



Flow Dependent Resources for the Lamprey River Designated Reach Instream Flow Methods

**University of New Hampshire
University of Massachusetts
Normandeau Associates, Inc.**

February 13, 2006

Project Team

- **Normandeau Associates**
limnology, aquatic ecology, aquatic ecosystem restoration, impact assessment, permitting, wetland and terrestrial assessment.
- **University of New Hampshire**
Hydrology, hydraulics, geomorphology, ground water, water resources management, economics, financial possibilities, management plan
- **University of Massachusetts**
Instream flow, habitat modeling, fish ecology, fisheries management, field methods

IPUOCR Entities



Instream Public Uses, Outstanding Characteristics, and Resources (IPUOCR)

- **Navigation**
- **Recreation**
- **Fishing**
- **Storage**
- **Conservation/Open Space**
- **Maintenance and Enhancement of Aquatic and Fish Life**
- **Fish and Wildlife Habitat**
- **Rare, Threatened or Endangered (RTE)**
- **Water Quality Protection/Public Health**
- **Public Water Supply**
- **Pollution Abatement**
- **Aesthetic Beauty/Scenic**
- **Cultural**
- **Historical or Archaeological**
- **Community Significance**
- **Hydrological/Geological**
- **Agricultural**

Protected Instream Flows (PISF)



Flows that protect and maintain protected entities

Reason Why We Are Here Today

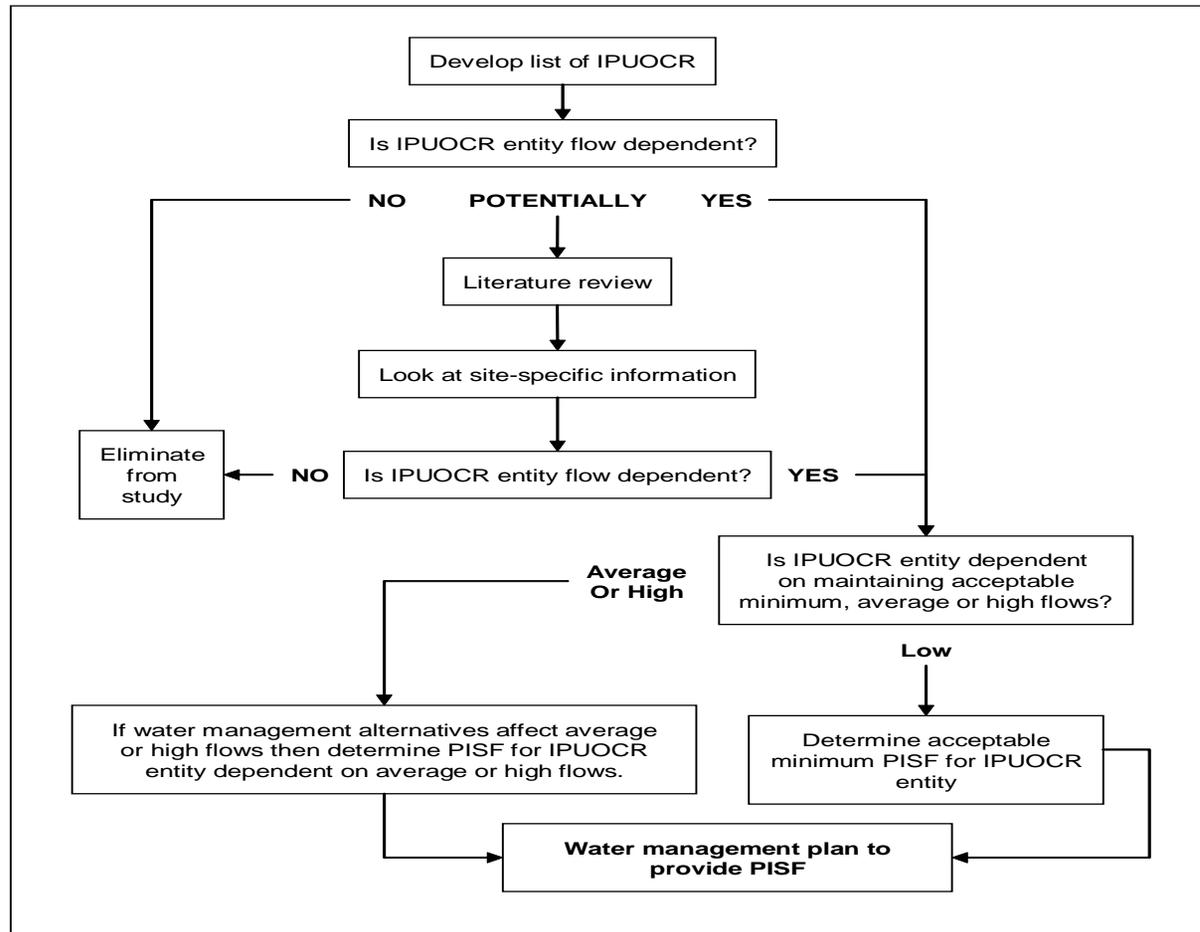
- **The consultant will produce a draft report describing the results of the IPUOCR entities research and on-stream survey, and proposing PISF methods to be used to assess their flow needs.**
- **The draft report will be submitted to the committees for review and comment.**

On-Stream IPUOCR Survey

- Create GIS Maps
- Survey August 23,25,26, 2005
- Photo Documentation
- Record Hydro-morphological
and Habitat Features
- Develop IPUOCR GIS Layers
and confirmed lists



IPUOCR Flow Dependence



Flow dependent resources

- **Recreation (swim/boat)**
- **Water Storage**
- **Pollution Abatement**

- Floodplain forests
- Oxbow/backwater wetlands
- Vernal pools
- High energy riverbanks
- River rapids

RTE Plants

- Water marigold
- Sharp-flowered mannagrass
- Knotty Pondweed
- Blunt Sphenopholis
- Small-crested Sedge
- Slender Blue Flag
- Climbing Hempweed

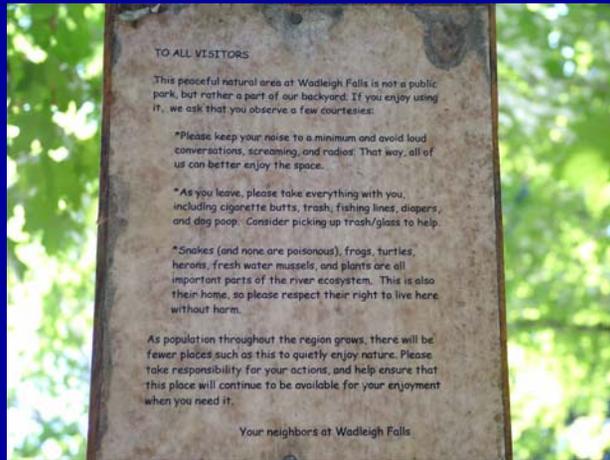
RTE Wildlife

- Wood Turtle
- Spotted Turtle
- Blanding's Turtle
- Pied Billed Grebe
- Osprey
- Bald Eagle
- Sedge Wren

- Fish and Fish Habitat
- Mussels
- Insects
- T/E Bridled Shiner
- Banded Sunfish
- Endangered Brook Floater

- Public Water Supply
- Groundwater

Recreation



- IPUOCR is swimming, kayaking, canoeing and rowing
- Flow dependent at average to high flows
- Many non-impounded reaches not navigable at low flow
- Evaluated if water management plan alternatives influence average to high flows

Water Storage



- **Storage above Wiswall used by Durham for drinking water**
- **Interview with Durham and review of records to determine flow needs**

Pollution Abatement



- **1 permitted discharge at Epping above designated reach**
- **Permits, waste load allocation studies and regional wastewater alternative reports reviewed**

Flow dependent resources

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Oxbow/Backwater Wetlands



- **Bordering wetlands along channel, in backwaters and oxbows**
- **Dependent on seasonal water levels determined by flow and/or dam control of water levels**
- **Will be evaluated by Floodplain Transect Model at representative locations**

Floodplain Forests



- **Swamp White Oak, Silver Maple and Red Maple Floodplain Forests**
- **Associated Vernal Pools**
- **Spring flows critical**
- **Assessed through Floodplain Transect Model**

High Energy Riverbanks and Rapids

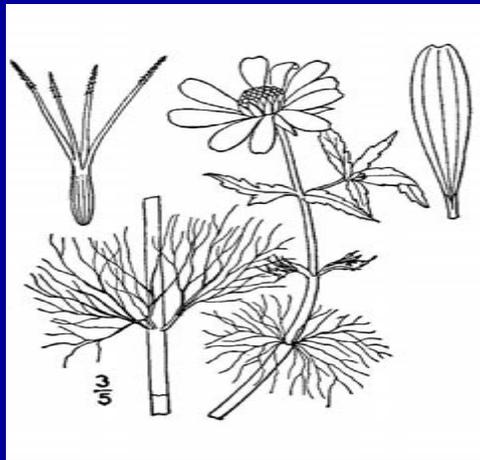


- **Dependent on ice and flood scour and seasonal flow changes**
- **unique assemblages of plants**
- **Assessed through Floodplain Transect Model**

Plants



RTE Plants



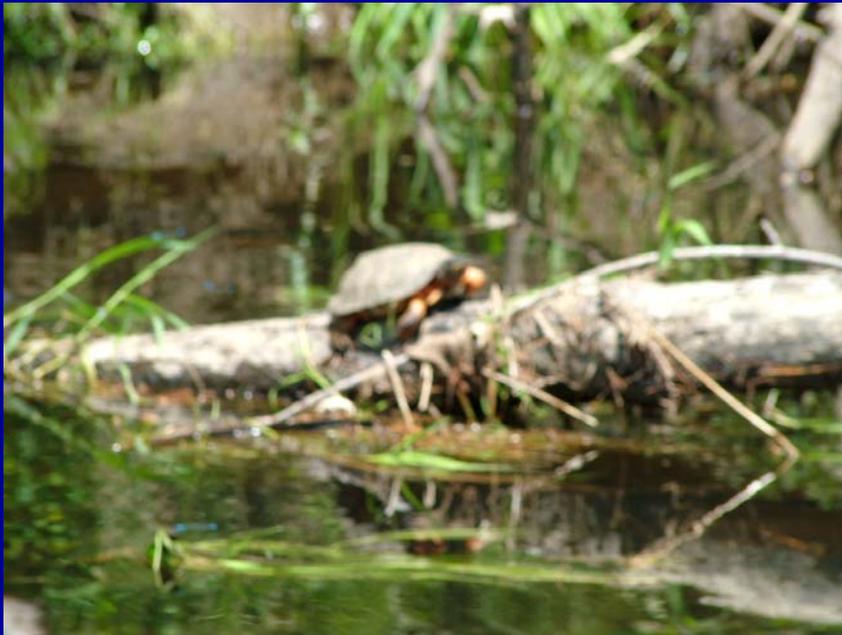
•USDA-NRCS
PLANTS
Database /
Britton, N.L., and
A. Brown. 1913.
*Illustrated flora
of the northern
states and
Canada*. Vol. 3:
500.

- Aquatics such as Knotty Pondweed and Water Marigold will be assessed through meso-HABSIM and/or Floodplain Transect Model
- Emergents such as Sharp-flowered mannagrass, Small-crested Sedge, Slender Blue Flag, and Climbing Hempweed will be Assessed through Floodplain Transect model

Reptiles and Amphibians



Turtles



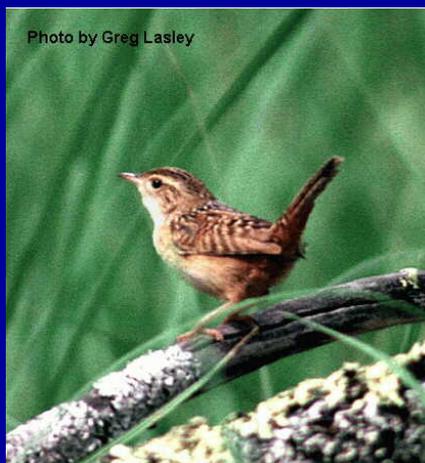
- **Wood Turtle - riparian habitat**
- **Dependent on adequate winter water cover (hibernation) and summer flows (habitat maintenance)**
- **Will be evaluated using Floodplain Transect Model at potential habitats**

Turtles, cont.



- **Blanding's and Spotted Turtles – in floodplain wetland complexes**
- **Maintaining winter water levels during hibernation critical**
- **Will be evaluated by Floodplain Transect Model in pond/wetland habitat**

Birds



Birds and Bird Habitat



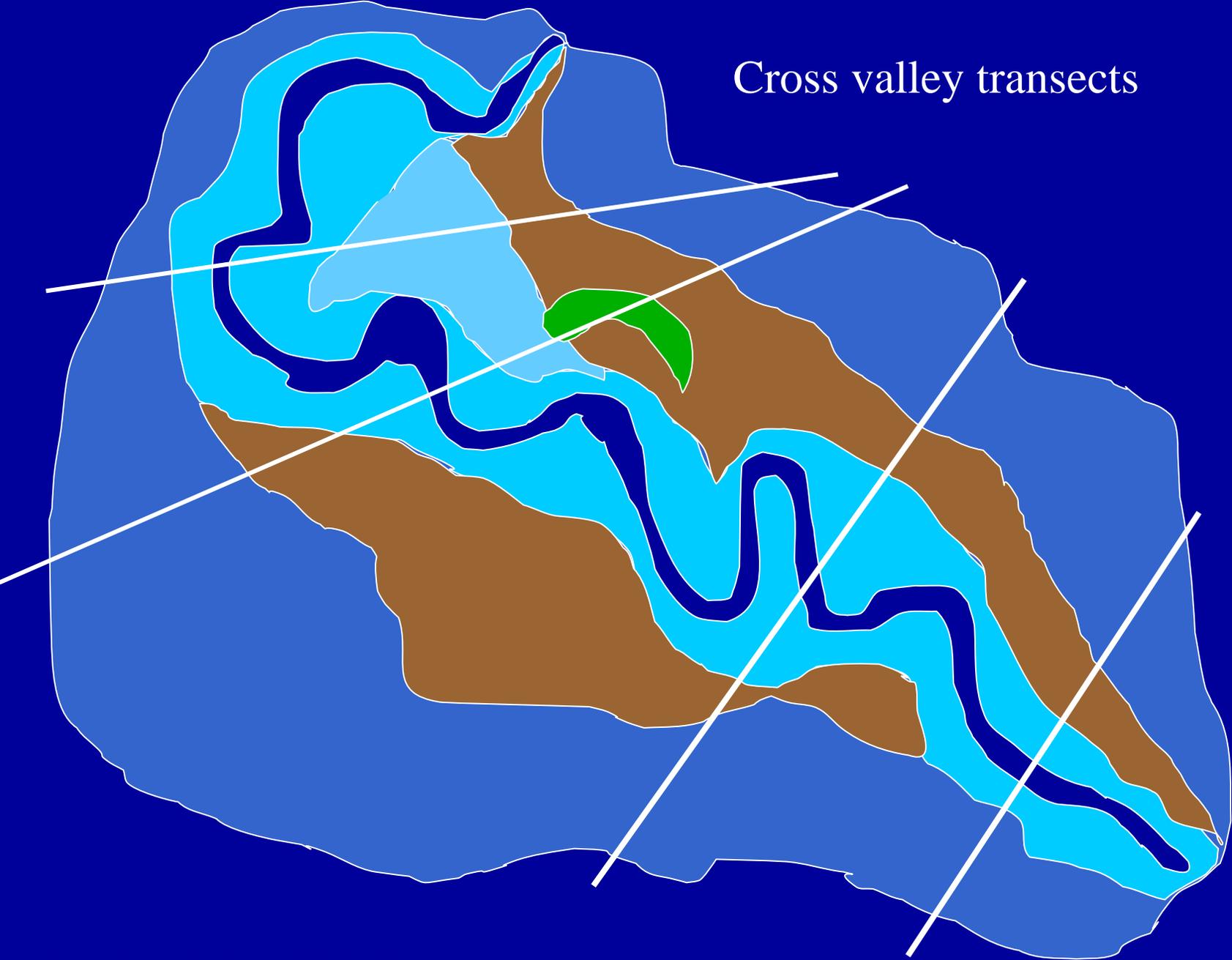
- **Wetland-dependent birds – Sedge Wren, Pied-Billed Grebe, other waterfowl and waders**
- **Spring/summer wetland water level stability critical**
- **Will be evaluated through Floodplain Transect Model in wetlands**

Birds and Bird Habitat, cont.



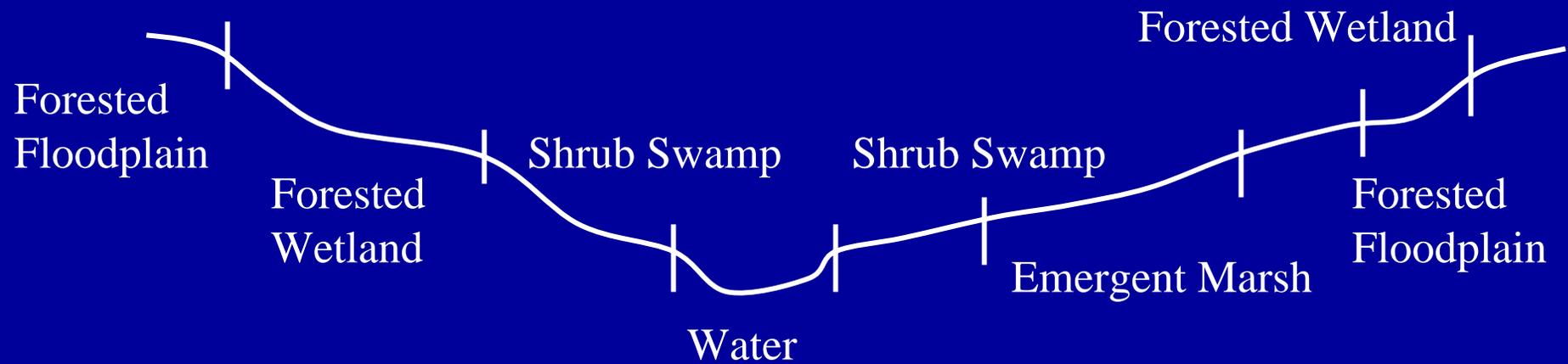
- **Piscivorous raptors**
 - eagles and osprey (RTE species)
- **flow-dependent prey**
- **Will use results of meso-HABSIM model for fish prey**

Cross valley transects

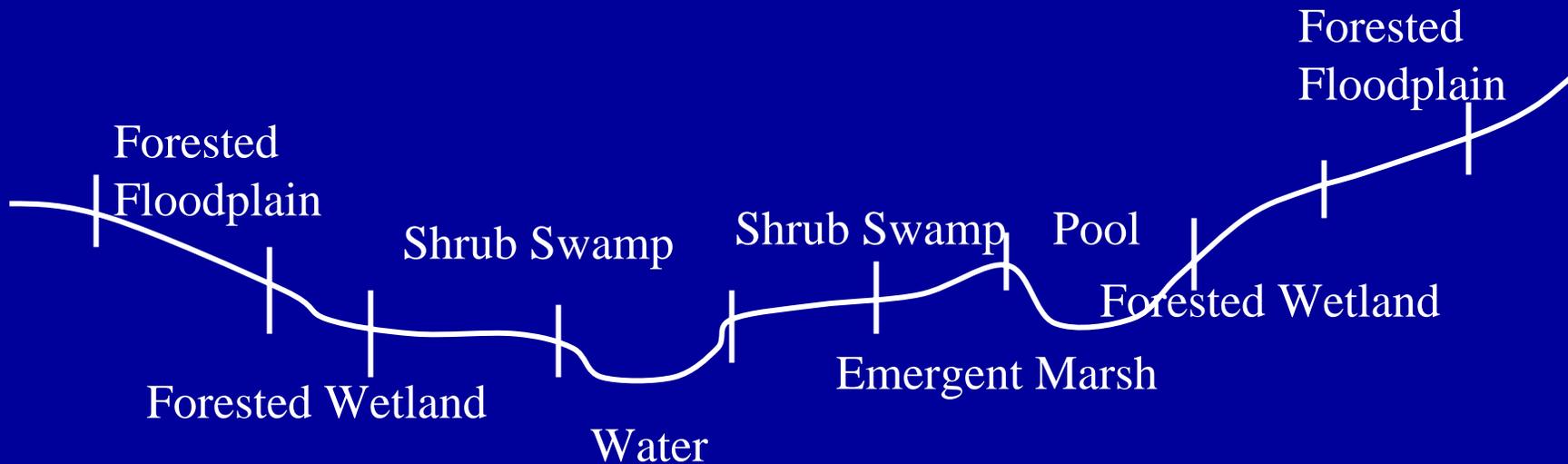


Adapted from Scott Jackson, UMASS

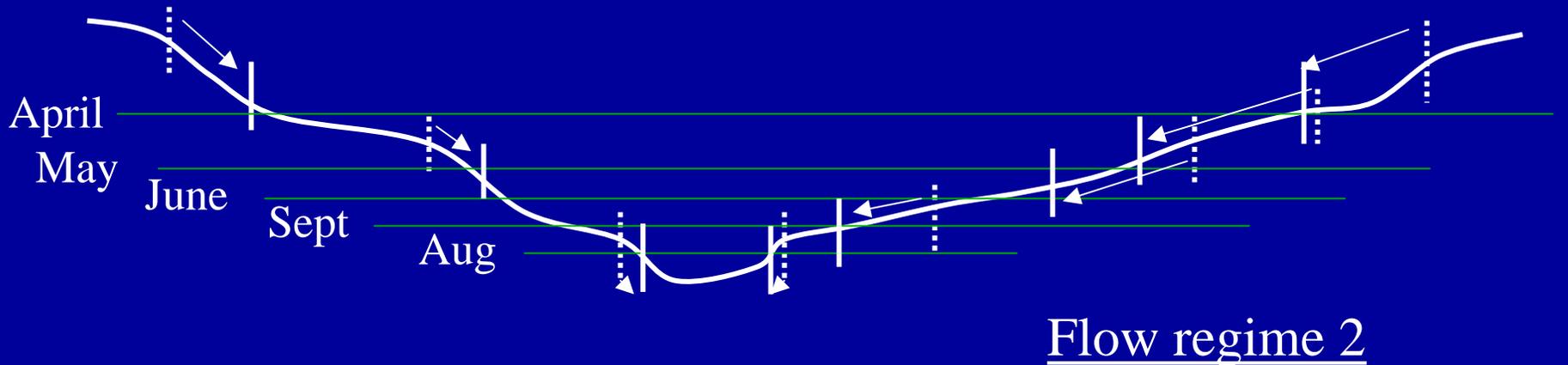
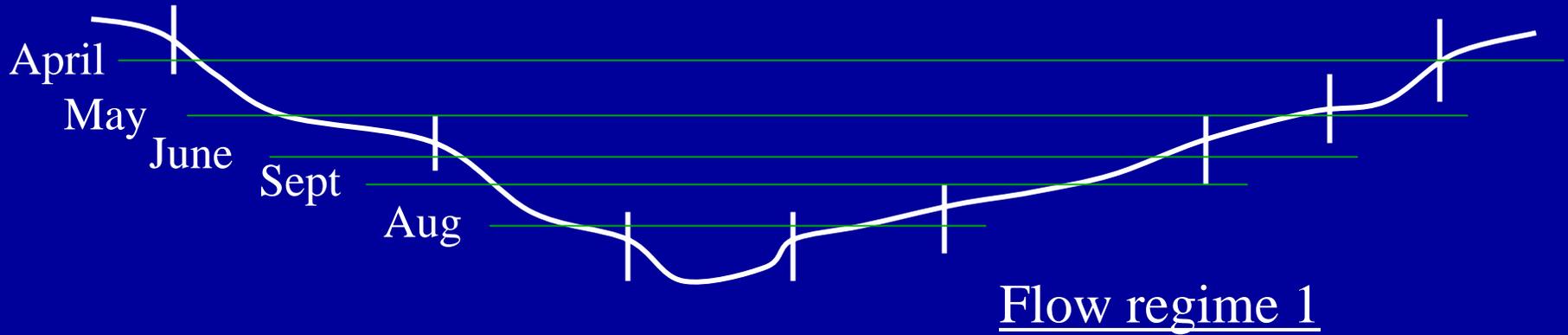
Transect #1



Transect #2

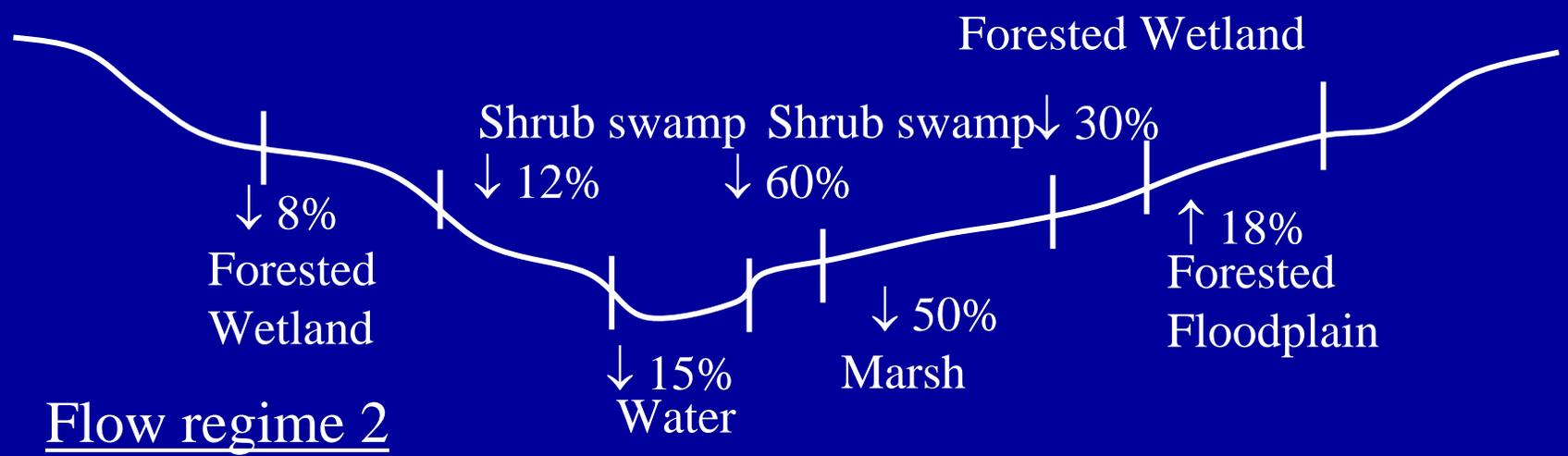
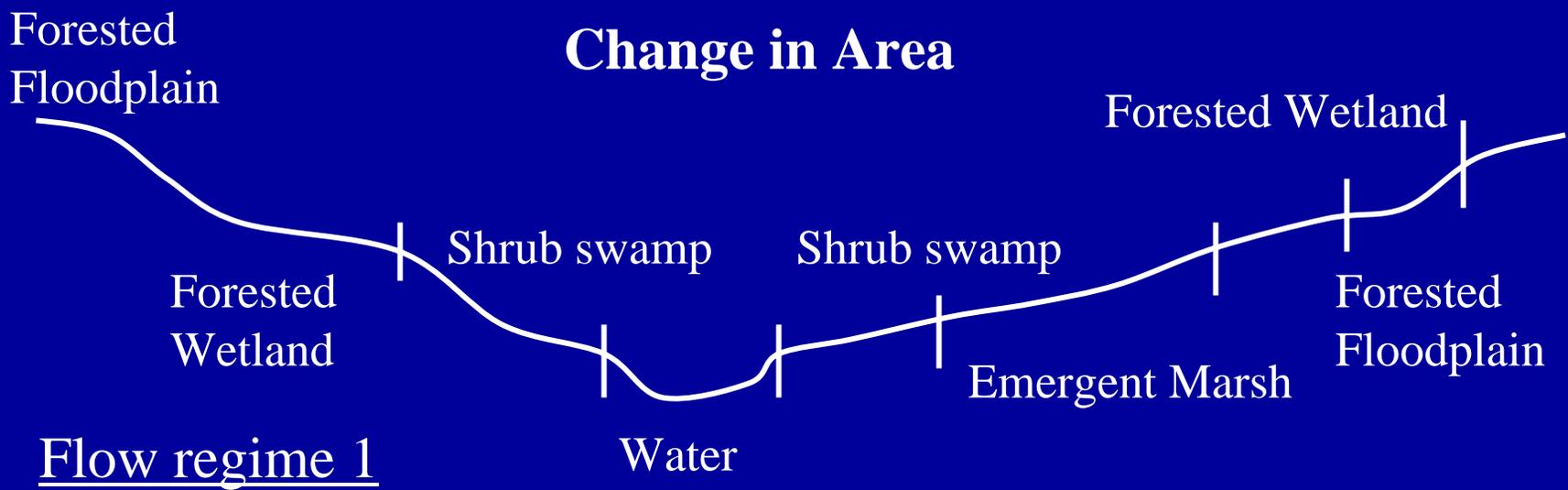


Transect #1



Adapted from Scott Jackson, UMASS

Change in Area



Habitat Suitability Indices

Species A

Forested
Floodplain

Forested Wetland

Forested
Wetland
0.32

Shrub Swamp

0.74

Shrub Swamp

0.66

Water
0.65

Emergent marsh
0.50

Forested
Floodplain
0.40

0.46

Flow Regime 1

Forested
Floodplain

Forested wetland

Forested
Wetland
0.30

Shrub swamp

0.69

Shrub swamp

0.60

Water
0.80

Emergent Marsh
0.54

0.44

Forested
Floodplain
0.38

Flow regime 2

Adapted from Scott Jackson, UMASS

Additional features of wetland/riparian analysis

- Low altitude air photos taken at low flow will be used to assist with delineation of habitat types
- Multiple terrestrial/wetland IPUOCRs will be represented on each transect if possible

Flow dependent resources

- Recreation (swim/boat)
- Water Storage
- Pollution Abatement

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- Endangered Brook Floater

- Public Water Supply
- Groundwater

Fisheries and Instream Flow Resources

Flow dependent resources

- Recreation (swim/boat)
- Water Storage
- Pollution Abatement
- Wood Turtle
- Spotted Turtle
- Blanding's Turtle
- Pied Billed Grebe
- Osprey
- Bald Eagle
- Pied billed Grebe
- Sedge Wren
- Water marigold
- Sharp-flowered mannagrass
- Knotty Pondweed
- Blunt Sphenopholis
- Small-crested Sedge
- Slender Blue Flag
- Climbing Hempweed
- Emergent Wetlands
- Swamp white oak floodplain forest, oxbow marsh, floodplain vernal pool, floodplain forest, oxbow shrub-swamp, high energy riverbank, river rapids
- Fish and Fish Habitat
- Mussels
- Insects
- T/E Bridled Shiner
- Banded Sunfish
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- **Public Water Supply**
- **Groundwater**

Water Resources: Surface and Ground Water

Affected Water Users and Affected Dam Owners



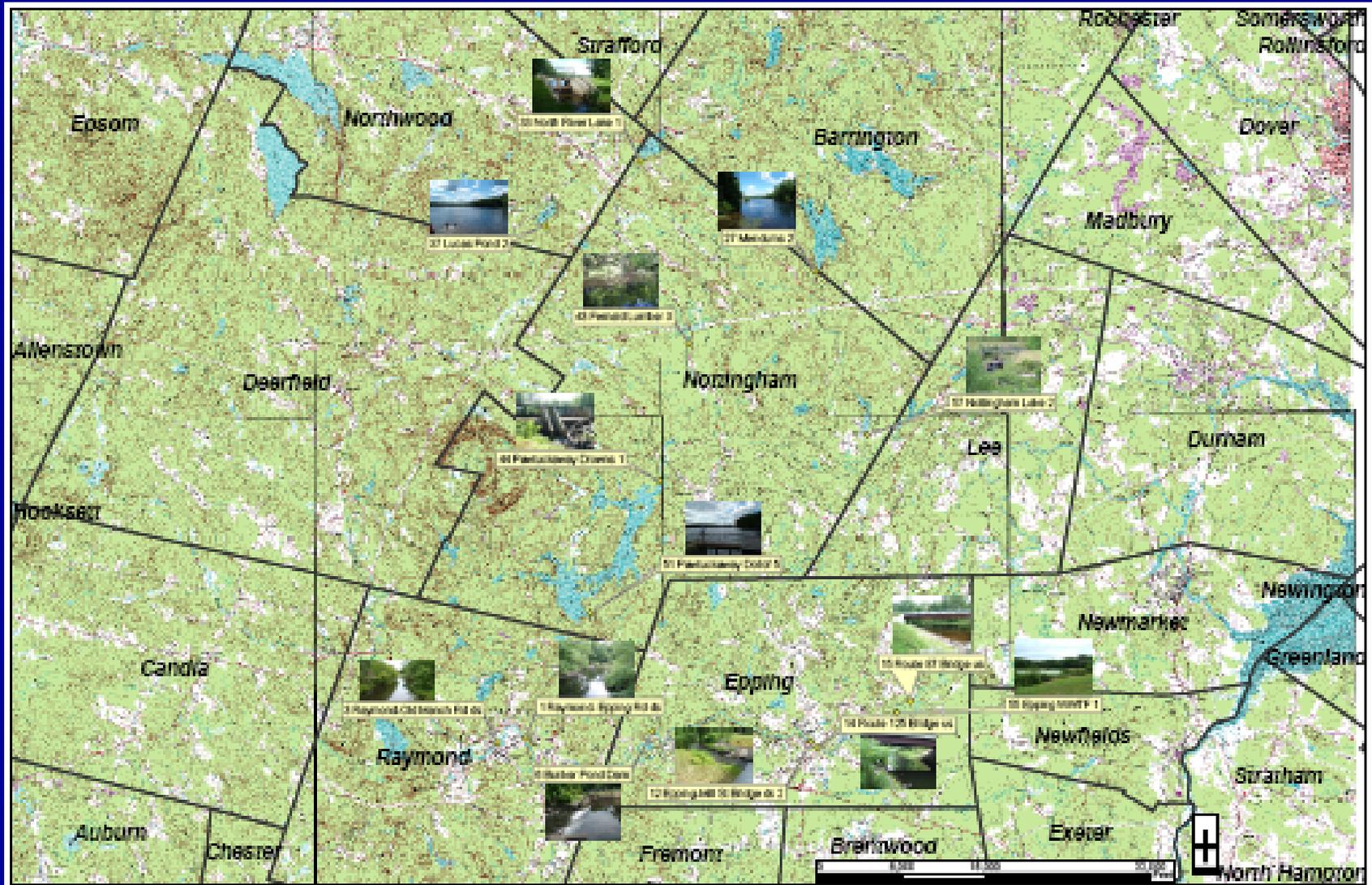
Affected Water Users

- **Epping Water Works**
- **Newmarket Water Works**
- **Raymond Water Department**
- **University of New Hampshire**
- **Pennichuck Water Works**
- **Epping WWTF**
- **Fernald Lumber**
- **Scenic Nurseries, Inc**

Affected Dam Owners

- Socha Dam
- Freeses Pond Dam
- Beaver Pond Dam
- Thurston Pond Dam
- Wiswall Dam
- Bunker Pond Dam
- Hoar Pond Dam
- Piscassic Ice Pond Dam
- Lucas Pond Dam
- Meadow Lake Dam
- Woodmans Marsh Dam
- Dole Marsh Dam
- Mendums Pond Dam
- Pawtuckaway Lake (Dollof, Drowns, Drowns dike, Gove dike)
- North River Pond Dam
- Nottingham Lake Dam
- Deer Pond Dam
- Burnhams Marsh
- Onway Lake Dam

Dams and Water Users



Web Addresses

- **DES Website**

<http://www.des.state.nh.us/rivers/instream/lamprey.asp>

- **UNH Website**

<http://www.unh.edu/erg/lamprey/>

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