A Strategy for Managing Fish, Wildlife and Habitat Data
For the Columbia River Fish and Wildlife Program

1.0 Introduction
- 1.1 Recognition of need
- 1.2 History of efforts
- 1.3 Sources of information
  - 1.3.1 Agency systems
  - 1.3.2 FWP projects
  - 1.3.3 Other analyses and reports
    - 1.3.3.1 Interagency projects - orphan data
    - 1.3.3.2 Peer-reviewed literature
    - 1.3.3.3 Tech reports
- 1.4 Purpose of this report –
  - 1.4.1 Summarize recent progress
  - 1.4.2 Describe a strategy for moving forward

2.0 Present Data Management Approaches
- 2.1 Most of the needed data are collected by and maintained by individual agency systems
  - 2.1.1 Many agencies
  - 2.1.2 Single-purpose systems
  - 2.1.3 Each system/agency is different
    - 2.1.3.1 Data collection methods
    - 2.1.3.2 Data content
    - 2.1.3.3 Hardware and software
  - 2.1.4 Systems meet agency mandates and objectives
  - 2.1.5 Agency systems evolve slowly
- 2.2 Existing regional projects
  - 2.2.1 StreamNet
  - 2.2.2 IBIS
  - 2.2.3 FPC
  - 2.2.4 DART
  - 2.2.5 PITAGIS & RMIS

3.0 Regional Information Management Needs
- 3.1 Depend upon agency data and management practices
- 3.2 Regional needs are typically **in addition to** the needs of agency programs
  - 3.2.1 Assessments are made at large spatial scales (roll-up of local data)
  - 3.2.2 Require consistent data across jurisdictional and agency boundaries
  - 3.2.3 Issues and users are complex and multi-disciplinary
  - 3.2.4 Information needs cross jurisdictional boundaries
  - 3.2.5 New reports and assessment tools create evolving information needs

3.2.6 Inter-agency analyses create new data sets that are (presently) not managed by existing systems

3.3 Data Management Problems

3.3.1 We have struggled with these issues since at least 1988

3.3.2 Data collection problems

3.3.2.1 A consistent set of core data for fish wildlife and their habitats has not been collected across the Basin

3.3.2.2 The quality of existing data is inconsistent

3.3.3 Data sharing problems

3.3.3.1 There is no inventory of existing data

3.3.3.2 Data feeds from the field to local, agency, or regional systems are cumbersome or nonexistent

3.3.3.3 It is difficult to access existing data

3.3.3.4 Data generated with public funds are not always available

3.3.4 Data usage

3.3.4.1 There is no way to synthesize and communicate data that do exist

3.3.4.2 There are significant gaps, spatially and temporally, in the existing data

3.3.4.3 There is insufficient data management support for regional efforts (e.g. subbasin planning, recovery planning, hatchery reform, SOTR, etc.).

4.0 A Strategy for Moving Forward

4.1 Coordination and cooperation

4.1.1 Stakeholders are often members of one or more of 3 distinct but overlapping communities or networks. Collaboration and coordination between these communities will be essential for success

4.1.2 Each network is able to provide key functions necessary to successful overall regional information management.

4.2 Efficiency – collect once and use for many purposes – data have value well beyond their initial use.

4.3 Develop? common goals –

4.3.1 Improve regional data management for timely assessment and reporting of fish and wildlife restoration and watershed health information

4.3.2 Develop analytic tools and reports to satisfy

4.3.2.1 Power Act

4.3.2.2 Recovery planning

4.3.2.3 Clean Water Act

4.4 Operate within a common regional frame of reference

4.5 Use the same blueprint for moving forward

4.6 Share the work of implementing new standards, practices and procedures

4.6.1 Agree on core standards and practices

4.6.2 Share technology and applications (pool resources)

4.6.3 Agencies incorporate standards and practices as they evolve agency systems
4.6.4 BPA fund:
4.6.4.1 Regional functions
4.6.4.1.1 Connections to legacy systems
4.6.4.1.2 Capture and maintain orphan datasets
4.6.4.1.3 Missing functional elements
4.6.4.1.4 Regional repositories and Internet infrastructure
4.6.4.1.5 Regional evaluation and planning functions
4.6.4.2 FWP project data
4.6.5 Develop pilot and prototype solutions to existing problems
4.6.6 Focus on FWP projects and orphan data

SUMMARY MESSAGE

1. We have right people – tech, policy
    a. Identifying data priorities
    b. Process for moving it forward
2. BPA funds part of the solution, but not the entire solution
    a. Set context for BPA funding
    b. Regional functions and infrastructure
    c. Incentives to improve agency systems
3. An improved system will cost more money
    a. Present investments will be leveraged
    b. Sequenced transition will control costs
    c.

A Strategy for Managing Fish, Wildlife and Habitat Data For the Columbia River Fish and Wildlife Program

Stewart Toshach – NWFSC – NOAAF

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Summary of Data Management Problems

- **Data Collection**
  - Inconsistencies in what is collected
  - Inconsistent data quality

- **Data Sharing**
  - No inventory of what is available
  - Difficult to access data
  - Data generated with public funds are not always readily available

- **Data Usage**
  - No way to synthesize and communicate the data that do exist
  - Significant gaps in existing data
  - Insufficient support for regional efforts (e.g. SOTR, recovery planning, subbasin planning, hatchery reform, etc.)

Source: ISRP, ISAB, SAIC reports

Regional Information Needs Are Broader Than Single Programs

- Complex issues and user communities
- Multidisciplinary information needs
- Cross-jurisdictional data are required
- Assessments are made at large spatial scales (roll-up of local data)
- New reports and assessment tools create evolving information needs

Legacy Information Systems Are Inefficient For Meeting Regional Needs

Existing systems typically:

- Were built to meet the management mandates of single agencies or programs
- Were created *ad hoc* as needs arose
- Use different technology and applications
- Use different definitions of the same data
- Have different levels of documentation of data , from very little to well described
- No single document describing data that all entities need
- Few formal business rules

We have learned key lessons from past experience

- The whole **IS** greater than the sum of the parts – Data have value beyond their initial purpose
- Developing efficient methods to move data from field collection into organized databases will yield the largest initial benefits
- Coordinating and planning ahead for data sharing is cheaper, faster, and provides higher quality data than acting after the fact.
- Consistent data management practices (not just technology) require policy-level support
- Effective information management is an ongoing effort, not an episodic task
- Data management schema may require both distributed and warehouse approaches

Options for Meeting Regional Information Needs

1) Business as usual – each entity & some programs have their own standards or no standards – Use bandaids to meet regional needs
2) Regional data repository based on improved data standards and practices
3) Regional distributed database network based on improved data standards and practices
4) **Evolve legacy systems to provide a combination of repositories and distributed network based on improved data standards and practices**

Examples of Recent Progress

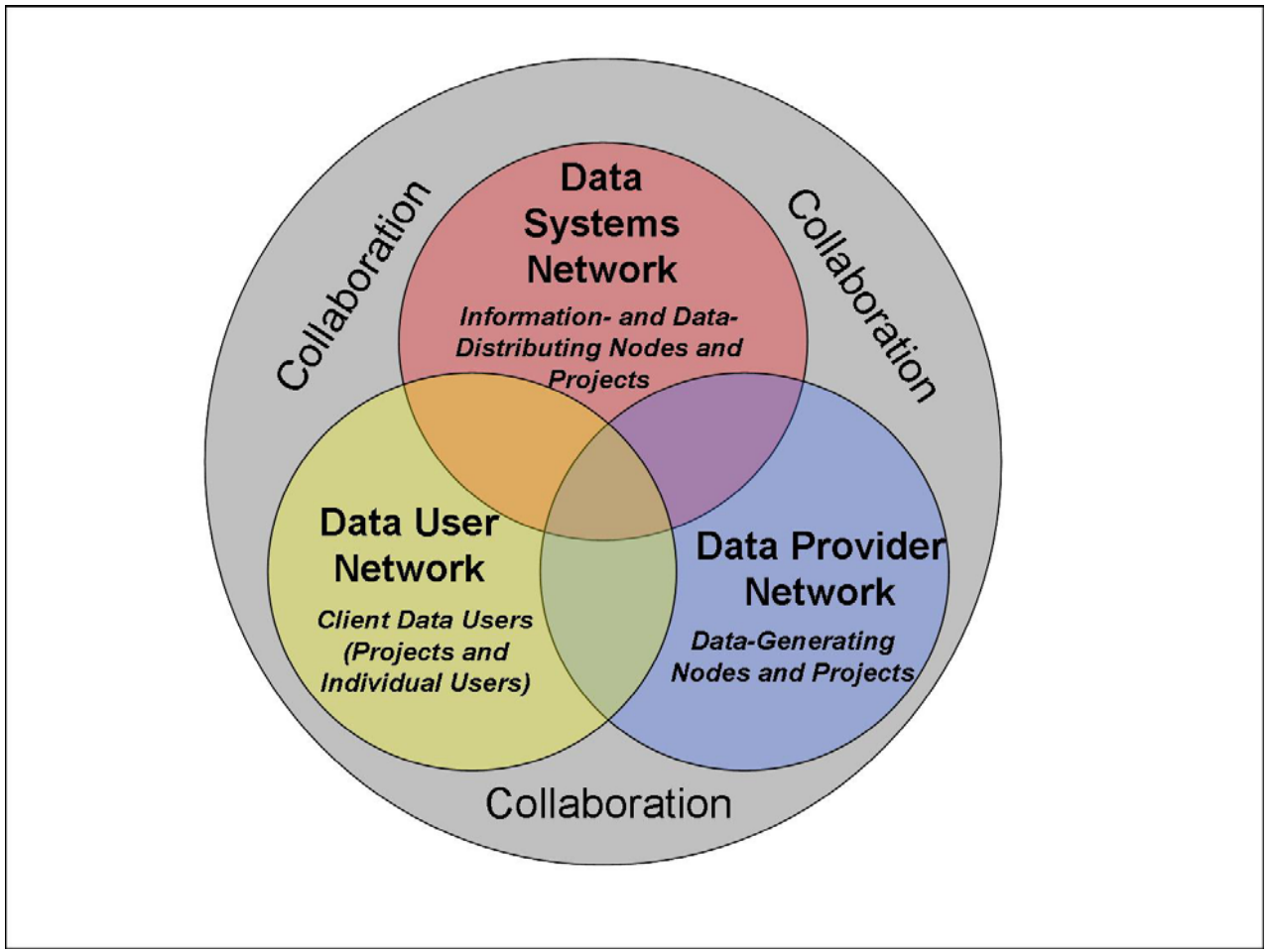
- Data sharing business rules (standards and practices)
- New data layers (e.g. limiting factors, global warming)
- Data needs & priorities
- Data collection protocols
- Quality assurance guidelines
- Core metadata standards
- Document deliverables
- Locational and temporal data standards (GPS)
- Names (e.g. sampling stations, fish populations)

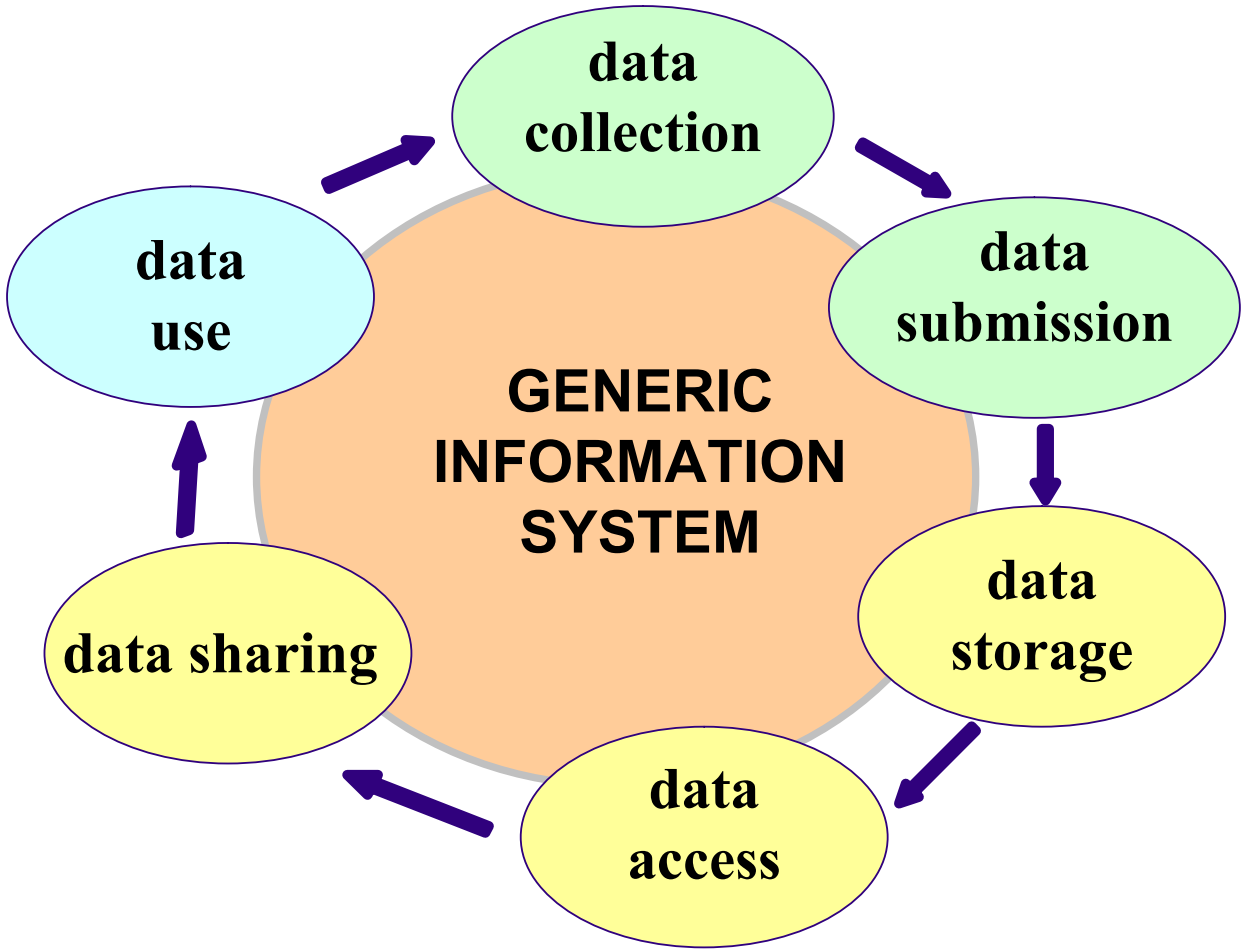
NOTE: Standards from FGDC, ISO and other organizations are being incorporated

Moving Forward:

What are the Important Elements for Handling and Sharing Data?

Important Element 1 – Coordination and Cooperation




data collection
data submission
data storage
data access
data sharing
data use
GENERIC INFORMATION SYSTEM

Important Element 2 – Efficiency - Collect once and reuse

Data bulk	#of users
Press releases, presentations	Public
Annual reports, Planning documents	Researchers and managers
Graphics, maps, environmental quality "report cards", indicators	Technical staff, research managers, public
Statistical summaries and graphs	Modelers, researchers, statisticians
Data tables, data sets, metadata	Modelers, researchers
Raw data: field data, laboratory results metadata	Field & lab scientists

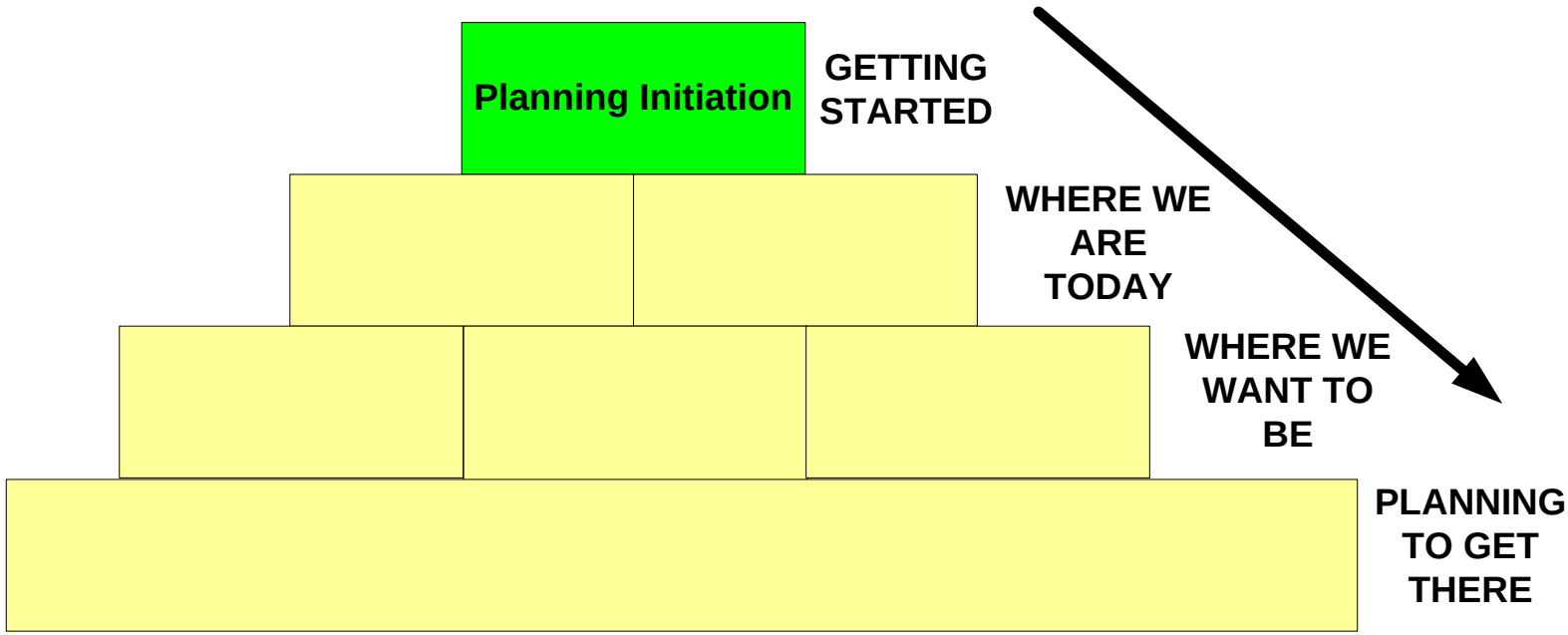
Important Element 3 – Adopt Common Goals

- Improve Data Systems for Timely Reporting of Salmon Recovery and Watershed Health Information

- Develop analytic tools and reports to evaluate progress toward natural resource management objectives

Important Element 4. Use a Common Regional Frame of Reference

Important Element 5. Use a Common Blueprint for Moving Forward



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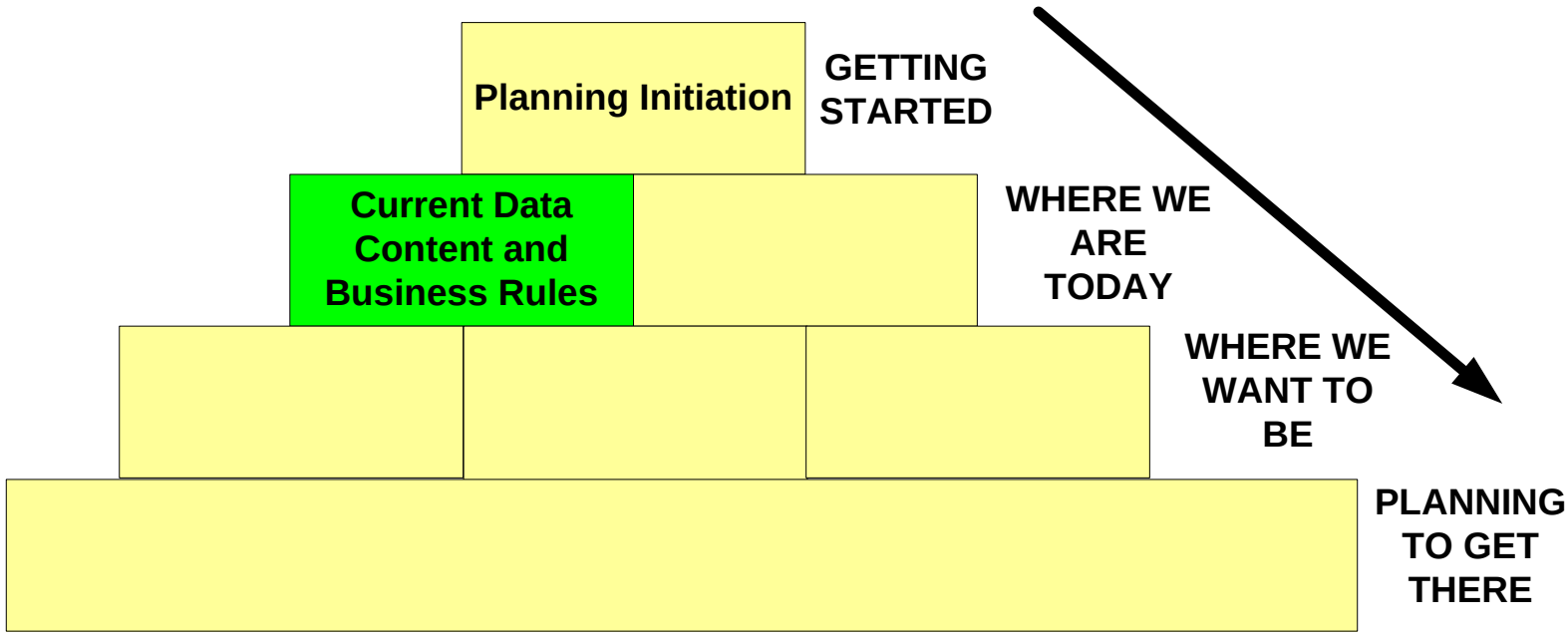
Understand Baseline of Current Data Content and Business Rules?



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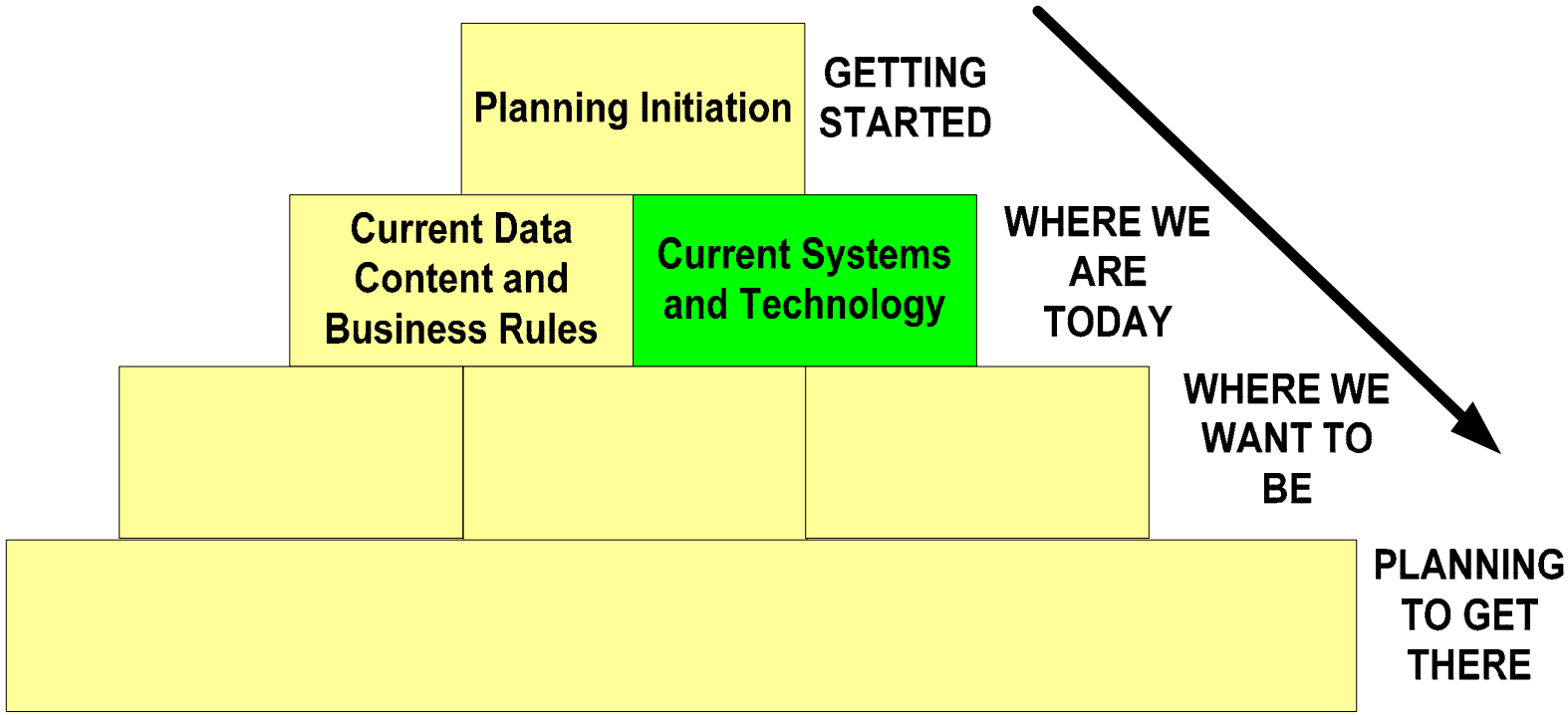
Describe Existing Data Content and Business Rules

Existing systems typically:

- Were built to meet the management mandates of single agencies or programs
- Were created individually as need arose
- Use different technology and applications
- Use different definitions of the same data
- Have different levels of documentation of data , from very little to well described
- No single document describing data that all entities need
- Few formal business rules

Describe the Application Systems (Software) and Technology Platforms (Infrastructure) You Have to Work With?



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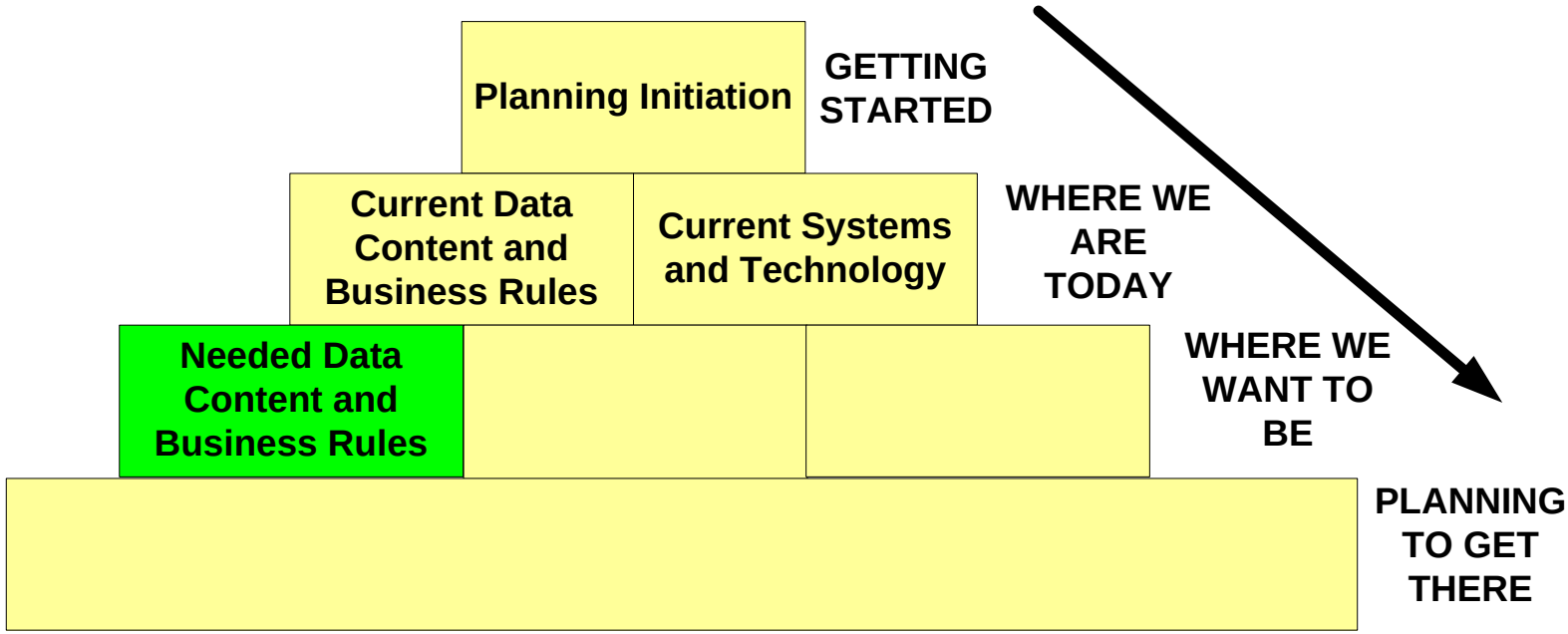
Current Systems & Technology

- observation and monitoring systems
- paper reporting systems
- Individual computers and computing systems
- spreadsheets
- relational data bases
- electronic recording systems
- etc

Define Needed Data Content and Business Rules <u>Before Moving On</u>



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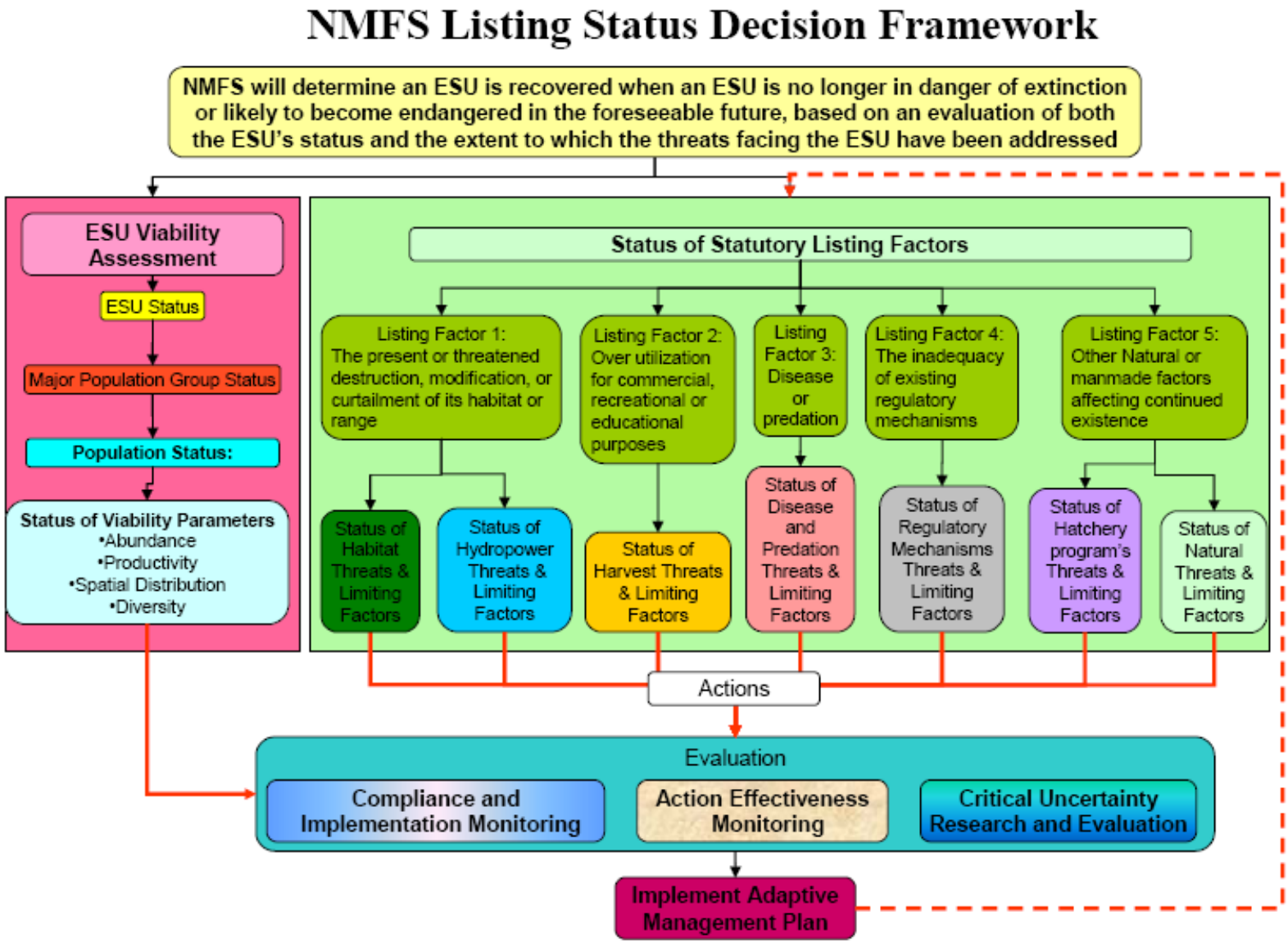
Example: New Questions/Data Needs



Example: Management Questions

Describe Data Content & Business Rules

Identify and document:

- **The questions you want to answer**
- **Details of needed data, and collection & lab methods**
- Frequency of collection
- Locations of collection
- **Data quality**
- **Data maintenance**
- **Standards/Protocols**

NOTE: Bolded items already exist or are under development

Use a Data Dictionary to Detail Needed Data and Other System Information

Data Element Name	Data Element Definition	Data Element Unit of Measure (uom)	Data Element Precision	Data Element Data Type	Data Source
Dissolved Oxygen	The amount of Dissolved Oxygen as measured using the ---------- method	mg/l	0.1	numeric	WSDOE

Examples of Business Rules (Protocols/Standards)

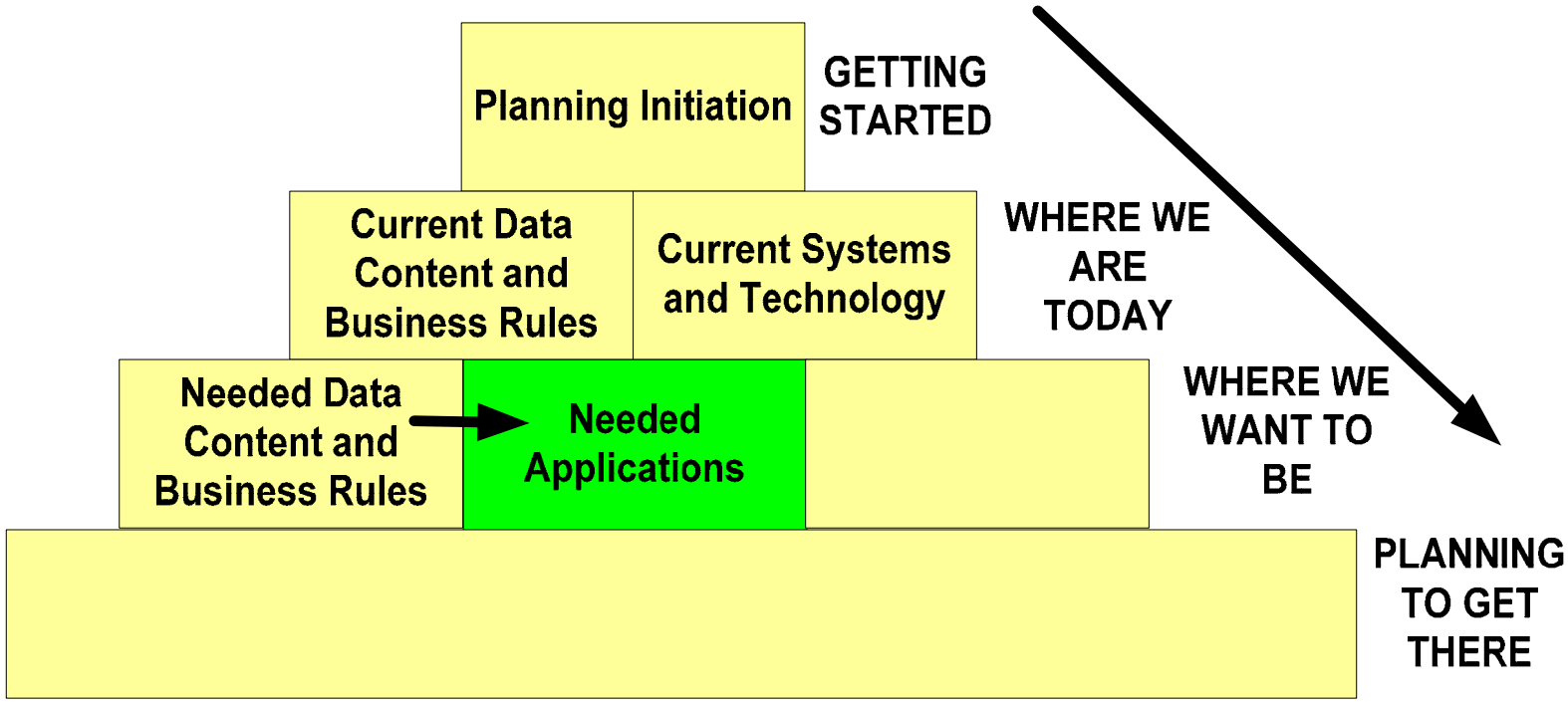
- **Project performance**
- **Data collection**
- Data reporting
- **Data sharing**
- **Quality assurance**
- **Metadata reporting**
- Document deliverables
- **Locational data (GPS)**
- Names e.g. sampling stations
- **Calendar date**

NOTE: some **already exist or are in prep.** – the FGDC, ISO and other organizations publish standards

Consider Data Availability (Find Gaps)

- Are available data adequate?
- Are some of the data collected by an entity but not currently shared?
- Is a new collection effort required?

Choose Applications that Meet Defined Needs and Business Rules



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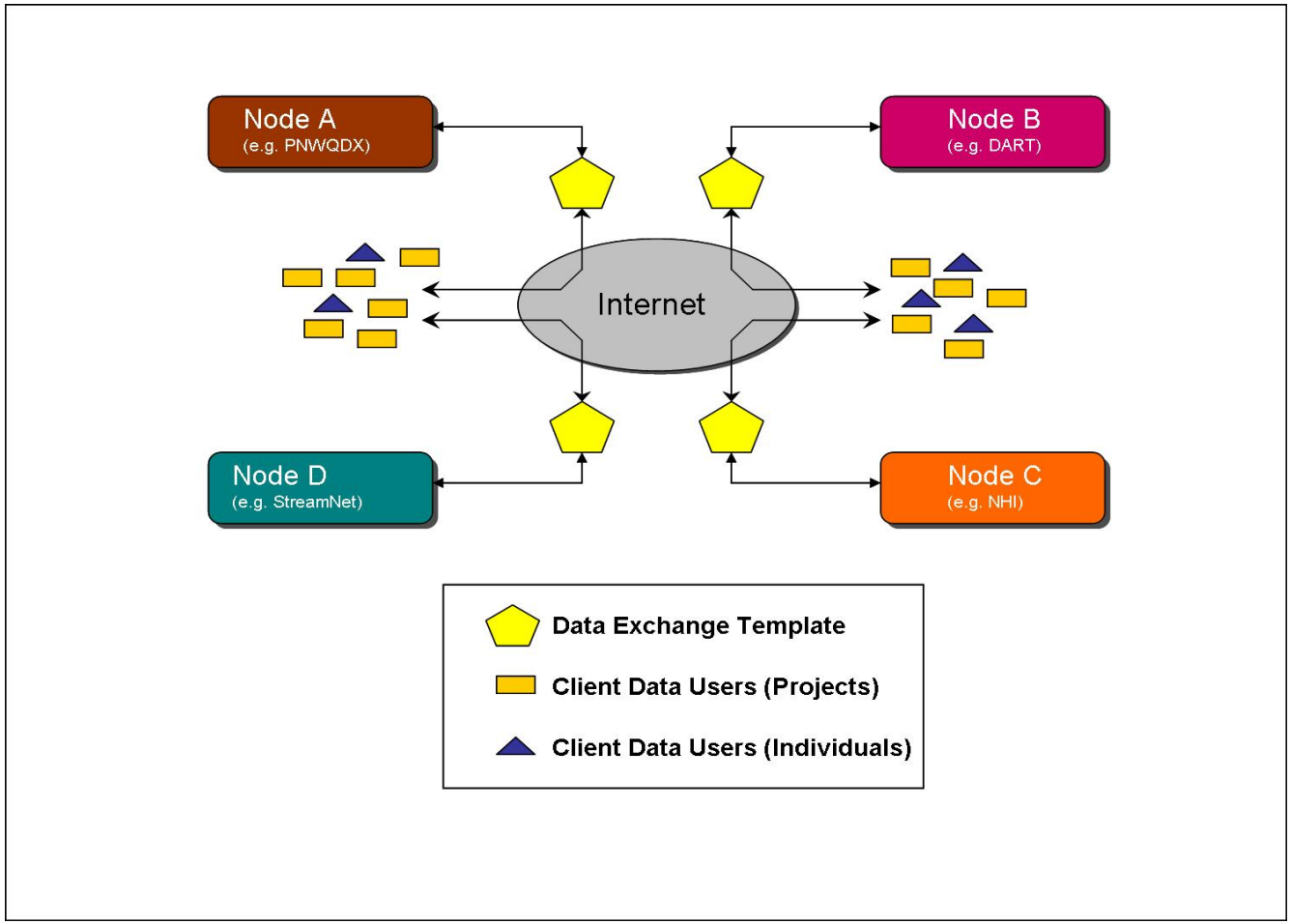
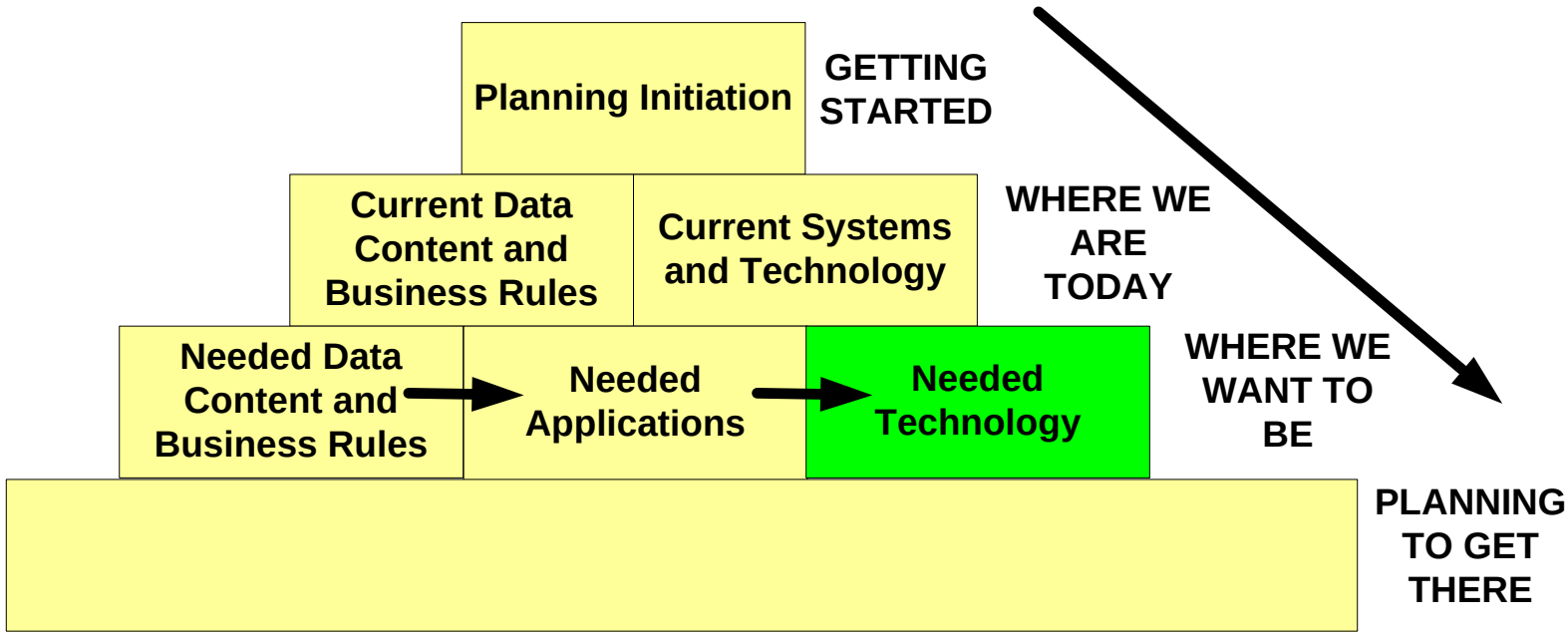
Identify and Document What the Applications (Software) Will Do

- Discover data from www
- Access the data for use
- Integrate data from different sources.
- Publish your data so others can use it
- Provide control over versions
- Perform quality checks
- Provide reports

Another Example: Distributed Network System Diagram



What Technology (Infrastructure) is Needed?



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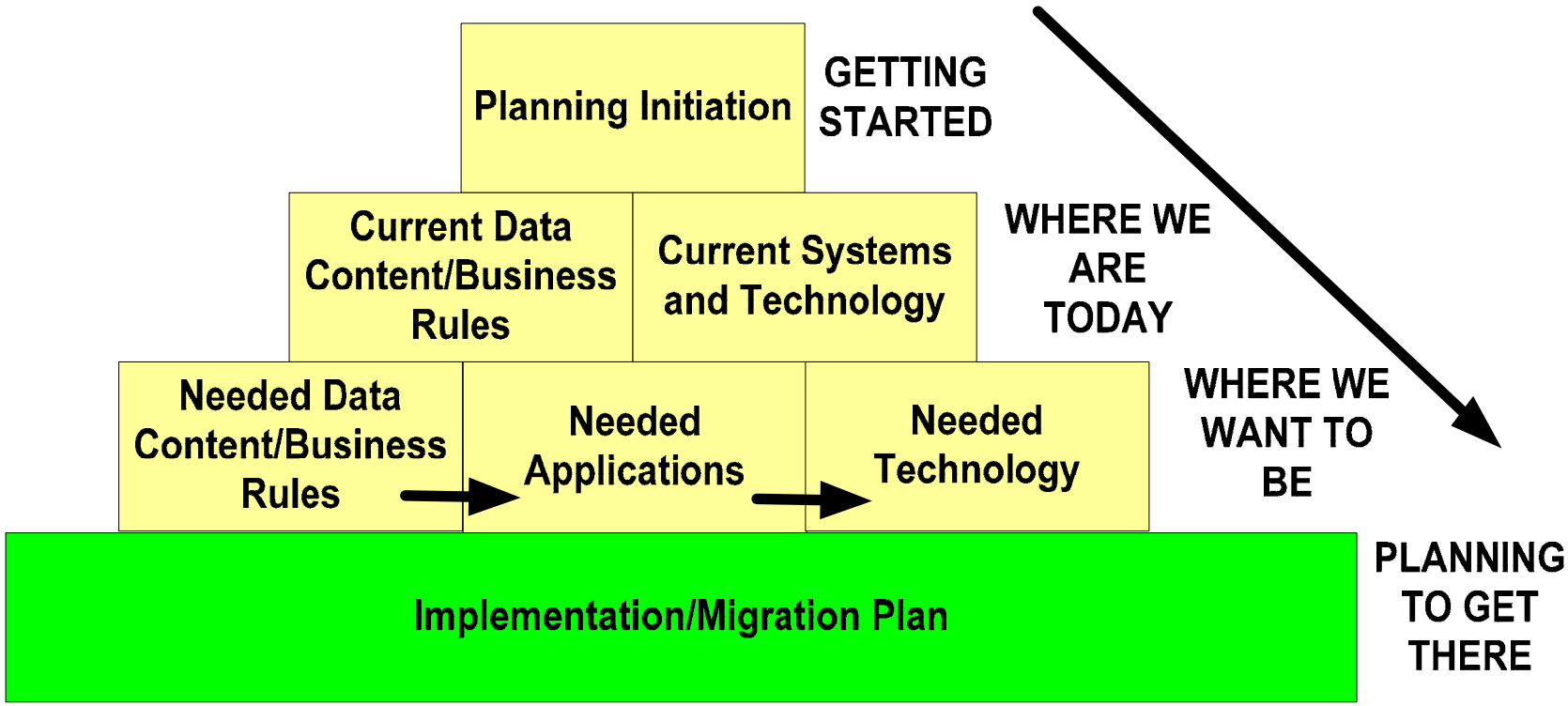
Examples of Technology (Infrastructure) Issues

- world wide web
- web mapping services – like Portals
- distributed data base systems
- geographic positioning systems
- geographic information systems
- Infrastructure – Bandwidth & reliability
- Security – firewalls - backups
- Compatibility with applications
- Storage capacity (e.g. Ortho Imagery for WA is 4 Terabytes)
- Compatibility with Peripherals – e.g. PDAs, remote sensors etc.
- Available 24/7?

Important Element 6: Implementation



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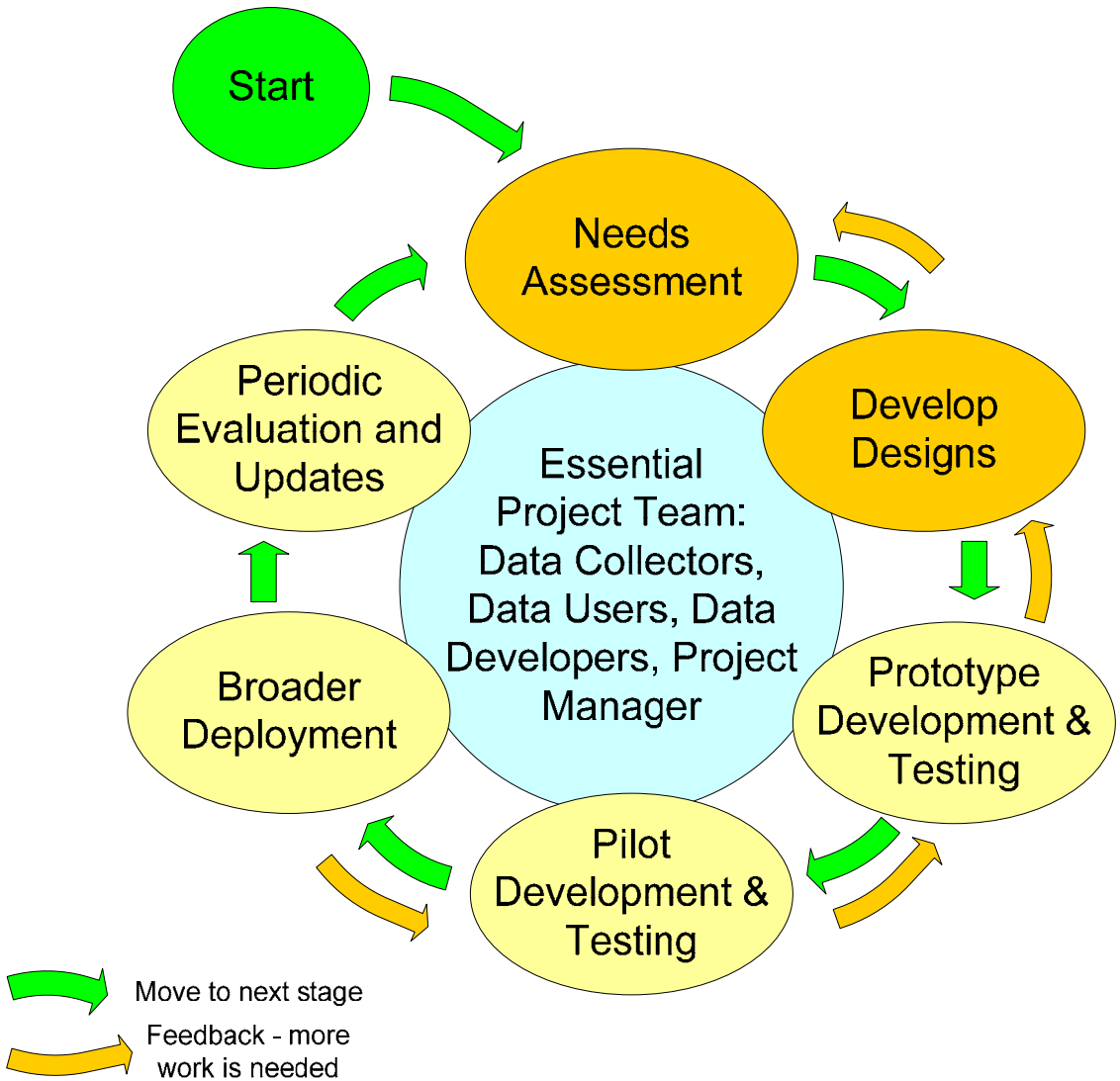

Start
Needs Assessment
Develop Designs
Prototype Development & Testing
Pilot Development & Testing
Broader Deployment
Periodic Evaluation and Updates
Essential Project Team: Data Collectors, Data Users, Data Developers, Project Manager
Move to next stage
Feedback - more work is needed

Keys to Implementation

Sponsorship

Partnership

Leadership

Production Schedule

Responsibilities

Sharing agreements – Data Stewardship

Time

Regional Executive Information Summit
Portland, OR., October, 2nd 2007

Information Sharing for Better Decision Making

- Sponsored by NED, PNAMP and PNW-RGIC

The Summit is an opportunity for your Executive to discuss regional data sharing needs with other Executives.

HOW REGIONAL COORDINATION WORKS

COMMON GOAL

CONSISTENT TABULAR AND SPATIAL PRODUCTS ACROSS GEOGRAPHIC AND JURISDICTIONAL BOUNDARIES

FUNCTIONS

REGIONAL INFORMATION PLANNING AND COORDINATION FUNCTIONS

DEFINING QUESTIONS & BUSINESS NEEDS	DATA COLLECTION	DATA REPORTING	DATA SYSTEM DESIGN	DATA SHARING	DATA INTEGRATION	SPATIAL MAPPING	SPATIAL MAPPING FRAMEWORK	NATIONAL SPATIAL COORDINATION

PNAMP
Aquatic Monitoring

PNW-RGIC
NationalFramework
Data Layers

NED
Natural Resources

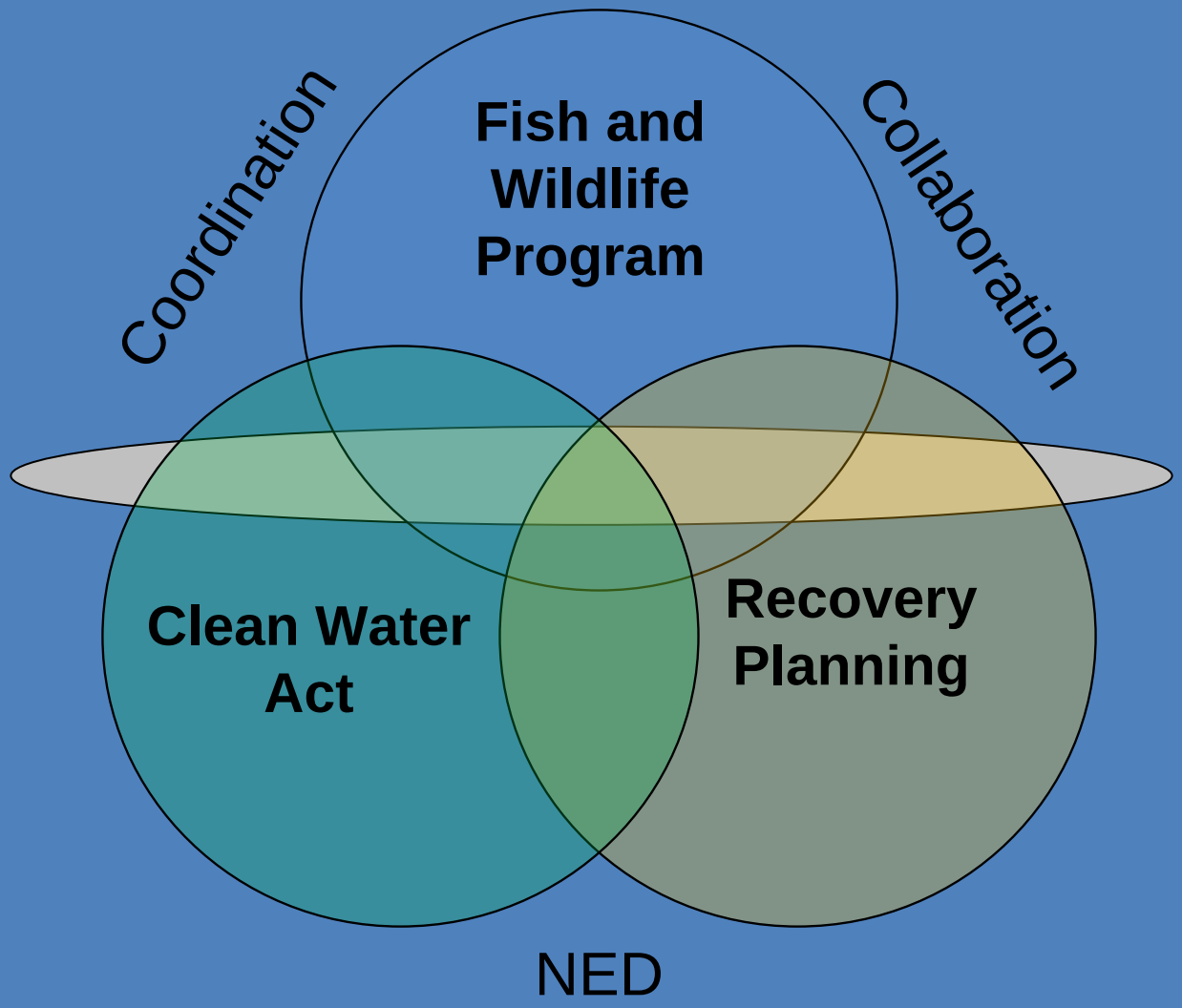
Developing a Strategy for Managing Fish, Wildlife and Habitat Data for the Columbia River Fish and Wildlife Program

July 11, 2007
Presentation to the NPCC
Fish and Wildlife Committee

Stewart Toshach –NOAAF
Phil Roger – CRITFC
Tom Iverson – CBFWA
Tom O'Neil – NHI
Dave Tetta - EPA

Outline of Strategy

1) Introduction and purpose
2) Present Data Management Approaches
3) Regional Information Needs
4) Strategy for Moving Forward
   a) Build from strengths
   b) Fill gaps
   c) Integrate with other regional efforts


Coordination
Fish and Wildlife Program
Collaboration
Clean Water Act
Recovery Planning
NED

Sources of Information

- Agency programs and systems
  - Largest source of data
  - Funded by agencies
  - Developed to meet agency mandates, not regional needs
  - Evolve slowly
- Fish and Wildlife Program projects
- Other sources
  - Inter-agency projects – Orphan Data
    (e.g. subbasin planning, hatchery reform, etc.)
  - Peer-reviewed literature
  - Technical reports (e.g. ISAB, PSC, agencies, etc.)

Existing Information Systems Are Not Designed For Meeting Regional Needs

Existing systems typically:

- Contain most of the existing data on fish and wildlife populations and their habitats
- Were built to meet the management mandates of single agencies or programs
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- **Data Sharing**
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We have learned key lessons from past experience

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- Data management schema may require both distributed and warehouse approaches
- Coordinating and planning ahead for data sharing is cheaper, faster, and provides higher quality data than acting after the fact

We Are Making Steady Progress

- Data sharing business rules (NED White Papers, StreamNet DEFs)
- New data layers (e.g. limiting factors, global warming, SBPs)
- Data needs & priorities (PNAMP Management Questions, BiOps)
- Data gaps (SOTR, etc.)
- Data collection protocols (CSMEP Study Designs, AFS book)
- Quality assurance guidelines (NED White Paper)
- Core metadata standards (USGS metadata training)
- Location and temporal data standards (NED White Paper)
- Names (CBFWA Amendment Strategy)
- Recent efforts provide alternative technologies (e.g. PNWWQX, ISEMP, NED Portal, IDFG)

NOTE: Standards from FGDC, ISO and other organizations are being incorporated

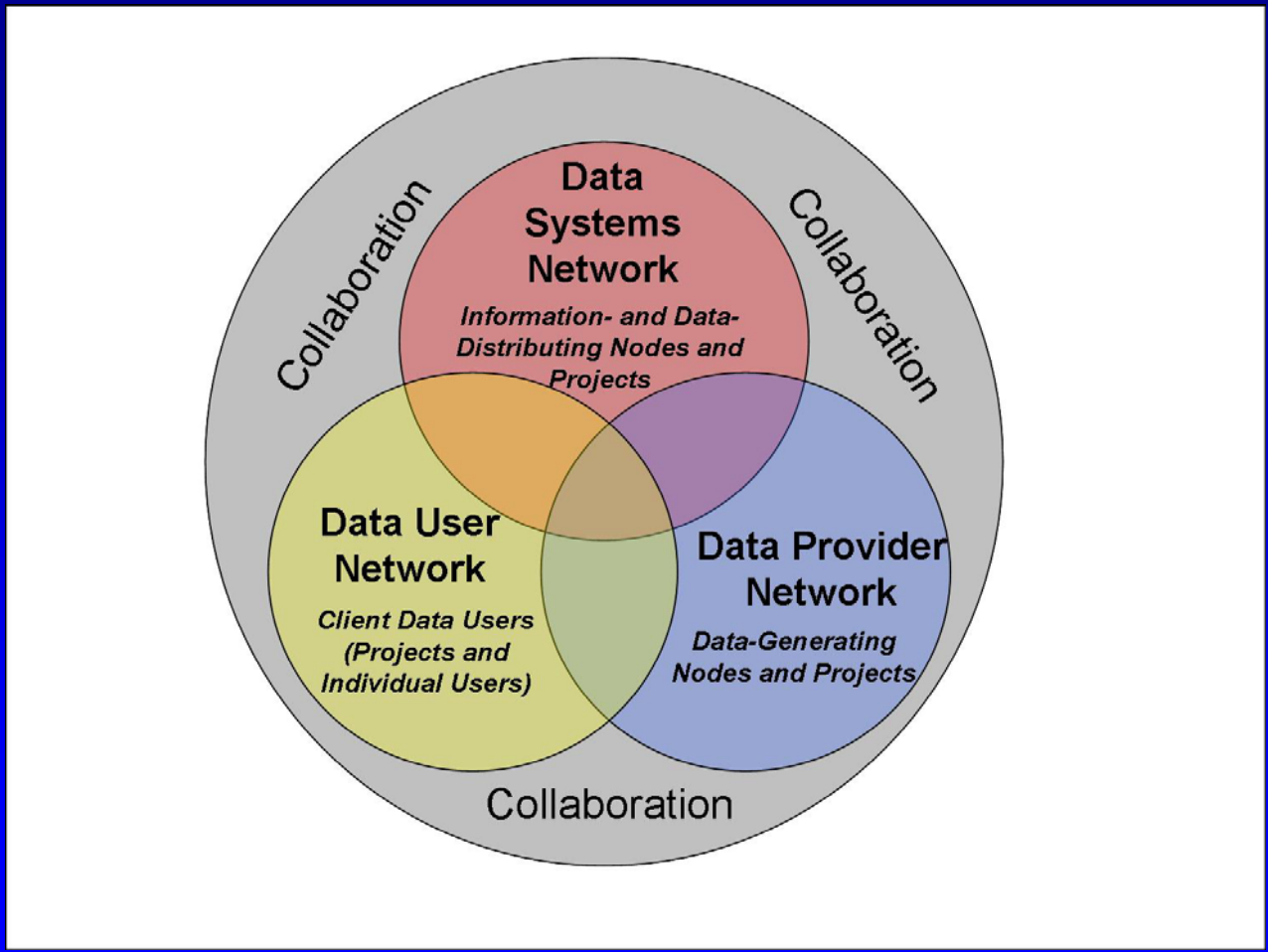
Moving Forward:

What are the Important Elements for Meeting Information Needs?

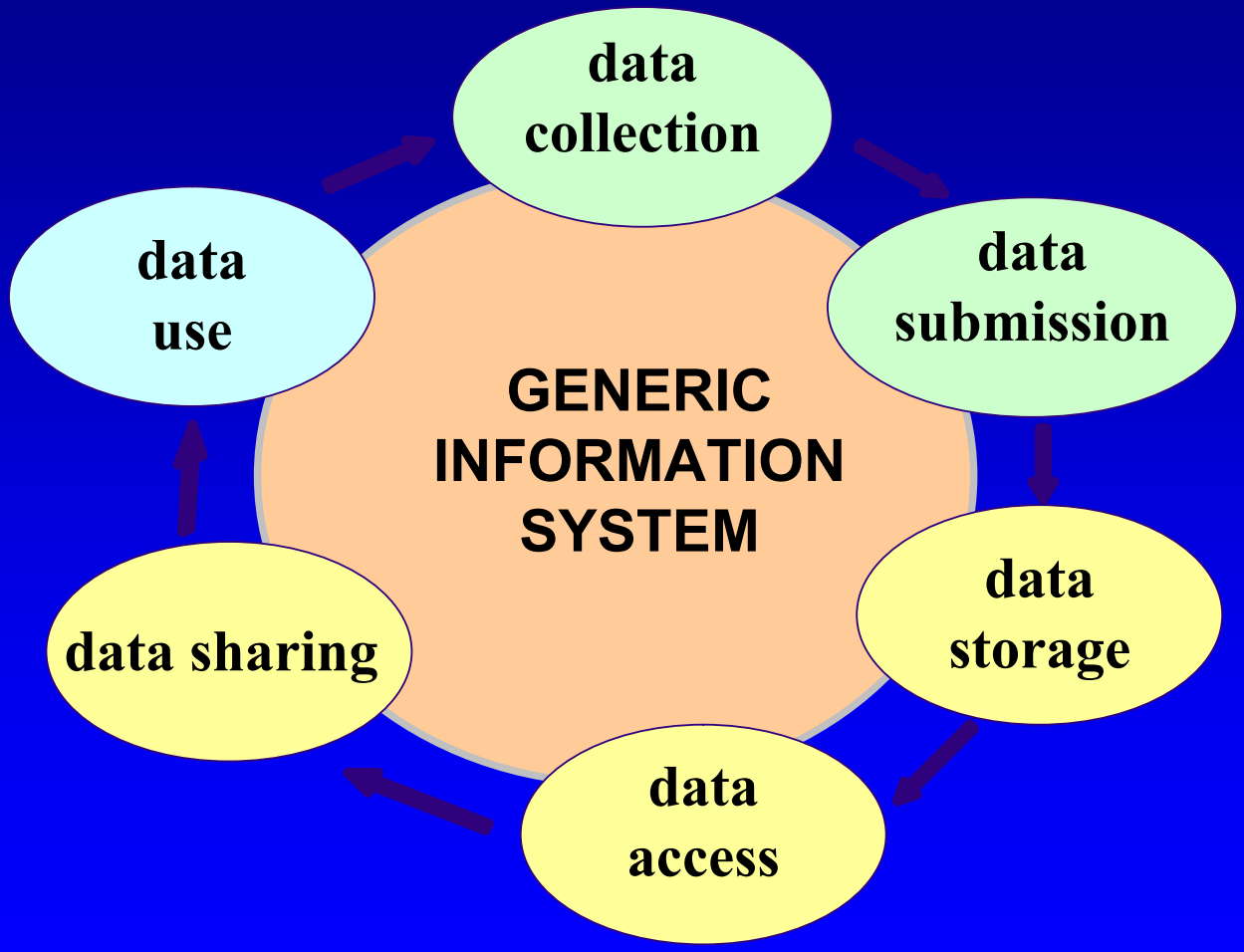
1 – Cross-Agency Agreements and Commitments

Most of the solution depends on adoption of administrative and business arrangements, agreements, and protocols – all of which depend on executive coordination and consent.

2 – Coordination and Cooperation



People Working Together



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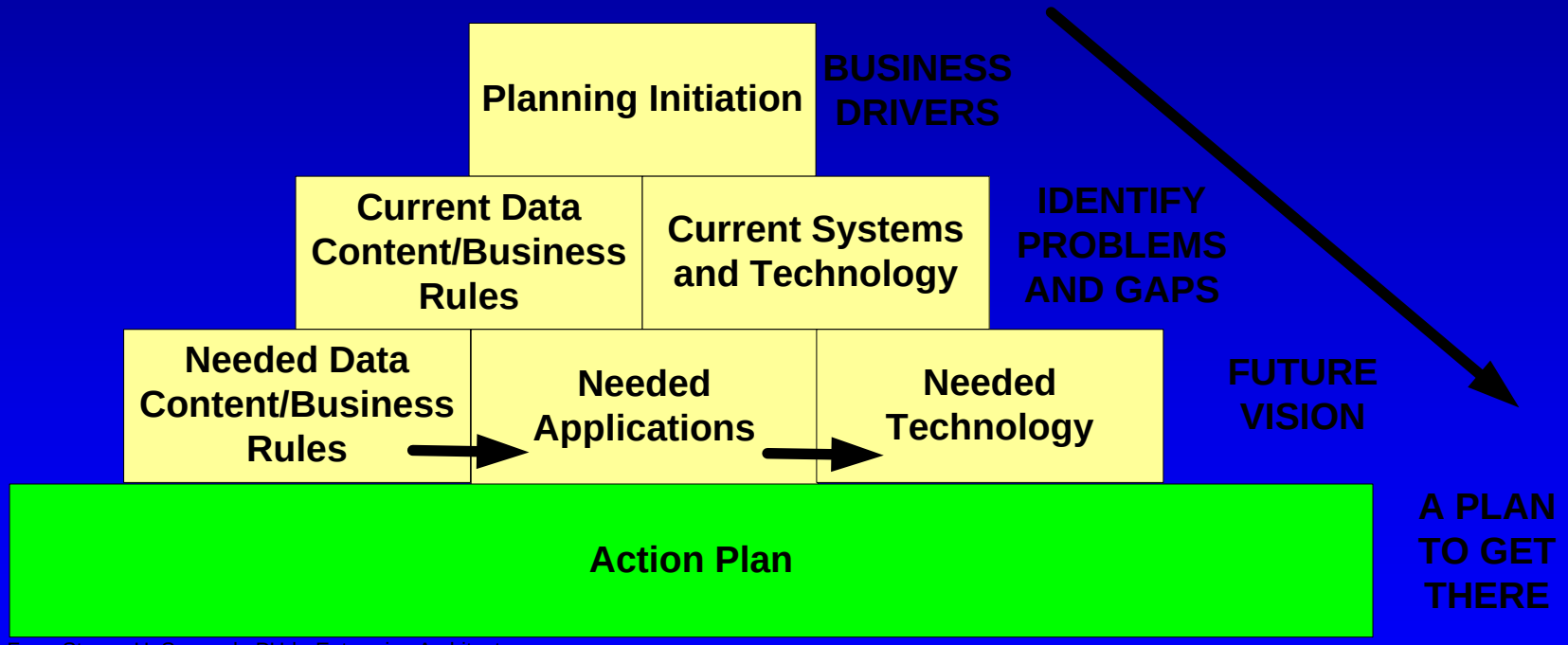
Raw data: field data, laboratory results metadata	Field & lab scientists

SAIC report 2001

4 – Adopt Common Goals

- Provide a mechanism to evaluate progress toward Program success and natural resource management objectives
- Improve Data Systems for Timely Reporting of Salmon Recovery and Watershed Health Information
- Support development of new analytic tools and reports

5 - Adopt a Common Approach



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6 – Share Responsibility for Implementation

- Agencies incorporate Best Practices
- Share technology and applications (pool resources)
- Develop cost-share arrangements
- Test alternative technologies (e.g. PNWWQX, ISEMP< NED Portal, IDFG, etc.)
- Start with small scale pilot and prototype solutions for existing problems and gaps

Schedule for Deliverables

- Develop Comprehensive Data Management Strategy
  - NED and CBFWA approval in August
  - Submit to NPCC in September
- Develop FY08-09 project funding recommendations
  - NED and CBFWA approval in August
  - Submit to NPCC in September

SUMMARY

- We are making steady progress and know what needs to be done
- We need executive support for the strategy – October Summit
- Improvements will require initial investments to realize long-term efficiencies