RIPARIAN ECOLOGICAL SITE DESCRIPTIONS AND STATE-TRANSITION MODELS FOR CONSERVATION PLANNING

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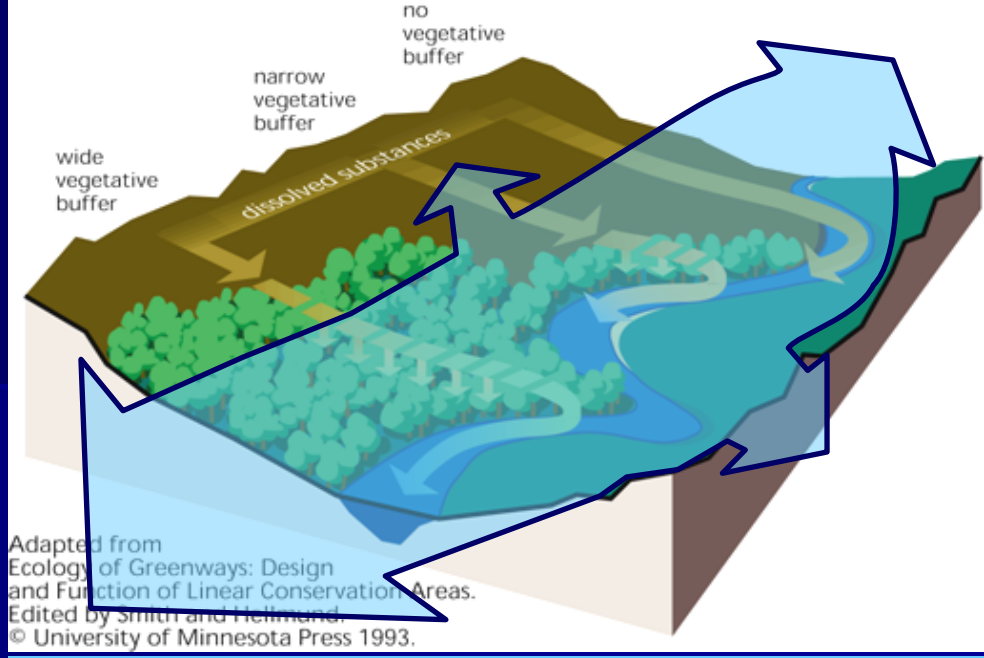
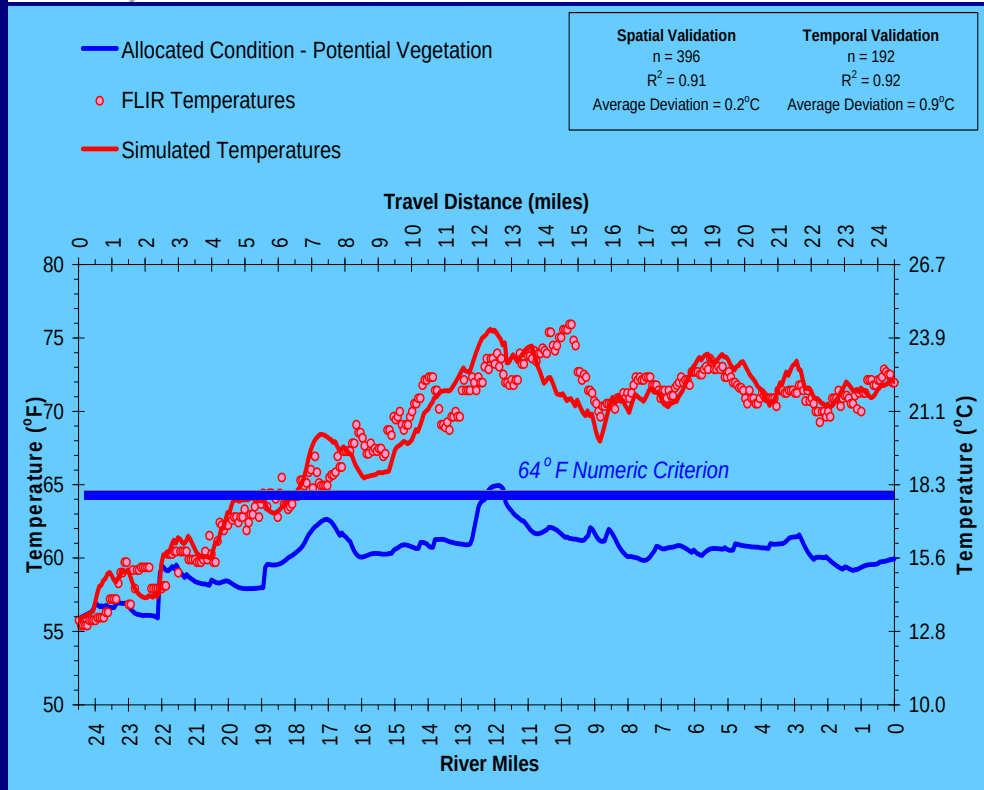
Menu …

- Need for understanding riparian ecological dynamics at the site level for planning and restoration
- How riparian ecological site descriptions (ESD) and state-transition models (STM) help
- An example
- A strategy for developing riparian ESDs
- Limitations

Some Assumptions

- Natural riparian communities growing to their natural potential are effective at:
  - Processing and trapping nutrients, sediments, pesticides, catching chemical spray drift, and sequestering carbon
  - Providing habitat and corridors for wildlife, recreation, and
  - Improving conditions for fish such as moderating water temperatures

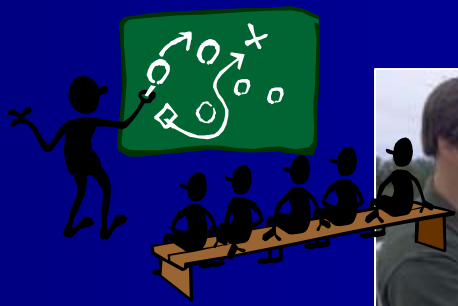




Some Assumptions

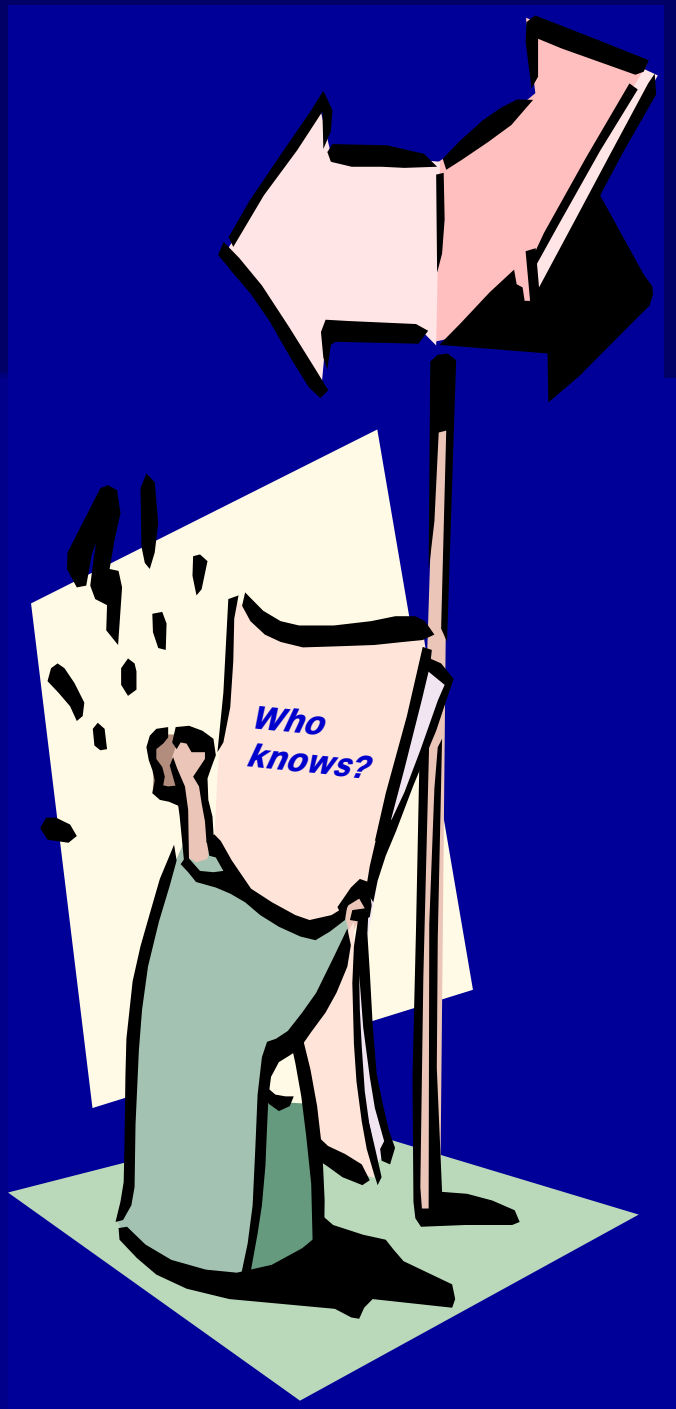
- Restoring and managing riparian forests:
  - General restoration guidelines for a geographic area are generally helpful …
  - but site level alternatives and specifications are needed to initiate treatment at the field and soil component levels.

"If the only tool you have is a hammer, you tend to see every problem as a nail."
--Abraham H. Maslow



Riparian Ecology and Treatment

- Will certain grass and herbaceous species persist and defeat attempts at establishing "native" tree and shrub species?
- What mix of native trees and shrubs will thrive at the site's various hydro-geomorphic levels?
- Are woody plantings as a treatment premature based on stream and floodplain classifications?
- Does a 'shelterwood' planting need to precede introduction of other species?
- Will natural regeneration of woody materials preclude the need for planting?



Riparian Ecological Sites and Descriptions

- Properly constructed riparian ESDs with STMs can answer riparian ecology and treatment scenario questions.
- An ecological site is a distinctive kind of land with specific physical characteristics that differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation. Soil components are typically tied to an individual site … so think of soil map delineations to get a sense of scale.
- The ESD describes the ecological site and contains an STM which is a box-and-arrow diagram that displays an organization of natural community phases (a "state") and illustrates pathways of ecological movement between phases due to succession and disturbances.

What does an STM look like?

State 1.0 – Current Potential State:

Seedling Sapling Plains Cottonwood – Community Phase 1.1
This community dominantly consists of seedling/sapling Plains cottonwoods with willows occupying the moister portions of the site. The tree canopy averages 10 to 30 percent, tree diameters are less than 4 inches diameter at breast height and tree ages are 1 to 20 years old. Cottonwoods are a pioneering species that require moist, barren, newly deposited alluvium that is exposed to full sunlight (Hanson). Ice jams can also create a seed bed for cottonwood establishment. Constant disturbance can cause a site to remain in this community phase or rejuvenate many times before conditions allow for succession to take place.

Community Phase Pathway 1.1a
This community pathway is the natural succession from an early-seral community to a mid-seral community. It occurs during time of natural growth with little or no disturbances. Channel usually is migrating away from the site at this stage of time. Distance to water table increases and some shade tolerant shrubs start to inhabit the understory.

Pole Stage Plains Cottonwood– Community Phase 1.2
This community phase consists of a mid-seral pole stage Plains cottonwood stand of vegetation. The tree canopy is typically 60 to 80 percent, with tree diameters of 6 -12 inches at breast height and tree ages of 40 to 60 years old. Understory shrubs that may inhabit the site typically consist of red-osier dogwood, Saskatoon serviceberry, common snowberry, common chokecherry, woods rose, currents and gooseberries. Green ash and box elder may or may not be present in the understory.

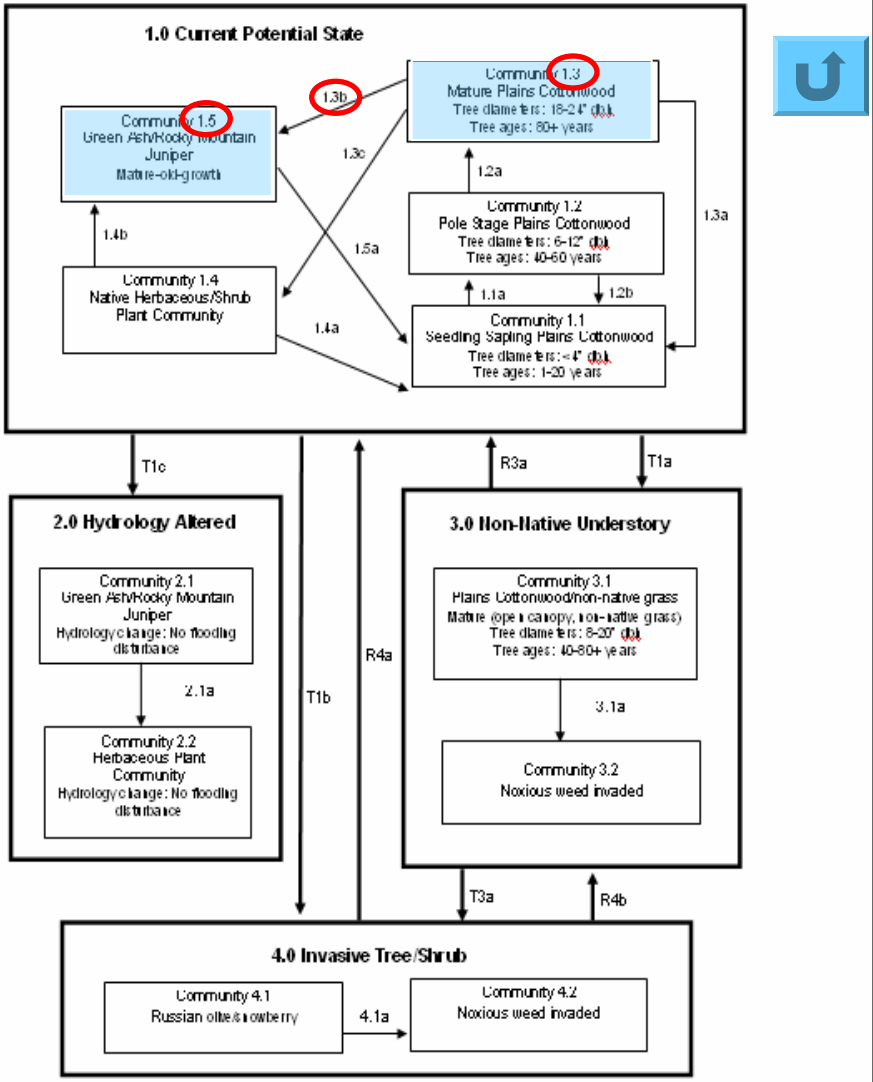
Community Phase Pathway 1.2a
This pathway occurs through growth and time with little or no natural disturbances. The cottonwoods start to self thin and the canopy starts to open promoting understory growth.

Community Phase Pathway 1.2b
This community phase pathway is the regression from mid-seral to early-seral series. It occurs mainly after total mortality fire with a seed source present or stump/root sprouting. Scouring and head cutting during flood events can also regress this site to the seedling cottonwood community phase.

Mature Old-Growth Plains Cottonwood – Community Phase 1.3
The community consists of mature, old-growth Plains cottonwoods with a canopy of 40 – 70 percent, tree diameters are 18 – 24+ inches diameter breast height, and tree ages are over 80 years old. It occurs when there are long intervals in the fire cycle or when there are long periods with no sediment depositing or scouring of the stream terrace. As time progresses through this plant community some cottonwoods die off. The stand thins and other trees such as green ash, box elder, and Rocky Mountain juniper start to inhabit the understory.

Community Phase Pathway 1.3a
This community phase pathway is the regression from community 1.3 to early-seral community. It occurs mainly after total mortality fire with a seed source present or

Ecological Site: Plains Cottonwood/Common Snowberry



How are riparian ESDs and STMs created?

1. **Conduct literature searches** -- Done at the soil survey, county or multiple-county level. The search reveals pertinent literature on riparian ecology including historic reports and photography.

2. **Create an ecological site network by contacting partners** -- Partners should include all active public and private organizations and individuals who are interested in riparian areas.

3. **Refine available ecological information (e.g., habitat types, plant associations) into a first approximation of draft ecological site names** -- Each site is uniquely named. NRCS uses the Major Land Resource Area concept to define the geographic region (USDA, 2006).

How are riparian ESDs and STMs created?

4. **Integrate pre-European fire regimes as necessary, alter draft site names, and review with the partner network** -- NRCS includes such fire regimes as part of normal disturbances that are displayed in the STM. Recurring fire can significantly alter the appearance and composition of riparian community states and phases.

5. **Perform tentative correlation of soil components to draft site names** -- In many cases, small streams may have riparian areas correlated to a soil that is quite narrow at published map scales. These soils may not be delineated on the soil map as a soil map unit.

6. **Develop first approximations of STMs for ecological site names and review with partner network**

How are riparian ESDs and STMs created?

7. Develop strategy for collecting needed field data on soil components by riparian ecological site, ecological state, and community phases

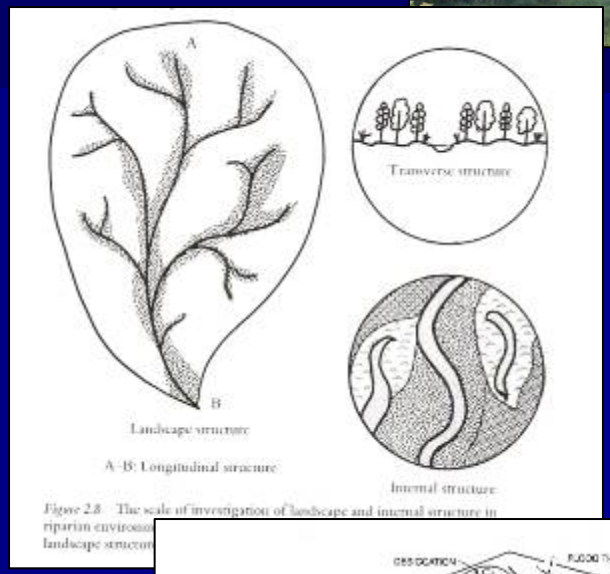
8. Collect and interpret field data and validate: a) correlation of soil components to ecological sites, and b) STMs

9. Develop first drafts of complete riparian ESDs and review with partners

10. Refine riparian ESDs, enter and publish in the Ecological Site Information System or ESIS (USDA-NRCS, 2008) and the electronic Field Office Technical Guide or eFOTG (USDA-NRCS, 2008) -- ESIS and the eFOTG are maintained by the NRCS on the World Wide Web. ESDs and STMs are dynamic and periodically updated.

Limitations

- Many U.S. riparian sites have a forest potential and development of forestland sites in various regions is just gaining momentum.
- Networks of partners to accelerate work have been difficult to create.
- Hydro-geomorphic surfaces present on a single riparian site can be intricate necessitating additional range and explanation of vegetation composition.
- A single stream may have a variety of hydrologic conditions (e.g., upstream dams, entrenchment, withdrawal for irrigation) which can influence vegetation and the complexity of the ESD and STM.



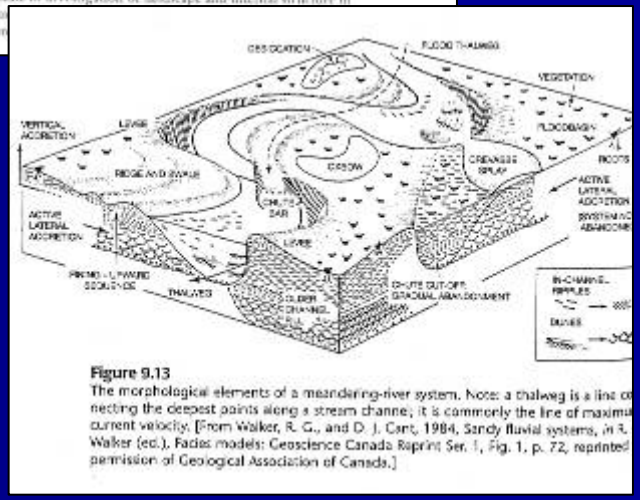
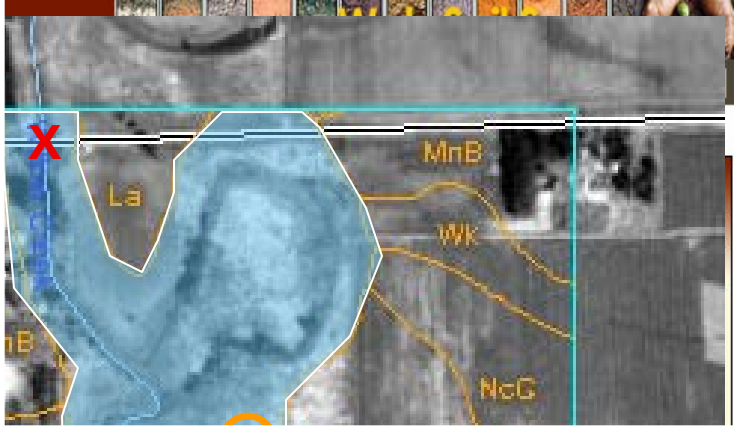


Figure 9.13
The morphological elements of a meandering-river system. Note: a thalweg is a line co necting the deepest points along a stream channe; it is commonly the line of maximu current velocity. [From Walker, R. G., and D. J. Cant, 1984, Sandy fluvial systems, *in* R. Walker (ed.), Facies models: Geoscience Canada Reprint Ser. 1, Fig. 1, p. 72, reprinted permission of Geological Association of Canada.]

Riparian ecology and dynamics are complex and unknown in many locations …

- As we know, there are known knowns.
- There are things we know we know.
- We also know there are known unknowns.
- That is to say we know there are some things we do not know.
- But there are also unknown unknowns, the ones we don't know we don't know.

—Feb. 12, 2002, Department of Defense news briefing



EeB	Egan-Ethan-Trent complex, 1 to 6 percent slopes	4.1	1.1%
GrA	Graceville silty clay loam, 0 to 2 percent slopes	10.5	2.8%
La	Lamo silty clay loam, 0 to 1 percent slopes	61.1	16.1%
Lb	Lamo silty clay loam, channeled	51.8	13.6%
T (A	**Area of Interest**	**380.2**	**100.0**