MIS 5206
Protection of Information Assets
- Unit #3 -

Risk Evaluation

Agenda

- In The News…
- Categorizing Information for IT Risk Management
- Revisit Risk & Controls of Publicly Shared Geographic Information
- More on Confidentiality: Linked & Linkable PII
- Risk Evaluation
- Risk Management Techniques, a brief review
- Test taking tip
- Quiz

In The News

Matthew Bryan says

SEPTEMBER 5, 2021 AT 8:29 PM

(Edit)
I thought this article was relevant to Unit 3's topics and raises some interesting points about the convergence of physical and information security. I've seen this in my current job as we're often partnering with physical security on technology matters. I can't help but think of how a consolidated physical and information security department would have helped RIT in Case Study 1. From a risk management perspective, a consolidated security department provides a holistic view into overall business risks and allows for more thoughtful conversations about how to modify them.

Summary:
The combining of our physical and cyber worlds is forcing organizations to revisit the often siloed functions of physical and information security. This concept is not new but may be worth implementing now, given increasing overlap that comes from advancing technology across functions. Converged security departments help organizations to streamline communications and provide efficiencies by merging adjacent practices, e.g. physical access controls, surveillance, etc.

The article cites the state government of Michigan as an example of successfully combining physical and information security departments. Organizations with converged security departments are more resilient and better prepared to deal with threats. Combined departments are able to share information more easily and can implement holistic security policies across the organization. This and other benefits are noted in a 2019 CISA report on combining physical and information security.

The need for convergence was made a priority during Covid-19's shift to remote work and the increased adoption of IoT technology in facilities management. These changes have increased the risk surface area for organizations. Convergence can help security organizations adapt to these changes, regardless of sector, by providing a unified approach to organizational security.

In The News

Richard Hertz says

SEPTEMBER 7, 2021 AT 3:00 PM

(Edit)

Last week I posted a link to the annual report showing the cost of risk from specific areas – a tool that would be useful in writing a biz case to fund investment in IT Risk Mgmt.

This week I want to share a link to a tool that provides a practical and usable framework for completing a Risk Assessment for an organization. It complements our readings and lectures, but it maps out more specific details about each step of the process to analyze and create a risk profile for an organization.

For example Section 4 (How to Perform a Cyber Risk Assessment) lists specific questions to be asked and data to be gathered!

This wasn't necessarily a new story – but it is definitely a URL that I bookmarked for future use.... 😉

In The News

Michael Duffy says

SEPTEMBER 7, 2021 AT 10:18 PM

(Edit)

I figured since we were on the topic of Risk Management I would try to find an article related. I stumbled upon this article through some searching; and it's Risk Management Framework (RMF) for Artificial Intelligence! Essentially with Artificial Intelligence becoming more complex and growing in the recent years; NIST is preparing an Version 1.0 framework for AI. In relation to the topics we are studying now; I found it interesting that an whole new framework would be prepared for AI.

NIST states that "there is no objective standard for ethical values, as they are grounded in the norms and legal expectations of specific societies and cultures." However; if there is one thing that is certain with the complexity of AI – it will pose substantiated risk. I am curious of the set of controls that will entail; as well as how will other businesses/governments in countries will adopt (or some disregard) a common set of controls and practices. NIST states that there could be a complete version by the end of 2022.

Quiz

Which of the choices below is the most often used criteria to determine the classification of a business object?

a. Value
b. Useful life
c. Age
d. Personal association

Which of the choices below is the most often used criteria to determine the classification of a business object?

a. Value
b. Useful life
c. Age
d. Personal association

Quiz

Which of the below definitions is the best description of a vulnerability?

a. A weakness in a system that could be exploited
b. A company resource that is lost due to an incident
c. The minimum loss associated with an incident
d. A potential incident that could cause harm

Which of the below definitions is the best description of a vulnerability?

a. A weakness in a system that could be exploited
b. A company resource that is lost due to an incident
c. The minimum loss associated with an incident
d. A potential incident that could cause harm

Quiz

Information such as data that is critical to the company needs to be properly identified and classified. In general, what are the guidelines to classify data?

a. Classify all data irrespective of the format (digital, audio, video) excluding paper
b. Classify only data that is digital in nature and exists on company servers
c. Classify all data irrespective of the format it exists in (paper, digital, audio, video)
d. Classify only data that is digital in nature and exists on company servers, desktops and in all company computers

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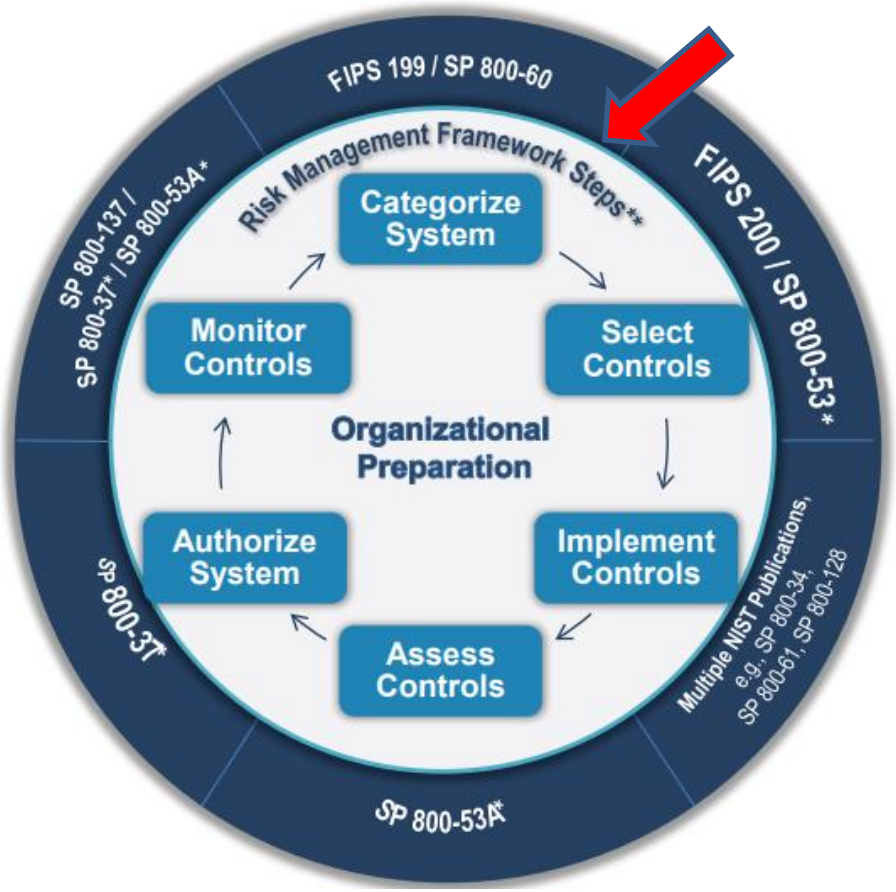
Information inventory, categorization and risk evaluation form the first step in information systems security…



- A holistic and comprehensive risk management process
- Provides a framework for managing risk throughout the information system development lifecycle

Supporting Publications

Federal Information Processing Standards (FIPS)

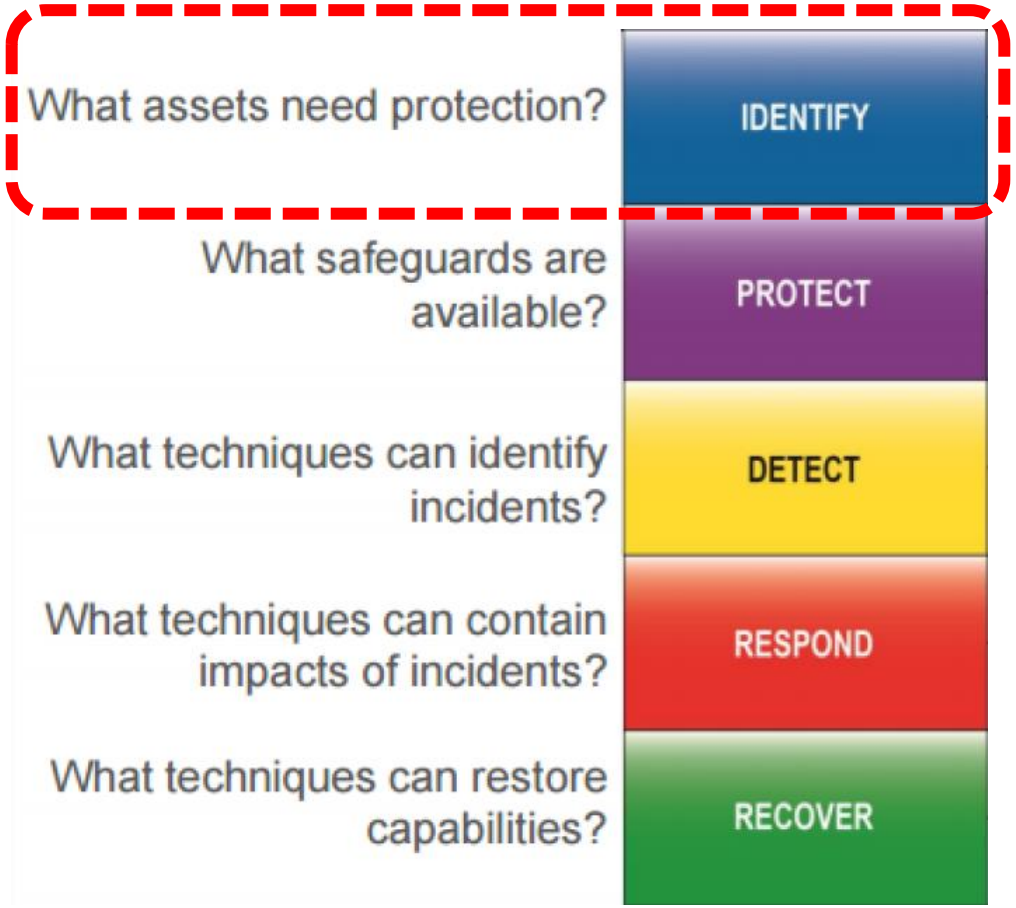
- FIPS 199 – Standards for Security Categorization
- FIPS 200 – Minimum Security Requirements

Special Publications (SPs)

- SP 800-18 – Guide for System Security Plan Development
- SP 800-30 – Guide for Conducting Risk Assessments
- SP 800-34 – Guide for Contingency Plan development
- SP 800-37 – Guide for Applying the Risk Management Framework
- SP 800-39 – Managing Information Security Risk
- SP 800-53/53A – Security Controls Catalog and Assessment Procedures
- SP 800-60 – Mapping Information Types to Security Categories
- SP 800-128 – Security-focused Configuration Management
- SP 800-137 – Information Security Continuous Monitoring
- Many others for operational and technical implementations

https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-37r1.pdf

Information Categorization is part of Risk Evaluation



Why is data categorization important?

- It focuses attention on the identification and valuation of information assets
- It is the basis for access and other control policies and processes

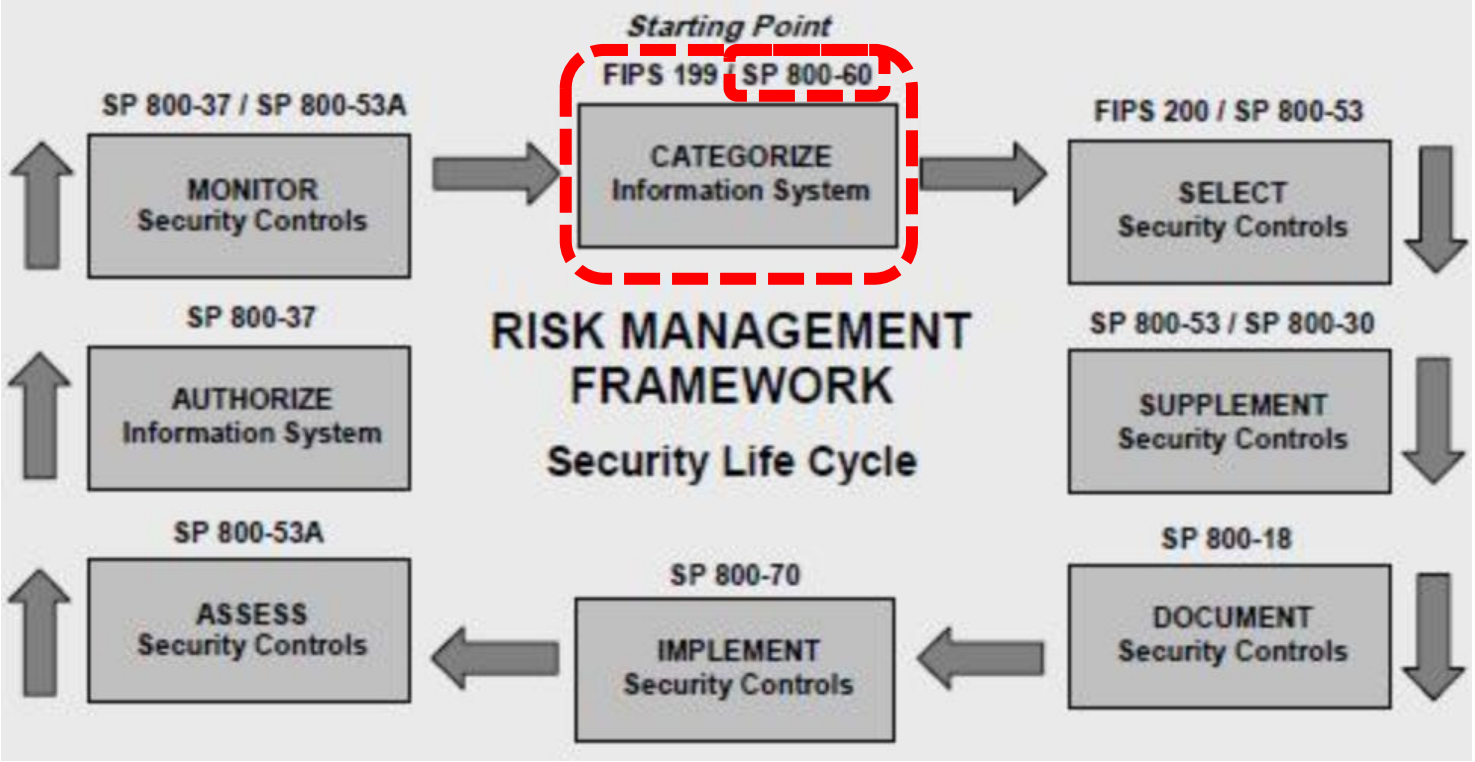
Where information and IT asset inventory, categorization & risk evaluation fit in information systems security…

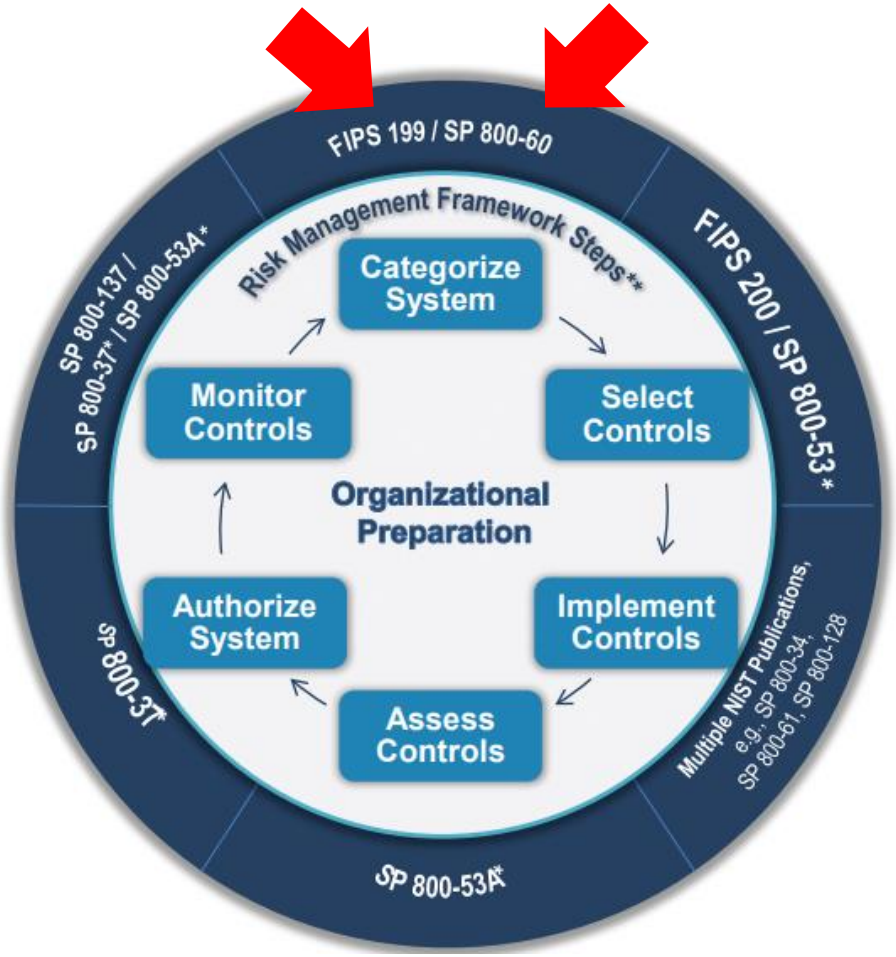
NIST Risk Management Framework

Function	Category Unique Identifier	Category
Identify	ID.AM	Asset Management
	ID.BE	Business Environment
	ID.GV	Governance
	ID.RA	Risk Assessment
	ID.RM	Risk Management Strategy
Protect	PR.AC	Access Control
	PR.AT	Awareness and Training
	PR.DS	Data Security
	PR.IP	Information Protection Processes and Procedures
	PR.MA	Maintenance
	PR.PT	Protective Technology
Detect	DE.AE	Anomalies and Events
	DE.CM	Security Continuous Monitoring
	DE.DP	Detection Processes
Respond	RS.RP	Response Planning
	RS.CO	Communications
	RS.AN	Analysis
	RS.MI	Mitigation
	RS.IM	Improvements
Recover	RC.RP	Recovery Planning
	RC.IM	Improvements
	RC.CO	Communications

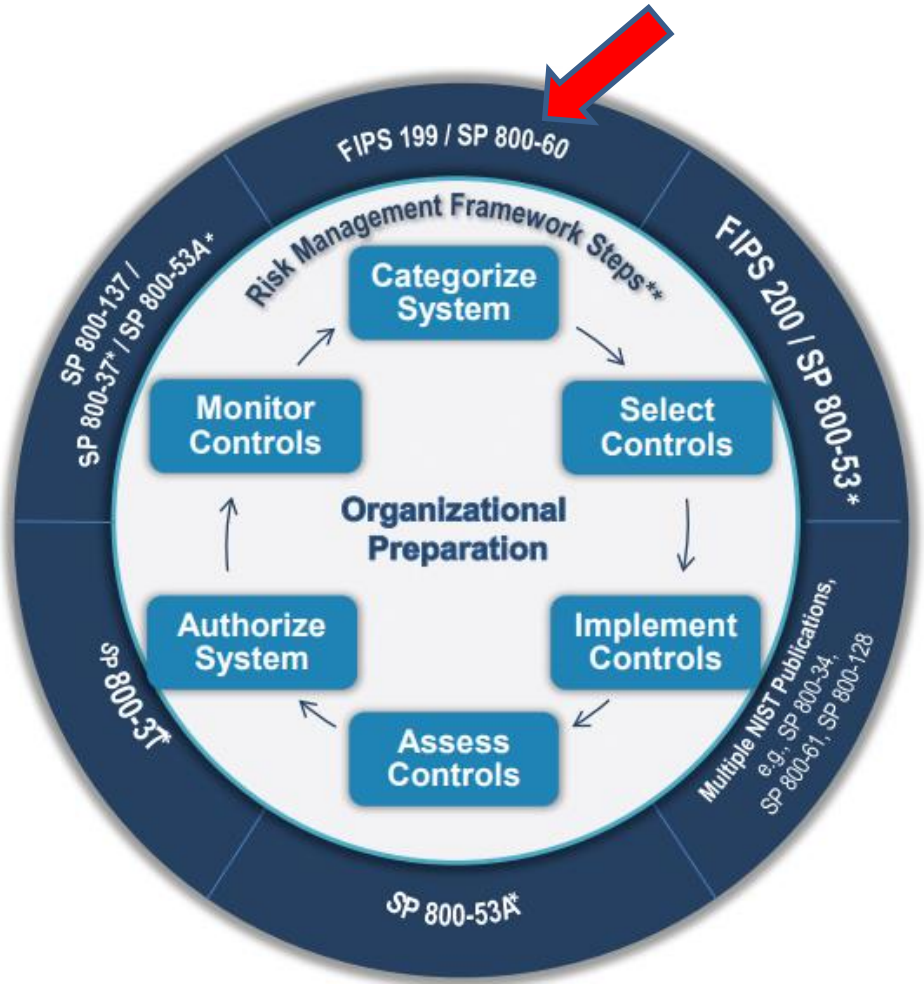
NIST Cybersecurity Framework

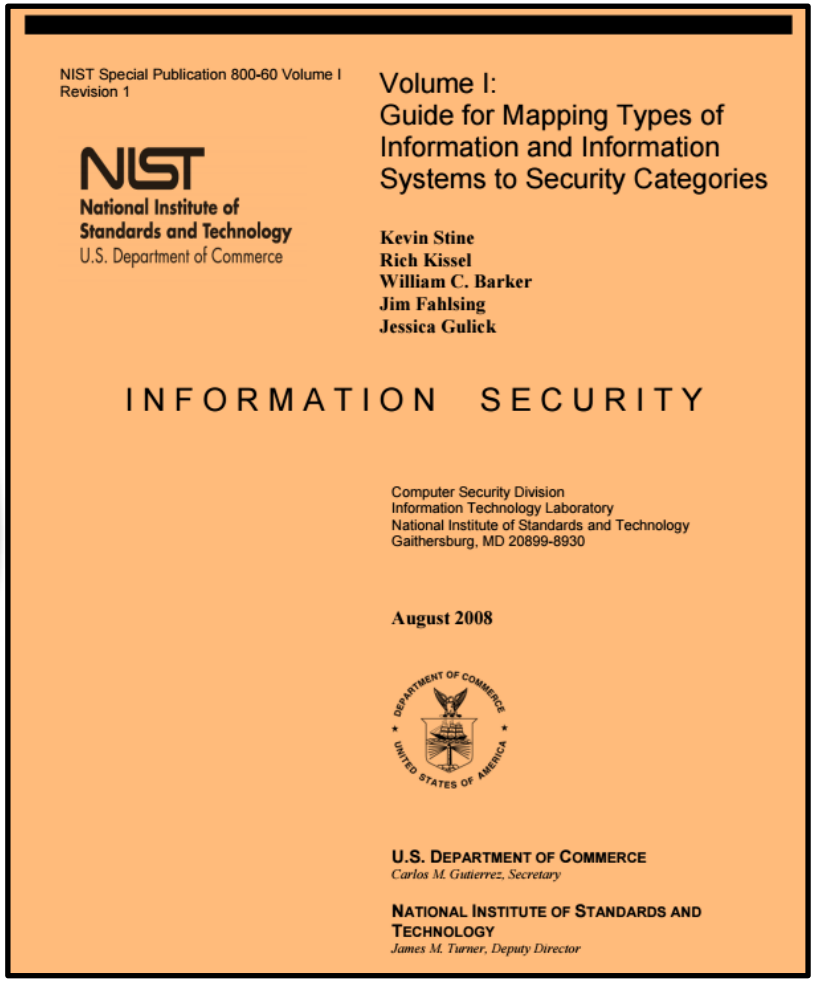
Different views of the NIST Risk Management Framework





A systematic qualitative guide for categorizing information and information systems…





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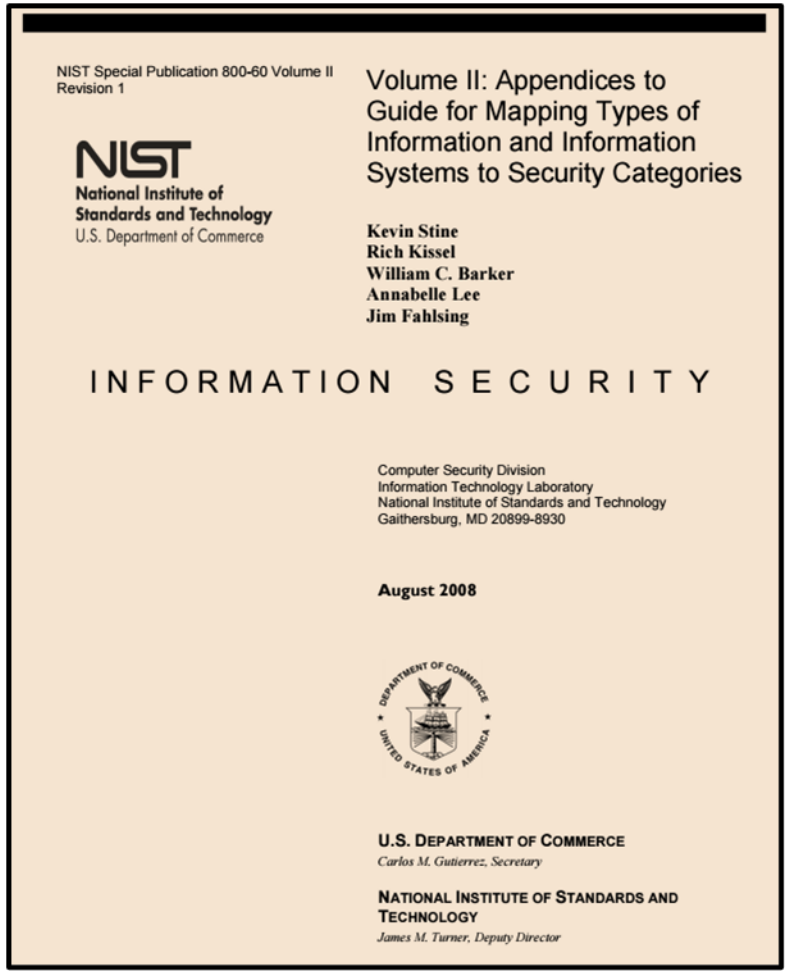

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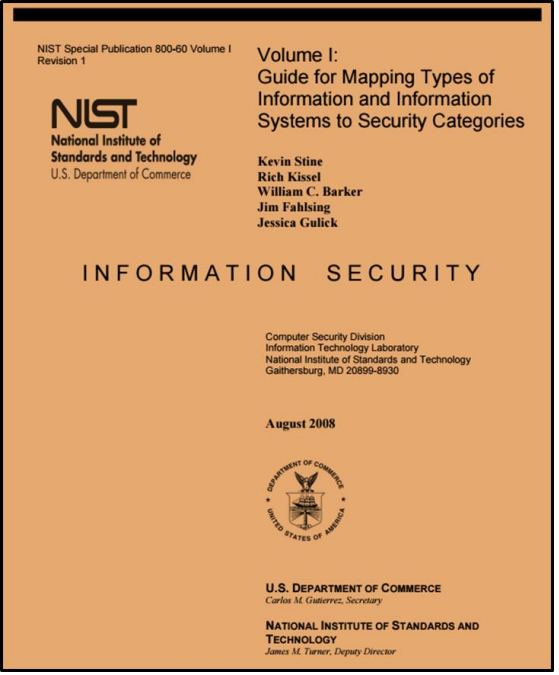
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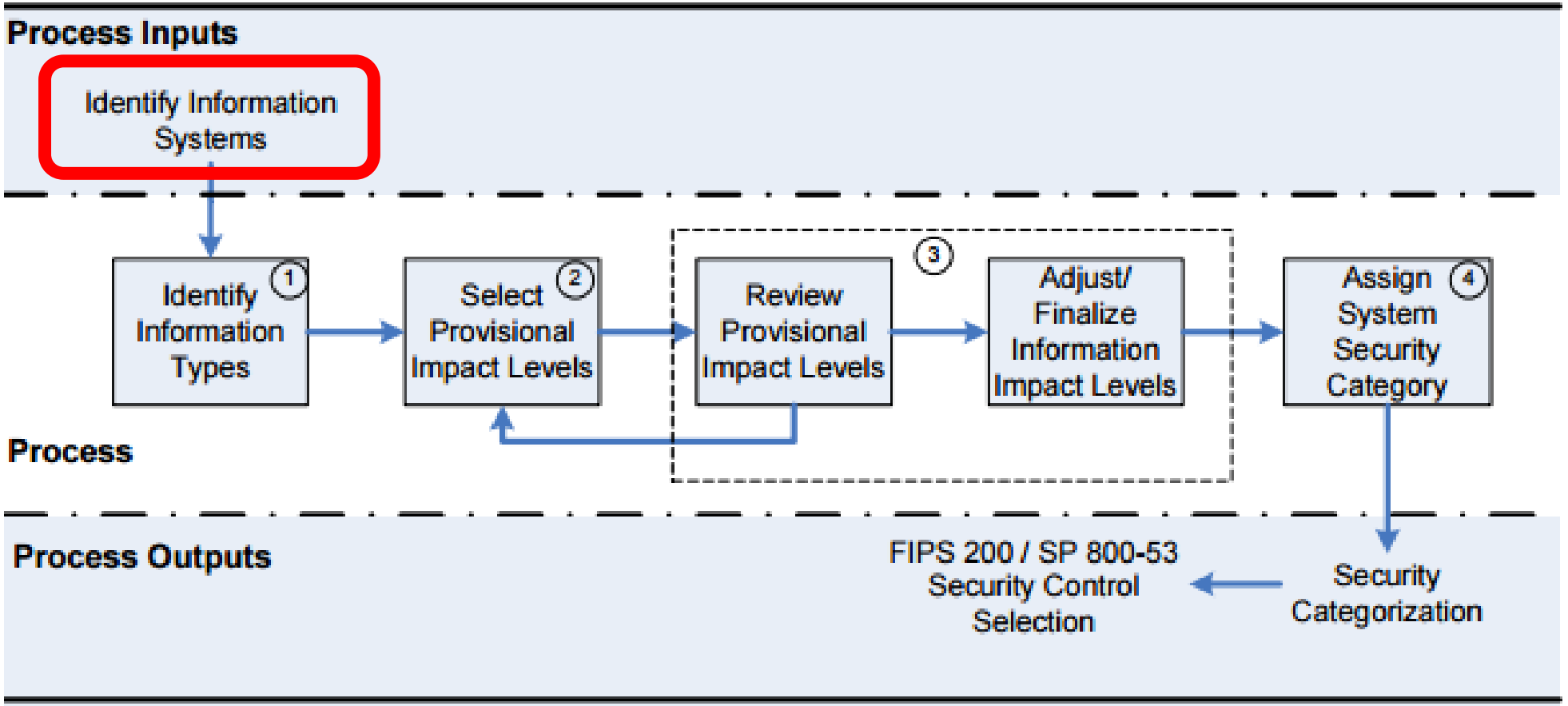
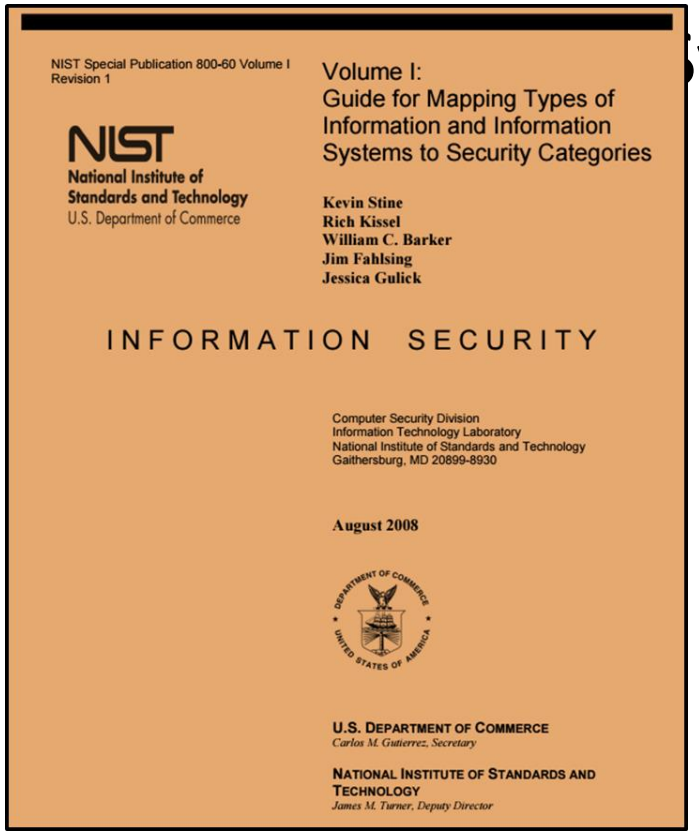


Figure 2: SP 800-60 Security Categorization Process Execution

2 Broad types of Information and Information Systems

1. **Mission-based Information & Information Systems**

2. Management and Support Information & Information Systems



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Mission-based Information and Information Systems

1. Defense and National Security
2. Homeland Security
3. Intelligence Operations
4. Disaster Management
5. International Affairs and Commerce
6. Natural Resources
7. Energy
8. Environmental Management
9. Economic Development
10. Community and Social Services
11. Transportation
12. Education
13. Workforce Management
14. Health
15. Income Security
16. Law Enforcement
17. Litigation and Judicial Activities
18. Federal Correctional Activities
19. General Sciences and Innovation
20. Knowledge Creation and Management
21. Regulatory Compliance and Enforcement
22. Public Goods Creation and Management
23. Federal Financial Assistance
24. Credit and Insurance
25. Transfers to State/Local Governments
26. Direct Services for Citizens

Disaster Management Information Types

D.4 Disaster Management

Disaster Monitoring and Prediction
Disaster Preparedness and Planning
Disaster Repair and Restoration
Emergency Response

Table 4: Mission-Based Information

Mission Areas and Information

D.1 Defense & National Security
Strategic National & Theater Defense
Operational Defense
Tactical Defense

D.2 Homeland Security
Border and Transportation Security
Key Asset and Critical Infrastructure Protection
Catastrophic Defense
Executive Functions of the Executive Office of the President (EOP)

D.3 Intelligence Operations
Intelligence Planning
Intelligence Collection
Intelligence Analysis & Production
Intelligence Dissemination
Intelligence Processing

D.4 Disaster Management
Disaster Monitoring and Prediction
Disaster Preparedness and Planning
Disaster Repair and Restoration
Emergency Response

D.5 International Affairs & Commerce
Foreign Affairs
International Development and Humanitarian Aid
Global Trade

D.6 Natural Resources
Water Resource Management
Conservation, Marine and Land Management
Recreational Resource Management and Tourism
Agricultural Innovation and Services

D.7 Ene
Energy Supply
Energy Conservation a
Energy Resource Man
Energy Production

D.8 Environmenta
Environmental Monito
Forecasting
Environmental Remed
Pollution Prevention a

D.9 Economic D
Business and Industry
Intellectual Property P
Financial Sector Overs
Industry Sector Income Stabilization

D.10 Community & Social Services
Homeownership Promotion
Community and Regional Development
Social Services
Postal Services

D.11 Transportation
Ground Transportation
Water Transportation
Air Transportation
Space Operations

D.12 Education
Elementary, Secondary, and Vocational Education
Higher Education
Cultural and Historic Preservation
Cultural and Historic Exhibition

D.13 Workforce Management
Training and Employment
Labor Rights Management
Worker Safety

D.16 Law Enforcement
Criminal Apprehension
Criminal Investigation and Surveillance
Citizen Protection
Leadership Protection
Property Protection
Substance Control
Crime Prevention
Trade Law Enforcement

D.17 Litigation & Judicial Activities
Judicial Hearings
Legal Defense
Legal Investigation
Legal Prosecution and Litigation
Resolution Facilitation

D.18 Federal Correctional Activities
Criminal Incarceration
Criminal Rehabilitation

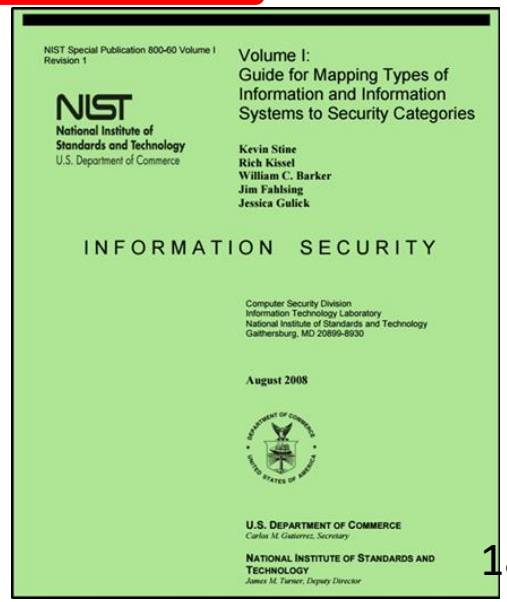
D.19 General Sciences & Innovation
Scientific and Technological Research and Innovation
Space Exploration and Innovation

Mode of Delivery]

D.24 Credit and Insurance
Direct Loans
Loan Guarantees
General Insurance

D.25 Transfers to State/ Local Governments
Formula Grants
Project/Competitive Grants
Earmarked Grants
State Loans

D.26 Direct Services for Citizens
Military Operations
Civilian Operations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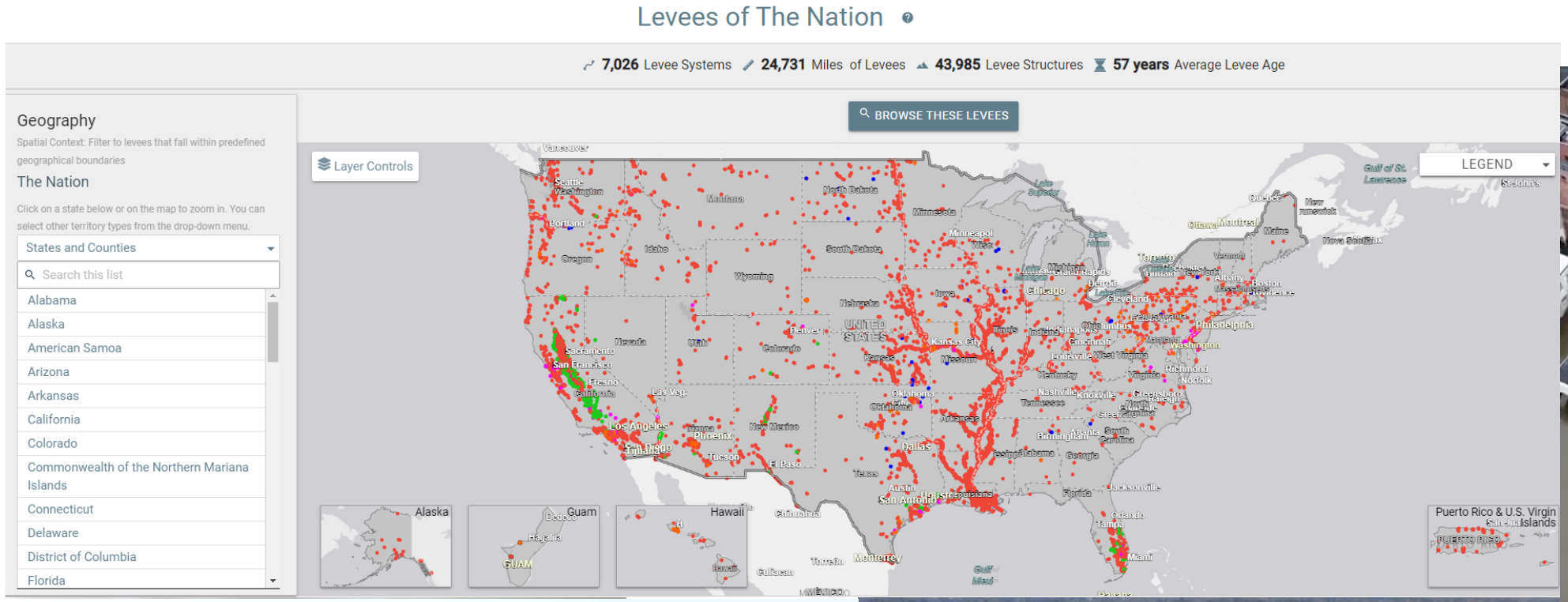
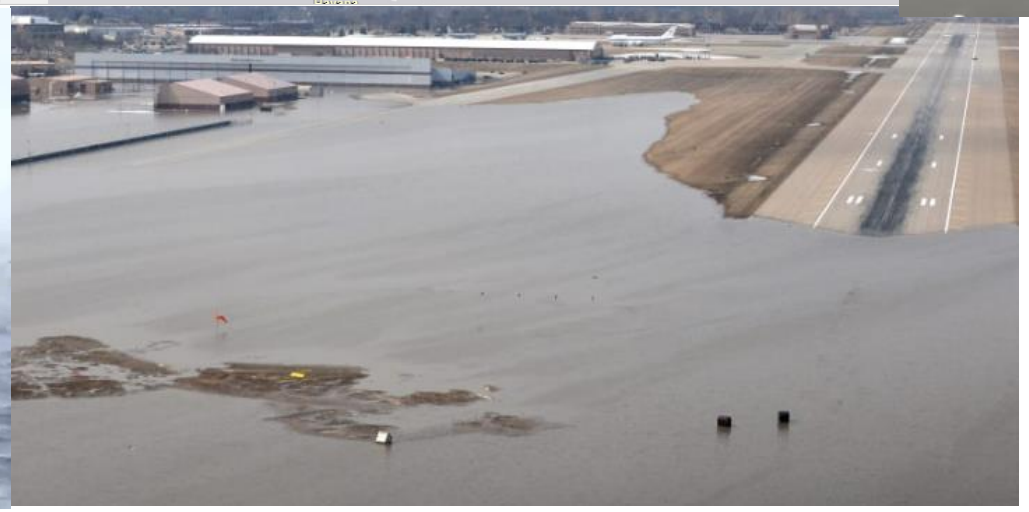
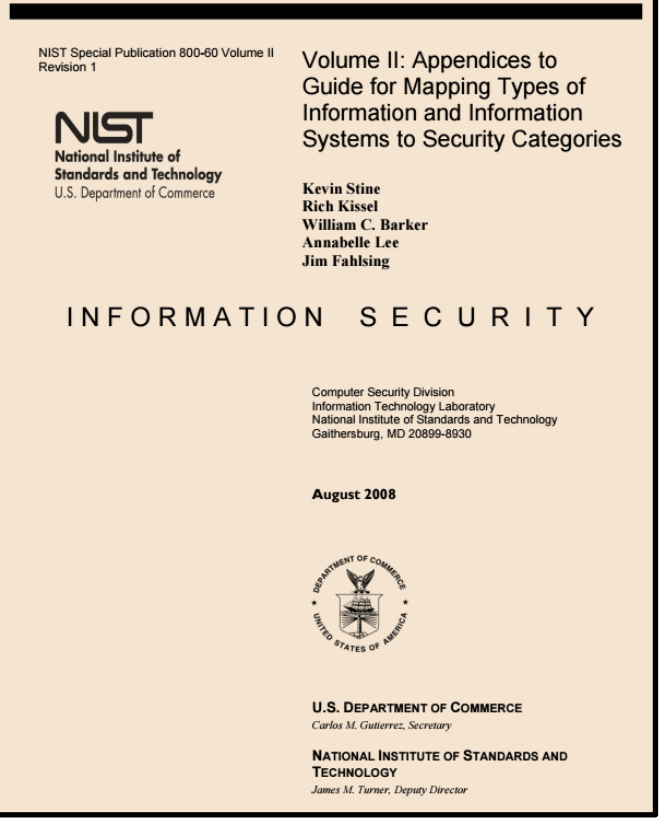
Disaster Management Information System Example





[National Levee Database]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2. Select Provisional Impact Levels for the identified information system

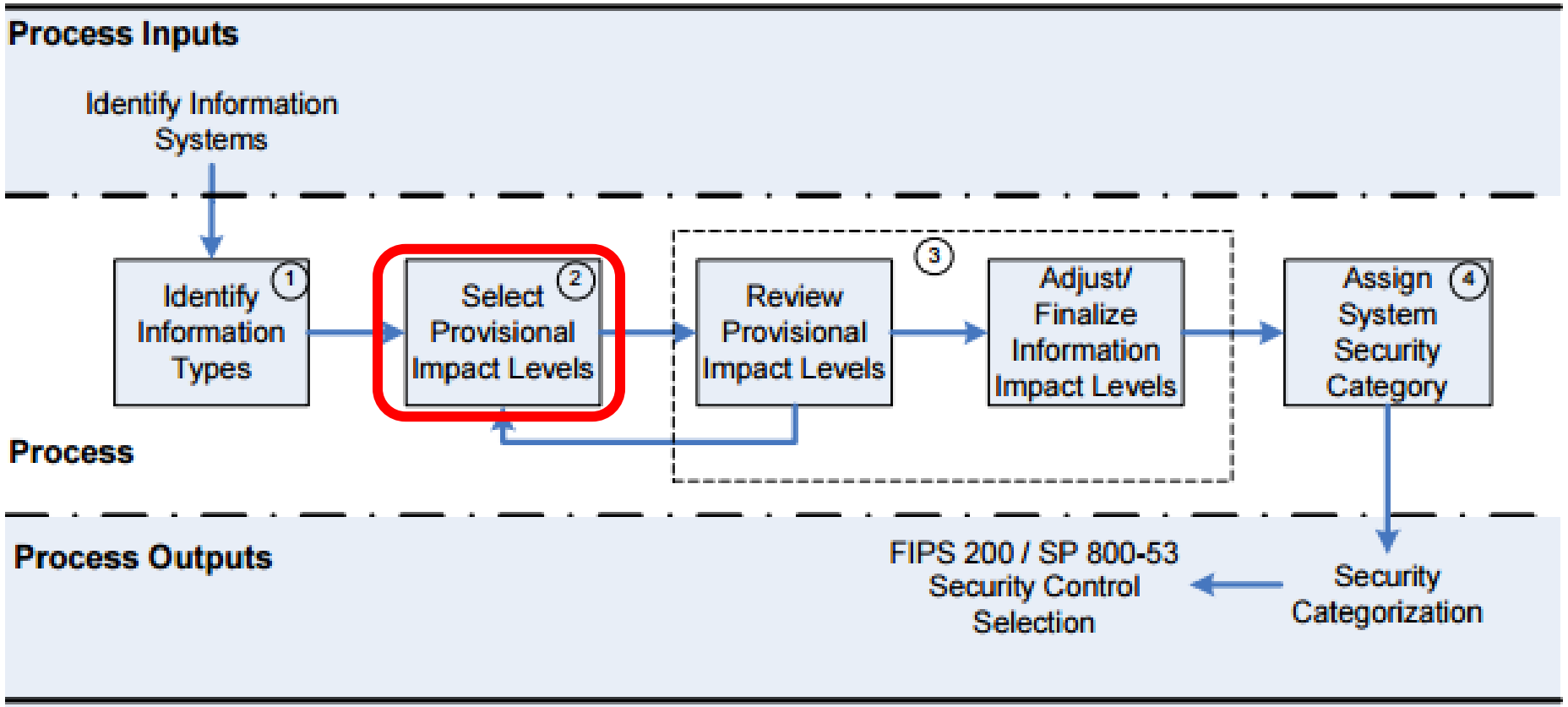

Figure 2: SP 800-60 Security Categorization Process Execution

Disaster Management Information Types

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Disaster Management Information Impact

D.4 Disaster Management

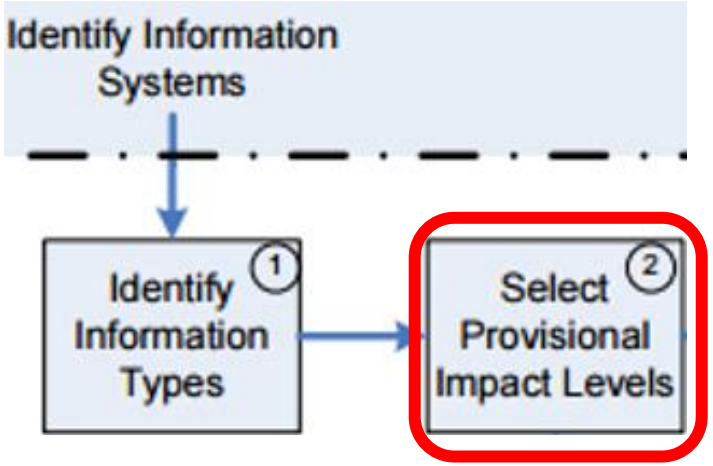
Disaster management involves the activities required to prepare for, mitigate, respond to, and repair the effects of all physical and humanitarian disasters whether natural or man-made. Compromise of much information associated with any of the missions within the disaster management mission area may seriously impact the security of a broad range of critical infrastructures and key national assets.

A spreadsheet is a useful way to organize datasets to categorize an information system

Information Types	Confidentiality	Integrity	Availability
Disaster Monitoring and Prediction			
Disaster Preparedness and Planning			
Disaster Repair and Restoration			
Emergency Response Information Type			

- *NIST SP 800-60 V.2 R1 is helpful for determining a preliminary impact level categorization of Disaster Information Types*

Disaster Management Information Types



D.4.1 Disaster Monitoring and Prediction Information Type

Disaster monitoring and prediction involves the actions taken to predict when and where a disaster may take place and communicate that information to affected parties. [Some disaster management information occurs in humanitarian aid systems under the International Affairs and Commerce line of business (e.g., State Department disaster preparedness and planning).] The recommended provisional categorization of the disaster monitoring and protection information type follows:

Security Category = {(confidentiality, Low), (integrity, High), (availability, High)}

D.4.2 Disaster Preparedness and Planning Information Type

Disaster preparedness and planning involves the development of response programs to be used in case of a disaster. This involves the development of emergency management programs and activities as well as staffing and equipping regional response centers. The recommended provisional categorization of the disaster preparedness and planning information type follows:

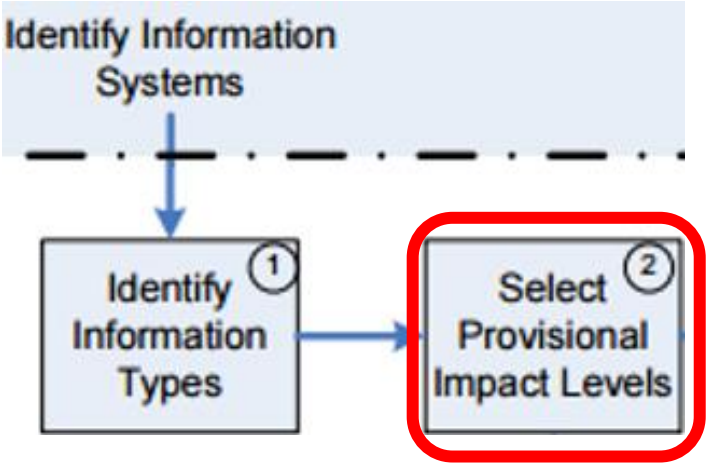
Security Category = {(confidentiality, Low), (integrity, Low), (availability, Low)}

D.4.3 Disaster Repair and Restoration Information Type

Disaster repair and restoration involves the cleanup and restoration activities that take place after a disaster. This involves the cleanup and rebuilding of any homes, buildings, roads, environmental resources, or infrastructure that may be damaged due to a disaster. The recommended provisional categorization of the disaster repair and restoration information type follows:

Security Category = {(confidentiality, Low), (integrity, Low), (availability, Low)}

Disaster Management Information Types



D.4.4 Emergency Response Information Type

Emergency Response involves the immediate actions taken to respond to a disaster (e.g., wildfire management). These actions include providing mobile telecommunications, operational support, power generation, search and rescue, and medical life saving actions. Impacts to emergency response information and the information systems that process and store emergency response information could result in negative impacts on cross-jurisdictional coordination within the critical emergency services infrastructure and the general effectiveness of organizations tasked with emergency response missions. The recommended provisional categorization of the emergency response information type follows:

Security Category = {(confidentiality, Low), (integrity, High), (availability, High)}

Can you recall…

- *How to determine the Summary Impact Levels for the Disaster Information Types*

Disaster Management Information Systems

Information Types	Confidentiality	Integrity	Availability	Summary Impact Level
Disaster Monitoring and Prediction	Low	High	High	?
Disaster Preparedness and Planning	Low	Low	Low	?
Disaster Repair and Restoration	Low	Low	Low	?
Emergency Response Information Type	Low	High	High	?

Can you determine the impact level categorization of an information system based on categorizations of the types of information it contains?

Disaster Management Information Systems

Information Types	Confidentiality	Integrity	Availability	Summary Impact Level
Disaster Monitoring and Prediction	Low	High	High	***High***
Disaster Preparedness and Planning	Low	Low	Low	***Low***
Disaster Repair and Restoration	Low	Low	Low	***Low***
Emergency Response Information Type	Low	High	High	***High***
Information System Impact Ratings:	?	?	?	

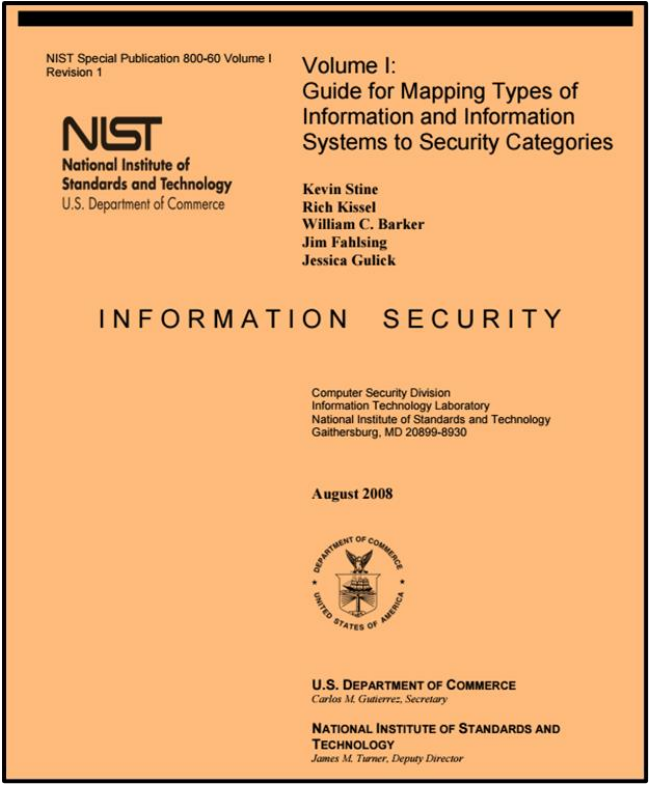
Can you determine the overall security categorization of a Disaster Information System?

Disaster Management Information Systems

Information Types	Confidentiality	Integrity	Availability	Summary Impact Level
Disaster Monitoring and Prediction	Low	High	High	***High***
Disaster Preparedness and Planning	Low	Low	Low	***Low***
Disaster Repair and Restoration	Low	Low	Low	***Low***
Emergency Response Information Type	Low	High	High	***High***
Information System Impact Ratings:	Low	High	High	?

Overall security categorization of a Disaster Information System

Disaster Management Information Systems				
Information Types	Confidentiality	Integrity	Availability	Summary Impact Level
Disaster Monitoring and Prediction	Low	High	High	***High***
Disaster Preparedness and Planning	Low	Low	Low	***Low***
Disaster Repair and Restoration	Low	Low	Low	***Low***
Emergency Response Information Type	Low	High	High	***High***
Information System Impact Ratings:	Low	High	High	***High***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James M. Turner, Deputy Director

Once categorized, select security control baseline for the information system

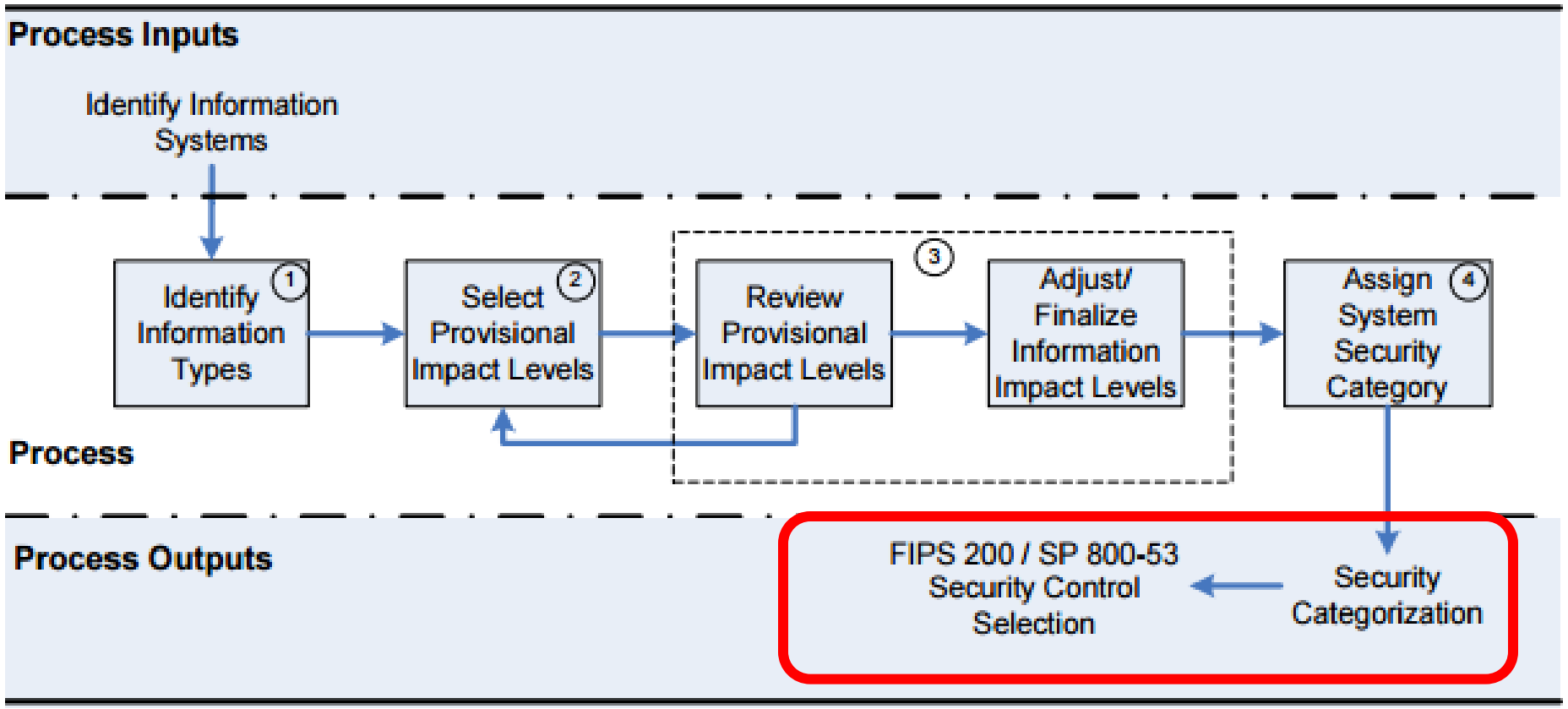
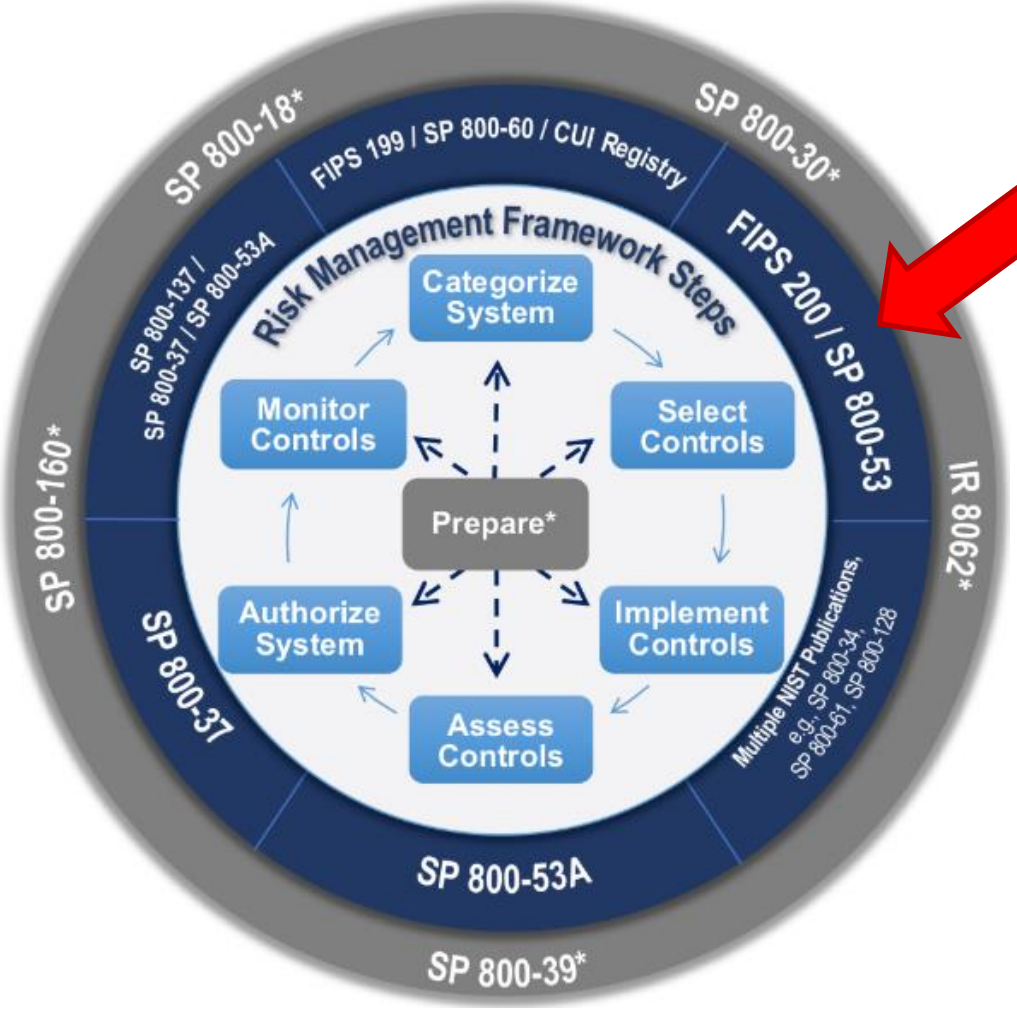
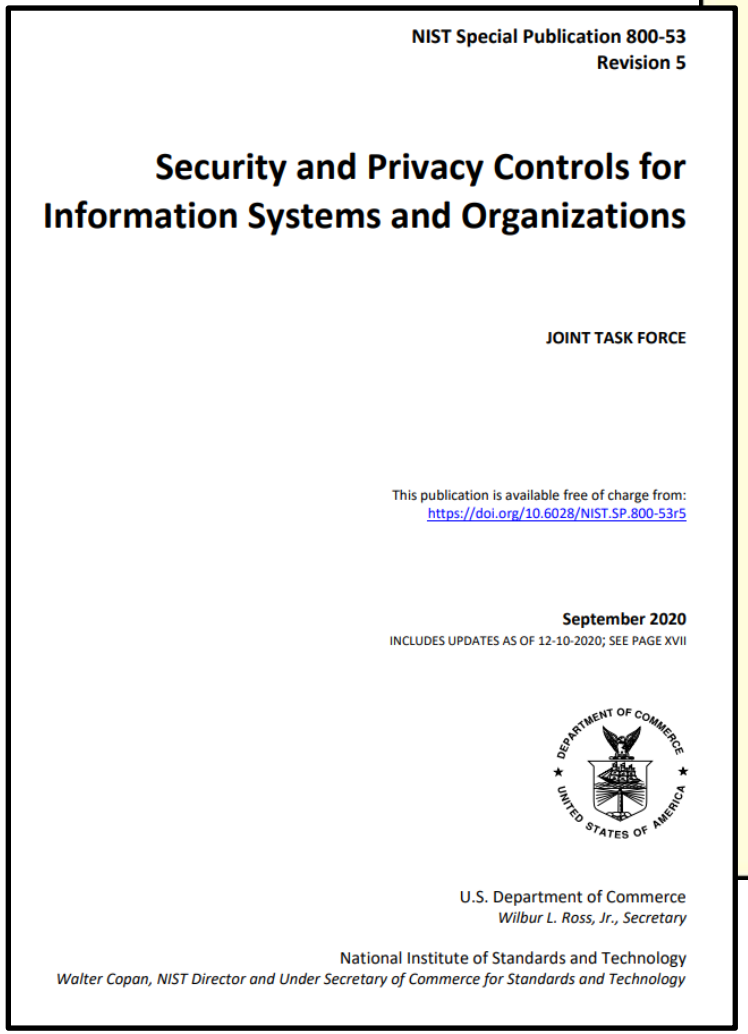


Figure 2: SP 800-60 Security Categorization Process Execution

Selecting cybersecurity risk controls





NIST Special Publication 800-53
Revision 5

Security and Privacy Controls for Information Systems and Organizations

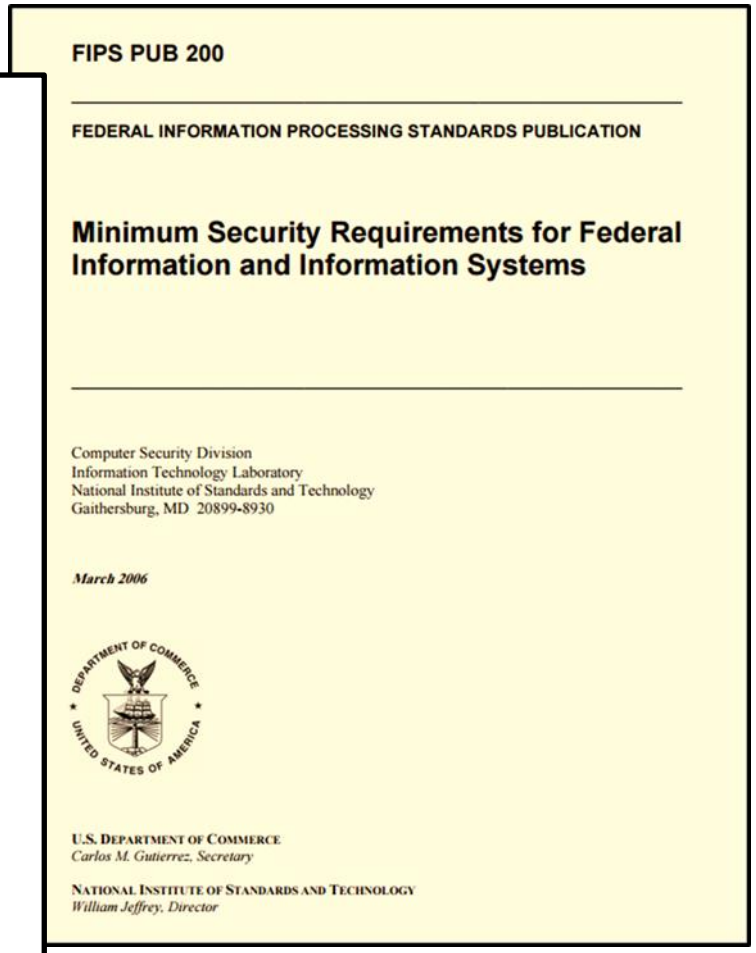
JOINT TASK FORCE

This publication is available free of charge from:
https://doi.org/10.6028/NIST.SP.800-53r5

September 2020
INCLUDES UPDATES AS OF 12-10-2020; SEE PAGE XVII

U.S. Department of Commerce
Wilbur L. Ross, Jr., Secretary

National Institute of Standards and Technology
Walter Copan, NIST Director and Under Secretary of Commerce for Standards and Technology



FIPS PUB 200

FEDERAL INFORMATION PROCESSING STANDARDS PUBLICATION

Minimum Security Requirements for Federal Information and Information Systems

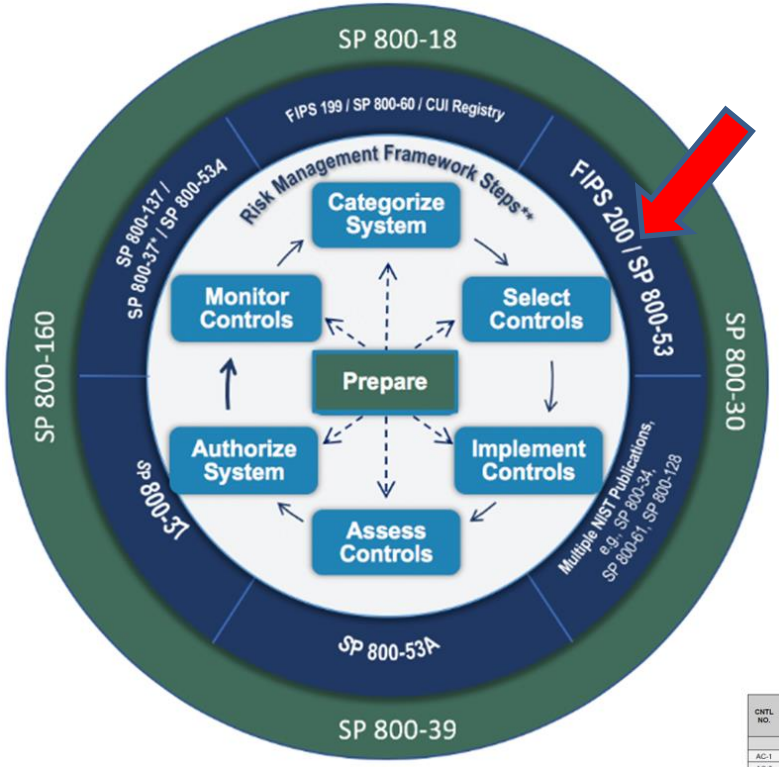
Computer Security Division
Information Technology Laboratory
National Institute of Standards and Technology
Gaithersburg, MD 20899-8930

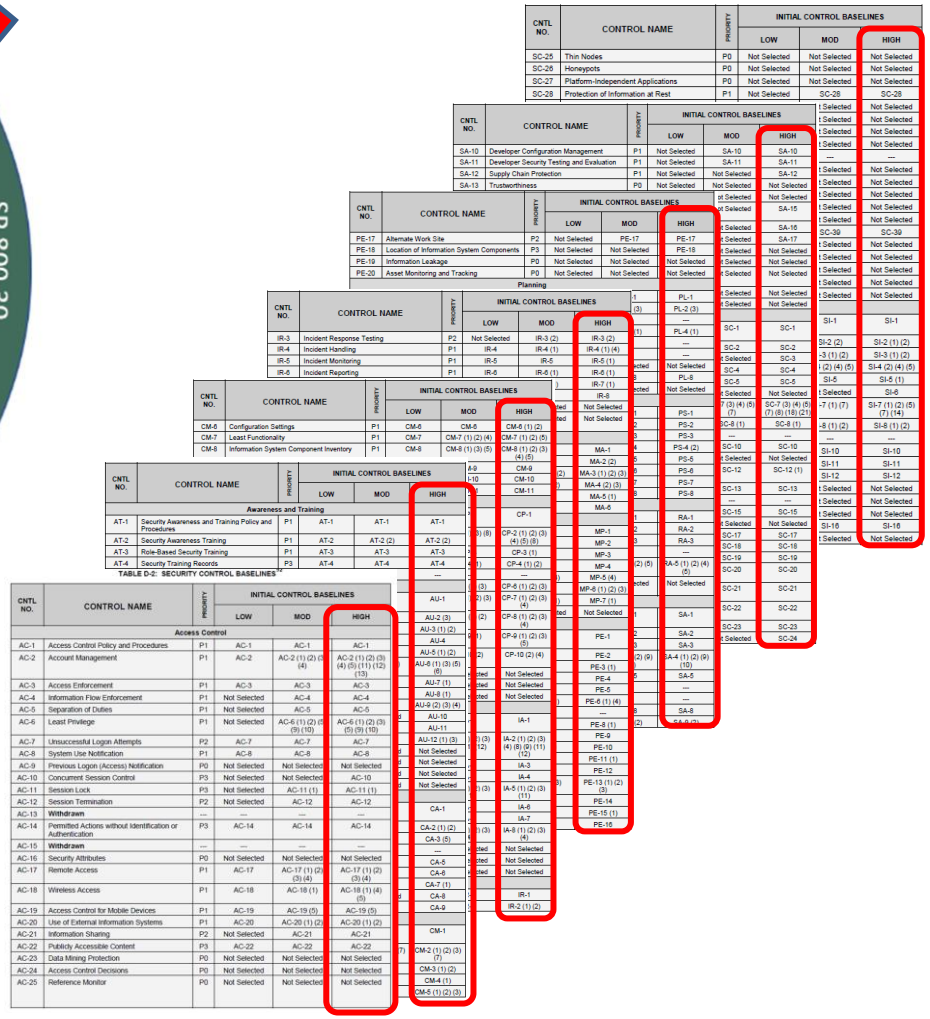
March 2006

U.S. DEPARTMENT OF COMMERCE
Carlos M. Gutierrez, Secretary

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
William Jeffrey, Director

FIPS 199 categorization is used to select among 3 security control baselines of security controls





CNTL NO.	CONTROL NAME	PRIORITY	INITIAL CONTROL BASELINES		
			LOW	MOD	HIGH
Access Control					
AC-1	Access Control Policy and Procedures	P1	AC-1	AC-1	AC-1
AC-2	Account Management	P1	AC-2	AC-2 (1) (2) (3) (4)	AC-2 (1) (2) (3) (4) (5) (11) (12) (13)
AC-3	Access Enforcement	P1	AC-3	AC-3	AC-3
AC-4	Information Flow Enforcement	P1	Not Selected	AC-4	AC-4
AC-5	Separation of Duties	P1	Not Selected	AC-5	AC-5
AC-6	Least Privilege	P1	Not Selected	AC-6 (1) (2) (3) (9) (10)	AC-6 (1) (2) (3) (5) (9) (10)
AC-7	Unsuccessful Logon Attempts	P2	AC-7	AC-7	AC-7
AC-8	System Use Notification	P1	AC-8	AC-8	AC-8
AC-9	Previous Logon (Access) Notification	P0	Not Selected	Not Selected	Not Selected
AC-10	Concurrent Session Control	P3	Not Selected	Not Selected	AC-10
AC-11	Session Lock	P3	Not Selected	AC-11 (1)	AC-11 (1)
AC-12	Session Termination	P2	Not Selected	AC-12	AC-12
AC-13	**Withdrawn**	---	---	---	---
AC-14	Permitted Actions without Identification or Authentication	P3	AC-14	AC-14	AC-14
AC-15	**Withdrawn**	---	---	---	---
AC-16	Security Attributes	P0	Not Selected	Not Selected	Not Selected
AC-17	Remote Access	P1	AC-17	AC-17 (1) (2) (3) (4)	AC-17 (1) (2) (3) (4)
AC-18	Wireless Access	P1	AC-18	AC-18 (1)	AC-18 (1) (4) (5)
AC-19	Access Control for Mobile Devices	P1	AC-19	AC-19 (5)	AC-19 (5)
AC-20	Use of External Information Systems	P1	AC-20	AC-20 (1) (2)	AC-20 (1) (2)
AC-21	Information Sharing	P2	Not Selected	AC-21	AC-21
AC-22	Publicly Accessible Content	P3	AC-22	AC-22	AC-22
AC-23	Data Mining Protection	P0	Not Selected	Not Selected	Not Selected
AC-24	Access Control Decisions	P0	Not Selected	Not Selected	Not Selected
AC-25	Reference Monitor	P0	Not Selected	Not Selected	Not Selected

CNTL NO.	CONTROL NAME	PRIORITY	INITIAL CONTROL BASELINES		
			LOW	MOD	HIGH
Awareness and Training					
AT-1	Security Awareness and Training Policy and Procedures	P1	AT-1	AT-1	AT-1
AT-2	Security Awareness Training	P1	AT-2	AT-2 (2)	AT-2 (2)
AT-3	Role-Based Security Training	P1	AT-3	AT-3	AT-3
AT-4	Security Training Records	P3	AT-4	AT-4	AT-4

TABLE D-2: SECURITY CONTROL BASELINES

CNTL NO.	CONTROL NAME	PRIORITY	INITIAL CONTROL BASELINES		
			LOW	MOD	HIGH
Planning					
PL-1	Security Planning Policy and Procedures	P1	PL-1	PL-1	PL-1
PL-2	System Security Plan	P1	PL-2 (3)	PL-2 (3)	PL-2 (3)
PL-3	**Withdrawn**	---	---	---	---
PL-4	Rules of Behavior	P2	PL-4 (1)	PL-4 (1)	PL-4 (1)
PL-5	**Withdrawn**	---	---	---	---
PL-6	**Withdrawn**	---	---	---	---
PL-7	Security Concept of Operations	P0	Not Selected	Not Selected	Not Selected
PL-8	Information Security Architecture	P1	PL-8	PL-8	PL-8
PL-9	Central Management	P0	Not Selected	Not Selected	Not Selected
PL-10	Security Plan Template	P0	Not Selected	Not Selected	Not Selected
PL-11	Baseline Tailoring	P0	Not Selected	Not Selected	Not Selected

CNTL NO.	CONTROL NAME	PRIORITY	INITIAL CONTROL BASELINES		
			LOW	MOD	HIGH
Personnel Security					
PS-1	Personnel Security Policy and Procedures	P1	PS-1	PS-1	PS-1
PS-2	Position Risk Designation	P1	PS-2	PS-2	PS-2
PS-3	Personnel Screening	P1	PS-3	PS-3	PS-3
PS-4	Personnel Termination	P2	PS-4 (2)	PS-4 (2)	PS-4 (2)
PS-5	Personnel Transfer	P2	PS-5	PS-5	PS-5
PS-6	Access Agreements	P3	PS-6	PS-6	PS-6
PS-7	Third-Party Personnel Security	P1	PS-7	PS-7	PS-7
PS-8	Personnel Sanction	P3	PS-8	PS-8	PS-8

CNTL NO.	CONTROL NAME	PRIORITY	INITIAL CONTROL BASELINES		
			LOW	MOD	HIGH
Risk Assessment					
RA-1	Risk Assessment Policy and Procedures	P1	RA-1	RA-1	RA-1
RA-2	Security Categorization	P1	RA-2	RA-2	RA-2
RA-3	Risk Assessment	P1	RA-3	RA-3	RA-3
RA-4	**Withdrawn**	---	---	---	---
RA-5	Vulnerability Scanning	P1	RA-5 (1) (2) (4) (5)	RA-5 (1) (2) (4) (5)	RA-5 (1) (2) (4) (5)
RA-6	Technical Surveillance Countermeasures Survey	P0	Not Selected	Not Selected	Not Selected

CNTL NO.	CONTROL NAME	PRIORITY	INITIAL CONTROL BASELINES		
			LOW	MOD	HIGH
System and Services Acquisition					
SA-1	System and Services Acquisition Policy and Procedures	P1	SA-1	SA-1	SA-1
SA-2	Allocation of Resources	P1	SA-2	SA-2	SA-2
SA-3	System Development Life Cycle	P1	SA-3	SA-3	SA-3
SA-4	Acquisition Process	P1	SA-4 (10)	SA-4 (1) (2) (9) (10)	SA-4 (1) (2) (9) (10)
SA-5	**Withdrawn**	---	---	---	---
SA-6	**Withdrawn**	---	---	---	---
SA-7	**Withdrawn**	---	---	---	---
SA-8	Security Engineering Principles	P1	SA-8	SA-8	SA-8
SA-9	External Information System Services	P1	SA-9 (2)	SA-9 (2)	SA-9 (2)
SA-10	Developer Configuration Management	P1	Not Selected	SA-10	SA-10
SA-11	Developer Security Testing and Evaluation	P1	Not Selected	SA-11	SA-11
SA-12	Supply Chain Protection	P1	Not Selected	Not Selected	SA-12
SA-13	Trustworthiness	P0	Not Selected	Not Selected	Not Selected
SA-14	Critical Information System Components	P0	Not Selected	Not Selected	Not Selected
SA-15	Development Process, Standards, and Tools	P2	Not Selected	Not Selected	SA-15
SA-16	Developer-Provided Training	P2	Not Selected	Not Selected	SA-16
SA-17	Developer Security Architecture and Design	P1	Not Selected	Not Selected	SA-17
SA-18	**Withdrawn**	---	---	---	---
SA-19	**Withdrawn**	---	---	---	---
SA-20	Customized Development of Critical Components	P0	Not Selected	Not Selected	Not Selected
SA-21	Developer Screening	P1	Not Selected	Not Selected	Not Selected
SA-22	Unsupported System Components	P1	Not Selected	Not Selected	Not Selected

CNTL NO.	CONTROL NAME	PRIORITY	INITIAL CONTROL BASELINES		
			LOW	MOD	HIGH
System and Communications Protection					
SC-1	System and Communications Protection Policy and Procedures	P1	SC-1	SC-1	SC-1
SC-2	Application Partitioning	P1	Not Selected	SC-2	SC-2
SC-3	Security Function Isolation	P1	Not Selected	Not Selected	SC-3
SC-4	Information in Shared Resources	P1	Not Selected	SC-4	SC-4
SC-5	Denial of Service Protection	P1	SC-5 (1)	SC-5 (1)	SC-5 (1)
SC-6	Resource Availability	P0	Not Selected	Not Selected	Not Selected
SC-7	Boundary Protection	P1	SC-7 (3) (4) (5) (7)	SC-7 (3) (4) (5) (7) (8) (18) (21)	SC-7 (3) (4) (5) (7) (8) (18) (21)
SC-8	Transmission Confidentiality and Integrity	P1	Not Selected	SC-8 (1)	SC-8 (1)
SC-9	**Withdrawn**	---	---	---	---
SC-10	Network Disconnect	P2	Not Selected	SC-10	SC-10
SC-11	Trusted Path	P0	Not Selected	Not Selected	Not Selected
SC-12	Cryptographic Key Establishment and Management	P1	SC-12	SC-12 (1)	SC-12 (1)
SC-13	Cryptographic Protection	P1	SC-13	SC-13	SC-13
SC-14	**Withdrawn**	---	---	---	---
SC-15	Collaborative Computing Devices	P1	SC-15	SC-15	SC-15
SC-16	Transmission of Security Attributes	P0	Not Selected	Not Selected	Not Selected
SC-17	Public Key Infrastructure Certificates	P1	SC-17	SC-17	SC-17
SC-18	Mobile Code	P2	Not Selected	SC-18	SC-18
SC-19	Voice Over Internet Protocol	P1	SC-19	SC-19	SC-19
SC-20	Secure Name /Address Resolution Service (Authoritative Source)	P1	SC-20	SC-20	SC-20
SC-21	Secure Name /Address Resolution Service (Recursive or Caching Resolver)	P1	SC-21	SC-21	SC-21
SC-22	Architecture and Provisioning for Name/Address Resolution Service	P1	SC-22	SC-22	SC-22
SC-23	Session Authenticity	P1	SC-23	SC-23	SC-23
SC-24	Fail in Known State	P0	Not Selected	Not Selected	SC-24
SC-25	Thin Nodes	P0	Not Selected	Not Selected	Not Selected
SC-26	Honeypots	P0	Not Selected	Not Selected	Not Selected
SC-27	Platform-Independent Applications	P0	Not Selected	Not Selected	Not Selected
SC-28	Protection of Information at Rest	P1	Not Selected	SC-28	SC-28
SC-29	Heterogeneity	P0	Not Selected	Not Selected	Not Selected
SC-30	Concealment and Misdirection	P0	Not Selected	Not Selected	Not Selected
SC-31	Covert Channel Analysis	P0	Not Selected	Not Selected	Not Selected
SC-32	Information System Partitioning	P1	Not Selected	Not Selected	Not Selected
SC-33	**Withdrawn**	---	---	---	---
SC-34	Non-Modifiable Executable Programs	P0	Not Selected	Not Selected	Not Selected
SC-35	Honeyclients	P0	Not Selected	Not Selected	Not Selected
SC-36	Distributed Processing and Storage	P0	Not Selected	Not Selected	Not Selected
SC-37	Out-of-Band Channels	P0	Not Selected	Not Selected	Not Selected
SC-38	Operations Security	P0	Not Selected	Not Selected	Not Selected
SC-39	Process Isolation	P1	SC-39	SC-39	SC-39
SC-40	Wireless Link Protection	P0	Not Selected	Not Selected	Not Selected
SC-41	Port and I/O Device Access	P0	Not Selected	Not Selected	Not Selected
SC-42	Sensor Capability and Data	P0	Not Selected	Not Selected	Not Selected
SC-43	Usage Restrictions	P0	Not Selected	Not Selected	Not Selected
SC-44	Detonation Chambers	P0	Not Selected	Not Selected	Not Selected

CNTL NO.	CONTROL NAME	PRIORITY	INITIAL CONTROL BASELINES		
			LOW	MOD	HIGH
System and Information Integrity					
SI-1	System and Information Integrity Policy and Procedures	P1	SI-1	SI-1	SI-1
SI-2	Flaw Remediation	P2	SI-2 (2)	SI-2 (2)	SI-2 (1) (2)
SI-3	Malicious Code Protection	P1	SI-3 (1) (2)	SI-3 (1) (2)	SI-3 (1) (2)
SI-4	Information System Monitoring	P1	SI-4 (2) (4) (5)	SI-4 (2) (4) (5)	SI-4 (2) (4) (5)
SI-5	Security Alerts, Advisories, and Directives	P1	SI-5	SI-5	SI-5 (1)
SI-6	Security Functionality Verification	P0	Not Selected	Not Selected	SI-6
SI-7	Software, Firmware, and Information Integrity	P1	SI-7 (1) (7)	SI-7 (1) (2) (5) (7) (14)	SI-7 (1) (2) (5) (7) (14)
SI-8	Spam Protection	P2	SI-8 (1) (2)	SI-8 (1) (2)	SI-8 (1) (2)
SI-9	**Withdrawn**	---	---	---	---
SI-10	Information Input Validation	P1	SI-10	SI-10	SI-10
SI-11	Error Handling	P2	SI-11	SI-11	SI-11
SI-12	Information Handling and Retention	P2	SI-12	SI-12	SI-12
SI-13	Predictable Failure Prevention	P0	Not Selected	Not Selected	Not Selected
SI-14	Non-Persistence	P0	Not Selected	Not Selected	Not Selected
SI-15	Information Output Filtering	P0	Not Selected	Not Selected	SI-15
SI-16	Memory Protection	P1	Not Selected	Not Selected	Not Selected
SI-17	Fail-Safe Procedures	P0	Not Selected	Not Selected	Not Selected

CNTL NO.	CONTROL NAME	PRIORITY	INITIAL CONTROL BASELINES		
			LOW	MOD	HIGH
Awareness and Training					
AT-1	Security Awareness and Training Policy and Procedures	P1	AT-1	AT-1	AT-1
AT-2	Security Awareness Training	P1	AT-2	AT-2 (2)	AT-2 (2)
AT-3	Role-Based Security Training	P1	AT-3	AT-3	AT-3
AT-4	Security Training Records	P3	AT-4	AT-4	AT-4
AT-5	**Withdrawn**	---	---	---	---
Audit and Accountability					
AU-1	Audit and Accountability Policy and Procedures	P1	AU-1	AU-1	AU-1
AU-2	Audit Events	P1	AU-2	AU-2 (3)	AU-2 (3)
AU-3	Content of Audit Records	P1	AU-3	AU-3 (1)	AU-3 (1) (2)
AU-4	Audit Storage Capacity	P1	AU-4	AU-4	AU-4
AU-5	Response to Audit Processing Failures	P1	AU-5	AU-5	AU-5 (1) (2)
AU-6	Audit Review, Analysis, and Reporting	P1	AU-6	AU-6 (1) (3)	AU-6 (1) (3) (5) (6)
AU-7	Audit Reduction and Report Generation	P2	Not Selected	AU-7 (1)	AU-7 (1)
AU-8	Time Stamps	P1	AU-8	AU-8 (1)	AU-8 (1)
AU-9	Protection of Audit Information	P1	AU-9	AU-9 (4)	AU-9 (2) (3) (4)
AU-10	Non-repudiation	P2	Not Selected	Not Selected	AU-10
AU-11	Audit Record Retention	P3	AU-11	AU-11	AU-11
AU-12	Audit Generation	P1	AU-12	AU-12	AU-12 (1) (3)
AU-13	Monitoring for Information Disclosure	P0	Not Selected	Not Selected	Not Selected
AU-14	Session Audit	P0	Not Selected	Not Selected	Not Selected
AU-15	Alternate Audit Capability	P0	Not Selected	Not Selected	Not Selected
AU-16	Cross-Organizational Auditing	P0	Not Selected	Not Selected	Not Selected
Security Assessment and Authorization					
CA-1	Security Assessment and Authorization Policies and Procedures	P1	CA-1	CA-1	CA-1
CA-2	Security Assessments	P2	CA-2	CA-2 (1)	CA-2 (1) (2)
CA-3	System Interconnections	P1	CA-3	CA-3 (5)	CA-3 (5)
CA-4	**Withdrawn**	---	---	---	---
CA-5	Plan of Action and Milestones	P3	CA-5	CA-5	CA-5
CA-6	Security Authorization	P2	CA-6	CA-6	CA-6
CA-7	Continuous Monitoring	P2	CA-7	CA-7 (1)	CA-7 (1)
CA-8	Penetration Testing	P2	Not Selected	Not Selected	CA-8
CA-9	Internal System Connections	P2	CA-9	CA-9	CA-9
Configuration Management					
CM-1	Configuration Management Policy and Procedures	P1	CM-1	CM-1	CM-1
CM-2	Baseline Configuration	P1	CM-2	CM-2 (1) (3) (7)	CM-2 (1) (2) (3) (7)
CM-3	Configuration Change Control	P1	Not Selected	CM-3 (2)	CM-3 (1) (2)
CM-4	Security Impact Analysis	P2	CM-4	CM-4	CM-4 (1)
CM-5	Access Restrictions for Change	P1	Not Selected	CM-5	CM-5 (1) (2) (3)

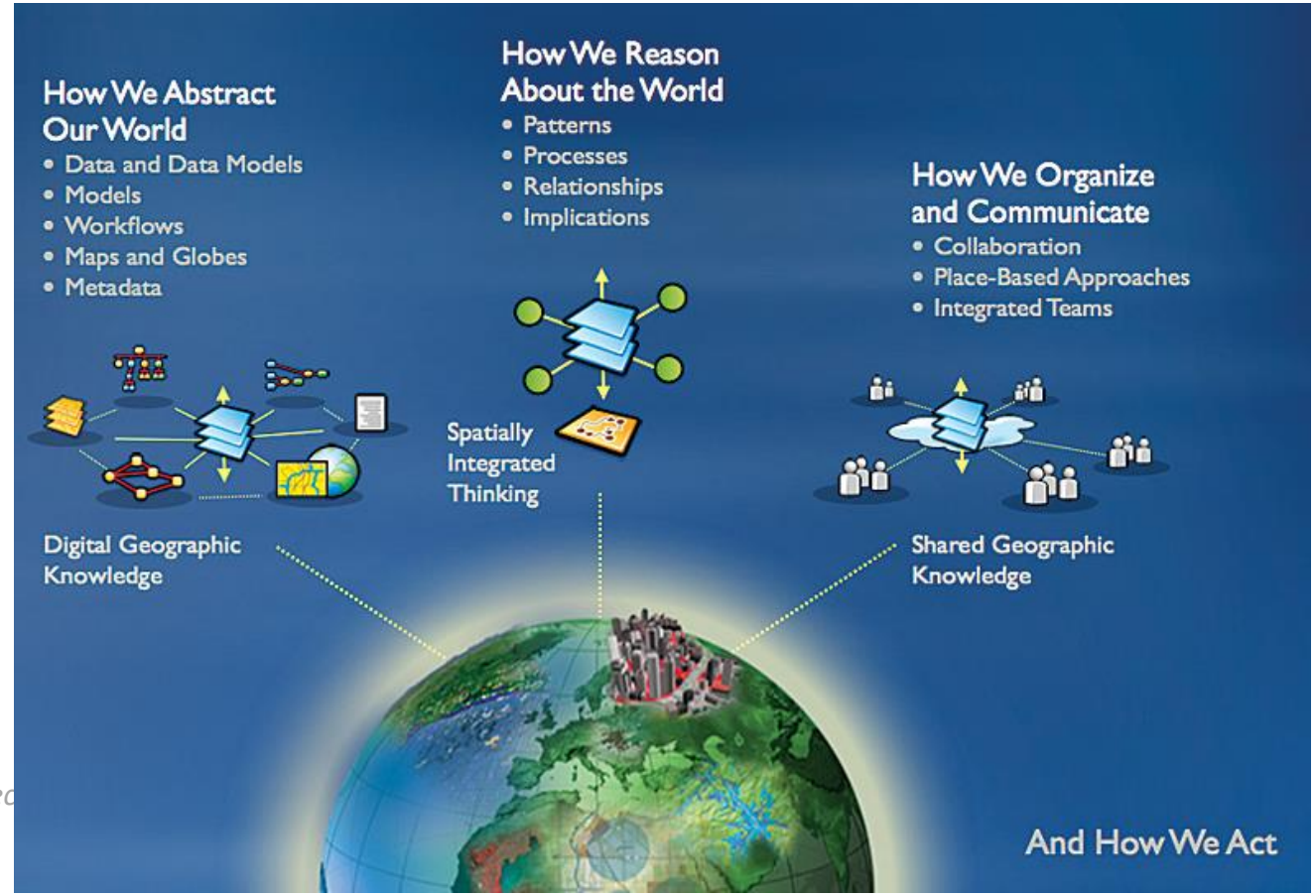
Agenda

- ✓ In The News
- ✓ Categorizing Information for IT Risk Management
- Revisit Risk & Controls of Publicly Shared Geographic Information
- More on Confidentiality: Linked & Linkable PII
- Risk Evaluation
- Risk Management Techniques, a brief review
- Test taking tip
- Quiz

Geographic information, for example, is important

Free flow of geographic information between government and public is recognized as essential to the Nation

- ***Informs public for participation in democratic decision making***
- ***Private businesses reuse the public's investment in government information***



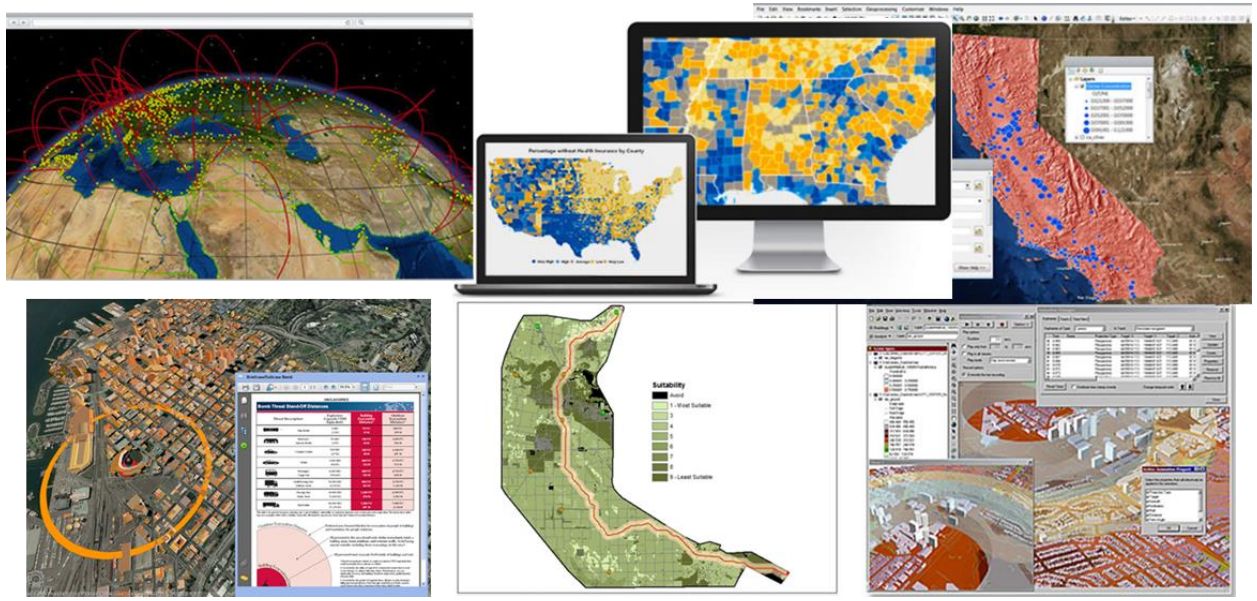
Disseminating public geospatial data is central to the missions of many public, private and non-profit organizations

From ESRI Marketing material

Geographic data's role in government

Geographic location is a key element of 80-90% of all governmental data

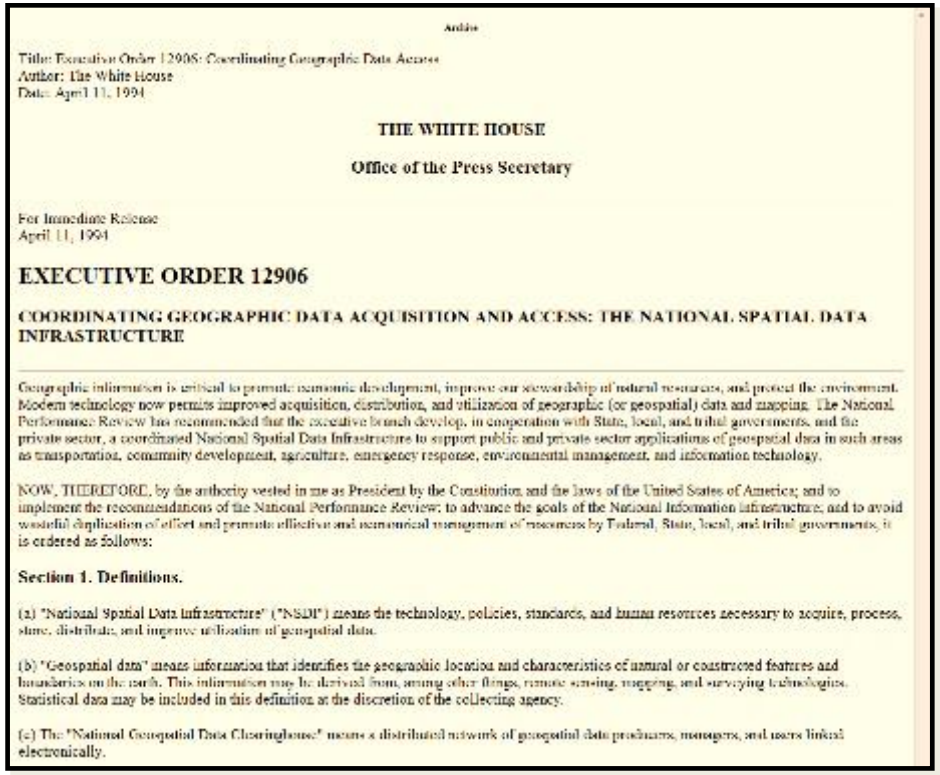
Data produced with Geographic Information Systems (GIS) are essential to >50% of U.S. domestic economic activities



National Spatial Data Infrastructure

1994 Executive Order instructed Federal Geographic Data Committee (FGDC) to create National Spatial Data Infrastructure (NSDI), and…

- Address $ billions wasted
  - Redundant collection of undocumented hard to find geospatial data stored in incompatible formats
- Encourage Agencies to stand-up NSDI Clearing House nodes (i.e. websites on Internet)
  - Populated with geospatial data and their descriptive metadata



Archive

Title: Executive Order 12906: Coordinating Geographic Data Access
Author: The White House
Date: April 11, 1994

THE WHITE HOUSE

Office of the Press Secretary

For Immediate Release
April 11, 1994

EXECUTIVE ORDER 12906

COORDINATING GEOGRAPHIC DATA ACQUISITION AND ACCESS: THE NATIONAL SPATIAL DATA INFRASTRUCTURE

Geographic information is critical to promote economic development, improve our stewardship of natural resources, and protect the environment. Modern technology now permits improved acquisition, distribution, and utilization of geographic (or geospatial) data and mapping. The National Performance Review has recommended that the executive branch develop, in cooperation with State, local, and tribal governments, and the private sector, a coordinated National Spatial Data Infrastructure to support public and private sector applications of geospatial data in such areas as transportation, community development, agriculture, emergency response, environmental management, and information technology.

NOW, THEREFORE, by the authority vested in me as President by the Constitution and the laws of the United States of America, and to implement the recommendations of the National Performance Review; to advance the goals of the National Information Infrastructure; and to avoid wasteful duplication of effort and promote effective and economical management of resources by Federal, State, local, and tribal governments, it is ordered as follows:

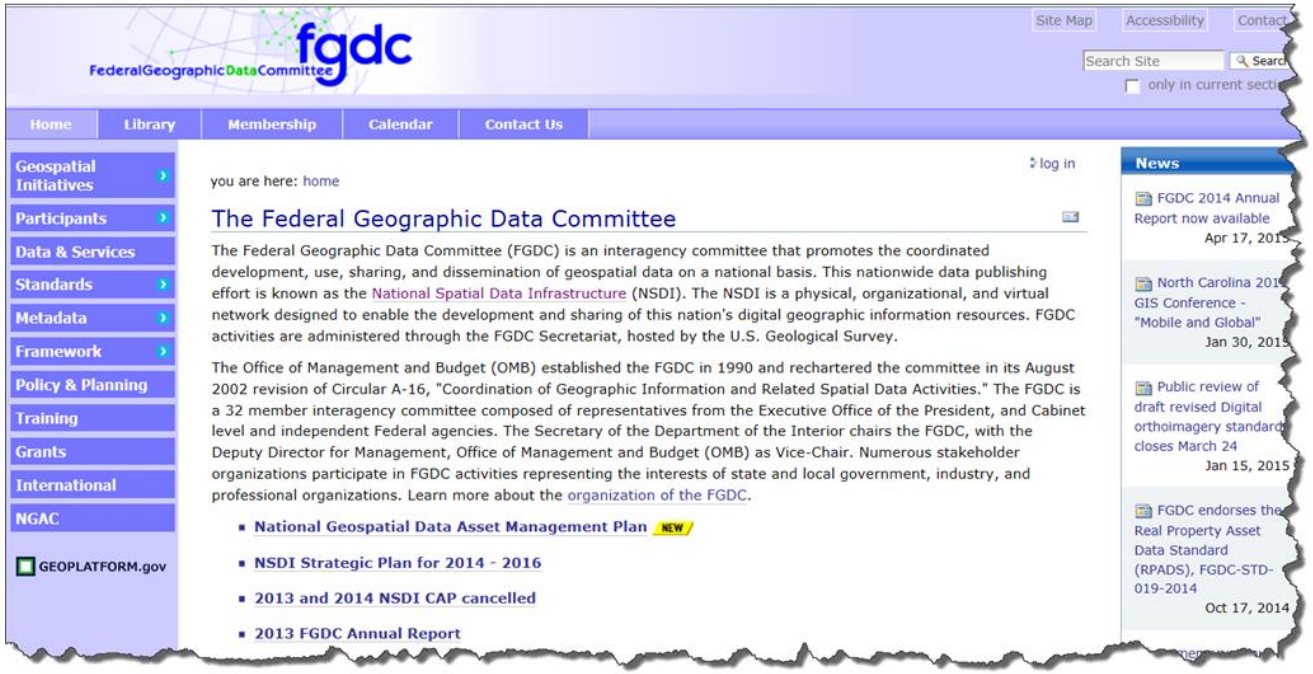
Section 1. Definitions.

(a) "National Spatial Data Infrastructure" ("NSDI") means the technology, policies, standards, and human resources necessary to acquire, process, store, distribute, and improve utilization of geospatial data.

(b) "Geospatial data" means information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the earth. This information may be derived from, among other things, remote sensing, mapping, and surveying technologies. Statistical data may be included in this definition at the discretion of the collecting agency.

(c) The "National Geospatial Data Clearinghouse" means a distributed network of geospatial data producers, managers, and users linked electronically.

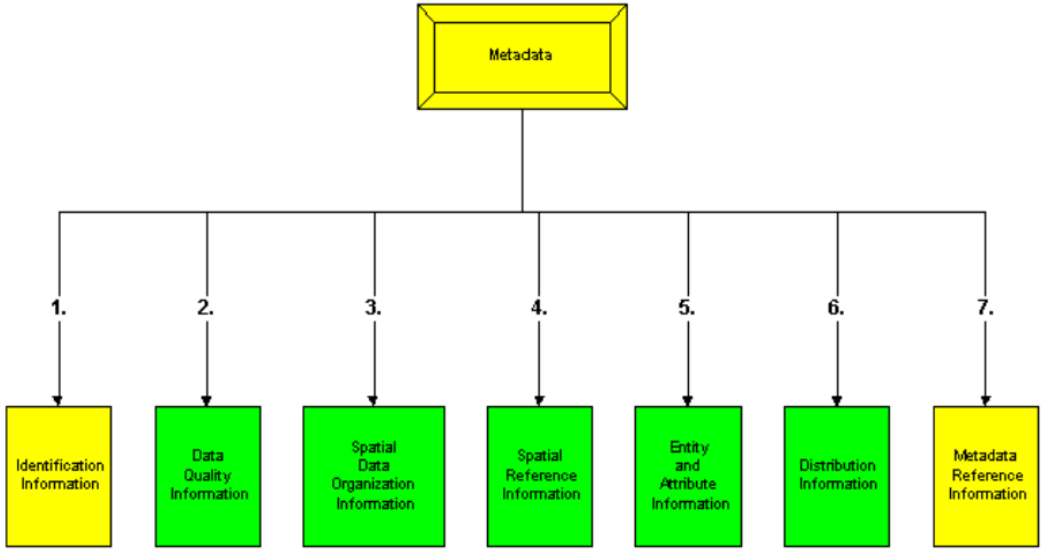
Public GIS data are shared and distributed via the Internet-based National Spatial Data Infrastructure

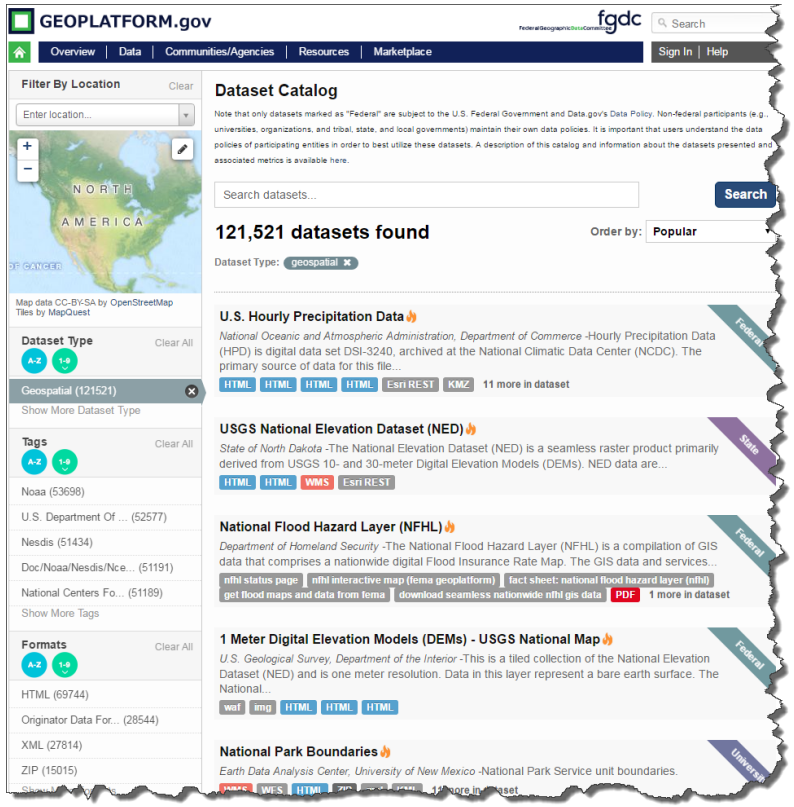


National Spatial Data Infrastructure

National Spatial Data Infrastructure

Provides a searchable metadata-enabled online clearinghouse for finding, downloading and resusing GIS datasets



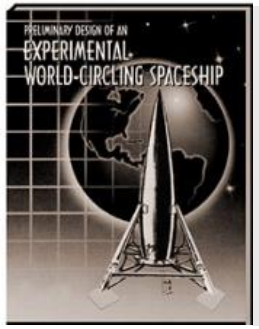


NSDI: A data source for terrorists?

After attacks on USS Cole in 2000 and the 9/11/2001 attacks, attention focused again on protecting critical infrastructure U.S. advisories might seek to attack

*…**GIS data** made available through NSDI websites became **recognized as at risk** of being exploited by those seeking to attack U.S. major cities and critical infrastructure*

RAND Corporation…



1946

The First Satellite Design

More than 11 years before *Sputnik*, RAND released its first report while still at Douglas Aircraft, *Preliminary Design of an Experimental World-Circling Spaceship*. At the time, it was the most comprehensive engineering study of the nuts-and-bolts realities of a satellite spacecraft.

1948

The JOHNNIAC

When the need for solutions to complex analytic studies outstripped the computing power of the time, RAND decided to build its own computer. Named after mathematician John von Neumann, the JOHNNIAC was one of the first mainframe computers with stored memory.

1954

Selection and Use of Strategic Air Bases

The report by a team led by Albert Wohlstetter shook the foundation of nuclear deterrence policy by shifting the United States from a first-strike to a second-strike posture. It suggested placing air bases closer to the United States and relying on long-range bombers and aerial refueling aircraft, eventually saving the Air Force billions of dollars.

1957

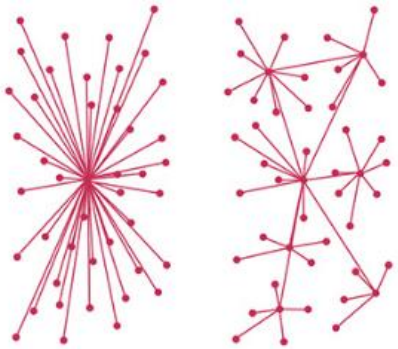
Artificial Intelligence

The first successful Artificial Intelligence program that used Information Processing Languages (IPLs) was developed in RAND's Systems Research Laboratory. IPLs were the precursors of popular contemporary languages such as LISP.

1961

The RAND Tablet

The tablet was one of the first devices permitting the input of handwritten text and freehand drawings into a computer. While limited in its capabilities and far too expensive for commercial use, the RAND Tablet nonetheless showed the way for PalmPilots, Tablet PCs, and iPads.



1962

Packet Switching: Seed of the Internet

Paul Baran developed a plan for a communication network that would withstand a nuclear attack. This notion of distributed communications, or packet switching, eventually became the foundation of the Internet.

1974

Improving Computer Security

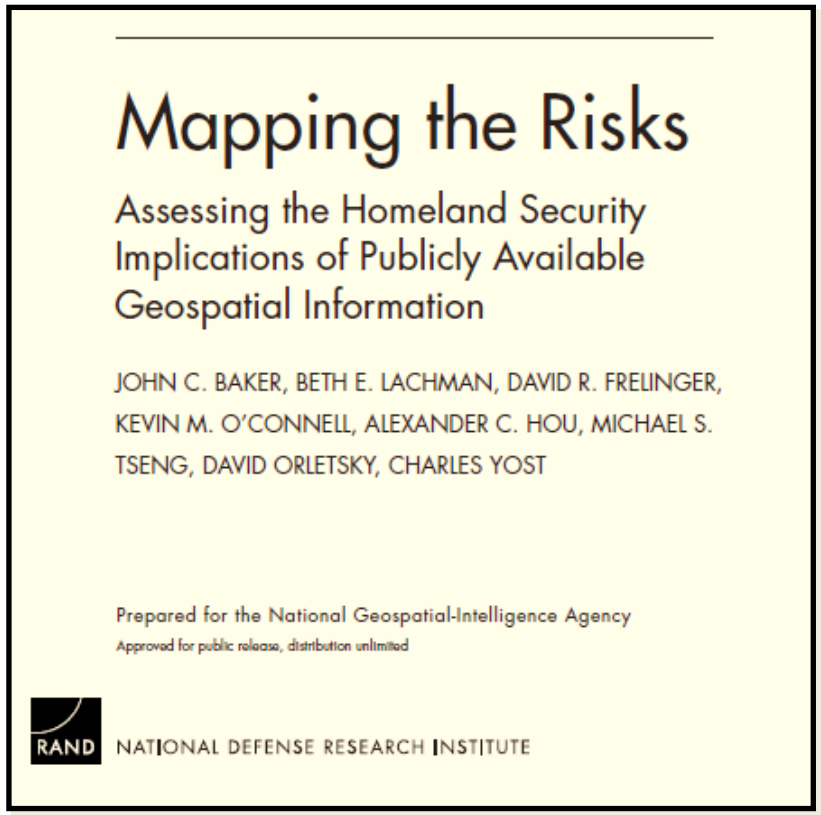
RAND's expertise in defense-related computer security issues was extended to the private sector during the 1970s. Willis Ware chaired a government committee that studied the problems arising from the application of computer technology to record keeping about people. This work guided the DoD computer configurations and eventually became the foundation of the Federal Privacy Act of 1974.

http://www.rand.org/about/history.html

Risks from public geospatial information

In 2003, Director of U.S. National Imagery and Mapping Agency asked RAND Corporation for a:

Framework to "guide public and private decision makers in weighing homeland security implications related to release of geospatial information"



Mapping the Risks

Assessing the Homeland Security Implications of Publicly Available Geospatial Information

JOHN C. BAKER, BETH E. LACHMAN, DAVID R. FRELINGER, KEVIN M. O'CONNELL, ALEXANDER C. HOU, MICHAEL S. TSENG, DAVID ORLETSKY, CHARLES YOST

Prepared for the National Geospatial-Intelligence Agency

Approved for public release, distribution unlimited

RAND NATIONAL DEFENSE RESEARCH INSTITUTE

Today the National Imagery and Mapping Agency is called the National Geospatial-Intelligence Agency

Risks from public geospatial information

RAND's 2004 deliverable included a survey and analysis of

- 465 programs/offices/initiatives at 30 agencies and departments identified as providing geospatial information to the public
  - 628 public datasets sampled from NSDI Clearinghouse websites
  - 37 (~6%) found to be useful in helping an attacker select a target or plan an attack against a site
    - None were considered so critical that an "attacker could not perform the attack without" them
- Conclusions
  - Publically available geospatial "information needed for identifying and locating potential targets is widely accessible"
  - "…detailed and up-to-date information required for attack planning against a particular target is much less readily available"

RAND's assessment of risks posed by GIS data shared publically over the Internet is focused by 3 "filters"

Framework for Analyzing the Homeland Security Sensitivity of Geospatial Data and Information Sources

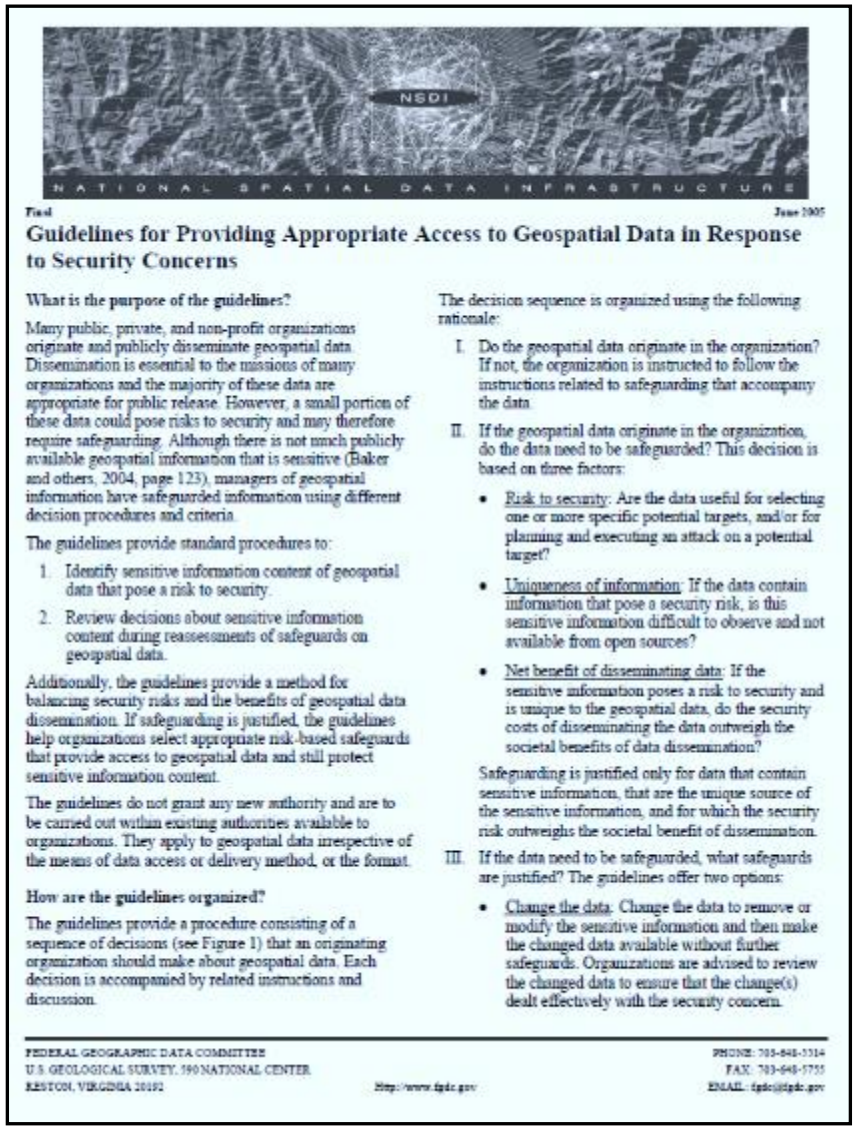
Filter	Key Questions for Decisionmakers
Usefulness	• Is the information useful for target selection or location purposes? • Is the information useful for attack planning purposes?
Uniqueness	• Is the information readily available from other geospatial information sources? • Is the information available from direct observation or other nongeospatial information types?
Societal benefits and costs	• What are the expected security benefits of restricting public access to the source? • What are the expected societal costs of restricting public access to the source?

Federal Geographic Data Committee's risk assessment and control guidelines for…

- **Identifying sensitive information contents of geospatial data that pose a risk to security**
- **Making information security decisions and applying safeguards to sensitive geospatial data contents**

"Does knowledge of the location and purpose of a feature as described in the data, have the potential to significantly compromise the security of persons, property, or systems?"

FGDC 2005, based on RAND's 2004 study



NSDI

NATIONAL SPATIAL DATA INFRASTRUCTURE

Final June 2005

Guidelines for Providing Appropriate Access to Geospatial Data in Response to Security Concerns

What is the purpose of the guidelines?

Many public, private, and non-profit organizations originate and publicly disseminate geospatial data. Dissemination is essential to the missions of many organizations and the majority of these data are appropriate for public release. However, a small portion of these data could pose risks to security and may therefore require safeguarding. Although there is not much publicly available geospatial information that is sensitive (Baker and others, 2004, page 123), managers of geospatial information have safeguarded information using different decision procedures and criteria.

The guidelines provide standard procedures to:

1. Identify sensitive information content of geospatial data that pose a risk to security.
2. Review decisions about sensitive information content during reassessments of safeguards on geospatial data.

Additionally, the guidelines provide a method for balancing security risks and the benefits of geospatial data dissemination. If safeguarding is justified, the guidelines help organizations select appropriate risk-based safeguards that provide access to geospatial data and still protect sensitive information content.

The guidelines do not grant any new authority and are to be carried out within existing authorities available to organizations. They apply to geospatial data irrespective of the means of data access or delivery method, or the format.

How are the guidelines organized?

The guidelines provide a procedure consisting of a sequence of decisions (see Figure 1) that an originating organization should make about geospatial data. Each decision is accompanied by related instructions and discussion.

The decision sequence is organized using the following rationale:

I. Do the geospatial data originate in the organization? If not, the organization is instructed to follow the instructions related to safeguarding that accompany the data.

II. If the geospatial data originate in the organization, do the data need to be safeguarded? This decision is based on three factors:

- Risk to security: Are the data useful for selecting one or more specific potential targets, and/or for planning and executing an attack on a potential target?
- Uniqueness of information: If the data contain information that pose a security risk, is this sensitive information difficult to observe and not available from open sources?
- Net benefit of disseminating data: If the sensitive information poses a risk to security and is unique to the geospatial data, do the security costs of disseminating the data outweigh the societal benefits of data dissemination?

Safeguarding is justified only for data that contain sensitive information, that are the unique source of the sensitive information, and for which the security risk outweighs the societal benefit of dissemination.

III. If the data need to be safeguarded, what safeguards are justified? The guidelines offer two options:

- Change the data: Change the data to remove or modify the sensitive information and then make the changed data available without further safeguards. Organizations are advised to review the changed data to ensure that the change(s) dealt effectively with the security concern.

FEDERAL GEOGRAPHIC DATA COMMITTEE
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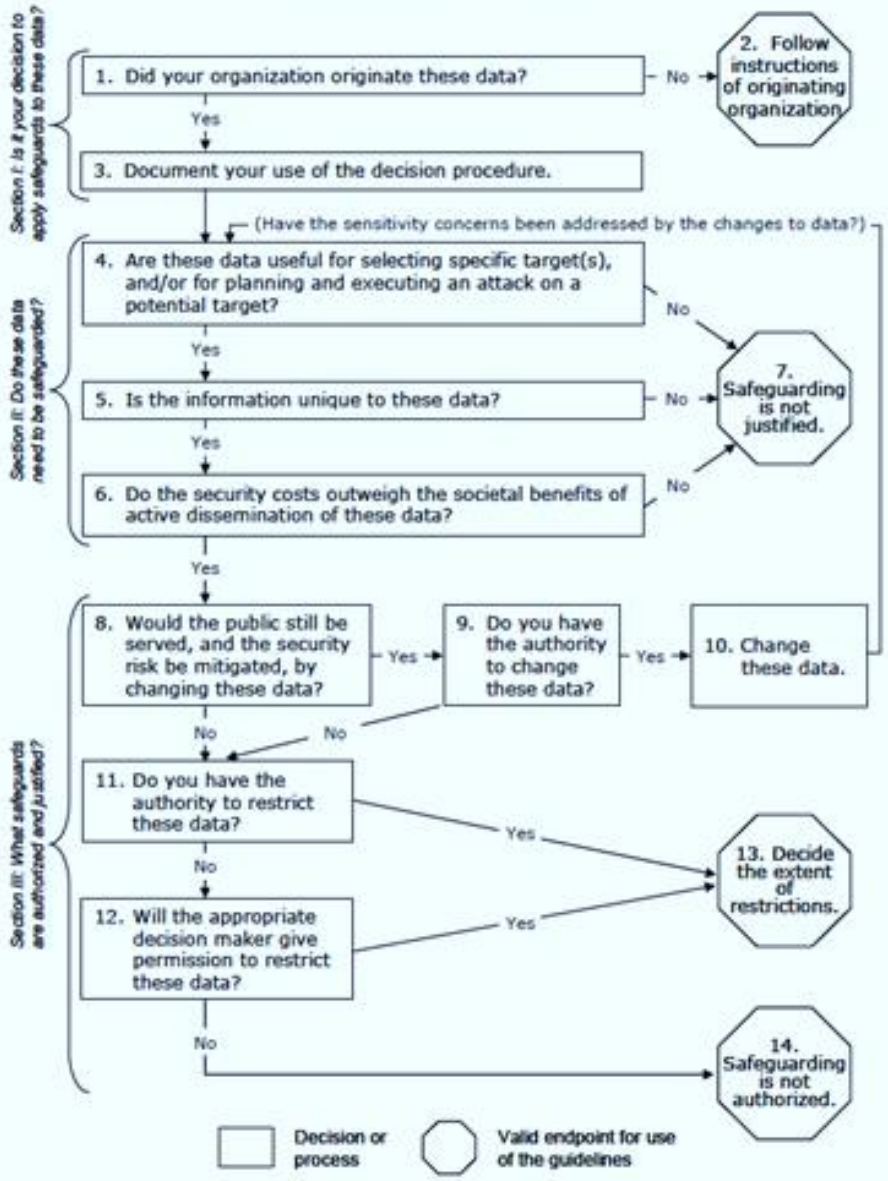
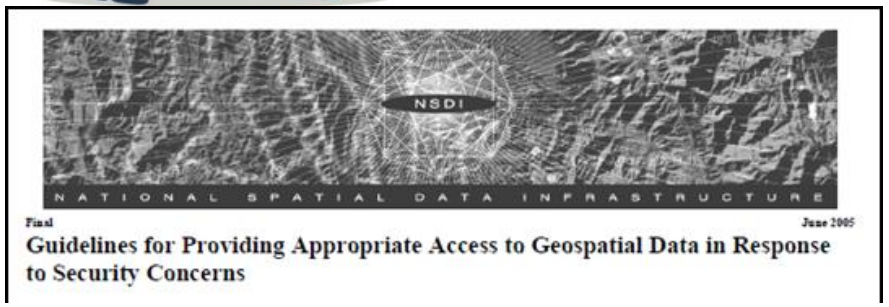
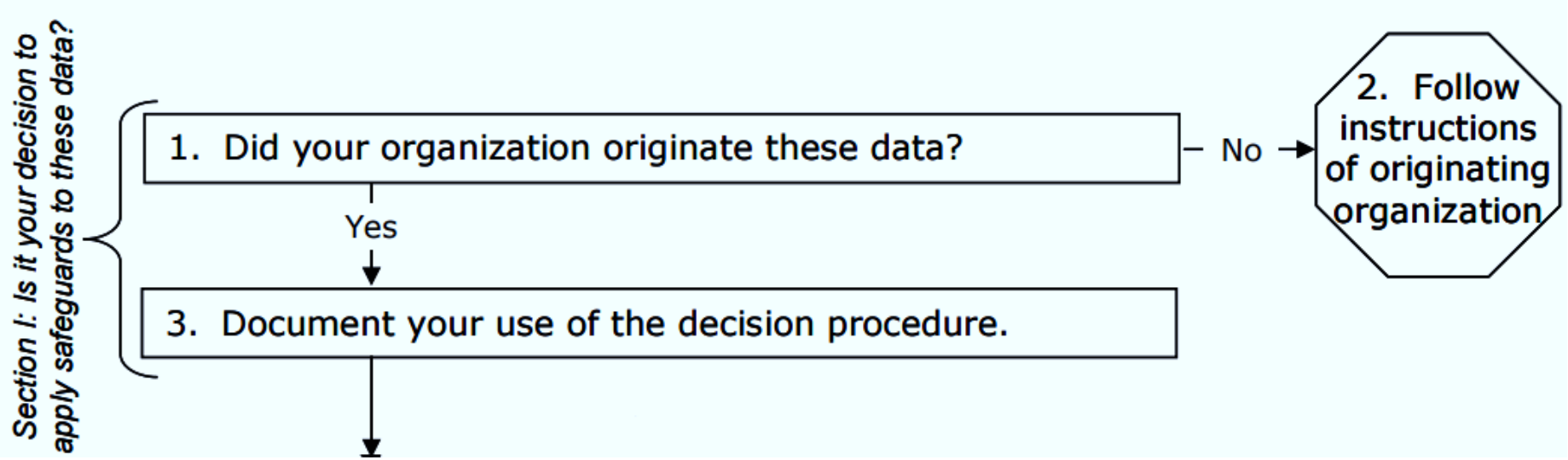
FAX: 703-648-5755
EMAIL: fgdc@fgdc.gov

Figure 1. Decision Tree for Providing Appropriate Access to Geospatial Data in Response to Security Concerns





Decision Tree for Providing Appropriate Access to Geospatial Data in Response to Security Concerns

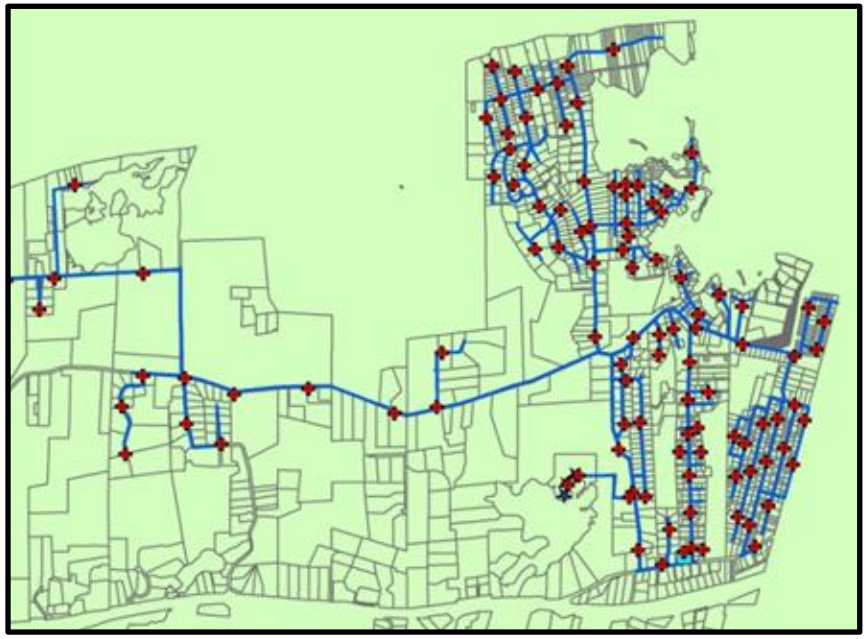


…risk assessment…

4. Are these data useful for selecting specific target(s), and/or for planning and executing an attack on a potential target?

"Sensitivity" of geospatial data is based on usefulness to terrorists

Do the data show "choke points to increase effectiveness of an attack ?"



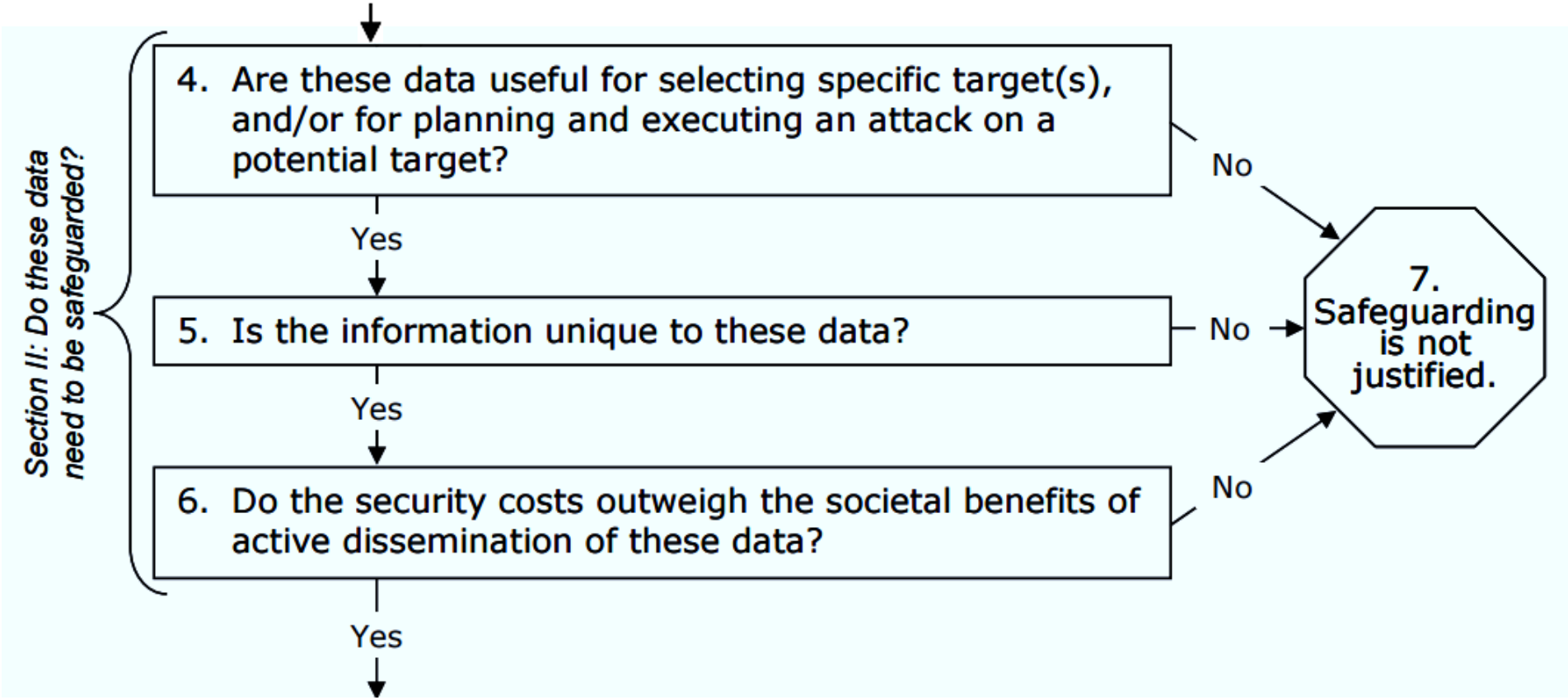
…risk assessment…

4. Are these data useful for selecting specific target(s), and/or for planning and executing an attack on a potential target?

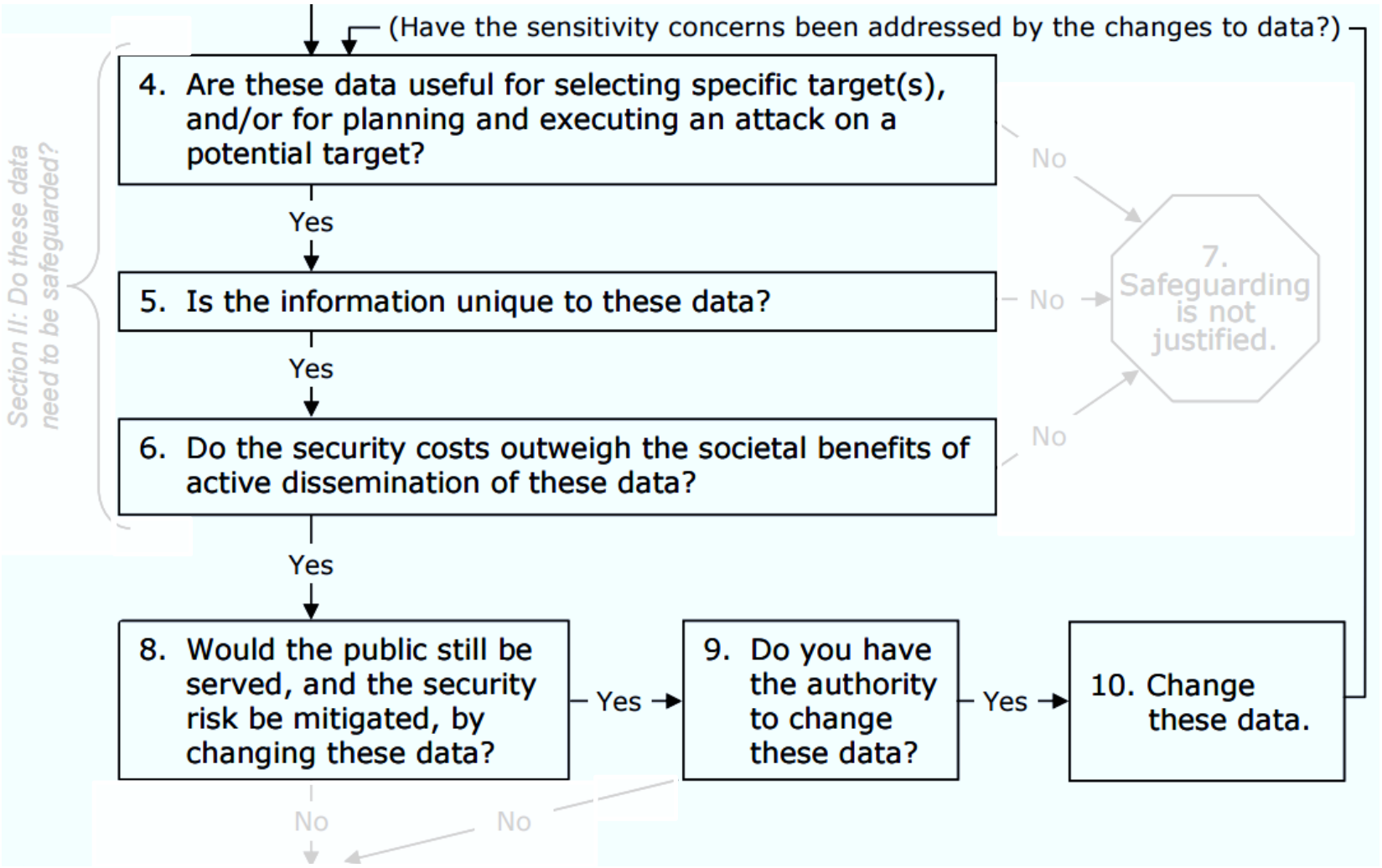
"Sensitivity" of geospatial data is based on usefulness to terrorists

Do the data "provide relevant current (real-time, near real-time, or very recent) security-related data" that can help an attacker "find the best way to cause catastrophic failure ?"

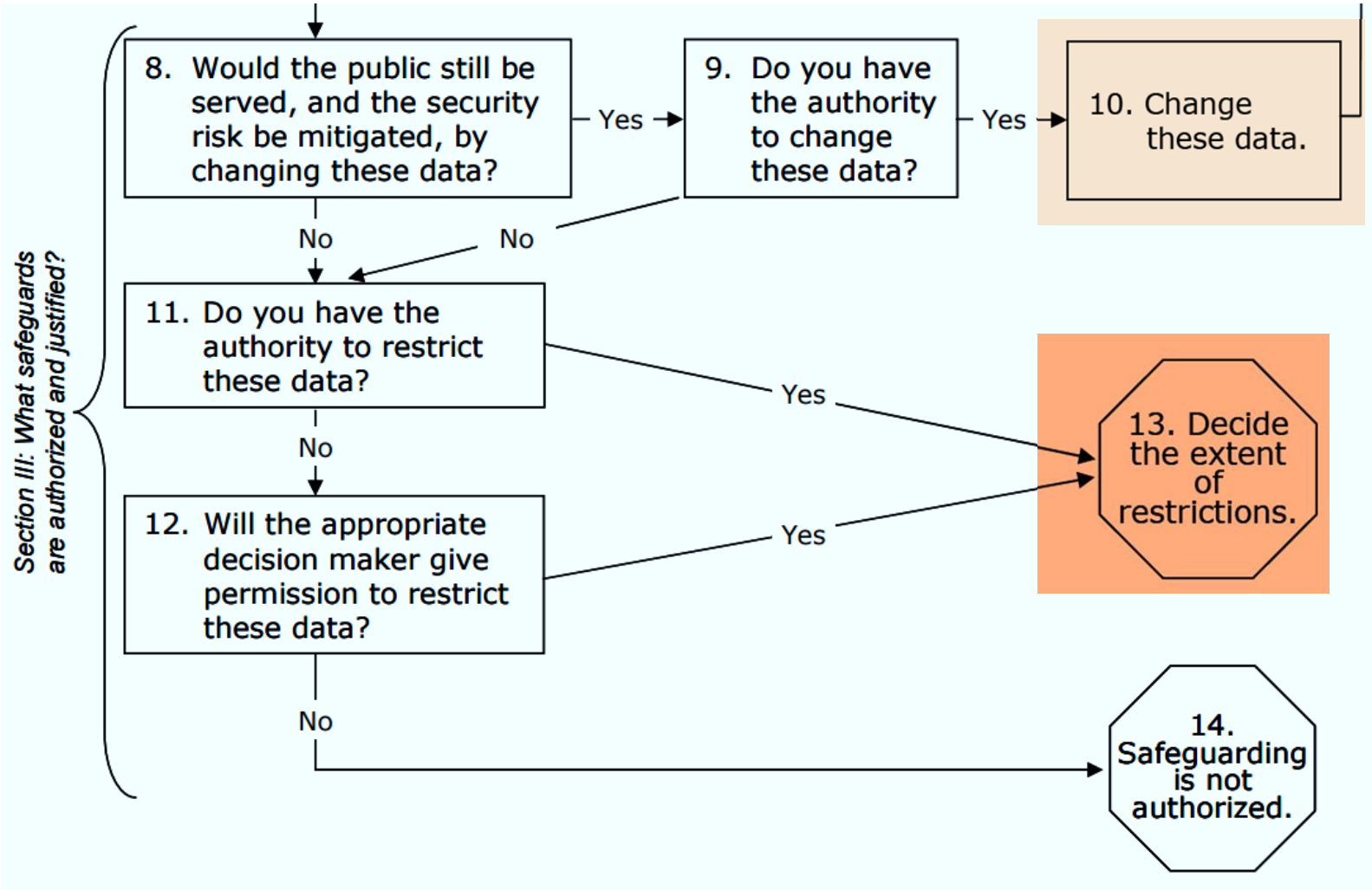
Assess the risk…



…control/mitigate the risk…



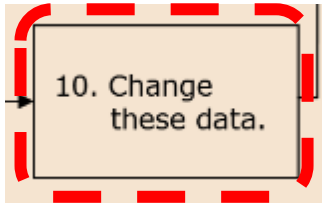
…control/mitigate the confidentiality risk…



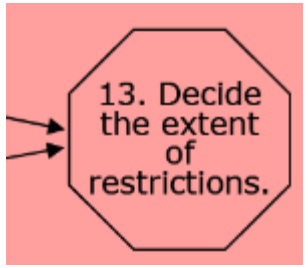
…control/mitigate the risk…

If security risks outweigh benefits of releasing the data to the public, agency can choose to safeguard data by:

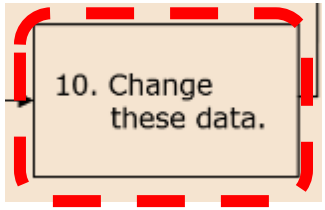
- **Modifying data**
  - Remove or reduce detail in offending data elements
    - either in the attributes, spatial representations, or both



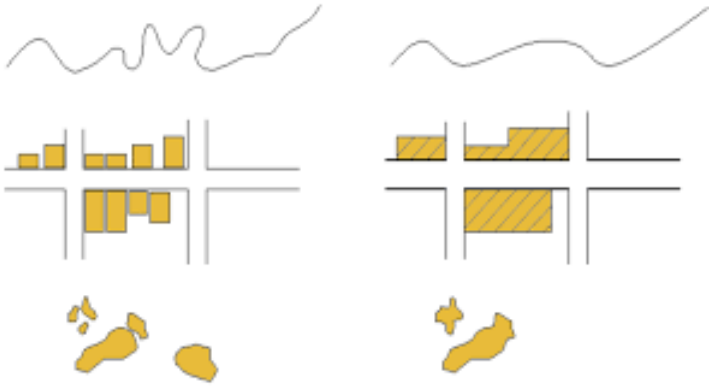
- **Restricting access to data**
  - If agency lacks authority to change data, or believes modifying data will undermine its value to the public, then agency can restrict access



...control/mitigate risk...

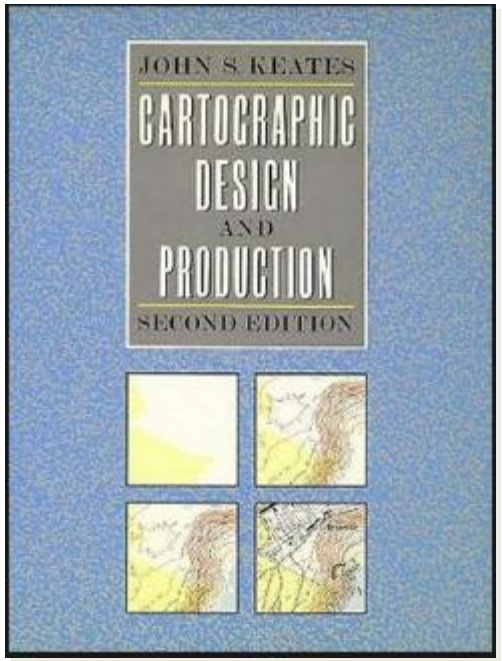


To remove or reduce detail in offending data elements apply techniques of ***Cartographic Generalization***



Before... *...after*

1. *Selective Omission*
2. *Simplification*
3. *Combination*
4. *Exaggeration*
5. *Displacement*



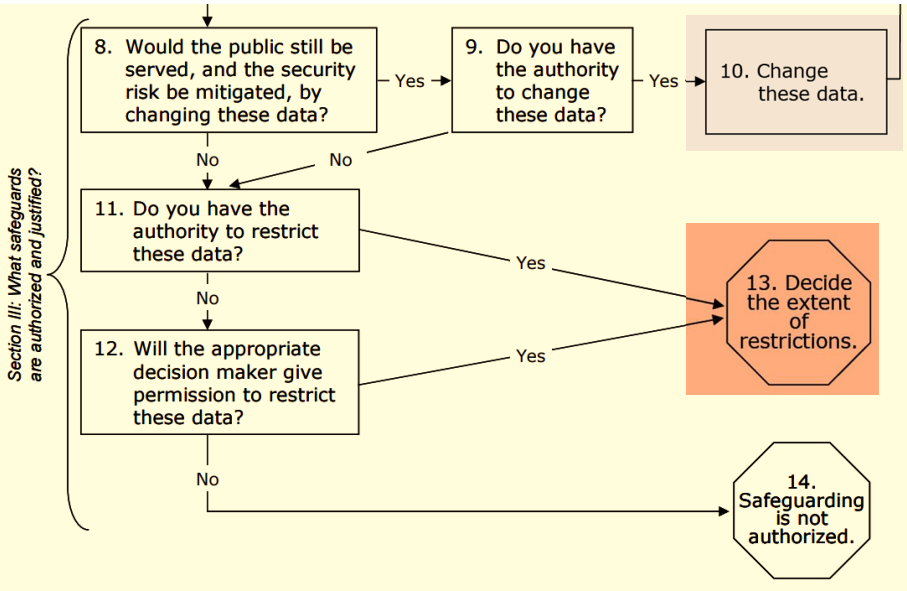
FIPS 199's and FGDC Guidelines' share a mutual security objective…

Confidentiality
Preserving authorized restrictions on information access and disclosure, including means for protecting personal privacy and proprietary information.

Integrity
Guarding against improper information modification or destruction, and includes ensuring information non-repudiation and authenticity.

Availability
Ensuring timely and reliable access to and use of information.

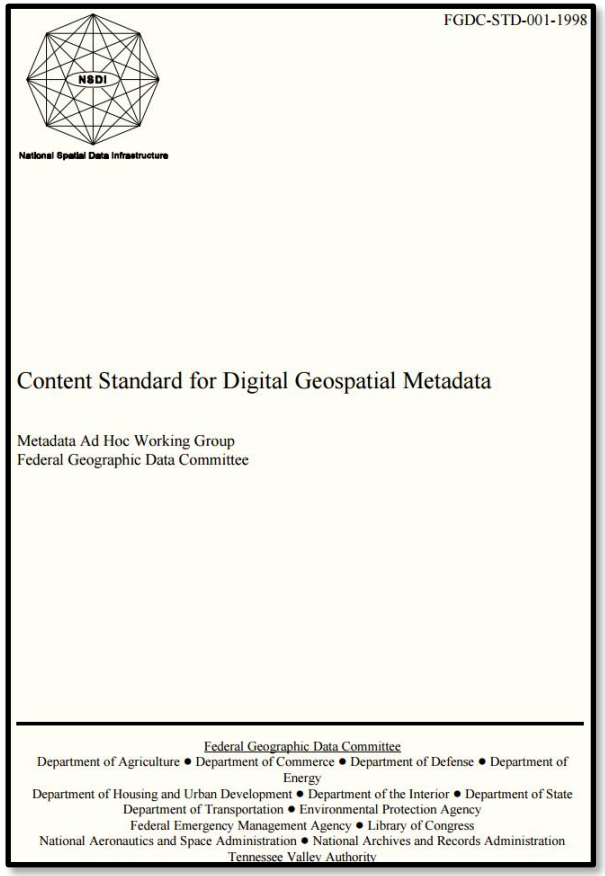
FGDC Guidelines' security objective



What FIPS 199 security objectives are at risk by implementing the FGDC's Guidelines ?

Metadata enables communicating data classification information

2 examples of metadata standards that include security categorization information for geographic datasets



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National Spatial Data Infrastructure

Content Standard for Digital Geospatial Metadata

Metadata Ad Hoc Working Group
Federal Geographic Data Committee

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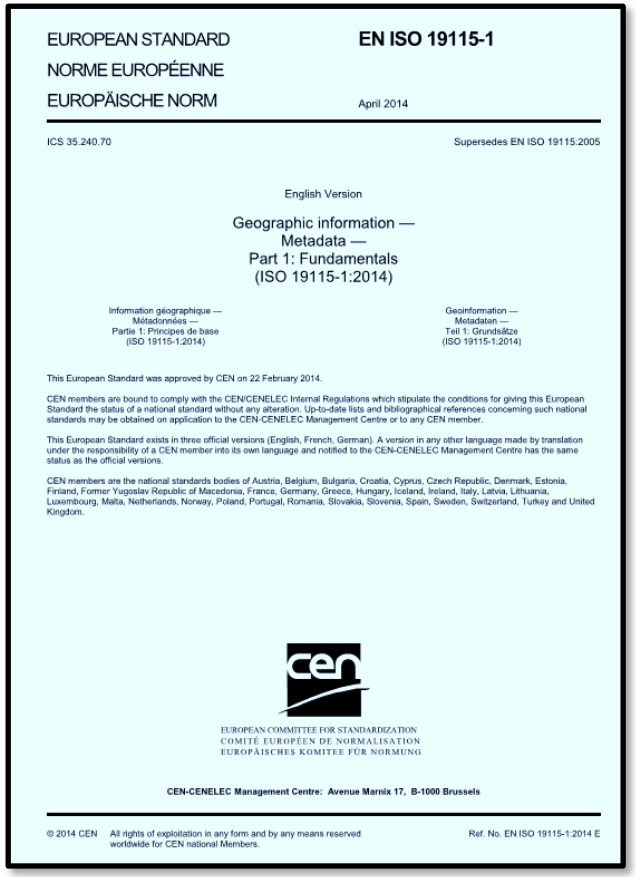
Department of Agriculture ● Department of Commerce ● Department of Defense ● Department of Energy
Department of Housing and Urban Development ● Department of the Interior ● Department of State
Department of Transportation ● Environmental Protection Agency
Federal Emergency Management Agency ● Library of Congress
National Aeronautics and Space Administration ● National Archives and Records Administration
Tennessee Valley Authority



EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN ISO 19115-1

April 2014

ICS 35.240.70

Supersedes EN ISO 19115:2005

English Version

Geographic information —
Metadata —
Part 1: Fundamentals
(ISO 19115-1:2014)

Information géographique —
Métadonnées —
Partie 1: Principes de base
(ISO 19115-1:2014)

Geoinformation —
Metadaten —
Teil 1: Grundsätze
(ISO 19115-1:2014)

This European Standard was approved by CEN on 22 February 2014.

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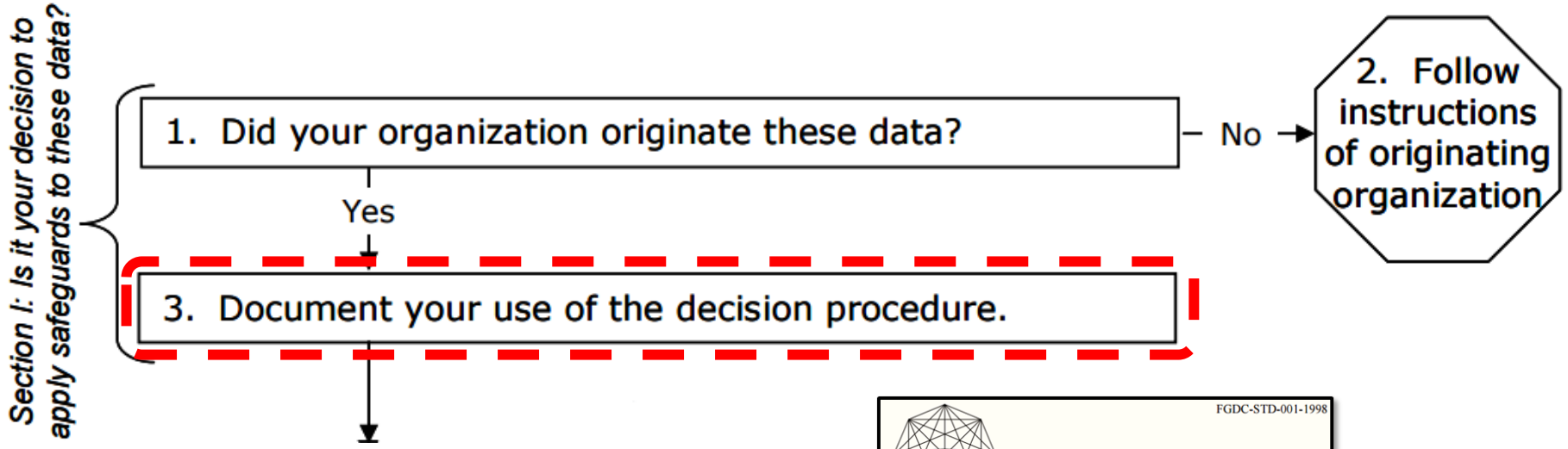
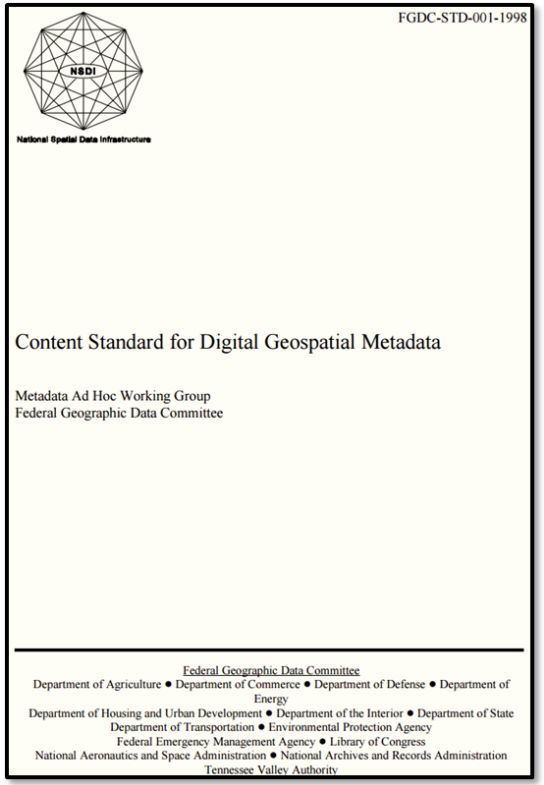
Decision Tree for Providing Appropriate Access to Geospatial Data in Response to Security Concerns





FGDC-STD-001-1998

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Content Standard for Digital Geospatial Metadata

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Federal Emergency Management Agency • Library of Congress
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Tennessee Valley Authority

Appendix 2: Documenting Use of the Guidelines in Metadata Accompanying Geospatial Data

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If your organization has a formal classification system you also can report the classification level of the geospatial data by category under "Security Information" (element 1.12).

Geospatial metadata can also be subject to safeguarding. To document the details of restrictions on access, use, or dissemination of the metadata:

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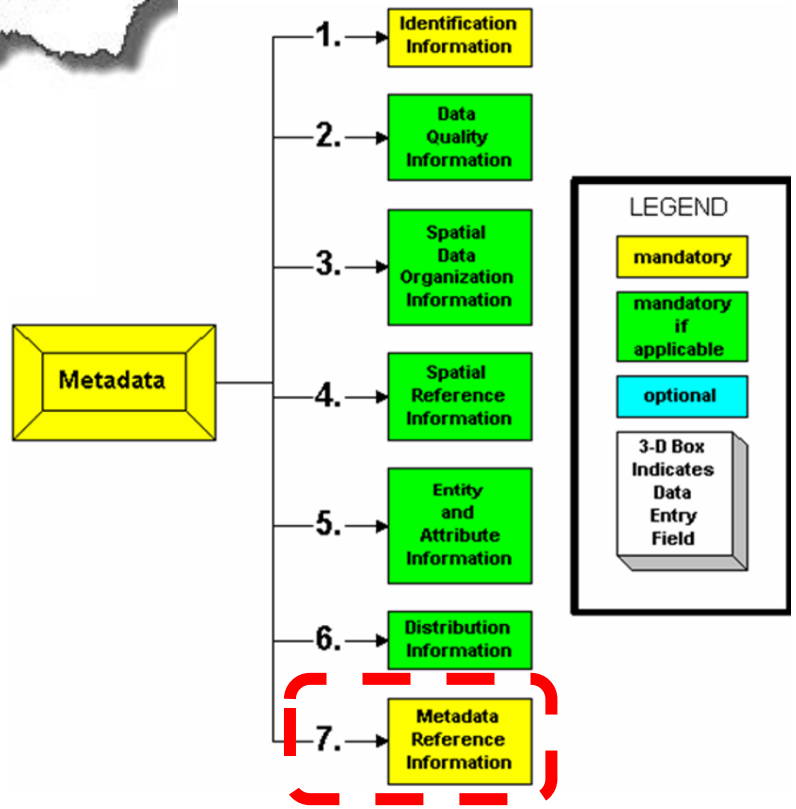
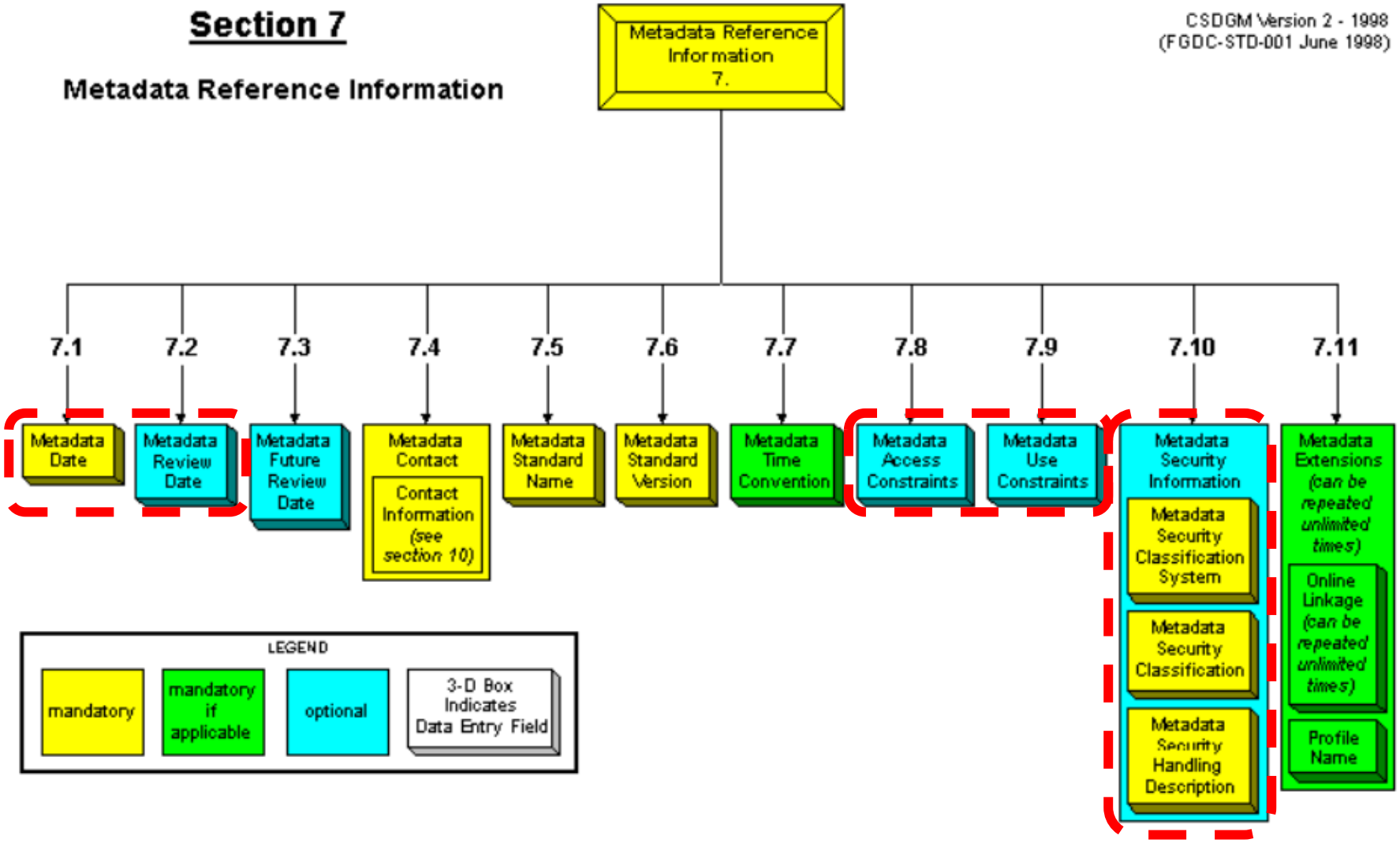
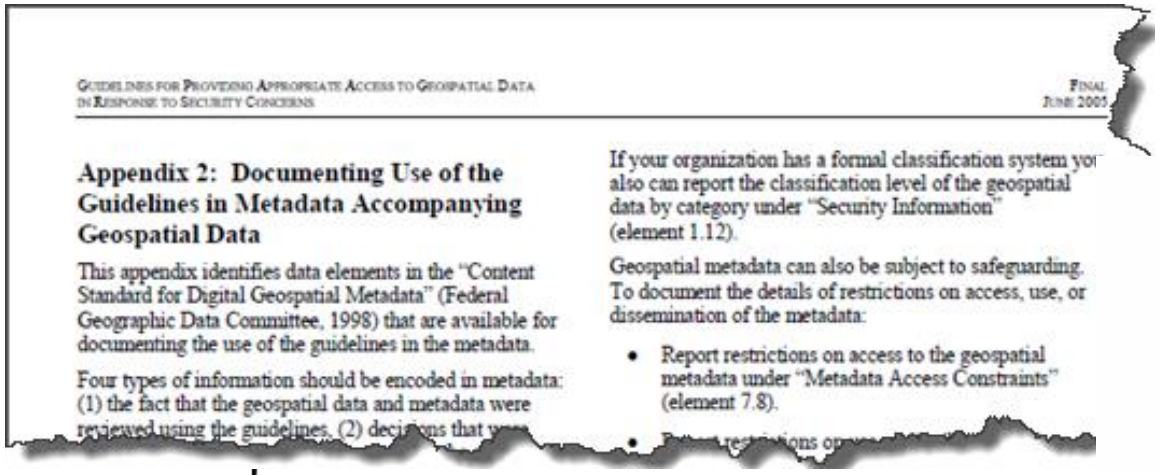



Section 7
Metadata Reference Information
Metadata Reference Information 7.
CSDGM Version 2 - 1998
(FGDC-STD-001 June 1998)
7.1
7.2
7.3
7.4
7.5
7.6
7.7
7.8
7.9
7.10
7.11
Metadata Date
Metadata Review Date
Metadata Future Review Date
Metadata Contact
Contact Information (see section 10)
Metadata Standard Name
Metadata Standard Version
Metadata Time Convention
Metadata Access Constraints
Metadata Use Constraints
Metadata Security Information
Metadata Security Classification System
Metadata Security Classification
Metadata Security Handling Description
Metadata Extensions (can be repeated unlimited times)
Online Linkage (can be repeated unlimited times)
Profile Name
LEGEND
mandatory
mandatory if applicable
optional
3-D Box Indicates Data Entry Field



GUIDELINES FOR PROVIDING APPROPRIATE ACCESS TO GEOSPATIAL DATA IN RESPONSE TO SECURITY CONCERNS

FINAL
JUNE 2005

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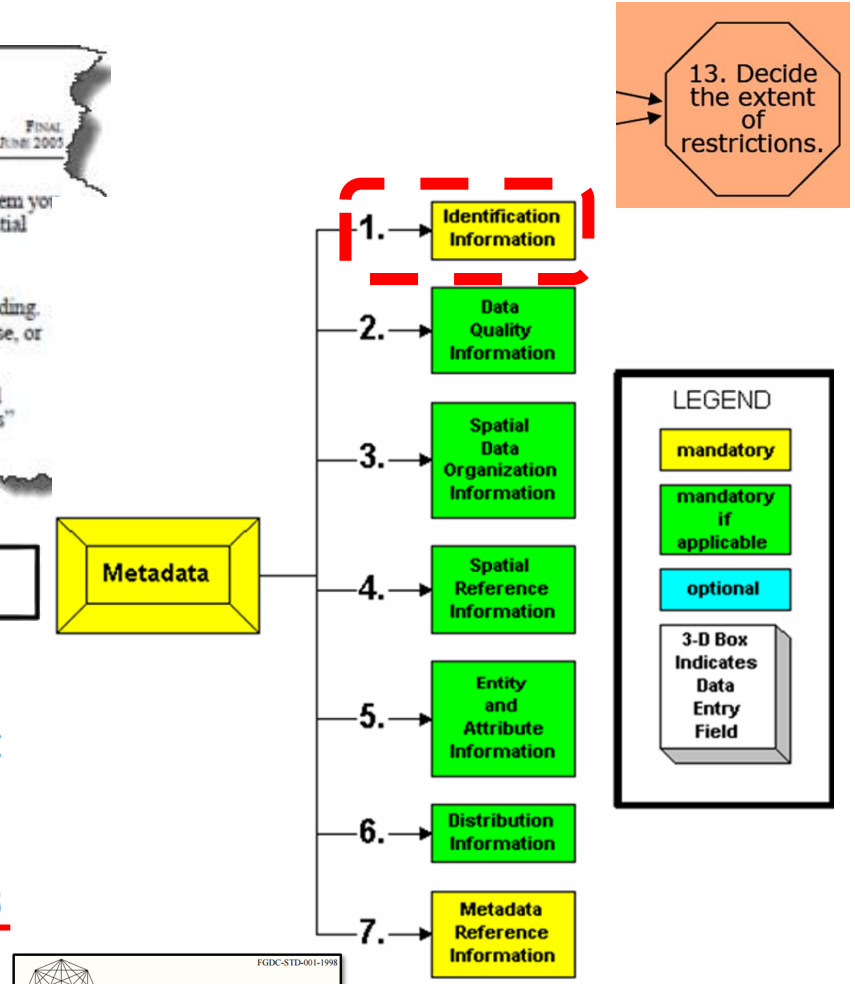

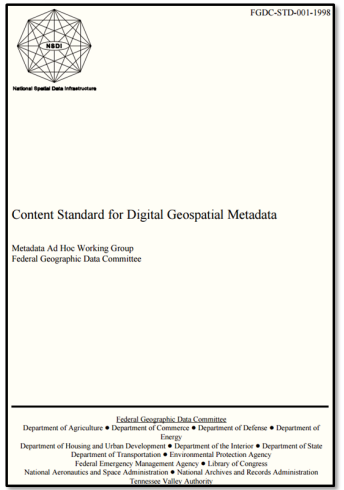

FGDC-STD-001-1998

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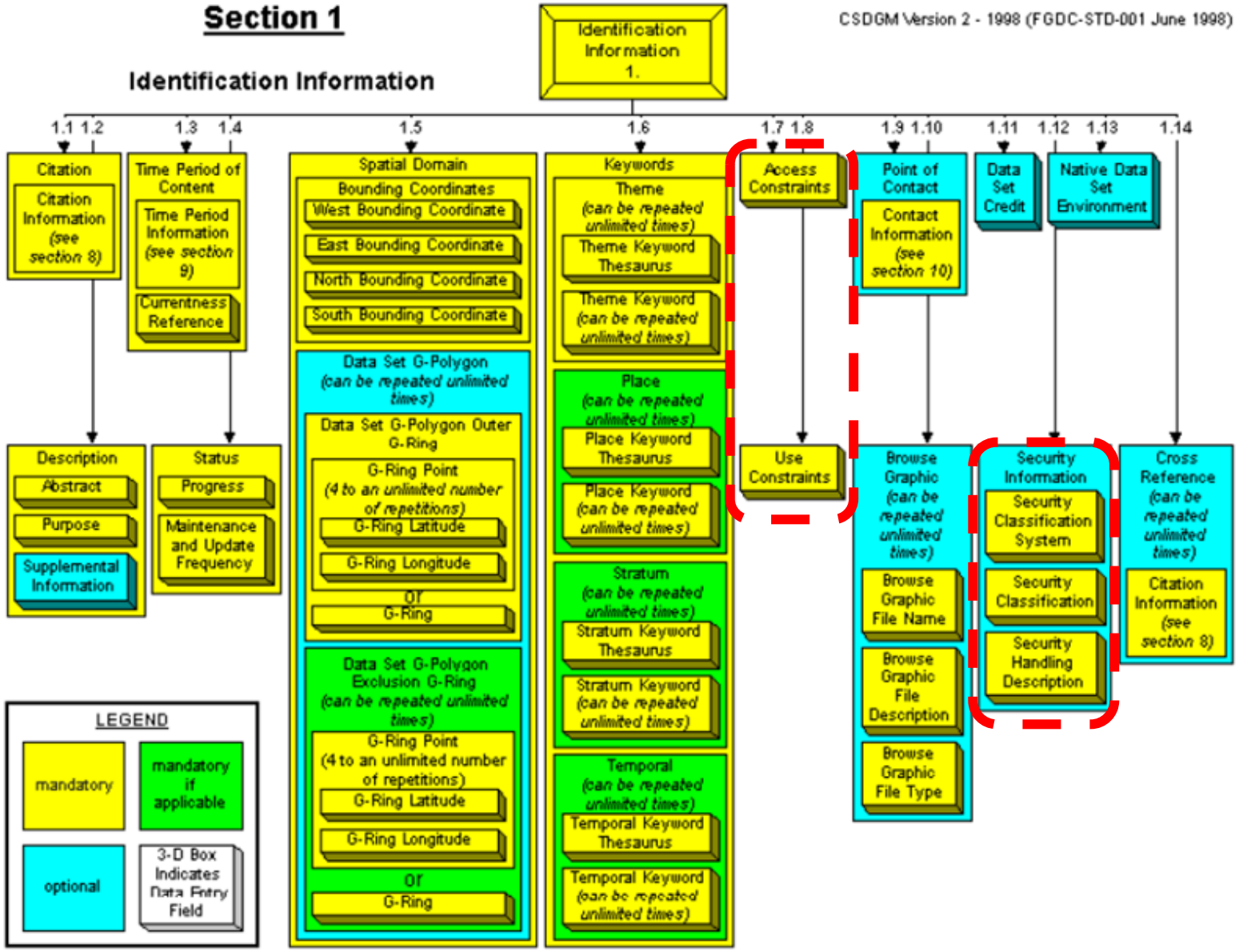
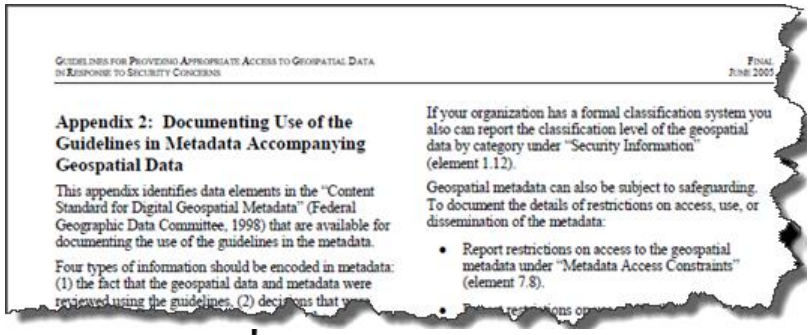


13. Decide the extent of restrictions.



GUIDELINES FOR PROVIDING APPROPRIATE ACCESS TO GEOSPATIAL DATA IN RESPONSE TO SECURITY CONCERNS

FINAL JUNE 2005

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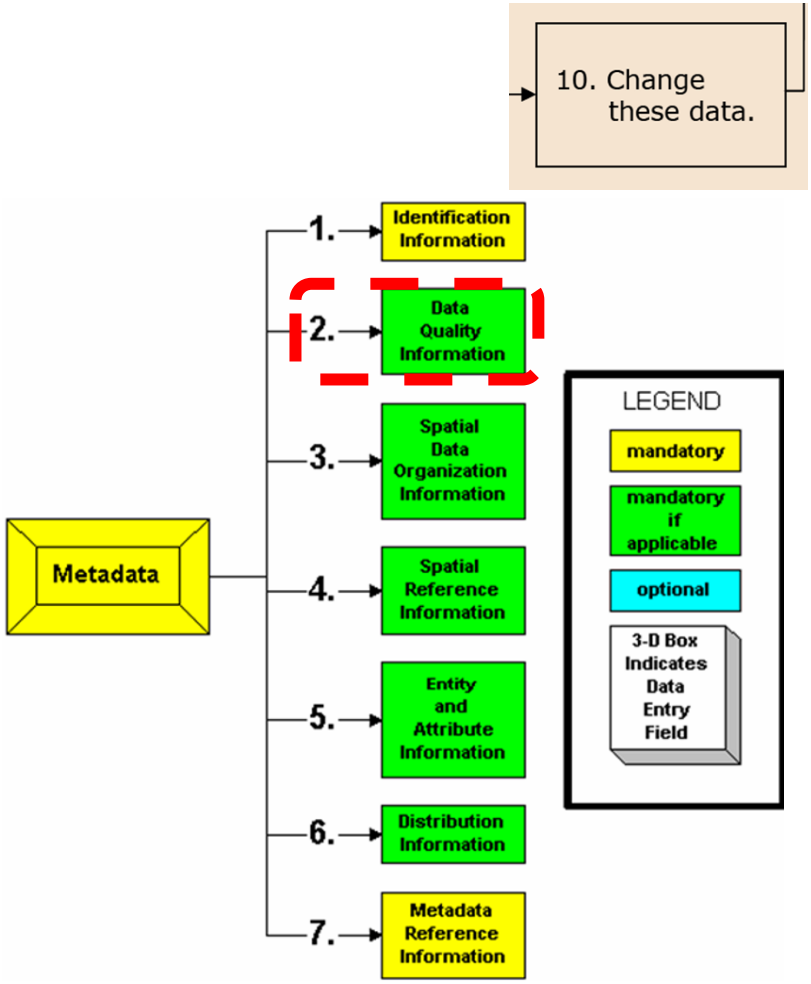
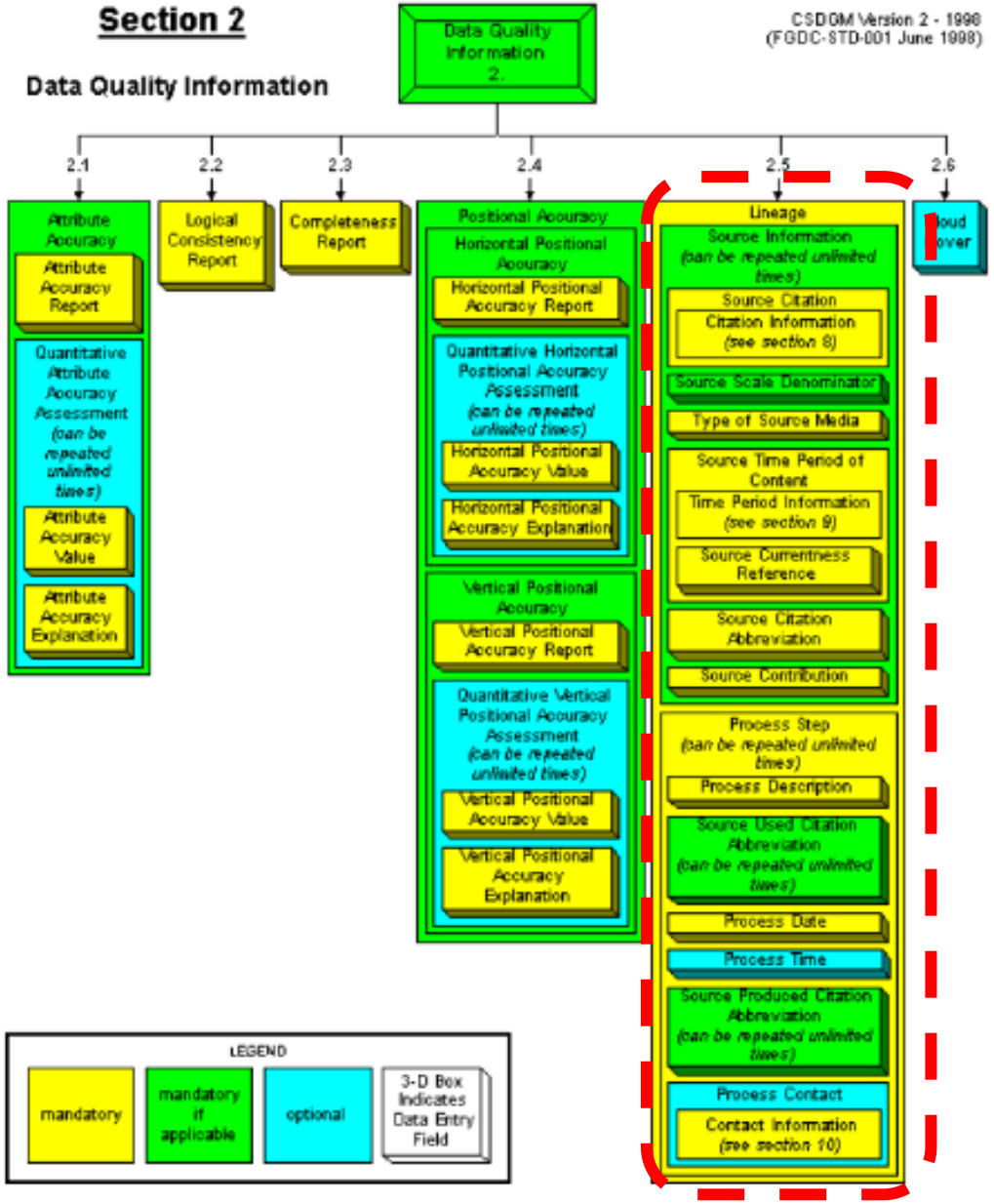
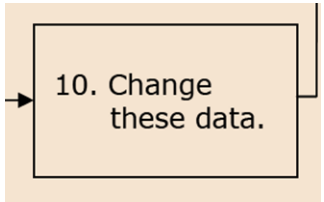
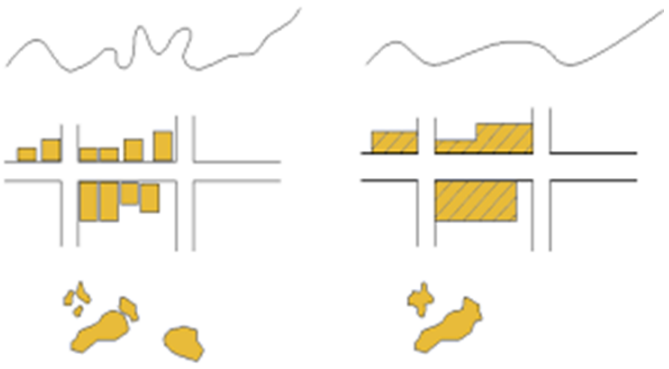
Four types of information should be encoded in metadata: (1) the fact that the geospatial data and metadata were reviewed using the guidelines, (2) decisions that were made, (3) the date of the decisions, and (4) the safeguards (changes to the geospatial data or restrictions on access, use, or dissemination of the geospatial data and metadata) that were applied.





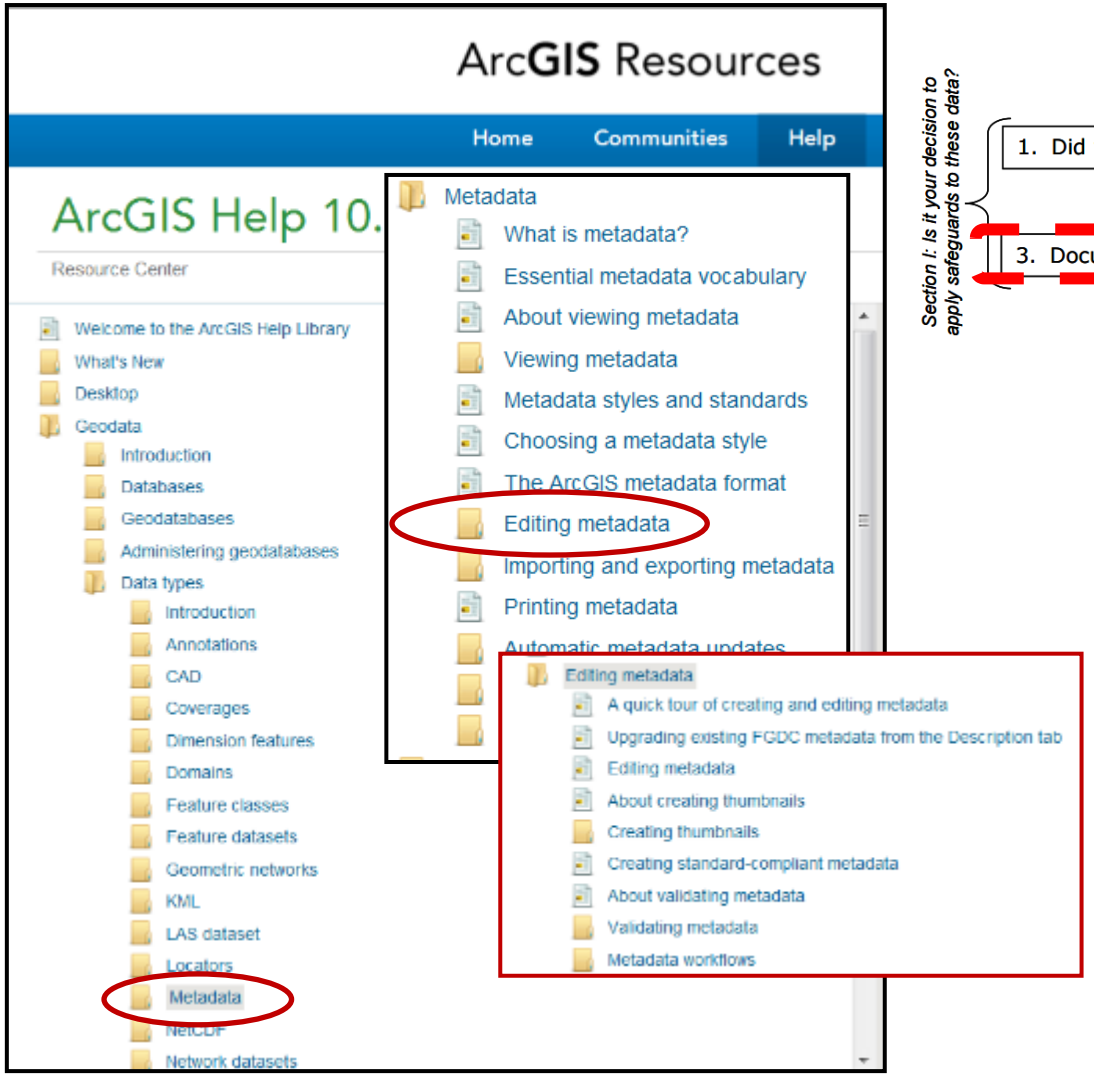


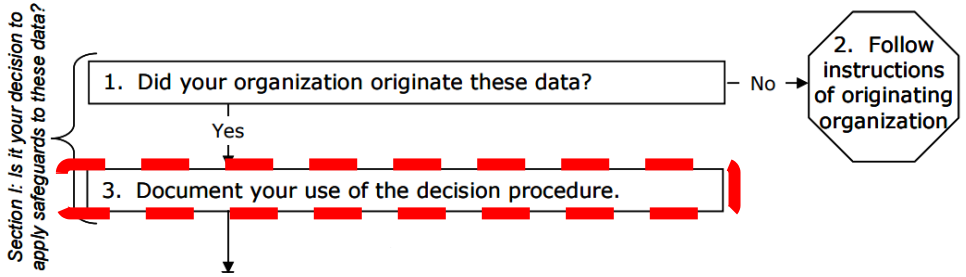


Before… *…after*

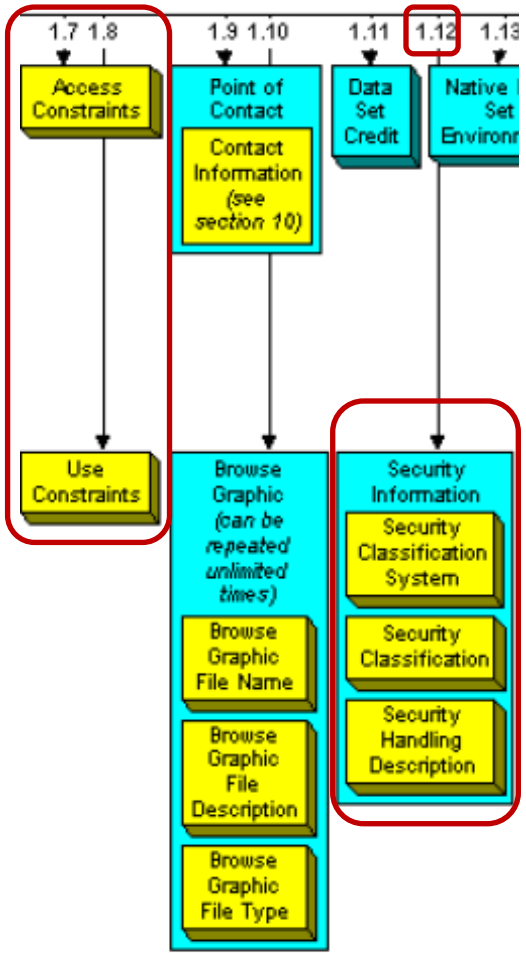
Techniques of Cartographic Generalization

1. *Selective Omission*
2. *Simplification*
3. *Combination*
4. *Exaggeration*
5. *Displacement*


ArcGIS Resources
Home
Communities
Help
ArcGIS Help 10.
Resource Center
Welcome to the ArcGIS Help Library
What's New
Desktop
Geodata
Introduction
Databases
Geodatabases
Administering geodatabases
Data types
Introduction
Annotations
CAD
Coverages
Dimension features
Domains
Feature classes
Feature datasets
Geometric networks
KML
LAS dataset
Locators
Metadata
NetCDF
Network datasets
Metadata
What is metadata?
Essential metadata vocabulary
About viewing metadata
Viewing metadata
Metadata styles and standards
Choosing a metadata style
The ArcGIS metadata format
Editing metadata
Importing and exporting metadata
Printing metadata
Automatic metadata updates
Editing metadata
A quick tour of creating and editing metadata
Upgrading existing FGDC metadata from the Description tab
Editing metadata
About creating thumbnails
Creating thumbnails
Creating standard-compliant metadata
About validating metadata
Validating metadata
Metadata workflows


Section I: Is it your decision to apply safeguards to these data?
1. Did your organization originate these data?
No
2. Follow instructions of originating organization
Yes
3. Document your use of the decision procedure.

Communicating risk classification and controls…



Note: Be wary of *metadata with undefined or free text domains which block use in automated controls…*

1.7 Access Constraints -- restrictions and legal prerequisites for accessing the data set. These include any access constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations on obtaining the data set.

Type: text
Domain: "None" free text ←
Short Name: accconst

1.8 Use Constraints -- restrictions and legal prerequisites for using the data set after access is granted. These include any use constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations on using the data set.

Type: text
Domain: "None" free text ←
Short Name: useconst

1.12 Security Information -- handling restrictions imposed on the data set because of national security, privacy, or other concerns.

Type: compound
Short Name: secinfo

1.12.1 Security Classification System -- name of the classification system.

Type: text
Domain: free text ←
Short Name: secsys

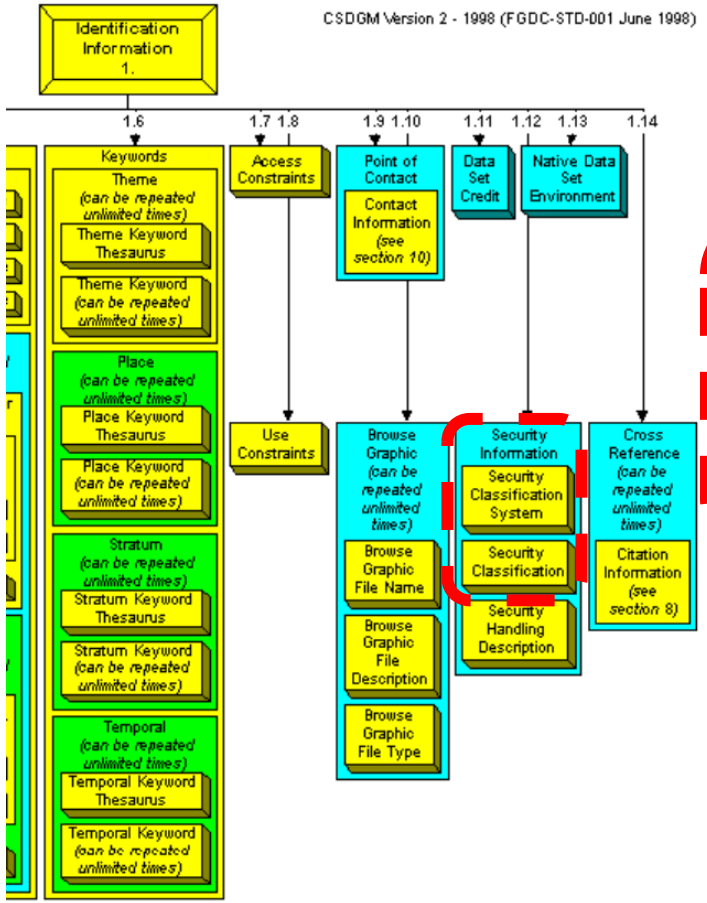
1.12.2 Security Classification -- name of the handling restrictions on the data set.

Type: text
Domain: "Top secret" "Secret" "Confidential" "Restricted" "Unclassified" "Sensitive" ←
free text ←
Short Name: secclass

1.12.3 Security Handling Description -- additional information about the restrictions on handling the data set.

Type: text
Domain: free text ←
Short Name: sechandl

…security classification for geospatial data…



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free text
Short Name: secclass

1.12.3 Security Handling Description -- additional information about the restrictions on handling the data set.
Type: text
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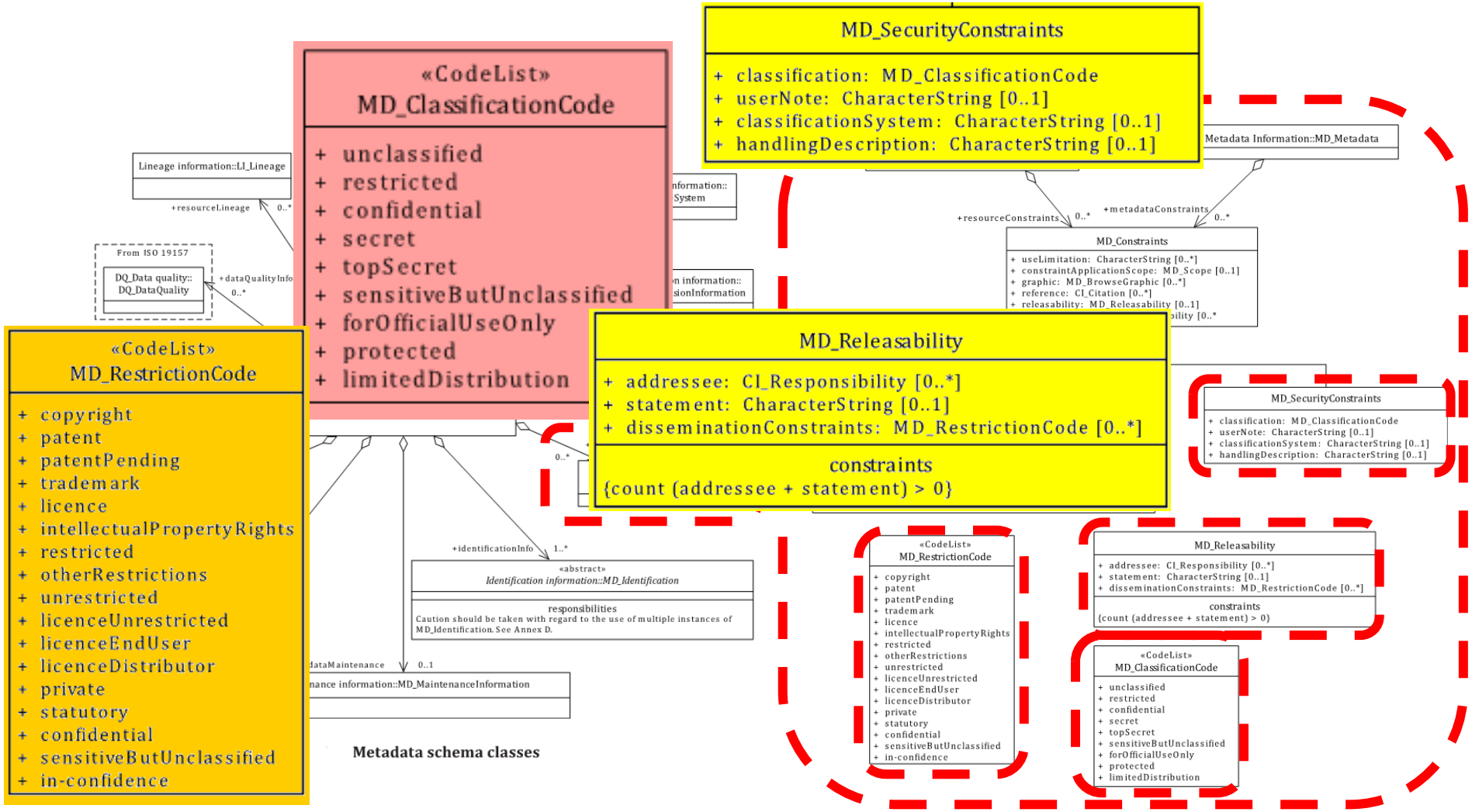
Short Name: sechandl

ISO19115-1 Geospatial metadata standard



Metadata schema classes

Department of Defense' Information Assurance (IA)

…also categorizes information systems and data in terms of CIA…

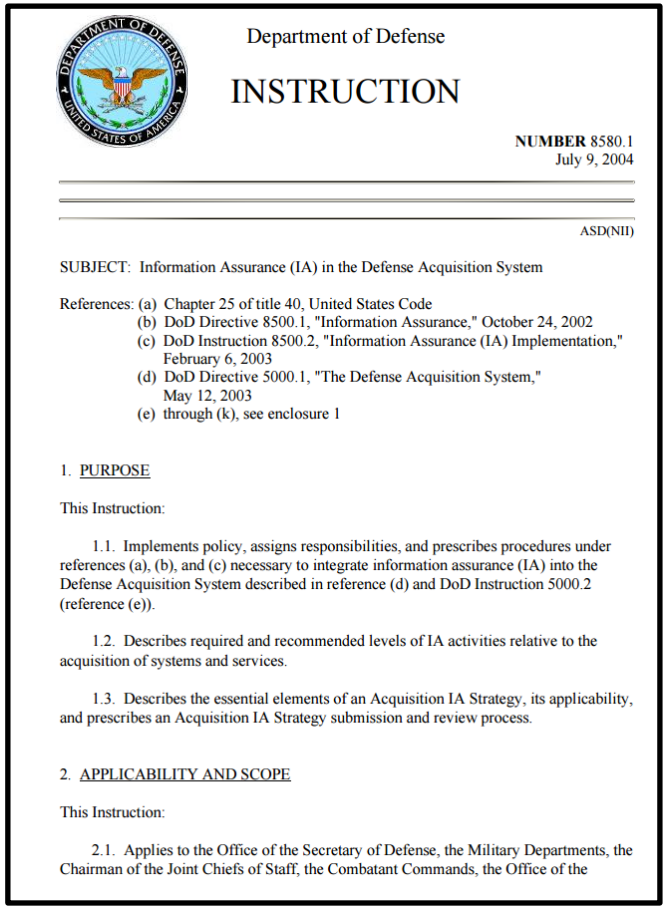
Confidentiality Levels

LEVEL	DEFINITION
High	Classified Information
Medium	Sensitive Information, Not Cleared for Public Release
Basic	Information Cleared for Public Release

+

Mission Assurance Categories

- MAC I – vital to operational readiness or mission effectiveness of deployed or contingency forces. Loss of integrity or availability unacceptable. Requires most stringent protective measures.
- MAC II – important to the support of deployed or contingency forces. Loss of integrity unacceptable, unavailability tolerable only for short time. Require additional safeguards beyond best practices.
- MAC III – necessary to conduct of day-to-day business. Protection commensurate with commercial best practices.



Department of Defense

INSTRUCTION

NUMBER 8580.1
July 9, 2004

ASD(NII)

SUBJECT: Information Assurance (IA) in the Defense Acquisition System

References: (a) Chapter 25 of title 40, United States Code
(b) DoD Directive 8500.1, "Information Assurance," October 24, 2002
(c) DoD Instruction 8500.2, "Information Assurance (IA) Implementation," February 6, 2003
(d) DoD Directive 5000.1, "The Defense Acquisition System," May 12, 2003
(e) through (k), see enclosure 1

1. PURPOSE

This Instruction:

1.1. Implements policy, assigns responsibilities, and prescribes procedures under references (a), (b), and (c) necessary to integrate information assurance (IA) into the Defense Acquisition System described in reference (d) and DoD Instruction 5000.2 (reference (e)).

1.2. Describes required and recommended levels of IA activities relative to the acquisition of systems and services.

1.3. Describes the essential elements of an Acquisition IA Strategy, its applicability, and prescribes an Acquisition IA Strategy submission and review process.

2. APPLICABILITY AND SCOPE

This Instruction:

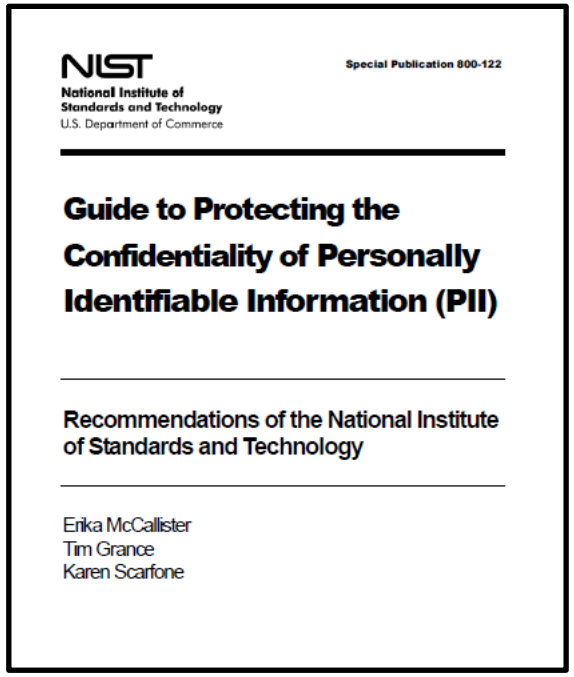
2.1. Applies to the Office of the Secretary of Defense, the Military Departments, the Chairman of the Joint Chiefs of Staff, the Combatant Commands, the Office of the

Agenda

- ✓ In The News
- ✓ Categorizing Information for IT Risk Management
- ✓ Revisit Risk & Controls of Publicly Shared Geographic Information
- More on Confidentiality: Linked & Linkable PII
- Risk Evaluation
- Risk Management Techniques, a brief review
- Test taking tip
- Quiz

NIST SP 800-122 – Guide to Protecting Confidentiality of PII

- Specifically focused on:
  - Identifying PII
  - **Determining PII confidentiality** impact level needed to supplement the FIPS 199 confidentiality impact level of an information system



NIST
National Institute of Standards and Technology
U.S. Department of Commerce

Special Publication 800-122

Guide to Protecting the Confidentiality of Personally Identifiable Information (PII)

Recommendations of the National Institute of Standards and Technology

Erika McCallister
Tim Grance
Karen Scarfone

Personally Identifiable Information (PII)

Any information about an individual maintained by an agency, including:

1. Any information that can be used to distinguish (i.e. identify) or trace an individual's identity, such as:
   - *Name*
   - *Identifying number*
   - *Address*
   - *Asset identifier*
   - *Telephone number*
   - *Personal characteristics*
   - *Personally owned property identifiers*
2. Any other information that is linked or linkable to the identifiers listed in #1:
   - Date of birth
   - Place of birth
   - Race
   - Religion
   - Weight
   - Geographic indicators
   - Medical information
   - Educational information
   - Financial information
   - Employment information
   - …

Linked information

Taught-By Relation

C #	Fid #
223	9
222	9
302	21
302	14
542	2

C #	Course Name	Cr	Dept
223	Calculus	5	Math
302	Intro Prog	3	CS
302	Organic Chem	3	Chem
542	Asian Hist	2	Hist
222	Calculus	5	Math

Course Data Table

Fid #	Name	Position	Dept
9	Henry	Prof.	Math
2	Jackson	Assist. Prof	Hist
14	Schuh	Assoc. Prof	Chem
21	Lerner	Assist. Prof	CS

Faculty Data Table

Enrolled Relation

Sid #	C #
1	223
4	222
4	302
3	302
5	302
2	542
2	223

Sid #	Name	Year	GPA
1	Smith	3	3.0
2	Jones	2	3.5
3	Doe	1	1.2
4	Varda	4	4.0
5	Carey	4	0.5

Student Data Table

C #	Course Name	Cr	Dept
223	Calculus	5	Math
302	Intro Prog	3	CS
302	Organic Chem	3	Chem
542	Asian Hist	2	Hist
222	Calculus	5	Math

Course Data Table

Linkable information

Property ("Parcel") Data Table

Shape	ID	PIN	Area	Addr	Code
	1	334-1626-001	7,342	341 Cherry Ct.	SFR
	2	334-1626-002	8,020	343 Cherry Ct.	UND
	3	334-1626-003	10,031	345 Cherry Ct.	SFR
	4	334-1626-004	9,254	347 Cherry Ct.	SFR
	5	334-1626-005	8,856	348 Cherry Ct.	UND
	6	334-1626-006	9,975	346 Cherry Ct.	SFR
	7	334-1626-007	8,230	344 Cherry Ct.	SFR
	8	334-1626-008	8,645	342 Cherry Ct.	SFR

PIN ("Property Identity Number") is a common identifying attribute that can serve as a "foreign key" to link the data tables together

Owner Tax Data Table

PIN	Owner	Acq.Date	Assessed	TaxStat
334-1626-001	G. Hall	1995/10/20	$115,500.00	02
334-1626-002	H. L Holmes	1993/10/06	$24,375.00	01
334-1626-003	W. Rodgers	1980/09/24	$175,500.00	02
334-1626-004	J. Williamson	1974/09/20	$135,750.00	02
334-1626-005	P. Goodman	1966/06/06	$30,350.00	02
334-1626-006	K. Staley	1942/10/24	$120,750.00	02
334-1626-007	J. Dormandy	1996/01/27	$110,650.00	01
334-1626-008	S. Gooley	2000/05/31	$145,750.00	02

Is this PII ?

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Any information about an individual maintained by an agency, including:

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   - *Name*
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Risk Evaluation

Risk evaluation is the process of identifying risk scenarios and describing their potential business impact

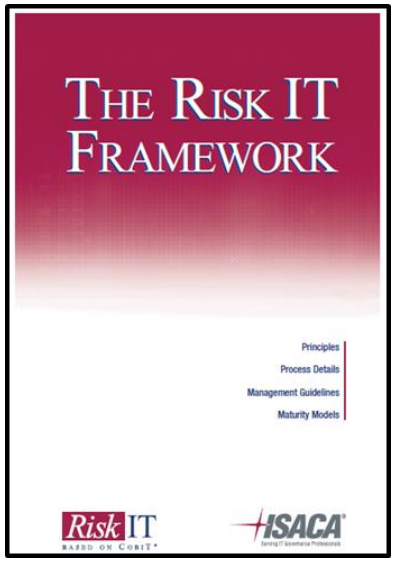
Risk Evaluation - Key Components

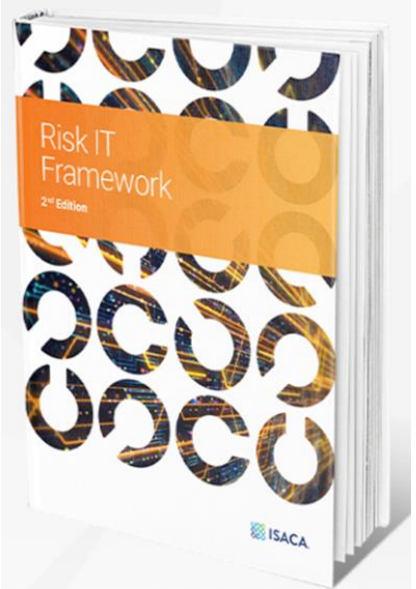
Collect Data	Identify relevant data to enable effective IT-related risk identification, analysis and reporting
Analyze Risk	Develop useful information to support risk decisions that take into account the business impact of risk factors
Maintain Risk Profile	Maintain and up-to-date and complete inventory of known risks and attributes as understood in the context of IT controls and business processes

Risk Evaluation - Collect Data (RE-1)

- **Goal:** Ensure IT-related risks are identified, analyzed and presented in business terms

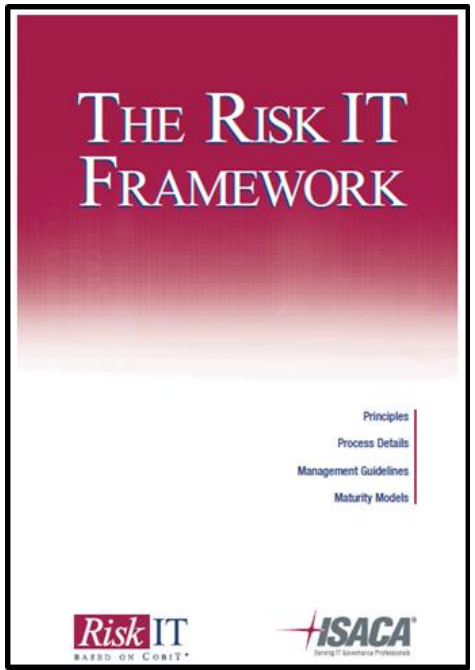
- **Metrics:**
  - # of loss events with key characteristics not captured or measured
  - Degree to which collected data support
    - Visibility and understanding of the threat landscape
      - Analyzing scenarios and reporting trends
      - Visibility and understanding of the control state





Risk Evaluation - Collect Data (RE1)

- Existence of a documented risk data collection model
  - # of data sources
  - # of data items with identified risk factors
  - Completeness of
    - Risk event data
      - Affected assets
      - Impact data
      - Threats
      - Controls
      - Measures of the effectiveness of controls
    - Historical data on risk factors

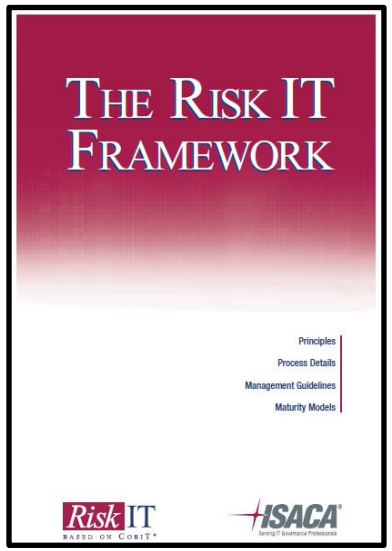


Risk Evaluation - Collect Data: Governance Roles

RACI Chart

Key Activities \ Roles	Board	CEO	CRO	CIO	CFO	Enterprise Risk Committee	Business Management	Business Process Owner	Risk Control Functions	HR	Compliance and Audit
RE1.1 Establish and maintain a model for data collection.	I	I	A/R	C	C	C	C	C	C		C
RE1.2 Collect data on the operating environment.		I	A/R	C	I	I	C	I	I	I	C
RE1.3 Collect data on risk events.		I	A	R	C	I		C	C		I
RE1.4 Identify risk factors.			A	R	I	I	C	C	R	C	C

A **RACI** chart identifies who is **R**esponsible, **A**ccountable, **C**onsulted and/or **I**nformed.



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Information Technology & Telecommunications

The City of New York

CITYWIDE INFORMATION SECURITY POLICY

Data Classification Policy

The Policy

The Agency head or designee has responsibility for ensuring agency information assets are appropriately categorized and the appropriate degree of protection is applied based on its valuation.

Background

To ensure that business information assets receive an appropriate level of protection, the value of the information must be a
Business information assets
business services with integ

Scope

This policy applies to all inf
written, stored electronically
New York general business
customers.

Information Classificatior

All information at the City o
four levels; public, sensitive

- **Public**—This informat
damage.
- **Sensitive**—This infor
inappropriate disclosur
- **Private**—This informa
public trust placed in t
- **Confidential**—This is
damage to the agency's ability to perform its primary business function. Datasets containing information whose disclosure could lead directly to massive financial loss, danger to public safety, or lead to loss of life is classified as confidential.

Information Valuation and Categorization

1) Ensure that business information assets receive an appropriate level of protection. The value of the information must be assessed to determine the requirements for security protection.
2) All information assets must be valued and categorized.
3) Information assets must be evaluated, valued and categorized by the Data Steward on a regular basis.
4) To ensure that appropriate protection is provided, the value of information should be determined before transmission over any communications network.

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Question:

How to approach prioritizing an enterprise's data for protection?

Let’s set up an information security categorization for an example: Health Catalyst’s product line data

Determine the overall information security categorization of the different datasets

Datasets	Confidentiality	Integrity	Availability	"Overall" Impact Rating
Financial Management				
Accountable Care				
Population Health Management				
Operational and Workflow Improvement				
Patient Injury Prevention				

Remember the application of FIPS 199 to derive overall categorization of the Dean's laptop:

Asset \ Impact to	Confidentiality	Integrity	Availability	**Categorization**
Staff Salary Data	High	Low	Medium	High
Student Data	High	Low	Low	High
Fundraising Presentations	Medium	Medium	High	High
Dean's Personal Data	Low	Low	Medium	Medium

Synonyms: impact rating, security categorization, …

How can you find a way to transform the ordinal FIPS 199 impact ratings to ratio data to conduct a quantitative risk analysis?

Datasets	Impact	Likelihood	Risk
Financial Management	High	High	?
Accountable Care	High	Moderate	?
Population Health Management	Moderate	Moderate	?
Operational and Workflow Improvement	Low	Moderate	?
Patient Injury Prevention	Low	Low	?

Analyze risk to prioritize protection

An authoritative lookup table for transforming ordinal to ratio risk data…

	Impact		
Threat Likelihood	**Low (10)**	**Moderate (50)**	**High (100)**
High (1.0)	10 x 1.0 = 10	50 x 1.0 = 50	100 x 1.0 = 100
Moderate (0.5)	10 x 0.5 = 5	50 x 0.5 = 25	100 x 0.5 = 50
Low (0.1)	10 x 0.1 = 1	50 x 0.1 = 5	100 x 0.1 = 10

Risk Scale: High (>50 to 100) *Moderate (>10 to 50)* *Low (1 to 10)*

01527a

NIST SP 800-100 "Information Security Handbook: A Guide for Managers", page 90
found via SCHEDULE menu item in MIS Community site

Analyze risk to prioritize protection

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Risk Scale: High (>50 to 100) Moderate (>10 to 50) Low (1 to 10)

01527a

Transforming ordinal risk rankings to interval risk measures

Datasets	Impact	Likelihood	Risk
Financial Management	High	High	?
Accountable Care	High	Moderate	?
Population Health Management	Moderate	Moderate	?
Operational and Workflow Improvement	Low	Moderate	?
Patient Injury Prevention	Low	Low	?

Datasets	Impact	Likelihood	Risk
Financial Management	100	1.0	100
Accountable Care	100	0.5	50
Population Health Management	50	0.5	25
Operational and Workflow Improvement	10	0.5	5
Patient Injury Prevention	10	0.1	1

Information Technology & Telecommunications

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Scope

This policy applies to all inf
written, stored electronical
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Information Classificatio

All information at the City o
four levels; public, sensitive, private, or confidential.

- **Public**—This information might not need to be disclosed, but if it is, it shouldn't cause any damage.
- **Sensitive**—This information requires a greater level of protection to prevent loss of inappropriate disclosure.
- **Private**—This information is for agency use only, and its disclosure would damage the public trust placed in the agency.
- **Confidential**—This is the highest level of sensitivity, and disclosure could cause extreme damage to the agency's ability to perform its primary business function. Datasets containing information whose disclosure could lead directly to massive financial loss, danger to public safety, or lead to loss of life is classified as confidential.

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Updated September 9, 2014 Version 1.5 — Data Classification Policy

PUBLIC Use pursuant to City of New York guidelines — Page 1 of 3

Information Valuation and Categorization

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How do you assess the value of information to an organization?

Quantitative Risk Assessment

*E*xpected losses can be weighed against the costs of counter-measures and provides a basis for trading Information Security ("InfoSec") costs and benefits

- One simple assessment technique calculates the annual loss expectancy (ALE) as a product of the cost of a single event (single loss expectancy, SLE) and the annualized rate of occurrence (ARO)

Annual **annual rate of occurrence (ARO)= how many times is this expected to happen in one year?**

- NOTE: The calculation assumes total loss of an asset. If an asset retains part of its useful value, the SLE should be adjusted by an appropriate amount

Single loss expectancy (SLE) = Asset value X Exposure factor

Problem

How would you determine the Annual Loss Expectance (ALE) for the theft of the Dean's laptop from the Case Study 'Snowfall and a stolen laptop' ?

Annual Loss Expectancy Calculation example

Note the assumptions of:

- *5% probability of annual rate of occurrence*
- *Credit monitoring service for 1,000 individuals*

greatly influence the results…

Annual Loss Expectancy Calculation		
Credit Monitoring Service (1000 records):		$15,000
Dean's Lost Productivity (assume $300,000 salary):		
10 hours restoring data from various sources		$ 3,000
10 hours re-doing lost work		$ 3,000
Replacement Device:		$ 1,000
IT investigation:		$ 200
Single Loss Expectancy:		$22,200
Annualized Rate of Occurrence:	0.05	
Annual Loss Expectancy:		$ 1,100

Risk management decision

Decision:

- Mitigate expected loss of a dean's laptop through purchase of security countermeasures

- Avoid
- Accept
- Transfer
- ✓ **Mitigate**

Annual Loss Expectancy Calculation		
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IT investigation:		$ 200
Single Loss Expectancy:		$22,200
Annualized Rate of Occurrence:	0.05	
Annual Loss Expectancy:		$ 1,100

Annual Cost of Countermeasures (per device)	
Automatic Backups:	$ 300
Managed Device Service:	$ 100
Annual Cost of Countermeasures:	$ 400

Analyze Risk

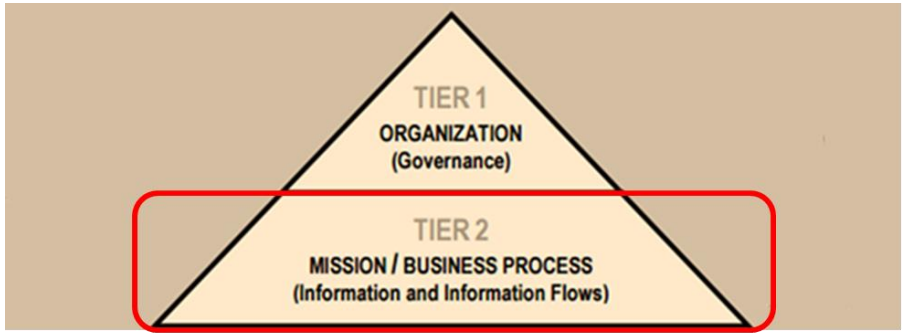
MANAGEMENT GUIDELINES—RE2

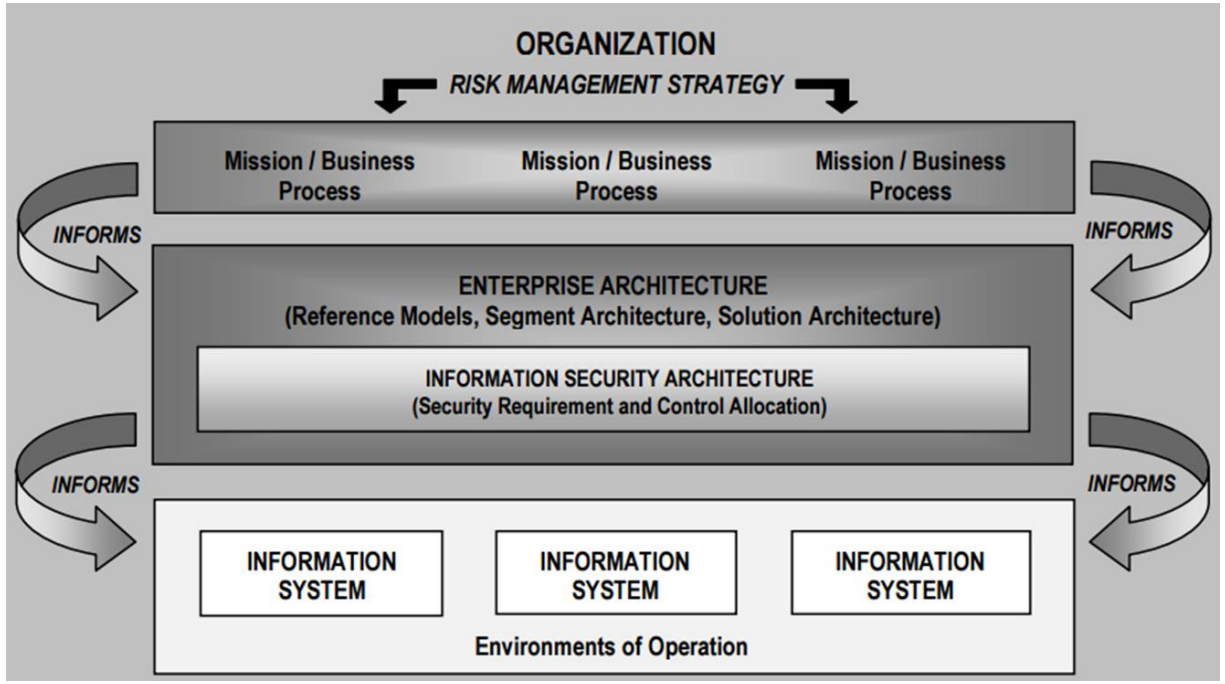
RACI Chart

Key Activities \ Roles	Board	CEO	CRO	CIO	CFO	Enterprise Risk Committee	Business Management	Business Process Owner	Risk Control Functions	HR	Compliance and Audit
RE2.1 Define IT risk analysis scope.		I	R	C	I	C	A	R	C		C
RE2.2 Estimate IT risk.		I	R	C	C	I	A/R	R	R		C
RE2.3 Identify risk response options.			C	C	C	R	A	R	R		I
RE2.4 Perform a peer review of IT risk analysis.			A/R				I		I		I

A **RACI** chart identifies who is **R**esponsible, **A**ccountable, **C**onsulted and/or **I**nformed.

But… who really knows the value and impact a breach implies for the business?





Information Technology & Telecommunications

The City of New York

CITYWIDE INFORMATION SECURITY POLICY

Data Classification Policy

The Policy

The Agency head or designee has responsibility for ensuring agency information assets are appropriately categorized and the appropriate degree of protection is applied based on its valuation.

Background

To ensure that business information assets receive an appropriate level of protection, the value of the information must be assessed to determine the requirements for security protection. Business information assets are those that affect and are integral to the City's ability to provide business services with integrity, comply with laws and regulations, and meet public trust.

Scope

This policy applies to all information. Information is defined as anything spoken, overheard, written, stored electronically, copied, transmitted or held intellectually concerning the City of New York general business, information systems, employees, business partners, or customers.

Information Classification

All information at the City of New York and corresponding agenc
four levels; public, sensitive, private, or confidential.

- **Public**—This information might not need to be disclosed, b
damage.
- **Sensitive**—This information requires a greater level of prot
inappropriate disclosure.
- **Private**—This information is for agency use only, and its di
public trust placed in the agency.
- **Confidential**—This is the highest level of sensitivity, and di
damage to the agency's ability to perform its primary busin
containing information whose disclosure could lead directly
danger to public safety, or lead to loss of life is classified as

Information Valuation and Categorization

1) Ensure that business information assets receive an appro
The value of the information must be assessed to determ
security protection.
2) All information assets must be valued and categorized.
3) Information assets must be evaluated, valued and categor
regular basis.
4) To ensure that appropriate protection is provided, the val
determined before transmission over any communication

Updated September 9, 2014 Version 1.5 — Data Classification Policy

PUBLIC Use pursuant to City of New York guidelines — Page 1 of 3

Information Technology & Telecommunications

The City of New York

CITYWIDE INFORMATION SECURITY POLICY

Data Steward

5) The Data Steward is normally someone who is responsible for or dependent on the business process associated with the information asset, and who is knowledgeable about how the information is acquired, transmitted, stored, deleted, and otherwise processed.
6) The Data Steward is responsible for determining the appropriate value and categorization of the information generated by the owner or the Agency.
7) The Data Steward must communicate the information value and categorization when the information is released or provided to another entity.
8) The Data Steward is responsible for controlling access to his/her information and must be consulted when other entities wish to extend access authority.

Information Technology & Telecommunications

The City of New York

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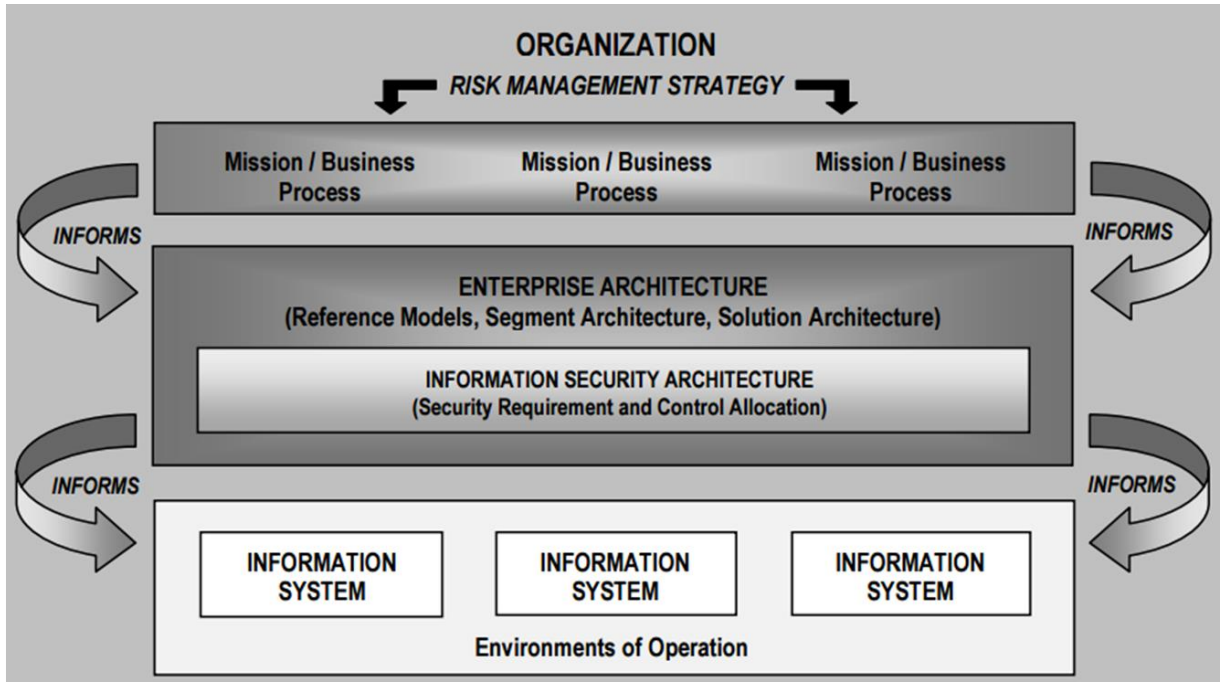
Where are the people who really know the value of the information and impact a breach implies for the business?



Maintain Risk Profile

RACI Chart

Roles

Key Activities	Board	CEO	CRO	CIO	CFO	Enterprise Risk Committee	Business Management	Business Process Owner	Risk Control Functions	HR	Compliance and Audit
RE3.1 Map IT resources to business processes.			I	R			C	A/R	C		I
RE3.2 Determine business criticality of IT resouces.		C		R		C	A	R			I
RE3.3 Understand IT capabilities.			C	A/R				C	C		I
RE3.4 Update IT risk scenario componenets.			C	R	I	C	C	A	R		C
RE3.5 Maintain the IT risk register and IT risk map.		I	A	R	I	I	I	R/C	C		I
RE3.6 Develop IT risk indicators.			A	C			C	C	R	C	C

A **RACI** chart identifies who is **R**esponsible, **A**ccountable, **C**onsulted and/or **I**nformed.

NYC Information Technology & Telecommunications

The City of New York

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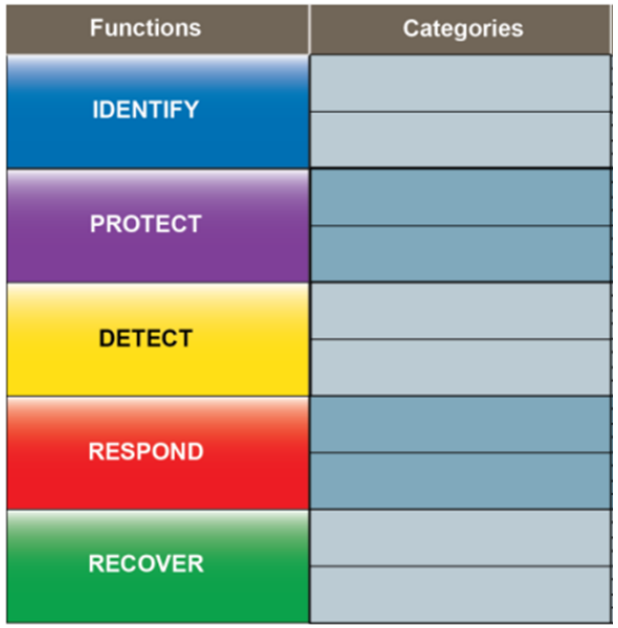
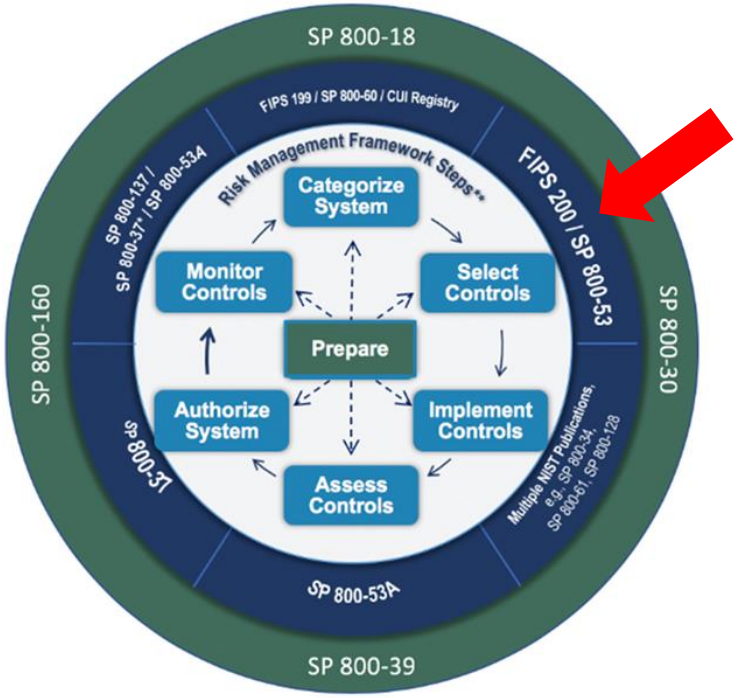
Review: Risk Management Techniques

Once threats and risks are identified, each risk can be managed by:

1. Avoidance
2. Acceptance
3. Transfer
4. Mitigation ("Controls")





Agenda

- ✓ In The News
- ✓ Categorizing Information for IT Risk Management
- ✓ Revisit Risk & Controls of Publicly Shared Geographic Information
- ✓ More on Confidentiality: Linked & Linkable PII
- ✓ Risk Evaluation
- ✓ Risk Management Techniques, a brief review
- Test taking tip
- Quiz

Test Taking Tip

- Eliminate any "probably wrong" answers first -

Focus on the "highest likelihood" answers for test taking efficiency

Here's why:

- Some of the answers use unfamiliar terms and stand out as unlikely and can therefore be discarded immediately
- Some answers are clearly wrong and you can recognize them based on your familiarity with the subject
- The correct answer may require a careful reading of the wording of the question and eliminating the unlikely answers early in the evaluation process helps you focus on key concepts for making the choice

Test Taking Tip

Example:

The promotion manager of Northeast Electronics has been made the owner of the department's printers and other resources. The manager can now designate who in the department can use the the large format printer. What term is used to describe this type of access control?

A. Mandatory
B. Role-Based
C. Discretionary
D. Distributed

Test Taking Tip

Example:

The promotion manager of Northeast Electronics has been made the owner of the department's printers and other resources. The manager can now designate who in the department can use the the large format printer. What term is used to describe this type of access control?

A. ~~Mandatory~~ Nothing seems mandatory about this scenario
B. Role-Based
C. Discretionary
D. Distributed

Test Taking Tip

Example:

The promotion manager of Northeast Electronics has been made the owner of the department's printers and other resources. The manager can now designate who in the department can use the the large format printer. What term is used to describe this type of access control?

~~A. Mandatory~~
B. Role-Based Maybe ….
C. Discretionary
D. Distributed

Test Taking Tip

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A. ~~Mandatory~~
B. ~~Role-Based~~ Nothing about roles other than manager in the question
C. Discretionary
D. Distributed

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C. Discretionary
~~D. Distributed~~ Distributed is not relevant to the information in the question

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~~D. Distributed~~

Answer: C

Quiz

Quiz

The overall objective of risk management is to:

A. eliminate all vulnerabilities, if possible
B. reduce risk to the lowest possible level
C. manage risk to an acceptable level
D. implement effective counter measures

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Quiz

The information security manager should treat regulatory compliance as:

A. an organizational mandate
B. a risk management priority
C. a purely operational issue
D. another risk to be managed

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Quiz

To address changes in risk, an effective risk management program should

A. ensure that continuous monitoring processes are in place
B. establish proper security baselines for all information resources
C. implement a complete data classification process
D. change security policies on a timely basis to address changing risk

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Quiz

Information classification is important to properly manage risk PRIMARILYbecause:

A. it ensures accountability for information resources as required by rolesand responsibilities
B. it is a legal requirement under various regulations
C. it ensures adequate protection of assets commensurate with the degree of risk
D. asset protection can then be based on the potential consequences ofcompromise

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Quiz

Data owners are PRIMARILY responsible for creating risk mitigation strategies to address which of the following areas?

A. Platform security
B. Entitlement changes
C. Intrusion detection
D. Antivirus controls

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B. Entitlement changes
C. Intrusion detection
D. Antivirus controls

An entitlement is a provision made in accordance with a legal framework of a society. Typically, entitlements are based on concepts of principle which are themselves based in concepts of social equality or enfranchisement. Wikipedia

Quiz

A risk analysis should:

A. limit the scope to a benchmark of similar companies
B. assume an equal degree of protection of all assets
C. address the potential size and likelihood of loss
D. give more weight to the likelihood vs. the size of the loss

Quiz

A risk analysis should:

A. limit the scope to a benchmark of similar companies
B. assume an equal degree of protection of all assets
C. address the potential size and likelihood of loss
D. give more weight to the likelihood vs. the size of the loss

Quiz – *Bonus question*

A year ago when Sam carried out a risk analysis, he determined that the company was at too much of a risk when it came to potentially loosing trade secrets.

The countermeasures his team implemented reduced this risk, and Sam determined that the annualized loss expectancy of the risk of a trade secret being stolen once in a hundred-year period is now $400.

What is the associated single loss expectancy value in this scenario?

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