

## **Minutes of September 16-17, 2005 Meeting of NORMEO, Moscow, ID.**

Members of the Northern Rocky Mountain Ecological Observatory (NORMEO) met in Moscow Idaho at the University Inn on September 16<sup>th</sup> and 17<sup>th</sup>. There were about 30 participants (list attached) including representatives of field stations, universities in Wyoming, Idaho, and Montana, federal scientists from the National Park Service and NOAA, and a Nez Perce tribal member.

### **Friday, September 16<sup>th</sup> 1:00PM**

The meeting opened with a summary of the current state of NEON, the role of the regional NEONS like ROMEIO in the NEON planning phase, and a review of our adjacent regions.

For the NEON update see power point presentations on the NEON Inc. website.

National NEON Update- Jim Gosz

- Jim read letter from NEON to COREIO describing how the domains were established.
- Regional Boundaries are diffuse, nebulous, and climatically derived.
- The focus of NEON is on a continental scale; there will be cross-domain partnerships. The design of the program is not focused on regional interests, nodes will be established for good science at all scales this is a national agenda, therefore the national perspective.

Status: Definite Situations and Indefinite Prospects

- Indefinite: which technologies will be put in place, must shoot for high end costs (1.5 billion dollars), inclusion of Hawaii and Alaska (will change the cost analysis), distributed or centralized facilities (i.e. Isotope center).
- Definite: NEON is unique (boundaries are not political), long term commitment (50 year time scale, will encompass wildland/urban gradient, standardized infrastructure nationally, and there is an emphasis on zero and first order streams.

Infrastructure

- Fixed Instrumental Unit (FIU)
- Roving Instrumental Unit
- Sentinel Instrument Unit – Manual

### **May 2006- Call for Prospectus give 1 year for development.**

The goals of NORMEO were presented and discussion groups were formed to develop action actions under three broad topics . Overall, there was uniform agreement that a Northern Rocky Mountain Ecological Observatory goals could be divided into three broad topics:

- Group 1. Internal organization of region (goals: a,d,f)- Evans
- Group 2. Interface with NEON/COREIO and adjacent regions (goals: b,g)- Kavanagh
- Group 3. Constituency/ Outreach (goals: e,h)- Allen
- Goal c was considered long-term and not addressed in this discussion.

(Thanks to ROMEIO and MAREIO for some of these goals)

- a. Establish dynamic communication and collaboration within a network of national,

- regional, state and local partners.
- b. Support the goals of NEON by promoting the development and coordination of regional observation platforms, research, modeling, educational and analysis facilities.
  - c. Support the development and application of emerging technologies to ecosystem analysis and forecasting.
  - d. Organize region-specific and topic-specific meetings, such as sensor networks, educational programs, data management systems.
  - e. Provide national, regional, state and local decision and policy makers in the Northern Rocky Mountains with regional observations, research results, forecasts, educational programs and analysis in a timely and usable manner.
  - f. Develop regional collaborative research and education programs that both support NEON and/or can be independent of NEON.
  - g. Advise NEON, Inc. of unique needs, interests, and capabilities of the Northern Rocky Mountain Region and respond to NEON Inc. developments and requests; coordinate collective regional responses.
  - h. Communication of regional priorities for science to constituencies.

### **Saturday, September 17<sup>th</sup>, 2005**

8:30 a.m. Convene.

Groups reported back with top 3 action items.

#### Group 1. Internal Organization of Region

Goals: Establish dynamic communication and collaboration within network & organize region-specific and topic-specific meeting

- **Action items**
  - establish the governance structure (by laws) of the network
  - Establish (elect?) an executive committee and appropriate subcommittees
    - Role of exec committee – govern the network
  - Executive committee (8-10 people)
    - Representation from major universities within each state: ID, MT, WA, WY
    - Early career scientist + established career scientist
    - Agency (local, state, fed, tribal), university participants, private
    - Role would be to organize meetings, set agenda, and move larger vision of network, establish appropriate subcommittees, provide mechanism for organizing communication among subcommittees.
    - *Possible subcommittees*: science, outreach and education, infrastructure identification, platform prospectus.
  - Develop and update a website (interactive, build and ID infrastructure).

- Develop a comprehensive email list serve for news and announcements.
- Find funds for above to support I.T. person.

Discussion:

- Who maintains web? NCO, develop a subcommittee
- Developing groups in large scale coordination: 1<sup>st</sup>, structure slows the process 2<sup>nd</sup>, minimal requirements allows for innovation, efficiency, but the goals must be clearly articulated.

Group 2. Interface with NEON/COREO

- **Action items**
  - appoint a group to research , meet and present – find one rep per state (ID/WA, WY, MT) – reach out to many different agencies and educational institutions
  - Inventorying strengths of region: people, facilities and data, areas of expertise, technical facilities
  - What is lacking?
  - Emphasize research complementarities
  - Identify who can represent some regional strengths and bring to next NORMEO meeting – be sure to identify new strengths in addition to “silverbacks”
  - Find funds for prospectus coordinator (Epscor? Within individual institutions? Post-doc?)
  - identify mechanisms for reaching out to adjacent regions and COREO
  - collating the major regional science questions & unique qualities of major ecosystems of this region (amend agenda, says Katy)
  - Define value of NEON - What are the benefits to various regional parties? i.e., how do you package NEON to
    - a) Other scientists?
    - b) Administrators?
    - c) Managers?

Group 3. Constituency/ Outreach

**General Discussion**

- Must be **inclusive** in the planning of regional node
  - Participants to invite; agencies, tribes
    - Native American tribes present unique situation- no one person/agency can represent all tribes, must incite representation from all constituent tribes in region
      - Should use existing networks for tribal representation (e.g. established agency contacts; Confederation of Tribes)
  - Inclusiveness should be considered at all level of organization
    - Regional meetings
    - Core group
    - Committees
    - Executive Committee

- Need to have **outreach** to inform constituents
  - Outreach to: K-20, institutions of higher ed, communities, legislators, businesses, agencies, media
  - Must produce a “package” for marketing
    - Determine the needs of various constituents- must address those needs in the marketing/information package
    - Scale the information so local constituent’s needs are addressed and they recognize the value of NEON initiative
    - We won’t satisfy everyone’s needs, but this is only NEON I (long-term project)
- Must address **accountability** issues
  - Project is long-term- need to educate K-5 population to have early buy-in
  - Must sell “legacy research”- the need for this type of project is a hard sell to general populace
  - Need to have Intermediate (short term) products that address local needs.
- Need to start **lobbying** key constituents
  - Politicians (and the people who influence them) should be our first priority for outreach
    - What’s in it for politician’s constituents?
    - How does it fit into the big scheme of budgets, programs, etc?
  - Need to have a buy-in from those people/groups that influence politicians
    - For example, industry
      - Connect science to management- need to develop this idea to influence constituents
  - Opinion makers from agencies need to be brought in to influence politicians
    - Not just management but technical advisors (possibly teams from agencies).

### **Action Items**

- Once a preliminary “package” has been produced, need to invite agencies and other to awareness meetings
  - For example: USFS, USGS, BLM, Park Service, Tribes, Congressional Staffer
  - Need to spread the word and convince influential people/groups to support mission of NORMEO
  - These people/groups can influence politicians
    - What are the needs of the people/groups?- need to identify these
    - Market the project to specific targeted audiences
      - Tailor the “package” to influence targeted audiences
- Influential person from higher education (administrator who has NEON vision) to bring higher ed administrator to the table
  - Collaborative effort across regional institutions- will influence politicians through buy-in and knowledgeable discourse of project
  - All institutions need to be invited
- Create a web site for information dissemination and preliminary “package” for marketing.

- Create two one page documents- one with details of NEON the second with information regarding NORMEO.

9:30 a.m. Review / Discussion of science questions identified by NRC and NEON Inc processes.

- 1) How are ecological systems affected by changes in land use and climate across a range of spatio temporal scales?
- 2) How do changes in the availability and distribution of the Nation's water affect ecological systems?
- 3) How do the patterns and movement of genes and organisms across the continent affect biodiversity and the spread of infectious diseases and invasive species?

#### Discussion of Science Questions

- Generic/Interconnected
  - Strength- allows tailoring to individual region
- Will NEON seriously consider spread of infectious disease? Yes, mobile units
- Change question to focus on regional issues
  - Note similar problems inter-regionally or collaboration
  - National scale problems (do we look out or in)
    - Ameriflux
    - Fragmentation
- NROMEEO to become case study within Rockies
- Practices by agencies / tribes are driven by management needs, universities are not included therefore to address regional and continental issues must show/ express awareness
- How do region programs inform you better for NEON to fill gap?
  - Development of this group
  - Outreach → Data → Compilation → AMAZING
- Information not in open literature
  - Know sources- relay on those that are known
- List agencies/tribes/interested groups
- Using existing programs begin with planning identifying resources
- Long-term data sets
- Flagstaff NEON meeting went bad because agencies did not feel cooperation or interaction- varying goals.
- Need a community of administrators for advancement, both regional and national scales.

10:15 a.m. Convene into small breakout groups associated with each of the 3 questions (above).

Within each group discuss the following questions:

- 1) What are the *unique qualities* of the major ecosystems in the Northern Rockies?
  - a. List major gradients from urban to wild within each one of these ecosystems.

- 2) What forecasts should we be able to make about these ecosystems in 2020? (relate these forecasts to your specific question)
- 3) What observations and models are needed to support these forecasts?
- 4) What infrastructure is needed to support these observations and models?

1:00 p.m. Each group summarize their key points in 5-10 minutes

**Question 1. How are ecological systems affected by changes in land use and climate across a range of spatio-temporal scales?**

- Major Forecasts in 2020. How do changes in land use/climate patterns influence?
- Biodiversity
  - Invasion hotspots
  - Spread of pests and infectious disease
  - Availability of natural resources
- Water Resources
- Air quality
- Natural catastrophic events (biophysical –fires-, biological –outbreaks-)
- Biogeochemistry
- **Unique aspects of Northern Rocky Mountain ecosystems**
- Step gradients of land management:
- From wilderness to ‘urban’
- Benefits of wilderness areas:
  - Encompass diverse ecosystems (from woodland to alpine)
  - Assessment of invasive species introduction vectors
- High increase population growth projected (high opportunity for research)
- Urban development
- Peri-urban development
- Habitat fragmentation
- Diverse climate gradients (spatial trends across climate gradients useful for predicting temporal trends with climate change)
- Temperate zone: major impact of climate change on global C cycles
- Complex pattern of land ownership along extensive wild land urban interface
  - Park Service
  - Forest Service
  - BLM
  - State
  - Private
  - Tribal
- **Observations and models**
- Climate
- Biota
  - Diversity
  - Habitat (high resolution)
    - Fragmentation

- Role of corridors
  - Dynamics (phenology, population dynamics, succession, food webs, ...)
- Hydrology
  - Dynamics freshwater systems
- Biogeochemistry (integration aquatic/terrestrial)
- Ecological acoustics
- Accessibility (human movement vectors)-recreation access.
- **Infrastructure needed**
- Data base structure:
  - synthesis of existing data;
    - USGS continental scale assessment of land use changes
    - N Parks Biological Survey
    - State
    - Universities
    - Coordinate with NCEAS
    - Forest Service
    - Nature Conservancy
    - (Timber Companies)
    - Counties
    - Watershed groups (coalitions)
    - Federal Data Quality Act and other hurdles
  - Protocol for future data collection
  - Data storage
  - Data accessibility (open file sharing)
- Computing capabilities/maintenance
- Met stations
- Flux Towers
- Long Term Ecological Research Sites
- Real time data monitoring
- Criteria for platforms
- Steep gradients in concentrated area-lends to one watershed that may/or may not represent the entire region.
- Criteria at the continental and regional scale.

**Question 2.– how do changes in the availability and distribution of the nation’s water affect ecological systems?**

Water quality, quantity and timing

- 1) Unique qualities/opportunities of the region
  - a. Headwaters for major river systems of Western North America-triple divide
    - i. Colorado
    - ii. Columbia
    - iii. Missouri/Mississippi
  - b. The region is a major carbon sink – partly fire suppression, partly forest density – linked to hydrological cycles

- c. More variation in climate across region than most of the other regions – more colors on the map and more heterogeneous
    - i. More continental on MT/Wyo side, maritime influence on West
    - ii. North to South aridity gradient
    - iii. Elevational gradient – warmer/drier lowlands, cooler/wetter uplands – see ideas of refugia during climate warming
    - iv. Smaller scale heterogeneity may be most relevant to this project given the availability of only three fixed platforms
    - v. Heterogeneity may have unusual effects on the resistance of region to change/threshold/collapse
  - d. Glaciers as reservoirs, potentially influence on local climate
  - e. Overall oligotrophic nature of soils and waters – sensitivity to nitrogen deposition – again, heterogeneity of systems (e.g., rich soils around Jackson)
  - f. International border – potential collaboration with Canadian network (CFCAS) (EMAN)
  - g. Multiple pressures on water – mining, industry, municipal, recreation (skiing -> warmwater), agriculture, aquaculture, wildlife, silviculture, fisheries, international pressure, tribal negotiation, state-to-state
  - h. Region still has areas that are relatively unaffected by invasive species
  - i. Inland system with anadromous fish – clear biotic link to ocean
  - j. We represent environmental and recreational refugia-biotic security zones; a look into the past.
- 2) Major gradients from urban to wild
- a. Missoula - Superfund
  - b. Helena/Butte
  - c. Coeur d'Alene - Superfund
  - d. Boise/Idaho Falls/...
  - e. Jackson
  - f. Bozeman
  - g. Lewiston
- 3) What are the changes one can predict in form, timing and quantity of precipitation? We need to be able to predict:
- a. Rate of change(?) Changes in water availability and form, and temporal and spatial distribution across region – elevational and urban gradients, implications
    - i. Changes at elevation in type and quantity of precipitation will strongly influence availability of water to entire region – most of our water is strongly influenced by alpine waters (even our groundwater which has low WRT)
    - ii. How will development in lowlands will change pressure – economic component – this may be different in other regions where water rights vs. water has the \$ value
  - b. How much water is needed, and in what spatial and temporal distribution, to sustain these urban → wild systems.

- 4) We need to be able to forecast –
  - a. what are the thresholds for system changes – in terms of timing, quantity, quality
    - i. direct human uses
    - ii. vegetation
    - iii. aquatic organisms
    - iv. wildlife
  - b. changes that have socioeconomic impacts
  - c. atmospheric soundings
  
- 5) Observations and modeling
  - a. Modeling
    - i. Watershed hydrological models
    - ii. Hydrological species response models
      1. Vegetation
      2. Aquatic organisms?
    - iii. Atmospheric modeling support for hydrological/biotic models?
  - b. Observations in support of models – multiscale observational strategy, attention to microscale climate that will strongly affect our mountain systems
    - i. Fluxes and storage of water
      1. detailed flux measurement at smaller scale
      2. larger scale – remote sensing
    - ii. Climate stations – large scale capturing of precipitation and climate patterns
    - iii. Biotic sampling
    - iv. Biogeochemical cycling
    - v. Genetic sampling, understanding distributional changes
  
- 6) Unique needs for infrastructure
  - a. Ability for smaller scale measurements may be more important here because mountainous terrain will create large differences over small scales
    - i. Radar systems
    - ii. Wireless sensors with telemetry
  - b. Access issues – long-term commitment to support of wildland access
    - i. Air (helicopter) access for the mobile site
    - ii. Road access to wildland
    - iii. Snow access
    - iv. Even for fixed site, we may need emergency access in likely case of fire
    - v. No power grid for wildland-hydro fuel cells.
    - vi. Freezing/thawing may require greater eqpmt maintenance (ice scour in streams)
    - vii. Dealing with complex terrain in making eddy-flux and other measurements.
  
- 7) Should we select a site where we expect greatest changes in hydrology?

Question 3. How do the patterns and movement of genes and organisms across the continent affect biodiversity and the spread of infectious diseases and invasive species?

- What are the unique questions in the N. Rockies?
- We still have terrestrial and aquatic ecosystems that have not been affected by invasive species, but we are vulnerable
- We are going to see things happen that other people have missed
- Unique laboratory
- We have tremendous complexity with steep gradients over short distances, we can capitalize on this heterogeneity
- Increasing human populations and land-use change in pristine environments and accompanying changes as population increases
- What are major gradients
- Steep climatic gradients
- Geologic gradients with young soils reflecting parent material
- Spokane, Missoula, Bozeman
- What forecasts should we be able to make about these ecosystems in 2020?
- Use existing data to determine susceptibility
- Have the ability to parameterize system with high degree of specificity now in position to evaluate consequences of perturbation, which can inform forecasting efforts.
- Monitoring goes beyond forecasting, but can also serve as early warning system and accountability mechanism
- What observations and models and infrastructure are needed to support these forecasts?
- Section by section resolution with permanent plots
- Sentinel deployment and use of existing data
- Permanent measurements to complement existing data collection with additional sentinel units to track spread of organisms

- NEON needs to take advantage of existing data and infrastructure, and not start from ground zero.
- NEON needs to produce a plan to take advantage of existing databases and cooperative with agencies to their mutual advantage.
- Sampling at one point represents a temporal trend at that point, but what about spatial distribution, range of population, characters of populations (genetic, abundance, gene flow, age distribution, health or status). What is temporal and spatial extent of question?
- Given design we are talking about, tradeoff, need large spatial extent with course resolution, is that good enough to address this question? Or, very fine resolution within small spatial area?
- National database analogous to genbank.
- Need to revisit existing information and sharing as infrastructure.
- Habitat association models to predict trends
- Mobile labs to address unique outbreaks

1:45 p.m. Open discussion/brainstorming on the following topics: (Katy Kavanagh)

Name of the Northern Rocky Mountain Domain?

- Suggestions: NoRocken, WIMWy, NoREO, Normeo, RoMoNEO, and NORMEO
- Vote: **NORMEO**- winner!!!!

Governance:

Advisory board/ temporary executive committee

- ID-Katy
- MT-Duncan and Art
- WY-Dave Williams
- WA-Dave Evans (coordinate with IRON)
- Agency1- Steve Katz
- Agency2- suggestions made exec committee will follow up

Subcommittee

*Proposal for regional observation platform*

- John Marshall\*, Tim Link, Kevin Feris, Lee Vierling, Chuck Peterson,

*Outreach-ID regional strengths, ID participants from Agencies etc...*

- Anna Sala (will find leader), Steve Daley Laursen,

*Prospectus resources*

- Exec committee. Plus Kevin Feris etc..., Dave Roberts.

*IT-web site development*

- Alistair Smith, Brian Kennedy, Exec Committee, EPSCoR-Wyo  
*COREO Reps- Next meeting Nov. 21<sup>st</sup>-23<sup>rd</sup> at Kellogg Biological Station, MI.*

- Art McKee, Katy Kavanagh

- Alternates: Stephanie, Duncan, Dave Roberts, Dave Williams.

Future meeting

- Location-Missoula, Montana
- Timing- Early Dec early week of the 13<sup>th</sup>
- Content-product development (action items), work on prospectus, involve other participants, NEON updates and background, governance structure, elections, proposal for selection platform selection criteria...ROMEO Rep, and other adjacent groups- IRON, PNWREO, NoPlains....

4:00 p.m.      Adjourn