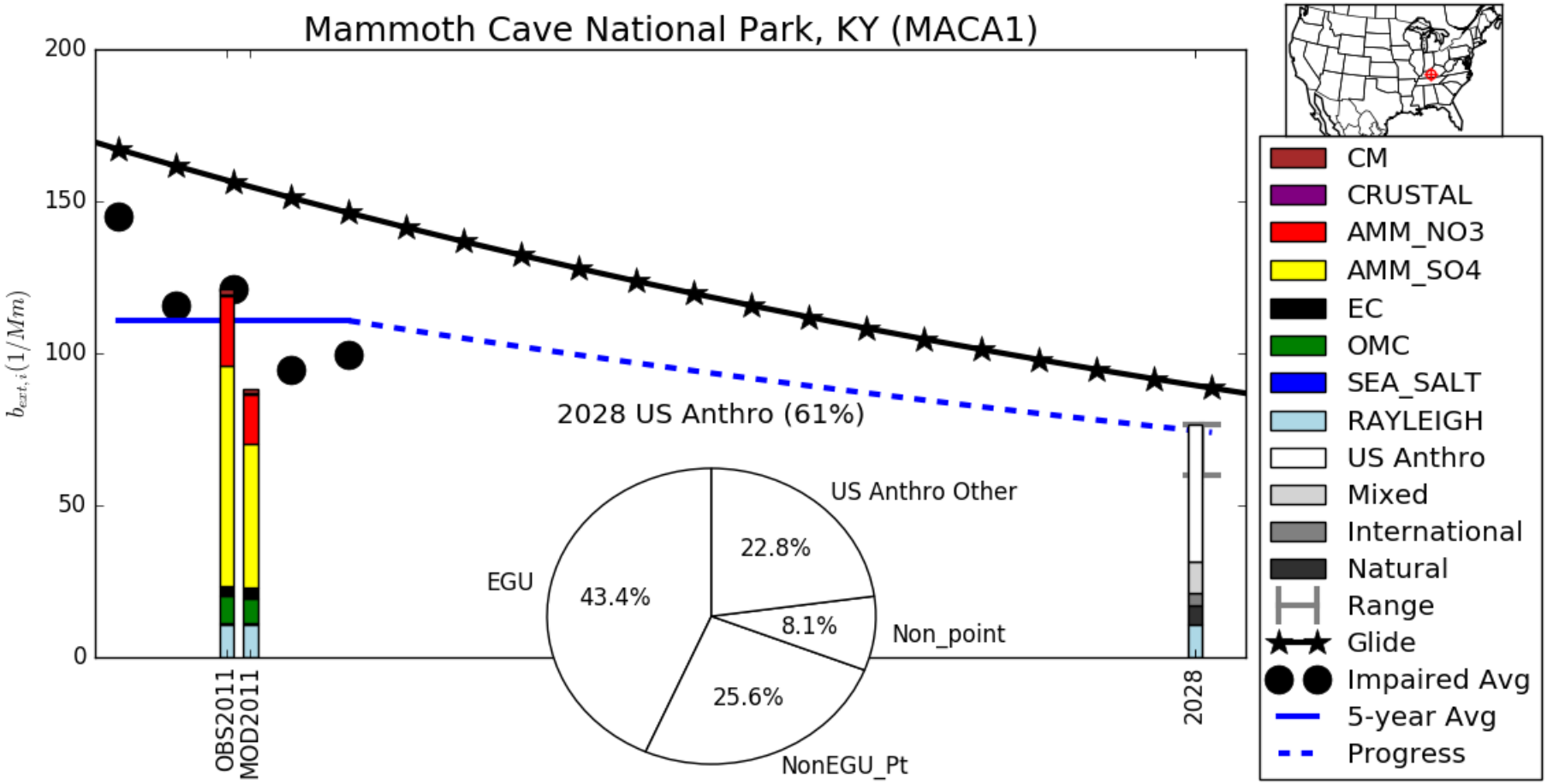


Figure 91: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Mammoth Cave National Park (KY).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

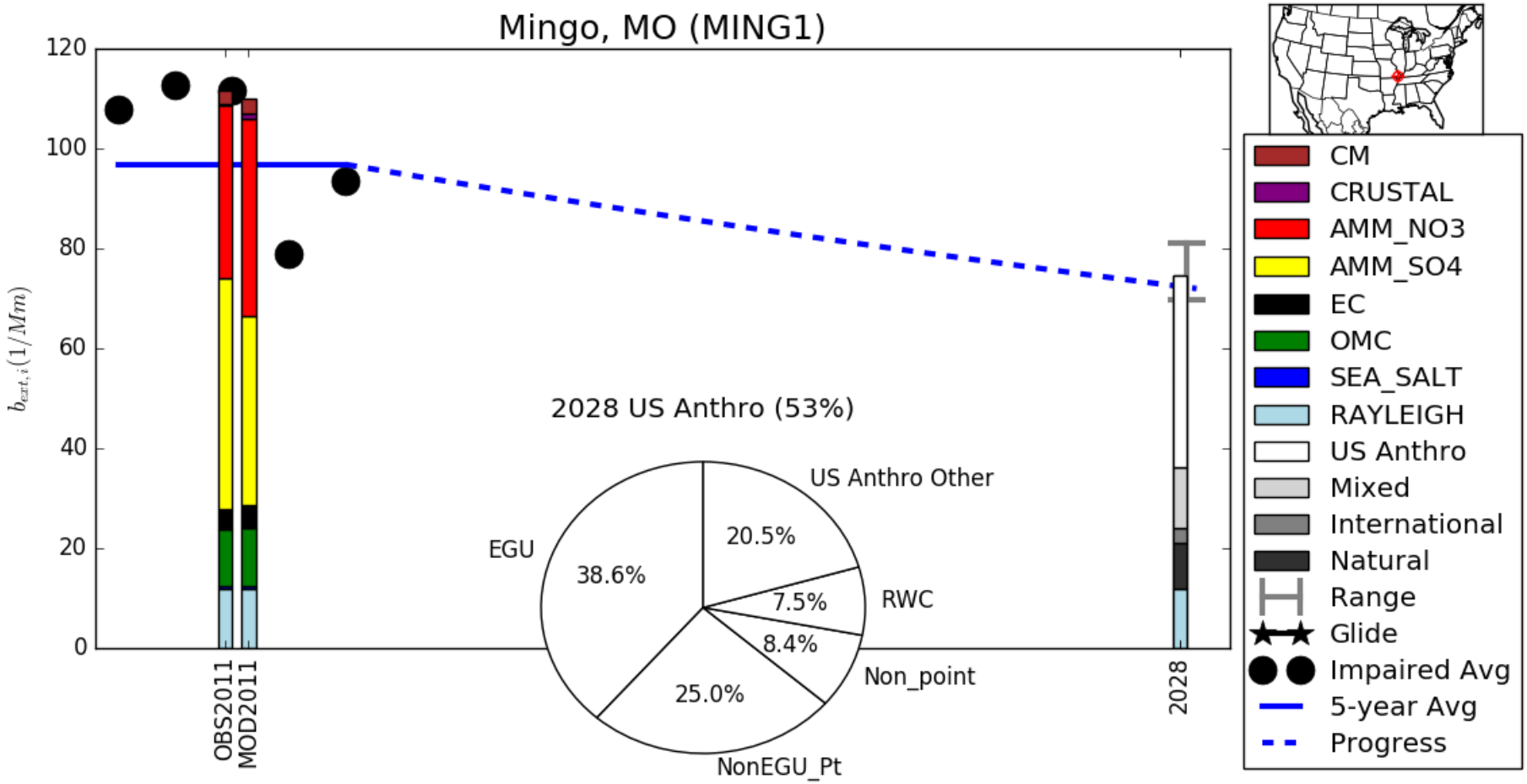


Figure 92: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Mingo (MO).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

A glidepath could not be calculated for this site due to incomplete ambient IMPROVE data in the 2000-2004 baseline period.

Southeast

- Breton (LA)(BRIS1)
- Chassahowitzka (FL)(CHAS1)
- Everglades National Park (FL)(EVER1)
- Okefenokee (GA) and Wolf Island (GA)(OKEF1)
- Cape Romain (SC)(ROMA1)
- St. Marks (FL)(SAMA1)

Regional visibility model performance and contribution summary on the 20% most impaired days

Most important ambient PM species contribution to visibility (on 20% most impaired days)	Dominated by sulfate, smaller amount of organic carbon
Model visibility performance summary (on 20% most impaired days)	Performance generally good, but sulfate underpredicted
Uncertainty in sector contributions	Relatively low "mixed" sector contribution percentage (36%-46%) except *very high* at EVER1 (80%).
2028 US anthropogenic percent contribution	32-43% except 9% at EVER1
Largest US anthropogenic sector contributions	EGU, nonEGU point, nonpoint (at EVER1)

Due to uncertainties in the modeling, the 2028 regional haze results should be used with caution. In particular, the modeling results (including the estimated 2028 US anthropogenic contributions) are most uncertain at sites with poor visibility model performance and/or high "mixed" (boundary conditions, fugitive dust, offshore, and secondary organics) contributions.

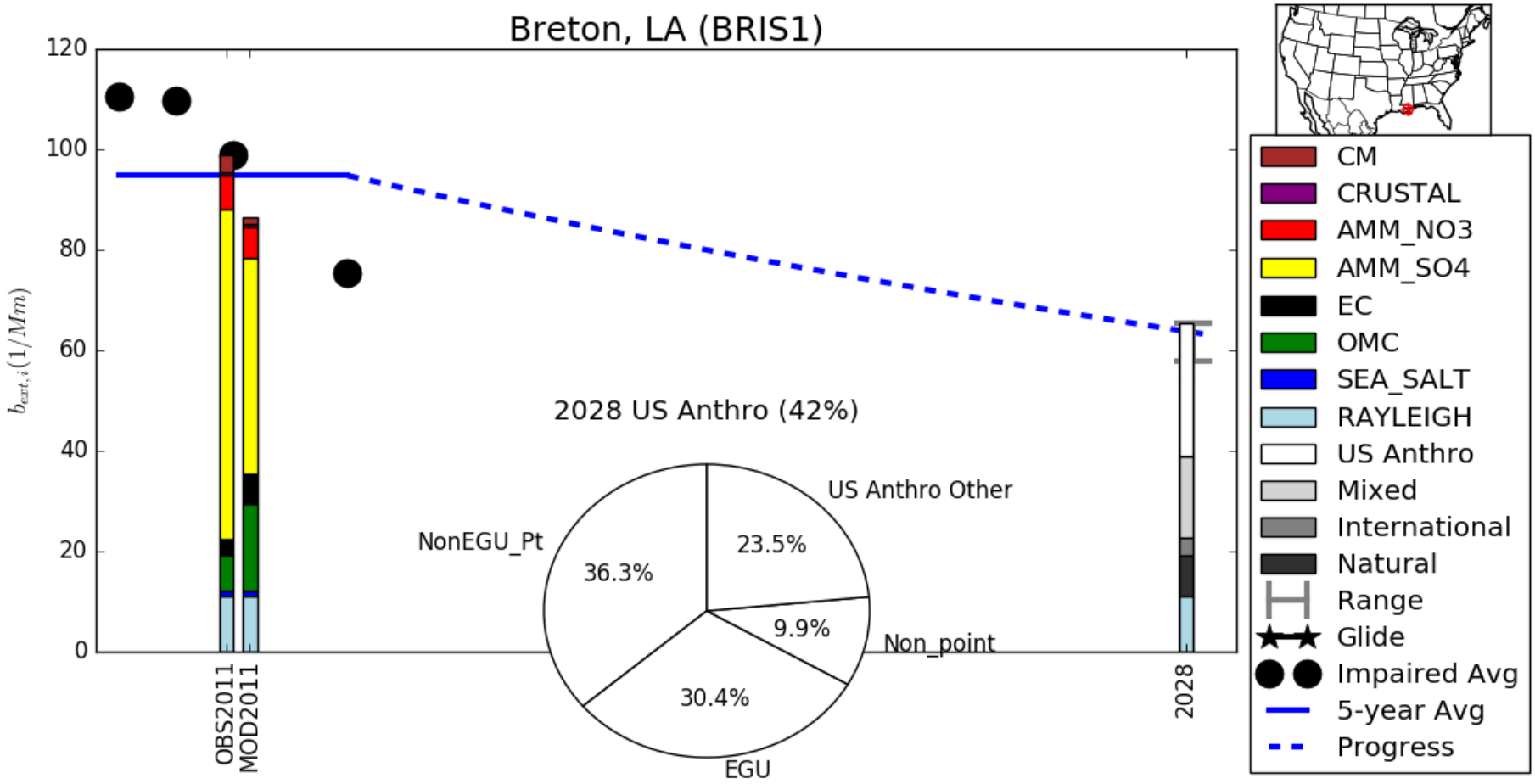


Figure 93: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Breton (LA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

A glidepath could not be calculated for this site due to incomplete ambient IMPROVE data in the 2000-2004 baseline period.

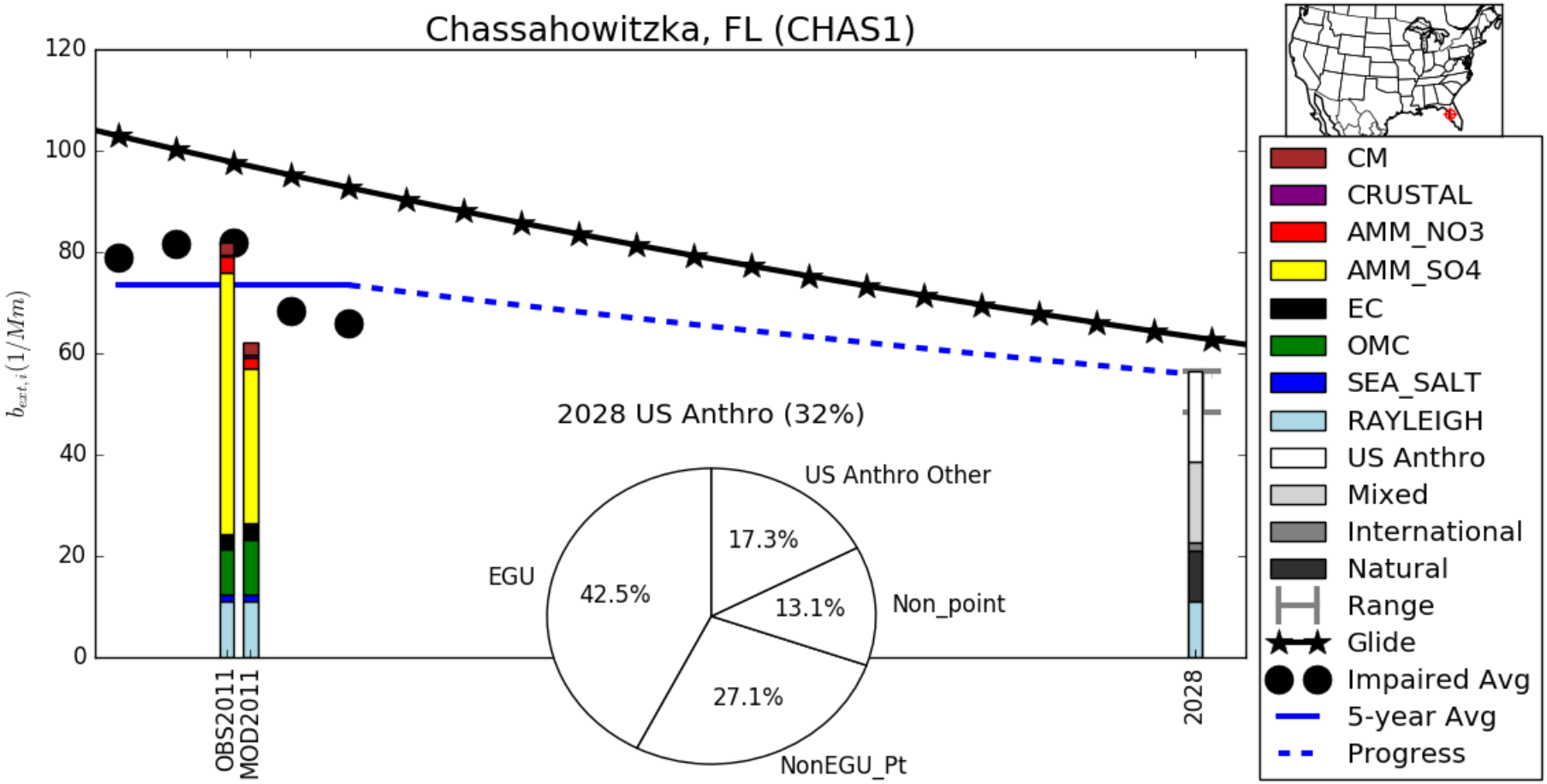


Figure 94: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Chassahowitzka (FL).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

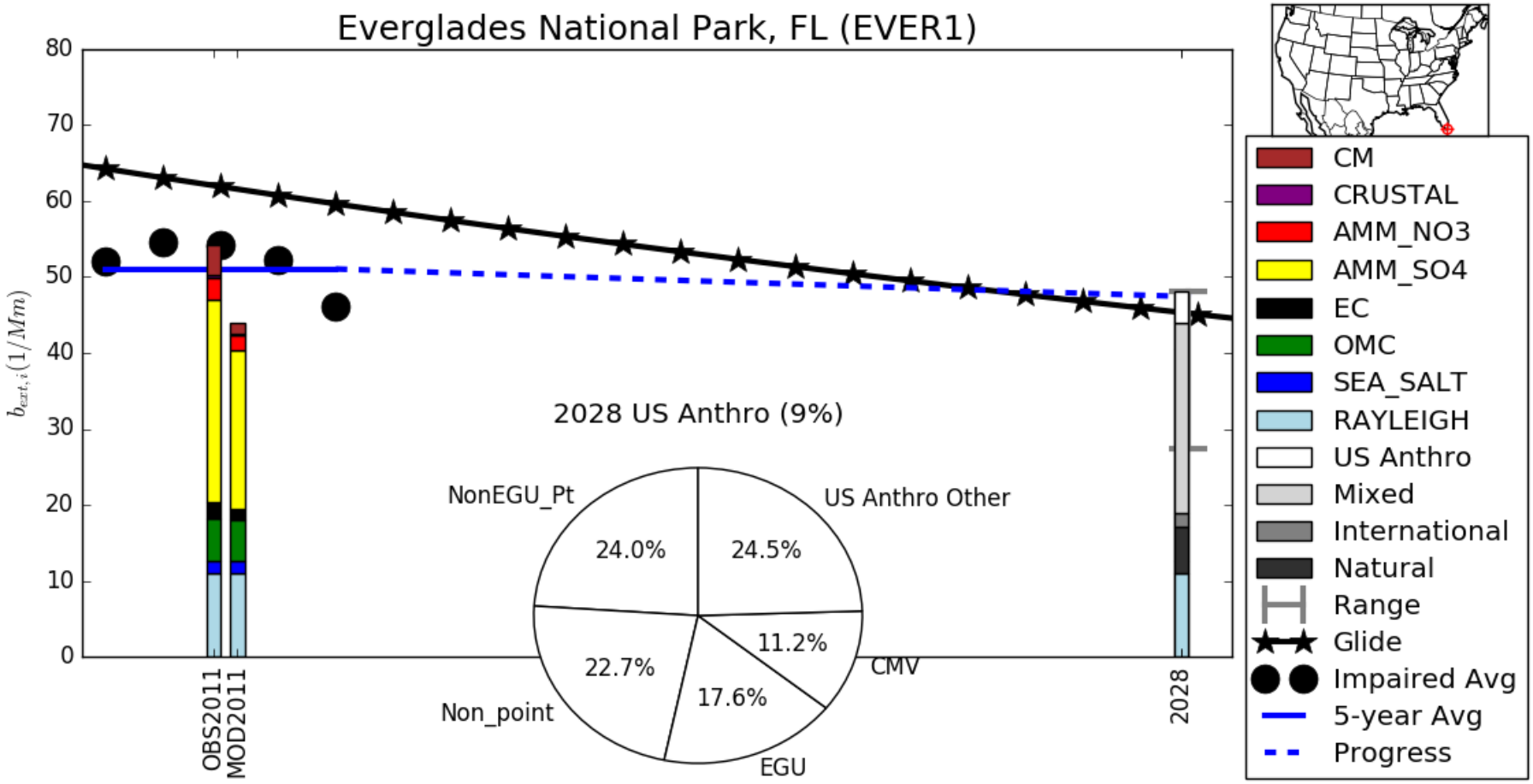


Figure 95: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Everglades National Park (FL).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

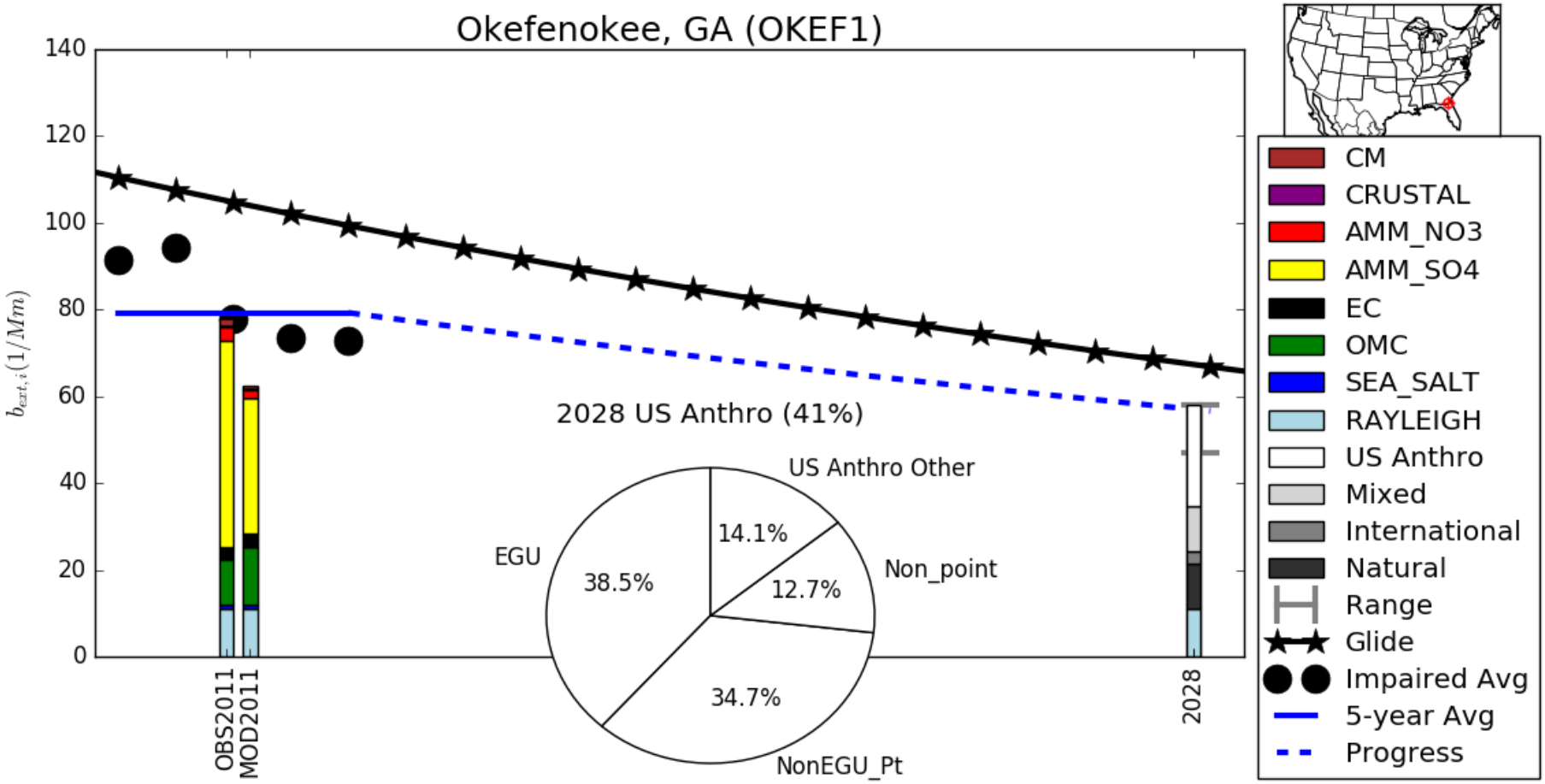


Figure 96: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Okefenokee (GA) and Wolf Island (GA).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

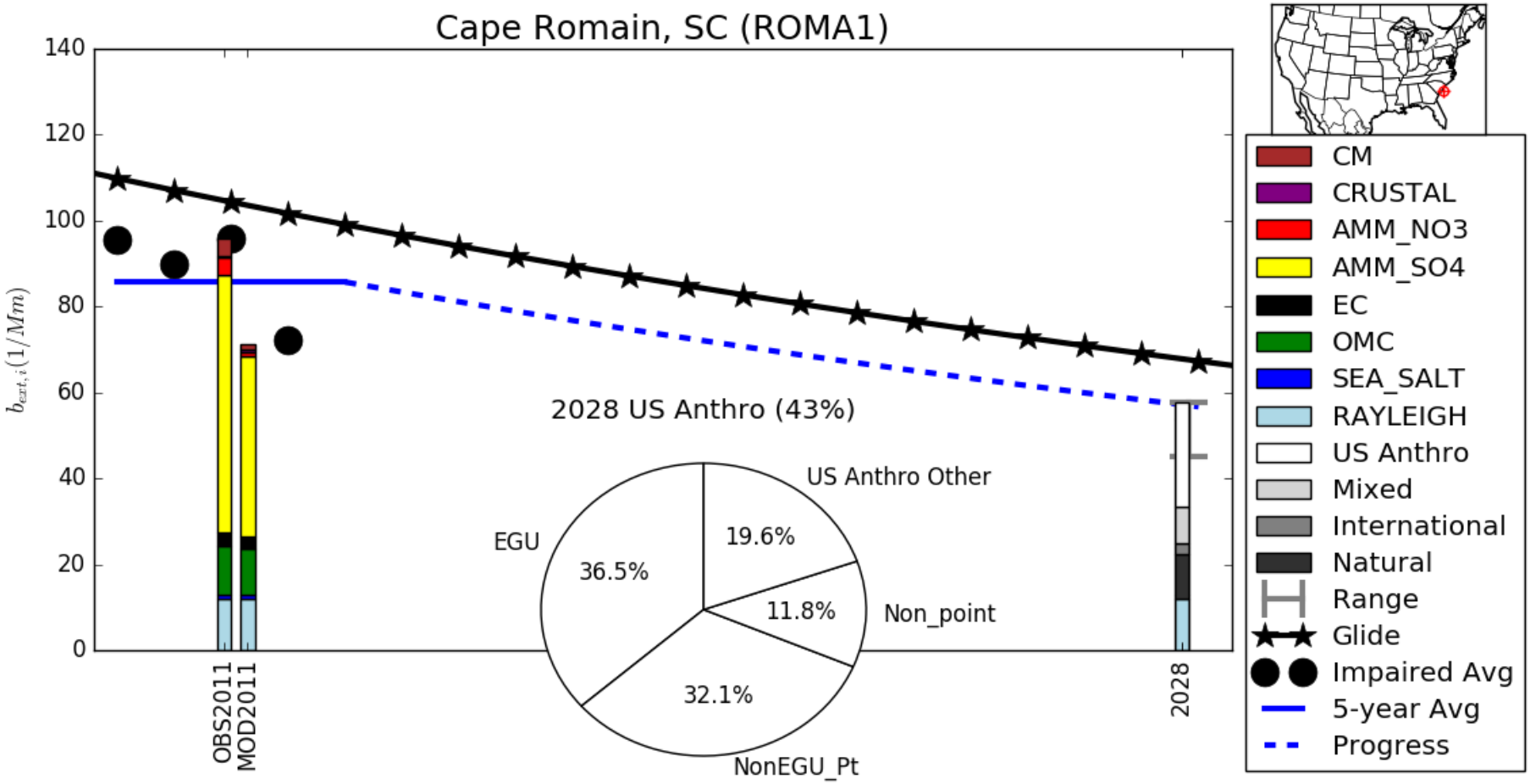


Figure 97: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Cape Romain (SC).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

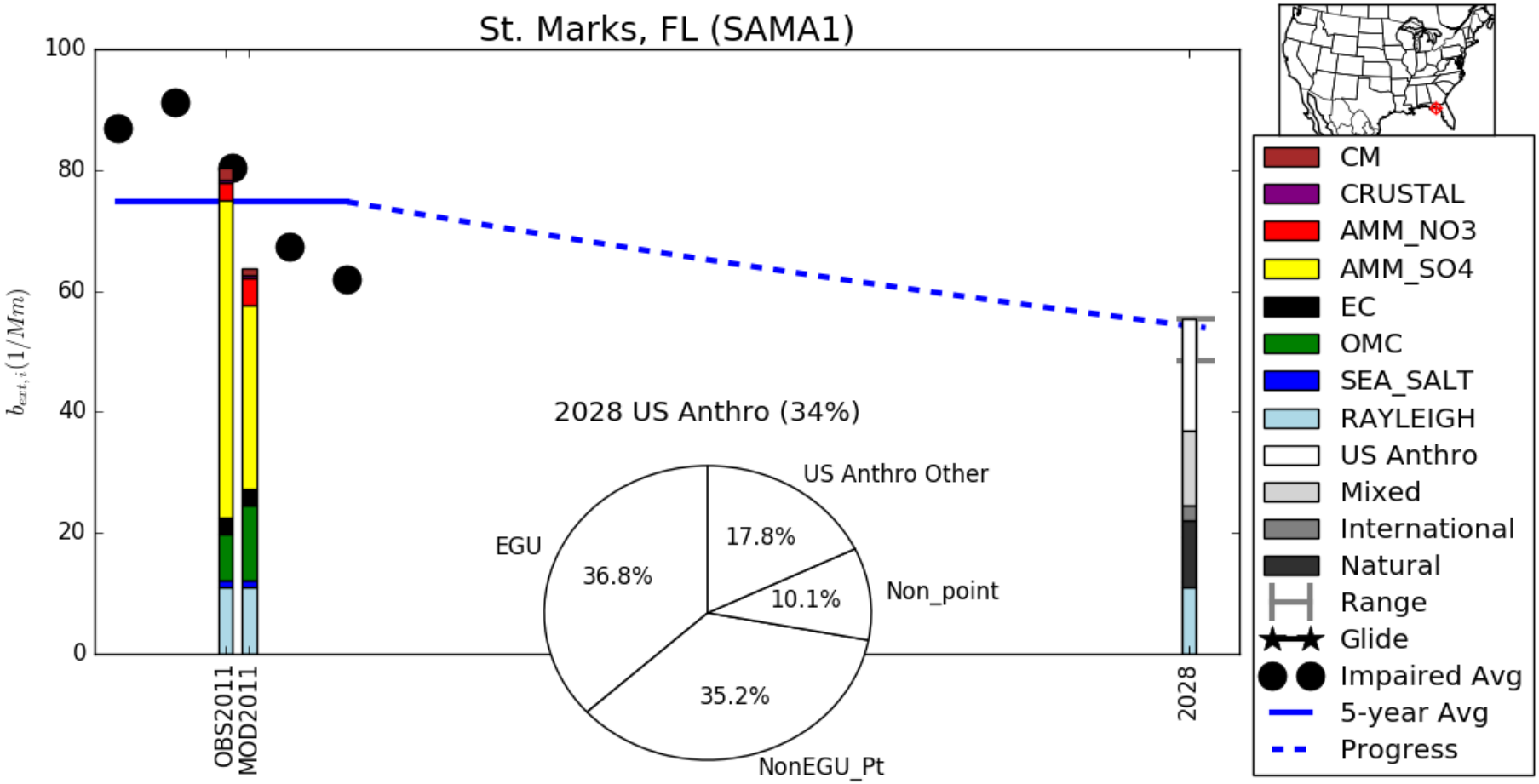


Figure 98: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at St. Marks (FL).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

A glidepath could not be calculated for this site due to incomplete ambient IMPROVE data in the 2000-2004 baseline period.

East Coast

- Brigantine (NJ)(BRIG1)
- Swanquarter (NC)(SWAN1)

Regional visibility model performance and contribution summary on the 20% most impaired days

Most important ambient PM species contribution to visibility (on 20% most impaired days)	Dominated by sulfate, smaller amounts of organic carbon and nitrate
Model visibility performance summary (on 20% most impaired days)	Performance generally good, but sulfate underpredicted
Uncertainty in sector contributions	Relatively low “mixed” sector contribution percentage (29%-38%)
2028 US anthropogenic percent contribution	38-51%
Largest US anthropogenic sector contributions	EGU, nonEGU point, and nonpoint

Due to uncertainties in the modeling, the 2028 regional haze results should be used with caution. In particular, the modeling results (including the estimated 2028 US anthropogenic contributions) are most uncertain at sites with poor visibility model performance and/or high “mixed” (boundary conditions, fugitive dust, offshore, and secondary organics) contributions.

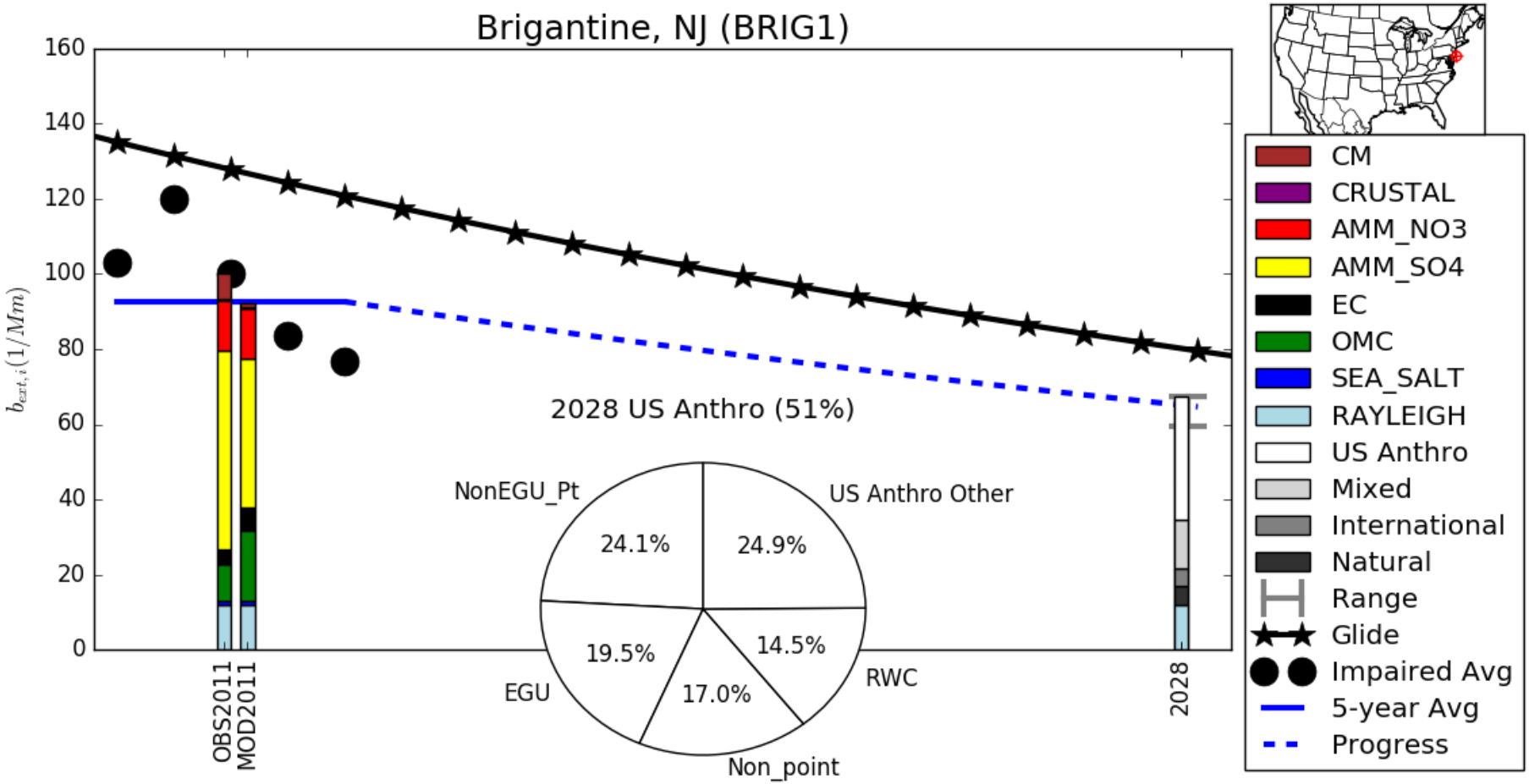


Figure 99: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Brigantine (NJ).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

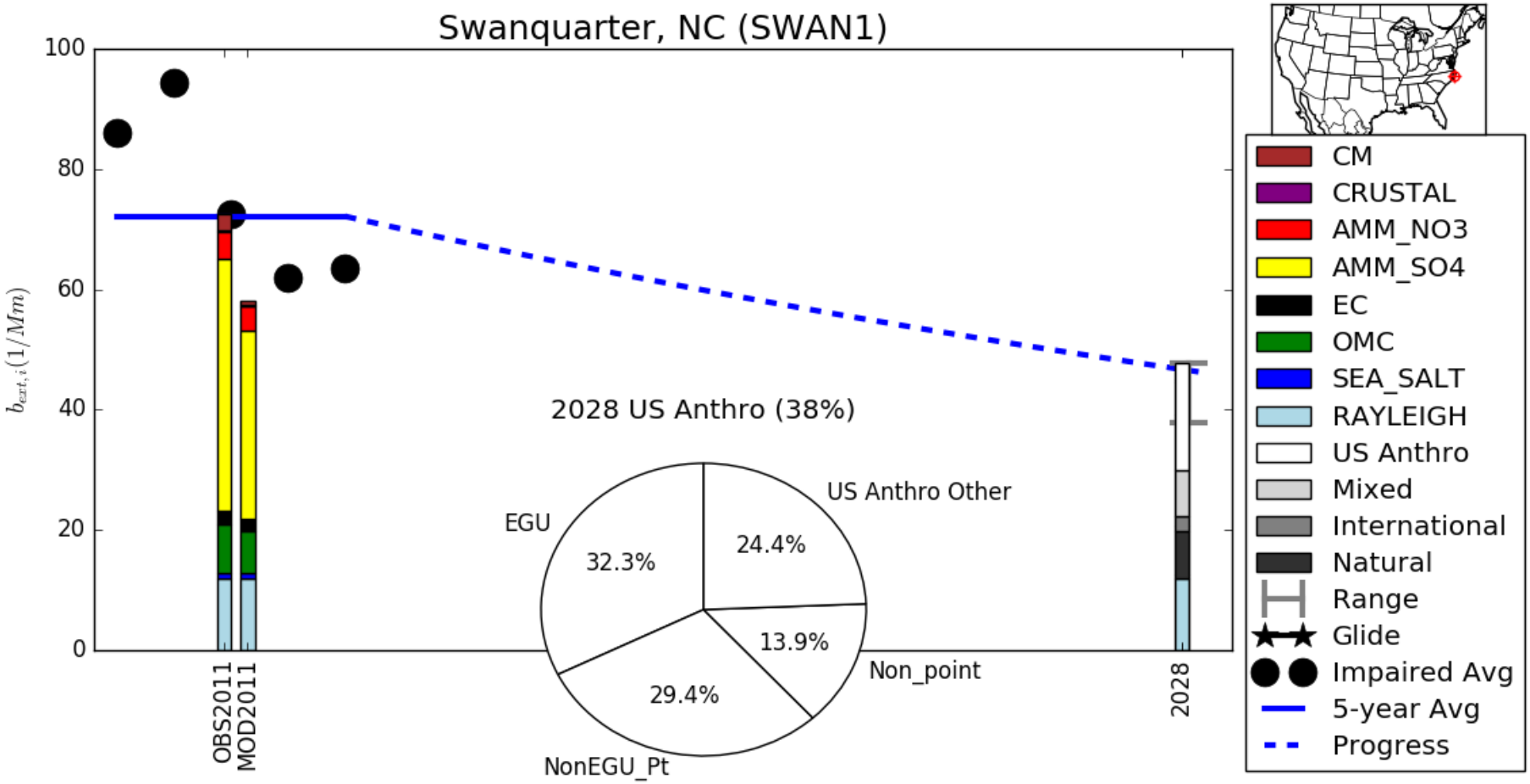


Figure 100: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Swanquarter (NC).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

A glidepath could not be calculated for this site due to incomplete ambient IMPROVE data in the 2000-2004 baseline period.

Northeast

- Acadia National Park (ME)(ACAD1)
- Great Gulf Wilderness (NH) and Presidential Range-Dry River Wilderness (NH)(GRGU1)
- Lye Brook Wilderness (VT)(LYEB1)
- Moosehorn (ME) and Roosevelt Campobello International Park (ME)(MOOS1)

Regional visibility model performance and contribution summary on the 20% most impaired days

Most important ambient PM species contribution to visibility (on 20% most impaired days)	Dominated by sulfate, smaller amount of organic carbon
Model visibility performance summary (on 20% most impaired days)	Performance generally good, but sulfate underpredicted
Uncertainty in sector contributions	Relatively high "mixed" sector contribution percentage (57%-65%) at ACAD1 and MOOS1, relatively low (30-34%) at GRGU1 and LYEB1.
2028 US anthropogenic percent contribution	16-22% at ACAD1 and MOOS1, 30-40% at GRGU1 and LYEB1
Largest US anthropogenic sector contributions	NonEGU point, EGU, nonpoint, and RWC

Due to uncertainties in the modeling, the 2028 regional haze results should be used with caution. In particular, the modeling results (including the estimated 2028 US anthropogenic contributions) are most uncertain at sites with poor visibility model performance and/or high "mixed" (boundary conditions, fugitive dust, offshore, and secondary organics) contributions.

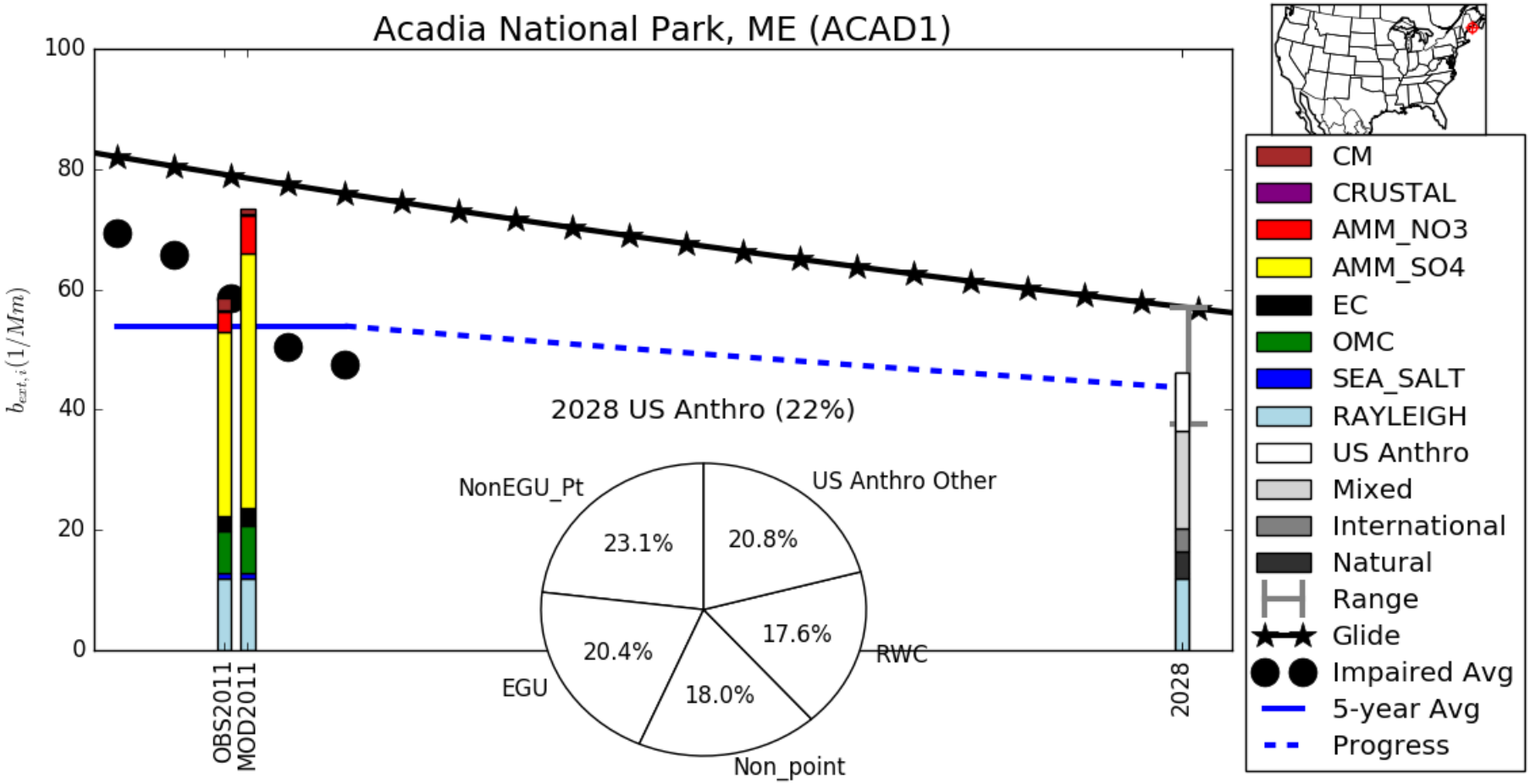


Figure 101: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Acadia National Park (ME).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

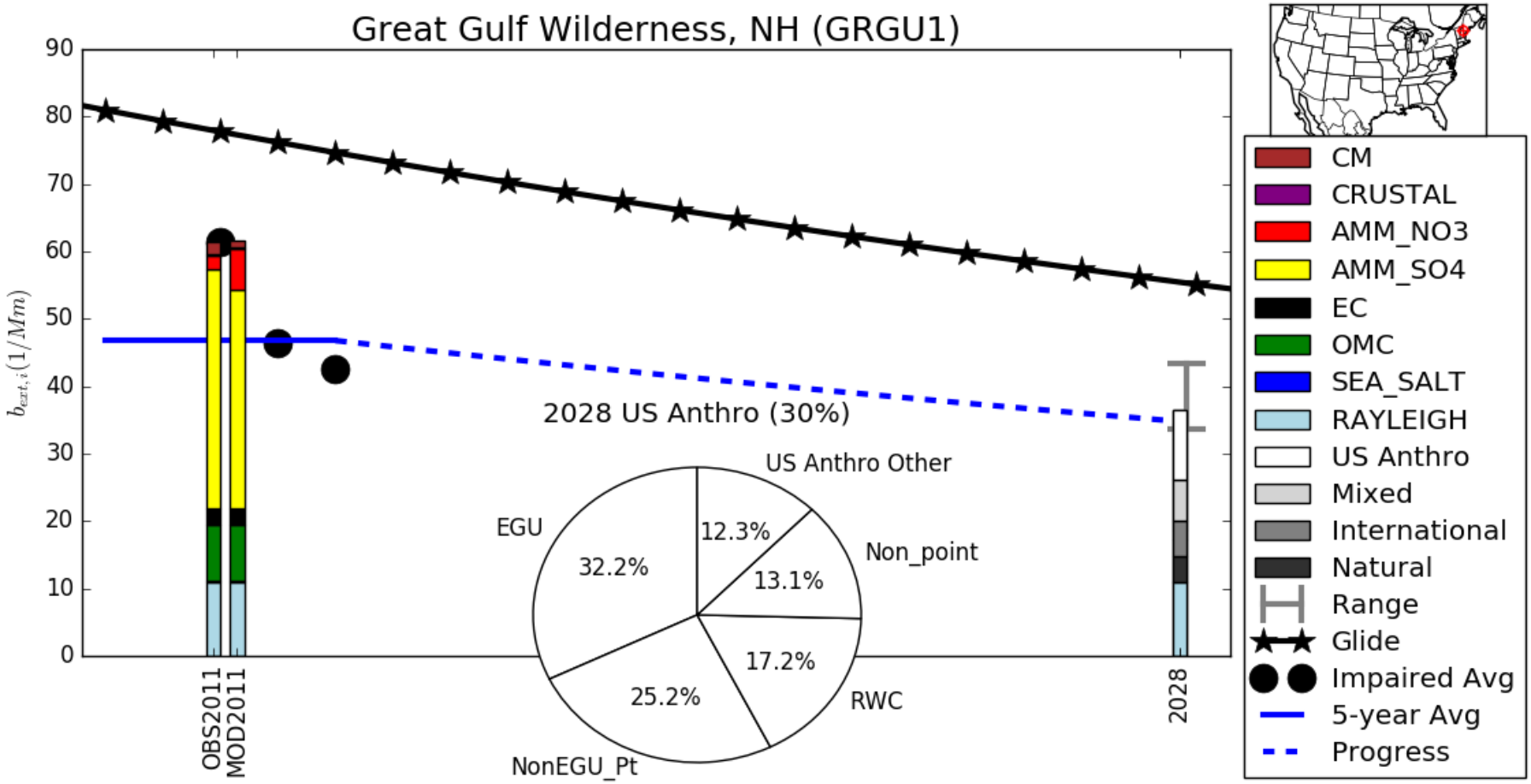


Figure 102: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Great Gulf Wilderness (NH) and Presidential Range-Dry River Wilderness (NH).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

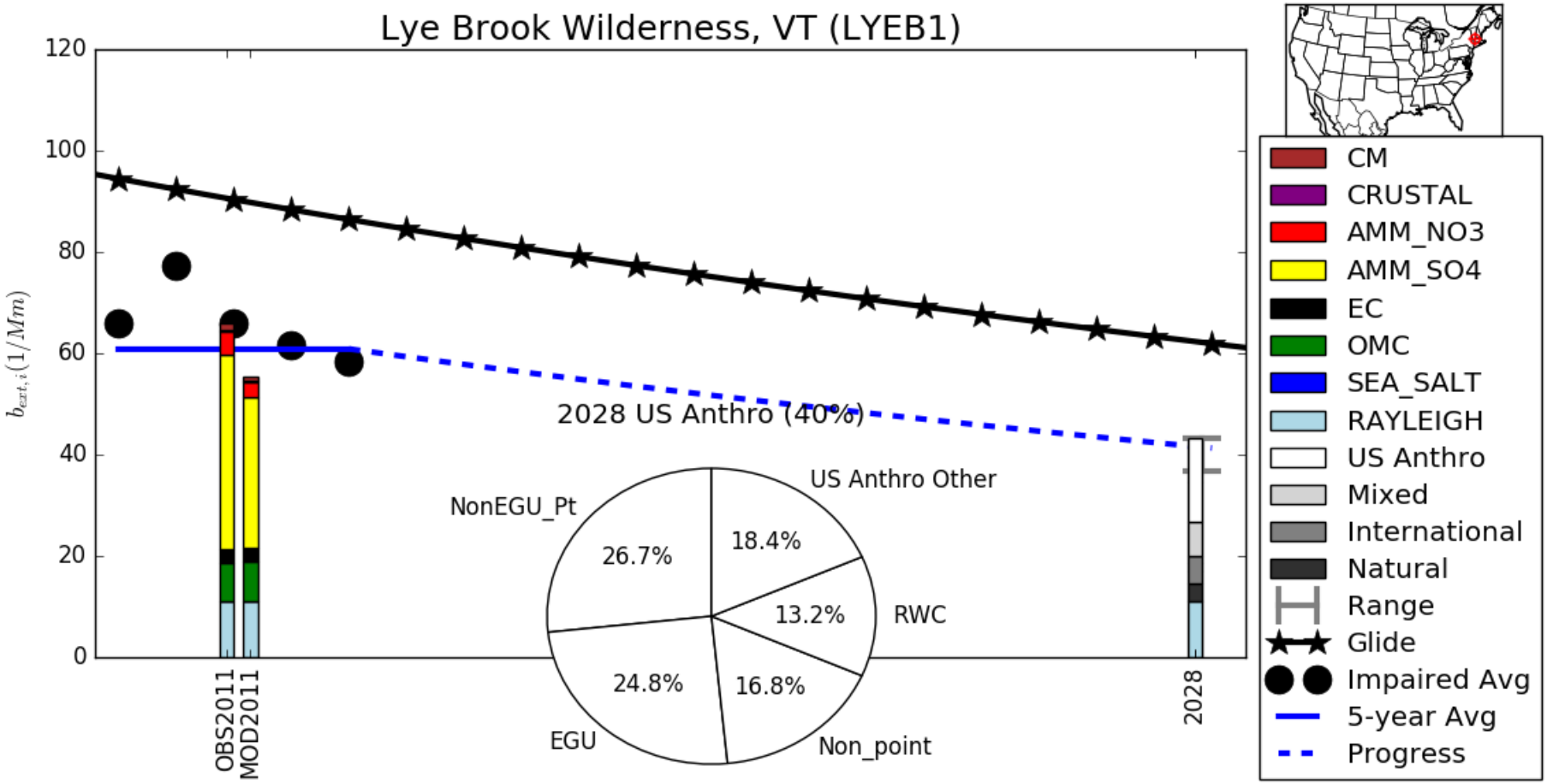


Figure 103: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Lye Brook Wilderness (VT).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.

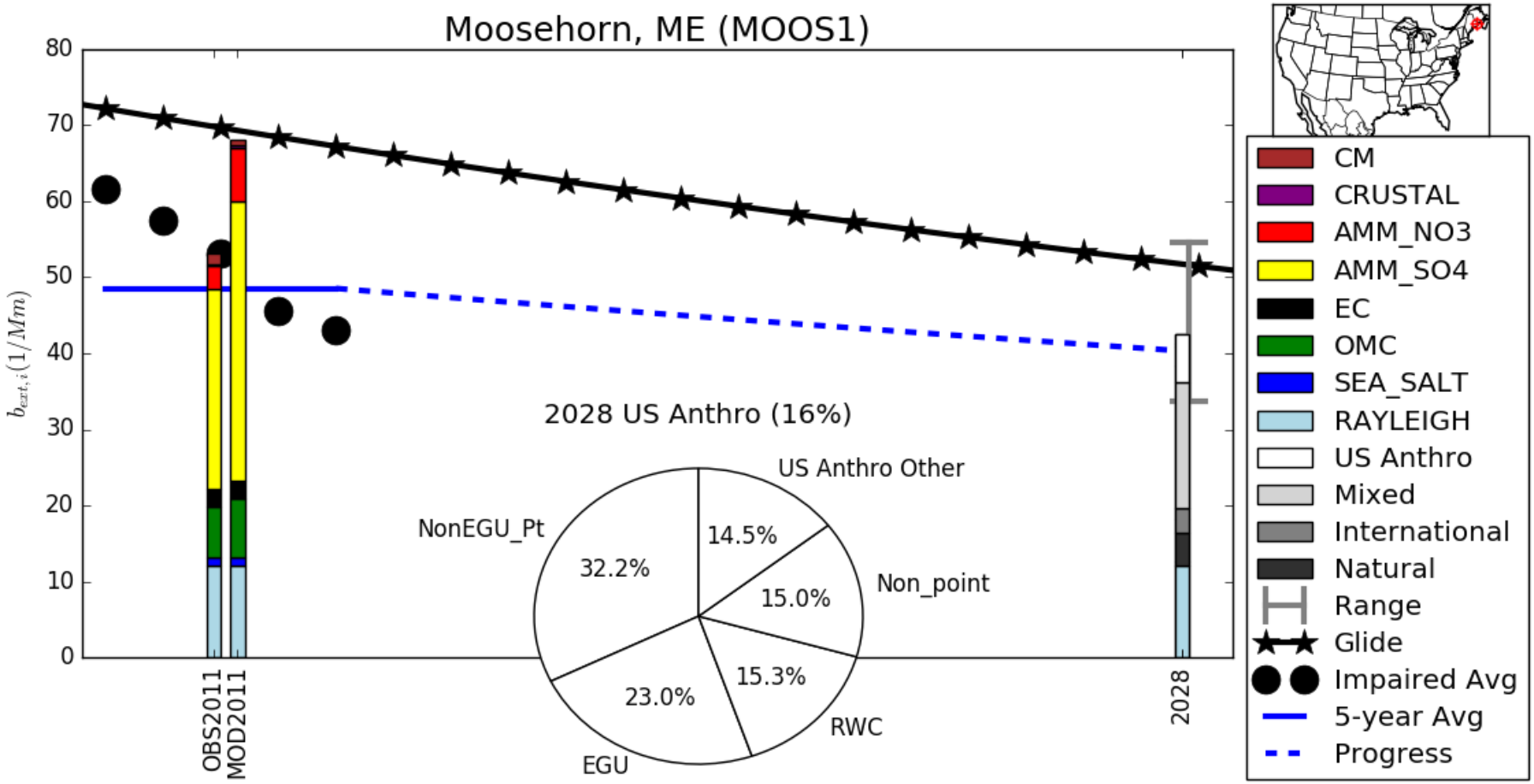


Figure 104: 2011 IMPROVE observations, 2011 CAMx model predictions, 2028 modeled projection, and 2028 sector contributions at Moosehorn (ME) and Roosevelt Campobello International Park (ME).

This figure reflects EPA's initial 2028 regional haze modeling that contains a number of uncertainties such that the results should be used with caution.