



# THADIAS at Argonne National Laboratory

*Joe Adduci, US Department of Energy  
Argonne National Laboratory*



*... for a brighter future*

# ***THADIAS: Theft and Diversion Incident Analysis System***

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U.S. Department  
of Energy

UChicago ►  
Argonne<sub>LLC</sub>

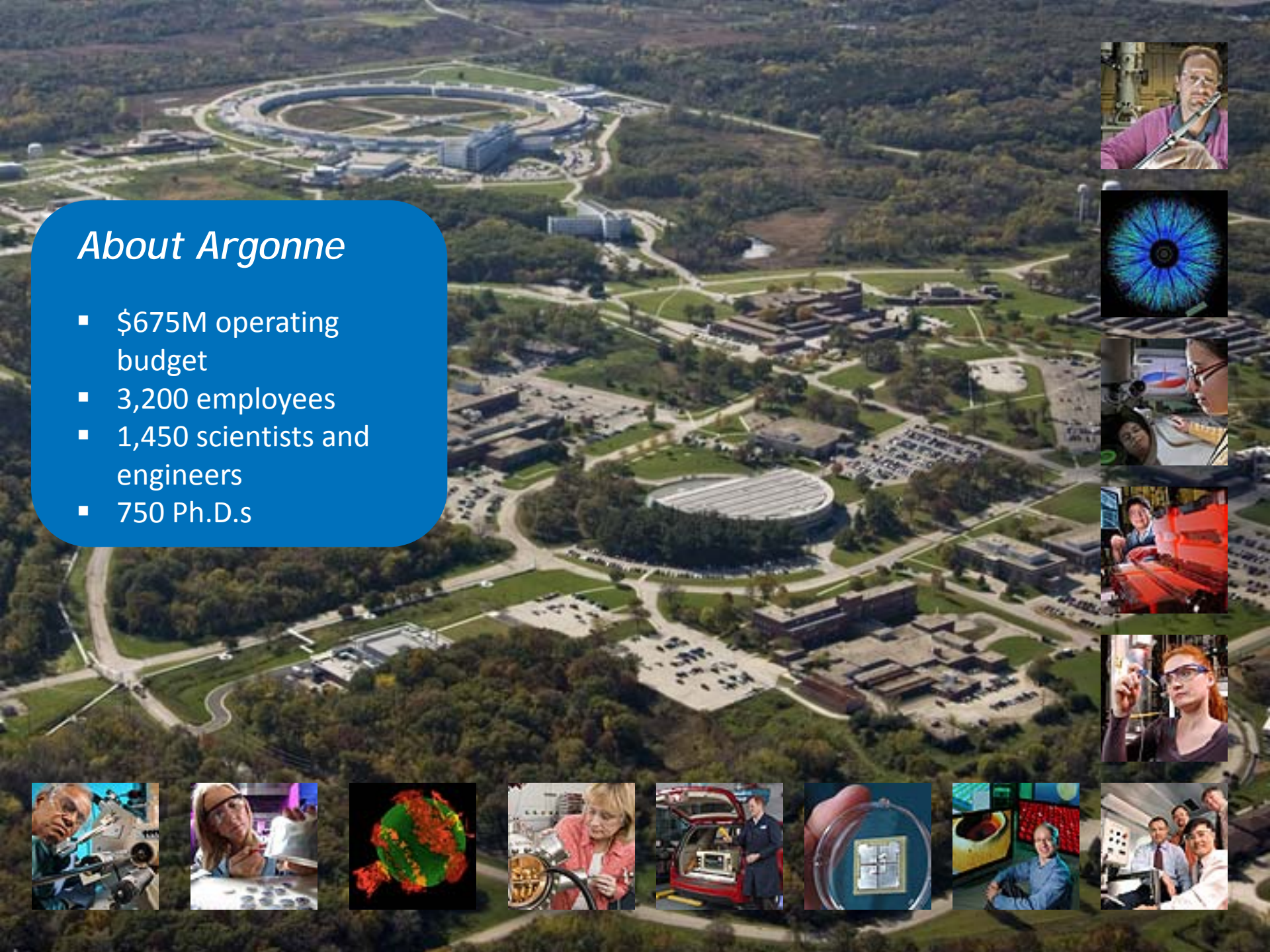
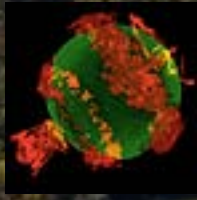
A U.S. Department of Energy laboratory  
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*July 22, 2012*



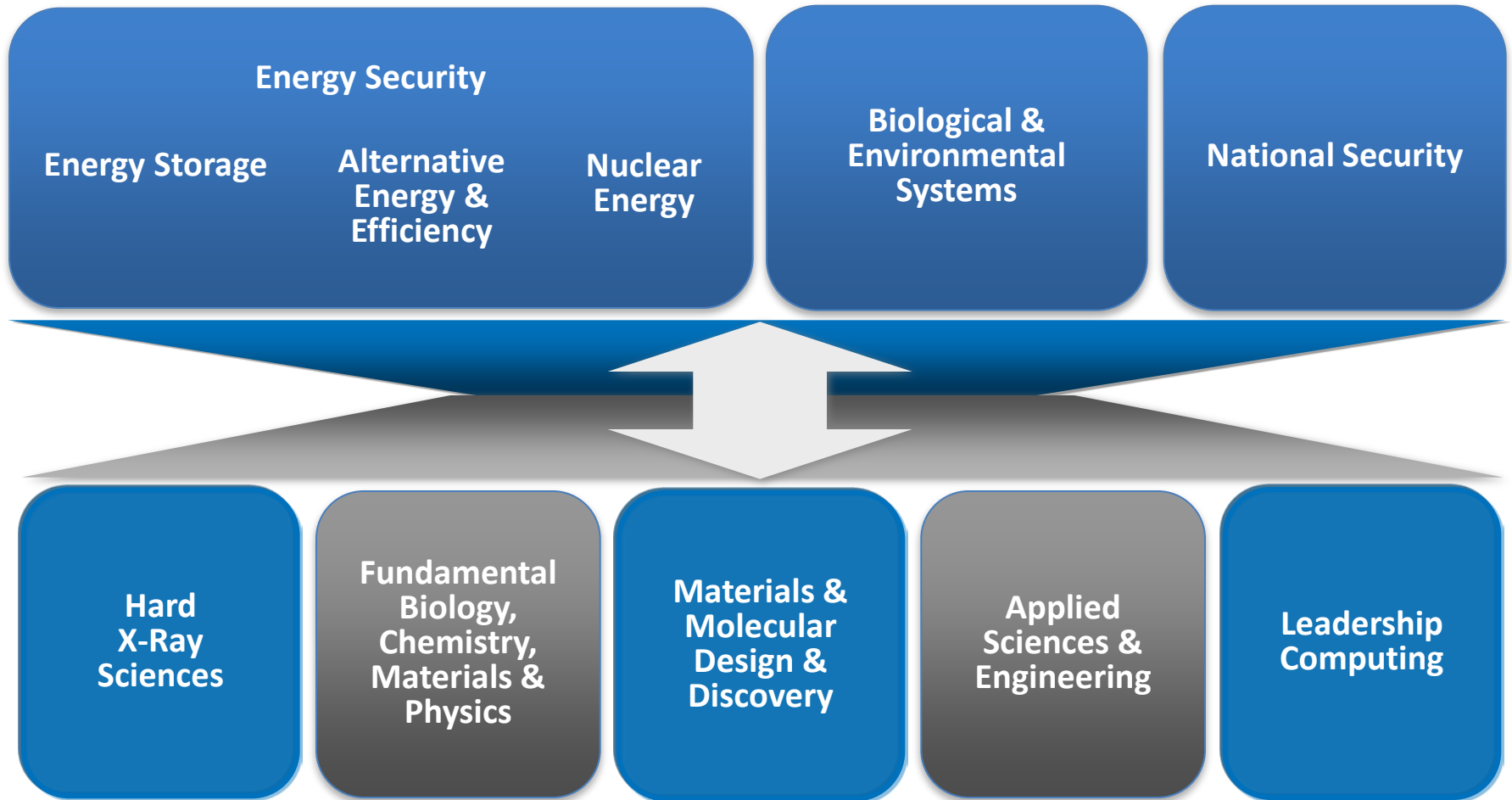
## About Argonne

- \$675M operating budget
- 3,200 employees
- 1,450 scientists and engineers
- 750 Ph.D.s



# Argonne's Core Capabilities and Major Initiatives

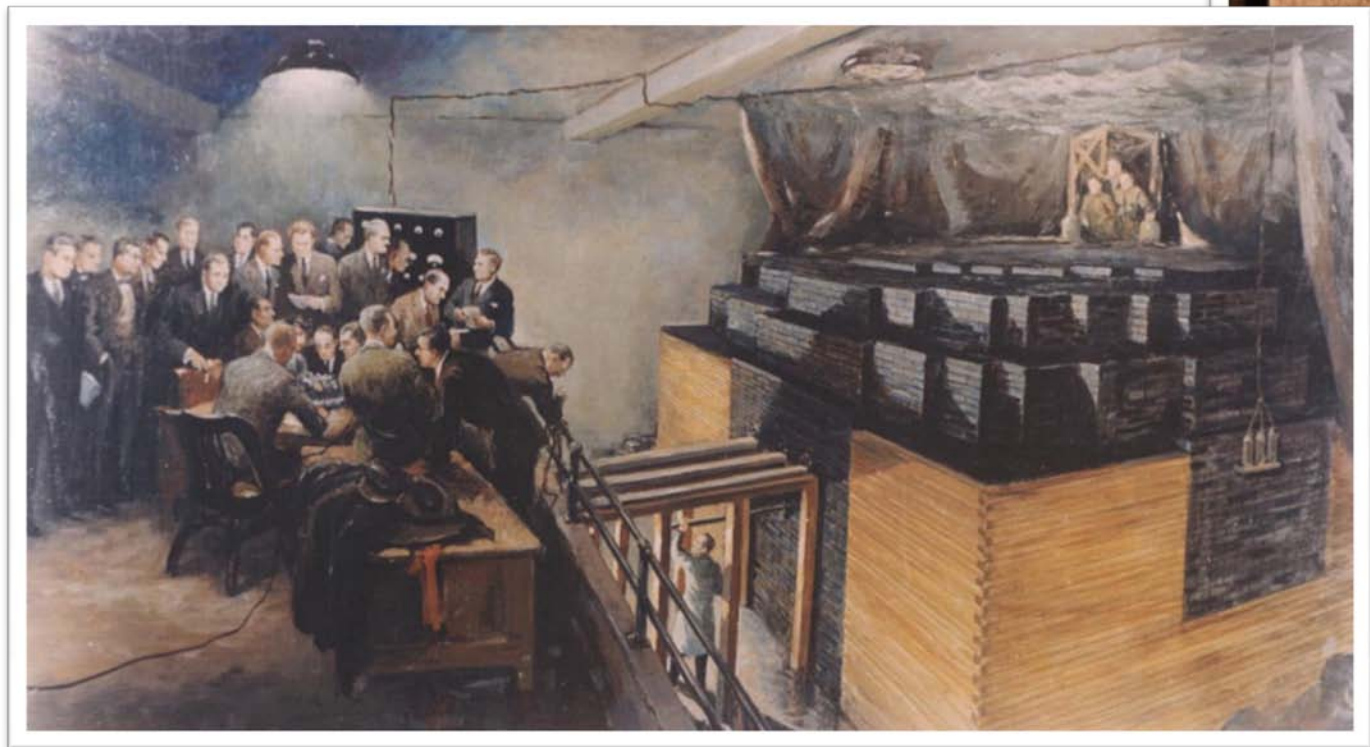
*Use Inspired Science and Engineering...*



*... Discovery and Transformational Science and Engineering*



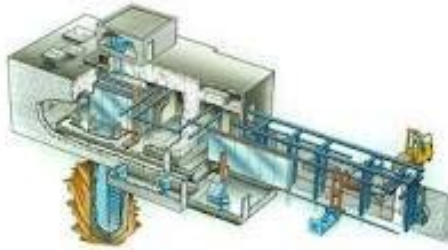
*We are a Direct Linear Descendent of Enrico Fermi's Metallurgical Laboratory and the beginning of the Manhattan Project*



***Argonne  
Developed and  
Tested the  
Prototypes for  
Most of Today's  
Modern Nuclear  
Reactors***

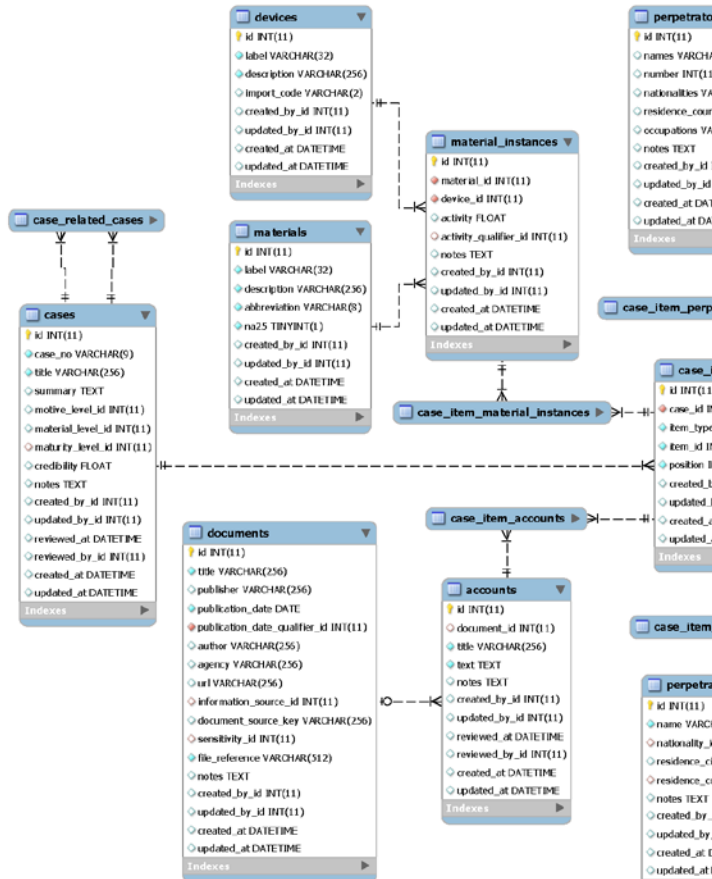


# *The Breadth of Nuclear Security Programs at Argonne Fosters Synergies*





# THADIAS is Built on a Relational Database Tied to a Geographical Information System



**THADIAS Analysis Dashboard**

Disclaimer Contact Us Change Password Logout

Country: [USA] Event Type: [Theft] Year: [2010] Material: [Cs-137, Am-241] Case No. [2010-1552] Search [X] Reset [X] Toggle Cluster [X]

**Case Details**  
 Case 2010-1552  
 Theft, AmBe, Cs, Branford, FL, United States, = 14 Dec 10  
[Case Report](#)  
 Theft of moisture/density gauge from vehicle in Florida during December 2010. On 12/14/2010, the Florida Bureau of Radiation Control received a report from Anderson Columbia Co. that a moisture/density gauge had been stolen from a truck at either the employee's residence in Branford, Florida, or the licensee's place of business in Lake City, Florida. A chain was cut from the truck securing the case with the gauge inside. Both the case and gauge were stolen. The licensee still has keys to the gauge and will offer a reward for its recovery. The gauge (Troxler model 3430, serial #27858) con...  
 Events  
 created 07/27/2011 [updated 10/04/2011]

**Search Results**  
 List all events  List visible and selected events  List only selected events

Event ID	Event Type	Country	Year	Material	Case No	Case Title
1952	Theft	United States	2010	Cs-137, Am-2010-1397	Theft, Cs, Am, Dallas, TX, United States, = 30 Apr 10	
3421	Theft	United States	2010	Cs-137, AmE2010-1547	Theft, AmBe, Cs, Howard County, MD, United States, = 03 Jun 10	
3426	Theft	United States	2010	Cs-137, AmE2010-1552	Theft, AmBe, Cs, Branford, FL, United States, = 14 Dec 10	
3427	Theft	United States	2010	Cs-137, AmE2010-1553	Theft, AmBe, Cs, Phoenix, AZ, United States, = 20 Dec 10	
3428	Theft	United States	2010	AmBe, Cs-132010-1554	Theft, Cs, AmBe, North Charleston, SC, United States, = 20 Dec 10	
3429	Theft	United States	2010	Cs-137, AmE2010-1555	Theft, Cs, AmBe, Tulsa, OK, United States, = 28 Jun 10	
3512	Theft	United States	2010	Cs-137, AmE2010-1556	Theft, AmBe, Cs, Fort Meade, MD, United States, = 02 Dec 10	
3552	Theft	United States	2010	AmBe, Cs-132010-1570	Theft, AmBe, Cs, Salinas, CA, United States, = 01 Nov 10	
3529	Theft	United States	2010	Cs-137, Am-2010-1557	Theft, Cs, Am, Tulsa, OK, United States, = 28 Jun 10	
3525	Theft	United States	2010	Cs-137, AmE2011-0100	Theft, Cs, AmBe, Bloomfield, CT, United States, = 29 Dec 10	
1965	Theft	United States	2010	Am-241, Cs-2010-1409	Theft, Am, Cs, Hesperia, CA, United States, < 22 Feb 10	
3531	Theft	United States	2010	Cs-137, AmE2010-1559	Theft, Cs, AmBe, Miami, FL, United States, = 01 Jul 10	
3092	Theft	United States	2010	Cs-137, AmE2011-0015	Theft, AmBe, Cs, Bloomfield, CT, United States, = 29 Dec 10	

Criteria: Country: United States; Event Type: Theft; Year: 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010; Material: Americium-241, Americium/Berrillium





# THADIAS Primary Data Sources

The screenshot shows the THADIAS web application interface. At the top, there is a navigation bar with 'File', 'Edit', 'View', 'Favorites', 'Tools', and 'Help'. Below this is a search bar with a 'Google' logo and a 'Search' button. The main content area is titled 'THADIAS Data Entry' and includes buttons for 'New Document...' and 'New Case...'. A 'Browsers' window is open, displaying a list of cases with columns for Case No., Title, Assignee, Created, and Updated. The list shows several cases related to thefts in Lithuania and Ukraine. To the left of the list is a sidebar with various filters and categories, including 'Assigned To', 'Bulpen', 'Event Type Category', and 'Event Type'. Below the list, there are input fields for 'Title', 'Summary', 'Events', and 'Materials', along with 'New...', 'Edit...', and 'Delete...' buttons.

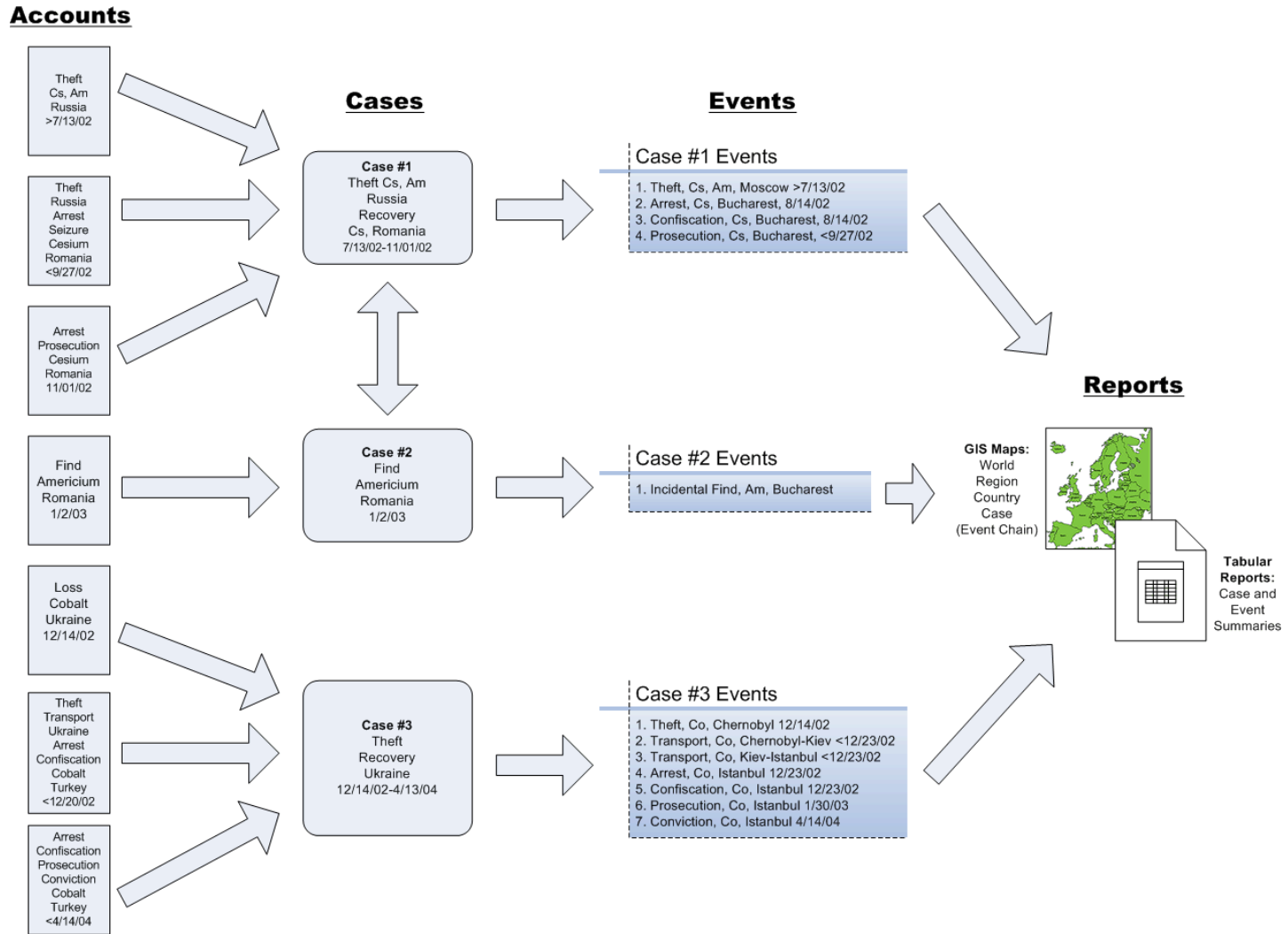
Case No.	Title	Assignee	Created	Updated
1992-0001	Theft, OthRad, Visiaginas, Lithuania, Y 01 Jan 92; Mat	Adduci, J	2006-04-	2010-08-
1992-0002	Theft, U, Vilnius, Lithuania, Y 01 Jan 92; Material-Spec	Adduci, J	2006-04-	2010-08-
1992-0003	Theft, U, Vilnius, Lithuania, Y 01 Jan 92; Material-Spec	Adduci, J	2006-04-	2010-08-
1995-0001	Theft, U, Chernobyl, Ukraine, Y 1 Jan 95; Incidental Fir	Adduci, J	2006-06-	2010-08-
1997-0001	Loss/Missing, Sr, Cape of Maria Sakhalin, Sea of Okh	Adduci, J	2005-07-	2010-08-
1998-0001	Theft, UnkRad, U, Leninogorsk, Kazakhstan, Y 01 Jan	Adduci, J	2006-04-	2010-08-

- Unclassified information-source based, drawing from numerous sources, including Open Source Center, IAEA, NRC, LLNL, NAP, NMED, Stanford University, Salzburg University, OSC, NTI, LANL and various open source news reporting
- Detailed records for nearly 3,000 cases, 4,000 events since 2002
- Comprises more than 7,500 accounts
- Systemically logged into relational database
- Linked to an online Geographic Information System



# The THADIAS Process Aggregates Seemingly Unrelated Reports (Accounts) into Cohesive Events

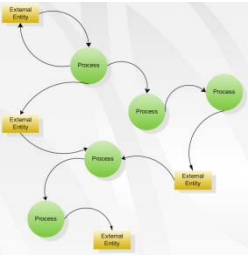
1. Aggregate related accounts by country, material, date, and events
2. Construct case from related accounts, resolve discrepancies
3. Build event chain for each case
4. Geolocate events
5. Identify related cases
6. Generate maps, reports, custom analyses





# THADIAS Tracks Broad Array of Diversion / Recovery Data

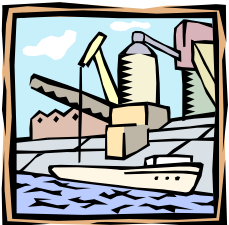
## Events



## Date



## Facility Types



## Locations



## Perpetrators

**Case Summary**  
Definition and summary of all information linked to a specific case

Case ID: 37

Investigative Confiscation, Am. Kiev, Ukraine, «07 Aug 03»  Approved

Uncertain Recovery  Incidental Police Work  Confirmed  None

Attributes: None Related Case: 127

Contraband: None Weapons: None

On 7 Aug 03, Kiev police arrested three or four persons and seized a metal container holding a small amount of Am-241 from one of them. One report described the container as a "Thornshade capsule containing a 'very small amount' of Am-241 that exceeded radiation norms by 1,000 times." The suspects were stopped in front of a Kiev hotel after police noted their "suspicious behavior." The man arrested with the container was reported to have been previously arrested on similar charges (see THADIAS case #127). He reportedly brought the material from Odessa Region to Kiev to sell. The confiscated source was sent for storage to Kiev's Radon Special Combine.

EventTitle	EventFacility	EventFacility	EventDate	EventID	Events
Material Disp	Kiev Radon S	Technical/Sci	8/7/2003	77	Add
Arrest, Am. Ki	Street	None	8/7/2003	76	View/Edit
Investigative	Street	None	8/7/2003	75	Delete

TransportTitle	TransportMod	TransportKind	RouteKnown	BeginDate	EndDate	Transport
Transport A	Train	<input checked="" type="checkbox"/>		8/7/2003	8/7/2003	Add

AccountID	Acc Title	AccDate	AccEvents	AccMaterials	FirstDate	Accounts
111	Ukrainian Pol	8/7/2003	Arrest, Mater	Americum	8/7/2003	Assign
219	American 24	8/7/2003	Arrest, Mater	Americum	8/7/2003	View/Edit
437	Container s	8/7/2003	Arrest, Mater	Americum	8/7/2003	Remove

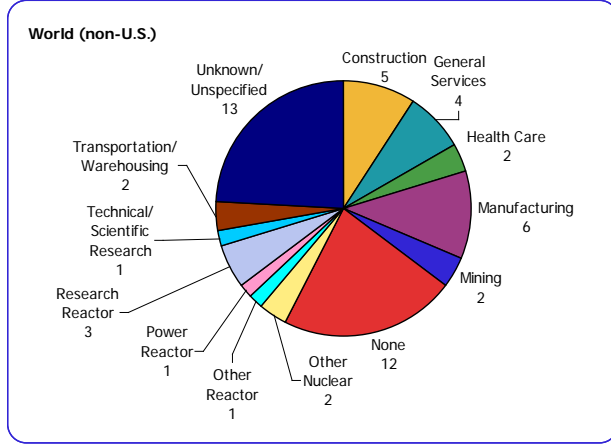
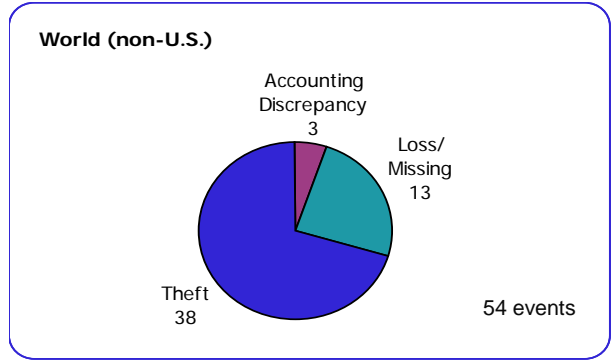
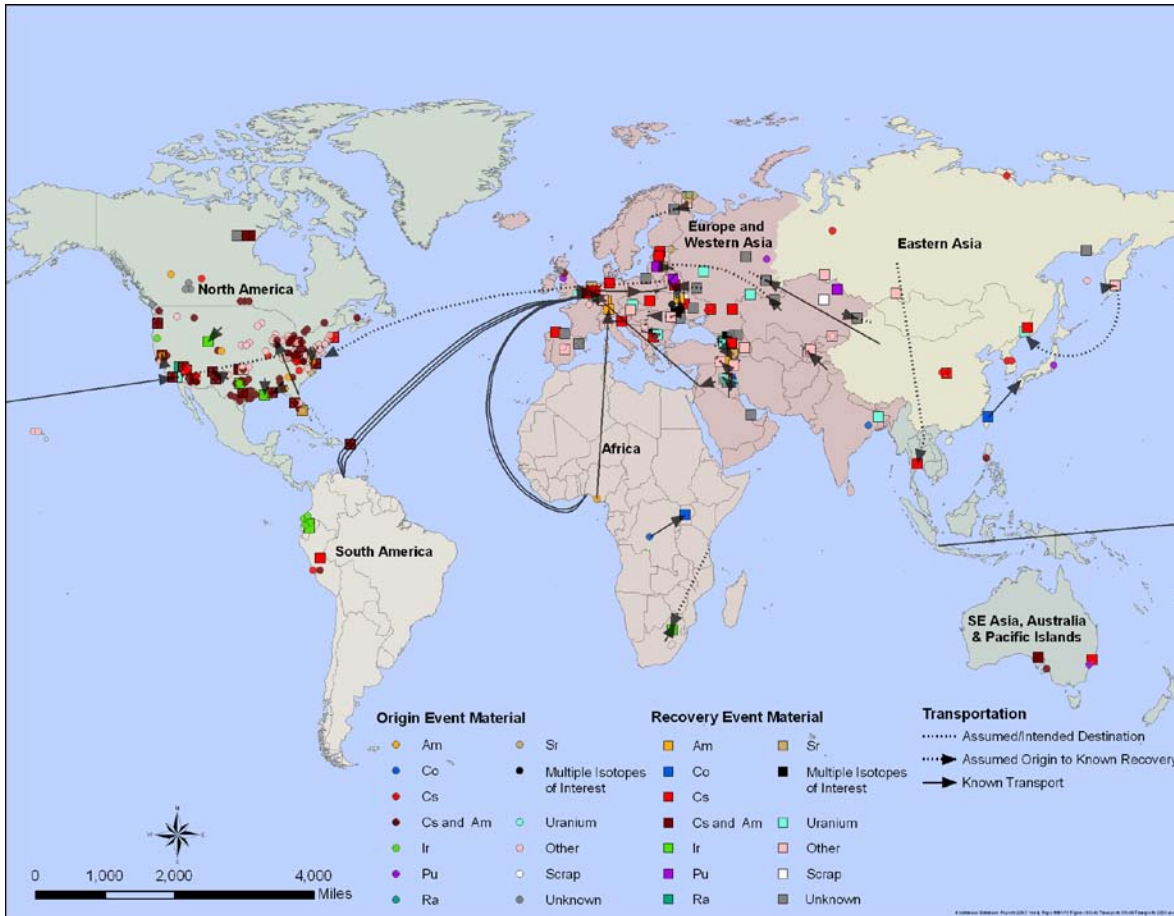
## Devices & Materials



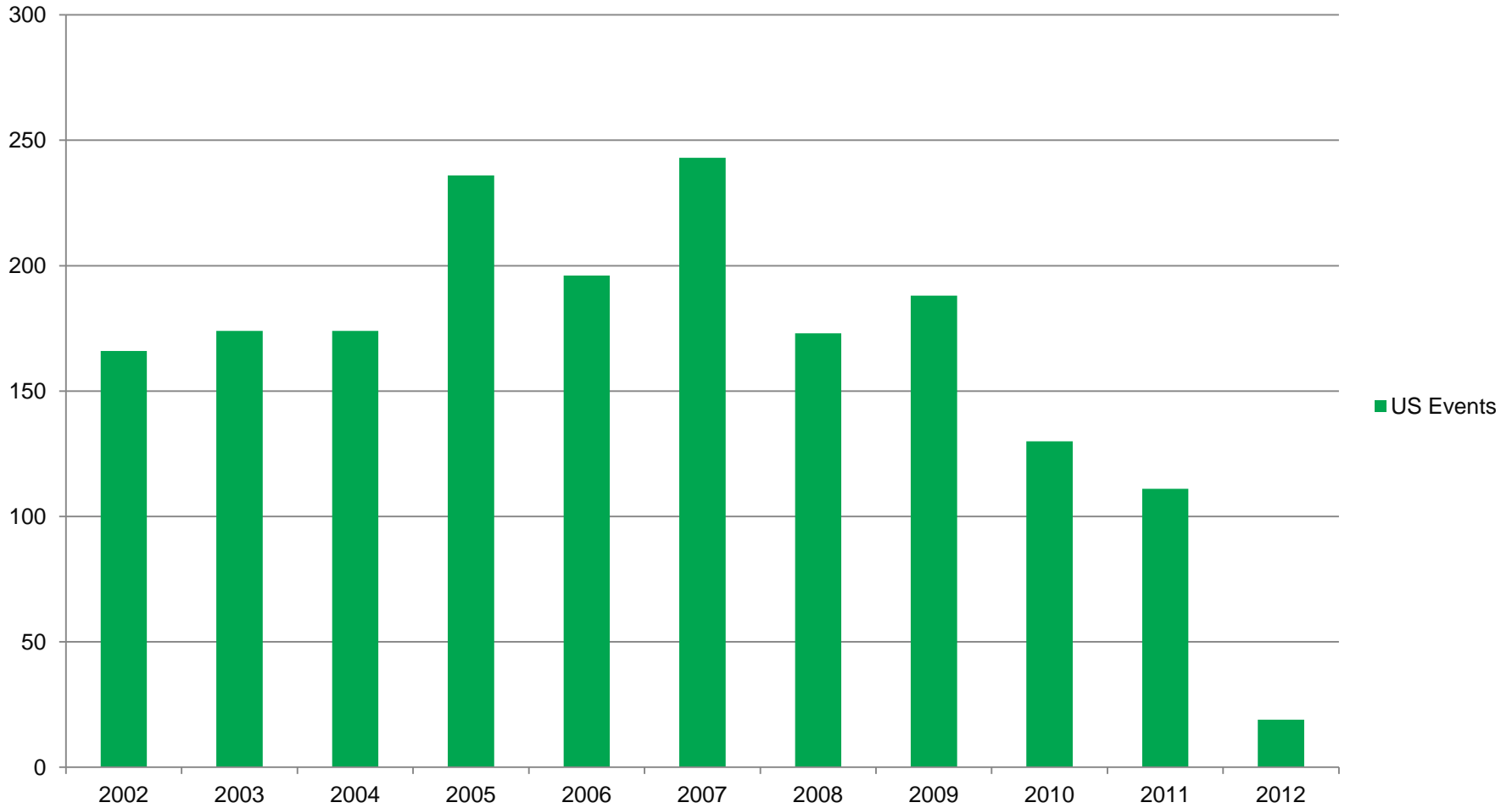
## Transportation



# Coupled with GIS, THADIAS Provides Insights into Origin and Recovery Events



## United States Events, 2002 - 2012

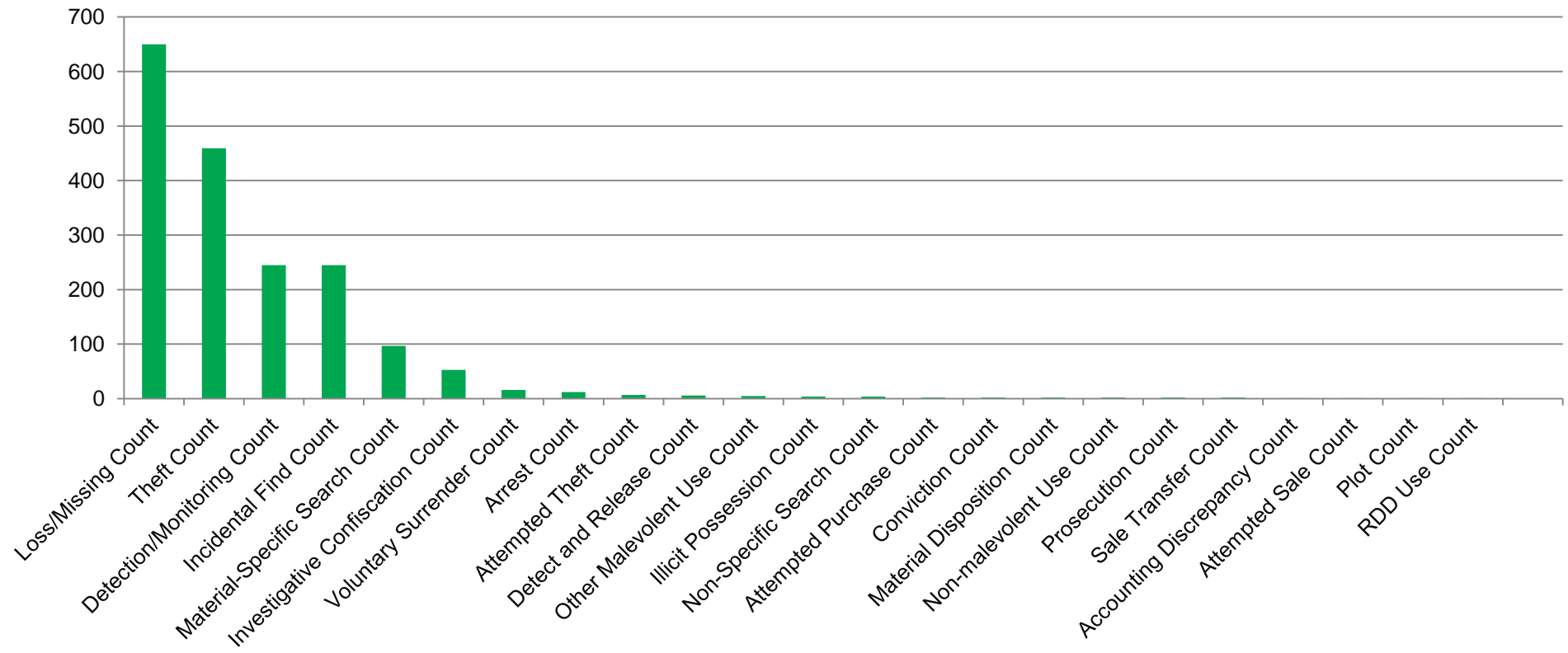




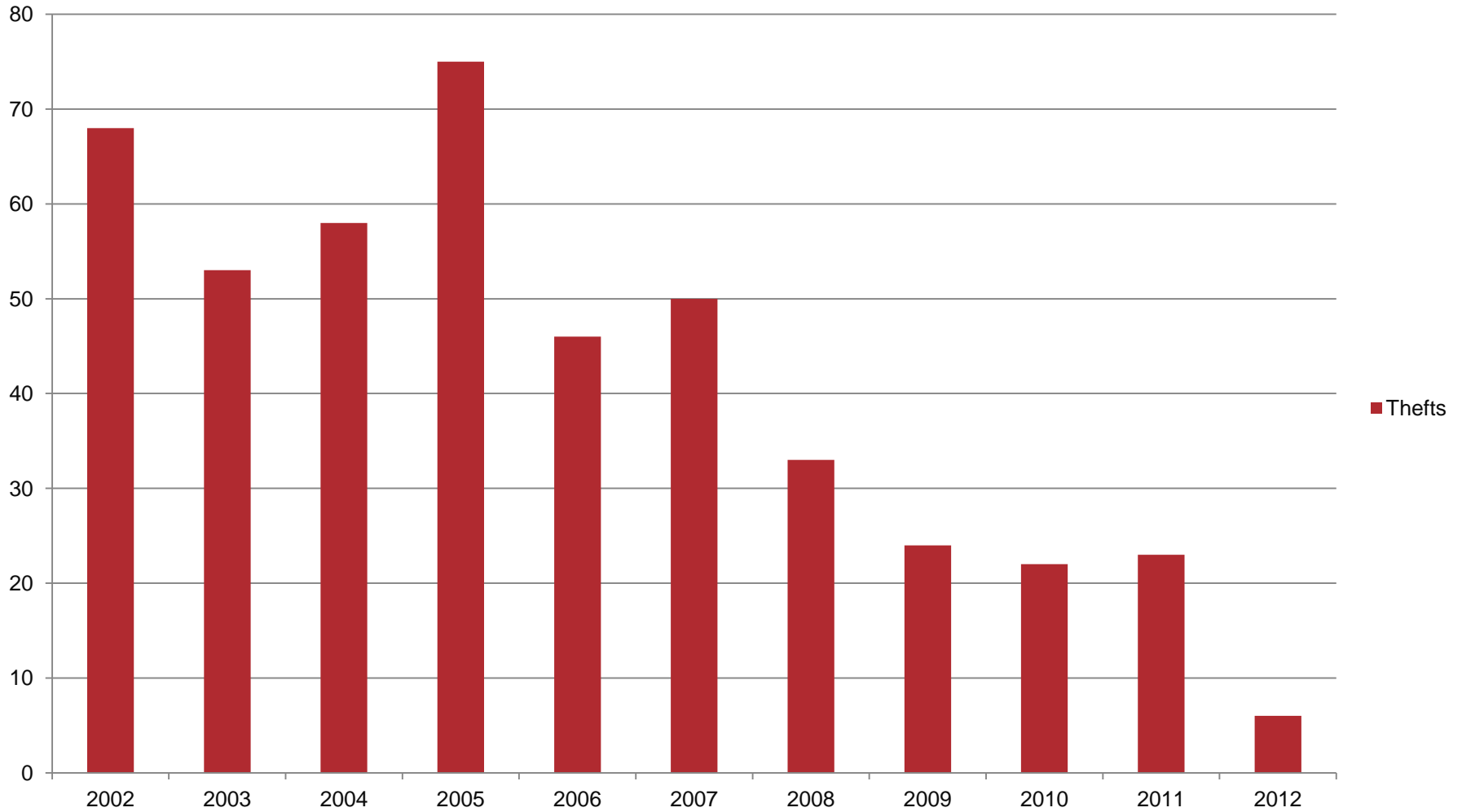
# All United States Events, 2002 - 2012



# United States Event Types, 2002 - 2012



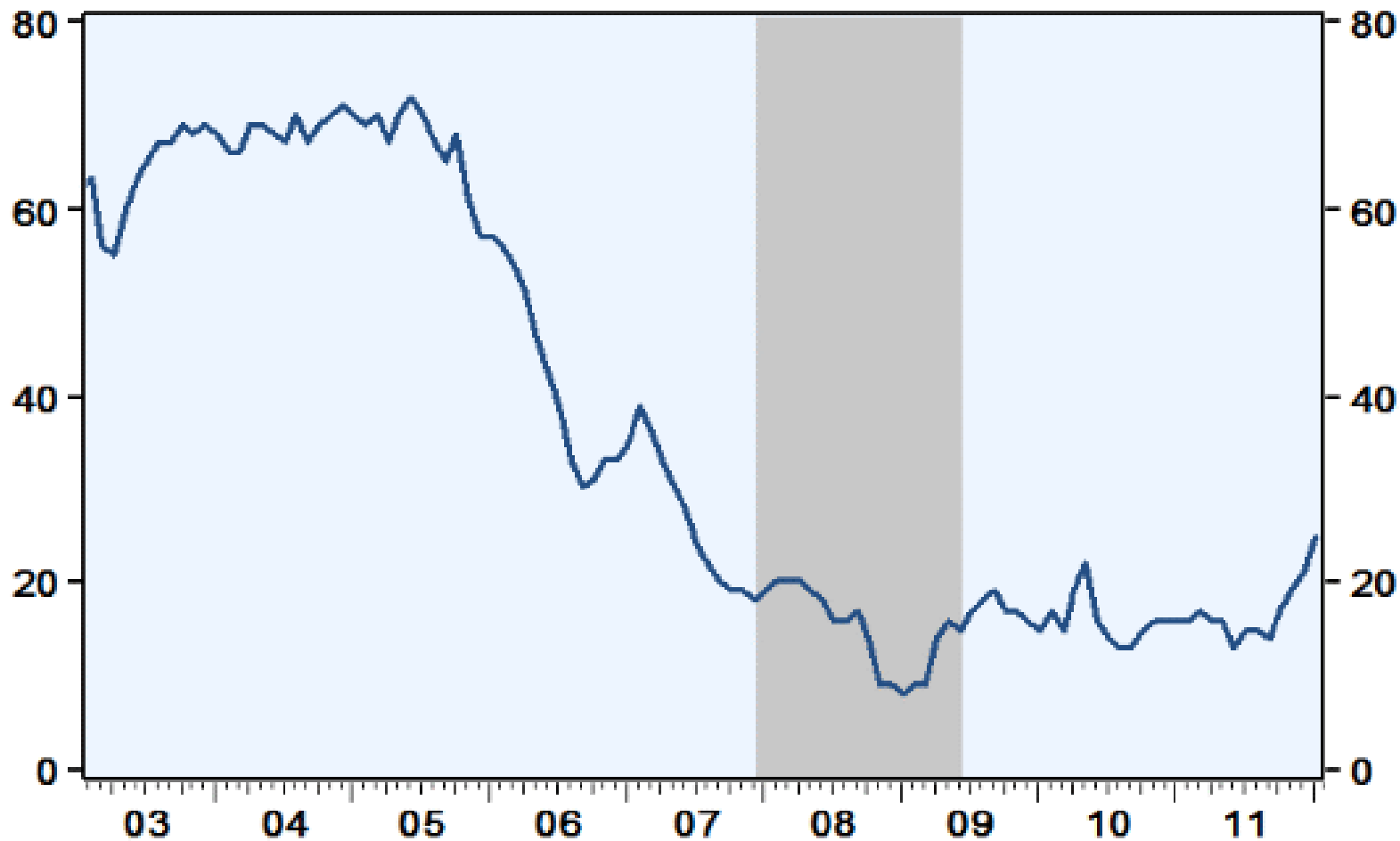
## United States Thefts, 2002 - 2012





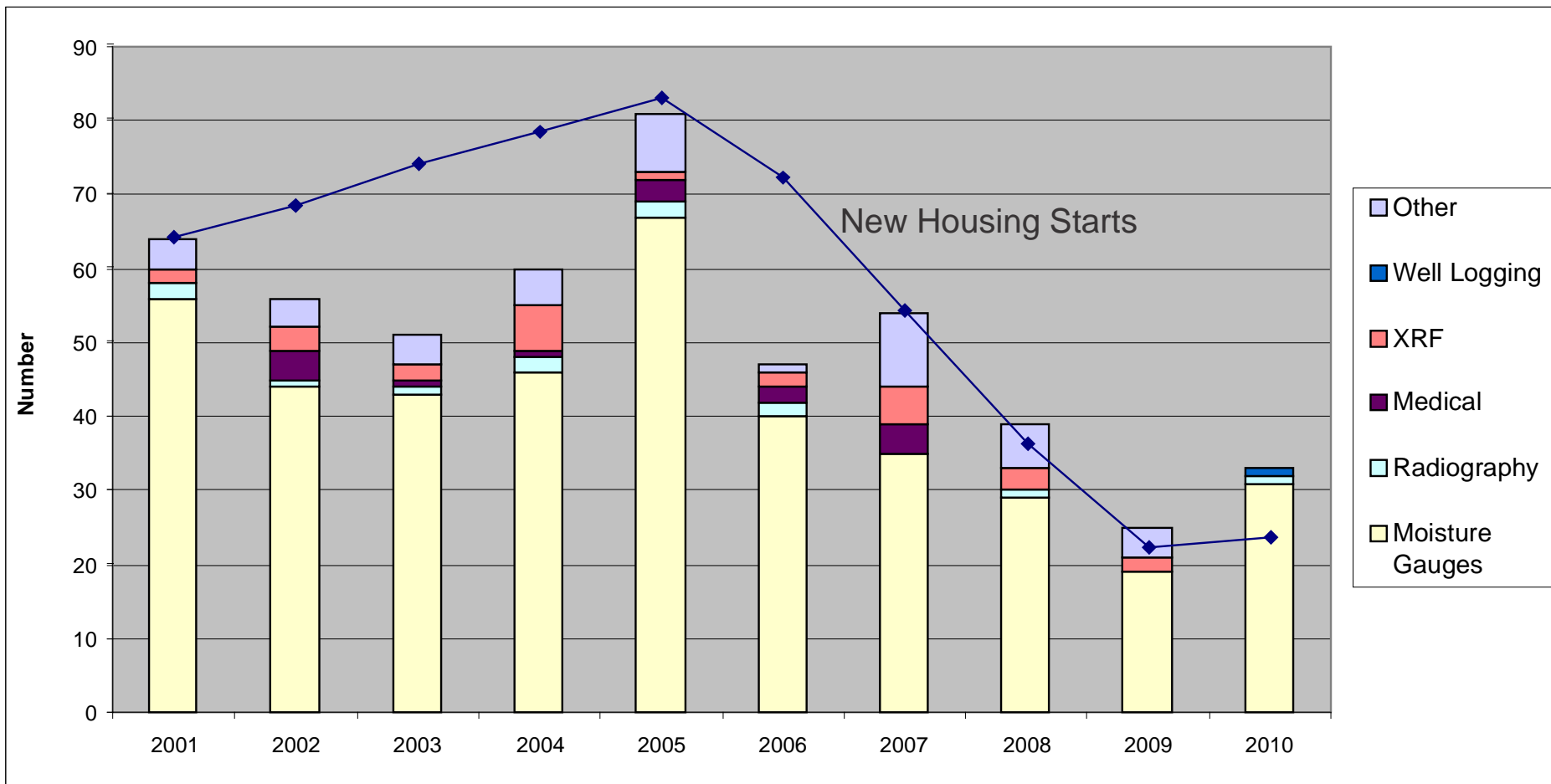
# Home Builders:Housing Market Index {Composite}

SA, All Good = 100

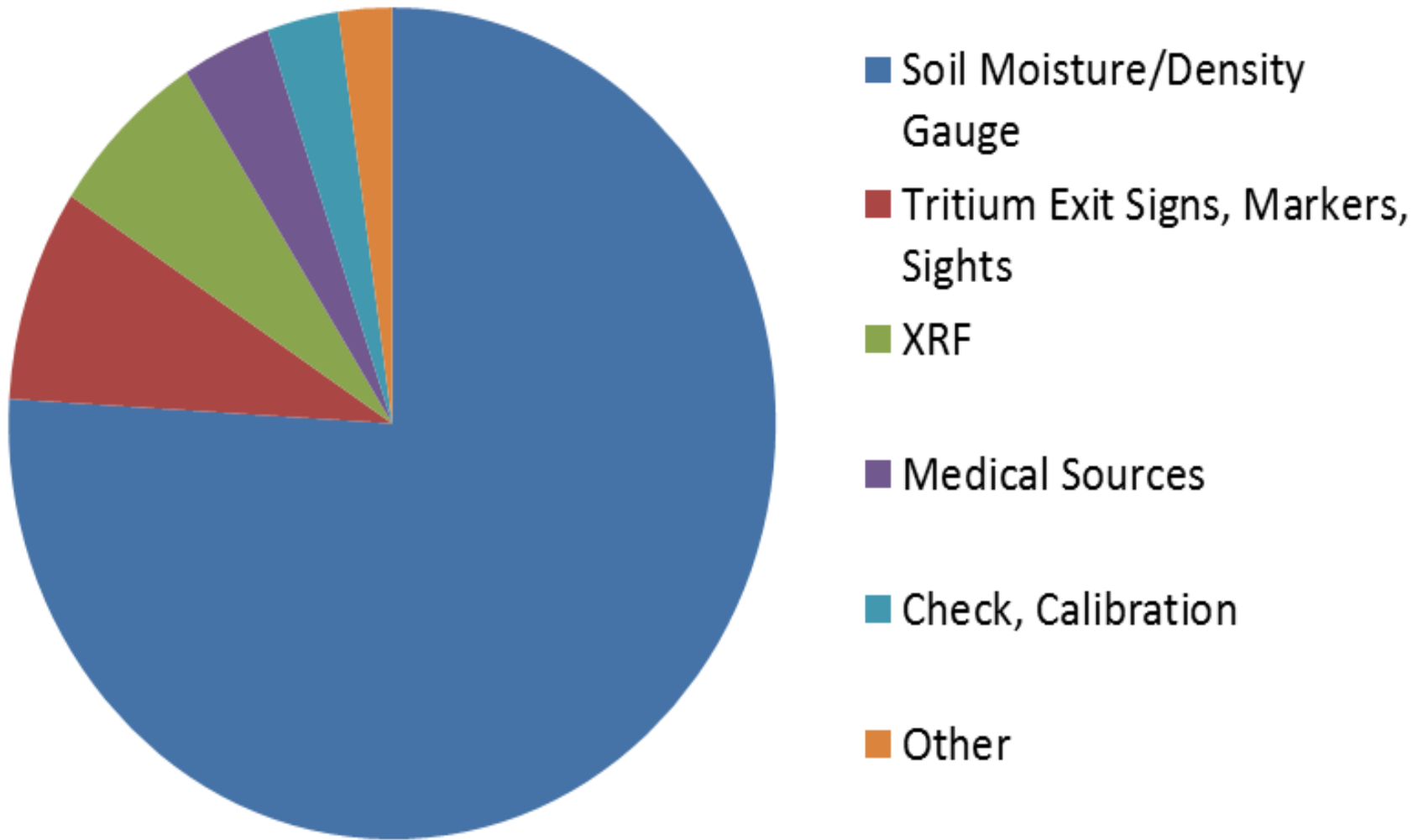


Source: National Association of Home Builders /Haver Analytics

# United States Thefts vs. New United States Housing Starts

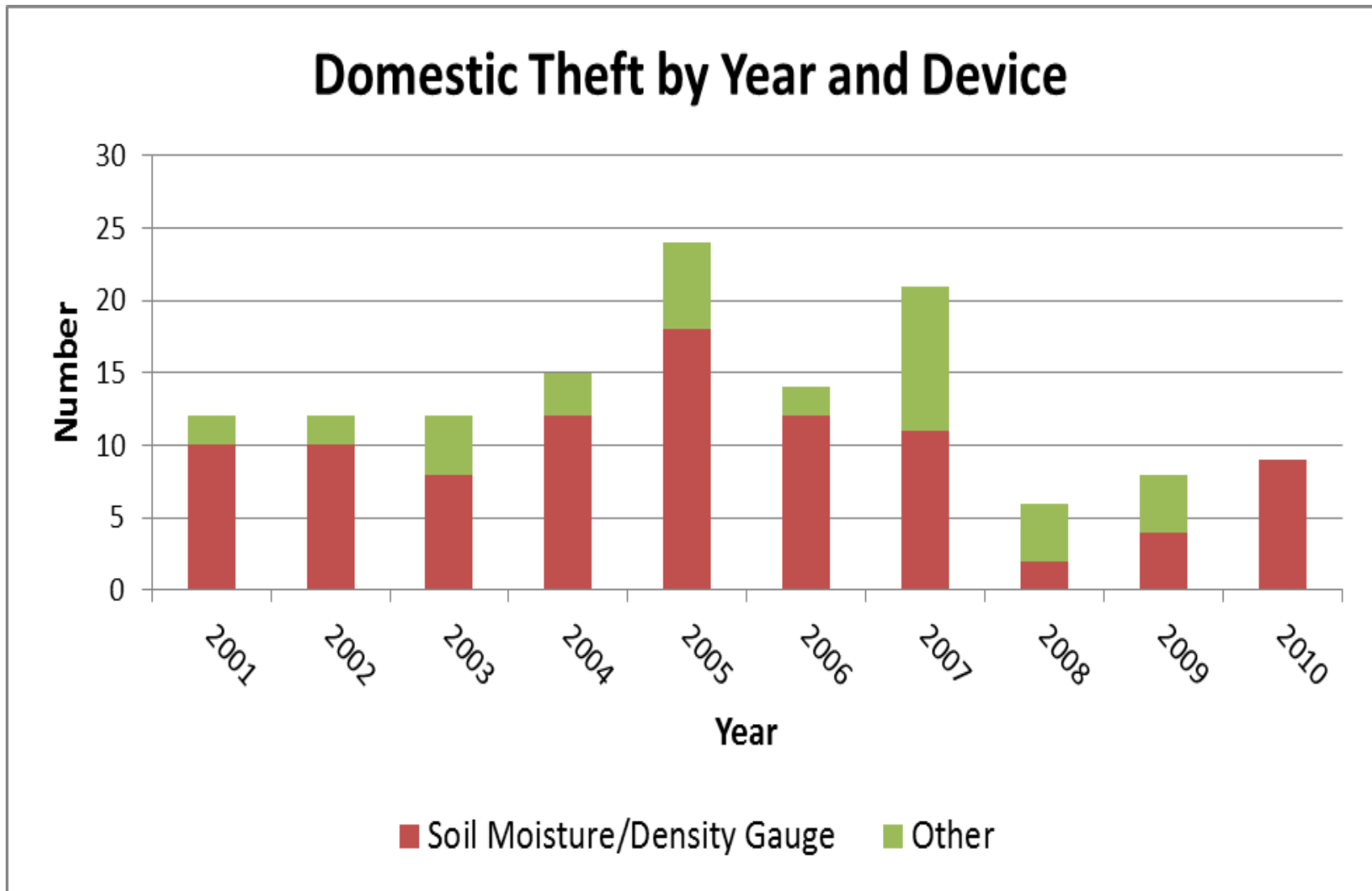


## *United States Thefts by Device Type*





# United States Thefts from Buildings by Year and Device

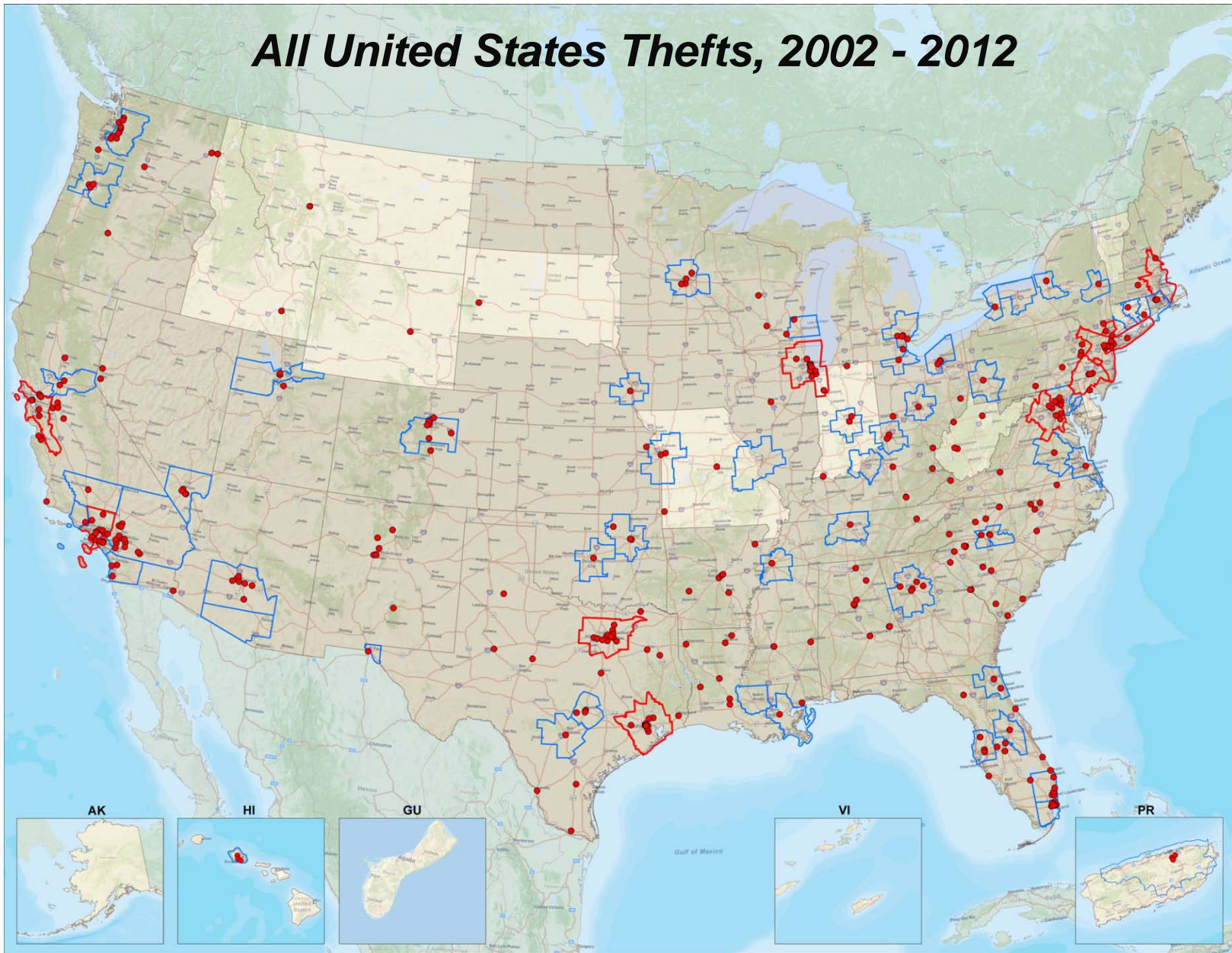


# Radiography Cameras Are Particularly Prone to Theft

- Designed to be mobile
- Typically use Ir-192 as the radioactive source
- Around 100 curies fully loaded
- Half-life of 74 days
- Typically re-loaded two to three times a year
- Significant amount of Ir-192 in motion around the globe at any point in time shipped via commercial and contract carriers, and moved by licensees
- The largest type of devices regularly lost/stolen world-wide

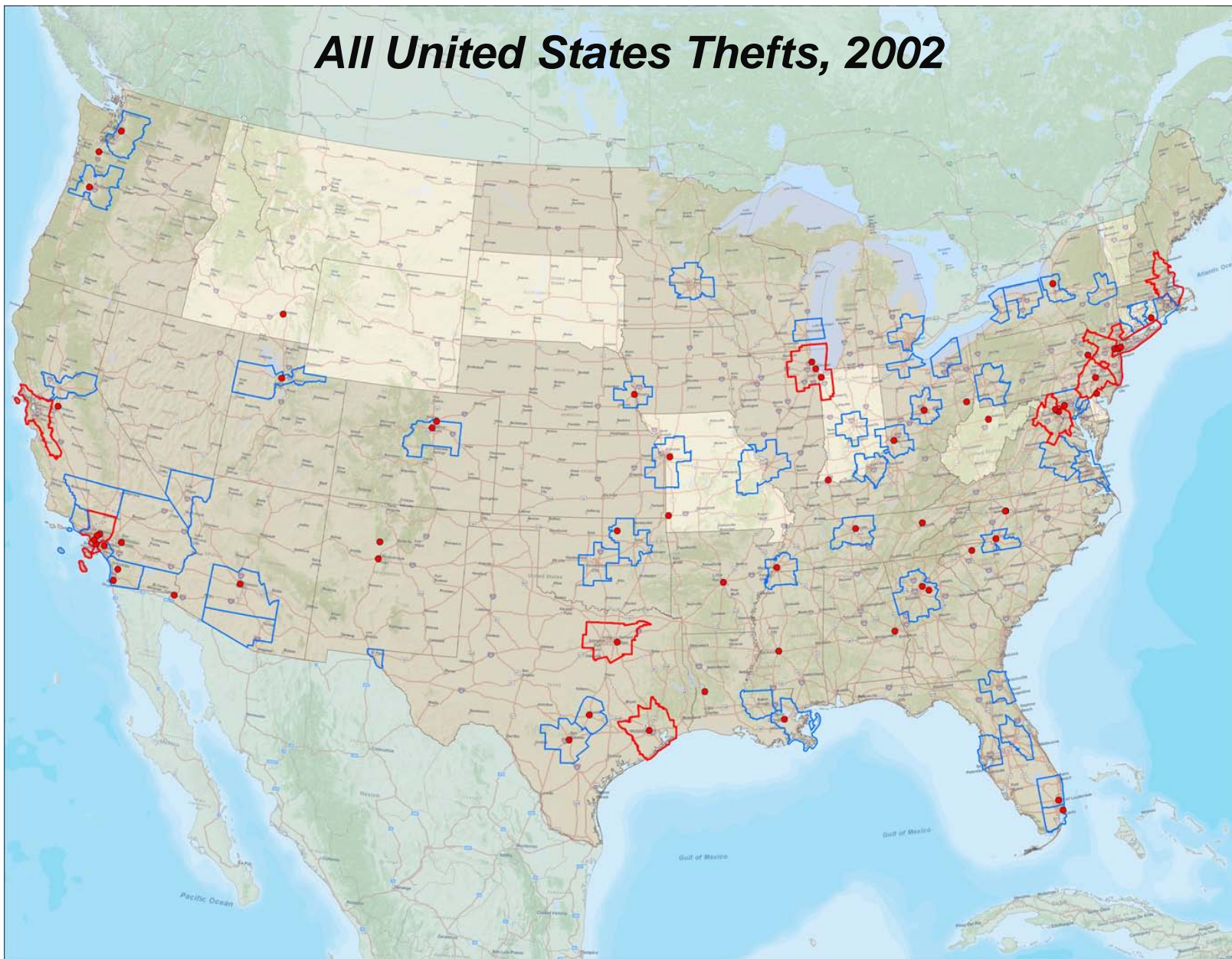


# All United States Thefts, 2002 - 2012



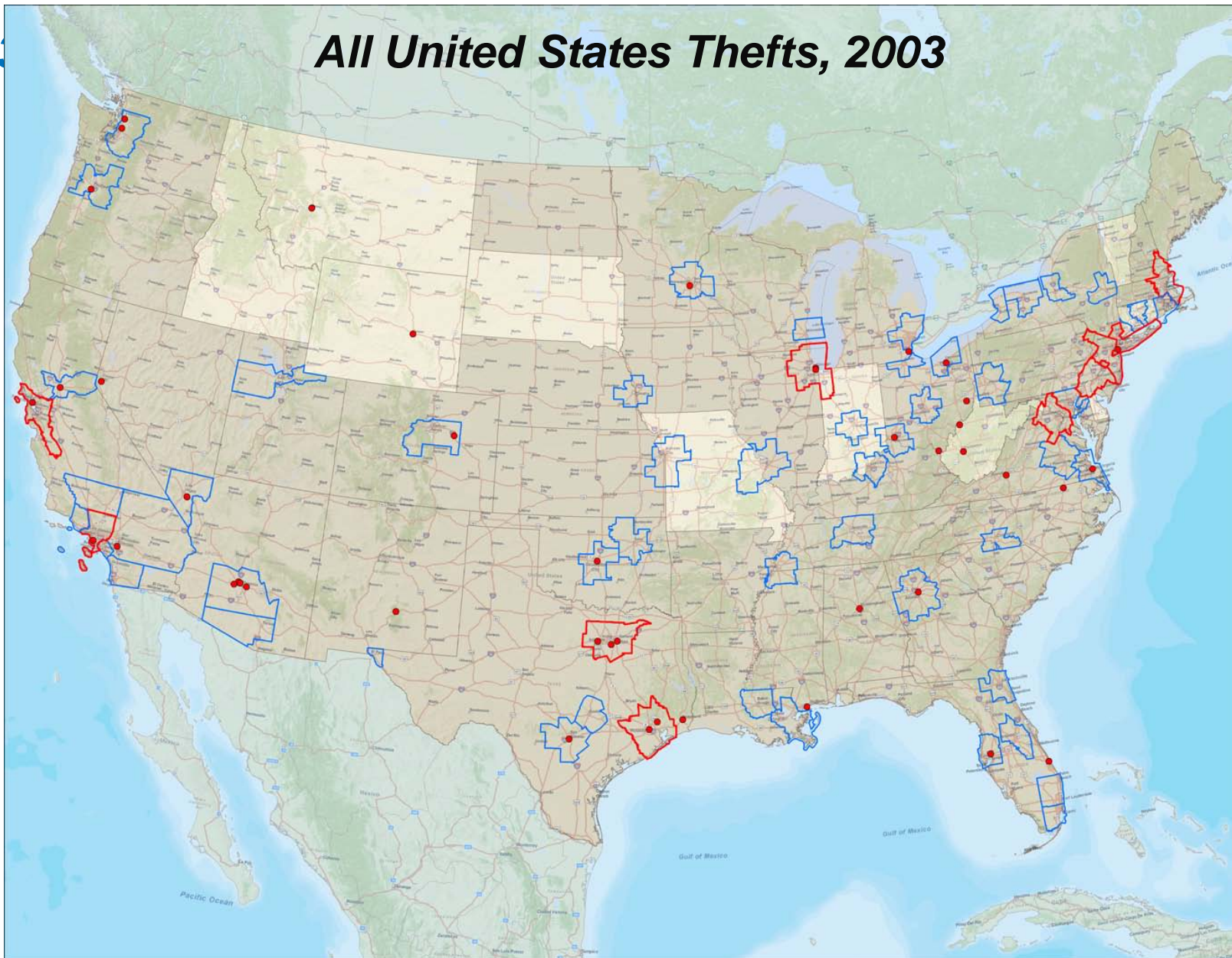


# All United States Thefts, 2002



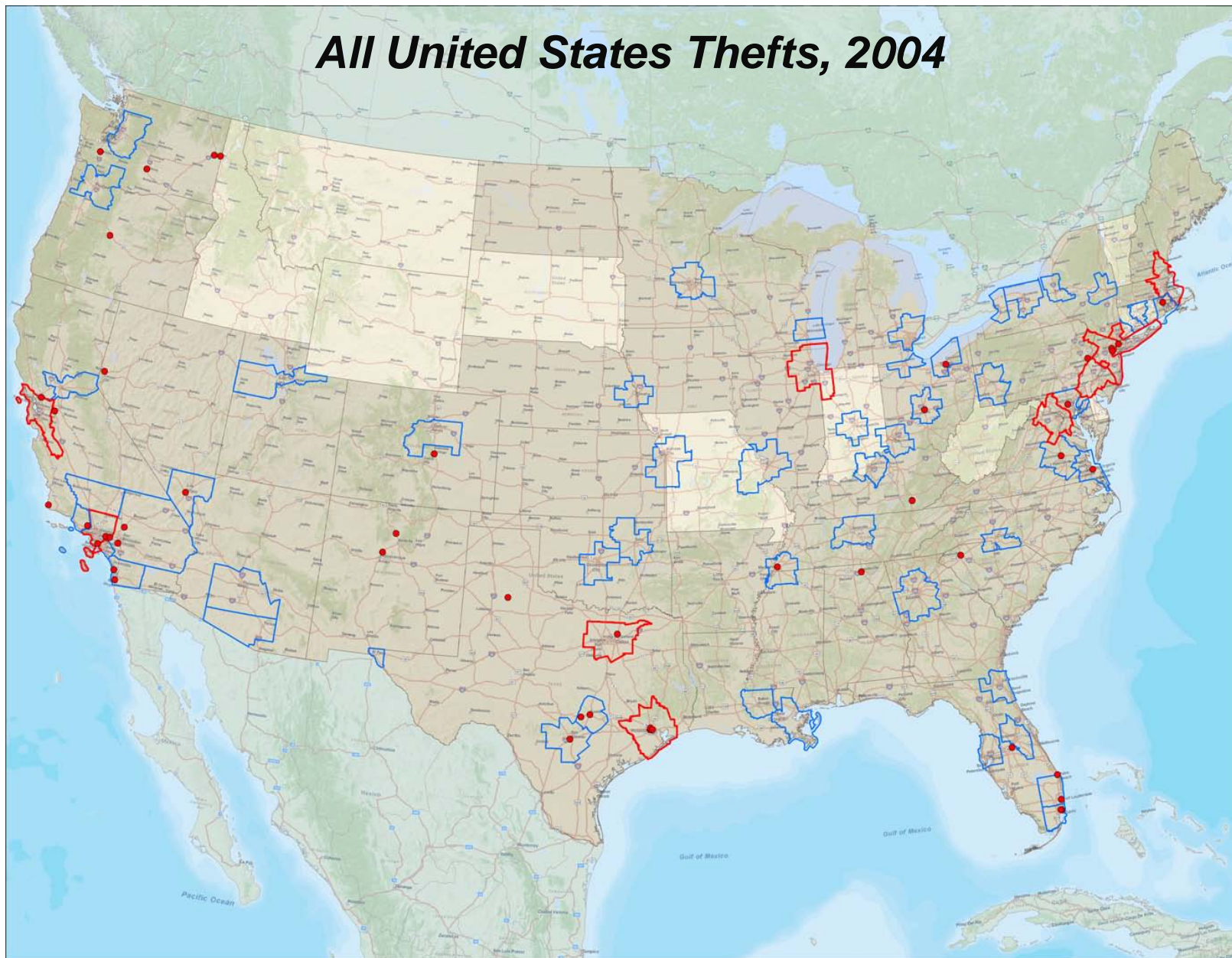


# All United States Thefts, 2003



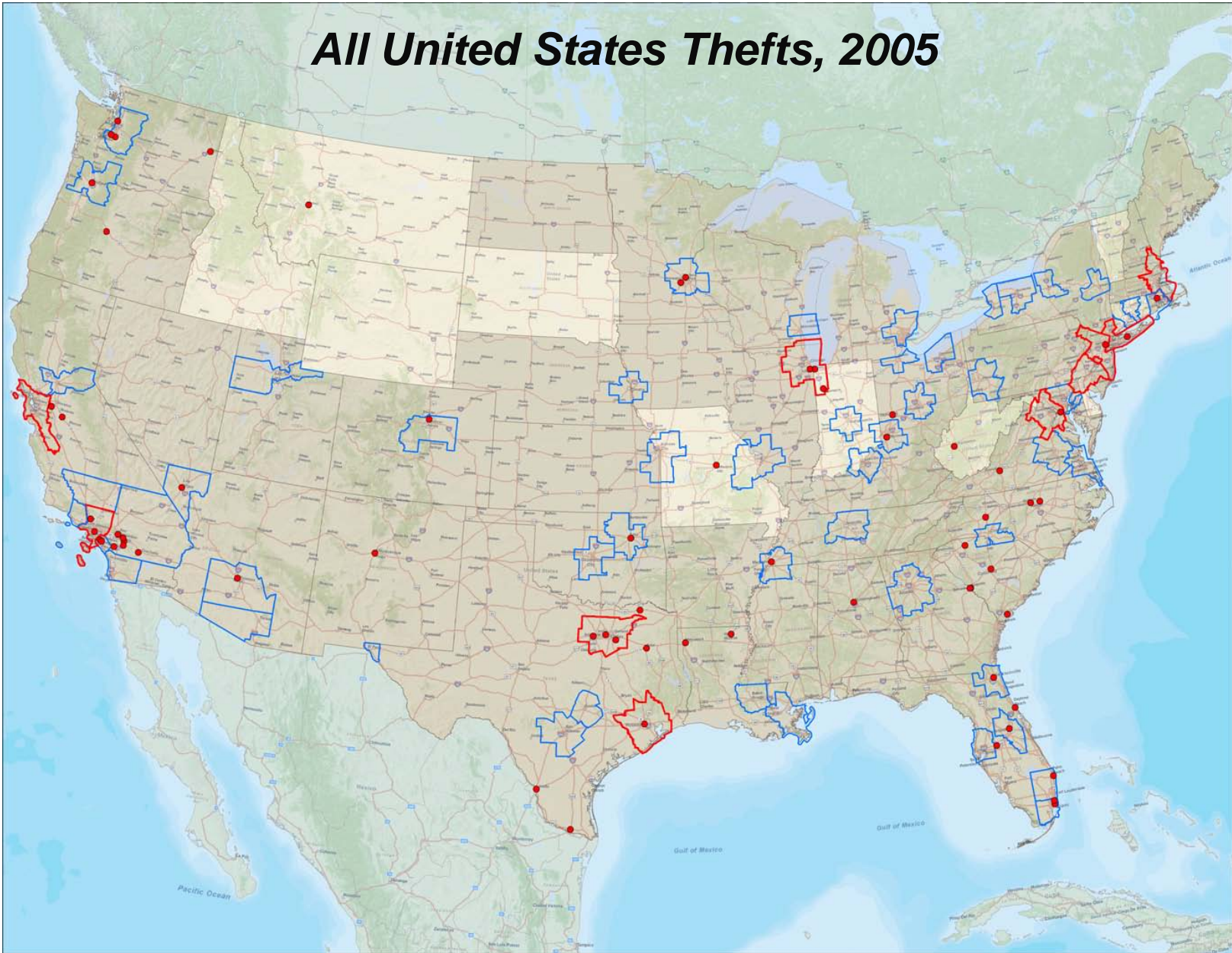


# All United States Thefts, 2004



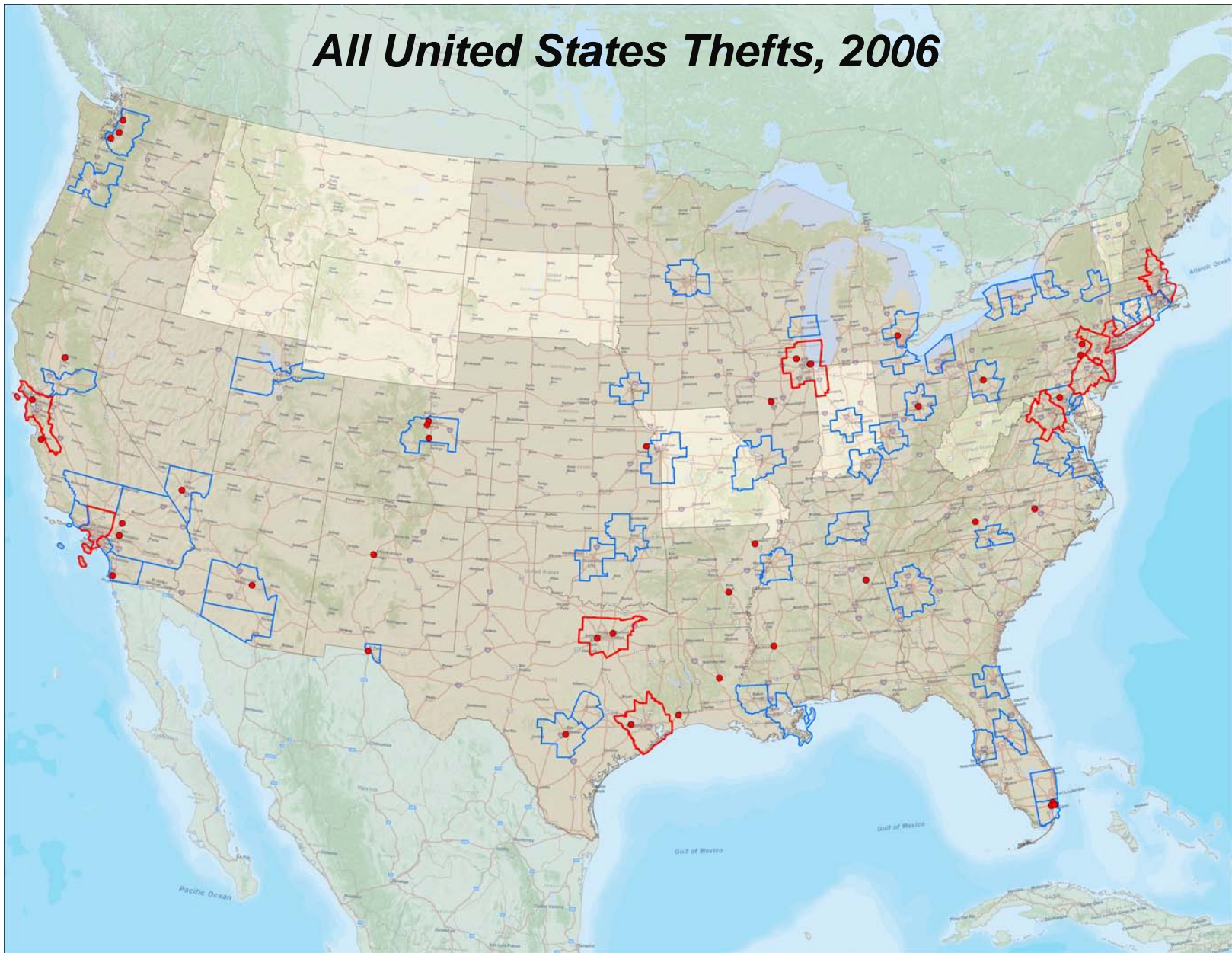


# All United States Thefts, 2005



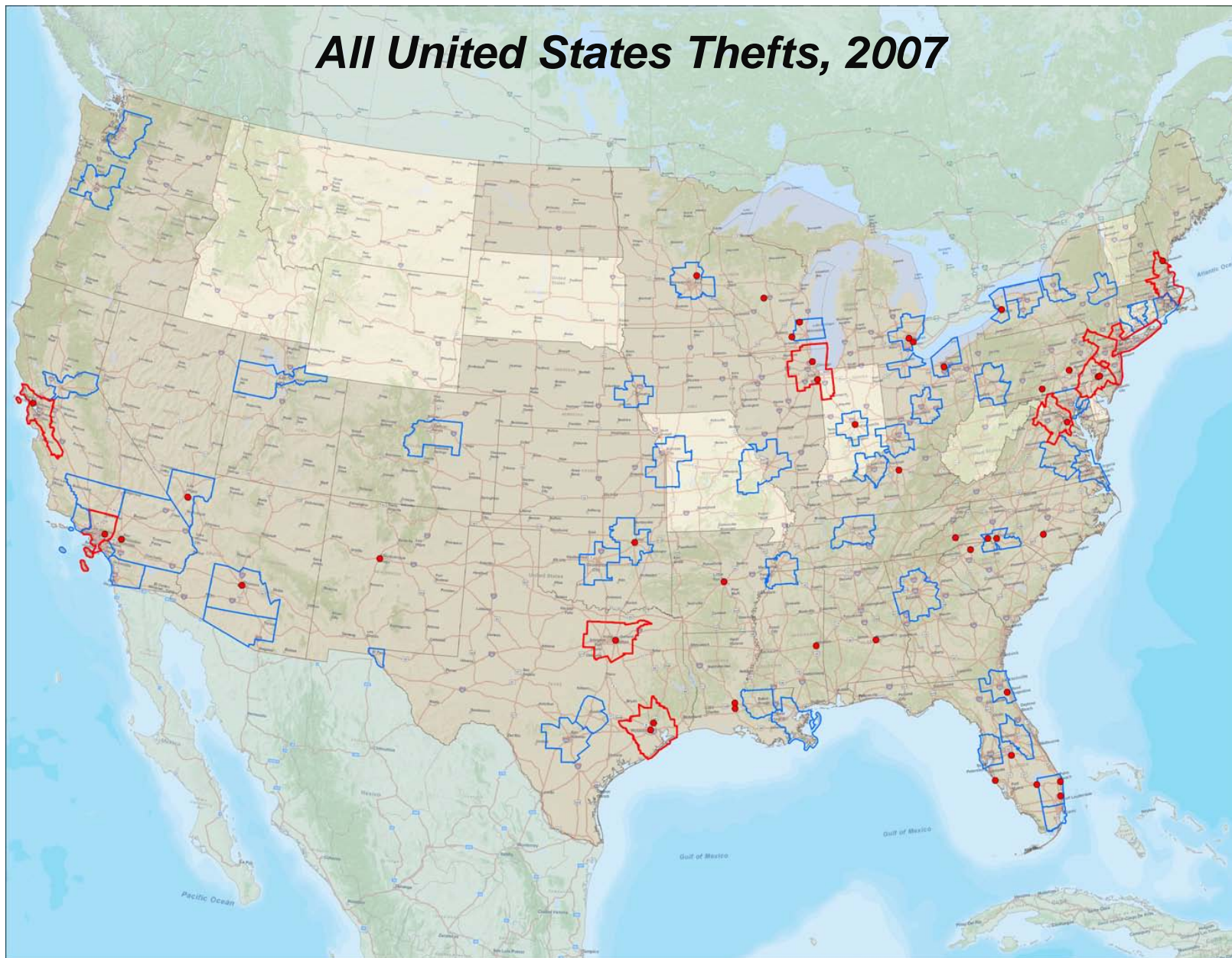


# All United States Thefts, 2006

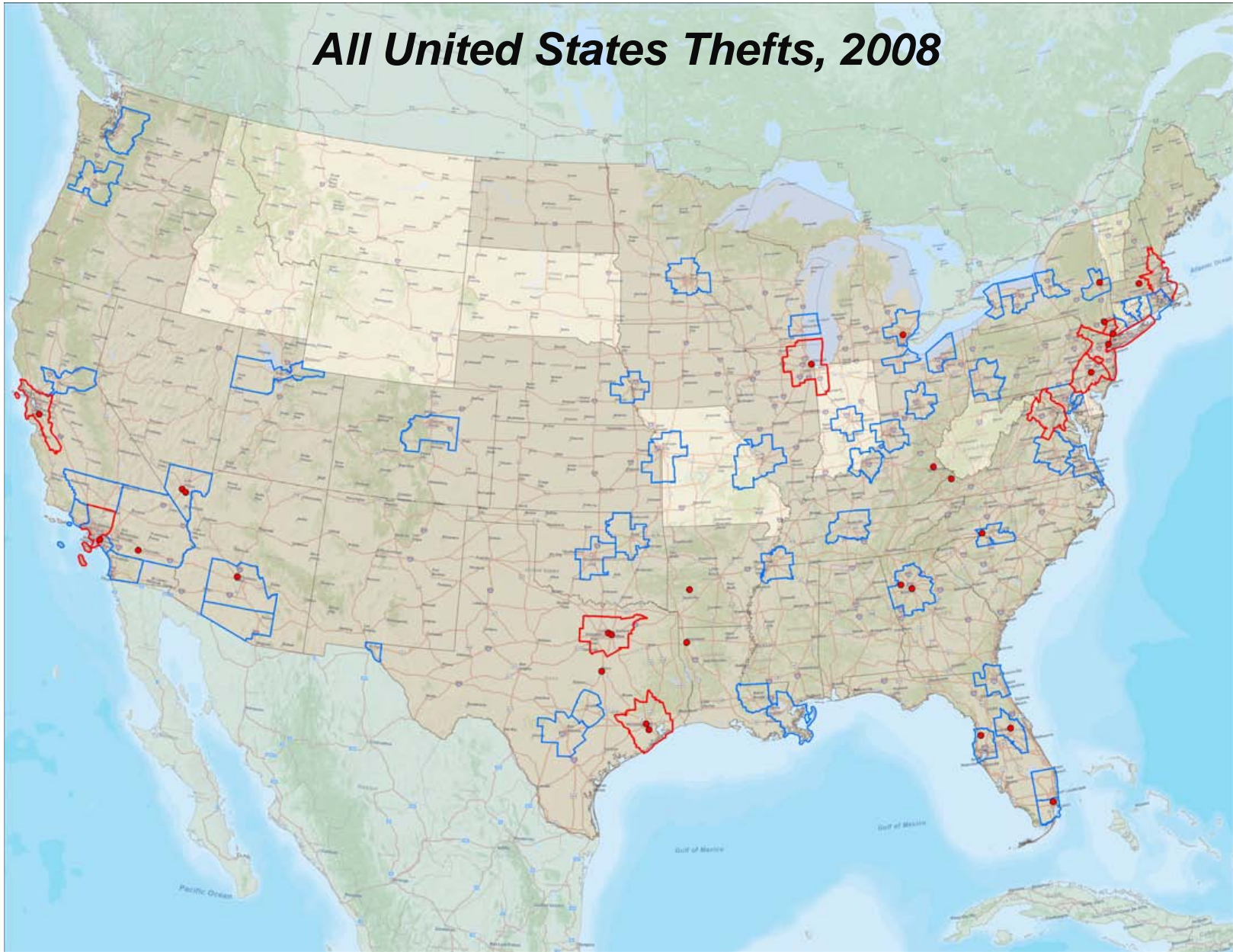




# All United States Thefts, 2007

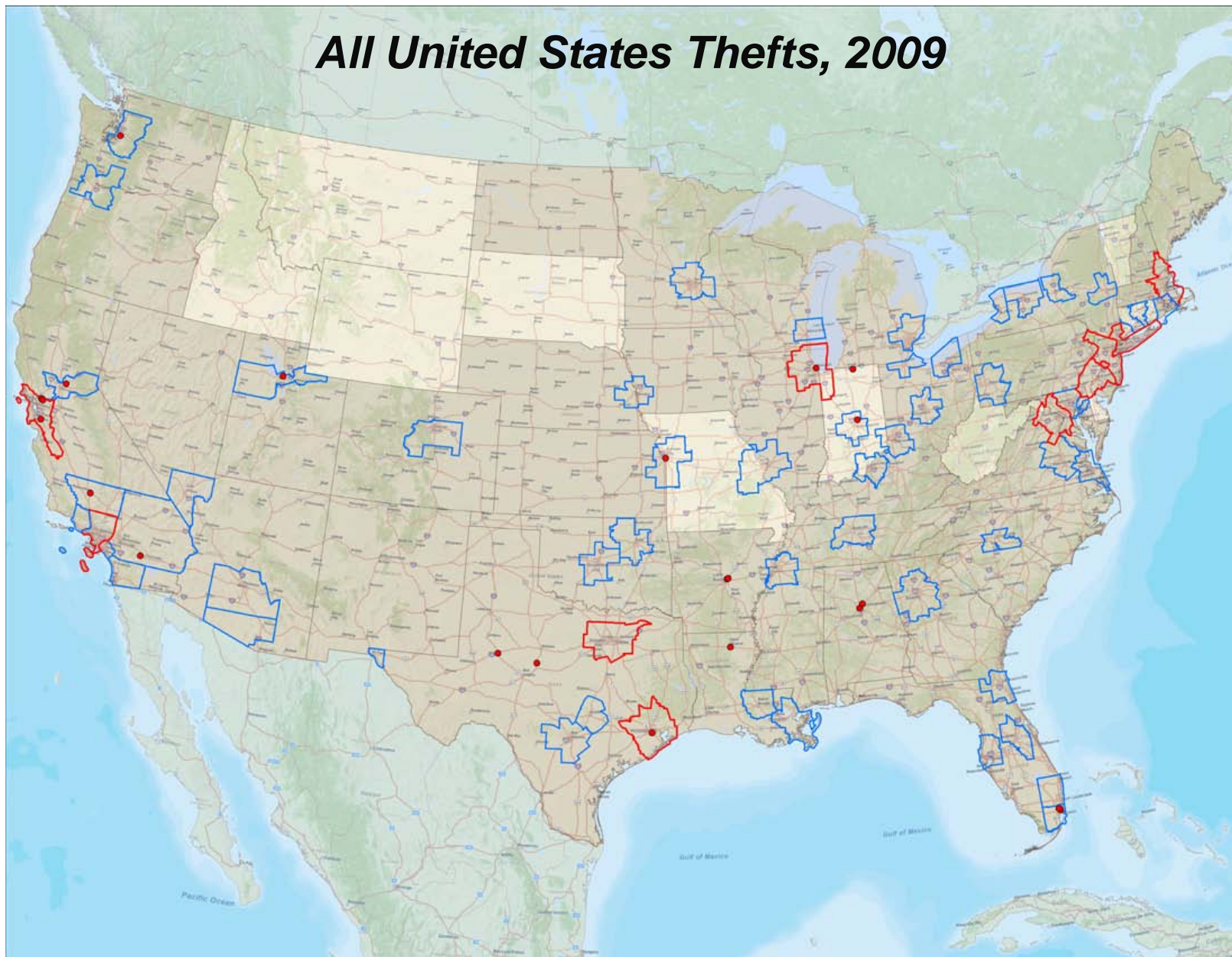


# All United States Thefts, 2008

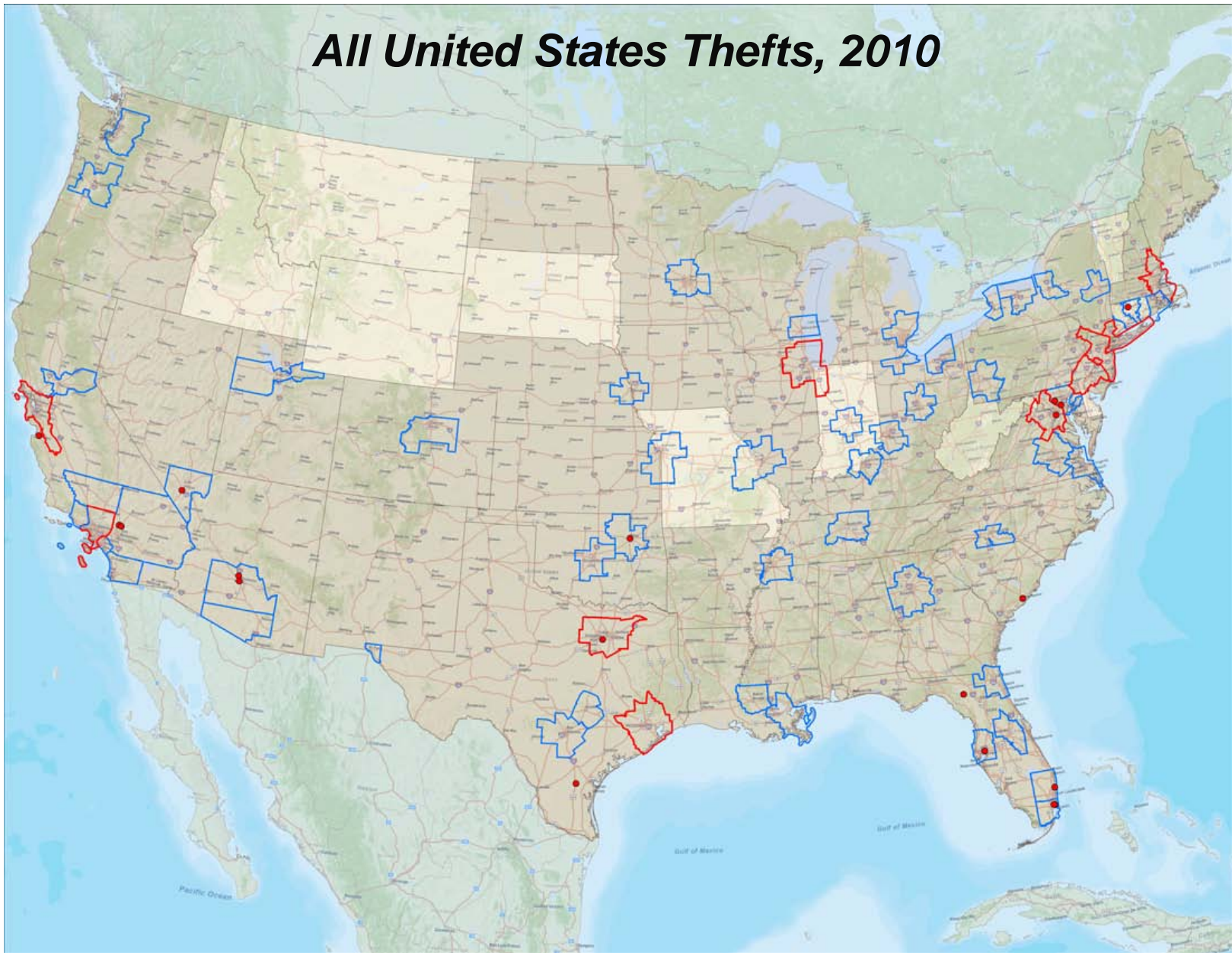




# All United States Thefts, 2009

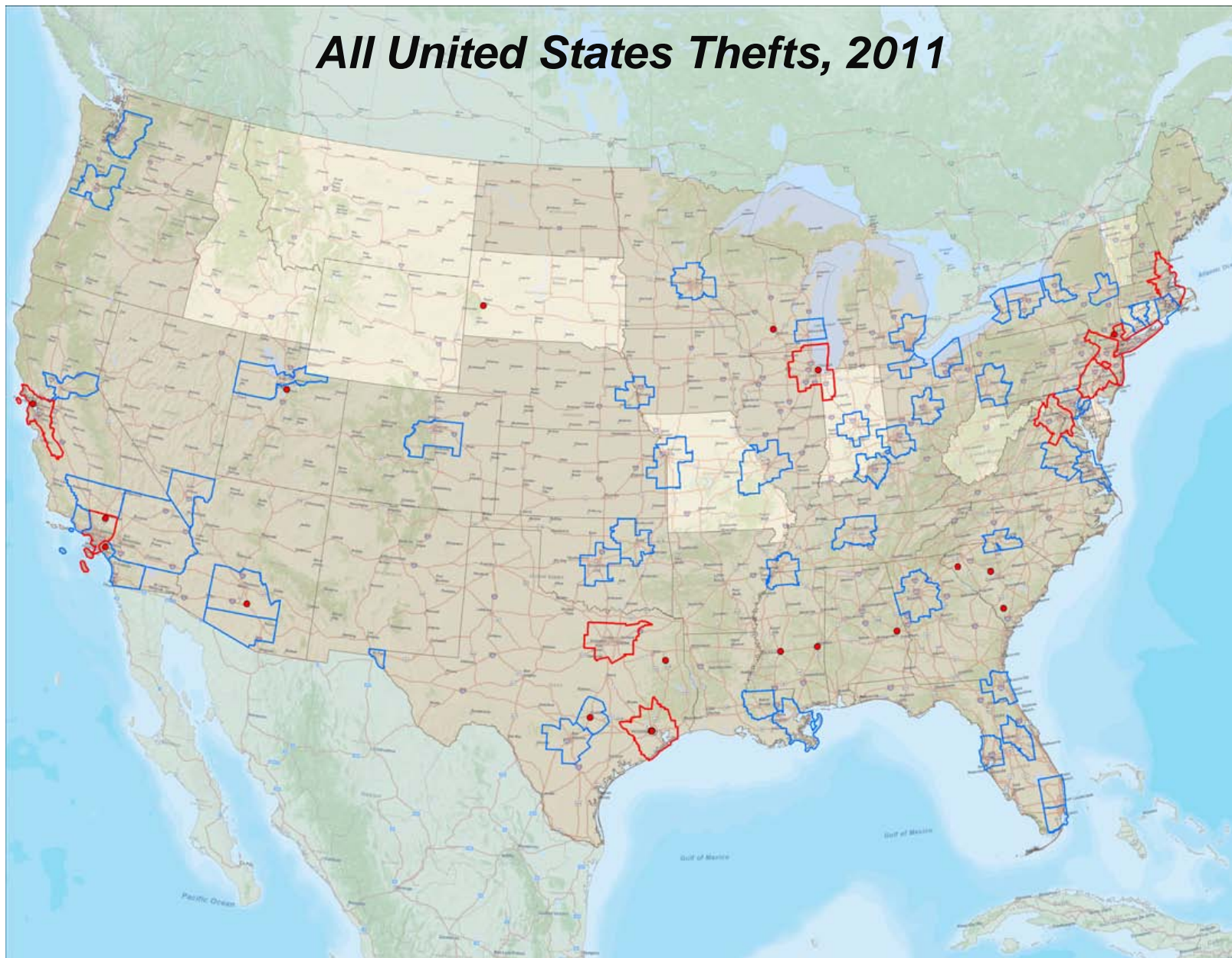


# All United States Thefts, 2010





# All United States Thefts, 2011



# All United States Thefts, 2012





# ***Significant Case: Loss***

- On May 19, 2011, the State of Texas was notified by a shipper that on May 18, 2011, a package carrying an eight curie Ir-192 source was lost during shipment in Houston, Texas. The source is used in a high dose afterloader for brachytherapy. The source was being transported to DHL in Houston, Texas for shipment to the country of Brazil. The door on the back of the truck popped open and the container with the source inside fell out. The driver was unaware. The source was later recovered.



# ***Significant Case: Insiders***

- A former Duke University security expert is suspected in carrying out at least 33 carefully executed burglaries of medical offices. The offices reported the string of break-ins from July 2010 to February 2011. In most cases, employees arrived to find door locks broken and security systems disabled. Cash, narcotics and electronics were among the stolen goods. The security expert had worked as a manager of security systems at Duke University since February 2003 and was involved with the installation of security systems designed to protect large devices containing radioactive material that were present on campus.  
[04142011a]In 2010, Jack H. Poore, Jr., 50, was convicted in the Circuit Court for Calvert County, Virginia, of the misdemeanor violation of illegally transferring radioactive material without a radioactive material license. An investigation revealed that in June 2008, Poore sold a lead paint analyzer to One Source Environmental, LLC for \$2,000. The analyzer contains Cobalt-57 which requires a radioactive material license from the Maryland Department of the Environment. After the sale, One Source discovered that in 2006 ALC Environmental, Inc. had reported the theft of the analyzer to the Philadelphia Police. Poore was a former employee of ALC Environmental.

# ***Significant Case: Insiders***

- In 2010, a previously terminated Quality Inspection and Testing employee gained unauthorized access to keys of a company vehicle loaded with a radiography camera. The individual appeared intent to drive the vehicle to the Rock Springs Airport located in Wyoming when the truck experienced an accident on Highway 191 about 4 miles south of Dutch John, Utah. When the Utah highway patrol drove up to the accident scene, the patrol found the radiography camera outside of the truck. The SPEC Model 150 radiography camera contained 40 curies of Ir-192.

# ***Significant Case: Insiders***

- In 2009, an industrial radiography camera was reported missing from an industrial radiography company in New York City. Members of the New York Police Department and the FBI's Joint Terrorism Task Force conducted an investigation into the missing device. The device was ultimately returned to the company. The perpetrator was an employee who was "borrowing" the device for moonlighting work without the knowledge of his employer.

# ***Significant Case: Orphaned Sources***

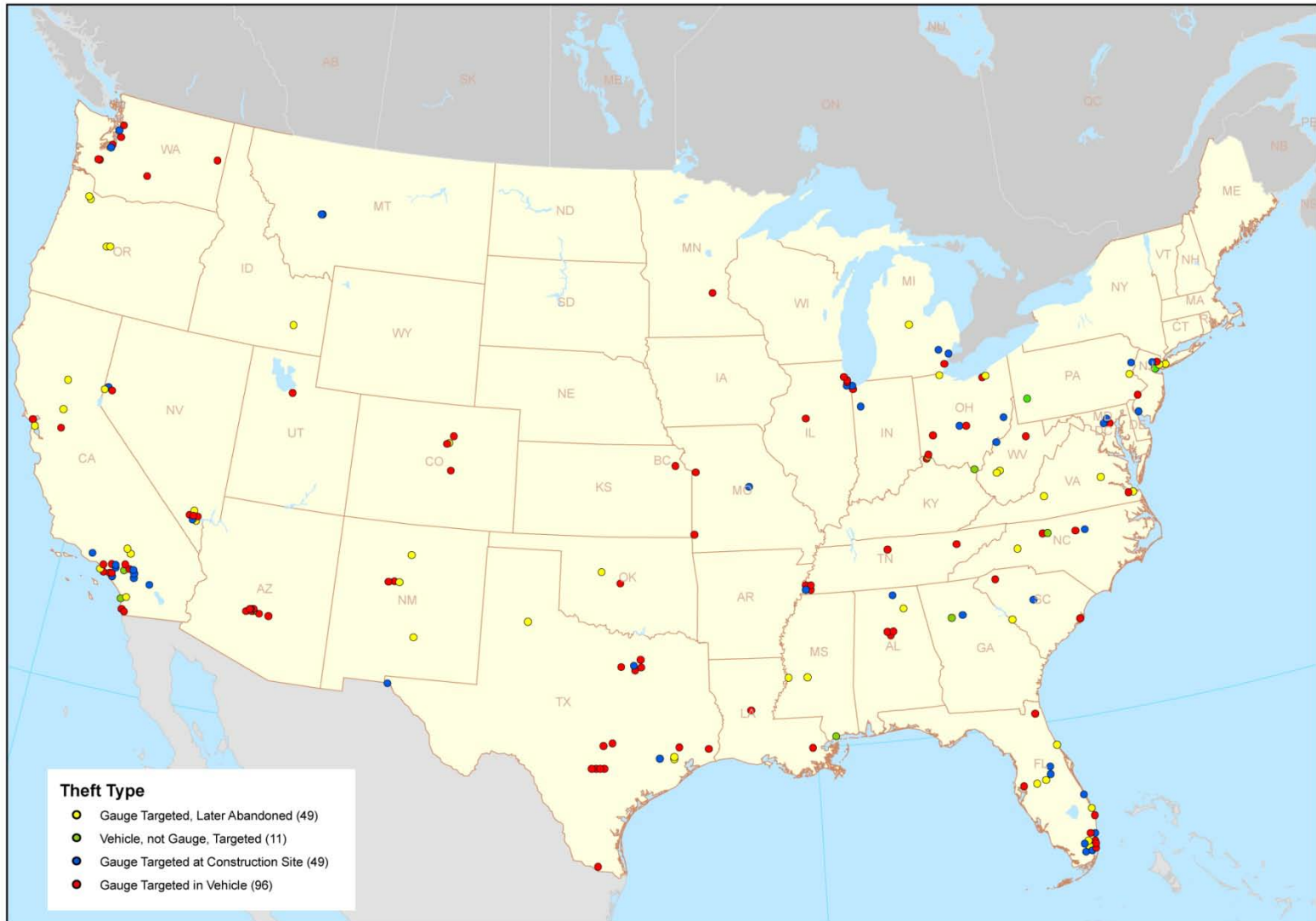
- In the spring of 2009, Valley Advanced Gamma Knife in Pennsylvania failed to remove a gamma knife unit containing approximately 3,000 curies of Co-60 from its closed Easton facility. The device was left unattended for a period of several weeks before the State of Pennsylvania became aware of the situation and intervened, resulting in the removal of the device from the shuttered facility.

# ***Common Misconception:***

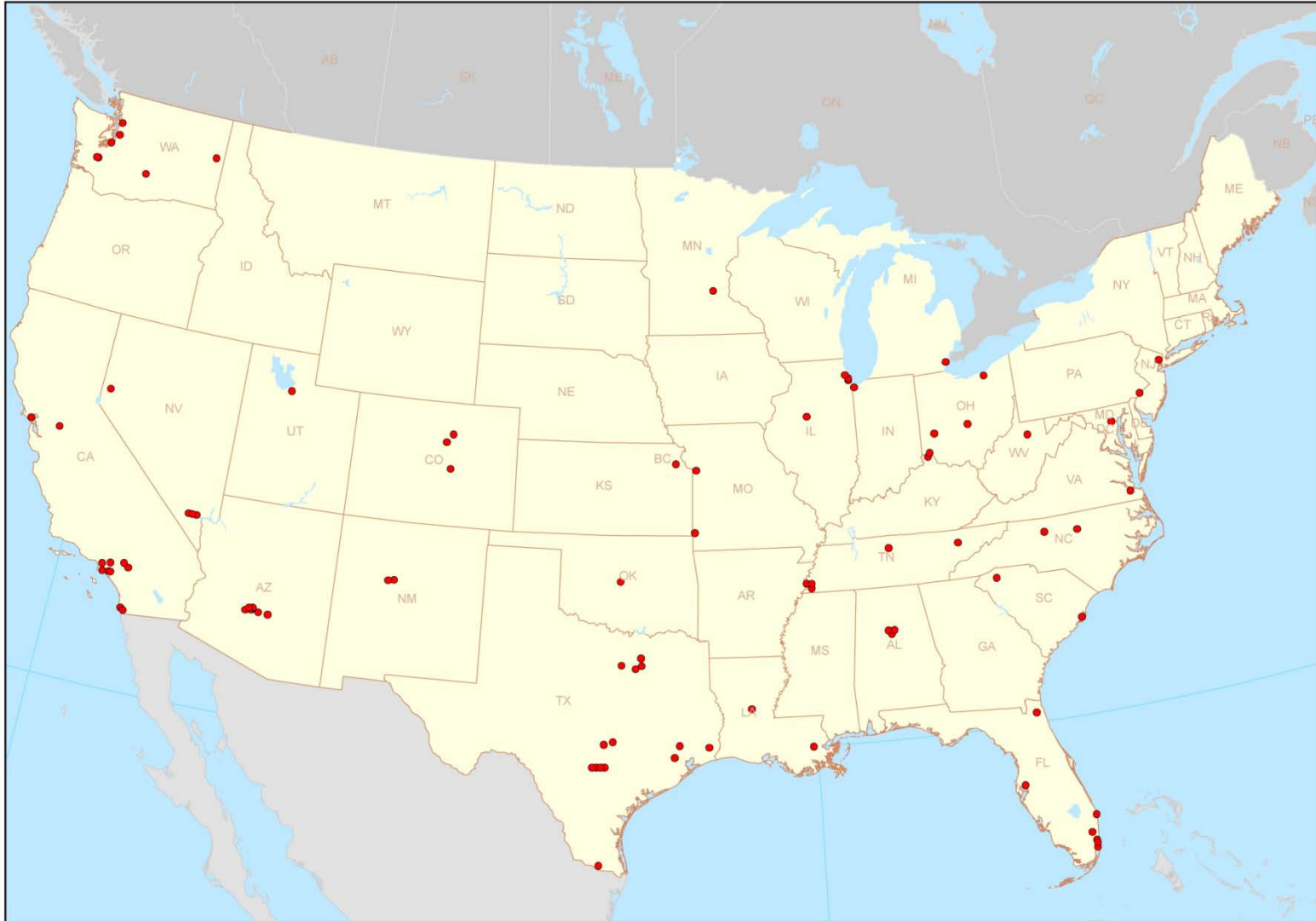
***“They’re Not Stealing the Gauge, They’re Stealing the Vehicle”***



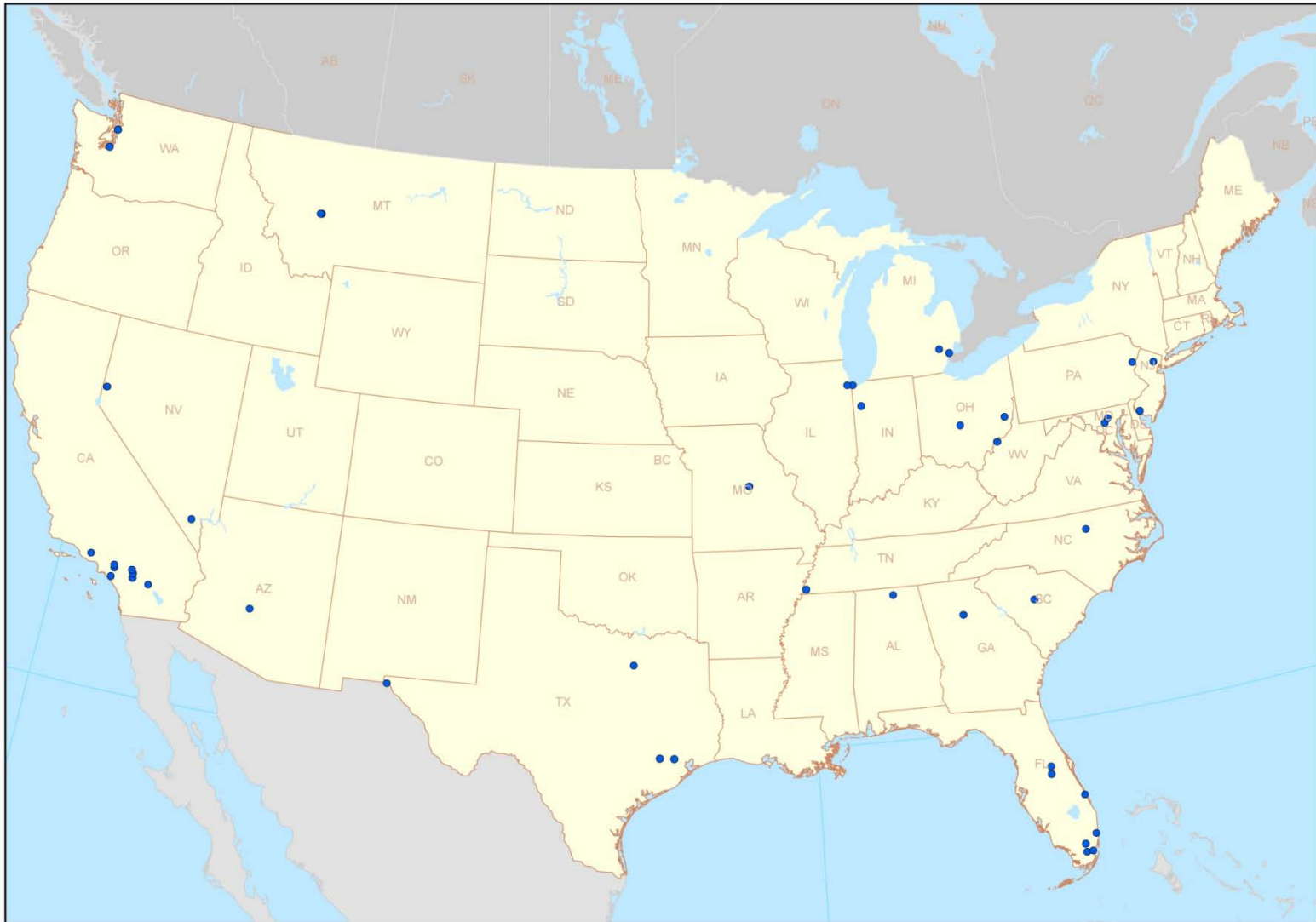
# United States Cs/Am Gauge Thefts, 2002-2006



# United States Cs/Am Gauge Thefts, 2002-2006 Gauge Targeted in Vehicle (Vehicle not Stolen)

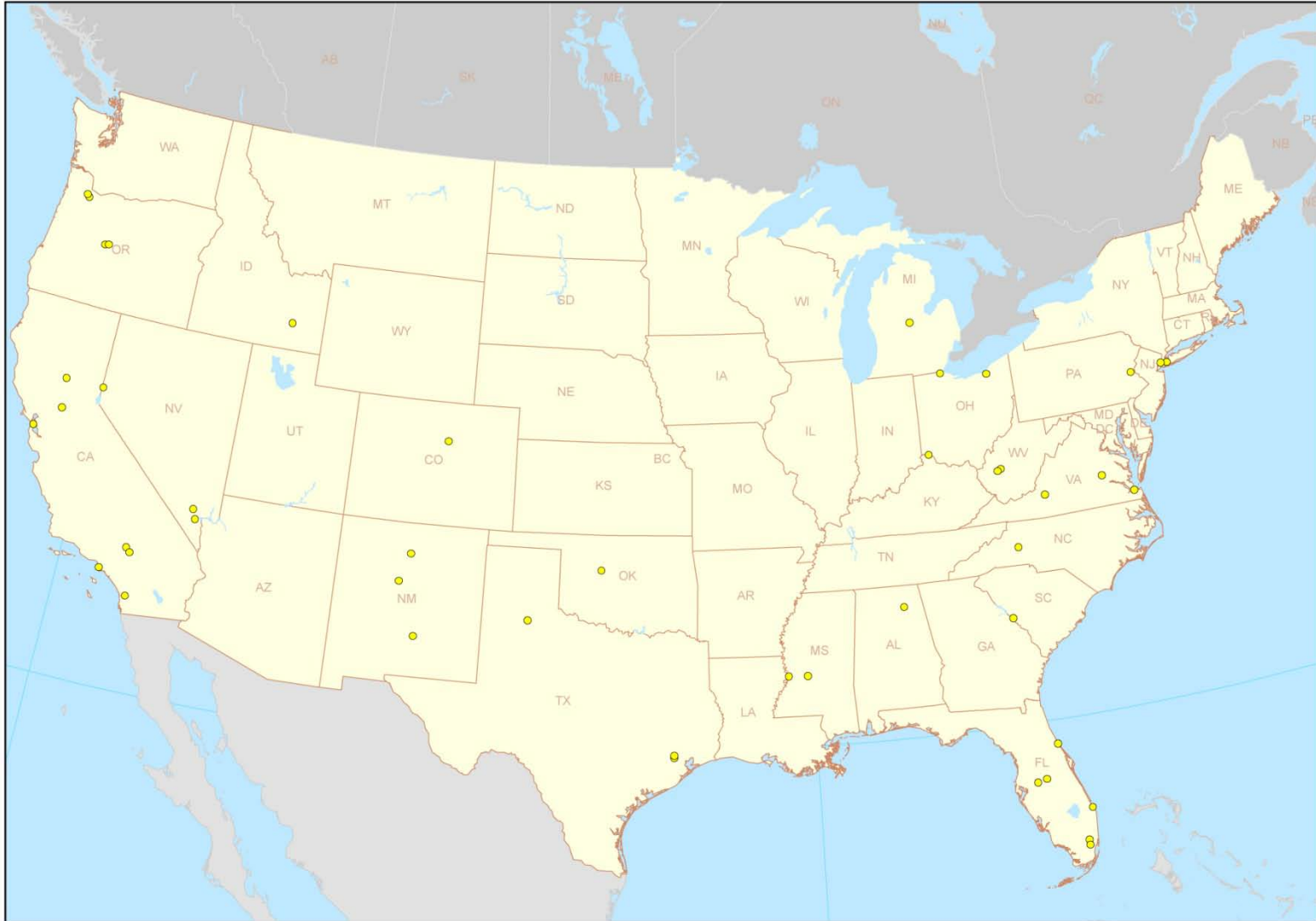


# United States Cs/Am Gauge Thefts, 2002-2006 Construction Site Thefts



# United States Cs/Am Gauge Thefts, 2002-2006

## Gauge Targeted, Later Abandoned



# United States Cs/Am Gauge Thefts, 2002-2006

## Gauge Not Targeted

