**Upper Mississippi Floodplain Forest Workshop – Draft NOTES**

**15-17 September 2015; Dubuque, IA**

***Convening scientists and managers to explore the status of current knowledge and science needs***

**Travel Day – 14 September 2015**

**Lodging options**

Make reservations in the room block for “Floodplain Forestry Workshop” **before August 22** at:

Holiday Inn - Dubuque/Galena ($83/night)

450 Main Street, Dubuque, IA 52001

TX: 888-465-4329

Online – https://tiny.cc/FloodplainWorkshop (Note – lodging URL is case-sensitive)

**All sessions except field trip and evening social will be at the Holiday Inn – Dubuque/Galena.**

**For remote participants, we will also broadcast the presentations and host a virtual Breakout 3 group online using the following connections:**

Audio: Dial 866-714-8353; participant code 43553755#

Adobe Connect (**NEW LINK**): https://usfs.adobeconnect.com/na-pine/

**Participants – See list in Appendix**

**Day 1 - 15 September 2015**

**Landscape Level Considerations (Blue Moon Room – Plenary Session)**

8:00 **Historical back drop of the UMR floodplain and current effect of climate change** (Mickey Heitmeyer)

* Think in terms of ecoregions. Point bars, swales, terraces. Maps of Missouri and Mississippi showing channel dynamics. Mississippi south of St Louis. Maps with soil features, some quite complex. Not a uniform surface. Species composition is highly important, difference between sandy loam and silt clay. Huge difference for water.
* SURGO can take basic taxonomy for drainage, etc. Have a lot of data. Both hydrology and topography with LiDAR. Looking at old USGS quads for on the ground would have been next to impossible to envision landforms. The power of the image and visibility looking at lands is amazing. Infrared series of locations to north of Quincy at Iowa line. Diving into data can construct map of Reno Bottoms with various contour lines. Will come back to this line, showing different elevations from 624 to 626 with heterogeneity of elevations, forest composition.
* Capability to inform our thinking about forest communities is remarkable. Elevation role relative to hydrology, river access to floodplain. Understanding historical patterns with data, elevation, can predict current and historic flood contours. Rob Jacobsen taken this to the next level for maps relative to flood recurrence intervals. Chuck worked with this on pools in Upper Miss. Coupling LiDAR with hydrology to show where recurrence intervals may have been and into the future.
* Make the bridge from that data set to the forest. Think about management authority and responsibility relative to these attributes. Inputs from tributaries have tremendous consequences on water volume, flow, dynamics and difference relative to climate. Gives you the idea that political boundaries are kind of useless. Ecoregions down to floodplain itself. What’s in ecoregion gives us clear picture of communities. Chuck put this together for Miss relative to ecoregions (geomorphic reaches).
* Presettlement habitats - Leads to what the historical communities were and where in broad categories. Need to understand forest-grassland continuum. All is predicated on a lot of botanical information relative to physiography. With background information. Floodplain forest on newer sites formed in Holocene on silt, clay soils, 1-2 yr flood frequencies.
* Matrix example for a lot of spots in river (from Chippewa) bottomland prairie, floodplain forest, matched with cell type and flood frequencies. Match attributes with communities in ways we never could in the past.
* Bottomland lakes – most simple, banded channels, clay and silt-clay surfaces with sediment deposit, 1 yr flood frequency, greater than 2,000 yrs old in Upper Miss. Can get appreciation of history. Swan Lake over 2,000 yrs old with silt clay surface. Lakes have transitional forest system.
* Riverfront forest – present immediately adjacent to or close to current or former channels, present throughout Upper Miss. Unique community.
* Floodplain forest – split into generic versus Bottomland Hardwood (little in Upper Miss). True floodplain forest more diverse, dominated by ash, hackberry, box elder. Usually diverse community transition from newly accreted to older sites on point bars, swales, ridge different with swales having 2-5 yr flood frequency (ridge longer). Dominated by oak, occur in back swamps or sites away from river. Extension of Miss Alluvial Valley with silt clay rather than silt loam. Most in southern parts of Miss. No true bottomland hardwood forest north.
* Slope Forest – mix of upland and floodplain on alluvial fans where material has eroded from bluff to floodplain, flood infrequently if at all (20 yrs or greater).
* Savanna – transition from forest to grass, greater than 5 yr flood, some oaks,
* Floodplain prairies - transition to grassland/wet mesic to mesic, range from very wet marsh-like to true upland mesic.
* What’s next? Putting information in maps to demonstrate complexity of historical context, starting from south.
* Presettlement communities – bottom to Cape Girardeau, Horseshoe Lake, lots of green with true bottomland hardwood, ridges, swales, floodplain forest and riverfront forest. Represents how we take this information to paper for view of historical context.
* Thieves Gap north where floodplain takes different form – Wide bands of floodplain forest to river channel.
* Transitions in system from ecoregion and ecological to climate features to geomorphic history. Below Thieves Gap, Lower Mississippi to true Upper Mississippi system. Old river channels, oxbows signature are still there. Floodplain forest behind, green with Slope Forest. Fairly uncomplicated banding of communities.
* North – more diversity with huge back swamp (Oakwood Bottoms), remnant piece of upland high terrace.
* Confluence – old remnant terrace east of Alton. Have been working on Missouri over past 2 yrs, will unveil this for 600 miles of Lower Miss as first continuous view of large river system ever. This is lowest piece of that mapping.
* Tributary fan with not true bottomland but transition in forest. Tight tolerance of community features from half foot to foot elevation change. Linear banding of half foot to foot.
* Bottom end of Pool 10 – maps available with Reno Bottoms, floodplain portion.
* Root River – tributary system with strong evidence of wet meadow.
* UMRS Landscape Patterns - Quincy from Pool 10 but gap to Pool 19 and no information on the Illinois River. Closing in on comprehensive view. North of Kaskaskia transition to grassland influence. Dominated by channel, very heterogeneous, mixed forest prairie, dominated by riverfront floodplain forest. Don’t have maps from Illinois River but Quincy to St Louis tight contours reflecting hydrology. Sny Anabranch north floodplain forest more restricted, more bottomland prairie. Transitioning to prairie farther north. Limited information on Pool 4.
* UMRS Climate Change - Summary of what we’ve gained from HGM. Talking about future. Climate varied since glaciers. Dominated thinking on shifts with large floods, extremes, environmental conditions. Notion not new.
* Discharge increasing - Current environment, seeing things interesting and disturbing. System over time getting wetter, more days of precipitation, more total water volume. Increase will change attributes and relationships.
* Example after 1993 flood – extreme but hint at future. South of Hannibal on Ted Shanks area. Inundated 191 of 200 day growing season, huge tree mortality. Pictures in 1970s with Salt River on bottom left, remnant oxbows.
* Bottomland Hardwood Loss - After flood, going forward, backdrop is what you see at Shanks today, less forest, increase Reed Canary Grass. Loss over 20 yr period (2000-2006) with aerial view from 1970s then today. This is HGM model of community today based on relationships. Red saturated semi-permanent increased, oak restricted to highest elevations. Very dramatic, more than climate change, which will be more gradual.
* Reno Bottoms - Other evidence in other spots. Floodplain forest shrinking, maybe because of elm and ash disease. Historical context maps, data aligned with 624 with historical distribution of diverse community in purple. Started looking at maps and forest inventory, transitioned to 625 then 626 with very different contour band to think about this community. Partly lock and dam operations, but potential for different water management scenarios that may push that back down. Foresters don’t have same playing table that you used to.
* Future Conservation Strategy & Management – Have brought big maps. Leave you with these concepts developed under HGM have greatly informed understanding of historical setting, type, distribution, identified range of attribute relationships (soils, hydrology, geomorphic surfaces). If you have site that is Holocene point bar, ridge, swale with silt loam soils with flood frequency will be high diversity of oak, elm, ash. If you have site impacted by lock and dam with lower elevation, floods on 1-2 yr with sandy loam in newly accreted surface, will be stuck with sycamore, cottonwood, silver maple. Site on tributary fan with Chippewa, Iowa or other tributary, silt loam, lots of hope for pecan and oak. Attributes inform you to make better decisions.
* Several key gaps in data – Real vision. When interacting with forestry, Jon Kemp, Randy, Gary at Rock Island, others. They had vision of comprehensive view from Cairo to Minneapolis to systemically make sure everything was where it belongs, not trying to make something happen in wrong place, oaks where they can’t grow, more diverse forest where bottomland prairie should be. Strategic comprehensive management plan for what the LCCs want to do at landscape level.
* Major gap from Quincy to Pool 10, quite a bit of info from Pool 4 to 10.
* Must identify landscape changes, model scenarios like at Reno Bottom for what to expect into future.
* Seek to fill gaps in system where communities have been destroyed or degraded, identify sites needing active management, evaluate changes for water management or hard structures, some out of our control, build in resiliency, hedge our bets for climate change.

9:00 **Upper Mississippi River Systemic Forest Stewardship Plan** (Lyle Guyon)

* Helping to write Upper Miss River Systemic Forest Stewardship Plan with National Great Rivers Center as NGO partnerships with University Illinois outside St Louis. Collaborative effort. Three lead authors, Charlie, Randy and Joe with writing team large effort. Originally began as project with Navigation and Ecosystem Sustainability Program. Corps writing team, FWS, USGS, other contributors from other agencies with few NGOs, Audubon, TNC, etc.
* Purpose of plan – Recognized need with coordinated effort from 3 Upper Miss Corps Districts as guide for regional coordination and management. Regional goals and objectives to actionable items and priorities, identify data gaps, promote use of adaptive science-based management of resources.
* Scope of plan – Upper Miss system bluff to bluff regardless of authority, addressing ecosystem sustainability and management, not just main channel or waterway, but everything in 500 yr floodplain.
* Ecosystem services – Best available information, out for about 3 yrs, historic river changes, dynamics, community, ecosystem services in report. Linking floodplain forest to water quality, living resources, habitat, land-based resources, addressing links of communities in areas to education/outreach and research, recreational use by public. Wide array of material.
* Resource trends – addressed issues of floodplain history, land conversion, loss of floodplain forest from presettlement, outlining perceived or documented hydrologic impacts, constraints of management (locks & dams, levees). Trends in forest towards loss of cottonwood, willow, hard mast component to monotypic silver maple. Loss of overall species and community diversity feeds restoration work. Disease, insects, invasives, pathogens move into system for management challenges. Reed canary, emerald ash borer.
* System-Wide Goals – template or guide for implementation. Regional scale goals down to level of stand management. Borrowed from science reports, consistent with other guidance documents. Goals outlined in report pertain to floodplain forest (4 goals): 1) functional floodplain; 2) restore & maintain; 3) on non-federal lands; 4) coordination and adaptive management. Broad goals.
* Objectives – Detail in setting stage for future actions.
* Goal 1, have 5 different detailed approaches leading to actions and implementation, system-wide database with reference and current site conditions (like Mickey’s talk), identifying underrepresented habitats, etc.
* Goal 2 specific objectives: restoring diversity, generate or establish target levels of representative communities, age & structure, canopy, etc.
* Goal 3 – support for restoration and maintenance on nonfederal lands, technical support, coordination with other agencies pursuant to authority, applicable cost share established through memorandums.
* Goal 4 Adaptive Management – address questions that arise during management implementation, adaptive management wheel. Web-accessible database as frameworks for coordination. Establish partnership with Lower Miss Valley Joint Venture recognizes separation in management between Upper and Lower Miss with effort on cross-collaboration between systems, which could be improved upon to benefit of both sections. Draw on lessons learned in Lower Valley forest management for Upper Valley. Sections in report reference similar document in Lower Miss JV with forest management recommendations for wildlife habitat, etc. Looked at that as source document for holistic management approach.
* Desired Stand Conditions – System-wide framework, overstory canopy coverage, recognizing variation. Not a one-size-fits-all table, but captures most attributes for implementation. Target canopy, overstory, basal area, stocking, emergent trees, understory, generation, woody debris, standing dead trees, invasives. Is what’s there acceptable to management?
* Floodplain Forest Restoration Tools – tied into active forest management, setting and achieving desired stand conditions, what is widely accepted method, timber stand improvement, harvesting, site prep, tree plantings, containerized versus bare-root trees, prescribed burning, elevation modification, water level management.
* Recommended Priority Actions – HGM progress with system-wide database, still some gaps, data acquisition (LiDAR online), forest resource inventory on the ground data, coordinated system-wide management.
* Implementation – where management has gone since report came out to meet goals and objectives. HGM gaps, data acquisition (forest resource inventory by ACOE) collected through data protocol on all federal lands integrated into Forest Management Geodatabase. Tremendous access and information. Tree-planting, reforestation, integration into other planning documents such as master plans (St Louis or Rock Island District) or forest management plans and silvicultural prescriptions.
* Forest Resources inventory – Data acquisition with 50,000 acres fee titled land inventoried, some on second data cycle, detailed spatial coverage. Georeferenced data points at 100m apart. Tremendous amount of information across variety of spatial scales. Island in Pool 26 above confluence with Illinois River. Can look at species occurrence across grid, distribution of pin oak versus green ash, overlain with LiDAR or flood frequency charts.
* Forest Management Plan – Dardenne Island - Chuck will talk about riparian modeling. Stand level management with St Louis District breaking these areas into individual stands. State of art knowledge for management.
* Stand Prescriptions – Set stage for stand-level treatments.
* Download PDF at www.ourmississippi.org

9:30 **Habitat goals and objectives** (Stephen Winter)

* Refuge exists from Wabesha to Clinton, IA, over 260 miles with 4 district offices (Winona, La Crosse, McGregor) and headquarters office in Winona. Habitat management planning process for Refuge to generate goals, objectives, strategies to implement. Working on it for a few years. Learning process, engaged with partnership.
* CCP done with HMP for desired goals, conditions.
* Systemic Forest Stewardship Plan – goals, objectives, identified forest habitat patch size and matrix ties into spatial database. Refuges complete CCP with step-down plans to implement relevant to Habitat Management Plan (HMP) with prescribed for structure. Initiated planning in 2012.
* Writing Refuge Management Goals and Objectives – subject (what to manage for – species, guild, community), attribute (target value), target (historic, etc).
* SMART objectives with greater level of specificity, which is really difficult (who, where, what, when with measures to compare to what we want. Must be achievable within realistic constraints. Results-oriented targeting end result. End point phase or stage achieved at certain time.
* Foundation of HMP is selection of priority habitats and resources of concern tied to legislative mandate. What is important, what are we legally obligated to manage for, what is critical?
* Potentially Occurring on the Refuge - What we potentially deal with over 260 miles administering 240,000 acres of property, What could be here, how abundant is it, what’s important for legislative mandate, what do state partners identify as critical resource, also Partners in Flight, etc.
* HMP Priority Terrestrial Habitats (also have aquatic) – Have ability to focus management for 15 yrs on these habitats.
* Bottomland Forest Priority Resources of Concern – Lists species to focus efforts on for 15 yrs.
* Refuge Bottomland Forest – across pools 4-14. What to call “bottomland forest” with just over 65,000 acres divided among 4 districts. Some districts are smaller (La Crosse just Pools 7 & 8).
* HMP Objectives – Can’t do a lot of work by ourselves, need help from other people. Have to realize HMP policy specifies what we are capable of doing without additional resources. Separate out Refuge-specific activities from partner activities within context of annual budgets. Beyond that, where we have to engage with partners.
* HMP Bottomland Forest Refuge-Specific Activities – can address 485 acres on our own among all 4 districts. Where and how much is known, but what measurable objectives are we trying to achieve? Have consulting firm write document, have draft chapters for goals and objectives 10 days ago. Difficult for us.
* Measurable Attributes – can achieve 70% overstory canopy on restoration or management sites. At least 2 co-dominant tree species other than silver maple. Age structure.
* If we start from scratch to plant trees, when do we measure if we’ve achieved this? How many years? Maybe 50-75 yrs, which is equal to 3-4 HMP lifetimes. How can we determine success if we can’t measure success for 3-4 HMP generations down the road. Difficult. Can scale time line to age of forest stands (mature forest versus attributes).
* May need to think of objectives differently. When we get to certain sized sapling, will be suggestion.
* Question: Are those attributes across entire ownership or 485 acres? Have drafts, intend different districts to pick attributes for particular projects from larger list.
* Knowledge gap on relating to priority resources of concern that we’ve identified as focus. Never an end to the questions. Will have to live with fact that HMP strives for specificity but has uncertainty. Wet forest, avoiding agriculture.
* Heron colonies with landscape classes - Is colony location related to forest patch size of landscape matrix? Core forest relative to surrounding. Cerulean Warbler territories relative to landscape position. Red-shouldered hawk bottomland forest characteristics. To achieve habitat for this species, would have measurable objectives.
* Critical Next Steps – generate information that will allow next HMP with solid, measurable attributes, habitat-wildlife relationships on refuge. After we finish HMP, will start Inventory & Monitoring Plan.

10:15 **Biodiversity patterns at landscape scales: implications for floodplain vegetation management** (Nathan De Jager)

* Miss River is series of navigation pools with dams, low flows, not designed to store flood waters. Important factor in northern reaches of Mississippi. Flooding is main driver creating unique management challenges. One of few larger floodplains is still connected system with ecosystem services. Creates unique challenges.
* Pools 3-10 extends south to northeast Iowa – fairly crude land cover classification. Pool 3 forest loss challenges, but floodplain forest is still the dominant land cover, particularly in northern part. Submersed aquatic vegetation, emergent marsh, some agriculture. Pool 4 natural impoundment of Lake Pepin with sediments, forest, some agriculture.
* Pool 5 – moving downriver more pronounced effect of locks and dams. Lake or river environment colonized by submersed flora. Pool 5A, Pool 6 (Winona), Pool 7 (Black River floodplain forest), Pool 8 (aquatic impounded area with forest), Pool 9 (Reno Bottoms forest on fringes with marsh, agriculture, large impoundment), Pool 10. Landscape with distribution of communities.
* Forest Loss – looking down from Pool 8 with large impoundment as main culprit for forest loss. Above impounded areas, forest communities developed under different hydrologic regime, can’t recruit as seedlings can’t tolerate conditions or they are outcompeted. Dramatic changes from 1890s to more marginal forest losses.
* Invasion - One of the main reasons is *Phalaris* creating stands. Data from FWS not total acres but just what was surveyed. About 50% of stands have Reed Canary Grass in understory ready to capitalize on open canopy conditions.
* Reinterpreting aerial photography. Pool 7 and 9 are about 80% of wet meadows. Available as management and research community.
* Effects of floodplain landscapes to create unique environmental conditions. Summarized papers to go beyond conceptual idea with spatially heterogeneous areas to quantify it to be useful to floodplain management. Better understanding in field of where you are likely to find different species.
* Pools 3-10 with 200 mile river reach and 120 plots using US Forest Service FIA method to collect data. Not random plot layout. Oversampling some areas, under sampling others. Important data to look at factors associated with community composition. Monitor them into the future.
* Flood Inundation Modeling – elevation data, not using bathymetry, have river stage data for past 50 years. Linearly interpolating between two gauges with river stage intersected with river mile. Asking if the elevation is dry or wet, taking averages for 30 yr period.
* Doing this because elevation is meaningless on river that flows downhill for 200 miles. Don’t have elevation for species. Elevation confounded by locks and dams. Growing season flood inundation with more gradual decline upriver. Doing this modeling to encapsulate how long area is flooded as meaningful metric.
* Distribution of forested plots with community index for silver maple. Not a strong relationship. Decline in diversity of understory with variation (r-squared is low).
* Stem or age structure – Plots flooded more than 50 days. Higher Y-intercept and steeper slope with higher abundance small diameter individuals in those low-lying areas. Lack of recruitment. Not resilient to disturbance due to wind, insects, pathogens.
* Composition and Structure Summary – looked at uncertainty around distributions that can help management, species mixtures for reforestation, targeting particular areas, how they change for management or climate change. Low elevation stands even age, low diversity. Will they make it?
* Forest as part of Floodplain Mosaic – Similar study with land cover mapping data with 16 vegetation types, overlaid on flood distribution model for Pools 3-10 including only active floodplain. Removed agricultural lands and areas that never flood.
* Species list associated with cover types and percentage of overall area – Silver maple dominant (54%). Mix of other communities, species of lowland (*Quercus, Populus, Salix*, marsh categories as 20%, Reed Canary Grass in meadows at 12-20%).
* Distribution of land area by Days Flooded – 95% flood less than 100 days (emergent marsh communities). Distribution of plants as proportion of class. High diversity going down elevation where floodplain forest dominates, then emergent marsh higher diversity communities.
* Modeling of contingent analysis – flooding more often than by random chance. Look at distribution of all communities. Highlight Salix and floodplain forest at high elevation, on elevations less often than you would predict. Shifts over to emergent marsh. 50-60 days important threshold. 100 days to emergent marsh communities.
* Modeling days of flooding – 95% forest occurs in areas that flood less than 100 days. Forest plots in areas that are unsuitable, not supposed to be there from hydrologic perspective. Lowland forest max of 50 days. Oaks in forested stands at higher elevation. Overlap between wet meadow and floodplain forest – niche overlap and potential competition.
* Might be critical threshold along gradient. Less than 5% of forest in those areas. Not losing a great deal of forest in transition to marsh classes in future. *Phalaris* invades understory, sedge meadows. Work recently at large scale.
* Mapping Reed Canary Grass in 2000, 2010 – red areas are dominated wet meadow polygons, not forested. Red greater than 70% RCG. Green more native. About 80% of wet meadow dominated by RCG. Saw drop from 2000 to 2010.
* Proportional area in wet meadow in 2000 – converting to wet forest, *Phalaris* lost to emergent marsh, some areas becoming forest. Wet shrub amount that became *Phalaris* in 2010. Dynamic system. Not static. Look at changes over time. Needs more study.
* Hot spots of Reed Canary Grass – identifying river miles with peaks of abundance. Where RCG might recruit in forested areas. Roughly 50% with evidence of RCG in understory (red areas). Non-surveyed forest in gray.
* Relationship between canopy openness and likelihood of RCG – regression curves from 1 = RCG to 0 – not present. Open canopies more likely to have RCG.
* How open are forests on landscape? – Change from 2000-2010 with net loss in dense canopy class. All losing closed forest, moving to next less dense criteria. Not going the other way (more dense). Over potentially massive area.
* Example of Forest Thinning in Pool 9 – differences in resolution confounded, but some areas have canopy gap in 2010 not there in 2000. Trees age, senesce, lose branches and above-ground biomass. Gap with more open, small canopy individuals.
* Community distributions – areas that flood for over 100 days where forest may not make it. Not suited to hydrologic conditions. May transition away from forest. Other areas make up majority of floodplain at less than 100 days, suitable for forest, will have problems with openness and RCG but tailored to stand improvements as the majority of the land mass and forest. Reforestation in corridor areas that are farmed, don’t flood.
* Distribution of agriculture by pool and flood class – in zero flood class. Could be highly valuable floodplain forest. Have 30% of land cover in agriculture. Area to consider for reforestation.
* Management implications & Tools – Expanding forest cover in low elevation areas. Aquatic habitat with some terrestrial area. Pool 10 terrestrial area with some aquatic habitat. Potential with tremendous land/water mass and agriculture. Opportunities for higher and lower area reforestation.
* Flood Duration Models – online with distribution of land area and classes with 1-3m pixel resolution. Send an email to get data.
* Forest Cover & Indices of Fragmentation – heron distribution, expanding core forest cover, have quantified those patterns, available online.
* Future Research Priorities – Quantify losses in forest cover (where and why). Reed Canary as invader. Natural regeneration. Timber harvest in even-aged stands to create structure. How does management influence regeneration. Impacts of climate change and future.
* *Questions:* 
  + Any good data to correlate flooding with seedlings/trees? One project by La Crosse where we monitored successional process relative to herbivory, flooding with density and mortality index over 3 yr period. Have estimates for silver maple, willow, cottonwood, elm, ash.
  + Use maps to set up regeneration and harvest? First approximation for seeding mixture, target species as first look into conditions suitable. Challenge is high elevation with lot of scatter. Soil accounts for 30% of variability.
  + Slide shows reduction in density (change in canopy density from land cover data). Where reduction has occurred, do we have data on the ground? May be stand mapping data as only data set. Possible to identify areas of concern. Could look at aerial photos to interpret understory? Doesn’t work. If there’s a big gap without shadows. Forest inventory data would be needed.
  + Is there relationship between total basal area and lower elevation low diversity sites? Think not. Allometry of community level stand size. With loss of small individuals, compensates by increasing diameter of large individuals. Think there is only so much biomass to an area.
  + Most agricultural land in zero flood class because of levees? Not a lot of levees there. Lots of land area in corridor that hasn’t flooded for one day in past 30 years.
  + Do relationships in Pools 2-10 hold true further south or do they change? Lots of reasons to change. Statistical relationships for species and areas in upper reaches are not applicable to Lower Miss River. Lots of reasons they would be different. Relations between inundation, sedimentation, adaptation to soil texture. In Lower reaches, issues with stream power, erosion, deposition that change the way that elevation correlates with soil moisture. High organic holds more water. In upper reach, correlates flood, elevation, soil type so flooding can be master variable. May not hold down river.
  + Opinion about increase in overstory gaps between 2000 and 2010? Started hearing from foresters that reduction in canopy density over next 50 years, silver maples would die out and not recruit. Is this the beginning or result of one or two floods? Indication in data that it’s not advanced, changes slight (91% to 89%). Not very noticeable. Maybe more to do with map resolution. Looking at photos, pretty confident that those slight changes are real. Hard to see on the photos on screen because of resolution. Looking through stereoscope, can zoom in. Some changes happening. Subtle. Largest land mass change from higher to lower density.
  + Within Audubon, looking for funding for restoration. One message is potential dramatic loss in forests. Is that something the forest community is concerned about, is it a gradual change, or could we lose a lot dramatically and quickly? Goal to put bounds on that. Identify with respect to hydrology how much acreage we are dealing with. In low elevation, only 5% of cover. Not confident forest will persist there, but it’s a small area. More forest in higher elevation with stand structure and species composition. Invasion is big unknown.

11:15 **Native plant communities of floodplain forests** (Hannah Texler)

* Survey and record statewide native plant communities on county basis to interpret and conserve places.
* Summary – define native plant communities. Have seen two different vegetative classifications. Will give a third from Minnesota. Floodplain communities, plant adaptations, biodiversity significance in UMR.
* Native Plant Communities (NPC) – oak forest, prairie, marsh. All aspects from ground layer up.
* Native Plant Community Classifications in UMR – every state has its own classification not easily cross-walked. National vegetation classification similar to Minnesota. Maps and areas in Minnesota with many patterns repeating.
* Compiling native plant community map for UMR, but being done. Would be interesting to talk more about how to collaborate to get mapping systems to reflect entire system, compare findings across different states.
* Minnesota Biological Survey – started in 1997 with comprehensive county mapping, switched to ecological subsection mapping in northern Minnesota. Start with satellite imagery, aerial photos, circle on GIS any areas with natural high quality vegetation. Visit sites in field for notes, plant species lists.
* Using classification developed as collaborative effort in DNR – ecologists from two divisions worked together on classification useful to land managers based on over 5,000 vegetation plots. Gives common language.
* Field Guides Organized by Ecological Provinces
* Classification Hierarchy – system, ecological, floristic region (geography), NPC class, type, subtype.
* Codes because names of communities are hard to repeat. First two letters are ecological system (Forest) with small letter as ecological region. Numbers are moisture and nutrient levels on scale of 0-9. Allows comparison.
* Context for UMRS Floodplain Forest community – in larger landscape from bluff to river. Concerned about floodplains but have almost completely lost bluff-top in Driftless areas, as it became farmland.
* Presettlement and Current Vegetation – orange is oak savanna that is now farmland, green is oak, blue floodplain in 1850s mapping. High quality native plant communities by Biological Survey in early 1990s. Colored areas are native communities. Biggest areas of floodplain with tributary streams.
* Communities that have been lost. Have different compositions. Deep forests dominated by silver maple. S3 (vulnerable to extirpation) to talk about significance of plant communities in terms of rarity and vulnerability. Ranked S1 (imperiled) to S5 (secure). All floodplain forest are S1 to S3 – imperiled, threatened, vulnerable. All even silver maple considered relatively rare and vulnerable.
* Ground layer inundated, can’t survive. See them up to 50% with annuals and flood tolerant perennials.
* FFs59 - Flooding occurs only in wet years. Depends on terrace above flood level.
* FFs59a – S3 Southern Terrace Forest Types – Trees back into classification on end. Occur on Miss River terraces. Common in understory. Shrubs (wahoo, hackberry, elderberry). Occur in more upland areas (Maryland black snakeroot).
* FFs59b – S1 Swamp White Oak Terrace Forest – rarest conservation status. Not many in Minnesota, only along Miss south of Hastings. High terraces. Swamp white oak dominant. Vines more important (poison ivy). Ground species (obedient plant). Important differences in ground layer. Fire may have been important.
* FFs59c – S2 Elm-Ash-Basswood Terrace – along tributary streams like Root and Zumbro. Includes trees characteristic of uplands. American Elm, boxelder, trout lily, etc, species also in mesic hardwood forest.
* Adaptations – Trees – to survive challenging environments, tolerate inundation, dryness, scouring. Difference in how much species can tolerate. Black willow, cottonwood. Less tolerant of prolonged flooding are hackberry, burr oak, etc. A lot stay dormant with leaf out after flooding.
* Adaptations – Herbaceous Plants – annuals and biennials with seeds that survive flooding. 10% annuals and biennials which is more than other communities where perennials dominant. Adaptation to flood disturbance, growing quickly, flowering, seeding before disturbance. Grab sites and hold onto them.
* Blufflands: A Center of Natural Diversity – 39% of all state-listed rare species in Minnesota occur on blufflands, more than in any other part of the state. Include Miss River, tributaries, bluffs. Minnesota is big state with a lot of ecoregions. This area is quite small, but has red-shouldered hawks, Blandings turtle, blue sucker, glade mallow.
* Rare Plants of Floodplain Forests – emphasize that have number of rare plants and animals. At least 13 state-listed, about half along Miss with half along tributaries.
* Newly listed – Updated T&E list, added Green Dragon Plant (relative of Jack in Pulpit) found only in floodplain forests. New designation of State Special Concern.
* 8 state listed animals - massasauga, woodland mole, etc. Don’t have too many federally listed species. Need management prescriptions with challenging times ahead.
* Finger Lakes – Weaver Dunes Area – GIS project with river system, designating biodiversity significance. Colored areas are native plant communities. Darker green along river is floodplain forest and terrace forest. To west is Weaver Dunes sand dunes. McCarthy wildlife management area with sedge meadow and FF, not dominated by RCG. Ranked, mapped, biodiversity significance rankings by color. Huge complex, interrelated, species use uplands and lowlands. Largest population of Blanding’s Turtles use barrens for nesting with wetlands for rest of their life cycle. Great continuity between communities. Points with rare plants and animals. Incredibly important for biodiversity. Floodplain forest is complex mosaic of deepwater and terrace.
* Stewardship and Protection – end with messages that are reiterations. Context of biodiversity as we protect and manage. Look for opportunities to restore native plant communities in appropriate areas of the landscape. Places with agriculture may be some opportunities, depending on whether land is available. Utilize data to make management decisions.
* *Questions:*
  + If you set aside concerns about lack of biodiversity in stand structure and focus on local conditions? Recognize issue and part of a lot of discussions. All concerned but silver maple forests are fairly rare plant community. Only on larger river systems. Incredibly significant. Habitat for birds and other animals. All for creating more diverse FF system on whole, but ok to have silver maple in some areas. Conjecture that some aren’t very different than they were 150 years ago. Leave some low diversity. Depends on regeneration. If silver maple don’t regenerate but convert to RCG, then we have a problem.
  + Other factors that go into impairment level or conservation status? Process of looking at known occurrences of plant communities. Has to do with how common they are on landscape. Look at relationship to nationwide and global distribution. Swamp White Oak area fairly rare. Threat is factored in where plant community is present but highly threatened and may not survive without stewardship or management. Rarity and threat are main things.
  + Lot of projects focused on planting trees. Should we look at understory as well or with canopy cover, there are enough seeds to convert to healthy understory? Don’t know the answer. Not many experiments to see what will happen. Depends on competitors like RCG if we need more intervention. Understory moves around well with annuals having small seeds to move through air or survive inundation. Can they get there in fragmented landscape?
  + In Minnesota, do you recognize subspecies of Burr Oak as Northern Burr Oak? No. In Iowa, seeing Burr Oak blight new disease. Think there is a northern variety with smaller acorns with less prevalent disease. Species more commonly found on floodplains. In USFS Forest Health Protection Group, will pass that question along.

**Regeneration and Management Prescriptions**

1:00 **Regeneration of cottonwood in the UMR** (Maria DeLaundreau)

* Mississippi River Fund changing name to Mississippi Park Connection. 72 miles of river from Ramsey/Dayton to Hastings. Park owns very little of the land.
* Outline - why we care, challenges to regeneration,
* Benefits of cottonwoods – preferred nesting of bald eagles (84% in cottonwoods, rest in silver maple, random one in willow), other species woodpeckers, prothonotary warblers, deer, beaver, bees use resin in buds as hive plaster with antimicrobial properties to protect hives from disease, aquatic system.
* Abiotic benefits – soak up water, reduce erosion, cool water and banks with large spreading form, facilitates succession.
* NPS Vegetation Survey – in 2011 surprised to not find young cottonwood (DBH 15cm or less) so haven’t been regenerating for decades. Ask for resources from fund.
* Regeneration Biology – well adapted to floodplain, seed dispersal by wind and water, seeds have short viability time (2 weeks), prefer alluvial soil with sand and silt, not competition, lots of moisture to start, roots grow 1-2cm per day to keep up with water table.
* Reduced Seedling Recruitment – changes in hydrology (lock and dam, climate change affect flooding timing and intensity), competition (RCG), browsing.
* Seeking a Solution – Where are cottonwoods regenerating? Where and how can we plant them?
* Experiment: End Goals – 1) determine best techniques for planting by hand; and 2) share information.
* Experiment: Collaboration – on partner land, contributing and combining resources. Project from MRF and Park Service, partnering with St Paul, Minneapolis Park & Rec, University of Minnesota.
* Variables – Different habitats, ideal places to regenerate naturally may differ from where to plant trees. Propagation types with seedlings and seeds. Protection against browsing.
* Site Selection – Floodplain, full sun (how much?), disturbed bare soil or control competition with weeds. Conditions of moist soil that floods, but not in year of planting.
* Planting Types – Cotton wood seeds and cuttings collected in winter, stored and planted, bare-root seedlings purchased.
* Engaging Volunteers – surveyed landowners within the National Park to ask about surveys, management, plans. Finding that all were very focused on other parks, didn’t really know what was growing in floodplain open spaces, not doing active management other than mowing around picnic tables. Didn’t expect more resources. Volunteers enjoyed collecting cuttings and seeds. Plantings through summer. Citizen science. Tending plots.
* Collecting cuttings is very easy. Find where cottonwoods are regenerating, cut down saplings into 2-ft sections, bundled and marked (can’t plant them upside down, painted the ends).
* Final Product – hundreds of trees to plant in spring.
* Preparing for Planting – lay everything out beforehand, what you are doing on that site (wanted no fencing in one location), verify planting day plans with partners (supplies, arrivals), long-term maintenance care plan.
* Planting Day – rake seeds into ground. Challenging with 6th biggest flood in Twin Cities in June delayed planting to end of July. No need to control weeds, just raked into the soil. Rebar pounded in to make hole, removed and replaced with cottonwood stick. Little shovels for seedlings. Don’t assume anything with volunteers. Clarify everything.
* Other Planting Activities – mulched trees to keep down weeds. Rows in forest opening. Not natural alignment, but looking for best methods for planting.
* Habitat – Trees grew better in field than forest with more light, new stem height, number of leaves. Tested new sites on islands. Don’t have data analyzed yet for this year.
* Propagation – seeds not at all successful. Unrooted cuttings had mixed success, partly just errors and flooding kept them in storage too long. Planting this year are better. Two-foot cuttings with only top halves (1ft) sticking out, now 4 ft tall. Bare-root growing the best.
* Protection – necessary. With no protection, heavy browsing by beaver and deer. Did well in growing and winter but during spring thaw, deer killed them all. Fencing reduced browsing. Tubing did better with greatest leaves and stem growth.
* Forward & Next Steps – collecting and analyzing data on year with more normal rainfall, develop best practices, sharing information through UMR.
* Partnership – lots involved with AmeriCorps, parks & rec boards, U of MN, ACOE, etc.
* *Questions*:
  + How long were you holding seeds before planting? Collected the day before they were planting. Not viable for very long.
  + Rooted cuttings versus unrooted or seedlings?
  + Why did the seeds not germinate? If they were germinating, may not have a regeneration problem. Have no idea.
  + Maximum sprouting rate? Cuttings that were collected about a third doing well.
  + Did you cover seed with soil or on the surface? Placed them on soil.
  + About 2 ft per year height growth? Had to stick half in ground with 1 ft sticking out. Now about 4 ft. Bare-root tallest are 6 ft.

1:30 **Regeneration of mid-tolerant species in the floodplain forest** (Brad Hutnik)

* Difference between early and mid-successional floodplain or bottomland hard wood species. Common definition of sustainable forestry. Be creative. Not sure how to accomplish this really well. Can use the Kaftfahrzeug-Haftpflichtversicherung method or forest-directed/logger selected.
* What is sustainable forestry? – For present and future generations. Knowing where you are in understory and overstory along gradient from river to bluff.
* Aldo Leopold quote to keep every cog and wheel. Make sure burr oaks are included. What if some of the “cogs and wheels” are missing? What is the machine supposed to do and how did it work before, how can we mimic that hydrology and use it to our advantage?
* Disturbance & Succession – key with flooding and other associated things such as ice flows, flooding modified by what’s in that flood, dams and improper timber harvesting in past, log drives with lasting impacts on what streams look like and how they act. What does shade tolerance mean? Don’t have a tolerant component. What does that mean for succession with only mid-tolerant species? Complex, uncertain dynamics.
* From *One Less River To Boss* in Electrical World Magazine – how high and low river used to go, through wonder of dams, now doesn’t do either of those. Never reached those high or low points recently. Seeing things we perceive as natural but only shadow of what was historically.
* Learn from personal experience – bottomland hardwood timber sale with exposed soil and sand. Came back in spring with mark on tree. Under water with “carp on the road.” New normal with this going under water on regular basis. Storm damage with weakly rooted species exposed to wind. Teasing out what this looked like in the past with small stands mimicking small scale blow down or patches. Some sites very clean – laid down everything in this patch, but left lots standing, lots of variation. Seed source, trees down, some linear depending on wind direction. Look at own observations, silvics in species themselves for clues to assist in regeneration.
* Silvics - Seed, seed size, bed, tolerance to shade, source of reproduction. Two main types – early spring intolerant species like mineral seed bed, little competition, source of current seed crop, not advance reproduction to season site. Past that, mid-successional or higher elevation with later seed in Sept-Oct, heavier seed, number of seed beds, mid-tolerant shade, don’t rely on that current year but on seed. Design system with seed maturing in fall relying on presence of advanced regeneration.
* Bottomland Hardwood Systems – have Silviculture handbook, working on revision to explore differences across state from large to small streams.
* Silviculture – what we are doing, practice of controlling composition, structure, growth. How to adapt existing tools to meet new objectives. Not bottomlands to manage for production in past (boards and cords) but still a useful tool for restoration, aesthetics, just adapt tools.
* Suite of Tools in 2 classes – Even-aged systems with 1-2 age classes or Uneven Systems with more than 3 classes. Remove overstory starts new age class is easiest. Tolerate shade, seed beds variable, establish regeneration could use “shelter wood” system. For other shade-tolerant species not appropriate. Use even age patches to replicate uneven systems across landscape. Always have option of artificial regeneration.
* Natural Regeneration Methods – cover type is broad so a lot of things are conditional. May be appropriate for one species not other. Two classes as early or mid-successional, scarification required. [This chart will be available in the presentation notes.] Mid-successional don’t sprout easily.
* Regeneration Methods – under modern conditions, regeneration can be difficult to obtain. Success is highly tentative. Could do everything right but with huge floods 2 years in a row, will lose everything. Need some regeneration in 2-3 yr period. Recommended treatments often fail, may require artificial planting. “Be prepared to fail.”
* Overstory Removal – How much needed to take overstory off? Fairly large regeneration 2-4 ft tall in areas without a lot of deer damage. More than 2,000 stems/acre due to competition. Retain part of overstory if concerned about birds (up to 20% crown closure) so can be creative. After that, may hinder regeneration. With advance regeneration, can release that next generation as needed through patches, in group or over larger area. Difficult if you have to establish next regeneration.
* Shelterwood – develop closed canopy to eliminate sun-loving competition, prepare seed bed if needed, allow regeneration to grow as overstory for 3-10 yrs, then remove overstory when you are not going to destroy regeneration. Removed overstory in middle of year, laid trees down, tops with leaves smothered the site. Critical to allow growth after harvest.
* Uneven aged management – Area regulation with certain percentage of stand in different age or size classes. Small quarter acre as patch or group selection. In Upper Midwest species like silver maple with 80 yr old stands now, not long-lived, put in 10% every 10 yrs with some regeneration, others where trees fell with die-back of stands. Time or accommodate scale for age of stands.
* Group Selection – thin between gaps. Optional. Can do 10-15% of area. Locate patches adaptively favoring or not certain species, releasing advance regeneration, scarifying in easiest sites with mineral soil seed bed. Apply overstory removal in small areas.
* Goals & Objectives – 50+ yr goal with large swamp white oak using group selection. Use uneven aged group/patch selection.
* Irregular gap/group/patch selection – open up around, create larger areas to consolidate 1-2 age classes. Very flexible. Could do it on a number of sites. Time between first harvest and expanding gaps, order of removal, how much to retain between are all flexible. Be sure to identify goals.
* LWSR Sale 2232-3 – marked stand, tallied area put into gaps using area targets. Had big questions about accuracy of GPS for forestry. Fairly accurate. Over time, gaps fill in quickly. Concentric circles, patches, loops for interesting feel to sites.
* Patch Management in Low Quality Stands – marking center, taking out everything 80 ft around tree. Forester-directed logger select. What species and how many in particular places. Very quick. Over 100 acres took 14 man-hours. Can do it quickly over large area.
* Timber Sale Setup – capture mortality, target size and species, release advance regeneration. Best works with 2-person crew, marks, recon, all data when done. Could vary them. All systems flexible. Don’t have any answers. No cookbook, but getting closer to answers.
* *Questions*:
  + In group selection, is there a minimum size for silver maple? Depends on orientation of the gap. Can make them circular, bigger or smaller. May depend on nearest seed source. Would generally recommend patch selection at half to 2 acres with herbicide or scarification to manage competition.
  + Any problems with reed canary grass inhibiting regeneration in cutting patches? Was a huge problem. Organizing where you will put the gaps for shade to keep it out of sites, especially to keep open for early successional, such as with herbicides.

2:00 **Successful elements of timber sale in the floodplain** (Randy Urich and Joe Lundh)

* Collection of observations over modest set of timber sales. Others have experience as well. Outline of points to cover. Common thread is to look from perspective of forest workers that we are dependent on to implement work. Take into consideration their perspective. Working with time constraints, changing hydrology, seasonal operations, risk factors, size of sale, forest product markets, etc.
* How to generate interest from loggers – resources from Minnesota Forest Industries, Missouri Logging Council, Illinois DNR with list of timber buyers, queried by county.
* Pre-bid Field Trips – before taking bids, invite interested loggers out to walk around. They can ask specific questions, more comfortable, base bids on what they saw.
* Overcoming Site Limitations – access problematic, some set up operation with work barge, barged forwarder out to island to run logs out to barge, full load barged to landing for semi loading. Winter logging across ice in Pool 8 with skid logs across fairly shallow backwater (less risk even if would have broken through) to access landing with semi. Winter harvest near Redwing with bigger backwater. Built a raft to get two skidders out to island, distributed weight with cable to pulley across ice, but didn’t work, pulled raft apart. Didn’t want to go back and forth to skid logs. Got old half-ton F150 pick up to pull logs to decking area. Not deep enough to cause harm. Other loggers used matting to get them across sensitive areas. Flotation tires for summer logging with minimal impacts. Forwarder machine for access.
* Marine Equipment Options & Sources – places that rent barges. Portable Barge builds habitat for ACOE. Company in Dubuque with sectional barges. Rent tow boats, push boats. Assume some qualifications for bigger boats. Using small 110hp boat to push barge. Poseidon Barge company have big and small sectional barges.
* Find interested creative loggers. Horse logging on islands (can survive fall through ice). Timber seller with small dozer to bring logs to shoreline, pushed into water, rafted together to portable saw mill. Photo in Pool 17 when ACOE was acquiring land.
* Working Within Time Constraints to Protect Priority Wildlife Species – eagle nest guidelines with zones, as backup, applied for take permit, ran past the time period and don’t have sale done yet. Nest wasn’t used. Another next with a lot of activity. Eaglet fledged. Northern Long-Eared Bat with time constraint, discussion with FWS.
* Preparing for Changing Hydrologic Conditions – minimum of 3 yrs for timber sale with ability to extend. Must be able to halt operations with changing conditions. Provide higher ground as temporary staging areas if sale goes over seasons with high water period.
* Seasonal Operations – best in winter. Summer or early Fall with dry conditions can work with minimal impact.
* Risk Factors for Loggers & Contractors – starts and stops for changing conditions, very flexible with bidders recognizing risk. Encourage manage for that. Give price to be flexible. Unexpected delays in work schedule due to areas that need temporary bridge. Could strand equipment on site. Thin ice as consideration. Size of timber sale and future availability (more wood volume equals more interest from bidders). Gores Pool Group Selection coordinated with partners to award to high bidder. More volume, one access, doing work over two seasons.
* Strive for consistent flow of timber sales into the future – Communicate when we have sales coming up to sequence those out for flow to keep loggers interested.
* Forest Product Markets – going as sawlogs. Silver maple in reasonable demand. Logger had his own saw mill to make lumber. Pulpwood depending on proximity to mills. Biomass investigated by Winona FWS. Decided there wasn’t enough quantity without grouping sites. Firewood from black locust control. Special products with locust into tree stakes. Company in La Crosse uses whole tree construction. Black locust leaves sprouts, not just getting rid of tree but follow up. Buyer willing to strip bark from live trees, stand for season of slow death, then cut next year to avoid sprouts.
* Timber Sale Methods – scaled sale with rough idea of sale, scaled as logs pulled out to maximize revenue. Lump sum with estimate ahead of time awarded to high bidder. Stumpage for in-kind services with agencies taking advantage of revenues that don’t go back into the program such as timber stand improvement (Rich, FWS).
* Working with Partners – marking stands together to share management ideas. Special equipment such as harvester in floodplain. Incentive for loggers to make that investment. Tracked swamp logger with cutter head. Innovate forwarder/skidder with tracks for floodplain.
* Open staging Areas with Access for Hauling – removal of product. Minimize skidding distance across embankment with distance and logs picking up sand. Safety with railroad crossings.
* *Questions*:
  + What is limiting factor for how extension you can do harvesting – funding, people, office hours, interest from loggers? Not doing as much as we want. Haven’t caught up in prescription writing.
  + Any special harvest for ash with emerald ash borer. Worked with Wisconsin DNR to set something up in Pool 9. Don’t have a lot of pure ash stands. Ash is a relatively minor component so would need huge areas.

2:30 **Topographic diversity, soil types, and impacts on plant communities: Upper Mississippi River National Wildlife & Fish Refuge McGregor District experience, including elevation modification** (Rich King)

* Keep every cog and wheel – guides NWR management. First to preserve rare systems. Status of topographic diversity, current research, management, opportunities.
* Topographic Diversity - View of Pool 9 from Ferryville, WI, in 1925. In 1924, the NWR was created because of plans to construct levees and farms. Different resources, forest, migratory birds were reason for establishment. Today, not much topographic diversity, only some low elevation islands.
* In 2 dimensions – Pool 9 in 1890 and 1989 not much forest in areas with open water. Reno Bottoms transformation. Keep in mind the target. Can’t go back to that but make it happen on smaller scales.
* Tree Species Diversity – because of hydrologic changes. Not a lot of soil type diversity, lots of mixing over time. Most diverse forest we have. If not due to soil type, how are we getting diverse stands?
* Soil Diversity in Reno Bottoms – not a lot in floodplain but a lot of topographic diversity by ACOE. Ridges and swales resulted. Status of topographic diversity.
* Current Research – flood inundation. If you were increasing topographic diversity, how high would you build it? Focus on red, green, yellow as three different areas on the pool. Critical value of 100 for growing season flood inundation. Above 100, will convert. Around 25-30 flood inundation level, think we can get diverse forest. A lot of variability in data. Fine in River Mile 618 McMillan Island where only have to go 2-3 ft above pool. Will have to build above 8 ft in upper pool.
* Cerulean Warblers – answer where should we increase topographic diversity? Most important variable for species is proximity to edge between floodplain forest and upland. May help other warblers. Depends on location as well as height. Focusing on disposal sites to collect forest data. Online herbariums have vouchered specimens, know exactly where they are collected and by whom. Tells us what should be there, what’s missing.
* Sandy depressions with leaves build soil and trees with A horizon organic matter development. Have oak regeneration happening even without oak overstory trees. Maybe soil temperature dropping. Some dunes look like sand prairies. Natural regeneration and recruitment of oaks, maybe animals transporting acorns. Warm season grasses take a while to establish, but raise organic matter, cool soil temperature.
* Ongoing management – Prairie du Chien, Marquette, IA with old rail corridor many decades old accumulating organic matter. Dynamic with a lot of elm, swamp white oak, burr oak, hickory. Close up view of topographical diversity.
* Pick up full of plant plugs from correctional institution – Raising plants takes a lot of time. To hiking trails for interpretation to show people what and why. Have identified species that don’t need rich organic levels (milkweed raised and planted by Friends group). Also working with topographic diversity to do site treatment, planting trees. Inmates can’t cross state lines, but like to work outside. Can have another planting with school kids, Aveda Corporation. Audubon coordinated with FWS only doing site prep. Ready to go with auger. School wanted it to last all day, so digging holes by hand.
* No book, no clear path – Did site prep with grinder head, didn’t give result wanted, too much trash because willows were too flexible. Learning as we go. May shear with dozer or use same grinder in winter. Have to allow opportunity to fail, try different things, talk about failure so others don’t do same mistake. Intermediate step of replacing Reed Canary Grass. Mowing, burning, flooding to allow cottonwood to shade out reed canary but don’t want this. Want more diverse forest. Intermediate step to go beyond minimizing reed canary grass.
* Dragon Root plant – with horticulture program in prison, work with rarer species. Maximize return on investment. Tough to find seeds. Voucher in Univ Wisconsin herbarium so know species should be there.
* Management Opportunities – use spoil without bumping into flood conveyance limitations. Old pond used decades ago. Bermed around it with trees on berm. Can use dredge spoil in old pond without affecting flood conveyance. Pool 9 in Ferryville – go back to those islands and diversity would affect flood conveyance. Where can we build islands or elevation?
* Work with what we have – Pool 5 island already high. Enhance what is already there. Challenge to move forward to build islands where there is open water. Get contract to work into the soil. Plant warm season grasses, sand prairie on humps, ridges, swales that are already there so they build soil. Plant sand prairie on topographic diverse areas we have. Establish over 5-6 yrs then plant trees we want. Limited on where to do this but can plant sand prairie and let them develop organic matter for us to plant.
* Already have much topographic diversity – how high and where to build islands, work with what we have, improve and develop topographic diversity. Norwegian Slough is diverse stand in Pool 10.
* *Questions*:
  + Willows shaded out reed canary grass. Those are not as common, birds still use them. Might be okay to let them be, then succession takes longer. In those areas with flood duration models above 30-100 days per year, those should be willow. Where it’s high and dry enough, could get more diverse community.
  + Looks like drawdowns could affect forest diversity? Lower pool drawdown could bring that zone lower, could pick up a few miles. Especially in lower part of pools effect could be exaggerated. Drop a foot, linearly could have a lot of impact.
  + Recommend where you have dredge spoils that they need management. Where they’ve been let go, you have prickly ash and Siberian elm. Great opportunities to direct succession and management.
  + Appreciate mentioning prairies and dredge spoils, as some areas have formed into dunes with Black Oak Savanna which is critically impaired plant community. Some areas may be best left alone. Topographic diversity gives us opportunities.

3:15 **The Silviculture Prescription Process** (Chris Hopfinger)

* What is driving management on pin oak stand before we do a thinning? Walk through process going from data, evaluation, field walks to implementing prescription.
* Definitions – Silvicultural Examinations are gathering of resource and site data, forest inventory, reforestation examinations/survival surveys. More data the better. Diagnosis of Treatment Needs follows examination to compile, summarize, analyze, record data. Can be several years in advance or combination with writing prescriptions. Detailed Silvicultural Prescription is written document describing management to implement, documents results, analysis, future desired vegetation condition as basis for treatment, monitoring, evaluation. Monitoring & Evaluation are field measurements. Was management objective met? Remedial treatments needed? Improvements?
* Prescription Development Conceptual – evaluation of site capabilities, evaluation of forest plan direction & objectives, develop desired stand condition, develop treatment possibilities, prescription.
* Evaluation of Site Capabilities – recent stand data on hand, prioritize areas in need of treatment (plan direction, invasive species, forest health, etc). Key to identify habitat of T&E species before evaluation.
* Characterization of Landscape - aerial photo of Cuivre Island in 1939 – forest cover types, structure class, disturbance, habitat stage groups, soils. Evaluation of Site Attributes – HGM for historical and natural communities, potential community types, GLO survey notes, hydrology, LiDAR, topographic features, aerial imagery, etc.
* Evaluation of Forest Plan Direction & Objectives – examples of goals and objectives. Also have Master Plans and OMPs. Goal 1 - functional sustainable floodplain ecosystem. Object using results of HGM to establish priority focus areas most likely to have impact. Goal 2 – restore health on federal lands. Obj establish ideal structure.
* Existing Stand Condition – stand table with basal area, trees/acre, size, snags, etc.
* Silvicultural Prescription Sheet – developed with ACOE and US Forest Service to take data table, entered on prescription sheet with stand information and description.
* Existing Stand Condition – in field to look at stand. Walk through to compare attributes on prescription sheet to field observations (species composition, soil texture, soil probe, basal area checks). Make notes on differences. Take additional plots if needed. Are you comfortable with prescription based on your observation? Use your judgment.
* Develop Desired Stand Condition – from stewardship plan. Stand Diagnosis - Basal area may warrant active management. Opportunities on sheet, insects, disease, effects of succession, potential for mortality, structure, stocking, size classes.
* Develop Treatment Alternatives – several avenues to reach end including no action alternative. Evaluate relationship of stand to overall landscape. Feasibility of Silvicultural systems and treatments. Forest Vegetation Simulator Model shows alternatives to the public, set for any time. Alternatives in terms of intermediate treatments, returning to historic conditions, feasibility of ecological process.
* Elements of Detailed Prescription – site and stand conditions, desired conditions, short and long-term objectives, prescription, tree-marking guidelines, resource protection or coordination measures on stand level, ranging from 5-50 acres. Describe cultural treatments, be specific on stock, densities, timing, monitoring and evaluation.
* Silvicultural Prescription – sheet with map. Tree harvest, timber stand improvement, reforestation, underplant, maintenance, invasive control.
* Questions:
  + How long is this good for? Depends on agency. Likely 5-10 years.

3:45 **Concurrent Breakout Sessions**

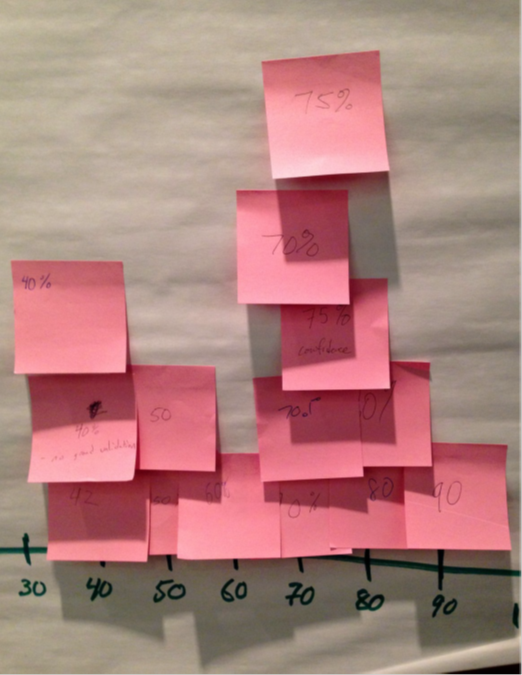
* Wanted workshop to be about how to apply information to site-level management. Heard about new understanding of hydrology, geomorphology, LiDAR, HGM, but still have to do work on ground with management prescription.

**Breakout session 1 (Blue Moon Room):** **Landscape level considerations** (Tim Schlagenhaft, facilitator; Jeremy Peichel, virtual group facilitator)

* Discussion questions:
  + List various landscape level influences (hydrology, climate, topography, which pool) on conditions in forest. Don’t want to miss important influences that may affect our management.
  + Pick 2-3 to go into deeper. How are they influencing the forest (tree species, stand age, invasives)?
  + Management actions to take to make a difference. What can we influence with management?
* Report out:
  + Needs - Data gaps. Good communication and coordination between everyone with common goals and objectives. Invasives talked about RCG but are non-native earthworms a problem for litter layer and fire fuel bed?
  + Current regional issues for site-level management action planning – hydrology, regional abundance of invasives, herbivores, deer, beaver which may be site-specific impact. Climate change in slow effects on temperature, leaf phenology, hydrology, mean annual flow, associated species distributional patterns. Punctuated disturbance such as flood, wind. Connectivity to uplands in landscape context. Role of floodplains in species migrations and lowland/upland. Ownership and access to sites. Hydrology and groundwater influences (needs research). Dealing with landscape level issues regarding assisted migration and future species distributions. Just move those species to where they will be best suited in future for temperature, hydrology, species more well-adapted to wet environments. Multiple ways to deal with hydrology – site elevation, water level management, can’t affect water coming in from watershed. Timing of peak flows as function of climate and landscape factors with bimodal peaks – spring runoff and second bump persisting into growing season. Advice to embrace uncertainty, starting thinking about alternative scenarios with multiple end points to project rather than single goal to adapt to changing site conditions and regional influences that you can’t affect.
  + Groundwater is hard to know but in Rock Island, they are manipulating groundwater in floodplains where they are pumping in corn fields. Example of how to affect flow from watersheds with Levee Districts manipulating flow. Entirely different hydrology. Can operate at large scales. Take existing agricultural infrastructure and use it for environmental management. Didn’t talk much about groundwater with HGM but it identifies locations where groundwater is more influential and where it’s less of an issue. Incised recent floodplains with strata, groundwater is different than in older terraced, paleochannel settings. Can inform general locations up and down the system.
  + Illinois River abiotic factors, climate change, bimodal hydrograph with wetter wets and dryer dries with subsurface drainage throughout Illinois River and all upper Midwest affecting vegetation and floodplains. Site advice, get a different career.
  + Hydrology as influence, groundwater, more flashy. Sediment deposition on water quality, suspended solids, nutrients. Lack of disturbance to create topographic diversity. Adapt with huge changes with locks and dams. Have lost a lot with elm supercanopy, sycamores in some areas. How to bring that back? How to set goals and objectives at larger scales with HGM. HNAs and modeling to determine where to put thinking. Landscape scale is political, social, and institutional. Flood conveyance on how high to build islands. Communication is really important.
  + Impressed with need to take a long view. All mapping is really important. Sediment loads and channel.
* *Overview of Topics from onsite groups* (Tim Schlagenhaft, facilitator): Disturbance missing, invasive species (earthworms), herbivores (voles, mice, deer, beaver). Climate change on migration, temperature, leaf phenology, flows and flashiness, species distributions. Sediment from watershed. Ownership, groundwater, lack of coordination and communication, how to transfer plan to site level, how to set goals and objectives. Shrubs, birds, ground cover. Time scale is very long with forests aging. Evaluating and measuring that is challenging. Illinois and Missouri Rivers. Long-term view. Advice to site management planners – embrace uncertainty, multiple outcomes, adapt. Should we do assisted migration?
* *Overview of Topics from virtual group* (Jeremy Peichel) – Discussed similar topics. Assisted migration. Focused on invasives, land use change in upper watershed and floodplain, division between Ag, ACOE, FWS. Patches and density. Link with potential connection with increased sediment and nutrient input from agricultural watersheds. Connect fungi in soils to increased input of nitrogen. Invasion of grasses permanently alter composition of soils to favor trees over grasses. Land use with nutrients, water, sediment as driving factor in river and floodplain. Engagement with partners in upper watershed issues that would make life easier in floodplain.

**Breakout session 2 (Clarion Room): Case Studies - Developing Silvicultural Prescriptions for a Floodplain Forest** (Greg Edge, facilitator) [notes from flip charts recorded below]

* 1) Missing stand data?
  + Is there an understory? (advance regeneration) Is there more than one age class? Is there anything affecting the hydrology? (Is there a dam downstream?) Condition of regeneration. Distribution of regeneration. Soil type – more info. Snags/acre. Stand quality.
    - LWSR Missing Data: flood frequency/disturbance regime. Existing I & D concerns. Qualitative inventory data health condition. Health conditions.
    - ACE Missing Data: snags per acre? Needed if habitat issues are of concern and for determining if/how current stand is responding to gap dynamics. Missing treatment history of site.
* 2) Target stand?
  + Mississippi River – target stand. Maintain silver maple.
  + BENI – young, healthy understory, open canopy overstory to promote understory. 100 trees/acre SWO. Dense stand of mixed early and mid-successional bottomland hardwood species – with potential for quality saw timber. Protect oak present openings for regeneration. Group selections 0.5 – 2.0 acres in size no more than 9-10 acres total.
  + LWSR target: Healthy floodplain forest to maintain trees. Increased proportion of non-silver maple species.
* 3) Regeneration prescription?
  + LWSR BENI – Shelter wood. 14” DBH cut all ash 18 BA saw timber. 14” DBH cut 50 BA silver maple. 5 BA of elm & honeylocust. Total 73 BA.
  + BENI – crop tree release of oak, hickory, 50 tpa.
  + LWSR – prescription: overstory removal of much ash, elm, maple (adequate regeneration). Season of harvest – late fall to capture a bit more seed of most species. Even-aged shelterwood system. Harvest in late summer or fell for scarification. Uneven aged through patch cuts. Thinning between patches. And to release existing repro. Increase proportion of non-silver maple species.
  + ACE AMEL Prescription: uneven age irregular group selection. 10% of area (about 2 acres). Thinning to 80% residual. Retain large diameter trees. Winter. Considerations – RCG, access, wildlife. Uneven age group selection cuts. Winter. Release and protect oak.
* LWSR confidence level?



* ACE #43 confidence level? Written on one note: Bitternut 75%.



4:30-5:00 **Facilitated group discussion – linking landscape level considerations to site level management** (Tim Schlagenhaft, facilitator)

**Breakout session 1 (Blue Moon Room):** **Landscape level considerations** (Tim Schlagenhaft, facilitator; Jeremy Peichel, virtual group facilitator)

* Overview of Topics: Disturbance missing, invasive species (earthworms), herbivores (voles, mice, deer, beaver). Climate change on migration, temperature, leaf phenology, flows and flashiness, species distributions. Sediment from watershed. Ownership, groundwater, lack of coordination and communication, how to transfer plan to site level, how to set goals and objectives. Shrubs, birds, ground cover. Time scale is very long with forests aging. Evaluating and measuring that is challenging. Illinois and Missouri Rivers. Long-term view. Advice to site management planners – embrace uncertainty, multiple outcomes, adapt. Should we do assisted migration?
* Virtual breakout – Similar topics. Assisted migration. Focused on invasives, land use change in upper watershed and floodplain, division between Ag, ACOE, FWS. Patches and density. Link with potential connection with increased sediment and nutrient input from agricultural watersheds. Connect fungi in soils to increased input of nitrogen. Invasion of grasses permanently alter composition of soils to favor trees over grasses. Land use with nutrients, water, sediment as driving factor in river and floodplain. Engagement with partners in upper watershed issues that would make life easier in floodplain.

**Breakout session 2 (Clarion Room): Case Studies - Developing Silvicultural Prescriptions for a Floodplain Forest** (Greg Edge, facilitator)

* Goal was to take concepts from this morning, such as regeneration of intolerant and mid-tolerant species and prescription writing process to detailed prescription. Divided in teams from A – stand in lower Wisconsin to Reed canary grass dominance. Stand assessment – are we collecting information we need? If not, incorporate that. What is missing in data sets?
  + Prescription writing – desired future condition or target stand important to formulate before writing. Landowner wanted to harvest today, manage stand properly. Lower Wisconsin drier and more diverse with more variety – even aged shelterwoods to direct overstory removal and uneven patch selection favoring silver maple and accentuating diversity. Wetter area had more challenge with uneven age group selection for continuous canopy, regeneration on smaller scale, reed canary issue.
  + Will leave sheets posted for review by participants. Confidence level from 40-90%. The Army Corps stand with 65-70% confidence in a tricky stand. Don’t want prescriptions with no odds of success, want some odds of success but tricky on bottomlands.
  + How much is based on difference in end points, scaling back expectation? Desired future condition important. If you set standards really low, much easier to meet that. Had landowner objective of abundant and desirable regeneration.
  + Did anyone talk about Systemic Forest Plan? Told them not to because we need to focus on something more limited. Gave them a private landowner objective of economic gain, harvest, but do it right. Limited scope exercise. Prescriptions could get much more complicated with many different factors.
  + Have high plan with general guidelines, writing prescriptions, everyone different. How do we connect those together to tie back to landscape goals? Struggling with that. Importance of why we talked about writing process, thinking systematically in terms of landowner objectives, how does that boil to desired future condition. Complicated.

Tour instructions

* Have maps to field tour. Will consolidate vehicles in convoy. About half hour drive, has restrooms in campground. Under mile level walking. Covered shoes in woods with timber management sites, tree plantings, northernmost naturally occurring pecan.

**6:00 Dinner (on your own)**

**Day 2 - September 16, 2017**

**8:00 - 12:00 Outcomes and Decision Support (Blue Moon Room – Plenary Session)**

8:00 Evaluating Potential Impacts of Diseases and Insects on Bottomland Forests (Linda Haugen)

* Handouts on the tables for some slides that aren’t as easy to read. Some truths. Not all problems are created equal. Information to help you: recognize important threats; and 2) position forests to minimize risk.
* Matrix of type of damage, plant part affected, tree killer? Example, economic impact. Stem borers, bark beetles, root disease, wood decay. Parts of plants with foliage diseases affect leaves but don’t kill trees. Chance of ecological or economic impact not as great. Some things will be bigger issue. Biggest impact affect main stem and kill trees. Beetles, root diseases.
* Floodplain Plain Species – code to color, darker is bigger concern. Canker, wilt are bigger issues. Some tree species.
* Deal with the known and plan for the unknown. Can’t see some things coming to plan ahead. Know what is “normal” so that you notice what is not. Talk to forest health specialists if things don’t seem right. Emerald Ash Borer was killing trees in Michigan for a long time before realized what was happening. How you can tell if it’s a problem is a three-letter acronym (EAB).
* Consequential or not? Case by case and past history. Do we know it causes a problem. Come and go. Is it lethal? Will it spread? For some pests, we don’t know. Manageable versus unmanageable.
* Can you do anything about it? Some pests have no management tools. No control over weather, flooding, wounding by natural agents, straight line winds. General guidelines to pay attention to. 1) Many moved in firewood, starting in campgrounds, outdoor tools with weed seeds, nursery stock. 2) Monitor for emerging problems. Talk to someone about what you see. 3) species selection, having more diversity. May have single species on bottomland forest.
* Asian long horned Beetle – not “here” in Upper Miss yet. Worry about it because it eats maple, willow, elm. First discovered in NY in 1996. Then eradicated in Chicago and found in Ohio 2011. Can get moved. Brought in by packing material. Floods in Mississippi carrying logs.
* Early detection gives you more options. Be alert. Watch forest.
* Oak Wilt – impact can be huge. Kills valuable trees quickly (in weeks). Red oaks (pin oaks) particularly affected on bottomlands. Spreads overland and roots.
* Have dead tree, in fungal tissue, staph feeding beetles, visit fresh wound on oak tree in spring when vessels are open. Infected tree. Symptoms progress. Several points to interrupt the cycle. Passing fungus through roots on landscape with pattern.
* So what can you do? Get recent killed trees out in winter to interrupt overland. Consider neighbors. Are they controlling oak wilt. Your efforts may not accomplish anything with ready supply of disease. Mix up species with mixed stand so oak wilt doesn’t march through root systems.
* It can be complicated. You may have different management choices for the same pest. Understand the biology and ecology, what it’s doing in your forest to make the right choices.
* Some think Black Walnut shouldn’t be in bottomlands. Thousand Cankers Disease started out west in 1990s with big problem in Colorado around 2003 in urban settings where species isn’t native. Tiny beetles (walnut twig beetle) attacks and carries fungus on body, forms cankers under bark, cause progressive tree death. TCD first detected in Indiana in 2014, Ohio 2012, 2010 Tennessee. Counties affected with red on map. Most places it’s found, it was there 10-20 yrs before anyone picked up on its presence. Urban areas on stressed trees. When conditions improved, trees recovered. In east, but will it be a problem? Beetle causing damage is native in southwest US, not eastern. Complicated by fungus isolated from weevils also. Other fungi involved Fusarium canker. Sometimes we don’t know for awhile whether it will be a big problem. Watch it.
* Dutch Elm Disease / American Elm – elm not gone from floodplain but its role is changed. Work for the US Forest Service in branch in St Paul field office with 7 states. Forest health specialists give direct support to land managers. Also National Forest System managed in different branch with Research branch. Working with Jim Slavicek in Delaware, OH, Kathleen Knight and Leila Pinchot.
* Dutch Elm Disease - Seedling crosses for genetic diversity. Not many tolerant cultivars where branch dies and trees recover. How to test for DED tolerance? Adding new trees. Tolerance may be inherited. What proportion of progeny survive compared to know susceptible tree. Can reproduce by age 15, seed orchard with group of trees cross-pollinating. Don’t know what proportion of progeny are tolerant. Taking advantage.
* Trimbelle site is ACOE site. We need this information. Operational trials with public lands partners. Seeds collected in 2012. Operational Trials Site details to grow American Elm – slides of sites.
* Sometimes our options change. We hope to have American elm back in the toolbox.

8:30 **Current status and likely impacts of emerald ash borer in floodplain forests** (Steve Katovich)

* Working on EAB since found in 2002. Pretty green beetle. Asian species in genus Agrilus which are well known. Have some natives (birch borer, 2-lined chestnut borer), which can be damaging but mostly in stressed trees. EAB caught us by surprised because it can kill healthy trees. Feeds on phloem tissue. Attacks trees in genus *Fraxinus*. Close relative has also been found.
* Photo of larval stage. Adults feed on leaves, but minimal damage. Lay eggs on ash trees. Larval stage is damaging. Occur right under bark. Eating phloem and cambium, which are important for moving water to crown and food from leaves to roots.
* Why is EAB a threat? Native ash have limited ability to resist attack. All 16 ash species did not evolve ability to resist attack. Cannot fight mortality of 100% in areas where EAB has resided 5-7 years, causing elimination of ash from forest. Similar to Chestnut Blight.
* Aerial view of stand of trees in Newburg, WI, northwest of Milwaukee. First detected in 2008 with all dead ash in 2012.
* Floodplain species very susceptible. All 16 native ash susceptible. Blue Ash more upland, may be more tolerant. Not good for any of them.
* What is at risk? Where ash is concentrated in county based data from Forest Inventory Analysis (FIA). In northern MN, WI, MI. Significant reduction in MI which had the most ash. Most MN is wetland ash (Black Ash). In Miss River corridor, doesn’t look like a lot of ash, but there is in these systems. Ask FIA to show that differently.
* Map has darker colors with higher concentration of ash in river corridors. Straight line in zoom in is IA/MN border. Riparian corridors, wet floodplain forest, not major species in every location but important. Common in some places.
* Cooperative EAB Project – County Detections – yellow had EAB, red counties are new in 2014. Known about it since 2002. Expands footprint. May not have encountered or is at low levels. Continuing to spread. Poor at controlling it. Colder winter temperatures may slow it down.
* History of EAB – first detected in 2002 in Detroit at high levels in SE MI and NW OH, Ontario. About 10 years before, brought on wood packing material from China. Change in footprint from SE MI, nurseries shipping material to MD, OH, Grand Rapids. Shut down quickly. Campground survey in 2012 with infestations. Lost cause to eradicate. 2005-06 with Chicago intense damage. Expands WV in 2007. In 2008 get first in WI and spot in SE MO. Mississippi River and St Paul corridor in 2009. Then 2012 with continued spread and 2013 with IA, WI, IL, MO, AR, GA, LA, CO, KS.
* Ecological impacts of EAB – clipping journal article titles on impacts in floodplains from review in Annual Review of Entomology. Short paragraph. Introducing ideas of ecological impacts of EAB, especially economic in urban landscapes but also ecological in forest with nutrient cycles, successional trajectories, invasiveness with light through canopy, downed woody debris. Impacts we don’t understand well yet.
* Increased coarse woody debris in flood events. Have a lot of ash, dead trees. Ash falls quickly after it dies. May be positive or negative.
* Invasive Plants – google invasive plants and EAB for articles in journals on northern OH, southern MI, some in riparian forests. Secondary spread of invasives with dead trees opening stands. Eradication in logging operations with equipment causing ground disturbance as big concern with moving invasives.
* Bird Response – for a woodpecker, EAB is a bonanza for native bark foraging birds, prove effective predators of EAB as best control. Large larvae right underneath bark. Photo of ash trees with woodpeckers knocking outer bark off. Call that “blonding” and is good sign of EAB in late winter, early spring. Tree gets pinkish white appearance. Other birds responding to gap openings.
* Native insects at risk – 43 native species of NA arthropods that feed on ash. Could lose those insects in cascading ecological change. If can’t feed on another host, losing ash affects 21 species as specialists on ash.
* Change in Forest Tree Composition – Loss of Diversity – Ash being replaced by maples and elms. Climate change. Asian longhorned beetle. Losing green and black ash, something else will move in and grow there. Forest will not be as diverse. Dominated by more silver maple. More silver maple may not be good thing. Already have a lot. Asian longhorned beetle loves to feed on maple. Makes forest more vulnerable to next disease with maple dominance.
* Any hope for ash? Not a lot, but do have biocontrol releases of parasitic wasp from China, Korea. Three species released with two more common. Some success but will take a long time. Beginning to see tree resistance with efforts to locate tolerant native ash trees. If there are, very low in number but some trees survived. Asian ash species that have resistance, could cross with NA ash or gene manipulation.
* Questions:
  + Does cold affect EAB? Did see mortality in some places with 50-60% of larvae dying due to very cold temperatures but not 100% mortality. Gets colder north out of Twin Cities. In IA, IL, southern MN not cold enough. Need minus 25-30 F or below to have impact. Underneath bark of tree, wood is good insulator. Tough to figure out.
  + EAB management guidelines still call for phloem reduction, cutting large diameter trees. Should we do that? Feeds on phloem so larger trees have more, reduce that to stop buildup of insect over time. Didn’t work out well in reality. Complicated issue, not what we talk about too much anymore as real helpful. Insect is attracted initially to big trees with most larvae coming there. In field, haven’t seen impact we hoped to reduce populations.

9:00 **Relationships of forest birds to floodplain forests** (Eileen Kirsch)

* Breeding and migration seasons with birds. Interest in bald eagles, need big trees. Use the USDA codes for trees? PODE3 is cottonwood.
* Herons and egrets are big birds needing big sturdy trees. Colony placement not related to landscape patterns. Evenly spaced more to do with foraging habitat, not interacting with birds from other colonies.
* Cavity nesting waterfowl need mature trees with branches falling off and rotting heart wood for nests. Wood ducks eat mast but also other tree species. Hooded mergansers like river. Other birds that need large trees, including Cerulean Warblers even though they are little.
* How do birds end up in floodplain forests where they are? Neotropical migrants winter out of the US. Migrate into the area. Don’t know how they get to Upper Miss River but guides them to this area. Have choices. Do they go to uplands, floodplain, edge sites? What do they like in site, specific trees, certain cover, large or small trees, does groundcover matter? Tree preferences.
* Research over 20 yrs. Data from Pools 4, 8, 13 with 5, 7, 12, 26. Foraging study on Pools 8, 9.
* Bird surveys 1994-1997 with random points through pools in wetlands, shrub car, wet meadows, floodplain forests. Let GIS randomly select locations.
* Importance of floodplain versus upland forest for breeding and migrating birds? Forests are distinct with species composition more monotypic in flat environment than in Driftless area with species change based on soil and aspect. Bird communities differ.
* Work by Knutsen 1995 with breeding birds higher in floodplain. Ovenbird more upland.
* Spring migration difference in uplands and floodplain with more neotropical and short-distance with more species in floodplain than uplands. List of species with red-winged blackbird in forests and rose-breasted grosbeak in uplands.
* Pictures of floodplain and upland species. Moving through area, but may not nest here.
* Latitudinal differences in assemblages – redstart and prothonotary warbler. Surveys from Cairo to St Paul detected difference in range or abundance south or north.
* American restart, House wrens, sapsuckers are northern. Prothonotary more south.
* Also applies in spring migration with latitudinal differences. Redstart upland versus floodplain in transect data (not banding data).
* Edge versus interior – rarity of “forest interior” species in 1990s data. Need large patches in breeding season due to predators at edge. During migration, edge is the best place to be. Need to eat a lot fast to keep moving. Edge warms more quickly for insect activity.
* Highly fragmented Pool 13 with navigation system – 50m buffer in pink. Literature shows 300m buffer considered interior. Only 5% of total area is more than 100m from an edge.
* Relationships of birds with landscape features within 200m of point – type of edge and amount of different types of habitats. Some species fall out along gradient. Redwings along open water edge, others in forests. Habitat relationships are weak. Bird data are pretty homogenous.
* Edge interior study in 2008 – calculated where there are interior more than 100m from edge with sampling station, also in associated edge, then in forests not big enough for an interior. Didn’t find anything. Numbers of species don’t differ between edge and random sites during breeding season. Even in migration, assemblages don’t differ except residents tend not to be in edge.
* Is there effect of forest width on breeding bird assemblage composition (Pools 3 and upper 4)? Edge versus interior not different, but may have slightly different species, needs more research. No pattern related to edge for spring migration.
* Within forest habit associations in forest species composition classes (MEA – maple elm ash; CW – cottonwood willow; etc).
* Principle Components analysis of forest/veg structure variables – canopy cover, forest class. Not a lot of pattern. Phalaris with species more associated with grass edge. Some very abundant species close to origin of plot. Not telling us a lot with data from random points.
* General relationships make sense but not particularly useful for management – On Pools 3 and Upper 4
* Habitat PCA – importance values of silver maple, box elder number of tree species, Phalaris cover (not presence) is orthogonal to basal area and tree height.
* NMS of breeding bird assemblages – not great stress level comparing random, edge, interior.
* LINKTREE analysiss of habitat – breaks in bird community composition associated with habitat. Groundcover less than 15%. Phalaris cover > 53%. Prothonotary or Cerulean warblers. Phalaris and ground cover has pattern. Low ground cover group to left with Phalaris cover grouping to right of graph (common yellowthroat, indigo bunting, grosbeak, chickadee). Diversity and evenness not different. What about low ground cover? Due to prolonged flooding with lots of Prothonotary Warblers and low species diversity.
* Bird community homogenous. Breeding assemblages 7-10 species dominate. Differences mostly along latitude. Rare interior forest birds. Not association with edge/interior. May be something with forest width. Difference related to ground cover and Reed Canary Grass cover. Canopy cover did not show variability.
* Red-shouldered hawk and Cerulean Warblers like tall trees with big spreading branches. Brown Creeper requires mature old trees nesting under slip bark, mostly northern breeding down to Pool 24 in floodplain forest. Young forests with lower species richness than mature forest. Shrub carr has high species diversity, next to mature floodplain – but very different community.
* Young forest – eastern wood peewee and great crested flycatcher. Mast – woodpecker, grosbeak, chickadee. Maple – tree swallow, pewee, robin, redstart. Population growth rates < 1 so may not maintain abundance.
* Tree preferences of foraging birds – in 2010, looked at spring migrating birds in Pools 8 and 9, recording where they eat, foraging strike, what species of tree, where in the tree, what phenology, species?
* 2010-2013 total foraging observations - Huge number, what tree species. Transient migrant species that don’t breed in our area. Migrating, starting to set up nests.
* In 2010 and 2012, were warmer than normal years near La Crosse – earliest spring ever with 80 degrees in March. 2011 and 2013 were colder than normal. Looked at patterns related to tree phenology. Warm year, low number of transient migrants (less than half of cold years). Not a lot of leaf out. Comparable observations of local breeding species, could find them if they were there. Didn’t find transients in warm years, as they move through more quickly. In colder year (2011), birds held up as north was still melting. Number of locally breeding species less variable.
* Bar chart – transient and locally breeding species. Silver maple, ash, cottonwood, elm were preferred species in that order. Focus on those tree species with difference. Transients don’t like silver maple, used more in cold years. Local breeding species love silver maple, use more tree species in cold years. Red and White Oaks liked by transient species, but not by locally breeding species. Hackberry very important for transients, leafs out later than other species. Local breeders tend not to use it but will more in cold years. No birds like cottonwoods as it leafs out early. Global warming may affect. Yellow-rumped warbler in 2013 when spring was late. In 2014, a lot of birds used only cottonwood when everything else was late. Finished leafing out well before other species.
* Conclusions – greater use of oaks and hackberry by transient. Maple use by breeding species.
* As climate warms, advanced phenology may reduce importance of forest for transients because oaks are more common in upland than floodplain. Have hackberry on floodplain, less in uplands for spring bird foraging. May be risk to forest health with reduced bird foraging during leaf out to control predators. Increased frequency of summer storms with severe rainfall may affect species composition and increase stress. Hackberry doesn’t like flooding. Very complex. Diversity important but don’t discount silver maple.
* Questions:
  + Reed canary grass all forest stands? Canopy cover, very dark with reed canary grass. In ordinations, included canopy cover. Most important was RCG cover. Have some ideas why that might be.
  + Sounds like lack of interior association is lack of large forest track? Maybe some of it. Interior species like ovenbirds nest on ground. Flooding without leafy litter for nests could be part of it. Don’t have big blocks of forest. Even in upland literature, certain species are area sensitive or interior breaks down regionally – differ between New England or Midwest.

9:45 **Achieving forest regeneration in the face of reed canary grass, flooding, and herbivory: lessons learned from the WKTY experience, Pool 8** (Meredith Thomsen)

* Work has been with 14-15 coauthors. Call site WKTY because adjacent field is leased to radio station towers. Successful salvaging. High water conspired that site was invaded by RCG. Interested in getting into site to start restoration over for better outcome.
* Example of broader phenomenon – lose forest cover, see invasion of RCG as low diversity wet meadow. Tree fall gaps from natural disturbance and timber harvest. How to harvest without opening canopy for invasion. Amazing landscape with hydrology and natural landform driving plant distributions. How do we tell where it’s more vulnerable?
* States & Transitions – elevation and hydrology will influence all. Mature forest self-sustaining. Canopy disturbance will happen, naturally results in recruitment from understory, seedling establishment. Re-piling of slash in salvage operation moved material. Treated with forestry mulcher to scarify, expose RCG rhizomes, repeated fall application for three year. Places where rhizomes weren’t exposed enough. Rotary tilled to further accomplish site prep.
* Project Background – using Oust® only, application rates with additional herbicide Pendulum®. Used cuttings, some seed.
* Map of treatment sites – half moon shape of site with fine green lines outlining treatment area. Get in with tiller to treat trees, slash piles. Assigned blocks to different herbicide combinations. Not sensible for land management.
* Data collection – large replicate plots, sample points, deer browsing. Periodic surveys through summers in 2007-2009. Percent cover estimates herbaceous layer, counted trees.
* RCG cover, year 1 – treatments were similar in effects on RCG and tree seedlings. None is untreated control. RCG dramatic reduction in cover maintained June, July, Aug significantly lower to 30% cover. Did get spot-sprayed RCG in summer.
* RCG cover, years 1-3 – same pattern with lower percent cover RCG. Good control. Blooming in untreated controls. Hasn’t sprouted in treated. Didn’t kill RCG but gave 2 months for tree seedling establishment without competition with RCG. Beneficial, not just for trees.
* Other herbs, years 1-3 – Big release from seed bank. Not statistically significant in first 2 years, more herb cover in year 3 with 48 plant species (39 native).
* Tree seedlings, years 1-3 - Low number of seedlings in controls with standing RCG. Higher number in years. Flowers fell off trees without producing seeds in first year. Seedlings per meter squared. Higher in 2008 then some mortality, thinning in seedlings in second year. 12 total species, majority silver maple, cottonwood, willows. Hand seeded, cottonwood cuttings. Had 25% survival for planted stakes after 2 years, similar to previous presentation in Minneapolis. Plant 4 times as many as you think you want. Concerned that stakes wouldn’t work in pre-emergent herbicide, but performance was similar with Oust®.
* Tree seedling origins – majority was natural seeds. Decline in seed inputs with lower number of seedlings.
* Lessons learned – stopped including controls in experimental design (untreated RCG because trees never get established, die in first year). No differences in effect of herbicide combinations. Low Oust® rate was as effective as anything else. Whether repeated applications over 3 yrs was needed is unknown. In 2009, mint blooming with native wetland species and silver maple (orange color in photo). More serious in 2009 with effect of cages in design.
* Seedling numbers and heights, summer year 3 – caged plots to closest open. Seedling number not different but heights with caged plants taller. Repeated signs of browsing. Shrubby shape of highly browsed trees.
* Enclosure Experiment –exclosures with 3 fence types (chemical, electric, mesh) and control plots. PlotsaverTM sprayed on plants. Solar electric. Poly Mesh with wire along top and bottom for rodents. Gradient in browsing pressure, deer activity, plant responses.
* Track density estimates to evaluate fence effectiveness – winter track surveys, browse surveys. Fence plots were large at 17.5m on side. Tree height, density, proportion of available stems that had been browsed. Deer browsing distinctive breaking material without upper teeth. Young trees didn’t usually have more than 15 branched. Deer browse from top leaf and stem. Can see bite taken.
* Mesh fences best protected trees – deer in track surveys gradient with chemical indistinguishable from control. Percent consumption identical in treatments but significantly lower in mesh. Data from 2010-2011. Browsing estimates were less than 10% with mean across all types at 40-50%.
* Effect of 2010 browsing – photo of tape supposed to deter deer. Not effective. Electric fence hard to keep working in floodplain. Short out with anything falling down, pull in high water. Mesh fences had some fish caught in them. Maybe raise bottom half with water depth?
* Effect of browsing – strong relationship with height and consumption. Overall browsed trees were shorter, increment growth rate lower.
* Effect of flooding – browsing and fence interacted with flooding. Hydrograph for site is classic. Established in late 2006, early growing season floods, some summer, but reliable drying out. Fences in late 2009 with browse survey in winter. Normal growing season with flood event in Sept 2010 with water up. Think deer were gone when water was up.
* Examine effect of browsing on seedlings in high water. Fences spanned elevation with numbers and dates flooded as predictor of tree performance. Number of dates flooded on that site that year versus 30 yr mean, which was dryer. Photo of taller willow, cottonwood, ash submerged. Fate of trees under flood conditions impacted by browsing history.
* 2011 Flooding Increased Mortality – higher mortality in plots flooded the longest. Significant effect of prior percent consumption. Significant effect on tree height, increase in mortality. Effect and interaction between two factors. Taller were under water longer. Root carbohydrate stores with less energy going into flooding because they were browsed.
* Lose a bunch of trees – high propagule supply in places flooded longer, but higher browsing with trees dying and thinned. Trees shorter stature, flooding kills more, allows reinvasion.
* Lessons – mesh fences are way to go, very effective. Protection from deer increased tree seedlings and flood survival. Must have year and deer right to increase chances with tree seedlings higher to shade out RCG and get leader out of reach of deer browsing. Choose sites with range of elevations, distribute effort across elevations to deal with uncertainty for success somewhere in site, depending on flood year.
* Next steps – Fecon + Oust was effective but also used late season Glyphosate to knock out RCG (late Oct, early Nov). Drop leaves before RCG senesces, so use glyphosate without affecting other desirable plants. Till or spray to need one pass. Are 3 years treatment necessary?
* Amber Miller-Adamany’s thesis – smaller plots, treating areas intensively to get trees established to spread and restore with smaller equipment and herbicide use.
* Glyphosate vs. Oust – significant effect of treatment, time and treatment X time last fall. Controls are aisles between plots so not statistically analyzed, just reference for measuring RCG. Both treatments likely reducing RCG. Significant difference and interaction between treatment and time. Diverging through growing with glyphosate keeping RCG down. However, concerns about lateness of application, starting to look brown, still showing good control.
* Herbicide treatment & Stock Type - Difference has to do with thatch. Ideal seed bed condition with Fecon. Difference in amount of litter. Thatch impeding RCG sprouting, but also likely tree seedling establishment. Planted tree stock, so it might not matter. Choose herbicide based on tree stock type – cuttings versus seeds. Fecon better than Oust for seed bed.
* Questions:
  + Concerns using Oust in floodplain? Must use it when site is dry. Late season application allows that. Doing that project in 2010 with big Sept flood.
  + Glyphosate left thatch behind, but was residual glyphosate an inhibiter on growth? Plants re-germinating following season, very unlikely to have residual effects.
  + Application rate of glyphosate? Had 5% solution, not rate per acre.
  + Why did the seeds not germinate? Unknown. Opportunity for future research!
  + any problems with reed canary grass inhibiting regeneration? Asked in a later Q&A period, Brad's response: RCG and other invasives may be a problem and should be considered when selecting patches and sizes. It may require other interventions after thinning (e.g. herbicide treatment) to keep them open for desired early-successionals to establish.
  + Is there value to collecting and storing ash seed for a post - beetle landscape? EAB will still be around so long term ash will continue to be attacked and killed. There may be value in preserving genetic material within ash so that if we do develop the ability to genetically modify trees in the future we have a wide amount of genetic material available to work with. Also, we may have better management options in the future for reducing EAB populations so some seed collected seems warranted.
  + It sounds like the lack of "interior" association simply due to the lack of large enough forest tracts? (i.e. there is not interior forest). That may be the case and some of the impact for specific birds (ovenbird) are related to the way they use the forest and the conditions they prefer for breeding.

**10:30 Break**

10:45 **Riparian vegetation simulation models** (Charles Theiling)

* Ecological modelers in Vicksburg, hydrologic modeler with ecological libraries added. Riparian bench and water quality model. Hydraulics chief, forestry, engineer modeler, H&H.
* Corps need for modeling, HEC-RAS model primer, Riparian Veg Simulation Model, Corps briefings, deterministic analysis.
* Planning Need – P&G “Principles & Guidelines for Federal Investment. Compare plans and make decision. Congress required that we establish model certification protocol.
* District Need – maintaining channel velocity and habitat. Flood control or ecosystem registration to answers of how this affects flood, predicts survival of things we planned to T&E survival.
* Participant on Research Area Review Group with needs for nation for environmental research. Matching models with data. Next year, have 5 of 10 studies implemented in Upper Miss. Have outstanding data, forest stand mapping, hydrological models, strong local interest, abundant expertise.
* HEC-RAS Primer – River analysis system. Programs around for a long time. Next generation fully integrated spatial analysis tools. One dimensional river stage discharge. Annual hydrograph, sediment transport, water temperature. Cross section with volume to tell how high water will raise in valley.
* UNET Flow Frequency Study – completed 2004, Miss, Illinois, River with USGS gauge for input data. Have 100 years of data in model with different output. Lots of data, expert review.
* UMR HEC-RAS – authorized full system orthophotography for topographic data. Cut cross-sections for Pool 18 with quarter mile spacing. Get line with elevation across channel and floodplain, put discharge through for low and high flow elevation. Plot from River mile 400 to 450 to get profiles for 2 yr to 500 yr flood. Helpful to flood control for elevation at your levee point.
* Floodplain Inundation – simple schematic in GIS fill routine. How floodplains operate, the 2 yr flood creates most of the floodplain. Taller floods don’t invade much area.
* Flood Inundation Surfaces for Pool 18 – the 2 and 5 yr differs but not as much difference from 5 yr to 500 yr flood. Have these images for entire river system. Can plot acreage of area for each flood stage.
* Riparian Vegetation Simulation Module – time step function, cross-section, points with questions on model. Are conditions right to establish, grow or kill plants? All cross sections? Through time duration? Then model moves water up and down, moves sediment across floodplain. Is space available? Are seeds there? Establish plant. Then go to Growth Model for root and stalk growth rates, compute root growth, compute stalk growth. Mortality Module – is plant too old, buried, under water, scoured?
* Building data library for Upper Miss – forest community. When plants growing, will change roughness and flood heights in model. Can run through other scenario to see what hydrologic response is.
* Model from BLM with Sacramento River data sets. Put their plant model to our hydrologic model. They had mixed forest, invasives, uplands. Will show calibration plots with blue line and teal dots for model. Nice replication of original model for cottonwood, narrow-leaved willow. Some divergence in low water for invasives.
* Will finish with BLM work in Sacramento, will bring model here to do Pool 25 or 26 and Pool 7. Once get experience, local teams will do Beardstown and Pool 18.
* Products – TR Riparian Veg Simulation Module, software products, technical report.
* Tech Transfer Plan – webinars, district training, workshops, user’s manual, reports, journal articles.
* Capability to Corps – integrated tool for environmental impact, habitat studies, mitigation. Products out to field.
* Funding – contribution of money coming to our region in R&D money budgeted for the nation. Will get $1.3M for Green Island Study Site to integrate with ongoing work in Upper Miss.
* 1D & 2D model mesh - Ongoing work going to 2D model to calculate output (flow, current direction, sediment type, sediment distribution) useful for seedling recruitment.
* Potential Vegetation Mapping (Deterministic Models) – what conditions establish floodplain forest.
* Hydrogeomorphic Model & Aquatic Hydraulic Model – include submersed aquatic community with emergents.
* Multiple Reference Condition Analysis – establish rules for 1890, assess condition system wide, scenario analysis such as turning off pumps in levee districts, remove levees such as at Emiquon. Do “what if” questions.
* *Questions*:
  + Ways to use information for site plan/prescription? Will be a lot of factors influencing action at site. Can help regionally, but may need more information at site level.
  + Architecture of models for establishment, growth, mortality has other plug ins for wind, insects or other mortality? Could add on. Not a shading or canopy component. Can be added in development process. If it’s missing, we will get resources to add it.
  + Is this patch scale? What is the scale of the modeling? Building this for 40 mile reaches with transect 1,000 ft apart. Large scale not individual sites. Will go to plots to inform model but can’t run it at that scale. Will be learning as we go.
  + Envisioning native plant community mapping in whole Upper Mississippi system. How would your modeling and HGM model inform that? Could use data, mapping, modeling matched with detailed plant inventory for better plant community classification. One of things on Missouri River is preparing taxonomic cross-walk, taking classification systems which differ in each state, Forest Service, NatureServe, etc. Have broader community categories in HGM to cross-walk to other classification systems. Access real world data on species compositions, locations, natural areas. State of Missouri has specific sites identified.

11:15 Fire in the Mississippi River floodplain in far southern Illinois (Scott Crist/Chad Deaton)

* Discussion area – Southwest tip of Illinois, from curve to confluence of Ohio River. Some data from Ohio River floodplain. Confluence of northern and southern habitat and species interacting.
* Fire Regimes of US – when fire managers talk habitat, it’s fuels and fire regimes. Regime is how fire occurred, extent, intensity, frequency. Lowe intensity, frequent return mild fires here.
* HGM Model Presettlement Land Cover – Miss River floodplain with different habitat types. Yellow outline is Forest Service land managed with darker shade intensive management for hardwood, nongame species, recreation.
* Big Muddy Bottoms Area Fire Regime Condition Class – description of how healthy system is with normal range of viability. Have landscape condition with some level of departure. Brown is agriculture, so far departed from natural. Miss River on left with floodplain to bluffline. Part of larger area managed.
* Soils, Vegetation, Geologic Cross Section Oakwood Bottoms – geology, resulting vegetation in cross-section from Mississippi to uplands on east. Bottoms between rivers.
* History of Fire – entire region developed with fire. How do we know? Paleoecological data from ice cores, sediment cores, fossils (White Oak 2,270 yr old) spike in charcoal ratio after last glaciation. Living indicators of fire occurrence in trees from Missouri (dendroecological data has grown). Early historic accounts (Chicago/Peshtigo fires, diaries, GLO records). Resulting vegetation.
* Arrival of European settlers displaced Native Peoples who had been burning. Improved forests for livestock. Indian and Missouri, fire frequency increased in post settlement period from 23 yrs to 5 yrs. In specific area to east (Jackson County, IL), fire interval of 3 yrs. Different recurrence with cessation in fire around Civil War. Massac County floodplain where tornado hit. High return intervals <2 yrs. Ditched, drained, farmed, then hydrology restored in State Park.
* Contemporary Fire – Oakwood wildfire from 1950s was 8,500 acres moved fast.
* Wildfire Density 1981-2012 – including large fires. Concern about protection. Fall of 2010 had fire in concentrated part of landscape. Prescribed fire in Oakwood Bottoms with fires, largest fire all happened in span of 6 weeks. Fire shapes vegetation. For Oakwood Bottoms, mostly farmed in early 1900s, then purchased by federal government in 1930s and allowed to revegetate itself. Scattered through area with oak dominated landscape. Evidence by dominance of overstory.
* Hydrologic restoration – began in 1960s, began noting oak regeneration problems. OB and levees, wells, pumps, reservoir with expansions. Goal to improve water management on units to mimic natural flooding. Disconnected from floodplain by levee. Lots of years with carpet of young oak seedlings but nothing more advanced. Assumed due to lack of fire, forest management.
* In 2007, project to reverse trends dominated by maple, ash, elm, loss of oaks. In 2007, restore pin oak using fires, TSI, planting, new flooding. Doing prescribed fire in bottomland hardwoods. Not a lot of people doing it.
* Some difficulties with burning in floodplain (can’t burn water). Timing with land inundated. Restrictions to protect T&E species with windows to do burning. Restricted on fuels. Annual flooding speeds up decomposition. Young stand. Depth of fuels, not a lot of fuels. Smoke big concern for couple reasons. In 1990s, long duration floods in 1993 and 1995 that killed a lot of overstory trees in upland, on unprotected side of levee. Lots of fuel and duff fuel load that produces smoke. Topographic position in valley bottom, trapping smoke.
* Photo of smoke crossing road – low speed gravel road, going away from populated areas. Leads to a difficult prescription for conditions in 2010.
* Fall 2010 – driest in 10-20 yrs. Moisture was 15-16%; duff moisture in single digits, very dry. Did not have full fresh fuel bed. Burned 1,350 acres with moderate intensity but high severity. Cold front flushed smoke, wind strong enough that fire stayed close to ground. Got calls from FAA in Kansas City and Memphis from airlines. Did have smoke trapped in valley with night-time inversion on second night after fire. Severity of exposed roots with cooking of roots leading higher severity in overstory.
* In 2011, wet year over summer, burned 300 acres in fall. Much lower severity. Moisture around 25% with duff saturated. Photo is most severe burn. Areas going out on its own.
* Nov 2014 - Burned about every year since with 1,950 acres over 2 week stand. Moderately dry, mixed severity. Photo burning with older rotten fuel, coarse woody debris partially consumed on one end. Maintains refugia for salamanders. Fairly good coverage across leaf litter. Pin oaks resprout one year after. Smoke photo same height but less dense and no complaints.
* Fuels Reduction – intensity does matter. High intensity burns reduced fuel loads. Initial burn with white ash and log consumed completely. Less severe prescribed fire had lower intensity with duff layer and total loading didn’t consume same amount of litter. In TSI areas, increased downed woody debris 1-3 inches and above consumed duff but decreased litter layer. Measured fuels in TSI after burn.
* Results Seedlings/saplings – anecdotally reduced seedling for all species, less for pin oaks. Mild burn plot photo, most has come back. Canopy coverage estimate with light coming through varied from 85-96% as strong reaction for this area. More severe fires don’t get this much light. Overstory mortality with that fire, reduced canopy. Combined with TSI, got more light in. Fire created canopy photo enhanced with TSI. Strong flush of forbs and herbaceous with willow. Major reduction in hackberry, etc.
* Bats – Wildlife response with monitoring of Indiana Bat and songbirds. Bat colony on site monitored for years. They prefer more open canopy for foraging, roost sites with solar exposure. Information on colonies pre- and post-fire. Responded to treatments, especially more severe burns. In 2006, bat maternity roost found. Shifted in 2008 & 2009 to north and east. Did some thinning that may have moved them. In 2013, 3 yrs after more severe prescribed burn in 2010, shifted 80% of roost sites found in that area. Greater availability of snags, improvement of foraging with increase in insects, decrease in herbaceous plants. Positive overall response.
* Birds – songbirds lend themselves to monitoring responses to forest management. Highly responsive due to ranges. Habitat more successful. Lower density of songbirds in poor quality habitat. Monitoring by INHS for songbirds at project level – plots in no treatment, thinning, and thinning with fire. Average species diversity significantly lower in no treatment category.
* Graphs with relative abundance by songbird species and treatment in 2013 – positive impacts on several species. Four species responded negatively. Observations shown that waterfowl have moved into areas with more severe burning, more herbaceous groundcover, more moist soil plants, seed, food in those areas. See one side of road with 90% of waterfowl coming out of burned areas, especially in spring migrations.
* Future – capitalize on learning with fire in floodplain. New impoundments, improving ability to flood and drain units. Would like to expand burning and TSI. See prolific sprouting in response (4 ft or more in year) so may add herbicide treatment to give oaks advantage.
* Landscape Scale Processes to Incorporate – climate with flooding and wind throw of large pin oak as significant disturbance (about 6,500 acres in southern IL). Not total blow down but occasional wind-thrown tree changed light regime. Drought, ice, changing temperature with warmer winter more summer drought. What will that do with species migration at crossroads of ecosystems. How to incorporate that? Insects and Disease with EAB. Invasive Species with *Phragmites*, treating small acreage, seeing number of populations increasing.
* *Questions*:
  + Reason why you burned in fall versus late winter burn? More managed for waterfowl. Water is kept on from mid-Oct/mid-Nov until Jan/Feb so it is flooded late winter. Unit that is dry holds moisture. Driest period is July, Aug, Sept. When get moisture in fall, doesn’t evaporate. Lose ability to burn. Have done some spring burning, particularly units 12 & 13 but not successful, too saturated. If we had a window, would take advantage of it.

**12:00 – 1:00 Lunch (on your own)**

**1: 00 - 4:30 Field Trip to Floodplain Forest Management Sites** (near Bellevue, IA) –

The group viewed forest management sites on ACOE property. Participants should be prepared to walk up to 3/4 mile during their field excursion.

**6:30 - 9:00 Evening Social at National Mississippi River Museum & Aquarium**

Please RSVP in online registration – bring $20/person to be collected at the door for drinks & snacks.

**Day 3 - September 17, 2015**

**8:00 - 11:00 What’s Next?**

**8:00 Concurrent breakout sessions**

* 1. *Breakout session 1: Implementing forest management prescriptions* (Andy Meier, facilitator)
  + Sign-up sheet – Communication between people in informal email working group. Volunteers to lead?
    - There is a Floodplain Science Network (FpSN) for anyone interested. UMRC Veg Ad Hoc Committee? Focus committees on forest restoration.
    - Next steps - Will send email to list for next steps discussion on conference call to hone in on 1-2 issues to address as multi-agency group. Set up chat room rather than just emails? Identify coordinators to take lead.
  + Have had discussion on forest issues. Challenges to managers in implementing prescriptions. What are main issues? How to address them?
    - Break into groups with different disciplines combined.
    - Discuss main challenges for writing and implementing prescriptions. Series of 6-7 questions on sheet. Fill out boxes on sheet to identify challenge, broader description, identifying constraint as operational, silvicultural, biological or institutional? List biggest or most workable things to do. On-the-ground management issues.
    - Opportunities for consistency in data collection, analysis, coordination
    - Approaches for sharing anecdotal results between managers
    - Which of these issues is being faced by multiple groups?
      * *Flooding* - Heitmeyer graph of precip cycles with highs/lows on 15yr cycle. Trees aged with low end of cycle. Predict that with precip records? More natural regeneration at low end in extended droughts for seedling regeneration before next flood. In 3-4 yr drought cycle, target low conditions. On high end, more RPMs, more taller tree work. Predict periods for natural regeneration. Andy Casper has looked at Pacific/Atlantic oscillations. Adjust prescriptions for flood/drought conditions.
      * *Access* - logistical and political. Regeneration is next step.Predict droughts to get into site. More money doesn't necessarily help. Difference between ecological restoration and forest management. No matter goal, still has to pencil out. Go to lengths to create access.
      * *Communication* - between groups up/down river. Document silvicultural trials and field projects to share results. Silviculture Library (UMN) or Trials Website. Bottomland Hardwood Managers website.
      * *NEPA policy guidance* - Constraints of being responsible stewards for Sect 7 coordination. Reality of time to implement anything with tree cutting (TSI or harvest plan). Limiting factor in getting work done. Not as much of an issue for state agencies as it is for federal agencies. Good communication to meet with those you need to coordinate with for open discussion on how to do it better, so they understand why cutting trees here. Moving so it doesn't halt process.
      * *Variability* - different directions things can head once you've made a decision. Other forest types, have good guidelines, more predictable on outcomes. Communication on where there are issues and how to solve.
      * *Reed Canary Grass control best practices* - "cookbook" of success stories.
      * *Wildlife Metrics* - translatable to habitats, not just bird/bat counts; gap size and cavity information to use in prescriptions. Speak to wildlife managers in partnering agencies on wildlife species of interest or literature search (gap size for species, habitat requirements, etc).
  1. *Breakout session 2: Determining research and monitoring priorities* (Bob Clevenstine, facilitator)
     + Identification of priority project focus
     + Nomination of potential sites/interest in project development
     + Unmet needs and requests for assistance
     + Research topics (from discussion and post-workshop emails):
  + *Nutrient Cycling & Sediment Transport & Invasives* - Continued work on nitrogen saturation of sediments and their association with invasive species dynamics (stiltgrass, RCG). Shawnee National Forest changes to microrhyzial fungi. May alter dynamics to harm attempt to plant trees or grasses. Link to ag runoff. Related to Bill Richardson's project on Maquoketa. Becky at USGS on forest flood sediments.
  + *Flood Duration* - Continuation of De Jager's work in Pool 3-10 with data throughout Rock Island & St Louis Districts - look at bigger picture associations with flood duration & inundation versus species. Close gap in HGM in that same area. Multi-agency collaboration.
  + *Silvicultural Data* - Oak-Hickory example. Next to no data on effectiveness of different systems. Would be valuable to get some research at university level. How to set this up?
    - *UMRCC ad hoc effort of Veg Committee* - Steve will propose bottomland forest focused effort. Gets together twice/yr on pool to sample submerged aquatic veg to get forest data. Why is group overlooking terrestrial vegetation? Forests take longer to play out changes, but permanent plots could be resampled. Structure as training event on data collection for nonforesters to collect forest data. Social component is staff up and down river, mixed in boats. Steve will bring up at next week's Fall meeting.
  + *Standard design for terrestrial monitoring* - implementing program long-term to get same level of information for terrestrial LTRM. What regeneration is occurring? Species shifts? Ground cover influence? Need terrestrial component to accompany water quality and veg. Have written monitoring chapter. Product to take into existing programs. Well-thought out proposal for LTRM component. Connect Nate's work, HGM, etc.
    - *ACOE Natural Resource Management Information System* - monitoring on Corps properties for years. Forest inventory cover since early 1980s, monitoring at harvest and planting sites. Different methodologies are not standardized over years. Forest inventory data - make that available widely to agencies. Right now, just ACOE access. Need funding for UMESC to dive into that data. Build on what's been done at UMESC, COE, FWS.
    - *Forest Inventory Analysis Team* (12 researchers across Midwest - Mark focuses on IA) - Forest Atlas with FIA data is standard for collecting inventory in floodplain, but maybe not sampled the same way. Adjust data to be better integrated into existing forest research program for USFS, then available to public on FA website. Data must be integrated to use existing tools.
      * How difficult would it be to integrate? Have not looked at data yet. Forest Service has regional information from Portland to Carolinas. ACOE have more targeted on river. Generic information. Have more detailed elevations, dealing with 8-12 inches (differs from Rocky Mountain data needs).
  + *Standard long-term methods* - Don't assume we all must have standardized methods. Start with what question we want to answer across system. Different questions may need different methods. Questions should generate methods, not other way around. Great LTM methods for certain questions, but may not have utility for others. Relationships between species and habitats not working using existing LTM methods.
    - There is no formal forest component in UMRR LTRM. Limited funding will likely not allow addition of new components. De Jager does work with USACE foresters but their individual funding is leveraged.
  + *Common Site Classification* - varies among organizations. Floodplain language differs. Need "floodplain features classification" developed with biology and LiDAR. Major first step.
    - *Consistent mapping of all floodplain communities* - NatureServe development of National Vegetation Classification may add different classes, floodplain features, HGM modeling. Have to use national vegetation classifications. Doesn't fit with what we know we have on the river. Classification system is open to revisions. National Park Service uses or ACOE may have to adopt NBCS classifications as well. Does UMESC data cross-walk to NBCS? Details don't match. HMPs have bigger cross-walk than CCP. Developing FMP variables on species density, basal area to identify forest types. What forest types are used? What works on floodplain (maple, cottonwood)? Land cover types are very broad. Need community type that all along river would use. ACOE Forest Inventory could be used to develop categories.
  + *Field Trials for Stand-level Management* - as well as broader. Usually talk about how to get regeneration on bottomlands. Could hone in on particular research questions, refine them so different groups setting up projects could field trial questions, identifying limiting factors on regeneration.
    - Develop short list of specific questions - how much RCG is too much to interfere with management? Group and patch selection - what sizes are most appropriate to regenerate species we want? Have data, but on site, we ask ourselves how to convert data into management prescription we can monitor and track over time. ACTION: Consider this as a task for the Ad Hoc Veg Group.
  + *Using Data to Inform Management Decisions* - Great to collect data, but how to apply data to restore habitats over time? Data collected helps on-the-ground decisions. Once Forest Management Geodatabase (FMG) developed to store data, create script in data set to pull out numbers to query at different scales on what dominant trees are, diameter class, forest community types? Communication with how to interpret that information. FMG will be put on server, allowing public access to add data. Powerful tool for forest management plans and prescriptions. Standardizing how data is configured. Will be available within a year.
    - *Test treatments at measurable footprint* - Refining Use of Data. Look at pre-prescription data, what we did, how that worked, tweak prescriptions to have better effect. Have information but not on-the-ground activity at scale to test treatments.
    - *Functions of floodplain forest* – how dynamics contribute to other river of floodplain forest health. Support to Andy as starting point. Need to know what the questions are first. Gwen can coordinate with the staff of the 3 Midwest LCCs for any research or working group support.
  + *Site (stand?) versus System* - The different interest levels that exist between these two scales seems to be much more evident in the forestry profession than say in the fish and wildlife communities.  While we heard about reach and whole river conditions and visions early in the workshop, I got the strong sense that most forestry practitioners are focused more exclusively on making a difference at the individual sites within their jurisdiction.  Not surprising – people relate more to what they are responsible for.  The workshop helped me clarify the two different sets of information that are needed to support site and systemic decisions, and how the information is typically used at each level.  But the necessary linkage between these perspectives and its value to overall forestry operations remains pretty vague.
  + *Public versus private* - There was very little discussion about private lands at the workshop.  That is to be expected given the institutions represented.  But it prevented us, I think, from dealing with the 900-lb elephant, because it wasn’t in the room.  If my memory holds, the 2007 WRDA that authorized NESP (that has so far received virtually no funding), approved the restoration of 30,000 acres of floodplain.  Most observers saw this as an open door to start thinking about more work (including forestry) in the leveed floodplains downstream of Rock Island.  Is the LCC network capable of cooperative work with private drainage and levee districts?
  + *Reno Bottoms (below Dam 8)* - Several parties came to an impromptu breakfast meeting on Wednesday to discuss revisiting the conservation/restoration opportunities presented in the Reno Bottoms (below Dam 8).  Workshops like this one always seem to result in unexpected ideas or renewed energy on subjects that have long been delayed.  Another reason to say thanks for setting it up.  Good stone soup!!

**9:30 Group discussion and next steps (Blue Moon Room – Plenary Session)**

* The Planning Team will prepare and distribute a summary report, detailed notes and presentations (with permission of presenters) for posting online in an accessible location. The team will meet to discuss next steps including:
  + Discussion on research priorities going forward (Tim Schlagenhaft & Gwen White, facilitators)
  + Future needs for Floodplain Forest management collaboration and updates – including management guides, websites, tool index, etc.
  + Connection to external or future LCD, SDM, or other process for landscape conservation?
  + Establishing working committees/other collaboration?
* Thanks to everyone for attending the workshop and to Jeremy Peichel (offsite engineer) and Linda Haugen (onsite engineer) for providing the virtual connections. The ETPBR LCC staff, Technical Advisory Groups (TAGs) and work teams are willing to provide support for next steps, where feasible.

**10:00 – Adjourn**

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