



Energy & Environmental Research Center (EERC)

Williston Basin Carbon Ore, Rare Earth, and Critical Minerals Initiative

Western Dakota Energy Association

Annual Membership Meeting

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Uncertain Times – Susceptibility to Supply Disruptions

PRESS RELEASES

U.S. Treasury Announces Unprecedented & Expansive Sanctions Against Russia, Imposing Swift and Severe Economic Costs

US, allies weaponizing sanctions to curb Russian aggression

President Joe Biden and U.S. allies in a matter of days have weaponized the global economy against Russia for invading Ukraine

CHINA POLITICS

China will not join sanctions against Russia, banking regulator says

China sanctions Raytheon, Lockheed over Taiwan deal

China says it will sanction Raytheon Technologies and Lockheed Martin, two U.S. defense contractors that previously faced sanctions, over arms sales to Taiwan

WORLD

China Opposes Sanctions and Has a Reputation for Busting Them

Sanctions on Russia for Ukraine war could prove less effective if China offers market access

Russia-Ukraine War | China Undermines Western Sanctions Against Russia Over Ukraine Crisis: Scott Morrison

Australia's Prime Minister Scott Morrison slammed China for liberalising trade with Russia, accusing Beijing of undermining Western sanctions over Ukraine.

New U.S. Sanctions on China: The Uyghur Forced Labor Prevention Act and Further Chinese Company Designations

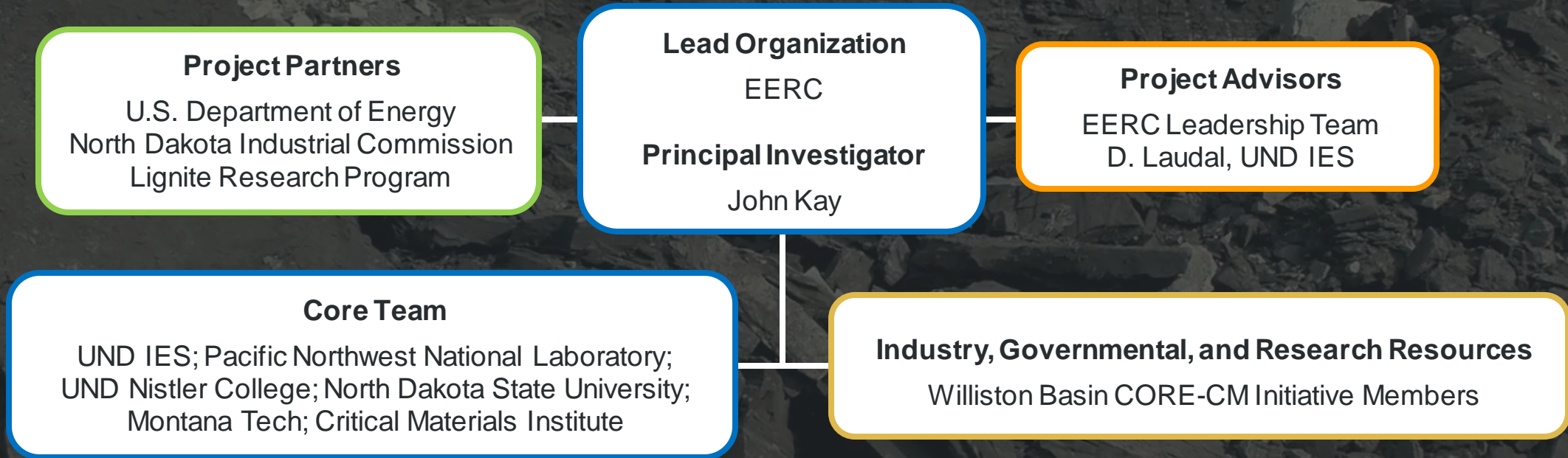
China imposes retaliatory sanctions against US over Xinjiang

The tit-for-tat sanctions add to spiralling tension over complaints of abuses of Muslim Uighurs in China's northwestern Xinjiang region.

Critical Minerals Play a Vital Role in Our Modern Economy and National Security



										<ul style="list-style-type: none"> Light Rare Earth Elements Heavy Rare Earth Elements Critical Rare Earth Elements Critical Minerals <p>* Gd: IUPAC Light REE; USGS Heavy REE ** Included with rare earth elements Fluorspar: Ca & F *** Uranium: Fuel Material (USGS 2021)</p>																			
1 IA 1 H Hydrogen 1.008																	18 VIIIA 2 He Helium 4.0026												
3 Li Lithium 6.94	4 Be Beryllium 9.0121831																	5 B Boron 10.811	6 C Carbon 12.011	7 N Nitrogen 14.007	8 O Oxygen 15.999	9 F Fluorine 18.998403163	10 Ne Neon 20.1797						
11 Na Sodium 22.98976928	12 Mg Magnesium 24.305	21 Sc Scandium 44.955908	22 Ti Titanium 47.867	23 V Vanadium 50.9415	24 Cr Chromium 51.9961	25 Mn Manganese 54.938044	26 Fe Iron 55.845	27 Co Cobalt 58.933194	28 Ni Nickel 58.6934	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.630	33 As Arsenic 74.921595	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.798												
19 K Potassium 39.0983	20 Ca Calcium 40.078	39 Y Yttrium 88.90584	40 Zr Zirconium 91.224	41 Nb Niobium 92.90637	42 Mo Molybdenum 95.94	43 Tc Technetium (98)	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.90550	46 Pd Palladium 106.42	47 Ag Silver 107.8682	48 Cd Cadmium 112.414	49 In Indium 114.818	50 Sn Tin 118.710	51 Sb Antimony 121.760	52 Te Tellurium 127.60	53 I Iodine 126.90547	54 Xe Xenon 131.293												
55 Cs Caesium 132.90545196	56 Ba Barium 137.327	57-71 Lanthanoids	72 Hf Hafnium 178.49	73 Ta Tantalum 180.94788	74 W Tungsten 183.84	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.227	78 Pt Platinum 195.084	79 Au Gold 196.966569	80 Hg Mercury 200.592	81 Tl Thallium 204.38	82 Pb Lead 207.2	83 Bi Bismuth 208.98040	84 Po Polonium (209)	85 At Astatine (210)	86 Rn Radon (222)												
87 Fr Francium (223)	88 Ra Radium (226)	89-103 Actinoids	104 Rf Rutherfordium (261)	105 Db Dubnium (268)	106 Sg Seaborgium (266)	107 Bh Bohrium (264)	108 Hs Hassium (265)	109 Mt Meitnerium (268)	110 Ds Darmstadtium (271)	111 Rg Roentgenium (272)	112 Cn Copernicium (285)	113 Nh Nihonium (284)	114 Fl Flerovium (289)	115 Mc Moscovium (288)	116 Lv Livermorium (293)	117 Ts Tennessine (294)	118 Og Oganesson (294)												
57 La Lanthanum 138.90547	58 Ce Cerium 140.116	59 Pr Praseodymium 140.90766	60 Nd Neodymium 144.242	61 Pm Promethium (145)	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	65 Tb Terbium 158.92535	66 Dy Dysprosium 162.500	67 Ho Holmium 164.93033	68 Er Erbium 167.259	69 Tm Thulium 168.93422	70 Yb Ytterbium 173.045	71 Lu Lutetium 174.9668															
89 Ac Actinium (227)	90 Th Thorium 232.0377	91 Pa Protactinium 231.03688	92 U Uranium 238.02891	93 Np Neptunium (237)	94 Pu Plutonium (244)	95 Am Americium (243)	96 Cm Curium (247)	97 Bk Berkelium (247)	98 Cf Californium (251)	99 Es Einsteinium (252)	100 Fm Fermium (257)	101 Md Mendelevium (258)	102 No Nobelium (259)	103 Lr Lawrencium (260)															



U.S. DEPARTMENT OF
ENERGY



**BASIN ELECTRIC
POWER COOPERATIVE**

A Touchstone Energy® Cooperative



AN ALLETE COMPANY



**Minnkota Power
COOPERATIVE**

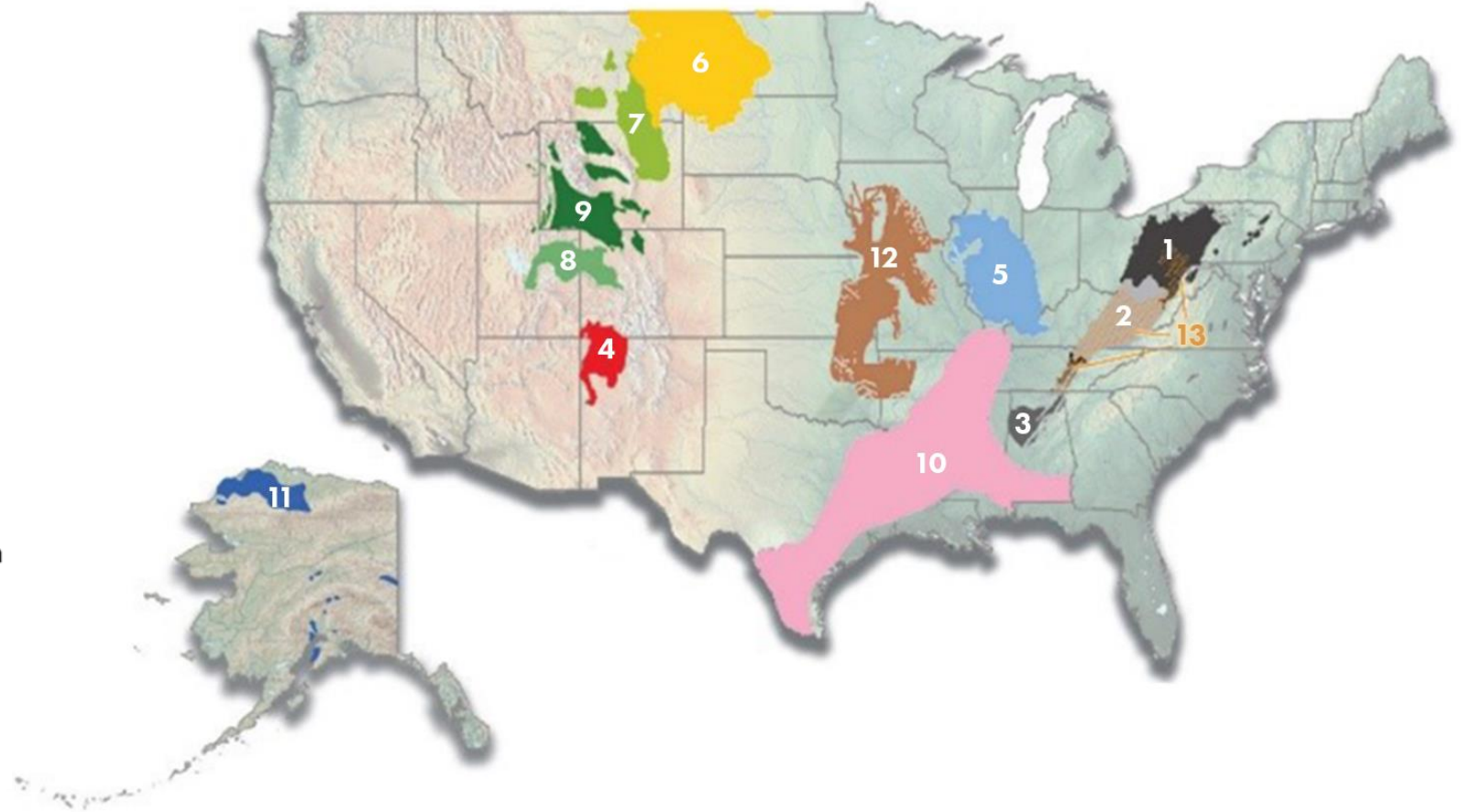
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13 Coalition Teams – CORE-CM Initiative

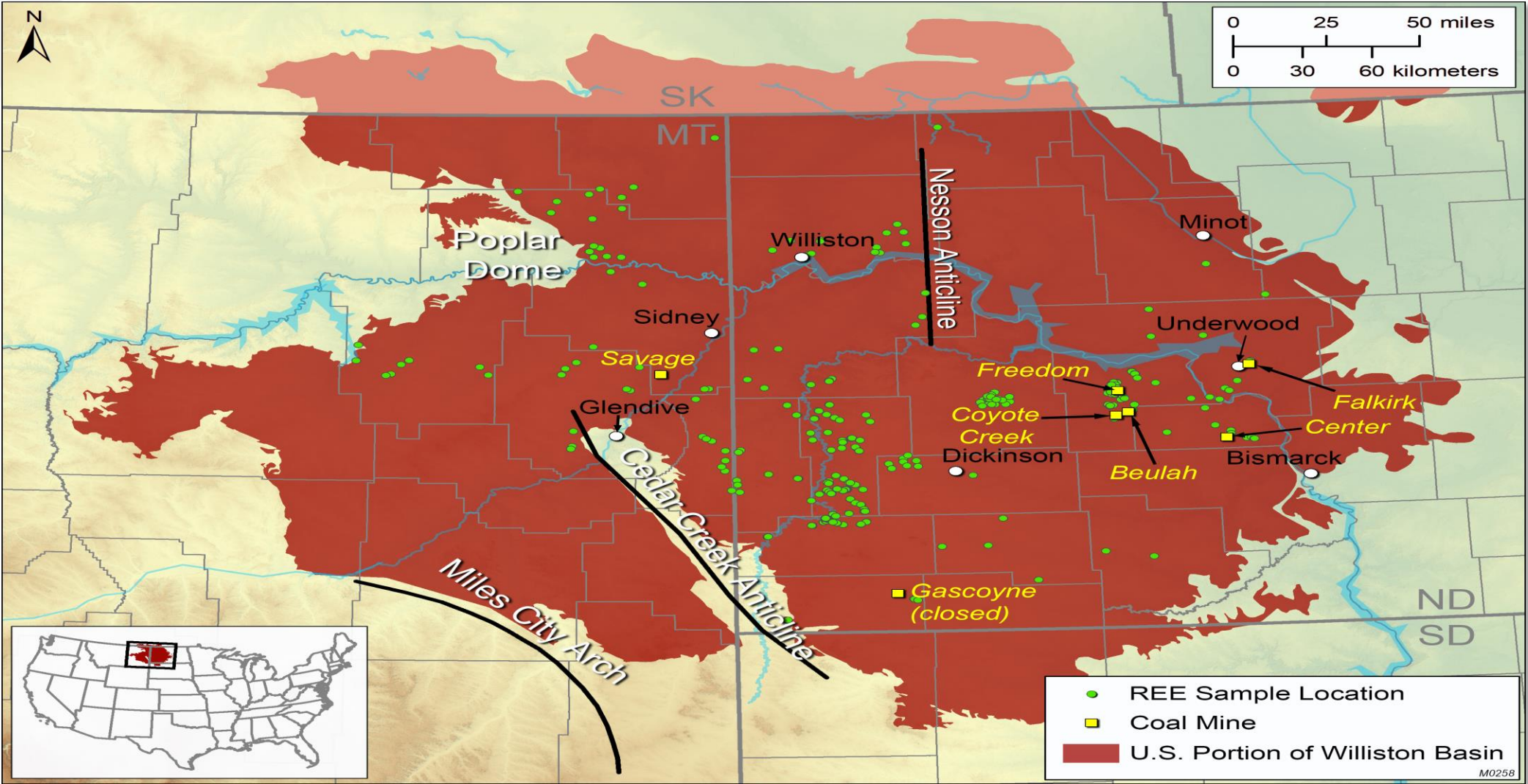
US BASINS

- 1** Appalachian Basin, North
- 2** Appalachian Basin, Central
- 3** Appalachian Basin, South
- 4** San Juan River-Raton Basin
- 5** Illinois Basin
- 6** Williston Basin
- 7** Powder River Basin
- 8** Uinta Basin
- 9** Green River-Wind River Basin
- 10** Gulf Coast Basin
- 11** Alaska Basin
- 12** Cherokee-Forest City Basin
- 13** Mid-Appalachian Basin



Source: NETL

REE and CM Sample Data Locations





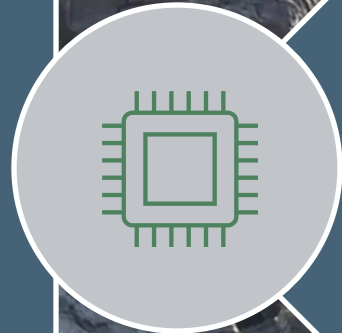
Assessment of Resources



**Strategies for
Infrastructure, Industries,
and Business**



**Strategies for
Waste Stream Reuse**



Technology Innovation Centers



**Technology Assessment,
Development,
and Field Testing**



**Stakeholder Education
and Outreach**

Creation of TIC Plans – Create the Innovation Pipeline

Identify Existing State/Regional Innovation Centers

Examples of Governance and Structure

Technology Innovation Centers and Business Incubators

- UND Center for Innovation / UND Tech Accelerator
- NDSU Research Technology Park
- Grand Sky Business Park
- Minot State / Dickinson State / Williston State / Lake Region / Dakota College

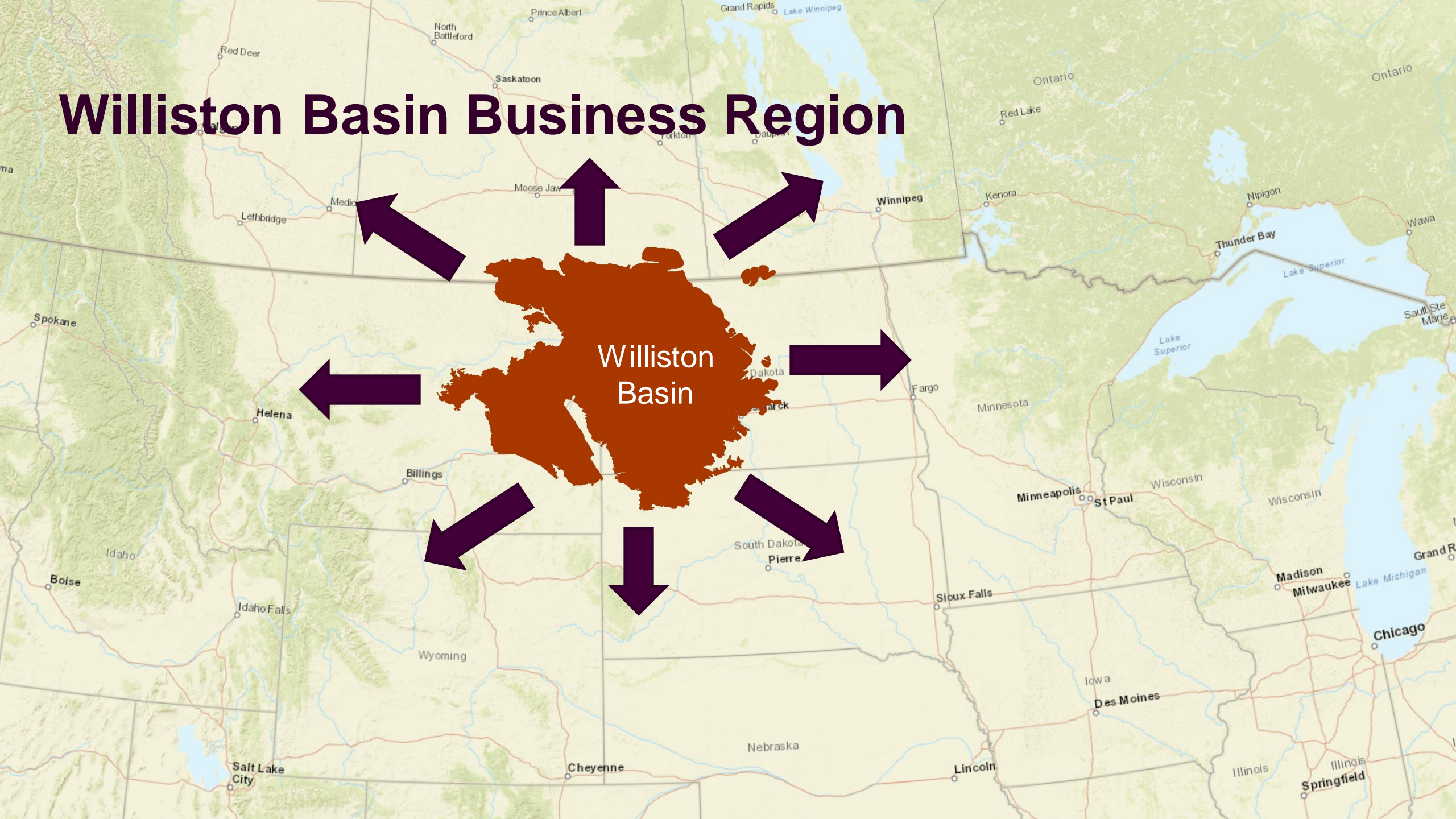
Programmatic Centers (training and advice)

- Jamestown Regional Entrepreneur Center
- CTB (Center for Technology and Business) Bismarck

State Agencies

- Accelerate North Dakota
- State-Led Economic Development Regions

Williston Basin Business Region





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THANK YOU

Critical Challenges. Practical Solutions.