



Willamette Spring Chinook – Life History and Habitat Connections

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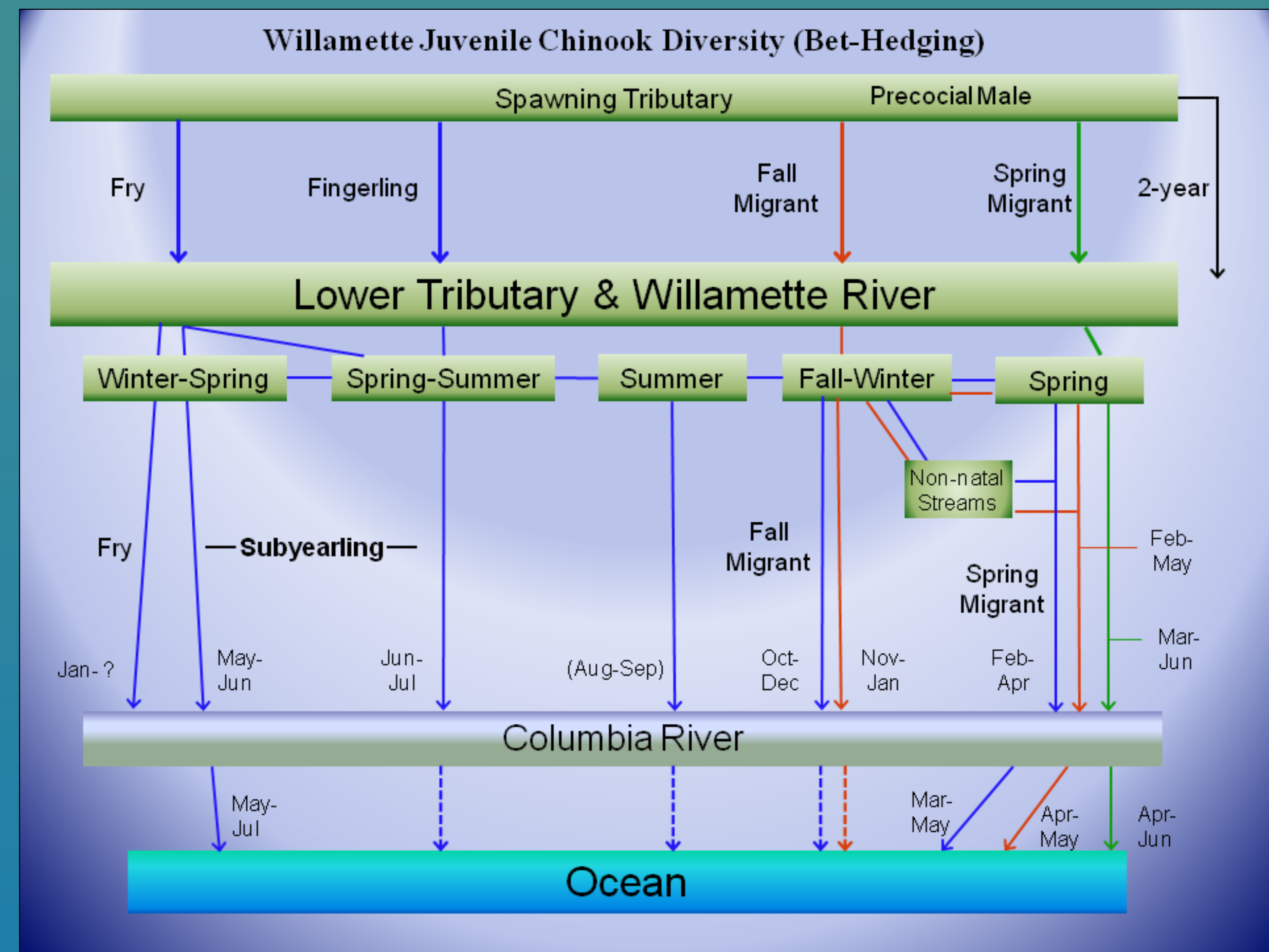
Oregon Department of Fish and Wildlife, Corvallis



Life Cycle of Juvenile Chinook

Willamette spring Chinook exhibit a wide range of rearing and migratory life histories

As a result, they use a wide range of habitats for growth and rearing, including the Willamette River



Juvenile Chinook in the Willamette River

- The type of habitat juvenile Chinook use depends on the size of the fish and on the time of year
- Fry use edges of the river, larger fish move into deeper water
- Juvenile salmon use shallow gravel bars in spring and deeper pools in summer
- During winter floods, juvenile Chinook move into flooded side channels, floodplains, and small, intermittent streams



- Pools for larger fish
- Productive riffles
- Small side channels
- Cold water pockets
- Refuge areas during floods
- Narrow channels with shade
- New gravel bars & islands
- Shallow edges for fry

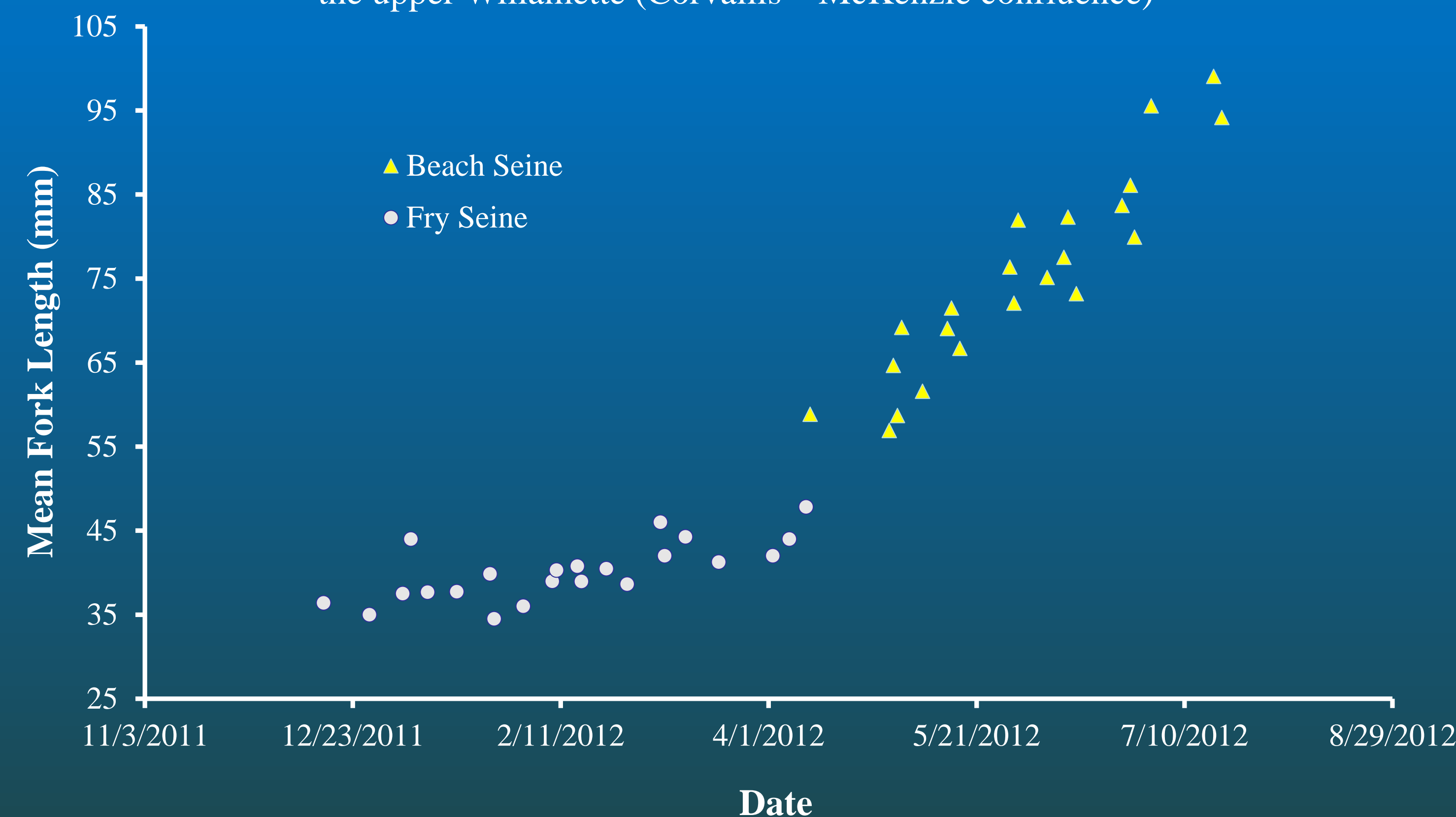
Areas of the river that are actively changing provide good juvenile Chinook habitat

Some Chinook fry migrate to the mainstem Willamette soon after emergence, so they can grow quickly in this productive habitat and smolt as subyearlings

Emergence timing and migration of Chinook fry from 2011 brood year

| | Peak Spawning | Est. Early Emergence | First fry caught | Peak catch | Distance to nearest spawning (miles) |
|------------------|---------------|----------------------|------------------|------------|--------------------------------------|
| North Santiam | Sept 30 | Nov 22 | Nov 23 | March | 0 – 27 |
| South Santiam | Sept 28 | Nov 29 | Dec 7 | April | 0 – 33 |
| Santiam | N/A | N/A | Dec 7 | March | 27 – 45 |
| McKenzie | Sept 27 | Dec 10 | Dec 28 | April | 0 – 34 |
| Upper Willamette | N/A | N/A | Dec 16 | February | 34 – 149 |
| Mid Willamette | N/A | N/A | Dec 13 | March | 39 – 119 |
| Lower Willamette | N/A | N/A | Jan 6 | April | 119 + |

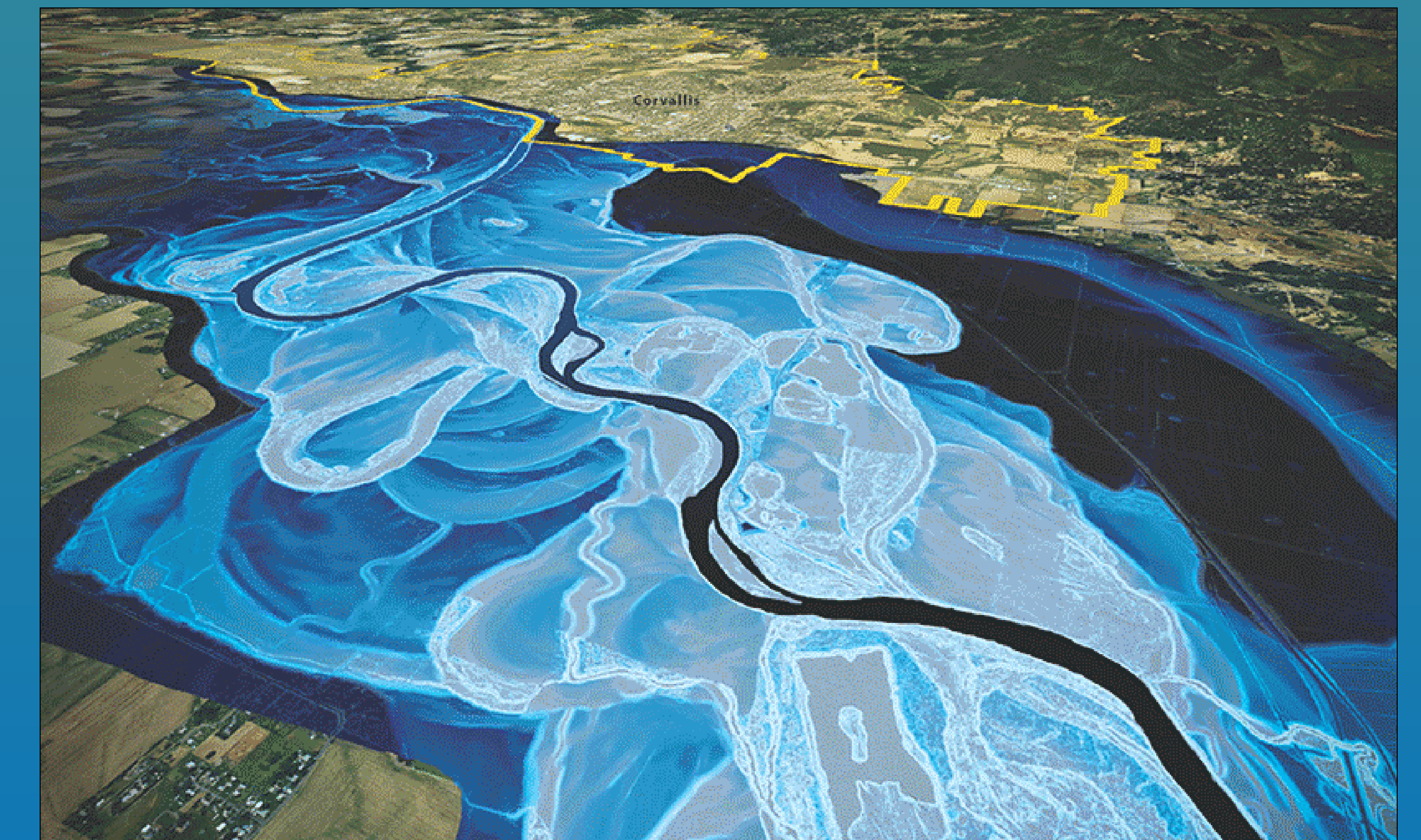
Mean lengths of juvenile Chinook from the 2011 brood year sampled in the upper Willamette (Corvallis – McKenzie confluence)



Reconnecting Salmon and the River

- Willamette spring Chinook evolved in a dynamic river system, adapting to the changing river by expressing diverse life histories.
- The mainstem Willamette provides important habitat for juvenile Chinook following a number different life histories
- Juveniles migrate into the mainstem at different life stages and are present in the Willamette all year
- A proportion of Chinook fry from each spawning tributary migrate into mainstem habitats soon after emergence
- Many of the juvenile Chinook that rear in the Willamette migrate to saltwater as subyearlings, a life history that contributes to adult returns

Many sections of the Willamette River used to be a vast network of braided channels



Lidar imagery and graphic design by Daniel Coe
<http://www.oregongeology.org/pubs/ll/p-posters.htm#Willamette>

Historically, juvenile salmon had access to a wide diversity of habitats that supported diverse life histories. At present, the most active areas are those with natural banks.

Current restoration efforts are working to restore connectivity among flood plain habitats and to protect dynamic areas of the Willamette.



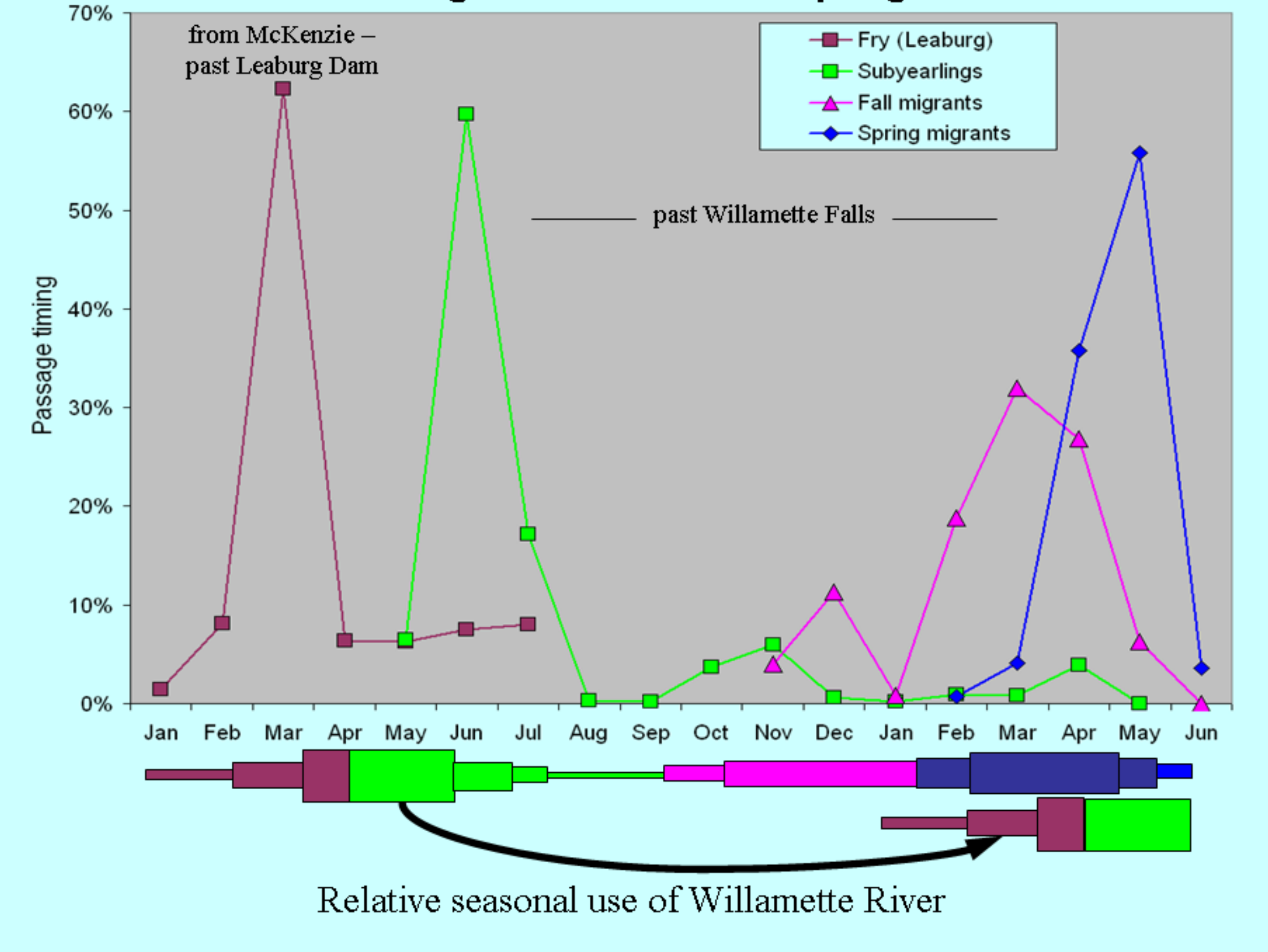
Flooded channels & fields – Harkins Lake, June 2010
Michael Pope, Greenbelt Land Trust

Current and future research

- Growth and migration of yearling migrants rearing in the upper McKenzie
- Survival to adult return of juveniles following the different life history pathways
- Contributions of fry migrants from the major spawning rivers
- Understanding size and growth thresholds that trigger migration

- Patterns of movement shows some fry leaving spawning tributaries shortly after emergence in winter & early spring
- Migrant fry rear in the main-stem Willamette, in edge habitat
- Some leave the Willamette as subyearlings after rearing in the mainstem
- Some juvenile Chinook rear through the summer and winter, leaving the Willamette as yearling migrants

Generalized Migration of Juvenile Spring Chinook



Juvenile Chinook are most abundant in the Willamette River during winter and spring when fry, subyearlings, and yearling fish are all present