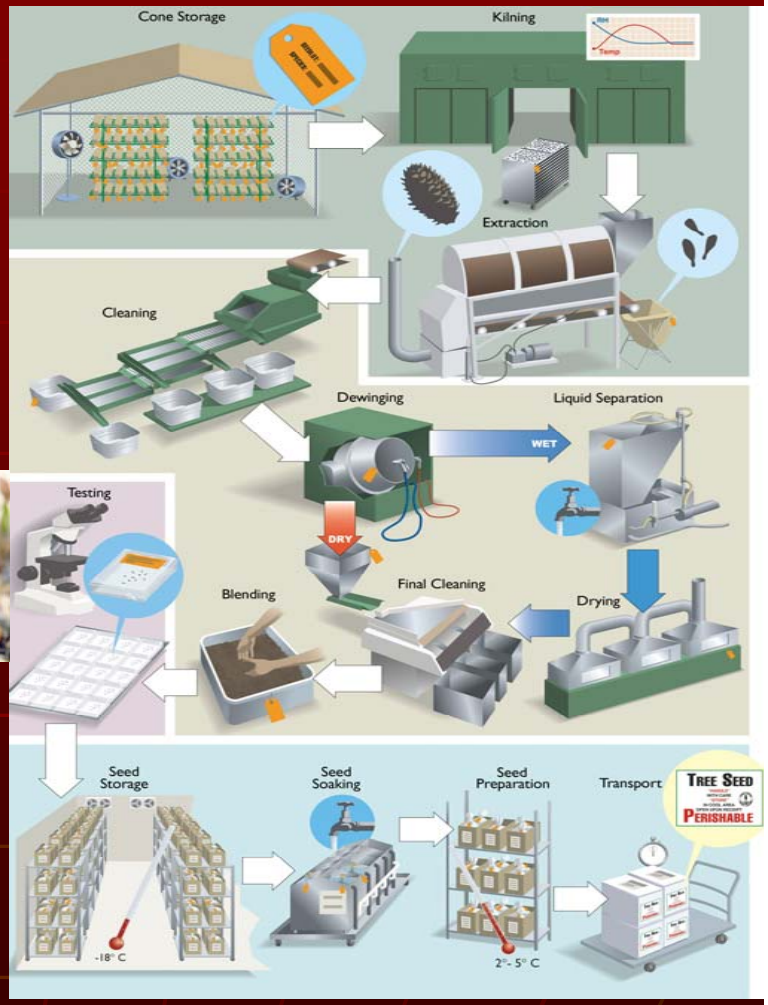
Tree Seed Workshop



2007

Tree Seed Centre Operations

- Deliver "Excellence in Cone and Seed Services"
  - Cone evaluations
  - Cone and seed processing
  - Seed Storage*
  - Seed Testing*
  - Seedlot Registration*
  - Seedlot transactions *
  - Pretreatment & distribution
- Meet Crown land reforestation program needs

*** Stewardship Activities**

TSC Facility Background

- Moved from Duncan in 1986 (started in 1957) **50!**
- 2.6 hectare parcel (ALR) / 15 FTE's
- Mission Critical Facility (Priority Response Level 1)

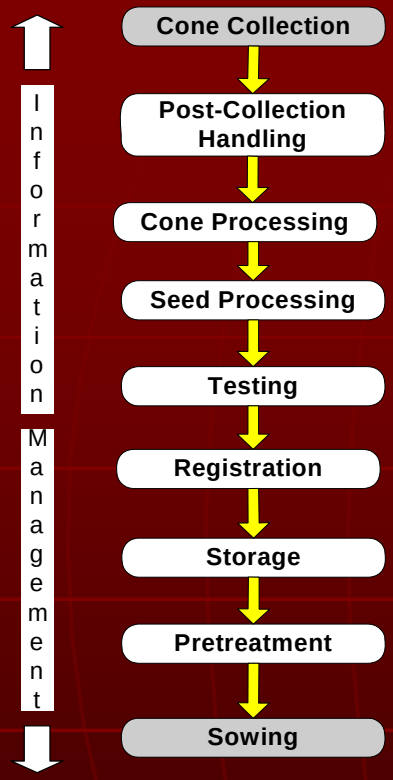
Security

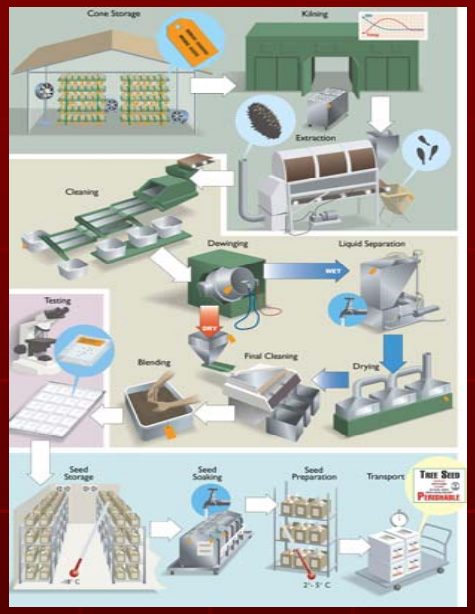
- fenced perimeter and on-site residence
- fire protection system
- intrusion alarms and video monitoring
- Back-up power generators
- Systems checked daily / service & repair contracts

Tree Seed Centre – Business Areas

- Cone and Seed Processing
- Inventory Management
- Testing
- Facilities and Site Operations
- Systems Operations
- Finance and Administration
- Cone and Seed Improvement

Seed Handling System





Ensure seedlot:

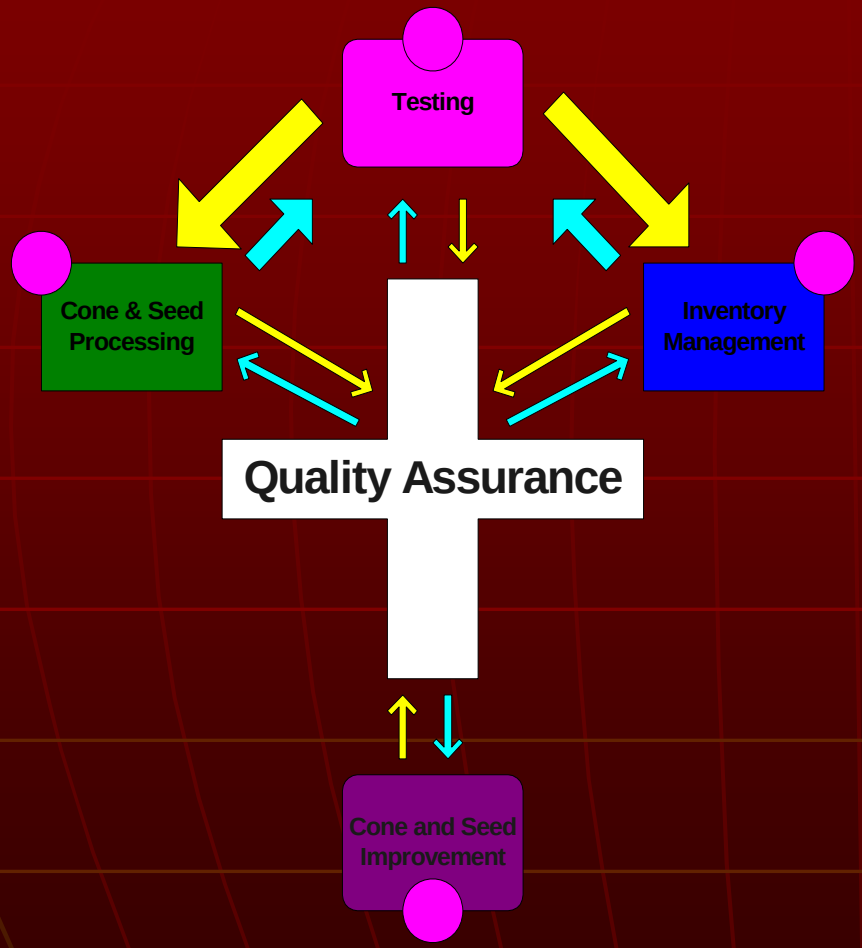
Identity

Integrity

Information

- Examines all steps of seed handling from collection to use
- Any previous “link” can impact your product

Quality Assurance Foundations



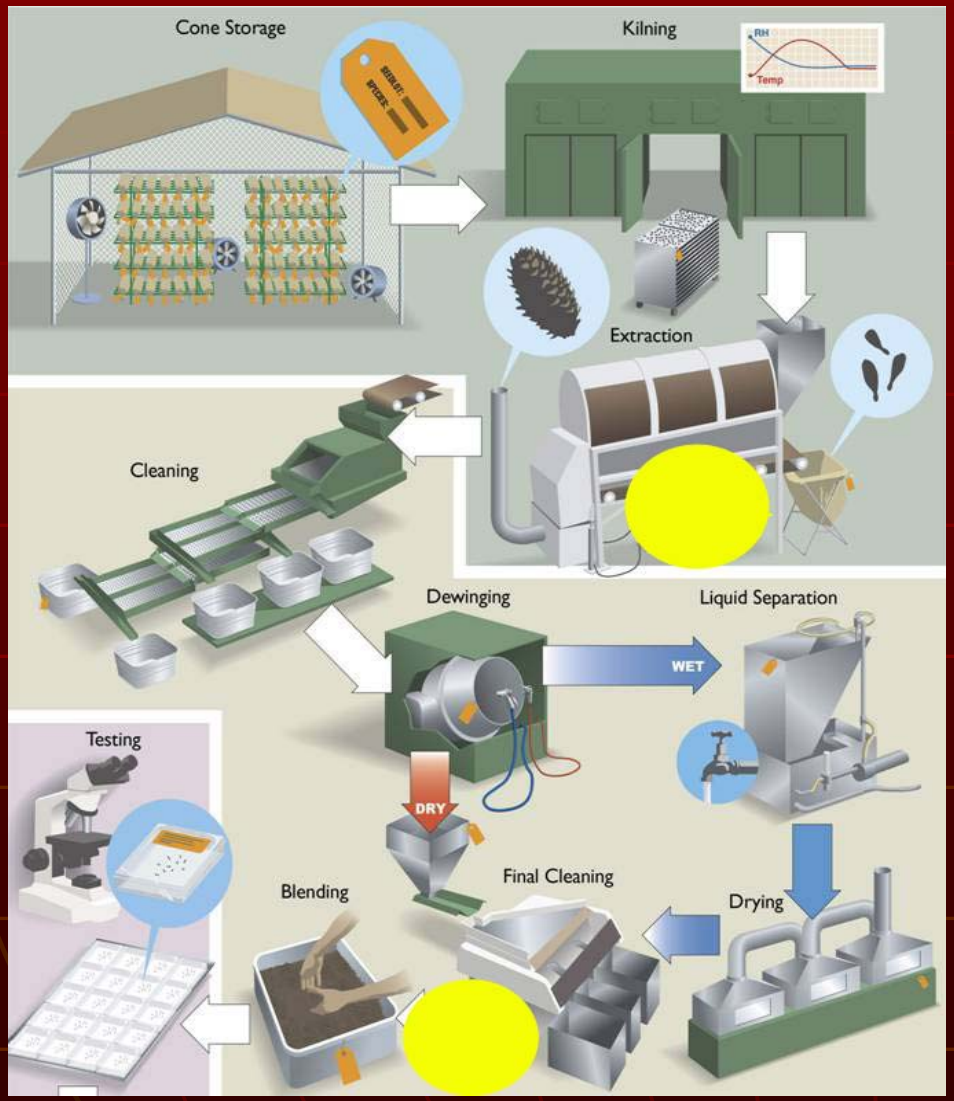
- Avoid Physical contamination (Clean)
- Avoid seedlot contamination (Label)
- Information Management (Organization)
- Handling a perishable product (Care)

CLOC is always ticking

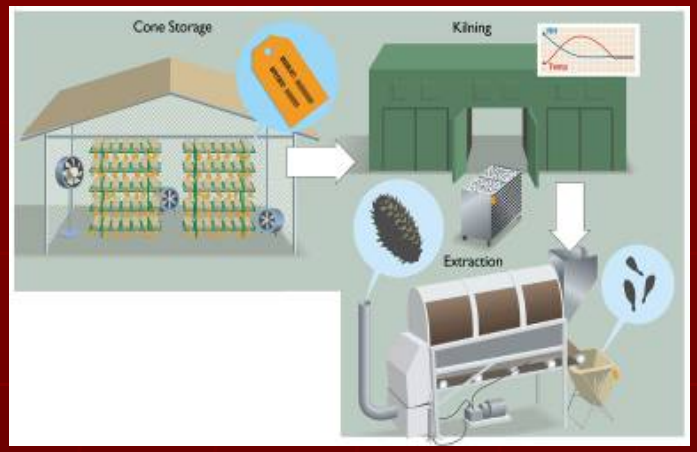
Cone-Seed Receipt & Storage

- Receive, store and evaluate cones/seeds
- Goal is to slowly dry the cones (after-ripening)
- turn sacks (**uniformity**)
- Protect from sun, rain, animals
- Allow for good air-flow
  - (1 sack depth except serotinousPli)

Cone and Seed Processing



Cone Processing



- Following off-site conditioning cones will be stored on site until processed
- Kilning
  - Lodgepole pine 60° C
  - All others kilned 40° C
- Extraction is a critical stage to ensure all filled-seed is removed from cones (monitoring)

Cone Processing (no kilning)

- *Abies* spp. Cones disintegrate (maturity)
- **NO KILNING**
- Resin vesicles
- Deep dormancy
- High degree of variability
- Fresh cones may be 40 - 50% moisture content
- Disintegration occurs at about 15%

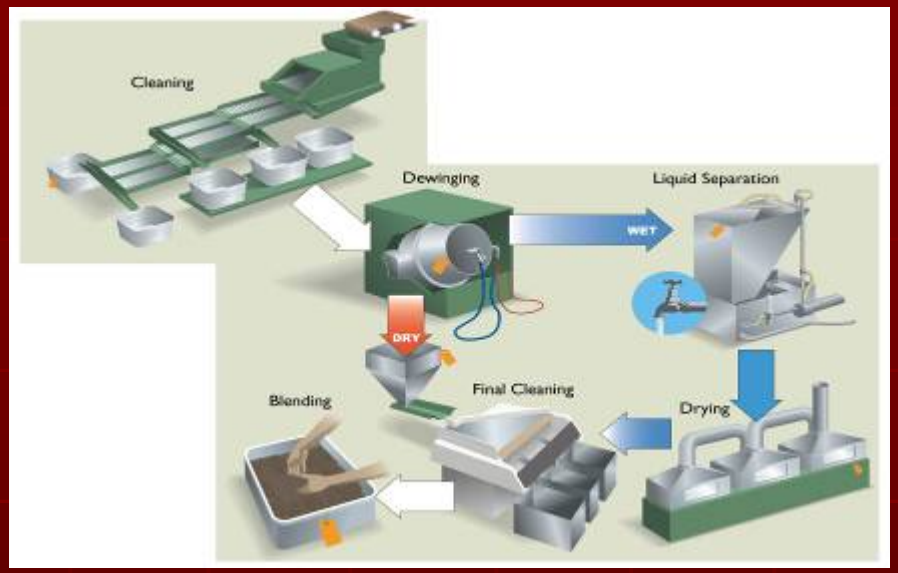
- Cw and Hw currently not being kilned
  - Resin vesicles
  - Low dormancy

Kilning

Tumbling /Seed Extraction

- Dissect + Determine # unextracted seeds/cone
- Tradeoff: All seed out *vs.* increased debris

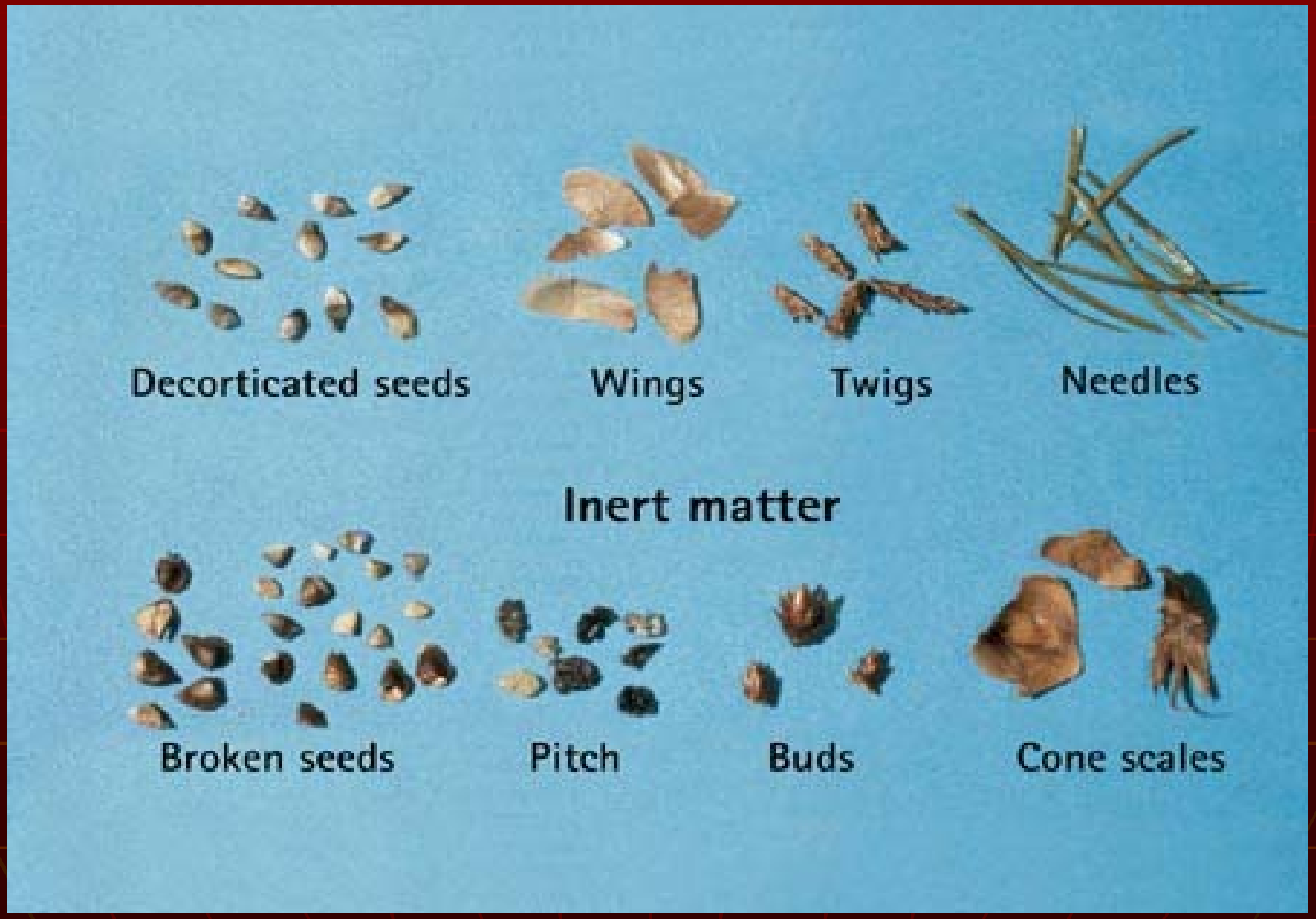
Seed Processing



- Initial Cleaning (scalping) will remove debris **based on size and shape** of screen opening
- Large decrease in volume of material
- Debris contains fungi, moisture and can abrade the seeds
- Dewinging based on seed wing anatomy attachment (*wet or dry*)
- Final Cleaning **based on specific gravity of seeds** (*gravity table or pneumatic separators*)

Initial Cleaning (Scalping)

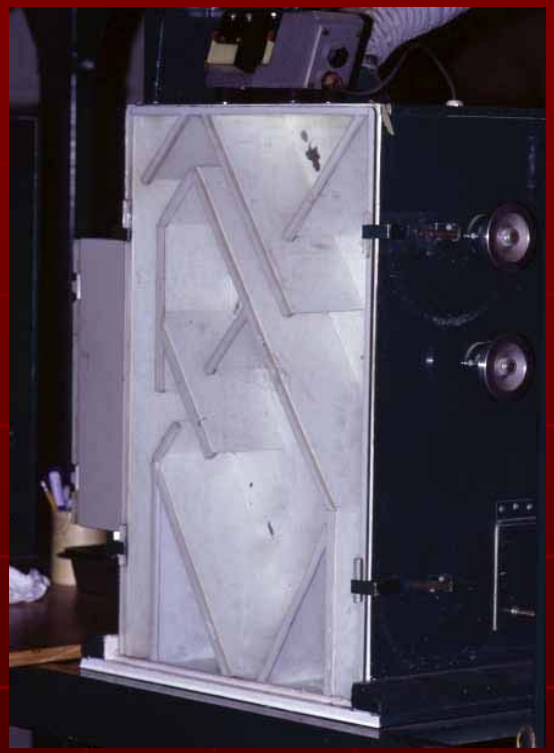
Common Impurities



Wet vs. Dry Dewinging

Dewinging

Final Cleaning and Blending



Process to Chief Foresters Standards

- clean to a minimum of 97% purity
- dry to a moisture content between 4-9.9%

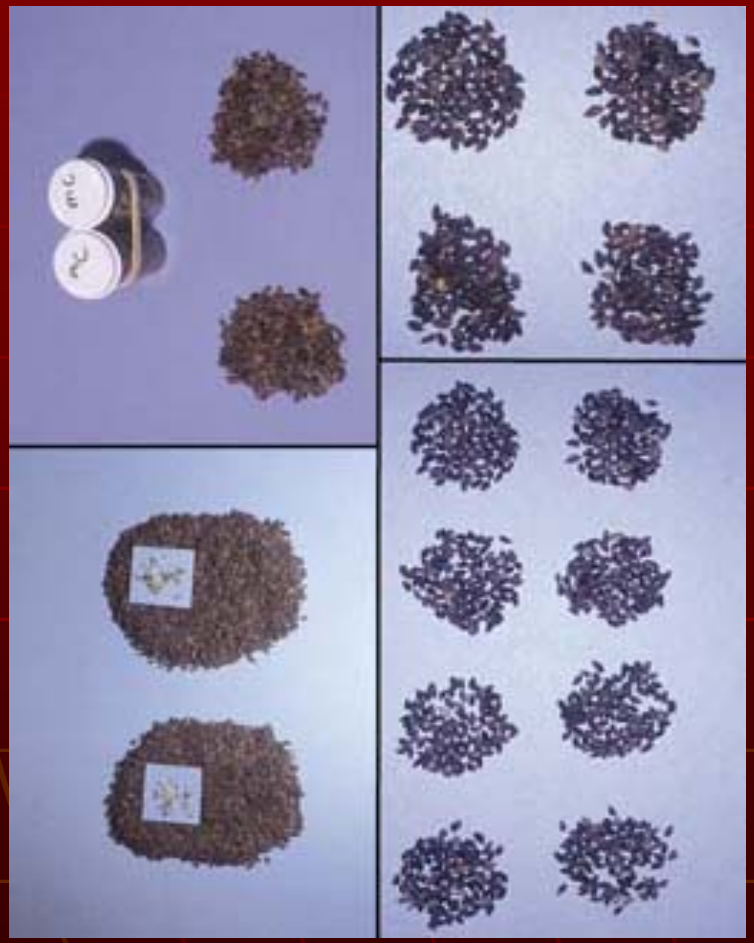
Cone and Seed Processing

Seed Testing

- **STANDARD**
  - "Seedlot" Results on SPAR (current '**A**' & past)
  - **Moisture Content** & **Purity**
  - SPG (derived from Purity & WT100)
  - Germination (possibly several tests)
  - X-ray

- **QUALITY ASSURANCE**
  - "Request" or trial result (*subset of a seedlot*)
  - Stratified Sowing Requests at shipping
  - Returned seed from nurseries

Standard Testing



Activities

- Conduct standard tests
  - Purity
  - Moisture content
  - Average seed weight
  - Germination (possibly several)
  - Total seedlot weight
  - X-ray
  - possibly fungal assays
- Identify/schedule seed for retesting
- ISTA is primary guide

Sampling

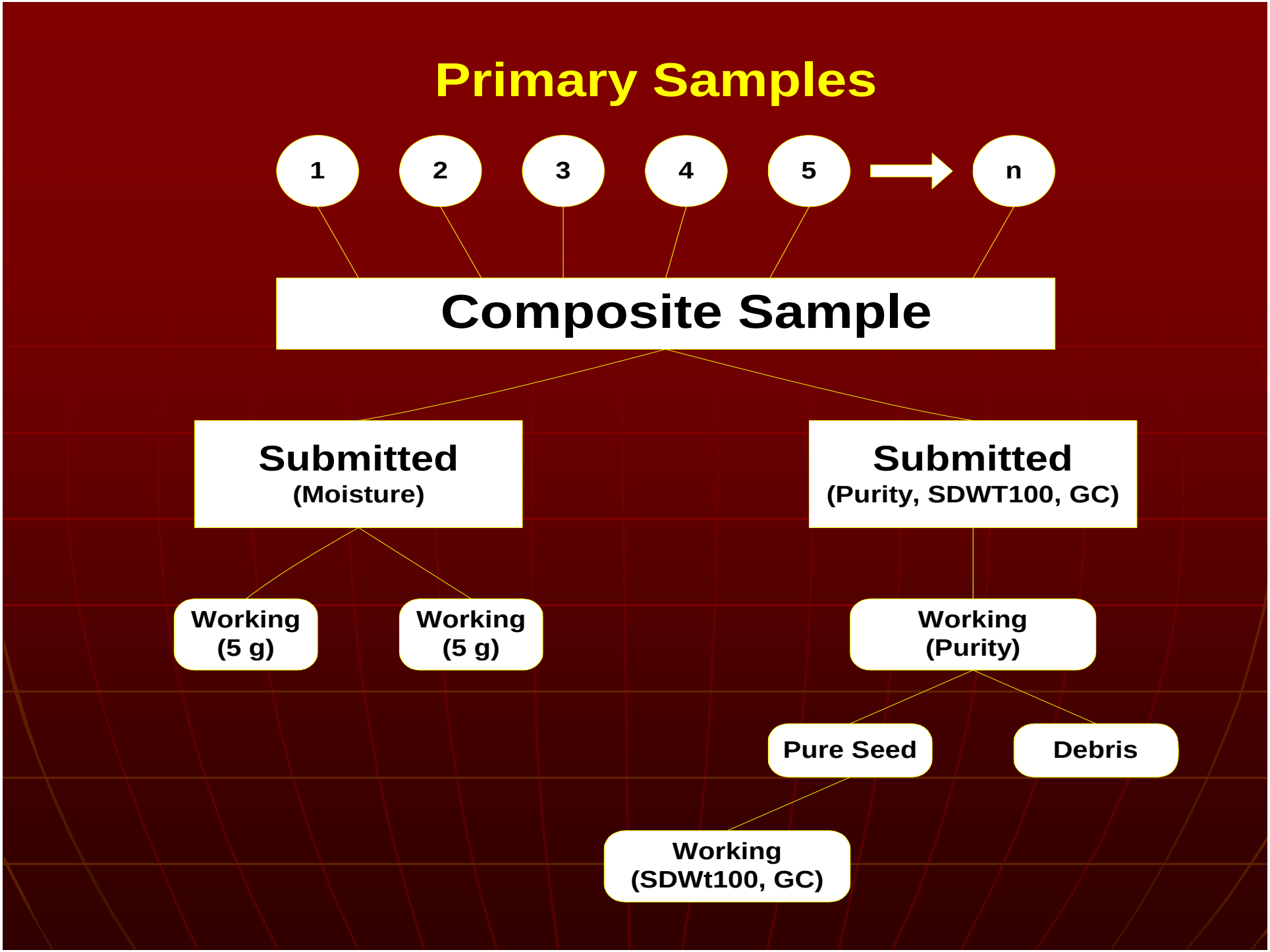
Objectives

1)To obtain a sample size suitable for tests

2) To ensure the contents in a sample are the same as the entire seedlot

Random and **Representative** are keywords

- **Primary samples** are taken at various points in a seedlot **(various boxes; positions within boxes)**
- ISTA specifies minimum # samples per container (*eg.* with 5-8 containers ***(about 35 to 60 Kg)*** take 2 primary samples from each container)
- sampling performed by trier or by hand


Primary Samples
1
2
3
4
5
n
Composite Sample
Submitted
(Moisture)
Submitted
(Purity, SDWT100, GC)
Working
(5 g)
Working
(5 g)
Working
(Purity)
Pure Seed
Debris
Working
(SDWt100, GC)

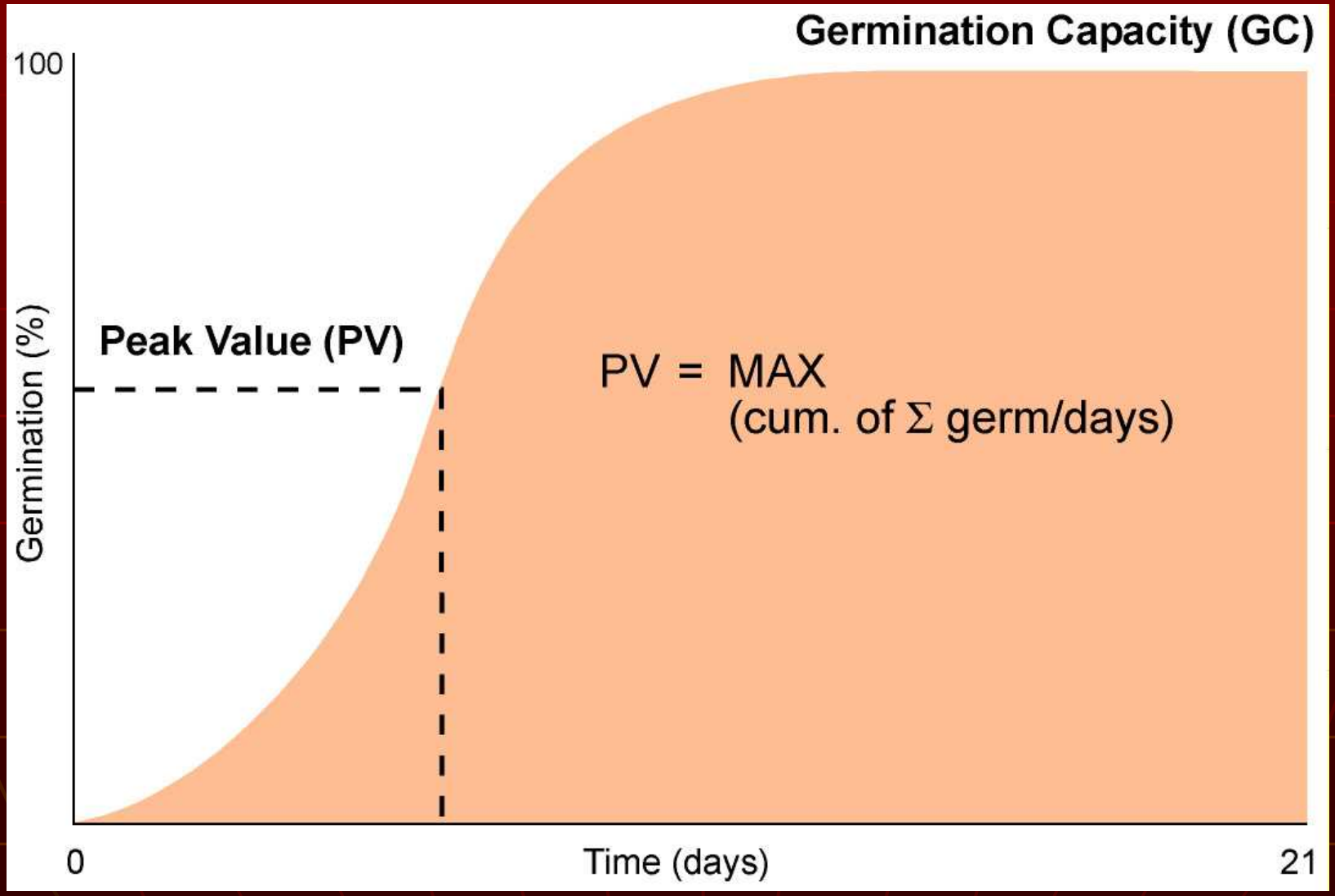
Test Tolerances

- Tolerances are acceptable levels of variability between replicates within a test
- If a replicate falls outside the tolerances then the test is repeated
- The **ISTA tolerances** are used at the TSC

Germination Test

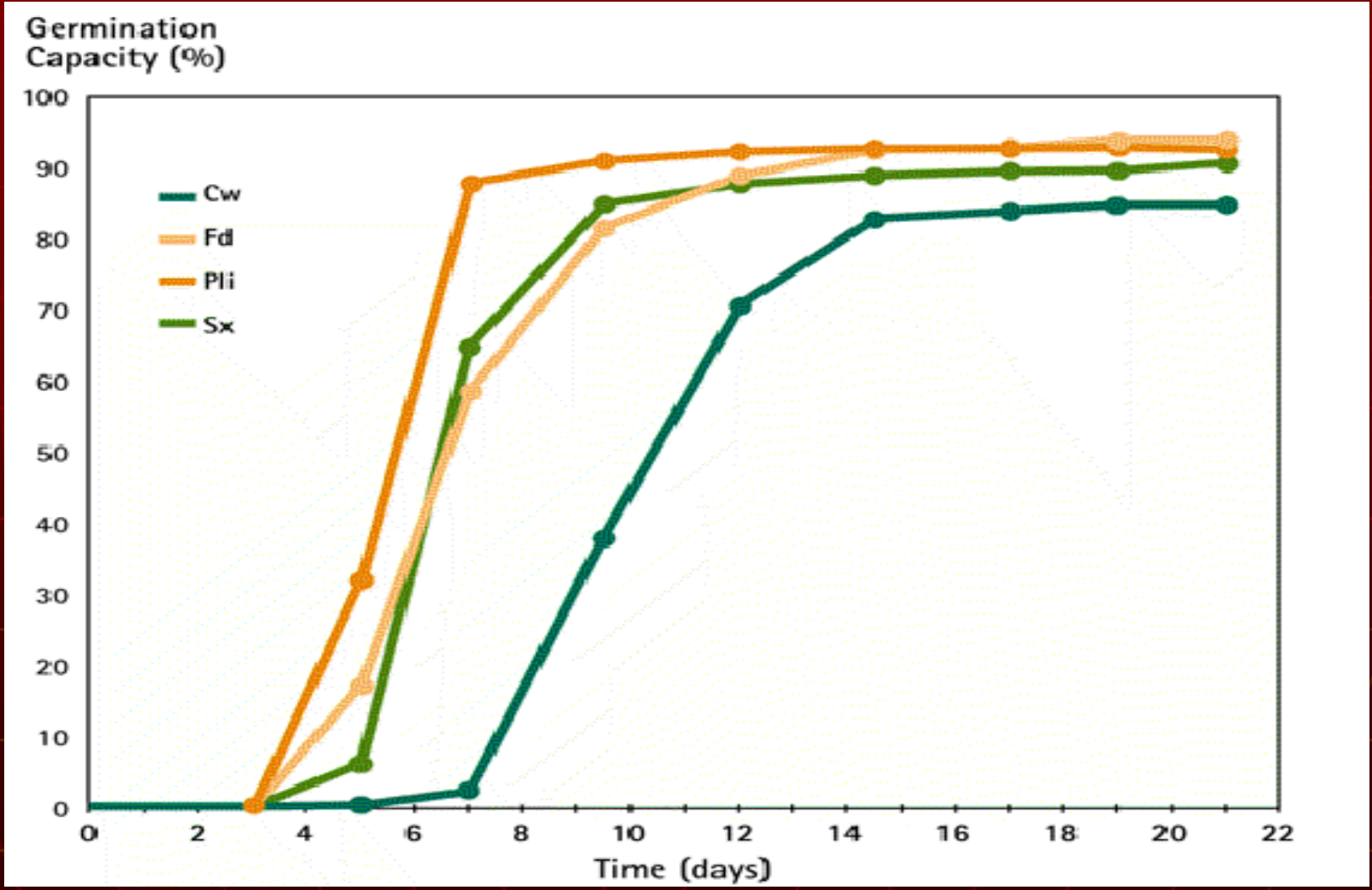
- All species *except Cw* receive an initial soak
- All species *except Cw* receive some chilling
- A germination test is composed of 4 x 100 seeds
  - 1 labelled germination dish
  - 1 -22-ply kimpack
  - 1 filter paper
  - 50 ml of water
  - 100 seeds

Germination Variables



Abnormal Germinants

Germination Curve Comparison



Quality Assurance Testing

- Processing results
  - *Abies* conditioning
  - Unkilned seed
- “Request” or trial result
- Stratified sowing requests
- Returned seed from nurseries

QA Results

- Sowing request (see attachment)
  - Compare testing, seed preparation and nursery germination
  - Some minor genetic class differences
- Pelleting efficiency (Cw =99% ; DR = 98%)
- Returned Seed – quality generally maintained (approximately 1% GC drop!)

Seedlot Registration

Purpose

- Register seedlots
- Maintain identity, integrity & information about seedlot
  - Source
  - Transferability
  - Genetic worth
  - Quality
  - Quantity
  - Heritage
  - Ownership
  - History of use

Seed Preparation & Shipping

Activities

- Scheduling
- Manage changes
- Withdraw seed
- Prepare seed
  - Soak and stratify
  - pellet
  - send dry
- Label and ship seed

Seed Pretreatment

- Application of treatments to seeds to overcome dormancy (*or* increase speed, uniformity, vigour, reduce pest window) and facilitate sowing for seedling production
- Generally mimics lab testing
- **Fungi are main 'enemy'**
- BASIC STEPS
  - SOAK
  - STRATIFY (moist chilling)

Seed Soaking

Surface Dry

- After soaking excess moisture is drained by hanging the net and then surface dried
  - seed flows freely = seeder requirement
  - to reduce bulking-up of pathogens
  - to allow oxygen to freely reach the embryo
  - reduction in pre-germination

DO NOT REMOVE INTERNAL MOISTURE

- Many systems can do a good job
  - minimum seed depth, uniform drying
  - movement of seed probably required

Surface ‘moist’ *vs.* ‘dry’ seed

Stratification Durations

- 0 Days Cw
- 21 Days
  - Sx, SS, Fd_, Lw
- 28 Days
  - Pli, Py, Hw, Bg
- 62 Days (G44)
  - Ba, Bl, Bn
- 92 Days (Split Regimes)
  - Ba, Bl, Bn….Yc
- 112+ Days
  - Pw

Seed Storage

- Moisture < 10%
- minimal metabolic activity (-18°C)
- seedlot deterioration estimated as

  $\Delta GC / \Delta time$

- retest species deteriorating faster more often

- Gene Conservation

Cone-Seed Improvement

Activities

- Conduct applied and basic research
- promote seed-use efficiency
- Develop and summarize QA programs
- Provide tree seed information and extension services

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http://www.for.gov.bc.ca/hti/treeseedcentre/index.htm