



Linking together predator-prey food webs

Studies of Oregon Coast Range riparian zones

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U. S. Geological Survey-BRD



QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

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How does riparian composition affect terrestrial and aquatic food webs?

Our Approach:

Alder- v. Douglas fir-dominated canopies

Each study:

one predator group & potential invertebrate prey

Invertebrate Availability

Aquatic (benthic &/or emergence)

Terrestrial (infall or blacklight)

Predator Diet

Fish

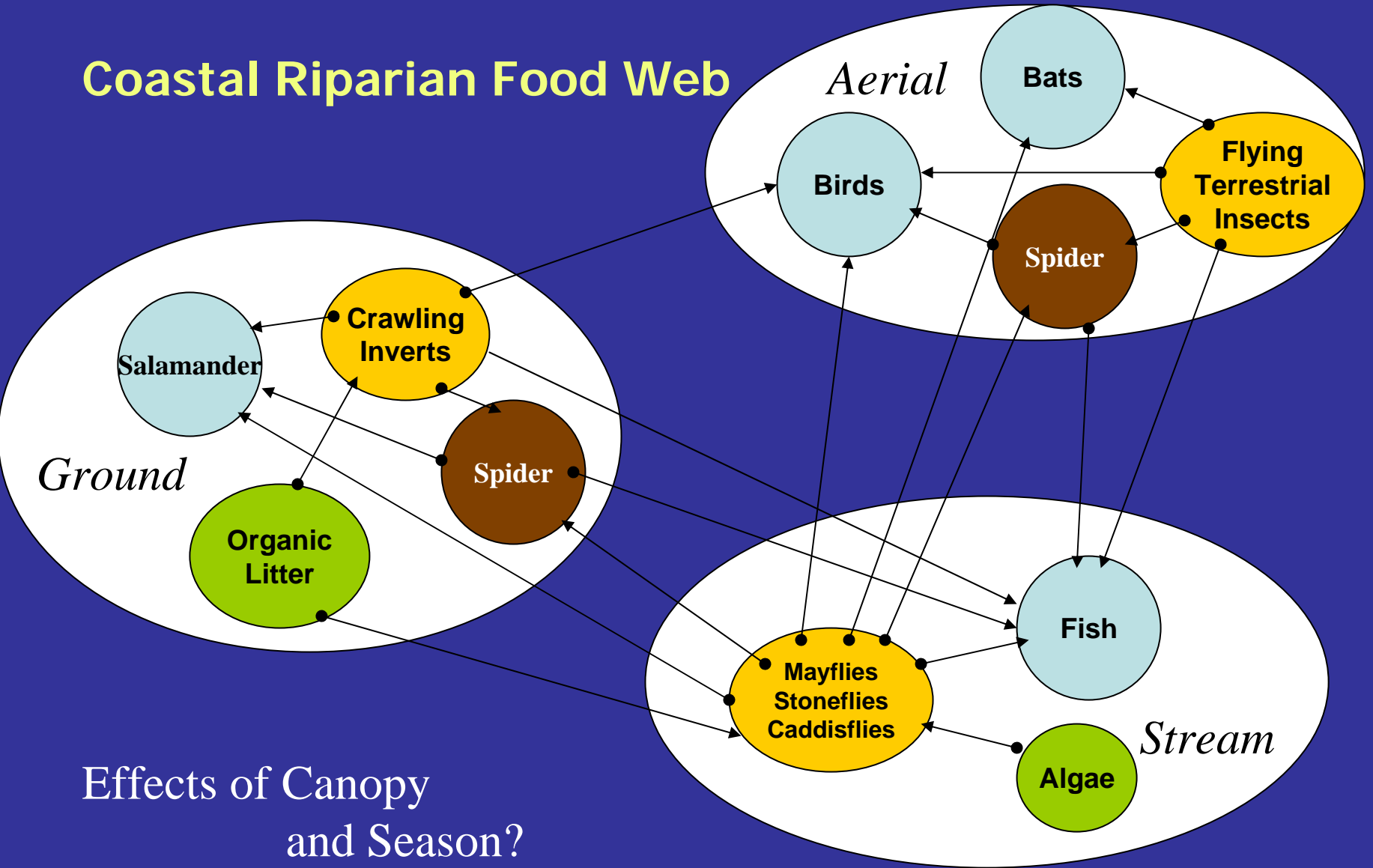
Salamanders

Song birds

Bats



Coastal Riparian Food Web



Effects of Canopy
and Season?

Seasonal Patterns in Coastal Riparian Forests:

Spring



Migratory song birds arrive
Cutthroat spawning
Salamanders active

Aquatic emergence high
Terrestrial insects increase
Benthic prey abundant

Webs

Fish eat approximately equal
aquatic & terrestrial prey

Birds eat primarily terrestrial prey

Summer



Birds complete broods
Cutthroat young-of-the-
year abundant
Bats most active

Terrestrial insects
most abundant &
active (terrestrial &
stream habitats)

Webs: Fish eat more terrestrial than aquatic prey

Most Bats favor larger terrestrials (e.g. moths)

Fall

Few resident birds

Bats absent

Fish actively feeding

Invertebrate prey

less available

Terrestrial invertebrates

less active



Webs: Consumption of terrestrial and aquatic prey varies by fish species

Winter

Fish actively feeding

Salamanders active

Primarily

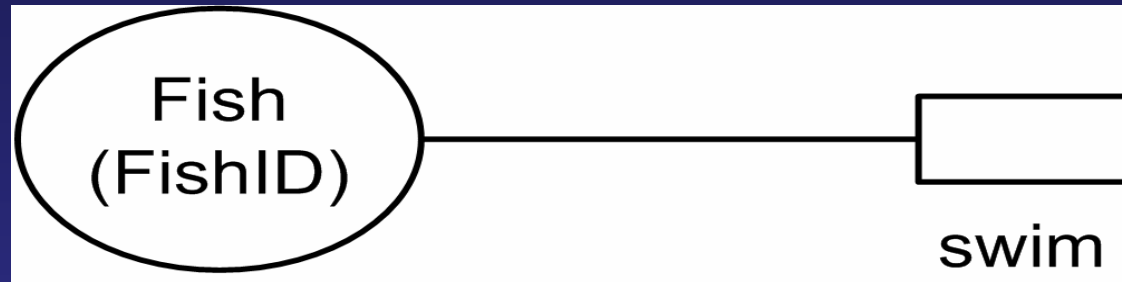
aquatic invertebrates

available in the stream

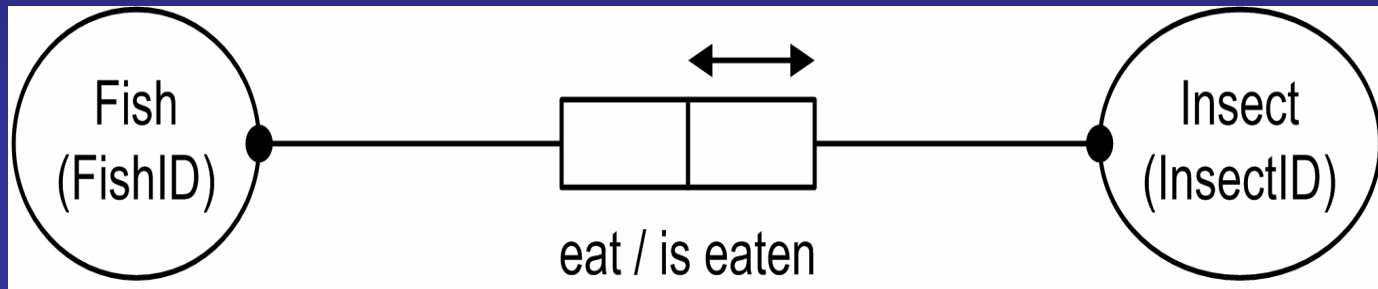
Webs: Fish & stream-dwelling salamanders eat benthics

Object Role Modeling (ORM)

- Unary Fact: Fish swim

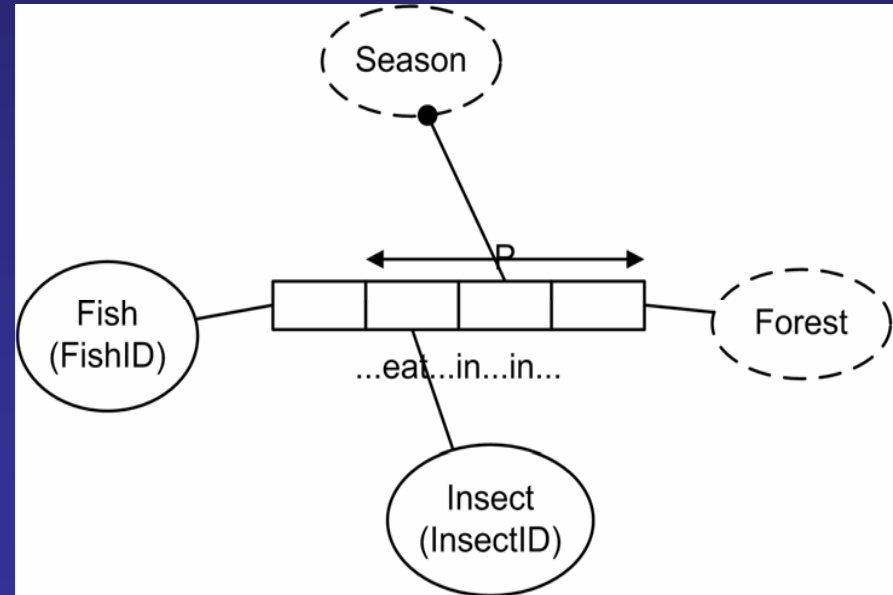
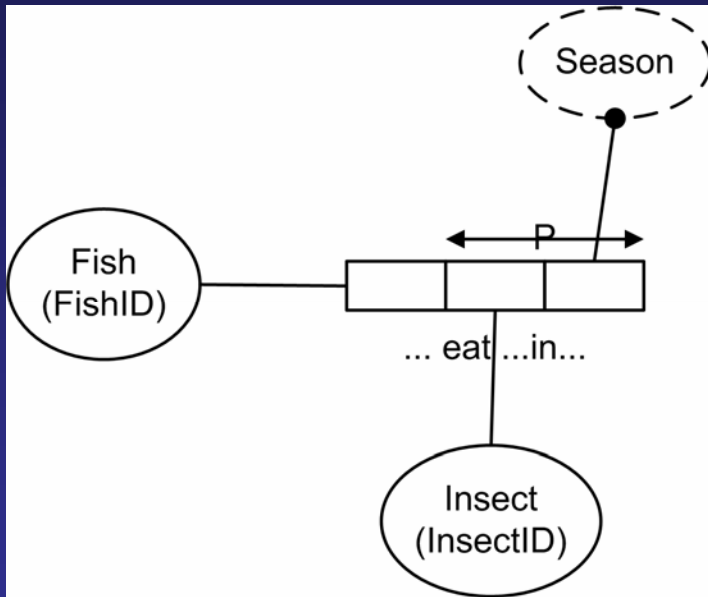


- Binary Fact: Fish eat insects



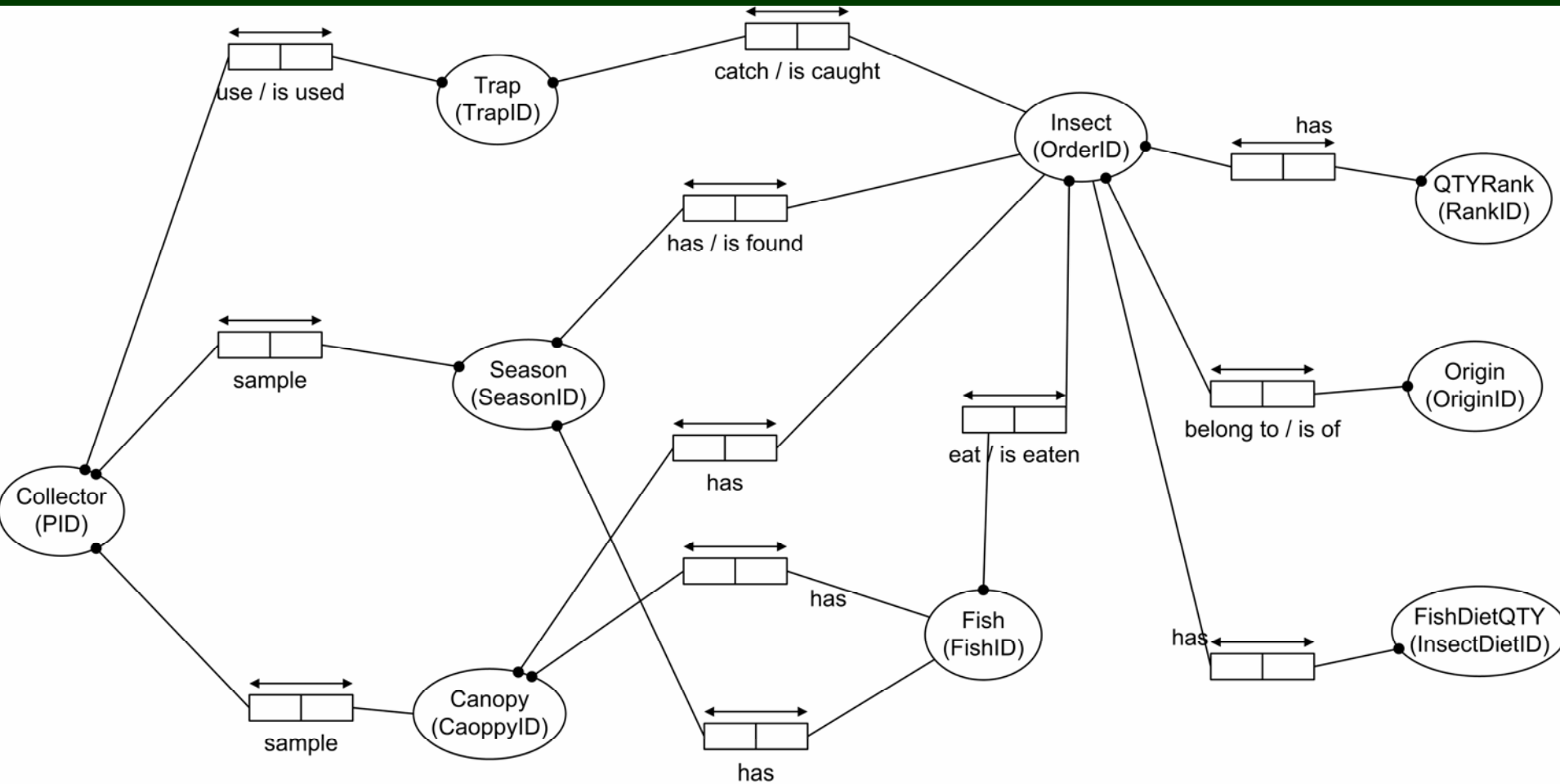
Object Role Modeling (ORM)

- Ternary Fact: Fish eat insects in season



- **Quaterary Fact:**
Fish eat insects in season in forest

ARMACS ORM Model



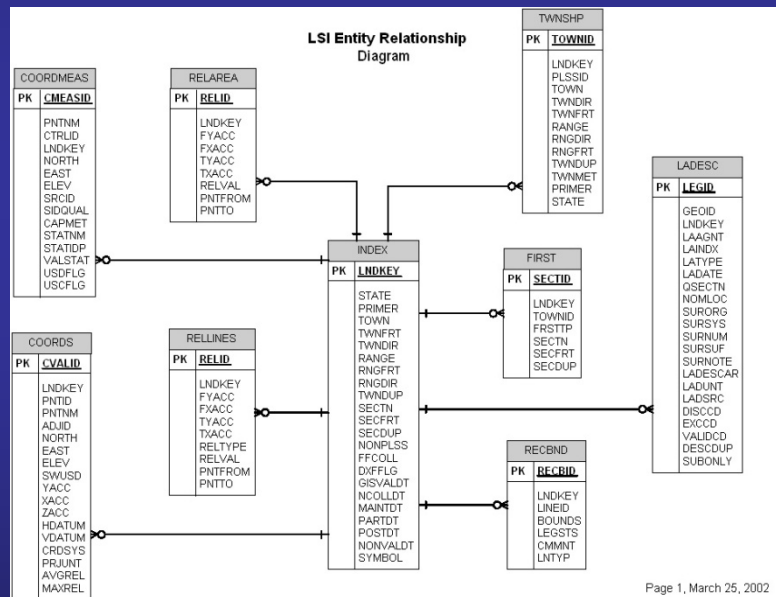
Data Modeling

- Fish eat Insect in Season in Forest

Fish eat Insect Season Forest	
PK	<u>Insect ID</u>
PK	<u>Season</u>
PK	<u>Forest</u>
	FishID

Graphical Models

Conceptual Model
(Object Role Model)

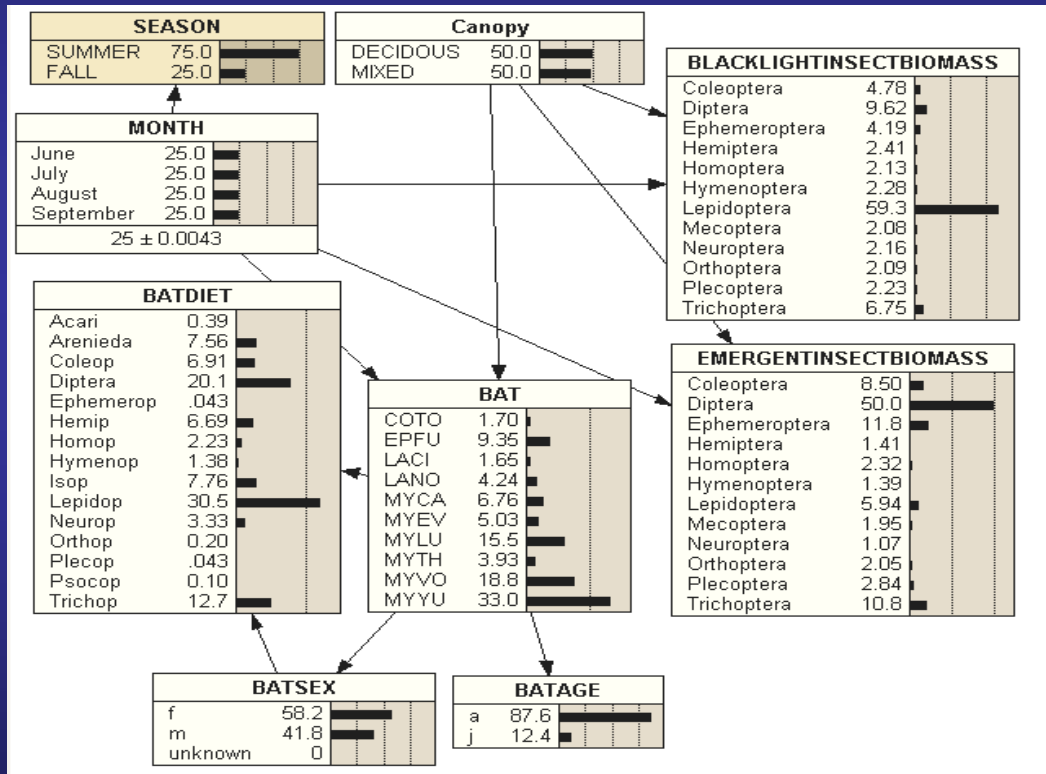


Data Model
(Relational Database)



Graphical Models

Conceptual Model
(Object Role Model)



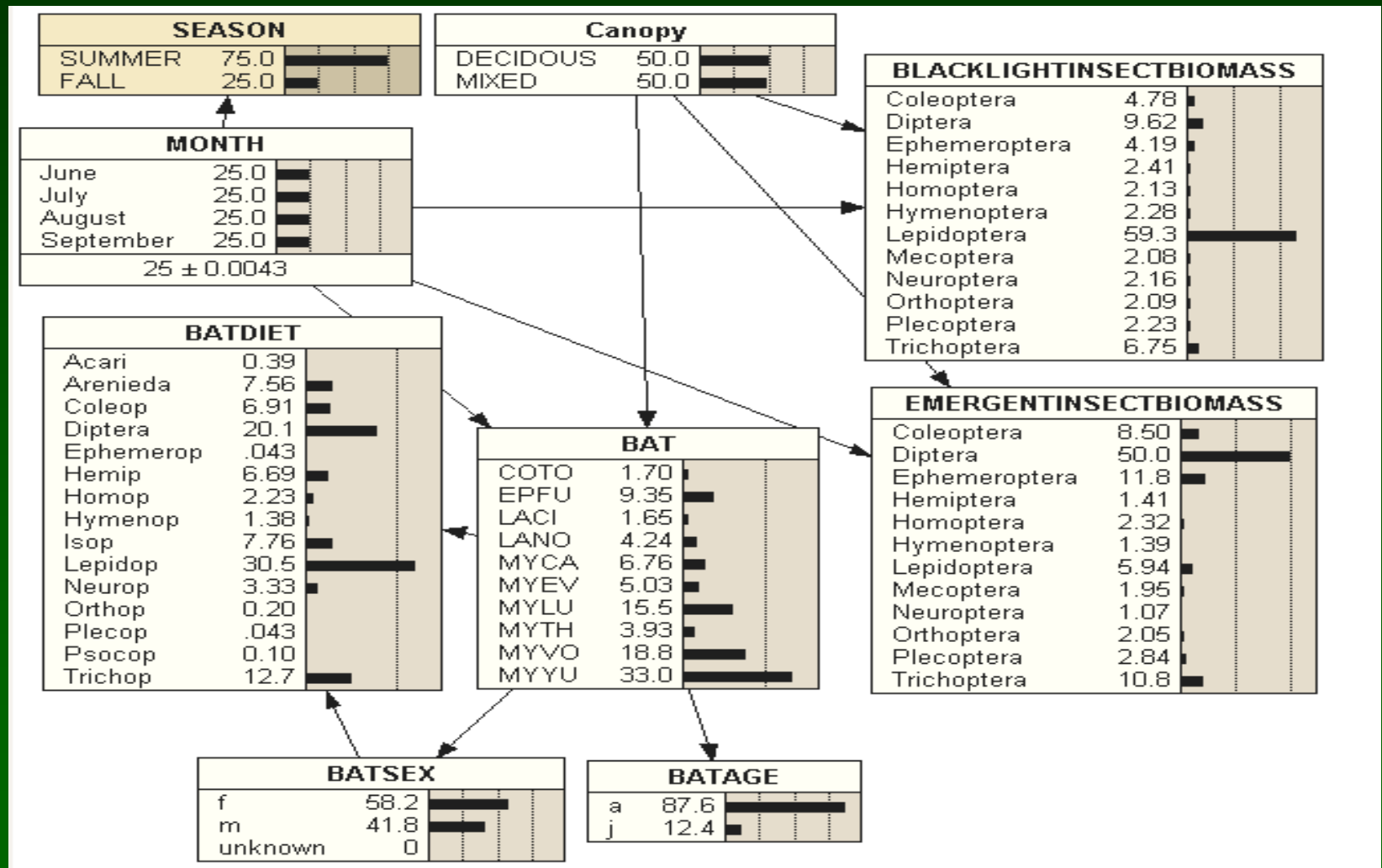
Data Model
(Relational Database)

Probabilistic Model
(Bayesian Network)



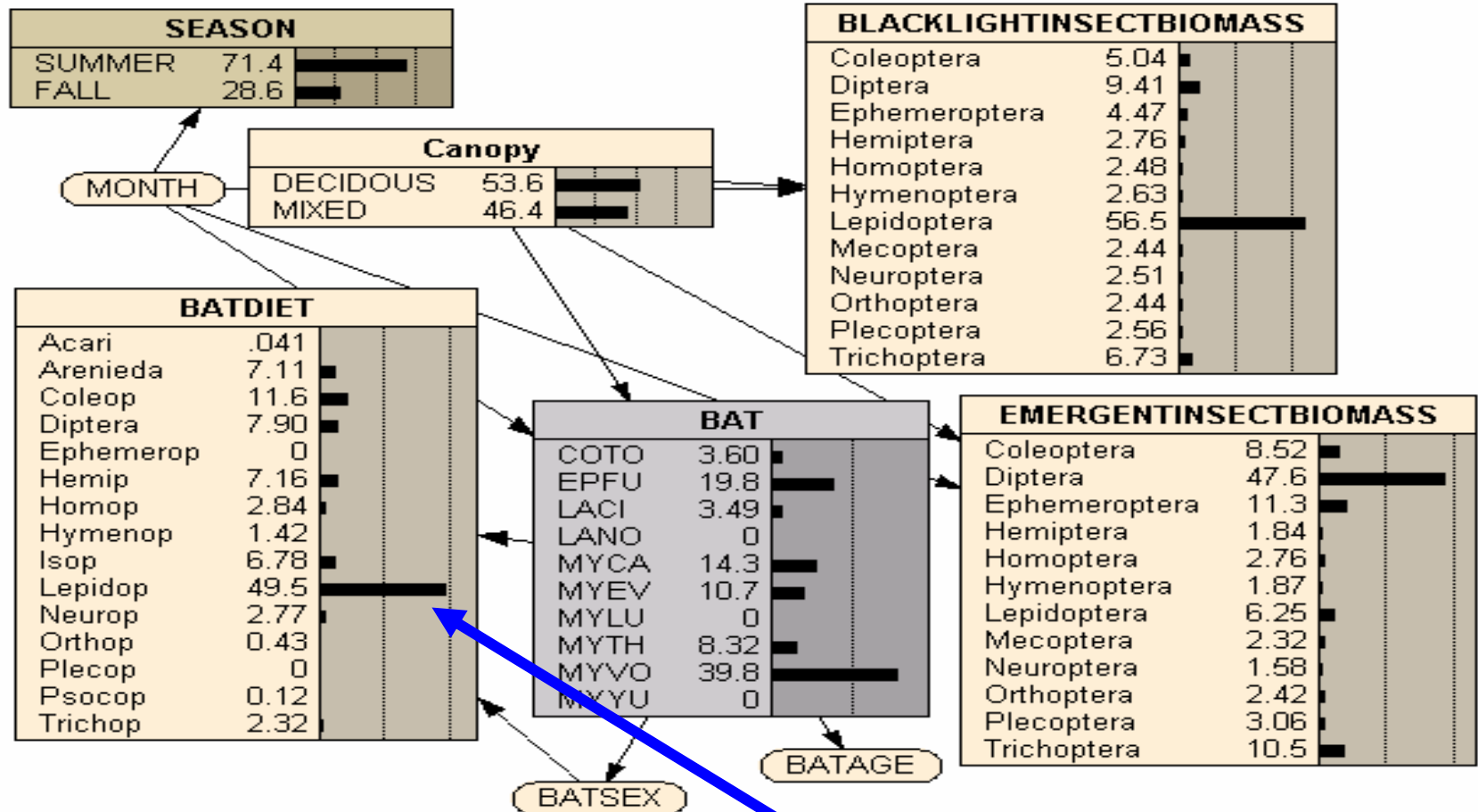
ARMACS Bayesian Belief Network Model

Builds from individual models



ARMACS Bayesian Belief Network Model

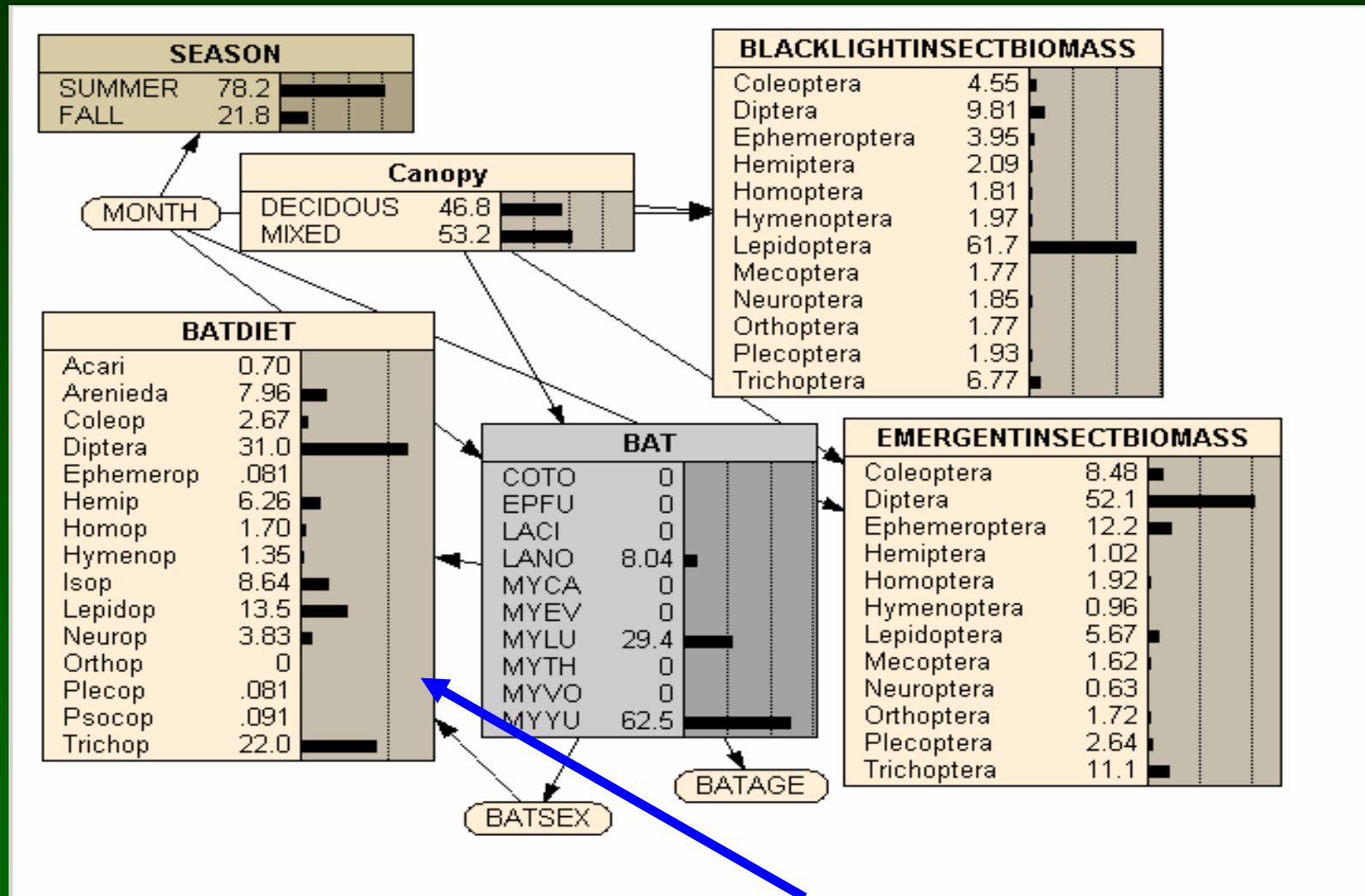
Observing General Patterns



Most Bats fed on Lepidoptera

ARMACS Bayesian Belief Network Model

Query by Species



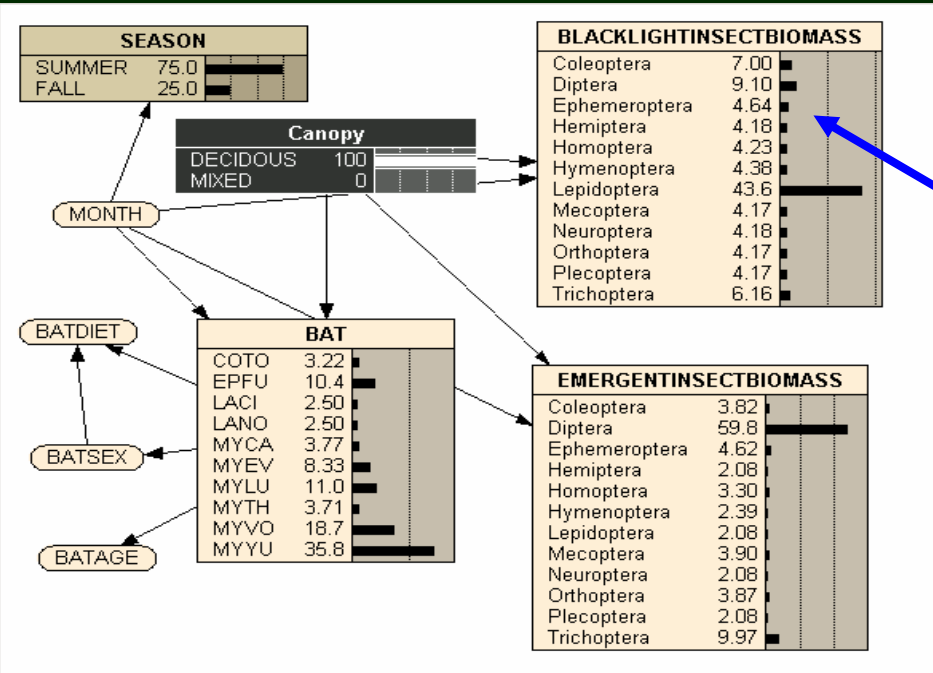
3 Bat species fed more on emergent aquatic insects

ARMACS Bayesian Belief Network Model

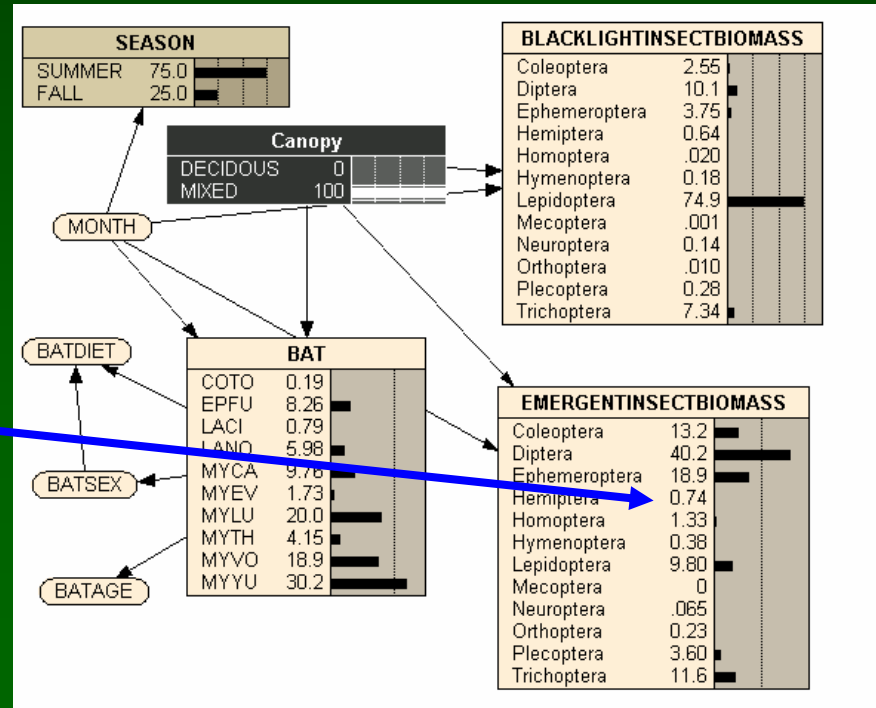
Can be queried for varying conditions



Deciduous:
greater diversity
in night time insects

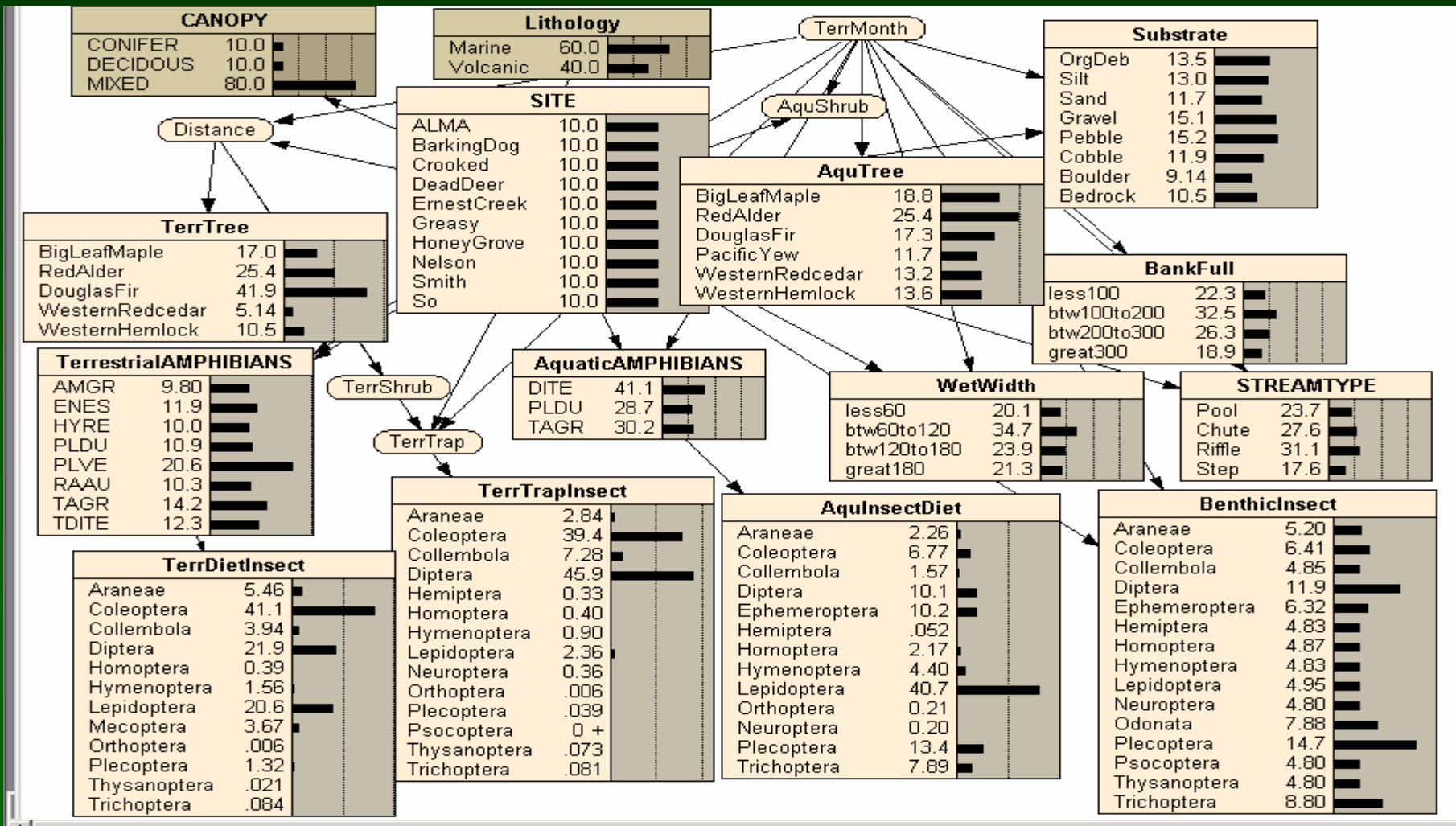


Mixed canopy: greater
diversity in stream
emergent insects



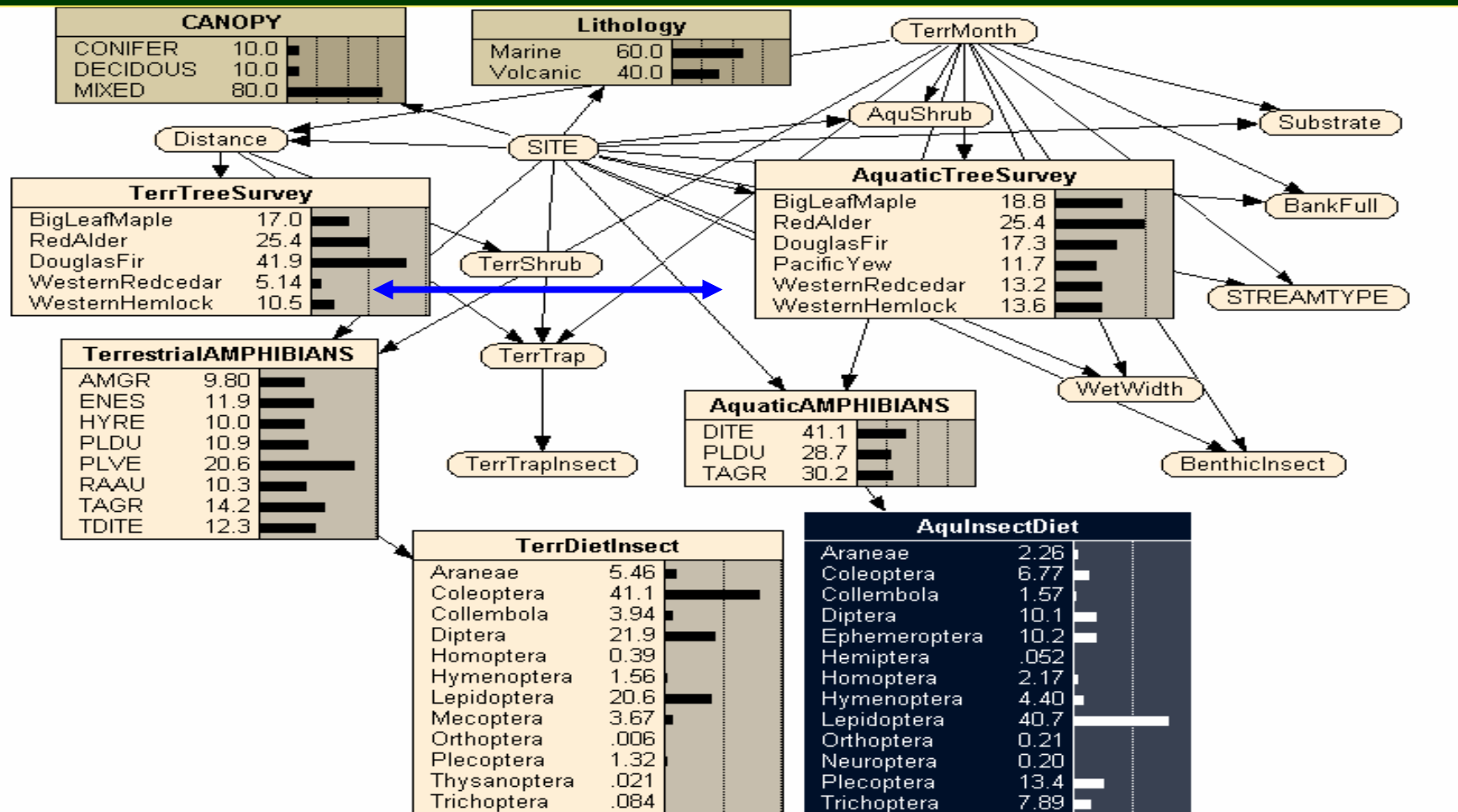
ARMACS Bayesian Belief Network Model

Query for distributions



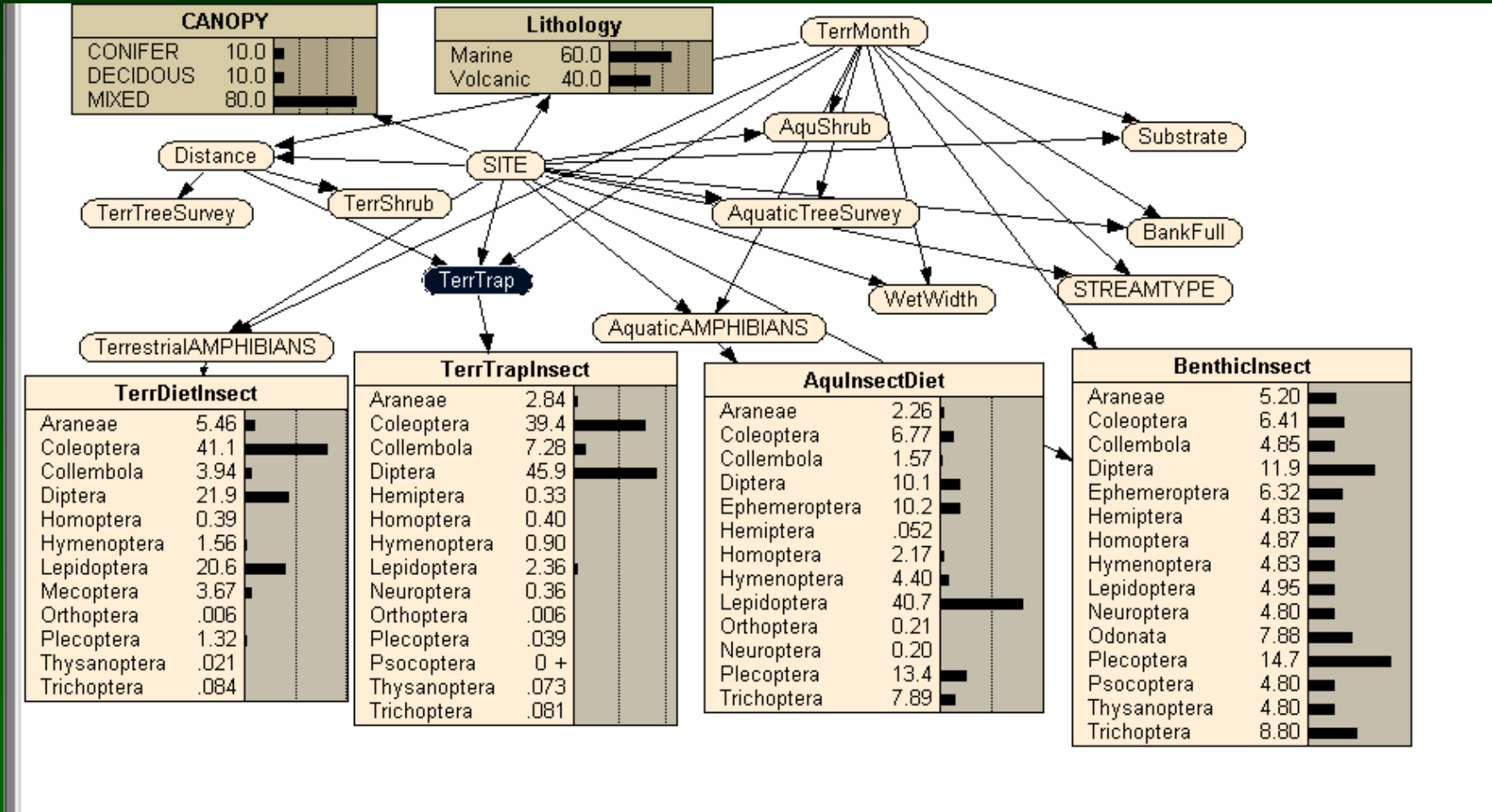
ARMACS Bayesian Belief Network Model

Query for distributions

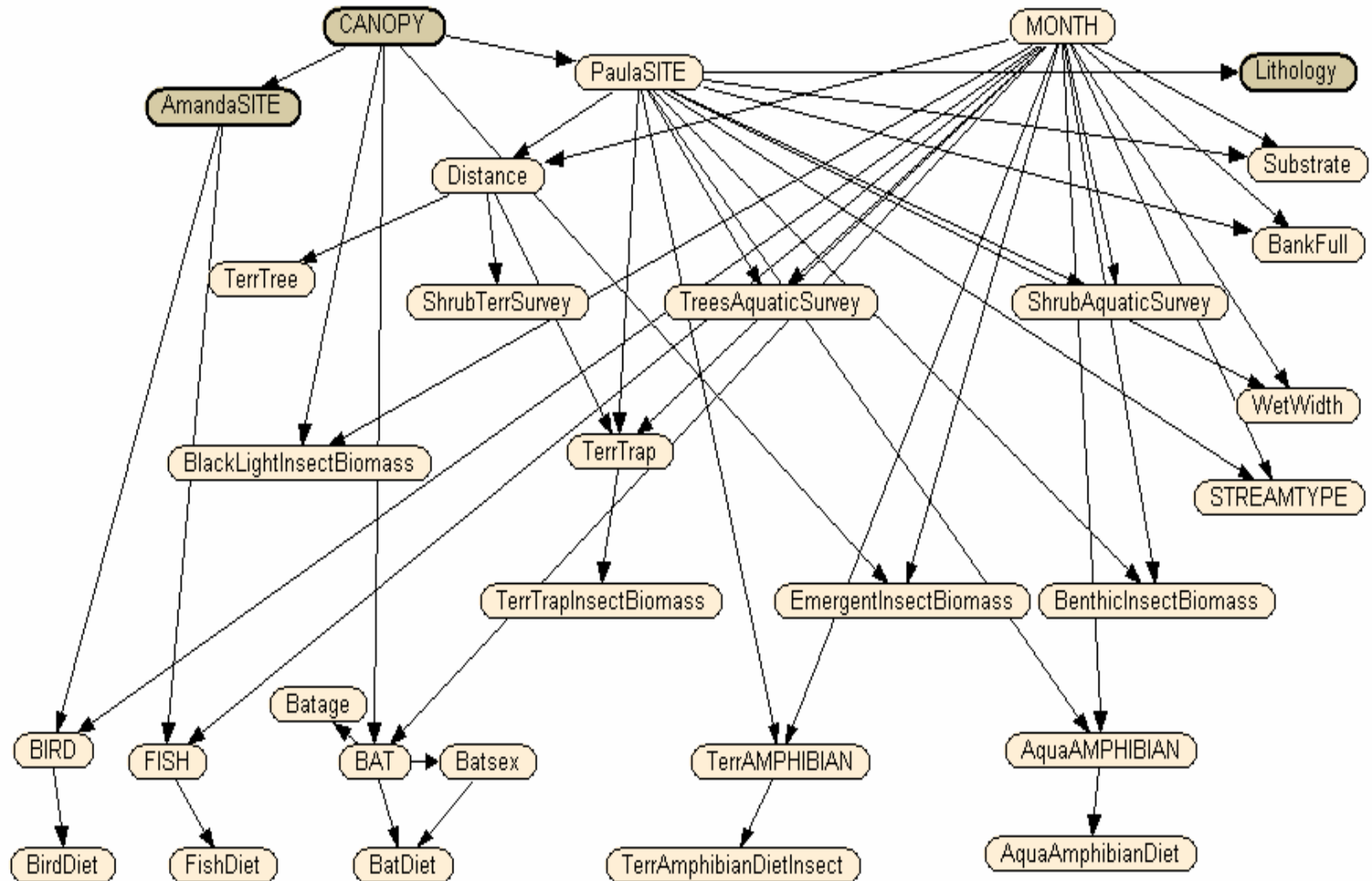


ARMACS Bayesian Belief Network Model

Compare Across Variables: Consumption v. Availability



ARMACS Coast Range Riparian Foodweb Model





Models built by experience from multiple studies

Emily Scott, Nico Romero, Stephanie Hart, Sharmi Premdas

Required compatible data with linking variables :
sites, date, vegetation,
invertebrates



ARMACS Riparian Foodwebs Model

A Probabilistic Model for the Oregon Coast Range

By isolating variables,
temporal, spatial and species-specific comparisons are possible

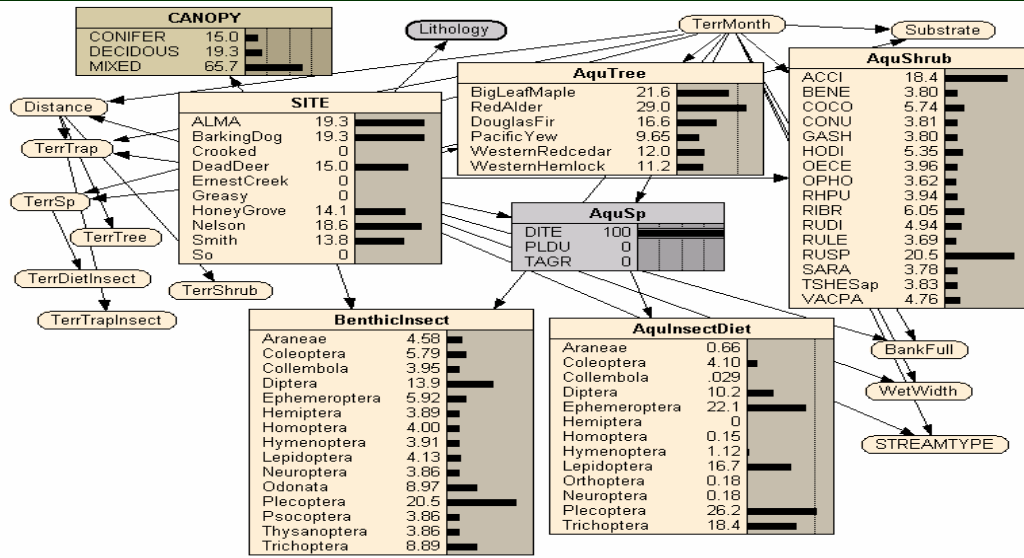


Begins with simple relationships

Builds individual models
from quantitative, local information

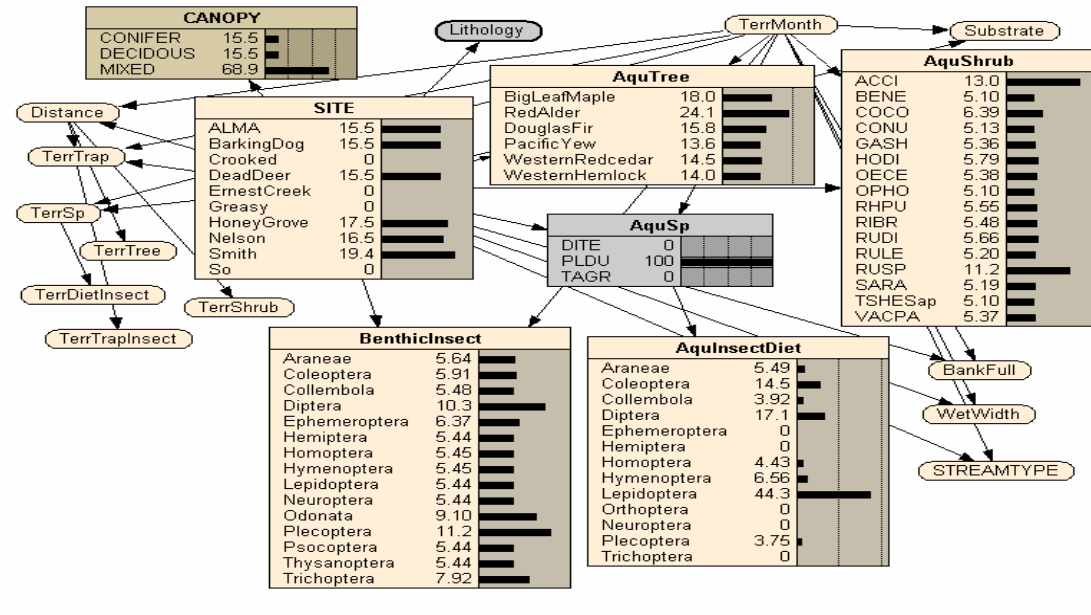
Combines individual models into a network

ARMACS Bayesian Belief Network Model



Query for
Species of Interest

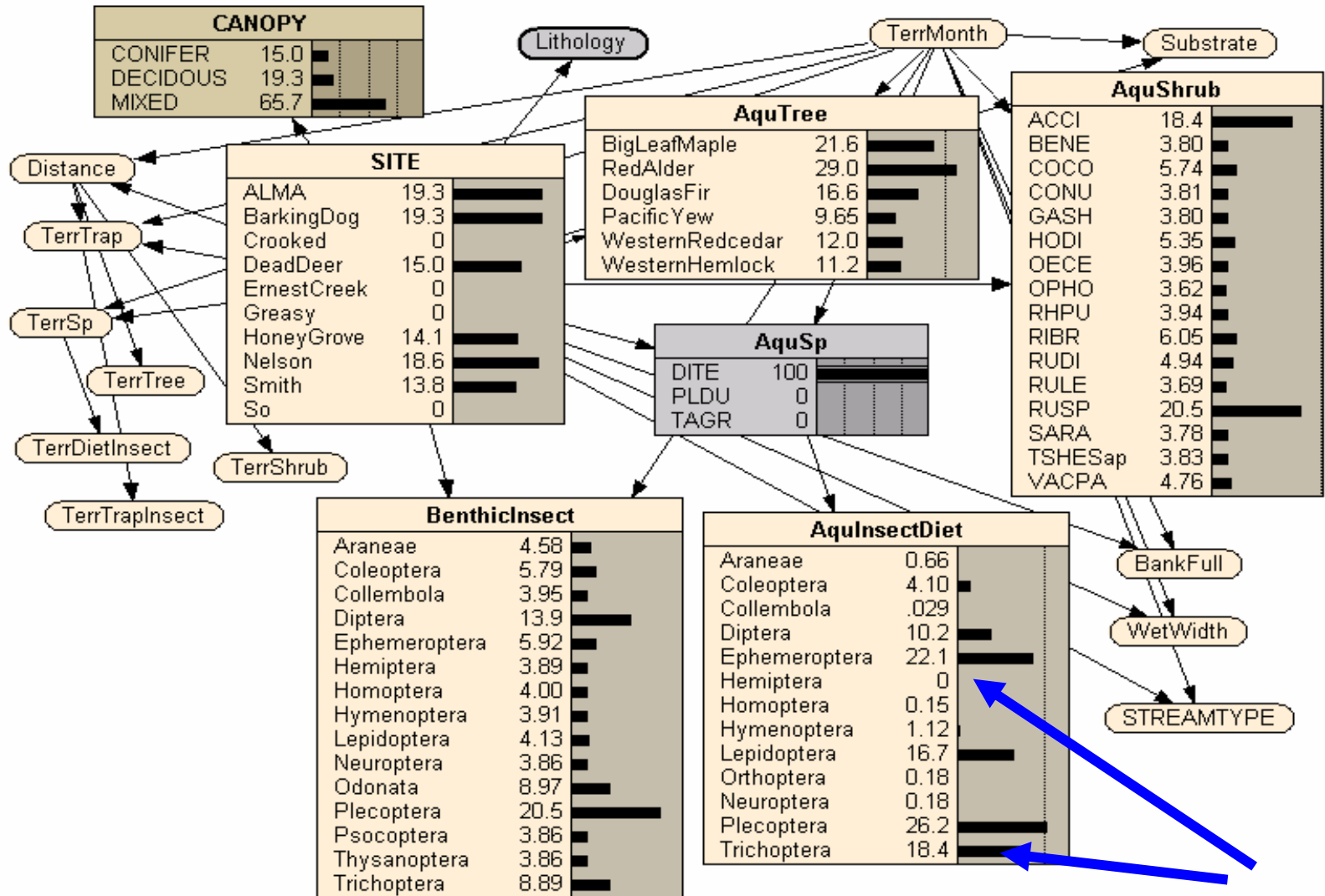
Pacific giant salamander



Dunn's salamander

ARMACS Bayesian Belief Network Model

Species of Interest: Pacific Giant Salamander



ARMACS Bayesian Belief Network Model

Species of Interest: Dunn's Salamander

