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neon
Operated by Battelle

Preparing an Operations and Maintenance Budget: Approaches and Practices for Budget Contingency

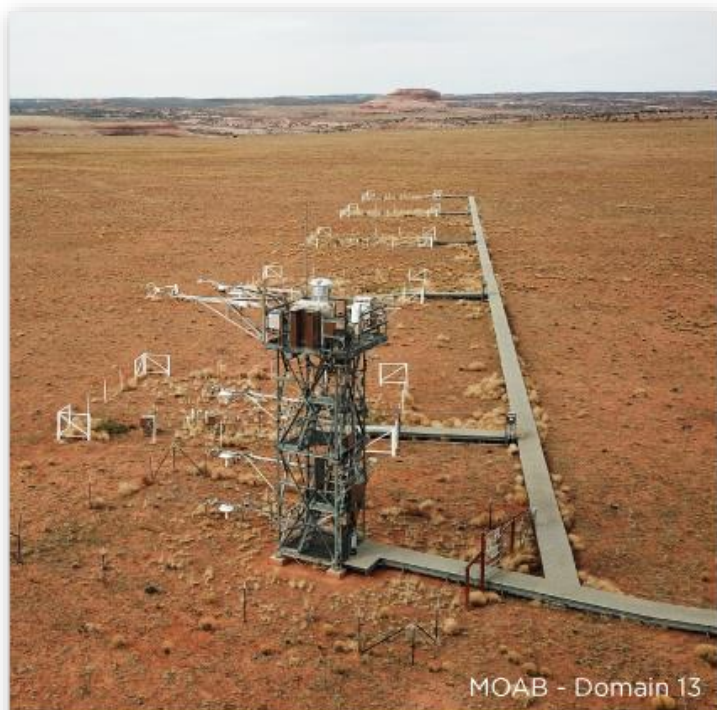
2024 NSF Research Infrastructure Workshop

What is the National Ecological Observatory Network?



NEON's Linked Collection Systems

Standardized methods, co-located in time and space across 81 sites



Automated Instruments



Airborne Remote Sensing



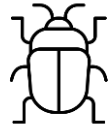
Observational Sampling

NEON Contributions to the Scientific Community



Data

- Open, FAIR, and freely available data (>180 products)
- Standardized and co-located sampling protocols
- Collected across taxa, time, and space



Specimens & Samples

- Archived for life of NEON
- Available for research and educational use
- Collected across taxa, time, and space



Community & Workforce Development

- Contribution to information and data management standards
- Early career field work opportunities
- Training, user support
- Interoperability with other datasets



Research Infrastructure

- Assignable Assets Program
 - Field sampling
 - Sensor infrastructure
 - Remote sensing
 - Mobile platform
 - NEON experts
 - Field site coordination

NEON by the Numbers

Locations:

- ✦ 22 Facilities (Offices/Labs)
- ✦ 81 Field Sites (47 Terrestrial, 34 Aquatic)

Staffing:

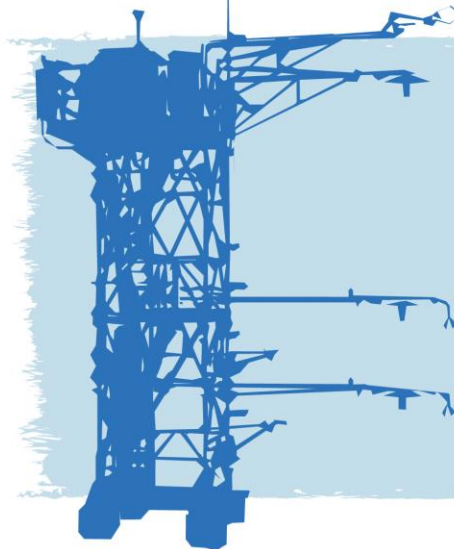
- ✦ 350 Full-time
- ✦ 225 Seasonal

Samples:

- ✦ >450K currently, growing each yr.

Instrumentation: ingest 5.6 billion data points/day

28,000 Assets

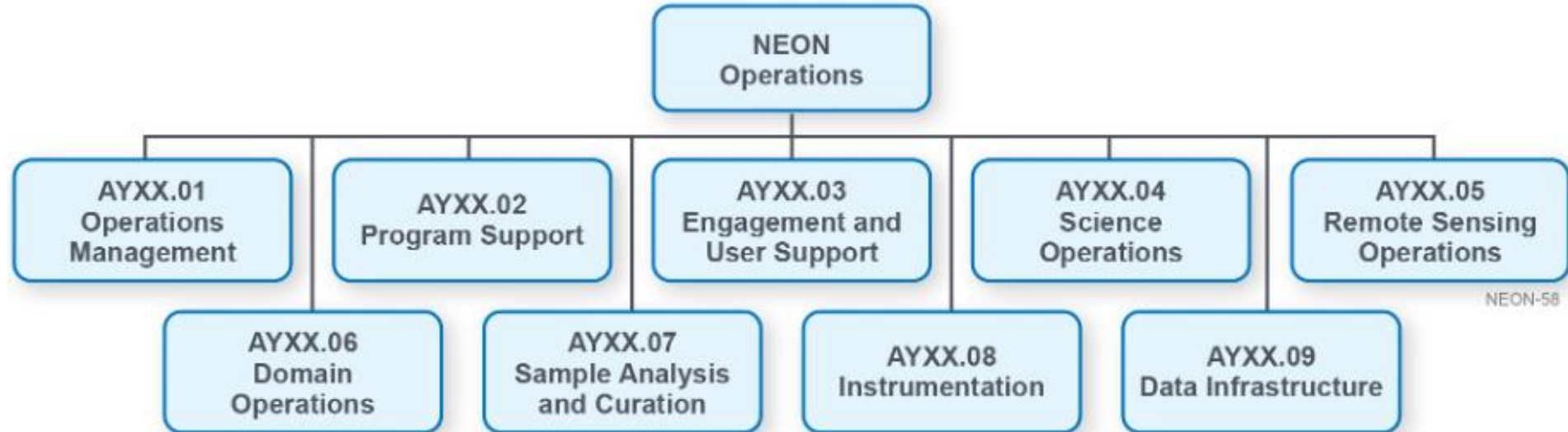


3 AOP payloads

16,265 Total Sensors
8,752 Environmental
3,748 Data Loggers
3,765 Supporting

Calibrations Annually
7,413 5,595 Sensors
1,818 Data Loggers

Operating and maintaining NEON – the Work Breakdown Structure (WBS)



- Each high level WBS element is overseen by a member of the NEON leadership team
- The WBS forms the basis for everything from the Annual Work Plan for NEON Operations, to cost performance and risk management

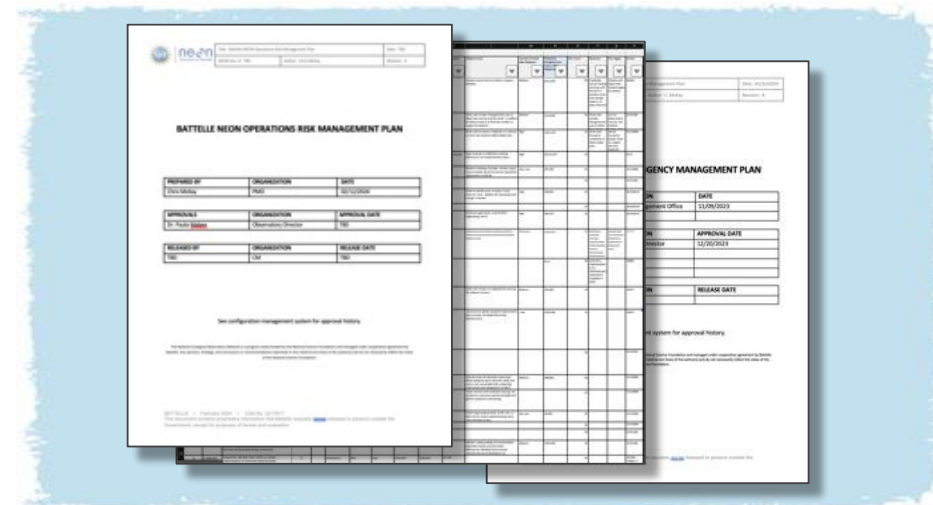
Breaking down the work further

- Each top level WBS element is broken down to over 225 level 4 “work packages” per year that are estimated, priced, and are managed by one “Cost Account Manager” or CAM
- NEON assigns about 40 staff as CAMs for individual work accounts
- Responsibilities of CAMs:
 - ✦ Monthly Estimates to Complete the work
 - ✦ Analysis of variance of actual costs from baseline plan
 - ✦ Identification and tracking of risks
 - ✦ Input to progress reporting

WBS #	Title
AYXX	NEON Operations
AYXX.01	Operations Management
AYXX.01.01	Program Administration and Management
AYXX.01.01.01	Chief Scientist/Observatory Director Office
AYXX.01.01.02	Program Management Office
AYXX.01.01.03	Project Controls
AYXX.01.01.04	Quality Management
AYXX.01.01.05	Safety Management
AYXX.01.01.06	Award Management
AYXX.02	Program Support
AYXX.02.01	Facilities Operations
AYXX.02.01.01	Field Support Management
AYXX.02.01.02	Permit Maintenance
AYXX.02.01.03	Insurance
AYXX.02.01.04	Logistics
AYXX.02.01.05	General Shipping
AYXX.02.01.06	Instrument Shipping
AYXX.02.01.07	Sample Shipping
AYXX.02.01.08	Boulder Facilities
AYXX.02.02	Observatory Monitoring
AYXX.02.02.01	Observatory Service Desk
AYXX.02.03	Major IS Site Maintenance and Support
AYXX.02.03.01	IS Major Site Maintenance
AYXX.02.03.20	IS Major Site Upgrades
AYXX.02.03.30	IS Major Site Repairs
AYXX.03	Engagement and User Support
AYXX.03.01	Engagement Management
AYXX.03.01.01	Engagement Management
AYXX.03.01.02	Advisory Committees
AYXX.03.01.03	Program Evaluation
AYXX.03.02	Scientific Outreach
AYXX.03.02.01	Conference Representation
AYXX.03.02.02	Research Facilitation
AYXX.03.02.03	Local Engagement
AYXX.03.03	Data Skills & Research Training
AYXX.03.03.01	Data Skills Resources
AYXX.03.03.02	Curriculum Development
AYXX.03.04	Data Accessibility
AYXX.03.04.01	Web Portals and Digital Outreach
AYXX.03.04.02	Data Interoperability
AYXX.03.04.03	External Data Hosting
AYXX.03.04.04	Data Product Publication Support
AYXX.03.05	User Support
AYXX.03.05.01	User Support
AYXX.03.05.02	Assignable Asset Support
AYXX.03.05.03	Assignable Asset Small Projects
AYXX.04	Science Operations
AYXX.04.01	Science Management

Managing Risk – preparing instead of reacting

- All areas of NEON Operations contain some risks, that if realized, will affect cost, schedule, or performance
- Risks could be threats (negative effects) or opportunities (positive effects)
- In the recent award, NSF has implemented “Budget Contingency” funding to address risk cost impacts as part of regular award management
- Relevant Program Documents
 - ✦ Risk Management Plan
 - ✦ Risk Register
 - ✦ Contingency Management Plan



What Does a Risk Look Like on NEON?



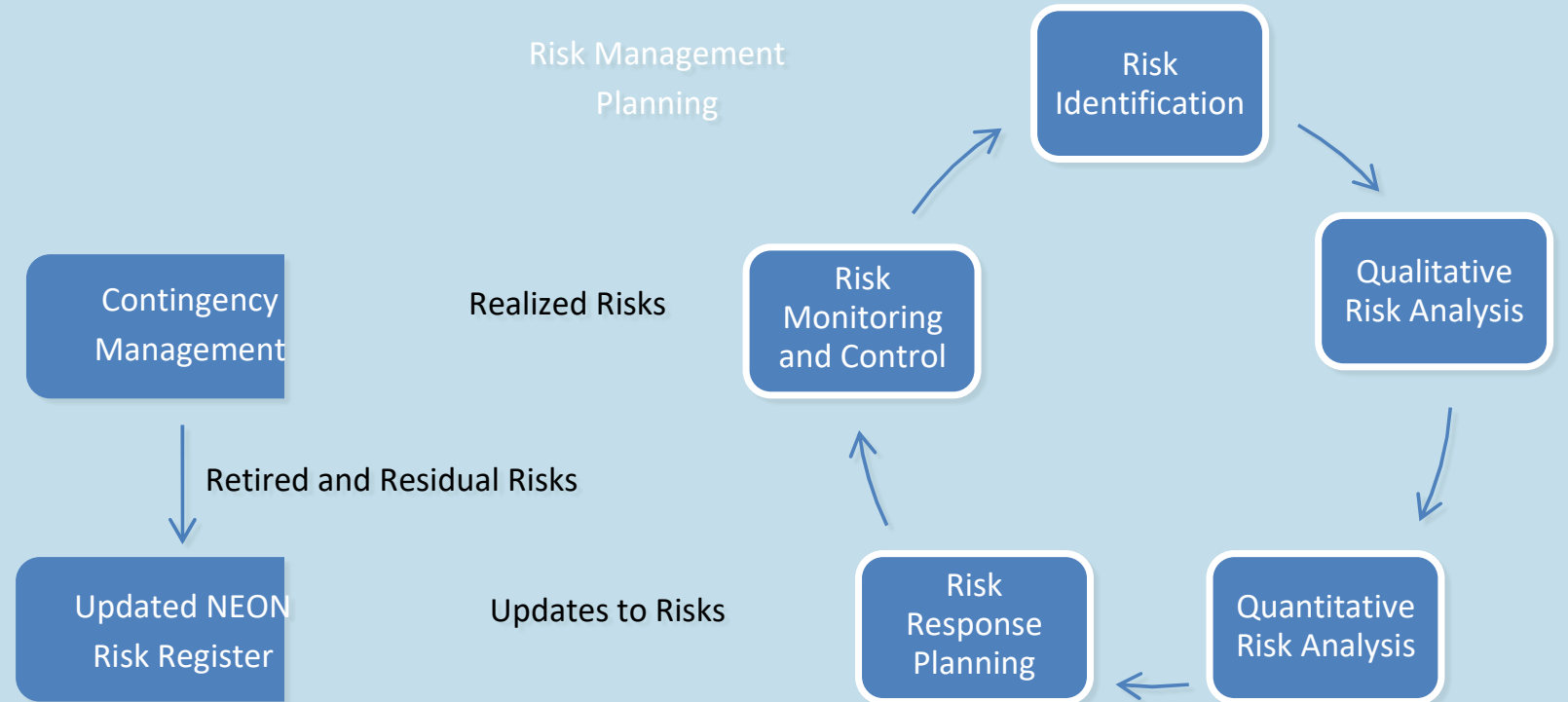
D08 Alabama



D17 California

Risk Management Process

- Core process is based on PMI guidance and is included in the RIG (section 6.2.4)
- NEON has added links to the Risk Register and Contingency Management Plans



Risk Register

- Generated and updated using the process described previously
- Tracked in Battelle's project management software - Planisware
- Risks reviewed monthly by CAMs with updates for new, realized, or retired risks
- Additions approved internally through our Operations Integrated Product Team (OPS IPT) and then by NSF
- Quarterly OPS IPT review and updates to Risk Register, delivered with quarterly reporting as Excel file

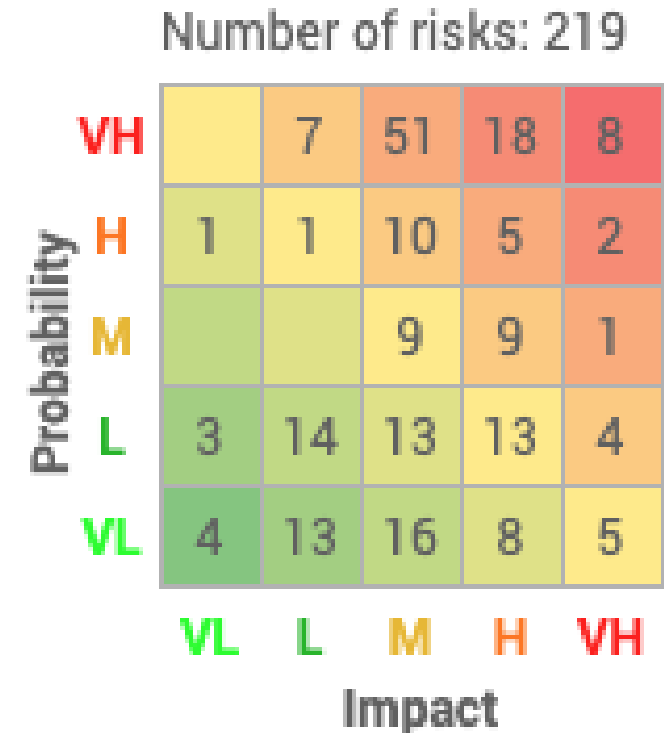
 Planisware

Risk Register example

Identifier	Risk Description (Title)	Risk category	Probability of occurrence	Impact VH=90% H=75% M=60% L=35% VL=15%	Cost impact	Probability Weighted Cost Exposure	Risk response strategy	Mitigation plan	Severity Estimate After Mitigation	Probability Weighted Cost Impact After Mitigation	Owner
IS-00001748	Threat: Inflation increases program labor costs above an annual 3% rate, preventing full scope execution within existing budget	Cost	90%	High	\$875,000	\$590,625	Mitigate	Include annual merit escalation in project estimate.	Medium	\$472,500	MCKAY
IS-00001912	Threat: Heavy snow load damages site infrastructure, instrumentation and equipment (D17 TEAK, TECR, SOAP and BIGC).	Cost	90%	Very High	\$500,000	\$405,000	Mitigate	Reinforce building structures, review current sensor mounts based on lessons learned for opportunities to bolster	Very Low	\$67,500	COLEMAN
IS-00001911	Threat: Stirling engines run out of propane before tanks can be refilled, leading to power loss and data loss at AIS sites (D13 WLOU, D17 TECR/BIGC, D16 MCRA, D15 REDB).	Performance	80%	High	\$50,000	\$30,000	Mitigate	Install larger propane tanks at AIS sites so that sensors remain powered during years with extended winters.	Very low	\$6,000	COLEMAN
IS-00001953	Opportunity: Add Data Portal staff to accelerate implementation of community-requested portal improvements, resulting in increase in use of NEON data and community satisfaction.	Performance	80%	High	\$500,000	\$300,000	Accept				JACOBS, THIBAUT
IS-00002019	Opportunity - Network Segmentation of NEON sites from central infrastructure (cybersecurity)	Cost	80%	Medium	\$50,000	\$24,000	Accept	Configure advanced controls using existing tooling			JACOBS
IS-00001713	Threat: Lightning damage to TIS huts with short towers (hut outside sphere of influence of tower) highest risk sites listed as follows; BLAN, DSNY, LAJA, KONA, KONZ, WOOD, DCFS, NOGP, CPER, STER, KLEM, YELL, NIWO, MOAB, SRER, ONAQ, ABBY, TOOL, BARR, CARI, HEAL	Cost	20%	Medium	\$25,000	\$3,000	Transfer				COLEMAN

Risk Register – Current Info

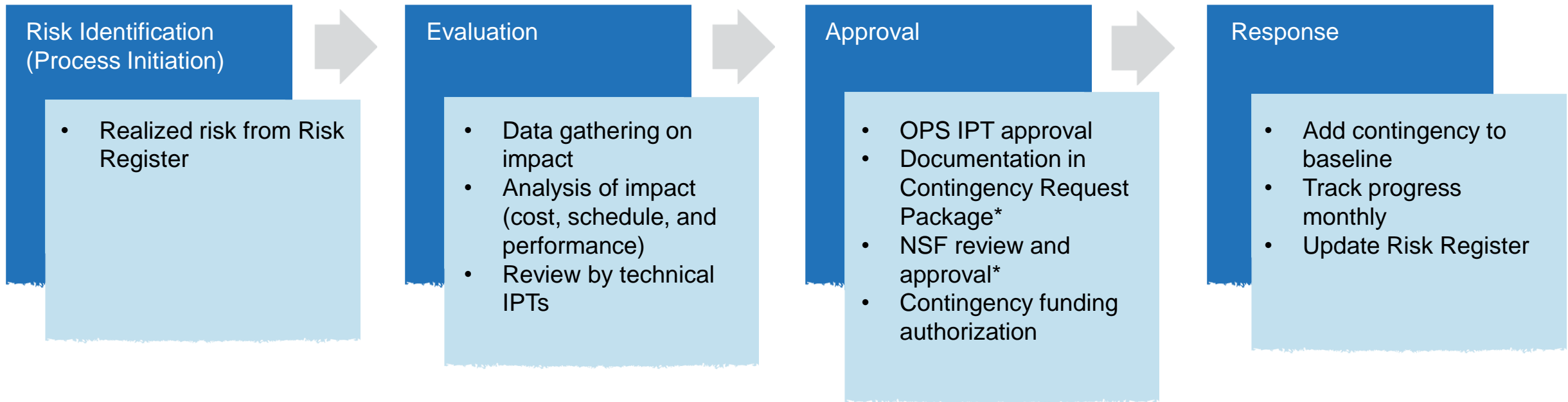
- 219 risks being tracked
- Qualitative analysis (SME estimation) determines a rating from 1-25 for each risk
- Risks are then grouped into a matrix to show the distribution of risks for NEON
- Quantitative analysis calculates a probability weighted cost exposure (PWCE) based on the probability, impact and a SME cost estimate (uncertainty is higher for risks that affect multiple sites or systems)



Example: Probability of Occurrence = 30%, Impact is High = 75%, Cost Estimate = \$150,000

$$PWCE = (30\% * 75\%) * \$150,000 = \$33,700$$

Contingency Management Process



** NEON uses an \$100K threshold for requests requiring NSF approval*

Contingency Management Process – budgeting on realized risks

Evaluation Step

- The final budgeting for contingency request occurs – CAMs and project controls responsible
- Realized risk responses are formally priced to ensure that actual required contingency draw amounts are available upon approval
- Contingency amounts will be used to improve PWCE estimates

Approval Step

- NSF awarded incremental contingency funding - a separate amendment is not needed for every contingency draw
- This allows immediate budgeting for contingency under \$100K approved by the NEON OPS IPT
- Upon approval, budget is increased at the work package level and documented in a change request

Contingency Management Tracking Sheet

Risk ID	Risk Realized	Summary	NEON WBS Affected	Date Realized	Date OPS-IPT Approval	NSF Approval Required (>\$100K)	Date NSF Approval Received	Total Contingency Available	Contingency Used / Requested	Remaining Contingency (\$)	Change Request #	Risk Retired?
IS-00001918	Threat: Unplanned tree maintenance is required to mitigate hazard tree.	D08 - hazard trees at LENO	WBS AY24.06.08.02	01/31/24	02/01/24	No	N/A	\$ 2,624,020.00	\$ 8,677.48	\$ 2,615,342.52	CR AY24-0007	No
IS-00001914	Threat: Wear and tear on boats, UTVs, snowmobiles, trailers or other off-highway vehicles requires higher than expected repair or replacement.	D08 - current pontoon boat and trailer has engine and deteriorated condition issues - needs replaced	WBS AY24.06.08.02	01/31/24	02/01/24	No	N/A	\$ 2,615,342.52	\$ 39,342.30	\$ 2,576,000.22	CR AY24-0007	No
IS-00001887	Threat: Insurance costs will rise due to inflation over budgeted amounts	Inland Marine insurance policy premium	WBS AY24.02.01.03	11/01/23	02/15/24	No	N/A	\$ 2,576,000.22	\$ 64,567.00	\$ 2,511,433.22	CR AY24-0003	No
IS-00001887	Threat: Insurance costs will rise due to inflation over budgeted amounts	Auto insurance policy premium	WBS AY24.02.01.03	01/15/24	02/15/24	No	N/A	\$ 2,511,433.22	\$ 45,554.00	\$ 2,465,879.22	CR AY24-0006	No
IS-00001749	Threat: Statistical optimization analyses indicate science design does not provide sufficient spatial or temporal coverage to detect ecological change	D14 has highest inter-annual variation in Gross Primary Production. Annual AOP flights needed. Current design is not meeting researcher needs.	WBS AY24.05.01.01	12/20/23	01/04/24	Yes - submitted to NSF on 3/20/24		\$ 2,432,195.78	135,211	\$ 2,296,984.78		No

Value of Contingency Budgeting for O&M Awards

Current State

- For NEON award, NSF budgeted contingency annually for the 5-year period
- Processes allow data to be gathered for improving Risk Register estimates and future award year budgeting
- Opportunities can accelerate data quality, data accessibility, and infrastructure resiliency

Future

- Data on NEON contingency use can inform risks, program budgets (base and contingency), and annual escalation %
- O&M Risk Management must be more robust – sharing lessons learned across programs is important

How can NEON enable the science of your community?



Santa Rita Experimental Range, AZ

Thank You!



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Learn more

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A WALK AROUND THE OBSERVATORY

INSTRUMENTS

OBSERVATIONS

AIRBORNE



Photo Credit: Abe Karam

Q&A