

# The Use of Reference Ecosystems in a Dam Removal and Stream and Adjacent Plant Community Restoration Project in Western Massachusetts

Presented by:

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## Presentation Overview

- Reference ecosystems and ecosystem trajectory overview
- Hathaway Dam Removal Project example
- Important Considerations

## Reference Ecosystems

Reference Ecosystem:

- Serve as the model for planning an ecological restoration project
  - Existing ecosystem(s)
  - Historic ecosystem(s)
- Later, can serve in the evaluation of that project

## Reference Ecosystems

The reference ecosystem can consist of:

- one or several specific locations that contain model ecosystems
- a written description
- a combination of both of the above

Information included:

- Biotic
- Abiotic

## Reference Ecosystems

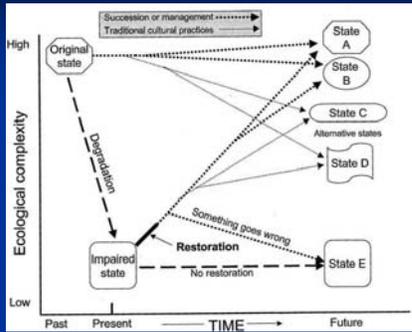
Sources of information that can be used in describing the reference ecosystem include:

- intact remnants of the site
- species lists/maps
- recent/historical aerial and ground-level photographs
- ecological descriptions, historical accounts, and oral histories
- herbarium and museum specimens
- paleoecological evidence

## Ecological Trajectory

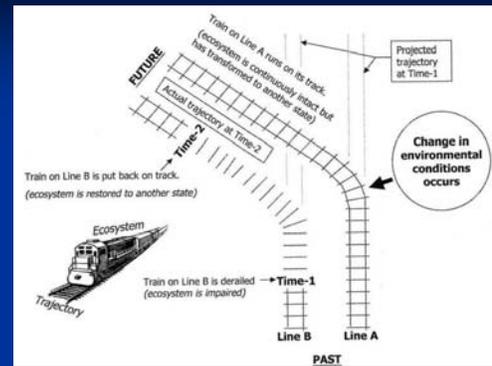
- Ecological trajectory: developmental pathway of an ecosystem through time
- Restoration attempts to return an ecosystem to its historic trajectory
- The restored ecosystem may not necessarily recover its former state
- A trajectory includes a broad yet confined range of potential ecological expressions through time
- The trajectory includes biotic and abiotic attributes of an ecosystem, and in theory can be monitored by the measurement of ecological parameters

## Ecological Trajectory

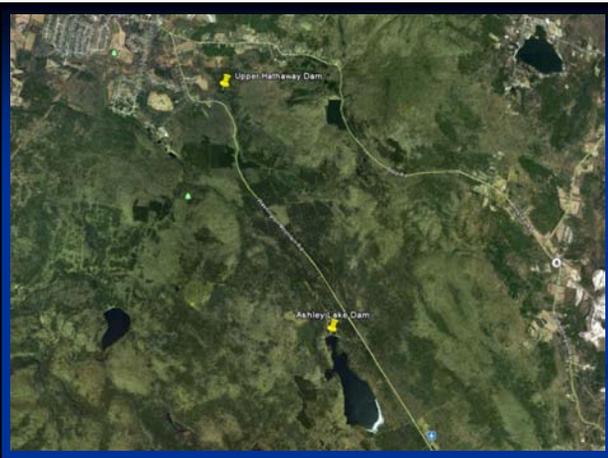


(Source: Cowell, Andre F. and James Aronson, 2007, Ecological Restoration: Principles, Values, and Structure of an Emerging Profession, Island Press)

## Ecological Trajectory



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## Offsite Mitigation: Upper and Lower Hathaway Dam Removal Project - Project Background -

- Lower Hathaway Dam: constructed circa 1893
- 75-foot-long by 6-foot-high stone and masonry dam
- Located approx. 250 feet downstream from Upper Dam
- No longer impounded any water other than a stream channel



## Offsite Mitigation: Upper and Lower Hathaway Dam Removal Project - Project Background -

- Upper Hathaway Dam: constructed in 1908
- 157-foot long by 22-foot-high reinforced concrete dam
- Impounded Hathaway Reservoir, a relic water supply for the City of Pittsfield
- Not used since the late 1950's.



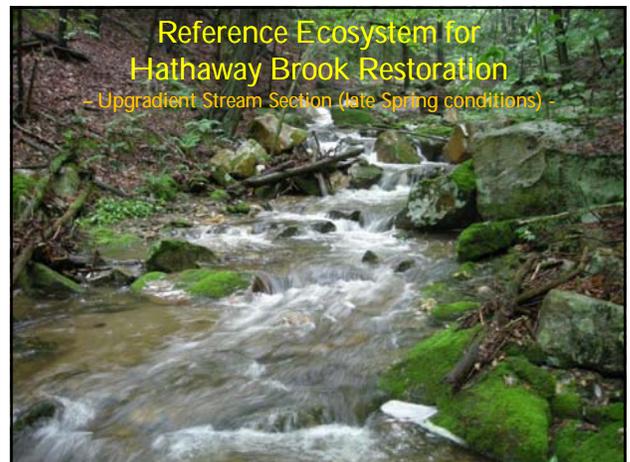
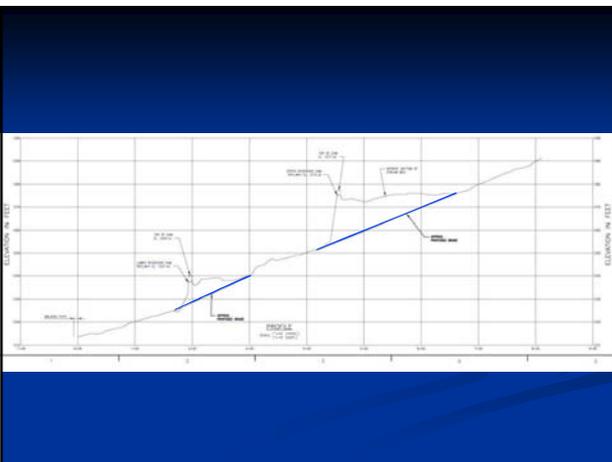
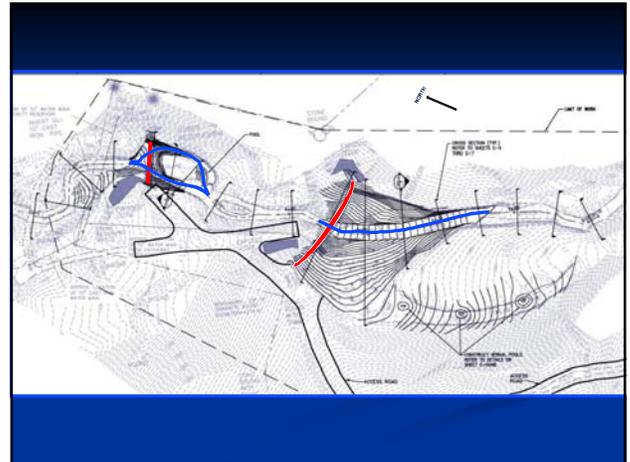


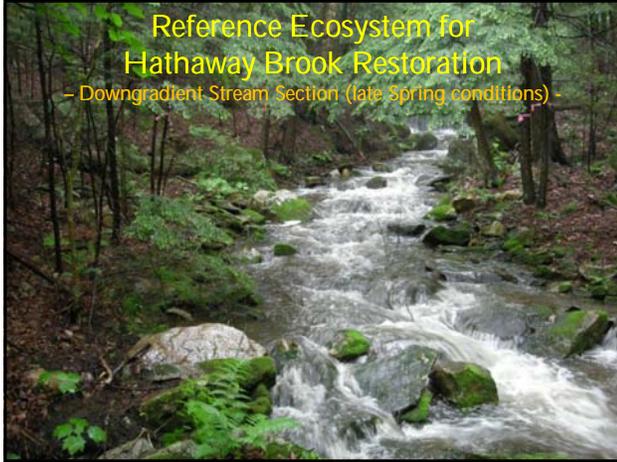
## Upper and Lower Hathaway Dam Removal Project - Project Background -

- Both dams no longer functioned as originally intended
- Dams severely deteriorated over time
- Presents a potential hazard to pedestrians and wildlife that encountered it
- Physical barrier to the movement of fish and other aquatic organisms



- City of Pittsfield decided to remove both dams

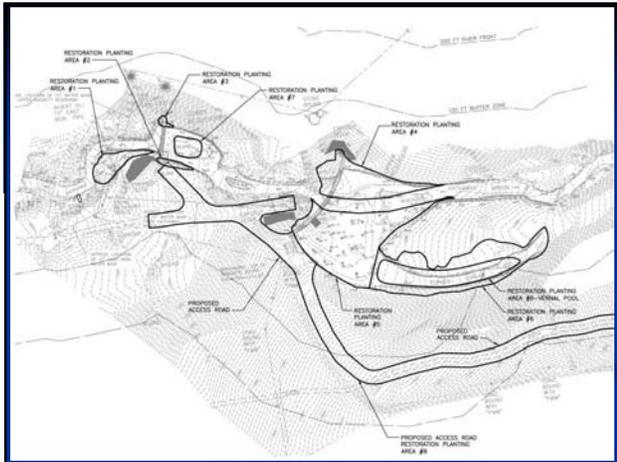




### Reference Ecosystem for Hathaway Brook Restoration

- Design Characteristics -

- Approx. 25%-30% boulders (10" -36" in length)
- Approx. 50% cobbles (2.5" -10" in length; sub-rounded to sub angular)
- Approx. 20-25% gravel (0.25"-2.5" in length; sub-rounded to sub angular)
- Include variability
- Include pool and riffle sections
- Include occasional coarse woody debris



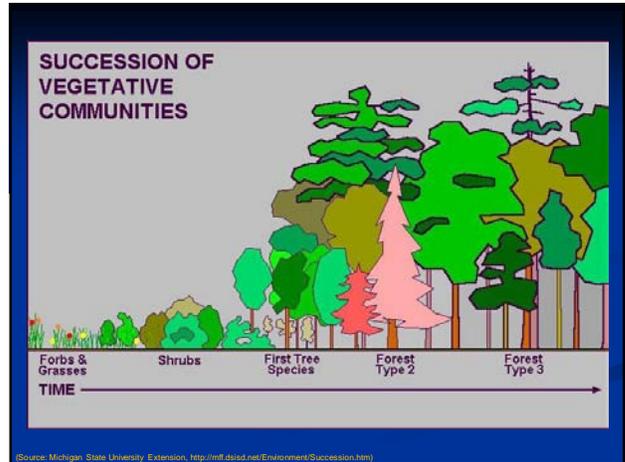
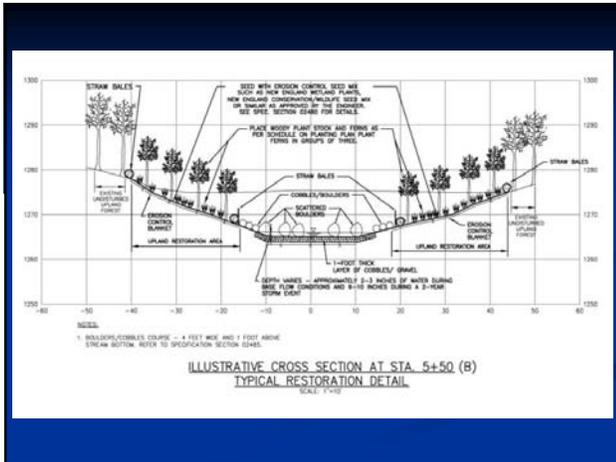
### Reference Ecosystem for Adjacent Upland Restoration

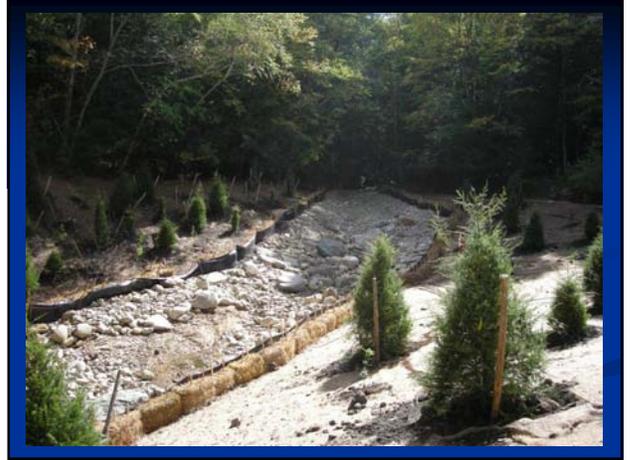
- Northern Hardwood Forest -

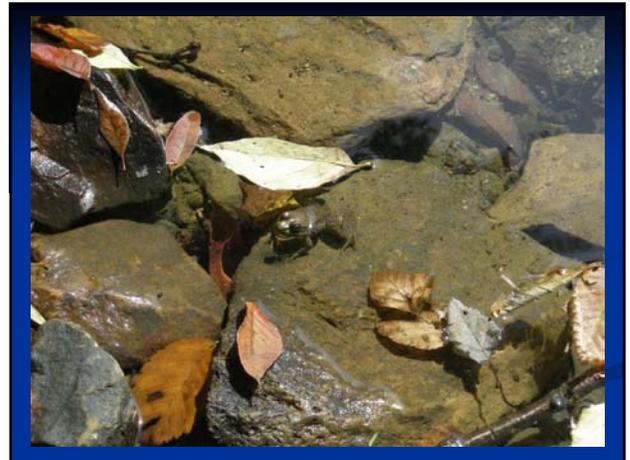
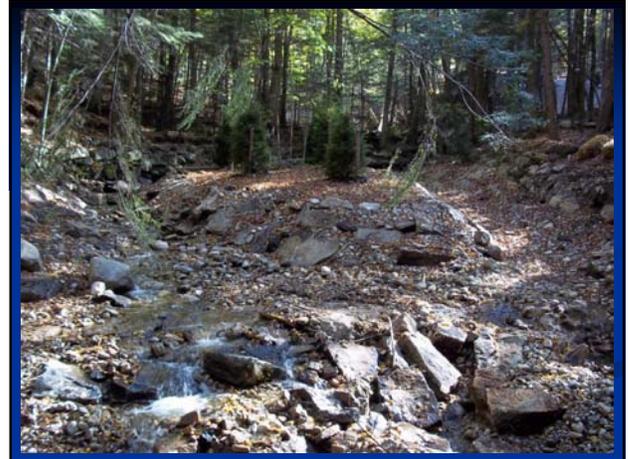
- **Tree layer:**
  - Eastern Hemlock (*Tsuga canadensis*)
  - Sugar Maple (*Acer saccharum*)
  - Yellow Birch (*Betula alleghaniensis*)
  - Green Ash (*Fraxinus pennsylvanica*)
- **Sapling layer:**
  - Eastern Hemlock (*Tsuga canadensis*)
  - American Beech (*Fagus grandifolia*)
  - Sugar Maple (*Acer saccharum*)
  - Yellow Birch (*Betula alleghaniensis*)
- **Shrub layer:**
  - Eastern Hemlock (*Tsuga canadensis*)
  - American Beech (*Fagus grandifolia*)
  - Sugar Maple (*Acer saccharum*)
  - Striped Maple (*Acer pennsylvanicum*)
- **Herb layer:**
  - Eastern Hemlock (*Tsuga canadensis*)
  - American Beech (*Fagus grandifolia*)
  - Striped Maple (*Acer pennsylvanicum*)
  - Christmas Fern (*Polystichum acrostichoides*)
  - Intermediate Woodfern (*Dryopteris intermedia*)
  - Hayscented Fern (*Dennstaedtia punctilobula*)

#### TREE/SHRUB/PLANT PLANTING SCHEDULE

Planting Area #	Planting Date	Planting Method	Planting Density	Planting Species	Planting Notes
RESTORATION PLANTING AREA #1	10/15/11	Hand Planting	1000 plants/acre	Eastern Hemlock, American Beech, Sugar Maple, Yellow Birch, Green Ash	Planting in riparian zone
RESTORATION PLANTING AREA #2	10/15/11	Hand Planting	1000 plants/acre	Eastern Hemlock, American Beech, Sugar Maple, Yellow Birch, Green Ash	Planting in riparian zone
RESTORATION PLANTING AREA #3	10/15/11	Hand Planting	1000 plants/acre	Eastern Hemlock, American Beech, Sugar Maple, Yellow Birch, Green Ash	Planting in riparian zone
RESTORATION PLANTING AREA #4	10/15/11	Hand Planting	1000 plants/acre	Eastern Hemlock, American Beech, Sugar Maple, Yellow Birch, Green Ash	Planting in riparian zone
RESTORATION PLANTING AREA #5	10/15/11	Hand Planting	1000 plants/acre	Eastern Hemlock, American Beech, Sugar Maple, Yellow Birch, Green Ash	Planting in riparian zone
RESTORATION PLANTING AREA #6	10/15/11	Hand Planting	1000 plants/acre	Eastern Hemlock, American Beech, Sugar Maple, Yellow Birch, Green Ash	Planting in riparian zone
RESTORATION PLANTING AREA #7	10/15/11	Hand Planting	1000 plants/acre	Eastern Hemlock, American Beech, Sugar Maple, Yellow Birch, Green Ash	Planting in riparian zone
RESTORATION PLANTING AREA #8	10/15/11	Hand Planting	1000 plants/acre	Eastern Hemlock, American Beech, Sugar Maple, Yellow Birch, Green Ash	Planting in riparian zone







## Important Considerations

- Reference ecosystems can be existing or historic
- Restoration project should take into account ecological trajectory
- Plantings should be native
- Use biodegradable materials
- Control for invasives
- Monitor and adjust as necessary

## Acknowledgements

Mr. Bruce Collingwood – City of Pittsfield

Mr. Doug Gove – AECOM

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Questions ?

