Hydrogeomorphic assessment and monitoring of channel-floodplain wetland systems in the Sprague River basin: progress and prospects

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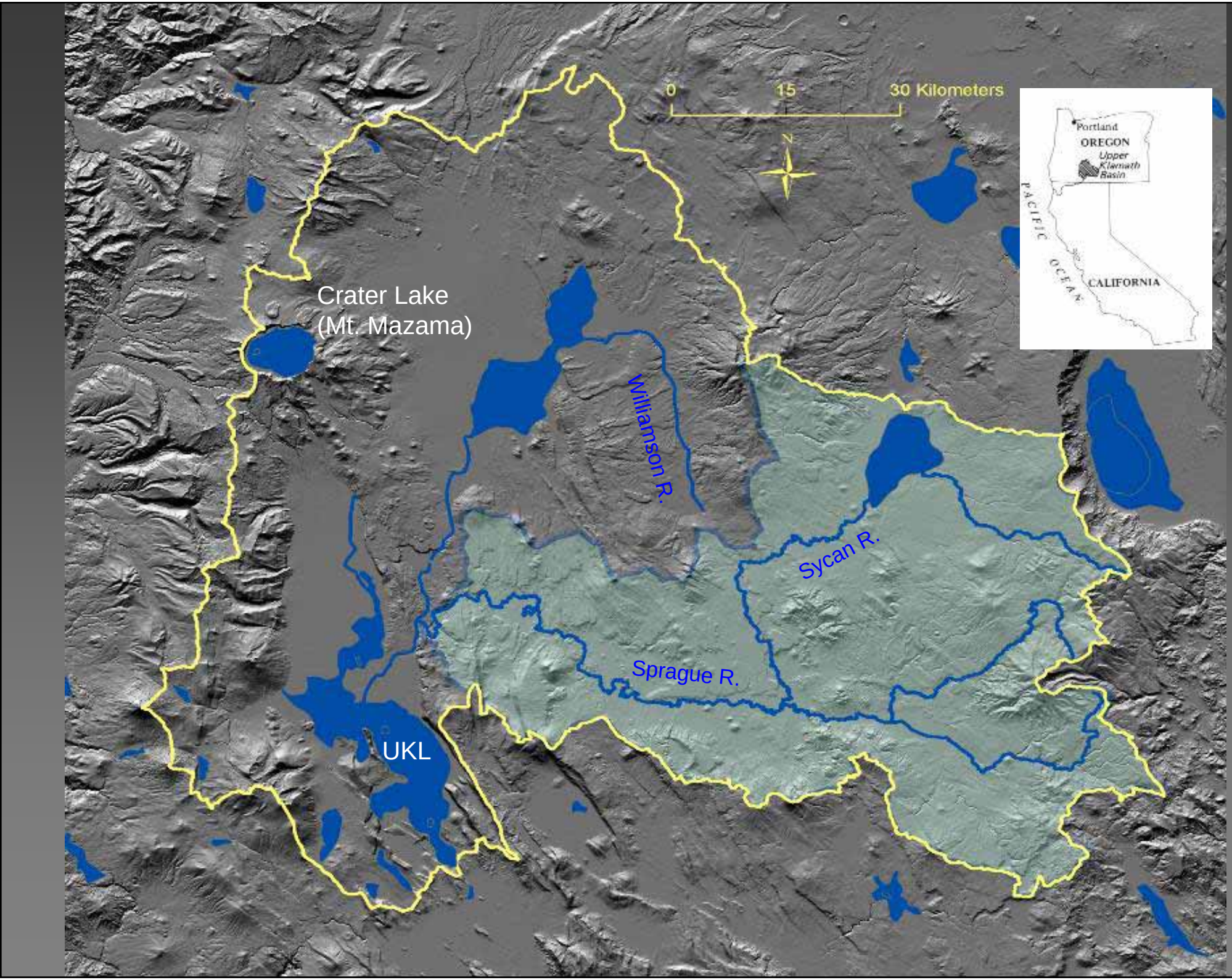
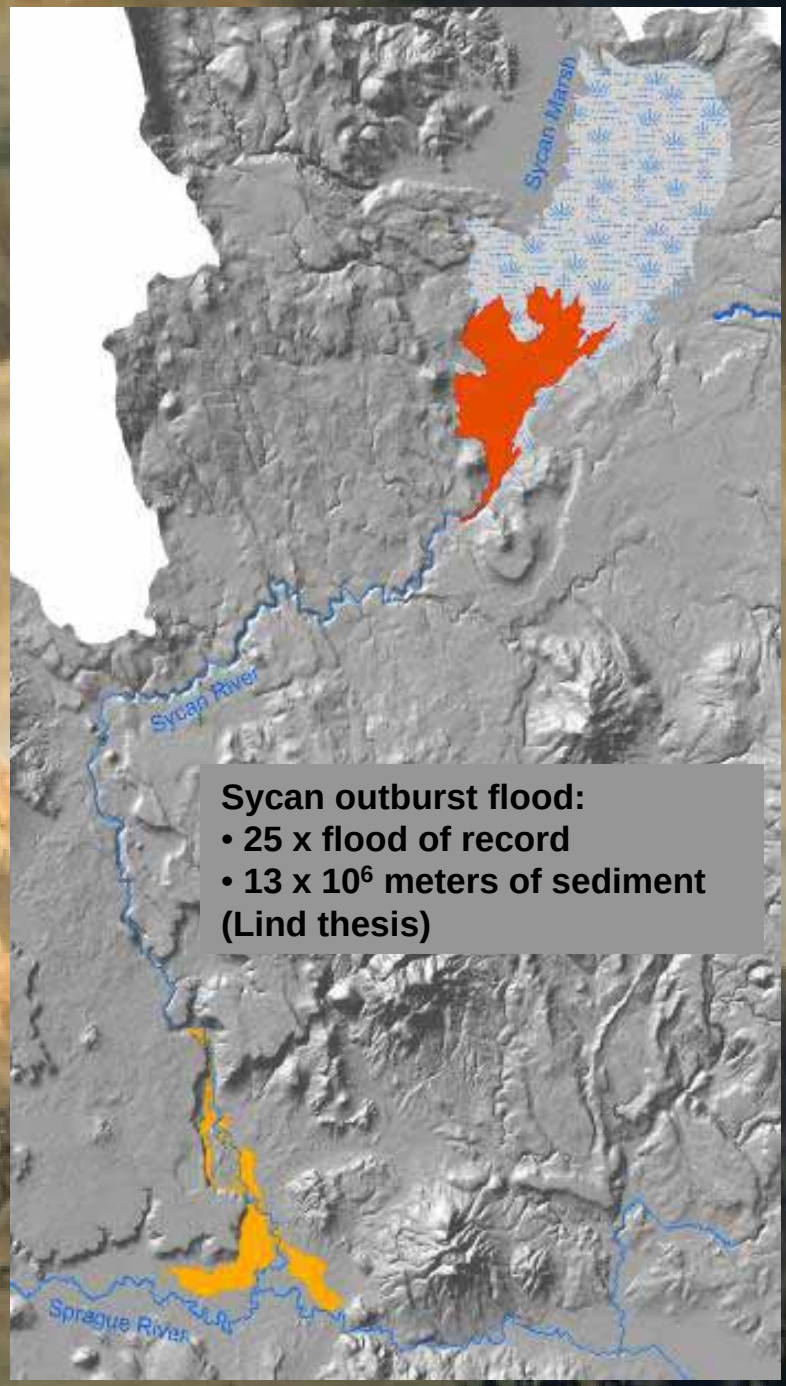

0
15
30 Kilometers
N
Portland
OREGON
Upper Klamath Basin
PACIFIC OCEAN
CALIFORNIA
Crater Lake
(Mt. Mazama)
Williamson R.
Sycan R.
Sprague R.
UKL

Eruption of Mount Mazama at 7660 YBP



Sycan outburst flood:
- **25 x flood of record**
- **13 x 10^6 meters of sediment**

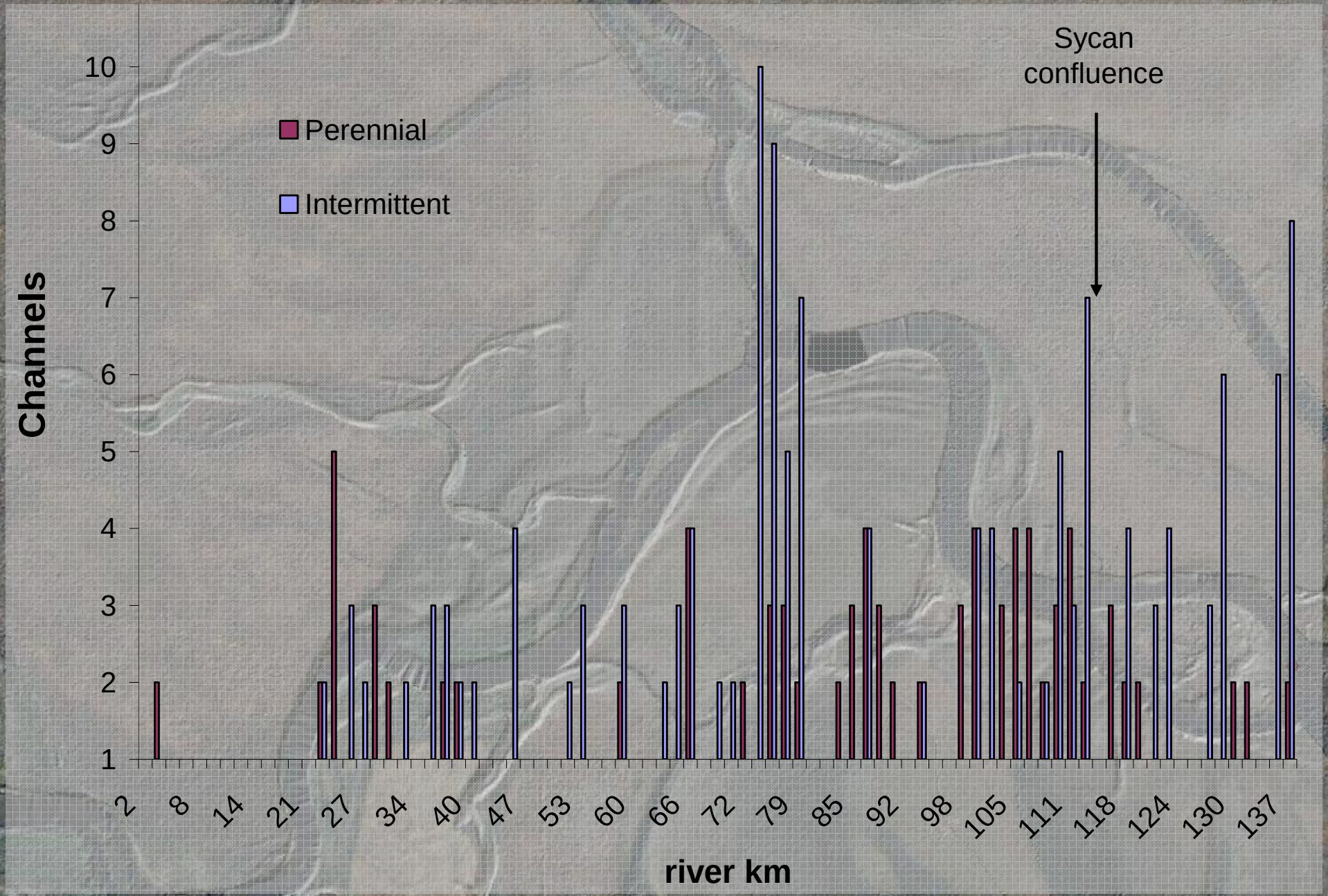
(Lind thesis)

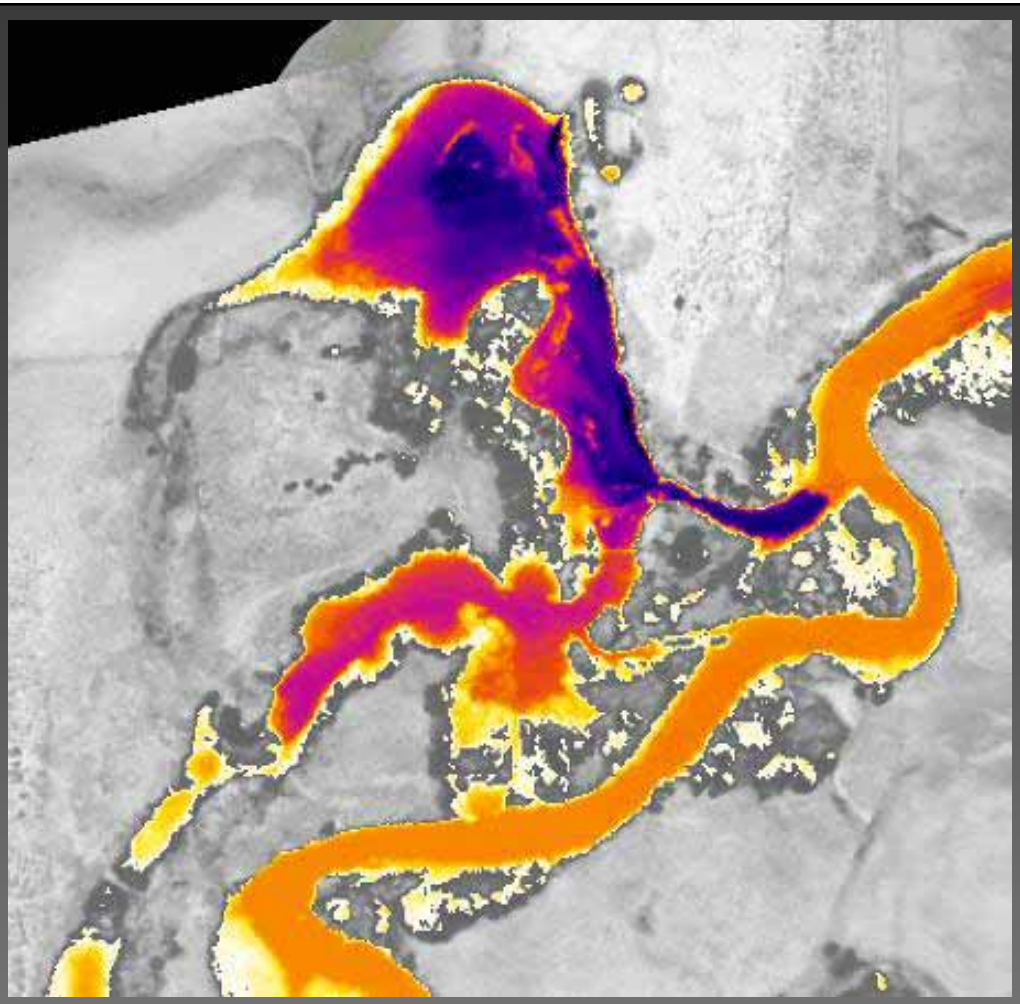
Sprague River landscape is complex; shaped by:

Tectonic Uplift
Volcanoes
Palaeolakes
Outburst Flooding
Extreme Sediment Loading (Fine Sediment)

Painting by P. Rockwood

- Low-gradient, laterally active, multi-channel river system
- Channels created, abandoned, re-occupied (by avulsion)
- Highly dissected wet-meadow floodplain





Abandoned channels often represent riverine or palustrine wetlands

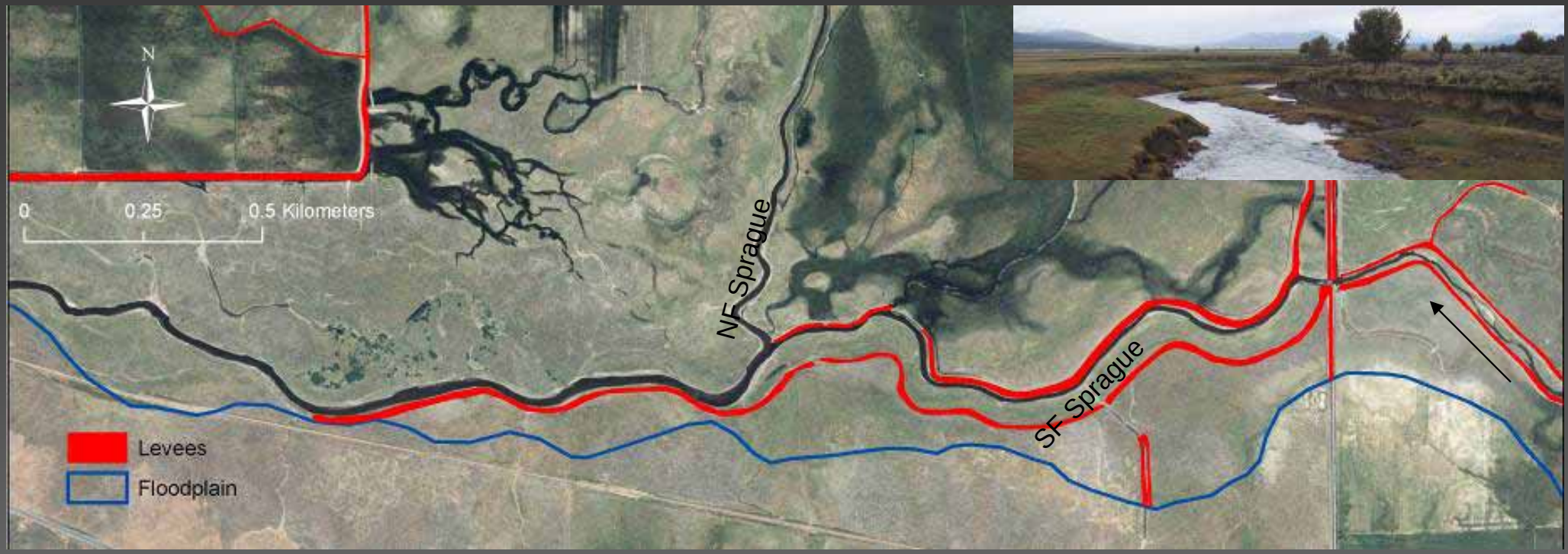
Some abandoned channels intercept groundwater discharge or hyporheic exchange flow from the main channel

These areas provide off-channel thermal refuge and cool the river, listed under the CWA 303d list as impaired for temperature

Brown Spring Creek, Sprague River

Riverine wetlands provide critical habitat for trout and endangered suckers

Would also provide potential habitat for re-introduced steelhead and Chinook salmon (under consideration in KBRA)



Levees inhibit overbank flow, re-entry flow, sediment transport, fish use of floodplain habitats

Accompanying land uses, including grazing, disturbs vegetation and destabilized channel banks

Emerging interest in setting back, breaching, or removing levees to improve channel-floodplain connection

Need to set a baseline, track project results, and improve science and its application to restoration

Hydrogeomorphic assessment and monitoring of channel-floodplain wetland systems in the Sprague Basin:

Develop a broad understanding of the natural hydrogeomorphic processes that create and maintain wetlands in the Sprague basin

Formulate conceptual models connecting fluvial (channel) processes and adjacent wetland systems (riverine and palustrine)

Apply, test, and refine these models using monitoring data

Target restoration projects as experiments, wherein results are tracked and models tested in an adaptive management framework

Target wetlands along major floodplains

Begin with riparian/riverine wetlands

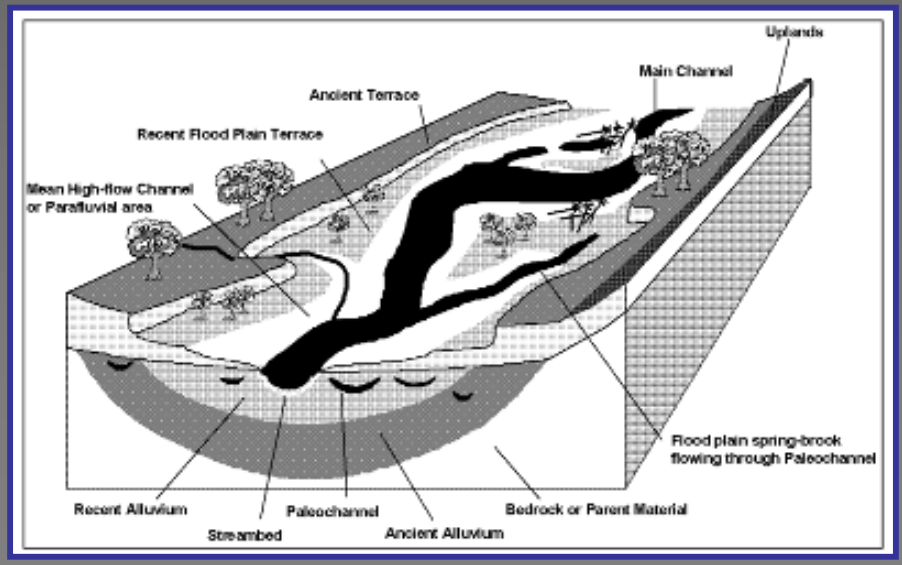
Expand monitoring to connected palustrine environments

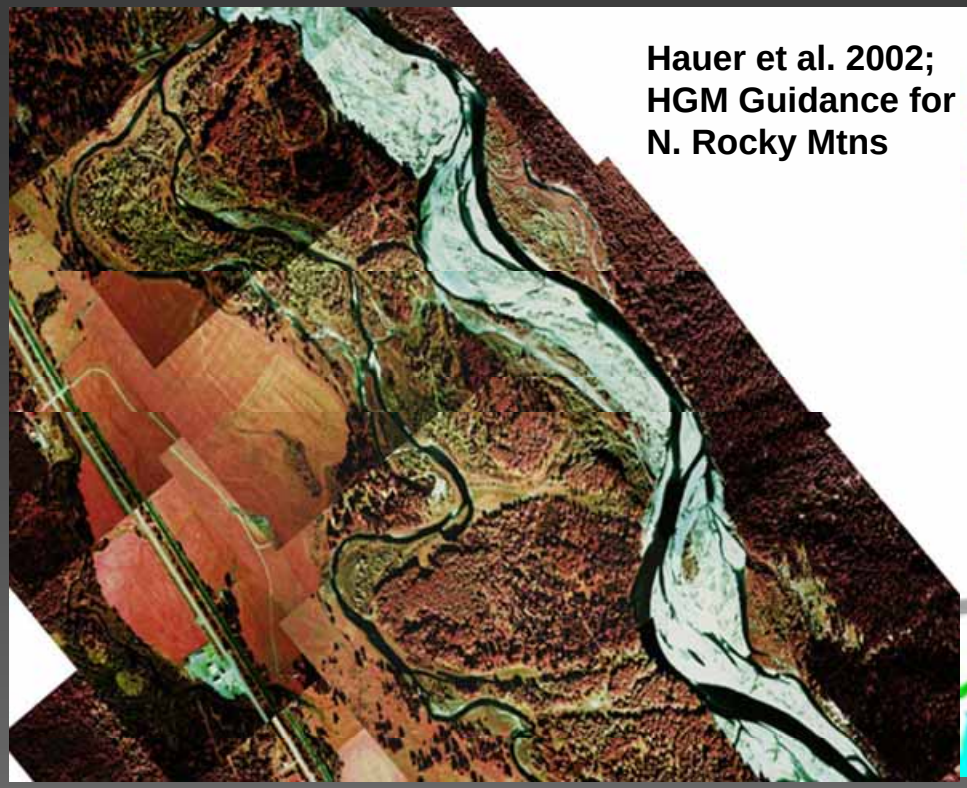
Approaches to wetland assessment

<u>1950's</u>: early wetland assessments for waterfowl habitat monitoring

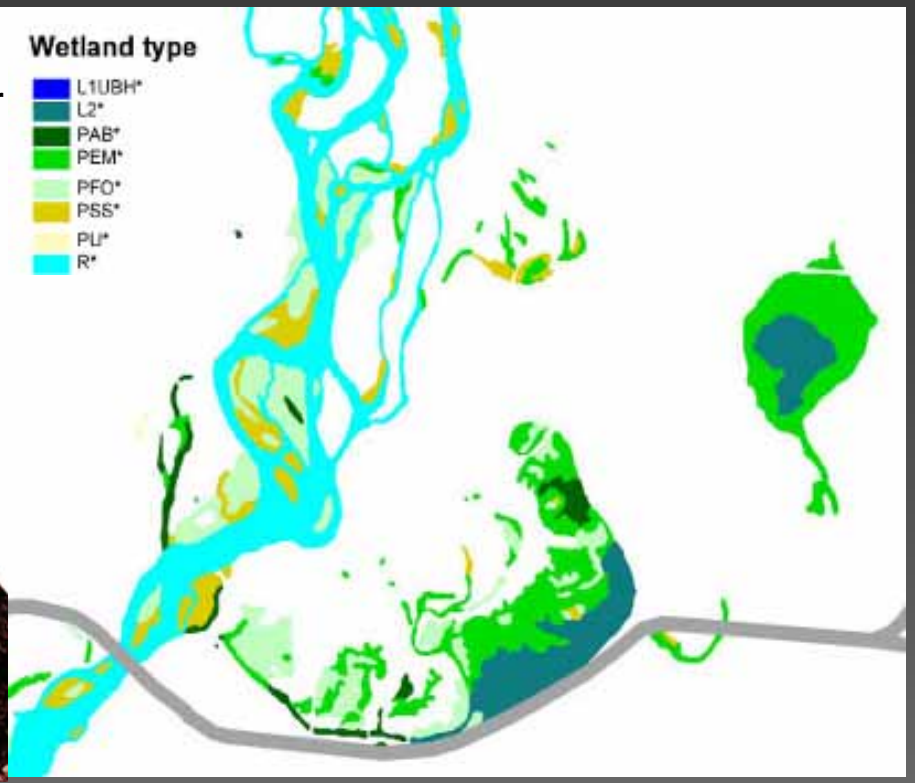
<u>1970s – present</u>: Growing interest in the environment, CWA, inclusion of wetlands in "waters of the U.S." development of the National Wetlands Inventory (NWI); uses hydrogeomorphic concepts for classification

<u>1990's – present</u>: HGM processes become more widely recognized, methods become more developed



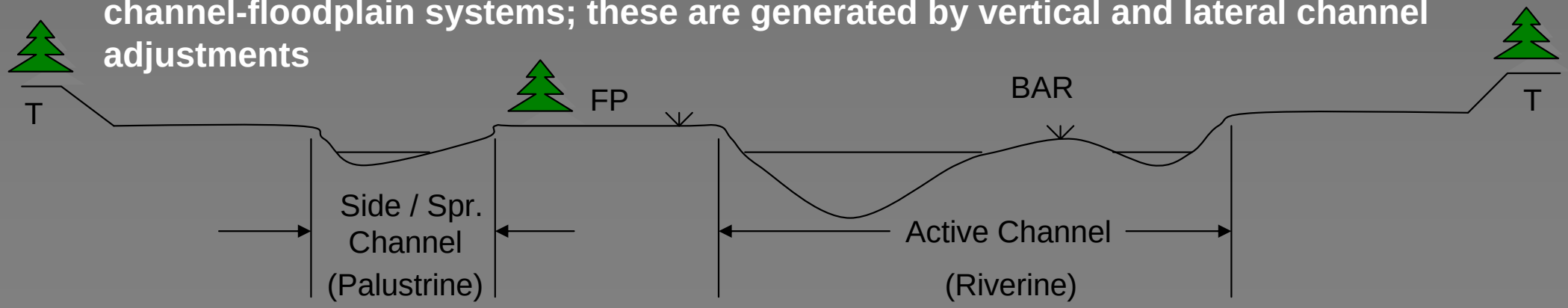


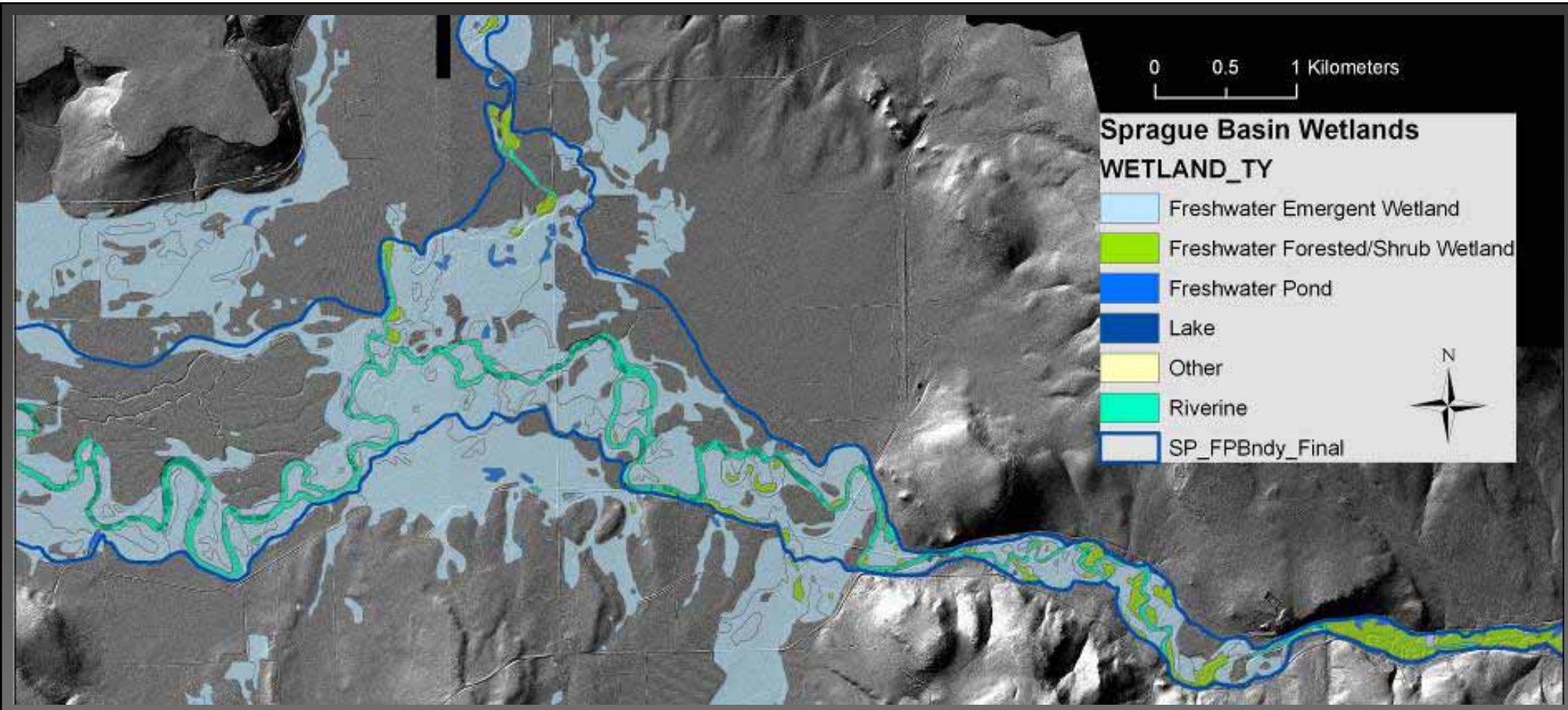
Hauer et al. 2002;
HGM Guidance for
N. Rocky Mtns



Region 10 Guidance for hydrogeomorphic assessment of floodplain wetlands in coarse-bedded rivers of the Northern Rock Mtns (ACE document by Hauer et al., 2002)

Recognizes a number of geomorphic landforms associated with regional channel-floodplain systems; these are generated by vertical and lateral channel adjustments

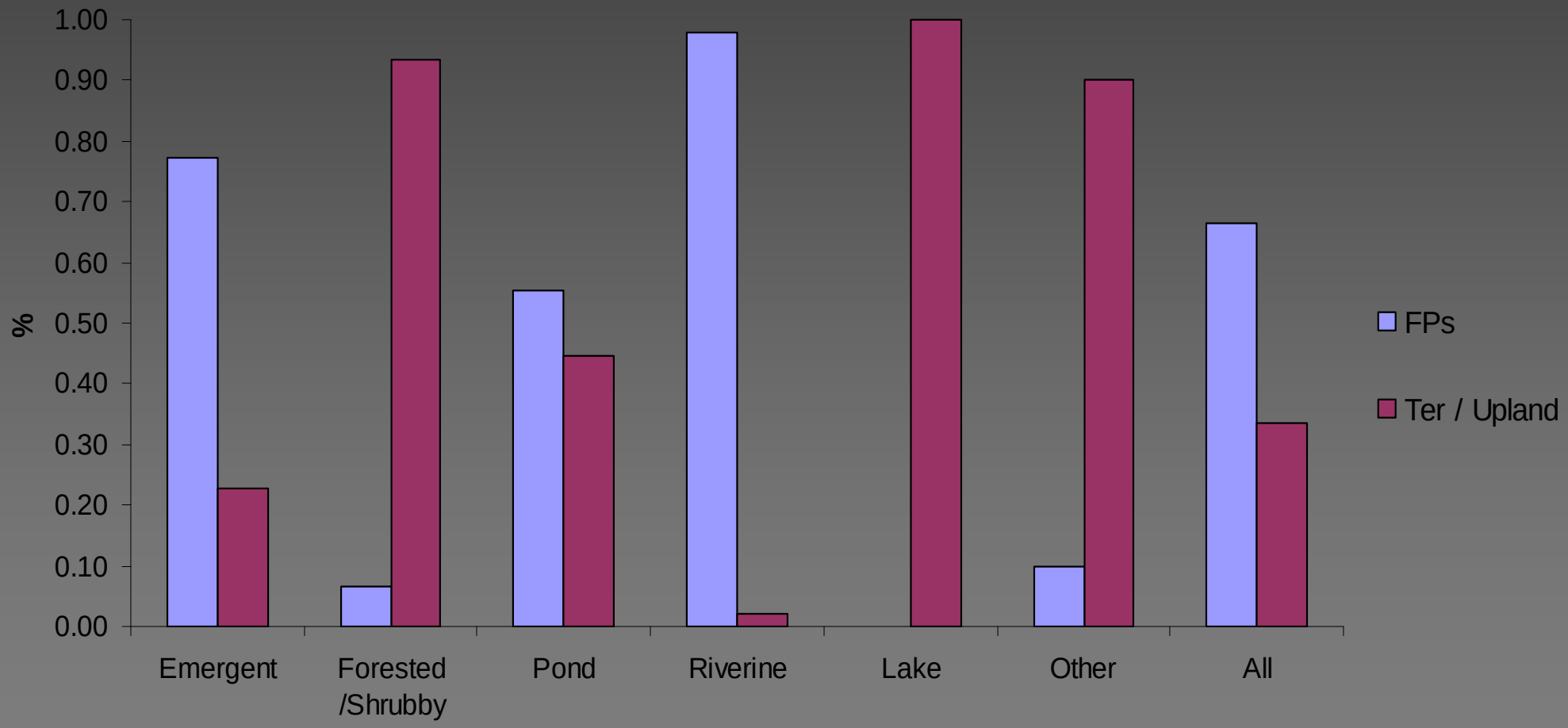


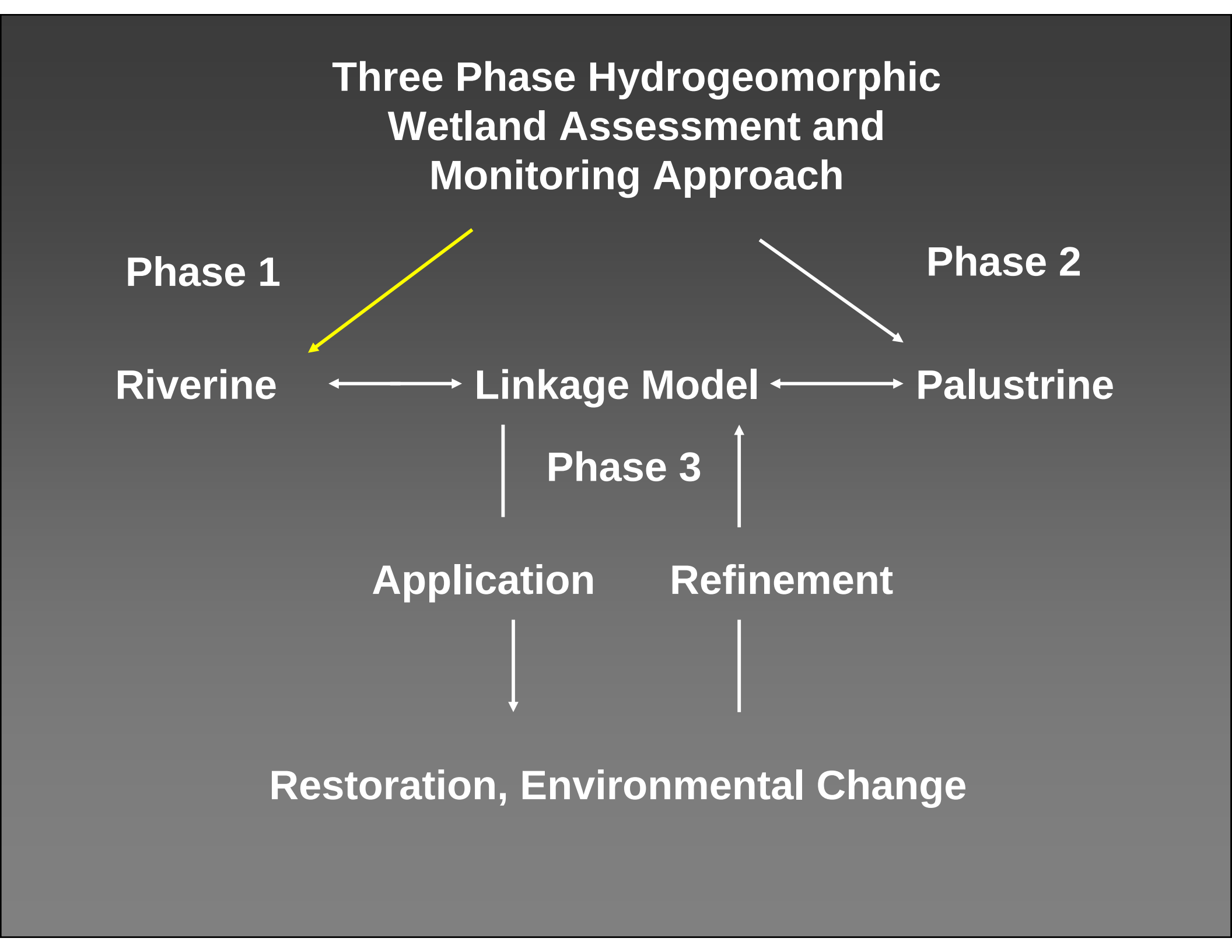


In comparison to N. Rocky Mtns:

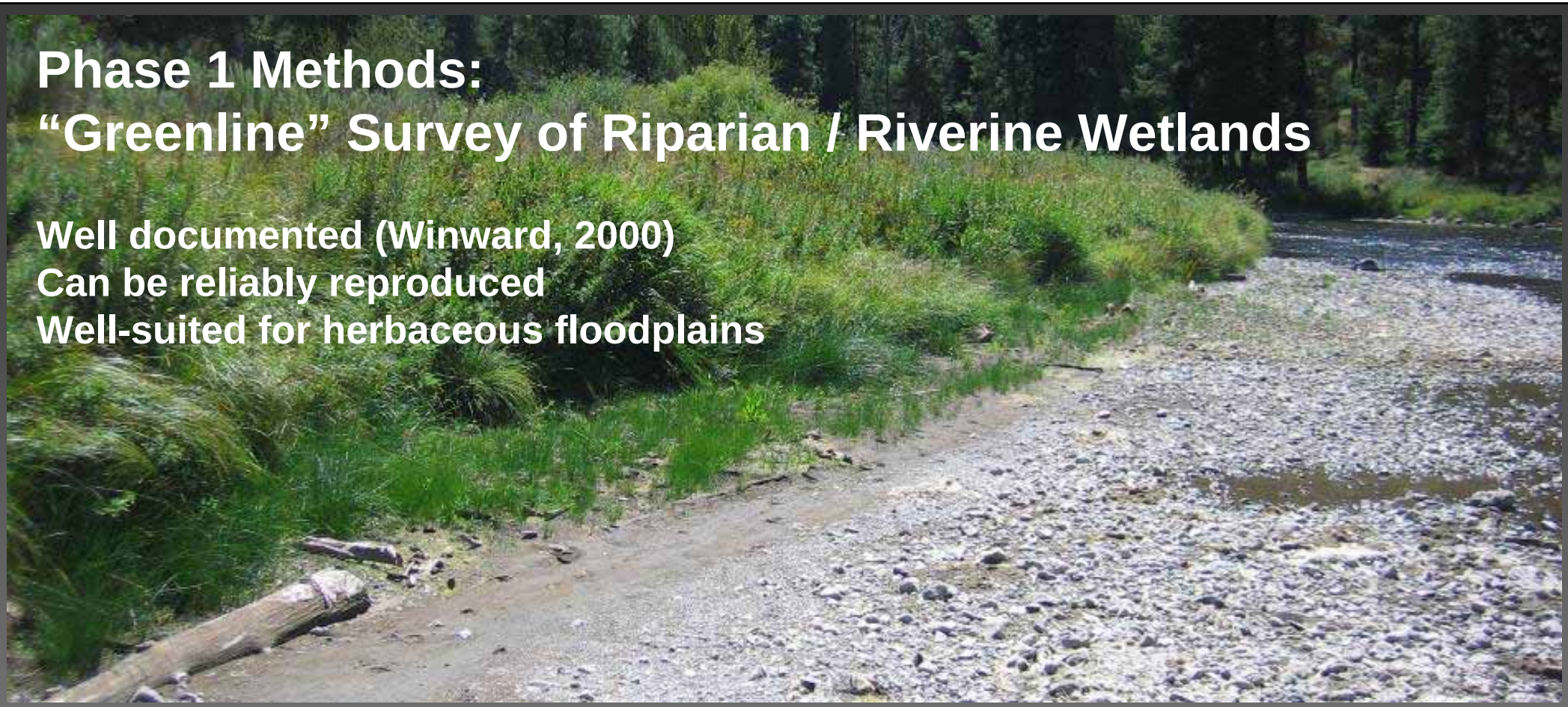
- **More meandering and anastomosing channels, less braiding**
- **Less woody vegetation floodplain**
- **More extensive palustrine area (wet meadow)**

Sprague Basin Wetland Profile (NWI data)




Three Phase Hydrogeomorphic Wetland Assessment and Monitoring Approach
Phase 1
Phase 2
Riverine
Linkage Model
Palustrine
Phase 3
Application
Refinement
Restoration, Environmental Change

Phase 1 Methods:
"Greenline" Survey of Riparian / Riverine Wetlands



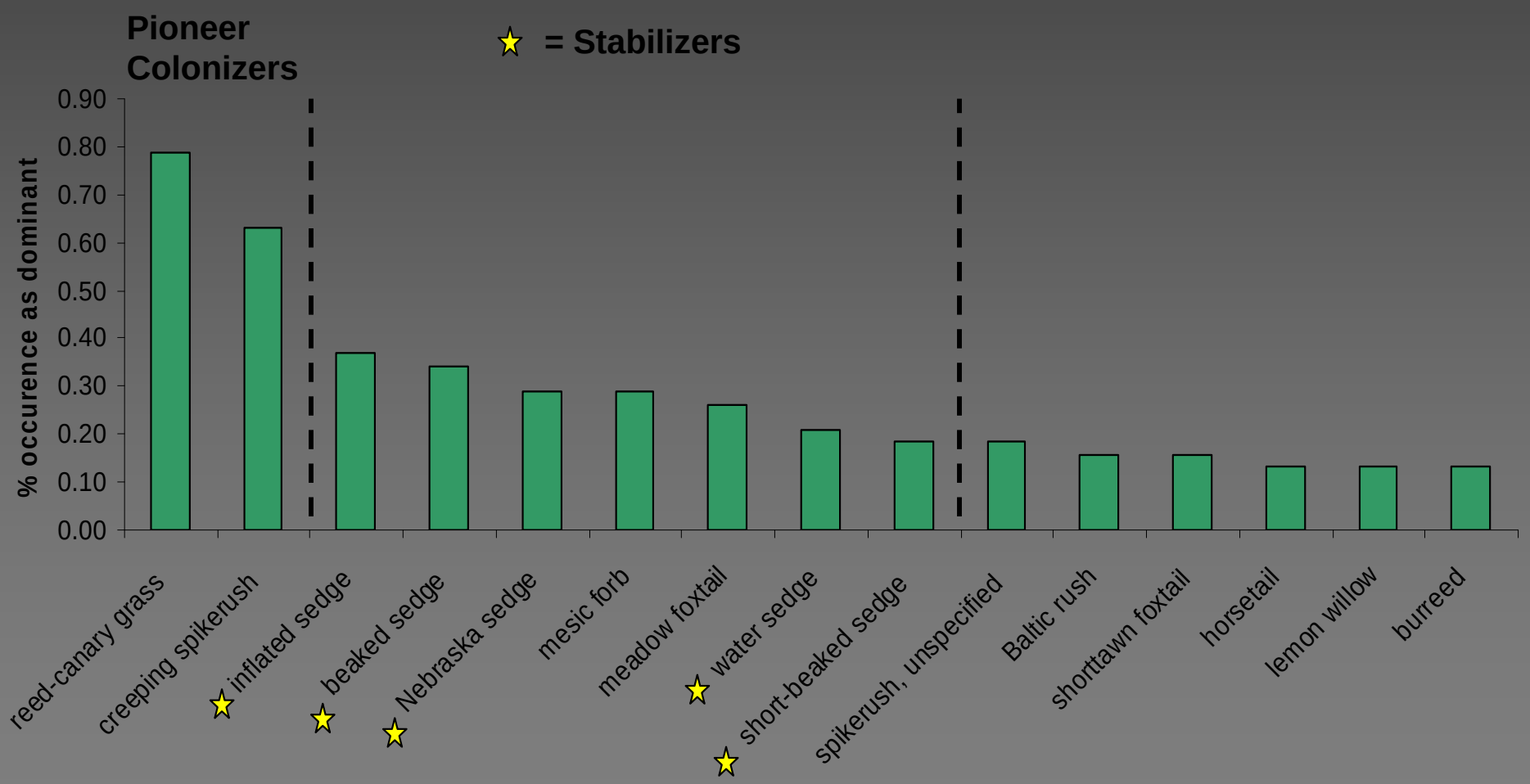
Well documented (Winward, 2000)
Can be reliably reproduced
Well-suited for herbaceous floodplains

Follow lowest line of continuous perrennial vegetation at baseflow, at least one foot wide

ID dominant and co- or sub-dominant plant species for 363 feet on each side of channel

topographic survey of the channel x-section, characterization of bed and bank sediment, rapid geomorphic assessment of relative channel stability (after Simon and Downs, 1995)

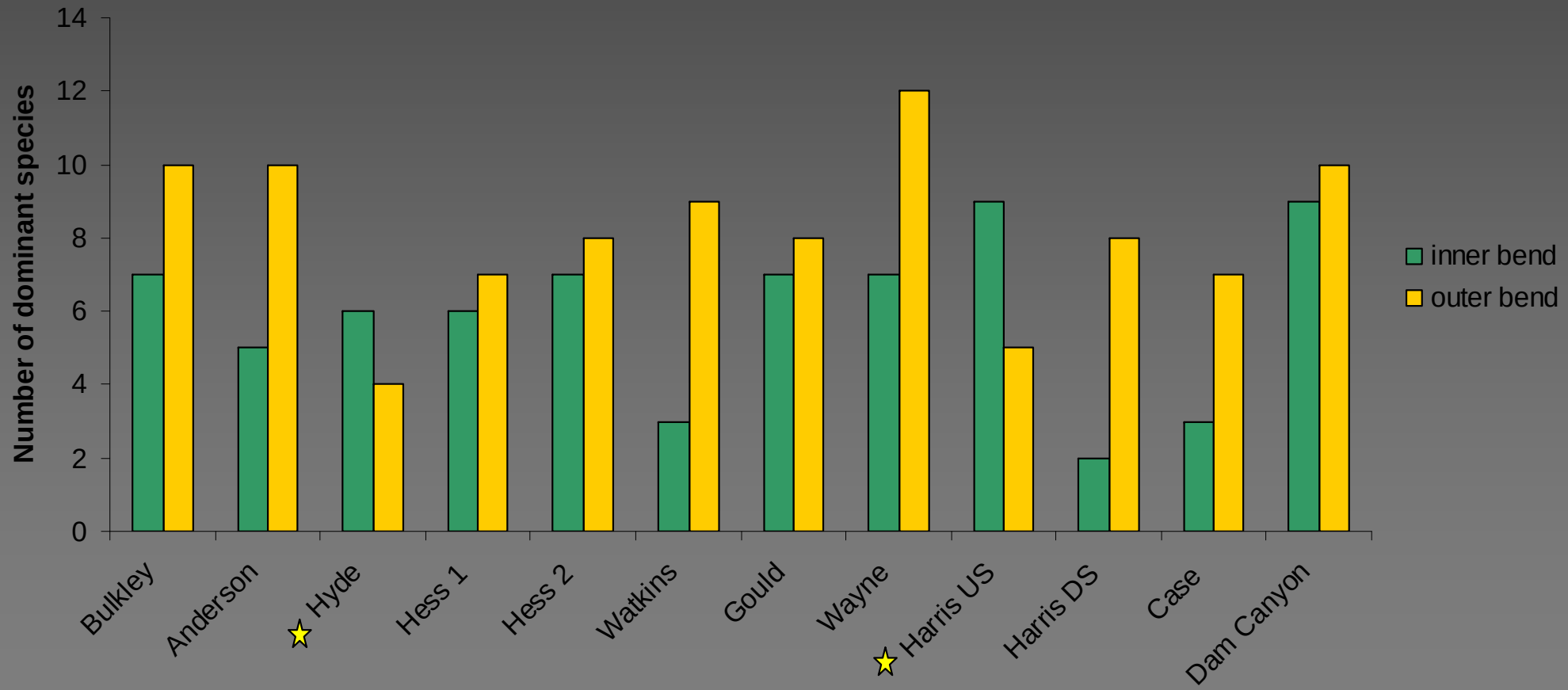
Results, n = 38 sites



Species with at least 5 sites reported as dominant

Can geomorphology explain differences in riparian vegetation?

Greater biodiversity on eroding banks at 10 of 12 sites with meandering channel



Conclusions / Interpretation

Prevalence of pioneer vegetation in the greenline indicates availability of fresh alluvium, which may result from widespread and recent or ongoing disturbance of channel banks (historical land-use conversion, grazing)

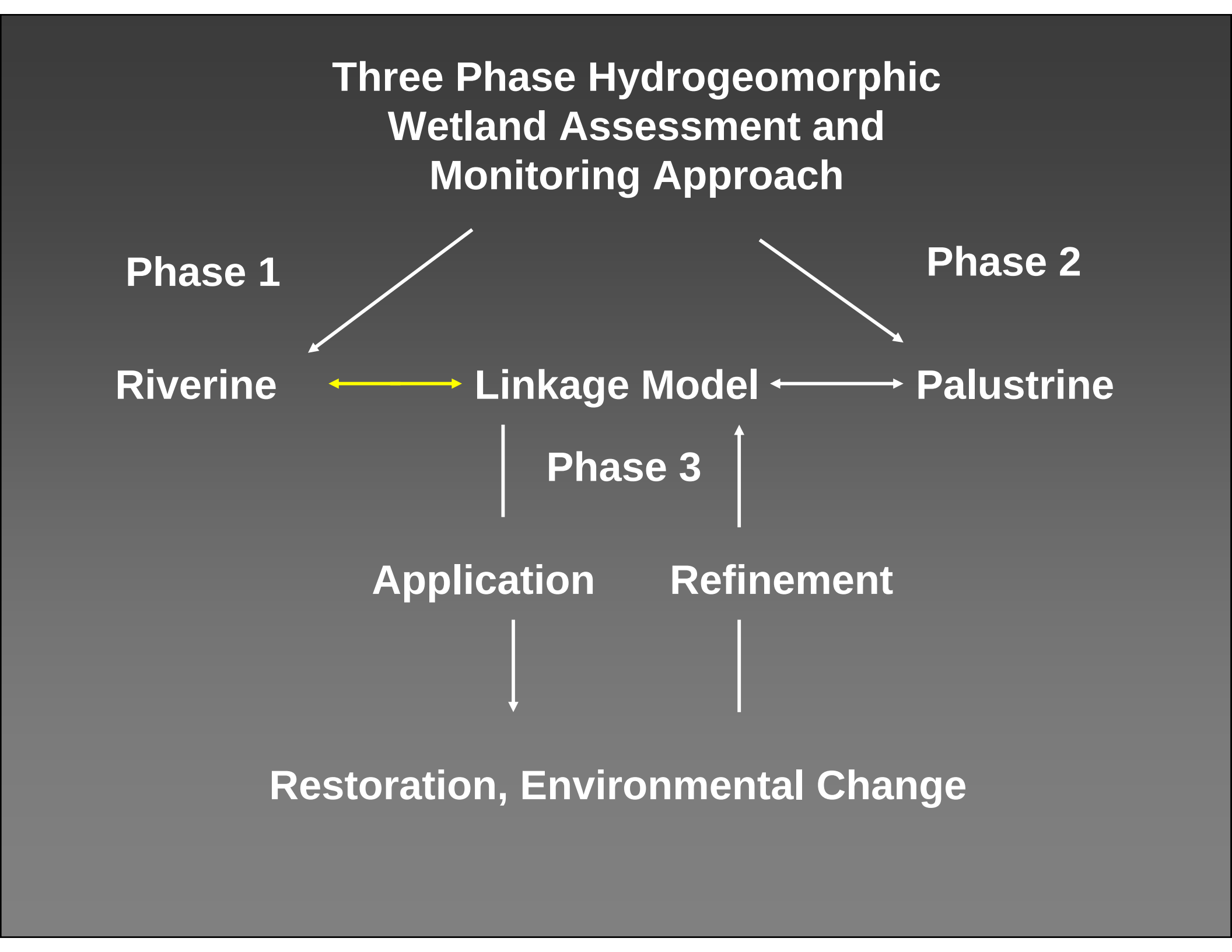
Invasive reed-canary grass has been an aggressive colonizer, perhaps outcompeting and limiting native sedges as early successional or transitional riparian vegetation

Outstanding questions: without intervention, will this situation continue? is it represented in palustrine wetlands? If not, how would they respond if hydrogeomorphic connections were enhanced?

Greater biodiversity of eroding and/or unstable outer bends among meandering channels begs the question:

Does this represent an artifact of the greenline method (vis-à-vis encountering a greater diversity of geomorphic surfaces in comparison to inner bends) or a true difference in vegetative potential associated with morphological state?

These alternatives to be need evaluated if the greenline method will be used to track riparian changes over long periods of time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In some places a palaeolake layer inhibits vertical incision, but potentially enhancing lateral movement (sometimes by avulsion, rapid channel switching) and physical connection with adjacent palustrine wetlands

Channel banks tend to evolve differently in these areas, with slow or spotty colonization of riparian vegetation on exposed benches

This layer should represent a strong variable in models of hydrogeomorphic connections between channel and floodplain wetland systems; needs more investigation during Phase 2 (palustrine wetland assessment and monitoring)