National Ecological Observatory Network

# NEON Risk Management Overview

Damiani/Beasley/NEON PO

# Risk Management Approach

- To establish a structured process for identifying, assessing, and managing risk
- Per implementation, provide a continuous assessment of risk throughout project execution
  - Identify and track risk drivers
  - Define risk mitigation strategies and execute those strategies in a timely and resource-effective manner
  - Monitor risk mitigation progress
  - Retire risks or accept them at agreed upon levels

# Risk Management Approach

- To derive efficiency in cost and schedule, several objectives have been established:
  - RM efforts will provide an approach for minimizing and eliminating risks before they occur
  - RM will not be incidental, but an integral, planned part of program management
  - RM efforts will be documented so that results of assessments can be shared at all levels
  - RM efforts will be reviewed and reported on a routine basis to assess risk status and trends
- Established Guidelines (Risks should be managed to acceptable levels, minimal quantification, risk control, etc.)

# RM Roles and Responsibilities

- The Systems Engineering Lead/Manager has the overall responsibility for implementing the RMP process on the project. Some specific responsibilities include:
  - Maintaining the RMP and a continual review of the process for effectiveness and efficiency
  - Ensure risks are identified and continue to be captured and mitigated over time
  - Schedule Risk Management Team (RMT) meetings and agendas per the RMP
  - Summarize common risk data, maintain metrics, and prepare reports when required and/or on a quarterly basis
  - Work with product teams to populate and maintain the database (Risk Radar) and its attributes (total risk quantification)

# RM Roles and Responsibilities

- The Risk Management Team, or RMT, implements and performs all of the necessary functions and activities of the Risk Management process;
  - Identify risks; provide initial and subsequent risk assessments
  - Complete total risk quantification
  - Oversee risk reduction and mitigation
  - Review changes in risk assessments; direct changes in mitigation strategy, as appropriate
  - Mediate and assign responsibilities for risks that cut across Functional Product Teams or have dependencies outside NEON
  - Authorize changes to the risk management process

# Risk Management Team

| ROLE IN RISK MANAGEMENT PROCESS | CANDIDATE STAFF | ACTIONS TAKEN |
|---|---|---|
| **RMT Chair** | NEON Deputy PM | Overall management of the risk management process and contingency budget |
| **Risk Monitor** | System Engineering Lead | Execute RMP workflows; coordinate meetings, and ensure risks are being mitigated |
| **Members** | Product Team Leaders | Functional area managers concentrate oversight on the management of risks associated with their respective areas and provide relative information for risk assessment and analysis |
| **Adjunct Members** | Project Management Support Staff, Contract Specialists, and other participants as required | Adjunct members concentrate on the oversight of cost, schedule, and budgetary risks, as well as associated contract risks and issues |
| **Supporting Resources** | Systems engineers and analysts | Broad range of technical analyses to support tradeoff studies and decision-making, to quantifying and placing risks in the database |

# Risk Management Logistics

- Planning and Control
  - Systems Engineering maintains RMP and drives internal process
  - Risk Management Team (RMT) formed to review, assess and monitor risks over time
    - RMT Chair: NEON Deputy PM
    - Risk Monitor: System Engineering Lead
    - Members: Product Team Leads
  - RMT meets internally, monthly, with product teams
  - Quarterly risk project reviews
    - Validate and quantify new risks
    - Update risk register
    - Continue risk assessment

# Risk Management Process

- The NEON Risk Management process is comprised of the following steps:
  - Risk identification
  - Risk analysis and assessment
  - Risk mitigation and response
  - Risk monitoring

# Risk Identification

- Risk identification defines the set of events that could reasonably have a negative impact on the program cost, schedule, performance, or scope
- Objective: To illuminate the real program risks and to obtain straightforward narrative statements describing these risks
- Risks are assigned titles, descriptions and numbers for database tracking
- Upon identification of a risk, the responsible engineer/scientist (RE/RS) will work with the RMT to accurately quantify the risk and document the various attributes associated with it

# Risk Identification

- Risk Quantification ⇒ Risk Attributes
  - Common information/attributes associated with each risk:
    - Title – Specific title of risk; avoid being vague
    - Description – Detailed description of the risk as it relates to the title
    - Responsible Person – Individual or RE to whom the risk is assigned for tracking purposes
    - Impact if Risk Occurs – Cost, schedule, etc., with relative information
    - Probability of Occurrence – percentage (use aggregate if occurs across domains)
    - Occurrence dates (start and end) – normally associated with project phases
    - Affected Product Team Areas – based on implementation of project (AOP, Engineering, Facilities, FIU, FSU, Operations, etc.)
    - Phase Applicability – Which program phases (D&D, CSTR, T&A, O&S) will be impacted upon risk occurrence
    - Impact Type – Science, Cost, Schedule, and/or Quality
    - Risk Control – External, internal (under RMT control), or both
    - Recommendation on action or mitigation
  - Note: Goal of Quantification is to provide enough information for assessment and analysis. Risk Attributes will mature over time via process

# Risk Assessment and Analysis

- Assessment
  - Given initial attributes, risks are assessed for validity and then prioritized according to project definitions
  - Allocation and prioritization is performed by utilizing overall impact and probability of occurrence scores
- Analysis / Monitor
  - Continue to discover the cause, effects, and magnitude of the identified risks
  - Develop courses of action (early mitigation plans) and examine the impacts caused by changes in input variables
  - Mature overall risk attributes, supply cost information

# Risk Assessment and Analysis

- Assessment Definitions…

| *Impact Category* | *Definition* |
|---|---|
| *Negligible (1-2)* | *An event that, if it occurred, would have no effect on the program.* |
| *Minor (3-4)* | *An event that, if it occurred, would cause only a small cost/schedule increase. Requirements would still be achieved.* |
| *Moderate (5-6)* | *An event that, if it occurred, would cause moderate cost/schedule increases, but important requirements would still be met.* |
| *Serious (7-8)* | *An event that, if it occurred, would cause major cost/schedule increases. Secondary requirements may not be achieved.* |
| *Critical (9-10)* | *An event that, if it occurred, would cause program failure (inability to achieve minimum acceptable requirements).* |

$(C_i + S_i)$

| *Cost Impact* | *Schedule Impact* | $C_i$, $S_i$ *Values* |
|---|---|---|
| *<$50k* | *<1 months* | *1* |
| *$50-150K* | *1-2 months* | *2* |
| *$150-500K* | *2-4 months* | *3* |
| *$500-1000K* | *4-6 months* | *4* |
| *>$1000K* | *>6 months* | *5* |

***Impact Scores***

| *Probability Range* | *Interpretation* | $P_i$ *(Probability Index)* |
|---|---|---|
| 0-20% (~10%) | *very unlikely to occur* | *0.1* |
| *21-40% (~30%)* | *unlikely to occur* | *0.3* |
| *41-60% (~50%)* | *may occur* | *0.5* |
| *61-80% (~70%)* | *likely to occur* | *0.7* |
| *81-100% (~90%)* | *very likely to occur* | *0.9* |

***Probability of Occurrence***

# Risk Assessment and Analysis

| Cost Impact | Schedule Impact | $C_i$, $S_i$ Values |
|---|---|---|
| <$50k | <1 months | 1 |
| $50-150K | 1-2 months | 2 |
| $150-500K | 2-4 months | 3 |
| $500-1000K | 4-6 months | 4 |
| >$1000K | >6 months | 5 |

| Probability Range | Interpretation | $P_i$ (Probability Index) |
|---|---|---|
| 0-20% (~10%) | very unlikely to occur | 0.1 |
| 21-40% (~30%) | unlikely to occur | 0.3 |
| 41-60% (~50%) | may occur | 0.5 |
| 61-80% (~70%) | likely to occur | 0.7 |
| 81-100% (~90%) | very likely to occur | 0.9 |

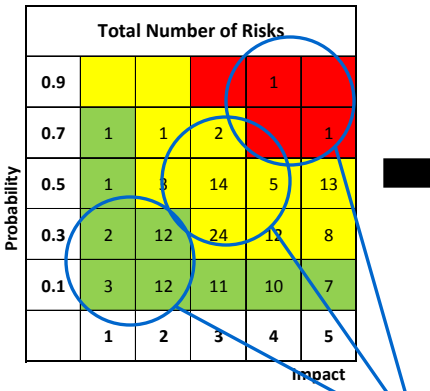
$$RRS_i = \langle C_i | S_i \rangle_{max} * P$$

| Risk Rating Scores/Values | | | | | |
|---|---|---|---|---|---|
| 90% | 0.9 | 1.8 | 2.7 | 3.6 | 4.5 |
| 70% | 0.7 | 1.4 | 2.1 | 2.8 | 3.5 |
| 50% | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 |
| 30% | 0.3 | 0.6 | 0.9 | 1.2 | 1.5 |
| 10% | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 |
| | 1 | 2 | 3 | 4 | 5 |

Probability / Impact

***Risk Exposure Levels***

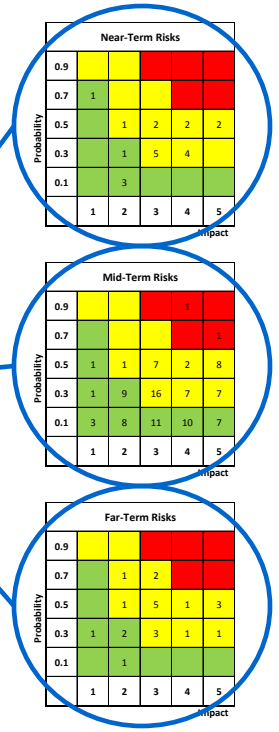
*Low Level = 0.1 to 0.7*
*Medium Level = 0.8 to 2.5*
*High Level = 2.6 to 4.5*




*Risks (number) allocated across exposure levels*

***Impact Terms***

*Near-Term = Up to 365 days*
*Mid-Term = Up to 730 days*
*Far-Term = Beyond*
*+*
*Individual Risk Impact Date (Based on Project Phase)*




***NEAR***

***MID***

***FAR***

# Risk Mitigation and Response

- Perform mitigation by addressing those risks identified and evaluated in the risk assessment and analysis efforts
  - At a minimum, a particular action or mitigation will be identified and developed for each medium to high level risk. Actions in risk mitigation fall into four general categories:
    - Risk Control – The most common, risk control involves the development of an action plan, individual steps, and then tracking progress against the plan
    - Risk Avoidance – situations arise where a lower risk choice is available from several alternatives
    - Risk Assumption – A unified decision by the RMT and the project to accept the consequences should a risk occur
    - Risk Transfer – options exist to the NEON Project Manager to reduce risk exposure by sharing risks (e.g., through incentives or warrantee programs with contractors)

# Risk Mitigation and Response

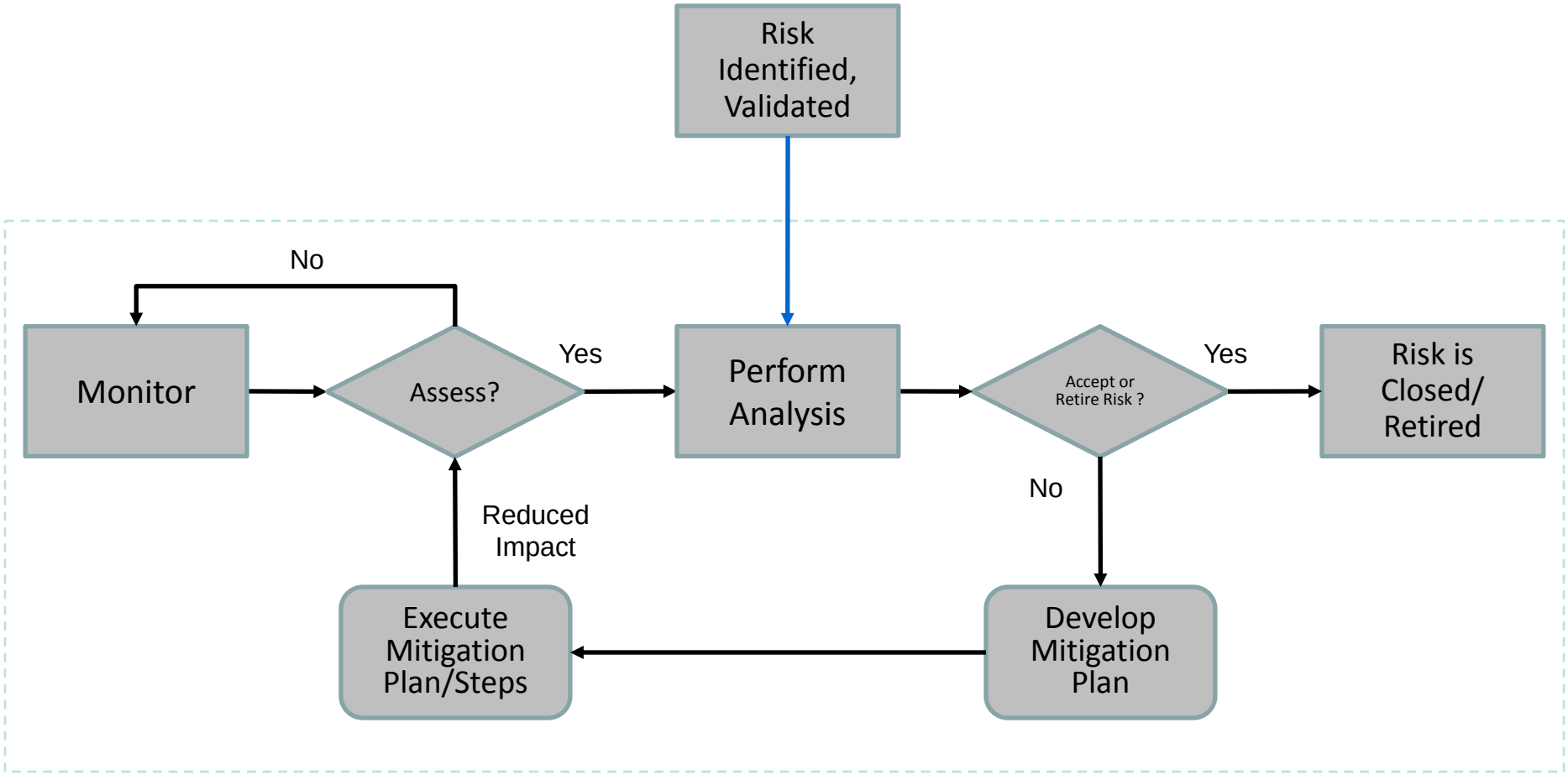
- Implement and execute risk monitoring
  - A risk monitoring function includes tracking and reporting of risks over time and provides a collective approach to risk management during the carry on phases of the project
  - Risk Monitor will continue to work with NEON staff individuals to identify and validate any future risks, maintain current ones, and verify mitigation and updates are being applied regularly to lower overall risk exposure
  - Retire or assume risks over time

# Tracking and Reporting

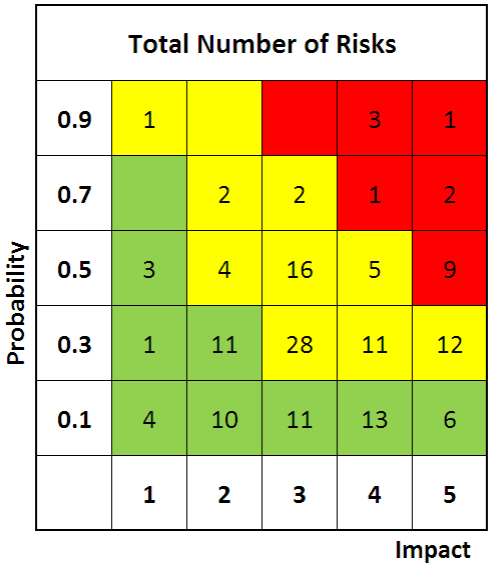
- Over the project life-cycle, the RMT provides a tracking and reporting function to
  - Advise project manager on status and issues
  - Continually evaluate and assess new risks
  - Update and maintain risk items within a risk register database
  - Verify status (open, closed, etc.)
  - Highlight risks that project management have decided to assume (i.e., those that have an impact deemed acceptable to the program without directly pursuing a mitigation strategy)
  - Show progress via reports and documentation
  - Provide quarterly meetings, offering a forum for all affected parties (to discuss risks and associated issues)
  - Release updated versions of the NEON Risk Register to the project on a quarterly or semi-annual basis

# Risk Life-Cycle

- *How Risks are managed over time…*



# NEON Risk Summary

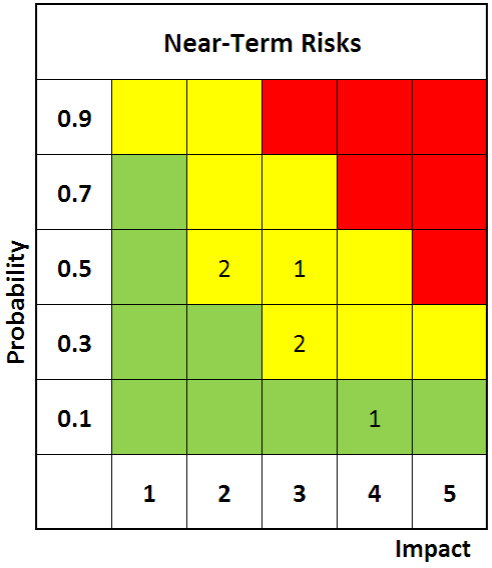


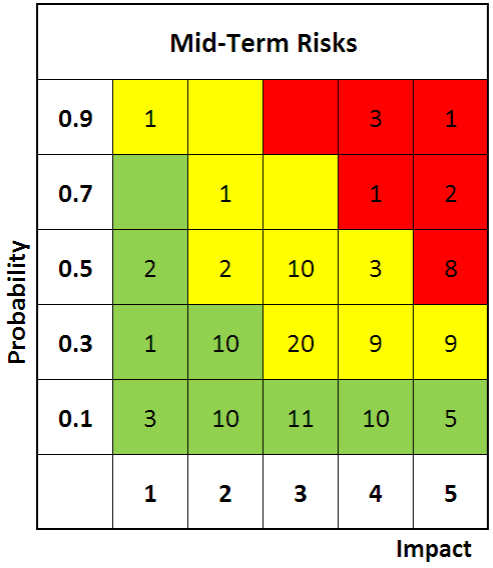

| Total Number of Risks | 156 |
|---|---|
| Total Occurrence Cost of Risks | $ 54,588,040 |

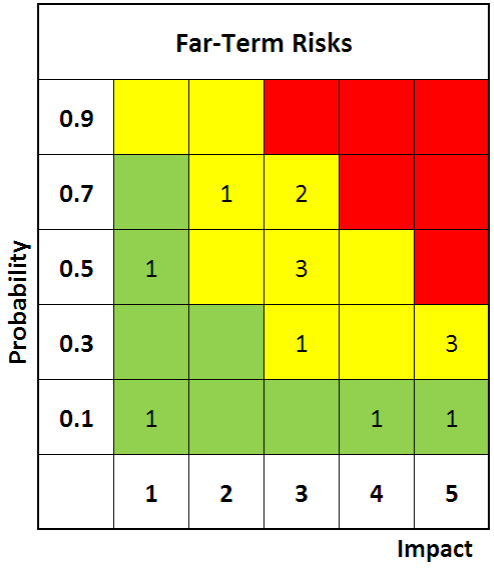
| | |
|---|---|
| Near-Term Risks | 6 |
| Mid-Term Risks | 122 |
| Far-Term Risks | 14 |
| Past-Term Risks | 14 |

~ Risks across project phases (D&D, CSTR, and OPS)

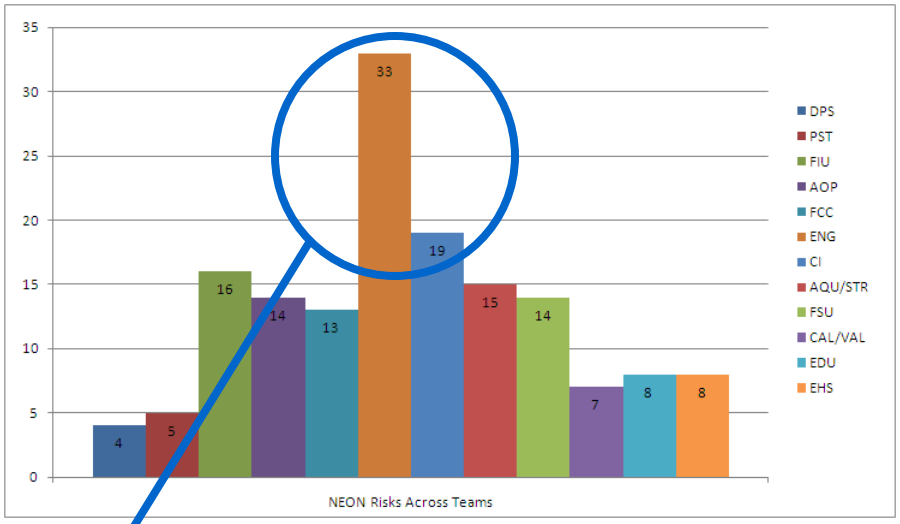
~ Risks Impacting Project Now

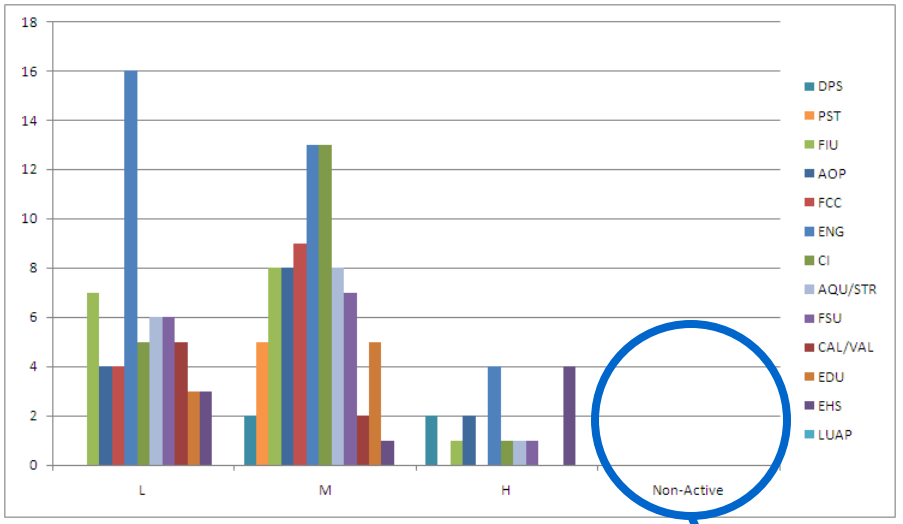


# Team Status and Summary




**Majority of risks within ENG and CI**

| Overall Risk Summary by Team (Exposure) | | | | | | |
|---|---|---|---|---|---|---|
| | L | M | H | Active | Non-Active | Total |
| AOP | 4 | 8 | 2 | 14 | 0 | 14 |
| CAL/VAL | 5 | 2 | 0 | 7 | 0 | 7 |
| CI | 5 | 13 | 1 | 19 | 0 | 19 |
| DPS | 0 | 2 | 2 | 4 | 0 | 4 |
| EDU | 3 | 5 | 0 | 8 | 0 | 8 |
| EHS | 3 | 1 | 4 | 8 | 0 | 8 |
| ENG | 16 | 13 | 4 | 33 | 0 | 33 |
| FCC | 4 | 9 | 0 | 13 | 0 | 13 |
| FIU | 7 | 8 | 1 | 16 | 0 | 16 |
| FSU | 6 | 7 | 1 | 14 | 0 | 14 |
| LUAP | 0 | 0 | 0 | 0 | 0 | 0 |
| PST | 0 | 5 | 0 | 5 | 0 | 5 |
| AQU/STR | 6 | 8 | 1 | 15 | 0 | 15 |
| TOTAL | 59 | 81 | 16 | 156 | 0 | 156 |

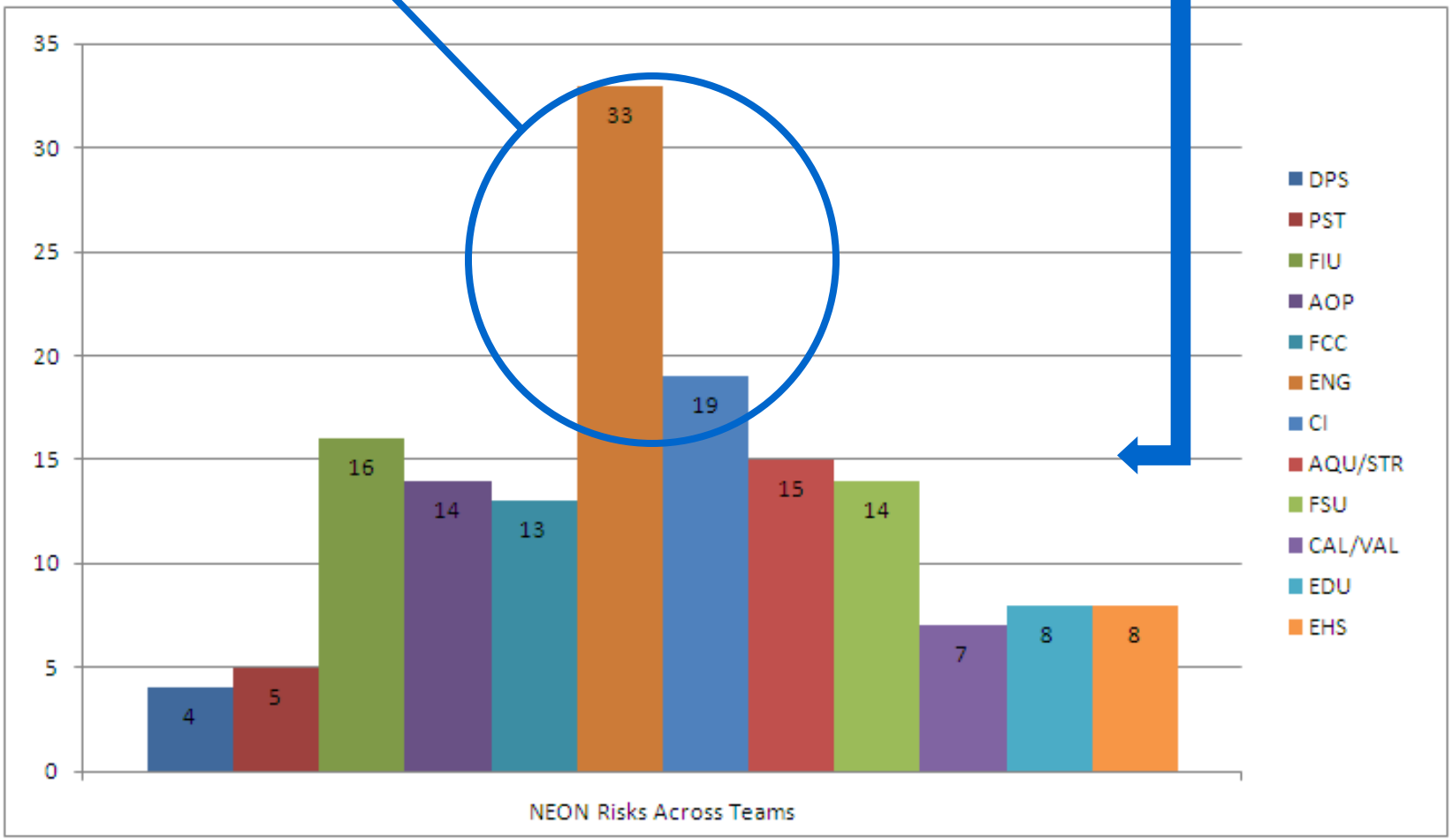
**Currently no retired or pending risks…**

**A Low to High risk consolidation**

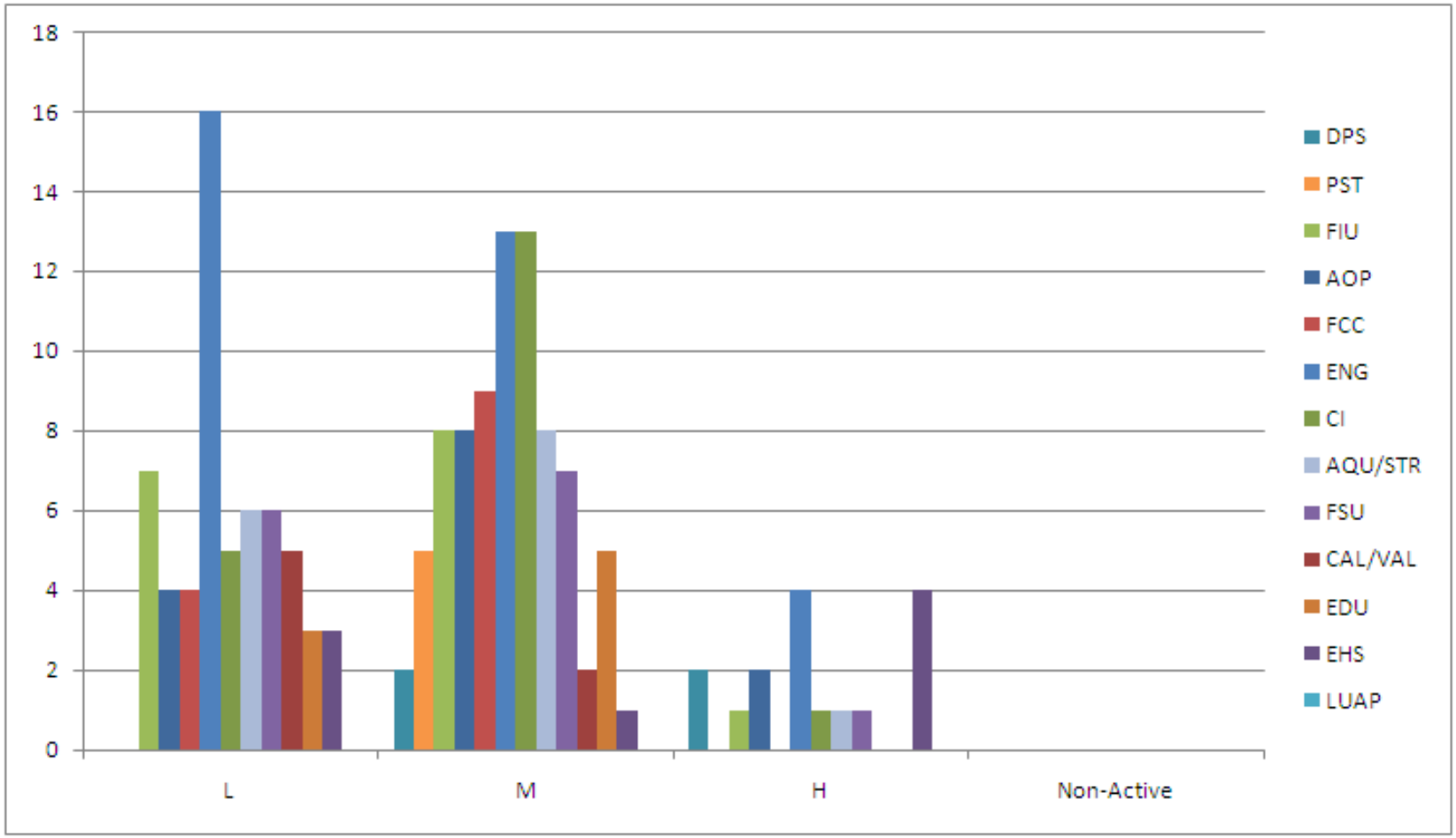
# Total Risks Across Teams

**Majority of risks fall within ENG and CI areas**

**Average of 10-15 risks per each team/area**



# Total Risks Across Teams (Exposure)



# Total Risks Across Teams (Exposure)

| Overall Risk Summary by Team (Exposure) | | | | | | |
|---|---|---|---|---|---|---|
| | L | M | H | **Active** | Non-Active | **Total** |
| AOP | 4 | 8 | 2 | 14 | 0 | 14 |
| CAL/VAL | 5 | 2 | 0 | 7 | 0 | 7 |
| CI | 5 | 13 | 1 | 19 | 0 | 19 |
| DPS | 0 | 2 | 2 | 4 | 0 | 4 |
| EDU | 3 | 5 | 0 | 8 | 0 | 8 |
| EHS | 3 | 1 | 4 | 8 | 0 | 8 |
| ENG | 16 | 13 | 4 | 33 | 0 | 33 |
| FCC | 4 | 9 | 0 | 13 | 0 | 13 |
| FIU | 7 | 8 | 1 | 16 | 0 | 16 |
| FSU | 6 | 7 | 1 | 14 | 0 | 14 |
| LUAP | 0 | 0 | 0 | 0 | 0 | 0 |
| PST | 0 | 5 | 0 | 5 | 0 | 5 |
| AQU/STR | 6 | 8 | 1 | 15 | 0 | 15 |
| TOTAL | 59 | 81 | 16 | 156 | 0 | 156 |

**A Low to High risk consolidation**

**A total of 156 active (open) Risks**

**Currently no pending or retired (Closed) Risks**


The National Ecological Observatory Network is a project sponsored by the National Science Foundation and managed under cooperative agreement by NEON Inc.