Wildlife Habitat Evaluation Program

WHEP Concepts

1. Communities and Ecosytems
2. Habitat Requirements
3. Focal Species
4. Species Richness
5. Plant Succession and its Effects on Wildlife
6. Vertical Structure (layering)
7. Arrangement and Interspersion
8. Edge and Contrasts
9. Area Sensitive Species
10. Home Range, Movements, and Migration
11. Carrying Capacity
12. Pond Dynamics, Balance and Stream Habitats
13. Food Webs

Concept 1 – Communities and Ecosystems

A biotic (living) community includes all the plant and animal populations living in a defined area.

- composition changes over time
  - in response to plant succession
  - in response to climate

Concept 1 – Communities and Ecosystems

- Living communities (biotic) interact with the nonliving resources (abiotic things like soil, air, water and sunlight) to form an ecosystem.
  - Ecosystems can be small (within a decaying log or a flower) or large (forest or stream system).

Concept 2 – Habitat Requirements

- Habitat is the physical, environmental factors including vegetation, that a species requires for *survival and reproduction*.
- Distribution and abundance of a species is bounded by physical limitations.
- Within these limitations habitat use further influenced by.
  - resource abundance.
  - resource distribution.
  - resource variability.

Concept 2 – Habitat Requirements

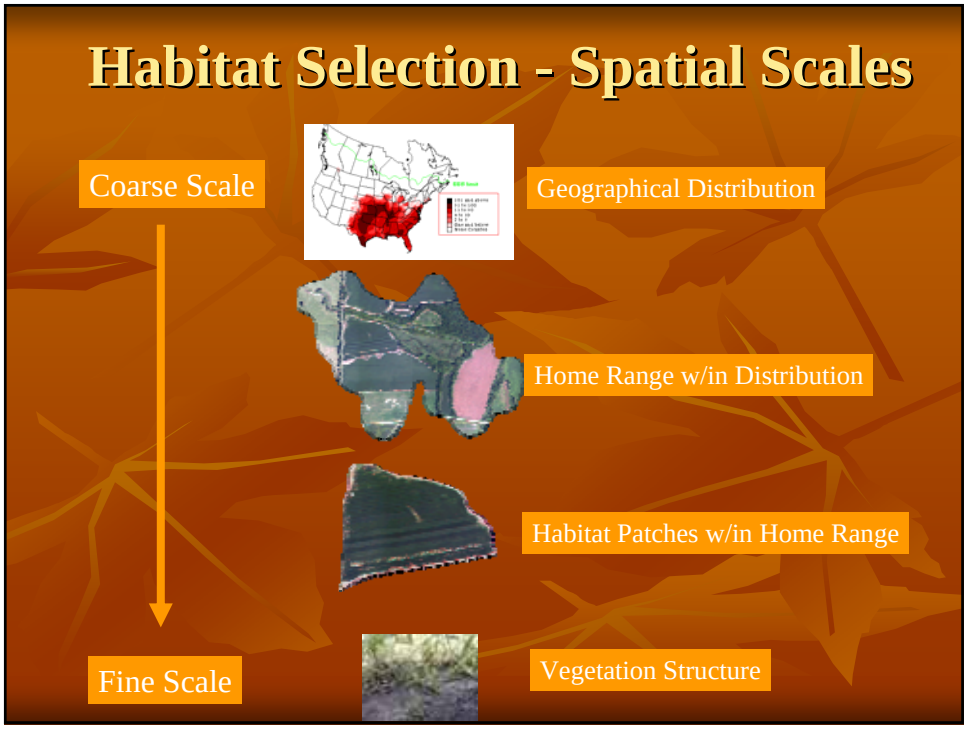
- Food
- Water
- Usable space
  - the area required to accommodate necessary movements of an animal –
    - breeding range, brood range, fall feeding area
- Cover
  - shelter
    - Protection from predators
    - Severe weather
    - Thermal cover

Adaptations – Design Features

- Habitat requirements differ among species because they have different adaptations
- Adaptations equip an animal to optimally exploit unique parts of a given environment
  - Specific resources
  - In a specific fashion
  - Specific successional stage
  - Specific plant community
  - Survive and reproduce

Adaptations-Design Features

Annual Cycle
Summer
Winter
Fall


Habitat Selection - Spatial Scales
Coarse Scale
Geographical Distribution
Home Range w/in Distribution
Habitat Patches w/in Home Range
Fine Scale
Vegetation Structure

Seasonal Processes

- Biological processes vary throughout the annual cycle.
- Energetic and nutritional requirements vary seasonally.
- Requisite resources vary seasonally.
- Habitat requirements vary seasonally.

Wildlife Habitat Management

- Providing the plant communities
  - Resources
    - Nutritional, energetic, and behavioral requirements of a organism
      - Involved in one or more specific seasonal biological processes
        - Year round

Concept 3- Focal Species

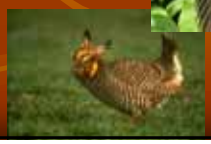
- Two basic approaches in wildlife habitat management.
  - Featured Species - best habitat possible for a particular featured wildlife species.
  - Species Richness/Diversity - provide habitat for as many different wildlife species as possible in a given area.

Concept 3 – Focal Species

Which species are to be favored?

- Landowners may have specific objectives for certain wildlife species
  - White-tailed deer
  - Eastern Wild Turkey
  - Waterfowl
  - Bobwhite

- Public may have concerns about a particular game or endangered species
  - Red-cockaded woodpecker
  - Bald eagle
  - Grassland songbirds



Concept 3 – Focal Species

- Identify habitat requirements for featured species
- Evaluate the habitat or landscapes ability to provide the requirements.
- Use management practices to improve the area's ability to supply habitat requirements.
- Select management practices that provide the habitat requirements that are most lacking and thus are limiting the population (limiting factors).
- The desired species may be totally incompatible with the available habitat and management goals must be changed.
- Management practices that improve habitat for some wildlife species may be detrimental to other wildlife species.

Concept 3 – Focal Species

- Management practices that improve habitat for some wildlife species may be detrimental to other wildlife species.

Concept 4 - Species Richness (Diversity)

- "Species richness" = is the number of different kinds of wildlife species that are found in an area.
- One goal in wildlife habitat management may be to provide habitat for as many species and as many individuals within a species as possible

Concept 4 – Species Richness

- Lands that are high in species richness often have many of the following characteristics:
  1. A mixture of different habitat types in various successional stages.
  2. A balance of edge with unbroken blocks of vegetation in one successional stage.(see Concepts 6 & 7)
  3. Unfragmented blocks of habitat at least 10 to 40 acres in size (but block size varies among species).
  4. Edges with low contrast. (see "soft edges" in Concept 7)
  5. Diverse vertical layering. (shrub layer, mid-story layer, lower canopy, upper canopy, etc).

Concept 4 – Species Richness

- By creating a variety of successional stages within an area you will provide the habitat requirements for many different wildlife species as well as attract more species.
- Some successional stages support greater species richness than others.
- When managing habitat for species richness, the goal is to provide some habitat for as many species as possible.
  - Species rich habitats
  - Diversity of habitats and successional stages

Concept 4 – Species Richness

Successional Processes

0-4 yrs

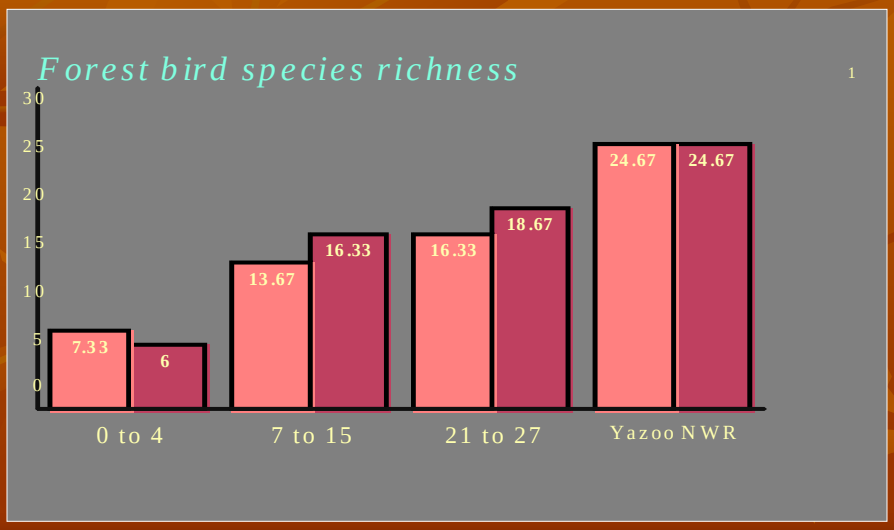
7-15 yrs

21-27 yrs

Mature

Concept 4 – Species Richness

Changes in avian community

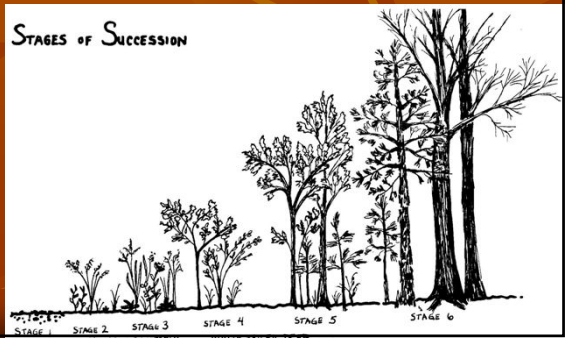


Concept 5 – Plant Succession

- Orderly Process of plant community development involving changes in plant species composition over time

Plant Succession Stages:

- Stage 1 — bare ground
- Stage 2 — annual forbs and grasses;
- Stage 3 — perennial grasses and forbs
- Stage 4 —shrubs
- Stage 5 — young woodland;
- Stage 6 — mature woodland, usually deciduous.



Concept 5 – Plant Succession Stage 1- Bare Ground

- Bare Ground
- Post-disturbance
  - Fire
  - Flooding
  - Hurricane
  - Volcano
  - Landslide
  - Agriculture
  - Clearcut

Concept 5 – Plant Succession

Stage 2 - Annual forbs and grasses

- Abundant bare ground
- Little litter accumulation
- Annual seed producing plants
- Extremely productive
- Short lived

Concept 5 – Plant Succession

Stage 3 – Perennial Grasses and Forbs

- Plants reproduce by vegetative means, live > 1 year
- Increasingly grass-dominated
- Litter accumulation
- Less seed production

Concept 5 – Plant Succession

Stage 4 – Shrubs

- Woody shrubs and saplings

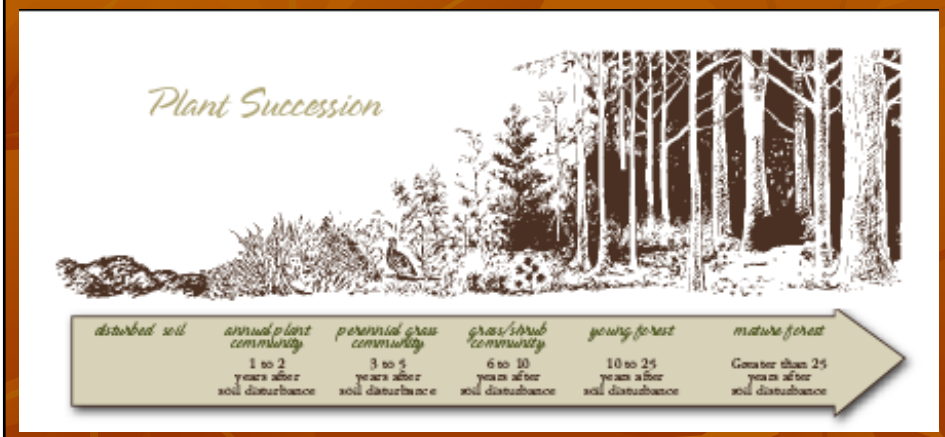
Concept 5 – Plant Succession

Stage 5 – Young Woodland

Concept 5 – Plant Succession

Stage 6 – Mature Forest

Plant Succession Stages:



Concept 6 – Vertical Structure

- Vegetation grows in multiple layers or strata.
  - Ground cover - Grasses and forbs (< 3 ft)
  - Shrub layer (3 ft to 10 ft above ground).
  - Mid-story - small diameter trees and larger shrubs (10 ft to 30 ft above ground).
  - Tree canopy –
    - lower canopy (trees that are not the dominant trees in the stand)
    - upper canopy (trees that are dominant with their entire crowns receiving sunlight).
- Different species are associated with different layers

Concept 6 – Vertical Layering

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Concept 6 – Vertical Layering

- How layers of vegetation are arranged is important to many wildlife species.

Concept 7 - Arrangement and Interspersion

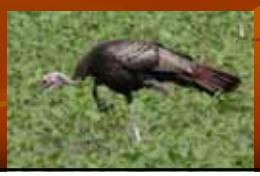
- Arrangement of different successional stages or vegetation types in relation to each other is important for some species
  - Size, shape, distribution of habitats
  - Horizontal arrangement
  - Juxtaposition.

Spatial Diversity

- **Interspersion - intermixing of units of different habitat types**
- **Juxtaposition - a measure of the proximity of year-round habitat**

Concept 7 - Arrangement and Interspersion

- Some wildlife species obtain all their habitat requirements from only one successional stage
- Others need more than one successional stage to provide all their habitat requirements.



Annual Cycle

Concept 7 - Arrangement and Interspersion

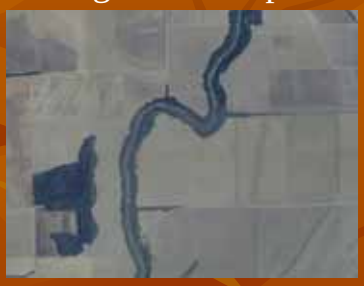
- Eastern wild turkeys use mature woodlands (stage 6) for feeding, roosting at night, and living in most of the year,
- Nest in or at the edge of dense brushy cover (stage 4 & 5) created by clear-cuts.
- Need grassy fields or grass/forb habitat (stage 2 & 3) for brood rearing and insect foraging.

Concept 8 -Edges and Contrast

- Edge (ecotone) = boundary where two or more types of vegetation or successional stages meet.

Concept 8 -Edges and Contrast

- Abrupt change where one type of vegetation stops and another begins the
  - Hard edge
  - Edge is narrow



Concept 8 -Edges and Contrast

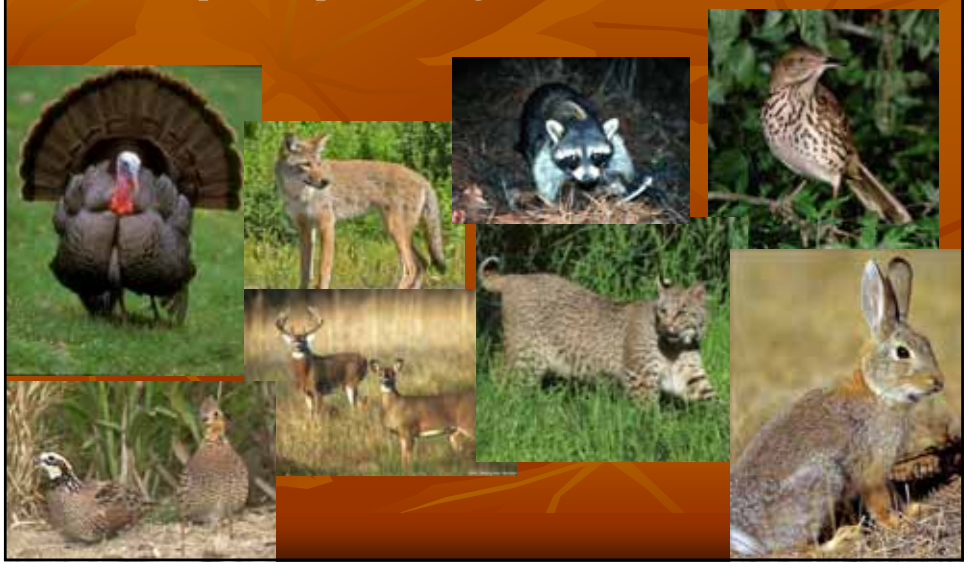
- Gradual transition from one stage to another.
  - Soft edge
  - Edge is wide
  - Multiple successional stages/vegetation types.

Concept 8 -Edges and Contrast

- Edges attract many different wildlife species
  - Variety of food, cover, and other habitat requirements associated with each stage
- Edge may benefit wildlife species that have:
  - Low mobility
  - Require multiple successional stages
  - Do not require large areas.
- However, creation of edge may be detrimental to some wildlife species:
  - Area sensitive species (see Concept 8)
  - Species requiring large tracts of unfragmented habitat in one successional stage.

Concept 8 -Edges and Contrast

- Some species prefer edge



Concept 8 -Edges and Contrast

- Some species avoid edge

Concept 9 - Area Sensitive Species

- Area Sensitive Species - need large, unbroken (unfragmented) areas in a certain successional stage to provide some or all of their habitat requirements.
- Large areas of vegetation in one successional stage are desirable.
- A forest or rangeland in one successional stage that has at least 100 acres of unfragmented area is considered to be the minimum requirement for many area sensitive species.
- Some species may require 1,000 acres or more at a minimum.
- Fragmentation is the disruption of areas of large, continuous habitat types either by man-made or natural processes.

Concept 9 - Area Sensitive Species

- Habitat Fragmentation

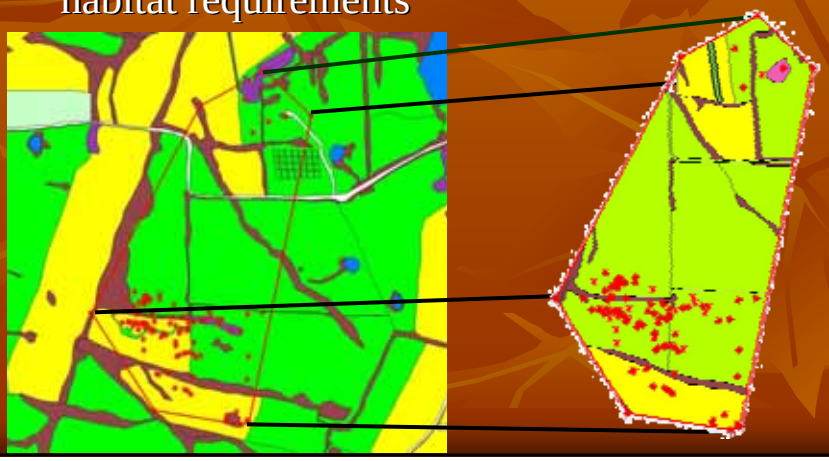
Concept 9 - Area Sensitive Species

Concept 10 -Migration and Home Range

- Animals move to acquire the resources they need for food, cover, water, shelter, and mates
- Animals exhibit different patterns of movement at different temporal scales
  - Daily (diel) movements - among habitat patches that provide essential feeding, resting, breeding, or escape cover
  - Seasonal movements among habitat patches or portions of the landscape that meet different seasonal habitat requirements
- Daily and seasonal movements occur within an animal's seasonal or annual home range

Concept 10 -Migration and Home Range

- Home Range – Area utilized by an animal on a seasonal or annual basis that provides all their habitat requirements



Concept 10 -Migration and Home Range

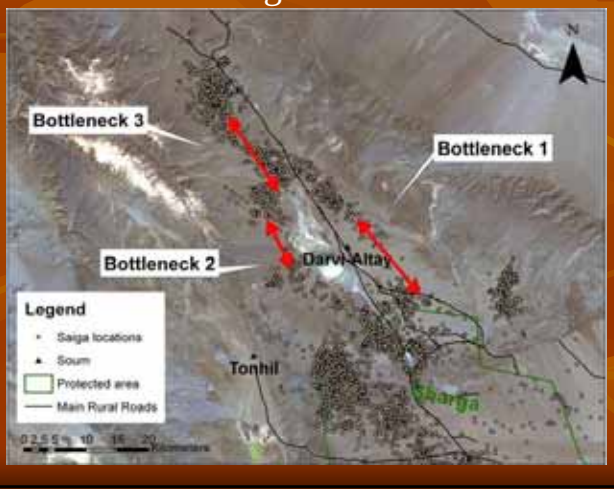
- Migration –Bi-directional movements between seasonal ranges
  - Latitudinal (north –south)
  - Elevational (high elevation during summer, lower elevation during winter)
- Wildlife are considered to migrate when they move from one type of habitat to a completely different type of habitat.
- Migration distances may be short or very long

Concept 10 -Migration and Home Range

- Migratory animals exhibit bimodal home ranges with spatially disjunct areas of seasonal activity.
- Ducks, geese, some songbirds, and American woodcock migrate.
- This requires that necessary habitats are available along the route.
- For many species, corridors that provide areas for safe travel are very important during migration.

Concept 10 -Migration and Home Range

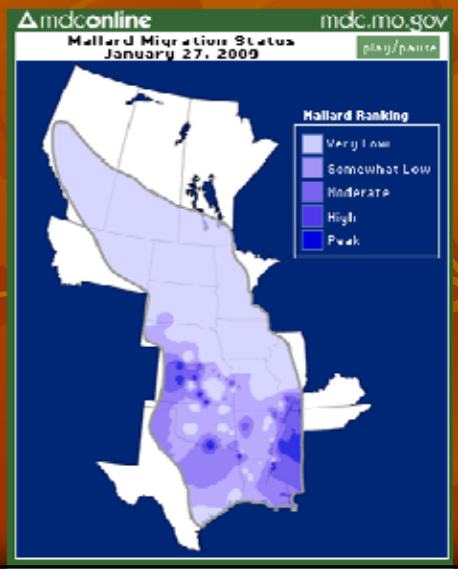
- Migration patterns of Saiga in Altai Mountains of western Mongolia



Concept 10 -Migration and Home Range

- Protecting migratory corridors of big game in western US

Concept 10 -Migration and Home Range Mallard Migration



Concept 10 -Migration and Home Range

- Migratory WHEP species

Concept 11 - Carrying Capacity

- Carrying Capacity = a limit to the number of a particular species a given patch or landscape can sustain.
- The quantity and quality of food, water, cover, and space determines the carrying capacity.
- If one of these basic requirements is in short supply, the carrying capacity is lowered.
- By adding the missing ingredient, a manager can increase the habitat's carrying capacity.

Concept 11 - Carrying Capacity

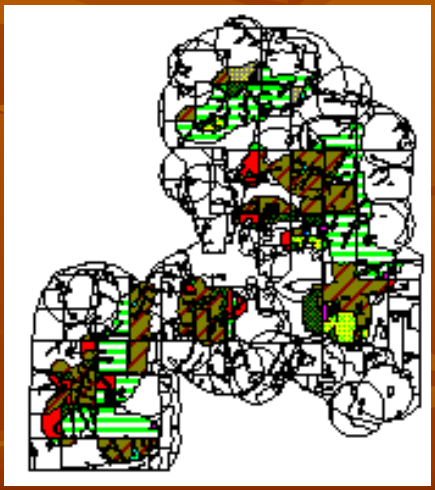
- Carrying capacity varies over time
  - From year to year
  - Within year, from season to season.
- Carrying capacity is usually greatest from late spring through fall when plant vegetation, insects, and other food supplies and cover are most abundant.
- This is when most young are born and grow.
- With the coming of winter or summer drought, food and cover gradually diminish, as does the habitat's carrying capacity.

Concept 11 - Carrying Capacity

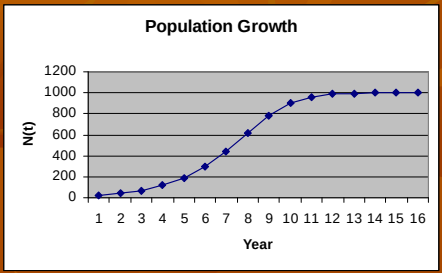
- More animals are produced each year than will survive to the next.
- Surplus animals are generally lost to starvation, disease, and/or predation.
- Young wildlife and animals in poor health experience the highest death rates.
- Harvesting (hunting) of game or fish for human consumption is one way to utilize the annual surplus.
- Harvest can help to keep a population in balance with available habitat and resources.

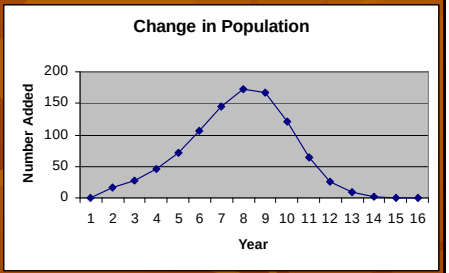
Concept 11 - Carrying Capacity

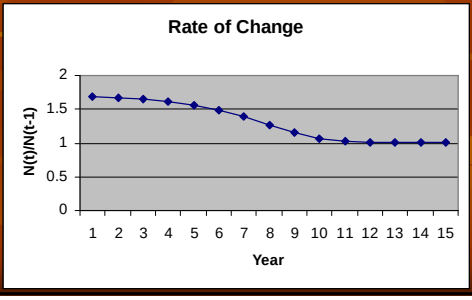
- A long-term increase in population can be accomplished only by increasing the habitat's carrying capacity



Concept 11 - Carrying Capacity







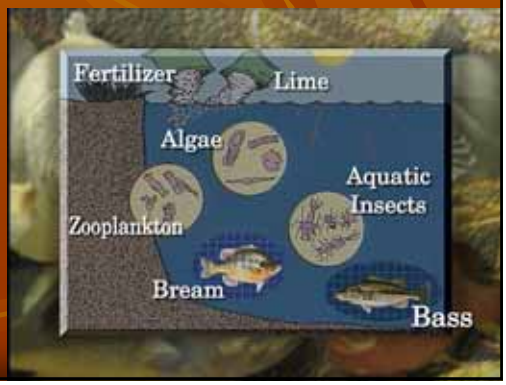
Concept 11 – Carrying Capacity

- Biological carrying capacity exceed cultural carrying capacity because of wildlife damage issues.
  - White-tail deer populations can thrive in urban areas, biological carrying capacity is very high because deer have adapted to feed successfully on ornamental plant material.
  - Home owners have low tolerance for deer feeding on expensive landscape plants and therefore the population of deer must be reduced to limit the damage.
  - In this case, the cultural carrying capacity is much lower than the biological carrying capacity.

Concept 12 - Pond Dynamics and Balance

Pond Management Basics

- Proper stocking of the right species and number,
- Correct fertilizer scheme,
- Stable water level,
- Aquatic weed control,
- Balanced harvest of fish.



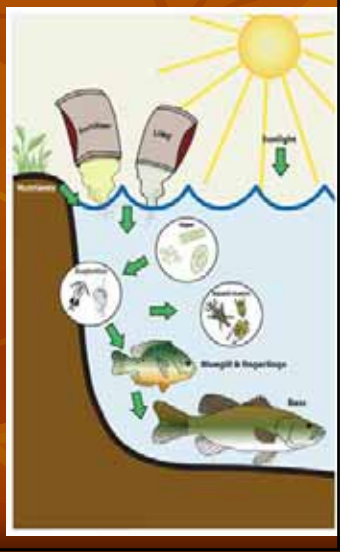
Concept 12 - Pond Dynamics and Balance

- Proper stocking of the right species and number,
  - Bluegill and redear sunfish at 500 per acre (mixed), stocked in the fall or winter
  - Fathead minnows at 500-1,000 per acre, stocked with the bream in the fall or winter
  - Largemouth bass at 50 per acre, stocked the following spring.

Concept 12 - Pond Dynamics and Balance

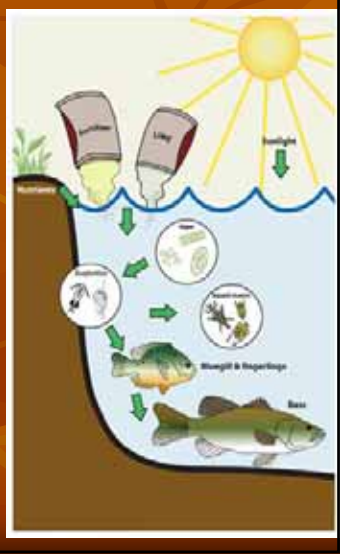
Managing Alkalinity with Lime

- Lime is used to increase the alkalinity and thus effectiveness of a fertilization program.
- Ponds with alkalinities < 20 ppm should be limed in the fall before springtime fertilization is initiated.



Concept 12 - Pond Dynamics and Balance
Fertilizing

- Fertilizer stimulates growth of microscopic plants, called phytoplankton.
  - Phytoplankton form the base of the food chain
  - Phytoplanton provide food for zooplankton
  - Zooplankton in turn are eaten by small fish.
  - Small fish feed bass.
- Phytoplankton make the water turn green, or "bloom," which also shades the bottom and discourages growth of troublesome aquatic weeds.



Concept 12 - Pond Dynamics and Balance
Aquatic Weed Control

- Pond structure
- Biological control (grass carp)
- Chemical control (herbicides)
- Mechanical control
  - Cutting
  - Drawdown

Concept 12 - Pond Dynamics and Balance

Low dissolved oxygen

- This is probably the biggest cause of fish kills in farm ponds.
- Oxygen depletions usually occur July through September in the time of highest water temperature.
- Results from natural processes.

Concept 12 - Pond Dynamics and Balance

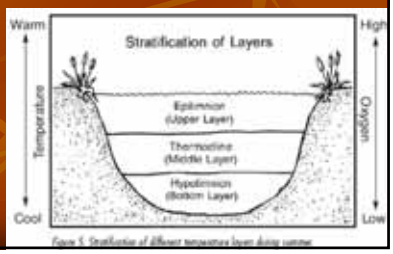
Low dissolved oxygen

- One common cause of oxygen depletion is die-off of microscopic algae during several days of cloudy weather.
- Decay of these microscopic algae uses up the dissolved oxygen the fish require to breathe.

Concept 12 - Pond Dynamics and Balance

Low dissolved oxygen

- Pond turnover or “destratification” can also cause low DO and fish kills
- Can occur after heavy cold rains in late summer or in early fall when temperatures drop suddenly.
- Causes a mixing of warm surface waters with cooler bottom waters and often results in an oxygen depletion.
- Early symptom of a low dissolved oxygen level:
  - Fish at the surface of the pond at sunrise, gasping for air.
  - Adult fish die first, and intermediate fish follow if the low oxygen level continues for many days.
  - Usually, some fingerling fish will survive



Concept 12 - Pond Dynamics and Balance

Harvest Management

- Harvest can start in the second year after stocking
- Balanced bass-bream
  - Harvest a minimum of 10 pounds of bream for every pound of bass.
- Trophy bream or blue-gill fishing
  - Minimize harvest of bass, producing a bass-crowded population
  - This will produce fewer, but much larger bream
- Trophy bass fishing
  - Heavier harvest of smaller (10-11 inch) bass to prevent over-crowding and protection of specific larger size-classes of bass.
  - No more than 15 to 25 pounds of bass per acre should be harvested annually
  - Harvest 10 lbs of bream/lb of bass

Concept 12 – Stream Habitats

- Stream - a body of water moving in a more or less definite pattern and following the course of least resistance to a lower elevation.
- Water volume and rate of land erosion fluctuate along the course of the stream, causing the bottom and shoreline to be relatively unstable.
- Moving water carries materials such as gravel, sediment, or debris that have been picked up and redistributed them along the stream course.

Concept 12 – Stream Habitats

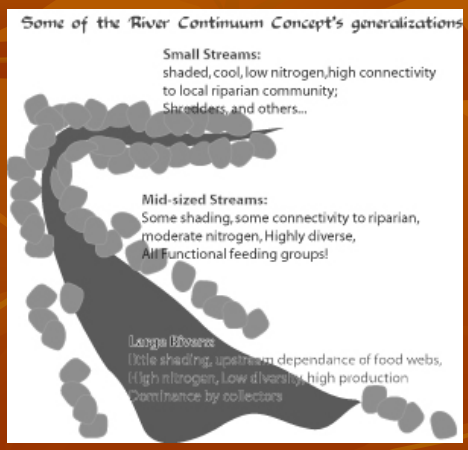
- When water flow is restricted to a narrow area, the stream can create more erosion resulting in deeper areas or pools.
- As the stream passes through wider passages, the water flow slows and material is deposited to form areas known as riffles.

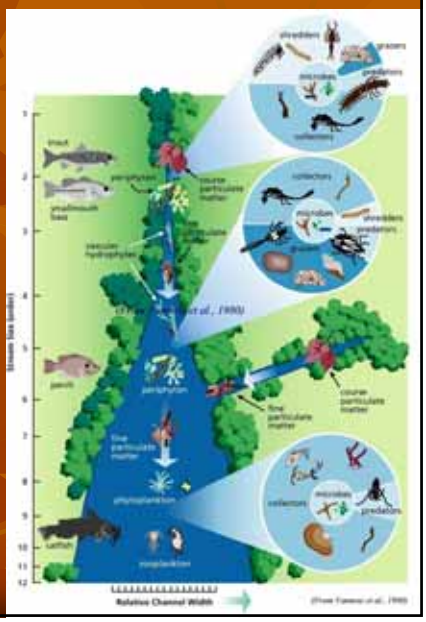
Concept 12 – Stream Habitats

- Pools and riffles are important habitat types for the various fish species that inhabit streams.
- Pools provide areas for fish to feed and find refuge from fast moving water that requires more energy for swimming.
- Riffles are usually preferred habitat for spawning.
- It is important that fish have the ability to move freely between these various habitats in the stream.

Concept 13 – Stream Habitats

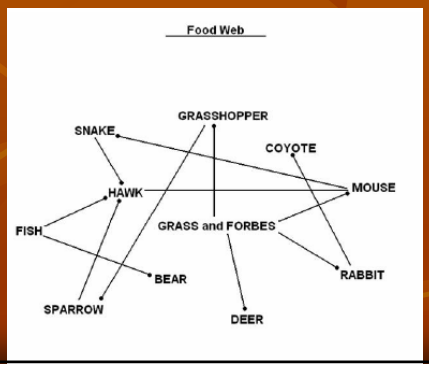
- Stream Continuum Concept





Concept 13 - Food Webs

- Food web - a network of interconnected food chains, which are the step-by-step passage of matter and energy (food) through an ecosystem.



Concept 13 - Food Webs

- Plants are primary producers in a food chain because they supply food at the lowest level of the food chain.
- Requires enormous number of individual plants to support the other parts of a food web.
- Primary consumers eat plants (herbivores).
  - rabbits, mice, deer, and certain other mammals, some insects and fish, and dabbling ducks, geese, and certain other birds.
- Primary consumers are eaten by secondary consumers, or carnivores (meat-eaters).
  - Predators such as birds of prey, snakes, foxes, wild cats, and people.
- Secondary consumers are eaten by tertiary consumers
  - Predators or scavengers such as turkey vultures, crabs, and sometimes people.
- Decomposers, organisms such as bacteria and fungi, reduce dead plant or animal matter into smaller particles.