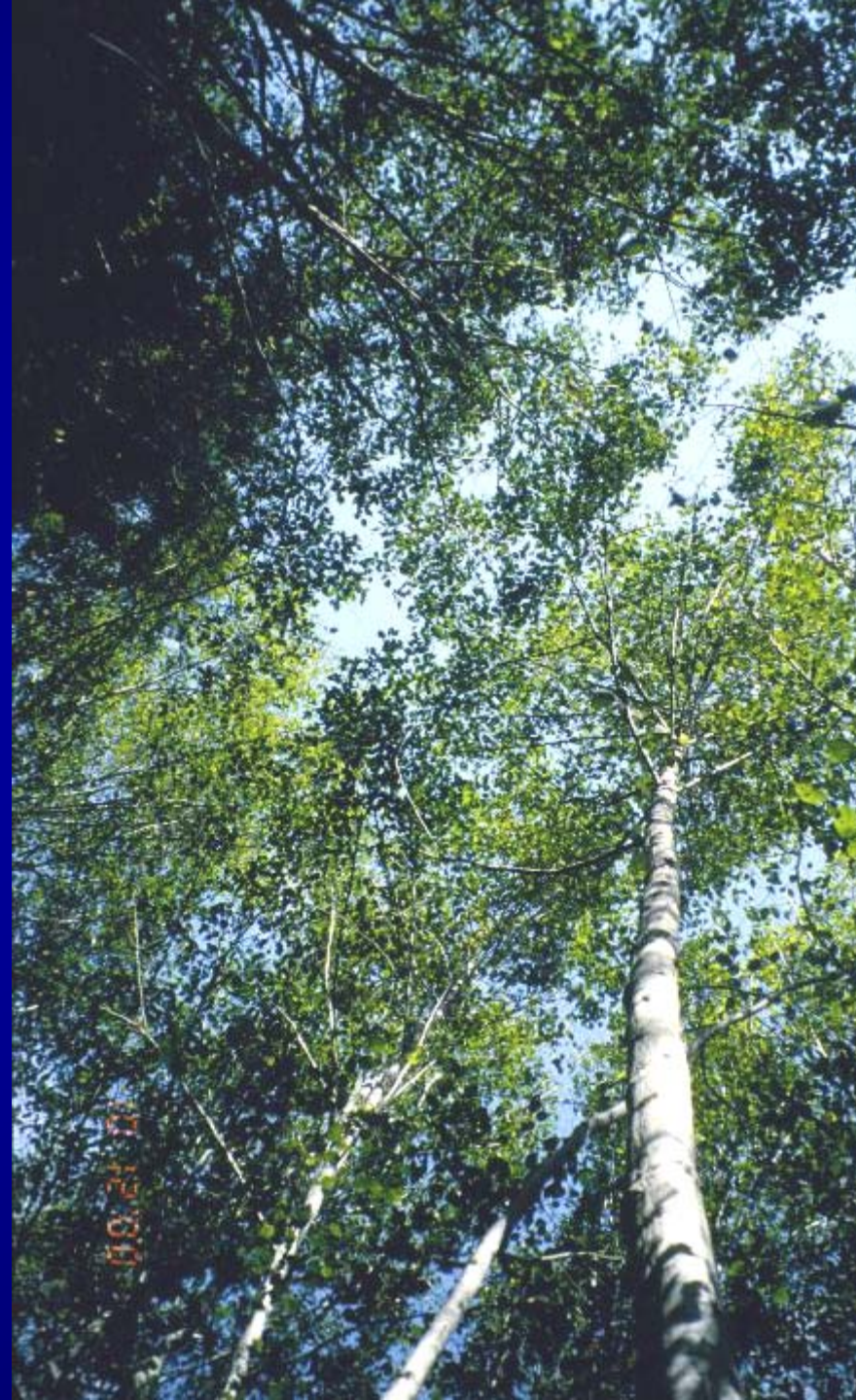


Riparian Zone Monitoring Plan (RZMP)



Michael Lennox

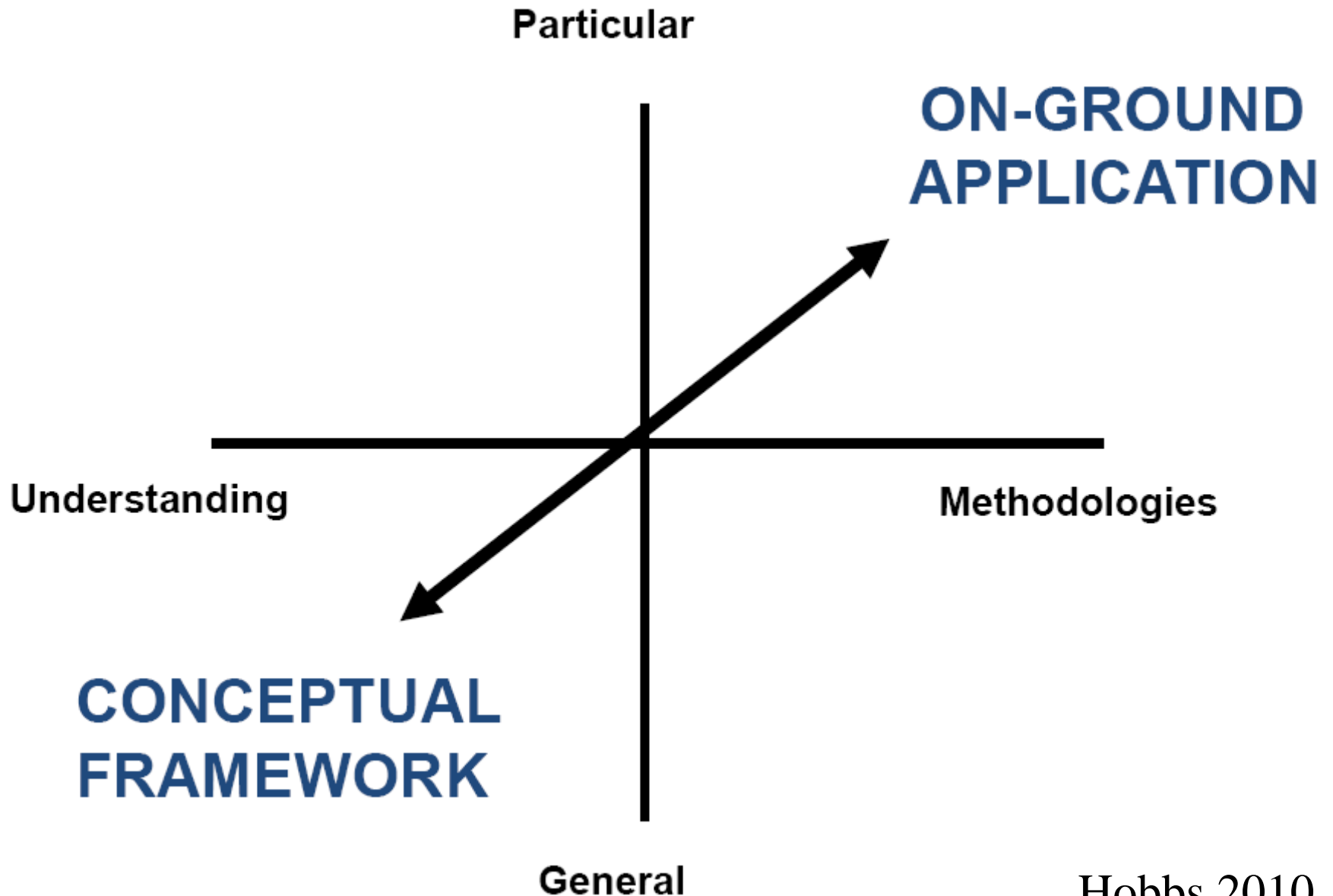
UC Cooperative Extension
Sonoma County



Measuring Change Over Time

1. Background research
2. RZMP approach & protocols
3. Future challenges







THE GOOD THE BAD AND THE UGLY

Hobbs 2010



THE GOOD THE BAD AND THE UGLY Hobbs 2010



Hobbs 2010



Hobbs 2010



2 years



8 years

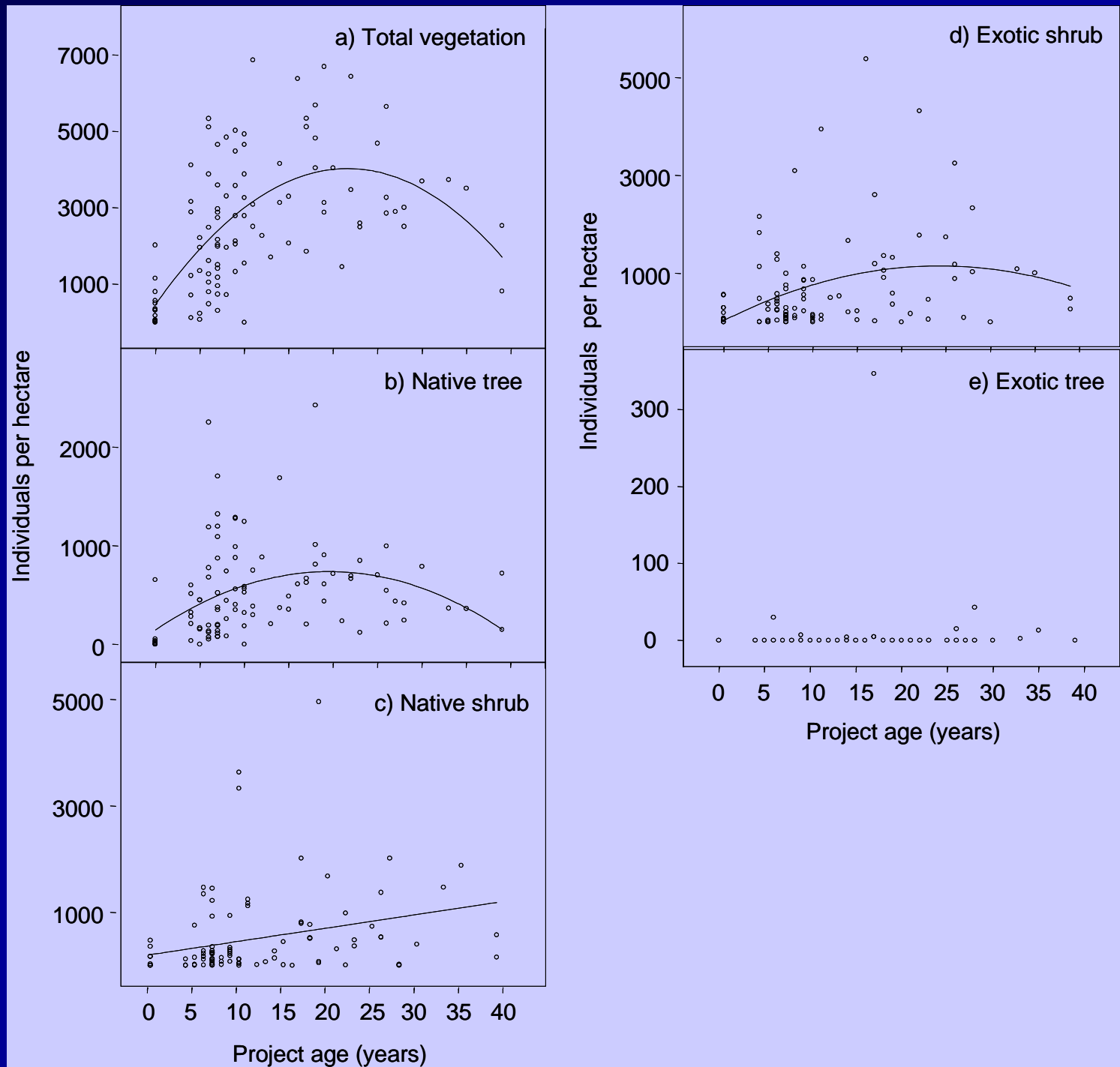


12 years

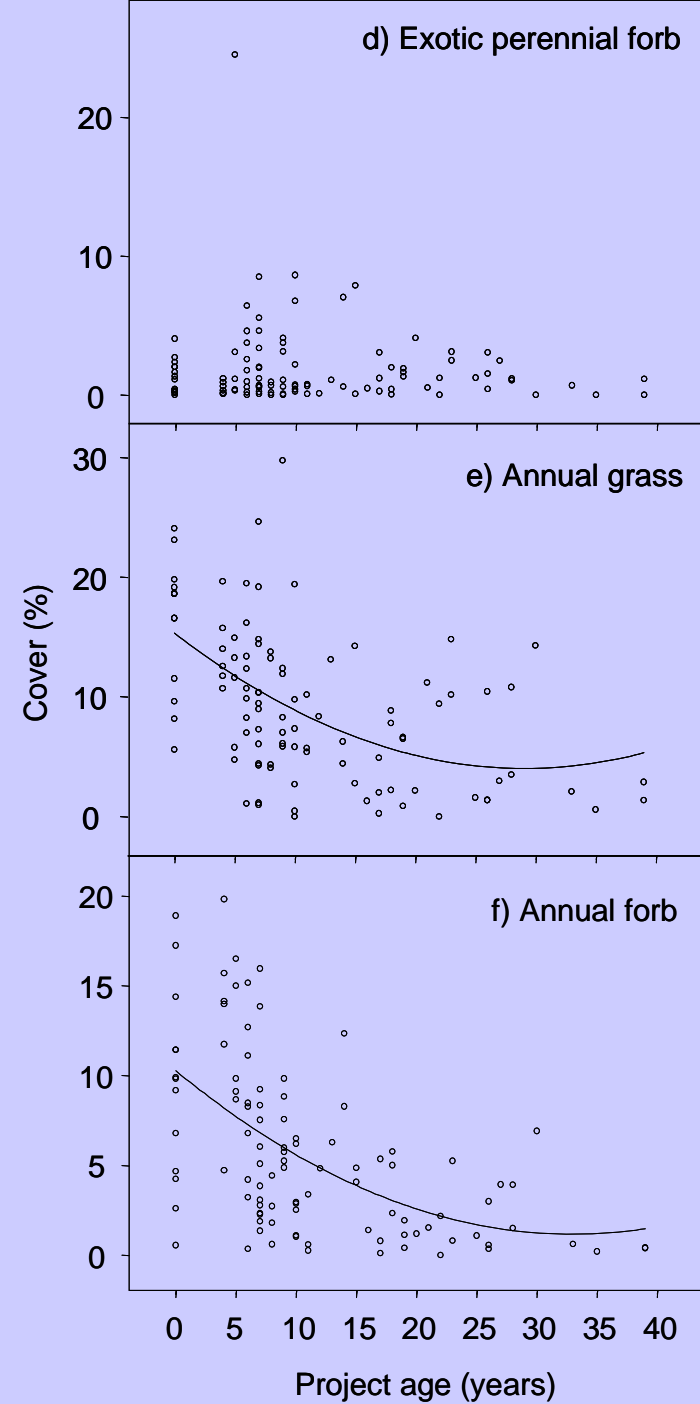
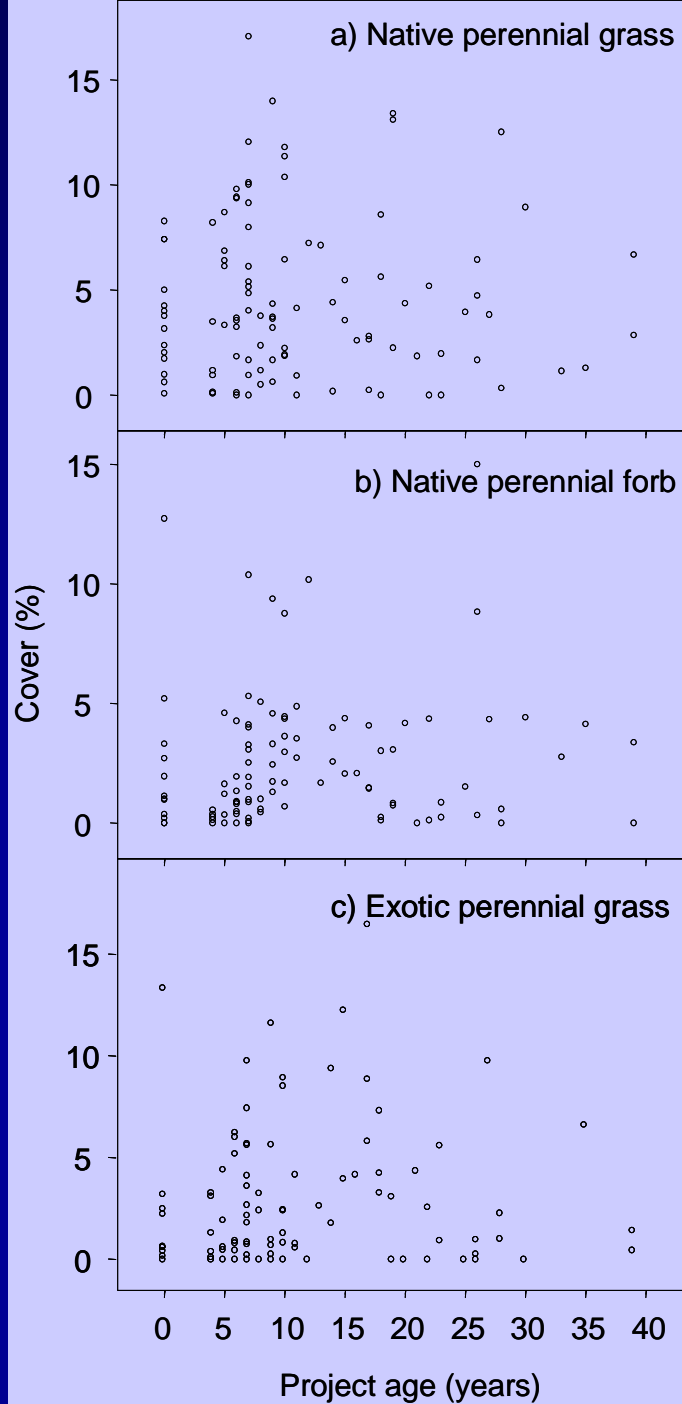


Photographic time-series
(images courtesy of Marin RCD)

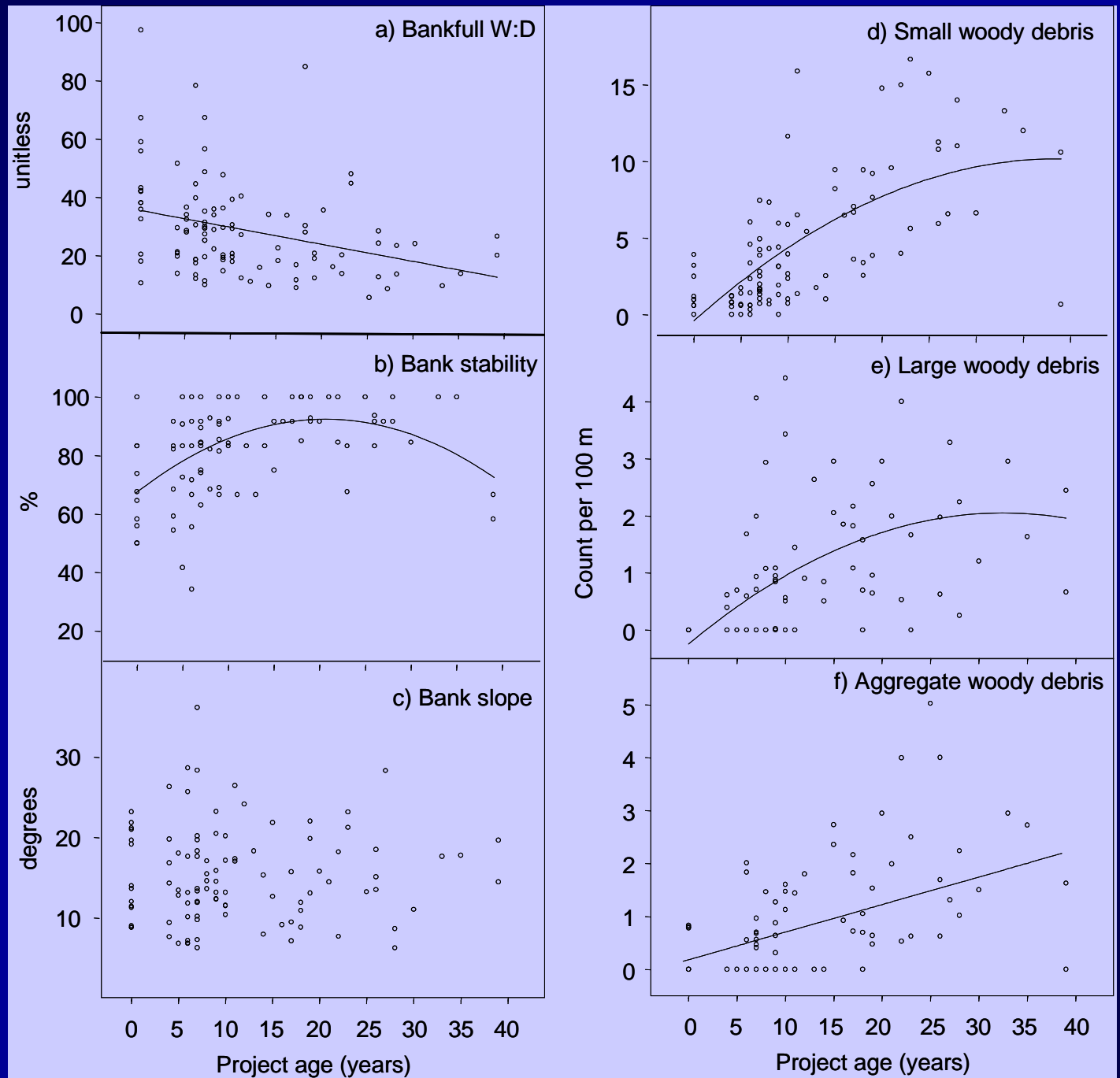
Density



Relative Cover



Stream Channel



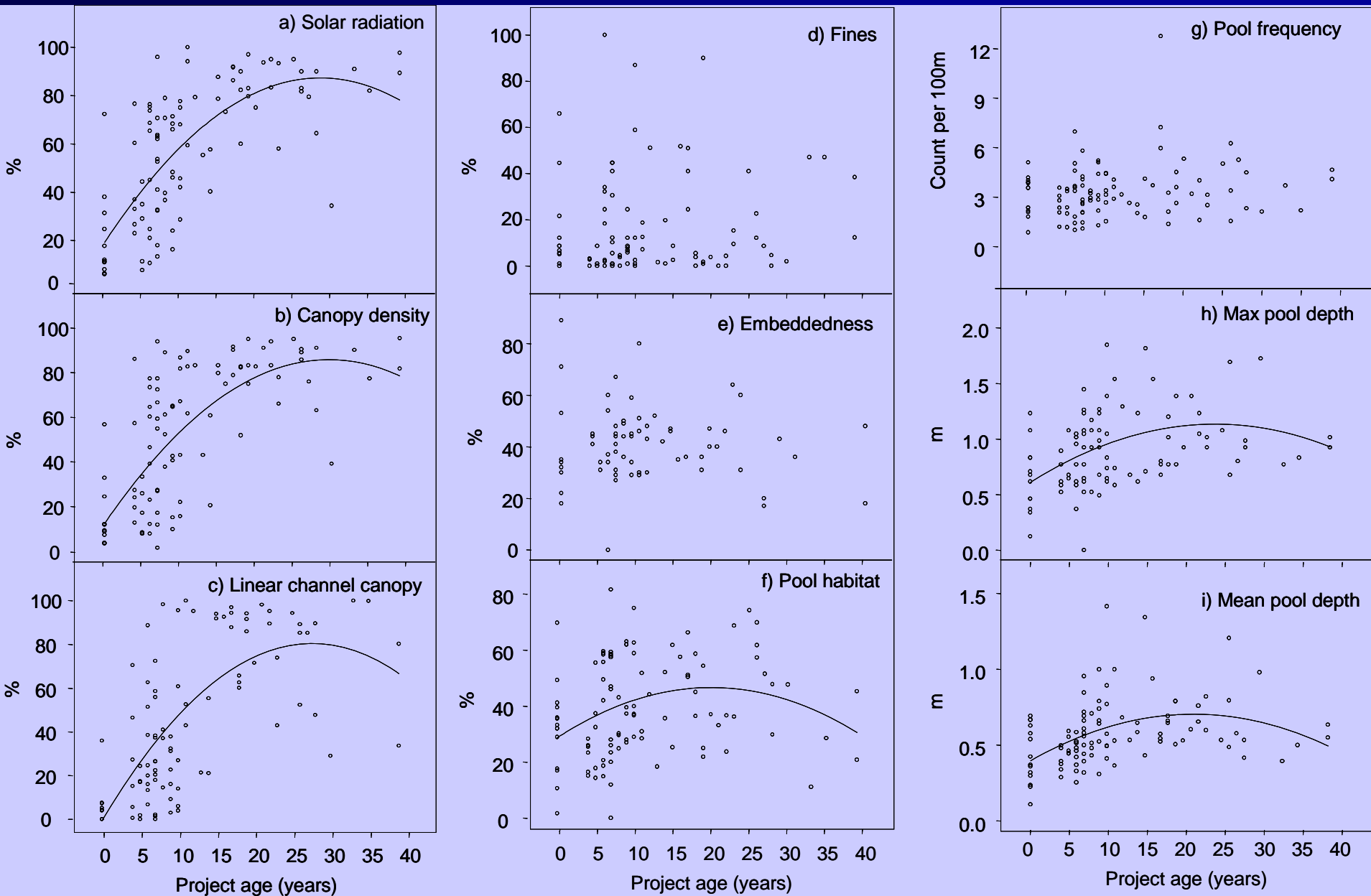
Walker Creek



20 year later debris jam < 1/100 meters



Water Column



How?

Living Wood

(Opperman 2005)

Instream habitat is provided by trees trapping woody debris that create deep pools in hardwood systems

Ecosystem Engineers

(Jones et al. 1994, 1997, Wright and Jones 2006)

1. An organism alters abiotic environment
2. Other organisms respond to abiotic changes

Fluvial Biogeomorphic Succession

(Corenblit et al. 2007, 2008)

The succession of fluvial landforms and associated vegetation

Big Picture



Site-specific projects
are connecting over
time for landscape scale
stream restoration



Restoration Method (planting)

- No effect on native tree density?
- More native tree species where planting occurred

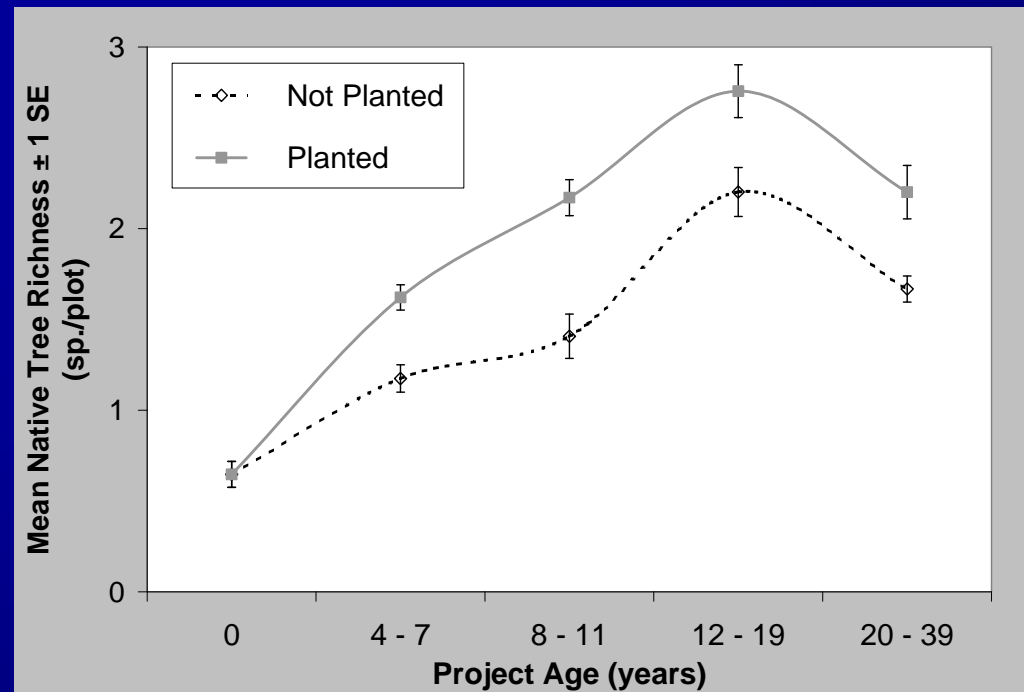
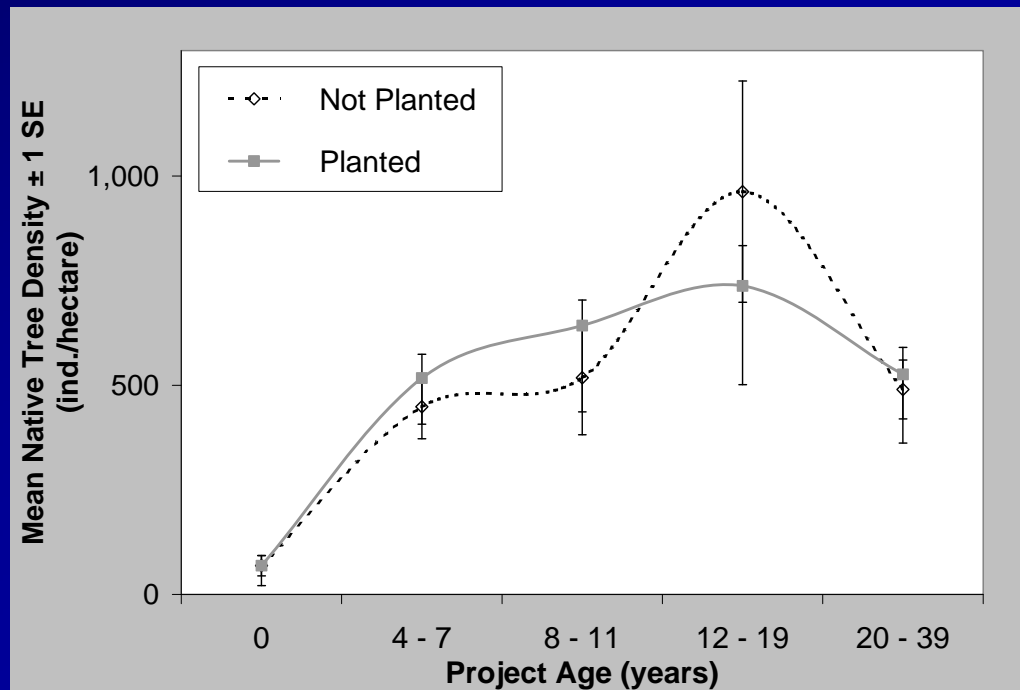
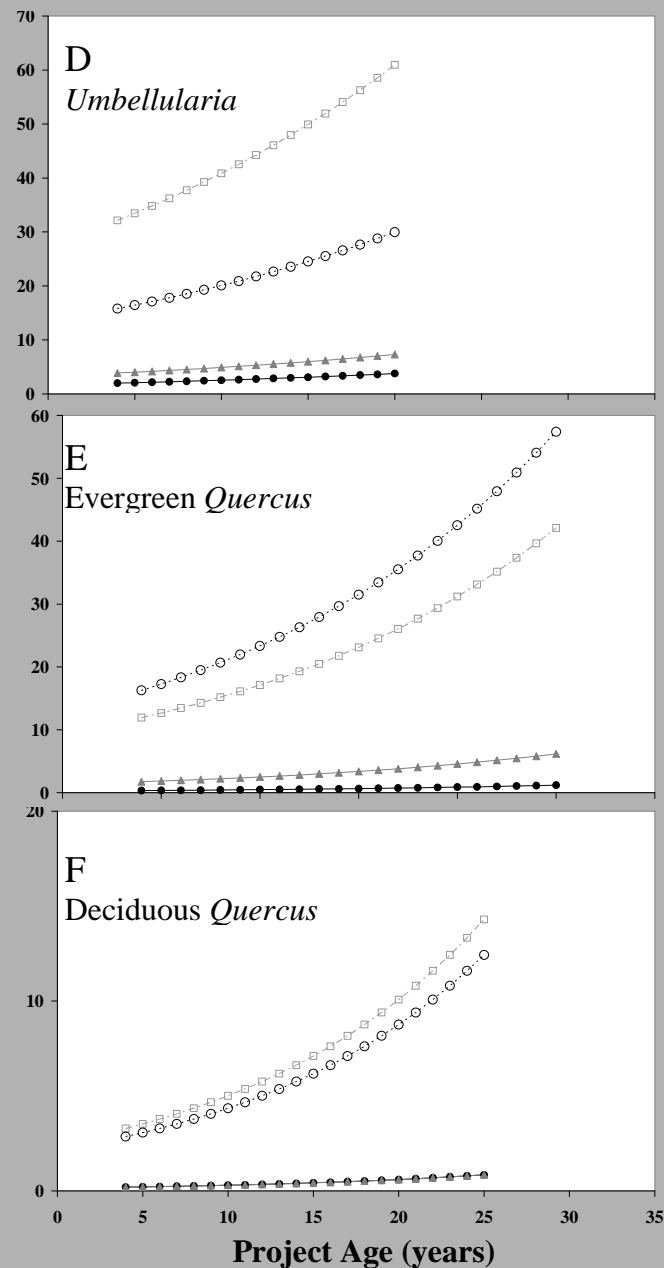
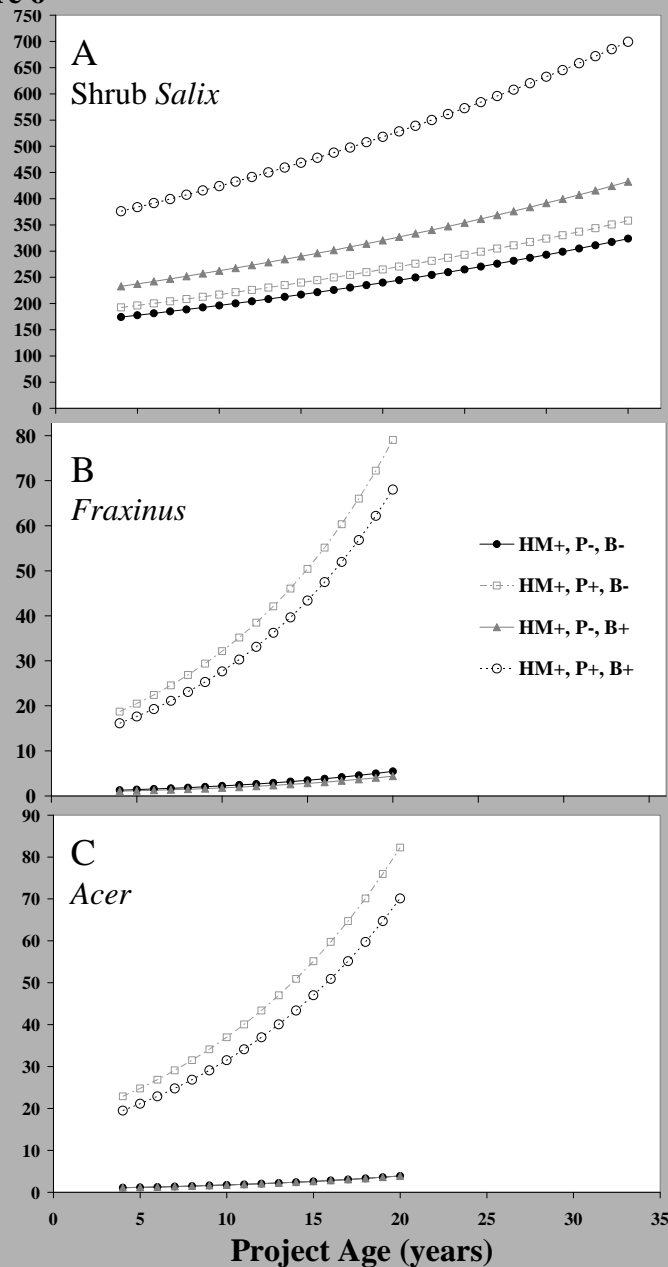


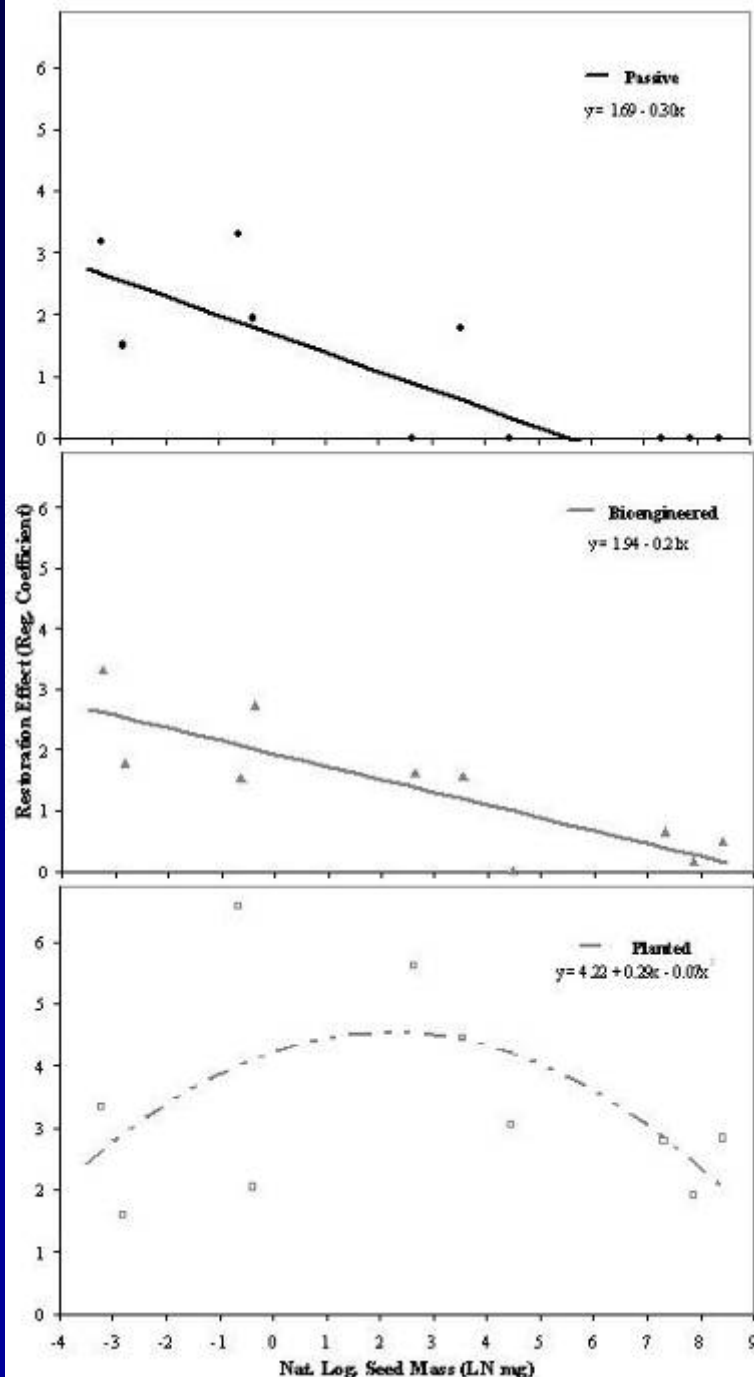
Figure 6

Density (ind./hectare)



Seed Size & Restoration Effect

- Small seeds colonize faster
- Planting changed the resulting forest composition

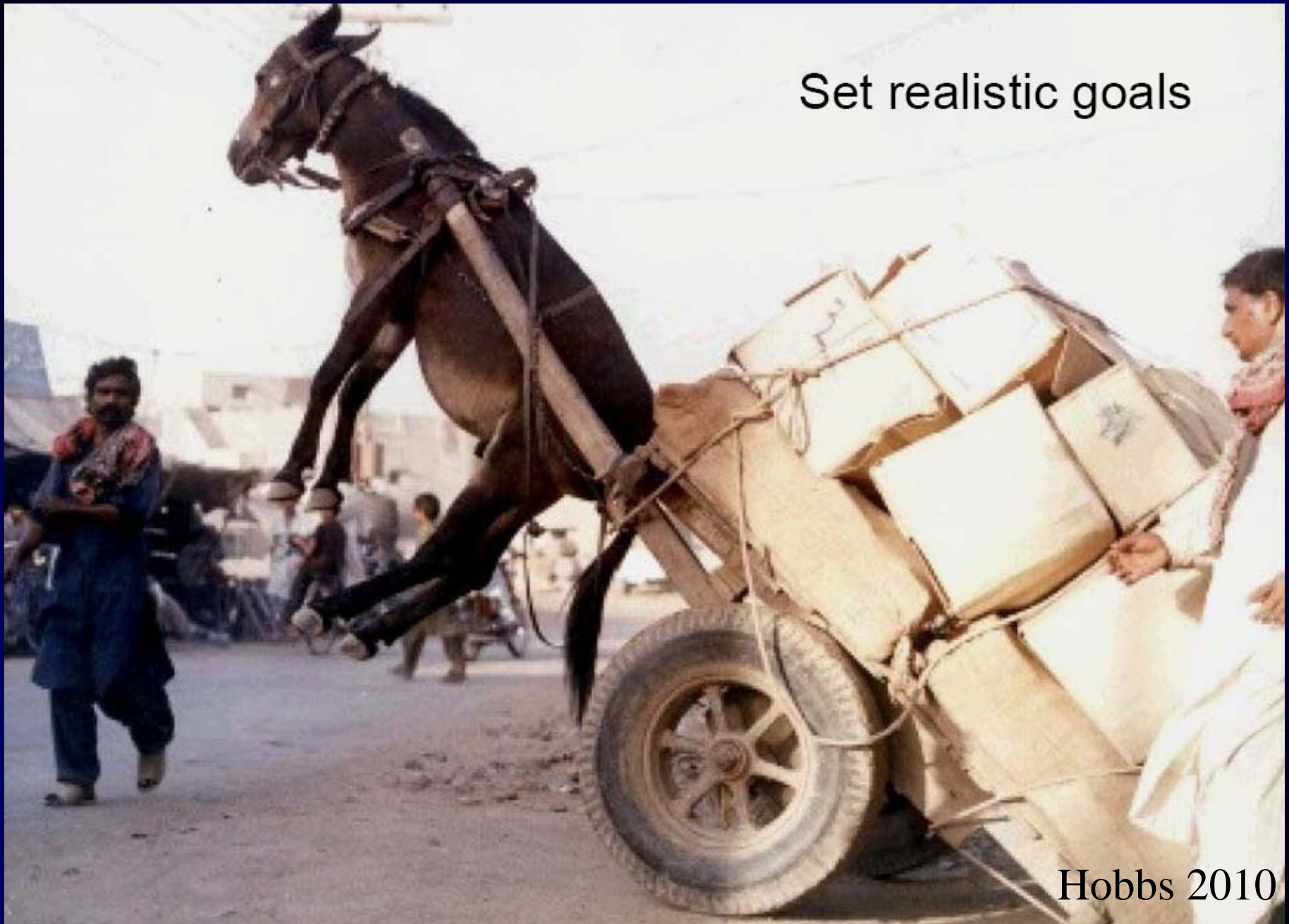


RZMP

provides a science-based guide to organize project monitoring based on site-specific objectives to further understand agricultural sustainability and ecosystem services

- USDA Natural Resources Conservation Service
- Students & Teachers Restoring A Watershed (STRAW)
- Point Reyes Bird Observatory Conservation Science
- Prunuske Chatham, Inc.
- Jeff Creque, Certified Rangeland Manager
- Marin Agricultural Land Trust
- San Francisco Bay Regional Water Quality Control Board
- Southern Sonoma County Resource Conservation District
- California Department of Fish and Game
- Point Reyes National Seashore
- Marin Municipal Water District
- The Nature Conservancy

Set realistic goals



Hobbs 2010

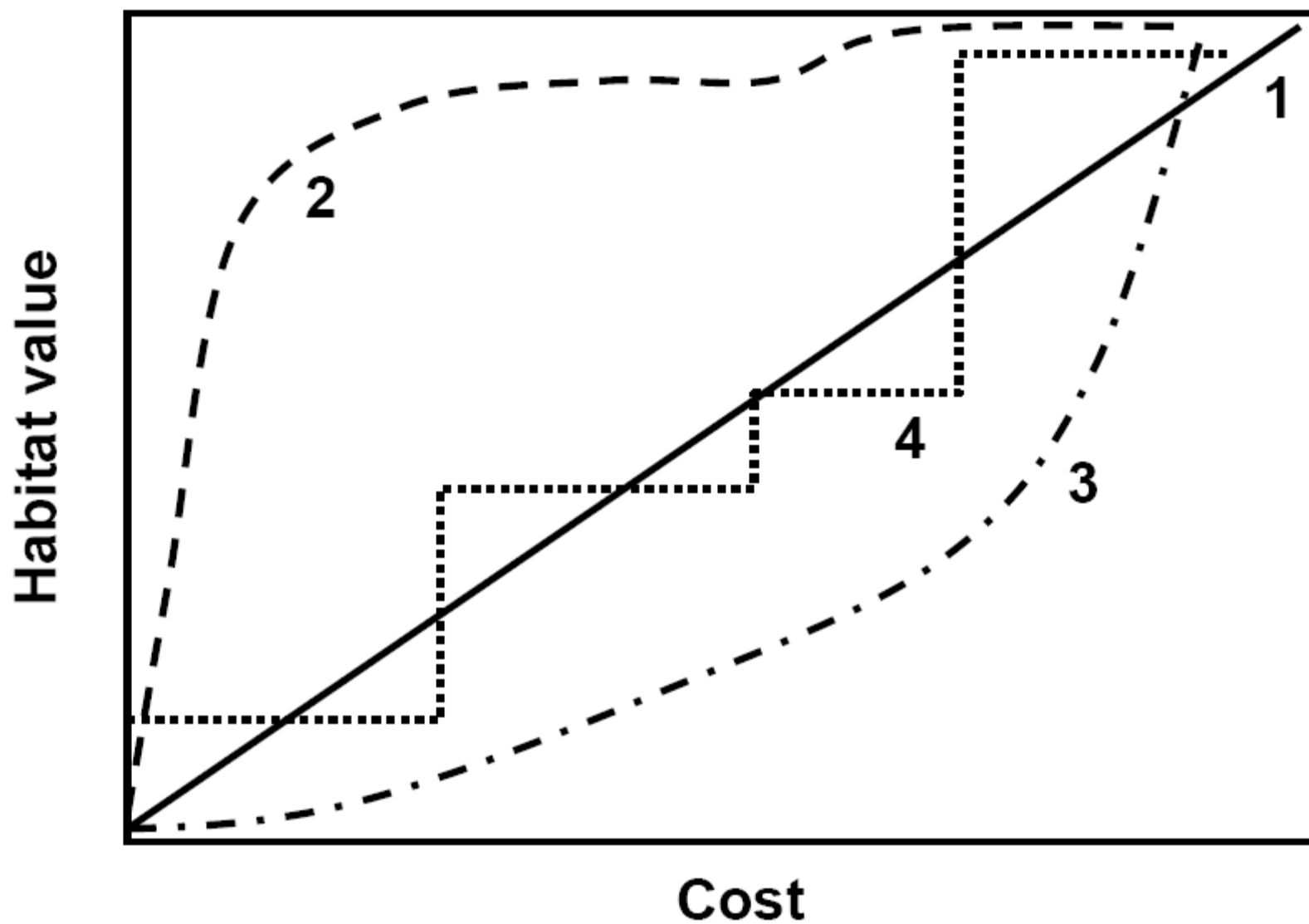


HISTORY MATTERS

We ignore the past at our peril—



but we can use it
as a guide
instead
of a straight-jacket



Miller & Hobbs 2008, Restoration Ecology

[illegible]

Implementation Monitoring



Project Objective	Completed Practices Location	Landowner Concern	Revegetation Survival
Measured Attribute (Target)	extent of each practice, as-built changes, delineate reveg. zones, # of each species planted/ area seeded, etc. (95%)	landowner satisfied (80%), problems fixed (90%)	survivorship (80%), establishment (40%)
Form/ Protocol	Site Map/ Sketch, Photo-points, Reveg. Data, Project Assessment Checklist	Landowner Questionnaire, Project Assessment Checklist, Maintenance/Event	Revegetation Survival

Site Map

- 4 subsections
- Photo-points
- Streambank Stability LIT (red)
- Aquatic Habitat Transect (blue)
- Riparian LIT (green)



Effectiveness Monitoring

Project Objective	Benefit ranch viability/ productivity	Reduce/ prevent sediment delivery/ erosion	Reduce/ prevent pathogen or nutrient delivery	Improve/ preserve riparian habitat	Improve/ preserve aquatic habitat
Measured Attribute (Target)	landowner observations, electric/ vet./ water bill, RDM	Eff. ratings (80%), RDM (1000 lb/ac), eff. rating (80%), groundcover (90%), bank stability (75%)	RDM (1000 lb/ac), groundcover (90%)	Eff. rating (80%), Cover of native tree (60%) shrub (30%) inv. exotic weeds (<30%), & species #	shelter rating (80), shade (90%), LWD (2/100ft), max. pool depth (1m), bankfull W:D (<3:1)
Form/ Protocol	Landowner Questionnaire, Project Assessment Checklist, Sediment Load Estimates	Project Assessment Checklist, Sediment Load Estimates, Streambank Stability Line Intercept, Cross-sections	Project Assessment Checklist, Streambank/ Riparian Line Intercept	Project Assessment Checklist, Streambank/ Riparian Line Intercept	Project Assessment Checklist, Aquatic Habitat, Stream Shade, Tag Lines, Resurvey Site

PAC = Implementation + Effectiveness

Riparian Vegetation (Ward et al. 2003b, Ward et al. 2003c, USDA 1998)

- Excellent = 'natural veg' at least 2 active channel widths (native perennials - rush, shrubs, trees, etc. - OR annual grass at intermittent streams) with all age classes of woody species or point bars regenerating
- Good = 'natural veg' 1 active channel width – covers floodplain (bare spots common at intermittent streams)
- Fair = 'natural veg' ½ active channel width – bare spots common or filtering function slightly compromised
- Poor = 'natural veg' < ½ active channel width – bare spots common or lack of regeneration or filtering function severely compromised

Stability (Ward et al. 2003b, Ward et al. 2003c, USDA 1998)

- Excellent = banks and channel are stable with outside bends protected by vegetation
- Good = moderately stable with infrequent, small areas of erosion – mostly healed over
- Fair = moderately unstable with outside bends actively eroding – steep bare soil with high erosion potential
- Poor = banks are unstable with active erosion frequent at site

Project Assessment Checklist (PAC)

Effectiveness Ratings (Collins 2009)

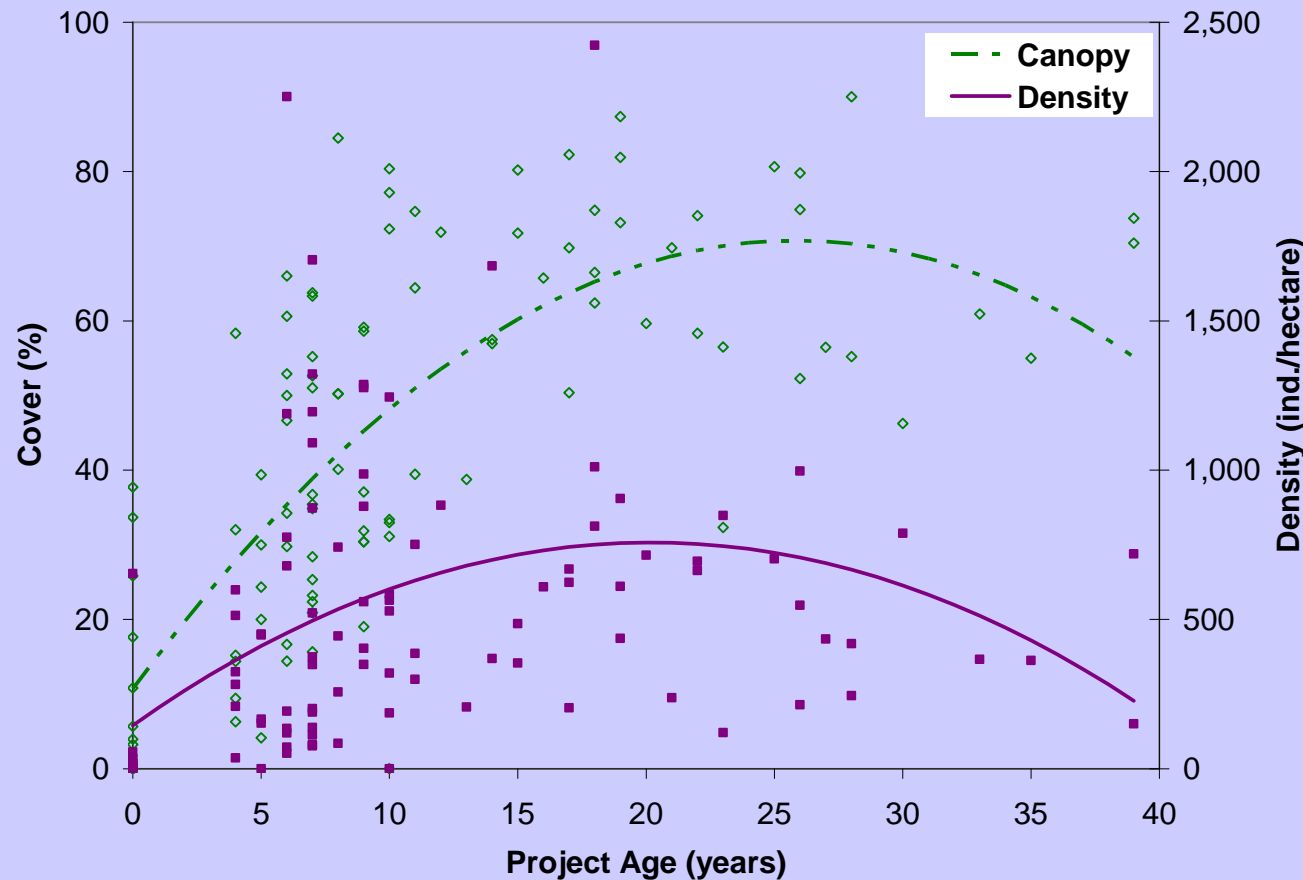
RATING	OBJECTIVES	TARGETS	UNINTENDED EFFECTS	STRUCTURAL CONDITION
<u>Excellent</u>	Achieved all stated objectives.	Met or exceeded targeted values.	No negative unintended effects. Unintended positive effects may outweigh failure to achieve a target value.	Excellent to Good. Has the intended functional value.
<u>Good</u>	Achieved most stated objectives.	Did not quite meet all targeted values. Or, if no targets were specified, maximum rating is Good.	Nonnegative unintended effects.	Excellent to Fair. Has the intended functional value.
<u>Fair</u>	Partially achieved most objectives, or objectives not achieved were outside the control of practice.	May or may not meet all targeted values.	May have minor unintended negative effects that partially offset objectives.	Excellent to Fair. Has functional value.
<u>Poor</u>	Achieved at least 1 objective – those not achieved were the fault of the practice.	May or may not meet all targeted values.	May have minor or major unintended negative effects that offsets or negates a targeted gain.	Excellent to Poor. Has some functional value.
<u>Fail</u>	Achieved no objectives – practice may be completely gone.	Did not meet targeted values.	May have unintended negative effects that are degrading the habitat and outweigh achieved objectives.	Excellent to Fail. Has no functional value.

Canopy Cover

L.I.T.

(Harris 2005)

- Veg. cover by height class
- Stability at bankful



Sediment Load Estimates



Streambank



Sheet/Rill



Gully

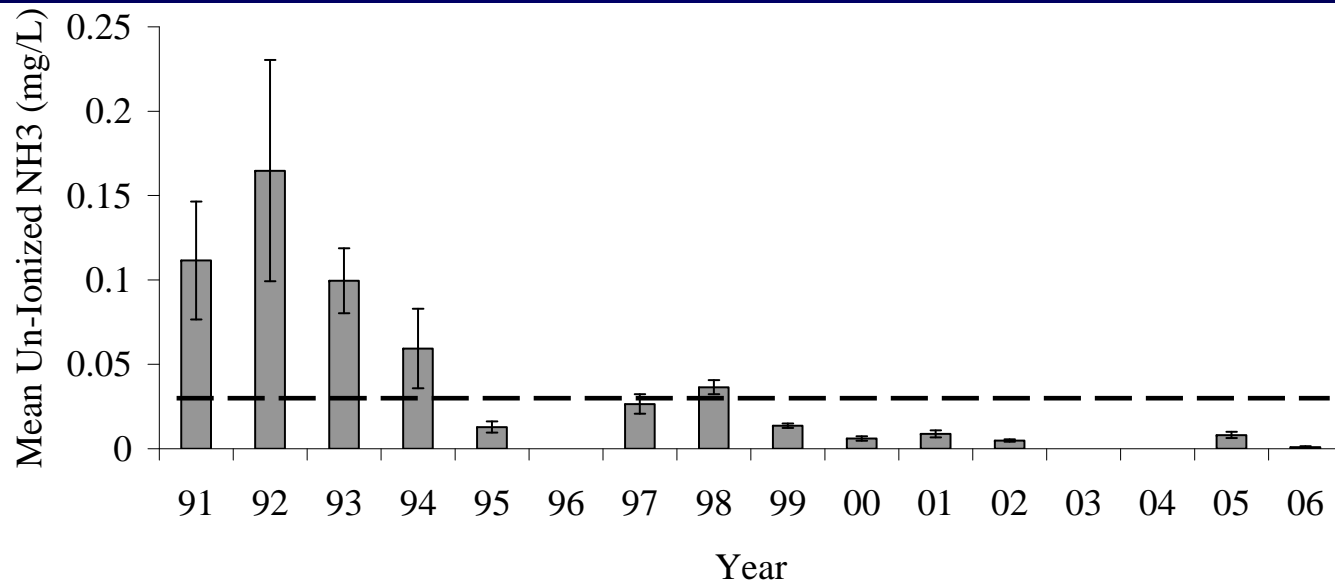
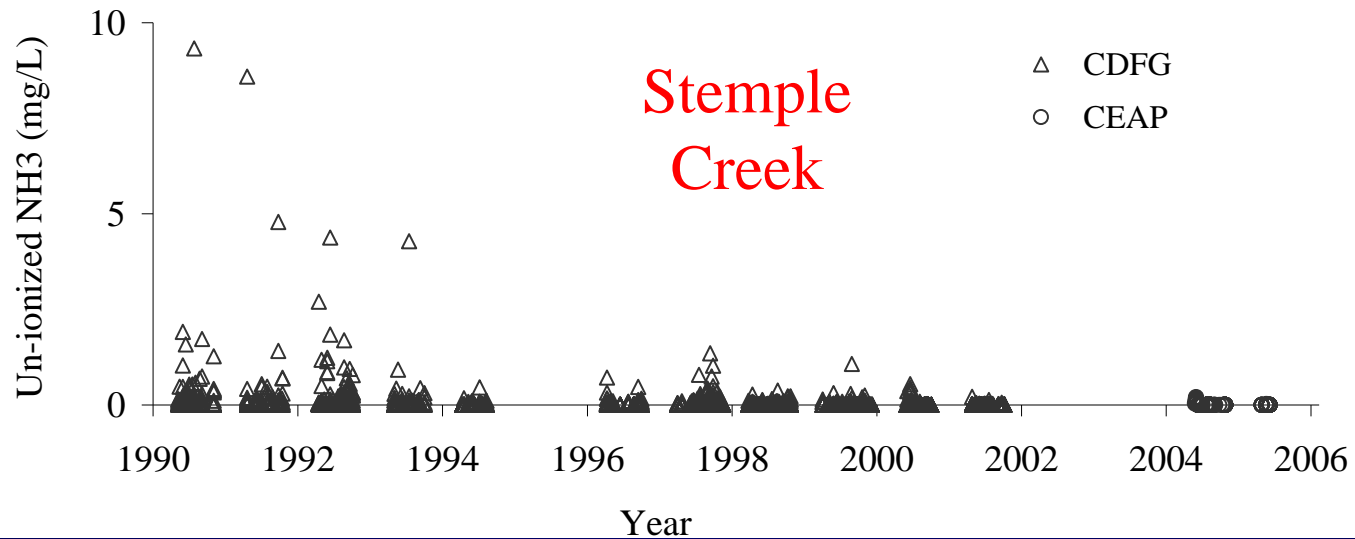


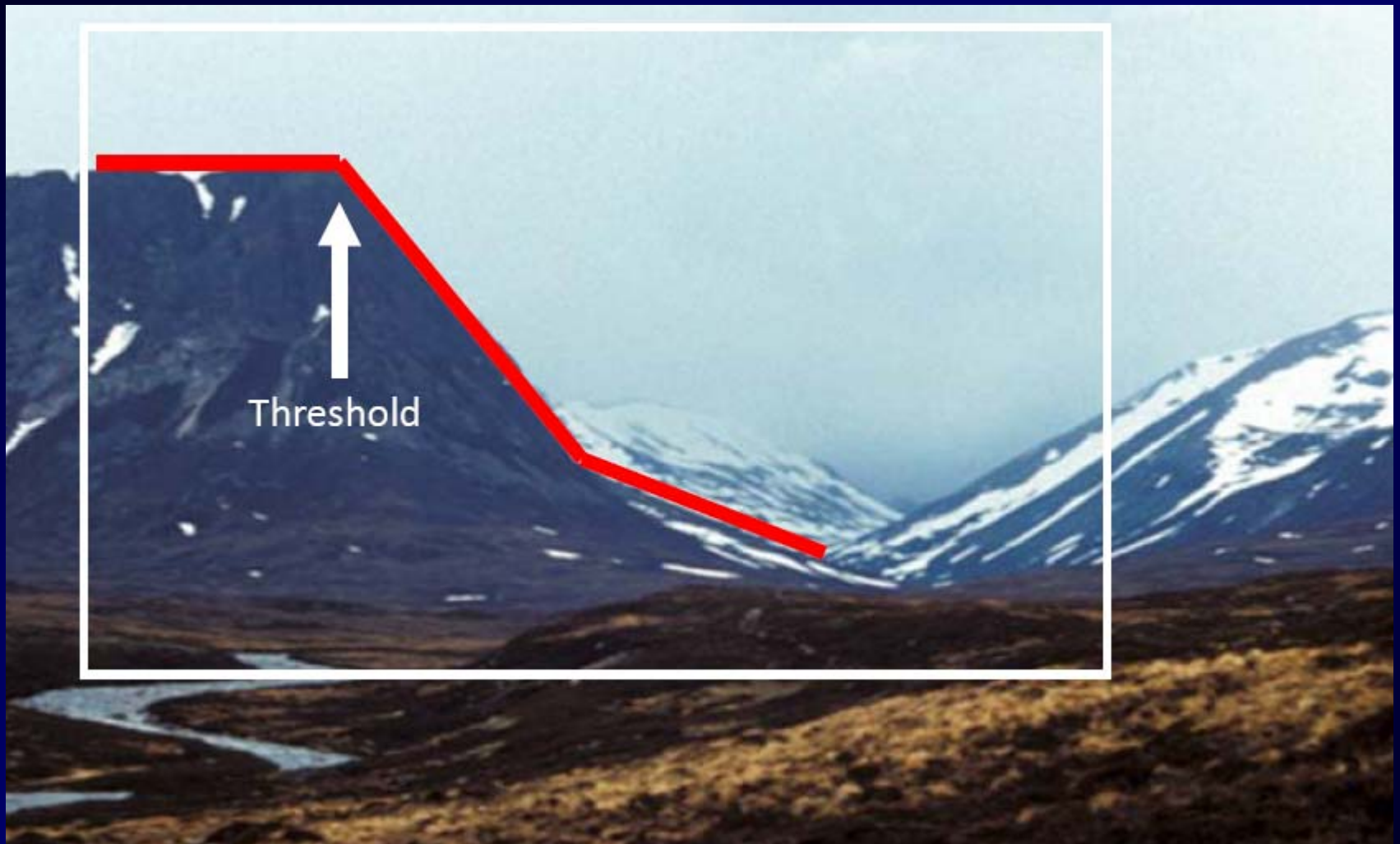
Validation Monitoring

Project Objective	Increase/ preserve terrestrial wildlife abundance/ diversity	Increase/ preserve aquatic species abundance/ diversity	Improve/ preserve water quantity/ quality
Measured Attribute	species #, species of interest	Fish/amphibian/shrimp density, presence, species #	Spring/ summer stream temp
Protocol	Area search, Point-count survey	Snorkel/ visual surveys	Data loggers

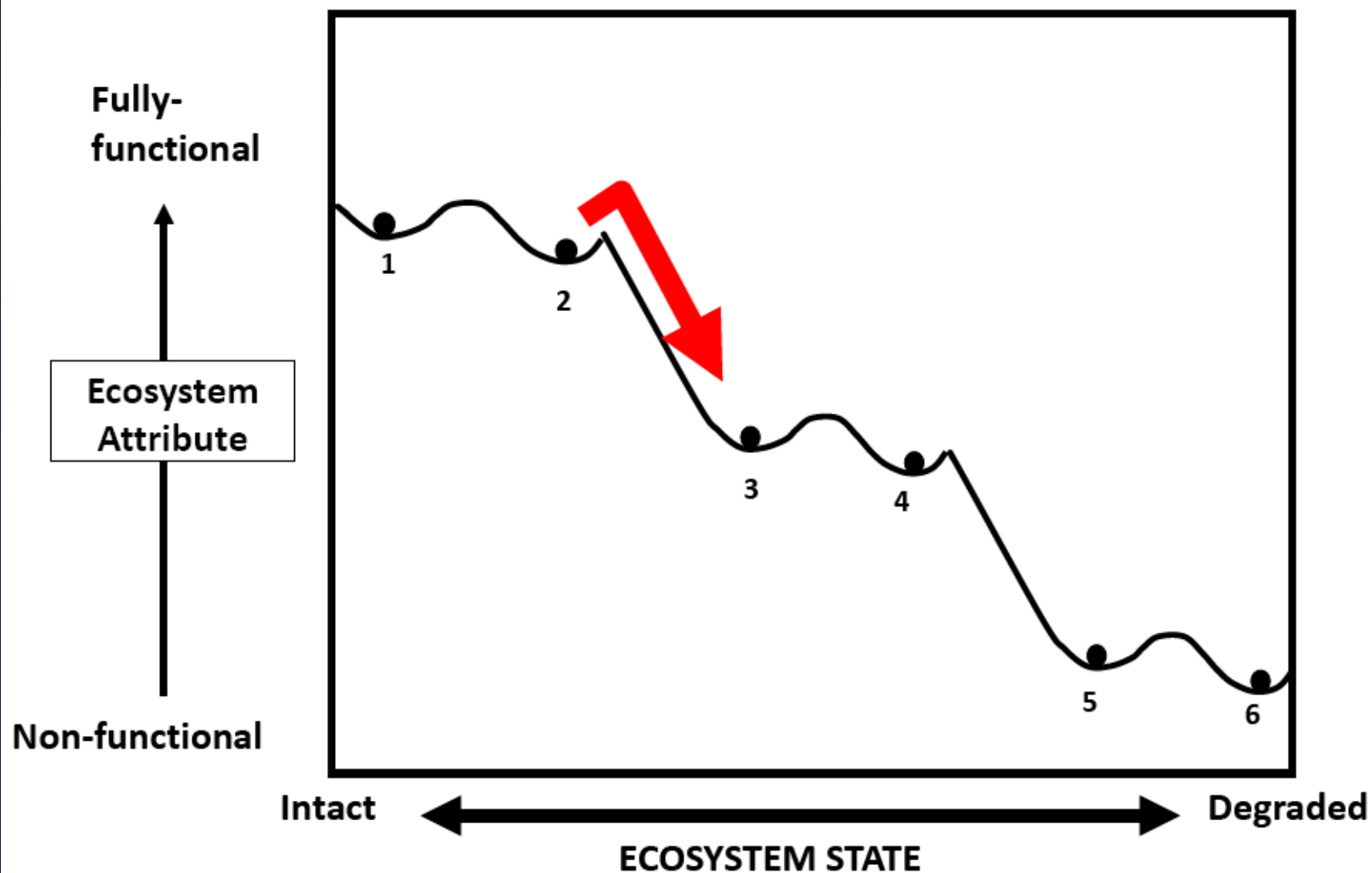
Monitoring Form/ Protocol (with location)	Project Objective											Percent of Project Sites
	Completed practices location	Landowner concern satisfied	Reveg. survival	Benefit/ sustain farm viability/ productivity	Reduce/ prevent sediment erosion/ delivery	Reduce/ prevent pathogen or nutrient delivery	Improve/ preserve riparian habitat	Improve/ preserve aquatic habitat	Increase/ preserve terrestrial wildlife abundance/ diversity	Increase/ preserve aquatic species abundance/ diversity	Improve/ preserve water quantity/ quality	
	Implementation			Effectiveness					Validation			
Pre-project:												
Objectives/ Targets (Appx. A)												100%
Monitoring Plan Checklist (Appx. A)												100%
Post-project completed for grant reports (2-3 years):												
Map/ Site Sketch (Appx. A)												100%
Revegetation Data (Appx. A)												100%
Project Assessment Checklist (Appx. B)												100%
Landowner Questionnaire (Appx. B)												100%
Revegetation Survival (Appx. B)												100%
Pre-project, post-project, for grant reports & repeated over time as funding allows:												
Photo-points (Appx. A)												100%
Sediment Load Estimates (Appx. C)												100%
Streambank Stability Line Intercept Transect (Appx. C)												25%
Riparian Line Intercept Transect (Appx. C)												25%
Aquatic Habitat (Appx. C)												25%
Stream Shade (Appx. C)												25%
Tag Lines (Weaver et al. 2005 - p. 40)												25%
Bird Populations (Ralph et al. 1993, 1995)												25%
As needed for certain projects (pre-project, post-project, & repeated):												
Channel Dimensions: cross-sections, long. profile (Appx. C)												5%
Maintenance & Event (Weaver et al. 2005 - p. 79)												5%
Water Quantity/ Quality (SWRCB 2001, MacDonald et al. 1991)												5%
Fish Passage (Collins 2009, Stockard and Harris 2005)												5%
Fish Populations (Duffy 2005, Dolloff et al. 1993)												5%
Freshwater Shrimp (Fong and Vandenberg 1998)												5%

RZMP & Water Quality

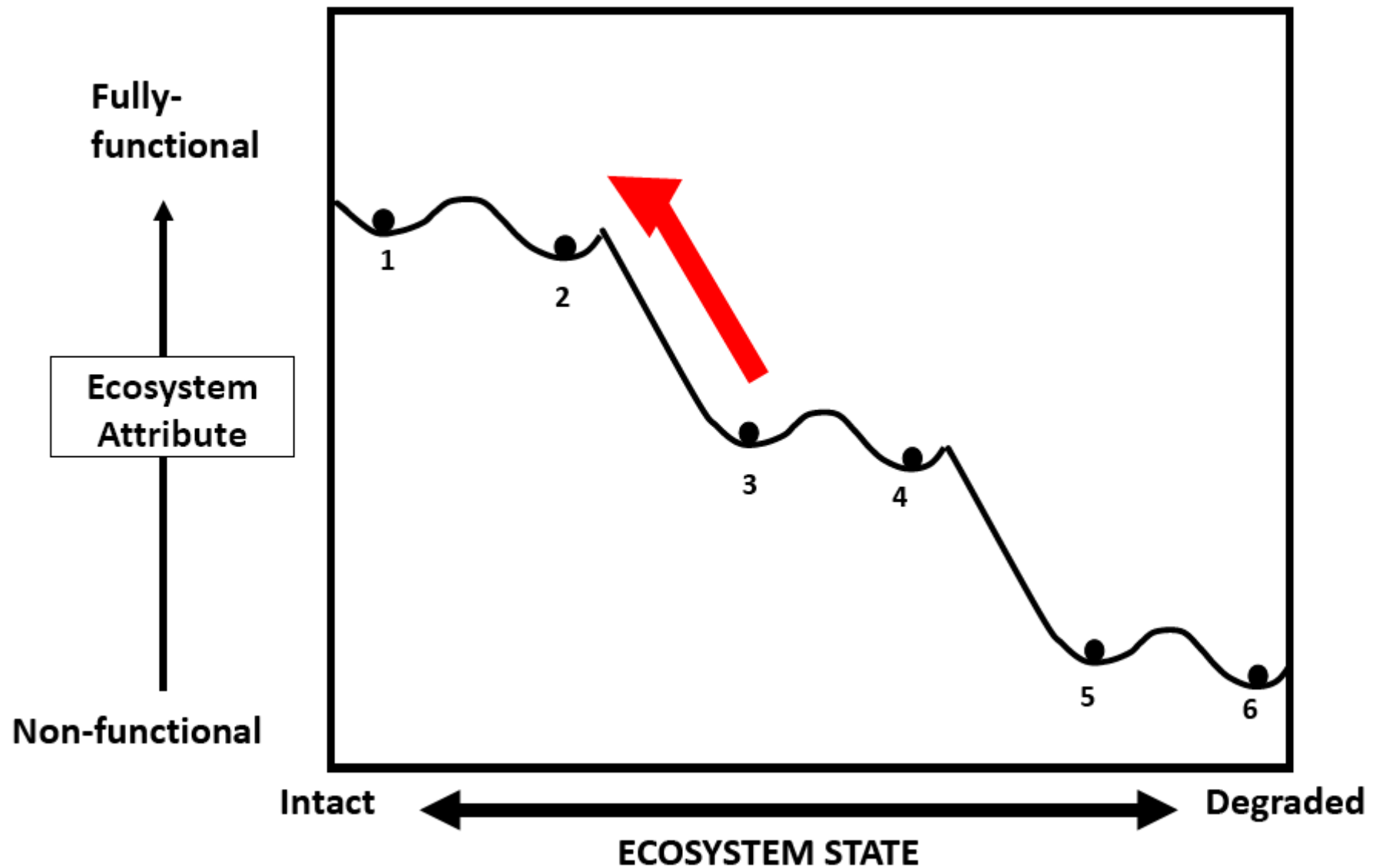


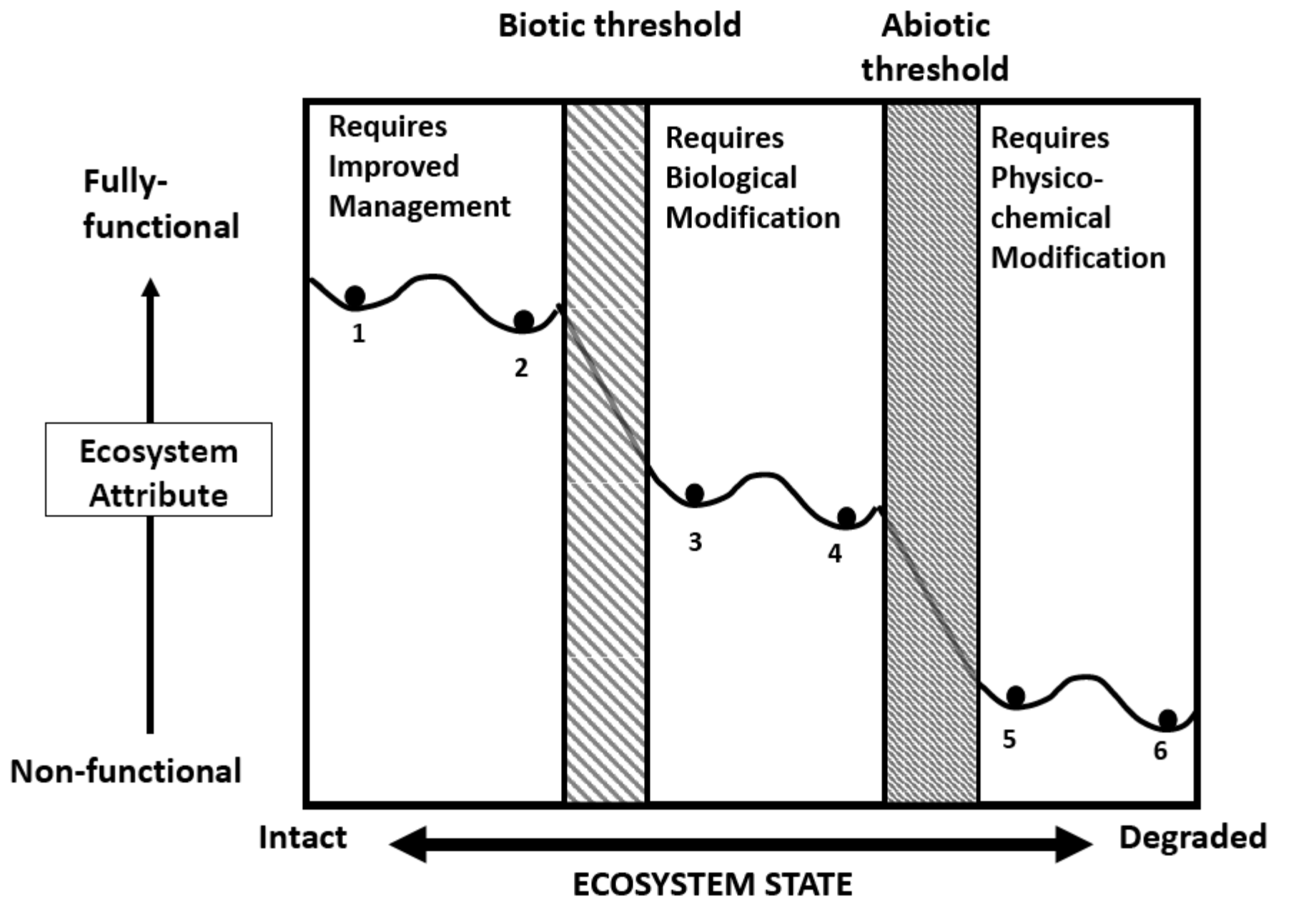


EASY!!



Difficult!!!





Challenges & Opportunities

- Project objectives & indirect outcomes
- Baseline data coordination
- Standardized protocols
- Understory, invasive species & priority weed lists
- Validation monitoring with partners
- Data management & reporting
- Long-term funding

mlennox@ucdavis.edu

Thank you



Marin Community Foundation, ARRA, SWRCB