An Early Warning System for the Great Lakes

Addressing Future Water Quality Issues Before They Start

International Joint Commission
Great Lakes Science Advisory Board

Webinar Presentation
June 13, 2024

More than a century of cooperation protecting shared waters
IJC.org

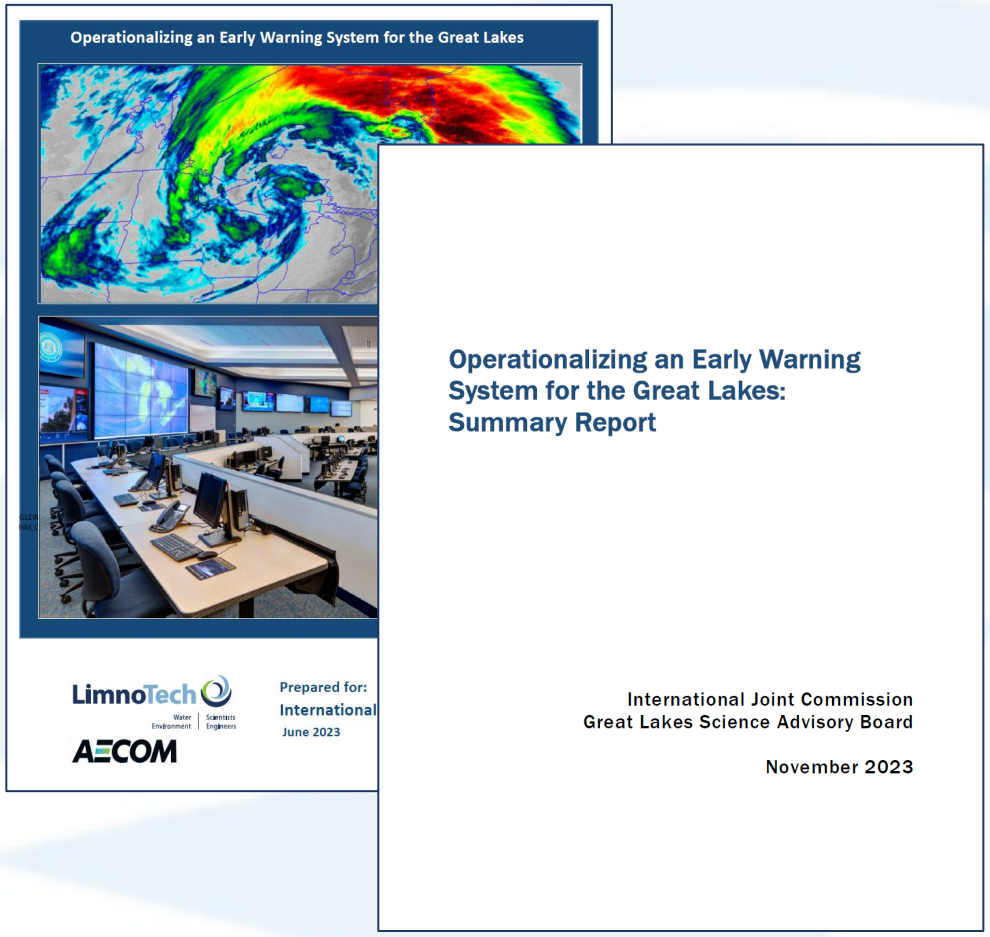
An Early Warning System for the Great Lakes

Agenda

- Presentation (30 minutes)
- Q & A (30 minutes)

Reports available at:

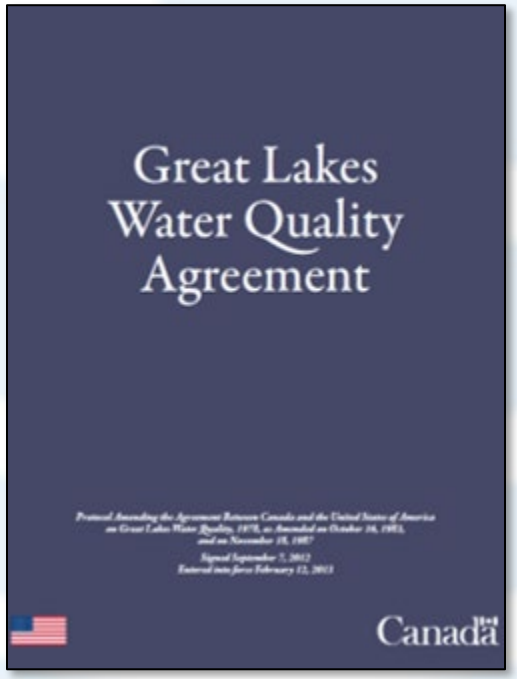
bit.ly/SAB-GLEWS-Reports



Opening Remarks

Gail Krantzberg
Science Priority Committee Board Co-chair,
Professor of Engineering and Public Policy,
McMaster University, Hamilton, Ontario

About the International Joint Commission



- Canada-US Great Lakes Water Quality Agreement
- Water Quality Board (WQB): Principal advisor to the IJC on Great Lakes issues and Agreement implementation
- Science Advisory Board (SAB): Advises IJC and WQB on research and science:
  - *Research Coordination Committee (RCC)*
  - *Science Priority Committee (SPC)*

Protecting A Globally Significant Resource

Contain roughly 20% of the world's fresh surface water.

Drinking water for 38 million people.

The world's 3rd largest regional economy.

GLEWS Phase 2 Work Group Membership

Project Co-Chairs:
Michael Twiss, Algoma University & IJC SAB
Lucinda Johnson, University of Minnesota & IJC SAB

Maggie Xenopoulos, Trent University & SAB
John Livernois, University of Guelph & IJC SAB
Karen Kidd, McMaster University & IJC SAB
Gail Krantzberg, McMaster University & IJC SAB
Rebecca Rooney, University of Waterloo & IJC SAB
Gavin Christie, Fisheries and Oceans Canada & IJC SAB (retired)
Ram Yerubandi, Environment and Climate Change Canada & IJC SAB
Jon Allan, University of Michigan & IJC WQB
Carolyn Johns, Toronto Metropolitan University & IJC WQB
Elaine Faustman, University of Washington & IJC HPAB
Michael Price, Great Lakes Indian Fish and Wildlife Commission
Al Steinman, Grand Valley State University
Craig Stow, NOAA-GLERL

Mike McKay, University of Windsor
Roger Knight, Great Lakes Fishery Commission
Chris Vandergoot, Great Lakes Acoustic Telemetry Observing System
Susan Doka, Fisheries and Oceans Canada
Terry Brown, U.S. EPA-Office of Research and Development
Scott Sowa, The Nature Conservancy
Dave Allan, University of Michigan
Jon Hortness, U.S. Geological Survey
Bernard Crimmins, Clarkson University
Katya Kovalenko, University of Minnesota
Michelle Selzer, Michigan Dep't of Ag and Rural Devel't
Ngan Diep, Ontario Ministry of Environment, Conservation and Parks
Sean Backus, Environment and Climate Change Canada

Contractors:
John Bratton, LimnoTech
Tad Slawecki, LimnoTech
Mike Donahue, AECOM

IJC Staff:
Matthew Child
Lizhu Wang

Presenters

Lucinda Johnson
Science Priority Committee Board Co-chair,
Senior Research Fellow, Natural Resources Research Institute
University of Minnesota, Duluth

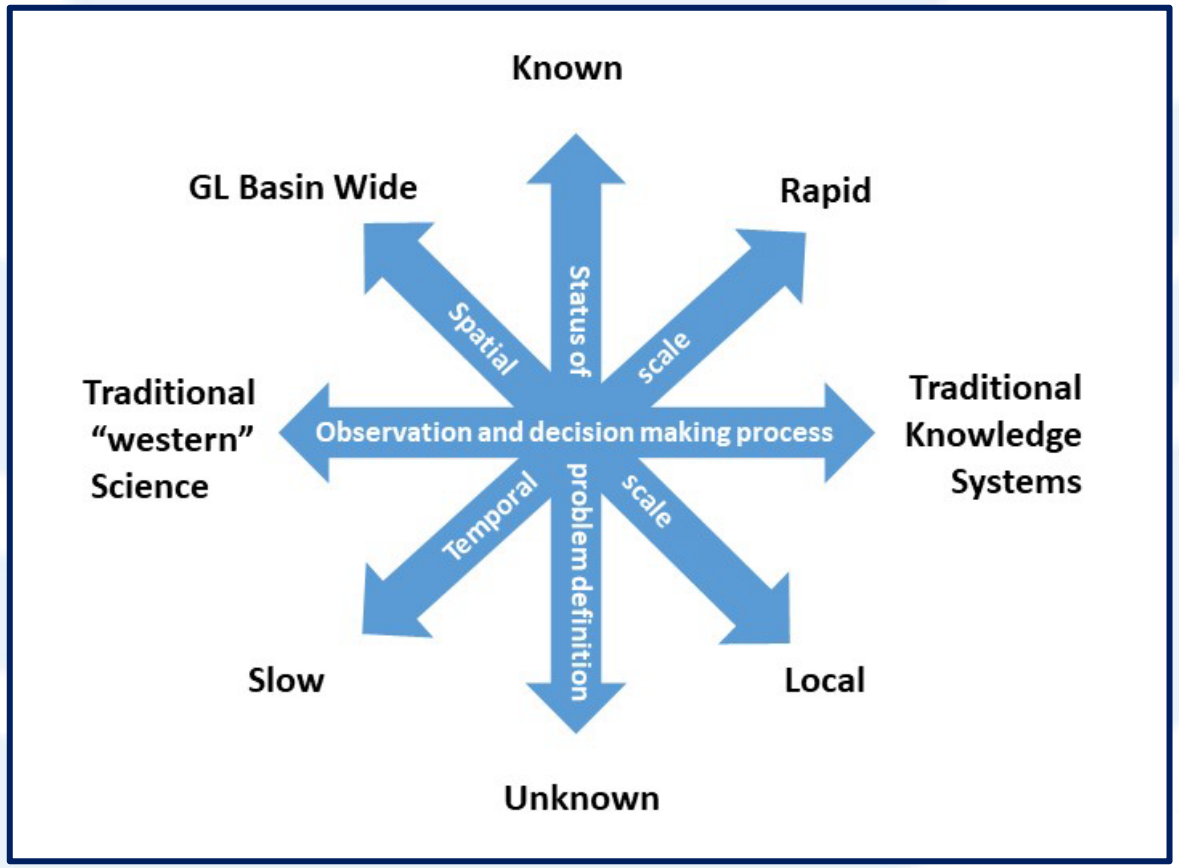
Michael Twiss
Research Coordinating Committee Board Member,
Professor of Biology
Algoma University, Sault Ste. Marie, Ontario

GLEWS Project Workflow

GLEWS Phase 1 (2017 – 2020)	GLEWS Phase 2 (2020 – 2023)
Literature review, interviews, workshop	Case studies, workshop
Organizational Structure Proposed	Draft Framework

Reports available at:
bit.ly/SAB-GLEWS-Reports

Ranges of Factors that Define Great Lakes Threats

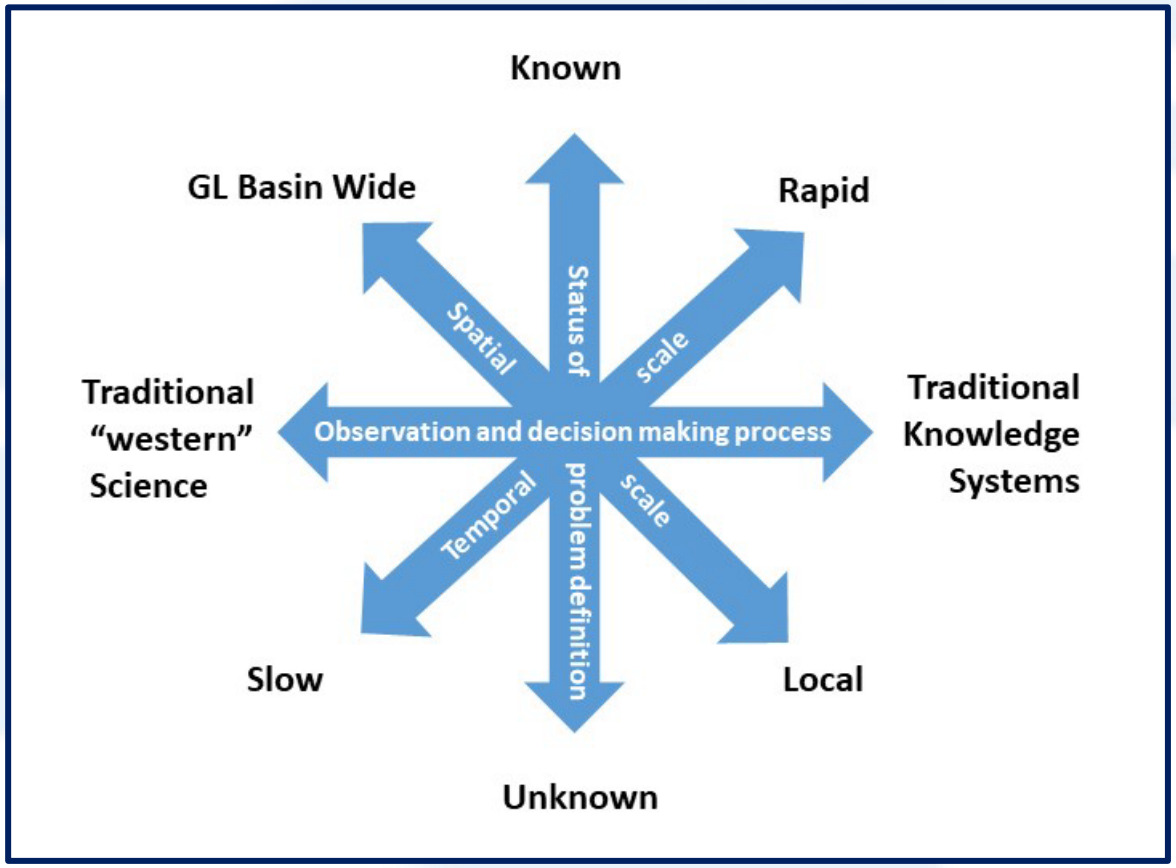


- Spatial scale
- Degree of knowledge
- Temporal scale
- Observational systems

Slow-Onset Great Lakes Stressors

Case study threat classes include:

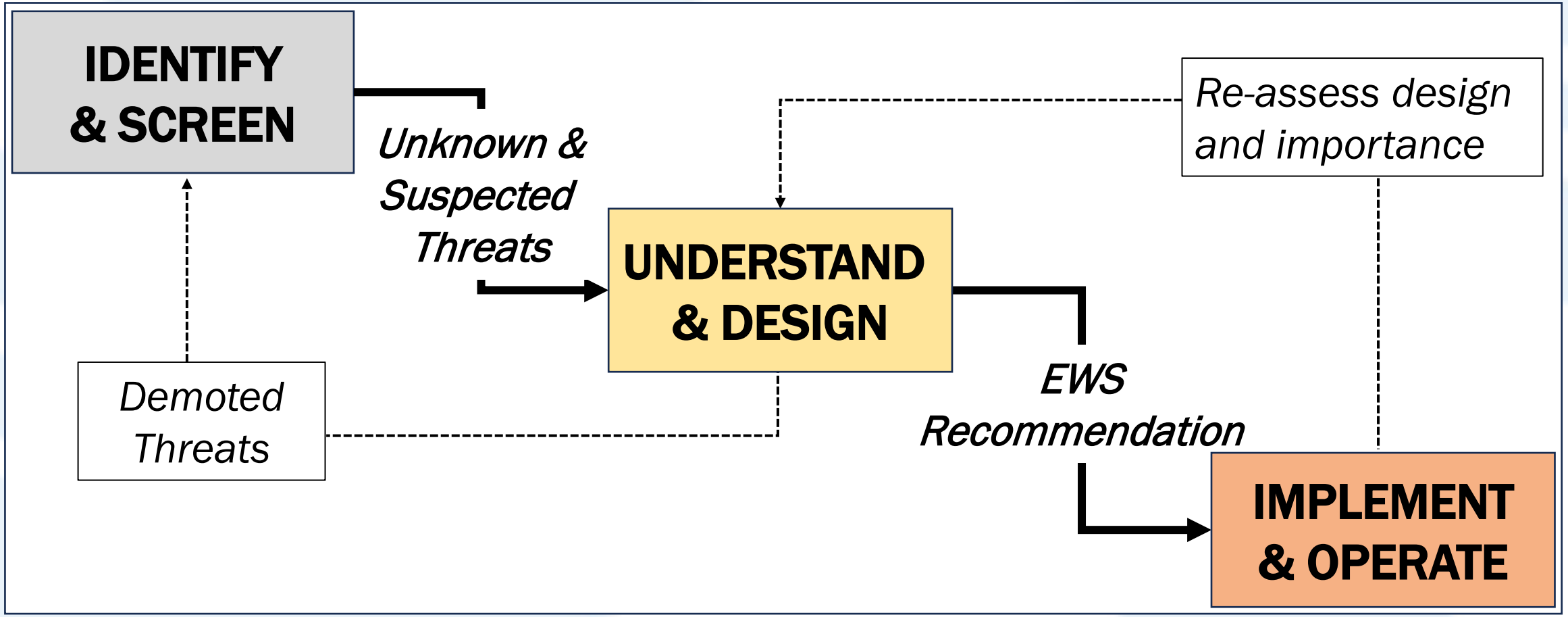
- Nutrients
- Climate change impacts
- Pathogens
- Human behaviour
- Chemicals of emerging concern



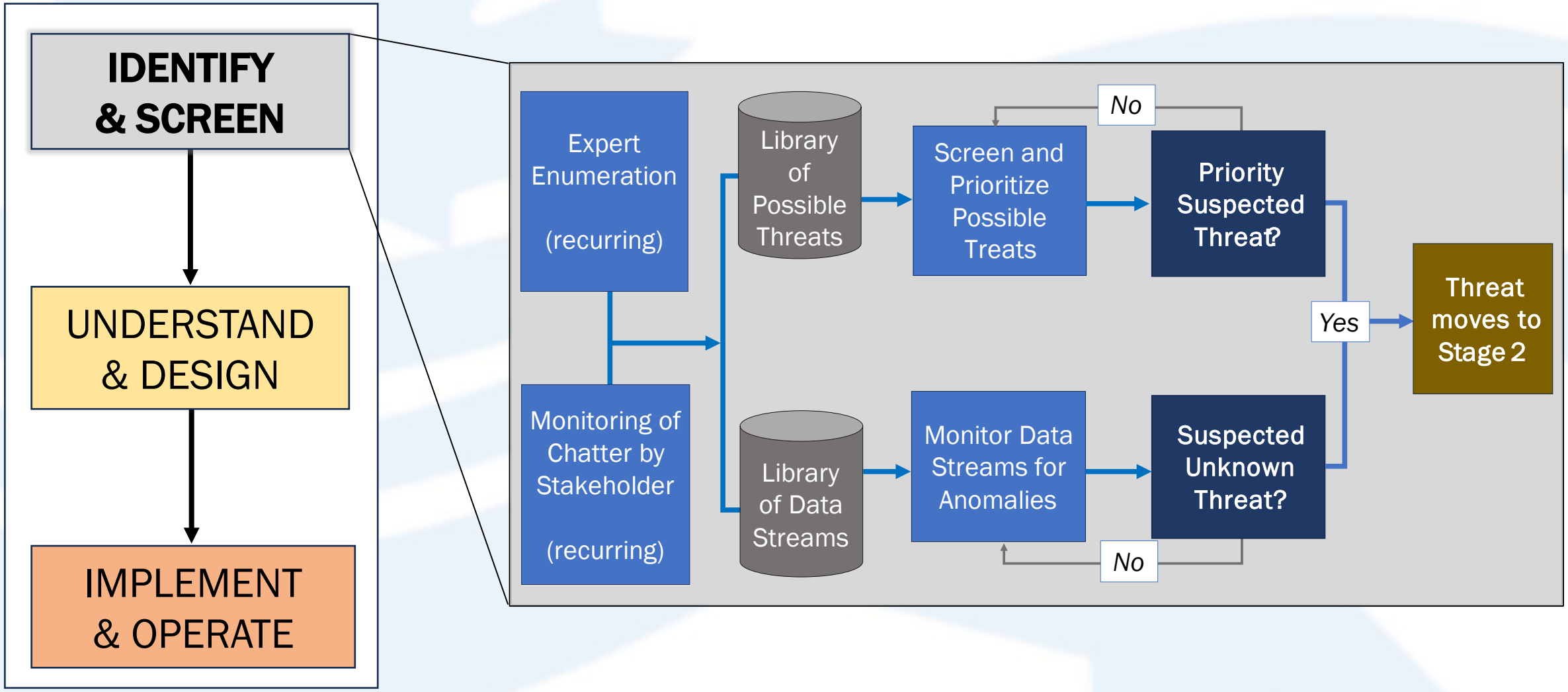
Key Elements of an Early Warning System

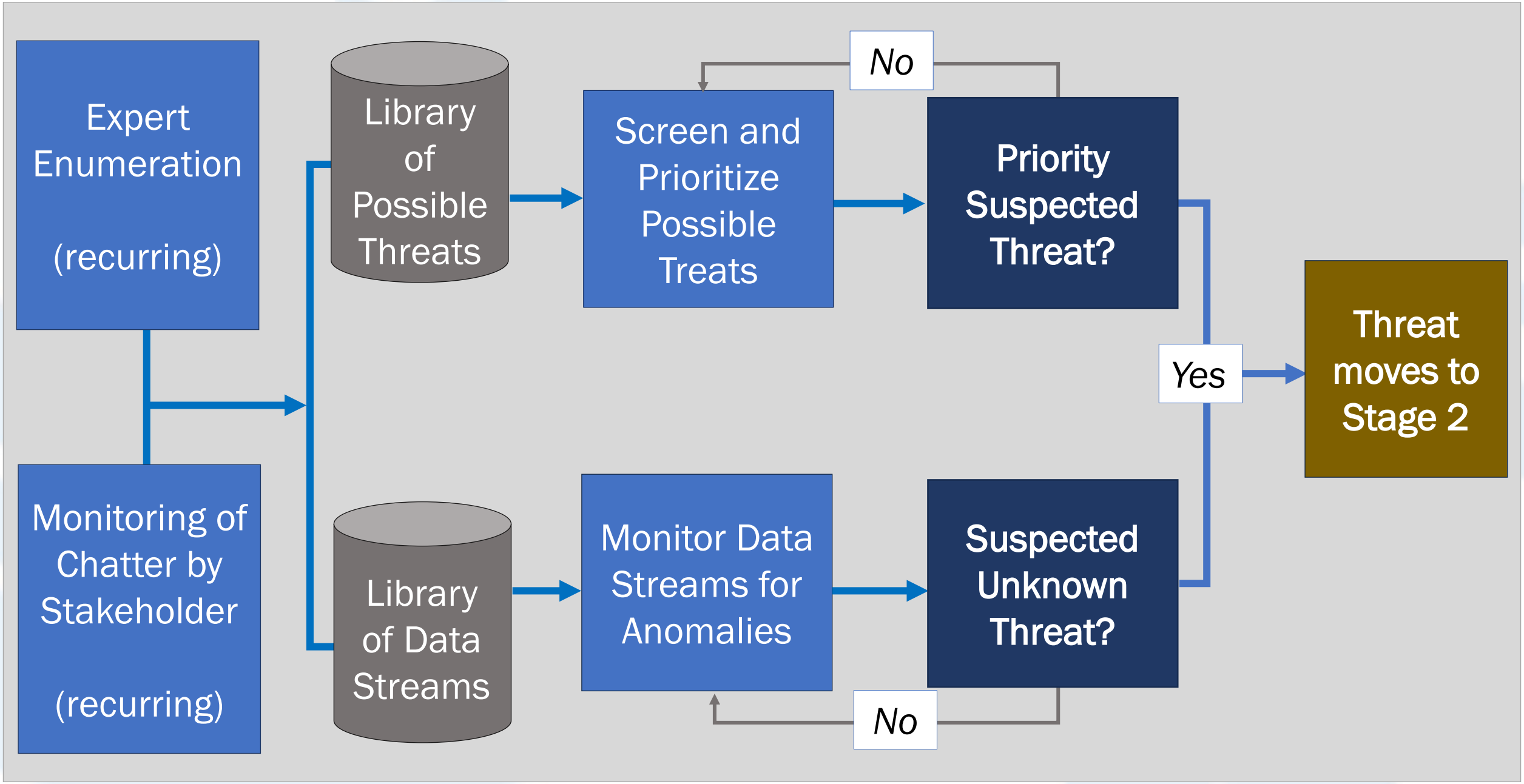
- Monitoring & Analysis
- Risk Knowledge
- Foresight
- Alerts & Response

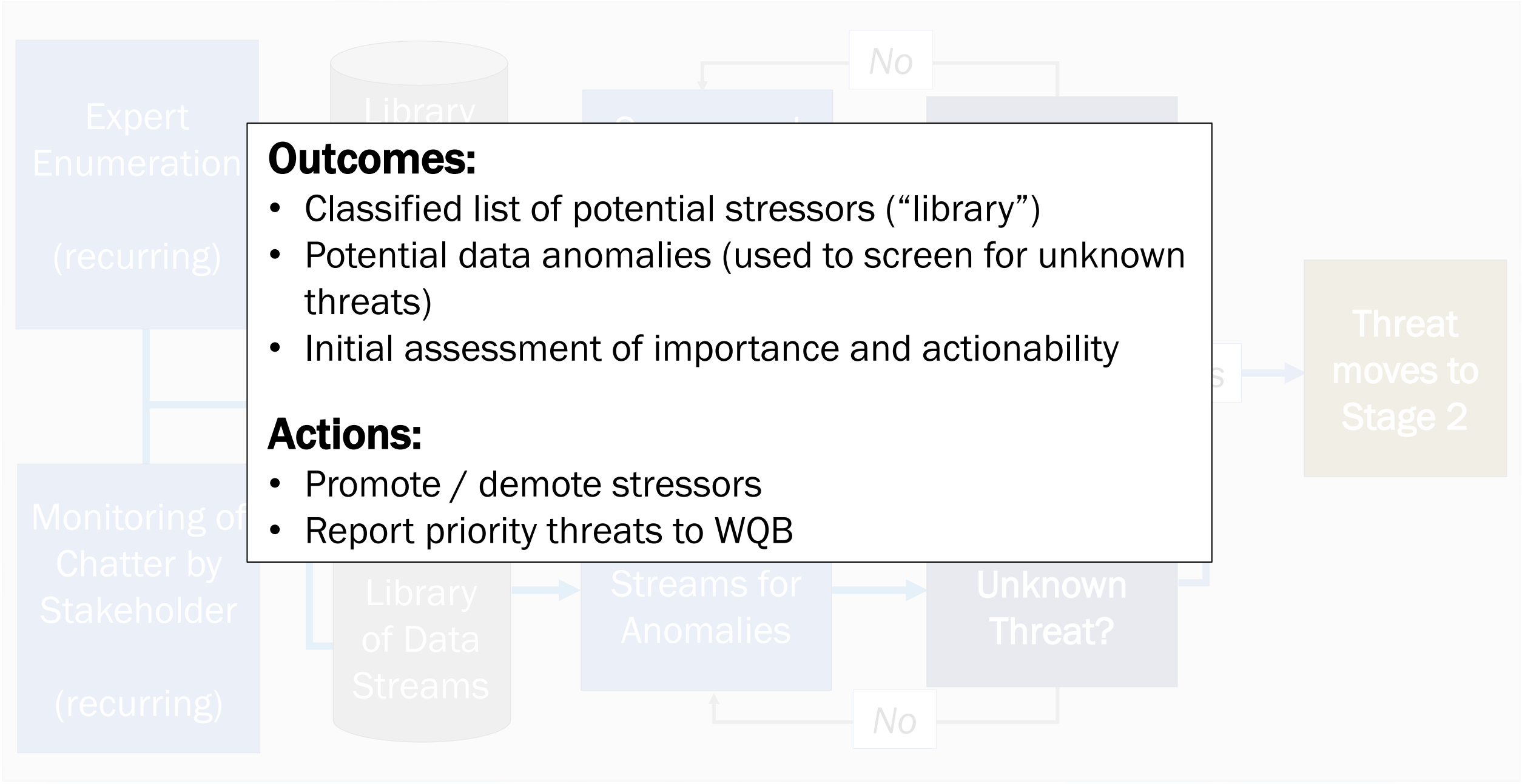
Proposed GLEWS Decision Framework



Identify & Screen




Expert Enumeration (recurring)
Monitoring of Chatter by Stakeholder (recurring)
Library of Possible Threats
Library of Data Streams
Screen and Prioritize Possible Treats
Monitor Data Streams for Anomalies
Priority Suspected Threat?
Suspected Unknown Threat?
No
No
Yes
Threat moves to Stage 2



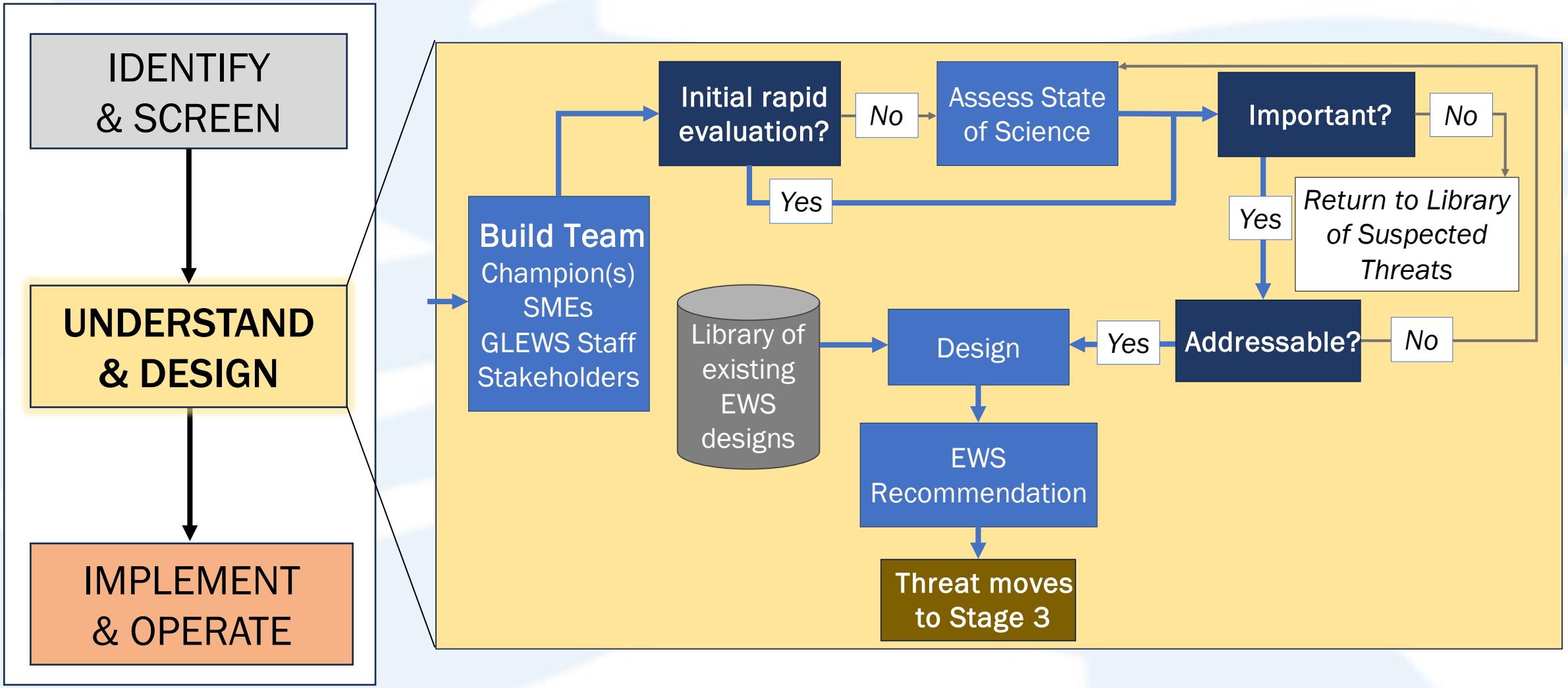
Outcomes:

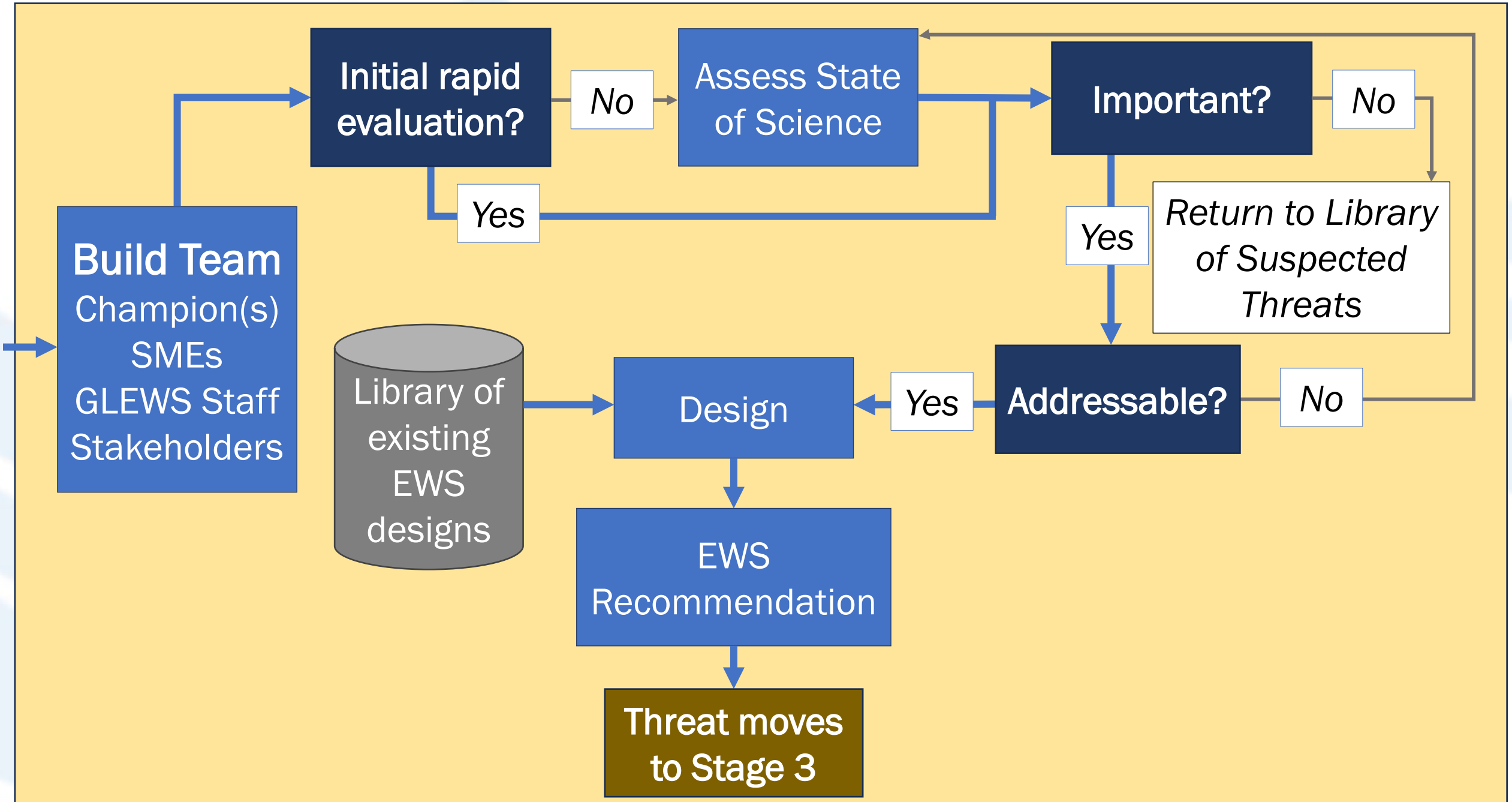
- Classified list of potential stressors (“library”)
- Potential data anomalies (used to screen for unknown threats)
- Initial assessment of importance and actionability

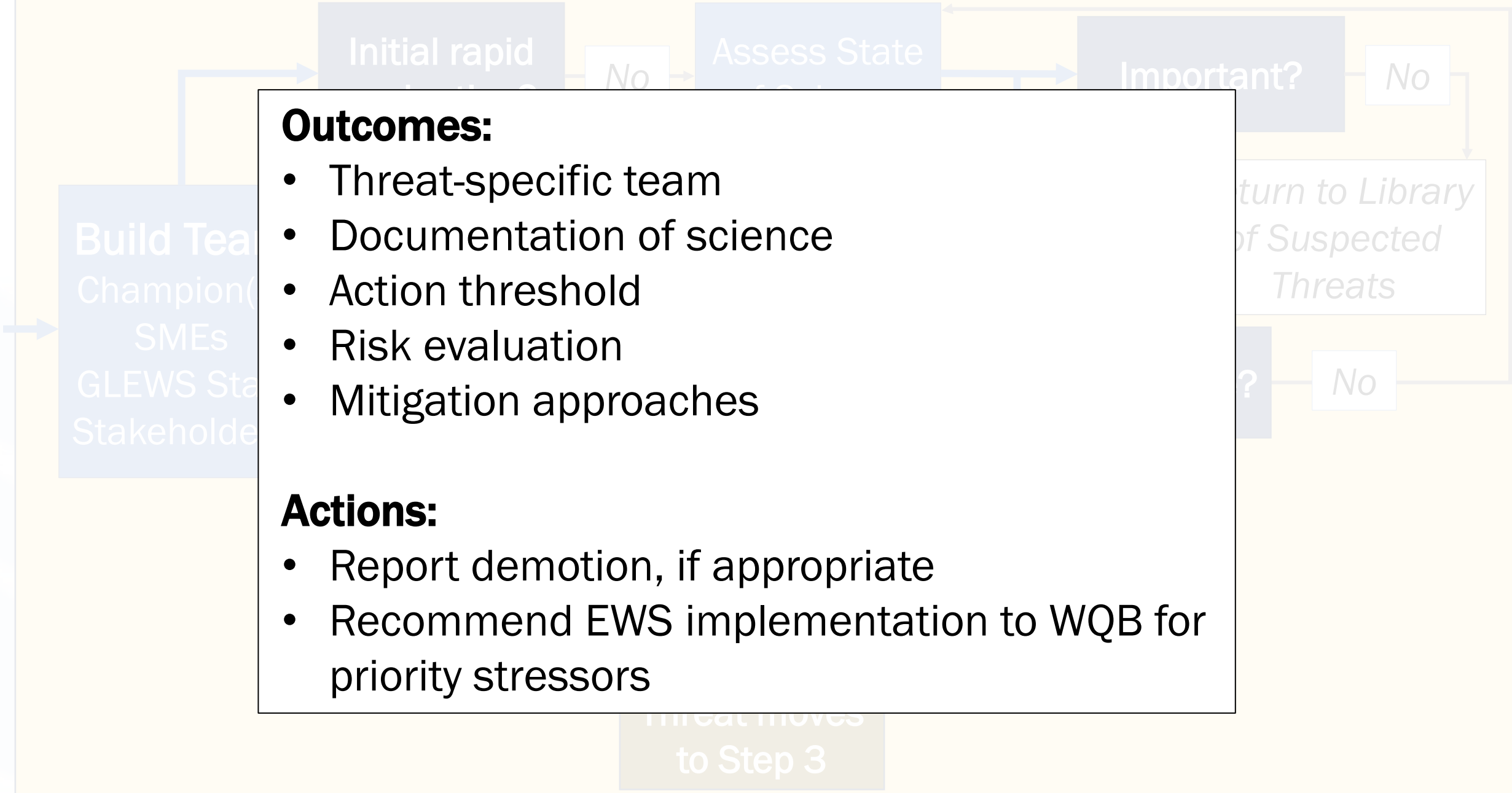
Actions:

- Promote / demote stressors
- Report priority threats to WQB

Understand & Design




Initial rapid evaluation?
No
Assess State of Science
Important?
No
Yes
Return to Library of Suspected Threats
Build Team
Champion(s)
SMEs
GLEWS Staff
Stakeholders
Yes
Library of existing EWS designs
Design
Yes
Addressable?
No
EWS Recommendation
Threat moves to Stage 3



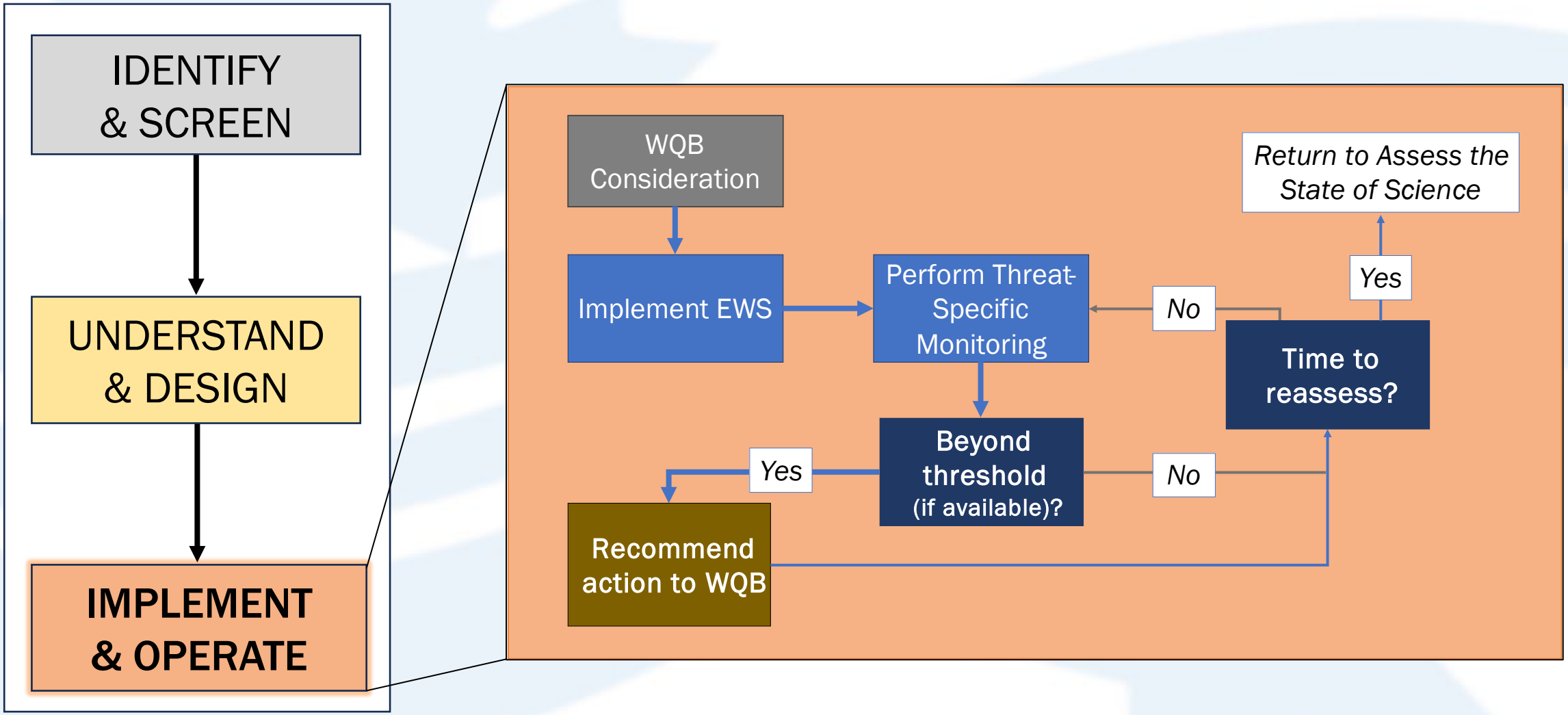
Outcomes:

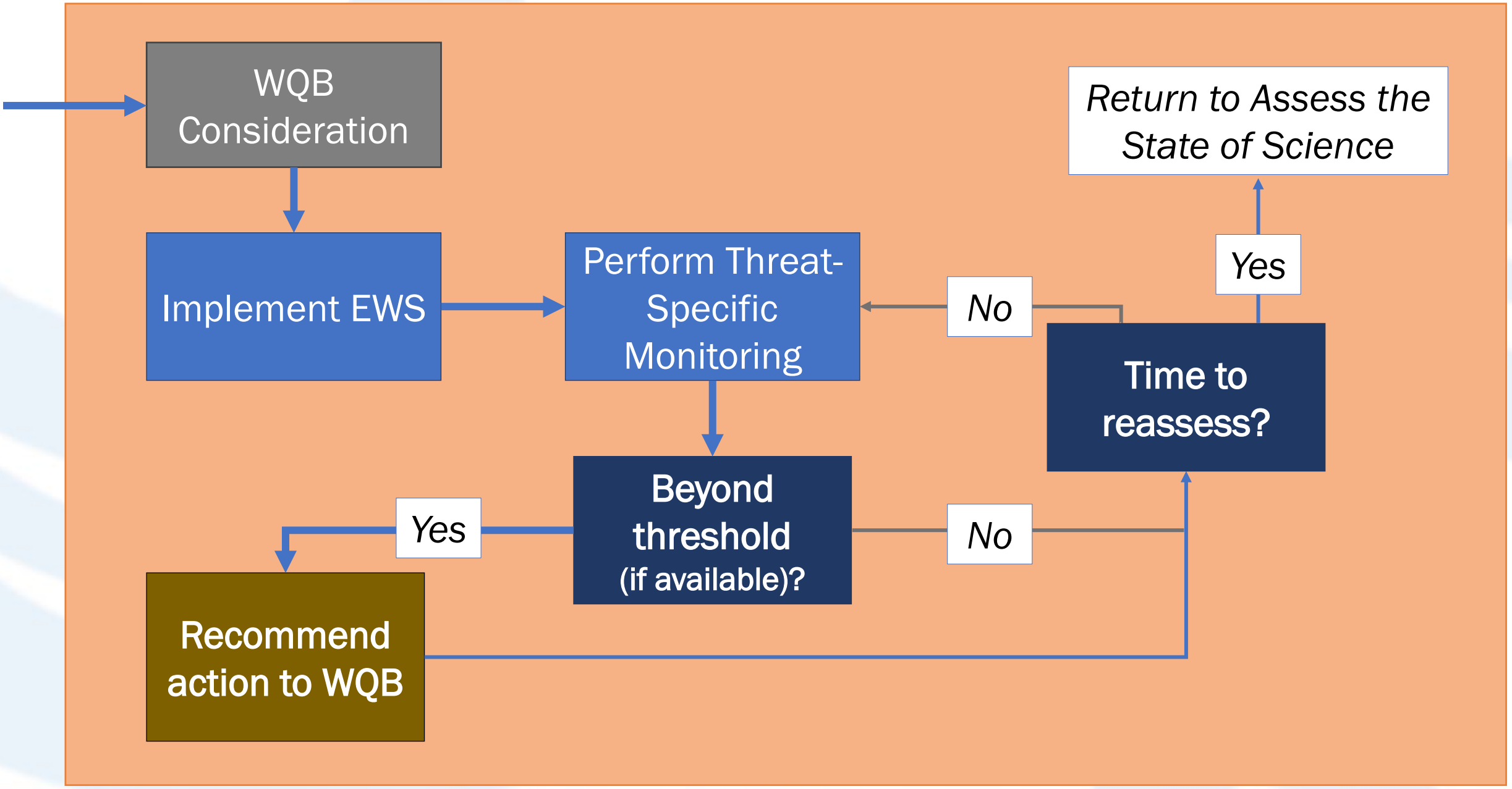
- Threat-specific team
- Documentation of science
- Action threshold
- Risk evaluation
- Mitigation approaches

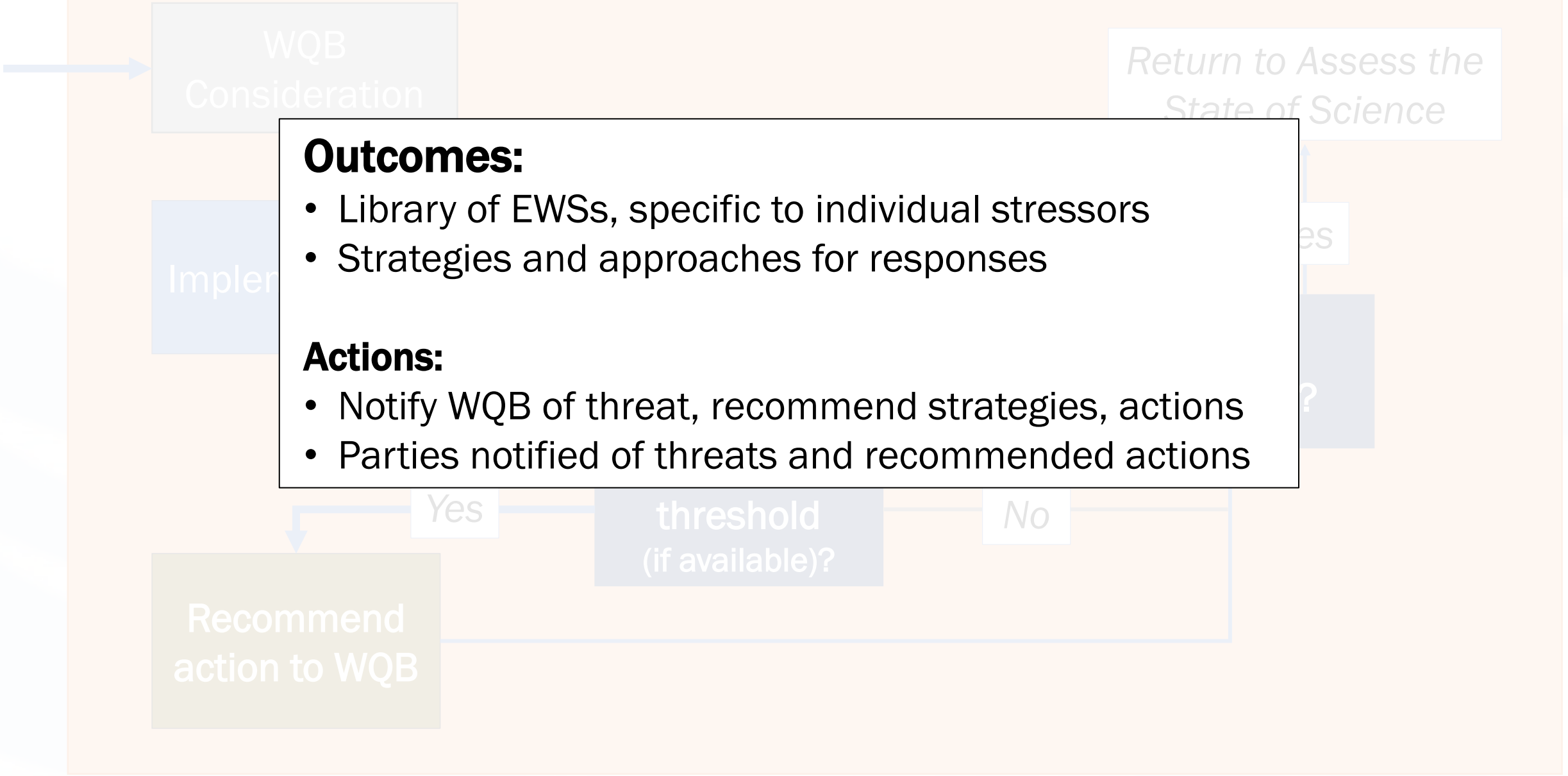
Actions:

- Report demotion, if appropriate
- Recommend EWS implementation to WQB for priority stressors

Implement & Operate

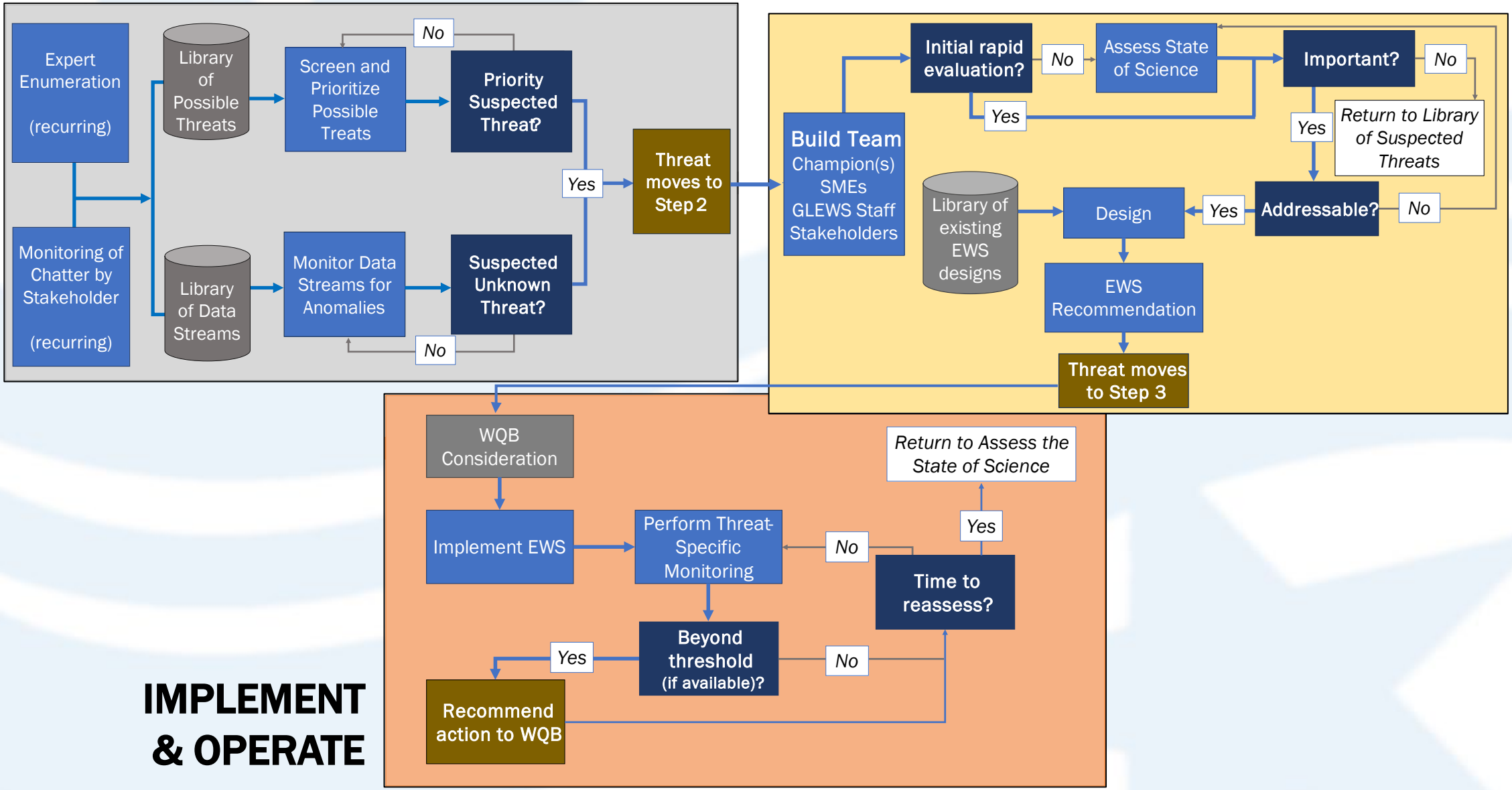



WQB Consideration
Implement EWS
Perform Threat-Specific Monitoring
Beyond threshold (if available)?
Yes
Recommend action to WQB
No
Time to reassess?
Yes
Return to Assess the State of Science


WQB Consideration
Return to Assess the State of Science
Outcomes:
• Library of EWSs, specific to individual stressors
• Strategies and approaches for responses
Actions:
• Notify WQB of threat, recommend strategies, actions
• Parties notified of threats and recommended actions
Yes
threshold
(if available)?
No
Recommend action to WQB

IDENTIFY & SCREEN

UNDERSTAND & DESIGN



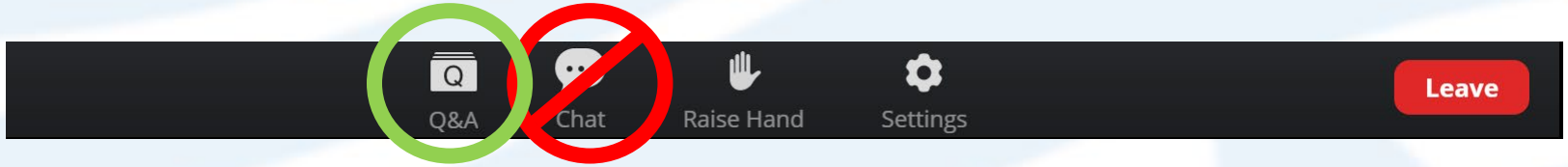
IMPLEMENT & OPERATE

Next Steps for GLEWS

GLEWS Phase 1 (2017 – 2020)	GLEWS Phase 2 (2020 – 2023)	GLEWS Phase 3 (Beginning 2024)
Literature review, interviews, workshop	Case studies	Stress test GLEWS steps 1 and 2 on case studies about: • Aqueous Nitrogen • Waterborne Antimicrobial Resistance
↓	↓	↓
Organizational Structure Proposed	**Draft Framework**	**GLEWS Pilot Project**

Question and Answers

- Please use the Q and A function



Thank you

For other questions or more information

Email: Matthew.child@ijc.org or John.Wilson@ijc.org

Science Advisory Board Website

ijc.org/en/sab/towards-great-lakes-early-warning-system

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