

# ***Management Applications: Coded Wire Tag Program***

Chinook and Coho Salmon  
in the Pacific Northwest

# Outline

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- Origins - the CWT Program
- Uses - Major Categories
- Descriptions
  - Objectives
  - Examples
  - Assumptions/Data Needs/Limitations

# Origins

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- Fin Marking & Tagging Efforts
  - General distribution/contribution patterns
  - Hatchery Production
- CWT Application Developed in the 1960's
  - Initial applications - hatchery production experiments
- 1977 Coastwide sampling program established

# The CWT Program

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- Coastwide coordination of CWT release and recovery efforts
- Standards for:
  - Sampling rates
  - Release/recovery reporting to centralized site
  - Access/capability to extract data of interest
  - Agreed upon methods for analysis among managers

# Uses of the CWT Program -

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- **Hatchery Evaluation/Management**
  - Hatchery Rearing/Release experiments
  - Estimating Hatchery Production - adults
  - Brood stock management
- **Natural Stock Evaluation/Management**
  - Natural stock spawning composition
  - Stock distribution (among fisheries, spawning areas)
  - Run size estimation
  - Smolt to Adult return rates
- **Fisheries Management**
  - Mixed Stock Fishery - Stock composition
  - Fishery Management – time/area stock differences
  - Harvest and/or Exploitation Rate estimation
- **Other experimental & monitoring uses**

# Production Experiments

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- Compare relative results of different rearing/release treatments
- Basic Assumptions
  - Availability of representative CWT release groups
  - Statistically adequate number of recoveries
  - Treatments are the only difference in rearing/release among groups

# Hatchery Programs: Estimating Production

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- **Hatchery Returns plus Landed Catch**
  - Simple: Production from single release program
  - More complex: Regional Production
- **Basic Assumptions**
  - Availability of representative CWT release groups
  - Statistically adequate number of recoveries
  - Fisheries: Estimated sample to catch ratios
  - Escapement: Estimate of ratio Tagged/Non-tagged returns
  - Regional production – relative size of returns to different components

# Stock Composition: Mixed Stock Fishery

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- **What stocks are contributing to the catch in the fishery? - What are the contributions of each component?**
- **Basic Assumptions**
  - Availability of representative CWT release groups for components
  - Statistically adequate number of recoveries
  - Fisheries: Estimated sample to catch ratios
  - Escapement: Estimate of ratio Tagged/Non-tagged returns for component runs (for total contribution estimates)



# Estimating Harvest and Exploitation Rates

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- Definitions
- Simple Terminal Area Case
- Multiple Fisheries
- Age Structure/Maturity Considerations
- Landed Catch vs Total Harvest Imposed Mortalities

# Harvest Rate: Landed Catch

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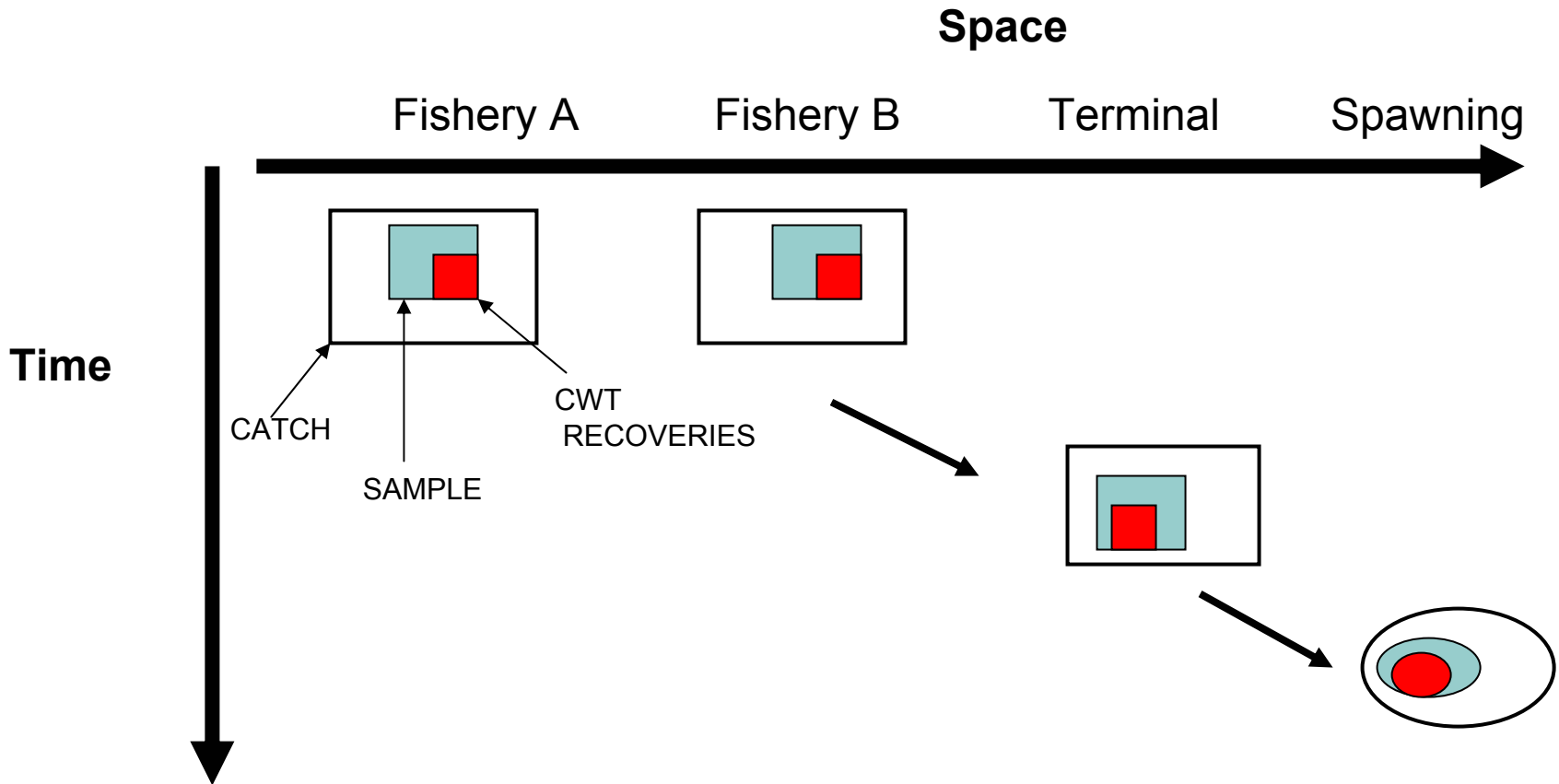
- **Proportion Harvested**

- Stock specific
- Simple example – Terminal area fisheries applications

- **Basic Assumptions**

- Availability of representative CWT release group(s)
- Statistically adequate number of recoveries
- Fisheries: Estimated sample to catch ratios
- Stocks include in the estimate are equally vulnerable to the fishery

# Components: Single Age Class



# Exploitation Rates: Landed Catch

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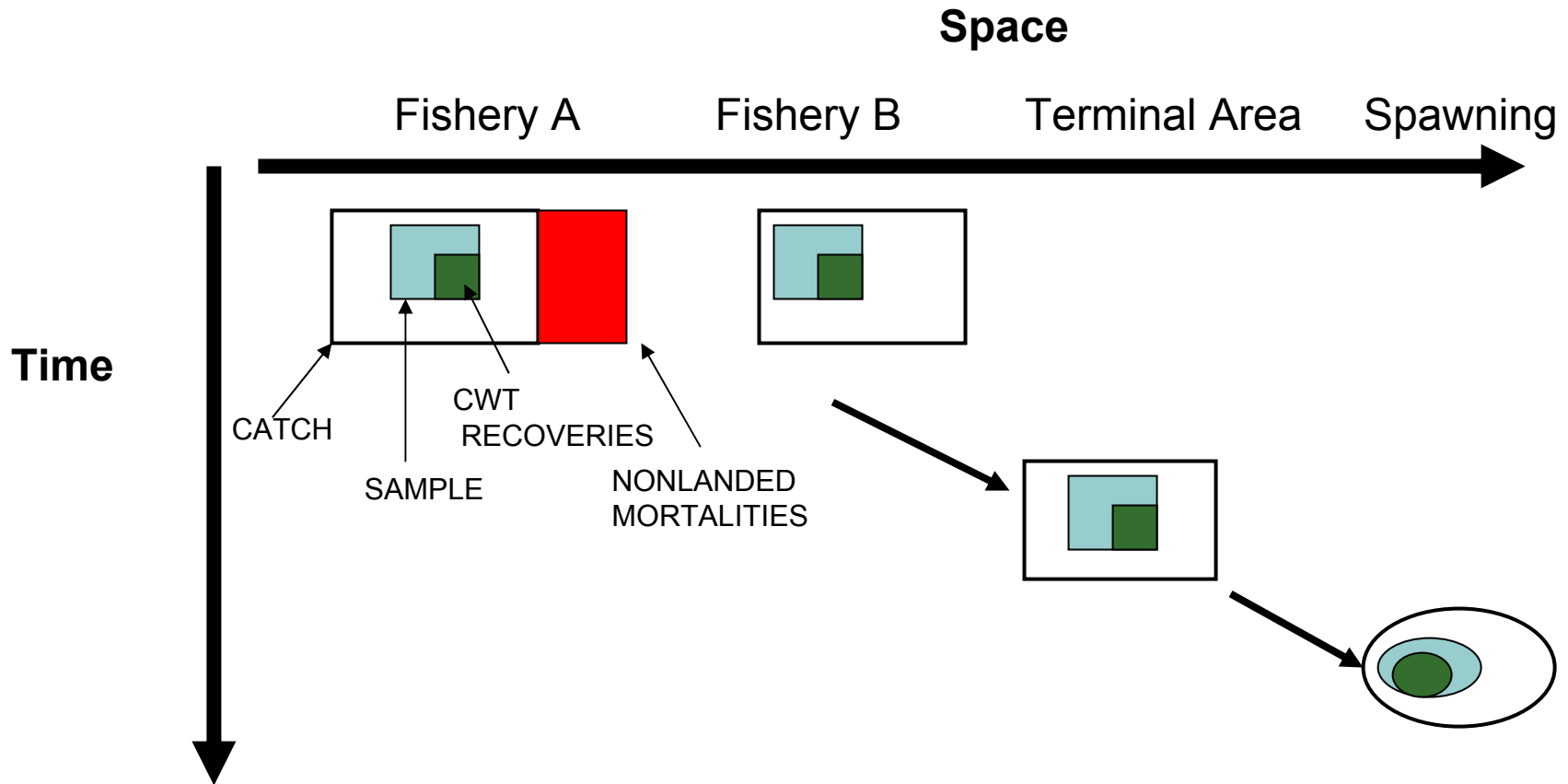
- **Expressed in terms of Cohort size at time of Fishery – proportion of fish alive at the time of the fishery**
- **Basic Assumptions**
  - Availability of representative CWT release group(s)
  - Statistically adequate number of recoveries
  - Fisheries: Estimated sample to catch ratios,
  - Fisheries: Estimate/assumption regarding movement in time/space
  - Escapement: Accurate estimate of total escapement

# Exploitation Rates: Considering Non-Landed Harvest Mortalities

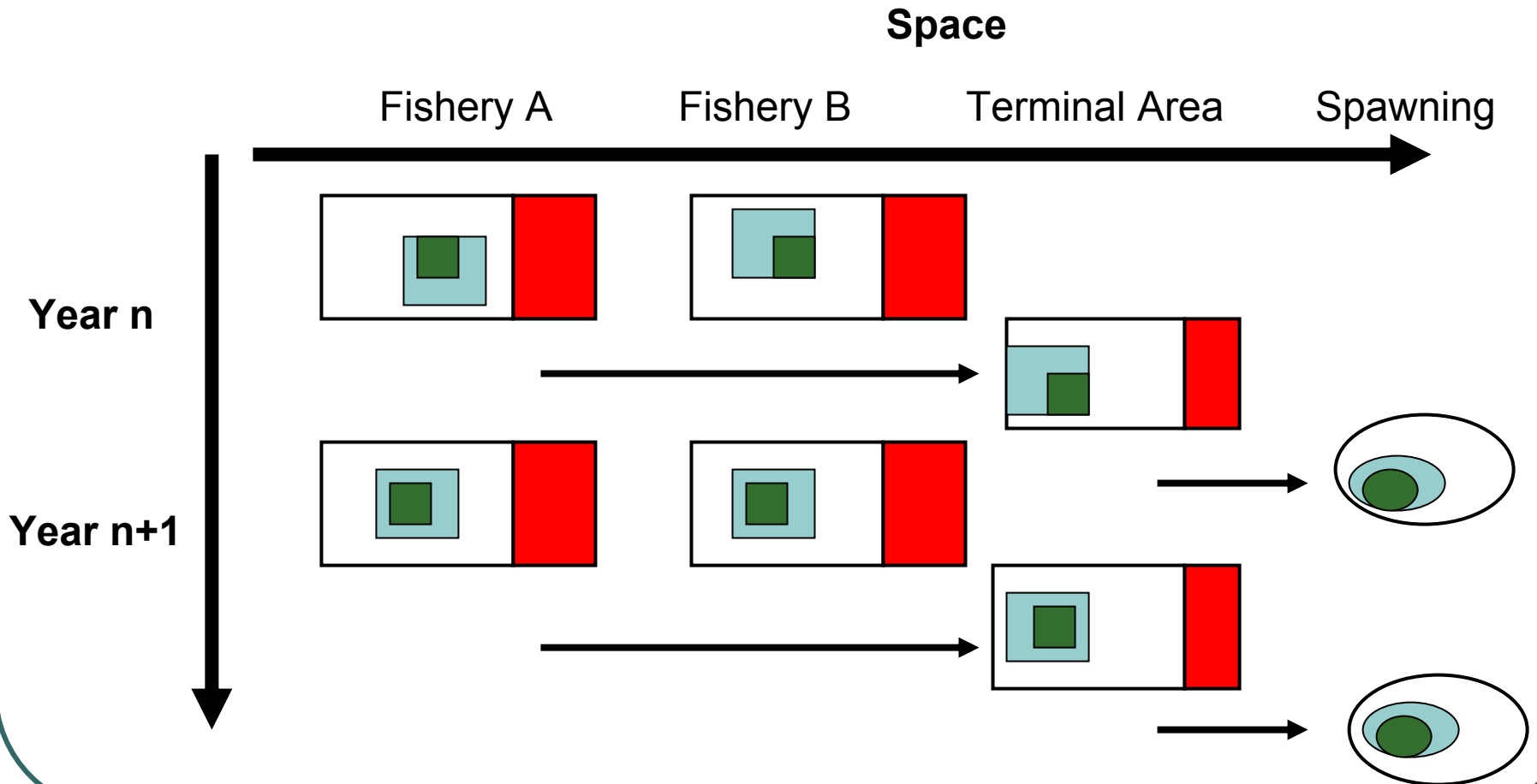
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- **Non-landed Catch Mortalities**
  - Releases of sub-legal sized fish
  - Drop-offs
  - Non-retention
  - etc.
- Lack of direct sampling for CWTs in non-landed mortalities
- Estimating Losses at the Fishery Level
  - Encounter rates
  - Mortalities

# Components: Single Age Class



# Components: Multiple Ages at Return (e.g. Chinook)



# Stock Exploitation Rates – Catch plus Non-landed Harvest Mortalities

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- **Expressed in terms of Cohort size at time of Fishery – including non-catch Mortalities**
- **Basic Assumptions**
  - Availability of representative CWT release group(s)
  - Statistically adequate number of recoveries
  - Fisheries: Estimated sample to catch ratios,
  - Fisheries: Estimate/assumption regarding movement in time/space
  - Escapement: Estimate of ratio Tagged/Non-tagged returns
  - Escapement: Accurate estimate of total escapement
  - Estimates of Non-Landed mortalities for fisheries – usually not sampled for CWTs, estimated based on composite estimate of non-landed catch, size/timing/spatial distribution of stocks.



# Stock Exploitation Rates – Use in Preseason Planning

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- **Multiple Stock Model**
  - Used to estimate allowable catch consistent with escapement or exploitation rate objectives
- **Data Needs**
  - Previous CWT Experiments for representative stocks
  - Preseason forecasts - stock abundance
- **Basic Assumptions**
  - Availability of representative CWT release group(s)
  - Fisheries: Estimate/assumption regarding movement in time/space
  - Stock distribution constant from year to year - sampled years are representative of average distributions
  - Time/Area movements

# Applications: Annual Management

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- **Time/Area Shaping:**
  - Determining spatial/temporal patterns within one or more fisheries
- **Examples**
  - Columbia River – Timing separation Snake Fall chinook vs Upriver Bright fall chinook
- **Assumptions/Data Needs**
  - Availability of representative CWT release groups for components
  - Statistically adequate number of recoveries by time/spatial units

# Brood Stock Management

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- Avoiding mixing of different stocks
  - Straying from other programs
  - Sorting among multiple programs
  - Support breeding protocols (avoiding deleterious inbreeding effects)

# Natural Production Applications

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- Determining stock composition: Natural spawners
- Estimating straying rates – usually using hatchery releases
- Reducing outside stock contributions
- Estimating run size – Mark/recapture methodologies

# Other Applications

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- Evaluating habitat/hydropower actions
  - Example: Smolt transport system – Columbia River
- Dam passage experiments