Fiscal Incentives for Scientific Research

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*The views expressed in this paper are those of the authors should not be attributed to the Federal Reserve Bank of San Francisco or the Federal Reserve System.

Introduction

- Fiscal Incentives are an important piece of overall government support of scientific research
  - Distinct from direct government spending on scientific research
    - E.g., research done by government agencies (DARPA, NOAA, etc.)
    - Grants to academic research (NSF, NIH, etc.)
  - Fiscal incentives are indirect government spending aimed at *incentivizing* private sector research
  - Motivated by economic theory:
    - Social returns to research are greater than private returns, implying private will underinvest in research relative to social optimum
    - Yet, profit-maximizing firms better able to identify needed/wanted innovations

Outline of My Remarks

- Primer on Types of Fiscal Incentives for Scientific Research
- Landscape of Fiscal Incentives for Scientific Research in the U.S.
  - Current incentives
  - Recent history of incentives
- Evidence on the effects and effectiveness of fiscal incentives for scientific research

Primer on Types of Fiscal Incentives for Research

- Federal and State
- Tax Incentives
  - R&D Tax Credits
  - Sector-specific tax incentives
    - E.g., investment or job creation tax credits for "high-tech" sectors (often biotech)
    - Property tax exemptions/abatements for high-tech sectors
  - Lower/zero tax rates on income from Intellectual Property (IP)
    - Some states (e.g., Delaware) do not tax IP royalties
    - Similarly, "patent boxes" used in Europe
- Grants/Subsidies to private firms

Landscape of U.S. Fiscal Research Incentives

- Current Federal R&D Tax Credit
  - Regular research credit
    - Credit equal to 20% of qualified R&D expenditures above "base amount"
    - Base amount is recent sales times average R&D-to-sales ratio over 1984 – 1988 (or recent R&D-to-sales ratio for newer businesses).
  - Alternative simplified credit (ASC)
    - Credit equal to 14% of qualified R&D expenditures above base amount
    - Base amount equals 50% of average R&D over prior 3 years.
  - Basic research credit
    - For companies that partner with non-profit entities like universities or research institutes to conduct basic research
      - for "scientific knowledge not having a specific commercial objective"

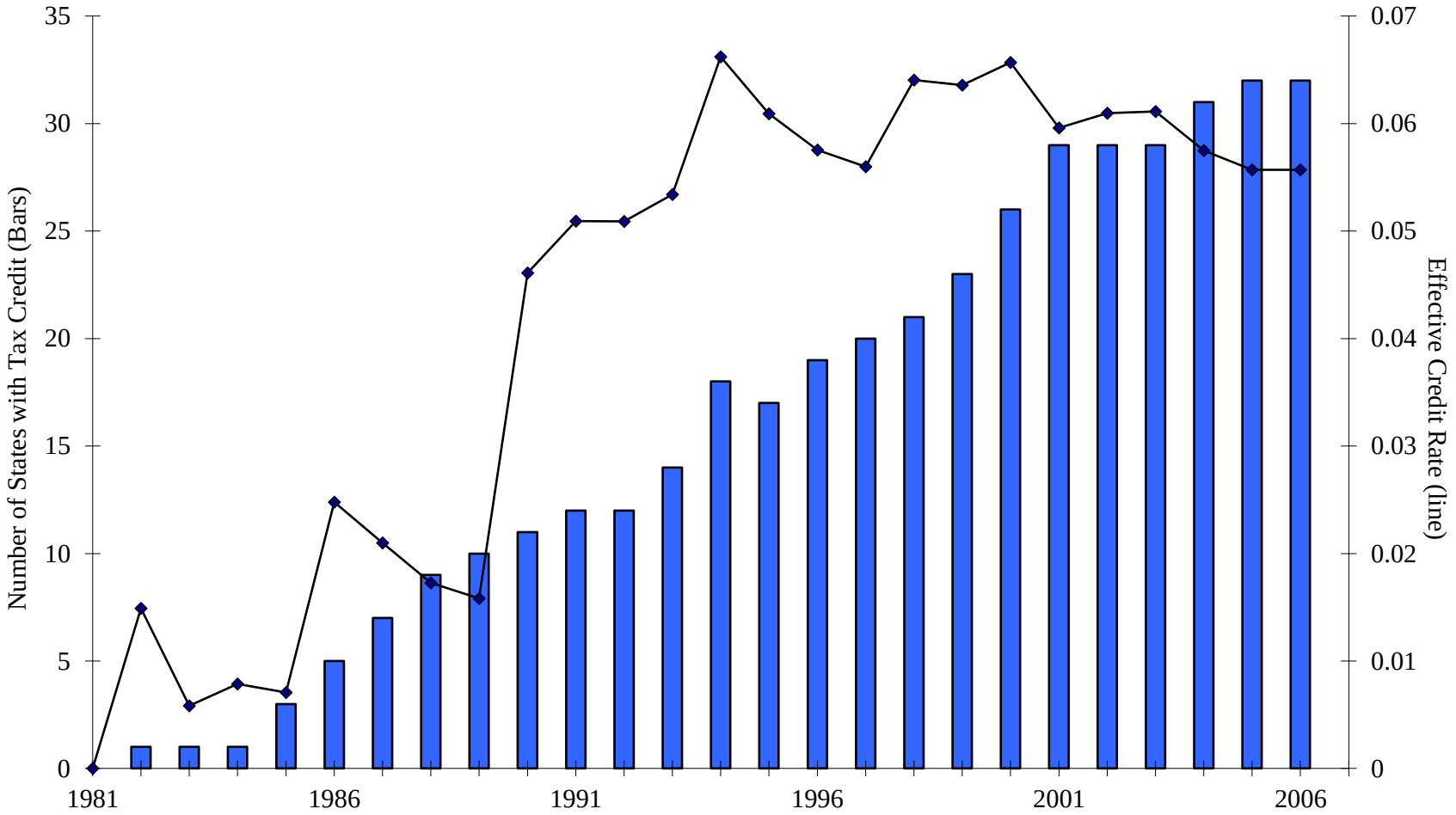
Landscape of U.S. Fiscal Research Incentives

- History of Federal R&D Tax Credit
  - Established in 1981
  - Temporarily extended 16 times since
  - Made permanent on Dec. 18, 2015

Landscape of U.S. Fiscal Research Incentives

- History of State R&D Tax Credits

Figure 1. Number and Average Value of State R&D Tax Credits in the U.S., 1981-2006



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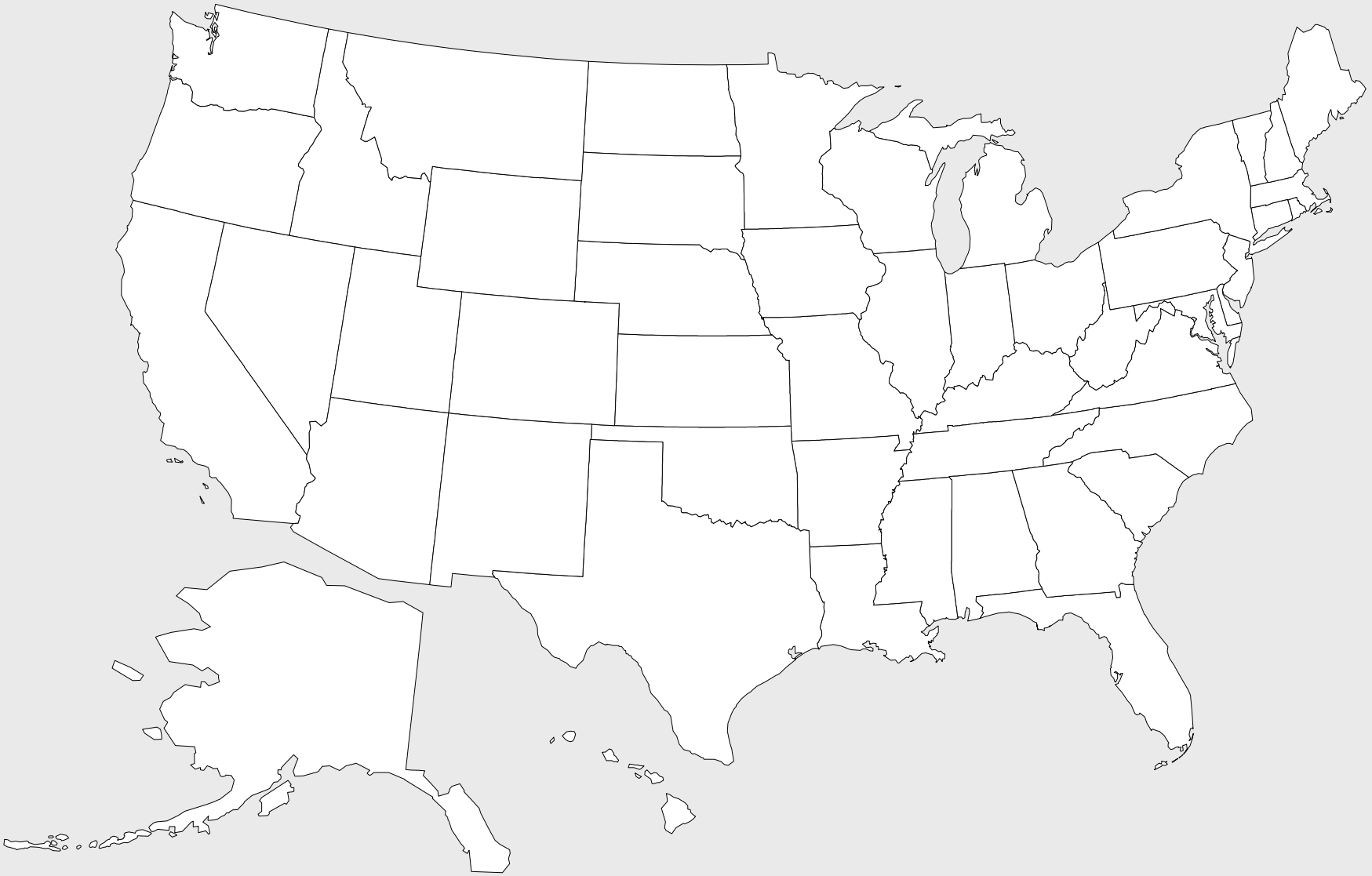

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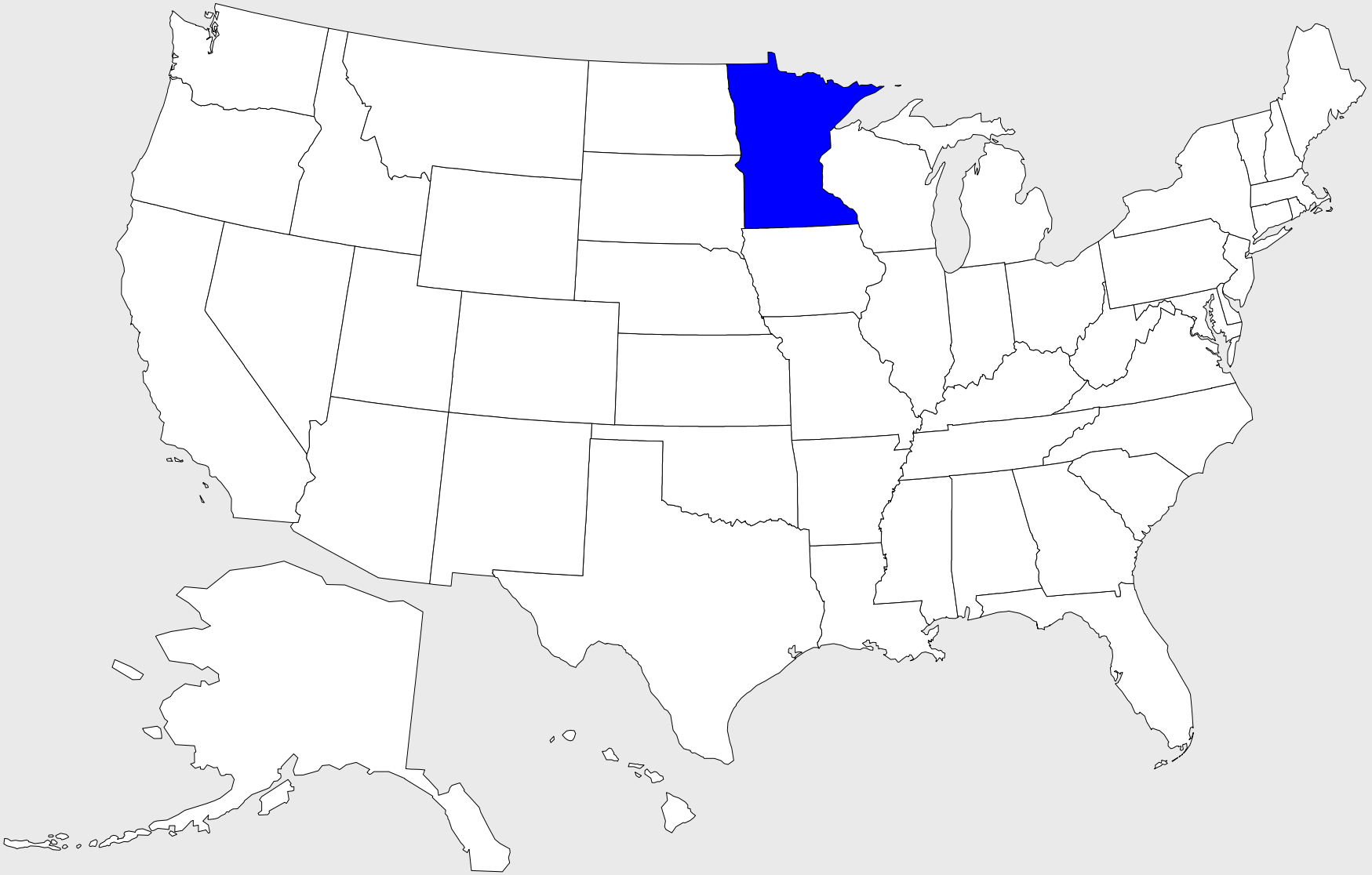

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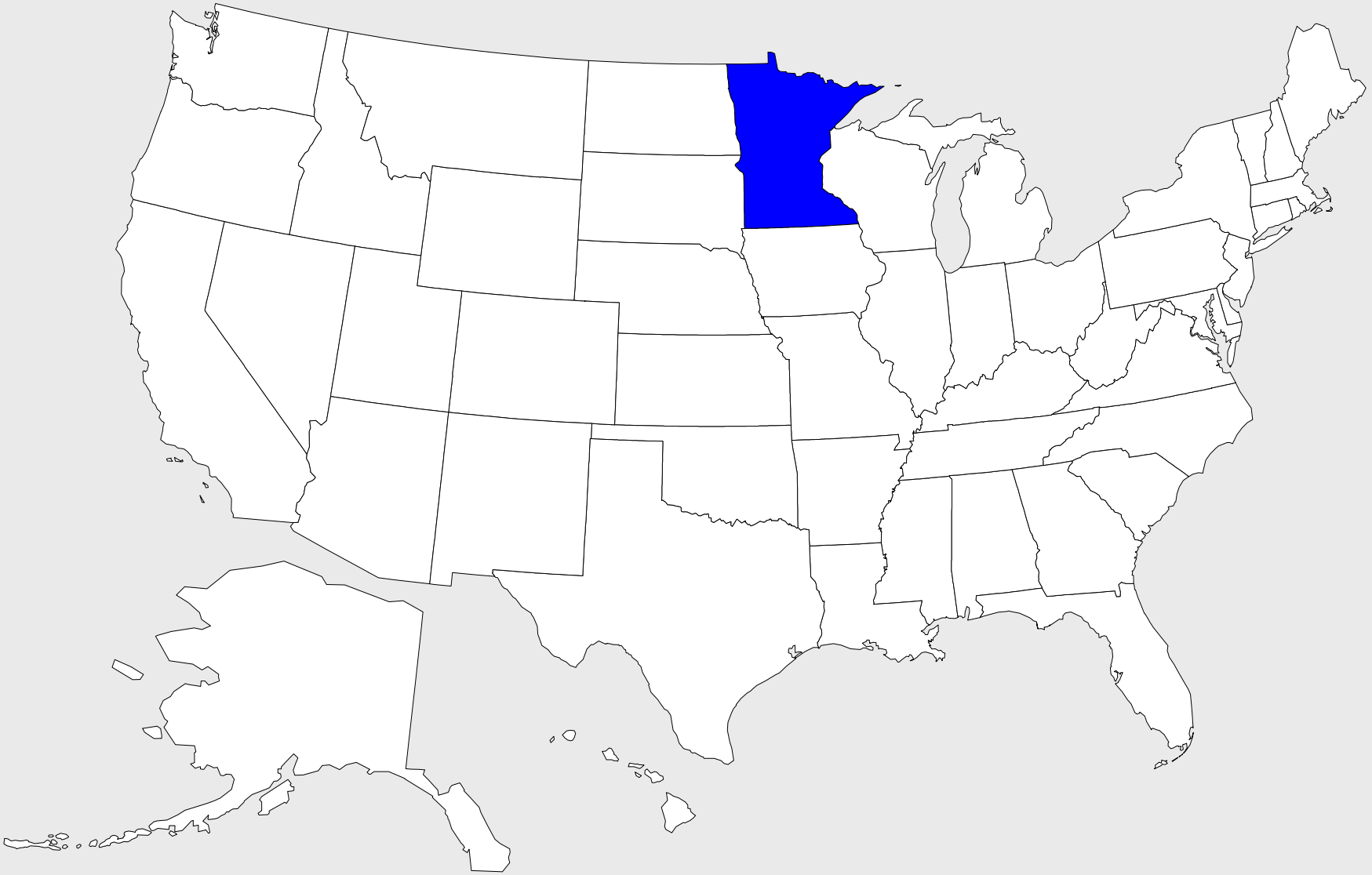

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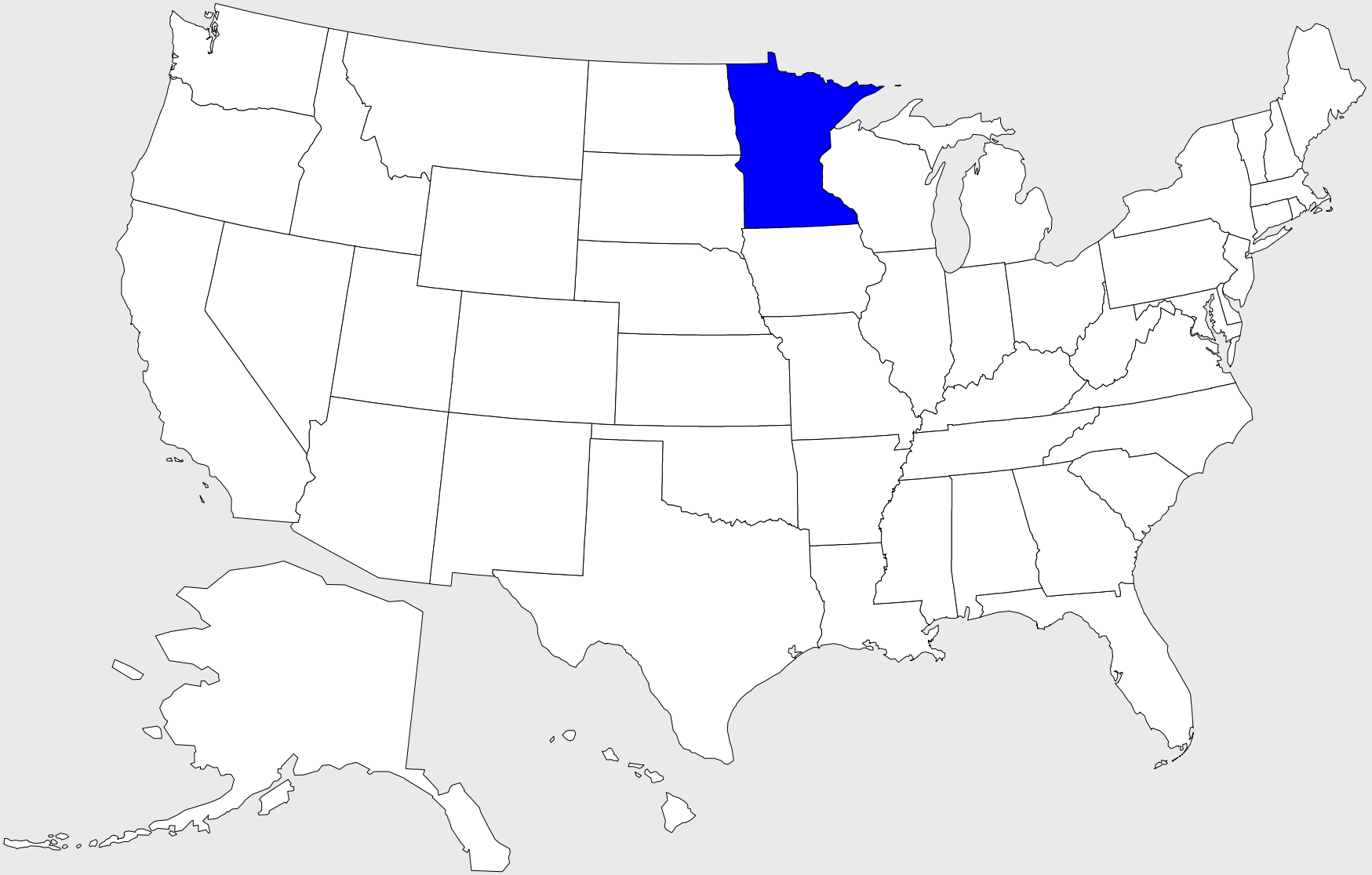

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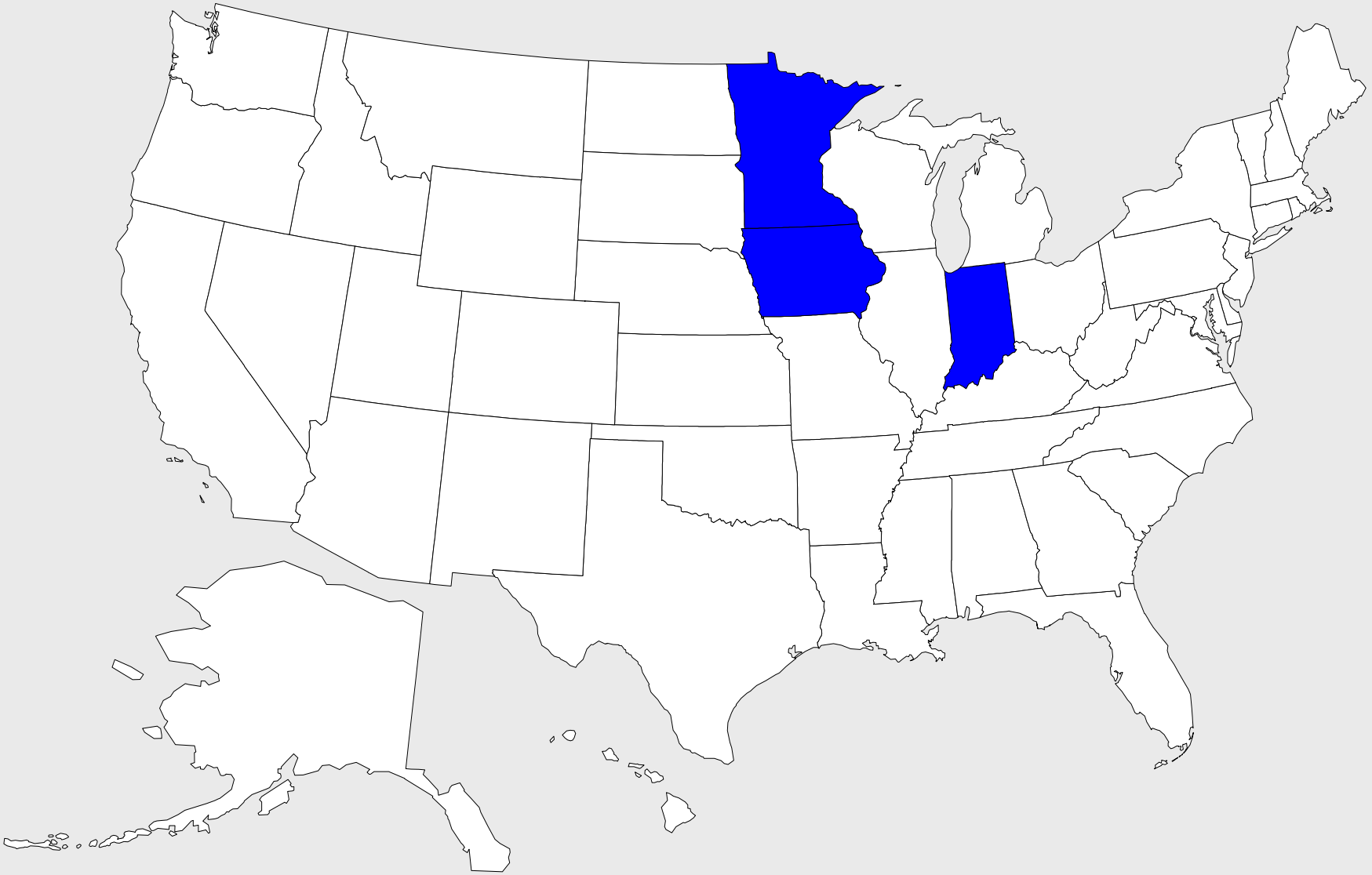

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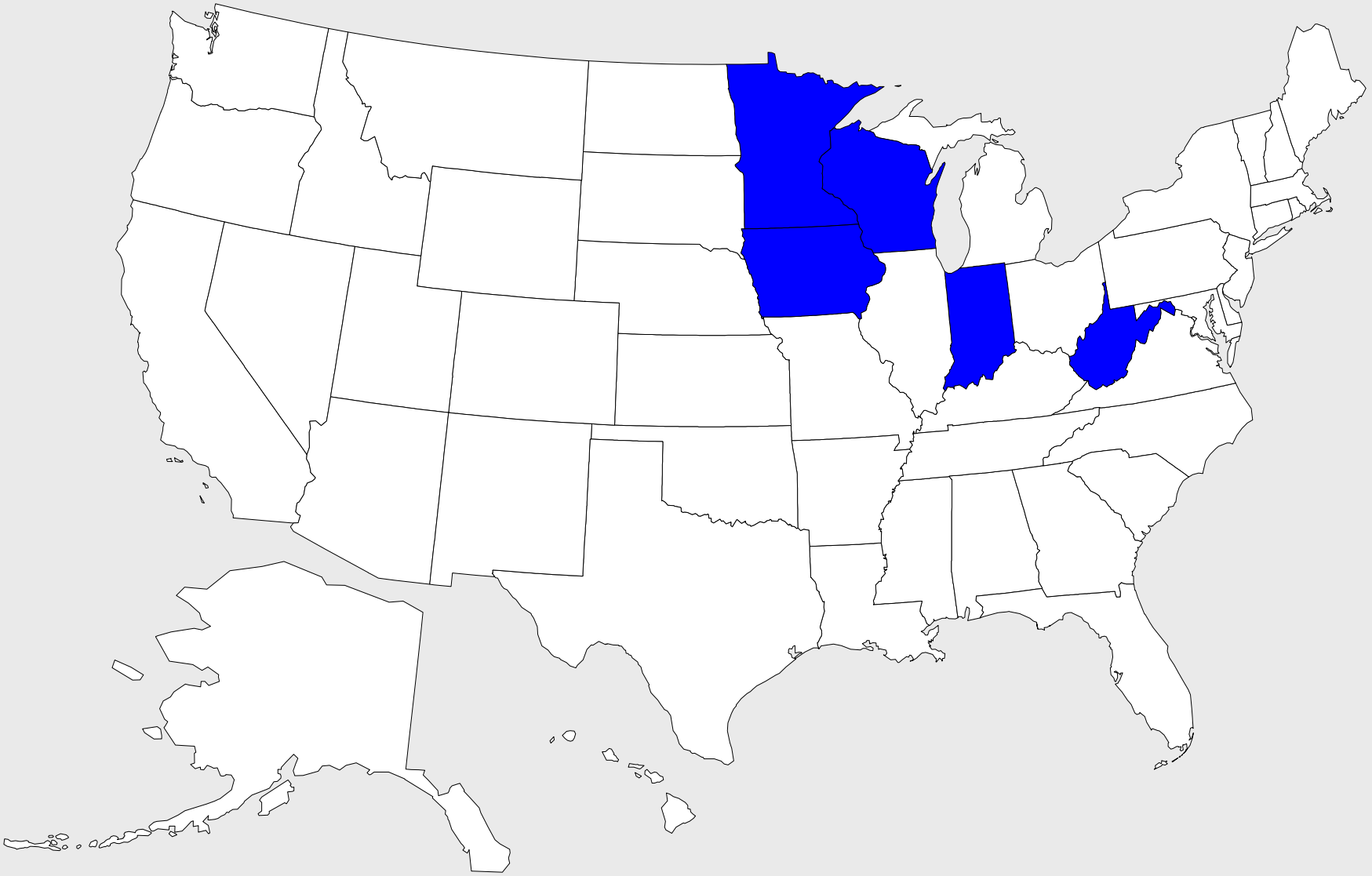

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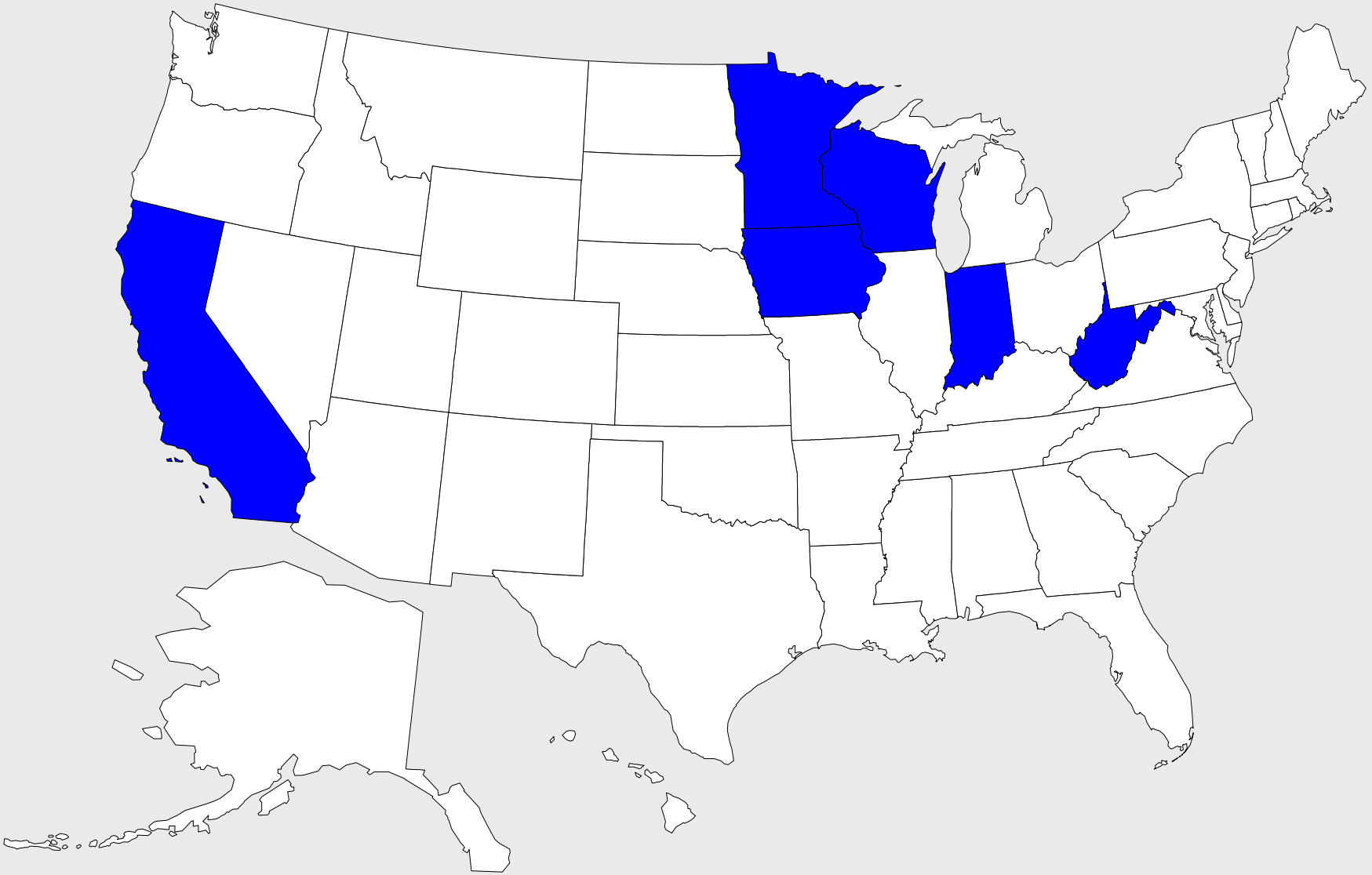

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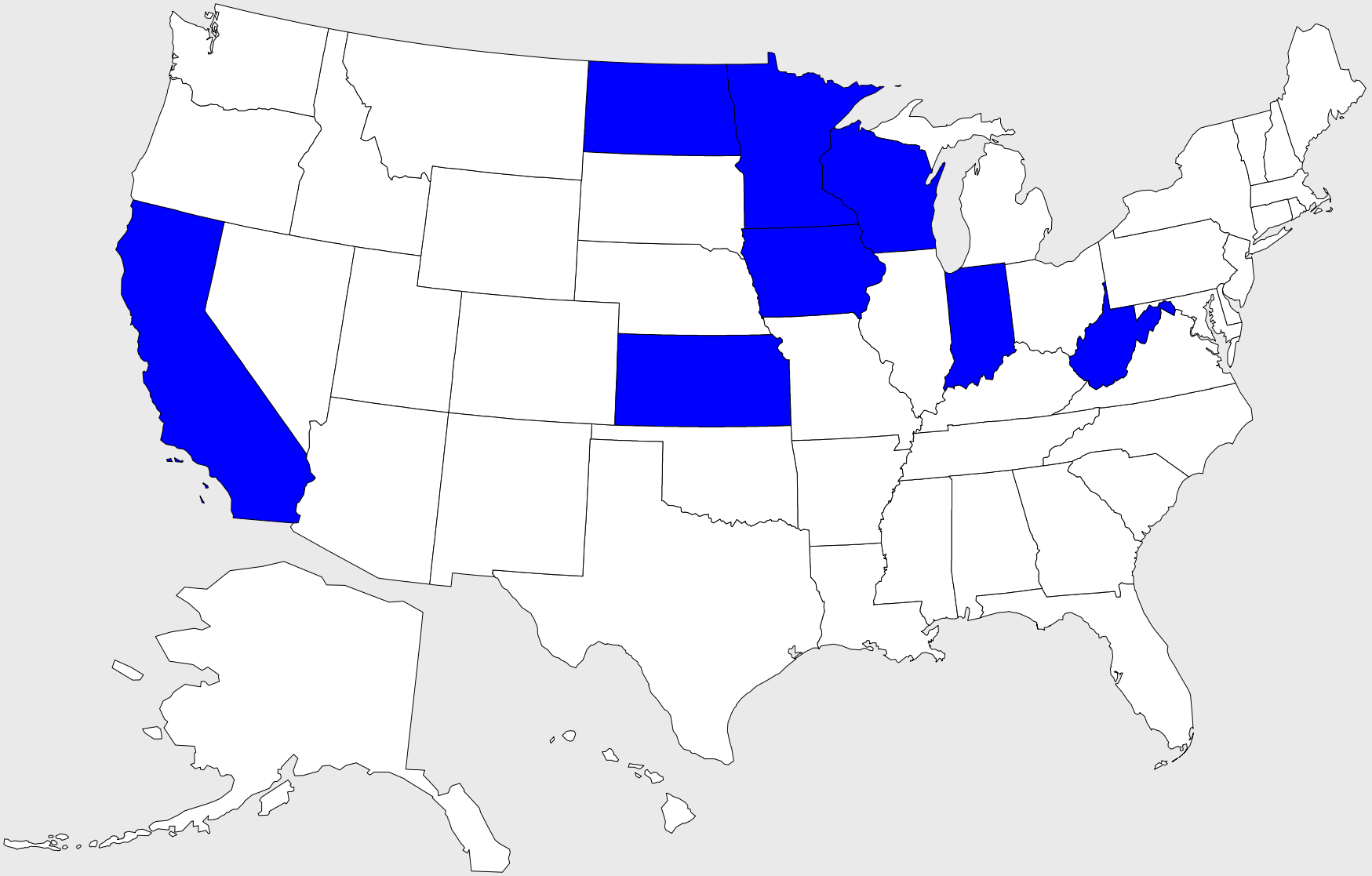

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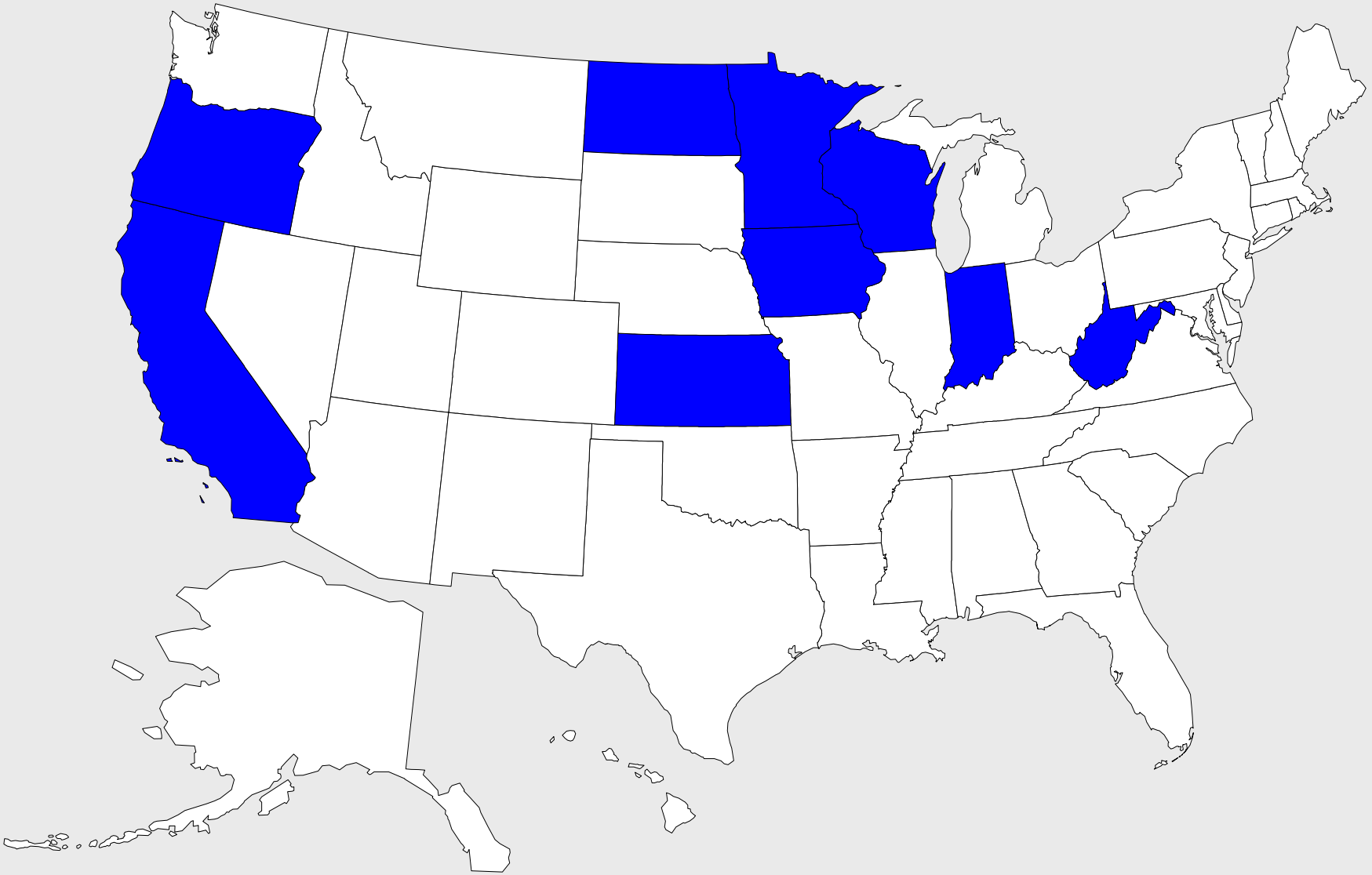

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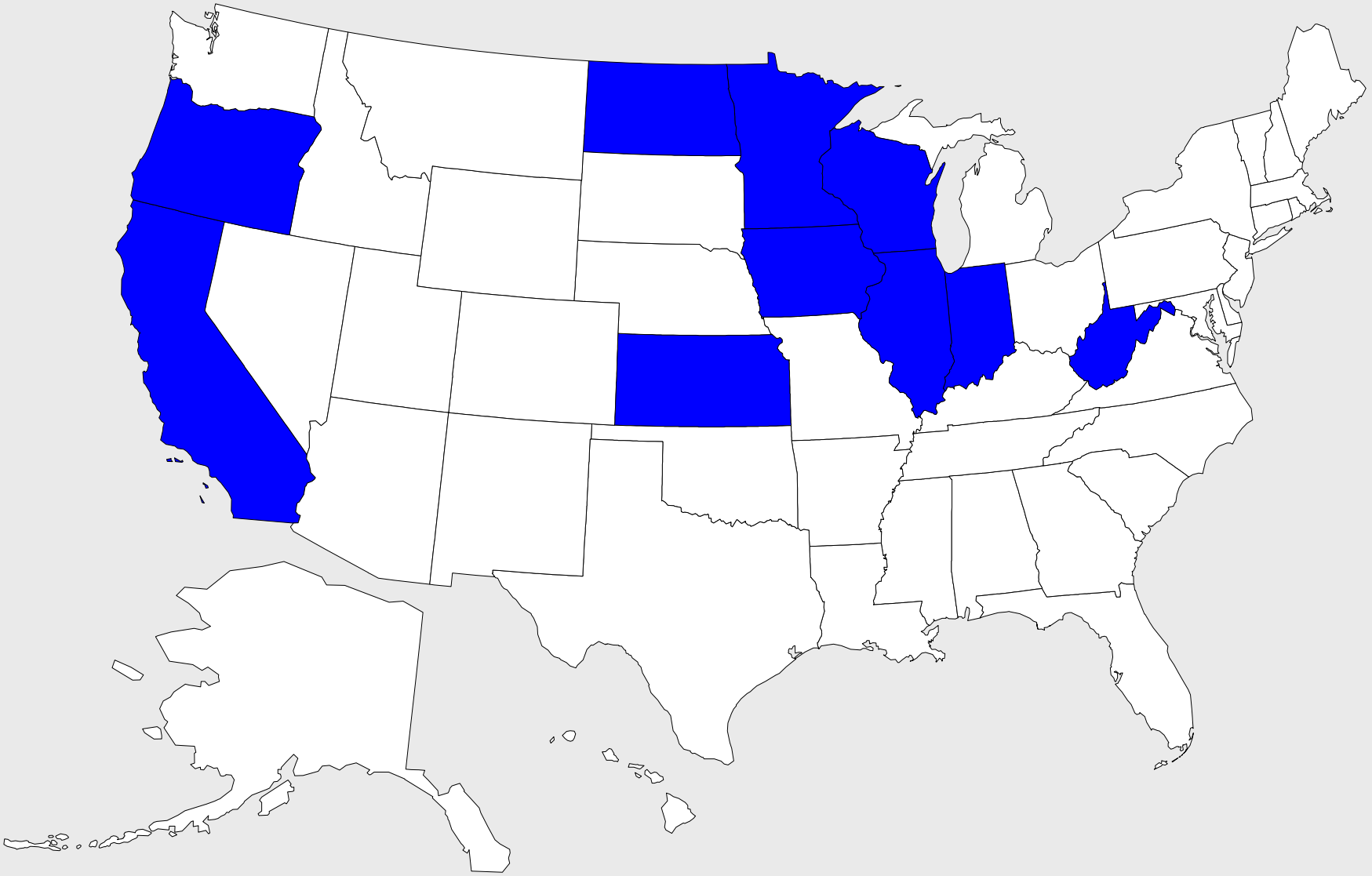

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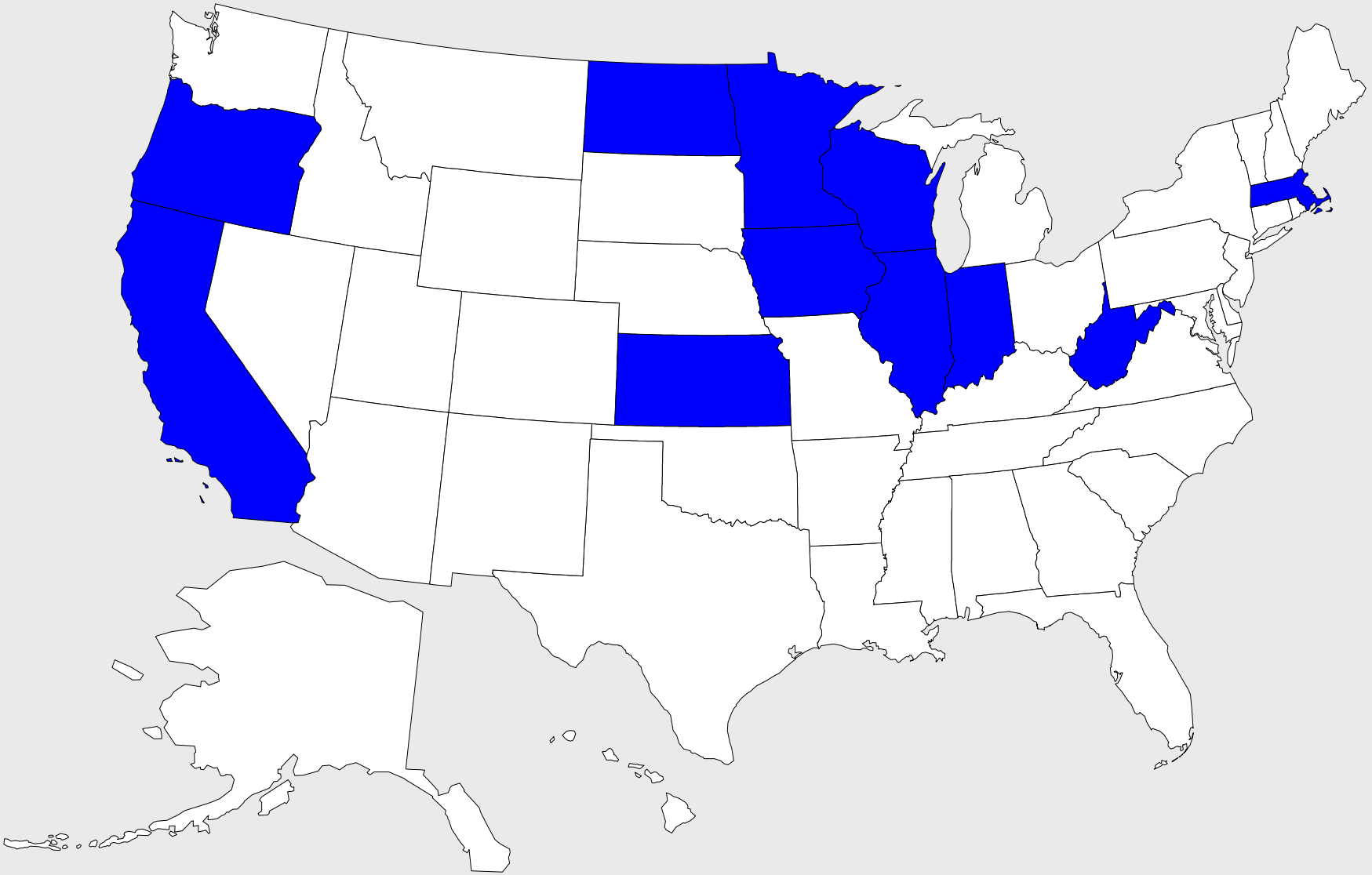

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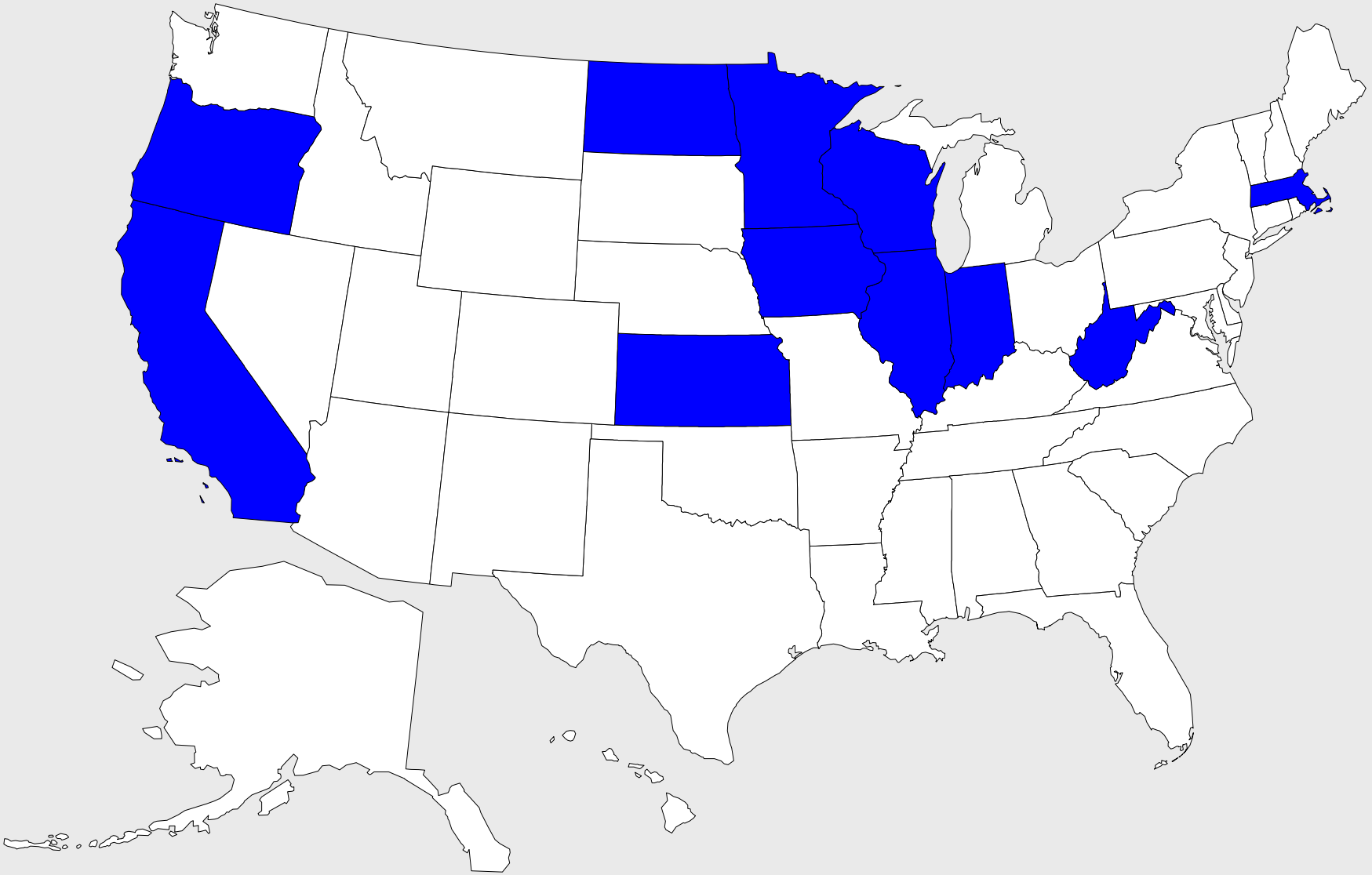

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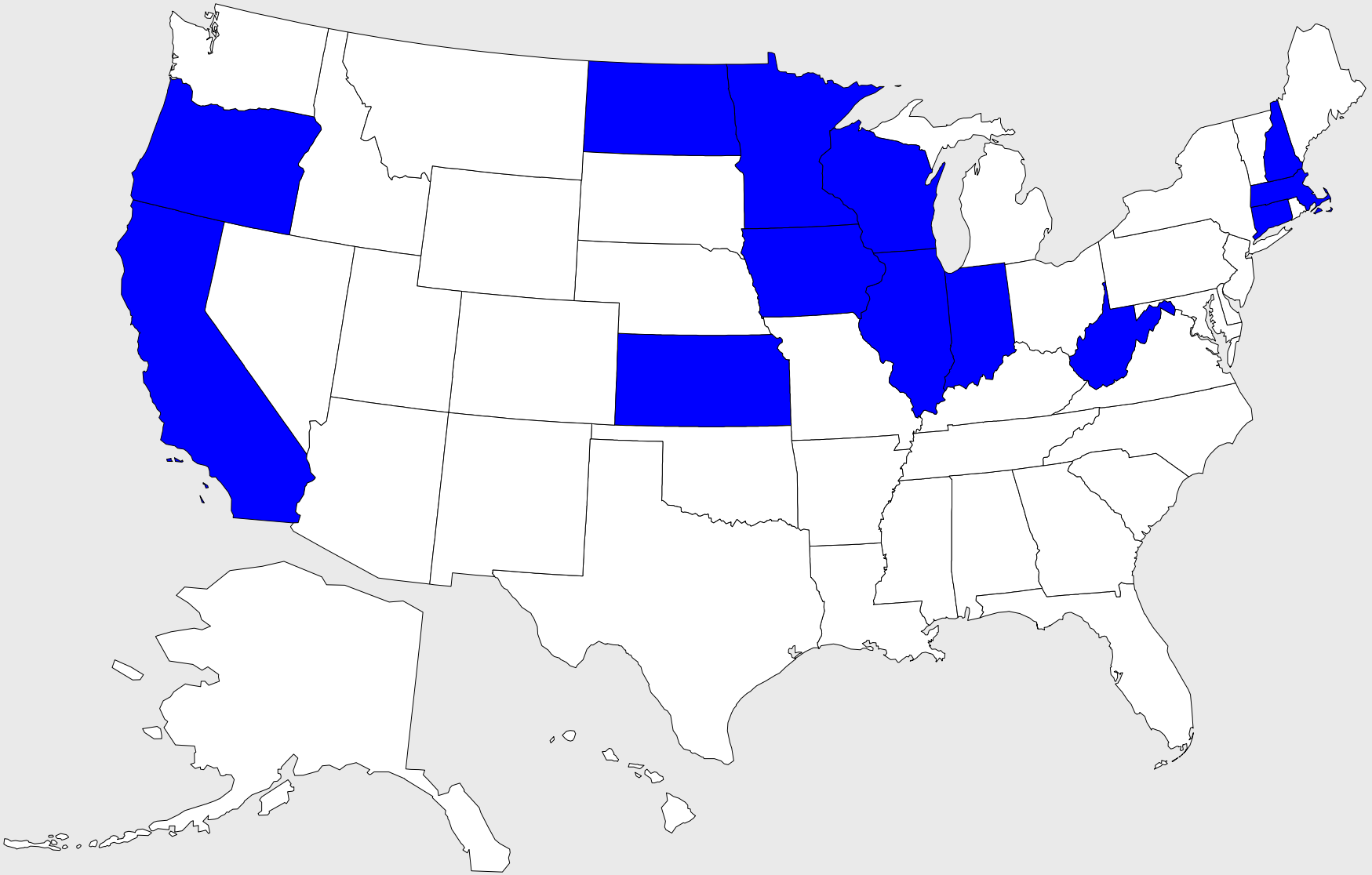

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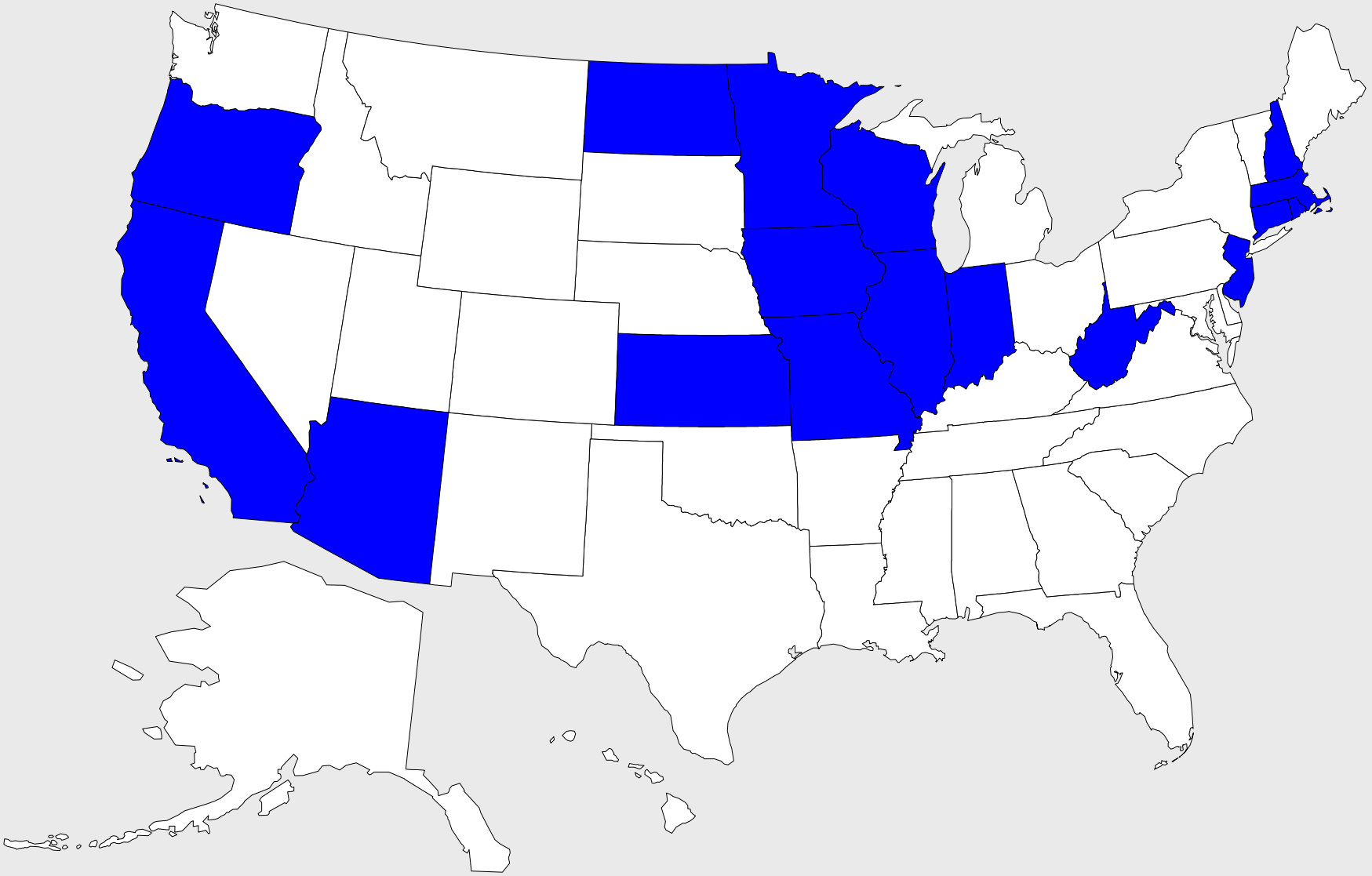

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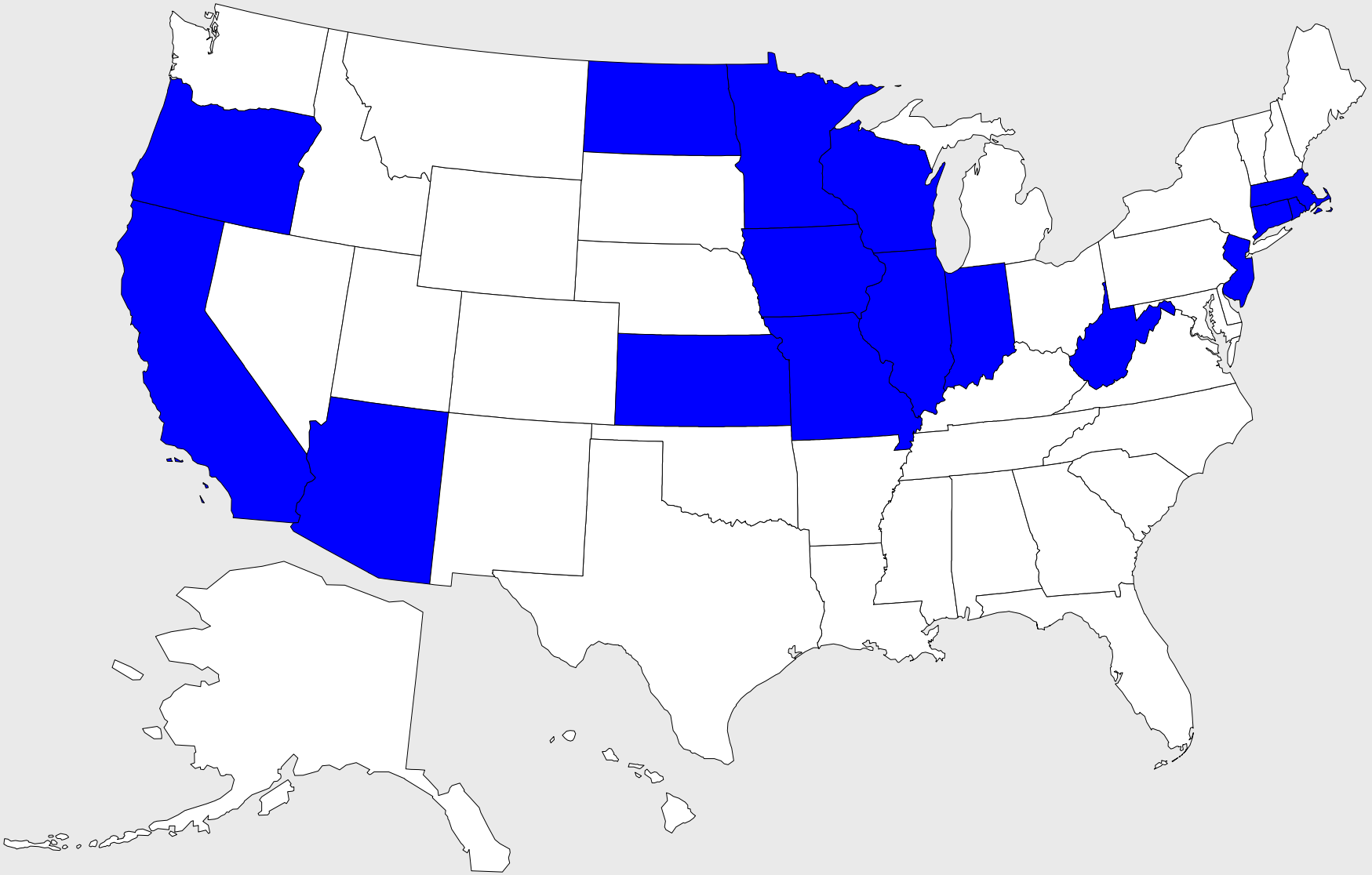

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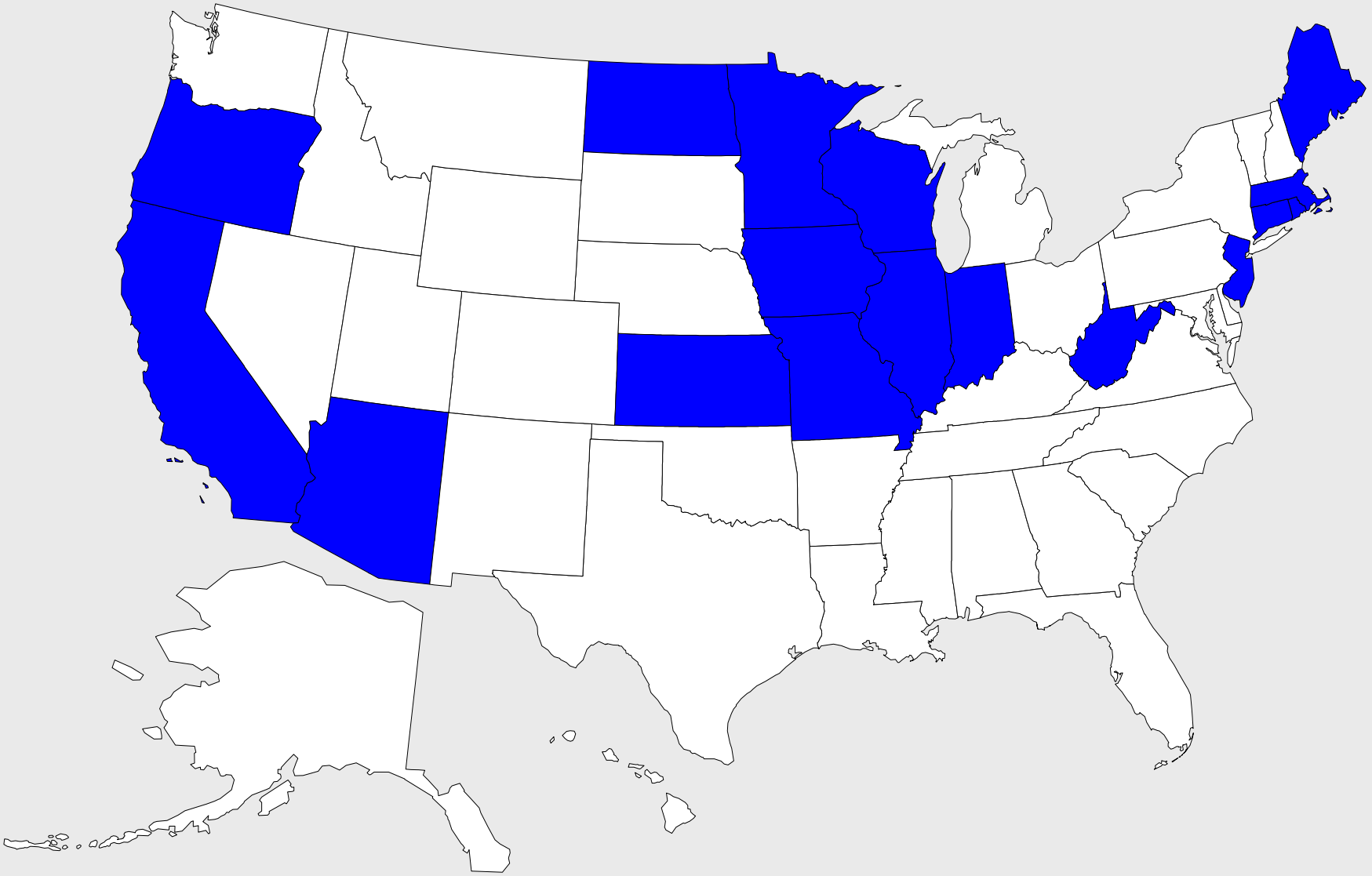

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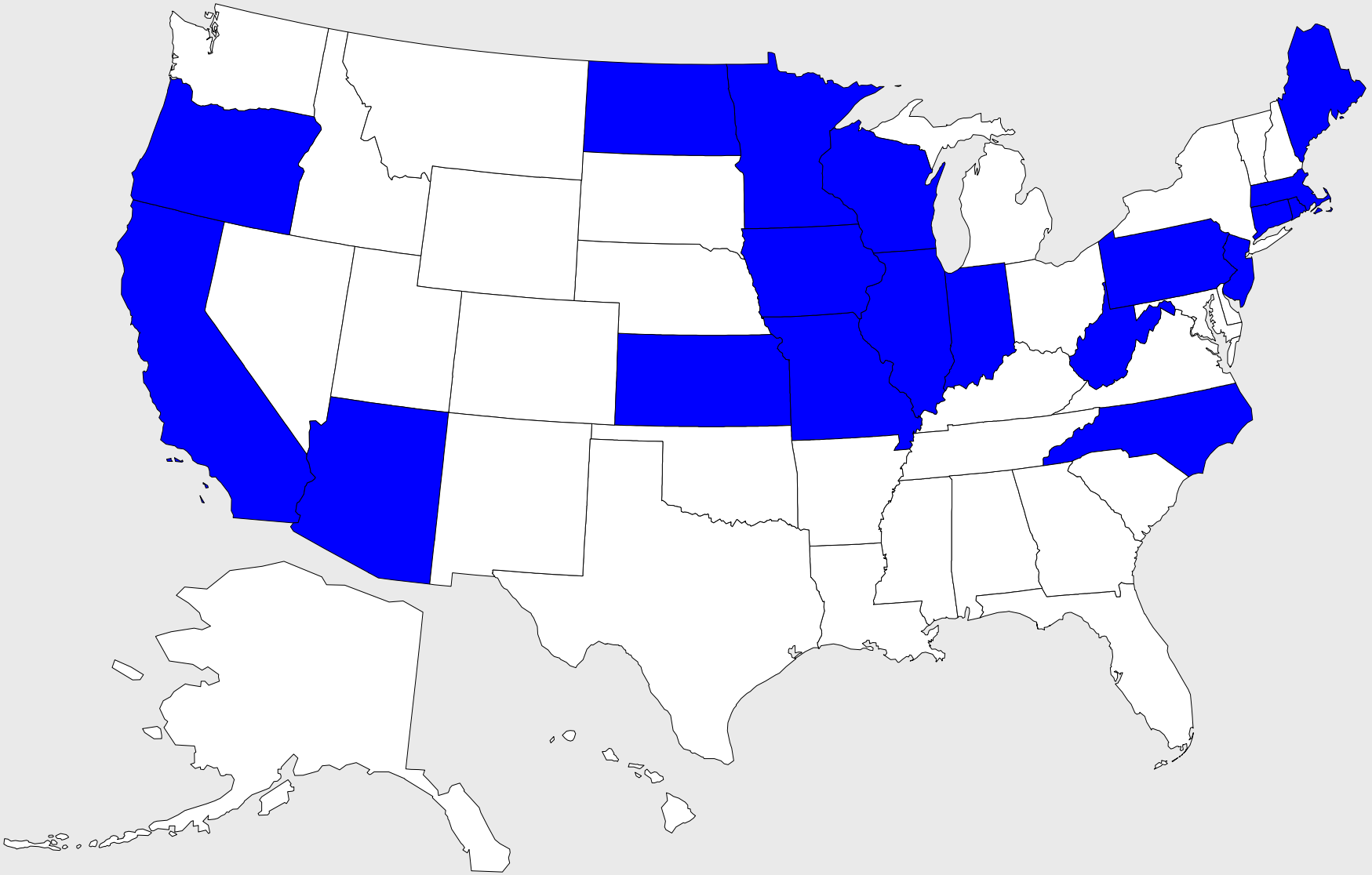

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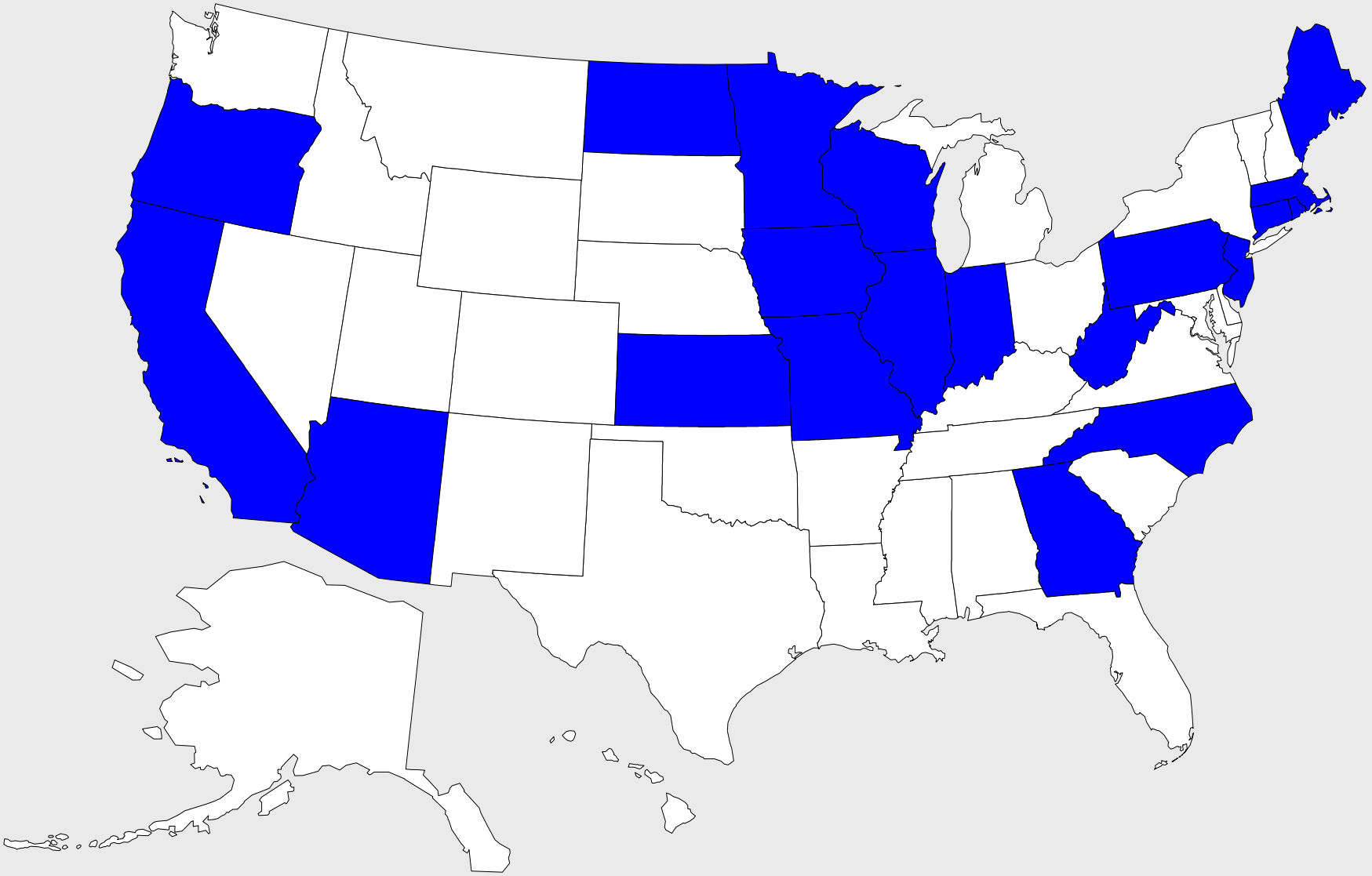

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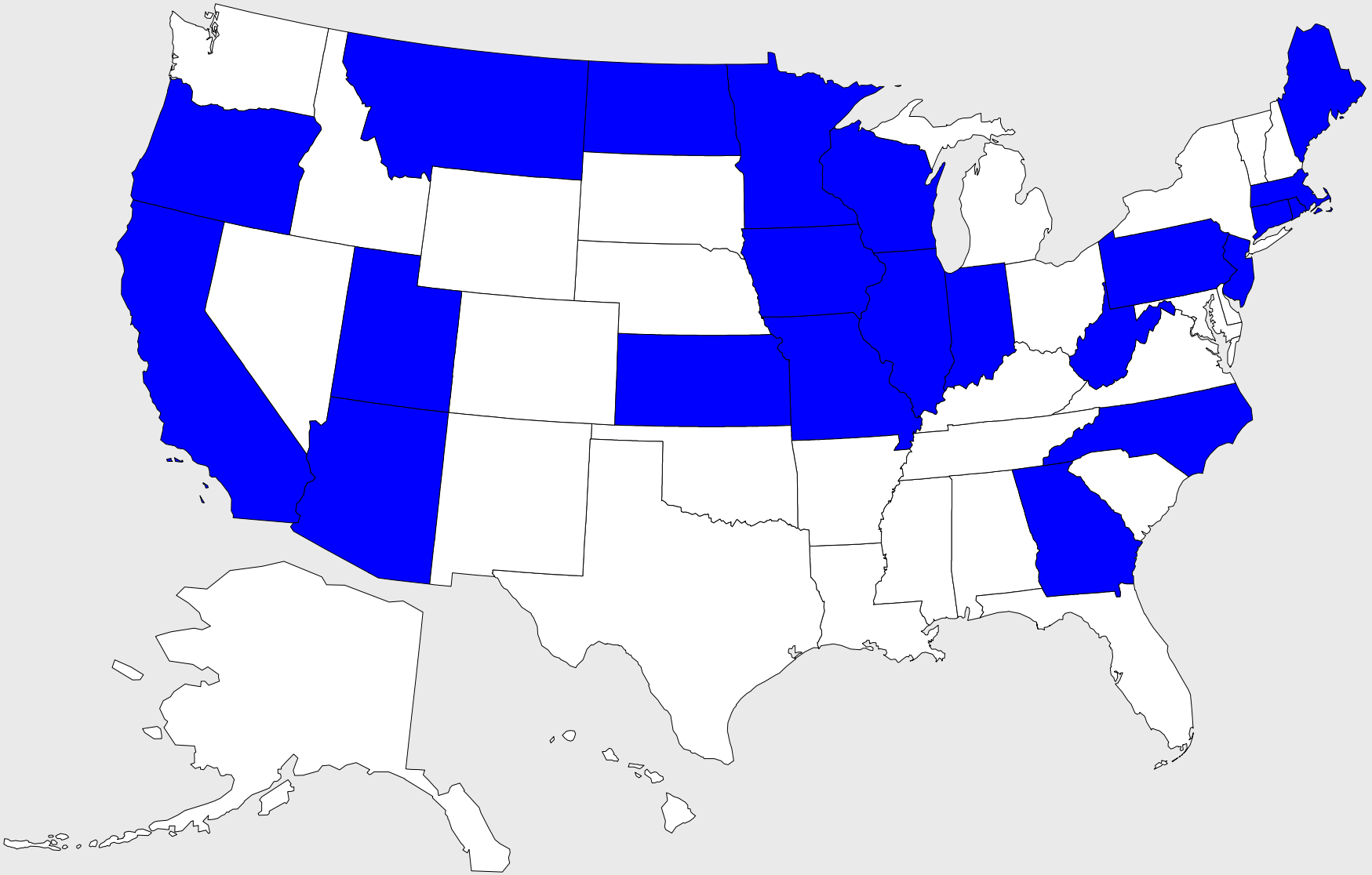

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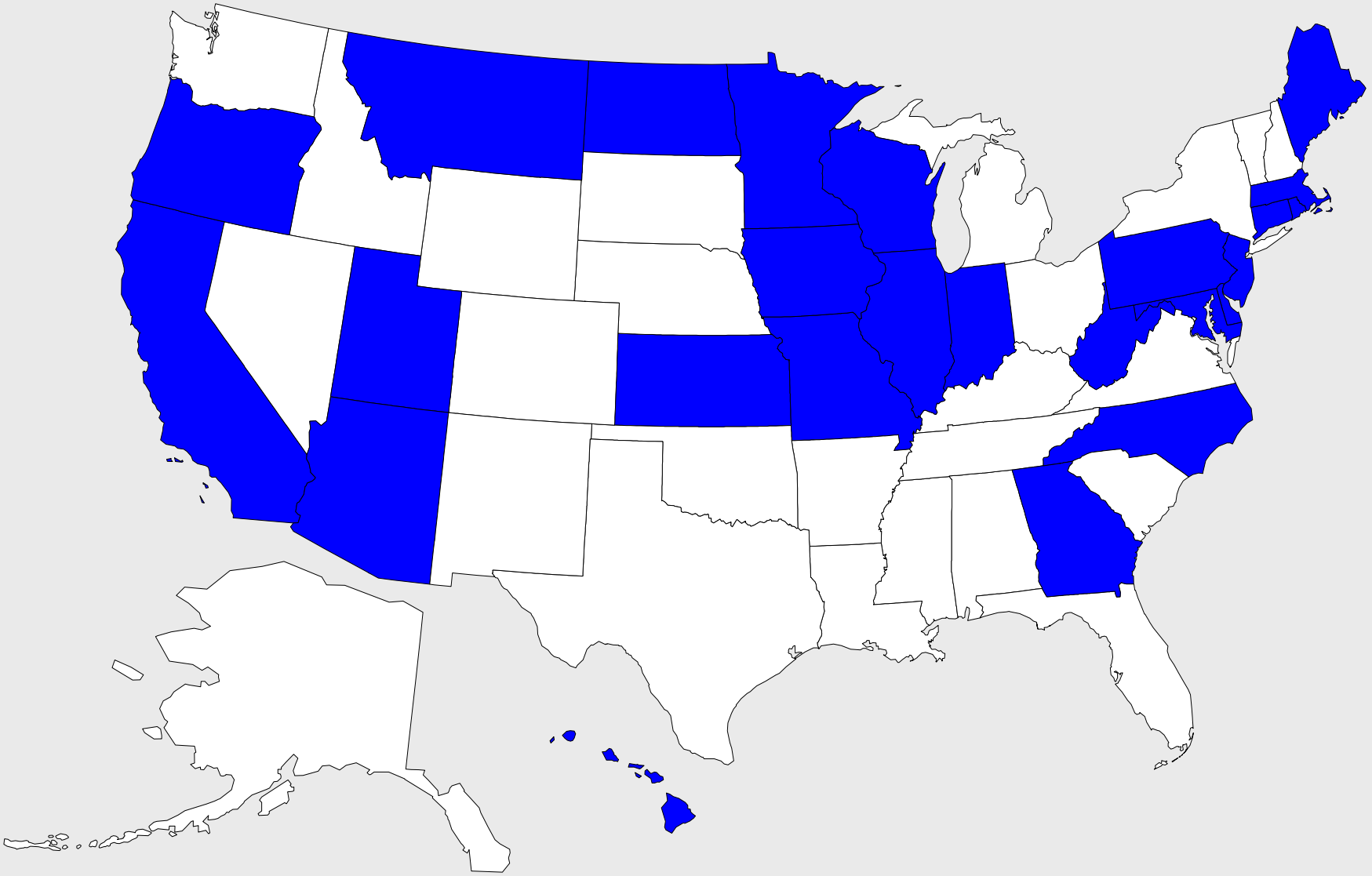

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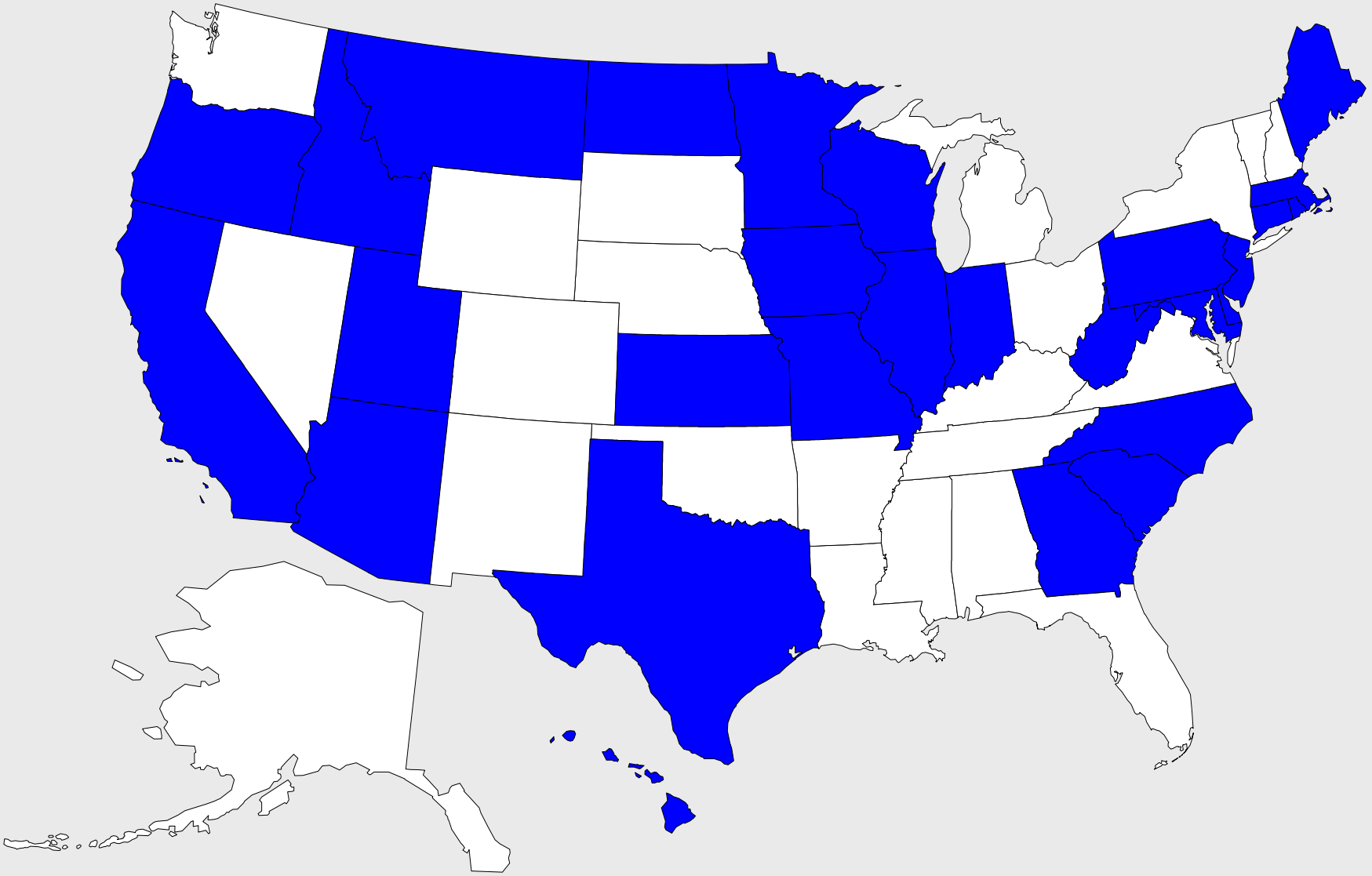

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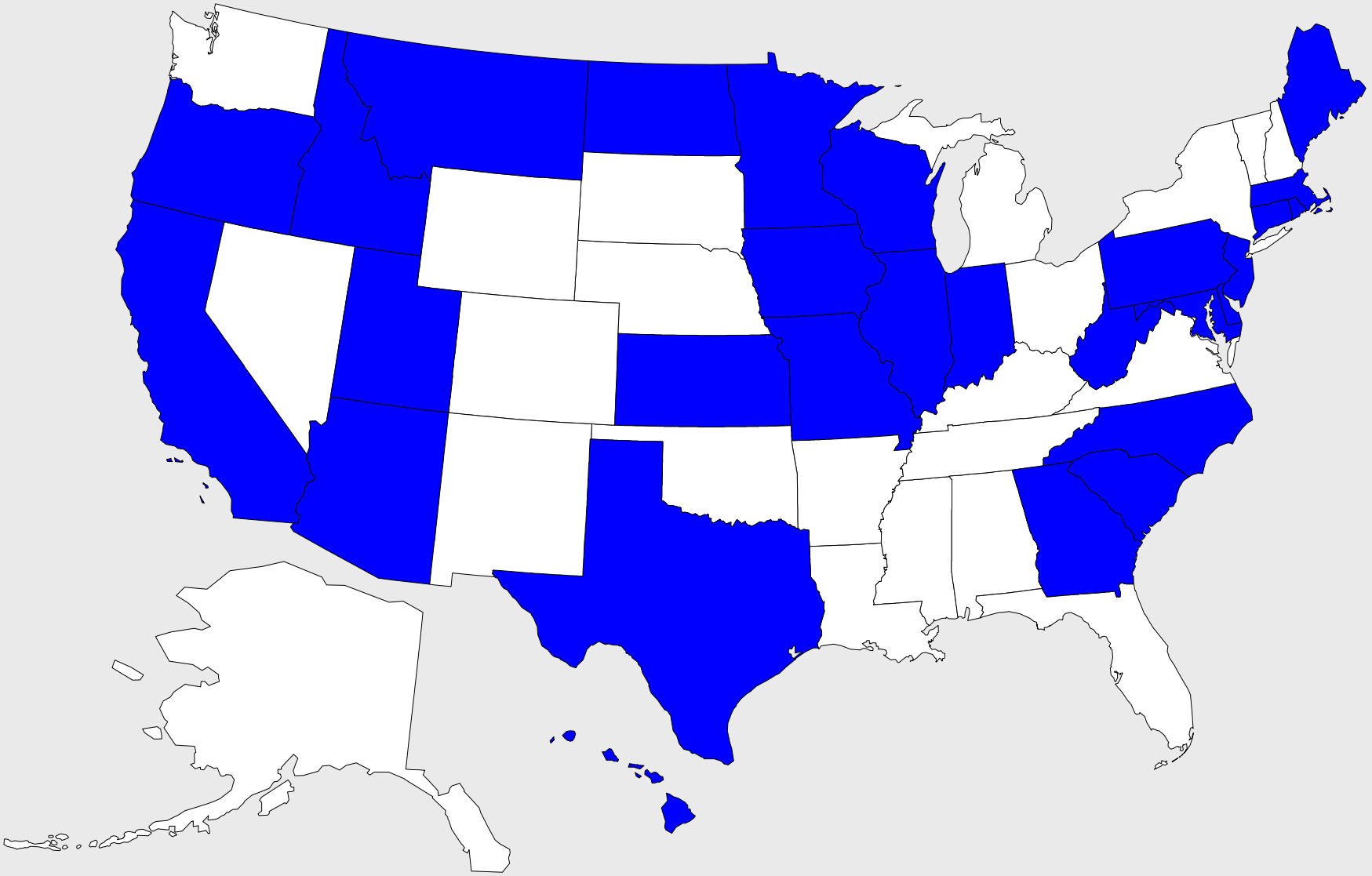

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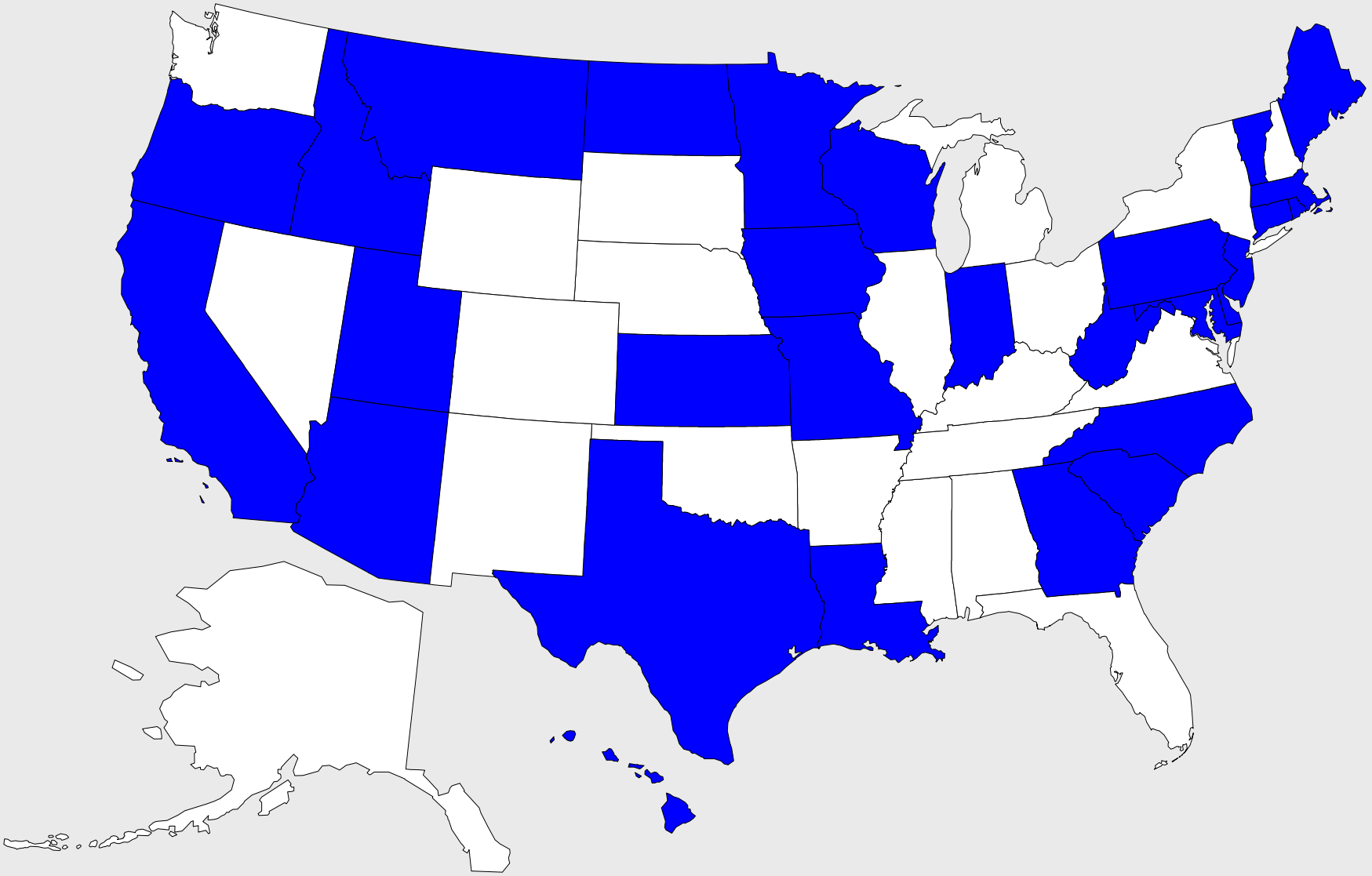

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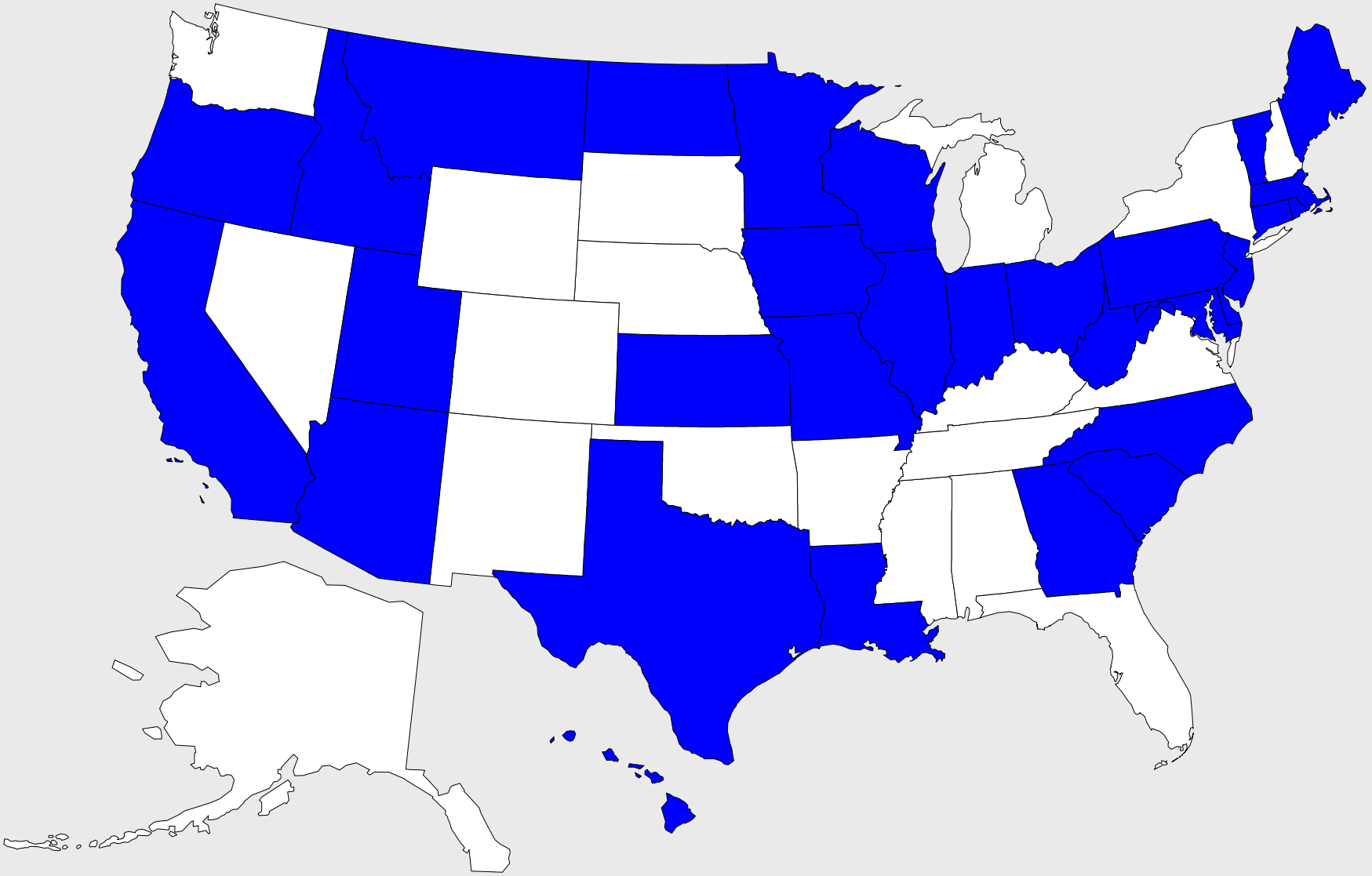

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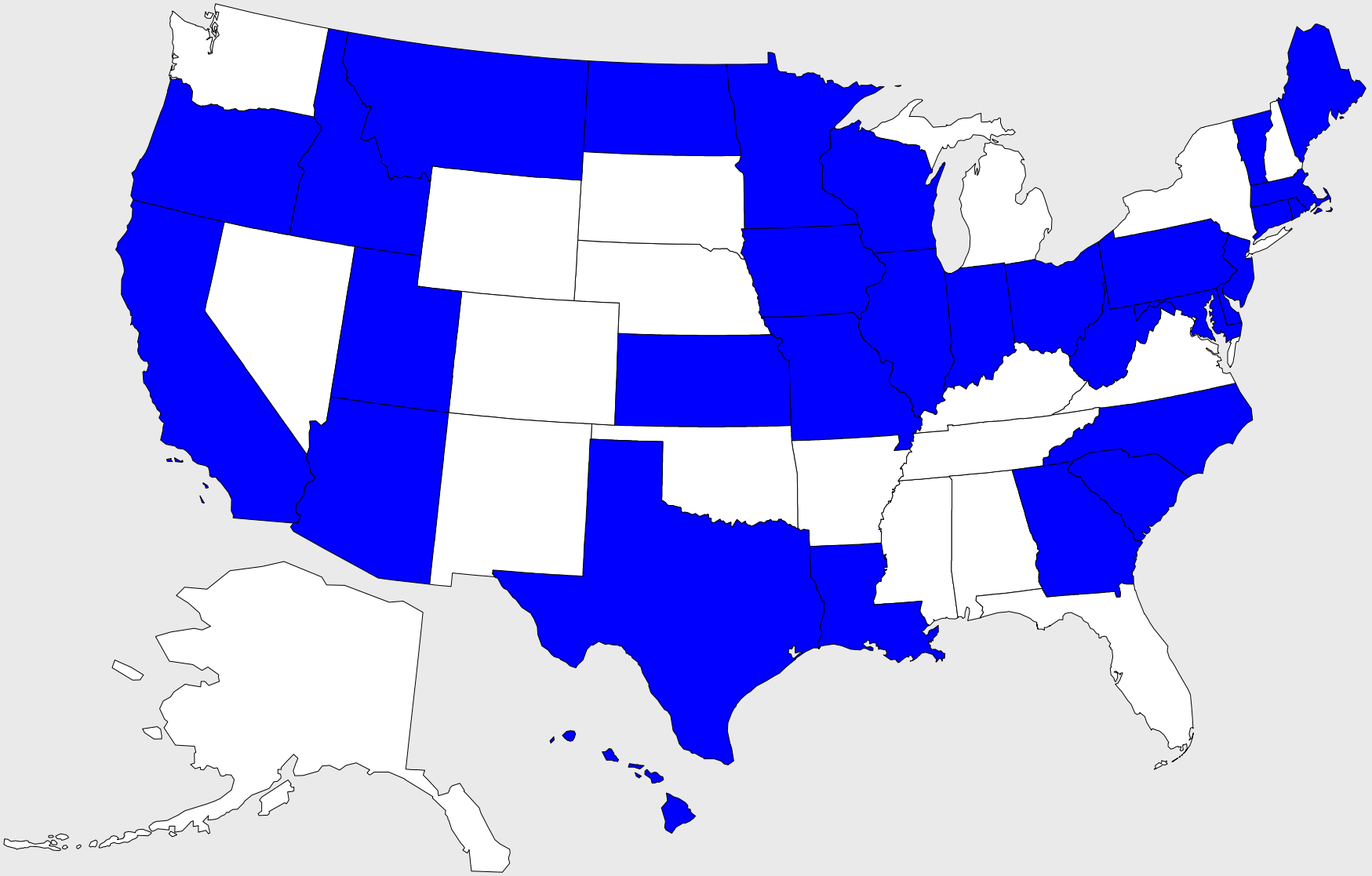

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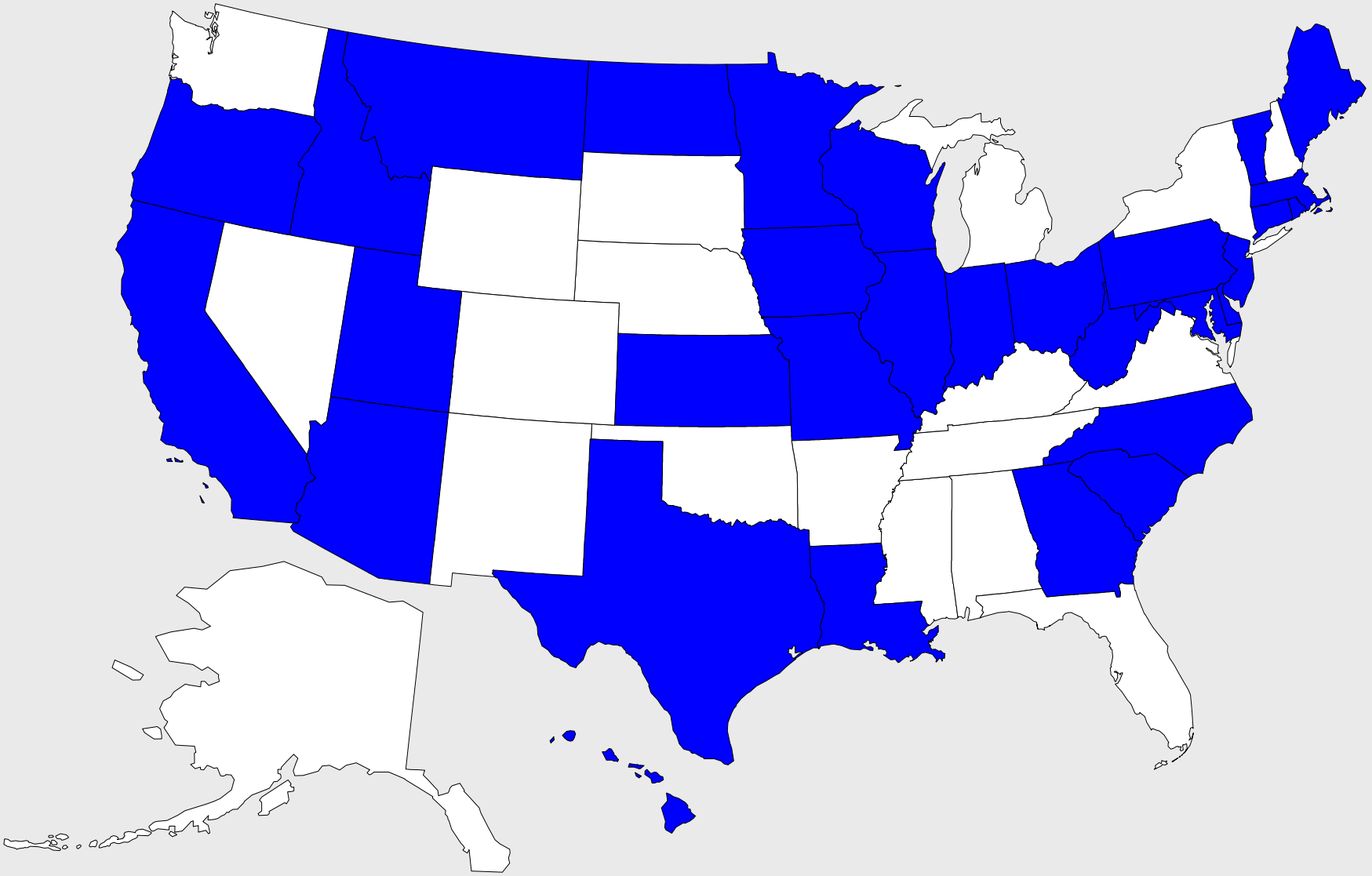
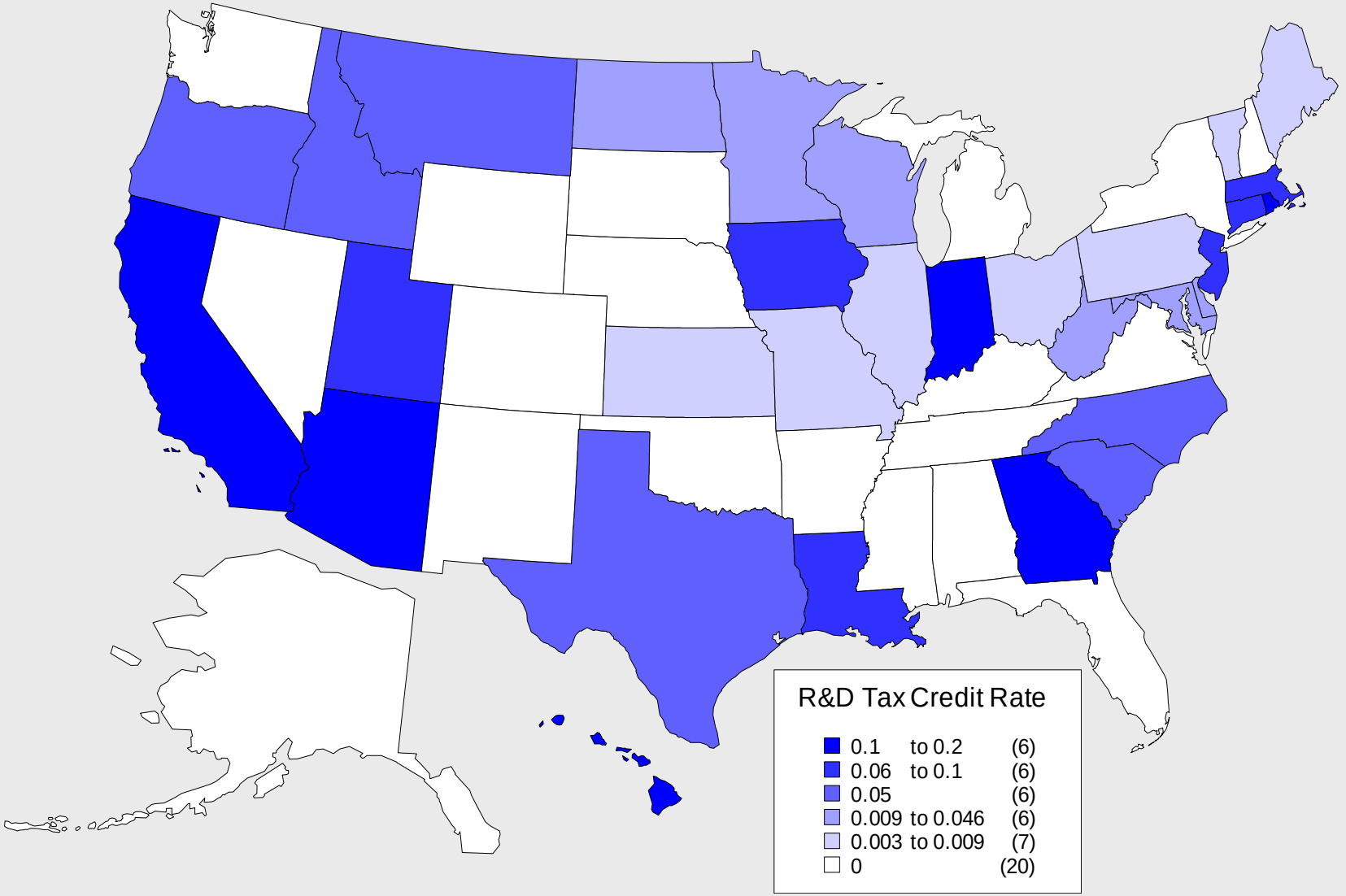


Effective R&D Tax Credit Rates, 2006



Biotech Tax Incentives

State	Year	Credit Type
Maryland	2008 - present	Income Tax Credit for early-stage biotech companies
Massachusettes	2009 - present	"Life Sciences Tax Incentive Program": Investment tax credit, special sales tax exemptions, refundable research tax credit
New Jersey	1996 - present	"Business Employment Incentive Program" (BEIP). Broad-based grant for job creation, with a lower job-creation qualifying threshold for biotech and "emerging high technology." Also provides financial assistance for companies in these sectors.
Arkansas	2003 - present	JCTC, Sales tax refunds, and R&D Tax credits with higher subsidies for "targetted businesses," which consists of: (i) Advanced materials and manufacturing systems; (ii) Agriculture, food and environmental sciences; (iii) Biotechnology, bioengineering and life sciences; (iv) Information technology; (v) Transportation logistics; and (vi) Bio-based products."
Colorado	1999 - present	Biotech Sales and Use Tax Refund
Washington	2004 - present	High Tech Business & Organization Credit for R&D Spending, Includes the "Biotechnology & Medical Device Manufacturing Sales & Use Tax Deferral/Waiver"
Maine	1997 - present	Sales tax exemption on machinery, equipment, instruments, and supplies for biotech research
Missouri	1999 - 2003	State & local sales or use tax exemption for life sciences companies (which is just slightly broader than the sales and use tax exemptions available to most manufacturers)
Florida	2002 - present	Specialized incentives and tax credits, (more technically, the biomedical industry was re-classified as "high-impact", so that qualified companies could be eligible for the state's preexisting capital investment tax credits and the High Impact Performance Incentive (a JCTC-type program)
North Carolina	1984 - present	Has the North Carolina Biotechnology Center which make low interest loans to biotech start-ups.
California	2004 - present	California Stem Cell Research and Cures Act, which provides biotech research grants

Effectiveness of Fiscal Research Incentives

- Studies of Federal R&D Tax Credits
  - Recent studies suggest firms' *qualified* R&D expenditures are quite responsive to changes in R&D tax treatment
    - Dechezleprêtre, et al. (2016), Agrawal, et al. (2014),
  - However, concerns that some of response is simply *relabeling*
    - Chen, et al. (2016), Rao (2016)
  - So jury's still out to some extent

Effectiveness of Fiscal Research Incentives

- Cross-state variation suggests big effects
- Wilson (2009):
  - Estimates R&D elasticity with respect to (1) in-state R&D tax treatment *and* (2) out-of-state R&D tax treatment
  - Estimates long-run elasticity of R&D with respect to in-state cost is about -2.5
  - But elasticity of R&D with respect to out-of-state cost is +2.5, implying zero-sum game across states.
  - Firms may be very responsive in terms of R&D location but not necessarily total national/global amount

Effectiveness of Fiscal Research Incentives

- Similarly, Moretti & Wilson (2017 AER) finds the geographical location of star scientists within the U.S. is very sensitive to state taxes.
- State-to-state migration rates of star scientists – identified from patent data – change in response to changes in tax differentials between origin and destination states.
- Sensitivity to corporate tax rate, individual tax rate, and tax credits (including R&D credit)

Effectiveness of Fiscal Research Incentives

- Moretti & Wilson (2014):
  - adoption of subsidies for biotech employers by a state raises number of star biotech scientists in-state by about 15% over a three year period.
  - A 10% decline in the user cost of capital induced by an increase in R&D tax incentives raises the number of biotech stars by 22%. (elasticity = -2.2)
  - Gains mostly due to relocation of star scientists to adopting states, with limited effect on productivity of incumbent scientists already in the state.
  - Gains concentrated among private sector inventors.
  - Little effect of subsidies on academic researchers, consistent with fact their incentives are unaffected.

Conclusion

- There are a host of federal and state fiscal incentives aimed at stimulating scientific research by the private sector
- Economic research shows businesses and individuals are quite responsive to these incentives.
- But much of responsiveness may be relabeling and/or relocating research activities to take advantage of fiscal incentives
- Jury's still out on whether incentives increase total amount of research that gets done.